



Interim Site Management Plan Dzus Fastener Company, Inc. Site (152033) West Islip, New York

Prepared for

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



Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
269 W. Jefferson Street
Syracuse, New York 13202
(315) 431-4610

July 2020

Revisions to Final Approved Interim Site Management Plan

Revision Number	Date Submitted	Summary of Revision	New York State Department of Environmental Conservation Approval Date

This page left intentionally blank

JULY 2020

CERTIFICATION STATEMENT

I, Donald Conan, certify that I am currently a New York State registered Professional Engineer and that this Interim Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.



Donald Conan

7/23/2020

Donald Conan, P.E., P.G.
New York P.E. No. 75666

Date

This page left intentionally blank

TABLE OF CONTENTS

	<u>Page</u>
LIST OF APPENDIXES.....	ii
LIST OF FIGURES	iii
LIST OF TABLES.....	iv
LIST OF ACRONYMS AND ABBREVIATIONS	v
ES. EXECUTIVE SUMMARY	ES-1
1. INTRODUCTION AND PROJECT OVERVIEW	1-1
1.1 REVISIONS.....	1-2
1.2 NOTIFICATIONS	1-2
2. SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS	2-1
2.1 SITE LOCATION AND DESCRIPTION	2-1
2.1.1 Site History	2-1
2.1.2 Operable Units	2-1
2.2 PHYSICAL SETTING	2-2
2.2.1 Land Use	2-2
2.2.2 Site Geology and Hydrogeology.....	2-2
2.3 INVESTIGATION AND REMEDIAL HISTORY	2-3
2.3.1 Operable Unit 1 Remedial Activities	2-3
2.3.2 Operable Unit 2 Remedial Activities.....	2-4
2.3.3 Operable Units 3 and 4 Remedial Activities.....	2-4
2.3.4 Operable Unit 5 Remedial Activities	2-5
2.3.5 Operable Unit 6 Remedial Activities	2-5
2.4 RESIDUAL MATERIALS.....	2-5
2.4.1 Sediment	2-6
2.4.2 Soil	2-6
2.4.3 Groundwater	2-6
2.4.4 Surface Water.....	2-7
2.4.5 Soil Vapor	2-7
3. INSTITUTIONAL AND ENGINEERING CONTROL PLAN	3-1
3.1 GENERAL.....	3-1
3.2 INSTITUTIONAL CONTROLS.....	3-1
3.3 ENGINEERING CONTROLS	3-2
3.3.1 Operable Unit 1 Cover System	3-2

3.3.2	Backfill.....	3-3
3.3.3	Sub-Slab Depressurization System.....	3-3
4.	MONITORING AND SAMPLING PLAN	4-1
4.1	GENERAL.....	4-1
4.2	SITE MONITORING	4-1
4.3	POST-REMEDATION SAMPLING	4-3
4.3.1	Sediment Sampling.....	4-3
4.3.2	Surface Water Sampling.....	4-4
4.3.3	Groundwater Sampling.....	4-4
4.3.4	Fish Sampling.....	4-7
5.	PERIODIC ASSESSMENTS/EVALUATIONS.....	5-1
5.1	CLIMATE ADAPTATION PLAN.....	5-1
5.2	GREEN REMEDIATION EVALUATION	5-3
5.2.1	Timing of Green Remediation Evaluations	5-3
5.2.2	Metrics and Reporting.....	5-3
6.	REPORTING REQUIREMENTS.....	6-1
6.1	SITE MANAGEMENT REPORTS.....	6-1
6.2	PERIODIC REVIEW REPORT	6-2
6.2.1	Certification of Institutional and Engineering Controls.....	6-3
6.3	CORRECTIVE MEASURES WORK PLAN	6-4
7.	REFERENCES	7-1

LIST OF APPENDIXES

APPENDIX A:	LIST OF SITE CONTACTS
APPENDIX B:	RESPONSIBILITIES OF OWNER AND REMEDIAL PARTY
APPENDIX C:	DEED RESTRICTIONS (2014 AND 2017)
APPENDIX D:	EXCAVATION WORK PLAN
APPENDIX E:	QUALITY ASSURANCE PROJECT PLAN ADDENDUM
APPENDIX F:	SITE-SPECIFIC HEALTH AND SAFETY PLAN ADDENDUM
APPENDIX G:	SITE MANAGEMENT FORMS
APPENDIX H:	PERMITS AND/OR PERMIT EQUIVALENT AND MITIGATION PLAN
APPENDIX I:	DZUS CLIMATE RESILIENCY ASSESSMENT REPORT
APPENDIX J:	SUMMARY OF GREEN REMEDIATION METRICS

LIST OF FIGURES

<u>Number</u>	<u>Title</u>
1-1	General Site Location
1-2	Operable Units
2-1	Residual Materials in Willetts Creek Floodplain
2-2	Residual Cadmium in Lake Capri
2-3	Residual Cadmium in Groundwater
3-1	OU1 and OU6
3-2	OU1 Cover System
4-1	Sampling Locations

LIST OF TABLES

<u>Number</u>	<u>Title</u>
1-1	Notifications
2-1	Remaining Contaminants
2-2	Groundwater Monitoring Well Network
4-1	Monitoring and Sampling Schedule
4-2	Environmental Media Sampling Requirements and Schedule
4-3	Monitoring Well Construction Details
5-1	Climate Adaptation Plan
6-1	Schedule of Interim Monitoring/Inspection Reports

LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	Microgram(s) per liter
DEC	New York State Department of Environmental Conservation
DER	Division of Environmental Remediation
EC	Engineering control
ECL	Environmental Conservation Law
ft	Foot (feet)
IC	Institutional control
ID	Identification
in.	Inch(es)
ISMP	Interim Site Management Plan
ISS	In situ stabilization/solidification
No.	Number
NYS	New York State
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
OU	Operable unit
ppm	Part(s) per million
PRR	Periodic Review Report
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SGV	Sediment Guidance Value
TCE	Trichloroethylene
USACE	United States Army Corp of Engineers

This page left intentionally blank

ES. EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the monitoring, sampling, maintenance and reporting activities required by this Interim Site Management Plan:

Site Identification: DEC Site No. 152033
Dzus Fastener Co., Inc., Operable Units (OUs) 1, OU2, OU3, OU4, OU5, and OU6
425 Union Boulevard
West Islip, New York 17795

Institutional Controls: <ul style="list-style-type: none"> • 2014 and 2017 Deed Restrictions • The former Dzus facility property (OU1 and OU6) is subject to the terms of the Deed Restrictions. 	1. The Owner shall prohibit any excavation or disturbance of the asphalt cover in the Treatment Cell Area.
	2. The Owner shall protect the Treatment Cell Area from the effects of erosion by maintaining the final topsoil/asphalt cover.
	3. The Owner shall prohibit the property from ever being used for purposes other than for non-residential commercial/industrial uses.
	4. The Owner shall prohibit the use of groundwater underlying the property without treatment rendering it safe for drinking water or industrial purposes.
	5. The Owner shall continue any required institutional and engineering controls unless permission is obtained from the relevant agency.
	6. The Owner of the property shall provide an annual certification that the institutional controls are still in place.
	7. The Owner shall evaluate the potential for vapor intrusion in any newly constructed buildings on the property, prior to occupancy. Any identified potential soil vapor impacts shall be monitored or mitigated.
Engineering Controls	1. Cover system (OU1).
	2. Backfill (Willetts Creek and Lake Capri).
	3. Sub-slab depressurization system on any future development at OU6.
	4. All engineering controls must be inspected at a frequency and in a manner defined in the Interim Site Management Plan.
Site Management Activities	Frequency
Monitoring	
1. Creek corridor inspection	Every 5 quarters; post major storm event (when necessary)
2. Residual materials behind Captree Plaza	Every 5 quarters; post major storm event (when necessary)
3. OU1 site cover	Every 5 quarters
4. Monitoring well inspection	Every 5 quarters
5. Wetland mitigation monitoring	Every 5 quarters
6. OU5 visual inspection	Post major storm event (when necessary)
Sampling	
1. Sediment	Every 5 quarters

Site Management Activities	Frequency
<i>Sampling</i>	
2. Surface water	Every 5 quarters
3. Groundwater	Every 5 quarters
4. Fish Tissue	Year 3 of Site Management; Every 5 years after
<i>Maintenance</i>	
1. Cover system on OU1	As needed
2. Clean fill over residual materials at OU3 and OU4	As needed
<i>Reporting</i>	
1. Inspection Reports	Within 30 days of an inspection or sampling event.
2. Periodic Review Report	Every 5 quarters

Descriptions of the above requirements are provided in the latter sections of this Interim Site Management Plan.

1. INTRODUCTION AND PROJECT OVERVIEW

This Interim Site Management Plan (ISMP) is a required element of the remedial program for the former Dzus Fastener Company Inc. Site located in West Islip, New York, hereinafter referred to as the Site (**Figure 1-1**). The Site is currently in the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program (Site Number [No.] 152033), which is administered by the New York State Department of Environmental Conservation (DEC). The Site is comprised of six operable units (OUs) (**Figure 1-2**): OU1 – the former source area, consisting of stabilized areas of soil at the location of the former Dzus Fastener Company Inc. facility; OU2 – the portion of the original cleanup efforts located along a portion of Willetts Creek, and the entirety of Lake Capri; OU3 – the soil and sediment along a portion of Willetts Creek; OU4 – the soil and sediment within a portion of Willetts Creek and Lake Capri; OU5 – tidal portion of Willetts Creek located south of Montauk Highway; and OU6 – documents the Resource Conservation and Recovery Act (RCRA) closure of the former Dzus facility.

The selected remedies have been completed at OU1, OU2, OU3, OU4, and OU6. However, site management activities for all OUs (including OU5) are covered by this ISMP. Investigation at OU5 has not yet been completed. Once activities at OU5 are complete, this ISMP will be revised and finalized as a Site Management Plan (SMP) for all OUs at the Site.

After completion of the remedial work at OU1, OU3, and OU4, residual levels of cadmium were left at the Site due to stability concerns with proximate infrastructure, which is hereafter referred to as residual materials. Institutional controls (ICs) and engineering controls (ECs) have been incorporated into the Site remedy to limit exposure to residual materials to ensure protection of public health and the environment. Deed Restrictions were recorded with the Suffolk County Clerk in 2014 and 2017 to impose land-use limitations or requirements needed to protect current and future Site users.

This ISMP was prepared to manage residual materials at the Site until the Deed Restrictions are no longer required in accordance with Environment Conservation of Law (ECL) Article 71, Title 36. This plan has been approved by the DEC, and compliance with this plan is required by the grantor of the Deed Restrictions and the grantor's successors and assigns. This ISMP may only be revised with the approval of the DEC.

It is important to note that:

- This ISMP details the site-specific implementation procedures that are required by the Deed Restrictions. Failure to properly implement the ISMP is a violation of the Deed Restrictions.
- Failure to comply with this ISMP is also a violation of ECL, 6 New York Codes, Rules and Regulations (NYCRR) Part 375 and the Order on Consent (Index No. WI-0538-90-04; Site No. 152033) for the Site; and thereby, subject to applicable enforcement.

All reports associated with the site can be viewed by contacting the DEC or its successor agency managing environmental issues in NYS. A list of contacts for persons involved with the Site is provided in **Appendix A** of this ISMP.

This ISMP was prepared by DEC, in accordance with the requirements in *Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation* (DEC 2010), and the guidelines provided by DEC. This ISMP addresses the means for implementing the ICs and/or ECs that are required by the Deed Restrictions for the site, and requirements stipulated by U.S. Army Corps of Engineers (USACE).

1.1 REVISIONS

Revisions to this plan will be proposed in writing to DEC's Project Manager. Revisions will be necessary upon, but not limited to, the following occurring – a change in media monitoring requirements, upgrades to or shutdown of a remedial system, post-remedial removal of sediment or soil, or other significant change to the site conditions. In accordance with the Deed Restrictions for the Site, the DEC will provide a notice of any approved changes to the ISMP and append these notices to the ISMP that is retained in its files.

1.2 NOTIFICATIONS

For properties on which residual materials remain, notifications will be submitted by respective property Owners to the DEC, as needed, in accordance with DER-10 for the following reasons:

- A 60-day advance notice of any proposed changes in site use that are required by 6NYCRR Part 375 and/or ECL.
- An advance notice of 7 days for any field activity associated with the remedial program.
- A 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP).
- Notice within 48-hours of any damage or defect to structures or ECs that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the DEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the Ownership of properties associated with the Site or the responsibility for implementing this ISMP will include the following notifications:

- At least 60 days prior to the change, the DEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Record of Decision (ROD) and all approved work plans and reports, including this ISMP.
- Within 15 days after the transfer of all or part of the Site, the new Owner's name, contact representative, and contact information will be confirmed in writing to the DEC.

Table 1-1 includes contact information for the notification. The information in this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in **Appendix A**. Responsibilities of the Owner and Remedial Party are provided in **Appendix B**.

Table 1-1 Notifications*

Name	Contact Information
DEC Remediation Project Manager Brianna Scharf, E.I.T	(518) 402-5987 brianna.scharf@dec.ny.gov
DEC Region 1 Regional Hazardous Waste Engineer Chris Engelhardt	(631) 444-0240 christopher.engelhardt@dec.ny.gov
NYSDOH Project Manager Jacquelyn Nealon	(518) 402-7860 jacquelyn.nealon@health.ny.gov
* Notifications are subject to change and will be updated, as necessary. NOTES: E.I.T. = Engineer-in-Training NYSDOH = New York State Department of Health	

This page left intentionally blank

2. SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 SITE LOCATION AND DESCRIPTION

The former Dzus Fastener Company facility is located at 425 Union Boulevard, West Islip, New York and is identified as P.O. Lots 2-8 and 101, 9 and 10, Block A on the Map of Babylon developed by the Long Island Seashore Co., Inc., filed 5 April 1921, File No. 92 in the Office of the County Clerk, Suffolk County. Operable Unit (OU) 1, referred to as the onsite portion of the Site, is a triangularly shaped area approximately 1-acre in size. OU1 is in a mixed industrial, commercial, and residential area. The onsite portion is bounded by Long Island Railroad tracks to the north, Union Boulevard to the south, Willetts Creek to the east, and was previously bounded by the former Dzus Fastener Company Inc. (renamed DFCI Solutions, Inc. [DCFI] in 2001) facility to the west. The buildings associated with the former facility were demolished in 2019. The boundaries of the Site are fully described in the 2014 and 2017 Deed Restrictions (**Appendix C**). The Owner of the Site parcel at the time of issuance of this ISMP is Robert Monahan, c/o Island Associates, 444 Route 111, Smithtown New York 11487. The offsite portions of the Site consist of OU2, OU3, OU4, and OU5.

2.1.1 Site History

The Dzus Fastener Company manufactured fasteners and springs from 1932 to 2015. The company was known as DFCI between 2001 and 2015, although the operation of the facility remained the same. Operations included the design and manufacture of ¼-turn fasteners, 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. The wastes from the metal plating, tumbling, electroplating, chromic acid, anodizing, and special finishing operations consisted of oils, heavy metals, volatile organic compounds, and salts. Leaching pools, which have been remediated, were used for the disposal of hazardous wastes. Due to the direction of groundwater flow, these contaminants migrated offsite into the sediments and soils surrounding Willetts Creek and Lake Capri. The soils and sediments have been remediated and the groundwater is monitored.

2.1.2 Operable Units

The Site has been divided into six OUs (**Figure 1-2**). An OU is an administrative term used to identify a portion of 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 originally encompassed the entire source area at the eastern end of the former Dzus facility property and the Dzus facility itself. The OU1 ROD was issued March 1995.
- OU2 included sediments in a portion of Willetts Creek adjacent to the Beach Street Middle School footbridge, Lake Capri, and groundwater downgradient of the facility. The

OU2 ROD was issued October 1997 (DEC 1997). A remedial action for OU2 was implemented in 1999. All extents of OU2 are now encompassed in OU3 and OU4.

- OU3 encompasses the area of offsite wetlands located behind the Captree Plaza strip mall on Union Boulevard and includes a portion of the Willetts Creek channel from the Captree Plaza to 500 feet (ft) south of the high school footbridge, West Islip School properties, and low-lying residential properties.
- OU4 encompasses soils on properties abutting Willetts Creek located south of the high school footbridge and bordering Lake Capri. OU4 also includes the sediments within Willetts Creek and Lake Capri.
- OU5 encompasses soils on properties abutting the tidal portion of Willetts Creek located south of the Montauk Highway. OU5 also includes the sediments within the tidal portion of Willetts Creek.
- OU6 documents the RCRA closure for the DFCI facility. The closure procedure included the decontamination and washing of the building floors and walls, excavation and removal of contaminated soils, installation and operation of a soil vapor extraction system, and remediation and closure of contaminated leaching pools. The RCRA Closure was completed June 2018. The buildings were demolished in 2019.

2.2 PHYSICAL SETTING

2.2.1 Land Use

OU1 and OU6 are part of the same Suffolk County tax parcel that is zoned as commercial property. OU1 (the onsite portion) consists of vacant asphalt and grass covered areas, OU6 (the RCRA closed portion) is a vacant lot at the time of this ISMP. OU6 is anticipated to be developed, subject to local permitting and zoning.

OU3 is in a mixed-use area consisting of commercial properties at the north end, residential, and school properties along the western boundary, and residential properties along the eastern boundary. OU4 consists of private residential properties surrounding Lake Capri. There is no public access to Lake Capri. Lake Capri drains into the tidal portion of Willetts Creek (OU5), which is lined by residential properties. The tidal portion of Willetts Creek flows into Babylon Cove in Great South Bay.

2.2.2 Site Geology and Hydrogeology

The Site is in the Atlantic Coastal Plain Physiographic Province. The geology of Long Island is characterized by a southward-thickening layer of unconsolidated Cretaceous and Cenozoic sediments overlying the 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 a saturated thickness of 200 to 210 ft, consisting mostly of Pliocene and Pleistocene glacial

deposits. The Upper Glacial Aquifer rests unconformably on the Cretaceous Magothy Formation. The water table ranges from approximately 14 ft below ground surface (bgs) at (OU1) to a few feet adjacent to OU5.

Willetts Creek flows south into Lake Capri, from a location directly east of OU1. The freshwater creek is slow moving, shallow (typically less than 8 inches [in.] deep) and varies in width from 10 to 25 ft wide. Willetts Creek is fed by upstream surface water runoff and groundwater infiltration. Lake Capri is an 8-acre manmade privately-owned freshwater lake. From Lake Capri, the flow continues through a culvert under Montauk Highway into the tidal (saltwater) portion of the creek. Babylon Cove is approximately 3,000 ft south of Montauk Highway.

Based upon historical documents, Lake Capri was created by impoundment of the Willetts Creek estuary upon construction of the embankment for Montauk Highway (Route 27A) before the turn of the 20th century. A 0.25-acre lagoon is in the northwest corner of the lake. The lagoon is fed by groundwater, and local stormwater run-off. The lake is freshwater, fed by surface water from the upper portion of Willetts Creek, stormwater runoff from two outflow structures from the local streets to the east, and the west and by groundwater. The lake is relatively shallow, with a general depth of approximately 4 ft. There is a weir, located at the south end of the lake, which helps mitigate overflow into a culvert that extends under Montauk Highway to the tidal portion of Willetts Creek (EA 2018).

The sediment in Willetts Creek and Lake Capri is generally fine silt with little amounts of clay underlain by fine to medium grain moderately sorted sand with little amount of gravels and trace pebbles. Historically, the sand was observed at depths of 1 to 2 ft below the sediment surface.

Willetts Creek, Lake Capri, and groundwater in the area are not used as a source of potable water. Potable water in the area is supplied by the Suffolk County Water Authority.

2.3 INVESTIGATION AND REMEDIAL HISTORY

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced are provided in Section 7.0 References.

In 1991, the Site was determined to be a Class 2 (a significant threat) site. An interim remedial measure was conducted in 1991, which resulted in removal of a leach pool at the eastern side of the Dzus facility. This area was designated as OU1 and consisted of these leaching pools (the source), and areas of soil contamination at the facility.

2.3.1 Operable Unit 1 Remedial Activities

Following the interim remedial measure in 1991, a ROD for the site was issued in March 1995 (DEC 1995). The selected remedy, consisting of in situ stabilization/solidification (ISS) for onsite soil containing cadmium at concentrations greater than 10 parts per million (ppm), was completed by December 1996.

The remedial activities that took place were:

- Design and implementation of ISS to remediate any soil contaminated with cadmium at concentrations greater than 10 ppm.
- Design and installation of a final topsoil/asphalt cover to protect the area from the effects of infiltration and freeze/thaw.
- Implementation of ICs in the form of Deed Restrictions.

2.3.2 Operable Unit 2 Remedial Activities

In compliance with the October 1997 ROD for OU2, the following remedial actions took place in 1999:

- Dredging, dewatering, and offsite disposal of approximately 12,000 cubic yards of contaminated sediments from Lake Capri.
- Excavation of approximately 100 cubic yards of sediment from Willetts Creek, corresponding to concentrations of cadmium exceeding 9 ppm.
- Riprap used to prevent future erosion of zones of contamination left in place.
- Implementation of a long-term groundwater monitoring program to evaluate the effectiveness of the onsite remedy.

The extents of OU2 are now encompassed within OU3 and OU4.

2.3.3 Operable Units 3 and 4 Remedial Activities

Remedial investigations and feasibility studies were conducted between 2017 and 2018 at OU3 and OU4. In accordance with the RODs for OU3 (DEC October 2017) and OU4 (November DEC 2018), the soil was remediated to Unrestricted Use Soil Cleanup Objectives (SCOs) and sediment was remediated to Class A Sediment Guidance Values (SGVs). To reach these standard values the following remedial activities occurred:

- Removal of bank soil that exceeded cadmium and chromium Unrestricted Use SCOs.
- Removal of sediment above Class A SGVs from Lake Capri and Willetts Creek.
- Restoration of Willetts Creek to a stable riparian corridor with stream and floodplain wetlands.

- Restoration of upland areas with topsoil, grass seed, and plantings.

2.3.4 Operable Unit 5 Remedial Activities

As of the date of this ISMP, the remedial investigation/feasibility study is being conducted at OU5.

2.3.5 Operable Unit 6 Remedial Activities

OU6 is the RCRA closed area of the Site, completed in 2017. The following remedial actions took place in 2017:

- Excavation and removal of contaminated soils, ranging from 4 to 10 ft below grade. Approximately 1,500 tons of non-hazardous soil were excavated and disposed of a permitted facility.
- Decontamination and washing of building floors and walls.
- Installation and operation of a soil vapor extraction system.
- Remediation and closure of contaminated leaching pools.

After several sampling events, the soil vapor extraction system was dismantled, and all remaining extraction wells were capped and sealed. A Deed Restriction was issued in November 2017 (**Appendix C**). Per the terms of the Deed Restriction, the property Owner must evaluate the potential for vapor intrusion at any newly constructed buildings prior to occupancy. The Owner must monitor or mitigate any identified potential soil vapor impacts.

