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LETTER OF TRANSMITTAL

TO: New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

DATE: 8/14/2017 | JOB NO.: 14907.33
ATTENTION: Payson Long
RE: Final OU3 Feasibility Study Report
Dzus Fastener Company, Inc. (152033)
West Islip, New York

WE ARE SENDING YOU [X] Attached [ ] Under separate cover via _____ the following items:

[ ] Shop drawings [ ] Prints [ ] Plans [ ] Samples [ ] Specifications

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1	Digital Submission - Final OU3 Feasibility Study Report, Dzus Fastener Company, Inc., West Islip, New York

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REMARKS EA is pleased to provide you with the above listed document. Should you have any questions or comments regarding this submittal, please do not hesitate to contact me at (315) 565-6554.

COPY TO NA

SIGNED Frank DeSantis Jr.

Frank DeSantis Jr., Project Manager

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Feasibility Study Report
Dzus Fastener Company, Inc. (152033)
West Islip, New York

Operable Unit 3 – Willetts Creek Area

Prepared for

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

Prepared by

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August 2017
Version: FINAL
EA Project No. 14907.33

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Date

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LIST OF ACRONYMS AND ABBREVIATIONS

AECOM	Architecture, Engineering, Consulting, Operations, and Maintenance
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
COC	Contaminant of concern
COPEC	Contaminants of potential ecological concern
cy	Cubic yard
DER	Division of Environmental Remediation
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
GRA	General response actions
IRM	Interim remedial measure
mg/kg	Milligram(s) per kilogram
mg/L	Milligram(s) per liter
No.	Number
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
OU	Operable unit
ppm	Parts per million
RAO	Remedial action objectives
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
ROD	Record of decision
SCG	Standards, criteria, and guidance
SCO	Soil cleanup objective(s)
SGV	Sediment Guidance Value
TCLP	Toxicity characteristic leaching procedure

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 Number [No.] D007624-33) was tasked to perform a Remedial Investigation (RI) and Feasibility Study (FS) at the Dzus Fastener Company, Inc. site (NYSDEC Site Number No. 152033) located in West Islip, Suffolk County, New York. The site is listed as a Class "2" in the State Registry of Inactive Hazardous Waste Sites (list of State Superfund sites); this site represents a significant threat to public health or the environment, and action is required. The site consists of three operable units (OUs) defined as follows:

- OU1 consisted of the leaching pools (the source) and areas of soil contamination at the facility. A Record of Decision (ROD) for OU1 was issued for this OU by NYSDEC in March 1995. The selected remedy consisted of *in situ* stabilization/solidification for onsite soils containing cadmium at concentrations greater than 10 parts per million (ppm).

- OU2 is comprised of the offsite contamination including sediment and water contamination for a section of Willetts Creek and Lake Capri. A ROD for OU2 was issued for this OU by NYSDEC in October 1997. The selected remedy included dredging, dewatering, and offsite disposal of contaminated sediments from Lake Capri; excavation and offsite disposal of sediment from Willetts Creek exceeding 9 ppm.

- OU3 encompasses the area of offsite impacted wetlands located behind a strip mall on Union Boulevard and inclusive of the Willetts Creek channel upstream of Lake Capri, found to be contaminated during routine post-remedial action effectiveness sampling (AECOM 2016).

OU3 is the focus of this FS Report.

1.1 PURPOSE AND SCOPE

This FS report has been prepared to develop and evaluate alternatives for remedial action, 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 OU3 at the Dzus Fastener Company, Inc. site.

This 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).

1.2 REPORT ORGANIZATION

This FS report has been organized as follows:

- ***Section 1***—Introduction and Project Overview
- ***Section 2***—Summary of OU3 Remedial Investigation 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 Site Location

The subject site is located at 425 Union Boulevard, West Islip, Suffolk County, New York. The site is approximately 4 acres in size and is located in a mixed residential, commercial, and industrial area (**Figure 1-1**). The site is bounded by Union Boulevard to the south, the former Dzus Fastener Company, Inc. facility and Beach Street to the west, and Long Island railroad tracks to the north. Immediately to the east of the site is Willetts Creek which flows south into Lake Capri, an 8-acre man-made lake. Lake Capri drains into the tidal portion of Willetts Creek through a culvert located under Montauk Highway (**Figure 1-2**). In its course, Willetts Creek flows past the Beach Street Middle School and the West Islip Senior High School, both on the creek's west bank. From the Dzus property down to the tidal portion of Willetts Creek, the east bank of the creek is surrounded by low-lying private residential properties. The west bank, beyond the schools, is also lined by private residences.

1.3.2 Site History

Dzus Fastener (incorporated in the State of New York under the name Dzus Fastener Company, Inc. in 1936) has produced fasteners and springs since 1932. Wastes from metal plating, tumbling, electroplating, chromic acid, anodizing, and special finishing operations consisted of oils, heavy metals, and salts. Leaching pools onsite were used for the disposal of hazardous wastes. A Phase I Investigation was completed by NYSDEC in 1984, and a Phase II Investigation report was submitted by Dzus Fastener Company, Inc. in August of 1990. An Interim Remedial Measure was completed by Dzus Fastener Company, Inc. in October 1990, during which approximately 1,960 cubic yards (cy) of contaminated soil from the area of the industrial leach field were removed. Soils and groundwater were contaminated with cadmium, chromium, cyanide, and organic compounds.

The facility changed its name from Dzus Fastener Company, Inc. to DFCI Solutions, Inc. in 2001, but operations have remained the same since its construction at this location in 1937.

Operations included the design and manufacture of ¼-turn fasteners, quick acting latches and panel strips in steel, stainless steel, aluminum, and plastic for use in military and commercial aerospace, transportation, electronics, air handling, refrigeration, motor control, and computer industries to secure access panels, covers, or detachable components. In 2015, DFCI Solution, Inc. ceased operations and moved all equipment out of the facility.

1.3.3 Operable Units

The site consists of three OUs (**Figure 1-3**). An OU represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination.

OU1 consisted of the leaching pools (the source) and areas of soil contamination at the facility. A Record of Decision (ROD) for OU1 was issued for the site by NYSDEC in March 1995. The selected remedy consisted of *in situ* stabilization/solidification for onsite soils containing cadmium at concentrations greater than 10 ppm. Three areas on the western portion of the facility were excavated and mixed with the soils to be treated on the eastern portion of the facility property. Additional remedial components included design and installation of a final topsoil/asphalt cover at the eastern portion of the facility, which would protect the stabilized area from erosion and implementation of institutional controls, in the form of a deed restriction at the site.

OU2 is comprised of the offsite contamination including sediment and water contamination of a section of Willetts Creek and Lake Capri. A ROD for OU2 was issued for the site by NYSDEC in October 1997. The selected remedy included dredging, dewatering, and offsite disposal of contaminated sediments from Lake Capri; excavation and offsite disposal of approximately 100 cy of sediment from Willetts Creek, corresponding to levels of cadmium exceeding 9 ppm; a long-term monitoring program to evaluate the effectiveness of the onsite remedy; and to verify that any existing groundwater plume does not impact public health or environment. Subsequent post-remedial monitoring of the wetland sediments in the Willetts Creek area found residual levels of cadmium in sediments that exceeded both the remedial goals established in the OU2 ROD as well as the most recent NYSDEC sediment guidance values (NYSDEC 2014).

OU3 encompasses the area of offsite impacted wetlands located behind a strip mall on Union Boulevard and inclusive of the Willetts Creek channel upstream of Lake Capri, found to be contaminated during routine post-remedial action effectiveness sampling. OU3 is the focus of this FS Report.

1.3.4 Property Information

The site is located along Union Boulevard in the city of West Islip, Suffolk County, New York (**Figure 1-1**). The property is an irregular-shaped parcel that is approximately 4 acres in size. The main access to the Dzus Fastener Company, Inc. site is located along Union Boulevard. The site consists of one Suffolk County tax parcel and is located in an area of mixed use including

residential, industrial, and commercial properties (**Figure 1-4**). Willetts Creek, the focus of OU3, flows through private residences, commercial properties, and school properties.

1.3.5 Physiography

The Dzus Fastener Company, Inc. site is located on the United States Geological Survey Bay Shore West, New York, 7.5-minute topographic quadrangle map, dated 2016 (**Figure 1-5**). Elevation at the site is approximately 20 feet (ft) above mean sea level (amsl). The nearest surface water feature to the site, as noted on the topographic map, is Willetts Creek to the east of the site. Willetts Creek flows south into Lake Capri, an 8-acre man-made lake, which drains into the tidal portion of Willetts Creek and flows into Babylon Cove in Great South Bay.

1.3.6 Site Geology

The site is located in the Atlantic Coastal Plain Physiographic Province. The geology of Long Island is characterized by a southward-thickening wedge of unconsolidated Cretaceous and Cenozoic sediments unconformably overlying a gently dipping Pre-Cambrian bedrock surface. The site is underlain by the Upper Glacial Aquifer. The Upper Glacial Aquifer is an unconfined aquifer approximately 250- to 260-ft thick with 200 to 210 ft of saturated thickness consisting of mostly Pliocene and Pleistocene glacial deposits. The Upper Glacial Aquifer rests unconformably on the Cretaceous Magothy Formation. The water table beneath the site is approximately 14-ft below ground surface (bgs). Based on historical data, the groundwater flow direction in the Upper Glacial Aquifer is to the south-southwest.

1.3.7 Site Hydrology/Hydrogeology

Willetts Creek is a north-south flowing, slow moving creek, approximately 16- to 23-ft wide and less than 8 inches in depth. It is located immediately to the east of the Dzus facility, and flows in a southerly direction approximately 4,500 ft to Lake Capri, a privately owned, 8-acre man-made lake. From Lake Capri, the creek flows another 3,000 ft below the lake to Babylon Cove. The creek is fed by both upstream surface water runoff and groundwater infiltration. The creek is divided into an upper and a lower reach. The upper portion is the freshwater reach located upstream of the lake; the lower portion is the tidal channelized reach downstream of the lake.

Lake Capri was formed by impoundment of the Willetts Creek estuary upon construction of the embankment for Montauk Highway (Route 27A), or its predecessor, before the turn of the century. The northwest corner of the lake is characterized as a small, approximately one-quarter acre lagoon fed in part by what is now a relatively short intermittent stream. Except for the fenced south end of the lake that fronts Montauk Highway, Lake Capri is surrounded by low-lying residential properties. The lake is relatively shallow; with a depth of slightly greater than 3 ft over broad areas. The lake is fed principally by surface flows from Upper Willetts Creek, by stormwater runoff from two outflow structures that drain local streets to the east and west, and by groundwater.

A concrete outfall structure at the south end of the lake controls overflow into a culvert that extends under Montauk Highway and to Lower Willetts Creek. Given the approximately 3 to 4 ft average head drop between Lake Capri and the tidal Lower Willetts Creek, it is likely that the lake also discharges by groundwater flow.

Using calculated gradients and an assumed hydraulic conductivity value of 10^{-2} to 10^{-3} centimeters per second, typical for an unconsolidated sandy/gravely aquifer, lateral groundwater flow in the Upper Glacial Aquifer is estimated to average approximately 2.4 to 24 ft per year.

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2. SUMMARY OF OU3 REMEDIAL INVESTIGATION AND EXPOSURE ASSESSMENT

The following sections briefly summarize the environmental impacts at OU3 as determined during the RI (EA 2016). Media that were evaluated during the RI included surface and subsurface soil and sediment. Using RI results and historical data, cadmium and trivalent chromium were determined to be contaminants of concern (COCs) for OU3with other exceedances of NYSDEC Soil Cleanup Objectives (SCOs) detected for additional Target Analyte List metals (including antimony, arsenic, iron, lead, manganese, sodium, and thallium), within onsite surface and subsurface soils.

This section is organized by 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 (NYSDEC 2006).

- ***Sediment***—Screening and Assessment of Contaminated Sediment – Sediment Guidance Values (NYSDEC 2014).

A full analysis of all data collected during the RI is included in the RI report (EA 2016).

2.1 OU3 SURFACE AND SUBSURFACE SOIL

The focus of the soil/fill material screening and characterization efforts conducted during the RI was to determine the nature and extent of impacts of cadmium and chromium within the floodplain soils of Willetts Creek, using a combination of surface and subsurface soil sampling to collect soil for laboratory analysis. Soil samples were collected from the ground surface and from soil borings. Floodplain soil sampling locations (**Figures 2-1A through 2-1E**) and results were used to evaluate the human health and ecological risks from direct contact exposure pathways to site surface and subsurface soil.

2.1.1 OU3 and Surrounding Area Surface Soil

Both cadmium and chromium were reported in surface soils above their applicable SCOs (residential use). Cadmium exceeded the SCO (2.5 milligrams per kilogram [mg/kg]) in 17 of 126 surface soil samples collected within OU3 and the surrounding area. Cadmium was reported at concentrations ranging from 1.4 to 84 mg/kg. Chromium exceeded the SCO (36 mg/kg) in 5 of 126 surface soil samples collected within OU3 and the surrounding area and are collocated with the cadmium exceedances. Chromium was reported at concentrations ranging from 5.5 to 130 mg/kg. Target analyte list metals analytical results for surface soil samples collected during the RI showed elevated concentrations of cadmium and chromium in areas of known contamination based on historical investigation results. The metal contamination appears to be

greatest within surface soil samples collected from the northern reaches of Willetts Creek (within OU3), and some residential yards or athletic fields that fall within the Willetts Creek floodplain.

2.1.2 OU3 and Surrounding Area Subsurface Soil

Subsurface soil samples were collecting using a hand auger from 6 to 12 in. bgs and soil borings that were advanced to depths up to 6 ft bgs, until native sand was encountered. Laboratory analytical results from the OU3 subsurface soil sampling program identified elevated concentrations of cadmium. Concentrations of cadmium in exceedance of the residential use SCOs were detected in 13 of 122 total subsurface soil samples collected during the RI. Soil boring samples collected from behind the shopping plaza are subject to commercial SCOs. Two of the 9 subsurface soil boring samples contained cadmium exceeding the commercial SCO (9.3 mg/kg). The deepest impacts to subsurface soil/fill were found within SB-05 (**Figure 2-1A**), located directly behind the shopping plaza, at a depth of 4.5–5.5 ft bgs. This sample was collected from the layer directly above native material, as observed during soil boring installations. Concentrations of chromium in exceedance of the residential use SCO (36 mg/kg) were detected in 4 of 122 samples and are collocated with the cadmium exceedances. Chromium was not detected in exceedance of the commercial use SCO (1,500 mg/kg) in the subsurface soil samples.

Vertical profile borings completed at 9 locations south of the Dzus Fastener Company, Inc. property indicated that native material is generally encountered no deeper than 5.5 ft bgs. Based on the proximity to the Dzus Fastener Company, Inc., the possibility exists that the cadmium exceedance noted in SB-05 may be the result of the use of fill material originating from onsite areas during construction of the shopping plaza. Because of this data gap, additional investigation is required to determine the extent of cadmium contamination in soils behind the shopping center.

2.2 OU3 AND SURROUNDING AREA SEDIMENT

A sediment investigation was conducted from 2013 to 2014 in response to the identification of elevated concentrations of cadmium during long-term monitoring following the remediation of OU2 in 1999. Sediment samples were collected from Willetts Creek to fill data gaps related to the vertical and horizontal extent of contamination identified during previous 2013 and 2014 sampling activities. Sediment samples were also collected from tidal portions of Willetts Creek located south of Montauk Highway to evaluate contaminant migration beyond Lake Capri. **Figures 2-2A through 2-2F** show sediment sample locations. Laboratory analytical results from the OU3 sediment sampling program identified elevated concentrations of cadmium. Concentrations of cadmium in exceedance of its Class B SGV (5 milligrams per kilogram [mg/kg]) were detected in 16 of 30 (approximately 53 percent) sediment samples collected during the RI. The deepest impacts to sediment were found within transect CR-11 and CR-15, at a depth of 2.5–3 ft bgs. Cadmium results for sediment samples collected during the RI showed elevated concentrations in areas that are consistent with areas of known contamination based on historical investigation results. The location with the highest cadmium concentration (1,400 mg/kg) was 152033-CR4SW-SS, located behind the shopping plaza on Union Boulevard in the

wooded/wetland area. This area has had historically high concentrations of cadmium in sediment, and is in the vicinity of SB-05, the soil boring location with the highest cadmium detection. The second highest detection of cadmium in sediment was 270 mg/kg, collected from location 152033-CR-8V, in the wetland area adjacent to Willetts Creek within the northern portion of OU3. The area was identified as a hot-spot for cadmium during the 2013 and 2014 investigation, when cadmium was detected in sediment at a concentration of 8,200 mg/kg in one location (AECOM 2016).

The highest detected chromium concentration for sediment in OU3 was 60 mg/kg, in sample collected from location 152033-CR-28V in the wetland area adjacent to Willetts Creek in the northern portion of OU3 and WC-10 from an outfall near transect CR33. These values, while still higher than historical chromium concentration, are within the Class B SGV for chromium. Sediment sampling locations (**Figures 2-1A through 2-1E**) and results were used to evaluate the human health and ecological risk assessments from direct contact exposure pathways to contaminated site sediment.

2.3 HUMAN HEALTH RISK 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 and sediment. The exposure assessment concluded that surface and subsurface soil/fill and sediment have the potential to impact human receptors.

The Dzus Fastener Company, Inc. OU3 is currently surrounded by residential properties, two schools, and some commercial property. The site consists of a portion of the Willetts Creek streambed, adjacent wetlands, floodplain soils in the surrounding residential area/school properties, and soils south of the Dzus Fastener Company, Inc. property in a shopping center area. Despite the existing fences, OU3 is easily accessible and may be frequented by potential human receptors. Direct contact with surface soil by trespassers or adult workers who enter the creek to maintain drainage at the footbridge crossings or residents who may enter the creek through backyards, is a potentially complete exposure pathway via incidental ingestion and dermal absorption. In addition, if future development or remedial action of the site were to occur, direct contact with surface and subsurface soil by construction workers or site visitors could potentially take place (incidental ingestion and dermal absorption). There is also a potential for inhalation of contaminant-laden particulates by construction workers, and possibly, downstream receptors. A potential direct exposure pathway for Willetts Creek sediment is via ingestion of fish; however, this exposure is considered unlikely due to lack of a stable fish population. Additionally, Willetts Creek acts as a contributing source to sediment contamination in Lake Capri. Lake Capri and the tidal portion of Willetts Creek, south of Lake Capri, support a substantial fish population which could be directly exposed to the potentially impacted sediments. Although the exposure to contaminated fish within Willetts Creek is unlikely, the potential for exposure exists further downstream within these two areas.

2.4 ECOLOGICAL RISK ASSESSMENT

In order to identify actual or potential impacts to fish and wildlife resources from contaminants of potential ecological concern (COPEC), a Fish and Wildlife Resources Impact Analysis was conducted. The exposure assessment concluded that surface and subsurface soil/fill and sediment concentrations of cadmium present a potential exposure pathway to fish and wildlife.

The Dzus Fastener Company, Inc. OU3 contains state-regulated freshwater wetlands and Willetts Creek was identified as a Class C stream, which may be suitable for fishing, fish survival, and primary and secondary recreation, but are often limited by flow or stream substrate. The ecological communities within the site include an intermittent stream, residential, recreational, commercial, or horticultural land cultivated for herbs and shrubs, and vegetation on the exterior surfaces of urban structures (such as commercial/apartment buildings, houses, bridges). No signs of stress to vegetation or wildlife resulting from impacts of the site-related COCs were observed during field activities. However, the wooded areas associated with Willetts Creek and other isolated areas with vegetation are of significant value to wildlife (such as urbanized bird and some mammalian species). Mobilization of sediments through periodic rain events and snow melt is the primary contaminant migration pathway at the site. Erosion of contaminated fill from the adjacent commercial areas is another potential contaminant migration pathway. The creek habitat and freshwater wetlands located along Willetts Creek are likely of limited value to fish and other aquatic fauna due to the intermittent nature of the creek in this reach. Further downstream, however, the creek is perennial with higher value to fish and aquatic fauna utilizing the riparian habitat and lacustrine habitat associated with Lake Capri. Sediment sampling results from Lake Capri and the tidal portion of Willetts Creek indicate that metals have migrated from the Dzus Fastener Company, Inc. site. Therefore, sediment contamination present a potential exposure pathway to fish and wildlife within the area of the site (OU3).

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 action 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 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. The RAOs for the Dzus Fastener Company, Inc. site are to meet the SCGs listed in the following table.

3.1 CLEANUP STANDARDS, CRITERIA, AND GUIDANCE

The media cleanup goals are based on New York State SCGs for soil and sediment, site-specific risk assessment, COCs, site characteristics, and feasible actions. The COCs for soil and sediment at the Dzus Fastener Company, Inc. site identified during the RI are cadmium and trivalent chromium. Cleanup goals can be achieved by either removing the soil and sediment contamination, or preventing impacts to human or ecological receptors via ingestion/direct contact with impacted soil.

Soil/Fill – Soil Cleanup Objectives

	Chemical of Potential Concern	Concentration Range Detected (ppm)[1]	SCO[2] (ppm)					Frequency Exceeding Residential Use SCO
			Unrestricted	Residential	Restricted-Residential	Commercial	Industrial	
Inorganics	Cadmium	1.4–84	2.5	2.5	4.3	9.3	60	31/271
	Chromium	5.5–130	30	36	180	1,500	6,800	9/271

[1] Based on historical data and 2016 Remedial Investigation results.
[2] New York State Department of Environmental Conservation 6 New York Codes of Rules and Regulations Table 375-6.8 (a) & (b)
NOTE:
ppm = Parts per million
SCO = Soil Cleanup Objectives

Sediment – Sediment Guidance Values

	Chemical of Potential Concern	Concentration Range Detected (ppm)[1]	SGV[2] (ppm)			Frequency Exceeding Class A SGV
			Class A	Class B	Class C	
Inorganics	Cadmium	0.61–8,200	<1	1-5	>5	214/270
	Chromium	0.43-60	<43	43-110	>110	6/32

Class A: Low risk to aquatic life.
Class B: Slightly to moderately contaminated and additional testing is required to evaluate the potential risks to aquatic life.
Class C: Highly contaminated and likely to pose a risk to aquatic life.

[1] Based on historical data and 2016 Remedial Investigation results.
[2] New York State Department of Environmental Conservation Technical Guidance for Screening and Assessment of Contaminated Sediment, 2014.
NOTE: ppm = Parts per million
SGV = Sediment Guidance Value

3.2 REMEDIAL ACTION OBJECTIVES

The medium-specific RAOs for the Dzus Fastener Company, Inc. site are displayed in the following table.

Soil	Specific RAOs
RAOs for Public Health Protection	• Prevent ingestion/direct contact with contaminated soil. • Prevent inhalation exposure to contaminants through particulates in airborne dust.
RAOs for Environmental Protection	• Prevent migration of contaminants that would result in sediment contamination. • Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.
Note: RAO = Remedial Action Objectives	

Sediment	Specific RAOs
RAOs for Public Health Protection	• Prevent direct contact with contaminated sediments.
RAOs for Environmental Protection	• Prevent impacts to biota from ingestion/direct contact with sediments causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain. • Restore sediments to pre-release/background conditions to the extent feasible.
NOTE: RAO = Remedial Action Objectives	

3.3 EXTENT OF IMPACT TO ENVIRONMENTAL MEDIA

The extent of soil/sediment that exceeded cadmium and chromium SCGs is shown on **Figures 2-1A through 2-1E** and **Figures 2-2A through 2-2F**. The estimated volume of soil/sediment material by area is summarized in the following table.

