Feasibility Study Report
Lackawanna Incinerator Site (915206)
Lackawanna, New York
Work Assignment D007624-10

Prepared for

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York 12233-7017

Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
6712 Brooklawn Parkway, Suite 104
Syracuse, New York 13211-2158
(315) 431-4610

November 2015
Version: FINAL
EA Project No. 14907.10

Feasibility Study Report
Lackawanna Incinerator Site (915206)
Lackawanna, New York
Work Assignment D007624-10

Prepared for

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York 12233-7017

Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
6712 Brooklawn Parkway, Suite 104
Syracuse, New York 13211-2158
(315) 431-4610

Donald F. Conan, PE — 11 November 2015
Vice President — Date

James C. Hayward, PE — 11 November 2015
Senior Engineer — Date

November 2015
Version: FINAL
EA Project No. 14907.10

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (CONTINUED)

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	Microgram(s) per liter
amsl	Above mean sea level
ARARs	Appropriate or relevant and applicable requirements
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DER	Division of Environmental Remediation
DPW	Department of Public Works
EA	EA Engineering, P.C. and Its Affiliate EA Science and Technology
EPA	United States Environmental Protection Agency
FS	Feasibility study
ft	Foot or feet
ft^2	Square foot or square feet
GRA	General response actions
in.	Inch(es)
IRM	Interim remedial measure
mi	Mile(s)
mg/kg	Milligrams per kilogram
No.	Number
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
PCB	Polychlorinated biphenyl
RAO	Remedial action objectives
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
SCG	Standards, Criteria, and Guidance
SCO	Soil cleanup objectives
XRF	X-ray fluorescence
yd^3	Cubic yards

1. INTRODUCTION AND PROJECT OVERVIEW

EA Engineering, P.C. and its affiliate EA Science and Technology (EA), under Contract to the New York State Department of Environmental Conservation (NYSDEC) (Work Assignment No. D007624-10) were tasked to perform a remedial investigation (RI) and feasibility study (FS) at the Lackawanna Incinerator site (NYSDEC Site Number (No.) 915206) located in the City of Lackawanna, Erie County, New York (Figure 1-1). The site is listed as a Class "2" site in the State Registry of Inactive Hazardous Waste Sites (list of State Superfund sites), meaning that the site represents a significant threat to public health or the environment, and action is required. The site consists of one operable unit; however, for the purposes of the RI and FS, the Lackawanna Incinerator site has been divided into the following areas (Figure 1-2):

- On-site Area: The incinerator property contains the former incinerator buildings.
- Smokes Creek Corridor: This area includes a recreational path and Smokes Creek, located immediately north and northeast of the On-site Area.
- Baker Hall Property: This area includes the northern, undeveloped portion of the parcel that adjoins the site to the east.

1.1 PURPOSE AND SCOPE

This FS Report has been prepared to develop and evaluate alternatives for remedial action, and determine which alternative is the most protective of public health and the environment, and conforms to relevant and appropriate standards, criteria and guidance (SCGs) for the Lackawanna Incinerator site.

The FS was prepared in accordance with the most recent versions of the *Guidance for Conducting Remedial Investigations and Feasibility Studies under Comprehensive Environmental Response, Compensation, and Liability Act* (United States Environmental Protection Agency [EPA] 1988) and Division of Environmental Remediation (DER)-10, *Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010), and focused on remedial alternatives proven effective at addressing site-related contamination.

1.2 REPORT ORGANIZATION

The FS report has been organized as follows:

- ***Section 1***—Introduction and Project Overview
- ***Section 2***—Summary of RI and Exposure Assessment
- ***Section 3***—Development of Remedial Action Objectives (RAOs)
- ***Section 4***—General Response Actions (GRAs)
- ***Section 5***—Identification and Screening of Technologies
- ***Section 6***—Scoping and Development of Remedial Alternatives
- ***Section 7***—Costing and Evaluation Criteria

- ***Section 8***—Detailed Analysis of Alternatives and Recommendations
- ***Section 9***—References.

1.3 BACKGROUND

1.3.1 Lackawanna Incinerator Site Location

The Lackawanna Incinerator site is located at 2960 South Park Avenue in the City of Lackawanna, Erie County, New York. The incinerator area is a 2.5-acre area, partially bounded by a perimeter fence, situated within a larger, city-owned parcel of land. Main access to the site is from Reddon Street, off of South Park Avenue. The site's main features are two brick multi-story buildings that housed municipal solid waste incinerators (the southern and northern buildings), and a large soil ramp that was used to access the third floor of the northern building (Figure 1-3). The remainder of the site is generally open space. The southern portion of the property consists primarily of an unpaved area with a framed shed that is currently used to house equipment for the City of Lackawanna Department of Public Works (DPW).

The site is located in a mixed-use area including industrial, commercial, and residential properties. The property is bounded to the west by the Lackawanna Veterans Stadium, to the south by the remaining area of the DPW property, to the east by a parcel (the northern area which is undeveloped) owned by the Baker Hall Victory Services, and to the north by a paved walking path open to the public that runs parallel to the southern bank of Smokes Creek. Numerous single-family residential properties are located south and southwest of the site. Holy Cross Cemetery is located north of the site, on the northern side of Smokes Creek.

1.3.2 Lackawanna Incinerator Site History

The incinerators were primarily used to burn municipal trash, although some medical waste from Our Lady of Victory Hospital, was intermittently burned (Malcolm Pirnie 2005). Operations at the site began in 1927 at the southern incinerator building (Figure 1-3). The southern incinerator was decommissioned in 1950, and operations shifted to a newly constructed replacement incinerator located in the north-central portion of the site. The first floor of the southern incinerator was filled with ash material after it was decommissioned in 1950.

The northern incinerator building is three stories tall. During operation, garbage trucks entered the third floor, via two overhead garage doors, and dumped material into the incinerators located on the second floor. Following combustion, ash from the incinerators was loaded into dump trucks that entered the ground floor on the western side of the building and exited to the east. Dump trucks accessed the third floor of the incinerator via a soil ramp. Initially, the ramp was constructed from a mix of soil and steel foundry slag. The ramp was widened through the addition of street sweepings, and discarded refractory brick from the incinerator chimneys following routine repair and maintenance activities (Malcolm Pirnie 2005). Operation of the northern incinerator ceased in 1980.

1.3.3 Current Land Use of Site and Adjoining Areas

On-site Area

The current primary use of the site is for materials staging and equipment/vehicle storage for the City of Lackawanna's DPW facilities, which adjoins the site to the south. Piles of waste road material, soil, and mulch, as well as excess piping, chain-link fencing, brick, cinder blocks, and scrap metal, are located throughout the site. A small shed structure, located along the southern site boundary, is used for storage

The main (second) floor of the southern incinerator was used as a woodworking shop until 2012, when the City of Lackawanna Department of Buildings and Codes condemned the southern incinerator, due in part to brick failure on the incinerator stack. The first floor of the northern incinerator is currently used by the City Animal Control Officer for the temporary caging of animals. The second floor contains the intact incinerator equipment for two incinerator trains, in addition to some automotive parts and scrap metal. The third floor currently contains truck parts, automotive repair tools, and approximately a dozen barrels with unknown contents which remain from a former period of use as an auto body shop. Various chemicals and cleaners are stored throughout the northern building.

Smokes Creek Corridor

The approximately 5.5-acre Smokes Creek Corridor is adjacent to the north of the On-site Area and Baker Hall Property, and is separated from these areas by chain-link fencing. Smokes Creek Corridor encompasses the southern bank of the north branch of Smokes Creek including a paved walking path which runs approximately 2,200 feet (ft) along the southern bank of Smokes Creek. Public access to the paved walking path is at its western extent, near the Lackawanna Veterans Stadium entrance, and at its eastern extent, through a park owned by the City of Lackawanna.

Baker Hall Property

The 17-acre Baker Hall Property, which includes the Baker Victory Services Orphan Home and Intermediate Care Facilities for the developmentally disabled, is located immediately east and southeast of the site. The northern portion of the Baker Hall Property, approximately 10 acres, is currently an overgrown vacant field with emergent woods, while the remaining southern portion of the property includes residential group homes.

1.3.4 Physiography

The site is located within the Erie-Ontario Lowlands physiographic province and is within the United States Geological Survey Buffalo SE, New York, 7.5-minute topographic quadrangle map, dated 1965 (Figure 1-4). The nearest surface water feature is Smokes Creek, which is adjacent to the paved walking path north of the site. Smokes Creek flows west approximately 2.7 miles (mi) until it discharges to Lake Erie.

A topographic survey of the site and adjoining areas was completed during the RI field activities. Site elevations range from approximately 594 to 615 ft above mean sea level (amsl). The natural grade at the site, prior to ramp construction, was generally level, with elevations ranging from about 590 to 593 ft amsl, based on historical topographic maps. North of the site, the ground surface elevation along the paved walking path is generally level at 592 ft amsl, and slopes down to Smokes Creek with a surface water elevation of approximately 580 ft amsl. A relatively narrow floodplain terrace (approximately 10-ft wide) is present from the water's edge to approximately 582 ft amsl.

1.3.5 Site Geology

Overburden at the site consists of fill material underlain by Pleistocene glaciolacustrine deposits. Native material at the site is overlain by fill materials consisting of reworked silt and clay intermixed with varying amounts of slag and gravel, as well as trace amounts of glass, cinders, brick, and ash. A review of the geologic map of New York, Niagara Sheet published by the University of the State of New York, the State Education Department, dated 1970, identifies the native material underlying the site as glaciolacustrine deposits overlying shale and mudrock of the Levanna Shale Member of the Skaneateles Formation.

The observed fill material consisted of a mix of sand, gravel, silt, clay, glass, ash, cinders, slag, wood, brick, coal, and metal fragments. The fill material was typically dense and ranged from dry to moist. In some on-site and adjacent off-site areas a portion of the fill material is likely derived from former incinerator operations, based on the presence of cinders or gravel-sized rounded glass (that appears to have been melted and subsequently hardened).

Glaciolacustrine deposits encountered in soil borings completed during the RI consisted primarily of reddish brown to gray laminated silt, clay, silty clay, and clayey silt of moderate to high plasticity. Consistency of the unit decreased from hard/stiff to softer with depth due to an increase in moisture content with depth. Horizontal and vertical laminations and fractures were observed in the glaciolacustrine deposits. Lenses containing varying amounts of fine to very fine sand were encountered in some borings, but were not consistent throughout the site. Till consisting of clay and silt with some fine sand and gravel was encountered at one location near the northwestern On-site Area boundary. Bedrock was not observed in any of the borings installed to a maximum depth of 28 ft below ground surface (bgs) during the RI or previous investigations.

1.3.6 Site Hydrology/Hydrogeology

Surface water drainage at the site flows radially from the elevated fill ramp to drainage ditches and two stormwater catch basins, which drain northward into Smokes Creek. The northern incinerator has a French drain that may be connected to this storm system. A third outfall located north of the adjacent Baker Hall Property discharges to Smokes Creek. Historically, the incinerators were quenched with water after a batch-combustion took place. The associated wastewater reportedly ran into a drain system, potentially entering the storm sewer network and

eventually Smokes Creek. Smokes Creek generally flows west approximately 2.7 mi downstream to its discharge point at Lake Erie.

Shallow groundwater flow at the site is generally north towards Smokes Creek. The local water table exists within the underlying glaciolacustrine deposits from approximately 6 to 10 ft bgs, excluding the area of the fill mound. Saturated soil was observed at a depth of approximately 10 ft bgs in the soil ramp, which may be indicative of perched water in the ramp area. The glaciolacustrine silt and clay serves as a confining unit.

2. SUMMARY OF REMEDIAL INVESTIGATION AND EXPOSURE ASSESSMENT

The following sections briefly summarize the environmental impacts at the Lackawanna Incinerator site as determined during the RI (EA 2014). Media that were evaluated during the RI included surface and subsurface soil/fill material within all three areas (On-site Area, Smokes Creek Corridor, and Baker Hall Property), as well as the Lackawanna Veterans Stadium (located to the west of the site), On-site Area groundwater and stormwater, and Smokes Creek surface water/sediment.

This section is organized by area and media of potential concern. The impacts associated with the environmental media are based on analytical results, and their comparison with the appropriate SCGs based on site use:

- Soil—6 New York Code of Rules and Regulations (NYCRR) Part 375 Environmental Remediation Programs – Soil Cleanup Objectives (SCOs) (NYSDEC 2006).

- Surface Water and Groundwater—NYCRR Part 703.5 Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations, as presented in the Division of Water Technical and Operational Guidance Series 1.1.1, (NYSDEC 1998, as amended).

- Sediment—Screening and Assessment of Contaminated Sediment (NYSDEC 2014).

A full analysis of all data collected during the RI is included in the RI Report (EA 2014). However, the results of the Lackawanna Veterans Stadium soil and groundwater sampling activities contained no exceedances of the applicable SCOs; therefore, Lackawanna Veterans Stadium results are not discussed further in this report.

2.1 SURFACE AND SUBSURFACE SOIL

RI soil delineation efforts were driven based on current zoning and future anticipated use to assess the nature and extent of site-related contamination in each of the three areas: On-site Area, Smokes Creek Corridor, and Baker Hall Property. RI data were compared to SCOs that were selected to identify areas that may require remediation sufficient for the current and future anticipated use of the property, which may also require institutional controls (e.g., land-use restrictions) as applicable to the on-site area. The supplemental SCOs were selected based on land use and background concentrations. Background concentrations of lead for the site were identified based on six surface soil samples collected from east and west of the site. Background concentrations of lead ranged from 38.2 to 148 milligrams per kilogram (mg/kg), which exceeds the unrestricted use SCO of 63 mg/kg.

The following table identifies the supplemental SCOs selected for each area of concern.

Area of Concern	Applicable SCO (Based on Current Land Use)
On-site Area	Commercial Use
Smokes Creek Corridor	Commercial Use
Baker Hall Property	Restricted Residential Use

2.1.1 On-site Area

Surface and subsurface soil results from the RI indicate that several inorganic constituents are present at concentrations that exceed Commercial SCOs (NYSDEC 2010) in soil/fill material at the site. Inorganic constituents that exceed Commercial SCOs include arsenic, barium, cadmium, copper, cyanide, lead, and nickel (Table 2-1). In general, the most elevated concentrations were present in the ramp area where the ash/fill materials are thickest, and in the area north of the northern incinerator building (Figure 2-1). Soil concentrations that exceeded Commercial SCOs in the On-site Area were generally observed at depths ranging from 1 to 3 ft bgs. In the ramp area, inorganic soil concentrations greater than Commercial SCOs were observed at depths ranging from approximately 14 ft bgs (SB-11) to 22 ft bgs (SB-13).

2.1.2 Smokes Creek Corridor

Surface and subsurface soil results from the RI indicate that incinerator-related inorganic constituents (primarily arsenic, barium, cadmium, copper, and lead) were present at concentrations that exceed Commercial Use SCOs (NYSDEC 2006, 2010) in the soil/fill material at the Smokes Creek Corridor (Table 2-3). The site-related contamination in the Smokes Creek Corridor was observed in the soil/fill material adjacent to the recreational path, which adjoins the northern boundary of the On-site Area and the Baker Hall Property (Figure 2-2). Soil contamination was identified throughout the recreational path which is approximately 2,200-ft long.

2.1.3 Baker Hall Property

Surface and subsurface soil results from the RI indicated that a similar suite of inorganic constituents that were observed in the On-site Area were also present at concentrations that exceeded Restricted Residential SCOs (NYSDEC 2006) in the soil/fill material at the Baker Hall Property (Table 2-2). The incinerator-related contamination at the Baker Hall Property is associated with soil/fill material, which was thickest in the northwestern corner of the property where it was observed to extend from the ground surface to as much as 4 ft bgs (Figures 2-3 and 2-4). The impacted soil/fill thinned to approximately 2-ft thick to the south along the western property line, which is shared with the former incinerator site, and along the northern property line, which is shared with the creek path. Following completion of the RI, an interim remedial measure (IRM) was completed which involved removal of soil/fill exceeding Restricted Residential SCOs. This is described in Section 6.3 of this report.

2.2 GROUNDWATER

The RI groundwater program included the installation of seven groundwater monitoring wells, and the completion of two rounds of groundwater sampling. The following table provides a summary of the frequency that groundwater concentrations exceeded the groundwater quality standards.

Constituents	Groundwater Standards and Guidance Values[(a)] (µg/L)	No. of Exceedances / No. of Samples	Concentration Range (µg/L)	Location of Maximum Concentration
November 2012 Sampling Event				
Antimony	3	6/7	4.56–6.08	MW-03A (west of ramp)
Chromium	50	1/7	293	MW-04 (upgradient)
Iron	300	6/7	728–15,000	MW-07 (downgradient)
Lead	25	1/7	30.5	
Magnesium	35,000	6/7	35,100–53,200	MW-03A (west of ramp)
Manganese	300	3/7	338–364	MW-04 (upgradient)
Nickel	100	2/7	123–195	
Sodium	20,000	7/7	27,400–214,000	MW-03A (west of ramp)
April 2013 Sampling Event				
Arsenic	24	2/7	30.2–43.7	MW-07 (downgradient)
Iron	300	7/7	653–14,200	MW-08 (downgradient)
Magnesium	35,000	6/7	41,700–72,800	
Sodium	20,000	7/7	33,400–254,000	MW-03A (west of ramp)

(a) NYSDEC 1998, as amended.
NOTE: µg/L = Micrograms per liter
Inorganic constituents analyzed by EPA Method 6000/7000 series.
Table includes only those target analyte list metals that exceeded the standard or guidance value in one or more samples.

Elevated concentrations of arsenic and lead, which are two of the incinerator-related inorganic constituents (arsenic, barium, cadmium, copper, and lead), were detected in monitoring well (MW-07) located along the downgradient On-site Area boundary, north of the ramp (Figure 2-5). Each compound was only detected in one of two monitoring events; however, their presence may indicate that a limited amount of leaching of inorganic compounds is occurring from the On-site Area impacted soil. Several other inorganic constituents (antimony, chromium, iron, magnesium, manganese, nickel, and sodium) exceeded Class GA standards and guidance values in both On-site Area site monitoring wells and the background monitoring well, which suggests that those constituents are unlikely to be related to On-site Area impacted soil.

2.3 SURFACE WATER AND SEDIMENT

Surface water and sediment samples collected during the RI within the Smokes Creek channel do not appear to be impacted by site-specific contaminants (Figure 2-6). Aluminum (surface water) and nickel (sediment) were the only constituents detected at concentrations exceeding the surface water standards and guidance values or sediment guidance values, respectively (NYSDEC 1998,

2006, and 2010). Neither aluminum nor nickel was identified as an incinerator-related contaminant of concern.

2.4 STORMWATER OUTFALLS

Two inorganic constituents (cyanide and selenium), which are likely related to the On-site Area soil contamination, were detected at concentrations that slightly exceeded Class C surface water standards in stormwater samples collected from the two outfalls located north of the former incinerator site. These outfall pipes, which appear to be connected to the stormwater drainage system, discharge to the floodplain (i.e., above the normal creek stage).

The surface soil samples collected downslope of the stormwater outfall locations that discharge from the On-site Area did not contain any inorganic constituents in exceedance of Commercial Use SCOs.

2.5 HUMAN HEALTH EXPOSURE ASSESSMENT

A qualitative assessment of human health exposure pathways for all impacted media was completed using analytical data obtained during the RI. Media evaluated include surface and subsurface soil/fill material, groundwater, surface water, and sediment. The exposure assessment concluded that surface and subsurface soil/fill has the greatest potential to impact current and future human receptors, due to concentrations of contaminants and exposure pathways including incidental ingestion and dermal absorption. Current potentially exposed populations include City of Lackawanna DPW workers, site visitors, and recreationists utilizing the Smokes Creek recreational path or fishing. Future potentially exposed populations include construction workers who could have direct contact with surface and subsurface soil (incidental ingestion and dermal absorption). There is also a potential for inhalation of contaminant-laden particulates by construction workers.

Although metals were detected in groundwater samples at concentrations exceeding the NYSDEC Class GA criteria, there is currently no groundwater usage at or in the immediate vicinity of the site (e.g., potable or industrial wells), and no expected future use of groundwater, as connection to a public water supply is available. Site groundwater flows to the north and discharges to Smokes Creek. Elevated concentrations of metals were observed in sediment samples collected from Smokes Creek, but the concentrations were similar to the range detected in background soil samples which indicates that they might be ubiquitous in the area, and not a result of migration from on-site soil contamination. Surface water in Smokes Creek did not contain concentrations of incinerator-related contaminants exceeding SCGs, as discussed in Section 2.3.

3. DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375 (NYSDEC 2006). The remedial goal for all remedial actions is considered to be the restoration of the site to the pre-disposal/pre-release conditions to the extent practicable and legal. RAOs are defined as the operable unit or media-specific objectives for the protection of public health and the environment, and are developed based on contaminant-specific SCGs (described in Section 2) to address contamination identified at a site. Although multiple media were evaluated during the RI, including surface water, sediment, groundwater, and indoor air, only soil (surface and subsurface) was determined to be impacted.

Soil	Specific RAOs
RAOs for Public Health Protection	• Prevent ingestion/direct contact with contaminated soil. • Prevent inhalation exposure to contaminants volatilizing from soil.
RAOs for Environmental Protection	• Prevent migration of contaminants that would result surface water or sediment contamination. • Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

3.1 MEDIA CLEANUP GOALS

The media cleanup goals for soil are based on New York State SCGs, the site-specific risk assessment, contaminants of concern, site characteristics, and feasible actions. The contaminants of concern for soil at the Lackawanna Incinerator site identified during the RI are inorganic constituents, primarily arsenic, barium, cadmium, copper, and lead. These goals can be achieved by either removing the soil contamination, or preventing impacts to human or ecological receptors via ingestion/direct contact with impacted soil.

The proposed cleanup goals for soil/fill at the Lackawanna Incinerator site are specified by area in the following table.

Constituents	On-Site Area and Smokes Creek Corridor Commercial	Baker Hall Property Restricted Residential	All Areas Unrestricted Use
Arsenic	16	16	13
Barium	400	400	350
Cadmium	9.3	4.3	2.5
Chromium	1,500	180	30
Copper	270	270	50
Cyanide, Total	27	27	27
Lead	1,000	400	63
Mercury	2.8	0.81	0.18
Nickel	310	310	30
Selenium	1,500	180	3.9
Silver	1,500	180	2
Zinc	10,000	10,000	109
Note: All SCOs are provided in parts per million (ppm).			

3.2 EXTENT OF IMPACT TO ENVIRONMENTAL MEDIA

The extent of soil that exceeded SCOs (based primarily on arsenic and lead concentrations) is shown on Figure 3-1. The estimated volume of fill material by area is summarized in the following table.

Area of Concern	Soil Cleanup Objective	Estimated Volume of Impacted Material	
		Cubic Yards (yd^3)	Tons[(a)]
On-site Area	Commercial	23,100	37,000
	Unrestricted Use	30,100	48,200
Smokes Creek Corridor	Commercial	2,450	4,000[(b)]
	Unrestricted Use	7,100	11,450[(b)]
Baker Hall Property[(c)]	Restricted Residential	7,200	11,550
	Unrestricted Use	16,450	26,300

(a) Estimates assume that 1 yd^3 of material is approximately equal to 1.6 tons.
(b) Smokes Creek Corridor volume includes asphalt; assumes 1 yd^3 of asphalt is approximately equal to 1.9 tons.
(c) Refined estimate based on the supplemental delineation activities conducted on the Baker Hall Property.

3.3 POTENTIALLY APPLICABLE OR RELEVANT AND APPOPRIATE REQUIREMENTS

Applicable or relevant and appropriate requirements (ARARs) are local, state, and federal regulations, including environmental laws and regulations that are used in the selection of remedial alternatives, as well as other non-environmental laws and regulations, such as the Occupational Safety and Health Act. The development and evaluation of remedial alternatives

presented in Section 6 include a comparison of alternative site remedies to ARARs. The recommended remedial action for the site must satisfy all ARARs unless specific waivers have been granted.

EPA defines "applicable" and "relevant and appropriate" in the revised National Contingency Plan, codified at 40 Code of Federal Regulations (CFR) 300.5 as follows:

- ***Applicable Requirements***—substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site.

- ***Relevant and Appropriate Requirements***—standards of control that address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well suited to the particular site.

To determine whether a requirement is relevant and appropriate, characteristics of the remedial action, the hazardous substances present, and the physical characteristics of the site must be compared to those addressed in the statutory or regulatory requirement. In some cases, a requirement may be relevant, but not appropriate. In other cases, only part of a requirement will be considered relevant and appropriate. When it has been determined that a requirement is both relevant and appropriate, the requirement must be complied to the same degree as if it were applicable (EPA 1988).

ARARs for remedial action alternatives at the Lackawanna Incinerator site can be generally classified into one of the following three functional groups: chemical, action, or location-specific.

To-be-considered materials (e.g., federal/state criteria, advisories, and guidance values) are non-promulgated advisories or guidance issued by federal or state government, which are not legally binding, and therefore, do not have the status of potential ARARs:

- Federal criteria, advisories, and guidance documents
- State of New York criteria, advisories, and guidance documents.

Federal and state guidance documents or criteria that are not generally enforceable, but are advisory, do not have the status of potential ARARs. Guidance documents or advisories to be considered in determining the necessary level of cleanup for protection of human health or the environment may be used where no specific ARARs exist for a chemical or situation, or where such ARARs are not sufficient to afford protection.

Federal and state requirements for soil, water, and air were considered to determine if they were ARARs, based on site characteristics, site location, and the alternatives considered. The

following sections summarize the specific federal, state, and local ARARs for the remedial actions that may be taken at the Lackawanna Incinerator site, and for the types of technologies that will be developed into remedial alternatives. As identified at the beginning of Section 3, soil is the only impacted media at the Lackawanna Incinerator site; in addition, the contaminants of concern identified during the RI consist of inorganic constituents, primarily arsenic and lead. Thus, each of the following ARARs has been chosen for its potential applicability or relevance and appropriateness.

3.3.1 Chemical-Specific Applicable or Relevant and Appropriate Requirements

Chemical-specific requirements are established health- or risk-based numerical values or methodologies that establish cleanup levels or discharge limits in environmental media for specific substances or pollutants. Cleanup standards for impacted soil are defined in 6 NYCRR Part 375 Environmental Remediation Programs with SCOs specified based on current and/or future land use.

3.3.2 Action-Specific Applicable or Relevant and Appropriate Requirements

Action-specific ARARs set controls or restrictions on the design, implementation, and performance levels of activities related to the management of hazardous substances, pollutants, or contaminants. The potential action-specific ARARs include:

- ***Occupational Safety and Health Act, 29 CFR 1910***—Site activities will be conducted under appropriate Occupational Safety and Health Act standards.

- ***Department of Transportation Rules for Hazardous Materials Transport, 49 CFR, Parts 107, 171.1-500***—Addresses requirements for marking, manifesting, handling, and transport of hazardous materials; applicable if offsite treatment or disposal of wastes is required

- ***Solid Waste Management Facilities, 6 NYCRR Part 360***—Provides standards and regulations for permitting and operating solid waste management facilities

- ***Waste Transporter Permits, 6 NYCRR Part 364***—Provides standards and regulations for waste transporters

- ***Hazardous Waste Management System: General, 6 NYCRR Part 370***—Provides standards and regulations for the state hazardous waste management system

- ***Identification and Listing of Hazardous Wastes, 6 NYCRR Part 371***—Provides standards and regulations for the identification and listing of hazardous wastes

- ***Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities, 6 NYCRR Part 372***—Provides standards, regulations, and

guidelines for the manifest system, as well as additional standards for generators, transporters, and facilities

- ***Resource Conservation and Recovery Act (RCRA) Toxicity Characteristic Criteria, 40 CFR Part 261.24***—All waste generated during the removal alternative will be characterized and handled per RCRA regulations, as implemented by WAC 173-303.

- ***Land Disposal Restrictions, 6 NYCRR Part 376***—Pertains to alternatives that require land disposal of hazardous wastes.

3.3.3 Location-Specific Applicable or Relevant and Appropriate Requirements

Location-specific ARARs must be considered when developing alternatives because these types of ARARs may affect or restrict remedial activities. Generally, location-specific requirements serve to protect the individual site characteristics, resources, and specific environmental features. The potential location-specific ARARs include:

- ***Protection of Waters, 6 NYCRR Part 608—***Provides standards, regulations, and guidelines for the protection of waters within the state

- ***Freshwater Wetlands Permitting, Requirements, Classification, and Implementation, 6 NYCRR Parts 662 through 665—***Provides standards, regulations, and guidelines.

4. GENERAL RESPONSE ACTIONS

In general, remedial technologies fit into one or more category of GRAs. GRAs are generic, medium-specific, remedial actions that will satisfy the RAOs discussed earlier. GRAs may include no action, institutional controls, containment, removal, treatment, disposal, monitoring, or a combination thereof (EPA 1988). The development of remedial alternatives for this FS begins with the identification of GRAs that can meet RAOs. These GRAs are then screened based on their effectiveness, implementability, and cost, and developed into remedial alternatives to address impacted media at the site (i.e., soil). GRAs for soil at the Lackawanna Incinerator site (including no action, site management, containment, removal, treatment, and disposal) are detailed in the following sections.

4.1 NO ACTION

The no action alternative is included for use as the baseline alternative against which other remedial alternatives are compared.

4.2 INSTITUTIONAL CONTROLS

Site management (also known as institutional controls) involves the placement of a restriction on the use of property that limits human or environmental exposure, provides notice to any individual who might come in contact with the site, or prevents actions that would interfere with the effectiveness of a remedial program, or with the effectiveness and/or integrity of site management activities at or pertaining to a site.

4.3 REMOVAL

Physical removal of impacted fill would be conducted by excavation, using standard construction equipment (i.e., excavators) to remove material from the ground and load it into transport mechanisms (i.e., trucks) for off-site treatment or disposal.

4.4 TREATMENT

Treatment subjects contaminants to processes that alter their state, transform them to innocuous forms, or immobilize them. Potentially applicable treatment technologies for soil at this site include *in situ* biological treatment, *in situ* soil flushing, *in situ* or *ex situ* solidification, *in situ* or *ex situ* chemical stabilization, *ex situ* acid leaching, and *ex situ* vitrification.

- Biological treatment involves the use of plants to treat the impacted media. This can be achieved through phytoextraction, which involves the physical removal of contaminants from the soil through plant.

- Soil flushing is the use of water or other suitable aqueous solution to flush contaminants from soil. The fluid is then extracted *in situ*.

- Stabilization is achieved through the use of amendments that are mixed into the soil matrix, and reduce the toxicity and mobility of the contaminants. This results in the production of a monolith of waste with high structural integrity, and can be done *in situ* or *ex situ*.

- Acid leaching is the use of potentially hazardous acid to remove inorganic contaminants from soil.

- Vitrification is the use of electric current to convert contaminants to an inert, solid form. Following vitrification, the contaminants are trapped within the treated area, eliminating mobility.

4.5 DISPOSAL

Disposal involves transporting the soil to a landfill. The soil would either be placed in a lined landfill cell or used for daily cover, based on characterization results.

4.6 CONTAINMENT

Contaminated soil and fill could be contained by installing an impermeable cover over the waste mass. The existing physical setting would require consolidation and grading of on-site fill.

4.7 ELIMINATION OF EXPOSURE

Elimination of exposure to contaminated soil and fill would be accomplished by installing a soil cover layer over the waste mass. As with containment, the existing physical setting would require consolidation and grading of on-site fill.

5. IDENTIFICATION AND SCREENING OF TECHNOLOGIES

The potentially applicable technologies identified earlier are screened using the process defined in DER-10, Technical Guidance for Site Investigation and Remediation (NYSDEC 2010). Three preliminary screening criteria (i.e., effectiveness, implementability, and cost) were used to screen the remedial technologies identified earlier for each media of concern.

5.1 SCREENING CRITERIA

5.1.1 Effectiveness

Effectiveness is a measure of the ability of an option to: (1) reduce toxicity, mobility, or volume of contamination, (2) minimize residual risks, (3) afford long-term protection, (4) comply with ARARs, (5) minimize short-term impacts, and (6) achieve protectiveness in a limited duration. Technologies that offer significantly less effectiveness than other proposed technologies may be eliminated from the alternative development process. Options that do not provide adequate protection of human health and the environment likewise may be eliminated from further consideration.

5.1.2 Implementability

Implementability is a measure of the technical feasibility and availability of the option and the administrative feasibility of implementing it (e.g., obtaining permits for off-site activities, right-of-ways, or construction). Options that are technically or administratively infeasible or that would require equipment, specialists, or facilities that are not available within a reasonable period may be eliminated from further consideration.

5.1.3 Cost

Qualitative relative costs for implementing the remedy are considered. Technologies that cost more to implement, but that offer no benefit in effectiveness or implementability over other technologies, may be excluded from the alternative development process.

5.2 SCREENING SUMMARY

5.2.1 Technologies Not Retained for Further Analysis

From the list of technologies potentially applicable for remediation of the chemicals and media of concern at this site, a few technologies were excluded from further consideration because they were considered ineffective, not implementable at this site, or too costly relative to the other technologies under consideration (Table 5-1). The reasons for exclusion are detailed below.

Phytoremediation was not retained because it would require a long time-frame with limited effectiveness. The site is currently used by the DPW and would need continued availability for use. The Smokes Creek Corridor is currently used as a recreational path and would need to be restored as a recreational path following remediation. The Baker Hall Property is currently

under development. In addition, phytoremediation is generally used for lower levels of contamination than what exists at the site.

Solidification was not retained because it would lead to an increase in volume of fill and post-remediation use for this expansion is limited. Also, typically solidification is used *in situ* for the stabilization of deep contamination that is impacting groundwater. The majority of the contamination on-site is above grade and groundwater does not appear to be impacted by site related contamination.

Soil flushing was not retained due to the high relative cost and unknown level of effectiveness. Soil flushing is an emerging technology which has not been widely implemented.

Acid leaching and vitrification were not retained due to difficulty of implementation. These technologies also require a long time-frame for implementation with a significantly higher cost than other retained technologies.

5.2.2 Technologies Retained for Further Analysis

Technologies that will be retained for further evaluation are removal, disposal, and containment. Removal (full or partial) would be implemented through the excavation of impacted soil using an excavator and some hand digging (i.e., within the gas line right-of-way on the Baker Hall Property). Disposal would be implemented through loading and transporting excavated soil to appropriate disposal facilities; soil would be characterized and accepted by the disposal facility prior to transport. Containment would be implemented through the placement of a 1.5–2 ft soil cover (depending on site use) or asphalt pavement over remaining impacted soil.

6. SCOPING AND DEVELOPMENT OF REMEDIAL ALTERNATIVES

Scoping for the FS was completed based on correspondence between EA and the NYSDEC. EA performed the alternative comparison in accordance with DER-10 (NYSDEC 2010) and the EPA publication *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA l540lG-891004) (EPA 1988). The results of the technology screening process were summarized in a letter dated January 24, 2014 from EA to NYSDEC; a copy of the letter is provided in Appendix A. The screening of alternatives was designed to provide a basis for an overall assessment of applicable technologies based on impacted media identified at the site and related areas during the RI.

The scoping and development of the technologies/alternatives selected during the previous step of the FS process and during later discussions with NYSDEC are described below. Separate sets of alternatives are presented for each area; however, the proposed remedy for this site will take a comprehensive approach, combining the recommended remedy for all three areas. There are known dependencies on adjacent parcels for each area, which will be acknowledged and discussed further in the presentation of the recommended comprehensive remedy in Section 8.4.

6.1 ON-SITE AREA SURFACE AND SUBSURFACE SOIL ALTERNATIVES

The extent and volume of soil requiring remediation was determined based on data collected during the RI (EA 2014) (Figure 6-1). The Commercial Use remedial action area encompasses the ramp that leads up to the northern incinerator building, as well as surface and shallow subsurface soil to the east and northeast of the building. The Unrestricted Use remedial action area encompasses the Commercial Use area and additional shallow soil west of the ramp.

Five alternatives have been considered for this area, including a “No Action” alternative as Alternative 1. With the exception of Alternative 1, each alternative is presented with two options: Option A includes the demolition and disposal of both incinerator buildings, while Option B includes the demolition and disposal of only the southern incinerator building. Under Option B, the northern building would remain available for use by the DPW; therefore, access to the western entrance of the building would need to be maintained.

Further delineation is recommended within the On-site Area to determine the final impacted area limits. A pre-design investigation and a 20 percent volume contingency have been built into each alternative to account for this.

6.1.1 On-Site Area Alternative 1: No Action

The no action alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the area in its present condition.

6.1.2 On-Site Area Alternatives 2A and 2B: Soil/Fill Excavation to Unrestricted Use SCOs with Disposal Off-Site, Demolition and Removal of Both Incinerator Buildings or the Southern Incinerator Building Only

On-site Area Alternative 2 involves excavation and removal of the ramp that leads up to the northern incinerator building, removal of both incinerator buildings (Alternative 2A) or only the southern incinerator building (Alternative 2B). The excavated area would be restored to smooth grades using clean fill from an off-site source, eliminating the ramp and depressions near the northern incinerator building for Alternative 2A, or sloping down toward the storm drain west of the northern incinerator building for Alternative 2B. Approximately 30,100 yd^3 of impacted soil would be removed from the site under these Alternatives. Figure 6-2 depicts the proposed excavation extents under Alternative 2A. Figure 6-3 shows the proposed excavation extents under Alternative 2B.

Pre-design activities would include:

- A storm sewer investigation would take place at the site prior to the remedial design process of this alternative. Such an investigation would involve mapping the existing storm sewer west of the northern incinerator building to determine inputs to the storm sewer outside of the proposed cover footprint, to determine whether or not the storm sewer can be decommissioned and removed, or if upgrades would be required to maintain stormwater flow.

- A pre-design delineation investigation would be completed to verify the horizontal extent of soil impacts using x-ray fluorescence (XRF) field analyses.

- The incinerator building(s), as well as materials within the building(s), would be characterized for disposal. Characterization would include sampling for polychlorinated biphenyls (PCBs), asbestos, and lead, as well as sampling the ash that is contained within the bottom floor of the southern incinerator building.

When confirmation sample analytical results indicate all soil containing lead exceeding Unrestricted Use SCOs has been removed, the site would be restored with the following:

- Clean fill from an off-site source would be used to achieve final grades, consisting of a gradual slope to the north (Alternative 2A, Figure 6-2) or toward the storm drain west of the northern incinerator building (Alternative 2B, Figure 6-3). The area west of the northern incinerator would be returned to pre-remediation grades for both alternatives.

- Final restoration would include 6 inches (in.) of topsoil and seed over all disturbed areas. For Alternative 2B, the asphalt road would be replaced.

Final grading for Alternative 2A would require approximately 13,000 yd^3 of clean backfill to be transported to the site in order to bring the elevations level with surrounding elevations; the

depressions from the northern incinerator building and access drive would need to be filled in to prevent ponding and promote positive drainage. Final grading for Alternative 2B would require only 9,800 yd^3 of clean backfill because these depressions would not be filled in, and stormwater runoff could be routed to the existing storm drain west of the northern incinerator building.

6.1.3 On-Site Area Alternative 3: No Action with Site Management

On-site area Alternative 3 involves no physical work being done at the site. Site management would involve placement of an environmental easement on the site to provide an effective and enforceable means of limiting the use of a property to a level that has been determined to be safe.

6.1.4 On-Site Area Alternatives 4A and 4B: Partial Excavation (Ramp) to Commercial Use SCOs, Demolition and Removal of Incinerator Building(s), and Re-Grading and Covering of Remaining Impacted Soil with a Soil Cover

On-site Area Alternative 4 involves excavation and removal of part of the ramp that leads up to the northern incinerator building, removal of both incinerator buildings (Alternative 4A) or only the southern incinerator building (Alternative 4B), re-grading, and covering of remaining impacted soil/fill exceeding Commercial SCOs with a soil cover (Figures 6-4 and 6-5). The former ramp area would be graded with a gentle slope toward the Smokes Creek Corridor area under Alternative 4A, or towards the existing storm drain to the west of the northern incinerator building under Alternative 4B. The soil cover would consist of 6 in. of clean soil and 6 in. of clean topsoil to prevent human exposure to remaining impacted soil. A demarcation layer of geotextile would be placed on top of the remaining impacted soil prior to placement of the soil cover. Installation of the soil cover would prevent exposure; however, because contamination would remain on-site under this alternative, a Land Use Restriction in the form of an Environmental Easement, as well as long-term monitoring would be necessary.

Pre-design activities would include:

- A storm sewer investigation would take place at the site prior to the remedial design process of this alternative. Such an investigation would involve mapping the existing storm sewer west of the northern incinerator building to determine inputs to the storm sewer outside of the proposed cover footprint, to determine whether or not the storm sewer can be decommissioned and removed, or if upgrades would be required to maintain stormwater flow.

- A pre-design delineation investigation would be completed to verify the horizontal extent of soil impacts using XRF field analyses.

- The incinerator building(s), as well as materials within the building(s), would be characterized for disposal. Characterization would include sampling for PCBs, asbestos, and lead; as well as sampling the ash that is contained within the bottom floor of the southern incinerator building.

Remedial action implementation would include the following activities:

- The building(s) would each be demolished and disposed of off-site at the appropriate disposal facilities. Based on high concentrations of metals in ash samples (Malcolm Pirnie 2005), it is assumed that the ash material from within the southern building would be disposed of as hazardous waste.

- Impacted ramp materials would be partially removed and partially re-graded to subgrade elevations as necessary to create a gradual slope toward the Smokes Creek Corridor area. Grading for Alternative 4B will promote drainage toward the existing storm drain west of the northern incinerator building.

Restoration would include the following activities:

- Depending on the results of the storm sewer investigation and the final conditions, the existing western storm drain would be either decommissioned (Alternative 4A) or repaired (Alternative 4B).

- Geotextile followed by 6 in. of clean soil from an off-site source and 6 in. of clean topsoil and seed would be placed over remaining impacted soil.

- Long-term monitoring would consist of periodic cover inspection and groundwater sampling.

Final grading for Alternative 4A would result in the removal of approximately 15,300 yd^3 of impacted soil to achieve proposed final subgrade elevations. Final grading for Alternative 4B would result in the removal of approximately 16,050 yd^3 of impacted soil to achieve final subgrade elevations. Due to the presence of the northern incinerator building under Alternative 4B, final grading will be different for these alternatives. Under Alternative 4A, the former footprint of the northern incinerator building, as well as the depressions on either side of it, will be filled in with impacted material; this results in different removal quantities. Soil would be transported to an approved disposal facility; for costing purposes, it is assumed that 10 percent of the material would be disposed of as hazardous material.

6.1.5 On-Site Area Alternatives 5A and 5B: Partial Excavation (Ramp) to Commercial Use SCOs, Demolition and Removal of Incinerator Building(s), and Re-Grading and Covering of Remaining Impacted Soil with Asphalt

On-site Area Alternatives 5A and 5B are similar to Alternatives 4A and 4B, in that they involve excavation and removal of part of the ramp that leads up to the northern incinerator building, removal of both incinerator buildings (Alternative 5A) or only the northern incinerator building (Alternative 5B), re-grading, and covering of remaining impacted soil/fill exceeding Commercial SCOs (Figures 6-6 and 6-7). The difference between Alternatives 4A/4B and Alternatives 5A/5B is that the cover would consist of asphalt rather than soil.

The asphalt cover would consist of 6 in. of compacted subbase material, 4 in. of asphalt binder course, and 2 in. of top course. Installation of asphalt over impacted fill would prevent exposure to remaining contamination and provide a resilient surface that would not be damaged by typical site use by the DPW; however, because contamination would remain on the property under this alternative, a Land Use Restriction in the form of an Environmental Easement would be necessary, as well as long-term monitoring.

For the most part, these alternatives would be implemented in the same manner as Alternatives 4A and 4B. Final grading for Alternative 5B would promote runoff to the east and west of the northern incinerator building, to avoid inundating the southern wall of the northern incinerator building with stormwater runoff. Under Alternative 5B, final grading would consist of a mild ridge running north-south in the former ramp area, to shed stormwater east and west of the remaining northern incinerator building. This ridge creates a larger impacted soil storage area than the flatter grades of Alternative 5A, which results in a lower removal volume for Alternative 5B. These nuances in the final conditions would result in the removal of approximately 16,500 yd^3 of impacted soil to achieve proposed final subgrade elevations for Alternative 5A, and approximately 15,100 yd^3 of impacted soil to achieve proposed final subgrade elevations for Alternative 5B. As with Alternatives 4A and 4B, soil would be transported to an approved disposal facility; for costing purposes, it is assumed that 10 percent of the material would be disposed of as hazardous material.

6.1.6 On-Site Area Alternatives 6A and 6B: Soil/Fill Excavation to Commercial Use SCOs with Disposal Off-Site, Demolition and Removal of Both Incinerator Buildings or the Southern Incinerator Building Only

Under these alternatives, impacted soil exceeding commercial SCOs would be excavated and disposed of off-site. Similar to Alternatives 4A, 4B, 5A, and 5B, the excavated area would be restored to smooth grades, eliminating the ramp and depressions near the northern incinerator building for Alternative 6A, or sloping down toward the storm drain west of the northern incinerator building for Alternative 6B. Figures 6-8 and 6-9 depict the proposed excavation extents and final conditions under Alternative 6A. Figures 6-10 and 6-11 show the proposed excavation extents and final conditions under Alternative 6B.

Pre-design and demolition activities would be implemented the same as Alternatives 4A, 4B, 5A, and 5B. Following building demolition and disposal, approximately 23,100 yd^3 of impacted soil and fill from the ramp area and northeast corner of the site, would be excavated to the elevations identified on Figures 6-8 and 6-10. As with Alternatives 4A, 4B, 5A, and 5B, soil would be transported to an approved disposal facility; for costing purposes, it is assumed that 10 percent of the material would be disposed of as hazardous material.

When confirmation samples indicate that no further excavation is necessary, the following restoration activities would be implemented:

- Clean fill from an off-site source would be used to achieve final grades, consisting of a gradual slope to the north (Alternative 6A, Figure 6-8) or toward the storm drain west of the northern incinerator building (Alternative 6B, Figure 6-10).

- Final restoration would include 6 in. of topsoil and seed over all disturbed areas. For Alternative 6B, the asphalt road would be replaced.

Final grading for Alternative 6A would require approximately 7,000 yd^3 of clean backfill to be transported to the site in order to bring the elevations level with surrounding elevations, the depressions from the northern incinerator building, and access drive would need to be filled in to prevent ponding and promote positive drainage. Final grading for Alternative 6B would require only 3,800 yd^3 of clean backfill because these depressions would not be filled in, and stormwater runoff could be routed to the existing storm drain west of the northern incinerator building. Because contaminants exceeding unrestricted use SCOs would remain on the property under this alternative, a Land Use Restriction in the form of an Environmental Easement would be necessary, as well as long-term monitoring.

6.2 SMOKES CREEK CORRIDOR

The Smokes Creek Corridor surface and subsurface remediation areas were determined based on data presented in the RI (EA 2014). The areas and remediation depths included in the impacted soil volumes address exceedances of both Commercial Use SCOs and Unrestricted Use SCOs (Figure 6-12). For the majority of the length of the recreational path to be remediated, contamination is within the 0–2 ft depth interval. In the area directly north of the northern incinerator building and some distance east and west of that area, contamination is within the 0–4 ft depth interval.

Prior to the remedial design process, a survey of the entire length of the Smokes Creek Corridor remediation area would be necessary to calculate more accurate excavation and backfill volumes. Volumes used in the costing of these alternatives in this FS are estimates based on limited existing survey data. A 20 percent volume contingency has been built into each alternative to account for this.

6.2.1 Alternative 1: No Action

The no action alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the Smokes Creek Corridor in its present condition.