2.4 RESIDUAL MATERIALS

Limited areas of soil, sediment, and groundwater where cadmium slightly exceeds SCOs remain following remedial activities (**Table 2-1**). The areas are described in detail in the following subsections and are depicted on **Figures 2-1** through **2-3**.

Table 2-1 Remaining Contaminants

Operable Unit	Location	Contaminants
OU1/ OU6	Residual materials remedied by in situ stabilization/solidification and topped with an asphalt or vegetative cover. Potential remaining TCE beneath former facility footprint (previously treated by soil vapor extraction system), Deed Restrictions (2014 and 2017), and long-term monitoring program.	Cadmium, chromium (III), TCE (OU6)
OU2	Incorporated into OU3 and OU4; detailed below.	
OU3	Residual materials in slope behind the Captree Plaza, west of the creek, covered with a demarcation layer and clean backfill. Long-term monitoring program.	Cadmium, chromium (III)
OU4	Residual materials within 30 ft of retaining wall along Montauk Highway, covered with a demarcation layer and clean backfill. Long-term monitoring program.	Cadmium, chromium (III)
OU5	Remedial investigation/feasibility study process is ongoing at the time of this ISMP.	Cadmium, chromium (III)
Groundwater	Low-level groundwater plume is being monitored as part of site management. Area served by public drinking water.	Cadmium, chromium (III)
NOTES: TCE = Trichloroethylene		

2.4.1 Sediment

To protect the retaining wall along the southern boundary of Lake Capri (adjacent to Montauk Highway), sediment removal was not performed within 30 ft of the structure. Clean stone was placed over existing materials to stabilize the area and prevent contact with residual materials. Long-term monitoring will be conducted (Section 4) to ensure the implemented remedy remains protective.

2.4.2 Soil

As described in Section 2.3.1, the selected remedy for OU1 was ISS. This remedy was implemented in 1999 in areas where concentrations of cadmium were above 10 ppm.

A 2:1 (horizontal to vertical) slope was maintained during soil removal behind the Captree Plaza to protect the nearby commercial building. All residual materials were left in place. The residual materials were covered with orange demarcation fabric, followed by clean soil to minimize the potential for direct human contact.

2.4.3 Groundwater

The groundwater monitoring well network consists of 12 wells sampled under the long-term sampling program. For ease of reference, the wells are divided into categories based on their hydrogeologic proximity to the former Dzus facility: upgradient, source area, downgradient, and Willetts Creek, as summarized in **Table 2-2**.

Table 2-2 Groundwater Monitoring Well Network

Well ID	Hydrogeology	Location
MW-17	Upgradient	Opposite of the railroad, northeast near Orinoco Drive
MW-9	Source area	Dzus facility; northeast parking lot, off back corner of the building
MW-9B	Source area	Dzus facility; well pair with MW-9
MW-13A	Downgradient	Grand Union Plaza East side; across Union Boulevard from Dzus facility
MW-13B	Downgradient	Grand Union Plaza East side; well pair with MW-13A
MW-15A	Downgradient	Shopping Plaza front parking lot; across Union Boulevard from Dzus facility
MW-15B	Downgradient	Shopping Plaza front parking lot; well pair with MW-15A
MW-18	Downgradient	West Islip High School off Higbie Lane; north side of parking lot in grass along the fence
MW-22A	Willetts Creek	Shopping Plaza side lot; north side of building on asphalt
MW-22B	Willetts Creek	Shopping Plaza side lot; well pair with MW-22A
MW-23A	Willetts Creek	Grand Union Plaza; behind north corner of building on asphalt
MW-23B	Willetts Creek	Grand Union Plaza; well pair of MW-23A

NOTES:
ID = Identification

The concentrations of cadmium in groundwater have decreased over time and the migration of cadmium to soils or sediments is not anticipated to result in exceedances to SCOs or SGVs. Long-term monitoring will continue to evaluate the effectiveness of the remedy. During the November 2018 groundwater sampling event, detected cadmium concentrations ranged from 2.3 to 18 micrograms per liter ($\mu\text{g/L}$). The highest concentration of cadmium in groundwater was observed at monitoring well MW-23B, located approximately 600 ft downgradient of the former Dzus facility. Monitoring well MW-23B is a deep well, screened between 35 and 45 ft bgs, and it is unlikely that groundwater at this depth is contributing to the flow in Willetts Creek. Groundwater concentrations exceeded the Class GA criterion of 5 $\mu\text{g/L}$ at 3 wells downgradient from the former Dzus facility. The plume of groundwater impacted with cadmium extends approximately 700 ft southwest from the former Dzus facility (**Figure 2-3**).

2.4.4 Surface Water

Historically, cadmium has not been detected in surface water samples collected from Lake Capri at concentrations above 5 $\mu\text{g/L}$. Surface water collected from Willetts Creek (location SW-5, near Beach Street Middle School) has contained detections of cadmium at concentrations exceeding 5 $\mu\text{g/L}$ in 8 of the 10 samples collected between 2006 and 2018. During that period, the concentrations of cadmium in Willetts Creek surface water (SW-5) ranged from 3.0 to 27.0 $\mu\text{g/L}$. Surface water will be monitored as part of the long-term site management program.

2.4.5 Soil Vapor

As required by the 2017 Deed Restriction, the property owner shall evaluate the potential for vapor intrusion for any buildings erected at the Site. Any identified potential soil vapor impacts shall be monitored and mitigated in accordance with the *New York State Department of Health Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH 2006).

This page left intentionally blank

3. INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 GENERAL

As previously described, IC/ECs are required to protect human health and the environment, due to residual materials at the Site. This Institutional and Engineering Control Plan describes the procedures for the implementation and management of all IC/ECs at the Site and includes:

- A description of all IC/ECs on the Site
- The basic operation and intended role of each implemented IC/EC
- A description of the features evaluated during each periodic inspection and compliance certification period
- A description of the features during each required inspection and periodic review
- A description of plans and procedures followed for implementation of IC/ECs
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the DEC
- A description of the reporting requirements.

3.2 INSTITUTIONAL CONTROLS

ICs are required by the RODs to: (1) implement, maintain and monitor EC systems; (2) prevent future exposure to residual materials; and (3) limit the use and development of the onsite portion to commercial or industrial uses only. Adherence to these ICs on the Site is required by the Deed Restrictions and will be implemented under this ISMP. ICs identified in the Deed Restrictions may not be discontinued without an amendment to, or extinguishment of, the Deed Restrictions.

The IC boundaries are specific to the parcel where OU1 and OU6 are located (**Figure 3-1**). These ICs will be implemented to prevent any future, non-commercial use for OU1 and OU6:

- The Owner shall prohibit any excavation or disturbance of the asphalt cover in the Treatment Cell Area unless the Owner first obtains permission to do so from DEC.
- The Owner shall protect the Treatment Cell Area from the effects of erosion by maintaining the final topsoil/asphalt cover.
- The Owner shall prohibit the property from ever being used for purposes other than for non-residential commercial/industrial uses, excluding daycare and health care facilities, without the express written waiver of such prohibition by DEC.

- The Owner shall prohibit the use of groundwater underlying the property without treatment rendering it safe for drinking water or industrial purposes, unless the Owner first obtains permission to do so from DEC.
- The Owner shall continue any required institutional and ECs unless permission is obtained from the relevant agency.
- The Owner shall evaluate the potential for vapor intrusion in any newly constructed buildings on the property, prior to occupancy. Any identified potential soil vapor impacts shall be monitored or mitigated.
- The Owner of the property shall provide an annual certification to the DEC that the ICs and ECs are still in place.

In addition to the ICs required by the RODs, the Long Island Region Fish Advisories published by the NYSDOH (2020) advise that women under 50 and children under 15 should not eat any fish from Lake Capri. Men over 50 and women over 15 are advised to not eat more than 1 meal per month of American eel or carp, and not more than four meals per month of all other fish. These advisories are based on chlordane and cadmium, the latter associated with the former Dzus Site. Future sampling under the fish advisory program will be conducted to determine if changes to the fish advisory for Lake Capri are warranted (discussed in Section 4.3.4).

3.3 ENGINEERING CONTROLS

3.3.1 Operable Unit 1 Cover System

Exposure to residual materials at OU1 is prevented by an asphalt and vegetative cover system (**Figure 3-2**). The asphalt cover was resealed in 2020. Procedures for the inspection of these areas are provided in the Monitoring and Sampling Plan included in Section 4 of this ISMP. The EWP provided in **Appendix D** outlines the procedures required to be implemented in the event the cover is breached, penetrated or temporarily removed, and any underlying residual material is disturbed. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (**Appendix F**) and associated Community Air Monitoring Plan that will be prepared for the excavation-specific work.

A supplemental investigation was conducted in 2019 and 2020 to evaluate the performance of the ISS remedy that was implemented in 1996. Declining groundwater trends at the site and concentrations below the NYSDEC Class GA standards in samples collected from the deep wells suggest that overall, the remedy has been effective in reducing the leachability of cadmium and chromium and limiting impacts to the lower aquifer.

3.3.2 Backfill

Due to stability concerns for existing structures located at OU3 and OU4, clean backfill material (minimum 12 in. of clean sand) was placed over residual materials in certain areas (**Figures 2-1 and 2-2**). The goal of the backfill placement was to maintain structural stability of the area, minimize mobilization of the residual material, and prevent direct human contact. Specifically, residual material remains in an area behind the Captree Plaza along Willetts Creek, and in an area bordering Montauk Highway at the southern end of Lake Capri. Future excavation work in these areas must be conducted in accordance with the EWP.

3.3.3 Sub-Slab Depressurization System

As described in the 2017 Deed Restriction (**Appendix C**), the Owner of the property shall evaluate the potential for vapor intrusion for any buildings developed on the property prior to occupancy. Additionally, the property Owner shall monitor or mitigate any identified potential soil vapor impacts.

If it is determined that a sub-slab depressurization system is required to mitigate soil vapor intrusion, a design must be submitted to DEC and NYSDOH for review and approval. The design of the system should include drawings, proposed location, components, layout, and the proposed schedule for operation and maintenance.

This page left intentionally blank

4. MONITORING AND SAMPLING PLAN

4.1 GENERAL

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. A summary of the monitoring and sampling required is provided in **Table 4-1**. Details of the requirements for inspections, monitoring, sampling, and maintenance activities are shown in the following subsections.

This Monitoring and Sampling Plan describes the methods to be used for sampling and analysis of all appropriate media (sediment, surface water, and groundwater), assessing compliance of appropriate and applicable DEC's Standards, Criteria and Guidelines, and periodically evaluating site information to confirm that the remedy continues to be effective in protecting public health and the environment. Details regarding the data quality usability objectives, analytical methods and other requirements for all samples collected as part of site management are included in the Quality Assurance Project Plan (**Appendix E**). Details regarding health and safety procedures for all fieldwork conducted as part of site management are included in the Health and Safety Plan (**Appendix F**).

Table 4-1 Monitoring and Sampling Schedule

Site Management Activity	Frequency
Monitoring	
Creek corridor inspection	Every 5 quarters; after major storm events
Residual material behind Captree Plaza and along Montauk Highway (in Lake Capri)	Every 5 quarters; after major storm events
OU1 site cover	Every 5 quarters
Monitoring well inspection	Every 5 quarters
Wetland mitigation monitoring	Every 5 quarters
OU5 visual inspection	After major storm events or during the next 5 quarter inspection event, dependent of the severity of the storm event.
Sampling	
Sediment	Every 5 quarters
Surface water	Every 5 quarters
Groundwater	Every 5 quarters
Fish Tissue	Year 3 of Site Management; Every 5 years after

4.2 SITE MONITORING

Monitoring of all site remedial components will be conducted at the frequencies listed in **Table 4-1**. Site inspection forms (**Appendix G**) will be completed during the inspections and submitted to DEC within 30 days of the completion of the site inspection. Inspections will also be performed in the event of an emergency (e.g., major storm events, natural disaster, failure of any of the ECs). Major storm events are defined as follows:

- On an annual basis, three storm events equal to or exceeding the current 10-year recurrence interval event (5.25 in. of precipitation in a 24-hour period), or one storm event equal to or

exceeding the current 100-year recurrence interval event (9.00 in. of precipitation in a 24-hour period).

If an emergency occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, verbal notice will be provided to DEC as soon as possible. In addition, an inspection of the Site will be conducted by a qualified environmental professional within 5 days of the event to verify the effectiveness of the IC/ECs. Written confirmation must be provided to the DEC within 7 days of the event that includes a summary of actions taken, or proposed to be taken, and the potential impact to the environment and the public.

The inspections will determine and document the following:

- Whether ECs continue to perform as designed
- If these controls continue to be protective of human health and the environment
- Compliance with requirements of this ISMP and the Deed Restriction
- Achievement of remedial performance criteria
- If site records are complete and up-to-date
- Reporting requirements are outlined in Section 6 of this ISMP.

Wetland mitigation monitoring will also be conducted for Willetts Creek and Lake Capri, to meet the conditions of the authorization received from USACE to perform the remediation under Nationwide Permit No. 38. The success criteria for the monitoring program will include, at a minimum, the success of the planted vegetation, as measured through survivorship counts and observations of vitality and growth, and the existence of wetland hydrology for the created wetlands. Plot vegetation density measurement techniques will be utilized and conducted each monitoring year.

The mitigation monitoring effort will include the collection of specific data for reporting, including the following:

- The growth and vitality of the planted hydrophytic species
- Current site conditions at fixed photographic points
- The species composition of recruited, desirable plant species
- The species composition and aerial cover of nuisance/non-native plant species
- Wildlife utilization and depredation
- Descriptions of hydrology indicators observed and hydric soil development.

Special conditions from the USACE authorization include:

- Ensure that all proposed wetland and stream mitigation plantings have an 85 percent survival rate, and all established wetland areas in conjunction with the compensatory mitigation have an 85 percent coverage of hydrophytic plants.

- Ensure that the vegetation in the newly established wetlands and within the stream mitigation areas do not consist of more than a total of 5 percent areal coverage of invasive species. Invasive species include, but are not limited to, the following:
 - Common reed (*Phragmites australis*)
 - Purple loosestrife (*Lythrum salicaria*)
 - Reed canary grass (*Phalaris arundinacea*)
 - Japanese knotweed (*Polygonum cuspidatum*)
 - Tartarian honeysuckle (*Lonicera tatarica*)
 - Eurasian water-milfoil (*Myriophyllum spicata*).
- Ensure that no mowing of the mitigation areas has occurred.
- Annual reports shall be submitted to USACE no later than 31 October of each year.

A copy of the USACE authorization and Mitigation Plan is included in **Appendix H**.

4.3 POST-REMEDATION SAMPLING

Sediment, surface water, and groundwater samples will be collected to evaluate the effectiveness of the remedy within OU1, OU3, and OU4 as outlined in the following subsections for the sampling events listed in **Table 4-2**.

Table 4-2 Environmental Media Sampling Requirements and Schedule

Sampling Media	Total Cadmium and Chromium (EPA Method 6010)	Schedule
Sediment	Total Cadmium and Chromium (EPA Method 6010)	Every 5 quarters
Surface Water	Dissolved Cadmium and Chromium (EPA Method 6010) and hardness (SM 2340B)	Every 5 quarters
Groundwater	Total and Dissolved Target Analyte List Metals (EPA Method 6010)	Every 5 quarters
Biological Tissue (Fish)	Total Cadmium and Chromium (EPA Method 6010)	Year 3; Every 5 years after

4.3.1 Sediment Sampling

Sediment sampling will be performed every five quarters (15 months) following completion of the remedial actions. The sediment sample location (**Figure 4-1**) has been chosen based on the historical location of cadmium contamination behind Captree Plaza. This area is the most upstream location where groundwater communicates with surface water and where cadmium concentrations were highest prior to remedy implementation.

One surficial sediment sample will be collected using a hand tool. The sample container will be labeled in terms of designation, depth, date, and time the sample was obtained. Samples will be preserved in accordance with the protocols outlined in the site-specific QAPP (**Appendix E**) and shipped to the laboratory under standard chain-of-custody procedures. The sediment sample will be analyzed for cadmium and chromium by EPA Method 6010, in accordance with the DEC Analytical Services Protocol. The results of the sampling will be compared against the Class A SGVs for cadmium (1 milligram per kilogram) and chromium (43 milligrams per kilogram).

If cadmium or chromium is detected in this area above the Class A sediment screening criteria, additional samples may be collected downstream along Willetts Creek and within Lake Capri based on discussions with NYSDEC. Assessments of the potential bioavailability, and sediment toxicity will also be considered for further evaluation. If additional action is warranted, the first step is to determine (by subsequent laboratory analysis) if the contamination is bioavailable to the ecological community. If it is, additional testing would be conducted to determine if the contamination is causing toxicity in the benthic organisms. The results of these assessments would be used to determine if further sampling or action is needed.

4.3.2 Surface Water Sampling

Surface water samples will be collected from Willetts Creek every 5 quarters (15 months) at the location shown on **Figure 4-1**, for analysis of dissolved cadmium and chromium by EPA Method 6010 and hardness by SM 2340B. Each surface water sample will be collected from the top of the water column, by submerging a laboratory-provided bottle into the water, and then transferring the collected water into a preserved sample bottle. Surface water analytical results will be compared to the New York State Ambient Water Quality Standards and Guidance values for Class C waters. If cadmium or chromium is detected in this area above the applicable Ambient Water Quality Standards and Guidance value, additional samples may be collected downstream along Willetts Creek and within Lake Capri based on discussions with NYSDEC. Water quality measurements will be collected at each surface water sample location using a water quality meter and will include the collection of parameters such as pH, specific conductivity, temperature, reduction-oxidation potential (Eh), turbidity, and dissolved oxygen. Deliverables for the surface water sampling program are specified in Section 8.0 Reporting Requirements. Quality assurance samples will be collected at the frequency detailed in **Table 1** of the QAPP Addendum (**Appendix E**).

4.3.3 Groundwater Sampling

Groundwater monitoring will be performed every 5 quarters (15 months) to assess the performance of the remedy. **Table 4-3** summarizes the construction details of the wells subject to the monitoring program. Groundwater samples will be collected from 12 wells for analysis of target analyte list metals by EPA Method 6010 and mercury by EPA Method 7470. Results will be compared against the applicable DEC Ambient Water Quality Standards and Guidance Values for Class GA water for each of the analytes. Quality assurance samples will be collected at the frequency detailed in **Table 1** of the QAPP Addendum (**Appendix E**).

Table 4-3 Monitoring Well Construction Details

Monitoring Well ID	Coordinates		Well Depth (ft)	Depth to Water (November 2018)	Well diameter (in.)
	Latitude	Longitude			
MW-9	1178247.26	198173.06	11.5	4.80	2
MW-9B	1178251.17	198165.84	44.5	4.76	2
MW-13A	1178294.25	197843.49	10.7	1.82	2
MW-13B	1178275.50	197862.07	44.3	2.69	2
MW-15A	1178248.47	197996.20	28.8	5.60	2
MW-15B	1178263.75	198010.44	84.7	5.53	2
MW-17	1178725.97	198570.78	16.0	7.45	2
MW-18	1177949.79	196051.70	13.5	4.95	2
MW-22A	1178629.59	198073.81	14.4	6.27	2
MW-22B	1178632.66	198082.20	44.5	6.11	2
MW-23A	1178346.20	197667.96	14.3	4.55	2
MW-23B	1178334.47	197658.41	44.5	4.52	2

Coordinates provided in NAD 1983 State Plane New York Long Island FIPS 3104 Feet

Groundwater samples will be collected from each well using low-flow sampling procedures. During each groundwater sampling event, samples will be analyzed by an approved Environmental Laboratory Accreditation Program-certified laboratory in accordance with New York State Department of Environmental Conservation Analytical Services Protocol.

The following procedures will be used for monitoring well groundwater sampling:

- Field staff will use new sampling gloves for the collection of each sample.
- Unlock and remove the well cap.
- Measure the static water level in the well with an electronic water-level indicator. The water-level indicator will be washed with Alconox detergent and water, then rinsed with deionized water between individual wells to prevent cross-contamination.
- Calculate the volume of water in the well and document on the field form.
- Purge water from the well with a peristaltic pump using new polyethylene tubing and silicone flex tubing within the pump housing dedicated to each well. Purge at a rate no higher than 250 milliliters per minute.

- During purging of the well, monitor the water quality indicator parameters, including pH, temperature, salinity, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity. Record purge rate, volume purged, depth to water, water quality indicator parameters values, and clock time at 3- to 5-minute intervals on the purging/sampling form (**Appendix G**).
- Purging will be complete if field parameters stabilize per the following conditions
- Purging will be complete if the following conditions are met:
 - Three consecutive pH readings are ± 0.1 pH units of each other
 - Three consecutive measured specific conductance is ± 10 percent of each other
 - Three consecutive measured redox potential is ± 10 millivolts of each other
 - Three consecutive measured dissolved oxygen is ± 10 percent of each other
 - Three consecutive measured turbidity readings are ± 10 percent of each other and below 50 nephelometric turbidity units.
- If these parameters are not met after purging a volume equal to 3–5 times the volume of standing water in the well, the DEC Project Manager, or representative will be contacted to determine the appropriate action(s).
- If the well goes dry before the required volumes are removed, the well may be sampled when it recovers (recovery period up to 24 hours).
- Remove the tubing from the flow through cell prior to collecting the sample.
- Collect the sample aliquot for specified analysis, and carefully pour directly into the appropriate sample bottle(s). Appropriate sample bottles will be obtained from the laboratory.
- Place analytical samples in cooler and chill to 4 degrees Celsius. Samples will be shipped to the analytical laboratories within 24 hours.
- If a centrifugal or submersible pump is used, it will be decontaminated with an Alconox and water flush followed by a potable water rinse, and the polyethylene suction/discharge line will be properly discarded.
- Re-lock well cap.
- Fill out field logbook, sample log sheet, labels, custody seals, and chain-of-custody forms.

If biofouling or silt accumulation occurs in the onsite and/or offsite monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced if an event renders the wells unusable. Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The DEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report (PRR). Well abandonment will be performed in accordance with DEC's guidance entitled *CP-43: Groundwater Monitoring Well Decommissioning Procedures*. Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the DEC.

4.3.4 Fish Sampling

Sampling under the fish advisory program will be conducted to determine if changes to the fish advisory for Lake Capri is warranted. The first sampling event will occur in the third year of site management; with additional sampling efforts completed every 5 years as needed. Fish tissue (predator and prey) samples will be collected from two areas in Lake Capri: near the mouth of Willetts Creek and in an area in the southern part of the lake, near the culvert leading to the tidal portion of Willetts Creek.

The objective of the biological sampling is to determine the concentrations of chromium and cadmium in fish tissue. The target fish species are largemouth bass (*Micropterus salmoides*) and golden shiner (*Notemigonus crysoleucas*). If target species cannot be captured in adequate numbers, non-target species will be used for analysis. Information on "targets of opportunity" is preferable to no data. The target species were chosen to represent different trophic levels (i.e., largemouth bass represent top trophic level piscivores and golden shiners represent lower trophic level forage fish). The fish chosen as "targets of opportunity" should represent a similar trophic level. Examples include using Bluegill (*Lepomis macrochirus*) in place of largemouth bass and Spottail Shiners (*Notropis hudsonius*) or fall fish (*Semotilus corporalis*) in place of golden shiners. A list of all acceptable backup fish species will be confirmed with NYSDEC prior to mobilization to the field.