Impacted Media	Soil/Sediment Cleanup Objective	Estimated Volume of Impacted Material	
		Cubic Yards (cy) [(a)]	Tons
Sediment	Lower limit of Class B[(b)] to native material	30,568	43,825
	Upper limit of Class B[(c)]	13,805	19,793
Soil	Residential Use	2,077	2,978
	Restricted Use	1,731	2,481
(a) Due to unclear distinction between sediment and soil for areas with horizontally unbound data, sediment volumes may include some soil but it is not significant. Depth to native material is an estimation based on soil boring data and knowledge of bedrock in the area. (b) Cadmium = 1 ppm and Chromium = 43 ppm (c) Cadmium = 5 ppm and Chromium = 110 ppm			
NOTE: cy = Cubic yard ppm = Parts per million			

3.4 POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRIATE 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. 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 this 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 Dzus Fastener Company, Inc. 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.

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 Dzus Fastener Company, Inc. site, and for the types of technologies that will be developed into remedial alternatives. Cadmium and chromium are the primary COCs identified during the RI. Thus, each of the following ARARs has been chosen for its potential applicability or relevance and appropriateness.

3.4.1 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, and the standards for impacted sediments are defined in 2014 Screening and Assessment of Contaminated Sediments (NYSDEC 2014) for freshwater sediment guidance values.

3.4.2 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:

- ***Air Quality Standards, 6 NYCRR Part 257***—Site activities will follow all substantive requirements of the state air pollution control regulations if air emissions are created.

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

- ***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.

3.4.3 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.

- ***Floodplains management Criteria for State Projects, 6 NYCRR Part 502***—Provides standards, regulations, and guidelines.

- ***Wetlands Protection, 40 CFR Part 6 Appendix A, Section 4***—Provides standards, regulations, and guidelines.

- ***Clean Water Act, 40 CFR Parts 122 and 404/401***—Site activities will be conducted under the National Pollution Discharge Elimination System established permitting requirements, technology-based limitation and standards, control of toxic pollutants, and monitoring of effluents to assure discharge permit conditions and limits are not exceeded.

- Additionally, local permits such as land development standards, storm water and surface water regulations and clearing and grading requirements may be required depending on the remedial action.

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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 and sediment). GRAs for soil and sediment at the Dzus Fastener Company, Inc. site (including no action, site management, removal, containment, treatment, and disposal) are detailed in the following sections.

4.1 SOIL

4.1.1 No Action

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

4.1.2 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.

4.1.3 Containment

Soil and fill containment would be accomplished by installing either a multi-media cap or impermeable liner over the contaminated areas to eliminate exposure and prevent transport through groundwater. The existing physical setting would require consolidation and grading of onsite fill.

4.1.4 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* stabilization and solidification, and *ex situ* chemical treatment such as acid leaching and 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 uptake or phytoremediation. It involves contaminant break down by the plant or microbes near the root system.

- 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 and solidification 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 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.

4.1.5 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 offsite treatment or disposal.

4.1.6 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.

4.2 SEDIMENT

4.2.1 No Action

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

4.2.2 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.

4.2.3 Containment

Sediment containment would be accomplished by installing a cap over the contaminated areas to eliminate exposure. Cap construction could consist of gravel or stone, sand, clay, or plastic that acts as a physical barrier. A reactive cap could also be constructed using sequestering

amendments (bauxite, barite, limestone), biopolymers (chitosan), or other compounds (zeolite, organoclay, apatite) in a thin layer or mixed with sand.

4.2.4 Treatment

Treatment subjects contaminants to processes that alter their state, transform them to innocuous forms or immobilize them. Potentially applicable treatment technologies for sediment at this site include *in situ* or *ex situ* physical/chemical treatment and *in situ* biological treatment.

Chemical treatment, such as solidification and stabilization, can be accomplished by the addition of amendments to treat or stabilize the contaminants within the sediment. Stabilization reduces the toxicity and mobility of the contaminants. This results in the production of a monolith of waste with high structural integrity.

Biological treatment involves the use of wetland plants to treat the impacted media. This can be achieved through phytoextraction, which involves the physical removal of contaminants from the sediment through plant uptake or phytoremediation. It involves contaminant break down by the plant or microbes near the root system.

4.2.5 Removal

Physical removal of contaminated sediment would be conducted by excavation after the water above the sediment has been removed or by mechanical or hydraulic dredging with dewatering, using standard dredging equipment to remove material from the creek bed/wetland and load it into transport mechanisms (i.e., trucks) for offsite treatment or disposal. Amendments would likely need to be used to modify chemical and physical properties of the sediment to facilitate handling and disposal.

4.2.6 Disposal

Disposal involves transporting the sediment to a landfill that will either place the sediment in a lined landfill or use it for daily cover, based on characterization results. Sediment may need to be dewatered, stabilized, or treated prior to transport in order to meet paint filter test requirements.

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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 offsite 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 COC 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 5-1A and Table 5-1B**). The reasons for exclusion are detailed below.

5.2.1.1 Technologies Not Retained for Soil/Fill Material Remediation

Phytoremediation was not retained because it would require a long timeframe, its effectiveness is

limited because of the challenges in plant uptake of metals, and also the fact that some impacted soil is below root zone. In addition, phytoremediation is generally used for lower levels of contamination than what exists at the site and is limited to growing season.

Impermeable liner cap (e.g., clay, plastic, etc.) was not retained due to potential complications with site hydrology associated with its implementation, such as ponding and increased runoff into adjacent stream. Being on the floodplain, it also has the potential to destruct riparian habitat and loss of ecological services provided by this area.

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.

In situ stabilization was not retained due to the technology causing significant disturbance to the site, the fact that it does not permanently reduce the volume of hazardous substances, space constraints, and complexities associated with the technology for contamination located within flood zone.

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

5.2.1.2 Technologies Not Retained for Sediment Remediation

Thin-layer capping with armor material, such as gravel or stone, was not retained due to uncertain effectiveness for source control.

Impermeable liner capping was not retained because of its impact on drainage characteristics of the creek and potential to alter site hydrology by reducing infiltration. It will also result in destruction of riparian habitat and loss of ecological services provided by this area.

In situ subaqueous reactive capping was not retained due to uncertainty with long-term effectiveness and moderately high cost.

Phytoremediation was not retained because of the challenges in plant uptake of metals, it would require a long timeframe with limited effectiveness, and also the fact that some impacted sediment is below root zone. In addition, phytoremediation is generally used for lower levels of contamination than what exists at the site and is limited to growing season.

In situ chemical treatment was not retained due to moderately high cost and potential impacts of adding chemicals to creek ecosystem.

Hydraulic and mechanical dredging were not retained due to high cost and difficulty associated with treatment and/or disposal of very large volume of water that would be generated with their implementation. In addition, establishment of dewatering facilities and water quality monitoring that are usually required for these technologies could slow the process.

5.2.2 Technologies Retained for Further Analysis

From the list of technologies potentially applicable for remediation of the COC and media of concern at this site (**Table 5-1A and Table 5-1B)**, after eliminating the technologies that were considered either too expensive, not implementable or ineffective, remaining technologies were retained to develop remedial alternatives. The technologies retained for both soil and sediment are listed below.

- The no action is retained, as set forth in the CERCLA National Contingency Plan, to automatically pass through the screening and be compared with other technologies.

- The engineering and institutional controls, that consist of land use restriction to limit human and environmental exposure, was retained due to is low cost and ease of implementation.

- Multi-media cap (consisting typically of sand, gravel, clay, and stone) was retained due to the relative ease of implementation and moderate cost.

- Excavation of soil and sediment was retained, despite the high cost, due to the ability to remove large volumes of contamination from the site in a short period.

- Stabilization/solidification and offsite disposal of soil and sediment was retained as it is relatively easy to implement and decreases water content. Additionally, it may be required for excavation options to meet RAOs.

5.2.3 Overview of Remedial Alternatives

The following remedial alternatives are considered in this FS for OU3:

- ***Alternative 1***—No Action

- ***Alternative 2***—Site Management

- ***Alternative 3—***Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal

- ***Alternative 4***—Excavation of Soil to Applicable Use based SCO and Sediment to Class B SGV with Offsite Disposal

- ***Alternative 5***—Excavation with Multi-media Capping of Soil and Sediment.

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6. SCOPING AND DEVELOPMENT OF REMEDIAL ALTERNATIVES

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 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 (EA 2016).

The scoping and development of the technologies/alternatives presented in section 5.0 of the FS are described below.

The extent and volume of soil/sediment requiring remediation was determined based on data collected during the RI. As shown in **Figures 6-1A through 6-2E**, for areas with horizontally unbound data, additional areas outside of known contamination have been used to indicate data gap and listed as "unbound contamination". The boundaries used for residential use excavation alternative were also used for the capping alternative as shown in **Figures 6-3A through 6-3E**. Similarly, for areas with vertically unbound data, a minimum of 6- to 12-inch buffer was added to provide a more conservative volume estimate. A pre-design investigation is needed to delineate the horizontal and vertical extent of contamination and determine the final impacted area limits. Detailed alternatives screening is presented in **Table 6-1**. The applicable use based SCO remedial alternative encompasses restricted use including residential use, restricted residential and commercial SCOs. Residential SCOs apply to private residences, restricted residential SCOs apply to school properties, and commercial SCOs apply to commercial property in a nearby shopping plaza. As OU3 includes a creek and floodplain area, special considerations are required for safe conveyance of base and flood flow within the creek, as well as the ecological impacts to the site. Alternatives must be able to work with or resist the geomorphic processes active within the riparian corridor to prevent exposure, suspension, and transport of contaminated materials.

For each remedial alternative that incorporates excavation and offsite disposal, the excavation plans and associated cost estimates are based on the assumption that >90 ppm is hazardous waste (AECOM 2016). A pre-design investigation including characterization to identify areas of soil/sediment material that exhibit hazardous waste characteristics should be conducted prior to remedial design to segregate hazardous from non-hazardous through Toxicity Characteristic Leaching Procedure (TCLP) analysis. Previous evaluations on leachable cadmium have shown low values which did not exceed the TCLP threshold for cadmium of 1 mg/L (Rust Environment & Infrastructure 1998a). Therefore, depending on the TCLP analysis, the volume of hazardous waste may vary altering the cost estimate accordingly.

6.1 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 area in its present condition.

6.2 ALTERNATIVE 2: SITE MANAGEMENT

Alternative 2, the second potential remediation alternative, is to implement an environmental easement on the property to control the use of the site. This alternative would leave the site in its present physical condition, but would address the RAO "prevent ingestion/direct contact with contaminated soil/sediment" through engineering controls (e.g. fence). Additionally, site perimeter controls and access points would be installed, and warning signage posted.

6.3 ALTERNATIVE 3: EXCAVATION OF SOIL TO RESIDENTIAL USE SCO AND SEDIMENT IN ZONE OF IMPACT TO NATIVE MATERIAL WITH OFFSITE DISPOSAL

The third potential alternative evaluated is excavation and offsite disposal of soil/sediment material at an authorized facility. This alternative is aimed at removing soil that exceeds cadmium and chromium residential use SCOs (for private residences, school properties and commercial property) and removing sediment to native material in the zone of impact. The zone of impact is the portion of Willetts Creek (and associated floodplain) where cadmium and chromium were consistently observed above residential use SCOs for soil and for sediment above the lowest end of the Class B SGV- an indication of potential for moderate ecological impact. This zone extends from behind the shopping plaza (CR4) downstream to approximately 500 ft. south of the footbridge at Edmore Lane (CR36).

Excavation is a common remedy used to remove contaminated soil and sediment impacted by contaminants from a source area. This approach can be effective at eliminating exposure and preventing transport of contaminants. *Ex situ* physical/chemical amendment (e.g. Portland cement) to help facilitate handling and offsite disposal of wastes. It requires addition of amendments that decrease water content and mobility of contaminants. The excavated area would be restored to a stable riparian corridor with stable stream and floodplain.

This alternative would be implemented as follows:

- Pre-Design Investigation to refine excavation boundaries.

- A utility locator would be brought onsite prior to the remedial design process of this alternative to locate known underground utilities or other obstructions that may prove problematic during excavation activities. This information would be utilized to either re-route these utilities outside the remediation or to accommodate their locations and future anticipated maintenance.

- A detailed 1-ft contour survey would be collected by a licensed surveyor to document the existing conditions of Willetts Creek corridor, including limits of wetlands and waterways, trees, utilities, topographic features including stream bottom, and other relevant existing conditions. The delineation will be used to obtain any necessary permits and authorizations for wetland disturbance/mitigation as required by the Army Corps of Engineers.

- A wetland survey, if required by United States Army Corps of Engineers 404 Permit.

- In order to understand the magnitude of flow, velocity and shear forces associated with typical floodplain conditions on Willetts Creek, a detailed hydrology and hydraulics study would be completed for Willetts Creek at the points of interest. Analysis of any drainages contributing within the work area would also be performed.

- Analysis of the stable dimensional, plan and profile forms of Willetts Creek would be documented for restoration of the stream following excavation activities.

- Clearing, chipping, and grubbing of woody material and subgrade preparation of the site would be conducted.

- Stream may be diverted by pipe diversion of base flow with storm capacity of Willetts Creek. Dewatering and maintenance of flow measures would be utilized to create a stable work area, especially when excavating below the water table. Options for water management include use of temporary storage tanks for offsite disposal or onsite treatment for discharge but will require permits and approval from federal, state, and local agencies. The creek is fed by both upstream surface water runoff and groundwater base flow. The sand and gravel deposit underlying the creek sediments may cause difficulty in dewatering due to their high permeability inducing high upward hydraulic gradients (Rust Environment & Infrastructure 1998b). These issues can be minimized by planning excavation during late summer when there are favorable hydrologic situations such as low creek flows and groundwater levels as well as high evapotranspiration.

- Approximately 32,645 cy of contaminated sediment and soil covering 5.7 acres averaging a depth of 3 ft would be excavated from the area. Excavated sediment would be stockpiled onsite at a staging area for gravity dewatering and stabilized on or near the area of excavation using Portland cement or a similar product to meet paint filter test requirements.

When confirmation sample analytical results indicate all soil containing cadmium and chromium exceeding residential use SCOs and all sediment and soil within the area of impact have been removed, the site would be restored with the following:

- Clean fill from an offsite source meeting the requirements of 6 NYCRR Part 375-6.7(d) would be used to achieve appropriate grades to restore stream and wetland functions including new stream channel, riffles, pools, and grade controls, and enable re-vegetation and stabilization. Grade control structures may be necessary in certain location to prevent scour and erosion to the replaced soil materials.

- The excavated and disturbed area within the Creek would be stabilized with an appropriate wetland and riparian seed mix and topsoil for growing medium. It is

recommended that any vegetative community established be in accordance with the native ecology present in similar systems.

- Clean fill from an offsite source meeting the requirements of 6 NYCRR Part 375-6.7(d) would be brought in to replace the excavated soil and establish the designed grades at the upland properties, and if appropriate top soil and grass seed.

- Monitoring as part of the Dzus site management plan would be implemented to assure the restoration is successful and the remedy remains protective.

6.4 ALTERNATIVE 4: EXCAVATION OF SOIL TO APPLICABLE USE BASED SCO AND SEDIMENT TO CLASS B SGV WITH OFFSITE DISPOSAL

The fourth potential remediation alternative evaluated is excavation of soil that exceeds the applicable use based SCO (residential use for private residences, restricted residential for school properties and commercial use for commercial property in a near-by shopping plaza) and sediment that exceeds Class B SGV for cadmium and chromium and offsite disposal at an authorized facility. For Alternative 4, contamination will remain in place and therefore, this alternative depends on agreement with property owners to allow access for the continued monitoring of the remaining contamination, modification of the Dzus Site Management Plan to address ongoing monitoring of the OU3 area, and the implementation of Deed Restrictions on private property.

This alternative would be implemented in the same way as Alternative 3, with differences for handling of soil highlighted below:

- Approximately 15,536 cy of contaminated sediment and soil covering 3.9 acres would be excavated from the site to a 6 ft maximum depth. Excavated soil/sediment would be stockpiled onsite at the staging area for gravity dewatering and treated on site/stabilized using Portland cement or a similar product to meet paint filter test requirements.

- A demarcation layer of geotextile would be placed on top of the remaining soil contamination (exceeding unrestricted use SCO) before backfilling with clean fill from an offsite source. Grade control structures may be necessary in certain locations to prevent scour and erosion to the replaced soil materials.

6.5 ALTERNATIVE 5: EXCAVATION WITH MULTI-MEDIA CAPPING OF SOIL AND SEDIMENT

The fifth potential remediation alternative evaluated is capping of impacted soil and sediment. Capping provides a physical barrier to contain the contaminated media to reduce potential exposures. In this alternative, contaminated soil and sediment would be covered by clean sand, soil, cobble, gravel, top soil, and/or organic matter to recreate a floodplain surface and creek system. Multi-media cap effectively address RAOs and is effective in long-term source control unless inorganics are soluble and upwelling is substantial. In the case of

significant upwelling of groundwater, an alternative material might be needed to minimize movement of contaminants upward through the cap. Installation of a cap in residential areas will require 2 ft of excavation, and 1 ft of excavation in commercial areas. For Alternative 5, contamination will remain in place and therefore, this alternative depends on agreement with property owners to allow access for the continued monitoring of the remaining contamination, modification of the Site Management Plan, and the implementation of Deed Restrictions on private property. Since the creek profile cannot be raised, capping will require excavation of 1.5 ft of contaminated sediment for the creek. This approach will remove contamination in areas with shallow contamination, which is a significant portion of the creek, and consequently will not require capping for those areas; however, backfill will need to be used to return the creek bed to its original contours

This alternative will be implemented in the same way as Alternatives 3 and 4, with differences highlighted below:

- Approximately 9,984 cy of contaminated sediment/soil will be excavated from the Willetts Creek and creek bank to allow for cap placement without altering the site bathymetry and topography. Excavated sediment and soil would be stockpiled at an adjacent or nearby staging area for gravity dewatering and amended using Portland cement or a similar product to meet paint filter test requirements

- Areas with soil contamination would be capped with clean common fill material and 6 inches of top soil. The residential areas will have 18 inches of common fill and commercial areas will have 6 inches of common fill.

- Multimedia capping would be installed with surface materials and contours conforming to the restored condition of Willetts Creek through the remediation area, including new stream channel, riffles, pools, and grade controls to ensure the long-term stability of the multimedia cap. The cap would be underlain by a protective layer of geotextile, to define the lower limit of the cap in the event of any future excavation in the area. This geotextile underlayment is typically non-woven geotextile and is orange in color to serve as a warning of the contaminated materials below.

Once excavation and cap placement are completed, the site would be restored with the following:

- The site would be stabilized with an appropriate wetland and riparian seed mix to stabilize the capped and excavated areas. Topsoil amendment may be necessary. It is recommended that any vegetative community established be in accordance with the native ecology.

- Additionally, the creation of an emergent or scrub-shrub system would decrease the likelihood of the establishment of large trees, which through flood flows, wind or other natural processes could uproot, damaging the multi-media capping system and risking exposure of contaminated sediments beneath.

Following completion, the cap would be inspected semi-annually for the first 5 years and annually thereafter. The cap inspection will serve to monitor effectiveness of the cap and identify any areas requiring repair.

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 2000). 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 A** 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 SCG—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 onsite 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 is to develop, screen, and evaluate potential remedial alternatives for the Dzus Fastener Company, Inc. site. Remedies were identified and screened in accordance with EPA (1988, 2000) and NYSDEC (1998, 2006, 2010) guidance. The comparison of alternatives and recommendations are described below, and summarized in **Table 8-1**.

The following remedial alternatives are considered for this FS:

- ***Alternative 1*** —No Action
- ***Alternative 2***—Site Management
- ***Alternative 3***— Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal
- ***Alternative 4***—Excavation of Soil to Applicable Use based SCO and Sediment to Class B SGV with Offsite Disposal
- ***Alternative 5***—Excavation with Multi-media Capping of Soil and Sediment.

8.1 COMPARISON OF ONSITE 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. Alternative 2 moderately fulfills this criterion by protecting public health by the implementation of institutional and engineering controls. Alternative 3 and 4 fulfill this criterion by removing the contaminants exceeding applicable SCGs. Alternative 5 fulfills this criterion by closing off the soil/sediment exposure pathway; and thereby, preventing human contact with remaining contamination.

8.1.2 Standards, Criteria, and Guidance

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

Alternatives 1 and 2 do not meet this criterion. Alternatives 3 meets this criterion by removing soil exceeding residential use SCO and sediment exceeding lower limit of Class B SGV. Alternative 4 meets this criterion by removing soil exceeding residential, restricted residential and commercial use SCO and sediment exceeding upper limit of Class B SGV. Alternative 5 meets this criterion by containing the contaminated soil/sediment under the cap.

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 onsite 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. Alternative 2 will not provide long-term effectiveness as a stand-alone alternative. Alternatives 3 and 4 will fulfill this criterion because contaminants at concentrations exceeding respective SCGs would be permanently removed from the site. Alternative 5 will fulfill this criterion but would require long-term maintenance of cap and monitoring as the impacted soil/sediment would remain on site.

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.

Alternatives 1 and 2 will not reduce the toxicity, mobility, or volume of contamination. Alternatives 3 and 4 will fulfill this criterion by removal of contamination exceeding respective SCGs. Alternative 5 will fulfill this criterion by modest removal and containment of contaminated soil/sediment.

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.

Alternatives 1 and 2 do not pose additional risk to the community, workers, or environment, as there are no construction activities involved. The remaining alternatives pose increased short-term risks to the public during excavation, grading, treatment, and other site activities through the generation of dust; these effects can be reduced through the implementation of standard dust mitigation construction practices. Workers can potentially be exposed to contaminated media during excavation and/or treatment activities involved. Risks can be minimized by implementing health and safety controls, including the use of appropriate personal protective equipment. These alternatives will pose increased short-term risks to the environment in the form of air emissions.

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. Implementing Alternatives 2–5 will present challenges due to proximity of schools and residences.

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. Alternative 2 is very low in cost and effectiveness. Alternative 3 is the most expensive but is also the most effective. Alternative 4 is more expensive than Alternative 5 but is also more effective.

8.1.8 Land Use

Alternative 1 and 2 would require an environmental deed restriction limiting future use of the site since contamination would remain. Under alternatives 3, 4, and 5 some of impacted media would remain on site, so the land use would be restricted. However, alternative 3 is the least restrictive because soil exceeding residential use for cadmium and chromium would be removed.

8.1.9 Community Acceptance

This criterion evaluates concerns of the community regarding the investigation and the evaluation of alternatives. The Dzus Fastener Company, Inc. site remedial approach has not been presented to the community for comment at this point.

8.2 PREFERRED REMEDIAL ALTERNATIVE FOR THE DZUS FASTENER COMPANY, INC. SITE

Alternative 3 is recommended because while the capital cost is high, the remedial approach removes soil exceeding residential use SCO and removes sediment posing low to high risks with highest reduction of toxicity, mobility and volume of contamination.