6.2.2 Smokes Creek Corridor Alternatives 2A and 2B: Partial Removal of Contaminated Soil to Commercial Use SCOs with Soil and Asphalt Cover of Remaining Contaminated Soil/Fill

This alternative is aimed at removing some impacted soil, and covering the remaining soil and fill exceeding the Commercial SCOs along the Smokes Creek Corridor to prevent contact. Under Alternative 2A, soil to a depth of 1 ft on either side of the asphalt recreational path, as well as the wedge of impacted soil/fill along the side slope contamination area would be removed and disposed of off-site; under Alternative 2B, the asphalt recreational path and impacted soil beneath the path to a total depth of 1 ft would be removed in addition to the soil being removed under Alternative 2A. Under both alternatives, a hot spot measuring 30 ft by 30 ft by 4 ft deep will be removed at the eastern extent of the proposed excavation. Remaining contaminated soil/fill would be covered with a non-woven geotextile demarcation layer. Site restoration under Alternative 2A consists of placing a soil cover (consisting of 6 in. of clean fill and 6 in. of clean topsoil) over the remaining soil/fill and returning the side slope to original grades with clean fill and topsoil. Site restoration under Alternative 2B involves the same soil cover and an engineered asphalt cover to replace the asphalt recreational path. Both the asphalt and soil cover would serve as barriers to prevent contact with remaining contamination, and prevent erosion and sedimentation of impacted soil into Smokes Creek; however, because contamination would remain on the property under these alternatives, long term monitoring would be necessary. The excavation depths and proposed cap areas are shown on Figures 6-13 and 6-14 for Alternative 2A and Figures 6-15 and 6-16 for Alternative 2B.

Prior to design activities, the existing basemap would be updated by a land surveyor licensed in the State of New York with a full survey of the remediation area. Remediation volumes would be revised based on the full survey.

Remedial action implementation for Alternative 2A would include the following activities:

- A total of approximately 1,760 yd^3 of impacted soil would be excavated and disposed of offsite. This would include:

  — The top 1 ft of impacted soil/fill on either side of the asphalt path
  — The impacted wedge of soil along the side slope.

- For the purpose of this FS, EA estimates that 10 percent of the excavated soil is hazardous and would be disposed of at a permitted hazardous waste landfill. The remainder of the soil would be disposed of at a general waste landfill, following acceptance.

Remedial action implementation for Alternative 2B would include the following activities:

- A total of approximately 2,350 yd^3 of impacted soil and 100-yd^3 of asphalt would be excavated from the Smokes Creek Corridor and disposed of off-site.

Restoration would include the following activities:

- Clean common fill with topsoil and seed or asphalt (for Alternative 2B) would be used to return excavated areas to original grades. The soil cover over remaining impacts would consist of 6 in. of clean common fill and 6 in. of topsoil.

- Seeded areas on the side slope would be stabilized using biodegradable erosion control blankets.

- Long-term monitoring would consist of periodic cap inspection and surface water sampling.

6.2.3 Smokes Creek Alternative 3: Excavation of Asphalt and Contaminated Soil to Unrestricted Use SCOs with Disposal Off-Site

This alternative includes excavation and off-site disposal of soil from along the Smokes Creek Corridor remediation area at a commercial landfill. This alternative is aimed at removing the soil exceeding the Unrestricted Use SCOs from along the Smokes Creek Corridor.

The excavated area would be completely restored to pre-remediation grades with the re-installation of the asphalt recreational path. Figures 6-17 and 6-18 depict the proposed final conditions under this alternative. As with Alternatives 2A and 2B, the existing basemap would be updated by a land surveyor licensed in the State of New York with a full survey of the remediation area prior to design.

Remedial action implementation would include the following activities:

- Approximately 6,900 yd^3 of soil would be excavated to a maximum depth of 4 ft bgs along the Smokes Creek Corridor. Approximately 200-yd^3 of asphalt would be removed and disposed of off-site.

- As with Alternatives 2A and 2B, EA estimates that 10 percent of the excavated soil is hazardous and would be disposed of at a permitted hazardous waste landfill. The remainder of the soil would be disposed of at a general waste landfill, following acceptance.

- Confirmation soil samples would be collected at a rate of one per 900-square feet ($ft^{2)}$ on the excavation bottom and one per 30-linear ft along excavation side walls.

Restoration would include the following activities:

- The recreational path area would be restored to pre-remediation grades using an approved backfill source and asphalt.

- Final restoration would be the same as Alternatives 2A and 2B, with topsoil, seed, and erosion control blankets along the side slope.

6.3 BAKER HALL PROPERTY

The Baker Hall Property surface and subsurface remediation areas were determined based on data presented in the RI (EA 2014) and additional data gathered during the supplemental delineation field activities that took place from October 29 to 31, 2014. The supplemental delineation results are provided as an appendix to the RI (EA 2014). The areas and remediation depths included in the impacted soil volumes address the areas of concern within the Baker Hall Property (Figure 6-19) that exceed Restricted Residential and Unrestricted Use SCOs. There is a 4-ft deep area in the northwest corner of the property close to the northern incinerator building that exceed both Unrestricted Use and Restricted Residential SCOs; a small area in the northwest corner exceeds Unrestricted Use down to 6 ft. The remaining remediation area is 2-ft deep. The area that exceeds Unrestricted Use SCOs extends further to the east than the Restricted Residential exceedences. A storm sewer is known to transect the remediation areas and runs parallel to the western property line to Smokes Creek north of the property. A gas line also runs parallel to the storm sewer and cuts to the east approximately 170 ft south of the northern fence line.

An IRM was completed from November 13, 2014 to May 28, 2015 to address soil and fill exceeding Restricted Residential SCOs. A total of 12,769 tons of impacted soil was excavated and disposed of off-site at a commercial landfill. The site was restored with clean fill and topsoil. Full details of the IRM construction activities are in the IRM Construction Completion Report (EA 2015).

6.3.1 Baker Hall Property Alternative 1: No Further Action

The no further action alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the site in its present condition.

6.3.2 Baker Hall Property Alternative 2: Remaining Soil/Fill Excavation to Unrestricted Use SCOs with Disposal Off-Site

This alternative includes excavation and off-site disposal of remaining soil exceeding the Unrestricted Use SCOs (NYSDEC 2006) from the Baker Hall Property at a commercial landfill including the soil within the gas line right-of-way. A small amount of soil from around the gas line would require localized hand-digging to prevent damage to the utility. The storm sewer is expected to be below the impacted areas; however, the potential exists that part of it is within the excavation areas. Excavation above the storm sewer would need to be completed with care; if the sewer is encountered during excavation activities, impacted soil removal would be completed with hand digging. The excavated area would be restored to pre-remediation grades. Figure 6-20 depicts the proposed final conditions under this alternative.

Remedial action implementation would include the following activities:

- Approximately 7,100 yd^3 of soil would be excavated south, east, and focused areas within previously excavated areas.
- The soil would be disposed of at a general waste landfill, following acceptance.
- Confirmation soil samples would be collected from the excavation bottoms and excavation side walls.

Restoration would include the following activities:

- The site would be returned to original grades using an approved backfill source.
- Backfill would be compacted in 1-ft lifts within excavations using a drum roller.
- Areas within 10 ft on either side of the gas line would be compacted using a walk-behind plate compactor.
- All disturbed areas would be restored with topsoil and seed.

7. COSTING AND EVALUATION CRITERIA

7.1 COST ASSUMPTIONS

Cost assumptions were prepared for each alternative using EPA's *Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 1996). Net present value of the project costs was estimated using an interest rate of 5 percent. The cost assumptions were calculated using the most common products, and application methods available for a remedial alternative. The EPA guidance was used in conjunction with *DER-10 Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010).

Cost estimates were prepared for each alternative based on the assumptions detailed in Section 6. Appendix B shows the detailed cost estimates developed. A summary of the costs for all alternatives is provided in Table 7-1.

7.2 CRITERIA USED FOR ANALYSIS OF ALTERNATIVES

The criteria to which potential remedial alternatives are compared (and used during this detailed analysis) are defined in 6 NYCRR Part 375 (NYSDEC 2006) and are listed below:

- Overall protectiveness of public health and the environment
- Conformance to SCGs
- Long-term effectiveness and permanence
- Reduction in toxicity, mobility, or volume of contamination through treatment
- Short-term impacts and effectiveness
- Implementability
- Cost-effectiveness
- Land use
- Community acceptance.

A description of the criteria and how alternatives are evaluated against them follows.

Overall Protectiveness of Public Health and the Environment—This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

Conformance to Standards, Criteria, and Guidance—Compliance with SCGs addresses whether a remedy would meet environmental laws, regulations, and other standards and criteria. The SCGs were presented in Section 3.

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 recommended remedy has been implemented, the following items are evaluated: (1) magnitude of the remaining risks, (2) adequacy of the engineering and/or institutional controls intended to limit the risk, and (3) reliability of these controls.

Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment—The degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances including the adequacy of the alternative in destroying the hazardous substances, reduction or elimination of hazardous substance releases and sources of releases, degree of irreversibility of waste treatment process, and characteristics and quantity of treatment residuals generated. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the site.

Short-Term Impacts and Effectiveness—Evaluation of the short-term effectiveness for an alternative includes consideration of the risk to human health, and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks. Impacts from remedial action implementation include vehicle traffic, temporary relocation of residences/buildings, temporary closure of public facilities, odor, open excavations; and noise, dust, and safety concerns associated with extensive heavy equipment activity. The greatest short-term risk to human health is related to safety and general construction activity.

Implementability—The technical and administrative feasibility of implementing each alternative is evaluated. Technical feasibility includes the difficulties associated with 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.

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.

Land Use—The current and anticipated future use of the site will be considered. Land use must comply with applicable zoning laws and maps.

Community Acceptance—Public comments will be considered after the close of the public comment period.

8. DETAILED ANALYSIS OF ALTERNATIVES AND RECOMMENDATIONS

The purpose of this FS was to develop, screen, and evaluate potential remedial alternatives for the Lackawanna Incinerator site. Remedies were identified and screened in accordance with EPA (1988 and 1996) and NYSDEC (1998, 2006, 2010) guidance. The comparison of alternatives and recommendations are described below, and summarized in Tables 8-1A, 8-1B, and 8-1C. A combined alternative to achieve pre-disposal conditions on-site and at the adjacent areas was developed to address the impacted area as a whole with cross-boundary dependencies taken into consideration.

The following remedial alternatives are considered for this FS:

- **On-Site Area Alternative 1**—No action
- **On-Site Area Alternative 2A**—Soil/fill excavation to unrestricted Use SCOs with disposal off-site, demolition and removal of both incinerator buildings
- **On-Site Area Alternative 2B**—Soil/fill excavation to unrestricted Use SCOs with disposal off-site, demolition and removal of the southern incinerator building
- **On-Site Area Alternative 3—**No action with site management
- **On-Site Area Alternative 4A**—partial excavation (ramp) to commercial Use SCOs, demolition and removal of both incinerator buildings, and re-grading and isolation of remaining impacted soil with a soil cover
- **On-Site Area Alternative 4B**—Partial excavation (ramp) to commercial Use SCOs, demolition and removal of the southern incinerator building, and re-grading and isolation of remaining impacted soil with a soil cover
- **On-Site Area Alternative 5A**—Partial excavation (ramp) to commercial Use SCOs, demolition and removal of both incinerator buildings, and re-grading and isolation of remaining impacted soil with asphalt
- **On-Site Area Alternative 5B**—Partial excavation (ramp) to commercial Use SCOs, demolition and removal of the southern incinerator building, and re-grading and isolation of remaining impacted soil with asphalt
- **On-Site Area Alternative 6A**—Soil/fill excavation to commercial Use SCOs, with disposal off-site, demolition and removal of both incinerator buildings
- **On-Site Area Alternative 6B**—soil/fill excavation to commercial Use SCOs, with disposal off-site, demolition and removal of the southern incinerator building

- **Smokes Creek Corridor Alternative 1**—No action

- **Smokes Creek Corridor Alternative 2A**—Partial removal of contaminated soil on both sides of asphalt path to commercial Use SCOs and isolation of remaining contaminated soil/fill with soil

- **Smokes Creek Corridor Alternative 2B—**Partial removal of asphalt and contaminated soil to commercial Use SCOs and isolation of remaining contaminated soil/fill with soil and asphalt

- **Smokes Creek Corridor Alternative 3**—Excavation of asphalt and contaminated soil to unrestricted Use SCOs with disposal off-site

- **Baker Hall Property Alternative 1**—No further action

- **Baker Hall Property Alternative 2**—Remaining soil/fill excavation to unrestricted Use SCOs with disposal off-site.

8.1 COMPARISON OF ON-SITE AREA ALTERNATIVES

8.1.1 Overall Protection of Public Health and the Environment

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

Alternative 1 does not fulfill this criterion. Through isolation with various cover types, Alternatives 4A–5B close off the soil exposure pathway; thereby, preventing human contact with remaining contamination. Alternatives 2A and 6A fulfill this criterion by completely removing the contaminants exceeding respective SCGs from the site, while contamination may remain underneath the northern incinerator building with Alternatives 2B and 6B.

8.1.2 Standards, Criteria, and Guidance

Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria.

Alternative 1 does not meet this criterion. Alternatives 4A–5B will fulfill this criterion by removing some and containing remaining soil exceeding SCGs. Alternatives 2A and 6A fulfill this criterion by removing all soil exceeding respective SCGs, while contamination may remain underneath the northern incinerator building with Alternatives 2B and 6B.

8.1.3 Long-Term Effectiveness and Permanence

This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If fill or treated residuals remain on-site after the recommended 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.

Alternative 1 will not provide long-term effectiveness or permanence. Alternatives 4A–5B would fulfill this criterion; both alternatives involve leaving impacted soil/fill on-site and would require long-term monitoring. Alternatives 2A and 6A would fulfill this criterion because contaminants at concentrations exceeding respective SCGs would be permanently removed from the site, while contamination may remain underneath the northern incinerator building with Alternatives 2B and 6B.

8.1.4 Reduction of Toxicity, Mobility, or Volume of Contamination

Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility, or volume of contamination at the site.

Alternative 1 will not reduce the toxicity, mobility, or volume of contamination. Alternatives 4A-5B will fulfill this criterion by reducing the volume and mobility of contamination via soil removal and soil containment. Alternatives 2A and 6A will fulfill this criterion via removal of contamination exceeding respective SCGs, while contamination may remain underneath the northern incinerator building with Alternatives 2B and 6B.

8.1.5 Short-Term Impacts and Effectiveness

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

Alternative 1 does not pose additional risk to the community, workers, or environment, as there are no construction activities involved. Alternatives 2A, 2B, and 4A–6B pose increased short-term risks to the public during excavation and grading, through the production of dust; these effects can be reduced through the implementation of standard dust mitigation construction practices. Workers can potentially be exposed to impacted media during excavation activities involved in Alternatives 2A, 2B and 4A–6B. Risks can be minimized by implementing health and safety controls, including the use of appropriate personal protective equipment.

8.1.6 Implementability

This criterion evaluates the technical and administrative feasibility of implementing each alternative.

All alternatives are implementable and have been used nationally. However, excavation of the ramp area under alternatives 2B, 4B, 5B, and 6B pose potential implementability issues, as the ramp may provide structural support to the northern incinerator building on-site.

8.1.7 Cost-Effectiveness

This criterion evaluates estimated capital costs, as well as annual operation, maintenance, and monitoring costs, on a present-worth basis.

Alternative 1 is the least expensive, but is also the least effective. Alternatives 4A and 5A are similar in cost, as are Alternatives 4B and 5B; however, Alternatives 4B and 5B are as effective as Alternatives 4A and 5A at a lesser cost. Alternatives 2A and 6A are the most effective to achieve respective SCOs and the most expensive. Alternatives 2B and 6B are less effective, but also cost less than their respective counterparts.

8.1.8 Land Use

Alternative 1 would not affect the future use of the site since contamination would remain. Impacted fill would remain on-site for Alternatives 4A–5B. Alternatives 4A and 4B involve a soil cover, and land use would be limited. Alternatives 5A and 5B involve a more resilient asphalt cover, and land use could be similar to the current use (DPW equipment/materials storage). Alternatives 6A and 6B involve the removal of fill with concentrations of metals exceeding commercial SCGs; however, the northern incinerator with potential contamination underneath would remain under Alternative 6B, which would limit future land use. Alternatives 2A and 2B involve the removal of fill with concentrations of metals exceeding unrestricted use SCGs; however, as with Alternative 6B, the northern incinerator with potential contamination underneath would remain under Alternative 2B, which would limit future land use.

8.1.9 Community Acceptance

This criterion evaluates concerns of the community regarding the investigation and the evaluation of alternatives. The Lackawanna Incinerator site remedial approach has not been presented to the community for comment at this point.

Alternative 6A is recommended because it fulfills the screening criteria at the lowest cost, and does not require monitoring and maintenance.

8.2 COMPARISON OF SMOKES CREEK CORRIDOR ALTERNATIVES

8.2.1 Overall Protection of Public Health and the Environment

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

Alternative 1 does not fulfill this criterion. Alternatives 2A and 2B fulfill this criterion by removing some and containing remaining contaminants. Alternative 3 fulfills this criterion by completely removing the contaminants from the site.

8.2.2 Standards, Criteria, and Guidance

Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria.

Alternative 1 does not meet this criterion. Alternatives 2A and 2B will fulfill this criterion by removing some and containing remaining soil exceeding SCGs. Alternative 3 fulfills this criterion by removing all soil exceeding SCGs.

8.2.3 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 recommended 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.

Alternative 1 will not provide long-term effectiveness or permanence. Alternatives 2A and 2B would fulfill this criterion; these alternatives involve leaving impacted soil/fill on-site, and would require long-term monitoring. Alternative 3 would fulfill this criterion because known contaminants would be completely removed.

8.2.4 Reduction of Toxicity, Mobility, or Volume of Contamination

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

Alternative 1 will not reduce the toxicity, mobility, or volume of contamination. Alternative 2A and 2B will fulfill this criterion by reducing the volume of contamination and by reducing mobility. Alternative 3 will fulfill this criterion by removal of contamination.

8.2.5 Short-Term Impacts and Effectiveness

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

Alternative 1 does not pose additional risk to the community, workers, or environment, as there are no construction activities involved. Alternatives 2A, 2B and 3 pose increased short-term risks to the public during excavation, grading, and other site activities through the production of dust; these effects can be reduced through the implementation of standard dust mitigation construction practices. Workers can potentially be exposed to impacted media during excavation activities involved in Alternatives 2A, 2B and 3. Risks can be minimized by implementing health and safety controls, including the use of appropriate personal protective equipment.

8.2.6 Implementability

This criterion evaluates the technical and administrative feasibility of implementing each alternative.

All alternatives are implementable and have been used nationally; however, Alternative 2A would be the most difficult to implement due to equipment and space limitations.

8.2.7 Cost-Effectiveness

This criterion evaluates estimated capital costs, and annual operation, maintenance, and monitoring costs on a present-worth basis.

Alternative 1 is the least expensive, but is also the least effective. Alternative 3 costs 50 percent more than Alternative 2A, and more than twice as much as Alternative 2B, but it is also the most effective.

8.2.8 Land Use

Alternative 1 would not affect the future use of the site since contamination would remain. Impacted fill would remain on-site for Alternatives 2A and 2B; however, the recreational path would remain or be replaced, in kind, and the land use would not change. Alternative 3 involves removal of impacted fill and replacement of the asphalt path, in kind, and the land use would not change.

8.2.9 Community Acceptance

This criterion evaluates concerns of the community regarding the investigation and the evaluation of alternatives. The Lackawanna Incinerator site remedial approach has not been presented to the community for comment at this point.

8.3 COMPARISON OF BAKER HALL PROPERTY ALTERNATIVES

8.3.1 Overall Protection of Public Health and the Environment

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

Both alternatives fulfill this criterion as long as site use is limited to residential use. In the event site use changes, Alternative 2 will fulfill the criterion by removing the contaminants exceeding the Unrestricted use SCOs.

8.3.2 Standards, Criteria, and Guidance

Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria.

Both alternatives fulfill this criterion for the respective SCGs. Soil exceeding restricted residential SCGs was removed during the IRM. Alternative 2 involves removal of soil exceeding Unrestricted use SCGs.

8.3.3 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 recommended 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.

Both Alternatives 1 and 2 would fulfill this criterion because known contaminants exceeding respective SCGs have been and would be completely removed.

8.3.4 Reduction of Toxicity, Mobility, or Volume of Contamination

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

Both Alternatives 1 and 2 will fulfill this criterion by full removal of contamination exceeding respective SCGs.

8.3.5 Short-Term Impacts and Effectiveness

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

Alternative 1 does not pose additional risk to the community, workers, or environment, as there are no construction activities involved. Alternative 2 pose increased short-term risks to the public during excavation through the production of dust; these effects can be reduced through the implementation of standard dust mitigation construction practices.

8.3.6 Implementability

This criterion evaluates the technical and administrative feasibility of implementing each alternative.

Both alternatives are implementable and have been used nationally.

8.3.7 Cost-Effectiveness

This criterion evaluates estimated capital costs, as well as annual operation, maintenance, and monitoring costs on a present-worth basis.

Alternative 1 is the least expensive. Alternative 2 is the most expensive, but land use would not be limited in the future.

8.3.8 Land Use

Alternative 1 would not change the current use of the site since contamination exceeding the appropriate SCGs has already been removed. Alternative 2 would not limit the future use of the site since contamination exceeding the most stringent SCGs would be removed.

8.3.9 Community Acceptance

This criterion evaluates concerns of the community regarding the investigation and the evaluation of alternatives. The Lackawanna Incinerator site remedial approach has not been presented to the community for comment at this point.

8.4 PREFERRED COMBINED REMEDIAL ALTERNATIVE FOR THE LACKAWANNA INCINERATOR SITE

Based on the objective to cleanup On-Site soil and Smokes Creek Corridor soil to Commercial Use SCOs, and the Baker Hall Property to Restricted Residential Use SCOs (NYSDEC 2006) the recommended remedial strategy is summarized in the following table:

Area	Alternative Description	Total Cost
On-Site Area	Alternative 6A: Soil/fill excavation with disposal off-site, demolition and removal of both incinerator buildings	$4,267,000
Smokes Creek Corridor	Alternative 2B: Partial removal of contaminated soil to commercial Use SCOs with soil and asphalt cover of remaining contaminated soil/fill	$947,000
Baker Hall Property	Alternative 1: No further action	$0
	Total	**$5,214,000**

This combination of alternatives would involve demolition and off-site disposal of both incinerator buildings, as well as excavation and off-site disposal of all soil exceeding the appropriate SCOs for the on-site area. Soil exceeding restricted residential SCOs has already been removed from the Baker Hall Property. The top ft of soil exceeding Commercial Use SCOs, as well as the hot spot identified at the eastern extent of the remedial area, would be removed from the Smokes Creek Corridor. Following excavation, confirmation soil samples would be collected from the excavation side walls and bottoms (as applicable) at a rate of one per 30-linear ft (side walls) and 900-ft^2 (bottom), to verify that impacts have been removed. All excavations would be backfilled with clean common fill from off-site, followed by topsoil and

seed, with the asphalt recreational path along Smokes Creek being restored in kind. In the On-site Area, the ramp that currently leads up to the northern incinerator building would be removed, and final grades would gently slope toward Smokes Creek, thereby reducing the overall volume of backfill that would be required. This combination would not require long-term monitoring or maintenance because impacted soil would be removed from all of the areas.

Implementing the combined alternative rather than the individual alternatives separately could provide 5-10 percent cost savings due to the following gained efficiencies in implementation:

- Combined pre-design effort would facilitate development of a comprehensive basemap update for all three parcels, a complete survey for underground utilities or other obstructions, and reduces/consolidates the efforts for developing planning documents.
- Mobilization/staging would allow for a single mobilization of required equipment and establishment of a centralized staging area, within the On-site Area, to minimize disruption to the adjoining parcels.
- Boundary conditions would prevent double-handling of impacted soil along common parcel boundaries. Additionally, the excavation could be sequenced from the least impacted area (Smokes Creek Corridor) to the most impacted area (On-site Area) to minimize traffic through “clean” areas.
- Schedule/coordination would allow for a reduction in the remediation timeframe of 1–3 months, reduce the number of meetings required to coordinate with stakeholders, and minimize the disruption to the surrounding community.

9. REFERENCES

EA Engineering, P.C. and Its Affiliate EA Science and Technology (EA). 2014. *Remedial Investigation/Feasibility Study Work Plan for the Lackawanna Incinerator Site (915206), Erie County, Lackawanna, New York.* June.

——. 2015. *Interim Remedial Measure Construction Completion Report, Former Lackawanna Incinerator Site, (9152060, Erie County, Lackawanna, New York.* September.

Malcolm Pirnie. 2005. *Draft Site Investigation/Remedial Alternatives Report, Former Incinerator Site, Lackawanna, New York.*

New York State Department of Environmental Conservation (NYSDEC). 1998. *NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards (Class GA).* June.

——. 2006. *6 New York Code of Rules and Regulations (NYCRR) Part 375 Environmental Remediation Programs – Soil Cleanup Objectives (SCOs).* December 14.

——. 2010. *DER-10 Technical Guidance for Site Investigation and Remediation.* May.

——. 2014. *Screening and Assessment of Contaminated Sediment (June 24).*

United States Environmental Protection Agency (EPA). 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.* EPA l540lG-891004.

——. 1996. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*. EPA 542-F-96-007. EPA Office of Solid Waste and Emergency Response. April.

Figures

Legend

★ Lackawanna Incinerator

0 0.25 0.5 1 Miles

1 in = 0.5 miles

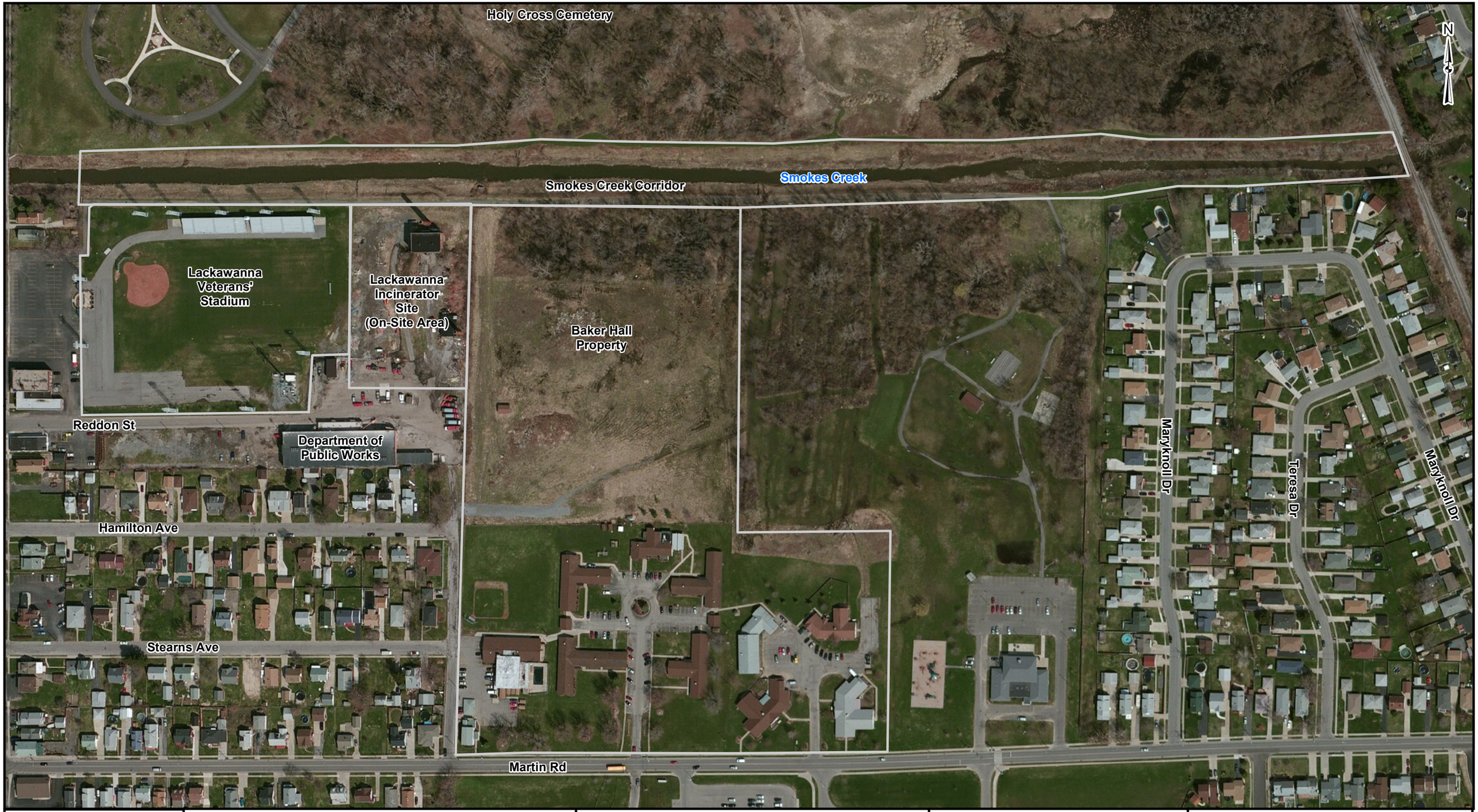
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 1-1
Site Location

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	CJS	HAW	MEM	AS SHOWN	NOV 2015	1490710	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS



Legend

Site-Related Area

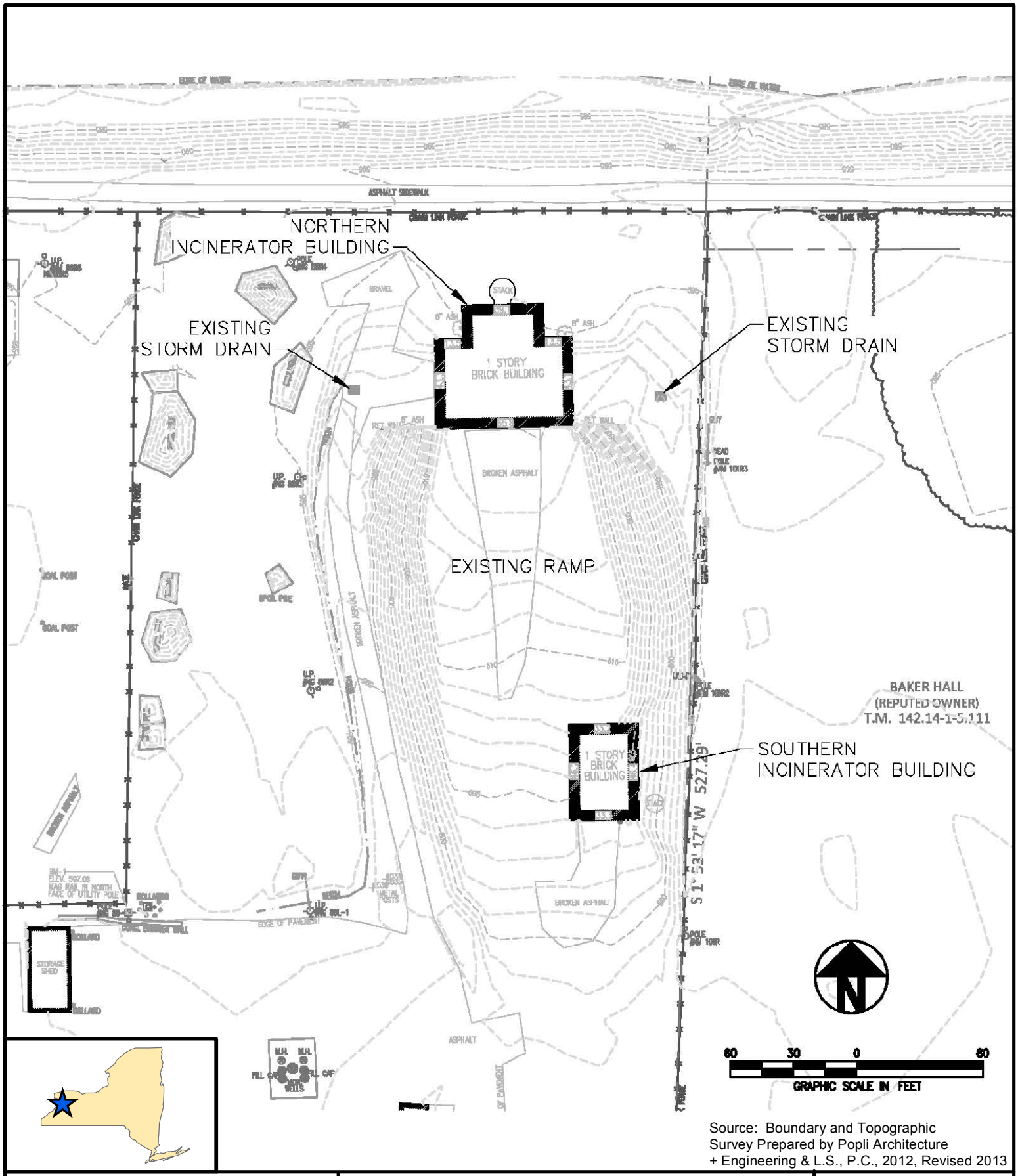
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 1-2
Site-Related Areas

Feet
0 100 200 400
1 inch = 200 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	ALK	HAW	MEM	AS SHOWN	NOV 2015	14907.10	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS



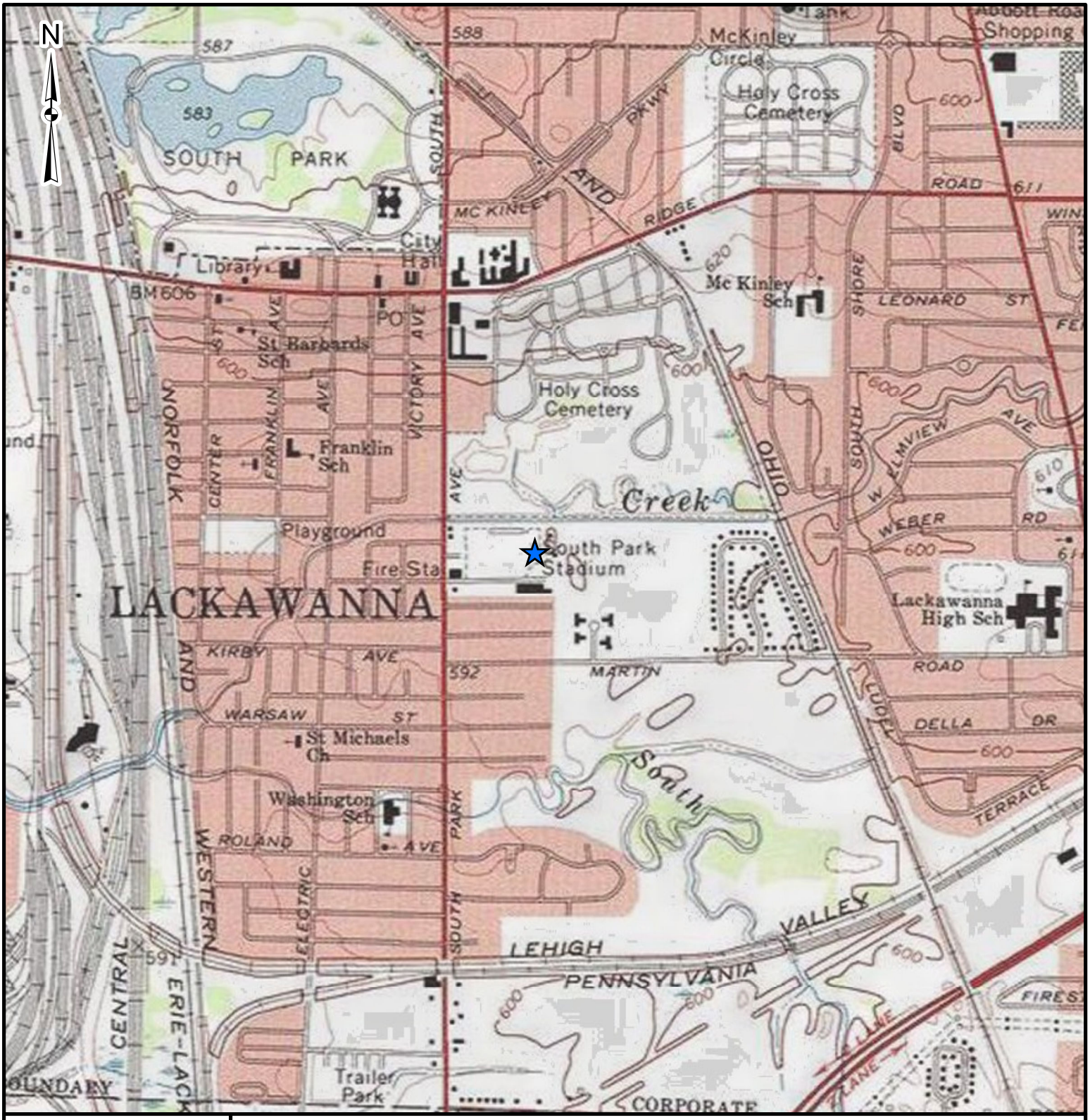
Source: Boundary and Topographic Survey Prepared by Popli Architecture + Engineering & L.S., P.C., 2012, Revised 2013

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 1-3
Existing Site Features

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	ALK	HAW	MEM	AS SHOWN	NOV 2015	1490710	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS



Legend

★ Lackawanna Incinerator Site

Feet
0 625 1,250 2,500
1 in = 1,250 ft

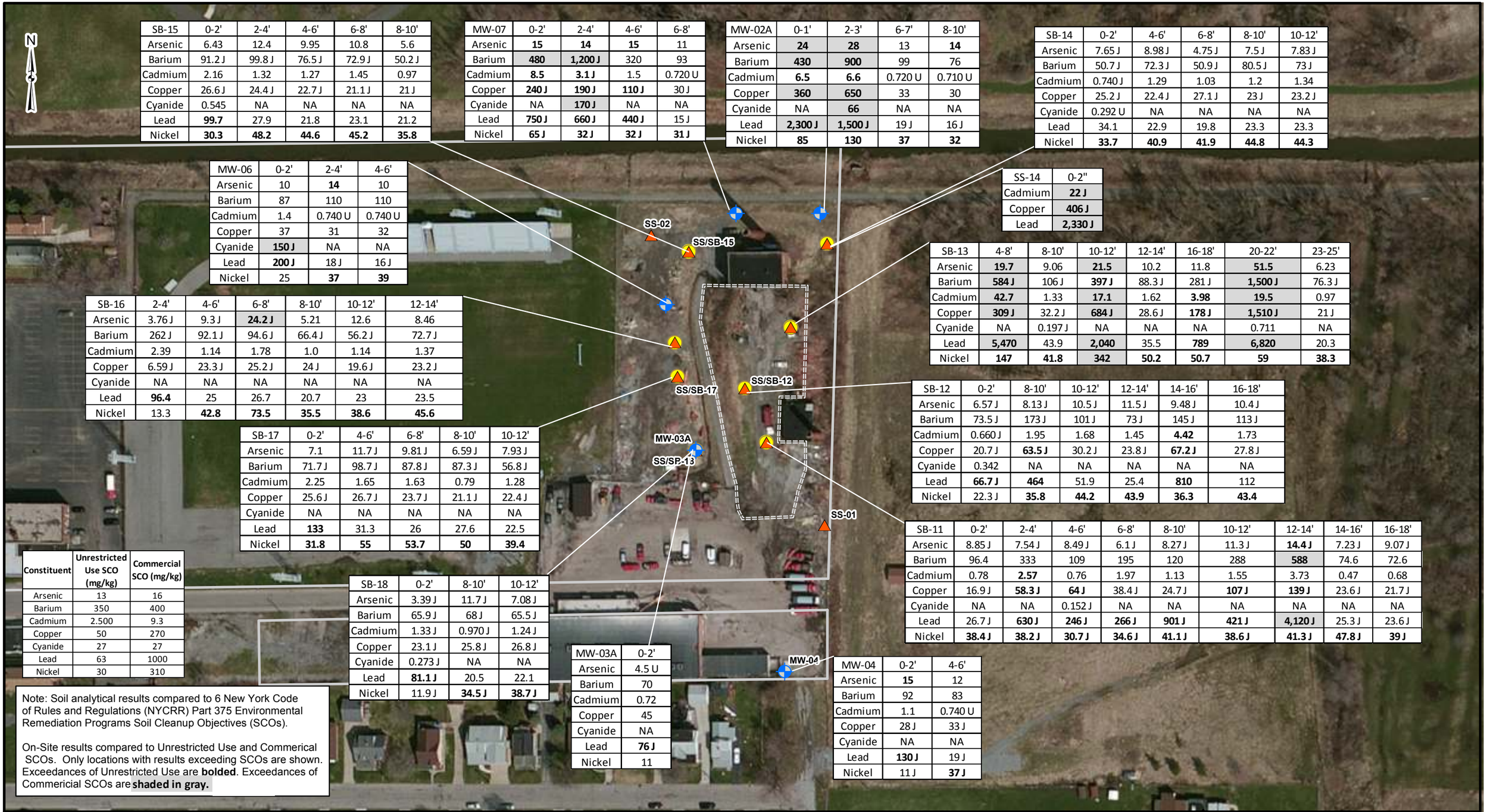
Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed
Copyright:© 2013 Esri
Sources: Esri, USGS, NOAA

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 1-4
Topographic Quadrangle Map - 1965

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	ALK	HAW	MEM	AS SHOWN	NOV 2015	1490710	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS



SB-15	0-2'	2-4'	4-6'	6-8'	8-10'
Arsenic	6.43	12.4	9.95	10.8	5.6
Barium	91.2 J	99.8 J	76.5 J	72.9 J	50.2 J
Cadmium	2.16	1.32	1.27	1.45	0.97
Copper	26.6 J	24.4 J	22.7 J	21.1 J	21 J
Cyanide	0.545	NA	NA	NA	NA
Lead	**99.7**	27.9	21.8	23.1	21.2
Nickel	**30.3**	**48.2**	**44.6**	**45.2**	**35.8**

MW-07	0-2'	2-4'	4-6'	6-8'
Arsenic	**15**	**14**	**15**	11
Barium	**480**	**1,200 J**	320	93
Cadmium	**8.5**	**3.1 J**	1.5	0.720 U
Copper	**240 J**	**190 J**	**110 J**	30 J
Cyanide	NA	**170 J**	NA	NA
Lead	**750 J**	**660 J**	**440 J**	15 J
Nickel	**65 J**	**32 J**	**32 J**	**31 J**

MW-02A	0-1'	2-3'	6-7'	8-10'
Arsenic	**24**	**28**	13	**14**
Barium	**430**	**900**	99	76
Cadmium	**6.5**	**6.6**	0.720 U	0.710 U
Copper	**360**	**650**	33	30
Cyanide	NA	**66**	NA	NA
Lead	**2,300 J**	**1,500 J**	19 J	16 J
Nickel	**85**	**130**	**37**	**32**

SB-14	0-2'	4-6'	6-8'	8-10'	10-12'
Arsenic	7.65 J	8.98 J	4.75 J	7.5 J	7.83 J
Barium	50.7 J	72.3 J	50.9 J	80.5 J	73 J
Cadmium	0.740 J	1.29	1.03	1.2	1.34
Copper	25.2 J	22.4 J	27.1 J	23 J	23.2 J
Cyanide	0.292 U	NA	NA	NA	NA
Lead	34.1	22.9	19.8	23.3	23.3
Nickel	**33.7**	**40.9**	**41.9**	**44.8**	**44.3**

MW-06	0-2'	2-4'	4-6'
Arsenic	10	**14**	10
Barium	87	110	110
Cadmium	1.4	0.740 U	0.740 U
Copper	37	31	32
Cyanide	**150 J**	NA	NA
Lead	**200 J**	18 J	16 J
Nickel	25	**37**	**39**

SS-14	0-2"
Cadmium	**22 J**
Copper	**406 J**
Lead	**2,330 J**

SB-13	4-8'	8-10'	10-12'	12-14'	16-18'	20-22'	23-25'
Arsenic	**19.7**	9.06	**21.5**	10.2	11.8	**51.5**	6.23
Barium	**584 J**	106 J	**397 J**	88.3 J	281 J	**1,500 J**	76.3 J
Cadmium	**42.7**	1.33	**17.1**	1.62	**3.98**	**19.5**	0.97
Copper	**309 J**	32.2 J	**684 J**	28.6 J	**178 J**	**1,510 J**	21 J
Cyanide	NA	0.197 J	NA	NA	NA	0.711	NA
Lead	**5,470**	43.9	**2,040**	35.5	**789**	**6,820**	20.3
Nickel	**147**	**41.8**	**342**	**50.2**	**50.7**	**59**	**38.3**

SB-16	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'
Arsenic	3.76 J	9.3 J	**24.2 J**	5.21	12.6	8.46
Barium	262 J	92.1 J	94.6 J	66.4 J	56.2 J	72.7 J
Cadmium	2.39	1.14	1.78	1.0	1.14	1.37
Copper	6.59 J	23.3 J	25.2 J	24 J	19.6 J	23.2 J
Cyanide	NA	NA	NA	NA	NA	NA
Lead	**96.4**	25	26.7	20.7	23	23.5
Nickel	13.3	**42.8**	**73.5**	**35.5**	**38.6**	**45.6**

SB-12	0-2'	8-10'	10-12'	12-14'	14-16'	16-18'
Arsenic	6.57 J	8.13 J	10.5 J	11.5 J	9.48 J	10.4 J
Barium	73.5 J	173 J	101 J	73 J	145 J	113 J
Cadmium	0.660 J	1.95	1.68	1.45	**4.42**	1.73
Copper	20.7 J	**63.5 J**	30.2 J	23.8 J	**67.2 J**	27.8 J
Cyanide	0.342	NA	NA	NA	NA	NA
Lead	**66.7 J**	**464**	51.9	25.4	**810**	112
Nickel	22.3 J	**35.8**	**44.2**	**43.9**	**36.3**	**43.4**

SB-17	0-2'	4-6'	6-8'	8-10'	10-12'
Arsenic	7.1	11.7 J	9.81 J	6.59 J	7.93 J
Barium	71.7 J	98.7 J	87.8 J	87.3 J	56.8 J
Cadmium	2.25	1.65	1.63	0.79	1.28
Copper	25.6 J	26.7 J	23.7 J	21.1 J	22.4 J
Cyanide	NA	NA	NA	NA	NA
Lead	**133**	31.3	26	27.6	22.5
Nickel	**31.8**	**55**	**53.7**	**50**	**39.4**

SB-11	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'
Arsenic	8.85 J	7.54 J	8.49 J	6.1 J	8.27 J	11.3 J	**14.4 J**	7.23 J	9.07 J
Barium	96.4	333	109	195	120	288	**588**	74.6	72.6
Cadmium	0.78	**2.57**	0.76	1.97	1.13	1.55	3.73	0.47	0.68
Copper	16.9 J	**58.3 J**	**64 J**	38.4 J	24.7 J	**107 J**	**139 J**	23.6 J	21.7 J
Cyanide	NA	NA	0.152 J	NA	NA	NA	NA	NA	NA
Lead	26.7 J	**630 J**	**246 J**	**266 J**	**901 J**	**421 J**	**4,120 J**	25.3 J	23.6 J
Nickel	**38.4 J**	**38.2 J**	**30.7 J**	**34.6 J**	**41.1 J**	**38.6 J**	**41.3 J**	**47.8 J**	**39 J**

Constituent	Unrestricted Use SCO (mg/kg)	Commercial SCO (mg/kg)
Arsenic	13	16
Barium	350	400
Cadmium	2.500	9.3
Copper	50	270
Cyanide	27	27
Lead	63	1000
Nickel	30	310

SB-18	0-2'	8-10'	10-12'
Arsenic	3.39 J	11.7 J	7.08 J
Barium	65.9 J	68 J	65.5 J
Cadmium	1.33 J	0.970 J	1.24 J
Copper	23.1 J	25.8 J	26.8 J
Cyanide	0.273 J	NA	NA
Lead	**81.1 J**	20.5	22.1
Nickel	11.9 J	**34.5 J**	**38.7 J**

MW-03A	0-2'
Arsenic	4.5 U
Barium	70
Cadmium	0.72
Copper	45
Cyanide	NA
Lead	**76 J**
Nickel	11

MW-04	0-2'	4-6'
Arsenic	**15**	12
Barium	92	83
Cadmium	1.1	0.740 U
Copper	28 J	33 J
Cyanide	NA	NA
Lead	**130 J**	19 J
Nickel	11 J	**37 J**

Note: Soil analytical results compared to 6 New York Code of Rules and Regulations (NYCRR) Part 375 Environmental Remediation Programs Soil Cleanup Objectives (SCOs).