There will be a total of 20 fish samples collected for chemical analysis. Ten fish tissue samples will be collected at each location as follows.

Location	Target Taxa	No. of Samples	Sample Type
FSA-1	Largemouth bass	5	Fillet (skin on)
	Golden Shiner	5	Whole body
FSA-2	Largemouth bass	5	Fillet (skin on)
	Golden Shiner	5	Whole body
Total fish		20	

Samples of forage fish may need to be composited to reach the minimum required mass of 5 grams for analysis. Composite samples will consist of fish of the same species and similar size. Individual specimens of top piscivores will likely be large enough for fillets to meet the required minimum mass and will not need to be composited. Quality assurance samples will be collected at the frequency detailed in **Table 1** of the QAPP Addendum (**Appendix E**). Additional tissue for quality control analyses is not required; the laboratory will prepare the analyses with submitted material.

The primary method for fish collection will be boat and backpack electroshocking. Supplemental gear to be employed as needed will include beach seine, gill net, bottom trawl, minnow traps, and rod and reel. All fish collected will be held live in containers during sampling until it is determined whether adequate numbers of target species are present in the sampling zone or whether targets of opportunity need to be selected. Specimens that do not meet/fill the species, size, tissue mass, and sample number requirements for the study will be released. A License to Collect or Possess: Scientific will be obtained by EA from the NYSDEC prior to sampling.

5. PERIODIC ASSESSMENTS/EVALUATIONS

5.1 CLIMATE ADAPTATION PLAN

The Dzus Climate Resiliency Assessment Report (EA 2019) (**Appendix I**) provides an assessment of the projected climate change impacts on the remedies implemented to address cadmium and chromium contamination in sediment and soil at the Site. Based on available information and a review of most likely climate impacts as discussed within this report, a Climate Adaptation Plan is presented in **Table 5-1**. This Climate Adaptation Plan provides the suggested details for the threshold levels and success measures for the following:

- Cadmium in sediments and soil in the tidal area of Willetts Creek (OU5)
- Cadmium in sediments and soil in specific areas covered by clean backfill along the banks of OU3 and OU4 (as discussed above in Section 3.3.1).

Table 5-1 Climate Adaptation Plan

Item	Project Location	Contaminant of Concern	Existing Measure	Potential Climate Change Impact	Potential Effect	Adaptation Measure	Threshold Level	Monitoring for Threshold	Success Measure
1	OU5	Cadmium in soil and sediment	Remedial investigation/feasibility study currently being conducted at OU5.	Storm surge flow from Babylon Cove and Great South Bay northward.	Scour and erosion of sediment bed; deposition of sediment on adjacent floodplain.	To be determined in a future revision to this plan	Storm surge equal to or exceeding the mid-range projection for major storm surge in 2050, defined as 6.0 ft in NAVD88 Datum	Review United States Geological Service Tide Station 01309225 Great South Bay at Lindenhurst, New York, after major storm event to assess if storm surge surpasses threshold.	A visual assessment of areas inundated by major storm surge reveals minimal sediment deposition in the floodplain.
2	OU3 and OU4	Cadmium in sediment and soil	Residual materials covered with clean material in specific areas following 2019–2020 remedial action.	Storm surge flow northward along Willetts Creek and Lake Capri.	Scour and erosion of stream bank and lake shore.	Sized riprap stone on the banks and creek bed to prevent erosion from design storm surge flowing north up Willetts Creek. Design based upon large coastal storm (such as Hurricane Sandy) type impact. As climate impacts increase, this design storm level will likely increase. Size of storm to inundate this area at the present time would be significant.	Storm surge equal to or exceeding the mid-range projection for major storm surge in 2050, defined as 6.0 ft in NAVD88 Datum.	Review United States Geological Service Tide Station 01309225 Great South Bay at Lindenhurst, New York, after major storm event to assess if storm surge surpasses threshold.	An assessment of areas inundated by major storm surge reveals minimal erosion within project limits. Backfill elevations over residual materials verified by survey.
3	OU3 and OU4	Cadmium in sediment and soil	Residual materials covered with clean material in specific areas following 2019–2020 remedial action.	Storm runoff flow south along Willetts Creek and Lake Capri.	Scour and erosion of stream bank and lake shore.	Implemented Adaptation Measure; Sized riprap stone on the banks and creek bed to prevent erosion from design storm. Current stone sized for present day 100-year storm level.	On an annual basis, three storm events equal to or exceeding the current 10-year recurrence interval event or one storm event equal to or exceeding the current 100-year recurrence interval event. The 10-year event is defined as 5.25 in. of precipitation in a 24-hour period. The 100-year event is defined as 9.00 in. of precipitation in a 24-hour period.	Review local precipitation gages after major storm event to assess if precipitation surpasses threshold.	An assessment of Willetts Creek and Lake Capri reveals minimal erosion within project limits. Backfill elevations over residual materials verified by survey.
4	OU1 to OU3	Cadmium and chromium in groundwater	ISS and an asphalt/vegetation cover.	Increased groundwater flow and weathering of asphalt cover and ISS mass due to higher runoff in the future.	Mobilization of cadmium and chromium in groundwater with migration to surface water at Willetts Creek.	Maintenance of asphalt and vegetative cover.	Increasing concentrations of cadmium and chromium in groundwater.	Monitor for cadmium and chromium concentrations in groundwater at OU1 to evaluate temporal trends.	An assessment of cadmium and chromium in groundwater reveals continual declining/stable concentrations.

This page left intentionally blank

5.2 GREEN REMEDIATION EVALUATION

DEC's DER-31 Green Remediation (DEC 2011) requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the ISMP provides a summary of any green remediation evaluations to be completed for the Site during site management, and as reported in the PRR. Green remediation measures at OU5 will be considered during planning and design.

5.2.1 Timing of Green Remediation Evaluations

Green remediation evaluations and corresponding modifications will be undertaken any time that the Project Manager feels appropriate, e.g. during significant maintenance events or in conjunction with storm recovery activities.

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

5.2.2 Metrics and Reporting

For sites, whose remedial programs are state-funded, a quantitative and qualitative overview of the site's environmental impacts must be proposed through the completion of the Summary of Green Remediation Metrics (**Appendix J**). Information will be collected on energy usage, solid waste generation, transportation and shipping, water usage, and land use and ecosystems to facilitate and document consistent implementation of green remediation during site management and to identify corresponding benefits.

This page left intentionally blank

6. REPORTING REQUIREMENTS

6.1 SITE MANAGEMENT REPORTS

All site management inspection, maintenance, and monitoring events will be recorded on the appropriate site management forms provided in **Appendix G**.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format to the DEC in accordance with the requirements of **Table 6-1** and summarized in the PRR.

Table 6-1 Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Inspection Report	Within 30 days of an inspection or sampling event.
Periodic Review Report	Every 5 quarters
* The frequency of events will be conducted as specified until otherwise approved by the DEC.	

Interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period
- Name, company, and position of person(s) conducting monitoring/inspection activities
- Description of the activities performed
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet)
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc.)
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.)
- Sampling results in comparison to appropriate standards/criteria
- A figure illustrating sample type and sampling locations
- Copies of all laboratory data sheets, and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the DEC-identified format)
- Any observations, conclusions, or recommendations
- A determination as to whether contaminant conditions have changed since the last reporting event.

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities
- Description of non-routine activities performed
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet)
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the DEC. Currently, data is to be supplied electronically and submitted to the DEC EQUIS™ database in accordance with the requirements found at this link <http://www.dec.ny.gov/chemical/62440.html>.

6.2 PERIODIC REVIEW REPORT

A PRR will be submitted to the DEC beginning 16 months after the approval of the Construction Completion Report for OU3 and OU4 is issued. After submittal of the initial PRR, the next PRR shall be submitted annually to the DEC. If the Site is subdivided into separate parcels with different Ownership, a single PRR will be prepared that addresses the Site. The report will be prepared in accordance with DEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the Site during the reporting period in the DEC-approved electronic format, if not previously submitted.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.

- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the DEC. Currently, data is supplied electronically and submitted to the DEC EQuIS™ database in accordance with the requirements found at this link: <http://www.dec.ny.gov/chemical/62440.html>.
- Results of wetland mitigation monitoring shall be included as an attachment to the PRR.

A site evaluation, which includes the following:

- The compliance of the remedy with the requirements of RODs.
- The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications.
- Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored.
- Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan.
- Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document.
- The overall performance and effectiveness of the remedy.

6.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional or Professional Engineer licensed to practice in New York State will prepare, and include in the PRR, the following certification as per the requirements of DEC's DER-10:

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

- *The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction.*

- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the DEC.*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment.*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control.*
- *Access to the Site will continue to be provided to the DEC to evaluate the remedy, including access to evaluate the continued maintenance of this control.*
- *If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document.*
- *Use of the Site is compliant with the Deed Restrictions.*
- *The engineering control systems are performing as designed and are effective.*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program.*
- *The information presented in this report is accurate and complete.”*

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

The PRR will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The PRR may need to be submitted in hard-copy format, if requested by the NYSDEC Project Manager.

6.3 CORRECTIVE MEASURES WORK PLAN

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC/EC, a Corrective Measures Work Plan will be submitted to DEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by DEC.

7. REFERENCES

EA Engineering, P.C., and its affiliate EA Science and Technology (EA). 2018. *Final Remedial Investigation Report, Operable Unit 4 – Lake Capri. Site No.152033.* September.

———. 2019. *Dzus Climate Resiliency Assessment, Dzus Fastener Company, Inc. (152033) West Islip, New York, Willets Creek and Lake Capri.* July.

NYSDEC (DEC). 1995. *Record of Decision, Dzus Fastener Company, Operable Unit 01, Inactive hazardous Waste Site, Site Number 152033.* March.

———. 1997. *Record of Decision, Operable Unit (OU) 02. Dzus Fastener Co., Inc. Site Number I-52-033. West Islip, Suffolk County.* October.

———. 1998. *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.* June. April 2000 addendum.

———. 2006. *6NYCRR Part 375, Environmental Remediation Programs.* 14 December.

———. 2010. *Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation.*

———. 2011. *DER-31 Green Remediation.* Revised January.

———. 2017. *Record of Decision, Operable Unit (OU) 03: Willets Creek Wetland Areas. Dzus Fastener Co., Inc. Site No. 152033. West Islip, Suffolk County, New York.* October.

———. 2018. *Record of Decision, Operable Unit (OU) 04: Lower End of Willets Creek and Lake Capri. Dzus Fastener Co., Inc. Site No. 152033. West Islip, Suffolk County, New York.* November 2018.

New York State Department of Health (NYSDOH). 2006. *New York State Department of Health Guidance for Evaluating Soil Vapor Intrusion in the State of New York*

This page left intentionally blank

Figures

This page intentionally left blank

G:\Projects\State&Local\INYSDEC - D007624\0007624 - Work Assignments\14907.44 - Dzus Oversight\GIS\IMXDs\SMP\Figure 1-1_Gen_Location.mxd

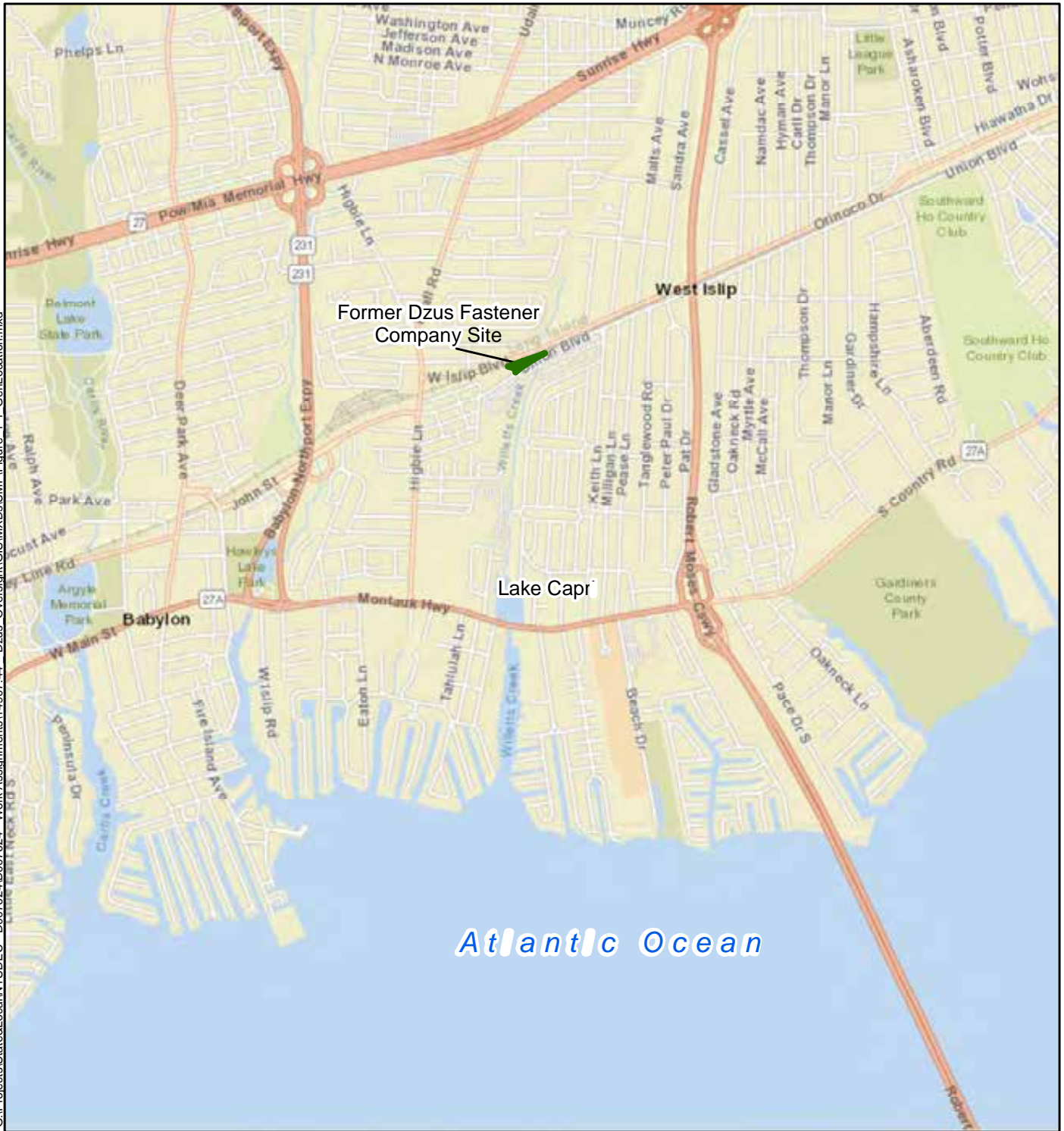
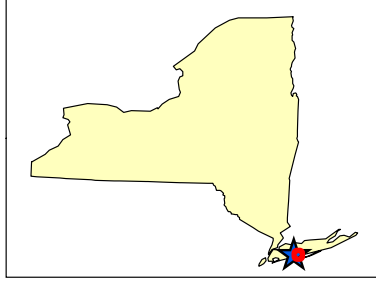



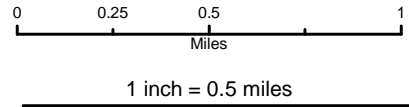
Figure 1
General Site Location
 Interim Site Management Plan
 Dzus Fastener Company, Inc.
 West Islip, NY

Map Date: 2/28/2020
 Projection: NAD83 State Plane New York Long Island

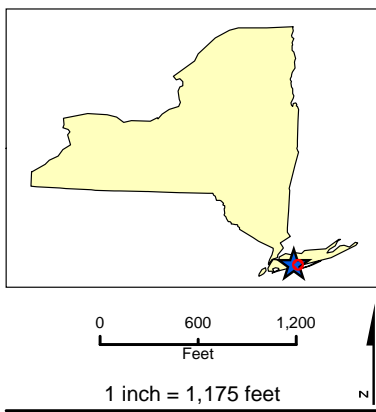
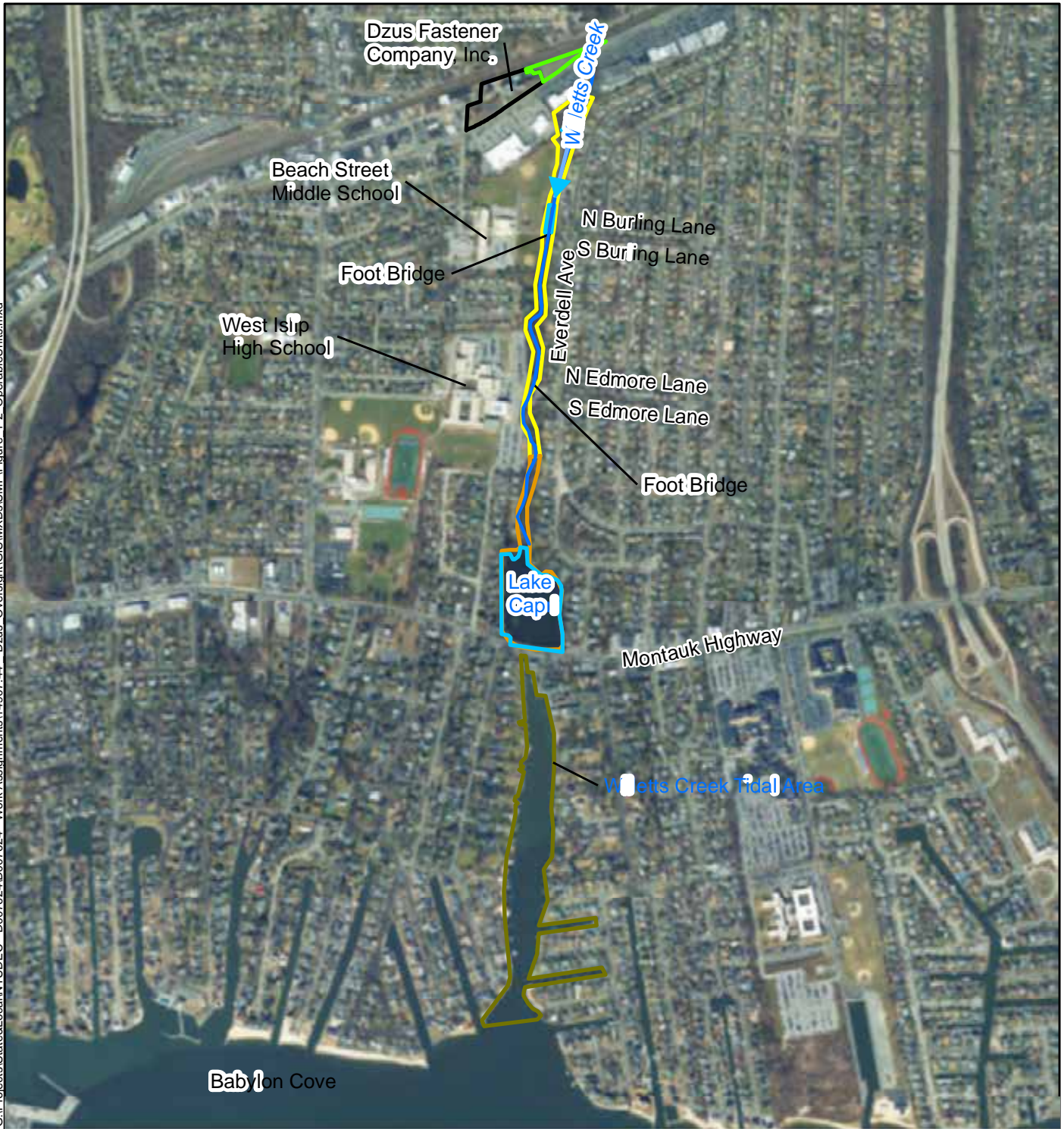


Legend

-  Dzus Fastener Company, Inc. Property Boundary



G:\Projects\State&Local\NYSDEC - D007624\0007624 - Work Assignments\14907.44 - Dzus Oversight\GIS\IMXD\SMP\Figure 1-2 OperableUnits.mxd

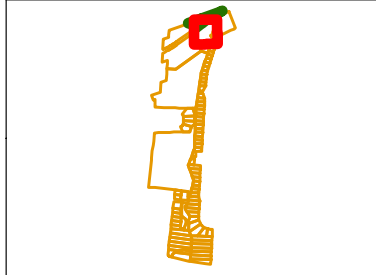


- Legend**
- Willetts Creek
 - Approximate Operable Unit Boundary
 - Operable Unit 1
 - Operable Unit 2
 - Operable Unit 3
 - Operable Unit 4
 - Operable Unit 5
 - Operable Unit 6

Figure 1-2
Operable Units
 Interim Site Management Plan
 Dzus Fastener Company, Inc.
 West Islip, NY

Map Date: 2/28/2020
 Projection: NAD83 State Plane New York Long Island

G:\Projects\State&Local\NYSDEC - D007624\D007624 - Work Assignments\14907_44 - Dzus Oversight\GIS\MXDs\SMPI\Figure 2-1_CaptreeResidual.mxd



Legend



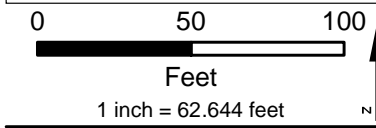
-  Residual Confirmation Sampling Location mg/kg (milligrams per kilogram)
-  Demarcation Fabric Extent

Figure 2-1
Residual Cadmium in Willetts Creek Floodplain
Interim Site Management Plan
Dzus Fastener Company, Inc.
West Islip, NY



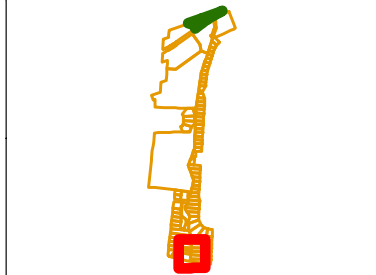
G:\Projects\State&Local\NYSDEC - D007624\0007624 - Work Assignments\14907.44 - Dzus Oversight\GIS\IMXDs\SMPI\Figure 2-2_MontaukHWY_residual.mxd

Sampling Program	Location ID	Start Depth (in)	End Depth (in)	Cadmium (mg/kg)
Remedial Investigation (2018)	LC50	0	6	52
		6	12	19
	LC51	0	6	27
	LC52	0	6	11
	LC55	0	6	3.9
	LC56	0	6	92
		6	12	58
12		18	5.6	
Routine Sampling (2017)	SED-3	Surface Grab		53
Historical Sediment Sampling (2013)	LE-1	Surface Grab		46
	LE-4	Surface Grab		140
Notes in = inches mg/kg = milligrams per kilogram or parts per million				



Lake Capri

Montauk Highway



- Legend**
- Rip Rap/Armor Placement Area
 - 2018 Sampling Location
 - 2017 Sampling Location
 - 2013 Sampling Location