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Figures

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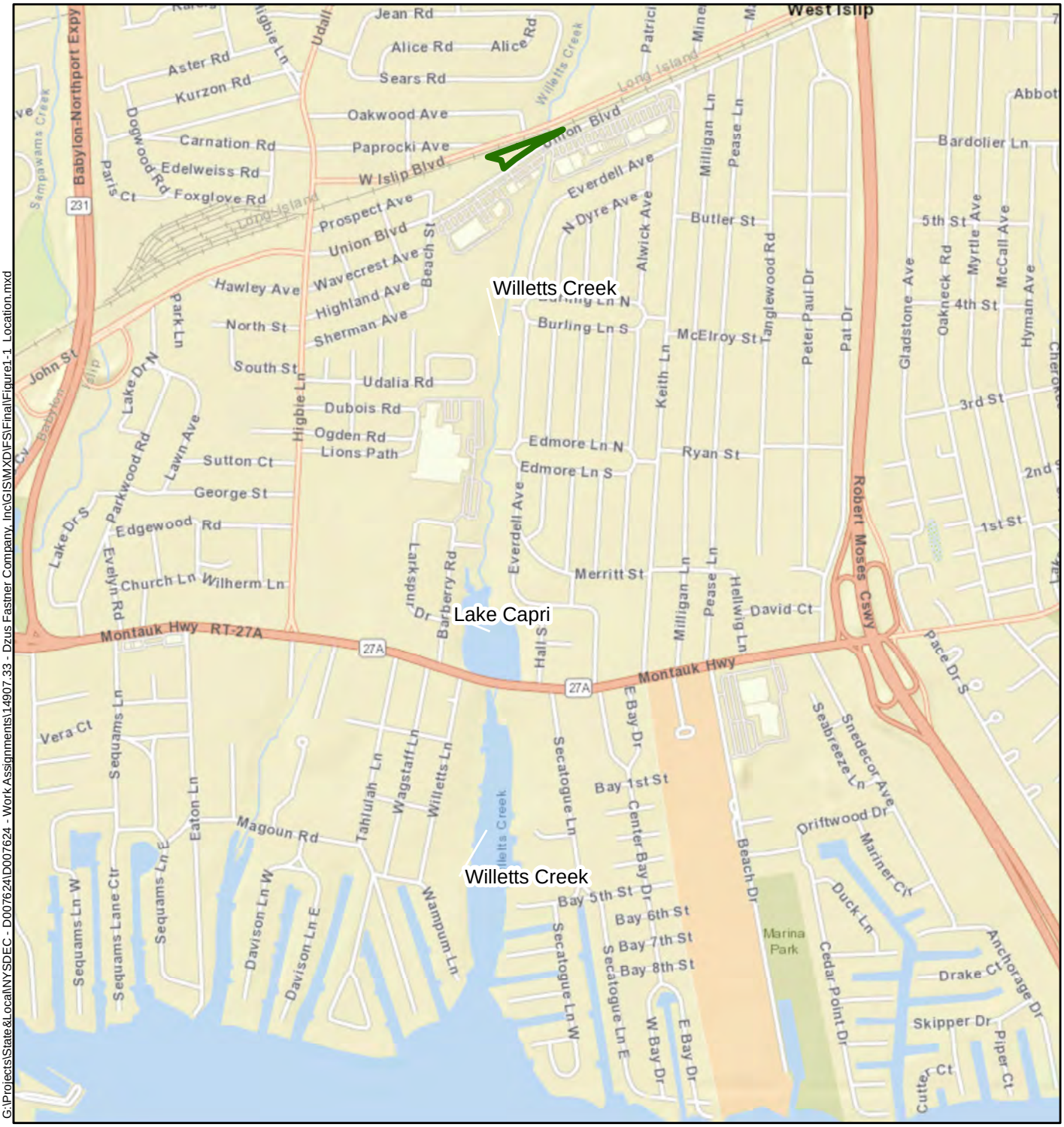

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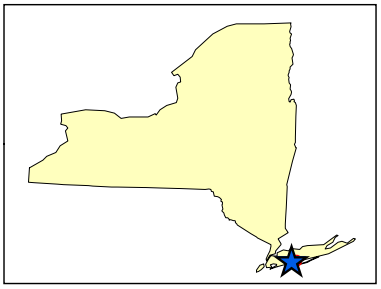

Legend

Site Boundary

0 0.25 0.5
Miles

1 inch = 0.25 miles

N

Figure 1-1
General Site Location

OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 5/1/2017
Projection: NAD83 State Plane New York Long Island

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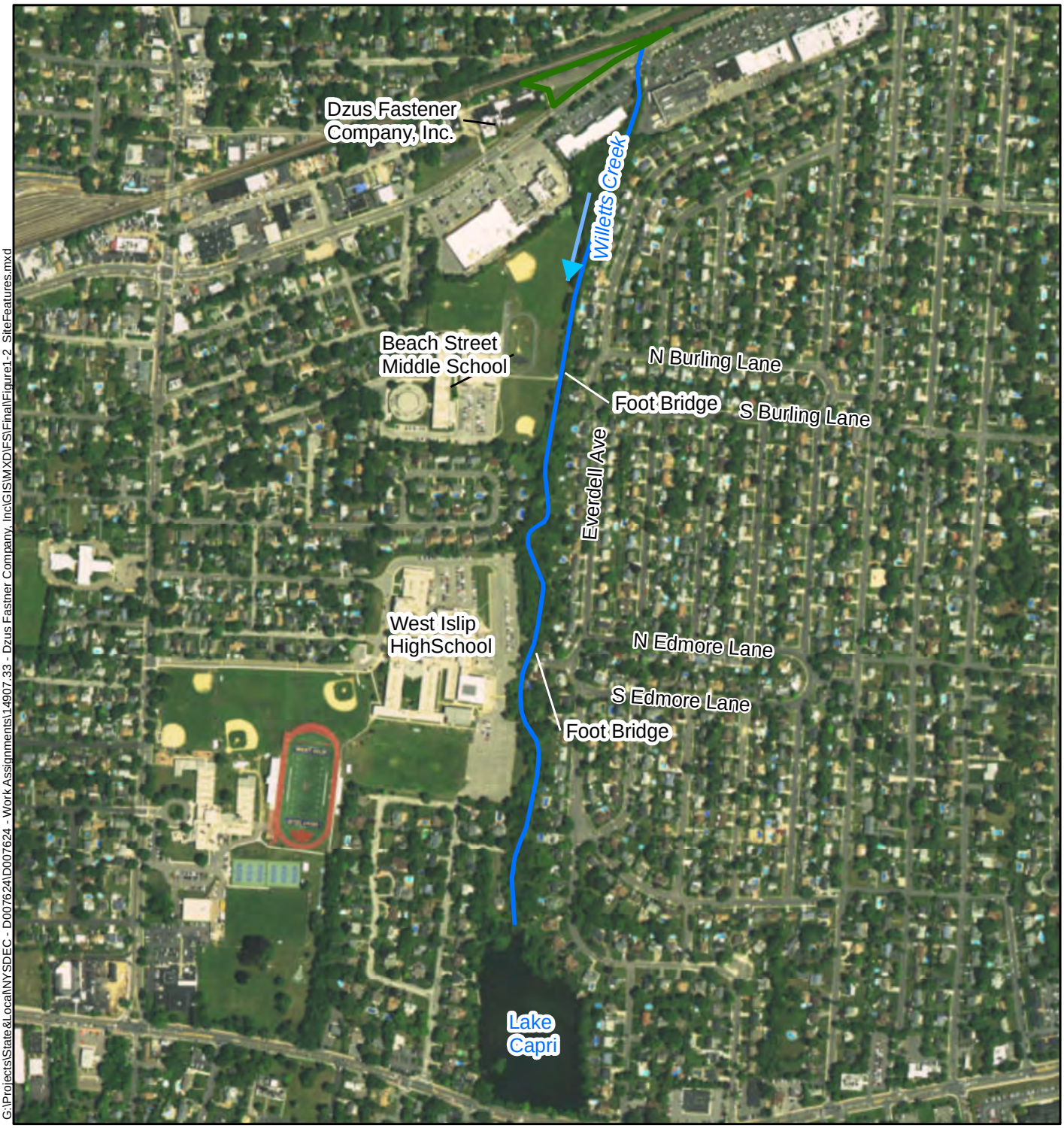

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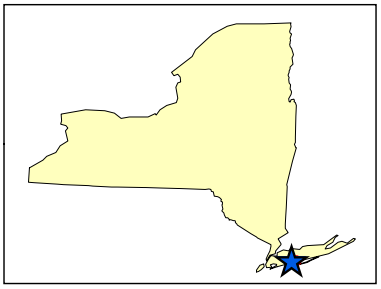

Legend

- Site Boundary
- Willletts Creek

0 0.125 0.25
Miles

1 inch = 0.125 miles

N

Figure 1-2
Site Features and Surrounding Area

OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 5/2/2017
Projection: NAD83 State Plane New York Long Island

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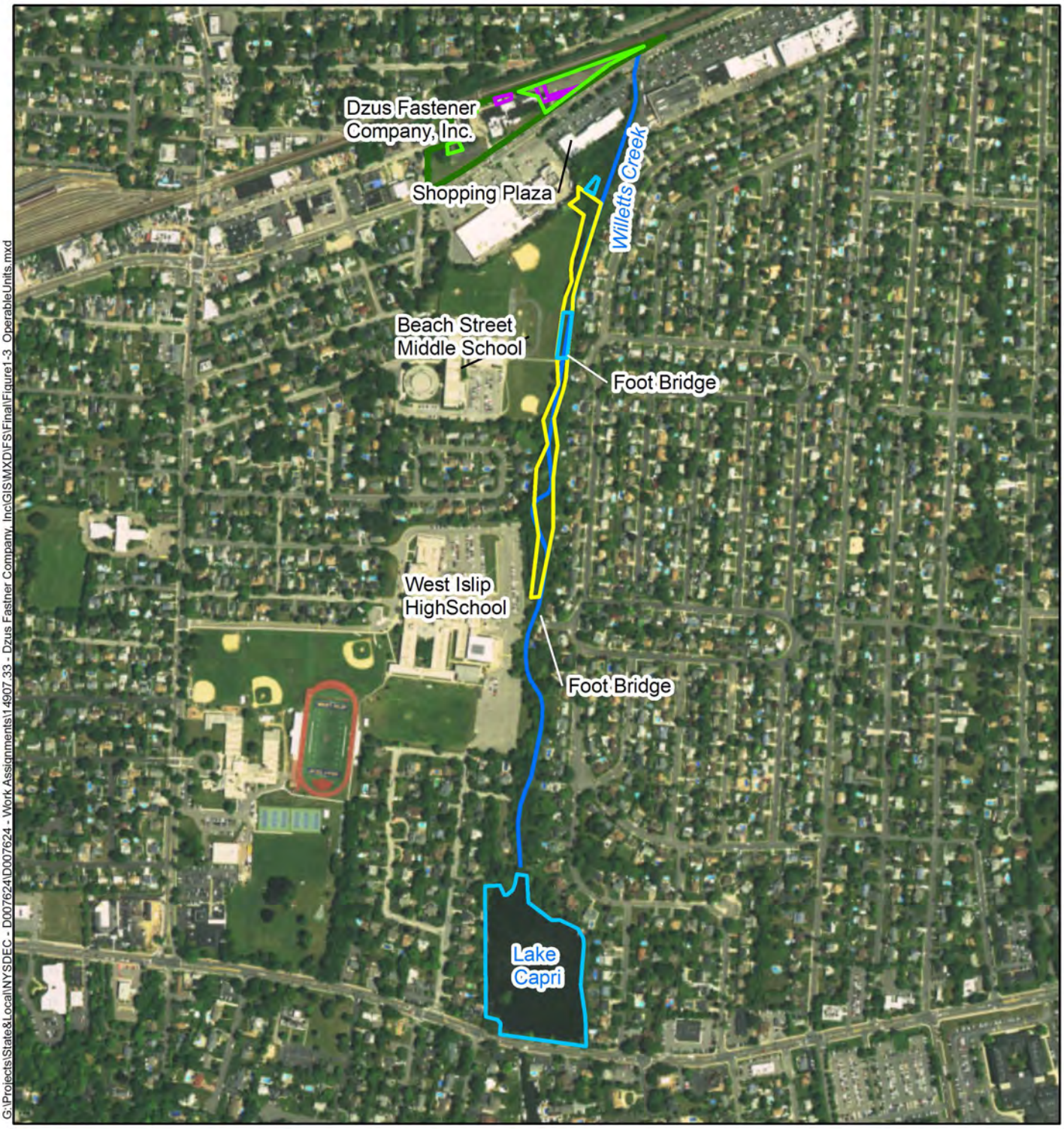

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0 0.125 0.25
Miles

N

Legend

- Site Boundary
- Willletts Creek

Approximate OU Boundary

- Operable Unit 1
- Operable Unit 1A
- Operable Unit 2
- Operable Unit 3

Figure 1-3
Operable Units
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 11/16/2016
Projection: NAD83 State Plane New York Long Island

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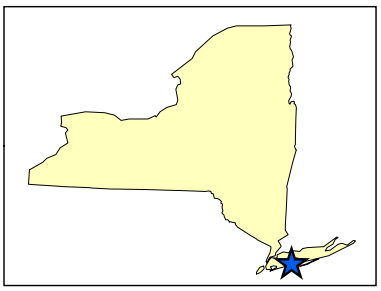

Legend

- Site Boundary
- Tax Parcel Boundary
- Willletts Creek

0 0.125 0.25
Miles

1 inch = 0.125 miles

N

Figure 1-4
Suffolk County Tax Parcel Identification

OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 9/23/2016
Projection: NAD83 State Plane New York Long Island

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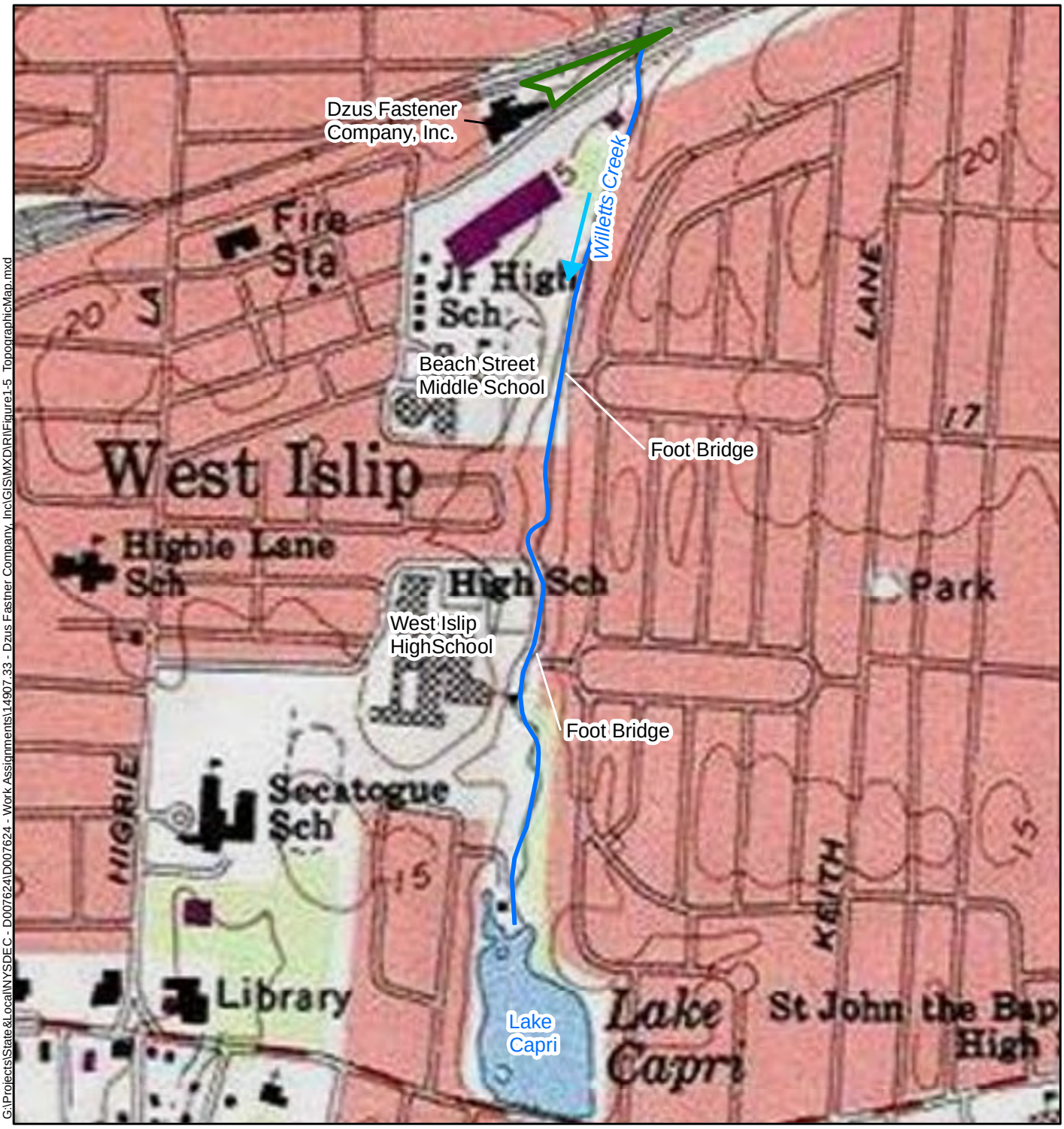

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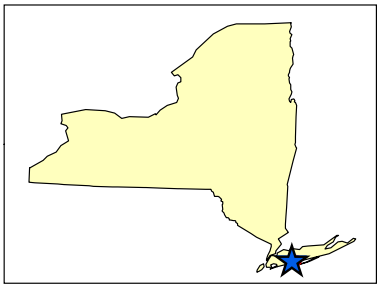

0 0.125 0.25
Miles

1 inch = 0.125 miles

N

Legend

- Dzus Site
- Willletts Creek

Figure 1-5
Topographic Map
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 4/13/2017
Projection: NAD83 State Plane New York Long Island

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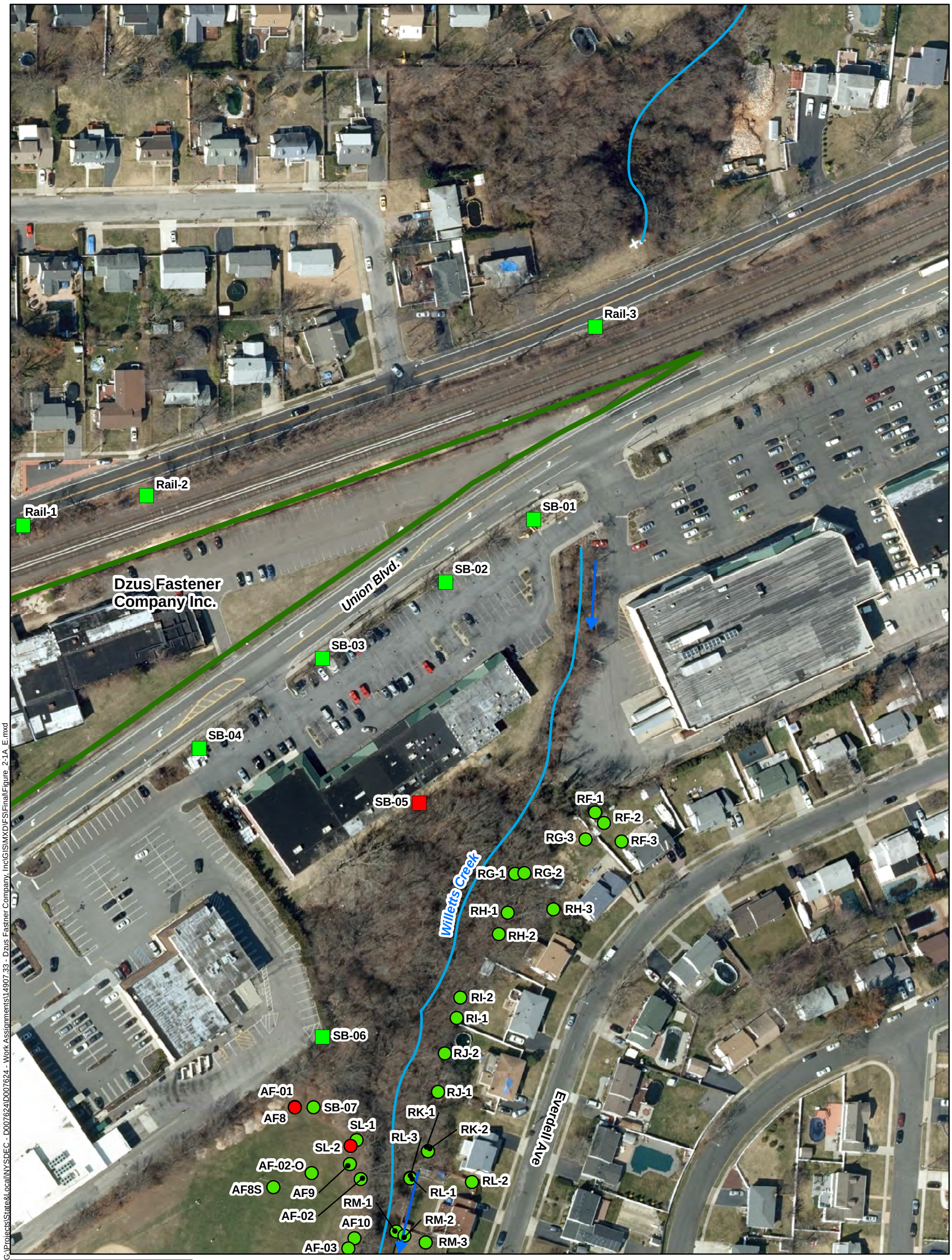

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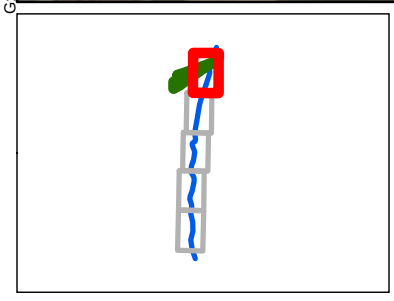

0 100 200
Feet

N

Legend

- Below Commercial SCO
- Above Commercial SCO
- Below Residential SCO
- Above Residential SCO
- Willetts Creek
- Dzus Fastener Site

Figure 2-1A
Soil Cadmium **E**xceedances
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Note: SCO = Soil Cleanup Objective as determined by applicable land use and Table 375-6.8(B) of 6 NYCRR Part 375.

SCO for Residential = 2.5 mg/kg
SCO for Commercial = 9.3 mg/kg

Sample nomenclature for floodplain soil samples identified by residential property IDs. School property samples denoted by "AF" or "HS." All other samples assigned IDs based on sample type and the order in which they were collected.