On-Site results compared to Unrestricted Use and Commerical SCOs. Only locations with results exceeding SCOs are shown. Exceedances of Unrestricted Use are **bolded**. Exceedances of Commericial SCOs are **shaded in gray.**

Legend

- Monitoring Well
- Surface Soil
- Soil Boring
- On-Site Area
- Soil Ramp

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP and the GIS User Community

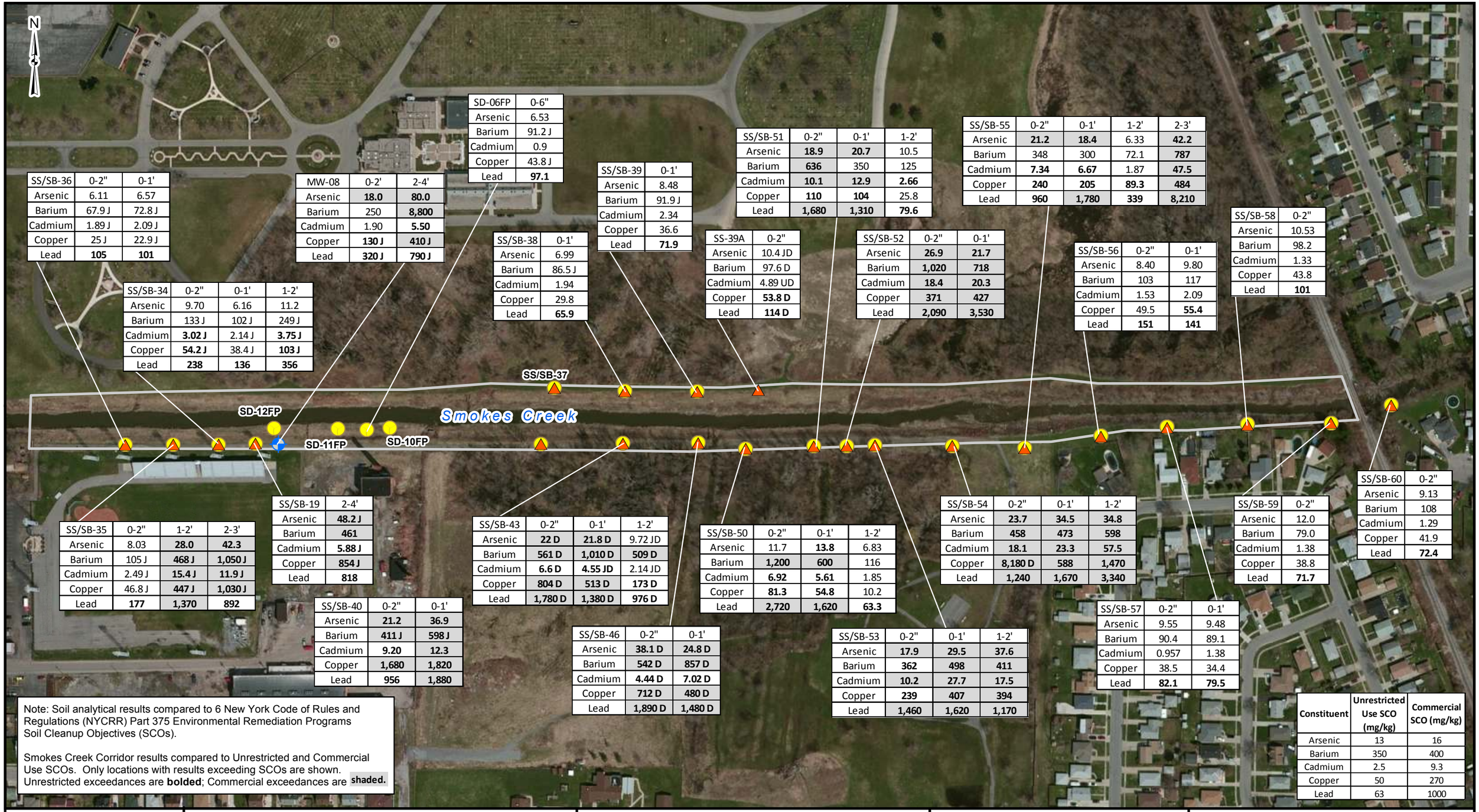
LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 2-1
RI Inorganic Soil Results
On-Site Area

0 50 100 200 Feet
1 in = 110 ft

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	HAW	HAW	MEM	AS SHOWN	NOV 2015	1490710	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation



SS/SB-36	0-2"	0-1'
Arsenic	6.11	6.57
Barium	67.9 J	72.8 J
Cadmium	1.89 J	2.09 J
Copper	25 J	22.9 J
Lead	**105**	**101**

MW-08	0-2'	2-4'
Arsenic	**18.0**	**80.0**
Barium	250	**8,800**
Cadmium	1.90	**5.50**
Copper	**130 J**	**410 J**
Lead	**320 J**	**790 J**

SD-06FP	0-6"
Arsenic	6.53
Barium	91.2 J
Cadmium	0.9
Copper	43.8 J
Lead	**97.1**

SS/SB-39	0-1'
Arsenic	8.48
Barium	91.9 J
Cadmium	2.34
Copper	36.6
Lead	**71.9**

SS/SB-51	0-2"	0-1'	1-2'
Arsenic	**18.9**	**20.7**	10.5
Barium	**636**	350	125
Cadmium	**10.1**	**12.9**	**2.66**
Copper	**110**	**104**	25.8
Lead	**1,680**	**1,310**	**79.6**

SS/SB-55	0-2"	0-1'	1-2'	2-3'
Arsenic	**21.2**	**18.4**	6.33	**42.2**
Barium	348	300	72.1	**787**
Cadmium	**7.34**	**6.67**	1.87	**47.5**
Copper	**240**	**205**	**89.3**	**484**
Lead	**960**	**1,780**	**339**	**8,210**

SS/SB-58	0-2"
Arsenic	10.53
Barium	98.2
Cadmium	1.33
Copper	43.8
Lead	**101**

SS/SB-34	0-2"	0-1'	1-2'
Arsenic	9.70	6.16	11.2
Barium	133 J	102 J	249 J
Cadmium	**3.02 J**	2.14 J	**3.75 J**
Copper	**54.2 J**	38.4 J	**103 J**
Lead	**238**	**136**	**356**

SS/SB-38	0-1'
Arsenic	6.99
Barium	86.5 J
Cadmium	1.94
Copper	29.8
Lead	**65.9**

SS-39A	0-2"
Arsenic	10.4 JD
Barium	97.6 D
Cadmium	4.89 UD
Copper	**53.8 D**
Lead	**114 D**

SS/SB-52	0-2"	0-1'
Arsenic	**26.9**	**21.7**
Barium	**1,020**	**718**
Cadmium	**18.4**	**20.3**
Copper	**371**	**427**
Lead	**2,090**	**3,530**

SS/SB-56	0-2"	0-1'
Arsenic	8.40	9.80
Barium	103	117
Cadmium	1.53	2.09
Copper	49.5	**55.4**
Lead	**151**	**141**

SS/SB-35	0-2"	1-2'	2-3'
Arsenic	8.03	**28.0**	**42.3**
Barium	105 J	**468 J**	**1,050 J**
Cadmium	2.49 J	**15.4 J**	**11.9 J**
Copper	46.8 J	**447 J**	**1,030 J**
Lead	**177**	**1,370**	**892**

SS/SB-19	2-4'
Arsenic	**48.2 J**
Barium	**461**
Cadmium	**5.88 J**
Copper	**854 J**
Lead	**818**

SS/SB-43	0-2"	0-1'	1-2'
Arsenic	**22 D**	**21.8 D**	9.72 JD
Barium	**561 D**	**1,010 D**	**509 D**
Cadmium	**6.6 D**	**4.55 JD**	2.14 JD
Copper	**804 D**	**513 D**	**173 D**
Lead	**1,780 D**	**1,380 D**	**976 D**

SS/SB-50	0-2"	0-1'	1-2'
Arsenic	11.7	**13.8**	6.83
Barium	**1,200**	**600**	116
Cadmium	**6.92**	**5.61**	1.85
Copper	**81.3**	**54.8**	10.2
Lead	**2,720**	**1,620**	**63.3**

SS/SB-54	0-2"	0-1'	1-2'
Arsenic	**23.7**	**34.5**	**34.8**
Barium	**458**	**473**	**598**
Cadmium	**18.1**	**23.3**	**57.5**
Copper	**8,180 D**	**588**	**1,470**
Lead	**1,240**	**1,670**	**3,340**

SS/SB-59	0-2"
Arsenic	12.0
Barium	79.0
Cadmium	1.38
Copper	38.8
Lead	**71.7**

SS/SB-60	0-2"
Arsenic	9.13
Barium	108
Cadmium	1.29
Copper	41.9
Lead	**72.4**

SS/SB-40	0-2"	0-1'
Arsenic	**21.2**	**36.9**
Barium	**411 J**	**598 J**
Cadmium	**9.20**	**12.3**
Copper	**1,680**	**1,820**
Lead	**956**	**1,880**

SS/SB-46	0-2"	0-1'
Arsenic	**38.1 D**	**24.8 D**
Barium	**542 D**	**857 D**
Cadmium	**4.44 D**	**7.02 D**
Copper	**712 D**	**480 D**
Lead	**1,890 D**	**1,480 D**

SS/SB-53	0-2"	0-1'	1-2'
Arsenic	**17.9**	**29.5**	**37.6**
Barium	**362**	**498**	**411**
Cadmium	**10.2**	**27.7**	**17.5**
Copper	**239**	**407**	**394**
Lead	**1,460**	**1,620**	**1,170**

SS/SB-57	0-2"	0-1'
Arsenic	9.55	9.48
Barium	90.4	89.1
Cadmium	0.957	1.38
Copper	38.5	34.4
Lead	**82.1**	**79.5**

Note: Soil analytical results compared to 6 New York Code of Rules and Regulations (NYCRR) Part 375 Environmental Remediation Programs Soil Cleanup Objectives (SCOs).

Smokes Creek Corridor results compared to Unrestricted and Commercial Use SCOs. Only locations with results exceeding SCOs are shown. Unrestricted exceedances are **bolded**; Commercial exceedances are **shaded.**

Constituent	Unrestricted Use SCO (mg/kg)	Commercial SCO (mg/kg)
Arsenic	13	16
Barium	350	400
Cadmium	2.5	9.3
Copper	50	270
Lead	63	1000

Legend

- Monitoring Well
- Surface Soil
- Soil Boring
- Smokes Creek Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

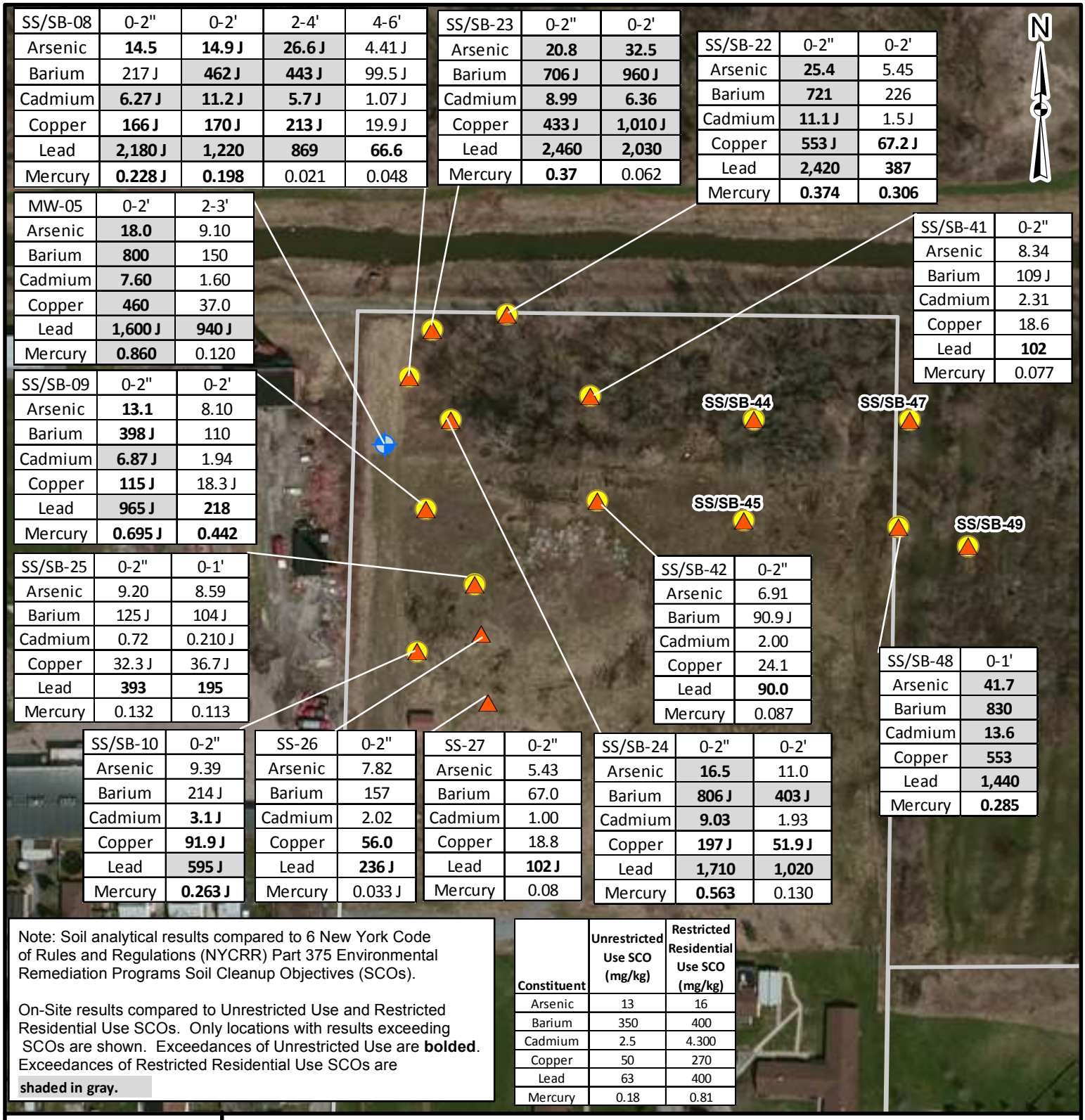
FIGURE 2-2
RI Inorganic Soil Results
Smokes Creek Corridor

0 100 200 400 Feet

1 inch = 200 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	ALK	HAW	MEM	AS SHOWN	NOV 2015	14907.10	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation



SS/SB-08	0-2"	0-2'	2-4'	4-6'
Arsenic	**14.5**	**14.9 J**	**26.6 J**	4.41 J
Barium	217 J	**462 J**	**443 J**	99.5 J
Cadmium	**6.27 J**	**11.2 J**	**5.7 J**	1.07 J
Copper	**166 J**	**170 J**	**213 J**	19.9 J
Lead	**2,180 J**	**1,220**	**869**	**66.6**
Mercury	**0.228 J**	**0.198**	0.021	0.048

SS/SB-23	0-2"	0-2'
Arsenic	**20.8**	**32.5**
Barium	**706 J**	**960 J**
Cadmium	**8.99**	**6.36**
Copper	**433 J**	**1,010 J**
Lead	**2,460**	**2,030**
Mercury	**0.37**	0.062

SS/SB-22	0-2"	0-2'
Arsenic	**25.4**	5.45
Barium	**721**	226
Cadmium	**11.1 J**	1.5 J
Copper	**553 J**	**67.2 J**
Lead	**2,420**	**387**
Mercury	**0.374**	**0.306**

MW-05	0-2'	2-3'
Arsenic	**18.0**	9.10
Barium	**800**	150
Cadmium	**7.60**	1.60
Copper	**460**	37.0
Lead	**1,600 J**	**940 J**
Mercury	**0.860**	0.120

SS/SB-41	0-2"
Arsenic	8.34
Barium	109 J
Cadmium	2.31
Copper	18.6
Lead	**102**
Mercury	0.077

SS/SB-09	0-2"	0-2'
Arsenic	**13.1**	8.10
Barium	**398 J**	110
Cadmium	**6.87 J**	1.94
Copper	**115 J**	18.3 J
Lead	**965 J**	**218**
Mercury	**0.695 J**	**0.442**

SS/SB-25	0-2"	0-1'
Arsenic	9.20	8.59
Barium	125 J	104 J
Cadmium	0.72	0.210 J
Copper	32.3 J	36.7 J
Lead	**393**	**195**
Mercury	0.132	0.113

SS/SB-42	0-2"
Arsenic	6.91
Barium	90.9 J
Cadmium	2.00
Copper	24.1
Lead	**90.0**
Mercury	0.087

SS/SB-48	0-1'
Arsenic	**41.7**
Barium	**830**
Cadmium	**13.6**
Copper	**553**
Lead	**1,440**
Mercury	**0.285**

SS/SB-10	0-2"
Arsenic	9.39
Barium	214 J
Cadmium	**3.1 J**
Copper	**91.9 J**
Lead	**595 J**
Mercury	**0.263 J**

SS-26	0-2"
Arsenic	7.82
Barium	157
Cadmium	2.02
Copper	**56.0**
Lead	**236 J**
Mercury	0.033 J

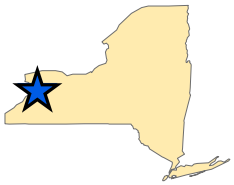
SS-27	0-2"
Arsenic	5.43
Barium	67.0
Cadmium	1.00
Copper	18.8
Lead	**102 J**
Mercury	0.08

SS/SB-24	0-2"	0-2'
Arsenic	**16.5**	11.0
Barium	**806 J**	**403 J**
Cadmium	**9.03**	1.93
Copper	**197 J**	**51.9 J**
Lead	**1,710**	**1,020**
Mercury	**0.563**	0.130

Note: Soil analytical results compared to 6 New York Code of Rules and Regulations (NYCRR) Part 375 Environmental Remediation Programs Soil Cleanup Objectives (SCOs).

On-Site results compared to Unrestricted Use and Restricted Residential Use SCOs. Only locations with results exceeding SCOs are shown. Exceedances of Unrestricted Use are **bolded**. Exceedances of Restricted Residential Use SCOs are **shaded in gray.**

Constituent	Unrestricted Use SCO (mg/kg)	Restricted Residential Use SCO (mg/kg)
Arsenic	13	16
Barium	350	400
Cadmium	2.5	4.300
Copper	50	270
Lead	63	400
Mercury	0.18	0.81



Legend

Monitoring Well

Surface Soil

Soil Boring

Baker Hall Property

Feet

0 75 150 300

1 in = 150 ft

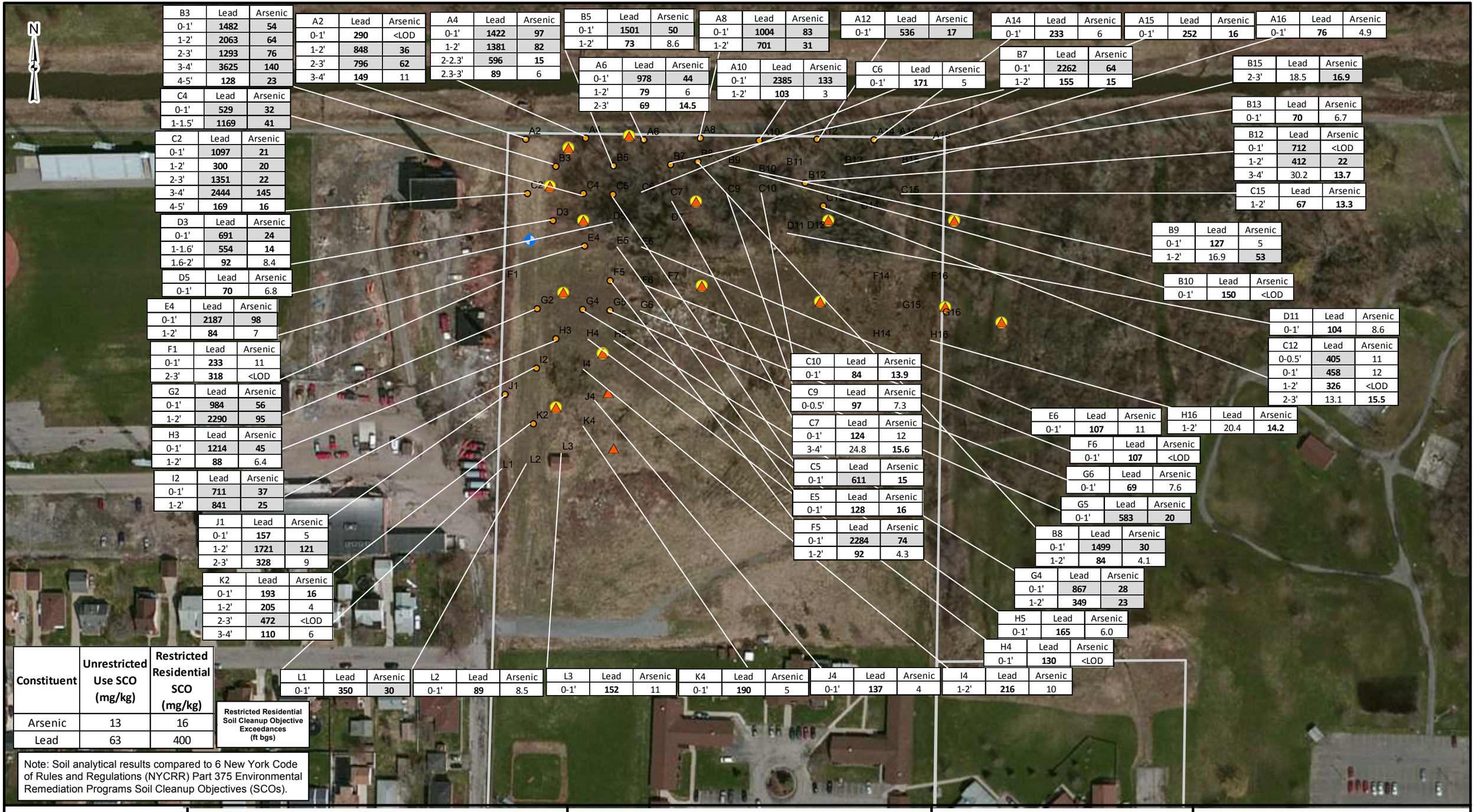
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

EA® NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 2-3
RI Inorganic Soil Results
Baker Hall Property

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	HAW	HAW	MEM	AS SHOWN	NOV 2015	1490710	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS



B3	Lead	Arsenic
0-1'	**1482**	**54**
1-2'	**2063**	**64**
2-3'	**1293**	**76**
3-4'	**3625**	**140**
4-5'	**128**	**23**

A2	Lead	Arsenic
0-1'	**290**	<LOD
1-2'	**848**	**36**
2-3'	**796**	**62**
3-4'	**149**	11

A4	Lead	Arsenic
0-1'	**1422**	**97**
1-2'	**1381**	**82**
2-2.3'	**596**	**15**
2.3-3'	**89**	6

B5	Lead	Arsenic
0-1'	**1501**	**50**
1-2'	**73**	8.6

A8	Lead	Arsenic
0-1'	**1004**	**83**
1-2'	**701**	**31**

A12	Lead	Arsenic
0-1'	**536**	**17**

A14	Lead	Arsenic
0-1'	**233**	6

A15	Lead	Arsenic
0-1'	**252**	**16**

A16	Lead	Arsenic
0-1'	**76**	4.9

A6	Lead	Arsenic
0-1'	**978**	**44**
1-2'	**79**	6
2-3'	**69**	**14.5**

A10	Lead	Arsenic
0-1'	**2385**	**133**
1-2'	**103**	3

C6	Lead	Arsenic
0-1'	**171**	5

B7	Lead	Arsenic
0-1'	**2262**	**64**
1-2'	**155**	**15**

B15	Lead	Arsenic
2-3'	18.5	**16.9**

B13	Lead	Arsenic
0-1'	**70**	6.7

B12	Lead	Arsenic
0-1'	**712**	<LOD
1-2'	**412**	**22**
3-4'	30.2	**13.7**

C15	Lead	Arsenic
1-2'	**67**	**13.3**

C4	Lead	Arsenic
0-1'	**529**	**32**
1-1.5'	**1169**	**41**

C2	Lead	Arsenic
0-1'	**1097**	**21**
1-2'	**300**	**20**
2-3'	**1351**	**22**
3-4'	**2444**	**145**
4-5'	**169**	**16**

D3	Lead	Arsenic
0-1'	**691**	**24**
1-1.6'	**554**	**14**
1.6-2'	**92**	8.4

D5	Lead	Arsenic
0-1'	**70**	6.8

B9	Lead	Arsenic
0-1'	**127**	5
1-2'	16.9	**53**

B10	Lead	Arsenic
0-1'	**150**	<LOD

D11	Lead	Arsenic
0-1'	**104**	8.6

C12	Lead	Arsenic
0-0.5'	**405**	11
0-1'	**458**	12
1-2'	**326**	<LOD
2-3'	13.1	**15.5**

E4	Lead	Arsenic
0-1'	**2187**	**98**
1-2'	**84**	7

F1	Lead	Arsenic
0-1'	**233**	11
2-3'	**318**	<LOD

G2	Lead	Arsenic
0-1'	**984**	**56**
1-2'	**2290**	**95**

H3	Lead	Arsenic
0-1'	**1214**	**45**
1-2'	**88**	6.4

I2	Lead	Arsenic
0-1'	**711**	**37**
1-2'	**841**	**25**

C10	Lead	Arsenic
0-1'	**84**	**13.9**

C9	Lead	Arsenic
0-0.5'	**97**	7.3

C7	Lead	Arsenic
0-1'	**124**	12
3-4'	24.8	**15.6**

C5	Lead	Arsenic
0-1'	**611**	**15**

E5	Lead	Arsenic
0-1'	**128**	**16**

F5	Lead	Arsenic
0-1'	**2284**	**74**
1-2'	**92**	4.3

E6	Lead	Arsenic
0-1'	**107**	11

H16	Lead	Arsenic
1-2'	20.4	**14.2**

F6	Lead	Arsenic
0-1'	**107**	<LOD

G6	Lead	Arsenic
0-1'	**69**	7.6

G5	Lead	Arsenic
0-1'	**583**	**20**

B8	Lead	Arsenic
0-1'	**1499**	**30**
1-2'	**84**	4.1

G4	Lead	Arsenic
0-1'	**867**	**28**
1-2'	**349**	**23**

H5	Lead	Arsenic
0-1'	**165**	6.0

H4	Lead	Arsenic
0-1'	**130**	<LOD

J1	Lead	Arsenic
0-1'	**157**	5
1-2'	**1721**	**121**
2-3'	**328**	9

K2	Lead	Arsenic
0-1'	**193**	**16**
1-2'	**205**	4
2-3'	**472**	<LOD
3-4'	**110**	6

L1	Lead	Arsenic
0-1'	**350**	**30**

L2	Lead	Arsenic
0-1'	**89**	8.5

L3	Lead	Arsenic
0-1'	**152**	11

K4	Lead	Arsenic
0-1'	**190**	5

J4	Lead	Arsenic
0-1'	**137**	4

I4	Lead	Arsenic
1-2'	**216**	10

Constituent	Unrestricted Use SCO (mg/kg)	Restricted Residential SCO (mg/kg)
Arsenic	13	16
Lead	63	400

Restricted Residential Soil Cleanup Objective Exceedances (ft bgs)

Note: Soil analytical results compared to 6 New York Code of Rules and Regulations (NYCRR) Part 375 Environmental Remediation Programs Soil Cleanup Objectives (SCOs).

Legend

- Monitoring Well
- Surface Soil
- Soil Boring

Lead XRF Reading

- <400 ppm
- >400 ppm
- Baker Hall Property

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 2-4
Baker Hall Supplemental
Delineation XRF Exceedances
For Lead and Arsenic

Feet
0 75 150 300
1 in = 123 ft

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	HAW	SGS	MEM	AS SHOWN	NOV 2015	1490710	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS

EA® NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

MW-08	11/29/2012 Total	11/29/2012 Dissolved	4/17/2013
Antimony	**5.62 J**	**5.4 J**	(<25 U)
Arsenic	2.9 J	(<5 UJ)	17
Chromium	7.68 J	1.62 J	27.7 J
Iron	**949**	27.7 J	**14,200 J**
Lead	(<3 UJ)	(<3 UJ)	17
Magnesium	**52,200**	**53,200 J**	**72,800**
Manganese	65.8 J	58.6 J	291 J
Nickel	5.89 J	(<10 UJ)	22.1
Sodium	**29,600**	**31,100 J**	**33,400 J**

MW-07	11/28/2012	4/17/2013
Antimony	(<12.5 UJ)	(<25 U)
Arsenic	12.3 J	**43.7**
Chromium	(<175 U)	9.3 J
Iron	**15,000**	**3,380 J**
Lead	**30.5 J**	18.4
Magnesium	**43,500**	**57,100 J**
Manganese	**338 J**	99.1 J
Nickel	**123**	9.08 J
Sodium	**35,300**	**54,800 J**

MW-02A	11/29/2012	4/17/2013
Antimony	**5.48 J**	(<25 U)
Arsenic	9.3 J	16.4
Chromium	(<65 U)	22.8 J
Iron	**4,200**	**896 J**
Lead	4.94 J	2.89 J
Magnesium	30,600	**48,800 J**
Manganese	147 J	106 J
Nickel	(<44 U)	13.8J
Sodium	**30,800**	**57,500 J**

MW-06	11/28/2012 Total	11/28/2012 Dissolved	4/16/2013
Antimony	12.5 UJ	**6.27 J**	(<25 U)
Arsenic	13.6 J	5 J	**30.2**
Chromium	(<69.9 U)	(<2.5 U)	11.2
Iron	**12,100**	(<25 U)	**4,040**
Lead	7.08 J	(<3 UJ)	2.6 J
Magnesium	**37,600**	31,200 J	34,300
Manganese	283 J	158 J	125
Nickel	(<52.2 U)	(<24.6 U)	22.3
Sodium	**48,800**	**43,600 J**	**38,200**

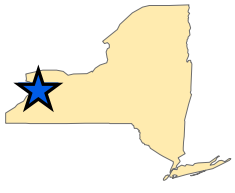
MW-05	11/29/2012	4/17/2013
Antimony	**4.84 J**	(<25 U)
Arsenic	8.4 J	18.7
Chromium	10 J	7.18 J
Iron	196	**852 J**
Lead	(<3 UJ)	(<6 U)
Magnesium	27,800	**44,800 J**
Manganese	50 J	121 J
Nickel	6.8 J	(<20 U)
Sodium	**32,000**	**47,500 J**

MW-03A	11/28/2012	4/16/2013
Antimony	**6.08 J**	(<25 U)
Arsenic	12.3 J	13.7
Chromium	(<24.2 U)	2.58 J
Iron	(<993 U)	**655**
Lead	(<3 U)	(<6 U)
Magnesium	**53,000**	**41,700**
Manganese	**342 J**	69.9
Nickel	(<20.7 U)	10.7 J
Sodium	**214,000**	**254,000**

NYSDEC Class GA Standards and Guidance Values (µg/L)	
Antimony	3
Arsenic	25
Chromium	50
Iron	300
Lead	25
Magnesium	35,000
Manganese	300
Nickel	100
Sodium	20,000

Well ID	Date Sampled
Analyte	Result (µg/L)

MW-04	11/28/2012 Total	11/28/2012 Dissolved	4/17/2013
Antimony	**4.56 J**	**6.34 J**	(<25 U)
Arsenic	6.9 J	(<5 UJ)	(<10 U)
Chromium	**293 J**	(<2.5 U)	21.5 J
Iron	**12,300**	(<25 U)	**723 J**
Lead	7.26 J	(<3 UJ)	5.09 J
Magnesium	**36,100**	**37,200 J**	**59,500 J**
Manganese	**364 J**	191 J	187 J
Nickel	**195**	(<10 U)	17.2 J
Sodium	**27,400 J**	**32,700 J**	**38,700 J**



Legend

- Monitoring Well
- On-Site Area
- Soil Ramp
- Tax Parcels

Note: Bold indicates exceedance of NYSDEC Class GA Standards and Guidance Values for inorganics.
J = Estimated value
U = The constituent was not detected; the associated value is the reporting limit.
µg/L = micrograms per liter

0 50 100 200 Feet

1 in = 100 ft

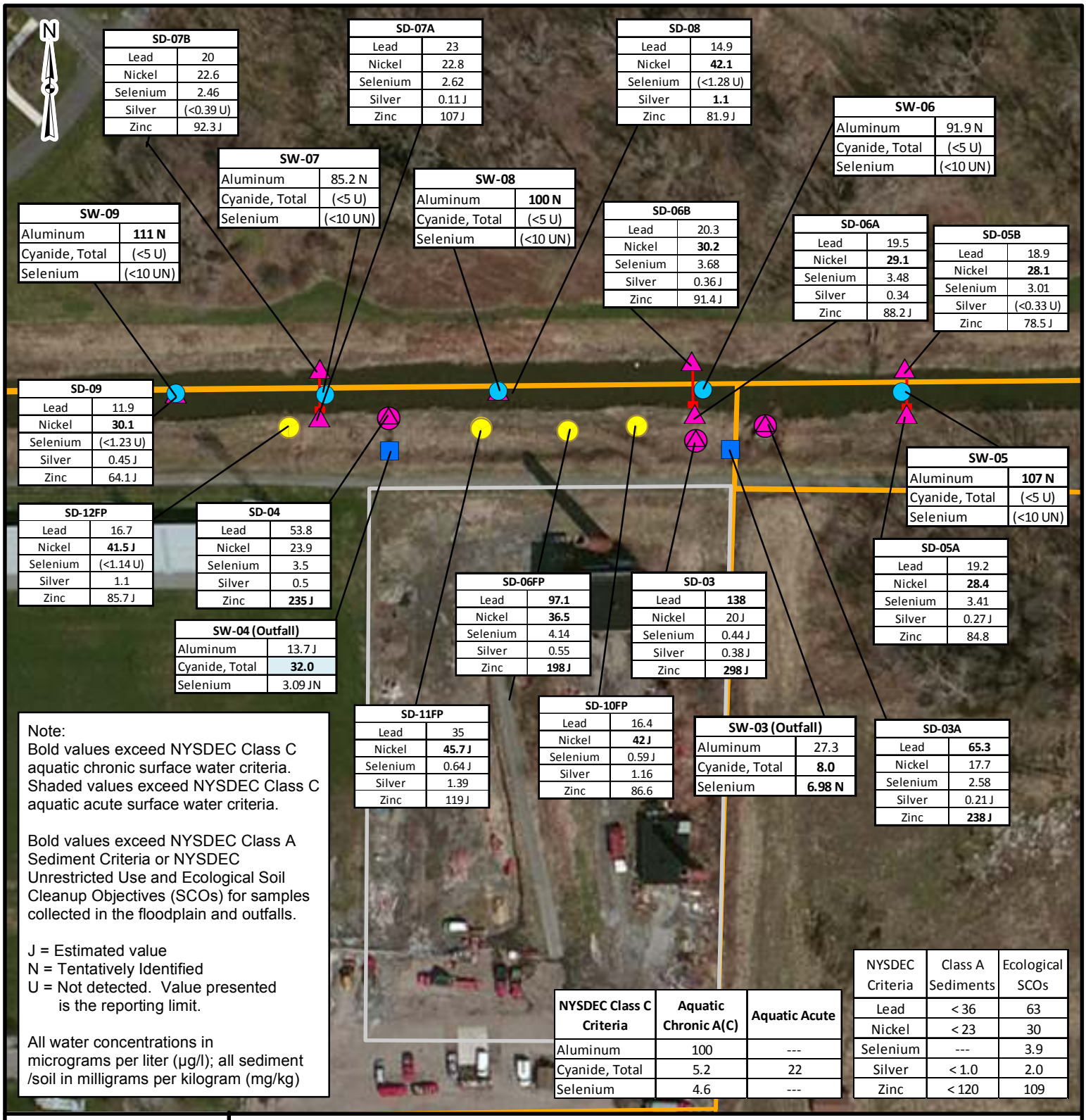
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

EA® | NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 2-5
Groundwater Inorganic Results

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	HAW	HAW	MEM	AS SHOWN	NOV 2015	1490710	14907.10 - Lackawanna Incinerator/ GIS/MXD/RI



Note:
Bold values exceed NYSDEC Class C aquatic chronic surface water criteria. Shaded values exceed NYSDEC Class C aquatic acute surface water criteria.

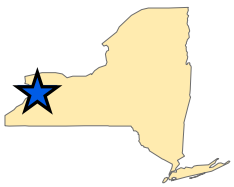
Bold values exceed NYSDEC Class A Sediment Criteria or NYSDEC Unrestricted Use and Ecological Soil Cleanup Objectives (SCOs) for samples collected in the floodplain and outfalls.

J = Estimated value
N = Tentatively Identified
U = Not detected. Value presented is the reporting limit.

All water concentrations in micrograms per liter (µg/l); all sediment /soil in milligrams per kilogram (mg/kg)

NYSDEC Class C Criteria	Aquatic Chronic A(C)	Aquatic Acute
Aluminum	100	---
Cyanide, Total	5.2	22
Selenium	4.6	---

NYSDEC Criteria	Class A Sediments	Ecological SCOs
Lead	< 36	63
Nickel	< 23	30
Selenium	---	3.9
Silver	< 1.0	2.0
Zinc	< 120	109



Legend

Surface Water
Storm Water
Outfall Surface Soil
Sediment
Soil Boring
Sediment Transect
On-Site Area
Tax Parcels

Feet
0 50 100 200
1 in = 100 ft

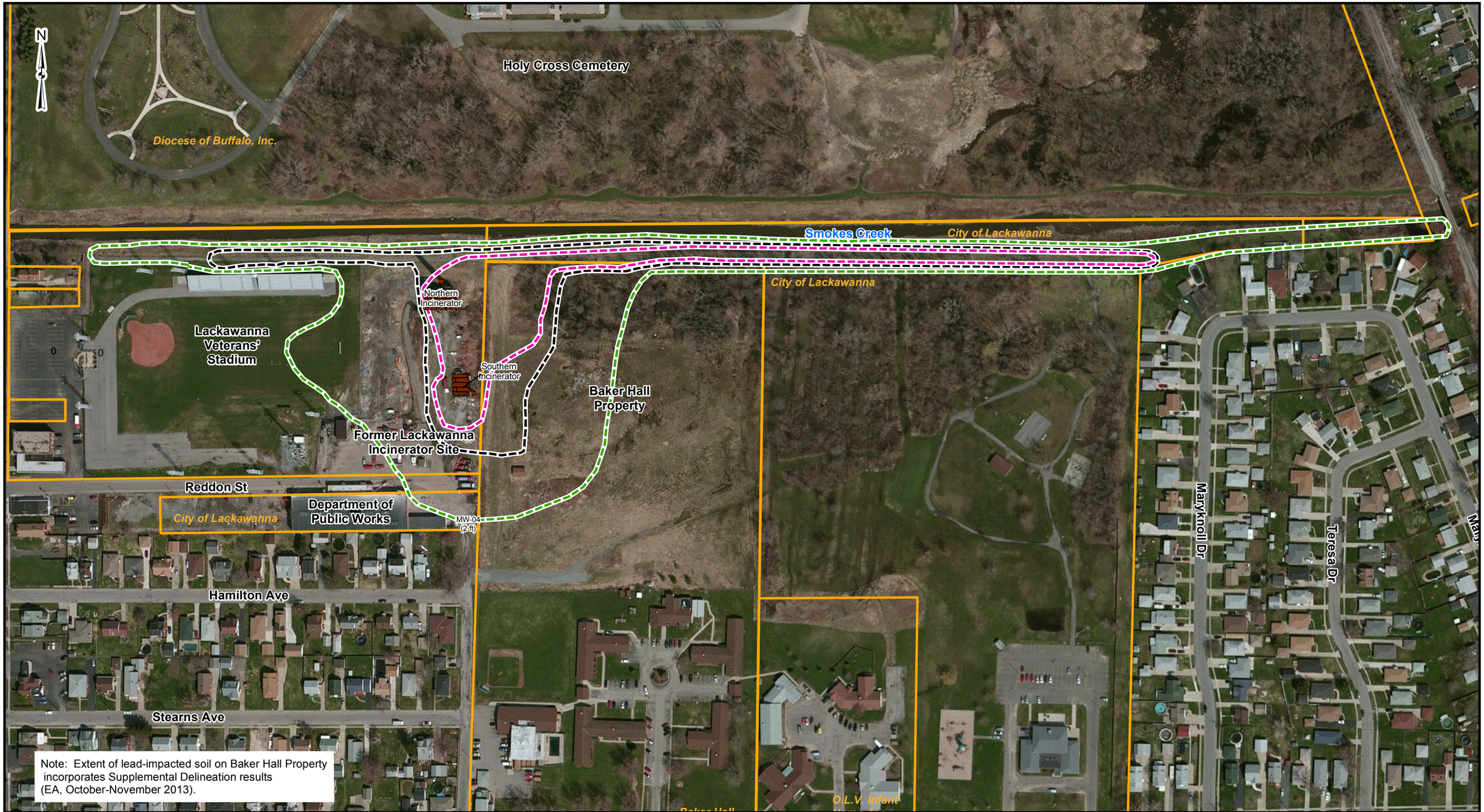
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILTY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 2-6
Stormwater Outfall, Smokes Creek Surface Water and Sediment Inorganic Results

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	HAW	HAW	LM	AS SHOWN	NOV 2015	1490710	14907.10 - Lackawanna Incinerator/ GIS/MXD/RI



Legend

Tax Parcels

Soil Cleanup Objectives Exceedance

- Unrestricted Use
- Restricted Residential
- Commercial

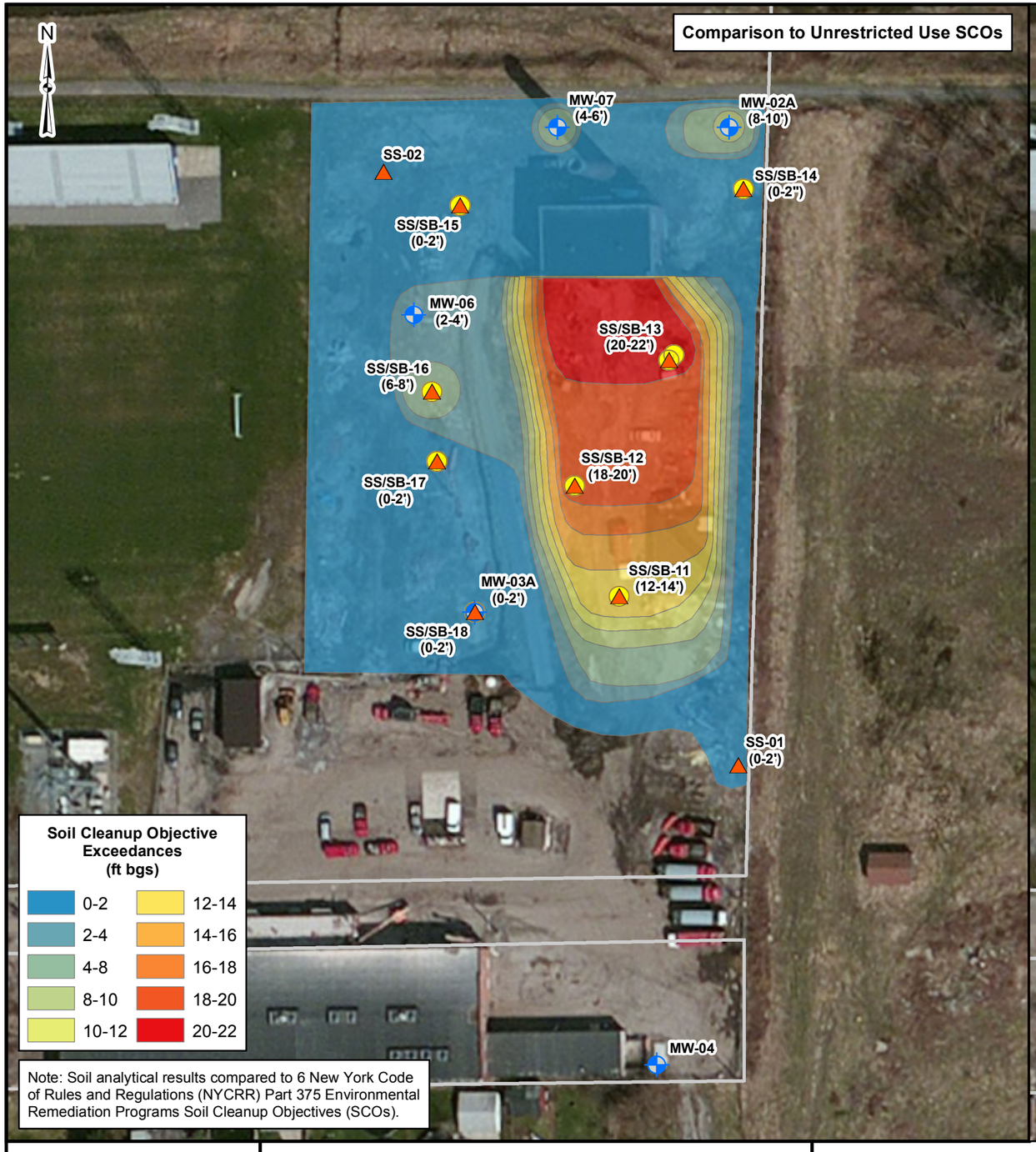
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

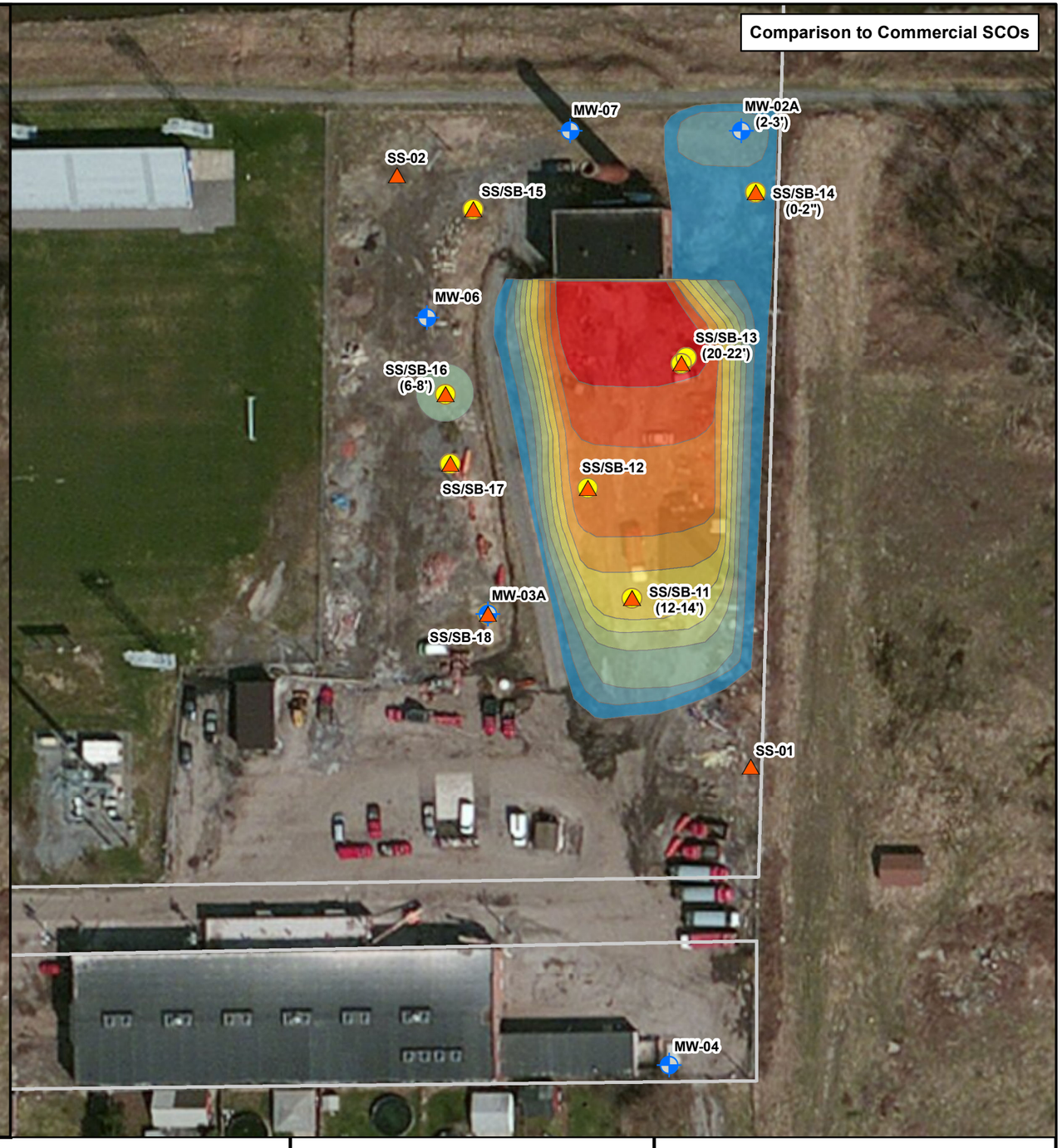
LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 3-1
Interpreted Extent of Lead in Soil/Fill