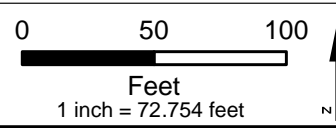
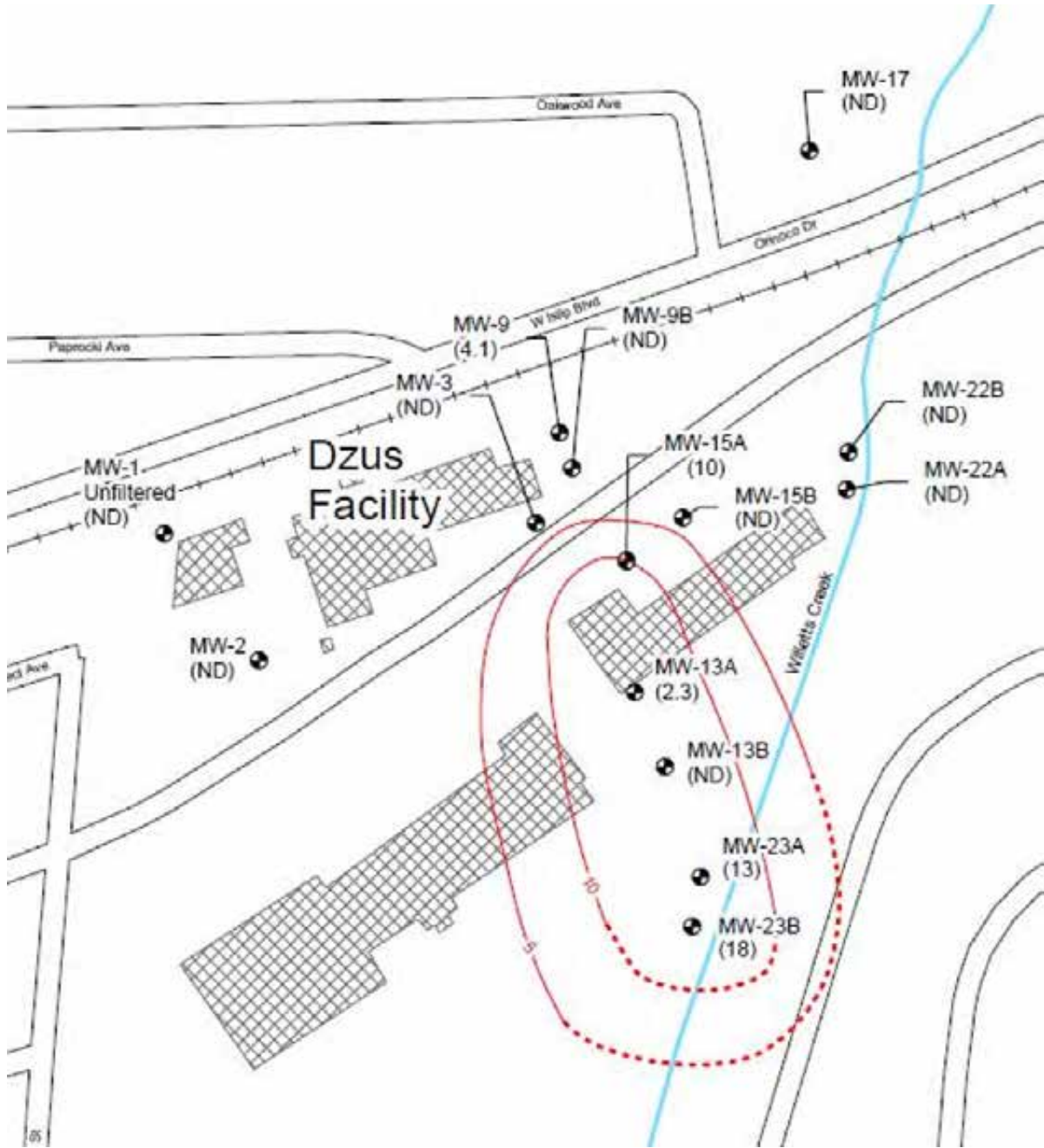


Figure 2-2
Residual Cadmium in Lake Capri
Interim Site Management Plan
Dzus Fastener Company, Inc.
West Islip, NY



Note: Figure from AECOM. 2019. Groundwater Sampling Report (November 2018 Sampling Event) Dzus Fasteners Site, Site #1-52-033. Final. May

Figure 2-3
Residual Cadmium in Groundwater
Interim Site Management Plan
Dzus Fastener Company, Inc.
West Islip, NY

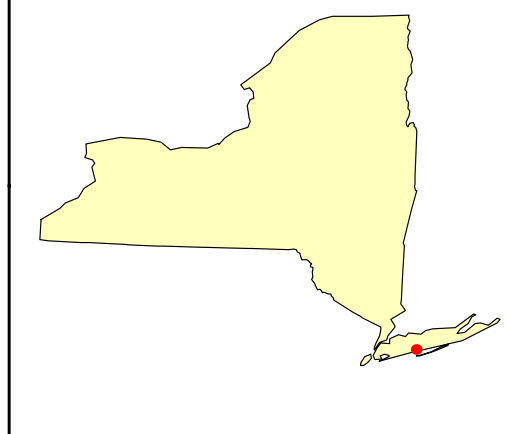
Map Date: 2/28/2020
Projection: NAD83 UTM Zone 18N

This page intentionally left blank

G:\Projects\State&Local\NY\SDEC - D007624\007624 - Work Assignments\14907.44 - Dzus_Oversight\GIS\MXDs\SMP\Figure_3-1_ICarea.mxd



VICINITY MAP



Legend



-  OU1 Boundary
-  OU6 Boundary

Figure 3-1
OU1 and OU6
Interim Site Management Plan
Dzus Fastener Company, Inc.
West Islip, NY

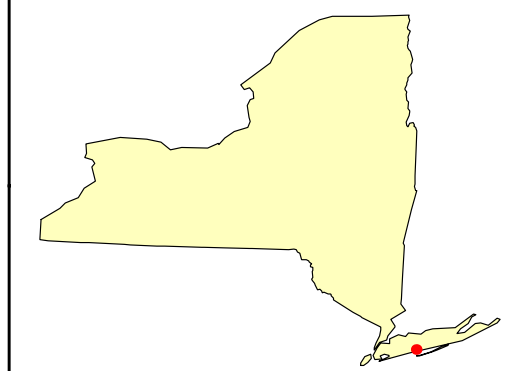
Map Date: 2/28/2020
Projection: NAD83 State Plane New York Long Island



G:\Projects\State&Local\NY\SDEC - D007624\0007624 - Work Assignments\GIS\MXDs\SMP\Figure_3-2_CoverSystemOU-1.mxd



VICINITY MAP



Legend

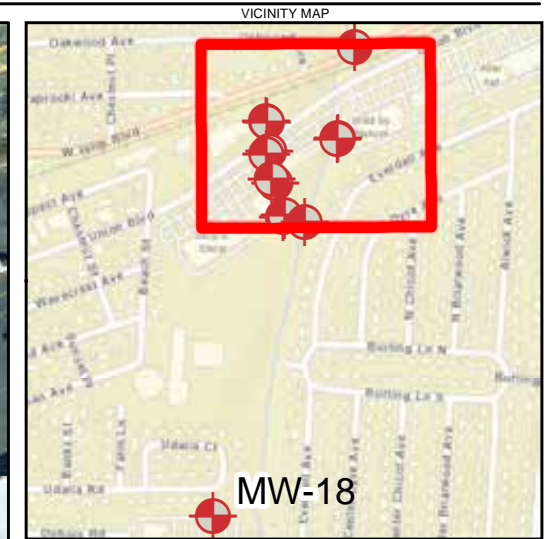
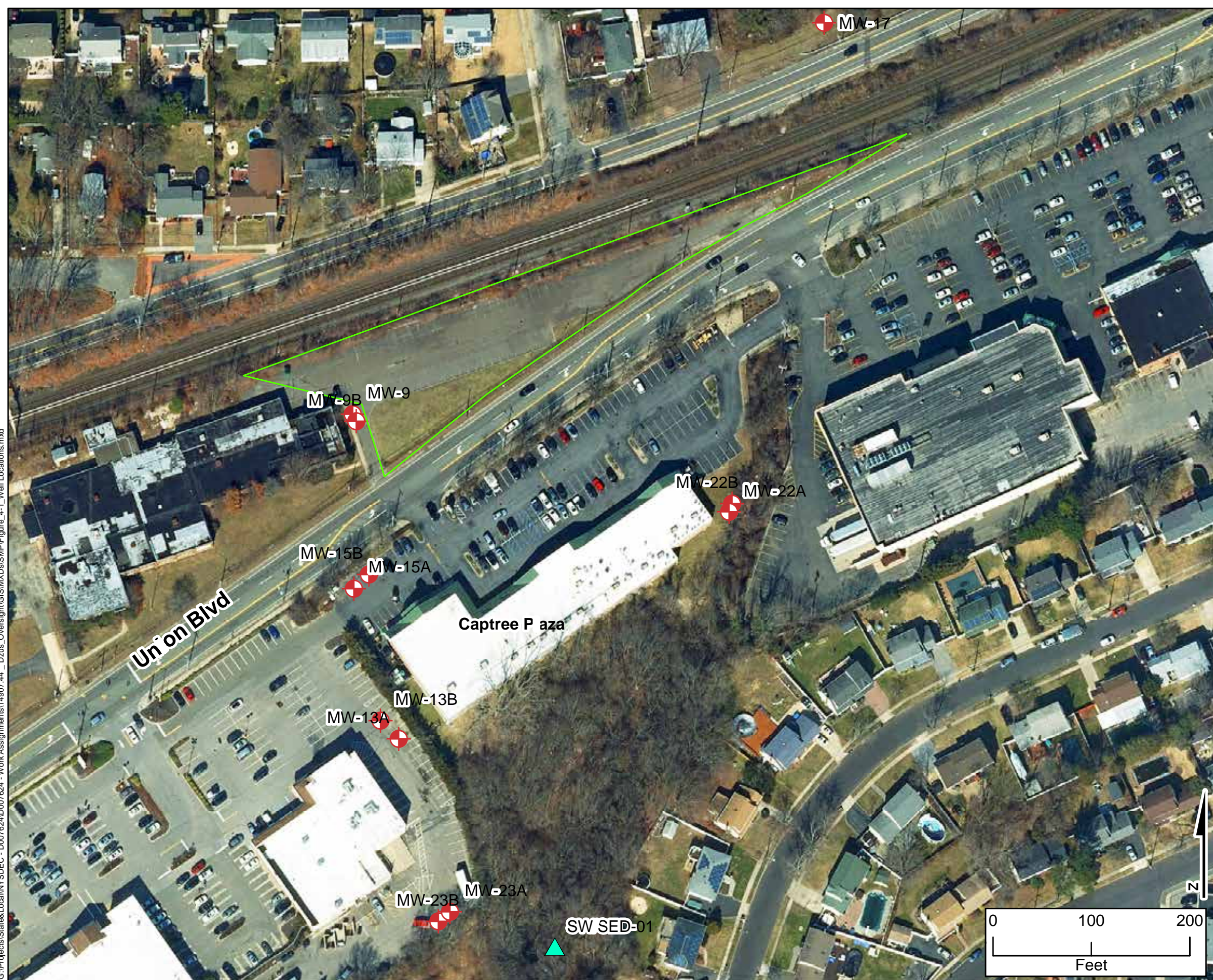
 OU1 Boundary

Figure 3-2
OU1 Cover System
 Interim Site Management Plan
 Dzus Fastener Company, Inc.
 West Islip, NY

Map Date: 2/28/2020
 Projection: NAD83 State Plane New York Long Island



G:\Projects\State&Local\NY SDEC - D007624\007624 - Work Assignments\1490744 - Dzus_Overview\GIS\MXDs\SMP\Figure_4-1_Well Locations.mxd



Legend

Sample Locations



-  Monitoring Well
-  Surface Water/Sediment Sample Location

Figure 4-1
Sampling Locations
Interim Site Management Plan
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 2/28/2020
Projection: NAD83 State Plane New York Long Island



This page intentionally left blank

Appendix A

List of Site Contacts

This page left intentionally blank

List of Site Contacts

Name	Phone/Email Address
Site Owner Robert Monahan (the Owner) c/o Island Associates	(631) 982-2100 robert@islandassociates.com
EA Engineering, P.C. and its affiliate EA Science and Technology Project Manager: Frank DeSantis, Jr.	(315) 565-6554 fdesantis@eaest.com
DEC DER Project Manager: Brianna Scharf	(518) 402-5987 brianna.scharf@dec.ny.gov
DEC Regional Hazardous Waste Engineer: Chris Engelhardt	(631)444-0240 christopherr.engelhardt@dec.ny.gov
DEC Kelly Lewandowski	(518) 402-9813 kelly.lewandowsky@dec.ny.gov
NYSDOH Project Manager: Jacquelyn Nealon	(518)402-7860 jacquelyn.nealon@health.ny.gov
Document Repository West Islip Public Library	(631) 661-7080
NOTES: DEC = New York State Department of Environmental Conservation DER = Division of Environmental Remediation	

This page left intentionally blank

Appendix B

Responsibilities of Owner and DEC

This page left intentionally blank

Responsibilities

The responsibilities for implementing the Interim Site Management Plan (ISMP) for the Dzus Fastener Company Inc., Site No. 152033 (the Site) are divided between the Site Owner and DEC, as defined below.

The Owner is currently listed as:

Robert Monahan (the Owner)
c/o Island Associates
444 Route 111
Smithtown New York 11487.

The Remedial Party is the New York State Department of Environmental Conservation (DEC).

DEC
Division of Environmental Remediation
625 Broadway
Albany, New York 12233
Project Manager: Brianna Scharf, E.I.T.
brianna.scharf@dec.ny.gov

EA Engineering, P.C. and its affiliate EA Science and Technology
269 W. Jefferson Street
Syracuse, New York 13202
Project Manager: Frank DeSantis, Jr.
fdesantis@eaest.com

Nothing on this page shall supersede the provisions of a Record of Decision, Deed Restriction, or other legally binding document that affects rights and obligations relating to the Site.

Site Owner's Responsibilities:

1. The Owner shall follow the provisions of the ISMP as they relate to future construction and excavation at the Site.
2. In accordance with a periodic time frame determined by the DEC, the Owner shall periodically certify, in writing, that all Institutional Controls set forth in the Deed Restriction remain in place and continue to be complied with. The Owner shall provide a written certification to the DEC, upon the DEC's request, in order to allow the DEC to include the certification in the Site's Periodic Review Report (PRR) certification to the DEC.

3. In the event the Site is delisted, the Owner remains bound by the Deed Restriction and shall submit, upon request by the DEC, a written certification that Deed Restriction is still in place and has been complied with.
4. The Owner shall grant access to the site to the DEC and its agents for the purposes of performing activities required under the ISMP and assuring compliance with the ISMP.
5. The Owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. In the event that damage to the remedial components or vandalism is evident, the Owner shall notify the DEC in accordance with the timeframes indicated in Section 1.2 of the ISMP.
6. In the event some action or inaction by the Owner adversely impacts the Site, the Owner must notify the DEC in accordance with the timeframe indicated in Section 1.2 and (ii) coordinate the performance of necessary corrective actions with DEC.
7. The Owner must notify the DEC of any change in Ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new Owner of the site property. Among the notification requirements is the following – A 60-day prior written notification must be made to the DEC. Notification is to be submitted to the DEC Division of Environmental Remediation’s Site Control Section. Notification requirements for a change in use are detailed in Section 2.4 of the ISMP. A 60-Day Advance Notification Form and Instructions are found at <http://www.dec.ny.gov/chemical/76250.html>.
8. Until such time as the DEC deems the vapor mitigation system unnecessary, the Owner shall operate the system, pay for the utilities for the system’s operation, and report any maintenance issues to the DEC.
- 11) In accordance with the tenant notification law, within 15 days of receipt, the Owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds New York State Department of Health or Occupational Safety and Health Administration guidelines on the Site to the tenants on the property. The Owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.
- 12) As indicated in the 2017 Deed Restriction, the property Owner shall evaluate the potential for vapor intrusion for any buildings erected at the Site. Any identified potential soil vapor impacts shall be monitored and mitigated in accordance with the *New York State Department of Health Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH 2006). Until such time as the NYSDEC deems

the vapor mitigation system unnecessary, the Owner shall operate the system, pay for the utilities for the system's operation, and report any maintenance issues to the DEC.

The Owner shall notify the DEC of any damage to or modification of the systems as required under Section 1.2 of the ISMP.

Change in Ownership and/or control and/or site Ownership does not affect the obligations with respect to the site unless a legally binding document executed by the DEC releases the Owner of its obligations.

Future site Owners and their successors and assigns are required to carry out the activities set forth above.

DEC Responsibilities

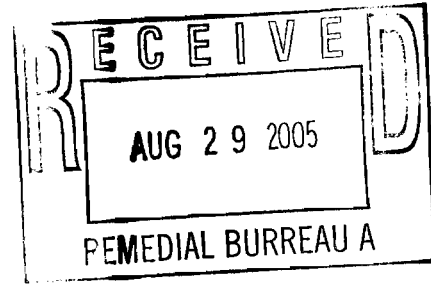
1. The DEC must follow the ISMP provisions regarding any construction and/or excavation it undertakes at the Site.
2. The DEC shall report all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated ISMPs.
3. Before accessing the site property to undertake a specific activity, the DEC shall provide the Owner advance notification that shall include an explanation of the work expected to be completed. The DEC shall provide to (1) the Owner, upon the Owner's request, (2) the DEC, and (3) other entities, if required by the ISMP, a copy of any data generated during the site visit and/or any final report produced.
4. If the DEC determines that an update of the ISMP is necessary, DEC shall update the ISMP and submit a copy of the updated ISMP to the Owner(s) within 5 business days.
5. DEC shall notify the Owner of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (Engineering Controls). DEC shall provide contact information for the new party/entity.
6. Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the ISMP, DEC amend the ISMP.
7. Any change in use, change in Ownership, change in site classification (e.g., delisting), reduction or expansion of remediation, and other significant changes related to the Site may result in a change in responsibilities; and therefore, necessitate an update to the ISMP and/or updated legal documents.

This page left intentionally blank

Appendix C

Deed Restrictions (2014 and 2017)

This page left intentionally blank



VIA FEDERAL EXPRESS
August 24, 2005

Mr. Gerard Burke
Central Office - New York State Department
of Environmental Conservation
625 Broadway, 11th Floor
Albany, NY 12233-7015

Re: *DFCI Solutions, Inc. f/k/a Dzus Fastener Co. Inc.*
Inactive Hazardous Waste Disposal Site No. 1-52-033

Dear Mr. Burke:

This will confirm our recent telephone conversations including August 23, 2005.

DFCI Solutions, Inc. is the owner of its company premises at 425 Union Boulevard, West Islip, New York. The property is listed on the Registry of Inactive Hazardous Waste Disposal Sites as Site No. 1-52-033, and is subject to an Order on Consent W1-0538-90-04. At this time, we respectfully request that the Site boundary be redefined as shown on Appendix "A" attached. Also the Site be reclassified from Class "2" to Class "5".

For your information, I herewith forward a copy of the Declaration of Covenants and Restrictions which we filed with Suffolk County on June 9, 2004. Should you have any questions, please do not hesitate to contact me at #1-631-669-0494 X 154; Fax #1-631-669-4084 or marie@dfcis.com.

Thank you in advance for your consideration and approval, in this matter of great importance to our small business.

Sincerely yours,

A handwritten signature in cursive script that reads "Olivia Marie".

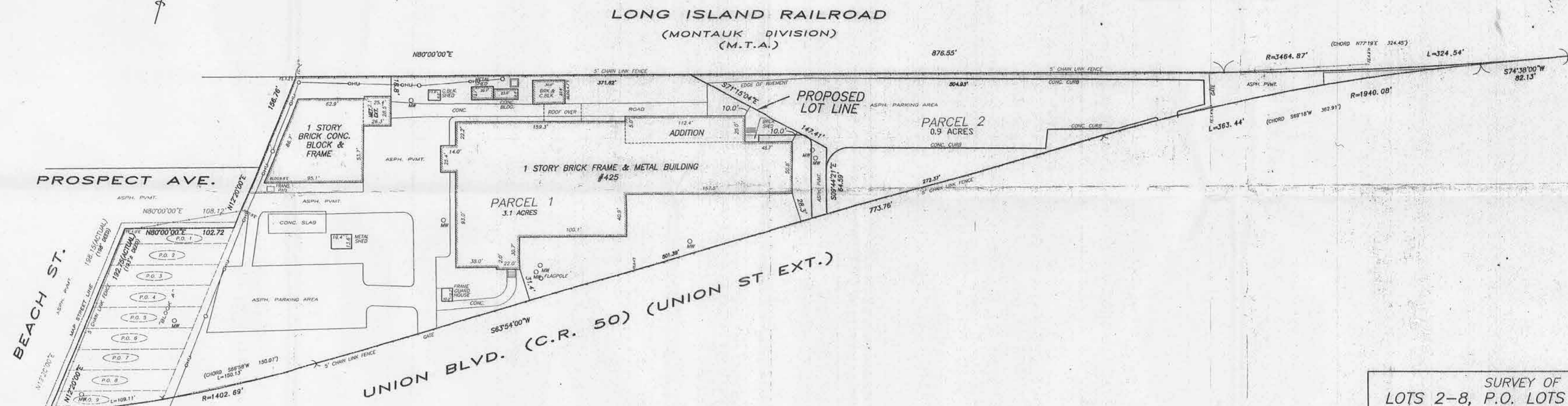
Olivia Marie
Vice President
Enclosures (2)

DFCI Solutions, Inc.