Map Date: 11/16/2016
Projection: NAD83 UTM Zone 18N

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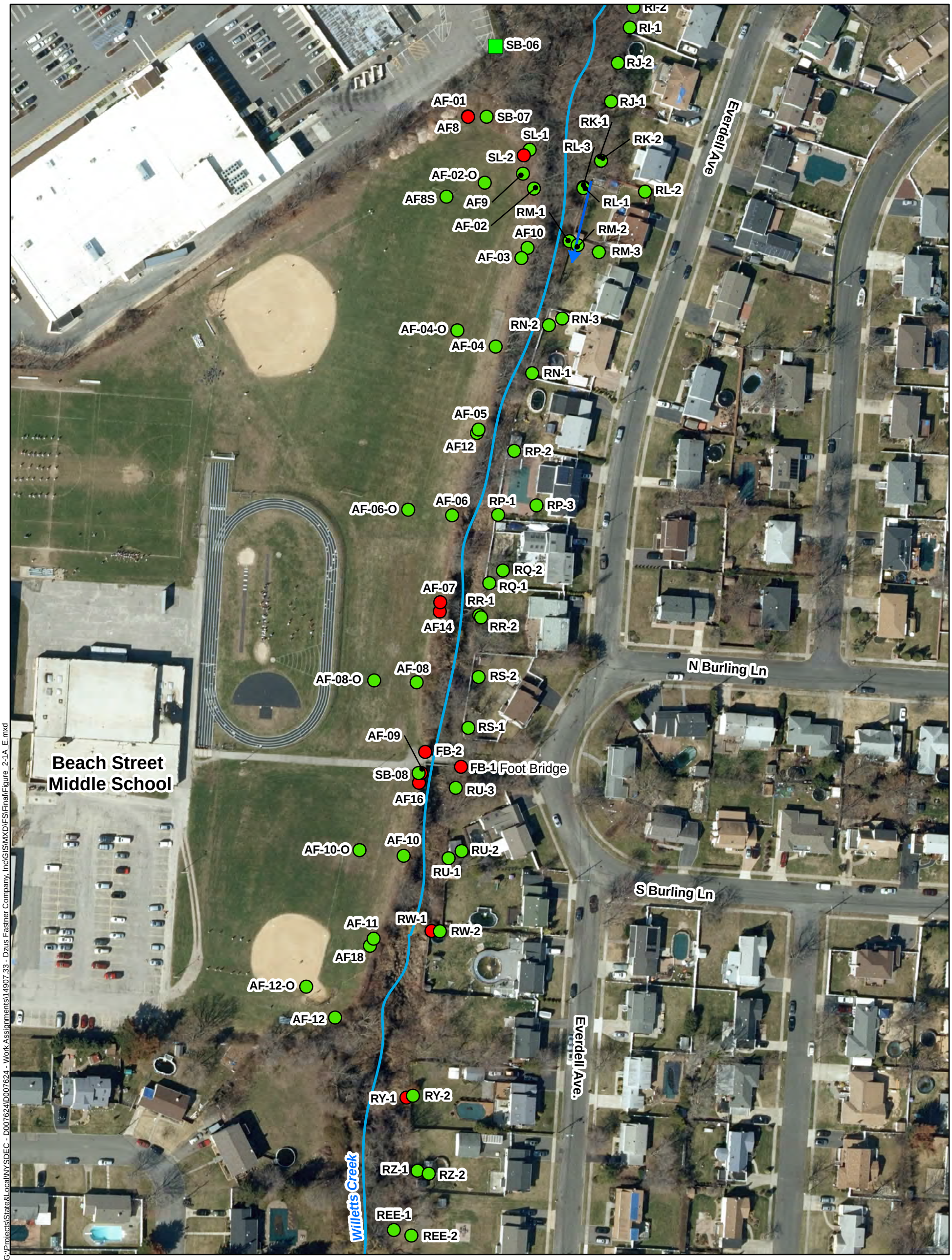

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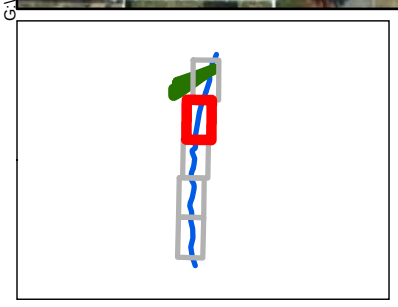

0 100 200
Feet

N

Legend

- Below Commercial SCO
- Above Commercial SCO
- Below Residential SCO
- Above Residential SCO
- Willetts Creek
- Dzus Fastener Site

Note: SCO = Soil Cleanup Objective as determined by applicable land use and Table 375-6.8(B) of 6 NYCRR Part 375.

SCO for Residential = 2.5 mg/kg
SCO for Commercial = 9.3 mg/kg

Sample nomenclature for floodplain soil samples identified by residential property IDs. School property samples denoted by "AF" or "HS." All other samples assigned IDs based on sample type and the order in which they were collected.

Figure 2-1B
Soil Cadmium **E**xceedances
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 11/16/2016
Projection: NAD83 UTM Zone 18N

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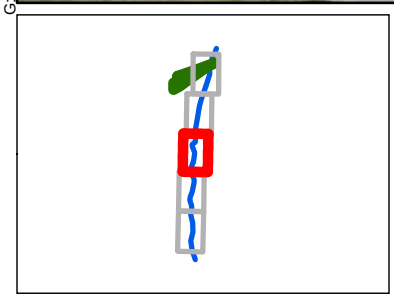

0 95 190
Feet

N

Legend

- Below Commercial SCO
- Above Commercial SCO
- Below Residential SCO
- Above Residential SCO
- Willetts Creek
- Dzus Fastener Site

Note: SCO = Soil Cleanup Objective as determined by applicable land use and Table 375-6.8(B) of 6 NYCRR Part 375.

SCO for Residential = 2.5 mg/kg
SCO for Commercial = 9.3 mg/kg

Sample nomenclature for floodplain soil samples identified by residential property IDs. School property samples denoted by "AF" or "HS." All other samples assigned IDs based on sample type and the order in which they were collected.

Figure 2-1C
Soil Cadmium **E**xceedances
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 11/16/2016
Projection: NAD83 UTM Zone 18N

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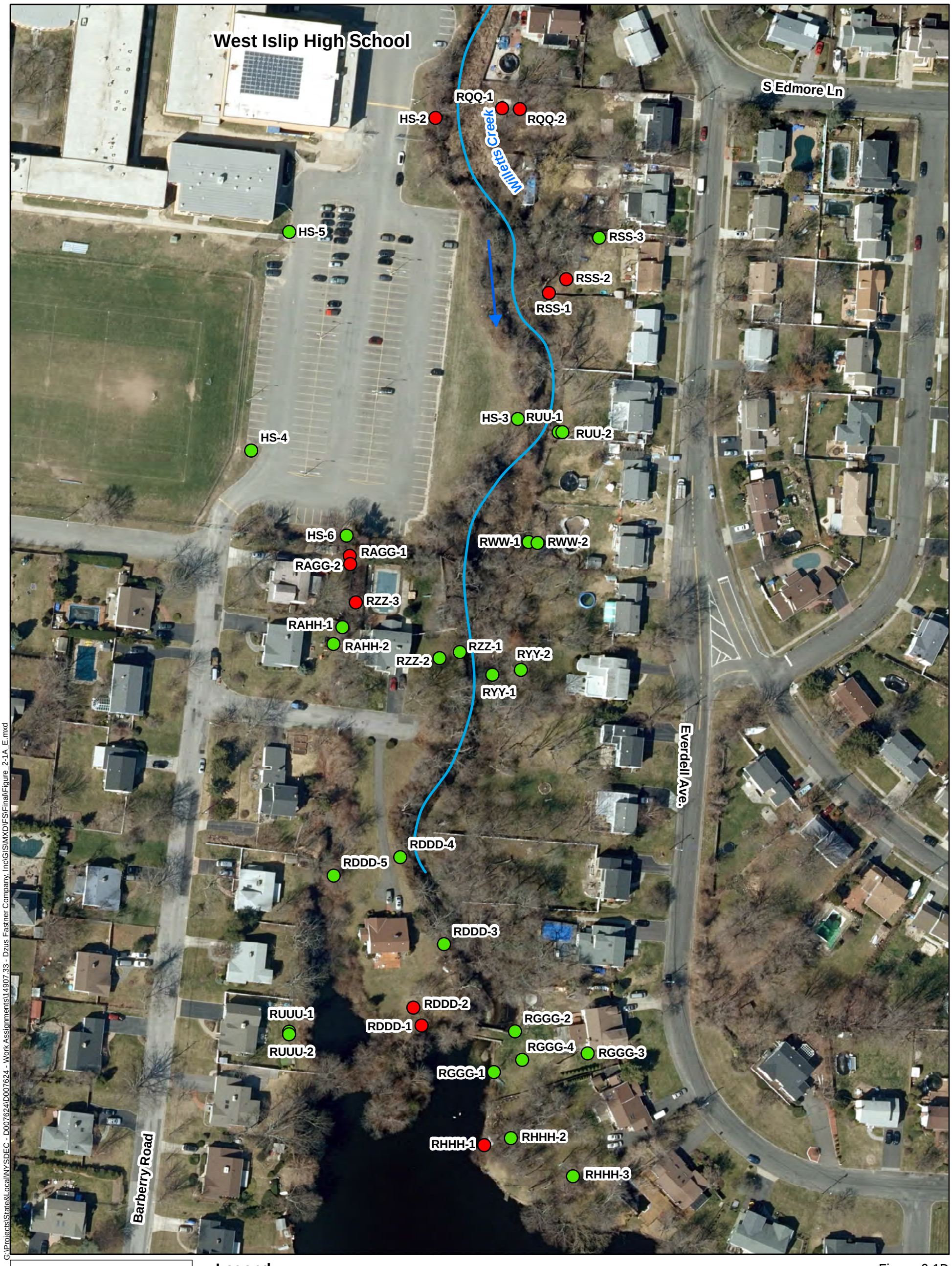

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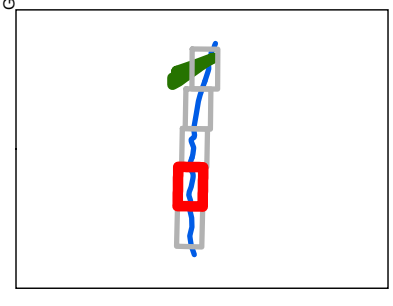

Legend

- Below Commercial SCO
- Above Commercial SCO
- Below Residential SCO
- Above Residential SCO
- Willetts Creek
- Dzus Fastener Site

Note: SCO = Soil Cleanup Objective as determined by applicable land use and Table 375-6.8(B) of 6 NYCRR Part 375.

SCO for Residential = 2.5 mg/kg
SCO for Commercial = 9.3 mg/kg

Sample nomenclature for floodplain soil samples identified by residential property IDs. School property samples denoted by "AF" or "HS." All other samples assigned IDs based on sample type and the order in which they were collected.

Figure 2-1D
Soil Cadmium **E**xceedances

OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 11/16/2016
Projection: NAD83 UTM Zone 18N

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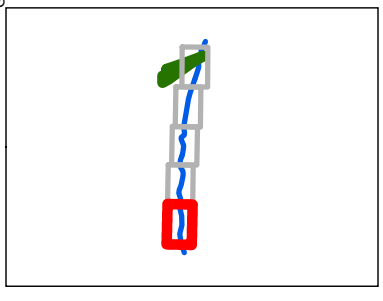

0 100 200
Feet

N

Legend

- Below Commercial SCO
- Above Commercial SCO
- Below Residential SCO
- Above Residential SCO
- Willetts Creek
- Dzus Fastener Site

Note: SCO = Soil Cleanup Objective as determined by applicable land use and Table 375-6.8(B) of 6 NYCRR Part 375.

SCO for Residential = 2.5 mg/kg
SCO for Commercial = 9.3 mg/kg

Sample nomenclature for floodplain soil samples identified by residential property IDs. School property samples denoted by "AF" or "HS." All other samples assigned IDs based on sample type and the order in which they were collected.

Figure 2-1E
Soil Cadmium **E**xceedances
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 11/16/2016
Projection: NAD83 UTM Zone 18N

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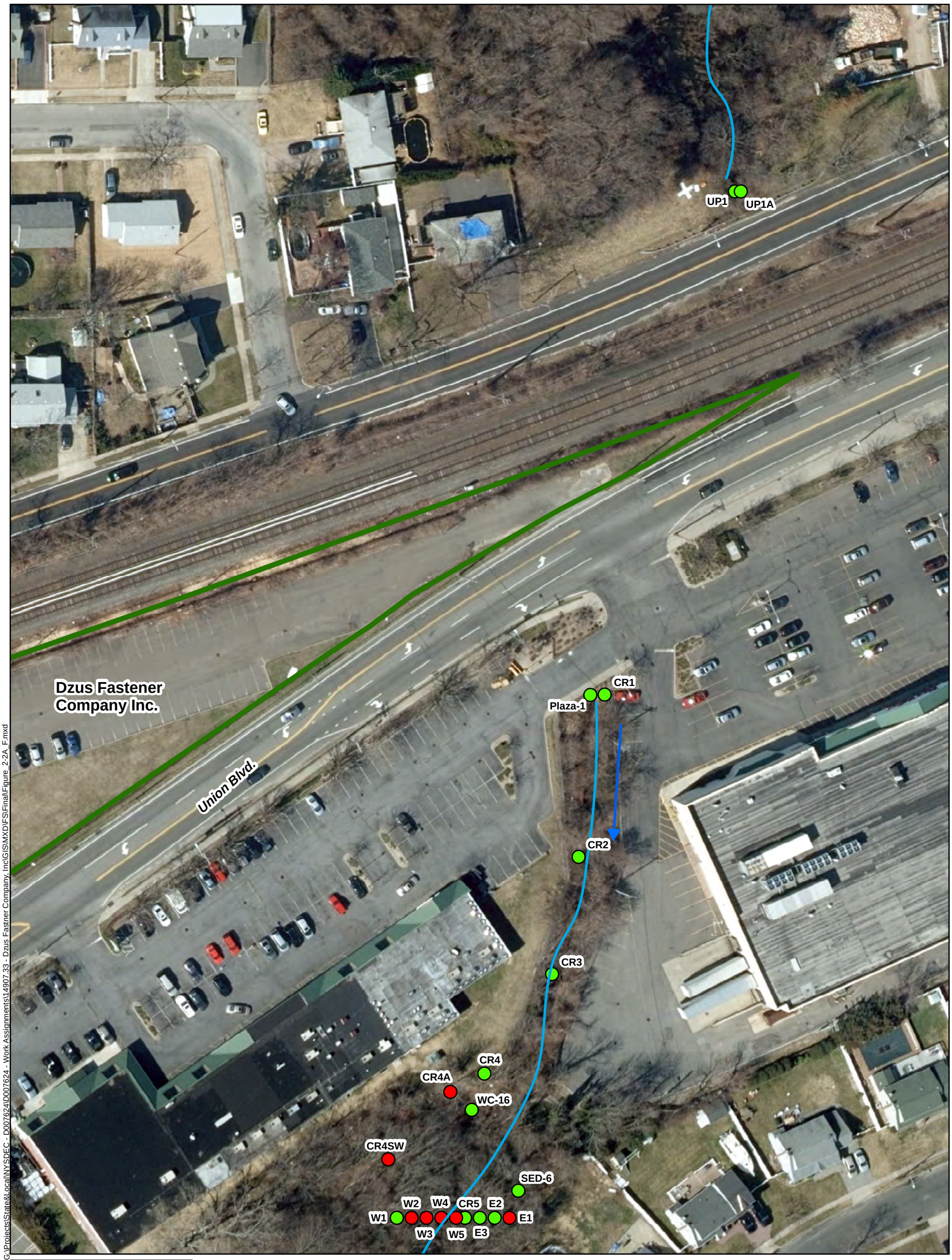

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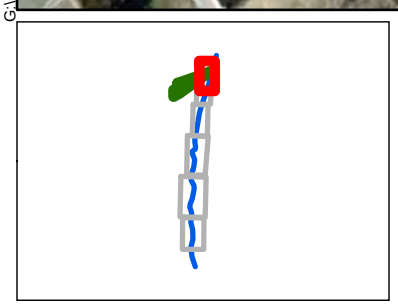

0 55 110
Feet

N

Legend

- Less than or equal to Class B SGV
- Greater than Class B SGV
- Willetts Creek
- Dzus Fastener Site

Note: SGV = Sediment Guidance Value
Class B Sediment Guidance Value for Cadmium= 1-5 mg/kg for slightly to moderately contaminated and additional testing is required to evaluate the potential risks to aquatic life as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment.

Sample nomenclature for floodplain soil samples identified by residential property IDs. School property samples denoted by "AF" or "HS." All other samples assigned IDs based on sample type and the order in which they were collected.

Figure 2-2A
Sediment Cadmium **E**xceedances
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 11/16/2016
Projection: NAD83 UTM Zone 18N

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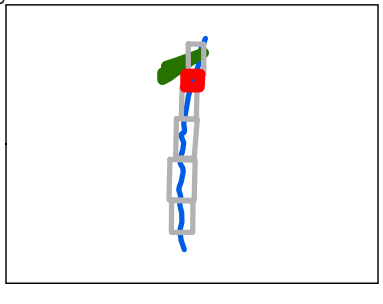

0 37.5 75
Feet

N

Legend

- Less than or equal to Class B SGV
- Greater than Class B SGV
- Willetts Creek
- Dzus Fastener Site

Note: SGV = Sediment Guidance Value
Class B Sediment Guidance Value for Cadmium= 1-5 mg/kg for slightly to moderately contaminated and additional testing is required to evaluate the potential risks to aquatic life as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment.

Sample nomenclature for floodplain soil samples identified by residential property IDs. School property samples denoted by "AF" or "HS." All other samples assigned IDs based on sample type and the order in which they were collected.

Figure 2-2B
Sediment Cadmium **E**xceedances
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 11/16/2016
Projection: NAD83 UTM Zone 18N

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W1
CR10
E1
W1
CR-11V
E1
W1
CR12
E1
W1
CR12/13
E1
W1
CR13
WC-15
E1
W1
CR14
E1
W1
CR-15V
E1
WC-13
Foot Bridge
W1
CR16
CR17
E2
W1
E1
CR17A
W1
W2
CR18
E1
E2
WC-12
W1
W2
E2
N Burling Ln
S Burling Ln
Everdell Ave.

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0
62.5
125
Feet

N

Legend

- Less than or equal to Class B SGV
- Greater than Class B SGV
- Willetts Creek
- Dzus Fastener Site

Note: SGV = Sediment Guidance Value
Class B Sediment Guidance Value for Cadmium= 1-5 mg/kg for slightly to moderately contaminated and additional testing is required to evaluate the potential risks to aquatic life as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment.

Sample nomenclature for floodplain soil samples identified by residential property IDs. School property samples denoted by "AF" or "HS." All other samples assigned IDs based on sample type and the order in which they were collected.

Figure 2-2C
Sediment Cadmium **E**xceedances
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 11/16/2016
Projection: NAD83 UTM Zone 18N

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

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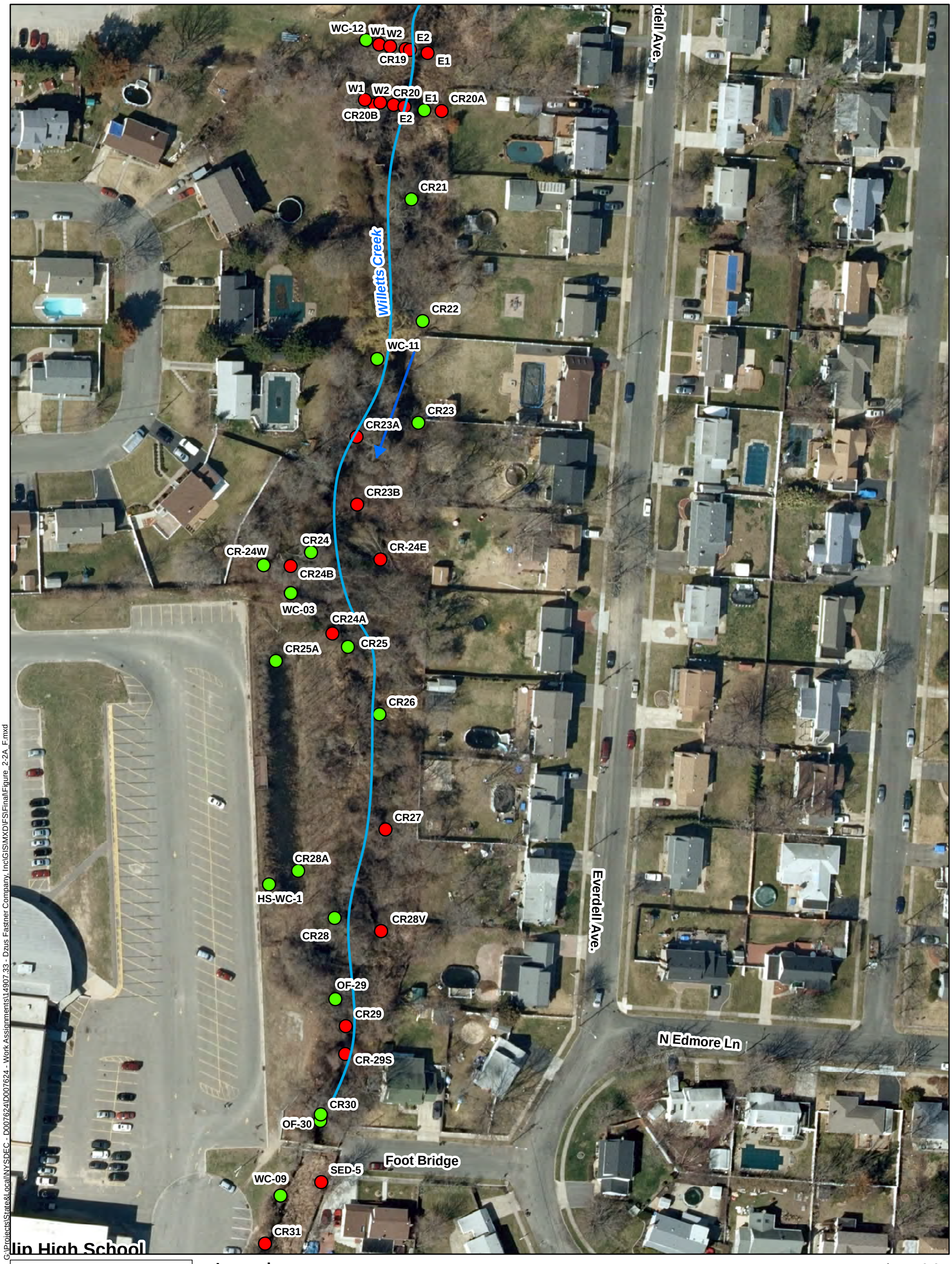

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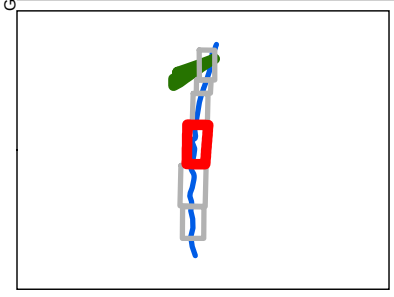

Legend

- Less than or equal to Class B SGV
- Greater than Class B SGV
- Willetts Creek
- Dzus Fastener Site

Note: SGV = Sediment Guidance Value
Class B Sediment Guidance Value for Cadmium= 1-5 mg/kg for slightly to moderately contaminated and additional testing is required to evaluate the potential risks to aquatic life as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment.

Sample nomenclature for floodplain soil samples identified by residential property IDs. School property samples denoted by "AF" or "HS." All other samples assigned IDs based on sample type and the order in which they were collected.