Feet
0 75 150 300
1 inch = 195 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	ALK	HAW	MEM	AS SHOWN	NOV 2015	14907.10	14907.10 - Lackawanna Incinerator/ GIS/MXD/RI





Legend

Monitoring Well | Soil Boring

Surface Soil | On-Site Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

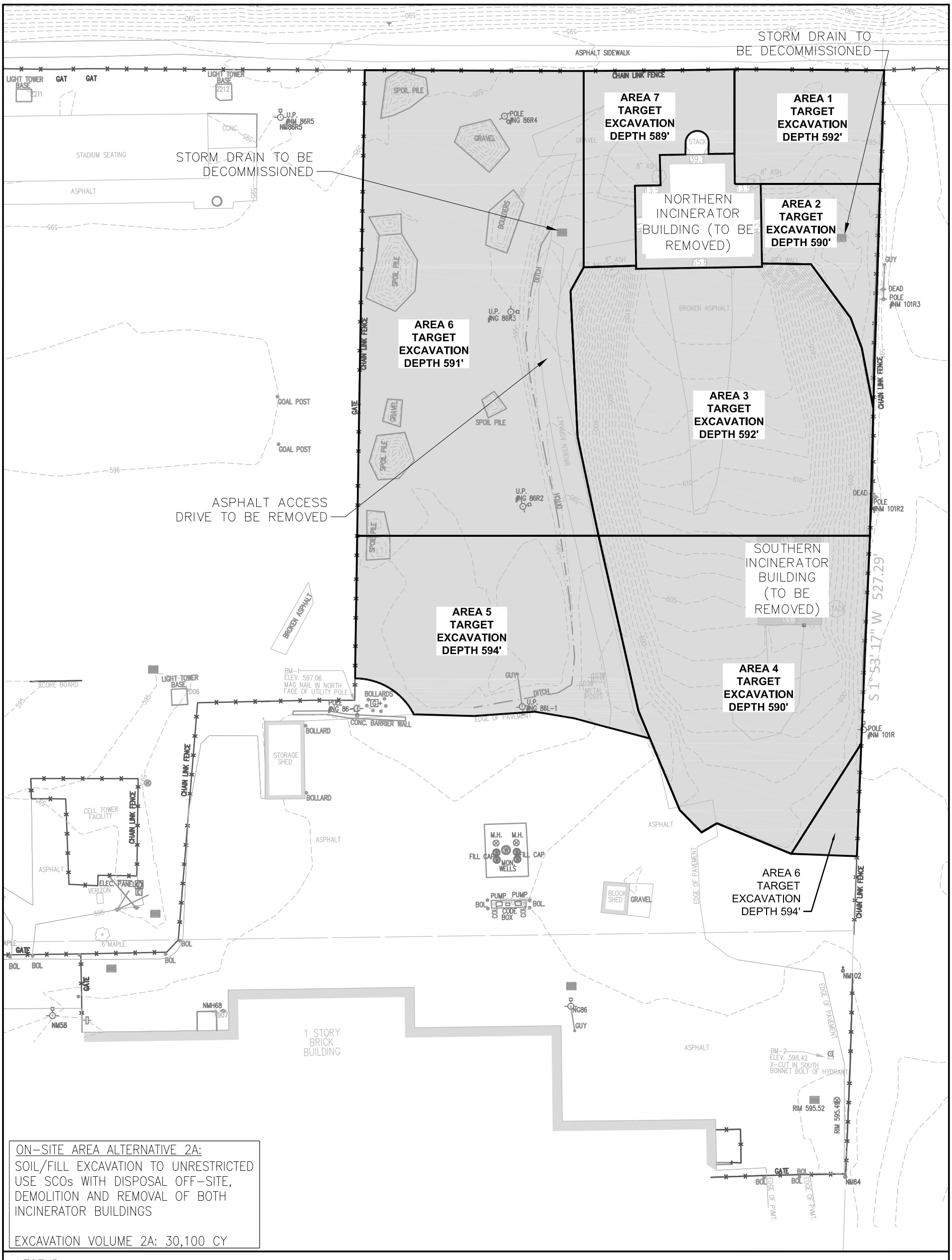
LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-1
Arsenic and Lead in Soil
Exceedance Depth Contours
On-Site Area

Feet
0 37.5 75 150
1 inch = 75 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	ALK	HAW	MEM	AS SHOWN	NOV 2015	14907.10	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10-LACKAWANNA-FIGURES.DWG [FIG 6-2] 10/27/15



ON-SITE AREA ALTERNATIVE 2A:
SOIL/FILL EXCAVATION TO UNRESTRICTED USE SCOs WITH DISPOSAL OFF-SITE, DEMOLITION AND REMOVAL OF BOTH INCINERATOR BUILDINGS

EXCAVATION VOLUME 2A: 30,100 CY

LEGEND:

--595-- EXISTING MAJOR CONTOUR

------ EXISTING MINOR CONTOUR

EXCAVATION AREA

BACKFILL AREA

50 25 0 50

GRAPHIC SCALE IN FEET

SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

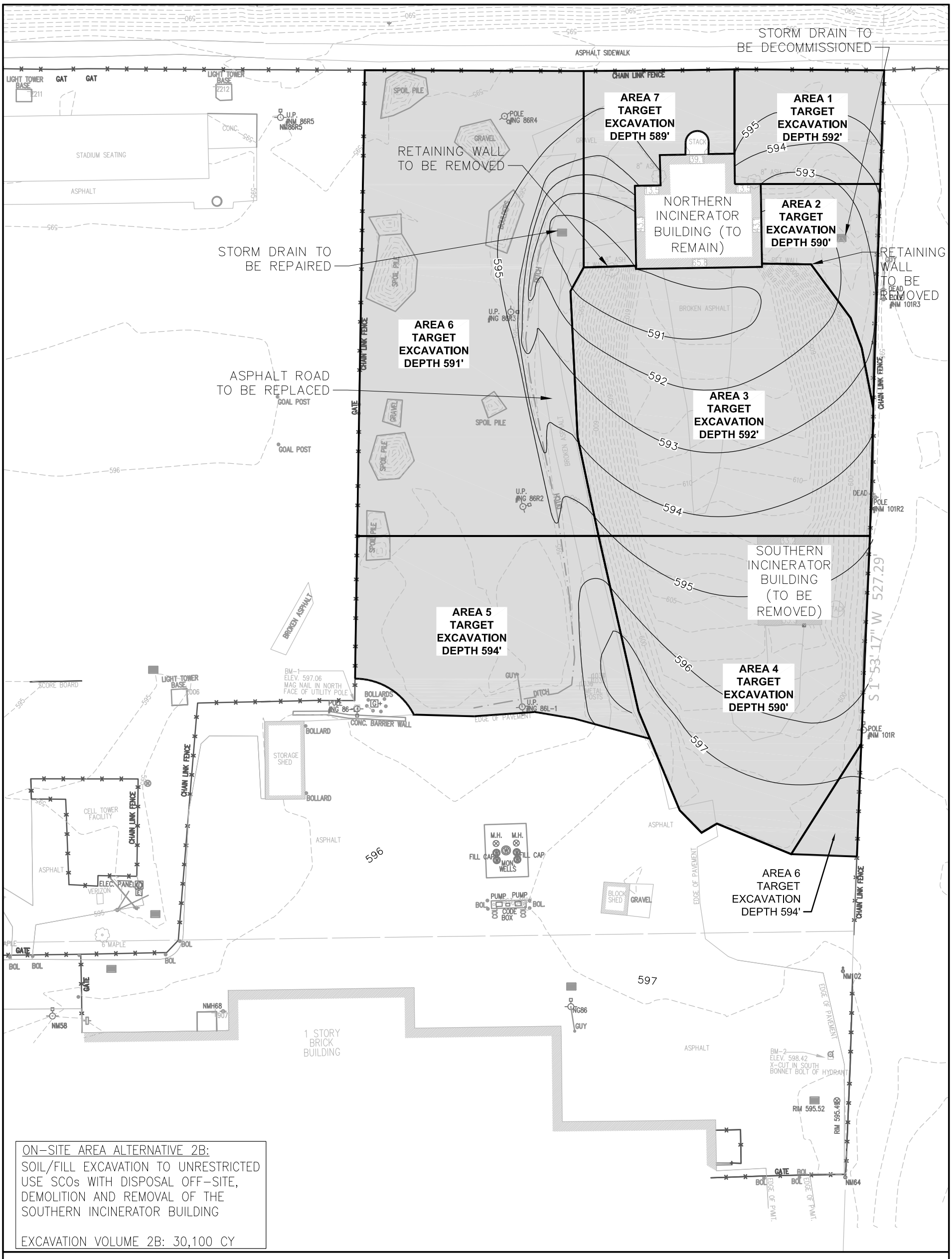
NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-2
ON-SITE AREA ALTERNATIVE 2A
FINAL CONDITIONS

PROJECT MGR	DESIGNED BY	CREATED BY	CHECKED BY	SCALE	DATE	PROJECT NO.	FILE NO.
JMB	MEM	DPA	JH	1" = 50'	NOV 2015	14907.10	Lackawanna-Figures

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10-LACKAWANNA-FIGURES.DWG [FIG 6-3] 10/27/15



ON-SITE AREA ALTERNATIVE 2B:
SOIL/FILL EXCAVATION TO UNRESTRICTED USE SCOs WITH DISPOSAL OFF-SITE, DEMOLITION AND REMOVAL OF THE SOUTHERN INCINERATOR BUILDING

EXCAVATION VOLUME 2B: 30,100 CY

LEGEND:

--595-- EXISTING MAJOR CONTOUR

------ EXISTING MINOR CONTOUR

—595— POST-REMEDIATION CONTOUR

BACKFILL AREA

EXCAVATION AREA

50 25 0 50

GRAPHIC SCALE IN FEET

SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

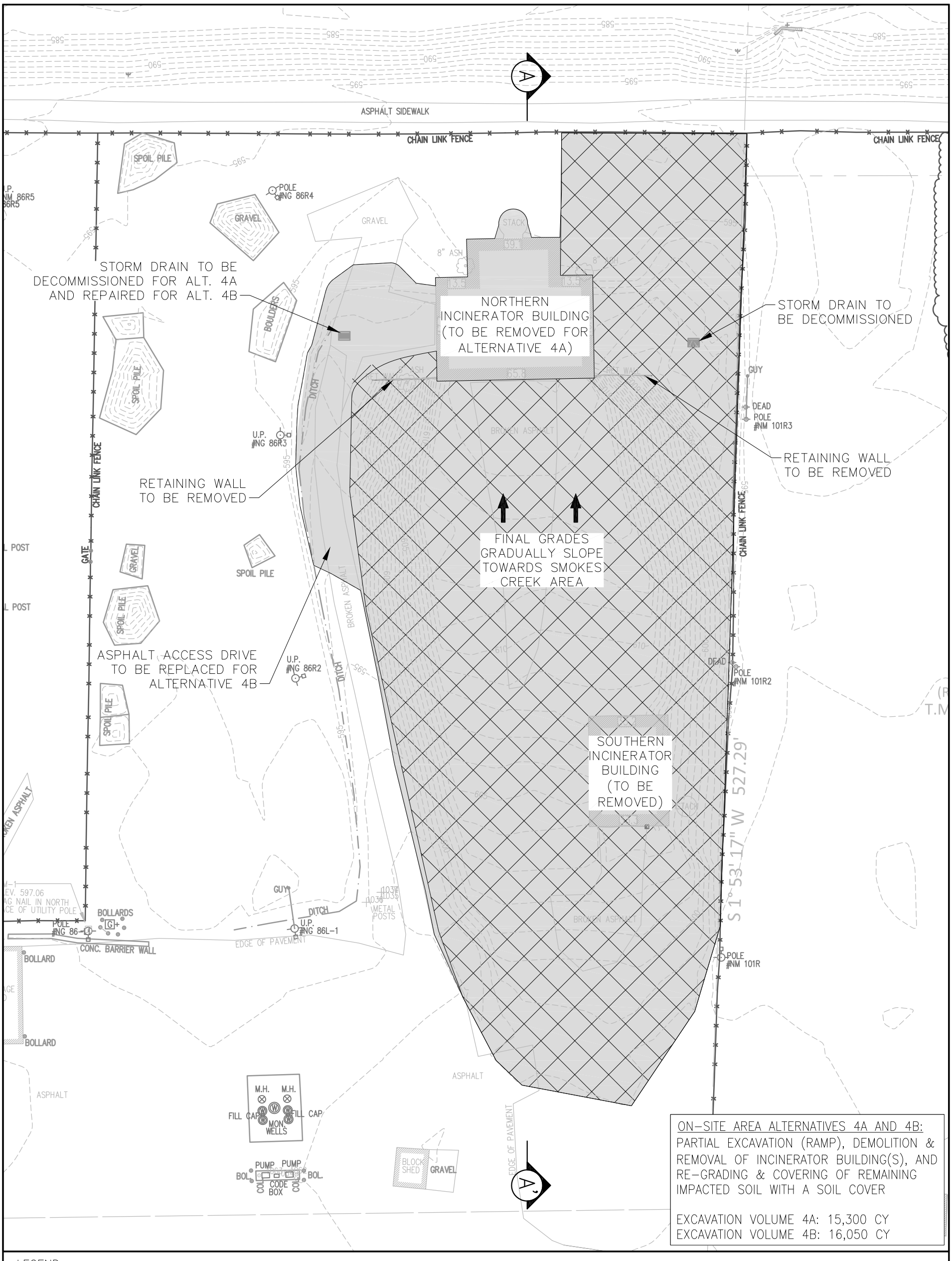
NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-3
ON-SITE AREA ALTERNATIVE 2B
FINAL CONDITIONS

PROJECT MGR	DESIGNED BY	CREATED BY	CHECKED BY	SCALE	DATE	PROJECT NO.	FILE NO.
JMB	MEM	DPA	JH	1" = 50'	NOV 2015	14907.10	Lackawanna-Figures

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10–LACKAWANNA–FIGURES.DWG [FIG 6–4] 10/27/15



LEGEND:

--595-- EXISTING MAJOR CONTOUR

------ EXISTING MINOR CONTOUR

ALTERNATIVE 4A REGRADING AND SOIL COVER AREA

ALTERNATIVE 4B REGRADING AND SOIL COVER AREA

40 20 0 40

GRAPHIC SCALE IN FEET

SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

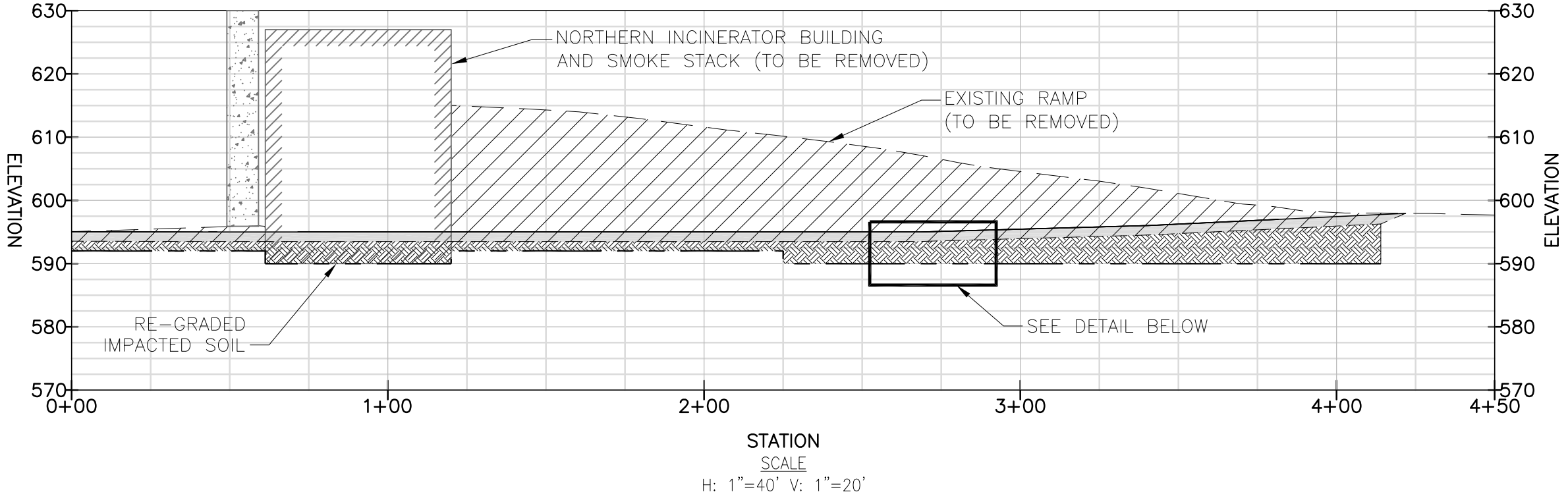
NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6–4
ON–SITE AREA ALTERNATIVES 4A AND 4B
FINAL CONDITIONS

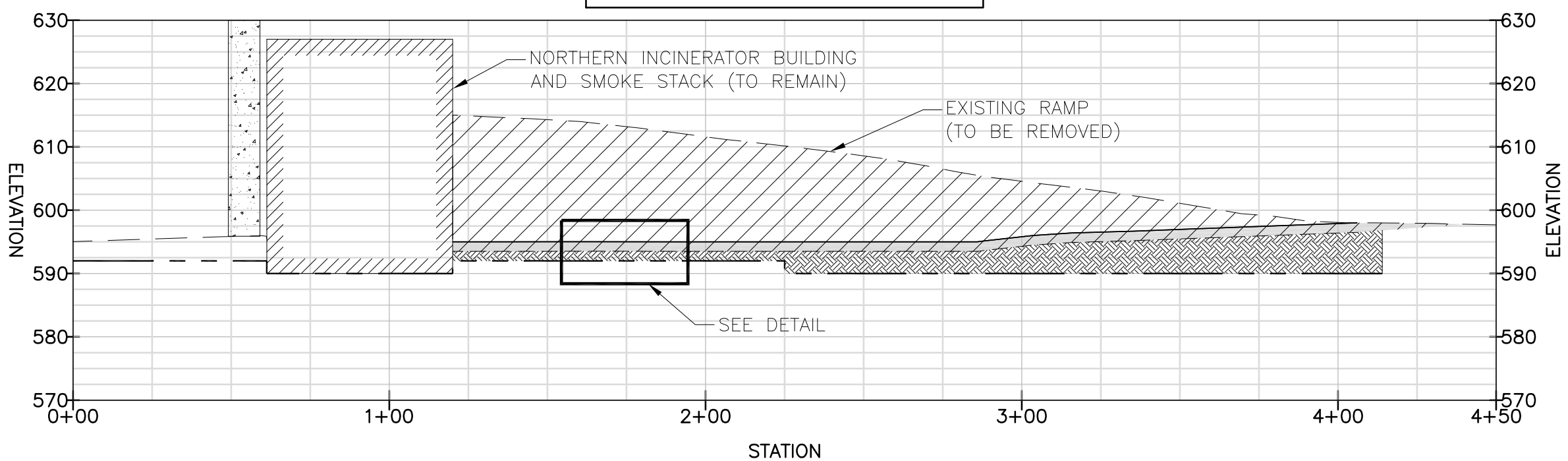
PROJECT MGR	DESIGNED BY	CREATED BY	CHECKED BY	SCALE	DATE	PROJECT NO.	FILE NO.
JMB	MEM	DPA	JH	1" = 40'	NOV 2015	14907.10	Lackawanna–Figures

FIG 6–2 ALTERNATIVE 4A A–A'

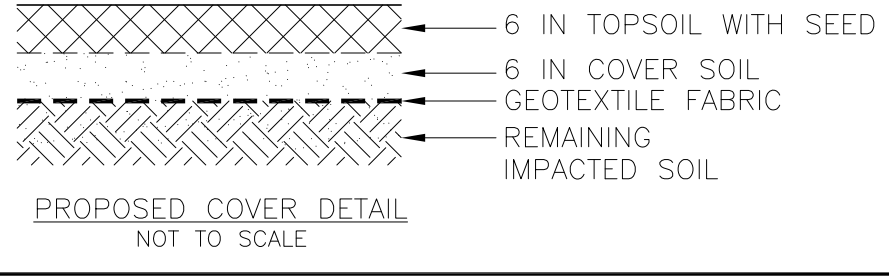


SCALE
H: 1"=40' V: 1"=20'

FIG 6–2 ALTERNATIVE 4B A–A'



SCALE
H: 1"=40' V: 1"=20'



PROPOSED COVER DETAIL
NOT TO SCALE

LEGEND:
- EXISTING SURFACE
- PROPOSED FINAL SURFACE
- SUBGRADE SURFACE
- BOTTOM OF IMPACTED SOIL
- AREA TO BE CUT
- SOIL COVER
- REMAINING IMPACTED SOIL

SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

FIGURE 6–5
ON–SITE AREA ALTERNATIVES 4A AND 4B
CROSS SECTION

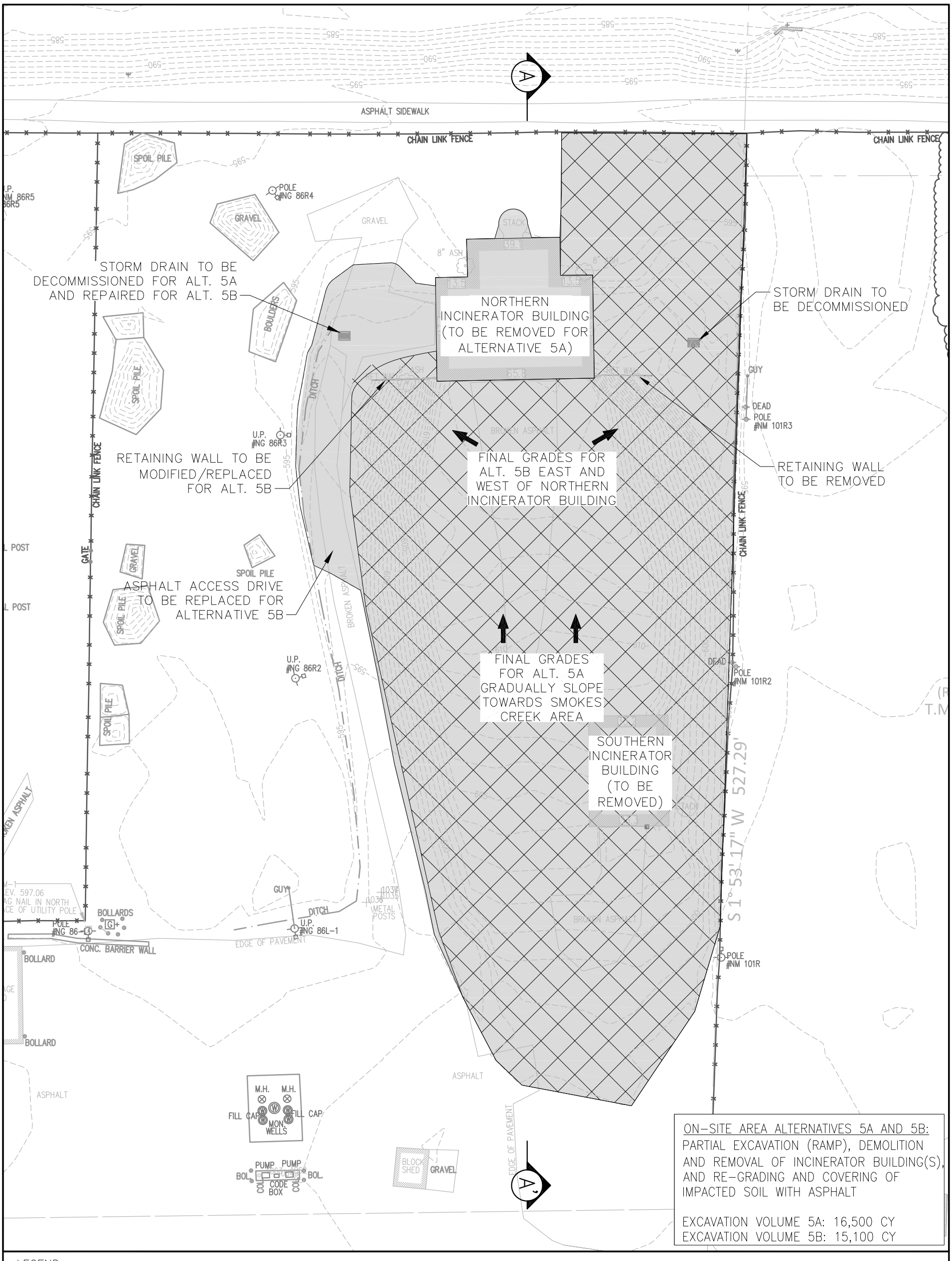
LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

Department of Environmental Conservation
NEW YORK STATE OF OPPORTUNITY

FILE NO.	Lackawanna–Figures
PROJECT NO.	14907.10
DATE	NOV 2015
SCALE	AS SHOWN
CHECKED BY	JH
CREATED BY	DPA
DESIGNED BY	MEM
PROJECT MGR	JMB

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10–LACKAWANNA–FIGURES.DWG [FIG 6–5] 10/27/15

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10–LACKAWANNA–FIGURES.DWG [FIG 6–6] 10/27/15



ON–SITE AREA ALTERNATIVES 5A AND 5B:
PARTIAL EXCAVATION (RAMP), DEMOLITION AND REMOVAL OF INCINERATOR BUILDING(S), AND RE–GRADING AND COVERING OF IMPACTED SOIL WITH ASPHALT

EXCAVATION VOLUME 5A: 16,500 CY
EXCAVATION VOLUME 5B: 15,100 CY

LEGEND:

--595-- EXISTING MAJOR CONTOUR

------ EXISTING MINOR CONTOUR

ALTERNATIVE 5A REGRADING AND ASPHALT COVER AREA

ALTERNATIVE 5B REGRADING AND ASPHALT COVER AREA

40 20 0 40

GRAPHIC SCALE IN FEET

SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

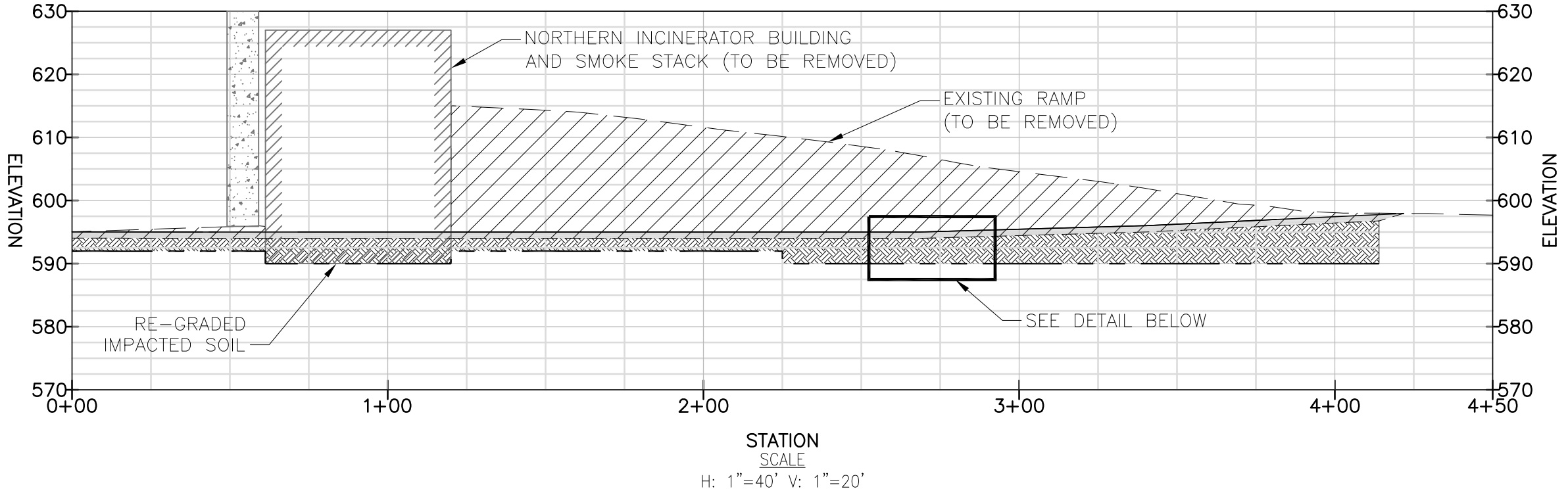
NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6–6
ON–SITE AREA ALTERNATIVES 5A AND 5B
FINAL CONDITIONS

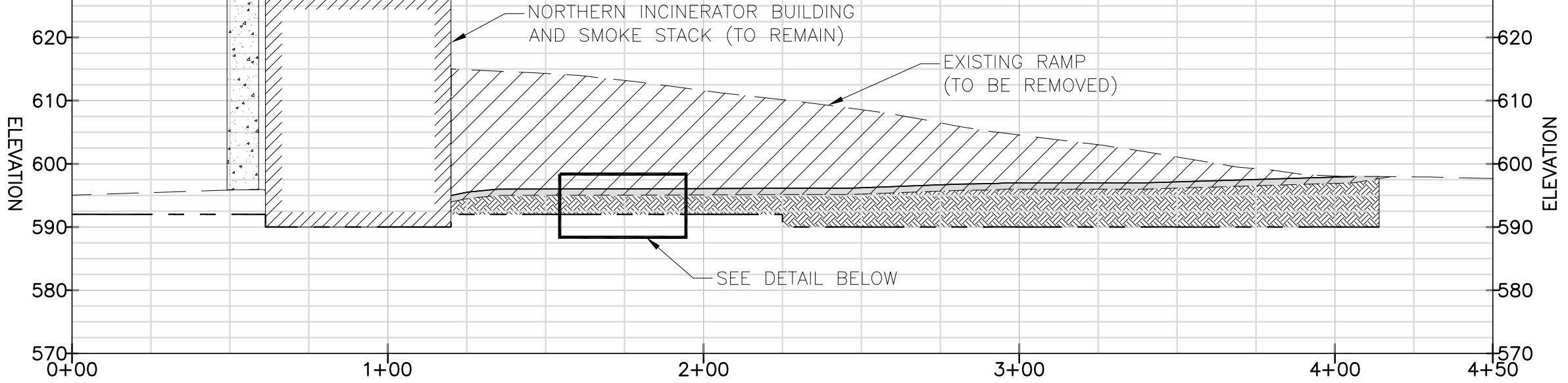
PROJECT MGR	DESIGNED BY	CREATED BY	CHECKED BY	SCALE	DATE	PROJECT NO.	FILE NO.
JMB	MEM	DPA	JH	1" = 40'	NOV 2015	14907.10	Lackawanna–Figures

FIG 6–6 ALTERNATIVE 5A A–A'

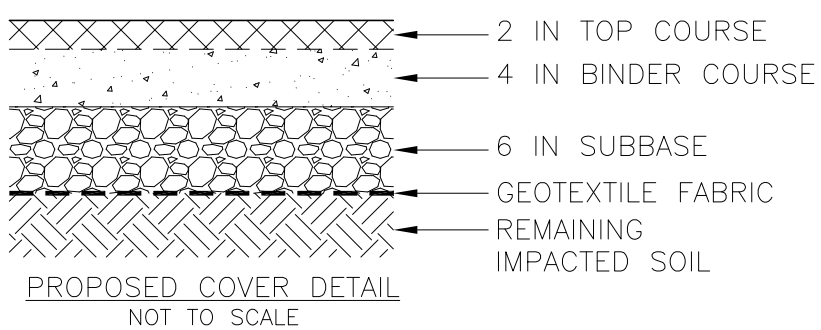


SCALE
H: 1"=40' V: 1"=20'

FIG 6–6 ALTERNATIVE 5B A–A'



SCALE
H: 1"=40' V: 1"=20'



PROPOSED COVER DETAIL
NOT TO SCALE

LEGEND:
- EXISTING SURFACE
- PROPOSED FINAL SURFACE
- SUBGRADE SURFACE
- BOTTOM OF IMPACTED SOIL
- AREA TO BE CUT
- ASPHALT COVER
- REMAINING IMPACTED SOIL

SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

FIGURE 6–7
ON–SITE AREA ALTERNATIVES 5A AND 5B
CROSS SECTIONS

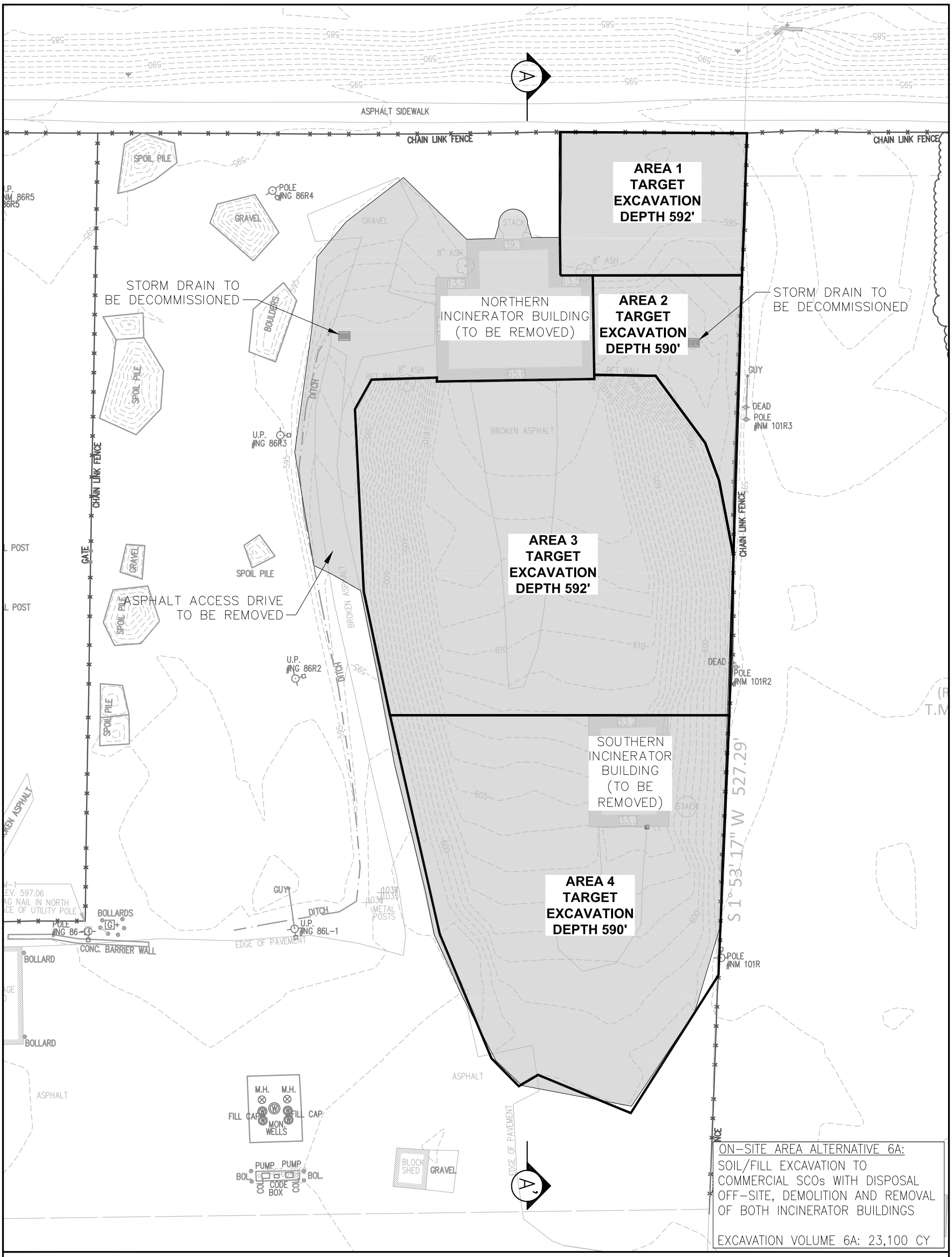
LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

Department of Environmental Conservation
NEW YORK STATE OF OPPORTUNITY

FILE NO.	Lackawanna–Figures
PROJECT NO.	14907.10
DATE	NOV 2015
SCALE	AS SHOWN
CHECKED BY	JH
CREATED BY	DPA
DESIGNED BY	MEM
PROJECT MGR	JMB

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10–LACKAWANNA–FIGURES.DWG [FIG 6–7] 10/27/15

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10-LACKAWANNA-FIGURES.DWG [FIG 6-8] 10/27/15



ON-SITE AREA ALTERNATIVE 6A:
SOIL/FILL EXCAVATION TO COMMERCIAL SCOs WITH DISPOSAL OFF-SITE, DEMOLITION AND REMOVAL OF BOTH INCINERATOR BUILDINGS

EXCAVATION VOLUME 6A: 23,100 CY

LEGEND:

--595-- EXISTING MAJOR CONTOUR

EXISTING MINOR CONTOUR

EXCAVATION AREA

BACKFILL AREA

40 20 0 40

GRAPHIC SCALE IN FEET

SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

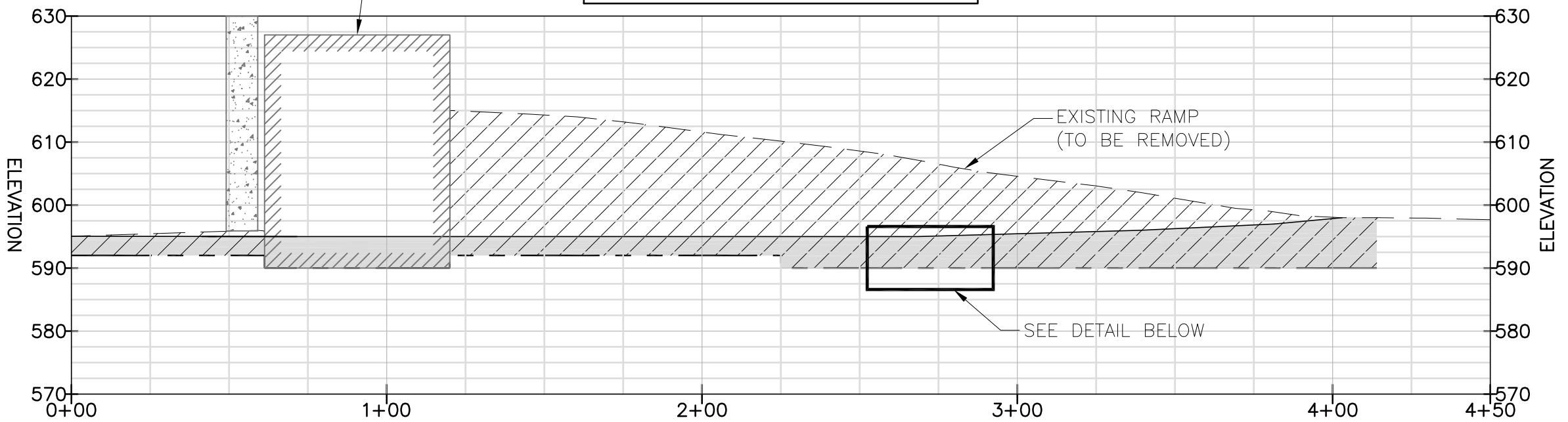
LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-8
ON-SITE AREA ALTERNATIVE 6A
FINAL CONDITIONS

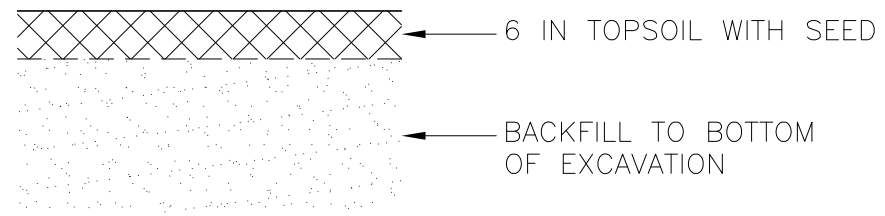
PROJECT MGR	DESIGNED BY	CREATED BY	CHECKED BY	SCALE	DATE	PROJECT NO.	FILE NO.
JMB	MEM	DPA	JH	1" = 40'	NOV 2015	14907.10	Lackawanna-Figures

NORTHERN INCINERATOR BUILDING
AND SMOKE STACK
(TO BE REMOVED)

FIG 6–8 ALTERNATIVE 6A A–A'



SCALE
H: 1"=40'
V: 1"=20'



PROPOSED RESTORATION DETAIL
NOT TO SCALE

LEGEND:
- EXISTING SURFACE
- PROPOSED FINAL SURFACE
- BOTTOM OF IMPACTED SOIL

AREA TO BE CUT

BACKFILL

SOURCE:
SURVEY BY POPLI, ARCHITECTURE
AND ENGINEERING & L.S., P.C. ON
OCTOBER 4, 2012.