Sales Office: 5401 S. Kirkman Road Suite 310 Orlando, FL 32819 Phone: 407.926.0231 Fax: 407.926.0232

Factory: 425 Union Boulevard West Islip, New York 11795 Phone: 631.669.0494 Fax: 631.669.0765

Web: www.dfcis.com Email Quotations: quotes@dfcis.com Email Other: marketing@dfcis.com



SURVEY OF
 LOTS 2-8, P.O. LOTS 1,9 & 10
 MAP OF
 "BABYLON DEVELOPMENT OF THE
 LONG ISLAND SEASHORE CO. INC."
 SITUATE AT
 WEST ISLIP
 TOWN OF ISLIP
 SUFFOLK COUNTY, NEW YORK
 SCALE 1"=50' NOVEMBER 26, 2003

AES
 AMERICAN ENGINEERING SERVICES, P.C.
 1600 OLD COUNTRY ROAD - SUITE 202
 PLAINVIEW, NEW YORK 11803
 516.454.7500
 FAX 454.1218

surveyors engineers architects planners

 STEPHEN E. RABIN, N.Y.S. NO. 49664

FILE NO. 92 JOB NO. 9959
 FILED: 4/5/1921 REVISIONS:
 N.C.T.M. DIST. 500 SEC. 455 BLK. 01 LOT 64.1

APPENDIX "A"



SUFFOLK COUNTY CLERK
 RECORDS OFFICE
 RECORDING PAGE

Type of Instrument: DECLARATION/DOP
 Number of Pages: 8
 Receipt Number : 04-0065429

Recorded: 06/09/2004
 At: 09:36:02 AM

LIBER: D00012323
 PAGE: 907

District:	Section:	Block:	Lot:
0500	455.00	01.00	064.001

EXAMINED AND CHARGED AS FOLLOWS

Received the Following Fees For Above Instrument

		Exempt			Exempt
Page/Filing	\$24.00	NO	Handling	\$5.00	NO
COE	\$5.00	NO	NYS SRCHG	\$15.00	NO
TP-584	\$0.00	NO	Notation	\$0.00	NO
Cert.Copies	\$15.60	NO	RPT	\$30.00	NO
SCTM	\$0.00	NO			
			Fees Paid	\$94.60	

THIS PAGE IS A PART OF THE INSTRUMENT
 THIS IS NOT A BILL

Edward P.Romaine
 County Clerk, Suffolk County

1 2

Number of pages

8

TORRENS

Serial # _____

Certificate # _____

Prior Ctf. # _____

RECORDED
2004 Jun 09 09:36:02 AM
Edward P. Romaine
CLERK OF
SUFFOLK COUNTY
L D00012323
P 907

Deed / Mortgage Instrument

Deed / Mortgage Tax Stamp

Recording / Filing Stamps

3

FEES

Page / Filing Fee 24

Handling 5.00

TP-584 _____

Notation _____

EA-52 17 (County) _____

EA-5217 (State) _____

R.P.T.S.A. 30

Comm. of Ed. 5.00

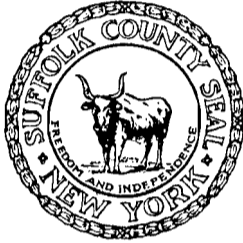
Affidavit _____

3 Certified Copy 1560

NYS Surcharge 15.00

Other _____

Sub Total 29



Sub Total 65

Grand Total 94

Mortgage Amt. _____

1. Basic Tax _____

2. Additional Tax _____

Sub Total _____

Spec./Assit. _____

or

Spec. /Add. _____

TOT. MTG. TAX _____

Dual Town _____ Dual County _____

Held for Appointment _____

Transfer Tax _____

Mansion Tax _____

The property covered by this mortgage is or will be improved by a one or two family dwelling only.

YES _____ or NO _____

If NO, see appropriate tax clause on page # _____ of this instrument.

4

Dist 0500

Section 4500

Block 0100

Lot 004001

5

Community Preservation Fund

Real Property Tax Service Agency Verification



Consideration Amount \$ _____

CPF Tax Due \$ _____

Improved _____

Vacant Land _____

TD _____

TD _____

TD _____

6 Satisfactions/Discharges/Releases List Property Owners Mailing Address

RECORD & RETURN TO:

DFCI SOLUTIONS, INC.
ATT: OLIVIA MARIE
VICE PRESIDENT
425 UNION BOULEVARD
WEST ISLIP, NY 11795

7

Title Company Information

Co. Name

Title #

8

Suffolk County Recording & Endorsement Page

This page forms part of the attached DECLARATION OF COVENANTS AND RESTRICTIONS made by:
(SPECIFY TYPE OF INSTRUMENT)

DFCI SOLUTIONS, INC.

The premises herein is situated in
SUFFOLK COUNTY, NEW YORK.

TO

In the Township of ISLIP

In the VILLAGE

or HAMLET of _____

BOXES 6 THRU 8 MUST BE TYPED OR PRINTED IN BLACK INK ONLY PRIOR TO RECORDING OR FILING.

(over)

DECLARATION of COVENANTS and RESTRICTIONS

THIS COVENANT, made the 2nd day of June 2004, by **DFCI SOLUTIONS, INC.** - formerly known as **DZUS FASTENER CO. INC.**; referred to herein as "**DFCI**") a corporation organized and existing under the laws of the State of New York and having an office for the transaction of business at 425 Union Blvd., West Islip, NY 11795.

WHEREAS, DFCI is the owner of an inactive hazardous waste disposal Site which is listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 1-52-033, located at 425 Union Blvd., West Islip, NY 11795, consisting of approximately 4.02 acres, P.O. Lots 2-8 and 101, 9 and 10, Block A, Map of Babylon Development by the Long Island Seashore Co., Inc. filed April 5, 1921, File No. 92 in the Office of the County Clerk at the County of Suffolk hereinafter referred to as the "Property"; and

WHEREAS, the Property is the subject to Order on Consent Index # W1-0538-90-04 issued by the New York State Department of Environmental Conservation to DFCI on December 13, 1993; and

WHEREAS, the New York State Department of Environmental Conservation set forth a remedy to eliminate or mitigate all significant threats to the environment presented by hazardous waste disposal on the Site in an Operable Unit 1 Record of Decision ("OU-1 ROD") dated March 1995, and such OU-1 ROD or the Work Plan for the implementation of the OU-1 ROD required that the Property be subject to restrictive covenants.

WHEREAS, the remedy selected in the OU-1 ROD has been implemented, except for the on-going Operation, Maintenance, and Monitoring phase.

NOW, THEREFORE, DFCI, for itself and its successors and/or assigns, covenants that:

First, the Property subject to this Declaration of Covenants and Restrictions is described in a Metes and Bounds Description attached to this declaration as Appendix "A" and made a part hereof.

Second, unless prior written approval by the New York State Department of Environmental Conservation or, if the Department shall no longer exist, any New York State agency or agencies subsequently created to protect the environment of the State and the health of the State's citizens, hereinafter referred to as "the Relevant Agency," is first obtained, no person shall engage in any activity that will, or that reasonably is anticipated to, prevent or interfere significantly with any proposed, ongoing or completed program under the OU-1 ROD at the Property or that will, or is reasonably foreseeable to, expose the public health or the environment to a significantly increased threat of harm or damage.

Third, the owner of the Property shall prohibit any excavation or disturbance of the asphalt cover in the Treatment Cell Area, which Treatment Cell Area is described in the Metes and Bounds description in Appendix "B1" and as Parcel 2 in the survey by American Engineering Services, P.C. dated November 26, 2003, in Appendix "B2", unless the owner of the Property first obtains permission to do so from the Relevant Agency.

Fourth, the owner of the Property shall protect the Treatment Cell Area from the effects of erosion by maintaining the final topsoil/asphalt cover as agreed upon between DFCI and the Department, or after obtaining the written approval of the Relevant Agency, by capping the Property with another material. Currently the Treatment Cell Area has an asphalt cover.

Fifth, the owner of the Property shall prohibit the Property from ever being used for purposes other than for non-residential commercial/industrial uses, excluding day-care and health care facilities, without the express written waiver of such prohibition by the Relevant Agency. Except as provided herein and in the OU-1 ROD, this Declaration of Covenants and Restrictions is not intended to impair any legal use of the Property.

Sixth, the owner of the Property shall prohibit the use of the groundwater underlying the Property without treatment rendering it safe for drinking water or industrial purposes, as appropriate, unless the user first obtains permission to do so from the Relevant Agency.

Seventh, the owner of the Property shall continue in full force and effect any institutional and engineering controls the Department required owner to put into place and maintain unless the owner first obtains permission to discontinue such controls from the Relevant Agency. Currently the institutional and engineering controls in place consist of the Treatment Cell asphalt cover, the maintenance thereof, and the on-going sampling and maintenance of the groundwater monitoring wells under the OU-1 ROD, which monitoring wells are being maintained by the DEC. The DEC is hereby granted access to the Property to continue the maintenance of such monitoring wells until such time as it determines such wells are no longer required. Such monitoring wells are noted in Appendix "B2".

Eighth, the owner of the Property shall provide an annual certification to the Relevant Agency that the institutional and engineering controls are still in place, unless the DEC determines otherwise.

STATE OF NEW YORK
COUNTY OF SUFFOLK

SS:

I EDWARD P. ROMAINE, CLERK OF THE COUNTY OF SUFFOLK AND CLERK OF THE SUPREME COURT OF THE STATE OF NEW YORK IN AND FOR SAID COUNTY (SAID COURT BEING A COURT OF RECORD) DO HEREBY CERTIFY THAT I HAVE COMPARED THE ANNEXED COPY OF DEED LIBER 12323 AT PAGE 907 RECORDED 6-9-04 AND THAT IT IS A JUST AND TRUE COPY OF SUCH ORIGINAL DECLARATION AND OF THE WHOLE THEREOF.

IN TESTIMONY WHEREOF, I HAVE HEREUNTO SET MY HAND AND AFFIXED THE SEAL OF SAID COUNTY AND COURT THIS 9th DAY OF June 2004

Edward P. Romaine

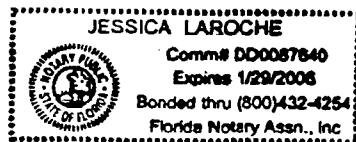
CLERK

12-0189, 12/97cg

By: *Stephen Meshover*
Stephen Meshover, President

STATE OF FLORIDA)
) ss.:
COUNTY OF ORANGE)

On the 09 day of June in the year 2004, before me, the undersigned, a Notary Public in and for said State, personally appeared STEPHEN MESHOVER, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.



Jess Laroche
Notary Public

Sixth, the owner of the Property shall prohibit the use of the groundwater underlying the Property without treatment rendering it safe for drinking water or industrial purposes, as appropriate, unless the user first obtains permission to do so from the Relevant Agency.

Seventh, the owner of the Property shall continue in full force and effect any institutional and engineering controls the Department required owner to put into place and maintain unless the owner first obtains permission to discontinue such controls from the Relevant Agency. Currently the institutional and engineering controls in place consist of the Treatment Cell asphalt cover, the maintenance thereof, and the on-going sampling and maintenance of the groundwater monitoring wells under the OU-1 ROD, which monitoring wells are being maintained by the DEC. The DEC is hereby granted access to the Property to continue the maintenance of such monitoring wells until such time as it determines such wells are no longer required. Such monitoring wells are noted in Appendix "B2".

Eighth, the owner of the Property shall provide an annual certification to the Relevant Agency that the institutional and engineering controls are still in place, unless the DEC determines otherwise.

Ninth, this Declaration is and shall be deemed a covenant that shall run with the land and shall be binding upon all future owners of the Property and shall provide that the owner, and its successors and assigns, consents to the enforcement by the Relevant Agency of the prohibitions and restrictions recorded by this Declaration of Covenants and Restrictions, and hereby covenants not to contest the authority of the Department to seek enforcement.

Tenth, the owner of the Property may petition the Department to modify or terminate this Declaration of Covenants and Restrictions at such time as it can certify that reliance upon such covenants and restrictions is no longer required to meet the goals of the Remedial Program under the OU-1 ROD. Such certification shall be made by a Professional Engineer. The Department shall not unreasonably withhold its consent to such petition.

Eleventh, any deed of conveyance of the Property, or any portion thereof, shall recite, unless the Relevant Agency has consented to the termination of such covenants and restrictions that said conveyance is subject to this Declaration of Covenants and Restrictions.

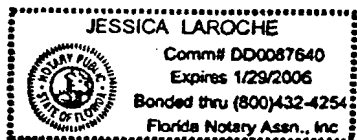
IN WITNESS WHEREOF, the undersigned has executed this instrument the day written below.

DFCI SOLUTIONS, INC.

By: Stephen Meshover
Stephen Meshover, President

STATE OF FLORIDA)
) ss.:
COUNTY OF ORANGE)

On the 16th day of June in the year 2004, before me, the undersigned, a Notary Public in and for said State, personally appeared STEPHEN MESHOVER, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.



Jess Laroche
Notary Public

APPENDIX "A"

METES AND BOUND DESCRIPTION OF PROPERTY

SCHEDULE "A"

ALL that plot, piece or parcel of land, with the buildings and improvements thereon erected, situate lying and being at West Islip, Town of Islip, County of Suffolk, State of New York, being more particularly bounded and described as follows;

BEGINNING at a point on the north side of Union Avenue (C.R. 50), said point being the intersection of the north line of Union Avenue (C.R. 50) and the east line of Beach Street (as widened).

RUNNING THENCE from said point of BEGINNING northerly along the east side of Beach Street (as widened) North 12 degrees 20 minutes 00 seconds East a distance of 192.75 feet; to the southerly line of Prospect Avenue;

THENCE easterly along said line of Prospect Avenue (as widened) North 80 degrees 00 minutes 00 seconds East a distance of 102.72 feet; to a point on the easterly line of Prospect Avenue;

THENCE northerly along said line North 12 degrees 20 minutes East a distance of 156.76 feet; to the southerly side line of land now or formerly of Long Island Railroad (M.T.A.) (Montauk division);

THENCE along said lands the following courses; North 80 degrees 00 minutes 00 seconds East a distance of 876.55 feet;

THENCE along the arc of a curve bearing to the left, having a radius of 3464.87 feet and a length of 324.54 feet, to a point on the northerly line of Union Avenue (C.R. 50);

THENCE along the north line of Union Avenue (C.R. 50) the following courses; South 74 degrees 38 minutes 00 seconds West a distance of 82.13 feet;

THENCE, along the arc of a curve bearing to the left, having a radius of 1940.08 feet and a length of 363.44 feet;

THENCE South 63 degrees 54 minutes 00 seconds West a distance of 773.76 feet;

THENCE, along the arc of a curve bearing to the right having a radius of 1402.69 feet and a length of 259.24 feet to the point or place of BEGINNING.

Containing within said bounds 4.0 acres more or less.

APPENDIX "B1"

TREATMENT CELL AREA METES AND BOUNDS DESCRIPTION

ALL that plot, piece or parcel of land, with the buildings and improvements thereon erected, situate lying and being at West Islip, Town of Islip, County of Suffolk, State of New York, being more particularly bounded and described as follows;

BEGINNING at a point on the south line of lands now or formerly of Long Island Railroad, said point being North 12 degrees 20 minutes 00 seconds East a distance of 156.76 feet;

THENCE North 80 degrees 00 minutes 00 seconds East a distance of 371.62 feet from the southeast corner of the terminus of Prospect Avenue;

RUNNING THENCE from said point of beginning along the south line of said lands of Long Island Railroad the following courses; North 80 degrees 00 minutes 00 seconds East a distance of 504.93 feet;

THENCE along the arc of a curve bearing to the left, having a radius of 3464.87 feet and a length of 324.54 feet to a point on the North side of Union Avenue (C.R. 50);

THENCE along the arc of a curve bearing to the left, having a radius of 1940.08 feet and a length of 363.44 feet;

THENCE along the North side of Union Avenue (C.R. 50) the following courses; South 74 degrees 38 minutes 00 seconds West a distance of 82.13 feet;

THENCE along the arc of a curve bearing to the left, having a radius of 1940.08 feet and a length of 363.44 feet;

THENCE South 63 degrees 54 minutes 00 seconds West a distance of 272.37 feet to a point on the North side of Union Avenue (C.R. 50);

THENCE in a northerly direction the following courses; North 09 degrees 44 minutes 21 seconds East a distance of 64.59 feet;

THENCE North 71 degrees 15 minutes 04 seconds East a distance of 147.41 feet to the point or place of BEGINNING.

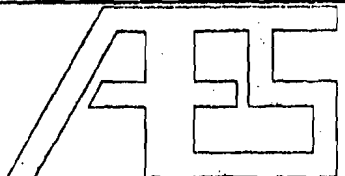
Containing within said bounds 0.9 acres more or less.

APPENDIX B 2

PS'13

SURVEY OF
 LOTS 2-8, P.O. LOTS 1,9 & 10
 MAP OF
 "BABYLON DEVELOPMENT OF THE
 LONG ISLAND SEASHORE CO. INC."
 SITUATE AT

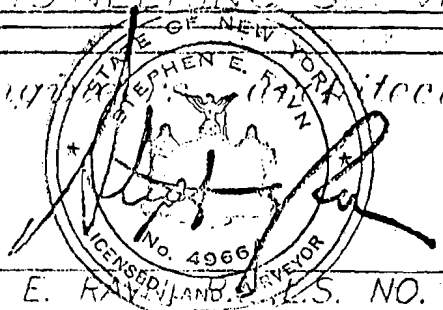
SCALE 1"=50' NOVEMBER 26, 2003



1605 JEFFERSON ROAD SUITE 202
 PLAINFIELD, NEW JERSEY 07061
 TEL 454 7500
 FAX 454 7715

AMERICAN ENGINEERING SERVICES, P.C.

surveyors engineers architects planners



STEPHEN E. RAY LICENSED SURVEYOR N.Y.S. NO. 49664

FILE NO. 92
 FILED: 4/5/1921

JOB NO. 9959
 REVISIONS:

N.C.T.M. DIST. 500 SEC. 455 BLK. 01 LOT 64.1

Appendix B 2
PS 2/3

AND RAILROAD
JK DIVISION
M.T.A.)

876.55'

9=346A, 87'

1=374 54

5745250
87.13

864.83'

R=1940 CB

PARCEL 2
0.9 ACRES

L=353.44'

773.37'

773.76'

PROPOSED
LOT LINE

147.41'

509'44.21" E
64.59'

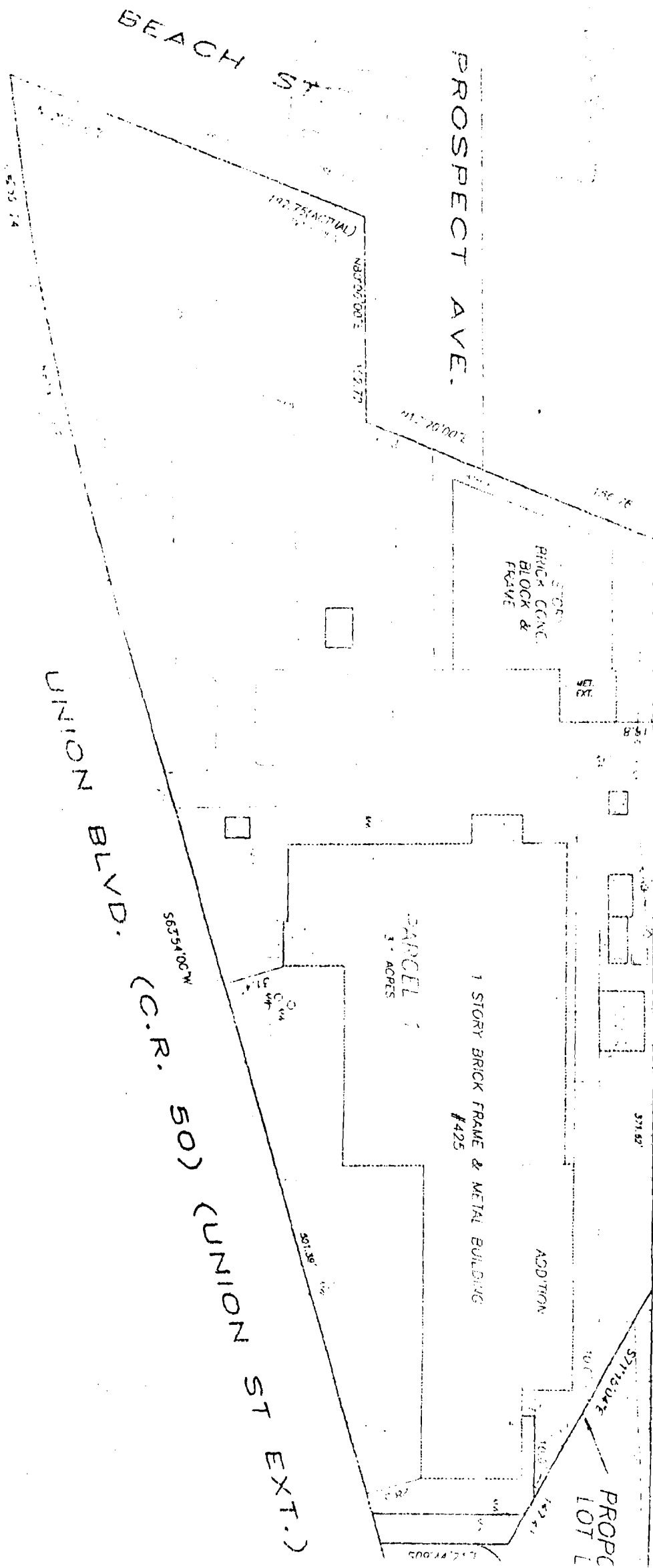
28.3'

ST EXT.)

SURVEY OF
LOTS 2-8, P.O. LOTS 1,

"BABYLON DEVELOPMENT"
LONG ISLAND BEACHORE CO
SPUATE AT

6040



LONG ISLAND RAILR
(MONTAUK DIVISION)
(M.T.A.)

DECLARATION of COVENANTS and RESTRICTIONS

THIS COVENANT, made the 17 day of November, 2017, by **DFCI SOLUTIONS, INC.** (formerly known as **DZUS FASTENER CO. INC.**; referred to herein as "**DFCI**") a corporation organized and existing under the laws of the State of New York and having an office for the transaction of business at 425 Union Blvd., West Islip, NY 11795.

WHEREAS, **DFCI** is the owner property located at 425 Union Blvd., West Islip, NY 11795, Suffolk County, consisting of approximately 4.02 acres, identified as Suffolk County Tax Map District 500, Section 455, Block 1, Lot 64.1, and being more particularly described in Appendix "A," attached to this declaration and made part hereof, and hereinafter referred to as "the Property"; and

WHEREAS, the Property is subject to Order on Consent Index # W1-0538-90-04 issued by the New York State Department of Environmental Conservation to **DFCI** on December 13, 1993; and

WHEREAS, the New York State Department of Environmental Conservation set forth a remedy to eliminate or mitigate all significant threats to the environment presented by hazardous waste disposal on the Site in an Operable Unit 1 Record of Decision ("OU-1 ROD") dated March 1995, and such OU-1 ROD or the Work Plan for the implementation of the OU-1 ROD required that the Property be subject to restrictive covenants; and

WHEREAS, the remedy selected in the OU-1 ROD has been implemented, except for the on-going Operation, Maintenance, and Monitoring phase; and

WHEREAS, **DFCI** previously executed a Declaration of Covenants and Restrictions for the Property dated June 2, 2004 and recorded in the Suffolk County Clerk's Office on June 9, 2004 at Liber D00012323, Page 907.

WHEREAS, recent testing on the Property has revealed the potential for soil vapor intrusion issues.

NOW, THEREFORE, DFCI, for itself and its successors and/or assigns, covenants that:

First, the Property shall remain subject to the Declaration of Covenants and Restrictions dated June 2, 2004 and all terms, restrictions and obligations thereunder remain unchanged.

Second, the Property subject to this Declaration of Covenants and Restrictions is as shown on a map attached to this declaration as Appendix "B" and made a part hereof.

Third, the owner of the Property shall evaluate the potential for vapor intrusion for any buildings developed on the Property prior to occupancy, including existing and new buildings.