Figure 2-2D
Sediment Cadmium **E**xceedances

OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 11/16/2016
Projection: NAD83 UTM Zone 18N

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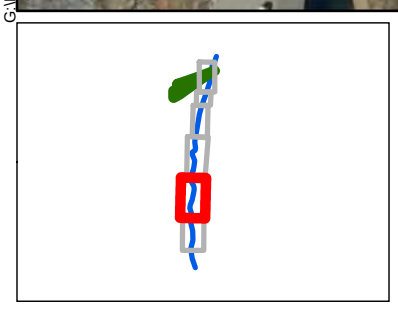

0 80 160
Feet

N

Legend

- Less than or equal to Class B SGV
- Greater than Class B Class SGV
- Willetts Creek
- Dzus Fastener Site

Note: SGV = Sediment Guidance Value
Class B Sediment Guidance Value for Cadmium= 1-5 mg/kg for slightly to moderately contaminated and additional testing is required to evaluate the potential risks to aquatic life as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment.

Sample nomenclature for floodplain soil samples identified by residential property IDs. School property samples denoted by "AF" or "HS." All other samples assigned IDs based on sample type and the order in which they were collected.

Figure 2-2E
Sediment Cadmium **E**xceedances
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 11/16/2016
Projection: NAD83 UTM Zone 18N

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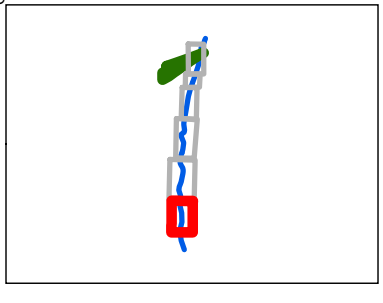

0 60 120
Feet

N

Legend

- Less than or equal to Class B SGV
- Greater than Class B SGV
- Willetts Creek
- Dzus Fastener Site

Note: SGV = Sediment Guidance Value
Class B Sediment Guidance Value for Cadmium= 1-5 mg/kg for slightly to moderately contaminated and additional testing is required to evaluate the potential risks to aquatic life as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment.

Sample nomenclature for floodplain soil samples identified by residential property IDs. School property samples denoted by "AF" or "HS." All other samples assigned IDs based on sample type and the order in which they were collected.

Figure 2-2F
Sediment Cadmium **E**xceedances

OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 11/16/2016
Projection: NAD83 UTM Zone 18N

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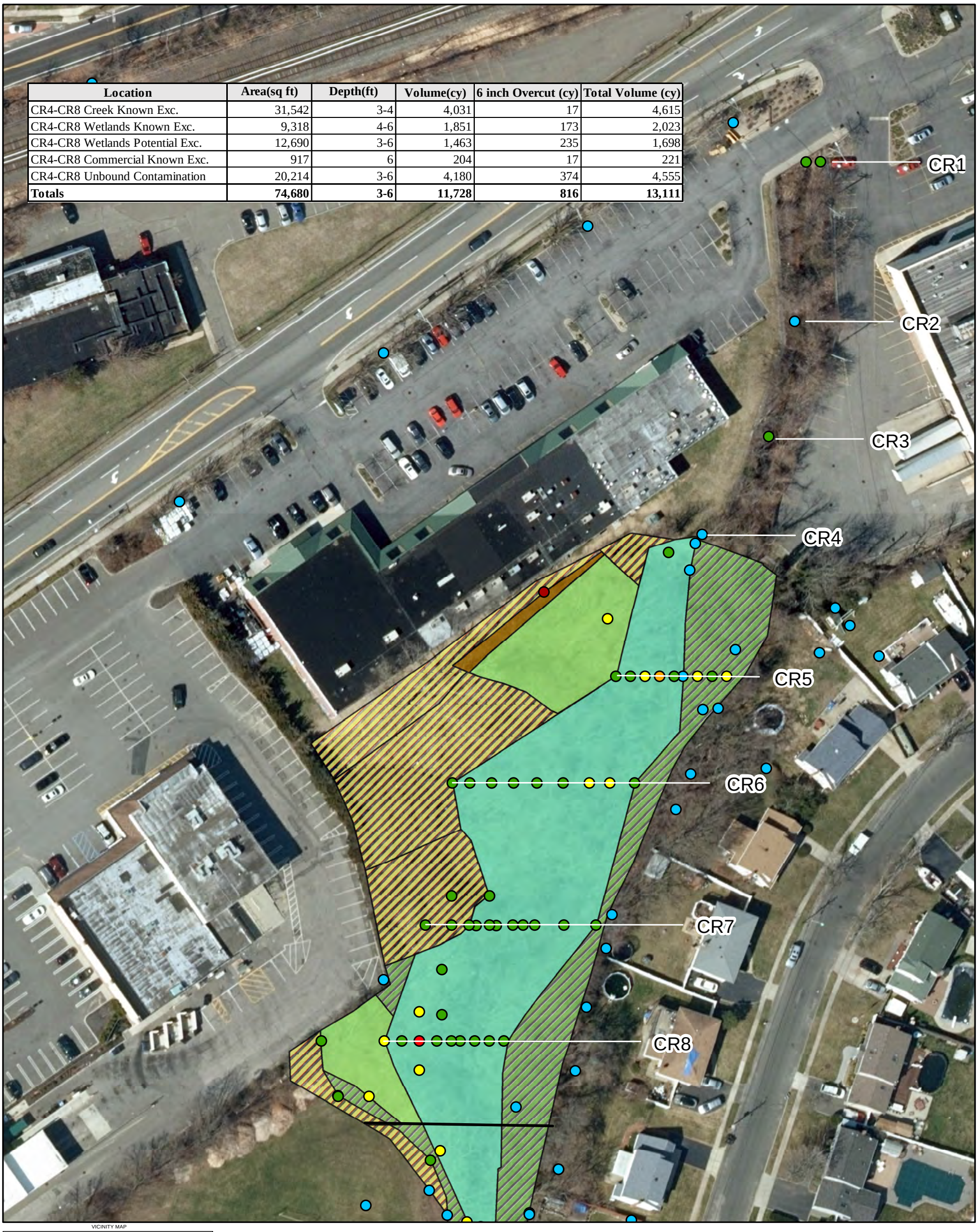
Location	Area(sq ft)	Depth(ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR4-CR8 Creek Known Exc.	31,542	3-4	4,031	17	4,615
CR4-CR8 Wetlands Known Exc.	9,318	4-6	1,851	173	2,023
CR4-CR8 Wetlands Potential Exc.	12,690	3-6	1,463	235	1,698
CR4-CR8 Commercial Known Exc.	917	6	204	17	221
CR4-CR8 Unbound Contamination	20,214	3-6	4,180	374	4,555
Totals	**74,680**	**3-6**	**11,728**	**816**	**13,111**



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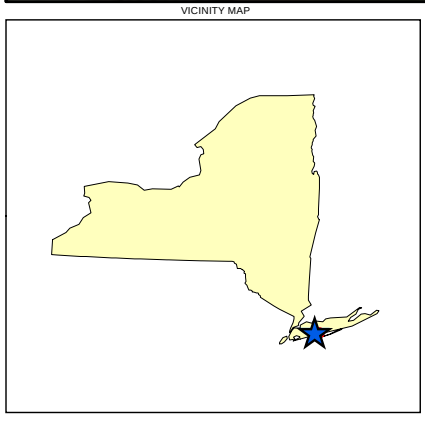
VICINITY MAP



0 50 100
Feet

N

Legend

Residential Use SCO Exceedance for soil and Class B SGV or higher impacted sediment

Known Exc.
- Commercial
- Creek
- Residential
- Wetlands

Potential Exc.
- Residential
- Wetlands

Unbound Contamination
- Soil/Sediment

Depth(ft)
- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value
SCO= Soil Cleanup Objective
Exc. = Exceedance
Cadmium Residential Use SCO= 2.5 mg/kg
Chromium Residential Use SCO= 36 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg
Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-1A
ALT 3: Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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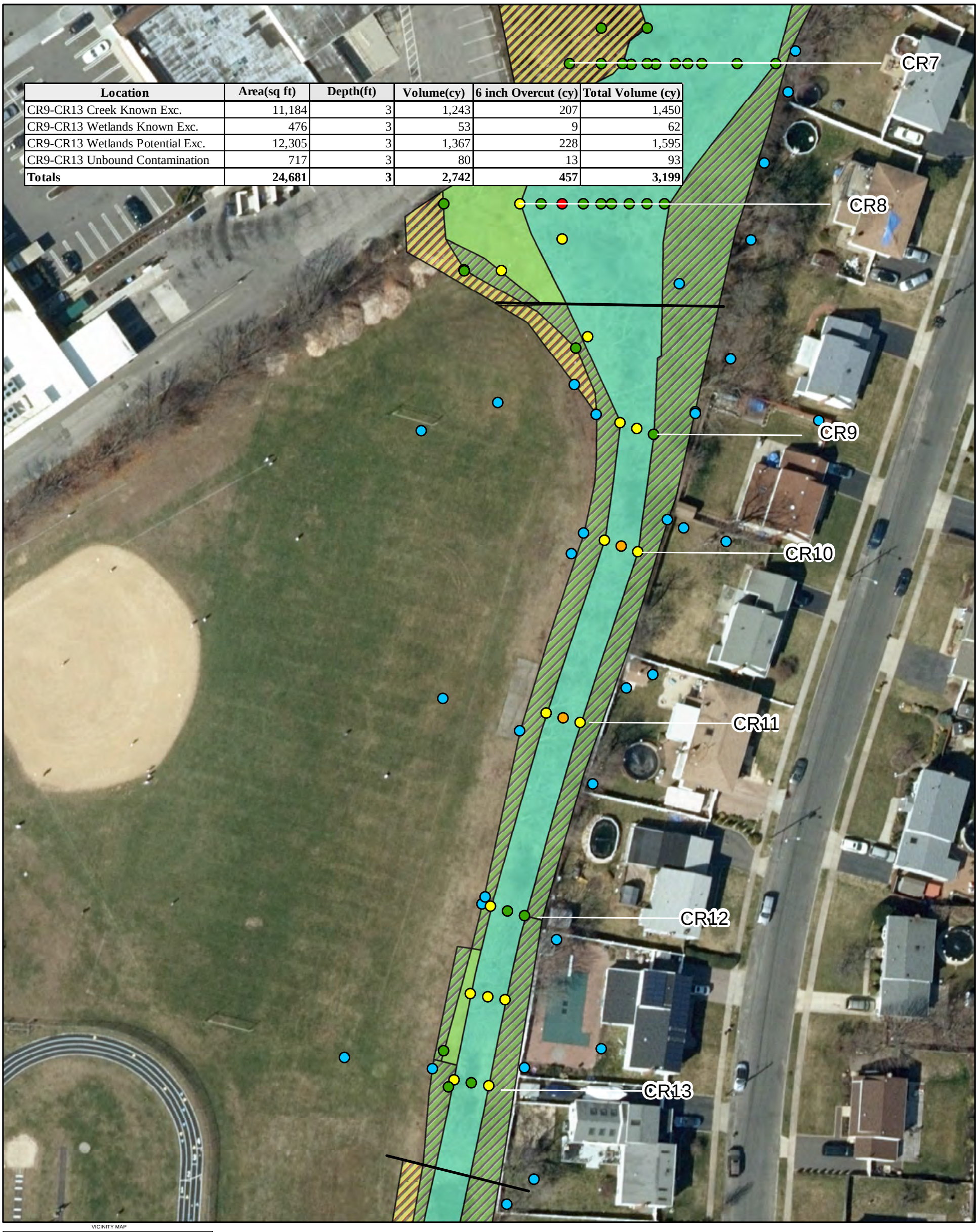
Location	Area(sq ft)	Depth(ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR9-CR13 Creek Known Exc.	11,184	3	1,243	207	1,450
CR9-CR13 Wetlands Known Exc.	476	3	53	9	62
CR9-CR13 Wetlands Potential Exc.	12,305	3	1,367	228	1,595
CR9-CR13 Unbound Contamination	717	3	80	13	93
Totals	**24,681**	**3**	**2,742**	**457**	**3,199**



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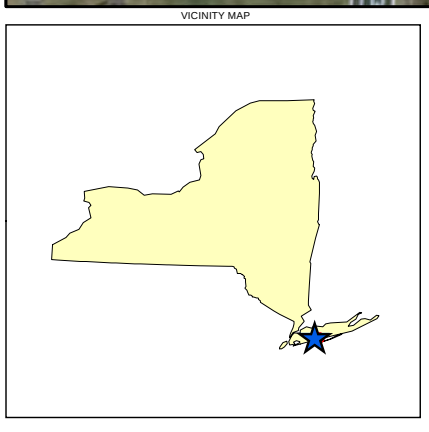
VICINITY MAP



0 50 100
Feet

N

Legend

Residential Use SCO Exceedance for soil and Class B SGV or higher impacted sediment

Known Exc.
- Commercial
- Creek
- Residential
- Wetlands

Potential Exc.
- Residential
- Wetlands

Unbound Contamination
- Soil/Sediment

Depth(ft)
- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value
SCO= Soil Cleanup Objective
Exc. = Exceedance
Cadmium Residential Use SCO= 2.5 mg/kg
Chromium Residential Use SCO= 36 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg
Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-1B
ALT 3: Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/11/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

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Location	Area(sq ft)	Depth (ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR14-CR20 Creek Known Exc.	18,670	3	2,074	346	2,420
CR14-CR20 Wetlands Known Exc.	203	3	23	4	26
CR14-CR20 Wetlands Potential Exc.	17,497	3	1,944	324	2,268
CR14-CR20 Residential Known Exc.	611	1.5	34	11	45
CR14-CR20 Residential Potential Exc.	1,795	1.5	100	33	133
CR14-CR20 Unbound Contamination	1,419	3	158	26	184
Totals	**40,194**	**1.5-3**	**4,332**	**744**	**5,077**

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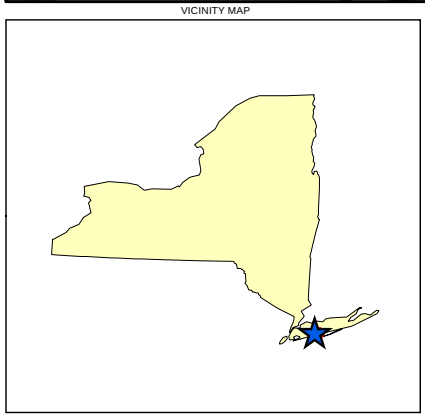
VICINITY MAP



0 50 100
Feet

N

Legend

Residential Use SCO Exceedance for soil and Class B SGV or higher impacted sediment

Known Exc.
- Commercial
- Creek
- Residential
- Wetlands

Potential Exc.
- Residential
- Wetlands

Unbound Contamination
- Soil/Sediment

Depth(ft)
- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value
SCO= Soil Cleanup Objective
Exc. = Exceedance
Cadmium Residential Use SCO= 2.5 mg/kg
Chromium Residential Use SCO= 36 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg
Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-1C
ALT 3: Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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Location	Area(sq ft)	Depth (ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR21-CR30 Creek Known Exc.	46,745	2.5-3	4,512	866	5,377
CR21-CR30 Wetlands Potential Exc.	21,561	2.5-3	2,208	399	2,608
CR21-CR30 Residential Known Exc.	2,075	1.5	115	38	154
CR21-CR30 Residential Potential Exc.	2,462	1.5	137	46	182
CR21-CR30 Unbound Contamination	2,080	1.5-3	191	39	230
Totals	**74,923**	**1.5-3**	**7,163**	**1,387**	**8,551**

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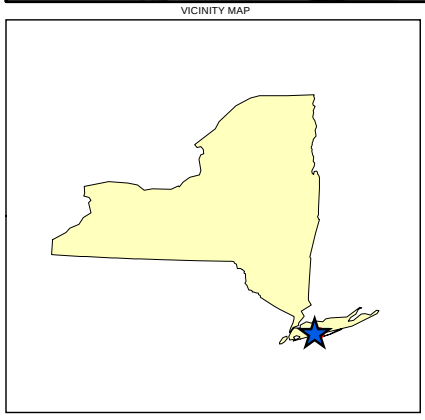
VICINITY MAP



0 50 100
Feet

N

Legend

Residential Use SCO Exceedance for soil and Class B SGV or higher impacted sediment

Known Exc.
- Commercial
- Creek
- Residential
- Wetlands

Potential Exc.
- Residential
- Wetlands

Unbound Contamination
- Soil/Sediment

Depth(ft)
- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value
SCO= Soil Cleanup Objective
Exc. = Exceedance
Cadmium Residential Use SCO= 2.5 mg/kg
Chromium Residential Use SCO= 36 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg
Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-1D
ALT 3: Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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Location	Area(sq ft)	Depth (ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR31-CR36 Creek Known Exc.	19,696	1.5	1,094	365	1,459
CR31-CR36 Wetlands Potential Exc.	7,618	1.5	423	141	564
CR31-CR36 Residential Known Exc.	3,916	1.5	218	73	290
CR31-CR36 Residential Potential Exc.	2,430	1.5	135	45	180
CR31-CR36 Unbound Contamination	1,968	1.5-2.5	177	36	213
Totals	**35,629**	**1.5-2.5**	**2,047**	**660**	**2,707**

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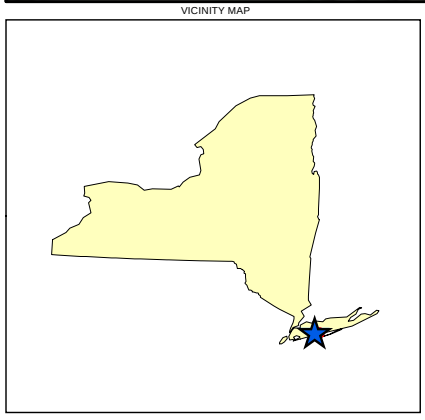

0 50 100
Feet

Legend

Residential Use SCO Exceedance for soil and Class B SGV or higher impacted sediment

Known Exc.
- Commercial
- Creek
- Residential
- Wetlands

Potential Exc.
- Residential
- Wetlands

Unbound Contamination
- Soil/Sediment

Depth(ft)
- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value
SCO= Soil Cleanup Objective
Exc. = Exceedance
Cadmium Residential Use SCO= 2.5 mg/kg
Chromium Residential Use SCO= 36 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg
Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

N

Figure 6-1E
ALT 3: Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/11/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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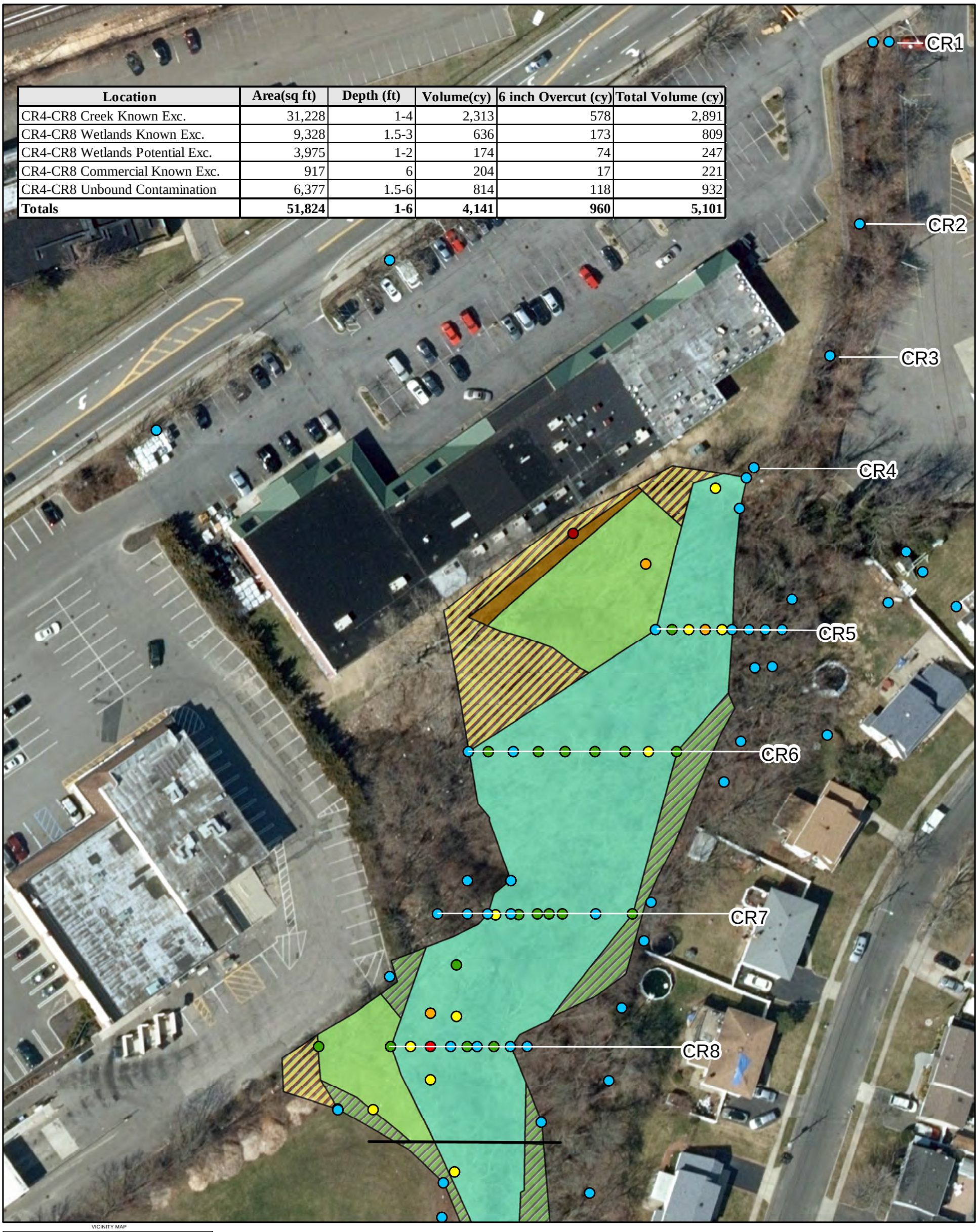
Location	Area(sq ft)	Depth (ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR4-CR8 Creek Known Exc.	31,228	1-4	2,313	578	2,891
CR4-CR8 Wetlands Known Exc.	9,328	1.5-3	636	173	809
CR4-CR8 Wetlands Potential Exc.	3,975	1-2	174	74	247
CR4-CR8 Commercial Known Exc.	917	6	204	17	221
CR4-CR8 Unbound Contamination	6,377	1.5-6	814	118	932
Totals	**51,824**	**1-6**	**4,141**	**960**	**5,101**



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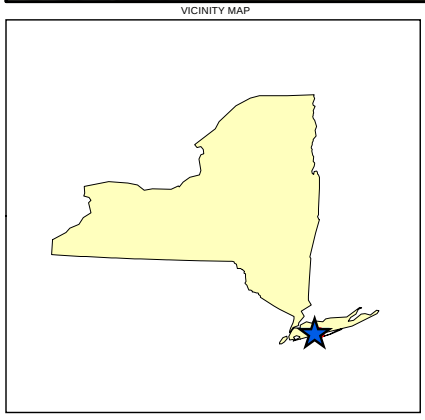
VICINITY MAP



0 50 100
Feet

N

Legend

Exceedances of Restricted Use SCO for Soil and Class B SGV for Sediment

Known Exc.
- Commercial
- Creek
- Residential
- Wetlands

Potential Exc.
- Residential
- Wetlands

Unbound Contamination
- Soil/Sediment

Depth(ft)
- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value SCO= Soil Cleanup Objective Exc. = Exceedance
Applicable Use based SCO here implies residential use for private residences, restricted residential for school properties, and commercial use for commercial property.
Restricted Use SCO for Cadmium:
a) Residential= 2.5 mg/kg b)Restricted Residential= 4.3 mg/kg c) Commercial=9.3 mg/kg
Restricted Use SCO for Chromium:
a) Residential= 36 mg/kg b) Restricted Residential= 180 mg/kg c) Commercial=1,500 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by
NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-2A
ALT 4: Excavation of Soil to Applicable Use based SCO and Sediment to Class B SGV with Offsite Disposal
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