FIGURE 6–9
ON–SITE AREA ALTERNATIVE 6A
CROSS SECTION

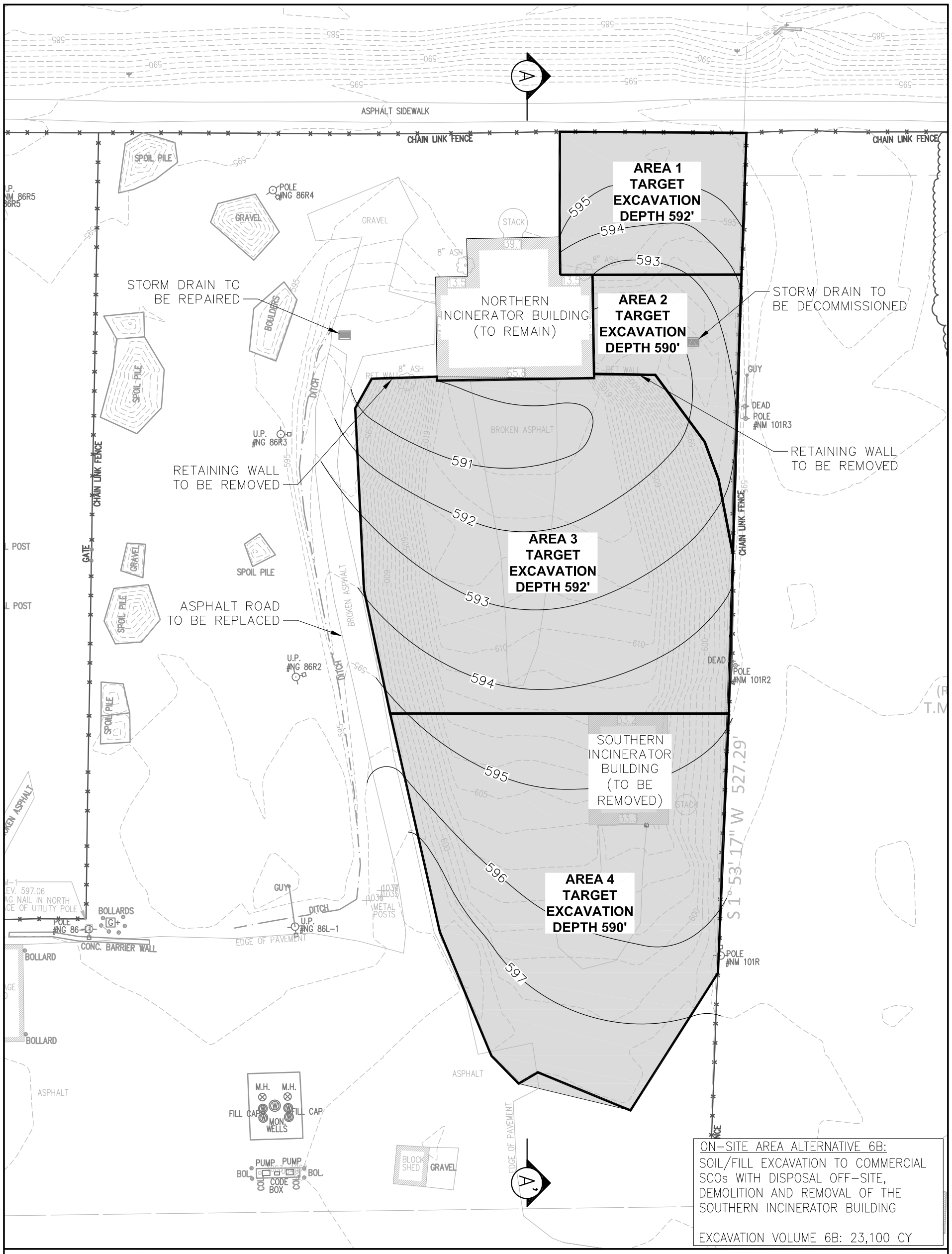
LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

Department of Environmental Conservation
NEW YORK STATE OF OPPORTUNITY

PROJECT MGR	JMB
DESIGNED BY	MEM
CREATED BY	DPA
CHECKED BY	JH
SCALE	AS SHOWN
DATE	NOV 2015
PROJECT NO.	14907.10
FILE NO.	Lackawanna–Figures

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10–LACKAWANNA–FIGURES.DWG [FIG 6–9] 10/27/15

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10-LACKAWANNA-FIGURES.DWG [FIG 6-10] 10/27/15



LEGEND:

--595-- EXISTING MAJOR CONTOUR

------ EXISTING MINOR CONTOUR

—595— POST-REMEDIATION CONTOUR

BACKFILL AREA

EXCAVATION AREA

40 20 0 40

GRAPHIC SCALE IN FEET

SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

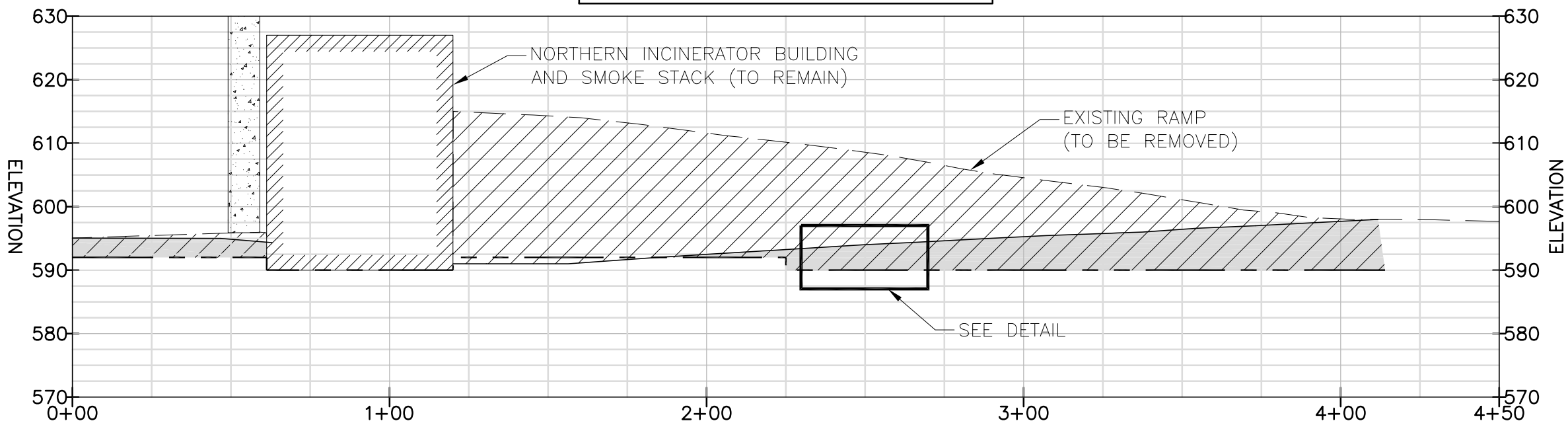
NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

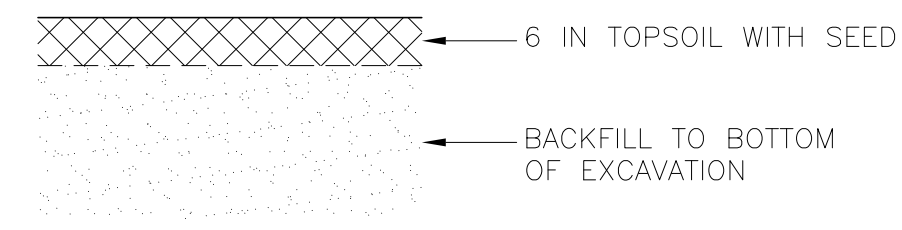
FIGURE 6-10
ON-SITE AREA ALTERNATIVE 6B
FINAL CONDITIONS

PROJECT MGR	DESIGNED BY	CREATED BY	CHECKED BY	SCALE	DATE	PROJECT NO.	FILE NO.
JMB	MEM	DPA	JH	1" = 40'	NOV 2015	14907.10	Lackawanna-Figures

FIG 6–10 ALTERNATIVE 6B A–A'



SCALE
H: 1"=40'
V: 1"=20'



PROPOSED RESTORATION DETAIL
NOT TO SCALE

LEGEND:
- EXISTING SURFACE
- PROPOSED FINAL SURFACE
- BOTTOM OF IMPACTED SOIL

AREA TO BE CUT

BACKFILL

SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

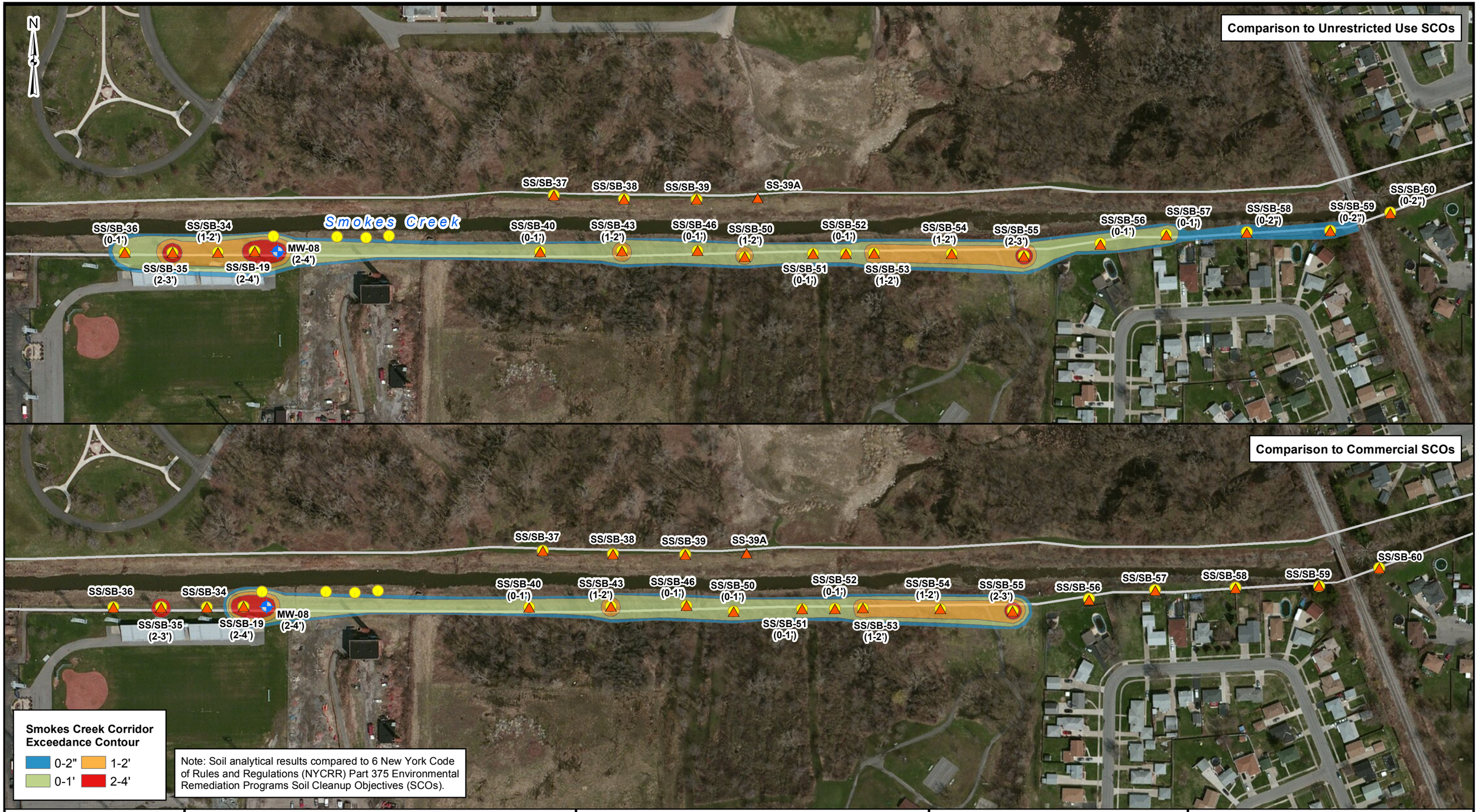
FIGURE 6–11
ON–SITE AREA ALTERNATIVE 6B
CROSS SECTIONS

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

NEW YORK STATE OF OPPORTUNITY
Department of Environmental Conservation

SCALE	AS SHOWN
DATE	NOV 2015
PROJECT NO.	14907.10
FILE NO.	Lackawanna–Figures
DESIGNED BY	MEM
CREATED BY	DPA
CHECKED BY	JH
PROJECT MGR	JMB

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10–LACKAWANNA–FIGURES.DWG [FIG 6–11] 10/27/15



Legend

- Monitoring Well
- Surface Soil
- Soil Boring
- Smokes Creek Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-12
Arsenic and Lead in Soil
Exceedance Depth Contours
Smokes Creek Corridor

0 100 200 400 Feet
1 inch = 200 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	ALK	HAW	MEM	AS SHOWN	NOV 2015	14907.10	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS

N

0-4 ft Partial Excavation Area - Plan View

Restoration:
- 2 ft soil cover with seed
- Asphalt cover

8 ft length on slope (Full removal/Backfill and stabilize with erosion control blankets)

5 ft pathway buffer (1 ft soil cover and seed)

8 ft asphalt pathway (to remain)

5 ft pathway buffer (1 ft soil cover and seed)

0-2 ft Excavation Area - Plan View

Restoration:
- Topsoil and seed with erosion control blankets
- Asphalt cover

4 ft length on slope (Full removal/Backfill and stabilize with erosion control blankets)

5 ft pathway buffer (1 ft soil cover and seed)

8 ft asphalt pathway (to remain)

5 ft pathway buffer (1 ft soil cover and seed)

A

A'

Smokes Creek

B

B'

Smokes Creek Corridor Alternative 2A:
Partial Removal (1-ft depth area and side slope) to Commercial, Partial Mixed Media (Soil) Cover of Impacted Soil/Fill, Asphalt to Remain

Excavation Volume 1,760 CY

Excavation Areas

0-2 ft. Impact Depth

0-4 ft. Impact Depth

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-13
Smokes Creek Corridor
Alternative 2A
Final Conditions

0 100 200 400 Feet

1 inch = 200 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	ALK	HAW	MEM	AS SHOWN	NOV 2015	14907.10	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10-LACKAWANNA-FIGURES.DWG [FIG 6-14] 10/27/15

FIG 6-13 A-A'

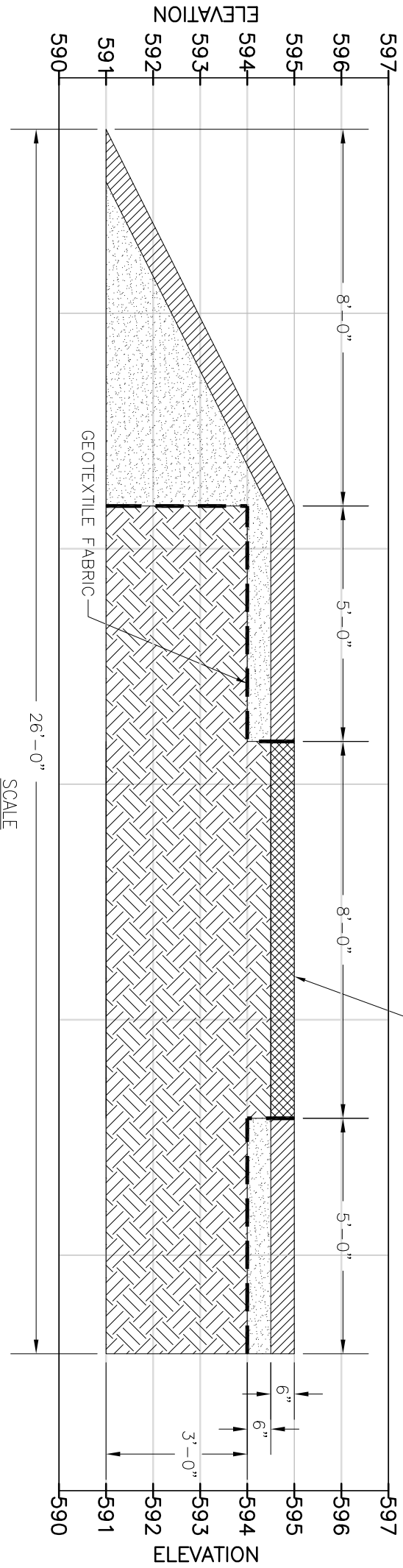
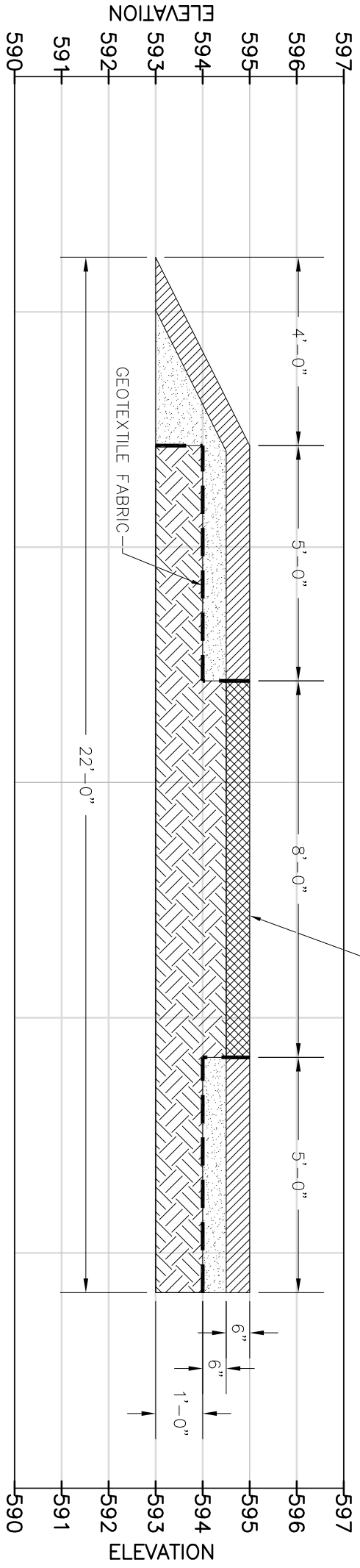


FIG 6-13 B-B'



LEGEND:

- TOPSOIL
- BACKFILL
- REMAINING IMPACTED SOIL
- ASPHALT

SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-14
SMOKES CREEK CORRIDOR ALTERNATIVE 2A
CROSS SECTIONS

PROJECT MGR	DESIGNED BY	CREATED BY	CHECKED BY	SCALE	DATE	PROJECT NO.	FILE NO.
JMB	MEM	DPA	JH	AS SHOWN	NOV 2015	14907.10	Lackawanna-Figures

N

0-4 ft Partial Excavation Area - Plan View

Restoration:
- 2 ft soil cover with seed
- Asphalt cover

8 ft length on slope (Full removal/Backfill and stabilize with erosion control blankets)

5 ft pathway buffer (1 ft soil cover and seed)

8 ft asphalt pathway (to be removed and replaced)

5 ft pathway buffer (1 ft soil cover and seed)

0-2 ft Excavation Area - Plan View

Restoration:
- Topsoil and seed with erosion control blankets
- Asphalt cover

4 ft length on slope (Full removal/Backfill and stabilize with erosion control blankets)

5 ft pathway buffer (1 ft soil cover and seed)

8 ft asphalt pathway (to be removed and replaced)

5 ft pathway buffer (1 ft soil cover and seed)

A

A'

Smokes Creek

B

B'

Smokes Creek Corridor Alternative 2B:
Partial Removal (1-ft depth area and side slope) to Commercial, Partial Mixed Media (Soil and Asphalt) Cover of Impacted Soil/Fill

Excavation Volume 2,450 CY

Excavation Areas

0-2 ft. Impact Depth

0-4 ft. Impact Depth

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-15
Smokes Creek Corridor
Alternative 2B
Final Conditions

0 100 200 400 Feet

1 inch = 200 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	ALK	HAW	MEM	AS SHOWN	NOV 2015	14907.10	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS

FILE PATH: \\WARWICK\WARWICKFP\PROJECTS\14907.10 – LACKAWANNA\CAD\14907.10-LACKAWANNA-FIGURES.DWG [FIG 6-16] 10/27/15

FIG 6-15 A-A'

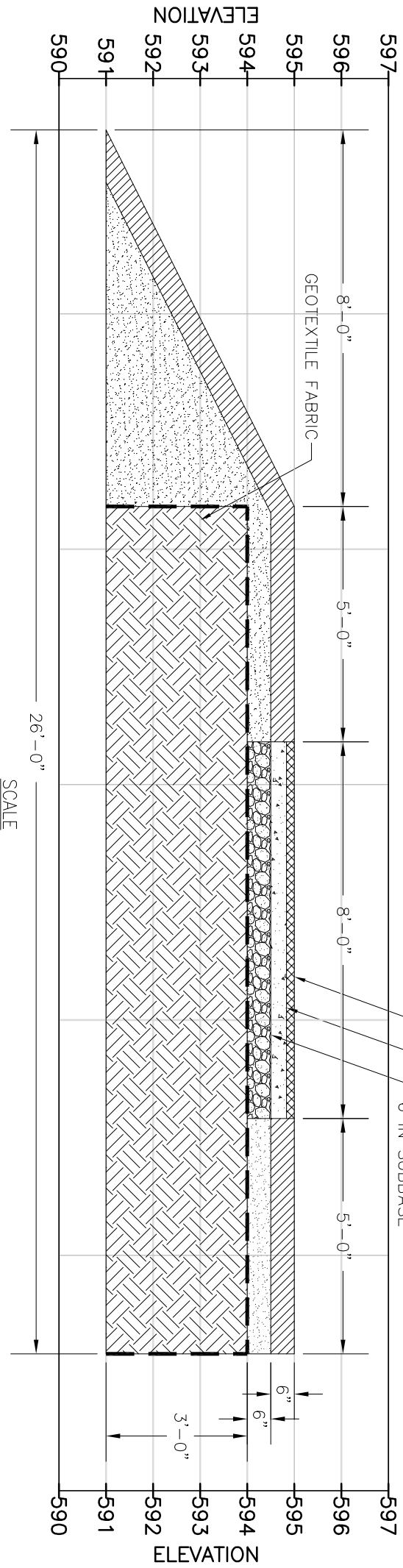
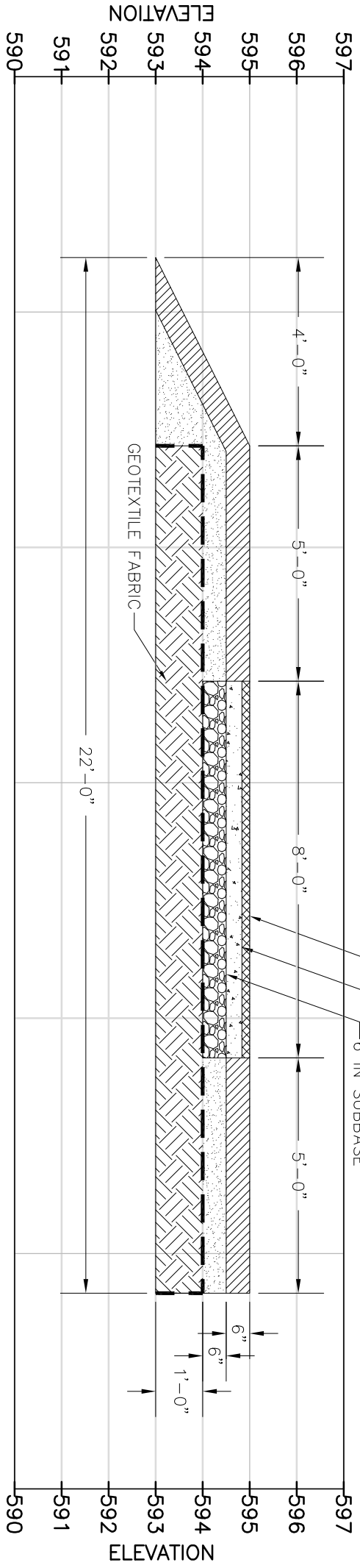


FIG 6-15 B-B'



LEGEND:

- TOPSOIL
- BACKFILL/ SOIL COVER
- BINDER COURSE
- TOP COURSE
- REMAINING IMPACTED SOIL
- SUBBASE

SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-16
SMOKES CREEK CORRIDOR ALTERNATIVE 2B
CROSS SECTIONS

PROJECT MGR	DESIGNED BY	CREATED BY	CHECKED BY	SCALE	DATE	PROJECT NO.	FILE NO.
JMB	MEM	DPA	JH	AS SHOWN	NOV 2015	14907.10	Lackawanna-Figures

N

0-4 ft Excavation Area - Plan View

Restoration:
- Topsoil and seed
- Asphalt

8 ft length on slope (Full removal/Backfill and stabilize with erosion control blankets)

5 ft pathway buffer

8 ft asphalt pathway

5 ft pathway buffer

0-2 ft Excavation Area - Plan View

Restoration:
- Topsoil and seed
- Asphalt

4 ft length on slope (Full removal/Backfill and stabilize with erosion control blankets)

5 ft pathway buffer (Full removal/Backfill)

8 ft asphalt pathway

5 ft pathway buffer (Full removal/Backfill)

A

A'

B

B'

Smokes Creek

Smokes Creek Alternative 3:
Soil/Fill Excavation to Unrestricted Use with Disposal Off-Site

Excavation Volume 7,100 CY

Excavation Areas

0-2 ft. Impact Depth

0-4 ft. Impact Depth

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-17
Smokes Creek Corridor
Alternative 3
Final Conditions

Feet
0 100 200 400
1 inch = 200 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	ALK	HAW	MEM	AS SHOWN	NOV 2015	14907.10	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS

FIG 6–17 A–A'

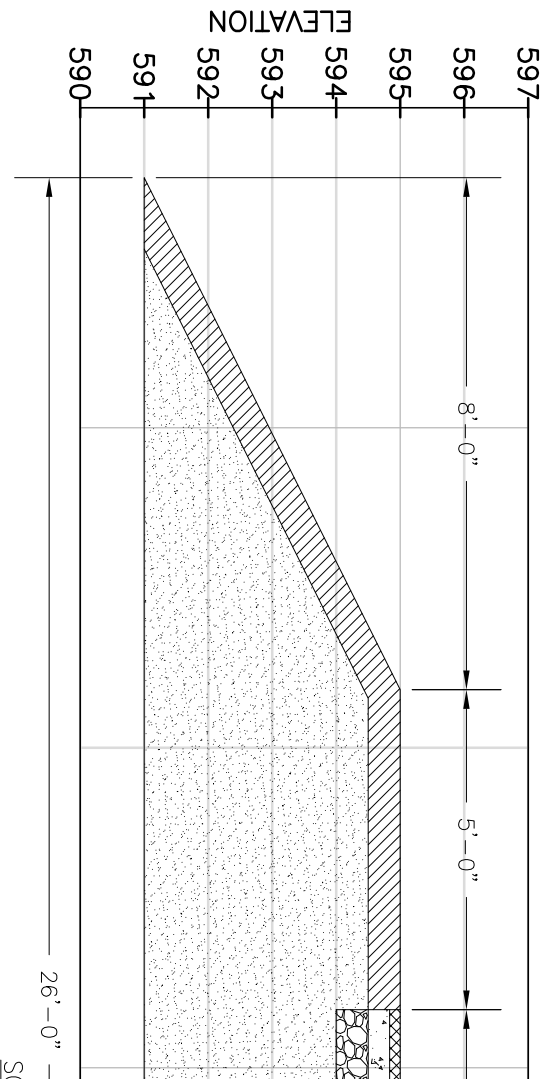
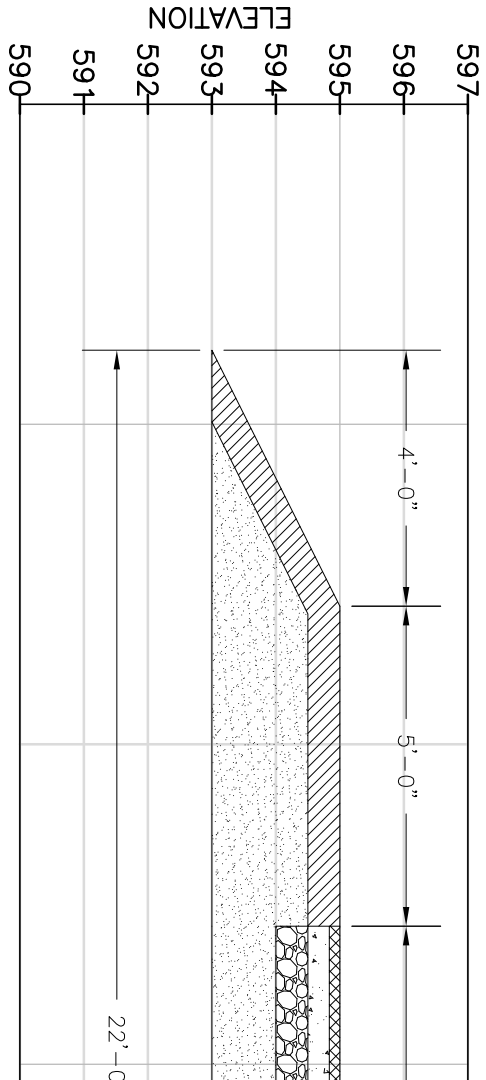


FIG 6–17 B–B'



LEGEND:

TOPSOIL

BINDER COURSE

SUBBASE

BACKFILL/ SOIL COVER

TOP COURSE

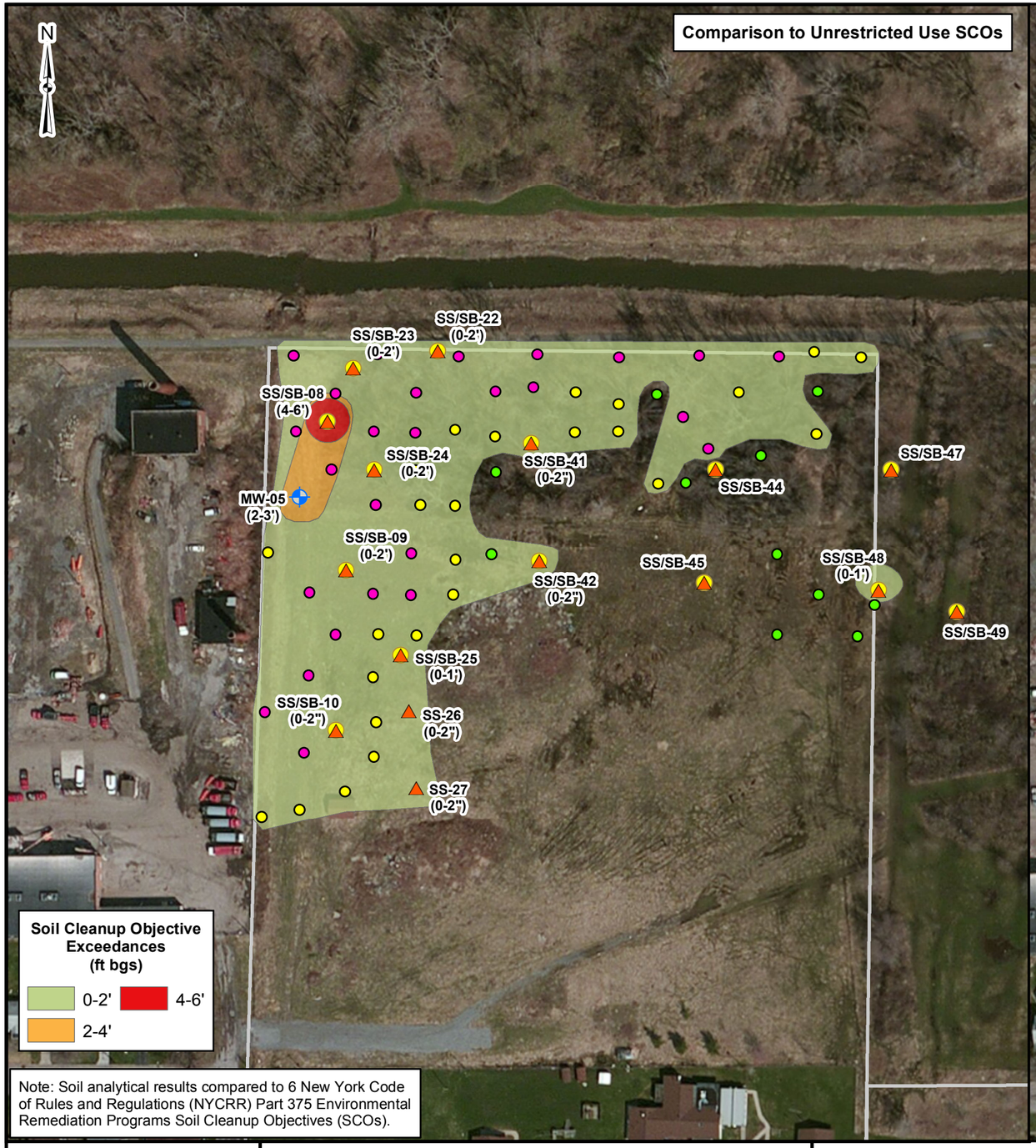
SOURCE:
SURVEY BY POPLI, ARCHITECTURE AND ENGINEERING & L.S., P.C. ON OCTOBER 4, 2012.

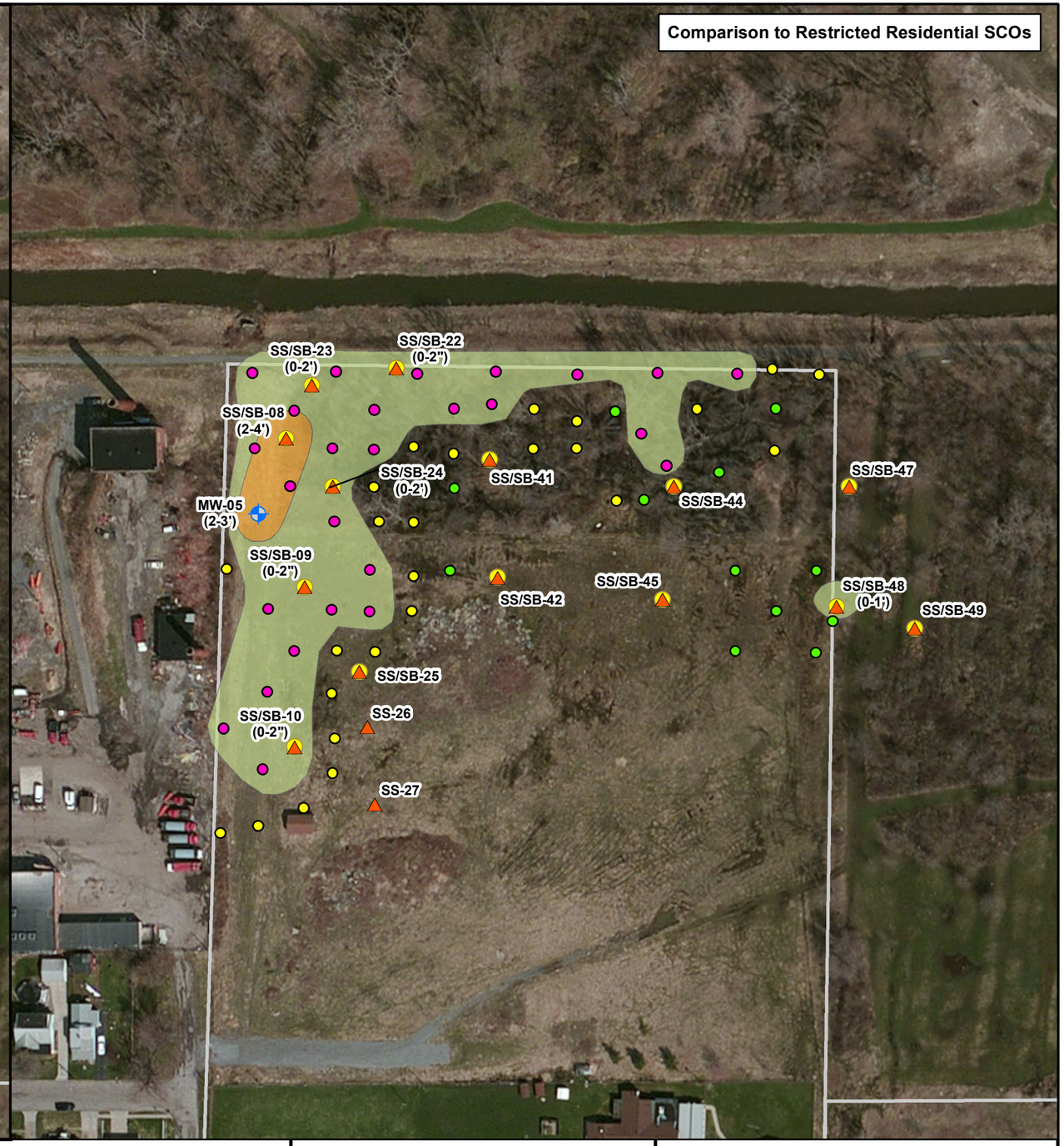
NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6–18
SMOKES CREEK CORRIDOR ALTERNATIVE 3
CROSS SECTIONS

PROJECT MGR	DESIGNED BY	CREATED BY	CHECKED BY	SCALE	DATE	PROJECT NO.	FILE NO.
JMB	MEM	DPA	JH	AS SHOWN	NOV 2015	14907.10	Lackawanna–Figures





Legend

- Monitoring Well
- Surface Soil
- Soil Boring
- Baker Hall Property

Lead XRF Reading

- <63 ppm
- 63-400 ppm
- >400 ppm

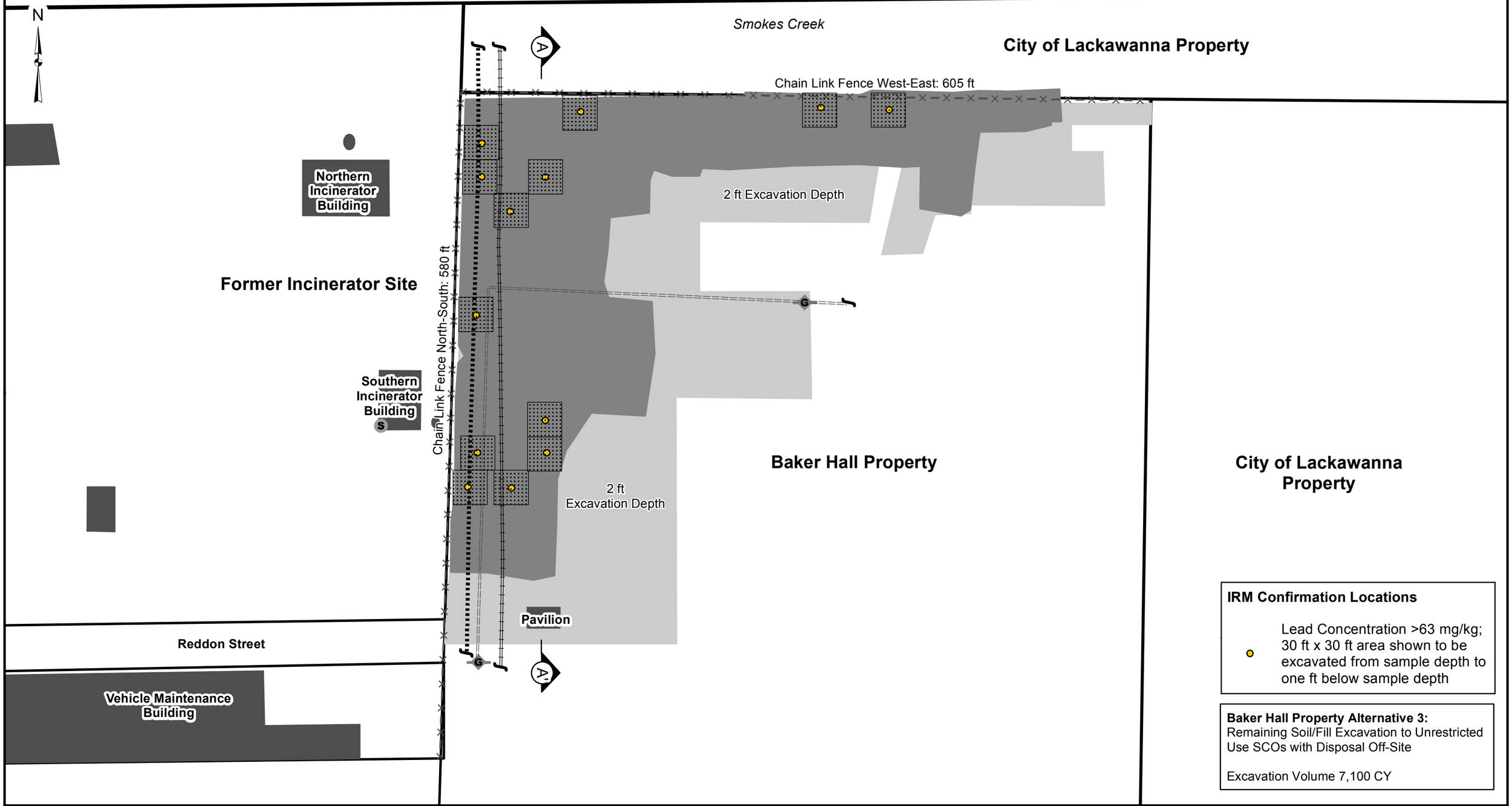
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-19
Arsenic and Lead in Soil
Exceedance Depth Contours
Baker Hall Property

Feet
0 62.5 125 250
1 inch = 125 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JMB	ALK	HAW	MEM	AS SHOWN	NOV 2015	14907.10	14907.10 - Lackawanna Incinerator/ GIS/MXD/FS



IRM Confirmation Locations

Lead Concentration >63 mg/kg; 30 ft x 30 ft area shown to be excavated from sample depth to one ft below sample depth

Baker Hall Property Alternative 3:
Remaining Soil/Fill Excavation to Unrestricted Use SCOs with Disposal Off-Site

Excavation Volume 7,100 CY

Site Features

- Tax Parcels
- Building / Structure
- Gas Line Marker
- Sewer Manhole
- IRM Excavation Area
- Alternative 3 Excavation Area
- Corrugated Metal Pipe
- Gas Line
- Sewer Line
- Chain Link Fence

LACKAWANNA INCINERATOR (SITE NO. 915206)
FEASIBILITY STUDY REPORT
LACKAWANNA, NEW YORK

FIGURE 6-20
Baker Hall Property
Alternative 2
Final Conditions

Feet
0 40 80 160
1 inch = 80 feet

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JCH	ALK	HAW	MEM	AS SHOWN	NOV 2015	14907.10	14907.10 - Lackawanna Incinerator/ GIS/MXD/RI

EA® NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

Tables

TABLE 2-1 SUMMARY OF INORGANIC EXCEEDANCES – ON-SITE AREA

Constituents	Concentration Range (mg/kg)	Unrestricted Use SCOs[(a)] (mg/kg)	Frequency Exceeding Unrestricted Use SCOs	Commercial SCOs[(a)] (mg/kg)	Frequency Exceeding Commercial SCOs
SURFACE SOIL					
Barium	24.4 - 399	350	1 of 10	400	0 of 10
Cadmium	0.400 - 22.0	2.5	4 of 10	9.3	1 of 10
Chromium	8.32 - 513	30	3 of 10	1,500	0 of 10
Copper	13.2 - 406	50	4 of 10	270	1 of 10
Lead	28.5 - 2,330	63	7 of 10	1,000	1 of 10
Manganese	163 - 4,190	1,600	2 of 10	10,000	0 of 10
Mercury	0.03 - 0.326	0.18	2 of 10	2.8	0 of 10
Nickel	11.8 - 80.6	30	3 of 10	310	0 of 10
Selenium	2.21 - 14.8	3.9	5 of 10	6,800	0 of 10
Zinc	67.9 - 1,840	109	7 of 10	10,000	0 of 10
SUBSURFACE SOIL					
Arsenic	1.51 - 51.5	13	13 of 68	16	7 of 68
Barium	21.3 - 1,500	350	8 of 68	400	7 of 68
Cadmium	0.170 - 42.7	2.5	11 of 68	9.3	3 of 68
Chromium	5.87 - 134	30	12 of 68	1,500	0 of 68
Copper	4.47 - 1,510	50	15 of 68	270	5 of 68
Cyanide, Total	0.096 - 170	27	4 of 68	27	4 of 13
Lead	9.70 - 6,820	63	26 of 68	1,000	6 of 68
Mercury	0.011 - 1.0	0.18	7 of 68	2.8	0 of 68
Nickel	5.17 - 342	30	54 of 68	310	1 of 68
Silver	0.3 - 26	2.0	15 of 68	1,500	0 of 68
Zinc	20.8 - 4,910	109	33 of 68	10,000	0 of 68

(a) NYSDEC Division of Environmental Remediation. 2006. 6 New York Code of Rules and Regulations Part 375 Environmental Remediation Programs, Commercial Use SCOs.

NOTE: mg/kg = Milligrams per kilogram
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objective

TABLE 2-2 SUMMARY OF SOIL INORGANIC CONCENTRATION EXCEEDANCES – BAKER HALL PROPERTY

Constituents	Concentration Range (mg/kg)	Unrestricted Use SCOs[(a)] (mg/kg)	Frequency Exceeding Unrestricted Use SCOs	Restricted Residential SCOs[(a)] (mg/kg)	Frequency Exceeding Restricted Residential SCOs
SURFACE SOIL					
Arsenic	5.43 - 25.4	13	5 of 14	16	3 of 14
Barium	55.8 - 806	350	4 of 14	400	3 of 14
Cadmium	0.720 - 11.1	2.5	6 of 14	4.3	5 of 14
Chromium	11.3 - 135	30	6 of 14	180	0 of 14
Copper	11.6 - 553	50	7 of 14	270	2 of 14
Lead	54.0 - 2,460	63	11 of 14	400	6 of 14
Mercury	0.033 - 0.695	0.18	6 of 14	0.81	0 of 14
Nickel	9.99 - 141	30	6 of 14	310	0 of 14
Selenium	0.60 - 11.3	3.9	5 of 14	180	0 of 14
Silver	0.10 - 5.35	2.0	3 of 14	180	0 of 14
Zinc	108 - 2,170	109	14 of 14	10,000	0 of 14
SUBSURFACE SOIL					
Arsenic	2.89 - 41.7	13	5 of 45	16	4 of 45
Barium	29.7 - 960	350	6 of 45	400	6 of 45
Cadmium	0.210 - 13.6	2.5	5 of 45	4.3	5 of 45
Chromium	5.63 - 87.4	30	4 of 45	180	0 of 45
Copper	3.06 - 1,010	50	7 of 45	270	3 of 45
Lead	5.04 - 2,030	63	28 of 45	400	18 of 45
Mercury	0.006 - 0.86	0.18	5 of 45	0.81	1 of 45
Nickel	9.59 - 121	30	19 of 45	310	0 of 45
Selenium	0.22 - 11	3.9	1 of 45	180	0 of 45
Silver	0.16 - 4.13	2.0	4 of 45	180	0 of 45
Zinc	28.5 - 4,180	109	12 of 45	10,000	0 of 45

(a) NYSDEC Division of Environmental Remediation. 2006. 6 New York Code of Rules and Regulations Part 375 Environmental Remediation Programs. Restricted Unrestricted Use and Commercial Use SCOs. December.

NOTE: mg/kg = Milligrams per kilogram
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objective

TABLE 2-3 SUMMARY OF SOIL INORGANIC CONCENTRATION EXCEEDANCES – SMOKES CREEK CORRIDOR

Constituents	Concentration Range (mg/kg)	Unrestricted Use SCOs[(a)] (mg/kg)	Frequency Exceeding Unrestricted Use SCOs	Commercial SCOs[(a)] (mg/kg)	Frequency Exceeding Commercial SCOs
SURFACE SOIL					
Arsenic	6.11 - 38.1	13	9 of 22	16	8 of 22
Barium	67.4 - 1,200	350	9 of 22	400	7 of 22
Cadmium	0.957 - 18.4	2.5	11 of 22	9.3	4 of 22
Chromium	12.8 - 85.6	30	11 of 22	1,500	0 of 22
Copper	18.6 - 8,180	50	12 of 22	270	5 of 22
Lead	42.0 - 2,720	63	20 of 22	1,000	7 of 22
Manganese	389 - 2,490	1,600	1 of 22	10,000	0 of 22
Mercury	0.044 - 0.851	0.18	7 of 22	2.8	0 of 22
Nickel	16.5 - 143	30	20 of 22	310	0 of 22
Selenium	0.390 - 9.00	3.9	2 of 22	6,800	0 of 22
Silver	0.135 - 12.0	2.0	5 of 22	1,500	0 of 22
Zinc	88.8 - 2,730	109	20 of 22	10,000	0 of 22
SUBSURFACE SOIL					
Arsenic	4.00 - 80.0	13	19 of 64	16	16 of 64
Barium	47.6 - 8,800	350	19 of 64	400	15 of 64
Cadmium	0.165 - 57.5	2.5	21 of 64	9.3	10 of 64
Chromium	11.7 - 146	30	20 of 64	1,500	0 of 64
Copper	10.2 - 1,820	50	25 of 64	270	13 of 64
Cyanide, Total	0.052 - 110	27	2 of 5	27	1 of 64
Lead	10.88 - 8,210	63	34 of 64	1,000	13 of 64
Mercury	0.008 - 2.09	0.18	17 of 64	2.8	0 of 64
Nickel	19.9 - 250	30	63 of 64	310	0 of 64
Selenium	0.470 - 13.0	3.9	5 of 64	6,800	0 of 64
Silver	0.150 - 19.1	2.0	14 of 64	1,500	0 of 64
Zinc	54.7 - 2,830	109	44 of 64	10,000	0 of 64

(b) NYSDEC Division of Environmental Remediation. 2006. 6 New York Code of Rules and Regulations Part 375 Environmental Remediation Programs, Unrestricted Use SCOs.