Fourth, the owner of the Property shall monitor or mitigate any identified potential soil vapor impacts in accordance with the *New York State Department of Health Guidance for Evaluating Soil*

Vapor Intrusion in the State of New York, October 2006 (and subsequent revisions) and shall implement the actions recommended to address exposures related to soil vapor intrusion, provided however, that while the existing building(s) remains unoccupied, the owner of the Property does not have to monitor or mitigate.

Fifth, the owner of the Property shall provide the monitoring results and an annual certification that any necessary mitigation system is operating properly to the New York State Department of Environmental Conservation or, if the Department shall no longer exist, any New York State agency or agencies subsequently created to protect the environment of the State and the health of the State's citizens, hereinafter referred to as "the Relevant Agency".

Sixth, this Declaration is and shall be deemed a covenant that shall run with the land and shall be binding upon all future owners of the Property and shall provide that the owner, and its successors and assigns, consents to the enforcement by the Relevant Agency of the prohibitions and restrictions recorded by this Declaration of Covenants and Restrictions, and hereby covenants not to contest the authority of the Department to seek enforcement.

Seventh, the owner of the Property may petition the Department to modify or terminate this Declaration of Covenants and Restrictions at such time as it can certify that reliance upon such covenants and restrictions is no longer required to meet the goals of the Remedial Program. Such certification shall be made by a Professional Engineer. The Department shall not unreasonably withhold its consent to such petition.

Eighth, any deed of conveyance of the Property, or any portion thereof, shall recite, unless the Relevant Agency has consented to the termination of such covenants and restrictions, that said conveyance is subject to this Declaration of Covenants and Restrictions.

IN WITNESS WHEREOF, the undersigned has executed this instrument the day written below.

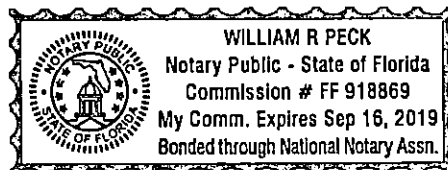
DFIC SOLUTIONS, INC.

By: [Signature]
Stephen Meshover, President

STATE OF FLORIDA)
) ss:
COUNTY OF ORANGE)

On the 17th day of November, in the year 2017, before me the undersigned, personally appeared Stephen Meshover, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by hi/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

[Signature]
Notary Public – State of Florida



Appendix D

Excavation Work Plan

.This page left intentionally blank



Excavation Work Plan Dzus Fastener Company, Inc. Site (152033) West Islip, New York

Prepared for

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



Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
269 W. Jefferson Street
Syracuse, New York 13202
(315) 431-4610

July 2020

Revisions to Final Approved Excavation Work Plan

Revision Number	Date Submitted	Summary of Revision	New York State Department of Environmental Conservation Approval Date

This page left intentionally blank

JULY 2020

CERTIFICATION STATEMENT

I, Donald Conan, certify that I am currently a New York State Registered Professional Engineer and that this Excavation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

Donald Conan, P.E., P.G. (Signature)

Date

NYS Professional Engineer #

This page left intentionally blank

TABLE OF CONTENTS

	Page
LIST OF ACRONYMS/ABBREVIATIONS	ii
1. INTRODUCTION	1
1.1 NOTIFICATION	1
1.2 SOIL SCREENING METHODS	2
1.3 SOIL STAGING METHODS	2
1.4 MATERIALS EXCAVATION AND LOAD-OUT	2
1.5 MATERIALS TRANSPORT OFFSITE	3
1.6 MATERIALS DISPOSAL OFFSITE	3
1.7 MATERIALS REUSE ONSITE	4
1.8 FLUIDS MANAGEMENT	4
1.9 COVER SYSTEM RESTORATION	5
1.10 BACKFILL FROM OFFSITE SOURCES	5
1.11 STORMWATER POLLUTION PREVENTION	5
1.12 EXCAVATION CONTINGENCY PLAN	6
1.13 COMMUNITY AIR MONITORING PLAN	6
1.14 ODOR CONTROL PLAN	7
1.15 DUST CONTROL PLAN	7
1.16 OTHER NUISANCES	8

LIST OF ACRONYMS/ABBREVIATIONS

DER	Division of Environmental Remediation
E.I.T.	Engineer-in-Training
EWP	Excavation Work Plan
ISMP	Interim Site Management Plan
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules, and Regulations
TCL	Target Compound List

1. INTRODUCTION

1.1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter residual materials located in the area behind Captree Plaza and adjacent to Montauk Highway (Figure 2-1 and Figure 2-2 of Interim Site Management Plan[ISMP]), the site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). The following table includes contact information for the above notification. The information on this table will be updated, as necessary, to provide accurate contact information. A full listing of site-related contact information is provided in Appendix A of the ISMP.

Notifications*

Name	Contact Information
NYSDEC Remediation Project Manager: Brianna Scharf, E.I.T	(518) 402-5987 brianna.scharf@dec.ny.gov
NYSDEC Region 1 Regional Hazardous Waste Engineer: Chris Engelhardt	(631) 444-0240 christopher.engelhardt@dec.ny.gov
NYSDOH Project Manager: Jacquelyn Nealon	(518) 402-7860 jacquelyn.nealon@health.ny.gov
*Notifications are subject to change and will be updated, as necessary. NOTES: E.I.T. = Engineer-in-Training NYSDOH = New York State Department of Health	

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated, and any work that may impact an engineering control.
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling.
- A schedule for the work, detailing the start and completion of all intrusive work.
- A summary of the applicable components of this Excavation Work Plan (EWP).
- A statement that the work will be performed in compliance with this EWP and 29 Code of Federal Regulations 1910.120.

- A copy of the contractor's health and safety plan, in electronic format.
- Identification of disposal facilities for potential waste streams.
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

1.2 SOIL SCREENING METHODS

Visual, olfactory, and instrument-based (e.g., photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion.

Soils will be segregated based on previous environmental data and screening results into material that requires offsite disposal and material that requires testing to determine if the material can be reused onsite as soil beneath a cover or if the material can be used as cover soil. Further discussion of offsite disposal of materials and onsite reuse is provided in Section 1.6 of this EWP.

1.3 SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters, and other discharge points.

Stockpiles will always be kept covered with appropriately anchored tarps. Stockpiles will be routinely inspected, and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by the NYSDEC.

1.4 MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this EWP. The presence of utilities and easements on the Site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate federal, state, local, and New York State Department of Transportation requirements.

A truck wash will be operated onsite, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of offsite in an appropriate manner. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of offsite soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed daily, at a minimum, as needed to maintain a clean condition with respect to site-derived materials.

1.5 MATERIALS TRANSPORT OFFSITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, state, and federal regulations, including 6 New York Codes, Rules, and Regulations (NYCRR) Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used. Truck transport routes will be determined based on where the proposed excavation will occur.

The most appropriate truck route will account for: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting offsite queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site. Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development. Queuing of trucks will be performed onsite in order to minimize offsite disturbance. Offsite queuing will be prohibited.

1.6 MATERIALS DISPOSAL OFFSITE

All material excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, state (including 6 NYCRR Part 360) and federal regulations. If disposal of material from this Site is proposed for unregulated offsite disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated offsite management of materials from this Site will not occur without formal NYSDEC approval.

Offsite disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate (i.e., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction/demolition recycling facility, etc.). Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken offsite will be handled, at minimum, as a Municipal Solid Waste per 6 NYCRR Part 360-1.2. Material that does not meet Unrestricted Soil Cleanup Objectives is prohibited from being taken to a New York State recycling facility (6 NYCRR Part 360-16 Registration Facility).

1.7 MATERIALS REUSE ONSITE

Chemical criteria for onsite reuse of material is subject to approval by NYSDEC prior to excavation work.

The qualified environmental professional will ensure that procedures defined for materials reuse in this ISMP are followed and that unacceptable material does not remain onsite. Contaminated onsite material, including historic fill and contaminated soil, that is acceptable for reuse onsite will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse onsite will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing onsite will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused onsite.

1.8 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported, and disposed in accordance with applicable local, state, and federal regulations. Dewatering, purge, and development fluids will not be recharged back to the land surface or subsurface of the site, and will be managed offsite, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e., a local pond, stream, or river) will be performed under a State Pollutant Discharge Elimination System permit.

1.9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the Record of Decision. A demarcation layer will be replaced to provide a visual reference to the top of the remaining contamination zone; the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in the ISMP. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated ISMP.

1.10 BACKFILL FROM OFFSITE SOURCES

All materials proposed for import onto the Site will be approved by the qualified environmental professional and will be in compliance with provisions in this ISMP prior to receipt at the Site. A Request to Import/Reuse Fill or Soil form (<http://www.dec.ny.gov/regulations/67386.html>) will be prepared and submitted to the NYSDEC Project Manager allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d) and New York State Division of Environmental Remediation (DER)-10 Section 5.4(e). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in Table 375-6.8(b) for residential use or commercial use depending on the parcel. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soils will be securely covered with tight-fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases. All stockpiles will be graded for stability and stored on poly.

1.11 STORMWATER POLLUTION PREVENTION

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the ISMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

1.12 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment, and surrounding soils, etc., as necessary, to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (Target Analyte List metals; Target Compound List volatiles and semi-volatiles, Target Compound List pesticides, and polyvinyl chlorinated biphenyls), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

1.13 COMMUNITY AIR MONITORING PLAN

Continuous air monitoring will be conducted for protection of the downwind community during site work activities, per the NYSDOH generic Community Air Monitoring Plan in DER-10 Appendix 1A. Continuous air monitoring for volatile organic compounds will be conducted by a minimum of one dedicated person and will use approved instrumentation during ground intrusive activities. The following action levels have been established for air monitoring.

Parameter	Action Level	Action
Total particulates	2.5 times background and/or greater than 150 micrograms per cubic meter	Work ceases until mitigated
Volatile organic compounds	5 parts per million above background (15-minute average) at the downwind perimeter of the work zone	Work ceases until mitigated
Visible dust	Visible dust as determined by the Engineer	Work ceases until mitigated

Additional action levels developed by the contractor will need to be approved by NYSDEC and NYSDOH. The locations of air monitoring instrumentation will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind

monitoring stations. Exceedances of action levels listed in the Community Air Monitoring Plan will be reported to NYSDEC and NYSDOH Project Managers.

1.14 ODOR CONTROL PLAN

This Odor Control Plan is capable of controlling emissions of nuisance odors offsite. Specific odor control methods to be used on a routine basis will include odor masking agents. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted, and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent onsite and offsite nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (a) direct load-out of soils to trucks for offsite disposal; (b) use of chemical odorants in spray or misting systems; and, (c) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to onsite conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

1.15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive onsite work will include, at a minimum, the following items:

- Dust suppression will be achieved by using a dedicated onsite water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- Onsite roads will be limited in total area to minimize the area required for water truck sprinkling.

1.16 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

Appendix E

Quality Assurance Project Plan Addendum

This page left intentionally blank



**Quality Assurance Project Plan Addendum
Dzus Fastener Company, Inc. (152033)
West Islip, New York**

Prepared for

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



Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
269 West Jefferson St.
Syracuse, New York 13202
(315) 431-4610

July 2020
Version: FINAL
EA Project No. 1602501

This page intentionally left blank

**Quality Assurance Project Plan Addendum
Dzus Fastener Company, Inc. (152033)
West Islip, New York**

Prepared for

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



Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
269 West Jefferson St.
Syracuse, New York 13202
(315) 431-4610

24 July 2020

Donald Conan, P.E., Vice-President
EA Engineering, P.C.

Date

24 July 2020

Frank DeSantis, Jr., Project Manager
EA Science and Technology

Date

July 2020
Version: FINAL
EA Project No. 1602501

This page intentionally left blank

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	ii
LIST OF ACRONYMS AND ABBREVIATIONS	iii
1. PURPOSE AND OBJECTIVES.....	1
1.1 PURPOSE.....	1
1.2 QUALITY ASSURANCE PROJECT PLAN OBJECTIVES	1
2. PROJECT ORGANIZATION AND RESPONSIBILITIES	3
2.1 EA ENGINEERING, P.C. AND ITS AFFILIATE EA SCIENCE AND TECHNOLOGY	3
2.2 LABORATORY	4
3. SAMPLING RATIONALE, DESIGNATION, AND CONTAINERS	5
3.1 SAMPLING RATIONALE	5
3.2 SAMPLE DESIGNATION.....	5
3.3 SAMPLE CONTAINERS	7
4. ANALYTICAL LABORATORY	9
5. ANALYTICAL TEST PARAMETERS.....	11
6. ANALYTICAL DATA VALIDATION.....	13

[ATTACHMENT A](#): A SUMMARY OF THE REPORTING LIMITS FOR THE NON-AQUEOUS ANALYTICAL METHODS

LIST OF TABLES

<u>Number</u>	<u>Title</u>
1	Remedial Investigation Analytical Program
2	Sample Containers, Preservation, And Holding Times

LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
HNO ₃	Nitric acid
EA	EA Engineering, P.C. and Its Affiliate EA Science and Technology
g	Gram(s)
mL	Milliliter(s)
No.	Number
NYSDEC	New York State Department of Environmental Conservation
ppm	Parts per million
QA	Quality assurance
QC	Quality control
QAPP	Quality Assurance Project Plan
RI	Remedial investigation

This page intentionally left blank

1. PURPOSE AND OBJECTIVES

1.1 PURPOSE

A Generic Quality Assurance Project Plan (QAPP) (EA Engineering, P.C. and its affiliate EA Science and Technology [EA] 2020a)¹ was developed for field activities performed under the New York State Department of Environmental Conservation (NYSDEC) Standby Contract Number (No.) D009806-01. This QAPP Addendum is for the site management Work Assignment for the Dzus Fastener Company, Inc. site in the Town of West Islip, Suffolk County, New York (NYSDEC Site No. 152003). This QAPP Addendum is to supplement the Generic QAPP with site-specific procedures for the collection, analysis, and evaluation of data that will be legally and scientifically defensible.

1.2 QUALITY ASSURANCE PROJECT PLAN OBJECTIVES

This QAPP Addendum provides site-specific information and standard operating procedures applicable to all work performed under the site management of Operable Units (OU) 1 through 6 that is not included in the Generic QAPP. The information includes definitions and generic goals for data quality and required types and quantities of quality assurance (QA)/quality control (QC) samples. The procedures address sampling and decontamination protocols; field documentation; sample handling, custody, and shipping; instrument calibration and maintenance; auditing; data reduction, validation, and reporting; corrective action requirements; and QA reporting.

¹ EA. 2020a. *Generic Quality Assurance Project Plan for Work Assignments under NYSDEC Contract No. D009806*. April.

This page intentionally left blank

2. PROJECT ORGANIZATION AND RESPONSIBILITIES

While all personnel involved in the investigation and generation of data are implicitly a part of the overall project management and QA/QC program, certain members of the Project Team have specifically designated responsibilities. Project personnel responsibilities are summarized below.

2.1 EA ENGINEERING, P.C. AND ITS AFFILIATE EA SCIENCE AND TECHNOLOGY

EA will provide oversight, coordination, health and safety, field support, and evaluation of analytical data. EA will also be responsible for evaluation of analytical test results, which will be submitted to NYSDEC. The EA staff involved in this project are as follows:

- ***Robert Casey, Project QA/QC Officer***—The QA/QC Officer will provide guidance on technical matters and review technical documents relating to the project. He will assess the effectiveness of the QA/QC program and recommend modifications when applicable. Additionally, the QA/QC Officer may delegate technical guidance to specially trained individuals under his direction.
- ***Frank DeSantis Jr., EA Project Manager***—The Project Manager provides overall coordination and preparation of the project within EA. This includes coordination with NYSDEC and New York State Department of Health, budget control, subcontractor performance, implementation of the QAPP, and allocation of resources and staffing to implement both the QA/QC program and the site Health and Safety Plan.
- ***Hilary Williams, EA Project QA/QC Coordinator***—The Project QA/QC Coordinator is responsible for project-specific supervision and monitoring of the QA/QC program. She will ensure that field personnel are familiar with and adhere to proper sampling procedures, field measurement techniques, sample identification, and chain-of-custody procedures. She will coordinate with the analytical laboratory for the receipt of samples and reporting of analytical results and will recommend actions to correct deficiencies in the analytical protocol or sampling. Additionally, she will prepare QA/QC reports for management review.
- ***Hilary Williams, EA Site Manager***—The Site Manager will serve as the onsite contact person for field investigations and tests. She will be responsible for coordinating the field activities, including inspecting and replacing equipment, preparing daily and interim reports, scheduling sampling, and coordinating shipment and receipt of samples and containers.

The Program Health and Safety Officer is also an integral part of the project implementation team.

- ***Peter Garger, Certified Industrial Hygienist, EA Program Health and Safety Officer***— The Program Health and Safety Officer will be responsible for the development, final technical review, and approval of the Health and Safety Plan. In addition, he will provide authorization, if warranted, to modify personal protective equipment requirements based on field conditions. He will also provide final review of all safety and health monitoring records and personal protective equipment changes to ensure compliance with the provisions of the Health and Safety Plan.

2.2 LABORATORY

Laboratory analyses for this project will be performed by a NYSDEC callout laboratory to be determined upon assignment. Frank DeSantis Jr. (EA Project Manager) will have sample analysis and review responsibilities on this project. The laboratories will have their own provisions for conducting an internal QA/QC review of the data before they are released to EA. The laboratories' contract supervisors will contact EA's Project Manager with any sample discrepancies or data concerns.

Hard copy and electronic data deliverable formatted QA/QC reports will be filed by the analytical laboratories when data are submitted to EA. Corrective actions will be reported to the EA Project Manager along with the QA/QC report (Section 9 of the Generic QAPP). The laboratories may be contacted directly by EA or NYSDEC personnel to discuss QA concerns. EA will act as laboratory coordinator on this project and all correspondence from the laboratories will be coordinated with EA's Project Manager.

3. SAMPLING RATIONALE, DESIGNATION, AND CONTAINERS

3.1 SAMPLING RATIONALE

The sampling rationale is presented for each planned field activity and is detailed in the Letter Work Plan (EA 2020b)². The rationale and frequency of the QC samples collected is discussed in the Generic QAPP (EA 2020a)¹. The site management laboratory program includes the number of samples for each sample location, as well as QA/QC samples (**Table 1**). The frequency of QA/QC samples is expressed as a percentage of the total number of samples collected for that matrix. The Generic QAPP also includes analytical methods and reporting limits.

3.2 SAMPLE DESIGNATION

Field samples collected from the site will be assigned a unique sample tracking number. Sample/designation will be an alpha-numeric code which will identify each sample by the site identification, matrix sampled, location number, sequential sample number (as appropriate), and date of collection.

Groundwater

Sample ID numbers for groundwater samples will be assigned using the following naming convention:

- 152033-SM-MW-XX-MMY Y = (NYSDEC SITE ID-Site Management-Monitoring Well-Location Number-Month/Year)
- Duplicate samples will be labeled 152033-SM-MW-FD-MMDDYY. If multiple duplicate samples are taken on same day from same sample area, “-01,” “-02,” etc. will be appended to the end of the sample name.
- Samples to be used for matrix spike/matrix spike duplicates will be noted on the chain-of-custody in the notes column.
- Rinse blanks will be labeled 152033-SM-MW-RB-MMDDYY and only collected when non-dedicated equipment is used.

Sediment Samples

Sample ID numbers for sediment samples will be assigned using the following naming convention:

- 152033-SM-SD-01-MMY Y = (NYSDEC SITE ID-Site Management-Media/Type-Location Number-Month/Year)

² EA. 2020b. *Interim Site Management Letter Work Plan*. Dzus Fastener Company, Inc. West Islip, New York. June.

- Duplicate samples will be labeled 152033-SM-SD-FD-MMDDYY. If multiple duplicate samples are taken on same day from same sample area, “-01,” “-02,” etc. will be appended to the end of the sample name.
- Samples to be used for matrix spike/matrix spike duplicates will be noted on the chain-of-custody in the notes column.
- Rinse blanks will be labeled 152033-SM-SD-RB-MMDDYY and only collected when non-dedicated equipment is used.

Surface Water Samples

Sample ID numbers for surface water samples will be assigned using the following naming convention:

- 152033-SM-SW-01-MMY Y = (NYSDEC SITE ID-Site Management-Media/Type-Sample Location).
- Duplicate samples will be labeled 152033-SM-SW-FD-MMDDYY. If multiple duplicate samples are taken on same day from same area, “-01,” “-02,” etc. will be appended to the end of the sample name.
- Samples to be used for matrix spike/matrix spike duplicates will be noted on the chain-of-custody in the notes column.
- Rinse blanks will be labeled 152033-SM-SW-RB-MMDDYY and only collected when non-dedicated equipment is used.

Fish Tissue Samples

Sample ID numbers for fish tissue samples will be assigned using the following naming convention:

- 152033-SM-FF-F1-1 = (NYSDEC SITE ID-Site Management-Media/Type-Sampling Area-Composite Number/Individual Fish Identifier) using the following abbreviations.

Media/Type	Sampling Area
FF – Forage Fish	F1 – Fish sampling area 1
PF – Predatory Fish	F2 – Fish sampling area 2

- Duplicate samples, for those samples collected in the field, will be labeled 152033-OU4-FF-FD-MMDDYY. If multiple duplicate samples are taken on same day from same site, “-01,” “-02,” etc. will be appended to the end of the sample name. Duplicates that are created in the laboratory will be assigned a sample name by the laboratory.

3.3 SAMPLE CONTAINERS

Table 2 outlines the types of sample containers, sample volume, preservatives, and holding times required for sample collection.

Table 1 Site Management Analytical Program

Samples	Sample Matrix	Number of Samples for Cadmium and Chromium ^(a)
SEDIMENT SAMPLING		
Number of Parent Samples	Sediment from 0-6 in. depth intervals	1
Field Duplicate ^(b)		1
Rinse Blank ^(c)		1
Matrix Spike/Matrix Spike Duplicate		1
Total Number of Analyses		4
SURFACE WATER SAMPLING^(d)		
Number of Parent Samples	Willetts Creek surface water	1
Field Duplicate		1
Rinse Blank		0
Matrix Spike/Matrix Spike Duplicate		1
Total Number of Analyses		3
GROUNDWATER		
Number of Parent Samples	Groundwater from 12 monitoring wells	12
Field Duplicate		1
Rinse Blank		1
Matrix Spike/Matrix Spike Duplicate		1
Total Number of Analyses		15
FISH TISSUE SAMPLING ^(e)		
Number of Predatory Fish Samples	Fish tissue	10
Number of Prey Fish Composite Samples		10
Total Number of Analyses		20
<p>(a) Chromium speciation is not required; sediment and fish tissue samples will be analyzed for total chromium and cadmium; surface water samples will be analyzed for dissolved cadmium and chromium; groundwater will be analyzed for total and dissolved target analyte list (TAL) metals by EPA Method 6010 and mercury by EPA Method 7470.</p> <p>(b) Laboratory quality control samples will be collected at a rate of 1 per 20 samples, per matrix.</p> <p>(c) Rinse blanks are collected one per analysis per field sampling day and only when non-dedicated equipment is used.</p> <p>(d) Surface water samples will also be analyzed for hardness by SM 2340B.</p> <p>(e) Duplicates and applicable laboratory control tests are performed at the lab using tissues from the parent samples; the collection of additional tissue for duplicates is not required in the field.</p> <p>NOTES: in. = Inches</p>		

Table 2 Sample Containers, Preservation, and Holding Times

Parameter	Matrix	Container Type/Size	Sample Volume	Preservation	Maximum Holding Time from Verifiable Time of Sample Receipt
Cadmium and total chromium by USEPA Method 6010	Sediment	Two 4-ounce wide mouth glass jar	8 ounces	Cool 4°C	6 months from collection
	Fish Tissue	Plastic bags	Minimum 5 grams per sample or composite; aim for 10 grams	Freeze within 24 hours of sample collection; ship on dry ice	Not Applicable
	Water (Surface Water Samples and Rinse Blanks)	One 250-milliliter plastic bottle; additional bottle for filtered samples	250 milliliters	HNO ₃ Cool 4°C	6 months from collection
TAL metals by USEPA Method 6010 and mercury by EPA Method 7470	Water (Groundwater Samples and Rinse Blanks)	One 250-milliliter plastic bottle; additional bottle for filtered samples	250 milliliters	HNO ₃ Cool 4°C	6 months from collection
Hardness by SM 2340B	Water (Surface Water Samples)	One 100-milliliter plastic bottle;	100 milliliters	HNO ₃ Cool 4°C	6 months from collection
NOTES: °C = Degrees Celsius g = Gram(s) mL = Milliliter(s) HNO ₃ = Nitric acid					

4. ANALYTICAL LABORATORY

The data collected during this investigation will be used to determine the presence and concentration of certain analytes in groundwater, sediment, surface water, and fish tissue.