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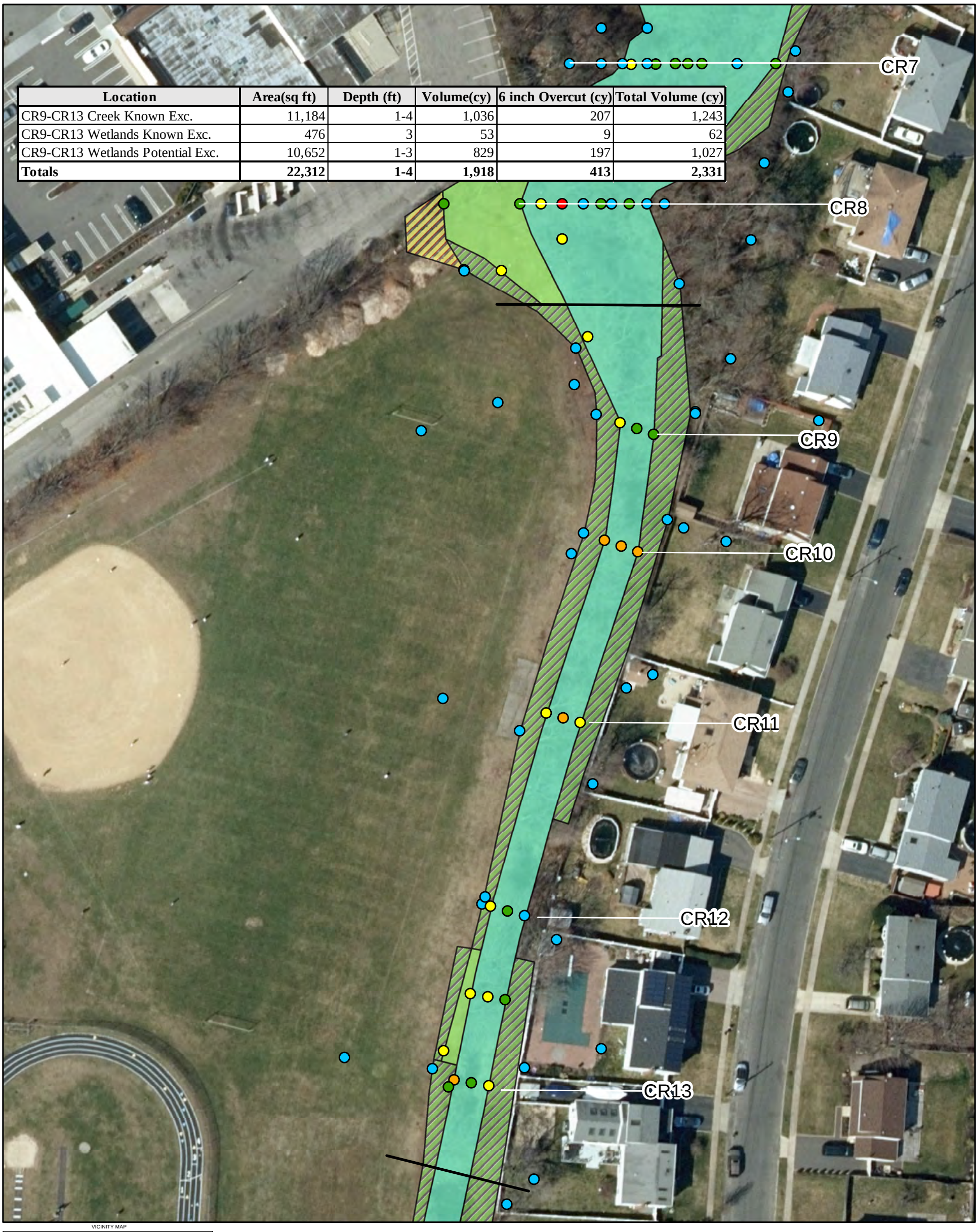
Location	Area(sq ft)	Depth (ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR9-CR13 Creek Known Exc.	11,184	1-4	1,036	207	1,243
CR9-CR13 Wetlands Known Exc.	476	3	53	9	62
CR9-CR13 Wetlands Potential Exc.	10,652	1-3	829	197	1,027
Totals	**22,312**	**1-4**	**1,918**	**413**	**2,331**



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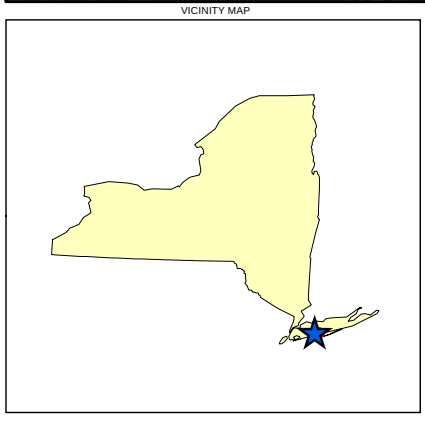

0 50 100
Feet

N

Legend

Exceedances of Restricted Use SCO for Soil and Class B SGV for Sediment

Known Exc.
- Commercial
- Creek
- Residential
- Wetlands

Potential Exc.
- Residential
- Wetlands

Unbound Contamination
- Soil/Sediment

Depth(ft)
- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value SCO= Soil Cleanup Objective Exc. = Exceedance
Applicable Use based SCO here implies residential use for private residences, restricted residential for school properties, and commercial use for commercial property.
Restricted Use SCO for Cadmium:
a) Residential= 2.5 mg/kg b)Restricted Residential= 4.3 mg/kg c) Commercial=9.3 mg/kg
Restricted Use SCO for Chromium:
a) Residential= 36 mg/kg b) Restricted Residential= 180 mg/kg c) Commercial=1,500 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by
NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-2B
ALT 4: Excavation of Soil to Applicable Use based SCO and Sediment to Class B SGV with Offsite Disposal
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

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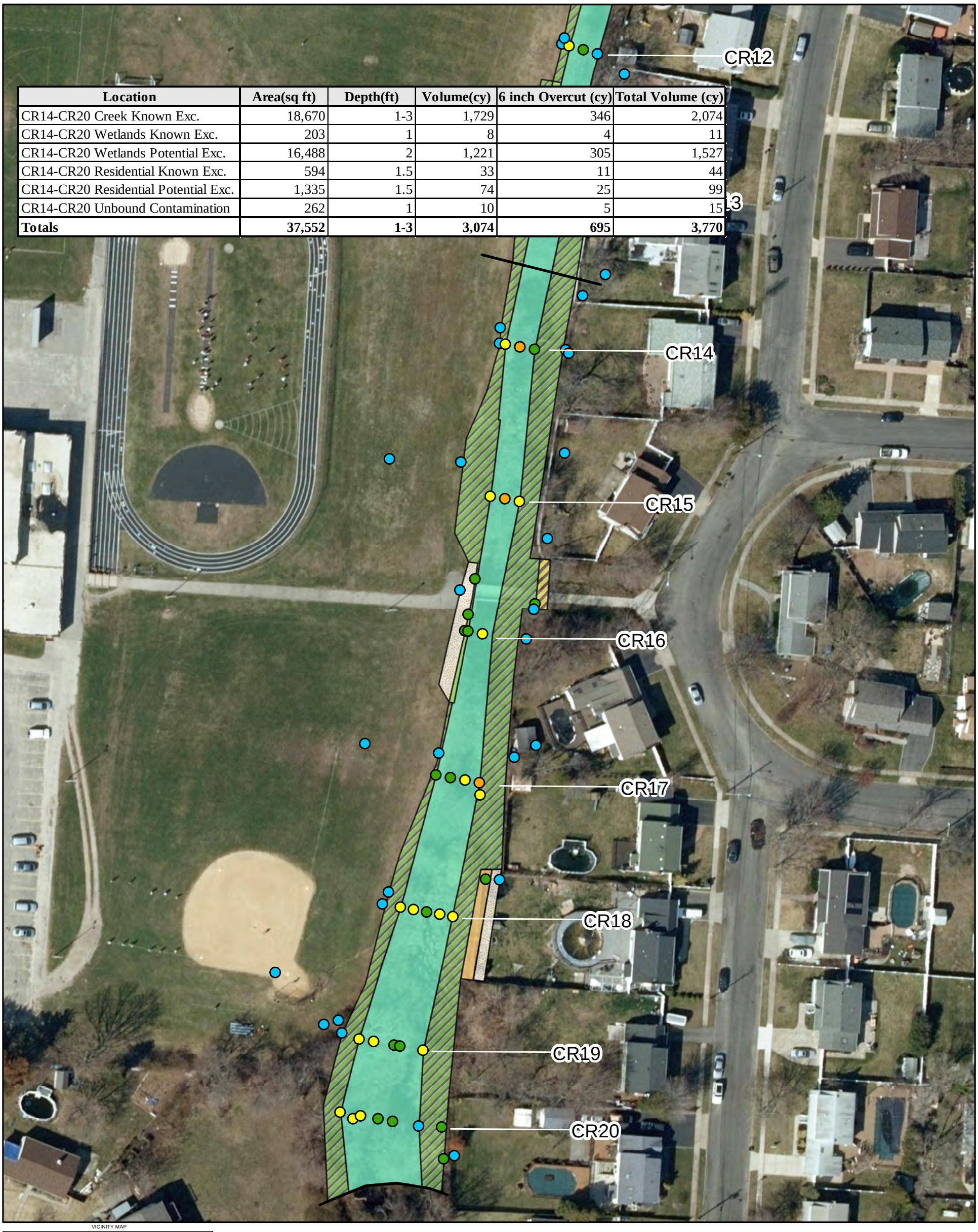
Location	Area(sq ft)	Depth(ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR14-CR20 Creek Known Exc.	18,670	1-3	1,729	346	2,074
CR14-CR20 Wetlands Known Exc.	203	1	8	4	11
CR14-CR20 Wetlands Potential Exc.	16,488	2	1,221	305	1,527
CR14-CR20 Residential Known Exc.	594	1.5	33	11	44
CR14-CR20 Residential Potential Exc.	1,335	1.5	74	25	99
CR14-CR20 Unbound Contamination	262	1	10	5	15
Totals	**37,552**	**1-3**	**3,074**	**695**	**3,770**



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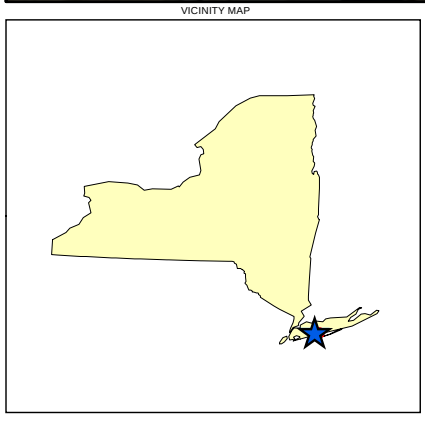
VICINITY MAP



0 50 100
Feet

N

Legend

Exceedances of Restricted Use SCO for Soil and Class B SGV for Sediment

Known Exc.
- Commercial
- Creek
- Residential
- Wetlands

Potential Exc.
- Residential
- Wetlands

Unbound Contamination
- Soil/Sediment

Depth(ft)
- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value SCO= Soil Cleanup Objective Exc. = Exceedance
Applicable Use based SCO here implies residential use for private residences, restricted residential for school properties, and commercial use for commercial property.
Restricted Use SCO for Cadmium:
a) Residential= 2.5 mg/kg b)Restricted Residential= 4.3 mg/kg c) Commercial=9.3 mg/kg
Restricted Use SCO for Chromium:
a) Residential= 36 mg/kg b) Restricted Residential= 180 mg/kg c) Commercial=1,500 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by
NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-2C
ALT 4: Excavation of Soil to Applicable Use based SCO and Sediment to Class B SGV with Offsite Disposal
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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Location	Area(sq ft)	Depth(ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR23-CR25 Creek Known Exc.	13,998	1.5	778	259	1,037
CR23-CR25 Wetlands Potential Exc.	5,107	1.5	284	95	378
CR23-CR25 Residential Known Exc.	2,099	1.5	117	39	155
CR23-CR25 Residential Potential Exc.	740	1.5	41	14	55
CR23-CR25 Unbound Contamination	2,033	1	75	38	113
Totals	**23,978**	**1-1.5**	**1,294**	**444**	**1,738**

Location	Area(sq ft)	Depth (ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR27-CR29 Creek Known Exc.	14,022	1.5	779	260	1,039
CR27-CR29 Wetlands Potential Exc.	3,495	1-1.5	187	65	252
Totals	**17,517**	**1-1.5**	**966**	**324**	**1,291**

CR22
CR23
CR24
CR25
CR26
CR27
CR28
CR29

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VICINITY MAP

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Feet

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Legend

Exceedances of Restricted Use SCO for Soil and Class B SGV for Sediment

Known Exc.
- Commercial
- Creek
- Residential
- Wetlands

Potential Exc.
- Residential
- Wetlands

Unbound Contamination
- Soil/Sediment

Depth(ft)
- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value SCO= Soil Cleanup Objective Exc. = Exceedance
Applicable Use based SCO here implies residential use for private residences, restricted residential for school properties, and commercial use for commercial property.
Restricted Use SCO for Cadmium:
a) Residential= 2.5 mg/kg b)Restricted Residential= 4.3 mg/kg c) Commercial=9.3 mg/kg
Restricted Use SCO for Chromium:
a) Residential= 36 mg/kg b) Restricted Residential= 180 mg/kg c) Commercial=1,500 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by
NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-2D
ALT 4: Excavation of Soil to Applicable Use based SCO and Sediment to Class B SGV with Offsite Disposal
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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Location	Area(sq ft)	Depth (ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR31-CR33 Creek Known Exc.	5,080	1.5	282	94	376
CR31-CR32 Wetlands Potential Exc.	2,540	1-2	136	47	183
CR31-CR32 Residential Known Exc.	2,093	1.5	116	39	155
CR31-CR32 Unbound Contamination	1,894	1-1.5	99	35	134
Totals	**11,607**	**1-2**	**633**	**215**	**848**

Location	Area(sq ft)	Depth(ft)	Volume(cy)	6 inch Overcut (cy)	Total Volume (cy)
CR34-CR36 Creek Kown Exc.	2,568	1	95	48	143
CR34-CR36 Residential Known Exc.	1,991	1.5	111	37	147
CR34-CR36 Residential Potential Exc.	2,264	1.5	126	42	168
Totals	**6,823**	**1-1.5**	**331**	**126**	**458**

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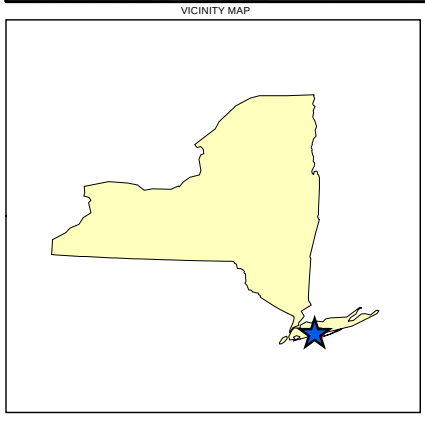
VICINITY MAP



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Feet

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Legend

Exceedances of Restricted Use SCO for Soil and Class B SGV for Sediment

Known Exc.
- Commercial
- Creek
- Residential
- Wetlands

Potential Exc.
- Residential
- Wetlands

Unbound Contamination
- Soil/Sediment

Depth(ft)
- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value SCO= Soil Cleanup Objective Exc. = Exceedance
Applicable Use based SCO here implies residential use for private residences, restricted residential for school properties, and commercial use for commercial property.
Restricted Use SCO for Cadmium:
a) Residential= 2.5 mg/kg b)Restricted Residential= 4.3 mg/kg c) Commercial=9.3 mg/kg
Restricted Use SCO for Chromium:
a) Residential= 36 mg/kg b) Restricted Residential= 180 mg/kg c) Commercial=1,500 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by
NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-2E
ALT 4: Excavation of Soil to Applicable Use based SCO and Sediment to Class B SGV with Offsite Disposal
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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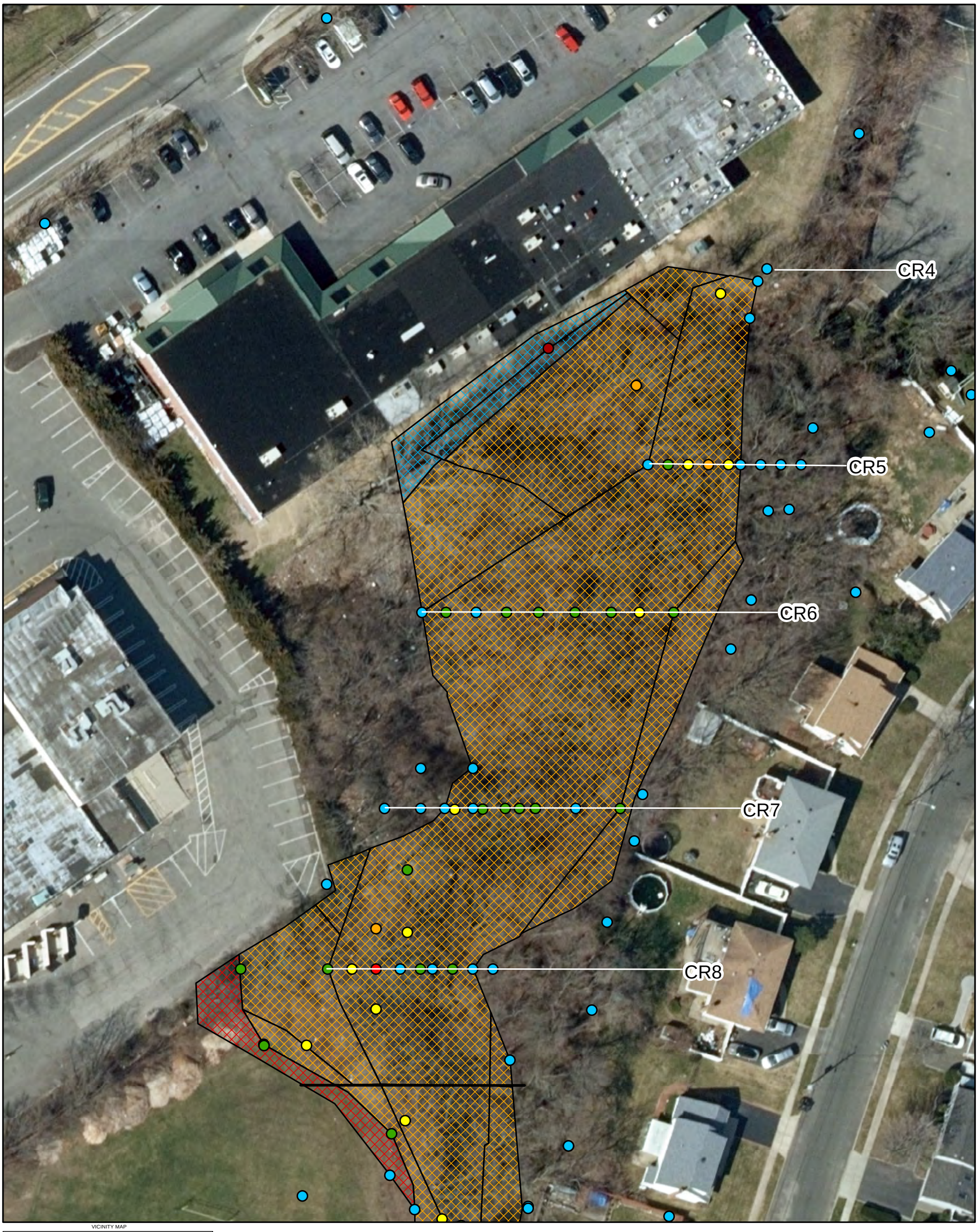

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VICINITY MAP

0 50 100
Feet

N

Legend

Cap type and depth of exceedances of Residential Use SCO for soil and Class B SGV for sediment

Cap type

- Commercial (1 ft)
- Stream/Wetland (1.5 ft)
- Residential (2ft)

Depth(ft)

- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value
SCO= Soil Cleanup Objective

Cadmium Residential Use SCO= 2.5 mg/kg
Chromium Residential Use SCO= 36 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg
Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-3A
ALT 5: Excavation with Multi-media Capping of Soil and Sediment
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/11/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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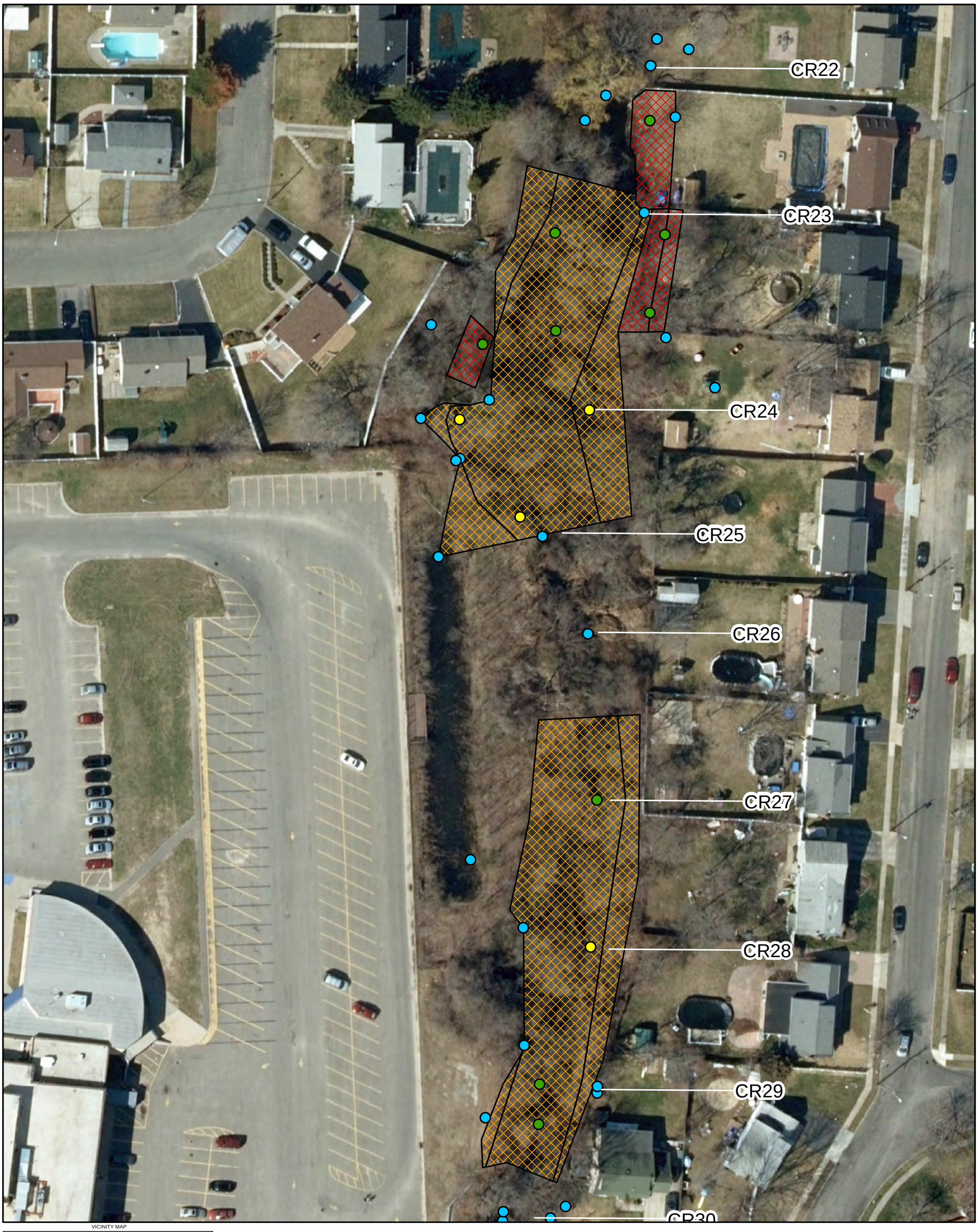