NOTE: mg/kg = Milligrams per kilogram
NYSDEC = New York State Department of Environmental Conservation
SCO = Soil Cleanup Objective

TABLE 5-1 TECHNOLOGY SCREENING MATRIX

Technology	Process Options	Effectiveness in Addressing RAOs	Implementability	Key Factors	Cost	Status
No Action						
No Action	NA	Ineffective	Easily implemented	NA	None	Retained per NCP
Site Management						
Engineering and Institutional Controls	Land use restrictions	Effective for human health risk RAOs associated with contact of fill	Easily implemented	Requires regulatory and public acceptance of restricted/diminished resource use.	Low	Retained for potential combination with other technologies.
***In situ* Biological Treatment**						
Phytoremediation	Reliance on natural processes and chemical change	Ineffective due to high concentration range of metails impacts to site soil	Difficult to implement; requires planting of appropriate species and subsequent harvest for disposal, demonstration of natural processes causing attenuation, and subsequent monitoring	Requires regulatory and public acceptance of short-term restrictions on resource use.	Moderate	Not retained.
Isolation						
Cap or Cover	Soil cover	Effectively addresses RAOs associated with contact of fill.	Moderately difficult to implement; requires import of soil for placement; monitoring of cover thickness; and periodic maintenance and monitoring.	Site layout would require grading. Part of site is active; would require coordination with DPW.	Moderate	Retain for consideration.
	Impermeable cover (e.g., clay, asphalt, plastic, etc.)	Effectively addresses RAOs.	Moderately difficult to implement; requires periodic maintenance and monitoring.	Site layout would require and grading. Part of site is active; would require coordination with DPW.	High	Retain for consideration.
***In Situ* Physical/Chemical Treatment**						
In situ Stabilization	Addition of amendments/reagents to soil/fill to convert contaminants to stable compounds with reduced or eliminated leaching potential; requires *in situ* mixing	Effective for risk-based RAOs and partially effective for source control; would require leachability testings to measure the immobility of contaminants	Moderately difficult to implement, requires import and availability of suitable materials/reagents (i.e., activated carbon, gypsum, apatite, etc.) and periodic monitoring.	Causes significant disturbance to site that may hinder future use; volume increase with bulk can be significant.	Moderate	Not retained.
Soil Flushing	Extraction of contaminants from soil with water or other suitable aqueous solutions; soil flushing process includes injection or infiltration process of extraction fluid through soil.	Effectively addresses RAOs	Considered an emerging technology, has not been widely implemented; moderately difficult to implement; addition of environmentally compatible solvents may be used to increase effective solubility of some COCs; however, flushing solution may alter the physical/chemical properties of the soil system; technology offers the potential for recovery of metals and can mobilize a wide range of organic and inorganic contaminants from coarse-grained soils;	Capture of groundwater and flushing fluids with desorbed contaminants may need treatment to meet appropriate discharge standards prior to release to local, publicly owned wastewater treatment works or receiving streams; separation of solvents from recovered flushing fluid, for reuse in the process, is a major factor in the cost of soil flushing. Treatment of the recovered fluids results in process sludges and residual solids, such as spent carbon and spent ion exchange resin, which must be appropriately treated before disposal. Residual flushing additives in soil may be a concern.	High	Not retained.
Removal						
Excavation	Mechanical excavation used to remove soil/fill material	Will address relevant RAOs, assuming use of handling treatment/disposal options discussed below	Implementable for all areas; soil ramp would be removed; creek side slopes would need to be restored to original grades with clean fill.	Part of site is active; would require coordination with DPW.	High	Retain for consideration
***Ex-situ* Physical/Chemcial Treatment**						
Solidification or Stabilization	Amendments added to modify physical and chemical properties of material to facilitate handling and disposal	Effective at immobilizing inorganics within fill.	Relatively easy to implement; can be performed on small batches as material is staged for transport; requires import and addition of amendments; result is decreased water content and toxicity and mobility of contaminants; volume increase.	Requires use of amendments to achieve stabilization	Moderate	Not retained.
Ex situ chemical treatment	Acid leaching used to remove inorganics from soil/fill	Permeability of fill may hinder effectiveness.	Difficult to implement; requires establishment of a designated treatment facility using potentially hazardous chemicals to remove inorganics from fill.	Requires long term use of facilities for soil/fill treatment and disposal or recycling of leached fluids; rate of treatment may limit rate of excavation and disposal; requires use and maintenance of specialized equipment and chemicals	High	Not retained.
	Vitrification used to convert inorganic contaminants to inert forms	Permeability of fill may hinder effectiveness.	Difficult to implement; requires establishment of a designated treatment facility using high temperature processes to vitrify soil/fill	Requires long term use of facilities for soil/fill treatment and disposal; rate of treatment may limit rate of excavation and disposal; requires use and maintenance of specialized equipment	High	Not retained.
Disposal						
Off-site Disposal	Off-site commercial landfill	May be required for excavation options to meet RAOs	Low degree of difficulty to implement; requires identification of landfills capable of accepting material; landfill capacity and permitting may limit excavation and disposal rates.	Long range transport may be required dependent on landfill capacity/location; extensive site work and earthwork to accommodate transportation of material.	High	Retain for consideration

NOTE: RAO = Remedial Action Objective
NA = Not Applicable
NCP = National Contigency Plan
COC = Contaminant of Concern
DPW = Department of Public Works

TABLE 7-1 ALTERNATIVE COST SUMMARY

Alternative	Description	Total Cost (Net Present Value)	Capital Cost	Annual Cost (Years 1-5)	Annual Cost (Years 6-30)
ON-SITE AREA					
2A	Soil/Fill Excavation to Unrestricted Use SCOs with Disposal Off-Site, Demolition and Removal of Both Incinerator Buildings	$6,069,000	$6,069,000	$0	$0
2B	Soil/Fill Excavation to UU with Disposal Off-Site, Demolition and Removal of the Southern Incinerator Building	$5,583,000	$5,583,000	$0	$0
3	No Action with Site Management	$25,000	$25,000	$0	$0
4A	Partial Excavation (Ramp), Demolition and Removal of Both Incinerator Buildings, and Re-Grading and Covering of Remaining Contaminated Soil with a Soil Cover	$3,155,000	$2,969,000	$15,000	$11,000
4B	Partial Excavation (Ramp), Demolition and Removal of the Southern Incinerator Building, and Re-Grading and Covering of Remaining Contaminated Soil with a Soil Cover	$2,718,000	$2,643,000	$7,000	$4,000
5A	Partial Excavation (Ramp), Demolition and Removal of Both Incinerator Buildings, and Re-Grading and Covering of Remaining Contaminated Soil with Asphalt	$3,438,000	$3,379,000	$6,000	$3,000
5B	Partial Excavation (Ramp), Demolition and Removal of the Southern Incinerator Building, and Re-Grading and Covering of Remaining Contaminated Soil with Asphalt	$2,907,000	$2,848,000	$6,000	$3,000
6A	Soil/Fill Excavation to Commercial with Disposal Off-Site, Demolition and Removal of Both Incinerator Buildings	$4,267,000	$4,267,000	$0	$0
6B	Soil/Fill Excavation to Commercial with Disposal Off-Site, Demolition and Removal of the Southern Incinerator Building	$3,807,000	$3,807,000	$0	$0
SMOKES CREEK CORRIDOR					
2A	Partial Removal of Contaminated Soil on Both Sides of Asphalt Path to Commercial Use SCOs and Isolation of Remaining Contaminated Soil/Fill with Soil	$733,000	$643,000	$8,000	$5,000
2B	Partial Removal of Asphalt and Contaminated Soil to Commercial Use SCOs and Isolation of Remaining Contaminated Soil/Fill with Soil and Asphalt	$947,000	$857,000	$8,000	$5,000
3	Excavation of Asphalt and Contaminated Soil to Unrestricted Use SCOs with Disposal Off-Site	$1,548,000	$1,548,000	$0	$0
BAKER HALL PROPERTY					
2	Remaining Soil/Fill Excavation to Unrestricted Use SCOs with Disposal Off-Site	$1,271,000	$1,271,000	$0	$0

TABLE 8-1A ALTERNATIVE EVALUATION SUMMARY, ON-SITE AREA

	Alternative 1	**Alternative 2A**	**Alternative 2B**	**Alternative 3**	**Alternative 4A**	**Alternative 4B**	**Alternative 5A**	**Alternative 5B**	**Alternative 6A**	**Alternative 6B**
	No Action	**Soil/Fill Excavation to Unrestricted Use SCOs with Disposal Off-Site, Demolition and Removal of Both Incinerator Buildings**	**Soil/Fill Excavation to Unrestricted Use SCOs with Disposal Off-Site, Demolition and Removal of the Southern Incinerator Building**	**No Action with Site Management**	**Partial Excavation (Ramp), Demolition and Removal of Both Incinerator Buildings, and Re-Grading and Isolation of Remaining Impacted Soil with a Soil Cover**	**Partial Excavation (Ramp), Demolition and Removal of the Southern Incinerator Building, and Re-Grading and Isolation of Remaining Impacted Soil with a Soil Cover**	**Partial Excavation (Ramp), Demolition and Removal of Both Incinerator Buildings, and Re-Grading and Isolation of Remaining Impacted Soil with Asphalt**	**Partial Excavation (Ramp), Demolition and Removal of Southern Incinerator Building, and Re-Grading and Isolation of Remaining Impacted Soil with Asphalt**	**Soil/Fill Excavation to Commercial SCOs with Disposal Off-Site, Demolition and Removal of Both Incinerator Buildings**	**Soil/Fill Excavation to Commercial SCOs with Disposal Off-Site, Demolition and Removal of the Southern Incinerator Building**
(1) Overall Protection of the Public Health and the Environment										
	There is no reduction of risk with this alternative. The soil pathways would continue to pose unacceptable risk to all receptors.	Eliminates potential for human contact and migration of contaminants to groundwater and surface water through complete removal of contamination.	Eliminates potential for human contact and migration of contaminants to groundwater and surface water through complete removal of contamination.	There is a slight reduction of risk. An environmental easement would limit the use of the property to a level that has been determined to be safe.	Prevents human contact and reduces potential migration of contaminants to groundwater and surface water.	Prevents human contact and reduces potential migration of contaminants to groundwater and surface water.	Prevents human contact and reduces potential migration of contaminants to groundwater and surface water.	Prevents human contact and reduces potential migration of contaminants to groundwater and surface water.	Eliminates potential for human contact and migration of contaminants to groundwater and surface water through complete removal of contamination.	Eliminates potential for human contact and migration of contaminants to groundwater and surface water through complete removal of contamination.
(2) Standards, Criteria and Guidance (SCGs)										
	Does not meet SCG criteria.	Will meet SCG criteria.	Will meet SCG criteria.	Will not meet SCG criteria.	Will meet SCG criteria.	Will meet SCG criteria.	Will meet SCG criteria.	Will meet SCG criteria.	Will meet SCG criteria.	Will meet SCG criteria.
(3) Long-Term Effectiveness and Permanence										
	This alternative will not provide long-term effectiveness or permanence. This alternative offers no controls.	Effectively addresses RAOs through source removal.	Effectively addresses RAOs through source removal.	The easement would be in place long-term.	When designed and implemented properly, effectively eliminates exposure and prevents transport; however, requires long-term monitoring/maintenance.	When designed and implemented properly, effectively eliminates exposure and prevents transport; however, requires long-term monitoring/maintenance.	When designed and implemented properly, effectively eliminates exposure and prevents transport; however, requires long-term monitoring/maintenance.	When designed and implemented properly, effectively eliminates exposure and prevents transport; however, requires long-term monitoring/maintenance.	Effectively addresses RAOs through source removal.	Effectively addresses RAOs through source removal.
(4) Reduction of Toxicity, Mobility, or Volume of Contamination										
Amount of Hazardous Materials Destroyed, Treated, or Removed	None	Will reduce the volume and mobility of contamination via soil removal.	Will reduce the volume and mobility of contamination via soil removal;	None	Will reduce the volume and mobility of contamination via soil removal; however, residual source will remain beneath the cover.	Will reduce the volume and mobility of contamination via soil removal; however, residual source will remain beneath the cover.	Will reduce the volume and mobility of contamination via soil removal; however, residual source will remain beneath the cover.	Will reduce the volume and mobility of contamination via soil removal; however, residual source will remain beneath the cover.	Will reduce the volume and mobility of contamination via soil removal.	Will reduce the volume and mobility of contamination via soil removal;
Degree of Expected Reductions in Toxicity, Mobility, or Volume	None	Contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.	Contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.	None	Some contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.	Some contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.	Some contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.	Some contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.	Contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.	Contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.
Irreversible Treatment?	No	Not reversible.	Not reversible.	No	Partially reversible. Remaining fill could be un-covered.	Partially reversible. Remaining fill could be un-covered.	Partially reversible. Remaining fill could be un-covered.	Partially reversible. Remaining fill could be un-covered.	Not reversible.	Not reversible.
Residuals Remaining After Treatment	Yes	None above SCOs.	None above SCOs.	Yes	Residuals will remain under cover.	Residuals will remain under cover.	Residuals will remain under cover.	Residuals will remain under cover.	None above SCOs.	None above SCOs.
(5) Short-Term Impact and Effectiveness										
Community Protection	There is no action and therefore, no additional risk to the community.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust may be produced during mixing activities. These can be mitigated through standard construction practices.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust may be produced during mixing activities. These can be mitigated through standard construction practices.	There is a slight reduction of risk to the community.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust may be produced during mixing activities. These can be mitigated through standard construction practices.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust may be produced during mixing activities. These can be mitigated through standard construction practices.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust may be produced during mixing activities. These can be mitigated through standard construction practices.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust may be produced during mixing activities. These can be mitigated through standard construction practices.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust may be produced during mixing activities. These can be mitigated through standard construction practices.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust may be produced during mixing activities. These can be mitigated through standard construction practices.
Worker Protection	There is no action and therefore no workers will be present on site.	Workers can potentially be exposed to contaminated media during excavation and grading activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated media during excavation and grading activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	There is no action and therefore no workers will be present on site.	Workers can potentially be exposed to contaminated media during excavation activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated media during activities. Work around heavy equipment and electrical power carries potential risk to workers. Risks can be minimized by implementing controls.	Workers can potentially be exposed to contaminated media during excavation and grading activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated media during excavation and grading activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated media during excavation and grading activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated media during excavation and grading activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.
Environmental Impacts	There are no short-term impacts associated with this alternative.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.	There are no short-term impacts associated with this alternative.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.
Time Until Action Complete (Field Construction Time)	No action taken	Approximately 11 months	Approximately 10 months	No construction	Approximately 9 months	Approximately 8 months	Approximately 9 months	Approximately 7 months	Approximately 10 months	Approximately 9 months
(6) Implementability										
Ability to Construct and Operate	Not Applicable.	Excavation, demolition, and disposal alternatives can be implemented, and have been used nationally.	Excavation, demolition, and disposal alternatives can be implemented, and have been used nationally.	Site Management can be implemented, and have been used nationally.	Excavation, disposal, demolition, and containment alternatives can be implemented, and have been used nationally.	Excavation, disposal, demolition, and containment alternatives can be implemented, and have been used nationally.	Excavation, disposal, demolition, and containment alternatives can be implemented, and have been used nationally.	Excavation, disposal, demolition, and containment alternatives can be implemented, and have been used nationally.	Excavation, demolition, and disposal alternatives can be implemented, and have been used nationally.	Excavation, demolition, and disposal alternatives can be implemented, and have been used nationally.
Monitoring Requirements	Not Applicable.	Soil shall be sampled and analyzed to confirm removal of impacted area.	Soil shall be sampled and analyzed to confirm removal of impacted area.	None	Soil shall be sampled and analyzed to confirm removal of impacted area.	Soil shall be sampled and analyzed to confirm removal of impacted area.	Soil shall be sampled and analyzed to confirm removal of impacted area.	Soil shall be sampled and analyzed to confirm removal of impacted area.	Soil shall be sampled and analyzed to confirm removal of impacted area.	Soil shall be sampled and analyzed to confirm removal of impacted area.
Availability of Equipment and Specialists	Not Applicable.	Equipment and specialists are available for the implementation of all of these technologies.								
Ability to Obtain Approvals and Coordinate with Other Agencies	Not Applicable.	Ability to obtain approvals and coordinate with other agencies assumed to be possible.								
(7) Cost Effectiveness										
Cost	**$0**	**$6,069,000**	**$5,583,000**	**$25,000**	**$3,155,000**	**$2,718,000**	**$3,438,000**	**$2,907,000**	**$4,267,000**	**$3,807,000**
(8) Land Use										
	Not Applicable.	Unrestricted Use	Unrestricted Use	Not Applicable	Commercial	Commercial	Commercial	Commercial	Commercial	Commercial
(9) Community Acceptance										
	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

NOTE:
RAO = Remedial Action Objective
SCO = Soil Cleanup Objective
PPE = Personal protective equipment
ARAR = Applicable or Relevant and Appropriate Requirement
TBD = To be determined

TABLE 8-1B ALTERNATIVE EVALUATION SUMMARY, SMOKES CREEK CORRIDOR

	Alternative 1	Alternative 2A	Alternative 2B	Alternative 3
	No Action	**Partial Removal of Contaminated Soil on Both Sides of Asphalt Path to Commercial SCOs and Isolation of Remaining Contaminated Soil/Fill with Soil**	**Partial Removal of Asphalt and Contaminated Soil to Commercial SCOs and Isolation of Remaining Contaminated Soil/Fill with Soil and Asphalt**	**Excavation of Asphalt and Contaminated Soil to Unrestricted Use SCOs with Disposal Off-Site**
(1) Overall Protection of the Public Health and the Environment				
	There is no reduction of risk with this alternative. The soil pathways would continue to pose unacceptable risk to all receptors.	Prevents human contact and reduces potential migration of contaminants to groundwater and surface water.	Prevents human contact and reduces potential migration of contaminants to groundwater and surface water.	Removal of source reduces potential migration of contaminants to groundwater and surface water.
(2) Standards, Criteria and Guidance (SCGs)				
	Does not meet SCG criterion.	Will meet SCG criteria.	Will meet SCG criteria.	Will meet SCG criteria.
(3) Long-Term Effectiveness and Permanence				
	This alternative will not provide long-term effectiveness or permanence. This alternative offers no controls.	When designed and implemented properly, effectively eliminates exposure and prevents transport; however, requires long-term monitoring/maintenance.	When designed and implemented properly, effectively eliminates exposure and prevents transport; however, requires long-term monitoring/maintenance.	Effectively addresses RAOs through source removal.
(4) Reduction of Toxicity, Mobility, or Volume of Contamination				
Amount of Hazardous Materials Destroyed, Treated, or Removed	None	Will reduce the volume and mobility of contamination via soil removal; however, residual contamination will remain beneath the cover.	Will reduce the volume and mobility of contamination via soil removal; however, residual contamination will remain beneath the cover.	Will reduce the volume and mobility of contamination via soil removal.
Degree of Expected Reductions in Toxicity, Mobility, or Volume	None	Some contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.	Some contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.	Contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.
Irreversible Treatment?	No	Partially reversible. Remaining fill could be un-covered.	Partially reversible. Remaining fill could be un-covered.	Not reversible.
Residuals Remaining After Treatment	Yes	Residuals will remain under cover.	Residuals will remain under cover.	None.
(5) Short-Term Impact and Effectiveness				
Community Protection	There is no action and therefore, no additional risk to the community.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust will be produced during excavation activities. These can be mitigated through standard construction practices.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust will be produced during excavation activities. These can be mitigated through standard construction practices.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust will be produced during excavation activities. These can be mitigated through standard construction practices.
Worker Protection	There is no action and therefore no workers will be present on site.	Workers can potentially be exposed to contaminated media during excavation activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated media during excavation activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.	Workers can potentially be exposed to contaminated media during excavation activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.
Environmental Impacts	There are no short-term impacts associated with this alternative.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs.
Time Until Action Complete (Field Construction Time)	No action taken	Approximately 3 months	Approximately 3 months	Approximately 4 months
(6) Implementability				
Ability to Construct and Operate	Not Applicable.	Excavation, disposal, and containment alternatives can be implemented, and have been used nationally.	Excavation, disposal, and containment alternatives can be implemented, and have been used nationally.	Excavation and disposal alternatives can be implemented, and have been used nationally.
Monitoring Requirements	Not Applicable.	Soil shall be sampled and analyzed to confirm partial removal of impacted area.	Soil shall be sampled and analyzed to confirm partial removal of impacted area.	Soil shall be sampled and analyzed to confirm removal of impacted area.
Availability of Equipment and Specialists	Not Applicable.	Equipment and specialists are available for the implementation of all of these technologies.		
Ability to Obtain Approvals and Coordinate with Other Agencies	Not Applicable.	Ability to obtain approvals and coordinate with other agencies assumed to be possible.		
(7) Cost Effectiveness				
Cost	**$0**	**$733,000**	**$947,000**	**$1,548,000**
(8) Land Use				
	Not Applicable.	Commercial	Commercial	Unrestricted
(9) Community Acceptance				
	TBD	TBD	TBD	TBD

NOTE:
RAO = Remedial Acrion Objective
PPE = Personal protective equipment
ARAR = Applicable or Relevant and Appropriate Requirement
TBD = To be determined

TABLE 8-1C ALTERNATIVE EVALUATION SUMMARY, BAKER HALL PROPERTY

	Alternative 1	Alternative 2
	No Action	**Remaining Soil/Fill Excavation to Unrestricted Use SCOs with Disposal Off-Site**
(1) Overall Protection of the Public Health and the Environment		
	There is no reduction of risk with this alternative. The soil pathways would continue to pose unacceptable risk to all receptors.	Eliminates potential for human contact and migration of contaminants to groundwater and surface water through complete removal of contamination.
(2) Standards, Criteria and Guidance (SCGs)		
	Does not meet SCG criterion.	Will meet SCG criteria.
(3) Long-Term Effectiveness and Permanence		
	This alternative will not provide long-term effectiveness or permanence. This alternative offers no controls.	Effectively addresses RAOs through source removal.
(4) Reduction of Toxicity, Mobility, or Volume of Contamination		
Amount of Hazardous Materials Destroyed, Treated, or Removed	None	Will reduce the volume and mobility of contamination via soil removal.
Degree of Expected Reductions in Toxicity, Mobility, or Volume	None	Contaminated soil will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.
Irreversible Treatment?	No	Not reversible.
Residuals Remaining After Treatment	Yes	None.
(5) Short-Term Impact and Effectiveness		
Community Protection	There is no action and therefore, no additional risk to the community.	Increased short-term risks to the public during excavation activities and transport of equipment and materials to and from site. Dust will be produced during excavation activities. These can be mitigated through standard construction practices.
Worker Protection	There is no action and therefore no workers will be present on site.	Workers can potentially be exposed to contaminated media during excavation and grading activities. Work around heavy equipment carries potential risk to workers. Risks can be minimized by implementing health and safety controls.
Environmental Impacts	There are no short-term impacts associated with this alternative.	Wastes produced will include contaminated PPE. Wastes will be managed in compliance with ARARs. Limited short term environmental impacts associated with implementation and air emissions.
Time Until Action Complete (Field Construction Time)	No action taken	Approximately 4 months
(6) Implementability		
Ability to Construct and Operate	Not Applicable.	Excavation and disposal alternatives can be implemented, and have been used nationally.
Monitoring Requirements	Not Applicable.	Soil shall be sampled and analyzed to confirm removal of impacted area.
Availability of Equipment and Specialists	Not Applicable.	Equipment and specialists are available for excavation and disposal.
Ability to Obtain Approvals and Coordinate with Other Agencies	Not Applicable.	Ability to obtain approvals and coordinate with other agencies assumed to be possible.
(7) Cost Effectiveness		
Cost	**$0**	**$1,271,000**
(8) Land Use		
	Not Applicable.	Unrestricted Use
(9) Community Acceptance		
	TBD	TBD

NOTE:
RAO = Remedial Acrion Objective
PPE = Personal protective equipment
ARAR = Applicable or Relevant and Appropriate Requirement
TBD = To be determined

Appendix A

Technology Screening Letter

EA Engineering, P.C.
EA Science and Technology

6712 Brooklawn Parkway, Suite 104
Syracuse, NY 13211-2158
Telephone: 315-431-4610
Fax: 315-431-4280
www.eaest.com

January 24, 2014

DRAFT

Mr. David Gardner
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7017

RE: Contract/Work Assignment No: D007624-10
Site/Spill No/Pin: Lackawanna Incinerator Site (915206)
Remedial Action Objectives and Feasibility Study Technology Screening

Dear Mr. Gardner:

EA Engineering, P.C., and its affiliate EA Science and Technology (EA) is providing the Department with this technology screening review letter to facilitate development of the feasibility study (FS) being prepared for the Lackawanna Incinerator site (915206), located in Lackawanna, New York. The FS is being conducted in accordance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER) *Technical Guidance for Site Investigation and Remediation* (2010)[1].

INTRODUCTION

The former Lackawanna Incinerator site is located at 2960 South Park Avenue, in the City of Lackawanna, Erie County, New York (Figure 1). The site is situated on a 1.57-acre, city-owned parcel of land that is partially bounded by a perimeter fence. The main access to the site is located on Reddon Street, off of South Park Avenue. The site's main features are two brick multi-story buildings that housed municipal solid waste incinerators (the southern building and the northern building), and a large soil ramp that was used to access the third floor of the northern building. The remainder of the site is generally open space. The southern portion of the property consists primarily of an unpaved area with a framed shed that is currently used to house equipment for the City Department of Public Works (DPW).

The site is located in a mixed use area including industrial, commercial, and residential properties (Figure 2). The property is bounded to the west by the Lackawanna Veterans' Stadium, to the south by the DPW, to the east by a partially developed parcel owned by the Baker Hall Victory Services (Baker Hall Property), and to the north by a paved walking path open to the public that runs parallel to the southern shore of Smokes Creek. Numerous single-family

1 NYSDEC. 2010. DER-10 / Technical Guidance for Site Investigation and Remediation. May 3.

residential properties are located south and southwest of the site. Holy Cross Cemetery is located to the north of the site, on the north side of Smokes Creek.

The remedial goal for all remedial actions is considered to be the restoration of the site to the pre-disposal/pre-release conditions to the extent practicable. Remedial action objectives (RAOs) are defined as the medium-specific or area-specific cleanup objectives to provide protection of public health and the environment. The RAOs are based on contaminant-specific standards, criteria, and guidance (SCGs) for impacted media as defined in the remedial investigation (RI). The RI results were compared to medium-specific SCGs, as well as SCGs selected due to the current and reasonably ascertainable future land use and potential human and ecological receptors. The SCGs used to evaluate the RI data included:

- NYSDEC Class GA groundwater and Class C surface water standards and guidance values, as presented in the Division of Water Technical and Operational Guidance Series 1.1.1, 1998, as amended.

- NYSDEC Division of Fish, Wildlife, Marine Resources Draft freshwater guidance values, as presented in Sediment Screening and Assessment of Contaminated Sediments, January 2013.

- 6 New York Code of Rules and Regulations (NYCRR) Part 375, Environmental Remediation Programs Soil Cleanup Objectives (SCOs), for each site area, based on the current and future use: on-site soil to Commercial SCOs, the Stadium and Baker Hall Property soils to Restricted Residential SCOs, and the Smokes Creek Corridor soils to Protection of Ecological Resources SCOs.

REMEDIAL INVESTIGATION SUMMARY

The RI was conducted using a phased approach, to delineate the extent of site-related impacts. Impacts associated with the operation of the two former municipal waste incinerators include the remaining incinerator buildings, on-site ash fill material, as well as ash fill material along the south side of Smokes Creek, and extending to the east onto the adjacent Baker Hall Property. Site soil contamination appears to be related to the integration of ash in the ramp and the transport of ash from the incinerator buildings. Due to historical site use, runoff, and erosion, the ash has been reworked and distributed offsite, resulting in site-related impacts to the north and east along the southern bank of Smokes Creek and the paved recreational path, and to the east in the northern portion of the Baker Hall Property. For the purpose of this FS screening evaluation, they will be divided into four areas: on-site, Lackawanna Veterans' Stadium, Baker Hall Property, and Smokes Creek Corridor. Currently, these areas are considered one operable unit.

On-Site Area

Based on a comparison of on-site media to SCGs, the contaminants of potential concern (COPCs) at the site include inorganic constituents and polycyclic aromatic hydrocarbons (PAHs). The primary medium of concern is soil; however, and to a lesser extent, limited impacts to groundwater and surface water have also been identified, due to leaching of water through impacted soil.

Soil

Surface and subsurface soil results indicate that several inorganic constituents, primarily arsenic and lead are present at elevated concentrations greater than the Commercial SCOs in the soil/fill material at the site. The soil/fill material ranges from 0 to 4 ft of general fill in the western portion of the site, to over 22 ft of soil/ash fill material in the ramp area. In general, the most elevated exceedances were observed in the ramp area, where the ash/fill materials are also thickest, and in the area north of the northern incinerator building. The on-site soil concentrations exceeding the Commercial SCOs are summarized in the following table.

Constituent	Commercial SCO (mg/kg)	No. of Exceedances / No. of Samples	Range of Exceedances (mg/kg)
SURFACE SOIL			
Cadmium	9.3	1 / 10	22
Copper	270	1 / 10	406
Lead	1,000	1 / 10	2,330
SUBSURFACE SOIL			
Arsenic	16	7 / 68	19.7–51.5
Barium	400	7 / 68	430–1,500
Cadmium	9.3	3 / 68	17.1–42.7
Copper	270	5 / 68	309–1,510
Cyanide, Total	27	3 / 68	66–170
Lead	1,000	6 / 68	1,500–6,820
Nickel	310	1 / 68	342

In addition, ash material stored in the first level of the southern incinerator building contained lead at 22,000 mg/kg, based on testing conducted in 2005, and is assumed to be characteristic hazardous. Subsurface soil/fill material did not exhibit hazardous waste characteristics, based on the toxicity characteristic leaching procedure metals results from four samples collected from the ramp. The estimated volume of fill material contained on-site is approximately 22,000 yd^3 or 35,000 tons using as an estimate that 1 yd^3 of fill material is approximately equal to 1.6 tons.

Groundwater

Monitoring wells installed during the RI primarily screen the silt and clay unit, which directly underlies the fill material at the site. The hydrogeologic data evaluated during the RI indicates

that limited saturation is present within the fill materials, although localized zones may be associated with perched water or infiltration. Based on groundwater elevations, shallow groundwater flow is toward Smokes Creek. Drinking water in the area is obtained from Lake Erie and the Niagara River.

Groundwater analytical results indicated concentrations of several inorganic constituents (antimony, arsenic, chromium, iron, lead, magnesium, manganese, nickel, and sodium) above the Class GA standards and guidance values at each monitoring well location. Arsenic and lead were the only inorganic constituents not detected above standards at upgradient monitoring well, which suggests that on-site subsurface fill material may act as a source of elevated inorganic concentrations affecting groundwater quality at the site.

Lackawanna Veterans Stadium

No Restricted Residential SCO exceedances were observed in samples collected from the stadium property. One constituent (chromium at 40.5 J mg/kg) exceeded the more stringent Residential SCO (36 mg/kg) in one surface soil sample (located west of the southwestern corner of the former incinerator site).

Baker Hall Property

While the northern portion of the adjacent Baker Hall Property is currently vacant, multi-unit residential development is planned. Several inorganic constituents and PAHs were detected at concentrations exceeding the Restricted Residential SCOs. Surface and subsurface soil results indicate that several inorganic constituents, primarily arsenic and lead are present at elevated concentrations greater than the Restricted Residential SCOs in the soil/fill material at the property. The site-related impacts at the Baker Hall Property are associated with soil/fill material, which are thickest in the northwestern corner of the property (2–4-ft thick), east of the northern incinerator building. The impacted fill extends at a reduced thickness (0–2-ft thick) along the western property line shared with the former incinerator site, and along the northern property line. The inorganic exceedances of Restricted Residential SCOs are summarized in the following table.

Constituent	Restricted Residential SCO (mg/kg)	No. of Exceedances / No. of Samples	Range of Exceedances (mg/kg)
SURFACE SOIL			
Arsenic	16	3 / 14	16.5–25.4
Barium	400	3 / 14	706–806
Cadmium	4.3	5 / 14	6.27–11.1
Copper	270	2 / 14	433–553
Lead	400	6 / 14	595–2,460
SUBSURFACE SOIL			
Arsenic	16	4 / 42	18.0–41.7
Barium	400	6 / 42	403–960
Cadmium	4.3	5 / 42	5.7–13.6
Copper	270	3 / 42	460–1,010
Lead	400	7 / 42	869–2,030
Mercury	0.81	1 / 42	0.860

Several PAHs were detected at four locations at low parts per million concentrations slightly exceeding the Restricted Residential SCOs. In general, PAHs were observed in a subset of locations (along the northwestern Baker Hall Property boundary) where lead concentrations also exceeded the SCO.

Based on the results of the RI, the estimated volume of impacted soil/fill material at the Baker Hall Property is approximately 6,000 yd^3 or 9,600 tons, using as an estimate that 1 yd^3 of fill material is approximately equal to 1.6 tons. The composited soil/fill material sample obtained from the Baker Hall Property and analyzed for complete waste characterization parameters was not indicative of hazardous waste.

Smokes Creek Corridor

Stormwater and shallow groundwater from the former incinerator site discharge to Smokes Creek. Several inorganic constituents were detected above the Protection of Ecological Resources SCOs in soil samples collected along the recreational path and the creek floodplain.

Stormwater Outfalls

Two inorganic constituents (total cyanide and selenium) were detected at concentrations exceeding the Class C surface water standards in water samples collected from the two drain pipes north of the former incinerator site. These pipes discharge to the floodplain (i.e., above the normal creek stage). No organic compounds were detected in the water samples collected from the stormwater outfalls.

In floodplain soil samples collected immediately downslope from the pipe discharge locations, two inorganic constituents (lead and zinc) were detected above the Protection of Ecological Resources SCOs. At the eastern discharge location, both lead and zinc exceeded the SCO; while

at the western discharge location, zinc was the only inorganic exceedance. Similar concentrations for lead and zinc were also observed at the storm sewer outfall, just upstream of the site. Several PAHs were also detected above SCOs in the storm sewer soil sample.

Surface Water

Inorganic constituents were detected in each of the five surface water samples collected from Smokes Creek. Of these detections, aluminum was the only constituent detected above Class C standards. Total cyanide was not detected in surface water.

Sediment

Inorganic constituents were detected in sediment samples collected from Smokes Creek. Of these detections, nickel was the only constituent detected above the sediment guidance values (23–49 mg/kg for Class B sediment). These concentrations are similar to background soil concentrations. Total cyanide was detected in only one sediment sample, located north of the central portion of the site.

FEASIBILITY STUDY

The criteria and initial screening to be used to develop the FS Report are summarized below:

- Pursuant to DER-10 (NYSDEC 2010)[1], remedial goals for the site are defined by the applicable regulations for New York State Inactive Hazardous Waste Disposal Site Remedial Program (State Superfund Program or SSF), as defined by Environmental Conservation Law (ECL), Article 27, Title 13.

- RAOs are medium objectives for the protection of public health and the environment, and are developed based on contaminant-specific SCGs to address contamination identified at a site. NYSDEC has developed generic RAOs for various media that will be used during the development of the FS and remedy selection process. The RAOs for impacted media identified at the site are listed in Table 1.

EA completed the technology screening in accordance with DER-10 (NYSDEC 2010)[1] and the 1988 U.S. Environmental Protection Agency (EPA) publication *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA l540lG-891004) (EPA 1988)[2]. The basis of the screening was designed to evaluate applicable technologies based on impacted media identified at the site during the RI.

2 EPA. 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA l540lG-891004). October.

SITE CONSIDERATIONS

In addition to media impacts identified during the RI, there are a number of operational, environmental, and physical constraints that have a significant influence on the implementability of a potential remedial alternative. The considerations for each area are identified below.

On-Site Area

- The site, including the northern incinerator building, is actively used by the Lackawanna DPW. Coordination will be an important consideration for any remedial alternative, not including "No Action," selected for the site.

- The southern incinerator building would need to be demolished to enable access to contaminated fill for any of the remedial alternatives except for "No Action." The building would need to be inspected for asbestos prior to demolition.

- The northern incinerator building would remain on-site for all of the proposed remedial alternatives. As a result, accessibility would be altered due to the removal of the existing soil ramp. In addition, a structural assessment would need to be completed to evaluate the structural integrity of the building following ramp removal and during excavation surrounding the building.

- Storm grates and sewers encountered during excavation or stabilization would need to be evaluated to determine whether or not they are serving the intended purpose of providing drainage from the site and if they need to remain or be removed.

Baker Hall Property

- There is a known 8-in. high-density polyethylene high pressure gas main and 3 ft storm sewer line within the areas of known contamination on the Baker Hall Property.

- Sensitive habitats potentially exist in the northern area of the Baker Hall Property.

Smokes Creek Corridor

- Contamination of the Smokes Creek recreational path extends to the southern bank of Smokes Creek. Creek diversion and/or restoration may be necessary for some remedial alternatives.

- Storm grates and sewers encountered during excavation or stabilization would need to be evaluated to determine whether or not they are serving the intended purpose of providing drainage from the site and if they need to remain or be removed.

TECHNOLOGY SCREENING

The technology screening assessed applicable technologies based on area-specific media and contaminants, as well as with the following five categories:

- Compliance with RAO
- Effectiveness
- Implementability
- Reduction of toxicity, mobility, and volume
- Cost.

The technology screening table attached (Table 2) to this letter provides a review of each screened technology for potentially addressing surface and subsurface soil/fill material based upon the above listed criteria. EA has evaluated multiple technologies known to be effective in the remediation of inorganic contaminants in soil/fill.

Based on the screening matrix, EA proposes to develop the FS evaluating the remedial alternatives presented in Table 3. As noted above, demolition of the southern incinerator building and structural assessment of the northern incinerator building is recommended prior to implementation of any of the alternatives included in the screening matrix except for "No Action."

Please provide concurrence and/or comments with the proposed remedial alternatives so that EA may move forward with preparation of the FS for the former Lackawanna Incinerator site. If you have any questions, please do not hesitate to contact me at (315) 431-4610.

Sincerely,

EA SCIENCE AND TECHNOLOGY

Jennifer Martin Bouchard
Project Manager

EA ENGINEERING, P.C.

Chris Canonica, P.E.
Vice President

Appendix B

Costs

TECHNOLOGY		LOCATION		MEDIA		Estimated Cost to Implement		$6,069,000	
On-Site Alternative 2A Soil/Fill Excavation to Unrestricted SCOs with Disposal Off-Site Demolition and Removal of Both Incinerator Buildings		Lackawanna Incinerator Site Lackawanna, NY		Soil		Construction Time: Operation Time: Post Remediation Monitoring		11 - 0	months months years

		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$6,069,000**
Construction Activities		**1**			**$8,486**		**$132,200**		**$34,747**	**$96,239**	**$4,509,377**
Pre-Design Characterization Study											
Driller											
Mob/Demob	*quote- SJB*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 300	$300
Geoprobe/Crew for Soil Borings	*quote- SJB*	2	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 850	$1,700
Sample Collection		10	hr	$ -	$ 50	$ 85.00	$ 850	$ -	$ -		$900
XRF Unit	*recent quote*	2	day							$ 500	$1,000
Sample Analysis for TCLP Lead and Zinc (5% of total samples)	*Life Science Laboratories*	4	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593.48	$2,374
Sewer Investigation/Mapping - Labor		16	hrs	$ -	$ -	$ 85.00	$ 1,360	$ -	$ -	$ -	$1,360
Topographic Survey	*02 21 23 09 0020*	2.5	acre	$ 20.94	$ 52	$ 597.77	$ 1,494	$ 23	$ 58	$ -	$1,605
Reporting	*Engineer's Estimate*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$5,000
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	1.0	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Work Plan Preparation (Including QAPP, FAP and HASP)		1.0	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	1,000	lf	$ 0.81	$ 810	$ -	$ -	$ -	$ -	$ -	$810
Monitoring Well Abandonment	*recent quote- EnviroTrac*	150	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22	$3,300
Sewer/Storm Drain Demolition	*02 31 13.33 2900*	750	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$8,250
Trenching 6-10ft with 3/4 CY excavator	*31 23 16.13 0500*	1,667	bcy	$ -	$ -	$ 4.65	$ 7,750	$ 3	$ 5,233		$12,983
Fence Demolition	*02 41 13.62 1100*	1,010.00	lf							$ 2.30	$2,323
Fence Post Removal	*02 4113621000*	101.00	each							$ 22.99	$2,322
Sewer/Storm Drain Reconstruction											
PVC Sewer Pipe, 8" diameter, 13" lengths	*33 31 13.25 2080*	700	lf	$ 7.23	$ 5,061	$ 5.06	$ 3,542	$ -	$ -		$8,603
PVC Sewer Pipe, 10" diameter, 13" lengths	*33 31 13.25 2120*	150	lf	$ 11.93	$ 1,790	$ 6.15	$ 923	$ -	$ -		$2,712
Install manholes- concrete, precast, 4' ID, 8' deep	*33 49 13.10 0600*	1	ea	$ 646.68	$ 647	$ 1,622.55	$ 1,623	$ -	$ -		$2,269
Consolidation of ramp materials to incinerator footprint, 200 HP Dozer, 50' Haul	*31 23 23.14 4000*	1,000	lcy	$ -	$ -	$ 0.33	$ 330	$ 1	$ 560		$890
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,344	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,687	$6,687
Ramp & Building Demolition											
Access Road Demolition	*32 01 15.71 5330*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.10	$440
Sample Collection (from building)		18	hr	$ -	$ -	$ 85.00	$ 1,488	$ -	$ -		$1,488
Sample Analysis for PCBs (TCL PCBs)	*Life Sciences quote*	35	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$2,275
Sample Analysis for Lead & Asbestos (TAL Inorganics)	*Life Sciences quote*	35	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$2,625
North Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	5,633	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$92,600
Brick Wall Demolition	*02 41 16.13 0650*	1,898	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$721
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
South Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	2,258	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$37,113
Brick Wall Demolition	*02 41 16.13 0650*	1,365	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$519
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
Asbestos Abatement		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$50,000
Transportation and Disposal											
Masonry Disposal	*Quote from Modern Landfill*	653.95	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$46,431
Building Ash Hazardous Waste Disposal	*Quote from Modern Landfill*	342	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$47,817
Drum Disposal (Waste Oil)	*Quote from Modern Landfill*	10	drum	$ -	$ -	$ -	$ -	$ -	$ -	$ 90.00	$900
General Waste Disposal	*Quote from Modern Landfill*	100	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$3,768
Metal Disposal / Recycling	*Quote from Modern Landfill*	50	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$1,884
C&D Waste Disposal	*Quote from Modern Landfill*	859	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$61,019
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	8	mo	$ -	$ -	$ 13,600.00	$ 108,800	$ 3,420	$ 27,360	$ -	$136,160
Dust Control, Light	*31 23 23.20 2500*	32	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996	$31,882
Asphalt demolition - does not include disposal	*02 41 13 17 5010*	5,713.22	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.64	$32,223
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	30,100	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$39,130
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	34,615	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 4	$126,345
Haul Road Maintenance	*31 23 23.20 2600*	32	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,343	$42,966
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	30,100	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2	$55,384
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	34,615	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$44,307
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	160	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8	$1,338
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	160	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7	$1,146
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Confirmation Sampling											
Grab Samples- 1 per 900 square feet, 1 per 30 lf along side walls plus 20% QA/QC		147	sample	$ -	$ 50	$ 21.00	$ 3,081	$ 6	$ 839.01	$ -	$3,970
Lab Analyses - TAL Metals	*Life Science Laboratories*	176	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$13,205
Decontamination Water Samples		10	sample	$ -	$ -	$ 21	$ 213	$ 67	$ 667	$ -	$880
Decon Water Lab Analyses - TCL PCBs	*Life Science Laboratories*	10	sample	$ -	$ -		$ -		$ -	$ 50	$500
Hazardous Soil Disposal											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	61	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$36,202
Hazardous Soil Disposal	*CWM*	4,816	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140	$674,240
Transportation using dumps	*CWM*	4,816	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$93,912
Demurrage (assume 5 hours per week of loading)	*CWM*	10	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$850
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 33,808	$33,808
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	43,344	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 38	$1,633,202
Site Restoration											
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	17,946	lcy	$ 28.00	$ 502,483	$ -	$ -	$ -	$ -		$502,483
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	17,946	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$25,124
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	6,941	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$1,943
Topsoil	*Recent quote- ESG from Seven Springs*	2,157	lcy	$ 44.50	$ 96,003	$ -	$ -	$ -	$ -	$ 45	$192,007
Finishing grading slopes, gentle	*31 22 16.10 3300*	208	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$44
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	2	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$147
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Asphalt Parking Lot - Irregular shaped, replaced in kind											
Base	*32 11 26.13 1600*	952	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$81,118
Binder	*32 12 16.13 0200*	5,713	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$113,979
Top	*32 12 16.13 0380*	5,713	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$65,645
Fencing Installation	*32 31 13.20 0800*	1,010	lf							$ 28	$27,795
Mobilization and Demobilization											**$101,478**
10%	of Total Costs of Site Work, Treatment									$1,014,776	$101,478
Contingency											**$691,628**
15%	of Total Construction Activities									$4,610,854	$691,628
Professional/Technical Services											**$766,594**
5%	Project Management									$4,509,377	$225,468.83
6%	Remedial Design										$270,562.60
6%	Construction Management										$270,562.60

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$6,069,000
On-Site Alternative 2A Soil/Fill Excavation to Unrestricted SCOs with Disposal Off-Site Demolition and Removal of Both Incinerator Buildings	Lackawanna Incinerator Site Lackawanna, NY	Soil	Construction Time:	11 months
			Operation Time:	- months
			Post Remediation Monitoring	0 years

TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital Cost) $6,069,000

Assumptions:

Working condition is Safety Level: D/C (Labor productivity: 82%; Equipment productivity: 100%)
Weighted Average of city cost index (Buffalo, NY) 101.4% (not applicable for costs derived from vendor quotes).
Costs are loaded with a profit factor 10%
Inflation 3% per year

Soil Sampling Assumptions

1 times sampled; 0.25 hrs/sample; Labor $85 Cost per hr
20% added for QA/QC samples; 1 worker sampling

Characterization Cost	Table A (per CWM)	$593.48	per sample	2 hrs / well sampling
Analytical cost	TAL Metals	$75.00	per sample	2 worker per gw sample
For each sampling event, assumed:		$50	for materials (gloves, notebooks, etc.)	