Samples collected during execution of the Generic QAPP (EA 2020a)¹ and this QAPP Addendum will be submitted to a laboratory that will be determined upon NYSDEC assignment. The laboratory will be a New York State Department of Health Environmental Laboratory Analytical Program-certified laboratory, meeting specifications for documentation, data reduction, and reporting. Preliminary analytical results will be provided within 10 days of sample receipt and full NYSDEC Analytical Services Protocol Category B deliverables and associated electronic data deliverables will be provided to EA within 30 days of sample receipt.

This page intentionally left blank

5. ANALYTICAL TEST PARAMETERS

This QAPP Addendum will require the analysis of aqueous and non-aqueous samples using United States Environmental Protection Agency Method 6010 for cadmium and chromium. Aqueous samples (groundwater and surface water) and fish tissue samples will also be analyzed using USEPA Method 6010. Groundwater samples will be analyzed for the full list of total and dissolved TAL metals by EPA Method 6010 and mercury by EPA Method 7470.

Sampling Media	Analysis
Sediment	Total Cadmium and Chromium (EPA Method 6010)
Surface Water	Dissolved Cadmium and Chromium (EPA Method 6010) and hardness (SM 2340B)
Groundwater	Total and Dissolved Target Analyte List Metals (EPA Method 6010)
Biological Tissue (Fish)	Total Cadmium and Chromium (EPA Method 6010)

Compound lists for each analytical method are included in the Generic QAPP (EA 2020a).¹ A summary of the reporting limits for the aqueous and non-aqueous analytical methods is provided as **Attachment A**.

This page intentionally left blank

6. ANALYTICAL DATA VALIDATION

The laboratory will review data prior to its release from the laboratory. Objectives for review are in accordance with the QA/QC objectives stated in the Generic QAPP (EA 2020a)¹. The laboratories are required to evaluate their ability to meet these objectives. Outlying data will be flagged in accordance with laboratory standard operating procedures and corrective action will be taken to rectify the problem.

In order to ensure the validity of analytical data generated by a project, it will be validated by a third-party data validator who is independent from the analysts and the project. The resumes of the personnel providing the data validation services will be submitted for approval under a separate cover. The Generic QAPP (EA 2020a)¹ addresses implementation of independent validation.

This page intentionally left blank

Attachment A

A Summary of the Reporting Limits for the Aqueous and Non-Aqueous Analytical Methods

This page intentionally left blank

**Table A-1 Analytical Reporting Limits
EPA Method 6010 (Target Analyte List Metals) and
EPA Method 7470 (water) or 7471 (soil) for Mercury:
Water and Soil**

Analyte	Reporting Limit	
	Groundwater/Surface Water (µg/L)	Sediment (ppm)
Aluminum	2,000	2.0
Antimony	3	0.6
Arsenic	25	0.1
Barium	1,000	2.0
Beryllium	3	0.05
Cadmium	5	0.05
Calcium	50,000	50.0
Chromium	50	0.1
Cobalt	500	0.5
Copper	200	0.25
Iron	300	1.0
Lead	25	0.03
Magnesium	35,000	50.0
Manganese	300	0.15
Mercury (Method 7470)	0.7	0.002
Nickel	100	0.4
Potassium	50,000	50.0
Selenium	10	0.05
Silver	50	0.1
Sodium	20,000	50.0
Thallium	0.5	0.1
Vanadium	500	0.5
Zinc	5,000	0.2

NOTES:
µg/L = Microgram(s) per liter
ppm = Parts per million

This page intentionally left blank

Appendix F

Site-Specific Health and Safety Plan Addendum

This page left intentionally blank



**Site-Specific Health and Safety Plan Addendum
Dzus Fastener Company, Inc. (152033)
West Islip, New York**

Prepared for

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



Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
269 West Jefferson St.
Syracuse, New York 13202
(315) 431-4610

July 2020
Version: FINAL
EA Project No. 1602501

This page left intentionally blank

Site-Specific Health and Safety Plan Addendum Dzus Fastener Company, Inc. West Islip, New York

Prepared for

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



Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
269 West Jefferson St.
Syracuse, New York 13202
(315) 431-4610

24 July 2020

Donald Conan, P.E., P.G., Vice President
EA Engineering, P.C.

Date

24 July 2020

Frank DeSantis Jr., Project Manager
EA Science and Technology

Date

July 2020
Version: FINAL
EA Project No. 1602501

This page left intentionally blank

TABLE OF CONTENTS

	<u>Page</u>
LIST OF ATTACHMENTS	ii
LIST OF FIGURES	iii
LIST OF ACRONYMS AND ABBREVIATIONS	iv
1. INTRODUCTION	1
1.1 GENERAL	1
1.2 SITE DESCRIPTION	2
1.3 SITE HISTORY	2
1.4 POLICY STATEMENT	4
2. KEY PERSONNEL	7
3. SCOPE OF WORK.....	9
3.1 SEDIMENT COLLECTION	9
3.2 SURFACE WATER COLLECTION	10
3.3 GROUNDWATER COLLECTION	10
3.4 FISH SAMPLING	10
3.5 STORAGE AND DISPOSAL OF WASTE	10
4. POTENTIAL HAZARD ANALYSIS	11
5. STANDARD OPERATING PROCEDURES FOR SMALL BOATS.....	13
6. PERSONAL PROTECTIVE EQUIPMENT	15
7. SITE CONTROL AND SECURITY	17
7.1 SAFE WORK PRACTICES.....	17
7.2 DAILY STARTUP AND SHUTDOWN PROCEDURES.....	17

LIST OF ATTACHMENTS

- [ATTACHMENT A:](#) WORKER TRAINING AND PHYSICAL EXAMINATION RECORD
- [ATTACHMENT B:](#) HEALTH AND SAFETY PLAN ADDENDUM REVIEW RECORD
- [ATTACHMENT C:](#) SITE ENTRY AND EXIT LOG
- [ATTACHMENT D:](#) ACCIDENT/LOSS REPORT
- [ATTACHMENT E:](#) EMERGENCY TELEPHONE NUMBERS AND HOSPITAL DIRECTIONS
- [ATTACHMENT F:](#) EMERGENCY EQUIPMENT AVAILABLE ONSITE
- [ATTACHMENT G:](#) MAP TO HOSPITAL
- [ATTACHMENT H:](#) PERSONAL PROTECTIVE EQUIPMENT ACTIVITY RECORD
- [ATTACHMENT I:](#) SAFETY DATA SHEETS
- [ATTACHMENT J:](#) CORPORATE VESSEL OPERATIONS MANUAL AND STANDARD OPERATING PROCEDURE NO. 035 FOR SMALL BOAT OPERATIONS

LIST OF FIGURES

<u>Number</u>	<u>Title</u>
1	General Site Location
2	Site Features

LIST OF ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
EA	EA Engineering, P.C. and its affiliate EA Science and Technology
DER	Division of Environmental Remediation
FS	Feasibility Study
HASP	Health and Safety Plan
No.	Number
NYSDEC	New York State Department of Environmental Conservation
OU	Operable unit
PFD	Personal flotation device
RI	Remedial investigation
ROD	Record of Decision
SHSO	Site Health and Safety Officer

1. INTRODUCTION

1.1 GENERAL

A Generic Health and Safety Plan (HASP) (EA Engineering, P.C. and its affiliate EA Science and Technology [EA] 2020a)¹ was developed for field activities performed under the New York State Department of Environmental Conservation (NYSDEC) Standby Contract Number (No.) D009806-01. This HASP Addendum supplements the Generic HASP with site-specific information to protect the health and safety of personnel while performing field investigation activities to complete implementation of Site Management for the Dzus Fastener Company, Inc. site located at 425 Union Boulevard, West Islip, Suffolk County, New York (NYSDEC Site No. 152033).

This HASP Addendum describes the safety organization, procedures, and protective equipment that have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential for accidents or injuries to occur. One copy of the Generic HASP (EA 2020a)¹ and this HASP Addendum will be maintained onsite for use during the scheduled field investigation activities. The copies will be made available for site use and employee review at all times.

This HASP Addendum addresses regulations and guidance practices set forth in the Occupational Safety and Health Administration Standards for Construction Industry, 29 Code of Federal Regulations (CFR) 1926, including 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response and 29 CFR 1926.59, Hazardous Communications.

The following are provided as attachments:

- Attachment A—Worker Training and Physical Examination Record
- Attachment B—Health and Safety Plan Addendum Review Record
- Attachment C—Site Entry and Exit Log
- Attachment D—Accident/Loss Report
- Attachment E—Emergency Telephone Numbers and Hospital Directions
- Attachment F—Emergency Equipment Available Onsite
- Attachment G—Map to Hospital
- Attachment H—Personal Protective Equipment Activity Record
- Attachment I—Safety Data Sheets
- Attachment J—Corporate Vessel Operations Manual and Standard Operating Procedure No. 035 for Small Boat Operations.

NOTE: This site-specific HASP Addendum should be left open to display ATTACHMENT E (Emergency Telephone Numbers and Hospital Directions) and made available to all site personnel in a conspicuous location for the duration of field investigation activities in the event of an emergency.

¹ EA. 2020a. *Generic HASP for Work Assignments under NYSDEC Contract No. D009806*. April.

1.2 SITE DESCRIPTION

The subject site is located at 425 Union Boulevard, West Islip, Suffolk County, New York. The Site is 1 acre in size and is located in a mixed residential, commercial, and industrial area (**Figure 1**). The site is bounded by Union Avenue 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 2**).

1.3 SITE HISTORY

The Dzus Fastener Company, Inc. produced fasteners and springs beginning in 1932. Wastes from metal plating, tumbling, electroplating, chromic acid, anodizing, and special finishing operations consisted of oils, heavy metals, volatile organic compounds (VOCs), and salts. Leaching pools onsite were used for the disposal of hazardous wastes. 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. The facility changed its name from Dzus Fastener Company, Inc. to DFCI Solutions, Inc. in 2001, but operations did not change. In 2015, DFCI Solutions, Inc. ceased operations and moved all equipment out of the facility. The former facility buildings were demolished in 2019 and the property is currently undergoing redevelopment.

The contaminant source area, assigned New York State Department of Environmental Conservation (NYSDEC) Site Number (No.) 152033, is a 1-acre space that once contained leaching pools associated with the manufacture of metal fasteners (**Figure 1**). The Dzus Fastener Company, Inc. site was originally discovered in 1982 and numerous investigations and remediation have occurred over the years, with cadmium and chromium as the primary contaminants (COCs). During that work, the site evolved into six operable units (OUs). An OU is an administrative term used to identify a portion of a site that for technical or administrative reasons can be addressed separately through a distinct investigation and/or cleanup approach to eliminate or mitigate a release, threat of release, or exposure pathway. A Record of Decision (ROD) is typically prepared for each OU.

OU1 consists of the onsite leaching pools (the source) and areas of soil contamination at the facility. A ROD for OU1 was issued for the site by NYSDEC in March 1995. The selected remedy was implemented in 1996 and consisted of in situ stabilization/ solidification for onsite soil containing cadmium at concentrations greater than 10 parts per million (ppm). Three areas on the western portion of the facility were excavated and mixed with the soil 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 includes impacted sediment and water within Willetts Creek and Lake Capri. A ROD for OU2 was issued for the site by NYSDEC in October 1997. The selected remedy was implemented in 1999 and included dredging (the entire lake bottom to a depth of approximately 1 foot [ft]), dewatering, and offsite disposal of contaminated sediments from Lake Capri; excavation and offsite disposal of approximately 100 cubic yards (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 (SGV) (NYSDEC 2014).

OU3 encompasses the area of offsite impacted wetlands located behind a strip mall on Union Boulevard and includes a portion of the Willetts Creek channel upstream of Lake Capri. A ROD for OU3 was issued by the NYSDEC in October 2017. The selected remedy included excavation and offsite disposal of Willetts Creek bank soil that exceed the residential use SCOs for cadmium (2.5 milligrams per kilogram [mg/kg]) and chromium (36 mg/kg); removal and offsite disposal of sediment to native material in the portion of Willetts Creek (and floodplain); confirmation sampling; and restoration. Remedial construction for OU3 began in 2019 and is largely complete as of the date of this report. Restoration activities are expected to be completed in 2020.

OU4 was established to further delineate the extent of cadmium and chromium contamination downstream of OU3, and in Lake Capri. OU4 includes Lake Capri sediment, the area of Willetts Creek downstream from OU3, and the surrounding floodplains. A ROD for OU4 was issued by the NYSDEC in November 2018. Remedial construction for OU4 began in 2019 and were completed in 2020.

OU5 was established following completion of the OU4 RI to include the tidal area of Willetts Creek downstream of Lake Capri and south of Montauk Highway to Babylon Cove. OU5 includes sediment, surface water and floodplain soils in the tidal area of Willetts Creek to its intersection with Babylon Cove. OU5 is being investigated and managed separately from OU3 and OU4 and is the subject of this remedial investigation (RI).

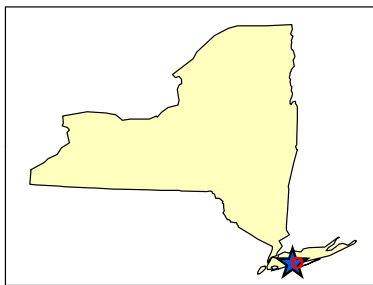
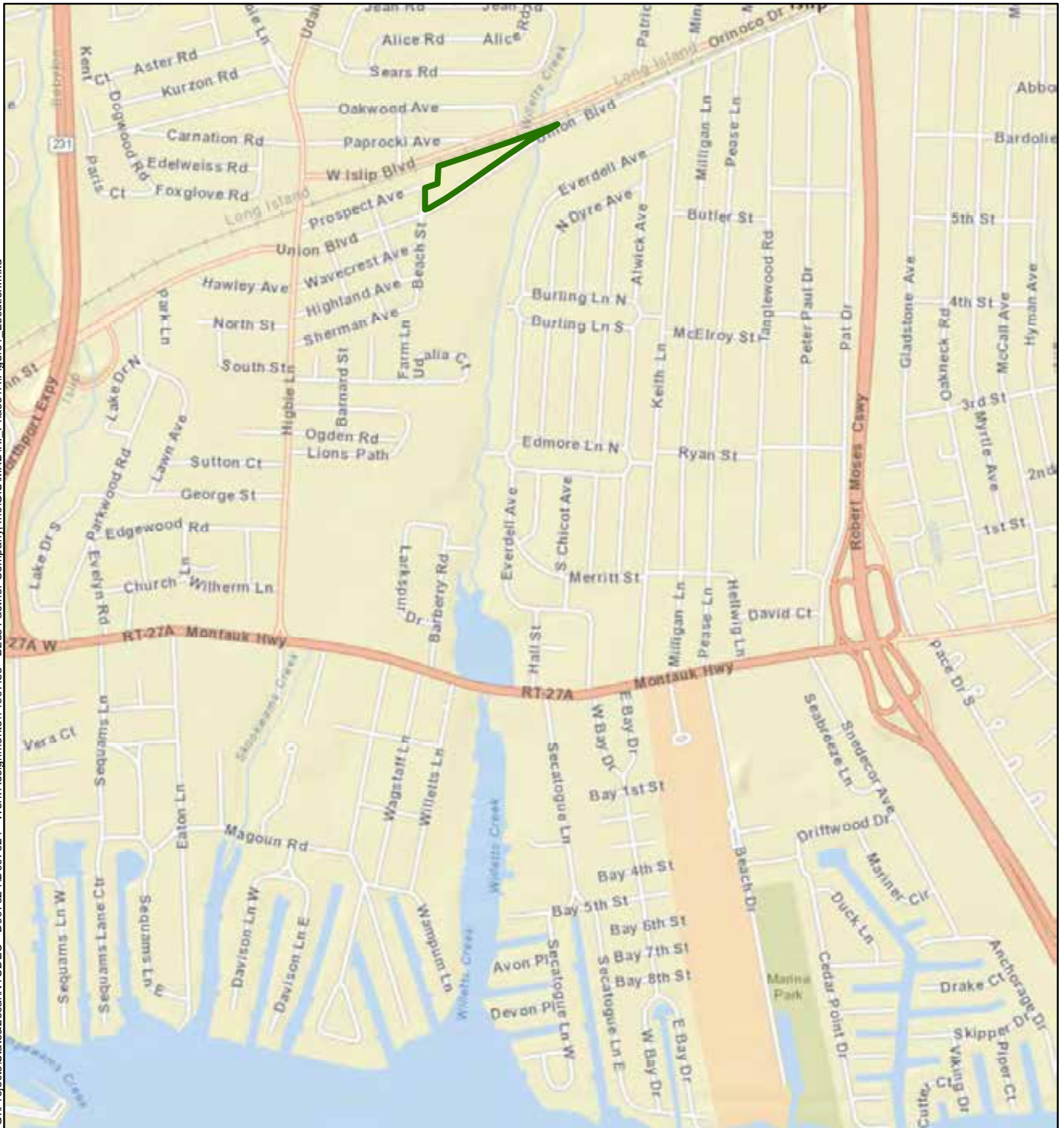
OU6 is an administrative OU that documents the Resource Conservation and Recovery Act closure of the former Dzus facility for the completion of regulated waste activities associated with the historical manufacturing activities. The general closure procedure for the former facility included the decontamination and washing of the building floors, excavation and removal of contaminated soils, installation and operation of a soil vapor extraction system, and remediation and closure of contaminated leaching pools. The Resource Conservation and Recovery Act closure has been completed.

1.4 POLICY STATEMENT

EA will take every reasonable step to provide a safe and healthy work environment and to eliminate or control hazards in order to minimize the possibility of injuries, illnesses, or accidents to site personnel. EA and EA subcontractor employees will be familiar with this HASP Addendum for the project activities that they are involved in. Prior to entering the site, the HASP Addendum will be reviewed, and an agreement to comply with the requirements will be signed by EA personnel, subcontractors, and visitors (**Attachment B**).

Operational changes that could affect the health and safety of the site personnel, community, or environment will not be made without approval from the Project Manager and the Program Health and Safety Officer. This document will be periodically reviewed to ensure that it is current and technically correct. Any changes in site conditions and/or the scope of work will require a review and modification to the HASP Addendum. Such changes will be documented in the form of a revision to this Addendum.