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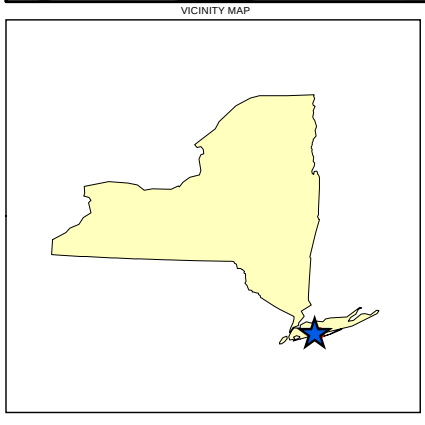
VICINITY MAP



0 50 100
Feet

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Legend

Cap type and depth of exceedances of Residential Use SCO for soil and Class B SGV for sediment

Cap type

- Commercial (1 ft)
- Stream/Wetland (1.5 ft)
- Residential (2ft)

Depth(ft)

- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value
SCO= Soil Cleanup Objective

Cadmium Residential Use SCO= 2.5 mg/kg
Chromium Residential Use SCO= 36 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg
Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-3B
ALT 5: Excavation with Multi-media Capping of Soil and Sediment
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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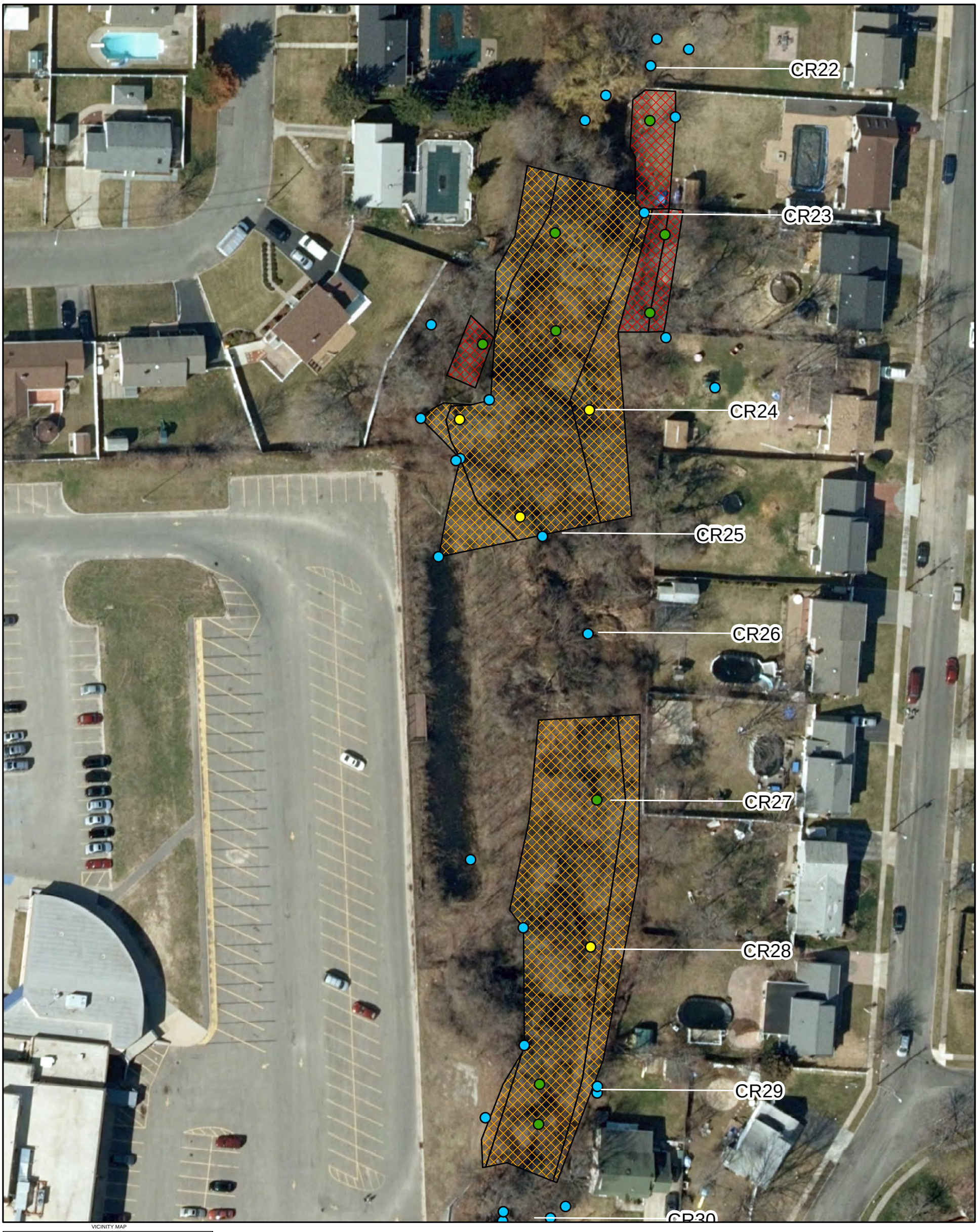

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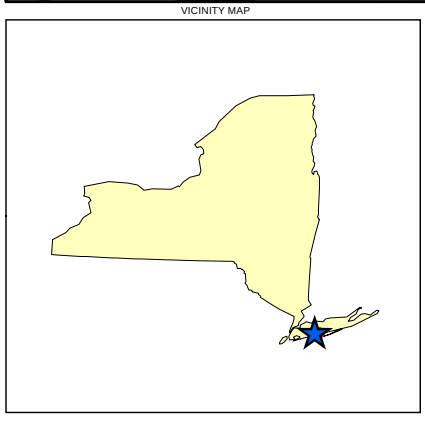
VICINITY MAP



0 50 100
Feet

N

Legend

Cap type and depth of exceedances of Residential Use SCO for soil and Class B SGV for sediment

Cap type

- Commercial (1 ft)
- Stream/Wetland (1.5 ft)
- Residential (2ft)

Depth(ft)

- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value
SCO= Soil Cleanup Objective

Cadmium Residential Use SCO= 2.5 mg/kg
Chromium Residential Use SCO= 36 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg
Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-3C
ALT 5: Excavation with Multi-media Capping of Soil and Sediment
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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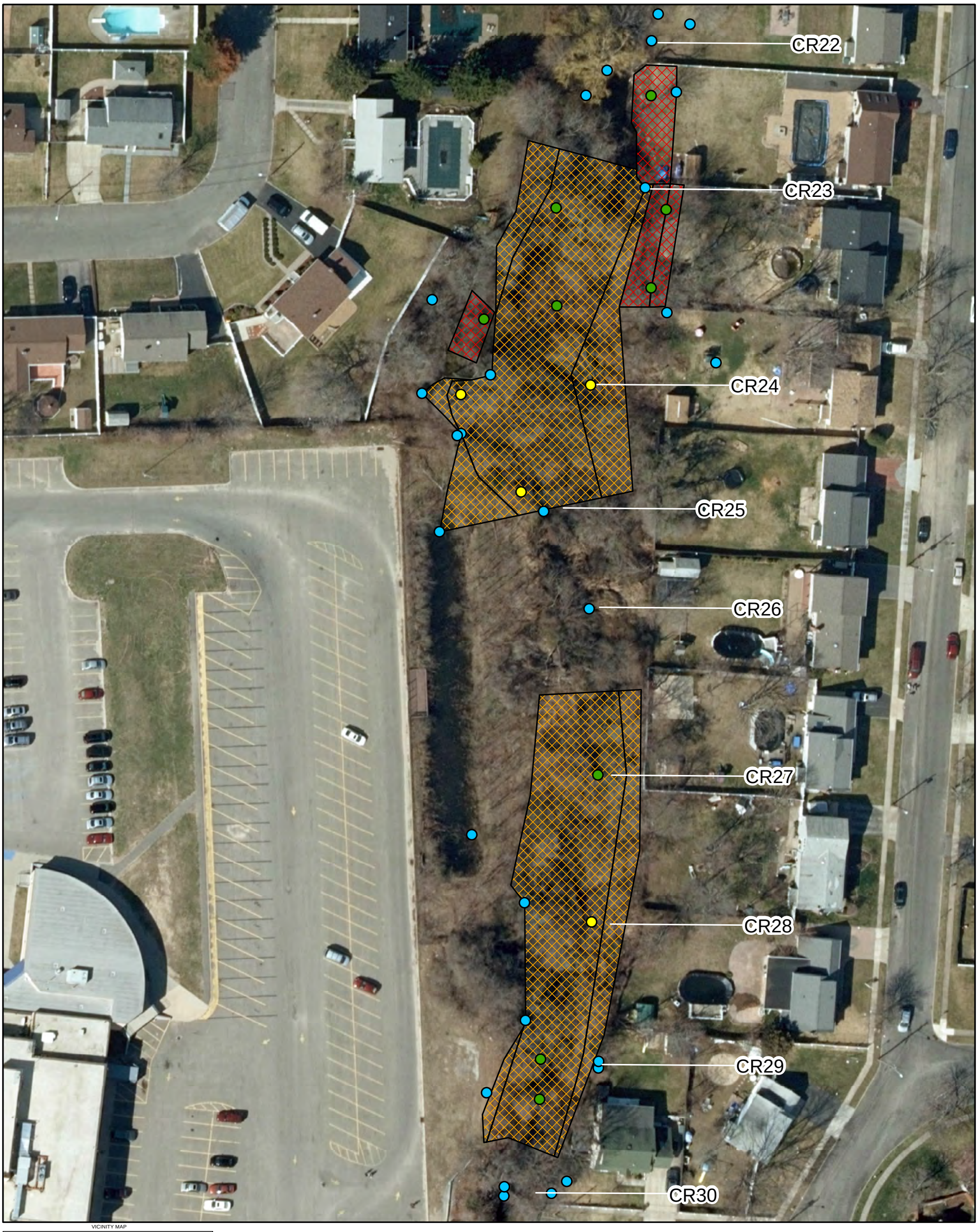

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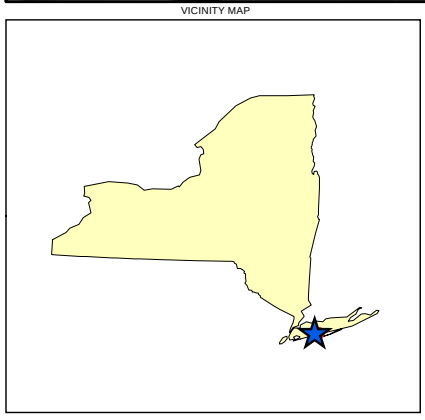
VICINITY MAP



0 50 100
Feet

N

Legend

Cap type and depth of exceedances of Residential Use SCO for soil and Class B SGV for sediment

Cap type

- Commercial (1 ft)
- Stream/Wetland (1.5 ft)
- Residential (2ft)

Depth(ft)

- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value
SCO= Soil Cleanup Objective

Cadmium Residential Use SCO= 2.5 mg/kg
Chromium Residential Use SCO= 36 mg/kg
as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg
Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-3D
ALT 5: Excavation with Multi-media Capping of Soil and Sediment
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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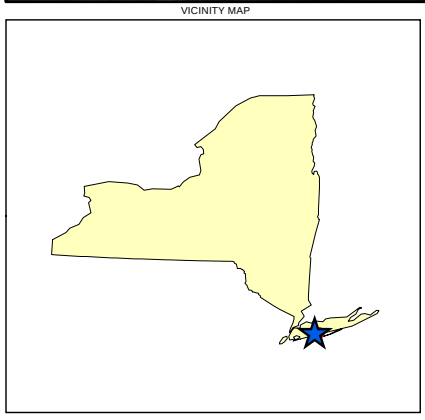
VICINITY MAP



0 50 100
Feet

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Legend

Cap type and depth of exceedances of Residential Use SCO for soil and Class B SGV for sediment

Cap type

- Commercial (1 ft)
- Stream/Wetland (1.5 ft)
- Residential (2ft)

Depth(ft)

- 0
- 1
- 2
- 3
- 4
- 6

Note: SGV=Sediment Guidance Value
SCO= Soil Cleanup Objective

Cadmium Residential Use SCO= 2.5 mg/kg
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as determined by NYSDEC 6 NYCRR Table 375-6.8(b)
Class B SGV for Cadmium= 1-5 mg/kg
Class B SGV for Chromium= 43-110 mg/kg
for slightly to moderately contaminated as determined by NYSDEC Technical Guidance for Screening and Assessment of Contaminated Sediment (June 2014).

Figure 6-3E
ALT 5: Excavation with Multi-media Capping of Soil and Sediment
OU3 Feasibility Study
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 8/14/2017
Source: ESRI, 2011
Projection: NAD83 State Plane New York Long Island

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Tables

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Table 5-1A Technology Screening Matrix (Soil)

FOR SOIL/FILL MATERIAL						
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.	Effective for removal of metals from shallow soils, but less to not effective with deeper impacted soil.	Moderately difficult to implement due to maintenance requirements; requires demonstration of natural processes causing attenuation and subsequent monitoring; limited to growing season.	Treatment period is longer than other technologies, and requires frequent monitoring and maintenance. Requires regulatory and public acceptance of short term restrictions on resource use.	Low	Not retained
Containment						
Capping	Multi-media cap.	Effectively addresses RAOs associated with contact of fill.	Relatively easy to implement; requires monitoring of cap thickness; periodic maintenance and monitoring.	Would require removal of some soil to allow for cap placement due to location of contamination within flood zone; effective in the long term, but would require long term monitoring.	Moderate	Retained for consideration
	Impermeable Liner (e.g., clay, plastic, etc.).	Effectively addresses RAOs associated with contact of fill.	Relatively easy to implement; requires periodic maintenance and monitoring.	Would require removal of some soil to allow for cap placement due to location of contamination within flood zone; impermeable liner would cause ponding and increase runoff into adjacent stream; effective in the long term, but would require long term monitoring	Moderate	Not retained
***In situ* Physical/Chemical Treatment**						
In situ Stabilization and solidification	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 testing to measure the immobility of contaminants; does not reduce volume of contamination on site.	Requires import and availability of suitable materials/reagents (e.g., Portland, gypsum, apatite, etc.); periodic monitoring.	Causes significant disturbance to site that may hinder future use; volume increase with bulk can be significant, and would require some removal due to location of contamination within flood zone; reduced permeability would cause ponding and increase runoff into adjacent stream; effective in the long term but would require long term monitoring.	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 *in situ* .	Effective for shallow soils.	Considered an emerging technology, has not been widely implemented; 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 would 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 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; moderately difficult to implement; potential for dewatering needs once groundwater is encountered; access/mobility at the creek will be limiting.	Could require establishment of dewatering facilities which could slow process.	High	Retained for consideration
***Ex situ* Physical/Chemical Treatment**						
Ex situ chemical treatment	Acid leaching used to remove inorganics from soil/fill.	Effective at removing inorganics from soil/fill.	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.	Effective at removing inorganics from soil/fill.	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						
Offsite Disposal	Offsite 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.	Material may require dewatering, stabilization, or treatment to meet criteria for acceptance. Long-range transport may be required dependent on landfill capacity/location; extensive site work and earthwork to accommodate transportation of material.	High	Retained for consideration

NOTE:
RAO = Remedial Action Objective
NA = Not Applicable
NCP = National Contingency Plan

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Table 5-1B Technology Screening Matrix (Sediment)

FOR SEDIMENT						
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; ineffective at reducing volume or mobility of contaminant.	Easily implemented.	Requires regulatory and public acceptance of restricted/diminished resource use.	Low	Retained for potential combination with other technologies
Containment						
In situ Subaqueous Capping - Physical Barrier	Thin layer capping with armor material (gravel or stone, less than 1-ft thick).	.Moderately effective for risk-based RAOs.	Moderately difficult to implement; requires import of stone; placement in water; monitoring of cap thickness; periodic maintenance & monitoring.	Would require partial removal of sediment so stream elevation does not change; effectiveness for source control uncertain; long term source control effective only if contaminant is of limited solubility.	Moderate	Not retained
	Multi-media cap.	Effectively addresses RAOs.	Moderately difficult to implement; requires import of sand, stone, clay placement in water; monitoring of cap thickness; periodic maintenance and monitoring.	Would require partial removal of sediment so stream elevation does not change; effective in long term source control unless inorganics are soluble and upwelling is substantial.	Moderate	Retained for consideration
	Impermeable Liner (e.g., clay, plastic, etc.).	Effectively addresses RAOs.	Moderately difficult to implement; requires import of liners; placement in water; periodic maintenance and monitoring.	Would require partial removal of sediment so stream elevation does not change; potential to affect drainage characteristics of creek and alter site hydrology; covers over habitat but effectively blocks transport.	Moderate	Not retained
In situ Subaqueous Capping - Reactive Cap	Capping using activated carbon/organo-carbon in a thin layer (less than 3 in.) or mixed with sand.	Effective for risk-based RAOs and partially effective for source control.	Moderately difficult to implement; requires import of special materials (i.e. Sedi-mite, activated carbon, organic carbon, or similar products); placement in water; monitoring of cap thickness; periodic maintenance and monitoring.	Would require partial removal so stream elevation does not change; may result in change of habitat; effective in long term source control unless inorganics are soluble.	Moderate	Not retained
	Capping using sequestering amendments (bauxite, barite, limestone), biopolymers (chitosan), or other compounds (zeolite, organoclay, apatite) in a thin layer (less than 3 in.) or mixed with sand.	Effective for risk-based RAOs and partially effective for source control.	Moderately difficult to implement; requires import of special materials (i.e. amendments); placement in water; monitoring of cap thickness; periodic maintenance and monitoring.	Would require partial removal so stream elevation does not change; long term effectiveness is still subject to evaluation; binding likely to decrease toxicity and dissolved phase mobility but does not inhibit physical transport.	Moderate	Not retained
***In situ* Biological Treatment**						
Phytoremediation	Reliance on natural processes for contaminant removal.	Effective for risk-based RAOs and source control; ineffective if metals are not soluble.	Difficult to implement; limited to areas that will support wetland plant growth; requires planting of appropriate species and subsequent harvest for disposal which may be disruptive to the adjacent residences. May require long time frames, and effectiveness may be limited.	Would require alteration of site wetland habitats; would not provide short-term risk reduction and overall effectiveness may be limited.	Moderate	Not retained
***In situ* Physical/Chemical Treatment**						
In situ Chemical Treatment	Addition of amendments to sediment; may require *in situ* mixing.	Effective for risk-based RAOs and partially effective for source control.	Difficult to implement; requires import of special materials (e.g., Sedi-mite, activated carbon, gypsum, apatite, etc.); placement in water; mixing of upper layers of sediment; periodic monitoring.	Causes significant disturbance to habitat; effective long term source control for dissolved phase, but does not prevent physical transport.	Moderate to high	Not retained
In situ Physical/Chemical Treatment	Solidification/stabilization.	Effective for risk-based RAOs and source control; ineffective if metals are not soluble; ineffective at reducing volume of contamination.	Difficult to implement; requires import of stabilization amendments; placement in water; mixing of upper layers of sediment; periodic monitoring.	Causes significant disturbance to habitat and long term change in sediment properties; effective long term source control.	Moderate to high	Not retained
Removal						
Hydraulic Dredging	Hydraulic excavation used to remove sediment.	Will address relevant RAOs, assuming use of handling treatment/disposal options discussed below.	Moderately difficult to implement; requires waterway access by hydraulic dredging equipment; requires subsequent dewatering to remove water added by hydraulic conveyance and the addition of material amendments to facilitate handling and disposal.	Requires establishment of dewatering facilities; rate may be limited by capacity of dewatering facility; rate may also be affected by sediment type; dredging typically requires water quality monitoring and resuspension/residuals controls.	High	Not retained
Mechanical Dredging	Mechanical excavation used to remove sediment.	Will address relevant RAOs, assuming use of handling treatment/disposal options discussed below.	Moderately difficult to implement; requires waterway access by dredging equipment; less dewatering required than for hydraulic dredging; may require the addition of material amendments to facilitate handling and disposal; buried debris, rocks, or bedrock may limit dredging implementation.	Requires establishment of dewatering facilities; rate may be limited by dewatering practices; rate may also be affected by presence of debris or obstacles to dredging; dredging typically requires water quality monitoring and resuspension/residuals controls.	High	Not retained
Excavation	Mechanical excavation used to remove sediment after the water above the sediment has been removed.	Will address relevant RAOs, assuming use of handling treatment/disposal options discussed below.	Implementable; moderately difficult to implement; potential for additional dewatering or solidification of excavated sediment.	Would require establishment of dewatering facilities which could slow process.	High	Retained for consideration
***Ex situ* Physical/Chemical 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	Retained for consideration
Disposal						
Offsite Disposal	Offsite commercial landfill.	Would be required for excavation options to meet RAOs.	Moderately difficult to implement; requires identification of landfills capable of accepting material; landfill capacity may limit excavation and disposal rates.	Material would require dewatering, stabilization, or treatment to meet criteria for acceptance. Long range transport may be required dependent on landfill capacity.	High	Retained for consideration

Note:
NA = Not Applicable
NCP = National Contingency Plan
RAO = Remedial Action Objectives
ft = Feet
in. = Inch(es)

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Table 6-1 Alternatives Screening