Disposal

Lead contaminated soil as hazardous waste		$275	per ton	5,157.55 tons hazardous disposal (assume 10% hazardous, add building ash materials)
				22 tons per load; 234 loads for haz disposal
Lead contaminated soil as non-haz		$39.87	per ton	45,007 tons non-haz disposal, incl. build materials; 2,046 loads for non-haz disposal
Concrete		3,300	lbs per cy	1.6 tons/cy
		150	lbs per cf	
Brick		120	lbs per cf	

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID	$96.08 per day
Truck/SUV (1/2 ton or smaller)	$70.74 per day
Horiba U-10 Water Quality Meter	$73.77 per day
Submersible Pump	$42.16 per day
2 in Pump Control Box	$72.27 per day
Generator: 110 V	$57.24 per day
Level D PPE	$11.91 per day

Work day consists of: 10 hrs

20 loads per day
20 working days per month
10 hours per working day
1 months for pre-design characterization
2 months for site prep/restoration
2 months for demolition
11 months to completion
150 ft/day drilling

Notes

sy	square yard	mo	month	51,419	SF Asphalt (Parking Lot)		
cy	cubic yard	ls	lump sum	6	base thickness (in)		
lcy	loose cubic yard	O&M	Operation and maintenance	952.2037037	CY Asphalt		
bcy	bank cubic yard	H&S	Health and Safety				
lf	linear feet						
sf	square feet						
msf	1,000 square feet						

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$5,583,000
On-Site Alternative 2B Soil/Fill Excavation to Unrestricted SCOs with Disposal Off-Site Demolition and Removal of the Southern Incinerator Building	**Lackawanna Incinerator Site Lackawanna, NY**	**Soil**	**Construction Time:**	**10 months**
			Operation Time:	**- months**
			Post Remediation Monitoring	**0 years**

		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$5,583,000**
Construction Activities		**1**			**$8,486**		**$116,774**		**$31,119**	**$96,216**	**$4,161,301**
Pre-Design Characterization Study											
Driller											
Mob/Demob	*quote- SJB*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 300	$300
Geoprobe/Crew for Soil Borings	*quote- SJB*	2	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 850	$1,700
Sample Collection		10	hr	$ -	$ 50	$ 85.00	$ 850	$ -	$ -		$900
XRF Unit	*recent quote*	2	day							$ 500	$1,000
Sample Analysis for TCLP Lead and Zinc (20% of total samples)	*Life Science Laboratories*	4	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$2,374
Sewer Investigation/Mapping - Labor		16	hrs	$ -	$ -	$ 85.00	$ 1,360	$ -	$ -	$ -	$1,360
Topographic Survey	*02 21 23 09 0020*	3	acre	$ 20.94	$ 52	$ 597.77	$ 1,494	$ 23	$ 58		$1,605
Reporting	*Engineer's Estimate*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$5,000
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	1	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Work Plan Preparation (Including QAPP, FAP and HASP)		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	1,000	lf	$ 0.81	$ 810	$ -	$ -	$ -	$ -	$ -	$810
Monitoring Well Abandonment	*recent quote- EnviroTrac*	150	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22	$3,300
Sewer/Storm Drain Demolition	*02 31 13.33 2900*	750	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$8,250
Trenching 6-10ft with 3/4 CY excavator	*31 23 16.13 0500*	1,667	bcy	$ -	$ -	$ 4.65	$ 7,750	$ 3	$ 5,233		$12,983
Fence Demolition	*02 41 13.62 1100*	1,010	lf							$ 2.30	$2,323
Fence Post Removal	*02 4113621000*	101	each							$ 22.99	$2,322
Sewer/Storm Drain Reconstruction											
PVC Sewer Pipe, 8" diameter, 13" lengths	*33 31 13.25 2080*	700	lf	$ 7.23	$ 5,061	$ 5.06	$ 3,542	$ -	$ -		$8,603
PVC Sewer Pipe, 10" diameter, 13" lengths	*33 31 13.25 2120*	150	lf	$ 11.93	$ 1,790	$ 6.15	$ 923	$ -	$ -		$2,712
Install manholes- concrete, precast, 4' ID, 8' deep	*33 49 13.10 0600*	1	ea	$ 646.68	$ 647	$ 1,622.55	$ 1,623	$ -	$ -		$2,269
Consolidation of ramp materials to incinerator footprint, 200 HP Dozer, 50' Haul	*31 23 23.14 4000*	1,000	lcy	$ -	$ -	$ 0.33	$ 330	$ 1	$ 560		$890
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,344	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,687	$6,687
Ramp & Building Demolition											
Ramp Demolition	*32 01 15.71 5330*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$440
Sample Collection (from building)		5	hr	$ -	$ -	$ 85.00	$ 425	$ -	$ -		$425
Sample Analysis for PCBs (TCL PCBs)	*Life Sciences quote*	10	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$650
Sample Analysis for Lead & Asbestos (TAL Inorganics)	*Life Sciences quote*	10	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$750
South Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	2,258	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$37,113
Brick Wall Demolition	*02 41 16.13 0650*	1,365	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$519
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
Asbestos Abatement		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$50,000
Transportation and Disposal											
Masonry Disposal	*Quote from Modern Landfill*	310.97	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$22,079
Building Ash Hazardous Waste Disposal	*Quote from Modern Landfill*	342	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$47,817
Drum Disposal (Waste Oil)	*Quote from Modern Landfill*	5	drum	$ -	$ -	$ -	$ -	$ -	$ -	$ 90.00	$450
General Waste Disposal	*Quote from Modern Landfill*	100	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$3,768
Metal Disposal / Recycling	*Quote from Modern Landfill*	25	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$942
C&D Waste Disposal	*Quote from Modern Landfill*	226	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$16,028
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	7	mo	$ -	$ -	$ 13,600.00	$ 95,200	$ 3,420	$ 23,940	$ -	$119,140
Dust Control, Light	*31 23 23.20 2500*	28	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996	$27,896
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	30,100	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$39,130
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	34,615	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 4	$126,345
Haul Road Maintenance	*31 23 23.20 2600*	28	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,343	$37,595
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	30,100	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2	$55,384
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	34,615	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$44,307
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8	$42
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	28	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7	$200
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Confirmation Sampling											
Grab Samples- 1 per 900 square feet, 1 per 30 lf along side walls plus 20% QA/QC		110	sample	$ -	$ 50	$ 21.00	$ 2,318	5.72	$ 631.26	$ -	$3,000
Lab Analyses - TAL Metals	*Life Science Laboratories*	132	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$9,935
Decontamination Water Samples		10	sample	$ -	$ -	$ 21	$ 213	$ 67	$ 667	$ -	$880
Decon Water Lab Analyses - TCL PCBs	*Life Science Laboratories*	10	sample	$ -	$ -		$ -		$ -	$ 50	$500
Hazardous Soil Disposal											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	61.00	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$36,202
Hazardous Soil Disposal	*CWM*	4,816	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140	$674,240
Transportation using dumps	*CWM*	4,816	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$93,912
Demurrage (assume 5 hours per week of loading)	*CWM*	10	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$850
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 33,808	$33,808
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	43,344	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 38	$1,633,202
Site Restoration											
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	13,611	lcy	$ 28.00	$ 381,117	$ -	$ -	$ -	$ -		$381,117
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	13,611	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$19,056
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	11,836	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$3,314
Topsoil	*Recent quote- ESG from Seven Springs*	2,232	lcy	$ 44.50	$ 99,341	$ -	$ -	$ -	$ -	$ 45	$198,682
Finishing grading slopes, gentle	*31 22 16.10 3300*	9,706	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$2,038
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	87	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$5,705
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Fencing Installation	*32 31 13.20 0800*	500	lf							$ 28	
Asphalt Parking Lot and Road Replacement											
Base	*32 11 26.13 1600*	1,039	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$88,534
Binder	*32 12 16.13 0200*	6,113	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$121,959
Top	*32 12 16.13 0380*	6,113	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$70,241
Fencing Installation	*32 31 13.20 0800*	1,010	lf							$ 28	$27,795
Mobilization and Demobilization											**$78,541**
7%	of Total Costs of Site Work, Treatment									$1,122,016.19	$78,541
Contingency											**$635,976**
15%	of Total Construction Activities									$4,239,842	$635,976
Professional/Technical Services											**$707,421**
5%	Project Management									$4,161,301	$208,065
6%	Remedial Design										$249,678
6%	Construction Management										$249,678
TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring)											**$5,583,000**

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$5,583,000
On-Site Alternative 2B **Soil/Fill Excavation to Unrestricted SCOs with Disposal Off-Site** **Demolition and Removal of the Southern Incinerator Building**	**Lackawanna Incinerator Site** **Lackawanna, NY**	**Soil**	**Construction Time:**	**10** months
			Operation Time:	**-** months
			Post Remediation Monitoring	**0** years

Assumptions:

Working condition is Safety Level:		D/C	(Labor productivity:	82%	; Equipment productivity:	100%	)		
Weighted Average of city cost index (Buffalo, NY)		101.4%	(not applicable for costs derived from vendor quotes).						
Costs are loaded with a profit factor		10%							
Inflation		3%	per year						
Soil Sampling Assumptions				1	times sampled	0.25	hrs/sample	$85	Cost per hr
				20%	added for QA/QC samples	1	worker sampling		
Characterization Cost	Table A (per CWM)	$593.48	per sample					2	hrs / well sampling
Analytical cost	TAL Metals	$75.00	per sample					2	worker per gw sample
For each sampling event, assumed:		$50	for materials (gloves, notebooks, etc.)						
Disposal									
Lead contaminated soil as a "listed" waste- incineration		$275	per ton	5,157.55	tons hazardous disposal (assume 10% hazardous, add building ash materials)				
				22	tons per load	234	loads for haz disposal		
Lead contaminated soil as non-haz		$39.87	per ton	44,006	tons non-haz disposal, incl. build materials	2,000	loads for non-haz disposal		
Concrete		3,300	lbs per cy						
		150	lbs per cf						
Brick		120	lbs per cf						
Typical Rental Rates - Includes G&A and 10% Profit									
Mini-Rae Survey Mode PID		$96.08	per day						
Truck/SUV (1/2 ton or smaller)		$70.74	per day						
Horiba U-10 Water Quality Meter		$73.77	per day						
Submersible Pump		$42.16	per day						
2 in Pump Control Box		$72.27	per day						
Generator: 110 V		$57.24	per day						
Level D PPE		$11.91	per day						

			55019	SF Asphalt (Road and Parking Lot)	
			3	assumed thickness (in)	
			509.4351852	CY Asphalt	
Work day consists of:	10	hrs			

20	loads per day
20	working days per month
10	hours per working day
1	months for pre-design characterization
2	months for site prep/restoration
1	month for demolition
10	months to completion
150	ft/day drilling

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY		LOCATION		MEDIA		Estimated Cost to Implement				$3,155,000	
On-Site Alternative 4A Partial Excavation (Ramp), Demolition and Removal of Both Incinerator Buildings Regrading/Containment of Remaining Contamination with Soil Cover		Lackawanna Incinerator Site Lackawanna, NY		Soil				Construction Time:		9	months
								Operation Time:		-	months
								Post Remediation Monitoring		30	years
		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$2,969,000**
Construction Activities		**1**			**$54,061**		**$109,042**		**$27,097**	**$78,899**	**$2,172,194**
Pre-Design Investigation											
Driller											
Mob/Demob	*quote- SJB*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 300	$300
Geoprobe/Crew for Soil Borings	*quote- SJB*	2	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 850	$1,700
Sample Collection		60	hrs		$ 50	$85	$ 5,100	$ -	$ -		$5,150
XRF Unit	*recent quote*	2	day							$ 500	$1,000
Sample Analysis for TCLP Lead and Zinc (20% of total samples)	*Life Science Laboratories*	4	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593.48	$2,374
Sewer Investigation/Mapping - Labor		16	hrs	$ -	$ -	$ 85.00	$ 1,360	$ -	$ -	$ -	$1,360
Topographic Survey	*02 21 23 09 0020*	3	acre	$ 20.94	$ 52	$ 597.77	$ 1,494	$ 23	$ 58		$1,605
Reporting	*Engineer's Estimate*	2	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$10,000
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	1.0	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Work Plan Preparation (Including QAPP, FAP and HASP)		1.0	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	300	lf	$ 0.81	$ 243	$ -	$ -	$ -	$ -	$ -	$243
Monitoring Well Abandonment	*recent quote- EnviroTrac*	60	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22	$1,320
Sewer/Storm Drain Demolition	*02 31 13.33 2900*	750	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$8,250
Trenching 6-10ft with 3/4 CY excavator	*31 23 16.13 0500*	1,666.67	bcy	$ -	$ -	$ 4.65	$ 7,750	$ 3	$ 5,233		$12,983
Fence Demolition	*02 41 13.62 1100*	500.00	lf							$ 2.30	$1,150
Fence Post Removal	*02 4113621000*	50.00	each							$ 22.99	$1,150
Sewer/Storm Drain Reconstruction							$ -				
PVC Sewer Pipe, 8" diameter, 13" lengths	*33 31 13.25 2080*	700	lf	$ 7.23	$ 5,061	$ 5.06	$ 3,542	$ -	$ -		$8,603
PVC Sewer Pipe, 10" diameter, 13" lengths	*33 31 13.25 2120*	150	lf	$ 11.93	$ 1,790	$ 6.15	$ 923	$ -	$ -		$2,712
Install manholes- concrete, precast, 4' ID, 8' deep	*33 49 13.10 0600*	1	ea	$ 646.68	$ 647	$ 1,622.55	$ 1,623	$ -	$ -		$2,269
Consolidation of ramp materials to incinerator footprint, 200 HP Dozer, 50' Haul	*31 23 23.14 4000*	1,000	lcy	$ -	$ -	$ 0.33	$ 330	$ 1	$ 560		$890
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,344	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,687	$6,687
Ramp & Building Demolition											
Access Road Demolition	*32 01 15.71 5330*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$440
Sample Collection (from building)		18	hr	$ -	$ -	$ 85.00	$ 1,488	$ -	$ -		$1,488
Sample Analysis for PCBs (TCL PCBs)	*Life Sciences quote*	35	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$2,275
Sample Analysis for Lead & Asbestos (TAL Inorganics)	*Life Sciences quote*	35	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$2,625
North Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	5,633	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$92,600
Brick Wall Demolition	*02 41 16.13 0650*	1,898	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$721
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
South Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	2,258	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$37,113
Brick Wall Demolition	*02 41 16.13 0650*	1,365	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$519
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
Asbestos Abatement		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$50,000
Transportation and Disposal											
Masonry Disposal	*Quote from Modern Landfill*	653.95	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$46,431
Building Ash Hazardous Waste Disposal	*Quote from Modern Landfill*	342	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$47,817
Drum Disposal (Waste Oil)	*Quote from Modern Landfill*	10	drum	$ -	$ -	$ -	$ -	$ -	$ -	$ 90.00	$900
General Waste Disposal	*Quote from Modern Landfill*	100	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$3,768
Metal Disposal / Recycling	*Quote from Modern Landfill*	50	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$1,884
C&D Waste Disposal	*Quote from Modern Landfill*	859	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$61,019
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	6	mo	$ -	$ -	$ 13,600.00	$ 81,600	$ 3,420	$ 20,520	$ -	$102,120
Dust Control, Light	*31 23 23.20 2500*	24	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996	$23,911
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	15,303	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$19,894
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	17,599	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 4	$64,236
Haul Road Maintenance - Assume 1 x per week	*31 23 23.20 2600*	24	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,343	$32,224
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	15,303	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2	$28,158
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	17,599	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$22,527
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8	$42
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	24	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7	$172
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Decontamination Water Samples		10	sample	$ -	$ -	$ 21	$ 213	$ 67	$ 667	$ -	$880
Decon Water Lab Analyses - TCL PCBs	*Life Science Laboratories*	10	sample	$ -	$ -		$ -	$ -	$ -	$ 50	$500
Hazardous Soil Disposal (10%)											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	8	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$4,541
Hazardous Soil Disposal	*CWM*	2,449	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140	$342,796
Transportation using dumps	*CWM*	2,449	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$47,747
Demurrage (assume 5 hours per week of loading)	*CWM*	10.00	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$850
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,189	$17,189
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	22,037	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 38	$830,349
Capping											
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	1,397	lcy	$ 28.00	$ 39,119	$ -	$ -	$ -	$ -		$39,119
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	1,397	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$1,956
Finishing grading slopes, gentle	*31 22 16.10 3300*	6,074	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$1,276
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	1,215	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$340
Geotextile (Non woven)	*31 32 19.16 1550*	6,074	sy	$ 1.16	$ 7,046	$ 0.35	$ 2,126	$ -	$ -		$9,172
Topographic Survey	*02 21 23 09 0020*	1	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Site Restoration											
Topsoil	*Recent quote- ESG from Seven Springs*	1,397	lcy	$ 44.50	$ 62,172	$ -	$ -	$ -	$ -		$62,172
Finishing grading slopes, gentle	*31 22 16.10 3300*	6,074	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$1,276
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	54.67	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$3,570
Monitoring Well Installation	*recent quote- EnviroTrac*	60	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 94	$5,640
Monitoring Well Development	*recent quote - Pohatcong*	6	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 200	$1,200
Topographic Survey	*02 21 23 09 0020*	1	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Fencing Installation	*32 31 13.20 0800*	500	lf							$ 28	$13,760
Environmental Easement											
Legal		1	ls							$ 15,000	$15,000
Surveyor - Monument Installation		1	ls							$ 10,000	$10,000
Mobilization and Demobilization											**$66,708**
10% of Total Costs of Site Work, Treatment										$667,076	$66,708
Contingency											**$335,835**
15% of Total Construction Activities										$2,238,902	$335,835
Professional/Technical Services											**$369,273**
5% Project Management										$2,172,194	$108,610
6% Remedial Design											$130,332
6% Construction Management											$130,332

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$3,155,000
On-Site Alternative 4A **Partial Excavation (Ramp), Demolition and Removal of Both Incinerator Buildings** **Regrading/Containment of Remaining Contamination with Soil Cover**	**Lackawanna Incinerator Site** **Lackawanna, NY**	**Soil**	**Construction Time:**	**9** months
			Operation Time:	**-** months
			Post Remediation Monitoring	**30** years

		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
LONG TERM MONITORING								**ANNUAL LTM COST (YRS 1-5)**			**$15,000**
								ANNUAL LTM COST (YRS 6-30)			**$11,000**
								LIFETIME LTM (NPV)			**$186,400**
Monitoring, Sampling, Testing and Analysis (Per Event)											
Assume 20% of combined sampling event for on-site and off-site											$3,202
Site Monitoring											
Inspection of soil cover		1	hr			$ 85.00					
Groundwater sampling for 1 event - Includes collection of field parameters		5	well	$ -	$ -	$ 85.00	$ 850	$ 424	$ 424		$1,274
Materials	*Engineer's Estimate*	1	event	$ 50.00							$50
Mobilization/Demobilization of Field Sampling Crew		1	event	$ -	$ -	$ -	$ -	$ -	$ -	$ 680	$680
Reporting		10	hr	$ 85.00	$ 850	$ -	$ -	$ -	$ -	$ -	$850
Laboratory analysis											
Metals and VOCs, plus 20% QA/QC	*Life Science Laboratories*	8	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 174	$348
Maintenance- Cap Maintenance											
Mowing brush, tractor with rotary mower, Medium density 2x per year	*32 01 90.19 1670*	55	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 74.80	$4,089
Lifetime Long Term Monitoring (Net Present Value)											
5 Years of Semi-Annual Monitoring											
25 Years of Annual Monitoring											
5% Discount Factor (per NYSDEC)											

TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring) **$3,155,000**

Assumptions:

Working condition is Safety Level: **D/C** **(Labor productivity: 82%; Equipment productivity: 100%)**
Weighted Average of city cost index (Buffalo, NY) **101.4%** **(not applicable for costs derived from vendor quotes).**
Costs are loaded with a profit factor **10%**
Inflation **3%** per year

Estimated number of soil samples **12** samples; **1** times sampled; **0.25** hrs/sample; Labor **$85** Cost per hr
20% added for QA/QC samples; **1** worker sampling

Characterization Cost — Table A (per CWM) — **$593.48** per sample; **2** hrs / well sampling
Analytical cost — TAL Metals — **$75.00** per sample; **2** worker per gw sample
For each sampling event, assumed: **$50** for materials (gloves, notebooks, etc.)

Disposal

Lead contaminated soil as hazardous waste- incineration **$275** per ton; **26,490** tons material disposed of off-site (haz and non-haz)
22 tons per load; **1,204** loads total
Lead contaminated soil as non-haz **$39.87** per ton

3,300 lbs per cy
150 lbs per cf
Brick **120** lbs per cf

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID **$96.08** per day; **1.6** tons/cy; 20 loads per day
Truck/SUV (1/2 ton or smaller) **$70.74** per day; 20 working days per month
Horiba U-10 Water Quality Meter **$73.77** per day
Submersible Pump **$42.16** per day
2 in Pump Control Box **$72.27** per day
Generator: 110 V **$57.24** per day
Level D PPE **$11.91** per day

10 hours per working day
Work day consists of: **10** hrs; 1 months for pre-design characterization
2 months for site prep/restoration
2 months for demolition
9 months to completion
150 ft/day drilling

Excavation With Concrete and Asphalt:

Concrete and Asphalt: **0.0%** % of excavation volume
Excavation Area: **43,560** sf
Excavation Volume: **10,000** cy; **11,500** lcy
Excavated Weight: **15,000** tons
Roll-off dumpster can hold approximately: **12** tons

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$2,718,000	
On-Site Alternative 4B **Partial Excavation (Ramp), Demolition and Removal of the Southern Incinerator and Regrading/Containment of Remaining Contamination with Soil Cover**	**Lackawanna Incinerator Site** **Lackawanna, NY**	**Soil**	**Construction Time:**	**7**	**months**
			Operation Time:	**-**	**months**
			Post Remediation Monitoring	**30**	**years**

Description	Data Source (Means[1] or Other)	Quantities: Quantity Amount	Quantities: Quantity Unit	Cost Breakdown (if available): Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Combined Unit Costs: Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$2,643,000**
Construction Activities		**1**			**$41,527**		**$74,131**		**$19,795**	**$80,358**	**$1,936,772**
Pre-Design Characterization Study											
Driller											
Mob/Demob	*quote- SJB*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 300	$300
Geoprobe/Crew for Soil Borings	*quote- SJB*	2	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 850	$1,700
Sample Collection		10	hr	$ -	$ 50	$ 85.00	$ 850	$ -	$ -		$900
XRF Unit	*recent quote*	2	day							$ 500	$1,000
Sample Analysis for TCLP Lead and Zinc (20% of total samples)	*Life Science Laboratories*	4	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593.48	$2,374
Sewer Investigation/Mapping - Labor		16	hrs	$ -	$ -	$ 85.00	$ 1,360	$ -	$ -	$ -	$1,360
Topographic Survey	*02 21 23 09 0020*	3	acre	$ 20.94	$ 52	$ 597.77	$ 1,494	$ 23	$ 58		$1,605
Reporting	*Engineer's Estimate*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$5,000
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	1.0	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Work Plan Preparation (Including QAPP, FAP and HASP)		1.0	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	300	lf	$ 0.81	$ 243	$ -	$ -	$ -	$ -	$ -	$243
Monitoring Well Abandonment	*recent quote- EnviroTrac*	60	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22	$1,320
Sewer/Storm Drain Demolition	*02 31 13.33 2900*	750	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$8,250
Trenching 6-10ft with 3/4 CY excavator	*31 23 16.13 0500*	1,666.67	bcy	$ -	$ -	$ 4.65	$ 7,750	$ 3	$ 5,233		$12,983
Fence Demolition	*02 41 13.62 1100*	500.00	lf							$ 2.30	$1,150
Fence Post Removal	*02 4113621000*	50.00	each							$ 22.99	$1,150
Sewer/Storm Drain Reconstruction											
PVC Sewer Pipe, 8" diameter, 13" lengths	*33 31 13.25 2080*	700	lf	$ 7.23	$ 5,061	$ 5.06	$ 3,542	$ -	$ -		$8,603
PVC Sewer Pipe, 10" diameter, 13" lengths	*33 31 13.25 2120*	150	lf	$ 11.93	$ 1,790	$ 6.15	$ 923	$ -	$ -		$2,712
Install manholes- concrete, precast, 4' ID, 8' deep	*33 49 13.10 0600*	1	ea	$ 646.68	$ 647	$ 1,622.55	$ 1,623	$ -	$ -		$2,269
Consolidation of ramp materials to incinerator footprint, 200 HP Dozer, 50' Haul	*31 23 23.14 4000*	175	lcy	$ -	$ -	$ 0.33	$ 58	$ 1	$ 98		$156
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,344	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,687	$6,687
Ramp & Building Demolition											
Access Road Demolition	*32 01 15.71 5330*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$440
Sample Collection (from building)		5	hr	$ -	$ -	$ 85.00	$ 425	$ -	$ -		$425
Sample Analysis for PCBs (TCL PCBs)	*Life Sciences quote*	10	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$650
Sample Analysis for Lead & Asbestos (TAL Inorganics)	*Life Sciences quote*	10	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$750
South Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	2,258	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$37,113
Brick Wall Demolition	*02 41 16.13 0650*	1,365	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$519
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
Asbestos Abatement		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$50,000
Transportation and Disposal											
Masonry Disposal	*Quote from Modern Landfill*	310.97	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$22,079
Building Ash Hazardous Waste Disposal	*Quote from Modern Landfill*	342	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$47,817
Drum Disposal (Waste Oil)	*Quote from Modern Landfill*	5	drum	$ -	$ -	$ -	$ -	$ -	$ -	$ 90.00	$450
General Waste Disposal	*Quote from Modern Landfill*	100	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$3,768
Metal Disposal / Recycling	*Quote from Modern Landfill*	25	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$942
C&D Waste Disposal	*Quote from Modern Landfill*	226	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$16,028
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	4	mo	$ -	$ -	$ 13,600.00	$ 54,400	$ 3,420	$ 13,680	$ -	$68,080
Dust Control, Light	*31 23 23.20 2500*	16	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996	$15,941
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	16,045	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$20,858
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	18,452	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 4	$67,349
Haul Road Maintenance	*31 23 23.20 2600*	16	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,343	$21,483
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	16,045	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2	$29,523
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	18,452	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$23,618
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8	$42
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	16	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7	$115
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Decontamination Water Samples		10	sample	$ -	$ -	$ 21	$ 213	$ 67	$ 667	$ -	$880
Decon Water Lab Analyses - TCL PCBs	*Life Science Laboratories*	10	sample	$ -	$ -		$ -		$ -	$ 50	$500
Hazardous Soil Disposal											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	24	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$13,947
Hazardous Soil Disposal	*CWM*	2,567	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140	$359,408
Transportation using dumps	*CWM*	2,567	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$50,060
Demurrage (assume 5 hours per week of loading)	*CWM*	10.00	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$850
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 18,022	$18,022
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	22,037	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 38	$830,349
Capping											
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	1,201	lcy	$ 28.00	$ 33,633	$ -	$ -	$ -	$ -		$33,633
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	1,201	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$1,682
Finishing grading slopes, gentle	*31 22 16.10 3300*	5,222	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$1,097
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	1,044	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$292
Geotextile (Non woven)	*31 32 19.16 1550*	5,222	sy		$ -		$ -	$ -	$ -	$ 2	$10,445
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Site Restoration											
Topsoil	*Recent quote- ESG from Seven Springs*	601	lcy	$ 44.50	$ 26,726	$ -	$ -	$ -	$ -		$26,726
Finishing grading slopes, gentle	*31 22 16.10 3300*	5,222	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$1,097
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	5.22	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$341
Monitoring Well Installation	*recent quote- EnviroTrac*	60	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 94	$5,640
Monitoring Well Development	*recent quote - Pohatcong*	6	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 200	$1,200
Asphalt Road Replacement											
Base	*32 11 26.13 1600*	68	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$5,793
Binder	*32 12 16.13 0200*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$7,980
Top	*32 12 16.13 0380*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$4,596
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Fencing Installation	*32 31 13.20 0800*	500	lf							$ 28	$13,760
Environmental Easement											
Legal		1	ls							$ 15,000	$15,000
Surveyor - Monument Installation		1	ls							$ 10,000	$10,000

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$2,718,000
On-Site Alternative 4B **Partial Excavation (Ramp), Demolition and Removal of the Southern Incinerator and Regrading/Containment of Remaining Contamination with Soil Cover**	**Lackawanna Incinerator Site** **Lackawanna, NY**	**Soil**	**Construction Time:** 7 months **Operation Time:** - months **Post Remediation Monitoring** 30 years	

		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
Mobilization and Demobilization											**$53,784**
10% of Total Costs of Site Work, Treatment										$537,845	$53,784
Contingency											**$298,583**
15% of Total Construction Activities										$1,990,556	$298,583
Professional/Technical Services											**$329,251**
5% Project Management										$1,936,772	$96,839
6% Remedial Design											$116,206
6% Construction Management											$116,206
LONG TERM MONITORING								**ANNUAL LTM COST (YRS 1-5)**			**$7,000**
								ANNUAL LTM COST (YRS 6-30)			**$4,000**
								LIFETIME LTM (NPV)			**$74,500**
Monitoring, Sampling, Testing and Analysis (Per Event)											
Assume 20% of combined sampling event for on-site and off-site											$3,202
Site Monitoring											
Inspection of soil cover		1	hr			$ 85.00					
Groundwater sampling for 1 event - Includes collection of field parameters		5	well	$ -	$ -	$ 85.00	$ 850	$ 424	$ 424		$1,274
Materials	*Engineer's Estimate*	1	event	$ 50.00							$50
Mobilization/Demobilization of Field Sampling Crew		1	event	$ -	$ -	$ -	$ -	$ -	$ -	$ 680	$680
Reporting		10	hr	$ 85.00	$ 850	$ -	$ -	$ -	$ -	$ -	$850
Laboratory analysis											
Metals and VOCs, plus 20% QA/QC	*Life Science Laboratories*	8	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 174	$348
Maintenance- Cap Maintenance											
Mowing brush, tractor with rotary mower, Medium density 2x per year	*32 01 90.19 1670*	5	msf	$ -	$ -					$ 74.80	$391
Lifetime Long Term Monitoring (Net Present Value)											
5 Years of Semi-Annual Monitoring											
25 Years of Annual Monitoring											
5% Discount Factor (per NYSDEC)											

TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring) **$2,718,000**

Assumptions:

Working condition is Safety Level: **D/C** **(Labor productivity: 82%; Equipment productivity: 100%)**
Weighted Average of city cost index (Buffalo, NY) **101.4%** **(not applicable for costs derived from vendor quotes).**
Costs are loaded with a profit factor **10%**
Inflation **3%** per year

Estimated number of soil samples **12** samples **1** times sampled **0.25** hrs/sample **$85** Labor Cost per hr
20% added for QA/QC samples **1** worker sampling

Characterization Cost Table A (per CWM) **$593.48** per sample **2** hrs / well sampling
Analytical cost TAL Metals **$75.00** per sample
For each sampling event, assumed: **$50** for materials (gloves, notebooks, etc.) **2** worker per gw sample

Disposal

Lead contaminated soil as a "listed" waste- incineration **$275** per ton **25,607** tons material disposed of off-site (haz and non-haz)
22 tons per load **1,164** loads total
Lead contaminated soil as non-haz **$39.87** per ton

Concrete **3,300** lbs per cy
150 lbs per cf
Brick **120** lbs per cf

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID **$96.08** per day
Truck/SUV (1/2 ton or smaller) **$70.74** per day
Horiba U-10 Water Quality Meter **$73.77** per day
Submersible Pump **$42.16** per day
2 in Pump Control Box **$72.27** per day
Generator: 110 V **$57.24** per day
Level D PPE **$11.91** per day

Work day consists of: **10** hrs

Excavation With Concrete and Asphalt:

Concrete and Asphalt: **0.0%** % of excavation volume
Excavation Area: **43,560** sf
Excavation Volume: **10,000** cy **11,500** lcy
Excavated Weight: **15,000** tons
Roll-off dumpster can hold approximately: **12** tons

20 loads per day
20 working days per month
10 hours per working day
1 months for pre-design characterization
2 months for site prep/restoration
1 months for demolition
7 months to completion
150 ft/day drilling

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY		LOCATION		MEDIA		Estimated Cost to Implement				$3,438,000	
On-Site Alternative 5A Partial Excavation (Ramp), Demolition and Removal of Both Incinerators Regrading/Containment of Remaining Contamination with Asphalt		Lackawanna Incinerator Site Lackawanna, NY		Soil					Construction Time:	9	months
									Operation Time:	-	months
									Post Remediation Monitoring	30	years
		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$3,379,000**
Construction Activities		**1**			**$14,941**		**$104,792**		**$27,097**	**$81,020**	**$2,476,461**
Pre-Design Characterization Study											
Driller											
Mob/Demob	*quote- SJB*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 300	$300
Geoprobe/Crew for Soil Borings	*quote- SJB*	2	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 850	$1,700
Sample Collection		10	hr	$ -	$ 50	$ 85.00	$ 850	$ -	$ -		$900
XRF Unit	*recent quote*	2	day							$ 500	
Sample Analysis for TCLP Lead and Zinc (20% of total samples)	*Life Science Laboratories*	4	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593.48	$2,374
Sewer Investigation/Mapping - Labor		16	hrs	$ -	$ -	$ 85.00	$ 1,360	$ -	$ -	$ -	$1,360
Topographic Survey	*02 21 23 09 0020*	2.5	acre	$ 20.94	$ 52	$ 597.77	$ 1,494	$ 23	$ 58		$1,605
Reporting	*Engineer's Estimate*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$5,000
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	1.0	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Work Plan Preparation (Including QAPP, FAP and HASP)		1.0	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	300	lf	$ 0.81	$ 243	$ -	$ -	$ -	$ -	$ -	$243
Monitoring Well Abandonment	*recent quote- EnviroTrac*	60	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22	$1,320
Sewer/Storm Drain Demolition	*02 31 13.33 2900*	750	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$8,250
Trenching 6-10ft with 3/4 CY excavator	*31 23 16.13 0500*	1,667	bcy	$ -	$ -	$ 4.65	$ 7,750	$ 3	$ 5,233		$12,983
Fence Demolition	*02 41 13.62 1100*	500.00	lf							$ 2.30	$1,150
Fence Post Removal	*02 4113621000*	50.00	each							$ 22.99	$1,150
Sewer/Storm Drain Reconstruction											
PVC Sewer Pipe, 8" diameter, 13" lengths	*33 31 13.25 2080*	700	lf	$ 7.23	$ 5,061	$ 5.06	$ 3,542	$ -	$ -		$8,603
PVC Sewer Pipe, 10" diameter, 13" lengths	*33 31 13.25 2120*	150	lf	$ 11.93	$ 1,790	$ 6.15	$ 923	$ -	$ -		$2,712
Install manholes- concrete, precast, 4' ID, 8' deep	*33 49 13.10 0600*	1	ea	$ 646.68	$ 647	$ 1,622.55	$ 1,623	$ -	$ -		$2,269
Consolidation of ramp materials to incinerator footprint, 200 HP Dozer, 50' Haul	*31 23 23.14 4000*	1,000	lcy	$ -	$ -	$ 0.33	$ 330	$ 1	$ 560		$890
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,344	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,687	$6,687
Ramp & Building Demolition											
Access Road Demolition	*32 01 15.71 5330*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$440
Sample Collection (from building)		18	hr	$ -	$ -	$ 85.00	$ 1,488	$ -	$ -		$1,488
Sample Analysis for PCBs (TCL PCBs)	*Life Sciences quote*	35	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$2,275
Sample Analysis for Lead & Asbestos (TAL Inorganics)	*Life Sciences quote*	35	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$2,625
North Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	5,633	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$92,600
Brick Wall Demolition	*02 41 16.13 0650*	1,898	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$721
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
South Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	2,258	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$37,113
Brick Wall Demolition	*02 41 16.13 0650*	1,365	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$519
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
Asbestos Abatement		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$50,000
Transportation and Disposal											
Masonry Disposal	*Quote from Modern Landfill*	653.95	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$46,431
Building Ash Hazardous Waste Disposal	*Quote from Modern Landfill*	342	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$47,817
Drum Disposal (Waste Oil)	*Quote from Modern Landfill*	10	drum	$ -	$ -	$ -	$ -	$ -	$ -	$ 90.00	$900
General Waste Disposal	*Quote from Modern Landfill*	100	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$3,768
Metal Disposal / Recycling	*Quote from Modern Landfill*	50	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$1,884
C&D Waste Disposal	*Quote from Modern Landfill*	859	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$61,019
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	6	mo	$ -	$ -	$ 13,600.00	$ 81,600	$ 3,420	$ 20,520	$ -	$102,120
Dust Control, Light	*31 23 23.20 2500*	24.00	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996	$23,911
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	16,518	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$21,473
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	18,995	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 4	$69,333
Haul Road Maintenance	*31 23 23.20 2600*	24	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,343	$32,224
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	16,518	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2	$30,393
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	18,995	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$24,314
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8	$42
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	24	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7	$172
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Decontamination Water Samples		10	sample	$ -	$ -	$ 21	$ 213	$ 67	$ 667	$ -	$880
Decon Water Lab Analyses - TCL PCBs	*Life Science Laboratories*	10	sample	$ -	$ -		$ -		$ -	$ 50	$500
Hazardous Soil Disposal											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	8	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$4,901
Hazardous Soil Disposal	*CWM*	2,643	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140	$369,998
Transportation using dumps	*CWM*	2,643	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$51,535
Demurrage (assume 5 hours per week of loading)	*CWM*	6.00	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$510
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 18,553	$18,553
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	23,786	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 38	$896,241
Capping											
Finishing grading slopes, gentle	*31 22 16.10 3300*	6,074	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$1,276
Geotextile (Non woven)	*31 32 19.16 1550*	6,074	sy	$ 1.16	$ 7,046	$ 0.35	$ 2,126	$ -	$ -		$9,172
Asphalt Cover Construction											
Base	*32 11 26.13 1600*	1,012	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$86,247
Binder	*32 12 16.13 0200*	6,074	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$121,185
Top	*32 12 16.13 0380*	6,074	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$69,795
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Site Restoration											
Topsoil	*Recent quote- ESG from Seven Springs*	230	lcy	$ 44.50	$ 10,235	$ -	$ -	$ -	$ -		$10,235
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	11	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$718
Monitoring Well Installation	*recent quote- EnviroTrac*	60	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 94	$5,640
Monitoring Well Development	*recent quote - Pohatcong*	6	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 200	$1,200
Topographic Survey	*02 21 23 09 0020*	2.50	acre	$ 20.94	$ 52	$ 597.77	$ 1,494	$ 23	$ 58		$1,605
Fencing Installation	*32 31 13.20 0800*	500	lf							$ 28	$13,760
Environmental Easement											
Legal		1	ls							$ 15,000	$15,000
Surveyor - Monument Installation		1	ls							$ 10,000	$10,000
Mobilization and Demobilization											**$95,473**
10% of Total Costs of Site Work, Treatment										$954,733	$95,473
Contingency											**$385,790**
15% of Total Construction Activities										$2,571,934	$385,790
Professional/Technical Services											**$420,998**
5% Project Management										$2,476,461	$123,823
6% Remedial Design											$148,588
6% Construction Management											$148,588

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$3,438,000
On-Site Alternative 5A **Partial Excavation (Ramp), Demolition and Removal of Both Incinerators** **Regrading/Containment of Remaining Contamination with Asphalt**	**Lackawanna Incinerator Site** **Lackawanna, NY**	**Soil**	**Construction Time:** 9 months **Operation Time:** - months **Post Remediation Monitoring** 30 years	

		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
LONG TERM MONITORING								**ANNUAL LTM COST (YRS 1-5)**			**$6,000**
								ANNUAL LTM COST (YRS 6-30)			**$3,000**
								LIFETIME LTM (NPV)			**$59,100**
Monitoring, Sampling, Testing and Analysis (Per Event)											
Assume 20% of combined sampling event for on-site and off-site											$3,202
Site Monitoring											
Inspection of soil cover		1	hr			$ 85.00					
Groundwater sampling for 1 event - Includes collection of field parameters		5	well	$ -	$ -	$ 85.00	$ 850	$ 424	$ 424	$ 509	$1,274
Materials	*Engineer's Estimate*	1	event	$ 50.00							$50
Mobilization/Demobilization of Field Sampling Crew		1	event	$ -	$ -	$ -	$ -	$ -	$ -	$ 680	$680
Reporting		10	hr	$ 85.00	$ 850	$ -	$ -	$ -	$ -	$ -	$850
Laboratory analysis											
Metals and VOCs, plus 20% QA/QC	*Life Science Laboratories*	8	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 174	$348
Lifetime Long Term Monitoring (Net Present Value)											
5 Years of Semi-Annual Monitoring											
25 Years of Annual Monitoring											
5% Discount Factor (per NYSDEC)											

TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring) **$3,438,000**

Assumptions:

Working condition is Safety Level: **D/C** **(Labor productivity:** **82%** **; Equipment productivity:** **100%** **)**
Weighted Average of city cost index (Buffalo, NY) **101.4%** **(not applicable for costs derived from vendor quotes).**
Costs are loaded with a profit factor **10%**
Inflation **3%** per year

Estimated number of soil samples		**12**	samples	**1**	times sampled	**0.25**	hrs/sample	**$85**	Cost per hr
				20%	added for QA/QC samples	**1**	worker sampling		
Characterization Cost	Table A (per CWM)	**$593.48**	per sample					**2**	hrs / well sampling
Analytical cost	TAL Metals	**$75.00**	per sample					**2**	worker per gw sample
For each sampling event, assumed:		**$50**	for materials (gloves, notebooks, etc.)						

Disposal

Lead contaminated soil as a "listed" waste- incineration	**$275**	per ton	**28,433**	tons material disposed of off-site (haz and non-haz)		
			22	tons per load	**1,292**	loads total
Lead contaminated soil as non-haz	**$39.87**	per ton				
Concrete	**3,300**	lbs per cy				
	150	lbs per cf				
Brick	**120**	lbs per cf				

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID	**$96.08**	per day	20 loads per day
Truck/SUV (1/2 ton or smaller)	**$70.74**	per day	20 working days per month
Horiba U-10 Water Quality Meter	**$73.77**	per day	
Submersible Pump	**$42.16**	per day	
2 in Pump Control Box	**$72.27**	per day	
Generator: 110 V	**$57.24**	per day	
Level D PPE	**$11.91**	per day	

			10 hours per working day
Work day consists of:	**10**	hrs	1 months for pre-design characterization
			2 months for site prep/restoration
Excavation With Concrete and Asphalt:			2 months for demolition
Concrete and Asphalt:	**0.0%**	% of excavation volume	9 months to completion
Excavation Area:	**43,560**	sf	150 ft/day drilling
Excavation Volume:	**10,000**	cy **11,500** lcy	
Excavated Weight:	**15,000**	tons	
Roll-off dumpster can hold approximately:	**12**	tons	

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$2,907,000
On-Site Alternative 5B Partial Excavation (Ramp), Demo and Removal of the Southern Incinerator and Regrading/Containment of Remaining Contamination with Asphalt	**Lackawanna Incinerator Site Lackawanna, NY**	**Soil**	**Construction Time:**	**7 months**
			Operation Time:	**- months**
			Post Remediation Monitoring	**0 years**

		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$2,848,000**
Construction Activities		**1**			**$13,947**		**$76,229**		**$20,257**	**$79,447**	**$2,094,012**
Pre-Design Characterization Study											
Driller											
Mob/Demob	*quote- SJB*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 300	$300
Geoprobe/Crew for Soil Borings	*quote- SJB*	2	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 850	$1,700
Sample Collection		10	hr	$ -	$ 50	$ 85.00	$ 850	$ -	$ -		$900
XRF Unit	*recent quote*	2	day							$ 500	
Sample Analysis for TCLP Lead and Zinc (20% of total samples)	*Life Science Laboratories*	4	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$2,374
Sewer Investigation/Mapping - Labor		16	hrs	$ -	$ -	$ 85.00	$ 1,360	$ -	$ -	$ -	$1,360
Topographic Survey	*02 21 23 09 0020*	2.5	acre	$ 20.94	$ 52	$ 597.77	$ 1,494	$ 23	$ 58		$1,605
Reporting	*Engineer's Estimate*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$5,000
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	1.0	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Work Plan Preparation (Including QAPP, FAP and HASP)		1.0	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	300	lf	$ 0.81	$ 243	$ -	$ -	$ -	$ -	$ -	$243
Monitoring Well Abandonment	*recent quote- EnviroTrac*	60	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22	$1,320
Sewer/Storm Drain Demolition	*02 31 13.33 2900*	750	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$8,250
Trenching 6-10ft with 3/4 CY excavator	*31 23 16.13 0500*	1,667	bcy	$ -	$ -	$ 4.65	$ 7,750	$ 3	$ 5,233		$12,983
Fence Demolition	*02 41 13.62 1100*	500.00	lf							$ 2.30	$1,150
Fence Post Removal	*02 4113621000*	50.00	each							$ 22.99	$1,150
Sewer/Storm Drain Reconstruction											
PVC Sewer Pipe, 8" diameter, 13" lengths	*33 31 13.25 2080*	700	lf	$ 7.23	$ 5,061	$ 5.06	$ 3,542	$ -	$ -		$8,603
PVC Sewer Pipe, 10" diameter, 13" lengths	*33 31 13.25 2120*	150	lf	$ 11.93	$ 1,790	$ 6.15	$ 923	$ -	$ -		$2,712
Install manholes- concrete, precast, 4' ID, 8' deep	*33 49 13.10 0600*	1	ea	$ 646.68	$ 647	$ 1,622.55	$ 1,623	$ -	$ -		$2,269
Consolidation of ramp materials to incinerator footprint, 200 HP Dozer, 50' Haul	*31 23 23.14 4000*	1,000	lcy	$ -	$ -	$ 0.33	$ 330	$ 1	$ 560		$890
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,344	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,687	$6,687
Ramp & Building Demolition											
Acess Road Demolition	*32 01 15.71 5330*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$440
Sample Collection (from building)		5	hr	$ -	$ -	$ 85.00	$ 425	$ -	$ -		$425
Sample Analysis for PCBs (TCL PCBs)	*Life Sciences quote*	10	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$650
Sample Analysis for Lead & Asbestos (TAL Inorganics)	*Life Sciences quote*	10	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$750
South Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	2,258	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$37,113
Brick Wall Demolition	*02 41 16.13 0650*	1,365	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$519
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
Asbestos Abatement		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$50,000
Transportation and Disposal											
Masonry Disposal	*Quote from Modern Landfill*	310.97	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$22,079
Building Ash Hazardous Waste Disposal	*Quote from Modern Landfill*	342	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$47,817
Drum Disposal (Waste Oil)	*Quote from Modern Landfill*	5	drum	$ -	$ -	$ -	$ -	$ -	$ -	$ 90.00	$450
General Waste Disposal	*Quote from Modern Landfill*	100	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$3,768
Metal Disposal / Recycling	*Quote from Modern Landfill*	25	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$942
C&D Waste Disposal	*Quote from Modern Landfill*	226	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$16,028
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	4	mo	$ -	$ -	$ 13,600.00	$ 54,400	$ 3,420	$ 13,680	$ -	$68,080
Dust Control, Light	*31 23 23.20 2500*	16	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996	$15,941
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	15,133	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$19,673
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	17,403	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 4	$63,522
Haul Road Maintenance	*31 23 23.20 2600*	16	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,343	$21,483
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	15,133	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2	$27,845
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	17,403	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$22,276
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8	$42
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	16	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7	$115
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Decontamination Water Samples		10	sample	$ -	$ -	$ 21	$ 213	$ 67	$ 667	$ -	$880
Decon Water Lab Analyses - TCL PCBs	*Life Science Laboratories*	10	sample	$ -	$ -		$ -		$ -	$ 50	$500
Hazardous Soil Disposal											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	8	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$4,491
Hazardous Soil Disposal	*CWM*	2,421	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140	$338,985
Transportation using dumps	*CWM*	2,421	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$47,216
Demurrage (assume 5 hours per week of loading)	*CWM*	10.00	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$850
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 16,998	$16,998
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	21,792	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 38	$821,118
Capping											
Finishing grading slopes, gentle	*31 22 16.10 3300*	5,217	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$1,096
Geotextile (Non woven)	*31 32 19.16 1550*	5,217	sy	$ 1.16	$ 6,052	$ 0.35	$ 1,826	$ -	$ -		$7,878
Asphalt Cover Construction & Road Replacement											
Base	*32 11 26.13 1600*	938	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$79,867
Binder	*32 12 16.13 0200*	5,617	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$112,061
Top	*32 12 16.13 0380*	5,617	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$64,541
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Retaining walls											
Site Restoration											
Topsoil	*Recent quote- ESG from Seven Springs*	230	lcy	$ 44.50	$ 10,235	$ -	$ -	$ -	$ -		$10,235
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	11	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$718
Monitoring Well Installation	*recent quote- EnviroTrac*	60	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 94	$5,640
Monitoring Well Development	*recent quote - Pohatcong*	6	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 200	$1,200
Topographic Survey	*02 21 23 09 0020*	2.50	acre	$ 20.94	$ 52	$ 597.77	$ 1,494	$ 23	$ 58		$1,605
Fencing Installation	*32 31 13.20 0800*	500	lf							$ 28	$13,760
Environmental Easement											
Legal		1	ls							$ 15,000	$15,000
Surveyor - Monument Installation		1	ls							$ 10,000	$10,000
Mobilization and Demobilization											**$73,310**
10% of Total Costs of Site Work, Treatment										$733,096	$73,310
Contingency											**$325,098**
15% of Total Construction Activities										$2,167,322	$325,098
Professional/Technical Services											**$355,982**
5% Project Management										$2,094,012	$104,701
6% Remedial Design											$125,641
6% Construction Management											$125,641

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$2,907,000
On-Site Alternative 5B **Partial Excavation (Ramp), Demo and Removal of the Southern Incinerator and Regrading/Containment of Remaining Contamination with Asphalt**	**Lackawanna Incinerator Site** **Lackawanna, NY**	**Soil**	**Construction Time:**	**7** months
			Operation Time:	**-** months
			Post Remediation Monitoring	**0** years

		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
LONG TERM MONITORING								**ANNUAL LTM COST (YRS 1-5)**			**$6,000**
								ANNUAL LTM COST (YRS 6-30)			**$3,000**
								LIFETIME LTM (NPV)			**$59,100**
Monitoring, Sampling, Testing and Analysis (Per Event)											
Assume 20% of combined sampling event for on-site and off-site											$3,202
Site Monitoring											
Inspection of soil cover		1	hr			$ 85.00					
Groundwater sampling for 1 event - Includes collection of field parameters		5	well	$ -	$ -	$ 85.00	$ 850	$ 424	$ 424	$ 509	$1,274
Materials	*Engineer's Estimate*	1	event	$ 50.00							$50
Mobilization/Demobilization of Field Sampling Crew		1	event	$ -	$ -	$ -	$ -	$ -	$ -	$ 680	$680
Reporting		10	hr	$ 85.00	$ 850	$ -	$ -	$ -	$ -	$ -	$850
Laboratory analysis											
Metals and VOCs, plus 20% QA/QC	*Life Science Laboratories*	8	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 174	$348
Lifetime Long Term Monitoring (Net Present Value)											
5 Years of Semi-Annual Monitoring											
25 Years of Annual Monitoring											
5% Discount Factor (per NYSDEC)											

TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring) **$2,907,000**

Assumptions:

Working condition is Safety Level: **D/C** **(Labor productivity: 82%; Equipment productivity: 100%)**
Weighted Average of city cost index (Buffalo, NY) **101.4%** **(not applicable for costs derived from vendor quotes).**
Costs are loaded with a profit factor **10%**
Inflation **3%** per year

Estimated number of soil samples **12** samples; **1** times sampled; **0.25** hrs/sample; **20%** added for QA/QC samples; **1** worker sampling

Labor: **$85** Cost per hr; **2** hrs / well sampling; **2** worker per gw sample

Characterization Cost	Table A (per CWM)	**$593.48**	per sample
Analytical cost	TAL Metals	**$75.00**	per sample
For each sampling event, assumed:		**$50**	for materials (gloves, notebooks, etc.)