	Operable Unit 3: Soil/Sediment				
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**
	No Action	**Site Management**	**Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal**	**Excavation of Soil to Applicable Use based SCO and Sediment to Class B SGV with Offsite Disposal**	**Excavation with Multi-media Capping of Soil and Sediment**
Size and Configuration of Process Options	NA	An environmental easement would be implemented at the site. Existing institutional controls would be continued to limit the use of the property and groundwater as well as continued monitoring of sediment, surface water, and fish tissue. A fence would be installed and maintained for site security.	Approximately 32,645 cy of contaminated sediment and soil covering 5.7 acres would be excavated from the site, to a 6 ft maximum depth. The excavated soils and sediment would be stockpiled to dewater by gravity and amended onsite. 7,206 tons of the excavated sediment (assumed to be hazardous) would be disposed of at a permitted hazardous waste landfill. Remaining non-hazardous waste (approximately 29,023 tons) would be transported to a general waste landfill. Clean fill would be used to backfill. Stream diversion measures will be employed during excavation of the main channel to maintain flow and water management will be needed to excavate below the water table.	Approximately 15,536 cy of contaminated sediment and soil covering 3.9 acres would be excavated from the site to a 6 ft maximum depth. The excavated soils and sediment would be stockpiled to dewater by gravity and amended onsite. 7,206 tons of excavated sediment (assumed to be hazardous) would be disposed of at a permitted hazardous waste landfill. Remaining non-hazardous waste (approximately 10,036 tons) would be transported to a general waste landfill. Clean fill would be used to backfill. Stream diversion measures will be employed during excavation of the main channel to maintain flow and water management will be needed to excavate below the water table.	Approximately 4 acres would be cleared, graded, and capped with a protective media designed to withstand flood flows when vegetated. Approximately 9,984 cy of contaminated sediment and soil would be excavated for cap placement. Post-excavation samples will be used to determine if capping is needed. Clean fill be used to backfill where needed.
Time for Remediation	NA	NA	Approximately 9 months	Approximate 6 months	Approximately 6 months
Spatial Requirements	NA	None	Area of excavation will be inaccessible during remedial activities. Access road to the excavation area will be necessary to accommodate excavation activities. Area for equipment storage and loading and unloading for contaminated/clean soil (approximately 100 ft X 400 ft).	Area of excavation will be inaccessible during remedial activities. Access road to the excavation area will be necessary to accommodate excavation activities. Area for equipment storage and loading and unloading for contaminated/clean soil (approximately 100 ft X 400 ft).	Area of excavation will be inaccessible during remedial activities. Access road to the excavation area will be necessary to accommodate excavation activities. Area for equipment storage and loading and unloading for contaminated/clean soil (approximately 100 ft X 400 ft).
Options for Disposal	NA	NA	Offsite disposal through approved hazardous waste and general waste facilities. Consideration for treatment and reuse of soils would be handled by the facility.	Offsite disposal through approved hazardous waste and general waste facilities. Consideration for treatment and reuse of soils would be handled by the facility.	Offsite disposal through approved hazardous waste and general waste facilities. Consideration for treatment and reuse of soils would be handled by the facility.
Substantive Technical Permit Requirements	None	None	Water quality monitoring to ensure no contamination moves downstream required. 404/401 permitting requirements for stream and wetland impacts. Mitigation and annual monitoring required. Any stream diversion/wetland/floodplain related permits. NYSDEC approved creek diversion and contingency plan.	Water quality monitoring to ensure no contamination moves downstream required. 404/401 permitting requirements for stream and wetland impacts. Mitigation and annual monitoring required. Any stream diversion/wetland/floodplain related permits. NYSDEC approved creek diversion and contingency plan.	Water quality monitoring to ensure no contamination moves downstream required. 404/401 permitting requirements for stream and wetland impacts. Mitigation and annual monitoring required. Any stream diversion/wetland/floodplain related permits.
Limitations or Other Factors Necessary to Evaluate Alternatives	NA	None	Disposal facilities will require TCLP analysis for waste characterization prior to acceptance. Pre-design characterization to determine extents of excavation.	Disposal facilities will require TCLP analysis for waste characterization prior to acceptance. Pre-design characterization to determine extents of excavation.	Disposal facilities will require TCLP analysis for waste characterization prior to acceptance. Hydraulic and hydrologic analysis required for cap stability analysis during remedial design.
Public Impacts	Will not reduce exposure to contaminants.	Will not physically reduce ecological exposure to contaminants.	Noise, dust, and traffic may disturb local residents and the high school next to the creek due to limited space and access to perform remediation activity. Existing recreation opportunities in Willetts Creek would be temporarily impacted.	Noise, dust, and traffic may disturb local residents and the high school next to the creek due to limited space and access to perform remediation activity. Existing recreation opportunities in Willetts Creek would be temporarily impacted.	Noise, dust, and traffic may disturb local residents. The high school next to the creek and some residences maybe affected due to lack of space and access to perform remediation activity. Existing recreation opportunities in Willetts Creek would be temporarily impacted.
Beneficial and/or Adverse Impacts on Fish and Wildlife Resources	Because soil and sediment would be left untreated, it could contribute to further contamination of the Willets Creek ecosystem.	Because the soil and sediment would be left untreated, it could contribute to further contamination of the Willets Creek ecosystem.	Potential for surface contact would be removed. Complete restoration of the benthic and wetland habitat would be required.	Potential for surface contact would be removed. Complete restoration of the benthic and wetland habitat would be required.	Potential for surface contact would be removed. Complete restoration of the benthic community and wetland would be required. Potential for future exposure due to tree falls and burrowing activity would be present.
Net Present Worth	$0.00	$25,000	$12,477,000	$7,477,000	$5,600,000

Note:
NA = Not Applicable
TCLP = Toxicity Characteristic Leaching Procedure
ppm = Parts per Million
ft = Feet
SVG = Sediment Guidance Value
SCO = Soil Cleanup Objectives
cy = Cubic Yard
NYSDEC = New York State Department of Environmental Conservation

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Table 7-1 Alternative Cost Summary

Alternative	Description	Capital Cost	Construction Time (months)	Annual Costs Years 1–5/ Years 6–30	Total Cost (Capital + LTM)
1	No Action	$0	0	$0/$0	$0
2	Site Management	$25,000	2	$0/$0	$25,000
3	Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal	$12,423,000	9	$5,000/$3,000	$12,477,000
4	Excavation of Soil to Applicable Use based SCO and Sediment to Class B SGV with Offsite Disposal	$7,423,000	6	$5,000/$3,000	$7,477,000
5	Excavation with Multi-media Capping of Soil and Sediment	$5,545,000	6	$5,000/$3,000	$5,600,000

Note: SGV = Sediment Guidance Value
ppm = Parts per million
LTM = Long-term monitoring
SCO = Soil Cleanup Objective

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Table 8-1 Alternative Evaluation Summary

OPERABLE UNIT 3: SOIL/SEDIMENT					
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**
	No Action	**Site Management**	**Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal**	**Excavation of Soil to Applicable Use based SCO and Sediment to Class B SGV with Offsite Disposal**	**Excavation with Multi-media Capping of Soil and Sediment**
(1) Overall Protection of the Public Health and the Environment					
	There is no reduction of risk with this alternative. The exposure pathways would continue to pose unacceptable risk to all receptors.	There is a slight reduction of risk. Implementation of this alternative would serve to prevent ingestion or direct contact with contaminated sediment.	Reduces potential for human and ecological contact and migration of contaminants through complete removal of soil exceeding Residential Use SCO and sediment exceeding lower limit of Class B SGV.	Reduces potential for human and ecological contact and migration of contaminants through complete removal of soil exceeding Restricted Residential Use SCO and sediment exceeding Class B SGV.	Capping of impacted area reduces potential for an exposure pathway via surface contact. Continued potential risk of movement of contaminants through sediment bed mobility and surface water if sediment chemistry becomes acidic.
(2) Standards, Criteria and Guidance					
	Does not meet SCG criterion.	Does not meet SCG criterion.	Will meet Residential Use SCO for soil and lower limit of Class B SGV for sediment.	Will meet Restricted Use SCO for soil and Class B SGV for sediment.	Will meet Restricted Use SCO for soil and Class B SGV for sediment.
(3) Long-Term Effectiveness and Permanence					
	This alternative will not provide long-term effectiveness or permanence. This alternative offers no controls.	As a stand-alone alternative, it is only moderately effective, as contamination will remain in place and physical barriers would prevent human contact or incidental ingestion of sediment/soil.	When designed and implemented properly, effectively eliminates exposure and prevents transport; RAOs are achieved in short time frame.	When designed and implemented properly, effectively reduces exposure and prevents transport; however, long term monitoring of surface water and groundwater would be required.	Cap would need to be maintained against breach through excavation, tree falls, burrowing animals, and increased flows due to storms; long term monitoring of cap thickness would be required. Site management and perimeter controls are required.
(4) Reduction of Toxicity, Mobility, or Volume of Contamination					
Amount of Hazardous Materials Destroyed, Treated, or	None	None	Will reduce the toxicity, volume and mobility of contamination via soil /sediment removal.	Will reduce the toxicity, volume and mobility of contamination via soil/sediment removal.	Will reduce the toxicity, volume and mobility of contamination via partial soil/sediment removal
Degree of Expected Reductions in Toxicity, Mobility, or Volume	None	None	Contaminated sediment/soil will be disposed of in permitted facilities that use measure to reduce or eliminate the risk of toxic mobility.	Contaminated soil/sediment will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.	Modest reduction in volume of contaminated soil/sediment and will be disposed of in permitted facilities that use measures to reduce or eliminate the risk of toxic mobility.
Irreversible Treatment?	Not Applicable	Not Applicable	Yes	Yes	Yes
Residuals Remaining After Treatment	Yes	Yes	No soil above residential use SCO and sediment above lower limit of Class B SGV; contaminated groundwater will remain.	None above restricted-residential use SCO/Class B SGV; contaminated groundwater will remain.	Residual soil/sediment contamination will remain below cap; contaminated groundwater will remain.
(5) Short-Term Impact and Effectiveness					
Community Protection	There is no action and therefore, no additional risk to the community.	There is no physical 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/residuals will 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/residuals will 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/residuals will 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.	There is no physical action and therefore, no workers will be present at the site	Workers can potentially be exposed to contaminated media during excavation and mixing 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 mixing 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 mixing 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.	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. Temporary impacts to creek, wetland and riparian habitats expected.	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. Temporary impacts to creek, wetland and riparian habitats expected.	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. Temporary impacts to creek, wetland and riparian habitats expected.
Time Until Action Complete (Field Construction	No action taken	Approximately 2 months for the fence to be installed	Approximately 9 Months	Approximately 6 Months	Approximately 6 Months

Table 8-1 Alternative Evaluation Summary

OPERABLE UNIT 3: SOIL/SEDIMENT					
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**
	No Action	**Site Management**	**Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal**	**Excavation of Soil to Applicable Use based SCO and Sediment to Class B SGV with Offsite Disposal**	**Excavation with Multi-media Capping of Soil and Sediment**
(6) Implementability					
Ability to Construct and Operate	Not Applicable	Institutional and engineering controls can be implemented, and have been used nationally.	Excavation and disposal alternatives can be implemented, and have been used nationally.	Excavation and disposal alternatives can be implemented, and have been used nationally.	Capping in riparian/stream or floodplain areas must be designed to resist transport. Able to be implemented with specialty contractors and appropriate equipment.
Monitoring Requirements	Not Applicable	Not Applicable.	Sediment/soil shall be sampled and analyzed to confirm removal of impacted area.	Sediment/soil shall be sampled and analyzed to confirm removal of impacted area.	Perimeter monitoring and initial characterization recommended. Cap must be monitored for stability.
Availability of Equipment and Specialists	Not Applicable	Specialists are available for the implementation of institutional and engineering controls.	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.	Ability to obtain approvals and coordinate with other agencies assumed to be possible.		
(7) Cost Effectiveness					
Cost	**$0**	**$25,000**	**$12,477,000**	**$7,477,000**	**$5,600,000**
(8) Land Use					
	NA	Restricted	Residential	Residential, Restricted-Residential, Commercial	Restricted
(9) Community Acceptance					
	TBD	TBD	TBD	TBD	TBD

Note: PPE = Personal protective equipment
TBD = To be determined
SCO = Soil Cleanup Objectives
SGV= Sediment Guidance Value
SCG = Standards, Criteria and Guidance
ARARs = Applicable or Relevant and Appropriate Requirements

Appendix A

Costs

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TECHNOLOGY	LOCATION	MEDIA	Estimated Cost to Implement	$12,477,000
Alternative 3 **Excavation of Soil to Residential Use SCO and Sediment in Zone of Impact to Native Material with Offsite Disposal**	**Dzus Fastener Site** **West Islip, NY**	**Soil & Sediment**	**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)**									**$12,423,000**
Construction Activities		**1**			**$113,556**		**$98,787**		**$22,189**	**$240,999**	**$9,671,423**
Pre-Construction											
Permitting	*Engineer's Estimate*	1	LS	$ -	$ -	$ -	$ -	$ -	$ -	$ 30,000	$30,000
Pre Design Investigation	*Engineer's Estimate*	1	LS	$ -	$ -	$ -	$ -	$ -	$ -	$ 100,000	$100,000
Site Preparation											
Survey/Boundaries & Markers	*01 71 23.13 1100*	1	day	$ -	$ -	$ 1,288.05	$ 1,288	$ 48	$ 48		$1,336
Clearing & Grubbing, cut & chip light trees, to 6" diameter	*31 11 10.10 0020*	5.4	acre	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,744	$31,016
Clearing & Grubbing, grub stumps and remove	*31 11 10.10 0150*	5.4	acre		$ -		$ -		$ -	$ 2,007	$10,836
Topographic Survey	*02 21 13 09 0020*	6.0	acre	$ 20.14	$ 120.84	$ 639.87	$ 3,839	$ 14.69	$ 88.14		$4,048
Stream Diversion Pipe	*33 41 13 50 1090*	3,200	lf	$ 24.98	$ 79,936	$ 12.06	$ 38,592	$ 0.87	$ 2,784		$121,312
Stream Diversion Pipe Inlet Sandbags	*Alternatives Analysis*	160	each							$ 5	$800
Stream Diversion Outlet Rip Rap	*Alternatives Analysis*	173	sy							$ 76	$13,113
Stream Diversion Outlet Geotextile Fabric	*Alternatives Analysis*	173	sy							$ 3	$433
Stream Diversion Outlet Crushed Stone	*Alternatives Analysis*	7.2	cy							$ 42	$302
Stream Diversion Pump (excludes pipe installation cost)	*Alternatives Analysis*	1	each							$ 65,125	$65,125
Foot Bridge Removal	*Alternatives Analysis*	400	sf							$ 20	$7,876
Foot Bridge Replacement	*Alternatives Analysis*	400	sf							$ 154	$61,600
Utility Locator (based on recent bids)	*recent quote*	1	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,582	$2,582
Erosion & Sediment Control Plan	*Alternatives Analysis*	3,200	lf	$ -	$ -	$ -	$ -	$ -	$ -	$ 7	$23,904
Work Plan Preparation (Including QAPP, FAP and HASP)	*Engineer's Estimate*	1	ls	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$15,000
Silt Fence	*31 25 14. 16 1000*	3,200	lf	$ 0.33	$ 1,056	$ 0.95	$ 3,040	$ 0.14	$ 448		$4,544
Fence Demolition	*02 41 13.62 1100*	3,200	lf	$ -	$ -	$ 1.55	$ 4,960	$ 0.51	$ 1,632		$6,592
Fence Post Removal	*02 4113621000*	320	each	$ -	$ -	$ -	$ -	$ -	$ -	$ 29.24	$9,357
Haul Road Upgrades, Roads. 8" gravel along stream	*01 55 23.50 0100*	4,667	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 16.89	$78,820
Stockpile and Staging Area	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,537	$11,537
Decontamination Pad	*recent quote- The Environmental Service Group*	1	pad	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,800	$6,800
Excavation											
Community Air Monitoring (Dust)	*recent quote - Pine Environmental*	5	mo	$ -	$ -	$ 3,400.00	$ 17,000	$ 3,420	$ 17,100	$ -	$34,100
Dust Control, Light	*31 23 23.20 2500*	33.33	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,250	$41,652
Soil-Excavator, hydraulic, crawler mtd. 3.5 CY cap = 350 CY/hr	*31 23 16.42 5500*	32,645	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.54	$50,273
34CY off-road 20min. Wait 2,000ft cycle	*31 23 23.20 6300*	37,542	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.52	$169,689
Haul Road Maintenance	*31 23 23.20 2600*	33	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,633	$54,439
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	32,645	bcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.49	$81,286
Excavator Loadout, 4.5 CY bucket, 80% fill factor	*31 23 16.43 4700*	37,542	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.46	$54,811
Decontamination Pad Maintenance	*recent quote- The Environmental Service Group*	12	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 8	$98
Staging and Stockpile Area Maintenance	*recent quote- The Environmental Service Group*	33	day	$ -	$ -	$ -	$ -	$ -	$ -	$ 7	$237
Topographic Survey	*02 21 13 09 0020*	6.0	acre	$ 20.14	$ 120.84	$ 639.87	$ 3,839	$ 14.69	$ 88.14		$4,048
Confirmation Sampling											
Grab Samples- 1 per 900 square feet, 1 per 30 lf along side walls plus 20% QA/QC		785	sample	$ -	$ 50	$ 21.00	$ 16,491		$ -	$ -	$16,541
Lab Analyses - TAL Metals	*Hampton-Clarke Veritech*	785	sample	$ -	$ -	$ -	$ -	$ -	$ -	$ 72.98	$57,310
Sediment Dewatering											
Stockpile pad											
Geomembrane	*Recent quote-Antana*	80,000	sf							$ 1.67	$133,600
Sand - 6 in above, 6 in below geomembrane for protection	*Recent quote-EnviroTrac*	3,800	ton							$ 39.76	$151,088
Stone - 1 ft drainage layer	*32 11 23.23 0300*	8,889	sy							$ 13.69	$121,689
Pumps and hoses	*Recent quote- EnviroTrac*	1	ls							$ 8,000	$8,000
Frac Tanks- delivery, pickup, spill guard, tank	*Recent quote- Rain for Rent*	2	ea							$ 1,643	$3,287
Water treatment facility	*Engineer's Estimate*	6	months	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,366	$8,195
Water treatment facility mob/demob	*Engineer's Estimate*	1	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,000	$10,000
Carbon	*Engineer's Estimate*	15,000	lbs	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.09	$16,391
Bag filter housing	*Grainger*	3	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 277.50	$833
Bag filters, pack of 20	*Grainger*	8	ea	$ -	$ -	$ -	$ -	$ -	$ -	$ 158.25	$1,266
Maintain Stockpile, 700HP Dozer, 50ft Haul	*31 23 16.46 6010*	27,353	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.49	$68,108
Sediment Stabilization and Loadout											
Portland cement for stabilization	*03 05 13.30 0300*	58,600	cwt	$ -	$ -	$ -	$ -	$ -	$ -	$ 8.75	$512,750
Mixing material in windrow, 180 H.P. grader, including added 8% by vol for portl	*32 01 16.71 5400*	29,541	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.24	$7,090
FEL, wheel mount, 2 1/4 CY cap. Loadout into dumps from stockpiles	*31 23 16.42 1600*	29,541	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.09	$61,741
Spotter at loadout	*31 23 23.20 2310*	823	hrs	$ -	$ -	$ -	$ -	$ -	$ -	$ 71.34	$58,740
Non-Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- EnviroTrac*	33,903	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 85.80	$2,908,890
Hazardous Soil Disposal											
Soil transportation and disposal	*Recent quote- EnviroTrac*	7,206	ton	$ -	$ -	$ -	$ -	$ -	$ -	$ 219.00	$1,578,083
Site Restoration											
Wetland Restoration	*Alternatives Analysis*	2	acre							$106,200	$244,259
Tree Restoration	*Alternatives Analysis*	1,123	each							$ 737	$827,258
Demarcation layer (non-woven geotextile)	*31 32 19.16 1550*	27,821	sy	$ 1.16	$ 32,273	$ 0.35	$ 9,737	$ -	$ -		$42,010
Supply and Transportation of NYS Certified Clean Back Fill Material	*Recent quote- EnviroTrac*	32,209	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 40.00	$1,288,374
Backfill 300HP Dozer, 150' haul	*31 23 23.14 5220*	32,209	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.72	$55,400
Grading by dozer	*31 23 23.20 2300*	32,209	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.76	$88,898
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	32,209	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.33	$10,629
Walk behind Plate Compactor	*01 54 33.20 1300*	1	month	$ -	$ -	$ 2,592.40	$ 2,592	$ 259	$ 259		$2,852
Topsoil	*Recent quote- EnviroTrac*	5,332	lcy	$ 44.50	$ 237,292	$ -	$ -	$ -	$ -		$237,292
Finishing grading slopes, gentle	*31 22 16.10 3300*	27,821	sy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.25	$6,955
Utility mix, 7#/M.S.F., Hydro or air seeding, with mulch and fertilizer	*32 92 19.14 5400*	250	msf	$ -	$ -	$ -	$ -	$ -	$ -	$ 73.96	$18,519
Topographic Survey	*02 21 13 09 0020*	6.0	acre	$ 20.06	$ 120	$ 587.90	$ 3,527	$ 15	$ 88		$3,736
Fencing Installation (assume 90% re-used/installed)	*32 31 13.20 0800*	3,200	lf	$ 19.23	$ 6,154	$ 4.46	$ 14,272	$ 1	$ 3,648		$24,074
Mobilization and Demobilization											**$127,917**
5% of Total Costs of Site Work, Treatment										$2,558,339	$127,917
Contingency											**$979,934**
10% of Total Construction Activities										$9,799,340	$979,934
Professional/Technical Services											**$1,644,142**
5% Project Management										$9,671,423	$483,571
6% Remedial Design											$580,285
6% Construction Management											$580,285
LONG TERM MONITORING										**ANNUAL LTM COST (YRS 1-5)**	**$5,000**
										ANNUAL LTM COST (YRS 6-30)	**$3,000**
										LIFETIME LTM (NPV)	**$54,268**
Fill thickness monitoring											
											$2,376
Inspection of soil cover		4	hr			$ 85.00	$ 340				$340
Mobilization/Demobilization of Field Sampling Crew		1	event	$ -	$ -	$ 850.00	$ 850	$ 336	$ 336	$ -	$1,186
Reporting		10	hr	$ 85.00	$ 850	$ -	$ -	$ -	$ -	$ -	$850
Cap Repairs											$724
Mobilization/Demobilization		1	event	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,500	$500
Supply and Transportation of NYS Certified Clean Back Fill Material, assume 20 x 20 area to be replaced every 5 years, annual cost	*Recent quote- EnviroTrac*	26	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 40.00	$204
Backfill FEL, minimal haul	*31 23 16.13 3020*	26	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.53	$18
Compacting backfill, 12" lift, 2 passes w/ drum roller	*31 23 23.23 5060*	26	lcy	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.33	$2
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 + LTM + Maintenance) **$12,477,000**

Assumptions:

Working condition is Safety Level:		D	(Labor productivity:	100%	; Equipment productivity:	100%	)	
Weighted Average of city cost index (Buffalo, NY)		101.4%	(not applicable for costs	$1				
Costs are loaded with a profit factor		10%						
Inflation		3%	per year					Labor
Estimated number of soil samples		69	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								
Cadmium contaminated soil as a "listed" waste- incineration		$275	per ton	7,206	tons soil hazardous			
				22	tons per load	328	loads for haz disposal	
Cadmium contaminated soil as non-haz		$39.87	per ton	29,023	tons soil for non-haz disposal	1,319	loads for non-haz disposal	
				4,880	tons stockpile pad materials for non-haz disposal			
Concrete		3,300	lbs per cy					
Typical Rental Rates - Includes G&A and 10% Profit								
Mini-Rae Survey Mode PID		$96.08	per day	9,309	tons haz soil, unamended	20	loads per day	
Truck/SUV (1/2 ton or smaller)		$70.74	per day	20%	percent haz	20	working days per month	
Horiba U-10 Water Quality Meter		$73.77	per day	37,494	tons non-haz soil, unamended			
Submersible Pump		$42.16	per day	80%	percent non-haz			
2 in Pump Control Box		$72.27	per day	46,803	total tons soil unamended, pre-dewatering			
Generator: 110 V		$57.24	per day	33,299	tons of soil unamended, post-dewatering			
Level D PPE		$11.91	per day	6,623	tons haz, post-dewatering			
				26,676	tons non-haz, post-dewatering	10	hours per working day	
Work day consists of:		10	hrs			3	months for site prep/restoration	
				2,930	tons cement for amendment	5	months loading	
				583	tons cement for haz	1	month sediment dewatering/amendment	
				2,347	tons cement for non-haz	9	Total site work	

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	Alternatives Analysis	Alternatives Analysis Report, Dzus Fasteners Site, AECOM, March 2016
sf	square feet		
msf	1,000 square feet		

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