Disposal

Lead contaminated soil as a "listed" waste- incineration **$275** per ton; **25,216** tons material disposed of off-site (haz and non-haz); **22** tons per load; **1,146** loads total
Lead contaminated soil as non-haz **$39.87** per ton
Concrete **3,300** lbs per cy; **150** lbs per cf
Brick **120** lbs per cf

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID	**$96.08** per day
Truck/SUV (1/2 ton or smaller)	**$70.74** per day
Horiba U-10 Water Quality Meter	**$73.77** per day
Submersible Pump	**$42.16** per day
2 in Pump Control Box	**$72.27** per day
Generator: 110 V	**$57.24** per day
Level D PPE	**$11.91** per day

20 loads per day
20 working days per month

Work day consists of: **10** hrs

10 hours per working day
1 months for pre-design characterization
2 months for site prep/restoration
1 month for demolition
7 months to completion
150 ft/day drilling

Excavation With Concrete and Asphalt:

Concrete and Asphalt:	**0.0%**	% of excavation volume	
Excavation Area:	**43,560**	sf	
Excavation Volume:	**10,000**	cy	**11,500** lcy
Excavated Weight:	**15,000**	tons	
Roll-off dumpster can hold approximately:	**12**	tons	

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$4,267,000
On-Site Alternative 6A Soil/Fill Excavation to Commercial SCOs with Disposal Off-Site Demolition and Removal of Both Incinerator Buildings	Lackawanna Incinerator Site Lackawanna, NY	Soil	Construction Time:	10 months
			Operation Time:	- months
			Post Remediation Monitoring	0 years

		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$4,267,000**
Construction Activities		**1**			**$7,919**		**$117,215**		**$30,950**	**$88,371**	**$3,161,257**
Pre-Design Characterization Study											
Driller											
Mob/Demob	*quote- SJB*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 300	$300
Geoprobe/Crew for Soil Borings	*quote- SJB*	2	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 850	$1,700
Sample Collection		10	hr	$ -	$ 50	$ 85.00	$ 850	$ -	$ -		$900
XRF Unit	*recent quote*	2	day							$ 500	$1,000
Sample Analysis for TCLP Lead and Zinc (20% of total samples)	*Life Science Laboratories*	4	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$2,374
Sewer Investigation/Mapping - Labor		16	hrs	$ -	$ -	$ 85.00	$ 1,360	$ -	$ -	$ -	$1,360
Topographic Survey	*02 21 23 09 0020*	2.5	acre	$ 20.94	$ 52	$ 597.77	$ 1,494	$ 23	$ 58	$ -	$1,605
Reporting	*Engineer's Estimate*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$5,000
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	1.0	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Work Plan Preparation (Including QAPP, FAP and HASP)		1.0	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	300	lf	$ 0.81	$ 243	$ -	$ -	$ -	$ -	$ -	$243
Monitoring Well Abandonment	*recent quote- EnviroTrac*	60	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22	$1,320
Sewer/Storm Drain Demolition	*02 31 13.33 2900*	750	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$8,250
Trenching 6-10ft with 3/4 CY excavator	*31 23 16.13 0500*	1,667	bcy	$ -	$ -	$ 4.65	$ 7,750	$ 3	$ 5,233		$12,983
Fence Demolition	*02 41 13.62 1100*	500.00	lf							$ 2.30	$1,150
Fence Post Removal	*02 4113621000*	50.00	each							$ 22.99	$1,150
Sewer/Storm Drain Reconstruction											
PVC Sewer Pipe, 8" diameter, 13" lengths	*33 31 13.25 2080*	700	lf	$ 7.23	$ 5,061	$ 5.06	$ 3,542	$ -	$ -		$8,603
PVC Sewer Pipe, 10" diameter, 13" lengths	*33 31 13.25 2120*	150	lf	$ 11.93	$ 1,790	$ 6.15	$ 923	$ -	$ -		$2,712
Install manholes- concrete, precast, 4' ID, 8' deep	*33 49 13.10 0600*	1	ea	$ 646.68	$ 647	$ 1,622.55	$ 1,623	$ -	$ -		$2,269
Consolidation of ramp materials to incinerator footprint, 200 HP Dozer, 50' Haul	*31 23 23.14 4000*	1,000	lcy	$ -	$ -	$ 0.33	$ 330	$ 1	$ 560		$890
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,344	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,687	$6,687
Ramp & Building Demolition											
Access Road Demolition	*32 01 15.71 5330*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$440
Sample Collection (from building)		18	hr	$ -	$ -	$ 85.00	$ 1,488	$ -	$ -		$1,488
Sample Analysis for PCBs (TCL PCBs)	*Life Sciences quote*	35	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$2,275
Sample Analysis for Lead & Asbestos (TAL Inorganics)	*Life Sciences quote*	35	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$2,625
North Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	5,633	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$92,600
Brick Wall Demolition	*02 41 16.13 0650*	1,898	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$721
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
South Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	2,258	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$37,113
Brick Wall Demolition	*02 41 16.13 0650*	1,365	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$519
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
Asbestos Abatement		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$50,000
Transportation and Disposal											
Masonry Disposal	*Quote from Modern Landfill*	653.95	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$46,431
Building Ash Hazardous Waste Disposal	*Quote from Modern Landfill*	342	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$47,817
Drum Disposal (Waste Oil)	*Quote from Modern Landfill*	10	drum	$ -	$ -	$ -	$ -	$ -	$ -	$ 90.00	$900
General Waste Disposal	*Quote from Modern Landfill*	100	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$3,768
Metal Disposal / Recycling	*Quote from Modern Landfill*	50	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$1,884
C&D Waste Disposal	*Quote from Modern Landfill*	859	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$61,019
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	7	mo	$ -	$ -	$ 13,600.00	$ 95,200	$ 3,420	$ 23,940	$ -	$119,140
Dust Control, Light	*31 23 23.20 2500*	28	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996	$27,896
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	23,100	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$30,030
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	26,565	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 4	$96,962
Haul Road Maintenance	*31 23 23.20 2600*	28	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,343	$37,595
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	23,100	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2	$42,504
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	26,565	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$34,003
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8	$42
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	28	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7	$200
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Confirmation Sampling											
Grab Samples- 1 per 900 square feet, 1 per 30 lf along side walls plus 20% QA/QC		81	sample	$ -	$ 50	$ 21.00	$ 1,697	$ 6	$ 461.96	$ -	$2,209
Lab Analyses - TAL Metals	*Life Science Laboratories*	97	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$7,271
Decontamination Water Samples		10	sample	$ -	$ -	$ 21	$ 213	$ 67	$ 667	$ -	$880
Decon Water Lab Analyses - TCL PCBs	*Life Science Laboratories*	10	sample	$ -	$ -		$ -		$ -	$ 50	$500
Hazardous Soil Disposal											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	47.00	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$27,894
Hazardous Soil Disposal	*CWM*	3,696	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140	$517,440
Transportation using dumps	*CWM*	3,696	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$72,072
Demurrage (assume 5 hours per week of loading)	*CWM*	10	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$850
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,946	$25,946
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	33,264	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 38	$1,253,388
Site Restoration											
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	7,982	lcy	$ 28.00	$ 223,484	$ -	$ -	$ -	$ -		$223,484
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	7,982	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$11,174
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	6,941	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$1,943
Topsoil	*Recent quote- ESG from Seven Springs*	1,293	lcy	$ 44.50	$ 57,533	$ -	$ -	$ -	$ -	$ 45	$115,066
Finishing grading slopes, gentle	*31 22 16.10 3300*	8,095	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$1,700
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	73	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$4,758
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Fencing Installation	*32 31 13.20 0800*	500	lf							$ 28	$13,760
Mobilization and Demobilization											**$82,128**
10% of Total Costs of Site Work, Treatment										$821,276	$82,128
Contingency											**$486,508**
15% of Total Construction Activities										$3,243,385	$486,508
Professional/Technical Services											**$537,414**
5% Project Management										$3,161,257	$158,062.85
6% Remedial Design											$189,675.42
6% Construction Management											$189,675.42

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$4,267,000
On-Site Alternative 6A Soil/Fill Excavation to Commercial SCOs with Disposal Off-Site Demolition and Removal of Both Incinerator Buildings	Lackawanna Incinerator Site Lackawanna, NY	Soil	Construction Time: 10 months Operation Time: - months Post Remediation Monitoring 0 years	

TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital Cost) $4,267,000

Assumptions:

Working condition is Safety Level: D/C (Labor productivity: 82%; Equipment productivity: 100%)
Weighted Average of city cost index (Buffalo, NY) 101.4% (not applicable for costs derived from vendor quotes).
Costs are loaded with a profit factor 10%
Inflation 3% per year

Estimated number of soil samples 12 samples; 1 times sampled; 20% added for QA/QC samples; 0.25 hrs/sample; 1 worker sampling

Labor: $85 Cost per hr; 2 hrs / well sampling; 2 worker per gw sample

Characterization Cost	Table A (per CWM)	$593.48	per sample
Analytical cost	TAL Metals	$75.00	per sample
For each sampling event, assumed:		$50	for materials (gloves, notebooks, etc.)

Disposal

Lead contaminated soil as a "listed" waste- incineration: $275 per ton; 4,037.55 tons hazardous disposal (assume 10% hazardous, add building ash materials); 22 tons per load; 184 loads for haz disposal
Lead contaminated soil as non-haz: $39.87 per ton; 34,927 tons for non-haz disposal, incl. build materials; 1,588 loads for non-haz disposal

Concrete	3,300	lbs per cy
	150	lbs per cf
Brick	120	lbs per cf

1.6 tons/cy

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID	$96.08	per day
Truck/SUV (1/2 ton or smaller)	$70.74	per day
Horiba U-10 Water Quality Meter	$73.77	per day
Submersible Pump	$42.16	per day
2 in Pump Control Box	$72.27	per day
Generator: 110 V	$57.24	per day
Level D PPE	$11.91	per day

20 loads per day
20 working days per month

Work day consists of: 10 hrs

10 hours per working day
1 months for pre-design characterization
2 months for site prep/restoration
2 months for demolition
10 months to completion
150 ft/day drilling

Excavation With Concrete and Asphalt:

Concrete and Asphalt:	0.0%	% of excavation volume	
Excavation Area:	43,560	sf	
Excavation Volume:	10,000	cy	11,500 lcy
Excavated Weight:	15,000	tons	
Roll-off dumpster can hold approximately:	12	tons	

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$3,807,000
On-Site Alternative 6B Soil/Fill Excavation to Commercial SCOs with Disposal Off-Site Demolition and Removal of the Southern Incinerator Building	Lackawanna Incinerator Site Lackawanna, NY	Soil	Construction Time: 9 months Operation Time: - months Post Remediation Monitoring 0 years	

Description	Data Source (Means[1] or Other)	Quantities: Quantity Amount	Quantity Unit	Cost Breakdown (if available): Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Combined Unit Costs: Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$3,807,000**
Construction Activities		**1**			**$7,919**		**$102,227**		**$27,441**	**$88,354**	**$2,841,347**
Pre-Design Characterization Study											
Driller											
Mob/Demob	*quote- SJB*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 300	$300
Geoprobe/Crew for Soil Borings	*quote- SJB*	2	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 850	$1,700
Sample Collection		10	hr	$ -	$ 50	$ 85.00	$ 850	$ -	$ -		$900
XRF Unit	*recent quote*	2	day							$ 500	$1,000
Sample Analysis for TCLP Lead and Zinc (20% of total samples)	*Life Science Laboratories*	4	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$2,374
Sewer Investigation/Mapping - Labor		16	hrs	$ -	$ -	$ 85.00	$ 1,360	$ -	$ -	$ -	$1,360
Topographic Survey	*02 21 23 09 0020*	3	acre	$ 20.94	$ 52	$ 597.77	$ 1,494	$ 23	$ 58		$1,605
Reporting	*Engineer's Estimate*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$5,000
Site Preparation											
Utility Locator (based on recent bids)	*recent quote*	1.0	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Work Plan Preparation (Including QAPP, FAP and HASP)		1.0	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	300	lf	$ 0.81	$ 243	$ -	$ -	$ -	$ -	$ -	$243
Monitoring Well Abandonment	*recent quote- EnviroTrac*	60	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22	$1,320
Sewer/Storm Drain Demolition	*02 31 13.33 2900*	750	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$8,250
Trenching 6-10ft with 3/4 CY excavator	*31 23 16.13 0500*	1,667	bcy	$ -	$ -	$ 4.65	$ 7,750	$ 3	$ 5,233		$12,983
Fence Demolition	*02 41 13.62 1100*	500.00	lf							$ 2.30	$1,150
Fence Post Removal	*02 4113621000*	50.00	each							$ 22.99	$1,150
Sewer/Storm Drain Reconstruction											
PVC Sewer Pipe, 8" diameter, 13" lengths	*33 31 13.25 2080*	700	lf	$ 7.23	$ 5,061	$ 5.06	$ 3,542	$ -	$ -		$8,603
PVC Sewer Pipe, 10" diameter, 13" lengths	*33 31 13.25 2120*	150	lf	$ 11.93	$ 1,790	$ 6.15	$ 923	$ -	$ -		$2,712
Install manholes- concrete, precast, 4' ID, 8' deep	*33 49 13.10 0600*	1	ea	$ 646.68	$ 647	$ 1,622.55	$ 1,623	$ -	$ -		$2,269
Consolidation of ramp materials to incinerator footprint, 200 HP Dozer, 50' Haul	*31 23 23.14 4000*	1,000	lcy	$ -	$ -	$ 0.33	$ 330	$ 1	$ 560		$890
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,344	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,687	$6,687
Ramp & Building Demolition											
Ramp Demolition	*32 01 15.71 5330*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$440
Sample Collection (from building)		5	hr	$ -	$ -	$ 85.00	$ 425	$ -	$ -		$425
Sample Analysis for PCBs (TCL PCBs)	*Life Sciences quote*	10	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$650
Sample Analysis for Lead & Asbestos (TAL Inorganics)	*Life Sciences quote*	10	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$750
South Incinerator Demolition											
Concrete Foundation / Slab Demolition - 12"	*02 41 16.17 1000*	2,258	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 16	$37,113
Brick Wall Demolition	*02 41 16.13 0650*	1,365	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$519
Smoke Stack Demolition	*02 41 16.13 0650*	3,818	cf	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.38	$14,508
Asbestos Abatement		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$50,000
Transportation and Disposal											
Masonry Disposal	*Quote from Modern Landfill*	310.97	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$22,079
Building Ash Hazardous Waste Disposal	*Quote from Modern Landfill*	342	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$47,817
Drum Disposal (Waste Oil)	*Quote from Modern Landfill*	5	drum	$ -	$ -	$ -	$ -	$ -	$ -	$ 90.00	$450
General Waste Disposal	*Quote from Modern Landfill*	100	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$3,768
Metal Disposal / Recycling	*Quote from Modern Landfill*	25	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$942
C&D Waste Disposal	*Quote from Modern Landfill*	226	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.00	$16,028
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	6	mo	$ -	$ -	$ 13,600.00	$ 81,600	$ 3,420	$ 20,520	$ -	$102,120
Dust Control, Light	*31 23 23.20 2500*	24	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996	$23,911
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	23,100	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$30,030
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	26,565	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 4	$96,962
Haul Road Maintenance	*31 23 23.20 2600*	24	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,343	$32,224
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	23,100	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2	$42,504
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	26,565	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$34,003
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8	$42
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	24	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7	$172
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Confirmation Sampling											
Grab Samples- 1 per 900 square feet, 1 per 30 lf along side walls plus 20% QA/QC		65	sample	$ -	$ 50	$ 21.00	$ 1,371	5.72	$ 373.34	$ -	$1,794
Lab Analyses - TAL Metals	*Life Science Laboratories*	78	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$5,876
Decontamination Water Samples		10	sample	$ -	$ -	$ 21	$ 213	$ 67	$ 667	$ -	$880
Decon Water Lab Analyses - TCL PCBs	*Life Science Laboratories*	10	sample	$ -	$ -		$ -		$ -	$ 50	$500
Hazardous Soil Disposal											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	47	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593	$27,894
Hazardous Soil Disposal	*CWM*	3,696	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140	$517,440
Transportation using dumps	*CWM*	3,696	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$72,072
Demurrage (assume 5 hours per week of loading)	*CWM*	10	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$850
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,946	$25,946
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	33,264	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 38	$1,253,388
Site Restoration											
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	4,335	lcy	$ 28.00	$ 121,371	$ -	$ -	$ -	$ -		$121,371
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	4,335	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$6,069
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	3,769	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$1,055
Topsoil	*Recent quote- ESG from Seven Springs*	1,195	lcy	$ 44.50	$ 53,177	$ -	$ -	$ -	$ -	$ 45	$106,353
Finishing grading slopes, gentle	*31 22 16.10 3300*	6,235	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$1,309
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	47	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65	$3,054
Topographic Survey	*02 21 23 09 0020*	1.25	acre	$ 20.94	$ 26	$ 597.77	$ 747	$ 23	$ 29		$802
Fencing Installation	*32 31 13.20 0800*	500	lf							$ 28	
Asphalt Road Replacement											
Base	*32 11 26.13 1600*	68	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 85	$5,793
Binder	*32 12 16.13 0200*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 20	$7,980
Top	*32 12 16.13 0380*	400	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 11	$4,596
Fencing Installation	*32 31 13.20 0800*	500	lf							$ 28	$13,760
Mobilization and Demobilization											**$48,822**
7% of Total Costs of Site Work, Treatment										$697,461.94	$48,822
Contingency											**$433,525**
15% of Total Construction Activities										$2,890,169	$433,525
Professional/Technical Services											**$483,029**
5% Project Management										$2,841,347	$142,067
6% Remedial Design											$170,481
6% Construction Management											$170,481
TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring)											**$3,807,000**

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$3,807,000
On-Site Alternative 6B **Soil/Fill Excavation to Commercial SCOs with Disposal Off-Site** **Demolition and Removal of the Southern Incinerator Building**	**Lackawanna Incinerator Site** **Lackawanna, NY**	**Soil**	**Construction Time:** 9 months **Operation Time:** - months **Post Remediation Monitoring** 0 years	

Assumptions:

Working condition is Safety Level:		D/C	(Labor productivity:	82%	; Equipment productivity:	100%	)		
Weighted Average of city cost index (Buffalo, NY)		101.4%	(not applicable for costs derived from vendor quotes).						
Costs are loaded with a profit factor		10%							
Inflation		3%	per year						Labor
Estimated number of soil samples		12	samples	1	times sampled	0.25	hrs/sample	$85	Cost per hr
				20%	added for QA/QC samples	1	worker sampling		
Characterization Cost	Table A (per CWM)	$593.48	per sample					2	hrs / well sampling
Analytical cost	TAL Metals	$75.00	per sample					2	worker per gw sample
For each sampling event, assumed:		$50	for materials (gloves, notebooks, etc.)						

Disposal

Lead contaminated soil as a "listed" waste- incineration	$275	per ton	4,037.55	tons hazardous disposal (assume 10% hazardous, add building ash materials)			
			22	tons per load	184	loads for haz disposal	
Lead contaminated soil as non-haz	$39.87	per ton	33,926	tons non-haz disposal, incl. build materials	1,542	loads for non-haz disposal	
Concrete	3,300	lbs per cy					
	150	lbs per cf					
Brick	120	lbs per cf					

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID	$96.08	per day
Truck/SUV (1/2 ton or smaller)	$70.74	per day
Horiba U-10 Water Quality Meter	$73.77	per day
Submersible Pump	$42.16	per day
2 in Pump Control Box	$72.27	per day
Generator: 110 V	$57.24	per day
Level D PPE	$11.91	per day

20 loads per day
20 working days per month

Work day consists of: 10 hrs

10 hours per working day
1 months for pre-design characterization
2 months for site prep/restoration
1 month for demolition
9 months to completion
150 ft/day drilling

Excavation With Concrete and Asphalt:

Concrete and Asphalt:	0.0%	% of excavation volume		
Excavation Area:	43,560	sf		
Excavation Volume:	10,000	cy	11,500	lcy
Excavated Weight:	15,000	tons		
Roll-off dumpster can hold approximately:	12	tons		

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY		LOCATION		MEDIA		Estimated Cost to Implement		$1,271,000	
Baker Hall Alternative 2 Remaining Soil/Fill Excavation to Unrestricted Use SCOs with Disposal Off-Site		Lackawanna Incinerator Site Lackawanna, NY		Soil		Construction Time:		4	months
						Operation Time:		-	months
						Post Remediation Monitoring		0	years

		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$1,271,000**
Construction Activities		**1**			**$44,030**		**$38,202**		**$32,194**	**$99,141**	**$990,520**
Pre-Design Characterization Study											
Site Preparation											
Survey/Boundaries & Markers	*01 71 23.13 1100*	1	day		$ -	$ 1,190.25	$ 1,190	$ 76	$ 76		$1,266
Topographic Survey	*02 21 23 09 0020*	1.0	acre	$ 20.94	$ 21	$ 597.77	$ 598	$ 23	$ 23		$642
Utility Locator (based on recent bids)	*recent quote*	1.0	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Work Plan Preparation (Including QAPP, FAP and HASP)		1.0	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	1,000	lf	$ 0.81	$ 810	$ -	$ -	$ -	$ -	$ -	$810
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,344	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,687	$6,687
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	2	mo	$ -	$ -	$ 13,600.00	$ 27,200	$ 3,420	$ 6,840	$ -	$34,040
Dust Control, Light	*31 23 23.20 2500*	8	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996	$7,970
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	7,088	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$9,215
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	8,152	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 4	$29,754
Haul Road Maintenance	*31 23 23.20 2600*	8	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,343	$10,741
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	7,088	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2	$13,043
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	8,152	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$10,434
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8	$42
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	8	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7	$57
Topographic Survey	*02 21 23 09 0020*	3	acre	$ 20.94	$ 52	$ 597.77	$ 1,494	$ 23	$ 58		$1,605
Confirmation Sampling											
Grab Samples- 1 per 900 square feet, 1 per 30 lf along side walls plus 20% QA/QC		368	sample	$ -	$ 50	$ 21.00	$ 7,720	$ 67	$ 24,529.21	$ -	$32,299
Lab Analyses - TAL Metals	*Life Science Laboratories*	368	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75	$27,570
Decontamination Water Samples		10	sample	$ -	$ -	$ -	$ -	$ 67	$ 667	$ -	$667
Decon Water Lab Analyses - TCL PCBs	*Life Science Laboratories*	10	sample	$ -	$ -		$ -	$ -	$ -	$ 50	$500
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	11,341	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$427,345
Site Restoration											
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	1,539	lcy	$ 28.00	$ 43,096	$ -	$ -	$ -	$ -		$43,096
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	1,539	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.40	$2,155
Grading by dozer	*31 23 23.20 2300*	1,539	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.23	$3,432
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	1,338	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.28	$375
Walk behind Plate Compactor	*01 54 33.30 1300*	5	day	$ -	$ -	$ 261.47	$ 1,307	$ 49	$ 244		$1,551
Topsoil	*Recent quote- ESG from Seven Springs*	5,750	lcy	$ 44.50	$ 255,875	$ -	$ -	$ -	$ -		$255,875
Finishing grading slopes, gentle	*31 22 16.10 3300*	30,000	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.21	$6,300
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	270.00	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65.31	$17,634
Topographic Survey	*02 21 23 09 0020*	2.5	acre							$ 641.99	$1,605
Mobilization and Demobilization											**$11,623**
5% of Total Costs of Site Work, Treatment										$232,452	$11,623
Contingency											**$100,214**
10% of Total Construction Activities										$1,002,142	$100,214
Professional/Technical Services											**$168,388**
5% Project Management										$990,520	$49,525.98
6% Remedial Design											$59,431.17
6% Construction Management											$59,431.17
TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring)											**$1,271,000**

Assumptions:

Working condition is Safety Level:	D/C	(Labor productivity:	82%	; Equipment productivity:	100%	)	
Weighted Average of city cost index (Buffalo, NY)	101.4%	(not applicable for costs derived from vendor quotes).					
Costs are loaded with a profit factor	10%						
Inflation	3%	per year					Labor
Estimated number of soil samples	74	samples	1	times sampled	0.25	hrs/sample	$85 Cost per hr
			20%	added for QA/QC samples	1	worker sampling	
Characterization Cost	Table A (per CWM)	$593.48	per sample				2 hrs / well sampling
Analytical cost	TAL Metals	$75.00	per sample				2 worker per gw sample
For each sampling event, assumed:		$50	for materials (gloves, notebooks, etc.)				

Disposal

Lead contaminated soil as a "listed" waste- incineration	$275	per ton	-	tons soil hazardous	
			22	tons per load	0 loads for haz disposal
Lead contaminated soil as non-haz	$39.87	per ton	11,341	tons soil for non-haz disposal	516 loads for non-haz disposal
Concrete	3,300	lbs per cy	-	tons concrete for disposal	

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID	$96.08	per day	20	loads per day
Truck/SUV (1/2 ton or smaller)	$70.74	per day	20	working days per month
Horiba U-10 Water Quality Meter	$73.77	per day		
Submersible Pump	$42.16	per day		
2 in Pump Control Box	$72.27	per day		
Generator: 110 V	$57.24	per day		
Level D PPE	$11.91	per day		
			10	hours per working day
Work day consists of:	10	hrs	2	months for site prep/restoration
			4	months to completion

Excavation With Concrete and Asphalt:

Concrete and Asphalt:	0.0%	% of excavation volume	
Excavation Area:	270,000	sf	
Excavation Volume:	7,088	cy	8,152 lcy
Excavated Weight:	11,341	tons	
Roll-off dumpster can hold approximately:	12	tons	

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$733,000
Smokes Creek Alternative 2A Partial Removal of Contaminated Soil On Both Sides of Asphalt Path to Commercial SCOs	Lackawanna Incinerator Site Lackawanna, NY	Soil	Construction Time:	3 months
			Operation Time:	- months
			Post Remediation Monitoring	0 years

Description	Data Source (Means[1] or Other)	Quantities: Quantity Amount	Quantities: Quantity Unit	Cost Breakdown: Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Combined Unit Costs: Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$643,000**
Construction Activities		**1**			**$38,398**		**$43,811**		**$11,009**	**$56,254**	**$476,926**
Pre-Design Characterization Study											
Site Preparation											
Topographic Survey	*02 21 23 09 0020*	2	acre	$ 20.94	$ 37	$ 597.77	$ 1,046	$ 23	$ 41		$1,123
Utility Locator (based on recent bids)	*recent quote*	1.0	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Monitoring Well Abandonment	*recent quote- EnviroTrac*	22	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22.00	$484
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Work Plan Preparation (Including QAPP, FAP and HASP)		1.0	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	1,998	lf	$ 0.81	$ 1,618	$ -	$ -	$ -	$ -	$ -	$1,618
Fence Demolition	*02 41 13.62 1100*	1,998	lf							$ 2.30	$4,595
Fence Post Removal	*02 4113621000*	200	each							$ 22.99	$4,598
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,343.50	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,686.70	$6,687
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	3	mo	$ -	$ -	$ 13,600.00	$ 40,800	$ 3,420	$ 10,260	$ -	$51,060
Dust Control, Light - once per week	*31 23 23.20 2500*	12.00	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996.30	$11,956
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	1,758	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.30	$2,285
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	2,022	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.65	$6,416
Haul Road Maintenance	*31 23 23.20 2600*	12	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,342.68	$16,112
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	1,758	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.84	$3,235
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	2,022	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.28	$2,588
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	90	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8.36	$752
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	90	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7.16	$644
Topographic Survey	*02 21 23 09 0020*	1.75	acre	$ 20.94	$ 37	$ 597.77	$ 1,046	$ 23	$ 41		$1,123
Confirmation Sampling											
Decontamination Water Samples		10	sample	$ -	$ -	$ -	$ -	66.73	$ 667	$ -	$667
Decon Water Lab Analyses - TAL Metals	*Life Science Laboratories*	10	sample	$ -	$ -		$ -	$ -	$ -	$ 495.00	$4,950
Hazardous Soil Disposal											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	4	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593.48	$2,400
Hazardous Soil Disposal	*CWM*	281	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$39,377
Transportation using dumps	*CWM*	281	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 19.50	$5,485
Demurrage (assume 5 hours per week of loading)	*CWM*	5	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85.00	$425
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,974.48	$1,974
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	2,531	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$95,382
Site Restoration											
Geotextile (non-woven)	*31 32 19.16 1550*	2,624	sy	$ 1.16	$ 3,044	$ 0.35	$ 918	$ -	$ -		$3,962
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	1,224	lcy	$ 27.50	$ 33,663	$ -	$ -	$ -	$ -		$33,663
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	1,224	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.40	$1,714
Grading by dozer	*31 23 23.20 2300*	1,224	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.23	$2,730
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	1,064	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.28	$298
Topsoil	*Recent quote- ESG from Seven Springs*	797	lcy	$ 44.50	$ 35,488	$ -	$ -	$ -	$ -		$35,488
Finishing grading slopes, gentle	*31 22 16.10 3300*	4,255	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.21	$893
Erosion Control Blankets		1,324	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.08	$2,754
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	38.29	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65.31	$2,501
Monitoring Well Replacement	*recent quote- EnviroTrac*	22	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 94.00	$2,068
Topographic Survey	*02 21 23 09 0020*	1.75	acre	$ 20.94	$ 37	$ 597.77	$ 1,046	$ 23	$ 41		$1,123
Fencing Installation	*32 31 13.20 0800*	1,998	lf							$ 27.52	$54,985
Environmental Easement											
Legal		1	ls							$ 15,000	$15,000
Surveyor - Monument Installation		1	ls							$ 10,000	$10,000
Mobilization and Demobilization											**$11,746**
5% of Total Costs of Site Work, Treatment										$234,927	$11,746
Contingency											**$73,301**
15% of Total Construction Activities										$488,672	$73,301
Professional/Technical Services											**$81,077**
5% Project Management										$476,926	$23,846
6% Remedial Design											$28,616
6% Construction Management											$28,616
LONG TERM MONITORING								**ANNUAL LTM COST (YRS 1-5)**			**$8,000**
								ANNUAL LTM COST (YRS 6-30)			**$5,000**
								LIFETIME LTM (NPV)			**$89,900**
Monitoring, Sampling, Testing and Analysis (Per Event)											
Assume 20% of combined sampling event for on-site and off-site											$2,350
Site Monitoring											
Inspection of soil cover		1	hr			$ 85.00					
Surface water sampling for 1 event		1	sample			$ 85.00	$ -				
Groundwater sampling for 1 event - Includes collection of field parameters		1	well	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0
Materials	*Engineer's Estimate*	1	event	$ 50.00							$50
Mobilization/Demobilization of Field Sampling Crew		1	event	$ -	$ -	$ -	$ -	$ -	$ -	$ 680	$680
Reporting		10	hr	$ 85.00	$ 850	$ -	$ -	$ -	$ -	$ -	$850
Laboratory analysis											
GW Analyses - Metals	*Life Science Laboratories*	1	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 100	$100
Surface water Analyses - Metals	*Life Science Laboratories*	5	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 100	$500
Maintenance- Cap Maintenance											
Mowing brush, tractor with rotary mower, Medium density 2x per year	*32 01 90.19 1670*	20	msf	$ -	$ -					$ 74.80	$1,472
Lifetime Long Term Monitoring (Net Present Value)											
5 Years of Semi-Annual Monitoring											
25 Years of Annual Monitoring											
5% Discount Factor (per NYSDEC)											

TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring) **$733,000**

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$733,000
Smokes Creek Alternative 2A Partial Removal of Contaminated Soil On Both Sides of Asphalt Path to Commercial SCOs	Lackawanna Incinerator Site Lackawanna, NY	Soil	Construction Time: 3 months Operation Time: - months Post Remediation Monitoring 0 years	

Assumptions:

Working condition is Safety Level: **D/C** **(Labor productivity: 82%; Equipment productivity: 100%)**

Weighted Average of city cost index (Buffalo, NY) **101.4%** **(not applicable for costs derived from vendor quotes).**

Costs are loaded with a profit factor **10%**

Inflation **3%** per year

Estimated number of soil samples		**12**	samples	**1**	times sampled	**0.25**	hrs/sample	**$85**	Cost per hr
				20%	added for QA/QC samples	**1**	worker sampling	**2**	hrs / well
								2	workers / gw well
Characterization Cost	Table A (per CWM)	**$593.48**	per sample						
Analytical cost	TAL Metals	**$75.00**	per sample						
For each sampling event, assumed:		**$50**	for materials (gloves, notebooks, etc.)						

Disposal

Lead contaminated soil as a "listed" waste- incineration	**$275**	per ton	**281**	tons soil hazardous (assume 10% hazardous)	
			22	tons per load	**13** loads for haz disposal
Lead contaminated soil as non-haz	**$39.87**	per ton	**2,531**	tons soil for non-haz disposal	**115** loads for non-haz disposal
Concrete	**3,300**	lbs per cy	**-**	tons concrete for disposal	

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID	**$96.08**	per day	20	loads per day
Truck/SUV (1/2 ton or smaller)	**$70.74**	per day	20	working days per month
Horiba U-10 Water Quality Meter	**$73.77**	per day		
Submersible Pump	**$42.16**	per day		
2 in Pump Control Box	**$72.27**	per day		
Generator: 110 V	**$57.24**	per day		
Level D PPE	**$11.91**	per day		
			10	hours per working day
Work day consists of:	**10**	hrs	2	months for site prep/restoration
			0	months loading
Excavation With Concrete and Asphalt:			3	months to completion
Concrete and Asphalt:	**0.0%**	% of excavation volume	150	ft/day drilling
Excavation Area:	**43,560**	sf		
Excavation Volume:	**10,000**	cy **11,500** lcy		
Excavated Weight:	**15,000**	tons		
Roll-off dumpster can hold approximately:	**12**	tons		

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY		LOCATION	MEDIA	Estimated Cost to Implement	$947,000	
Smokes Creek Alternative 2B Partial Removal of Asphalt and Contaminated Soil to Commercial SCOs and Covering of of Remaining Contaminated Soil/Fill with Soil and Asphalt		Lackawanna Incinerator Site Lackawanna, NY	Soil	Construction Time: Operation Time: Post Remediation Monitoring	3 - 0	months months years

		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$857,000**
Construction Activities		**1**			**$40,833**		**$44,545**		**$11,009**	**$56,977**	**$635,344**
Pre-Design Characterization Study											
Site Preparation											
Topographic Survey	*02 21 23 09 0020*	2	acre	$ 20.94	$ 37	$ 597.77	$ 1,046	$ 23	$ 41		$1,123
Utility Locator (based on recent bids)	*recent quote*	1.0	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Monitoring Well Abandonment	*recent quote- EnviroTrac*	22	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22.00	$484
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Work Plan Preparation (Including QAPP, FAP and HASP)		1.0	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	1,998	lf	$ 0.81	$ 1,618	$ -	$ -	$ -	$ -	$ -	$1,618
Fence Demolition	*02 41 13.62 1100*	1,998	lf							$ 2.30	$4,595
Fence Post Removal	*02 4113621000*	200	each							$ 22.99	$4,598
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,343.50	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,686.70	$6,687
Path Demolition											
Asphalt Demolition	*32 01 15.71 5330*	1,829	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.10	$2,012
Asphalt Disposal	*Quote from Modern Landfill*	184	ton							$ 71.00	$13,067
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	3	mo	$ -	$ -	$ 13,600.00	$ 40,800	$ 3,420	$ 10,260	$ -	$51,060
Dust Control, Light	*31 23 23.20 2500*	12.00	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996.30	$11,956
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	2,435	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.30	$3,165
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	2,800	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.65	$8,887
Haul Road Maintenance	*31 23 23.20 2600*	12	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,342.68	$16,112
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	2,435	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.84	$4,480
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	2,800	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.28	$3,584
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	90	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8.36	$752
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	90	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7.16	$644
Topographic Survey	*02 21 23 09 0020*	1.75	acre	$ 20.94	$ 37	$ 597.77	$ 1,046	$ 23	$ 41		$1,123
Confirmation Sampling											
Decontamination Water Samples		10	sample	$ -	$ -	$ -	$ -	66.73	$ 667	$ -	$667
Decon Water Lab Analyses - TAL Metals	*Life Science Laboratories*	10	sample	$ -	$ -		$ -	$ -	$ -	$ 495.00	$4,950
Hazardous Soil Disposal											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	6	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593.48	$3,323
Hazardous Soil Disposal	*CWM*	374	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$52,357
Transportation using dumps	*CWM*	374	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 19.50	$7,293
Demurrage (assume 5 hours per week of loading)	*CWM*	5	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85.00	$425
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,625.34	$2,625
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	3,550	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$133,759
Site Restoration											
Geotextile (non-woven)	*31 32 19.16 1550*	4,723	sy	$ 1.16	$ 5,479	$ 0.35	$ 1,653	$ -	$ -		$7,132
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	1,224	lcy	$ 27.50	$ 33,663	$ -	$ -	$ -	$ -		$33,663
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	1,224	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.40	$1,714
Grading by dozer	*31 23 23.20 2300*	1,224	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.23	$2,730
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	1,064	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.28	$298
Topsoil	*Recent quote- ESG from Seven Springs*	797	lcy	$ 44.50	$ 35,488	$ -	$ -	$ -	$ -		$35,488
Finishing grading slopes, gentle	*31 22 16.10 3300*	4,255	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.21	$893
Erosion Control Blankets		1,324	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.08	$2,754
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	38.29	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65.31	$2,501
Asphalt Cover Construction											
Base	*32 11 26.13 1600*	292	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 85.19	$24,838
Binder	*32 12 16.13 0200*	1,749	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 19.95	$34,899
Top	*32 12 16.13 0380*	1,749	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 11.49	$20,100
Monitoring Well Replacement	*recent quote- EnviroTrac*	22	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 94.00	$2,068
Topographic Survey	*02 21 23 09 0020*	1.75	acre	$ 20.94	$ 37	$ 597.77	$ 1,046	$ 23	$ 41		$1,123
Fencing Installation	*32 31 13.20 0800*	1,998	lf							$ 27.52	$54,985
Environmental Easement											
Legal		1	ls							$ 15,000	$15,000
Surveyor - Monument Installation		1	ls							$ 10,000	$10,000
Mobilization and Demobilization											**$16,241**
5% of Total Costs of Site Work, Treatment										$324,827	$16,241
Contingency											**$97,738**
15% of Total Construction Activities										$651,585	$97,738
Professional/Technical Services											**$108,008**
5% Project Management										$635,344	$31,767
6% Remedial Design											$38,121
6% Construction Management											$38,121
LONG TERM MONITORING								**ANNUAL LTM COST (YRS 1-5)**			**$8,000**
								ANNUAL LTM COST (YRS 6-30)			**$5,000**
								LIFETIME LTM (NPV)			**$89,900**
Monitoring, Sampling, Testing and Analysis (Per Event)											
Assume 20% of combined sampling event for on-site and off-site											$2,350
Site Monitoring											
Inspection of soil cover		1	hr			$ 85.00					
Surface water sampling for 1 event		1	sample			$ 85.00	$ -				
Groundwater sampling for 1 event - Includes collection of field parameters		1	well	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0
Materials	*Engineer's Estimate*	1	event	$ 50.00							$50
Mobilization/Demobilization of Field Sampling Crew		1	event	$ -	$ -	$ -	$ -	$ -	$ -	$ 680	$680
Reporting		10	hr	$ 85.00	$ 850	$ -	$ -	$ -	$ -	$ -	$850
Laboratory analysis											
GW Analyses - Metals	*Life Science Laboratories*	1	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 100	$100
Surface water Analyses - Metals	*Life Science Laboratories*	5	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 100	$500
Maintenance- Cap Maintenance											
Mowing brush, tractor with rotary mower, Medium density 2x per year	*32 01 90.19 1670*	20	msf	$ -	$ -					$ 74.80	$1,472
Lifetime Long Term Monitoring (Net Present Value)											
5 Years of Semi-Annual Monitoring											
25 Years of Annual Monitoring											
5% Discount Factor (per NYSDEC)											
TOTAL ESTIMATED NPV TECHNOLOGY COST (Capital + Lifetime O&M + Post Remediation Monitoring)											**$947,000**

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$947,000
Smokes Creek Alternative 2B **Partial Removal of Asphalt and Contaminated Soil to Commercial SCOs and Covering of of Remaining Contaminated Soil/Fill with Soil and Asphalt**	**Lackawanna Incinerator Site** **Lackawanna, NY**	**Soil**	**Construction Time:** 3 months **Operation Time:** - months **Post Remediation Monitoring** 0 years	

Assumptions:

Working condition is Safety Level: **D/C** **(Labor productivity: 82% ; Equipment productivity: 100%)**
Weighted Average of city cost index (Buffalo, NY) **101.4%** **(not applicable for costs derived from vendor quotes).**
Costs are loaded with a profit factor **10%**
Inflation **3%** per year

Estimated number of soil samples		**12**	samples	**1**	times sampled	**0.25**	hrs/sample	Labor
				20%	added for QA/QC samples	**1**	worker sampling	**$85** Cost per hr
								2 hrs / well
Characterization Cost	Table A (per CWM)	**$593.48**	per sample					**2** workers / gw well
Analytical cost	TAL Metals	**$75.00**	per sample					
For each sampling event, assumed:		**$50**	for materials (gloves, notebooks, etc.)					

Disposal

Lead contaminated soil as a "listed" waste- incineration	**$275**	per ton	**374**	tons soil hazardous (assume 10% hazardous)			
			22	tons per load	**17**	loads for haz disposal	
Lead contaminated soil as non-haz	**$39.87**	per ton	**3,550**	tons soil for non-haz disposal	**161**	loads for non-haz disposal	
Concrete	**3,300**	lbs per cy	**-**	tons concrete for disposal			

Typical Rental Rates - Includes G&A and 10% Profit

Mini-Rae Survey Mode PID	**$96.08**	per day	20	loads per day
Truck/SUV (1/2 ton or smaller)	**$70.74**	per day	20	working days per month
Horiba U-10 Water Quality Meter	**$73.77**	per day		
Submersible Pump	**$42.16**	per day		
2 in Pump Control Box	**$72.27**	per day		
Generator: 110 V	**$57.24**	per day		
Level D PPE	**$11.91**	per day		
			10	hours per working day
Work day consists of:	**10**	hrs	2	months for site prep/restoration
			0	months loading
Excavation With Concrete and Asphalt:			3	months to completion
Concrete and Asphalt:	**0.0%**	% of excavation volume	150	ft/day drilling
Excavation Area:	**43,560**	sf		
Excavation Volume:	**10,000**	cy **11,500** lcy		
Excavated Weight:	**15,000**	tons		
Roll-off dumpster can hold approximately:	**12**	tons		

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		

TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$1,548,000	
Smokes Creek Alternative 3 Excavation of Asphalt and Contaminated Soil to Unrestricted Use SCOs with Disposal Off-Site	Lackawanna Incinerator Site Lackawanna, NY	Soil	Construction Time: Operation Time: Post Remediation Monitoring	4 - 0	months months years

		Quantities		Cost Breakdown (if available)						Combined Unit Costs	
Description	Data Source (Means[1] or Other)	Quantity Amount	Quantity Unit	Material Unit Cost	Material Total Cost	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Unit Cost	Option Total Cost
REMEDIAL ACTION		**TOTAL CAPITAL COST (totals rounded to nearest thousand)**									**$1,548,000**
Construction Activities		**1**			**$121,375**		**$58,486**		**$20,701**	**$61,729**	**$1,150,274**
Site Preparation											
Topographic Survey	*02 21 23 09 0020*	1.75	acre	$ 20.94	$ 37	$ 597.77	$ 1,046	$ 23	$ 41		$1,123
Utility Locator (based on recent bids)	*recent quote*	1.0	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,465	$2,465
Monitoring Well Abandonment	*recent quote- EnviroTrac*	22	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 22	$484
Erosion & Sediment Control Plan		1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Work Plan Preparation (Including QAPP, FAP and HASP)		1.0	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 13.10 1000*	1,968	lf	$ 0.81	$ 1,594	$ -	$ -	$ -	$ -	$ -	$1,594
Fence Demolition	*02 41 13.62 1100*	1,968	lf							$ 2.30	$4,526
Fence Post Removal	*02 4113621000*	197	each							$ 22.99	$4,529
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,343.50	$11,344
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,686.70	$6,687
Path Demolition				$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0
Asphalt Demolition	*32 01 15.71 5330*	1,829	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.10	$2,012
Asphalt Disposal	*Quote from Modern Landfill*	393	ton							$ 71	$27,931
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	4	mo	$ -	$ -	$ 13,600.00	$ 54,400	$ 3,420	$ 13,680	$ -	$68,080
Dust Control, Light	*31 23 23.20 2500*	16	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 996.30	$15,941
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	6,898	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.30	$8,967
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	7,932	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.65	$28,952
Haul Road Maintenance	*31 23 23.20 2600*	16	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,342.68	$21,483
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	6,898	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.84	$12,691
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	7,932	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.28	$10,153
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	5	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8.36	$42
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	16	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7.16	$115
Topographic Survey	*02 21 23 09 0020*	1.75	acre	$ 20.94	$ 37	$ 597.77	$ 1,046	$ 23	$ 41		$1,123
Confirmation Sampling											
Grab Samples- 1 per 900 square feet plus 20% QA/QC		94	sample	$ -	$ 50	$ 21.00	$ 1,974	$ 67	$ 6,272.61	$ -	$8,297
Lab Analyses - TAL Metals	*Life Science Laboratories*	94	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 75.00	$7,050
Decontamination Water Samples		10	sample	$ -	$ -	$ 2	$ 20	$ 67	$ 667	$ -	$687
Decon Water Lab Analyses - Metals	*Life Science Laboratories*	10	sample	$ -	$ -		$ -	$ -	$ -	$ 50.00	$500
Hazardous Soil Disposal											
Soil Characterization Sampling (1 sample per 500 CY, per CWM)	*Life Science laboratories*	14.00	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 593.48	$8,309
Hazardous Soil Disposal	*CWM*	1,104	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 140.00	$154,504
Transportation using dumps	*CWM*	1,104	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 19.50	$21,520
Demurrage (assume 5 hours per week of loading)	*CWM*	5	hour	$ -	$ -	$ -	$ -	$ -	$ -	$ 85.00	$425
Fuel Surcharge- 36% of Transportation	*CWM*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,747.27	$7,747
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- ESG plus 10%*	9,932	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 37.68	$374,253
Site Restoration											
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- ESG from Seven Springs*	4,273	lcy	$ 28.00	$ 119,657	$ -	$ -	$ -	$ -		$119,657
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	4,273	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.40	$5,983
Grading by dozer	*31 23 23.20 2300*	4,273	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.23	$9,530
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	3,716	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.28	$1,040
Topsoil	*Recent quote- ESG from Seven Springs*	797	lcy	$ 44.50	$ 35,488	$ -	$ -	$ -	$ -		$35,488
Finishing grading slopes, gentle	*31 22 16.10 3300*	4,255	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.21	$893
Erosion Control Blankets		1,324	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.08	$2,754
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	38	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 65.31	$2,501
Asphalt Cover Construction											
Base	*32 11 26.13 1600*	194	ecy	$ -	$ -	$ -	$ -	$ -	$ -	$ 85.19	$16,542
Binder	*32 12 16.13 0200*	1,749	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 19.95	$34,899
Top	*32 12 16.13 0380*	1,749	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 11.49	$20,100
Monitoring Well Replacement	*recent quote- EnviroTrac*	22	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 94.00	$2,068
Topographic Survey	*02 21 23 09 0020*	1.75	acre	$ 20.94	$ 37	$ 597.77	$ 1,046	$ 23	$ 41		$1,123
Fencing Installation	*32 31 13.20 0800*	1,968	lf							$ 27.52	$54,159
Mobilization and Demobilization											**$26,151**
5% of Total Costs of Site Work, Treatment										$523,011.66	$26,151
Contingency											**$176,464**
15% of Total Construction Activities										$1,176,424	$176,464
Professional/Technical Services											**$195,547**
5% Project Management										$1,150,274	$57,514
6% Remedial Design											$69,016
6% Construction Management											$69,016
TOTAL ESTIMATED NPV TECHNOLOGY COST											**$1,548,000**

Assumptions:

Working condition is Safety Level:		D/C	(Labor productivity:	82%	; Equipment productivity:	100%	)
Weighted Average of city cost index (Buffalo, NY)		101.4%	(not applicable for costs derived from vendor quotes).				
Costs are loaded with a profit factor		10%					
Inflation		3%	per year				Labor
Estimated number of soil samples		12	samples	1	times sampled	0.25	hrs/sample	$85	Cost per hr
				20%	added for QA/QC samples	1	worker sampling	2	hrs / well
Characterization Cost	Table A (per CWM)	$593.48	per sample					2	workers / gw well
Analytical cost	TAL Metals	$75.00	per sample						
For each sampling event, assumed:		$50	for materials (gloves, notebooks, etc.)						
Disposal									
Lead contaminated soil as a "listed" waste- incineration		$275	per ton	1,104	tons soil hazardous (assume 10% hazardous)				
				22	tons per load	50	loads for haz disposal		
Lead contaminated soil as non-haz		$39.87	per ton	10,141	tons soil for non-haz disposal	461	loads for non-haz disposal		
Concrete		3,300	lbs per cy	-	tons concrete for disposal				
Typical Rental Rates - Includes G&A and 10% Profit									
Mini-Rae Survey Mode PID		$96.08	per day					20	loads per day
Truck/SUV (1/2 ton or smaller)		$70.74	per day					20	working days per month
Horiba U-10 Water Quality Meter		$73.77	per day						
Submersible Pump		$42.16	per day						
2 in Pump Control Box		$72.27	per day						
Generator: 110 V		$57.24	per day						
Level D PPE		$11.91	per day						
Work day consists of:		10	hrs					10	hours per working day
								2	months for site prep/restoration
								1.28	months for disposal
Excavation With Concrete and Asphalt:								4	months to completion
Concrete and Asphalt:		0.0%	% of excavation volume					150	ft/day drilling
Excavation Area:		43,560	sf						
Excavation Volume:		10,000	cy	11,500	lcy				
Excavated Weight:		15,000	tons						
Roll-off dumpster can hold approximately:		12	tons						

Notes

sy	square yard	mo	month
cy	cubic yard	ls	lump sum
lcy	loose cubic yard	O&M	Operation and maintenance
bcy	bank cubic yard	H&S	Health and Safety
lf	linear feet		
sf	square feet		
msf	1,000 square feet		