G:\Projects\State&Local\NYSDEC - D007624\D007624 - Work Assignments\14907.33 - Dzus Fastener Company, Inc\GIS\MXD\RI - Phase I\Figure1_Location.mxd




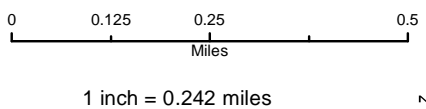
Legend
 Site Boundary

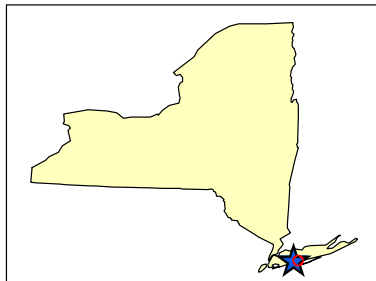
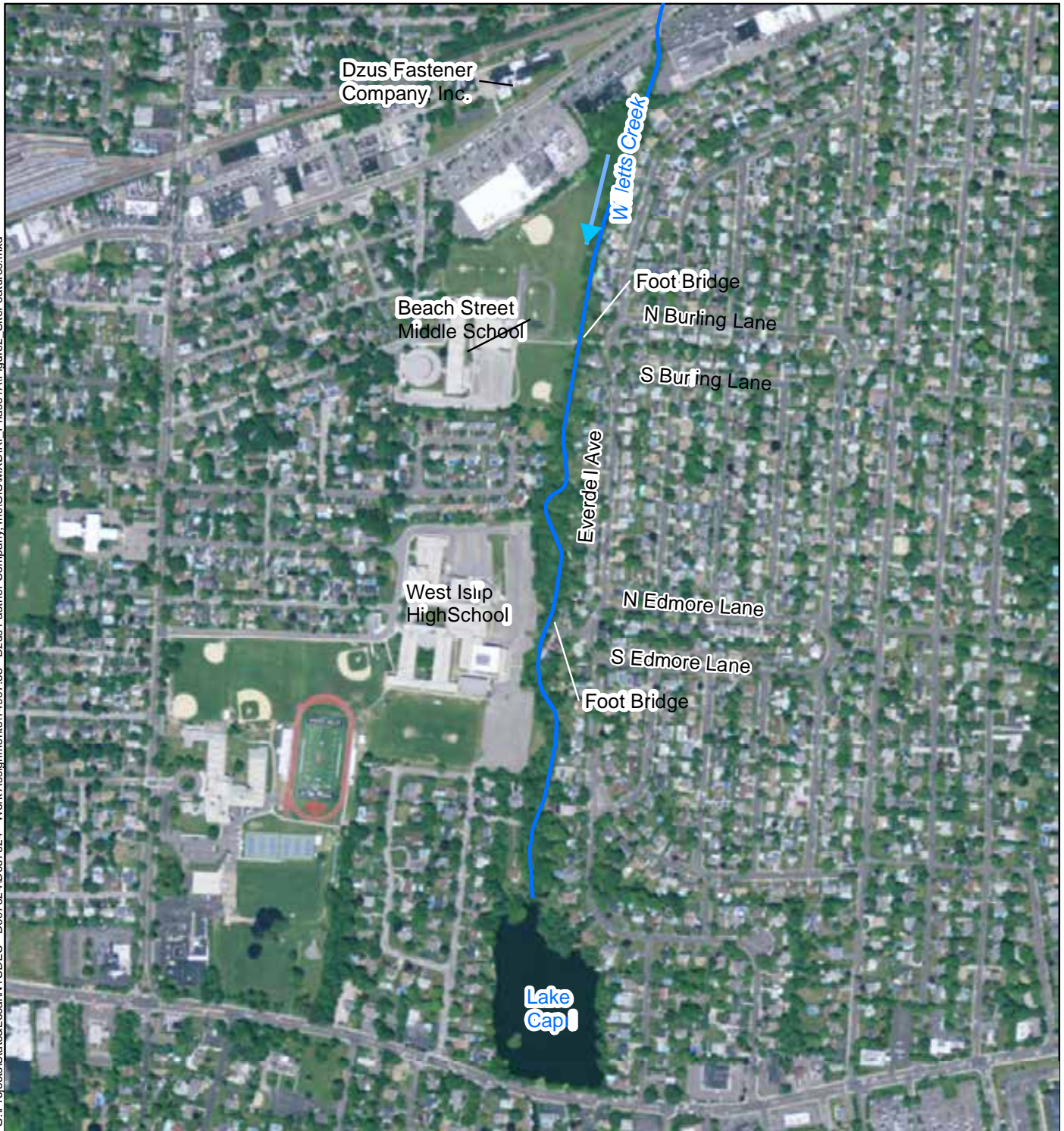
Figure 1
 General Site Location
 Dzus Fastener Company, Inc.
 West Islip, NY



Map Date: 5/26/2016
 Projection: NAD83 State Plane New York Long Island



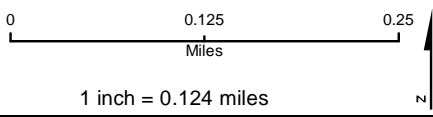
G:\Projects\State&Local\NYSDEC - D007624\D007624 - Work Assignments\14907.33 - Dzus Fastener Company, Inc\GIS\MXD\RI - Phase I\Figure2 - SiteFeatures.mxd



Legend
 Willetts Creek

Figure 2
Site Features
 Dzus Fastener Company, Inc.
 West Islip, NY

Map Date: 5/26/2016
 Projection: NAD83 State Plane New York Long Island



2. KEY PERSONNEL

The following table contains information on key project personnel:

Title	Name	Telephone No.
Program Health and Safety Officer	Peter Garger, Certified Industrial Hygienist	732-404-9370
Program Manager	Donald Conan, P.E., P.G.	315-431-4610
Quality Assurance/Quality Control Officer	Robert Casey	315-431-4610
Project Manager	Frank DeSantis, Jr.	315-431-4610
Site Manager/Site Health and Safety Officer (SHSO)	Hilary Williams	315-431-4610
Site Geologist/Scientist	Grant Reeder Hilary Williams	315-431-4610
NYSDEC Project Manager	Brianna Scharf	518 402-5987
NYS Department of Health PM	Jacquelyn Nealon	518 402-7860
Suffolk County Department of Health Services	Amy Juchatz	631-854-0087

This page left intentionally blank

3. SCOPE OF WORK

This HASP Addendum was developed to designate and define site-specific health and safety protocols applicable to project activities to be implemented and followed during field activities and consulting work at the Dzus Fastener Company, Inc. site, West Islip, New York. The scope of work covered by this HASP Addendum includes the following activities:

- Implementation and management of all Institutional and Engineering Controls
- Monitoring and sampling in accordance with the table below.

Site Management Activity	Frequency
<i>Monitoring</i>	
Creek corridor inspection	Every 5 quarters; after major storm events
Residual material behind Captree Plaza and along Montauk Highway (in Lake Capri)	Every 5 quarters; after major storm events
OU1 site cover	Every 5 quarters
Monitoring well inspection	Every 5 quarters
Wetland mitigation monitoring	Annual
OU5 visual inspection	After major storm events
<i>Sampling</i>	
Sediment	Every 5 quarters
Surface water	Every 5 quarters
Groundwater	Every 5 quarters
Fish Tissue	Year 1 of Site Management; Every 5 years after

- Periodic assessments and evaluations including a Climate Adaptation Plan and Green Remediation Evaluation

The sampling portion of these activities is summarized below and additional detail for each activity is provided in the Letter Work Plan (EA 2020b).²

3.1 SEDIMENT COLLECTION

Sediment sampling will be performed every five quarters (15 months) following completion of the remedial actions. One surficial sediment sample will be collected using a hand tool. The sediment sample location has been chosen based on the historical location of cadmium contamination behind Captree Plaza. This area is the most upstream location where groundwater communicates with surface water and where cadmium concentrations were highest prior to remedy implementation. The sample will be analyzed for total cadmium and chromium by USEPA Method 6010.

² EA. 2020b. *Interim Site Management Letter Work Plan. Dzus Fastener Company, Inc. West Islip, New York.* June.

3.2 SURFACE WATER COLLECTION

One surface water sample will be collected from Willetts Creek every 5 quarters (15 months) for analysis of dissolved cadmium and chromium by EPA Method 6010 and hardness by SM 2340B. Each surface water sample will be collected from the top of the water column, by submerging a laboratory-provided bottle into the water, and then transferring the collected water into a preserved sample bottle. Water quality measurements will be collected at each surface water sample location using a water quality meter and will include the collection of parameters such as pH, specific conductivity, temperature, reduction-oxidation potential (Eh), turbidity, and dissolved oxygen.

3.3 GROUNDWATER COLLECTION

Groundwater monitoring will be performed every 5 quarters (15 months) to assess the performance of the remedy. **Table 4-3** in the Letter Work Plan (EA 2020b) summarizes the construction details of the wells subject to the monitoring program. Groundwater samples will be collected via low-flow sampling from 12 wells for analysis of target analyte list metals by EPA Method 6010 and mercury by EPA Method 7470.

3.4 FISH SAMPLING

Sampling under the fish advisory program will be conducted to determine if changes to the fish advisory for Lake Capri is warranted. EA will conduct fish sampling to determine concentrations of chromium and cadmium in fish tissue. Fish sampling will be conducted in two areas of Lake Capri (near the mouth of Willetts Creek and near the culvert leading to the tidal portion of Willetts Creek).

3.5 STORAGE AND DISPOSAL OF WASTE

EA is responsible for the proper storage, handling, and disposal of investigative-derived waste including personal protective equipment and solids and liquids generated during sampling activities. All drummed materials will be clearly labeled as to their contents and origin. All investigative-derived waste will be managed in accordance with NYSDEC—Division of Environmental Remediation (DER)-10 Technical and Administrative Guidance Memorandum 4032 (NYSDEC 2010).³

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

4. POTENTIAL HAZARD ANALYSIS

Based on the field activities detailed in Section 3 of this report, the following potential hazardous conditions may be anticipated:

- Field operations conducted during the winter months can impose excessive heat loss to personnel conducting strenuous activities during unseasonably cold weather days and can impose cold-related illness symptoms during unseasonably cold weather days or when the wind chill is high. In addition, heavy rains, electrical storms, and high winds may create extremely dangerous situations for employees.
- Field operations conducted during the summer months can impose heat stress on field personnel conducting strenuous activities during unseasonably hot weather days. Because wearing personal protective equipment can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses and be able to recognize these signs and symptoms in both themselves and their co-workers. In addition, heavy rains, electrical storms, and high winds may create extremely dangerous situations for employees.
- Entry into a confined space in support of this project is forbidden. However, it is not anticipated that confined space entry will be required during the completion of the field activities.
- Field investigation activities intended to define potential sources of environmental contamination often require employees to be in direct proximity or contact with hazardous substances. Personal protective equipment, properly designed for the chemicals of concern, will always be provided and worn when a potential for skin contact is present.
- Personnel involved in activities associated with boating and watercraft are potentially exposed to a variety of hazards from activities including operations, maintenance, and transportation. All boats must carry one wearable personal flotation device (PFD) for each person on board. A Vessel Operations Manual and a Standard Operating Procedure for Small Boat Operations are provided as Attachment J.
- Hazards associated with working on the water include: slips caused by wet surfaces, shifting of equipment because of vessel instability, drowning, and electrocution caused by electrical storms. In addition to being required to wear a PFD and steel-toe muck boots while on-board the vessel, personnel will be requested to identify and prevent unsafe work conditions such as accumulations of water or sediment on the work surface, obstructions on the work deck that could cause a trip or fall, or overhead obstructions that could cause a fall. Work on the boat will be suspended during thunderstorms and other severe weather situations.

- Personnel may be injured during lifting and handling of heavy materials, equipment, or containers. Additionally, personnel may encounter slip, trip, and fall hazards associated with sampling activities. Precautionary measures should be taken in accordance with the Generic HASP (EA 2020a)¹ and this HASP Addendum.
- Weather—Daily, before beginning work over water, Ms. Williams, SHSO, will evaluate weather reports and conditions to ascertain local weather and prevent personnel exposure to severe weather. Weather has the propensity to change rapidly over water so personnel should continually monitor conditions. If severe weather is encountered, personnel will cease field operations, immediately return to shore, and find a safe space to shelter during the storm. A few signs to look for that indicate an approaching weather change:
 - Cloud build up, especially rapid vertically rising clouds
 - Sudden drop in temperature
 - Sudden increase in wind direction and/or speed.
- Biological Hazards—Potential hazards may be present at the site due to bites from stray, domestic, and wild animals (including rodents), spiders, bees, and other venomous arthropods. Potential hazards may also be present at the site in the form of poisonous plant life, which can result in skin rashes or abrasions. In the case of an animal or insect bite that can be serious or fatal, workers must seek immediate medical attention and report the incident to the SHSO prior to leaving the site. An employee known to be allergic or sensitive to poisonous insects should alert the Site Manager and SHSO. The following are the main potential biological hazards at the site:
 - Deer ticks (*Ixodes scapularis*) or black-legged ticks are present throughout forested areas at the Site and can transmit Lyme disease to humans. The limiting of exposed skin and use of DEET and permethrin is the most effective means to avoid tick bites.
 - Poison ivy (*Toxicodendron radicans*) is present along Willetts Creek and may occur as a climbing vine or a rooted, singular plant. It can be identified by three shiny leaves that grow outward from a thick woody vine or thin pale stem. Urushiol, an oil that causes rash on human skin, is present on the entire plant. Proper identification and avoidance are the best options when conducting field work at the Site.
 - Blue-Green Algae has been periodically reported in Lake Capri. Algal blooms usually occur in nutrient-rich waters, particularly during hot, calm weather. Some algal blooms can produce harmful health effects. The NYSDEC maintains a harmful algal bloom notifications page of waterbodies that currently have blooms.
- The potential chemicals of concern present at the site include, but are not limited to cadmium and chromium. Material safety data sheets for these chemicals are provided in Attachment I.

5. STANDARD OPERATING PROCEDURES FOR SMALL BOATS

Transport by boat is required to accomplish the fish sampling task summarized in Section 3 of this HASP Addendum. Work conducted from a boat will be performed in accordance with EA's Corporate Vessel Operations Manual⁴, EA Standard Operating Procedure No. 035⁵, and applicable Occupational Safety and Health Administration standards. The Corporate Vessel Operations Manual and Standard Operating Procedure No. 035 have been provided as Attachment J. Vessel operators will be responsible for completing the equipment requirement, small craft, and trailer inspection checklists included in Section 11 of the Corporate Vessel Operations Manual.

In addition to the above, personnel will abide by the following requirements:

- Personnel will use the buddy system at all times.
- Swimming is prohibited, with the following exception: personnel entering the water to prevent injury or loss of life.
- All personnel will wear a U.S. Coast Guard-approved PFD of the type able to support an unconscious person (Type I with 32-pound [lb] floatation).
- At least one Type IV throwable device (ring buoy, horseshoe buoy) will be available on each boat. Throwable devices shall be U.S. Coast Guard-approved and equipped with 150 ft of 600-lb capacity rope.
- One fire extinguisher (minimum rating of 1-A:10-B:C) will be available for immediate use on each boat.

The vessel operator shall provide a list of crew duties for normal operations and emergencies. Emergencies that shall be covered include, but are not limited to, man-overboard, vessel-fire, and vessel emergency. The vessel operator shall provide an orientation and emergency drill.

All employees working on the water will wear a U.S. Coast Guard-certified personal PFD at all times and will use additional personal protective equipment such as lanyards and/or safety nets as necessary. PFDs shall meet the following requirements:

- Before and after each use, the PFD will be inspected for defects that would alter its strength or buoyancy.
- All PFDs will be equipped with retro reflective tape.

Throwable devices must be immediately available for use. Requirements for throwable device use are as follows:

⁴ EA. 2004. *Corporate Vessel Operations Manual*. December.

⁵ EA. 2014. *Standard Operating Procedure No. 0.35 for Small Boat Operations*. Revision 1. December.

- PFDs must be readily accessible.
- PFDs must be able to be deployed in a reasonable amount of time in an emergency (e.g., vessel sinking, on fire, etc.).
- PFDs should not be stowed in plastic bags or in locked or closed compartments, or have other gear stowed on top of them.

All personnel will know what to do if they fall overboard and what action staff on the boat will take to rescue someone in the water. If a person falls overboard, depending on the temperature of the water, hypothermia can set in rapidly. Precautionary measures will be taken to help slow down loss of body heat, including staying calm in the water, tucking legs into upper body, and keeping the head above water. If a person overboard is observed, the following procedures apply:

- Shout out “Man overboard, port side” (left) or “Man overboard, starboard side” (right).
- Throw throwable device (i.e., life ring) over the side of the boat as near as possible to the person.
- Make sure the vessel operator is notified by the quickest means possible.
- Make sure that a crew member keeps an eye on the overboard person at all times and points to the person with an extended arm so as to not lose track of the person and so the vessel operator can use the extended arm as a reference point to maneuver the boat for recovery.

The standard U.S. Coast Guard Float Plan will be adhered to at all times during vessel operation, and includes:

- Vessel information
- Personnel on-board
- Expected time of departure, route, and time of return
- Means of communication and contact information.

Ms. Williams, SHSO, will ensure that the U.S. Coast Guard Float Plan is properly completed prior to any boating activities and will ensure that all necessary safety precautions are taken while workers are on the boat.

6. PERSONAL PROTECTIVE EQUIPMENT

Based upon currently available information, it is anticipated that Level D personal protective equipment will be required for anticipated conditions and activities.

The personal protective equipment components for use during this project are detailed in the Generic HASP. The components of Level D personal protective equipment are summarized below. Level D will be worn for initial entry onsite and initially for all activities and will consist of the following:

- Coveralls or appropriate work clothing
- Steel-toe, steel-shank safety boots/shoes
- Hard hats (when overhead hazards are present or as required by the SHSO)
- Chemical resistant gloves (nitrile/neoprene) when contact with potentially contaminated soil or water is expected
- Safety glasses with side shields.

In addition to Level D PPE, all EA personnel will wear a U.S. Coast Guard-approved, Type I PFD when working over of water. PFDs will meet the requires described in Section 5 of this HASP Addendum.

PFDs should be worn at all times when working on smaller craft.

This page left intentionally blank

7. SITE CONTROL AND SECURITY

Only authorized personnel will be permitted to conduct field activities. Authorized personnel include those who have completed hazardous waste operations initial training, as defined under Occupational Safety and Health Administration Regulation 29 CFR 1910.120/29 CFR 1926.65, have completed their training or refresher training within the past 12 months, and have been certified by a physician as fit for hazardous waste operations.

7.1 SAFE WORK PRACTICES

Safe work practices that will be followed by site workers include, but are not limited to, the following rules:

- Working before or after daylight hours without special permission is prohibited.
- Entering restricted or posted areas without permission from the SHSO is prohibited.
- Smoking is limited to designated areas.
- Possessing, using, purchasing, distributing, or having controlled substances in their system throughout the day or during meal breaks is prohibited.
- Consuming or possessing alcoholic beverages is prohibited.
- Good housekeeping—employees will be instructed about housekeeping throughout field activities.
- Sitting or kneeling in areas of obvious contamination is prohibited.
- Overgrown vegetation and tall grass areas should be avoided.

7.2 DAILY STARTUP AND SHUTDOWN PROCEDURES

The following protocols will be followed daily prior to start of work activities:

- The SHSO will review site conditions to determine if modification of work and safety plans is needed.
- Personnel will be briefed and updated on new safety procedures as appropriate.
- Safety equipment will be checked for proper function.
- The SHSO will ensure that the first aid kit is adequately stocked and readily available.

- Onsite equipment and supplies will be locked and secure.

Attachment A

Worker Training and Physical Examination Record

This page intentionally left blank

Attachment A

Worker Training and Physical Examination Record

SITE: Dzus Fastener Company, Inc., West Islip, New York						
Name	OSHA 40-hour Hazardous Waste Operations Training		OSHA Hazardous Waste Supervisor Training	CPR (date of expiration)	First Aid (date of expiration)	Date of Last Physical Examination
	Initial	Annual				
EA PERSONNEL						
Robert Casey	11/1/01	7/8/14	7/28/09	5/28/11	5/28/11	11/2/05
Frank DeSantis Jr.	3/29/07	2/11/19	1/9/12	12/20/18	12/20/18	4/3/17
Adam Etringer	12/6/02	5/20/20	---	1/14/21	1/14/21	5/25/17
Hilary Williams	7/12/07	4/3/20	6/30/15	1/14/21	1/14/21	1/6/20
Grant Reeder	12/28/18	12/28/19	---	1/14/21	1/14/21	9/13/19
SUBCONTRACTOR OR ADDITIONAL PERSONNEL						
---	---	---	---	---	---	---
---	---	---	---	---	---	---
<p>NOTES: Prior to performing work at the site, this Health and Safety Plan Addendum must be reviewed and an agreement to comply with the requirements must be signed by all personnel, including contractors, subcontractors, and visitors. Contractors and subcontractors are ultimately responsible for ensuring that their own personnel are adequately protected. In signing this agreement, the contractors and subcontractors acknowledge their responsibility for the implementation of the Health and Safety Plan Addendum requirements. All personnel onsite shall be informed of the site emergency response procedures and any potential safety or health hazards of the operations.</p> <p>EA = EA Engineering, P.C. and its Affiliate EA Science and Technology OSHA = Occupational Safety and Health Administration CPR = Cardiopulmonary resuscitation P.E. = Professional Engineer</p>						

This page intentionally left blank

Attachment B

Health and Safety Plan Addendum Review Record

This page intentionally left blank

This page intentionally left blank

Attachment C

Site Entry and Exit Log

This page intentionally left blank

This page intentionally left blank

Attachment D
Accident/Loss Report

This page intentionally left blank



ACCIDENT/LOSS REPORT

C. ACCIDENT INVESTIGATION INFORMATION
Was safety equipment provided? yes or no If yes, was it used? yes or no
Was an unsafe act being formed? yes or no If yes, describe:
Was a machine part involved? yes or no If yes, in what way?
Was the machine part defective? yes or no If yes, in what way?
Was a third party responsible for the accident/incident: yes or no If yes, list name, address, and telephone number.
Was the accident/incident witnessed? yes or no If yes, list name, address, and telephone number.

D. PROVIDER INFORMATION
Was first aid given onsite? yes or no
If yes, what type of medical treatment given?
Physician information (if medical attention was administered): Name: Address (include city, state, and zip): Telephone:
Hospital address (include name, address, city, state, zip code, and telephone number):
Was the employee hospitalized? yes or no If yes, on what date?
Was the employee treated as an outpatient, receive emergency treatment or ambulance service? yes or no
Please attach the physician's written return to work slip.
Note: A physician's return to work slip is required prior to allowing the worker to return to work.

E. AUTOMOBILE ACCIDENT INFORMATION (complete if applicable)
Authority contacted and report number:
EA employee's vehicle year, make, and model:
V.I.N. Plate/tag number:
<i>Owner's</i> name and address:
<i>Driver's</i> name and address:
Relationship to insured?
Driver's license number?



ACCIDENT/LOSS REPORT

E. AUTOMOBILE ACCIDENT INFORMATION (continued)
Describe damage to <i>your</i> property:
Describe damage to <i>other</i> vehicle or property:
<i>Other</i> driver's name, address, and telephone:
<i>Other</i> driver's insurance company (include name, address and telephone number):
Location of other vehicle?
Name, address, and telephone of other injured parties:
Witness (include name, address, and telephone number):
Witness's statement:
Witness (include name, address, and telephone number):
Witness's statement:

F. ACKNOWLEDGEMENT

Name of supervisor:
Date of this report:
Report prepared by:
I have read this report and the contents as to how the accident/loss occurred are accurate to the best of my knowledge.
Signature (injured employee): _____ Date: _____



ACCIDENT/LOSS REPORT

I am seeking medical treatment for a work related injury/illness.
Please forward all bills/invoices/correspondence to:

**EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle
Suite 400
Hunt Valley, Maryland 21031**

Attention: Michele Bailey

Human Resources

(410) 584-7000

Attachment E

Emergency Telephone Numbers and Hospital Directions

This page intentionally left blank

Attachment E**Emergency Telephone Numbers and Hospital Directions**

SITE: Dzus Fastener Company, Inc., West Islip, New York	
Police: Suffolk County Police Department	9-1-1 / (631) 854-8300
Fire: West Islip Fire Department	9-1-1 / (631)661-6440
Ambulance	9-1-1
Hospital: Good Samaritan Hospital Medical Center	(631) 376-3000
New York Regional Poison Control Center: 455 First Avenue, Room 123 New York, New York, 14222	(212) 689-9014 800-222-1222 (emergency)
Directions to Good Samaritan Hospital Medical Center (1000 Montauk Hwy, West Islip, New York 11795): Starting at 425 Union Boulevard, travel northeast 0.3 miles on Union Boulevard. Turn right onto Keith Lane/Union Boulevard and continue for 1.1 miles. Turn left to stay on Keith Lane for 217 feet. Total distance to Good Samaritan Hospital Medical Center is approximately 1.5 miles and 5 minutes.	
Program Safety and Health Officer: Pete Garger, CIH	(410) 584-7000
Program Manager: Donald Conan, P.E.	(315) 431-4610
EA Project Manager Frank DeSantis, Jr.	(315) 431-4610 Office (315) 395-7689 Cell
In case of spill, contact James Hayward, P.E.	(315) 431-4610
EA Medical Services (Physician) All One Health Services	(800) 229-3674
Field Manager/Site Health and Safety Officer: Hilary Williams	(315) 431-4610 Office (585) 322-2140 Cell
Site Geologist/Scientist: Grant Reeder	(315) 431-4610 Office (603) 856-6124 Cell
In case of accident or exposure incident, contact Corporate Health and Safety Officer Peter Garger, CIH	(410) 584-7000

This page left intentionally blank

Attachment F

Emergency Equipment Available Onsite

This page intentionally left blank

Attachment F

Emergency Equipment Available Onsite

Type of Equipment	Location
Communications Equipment	
Mobile Telephone	EA vehicle
Medical Support Equipment	
First Aid Kits	EA vehicle
Eye Wash Station	EA vehicle
Firefighting Equipment	
Fire Extinguishers	EA vehicle

This page left intentionally blank

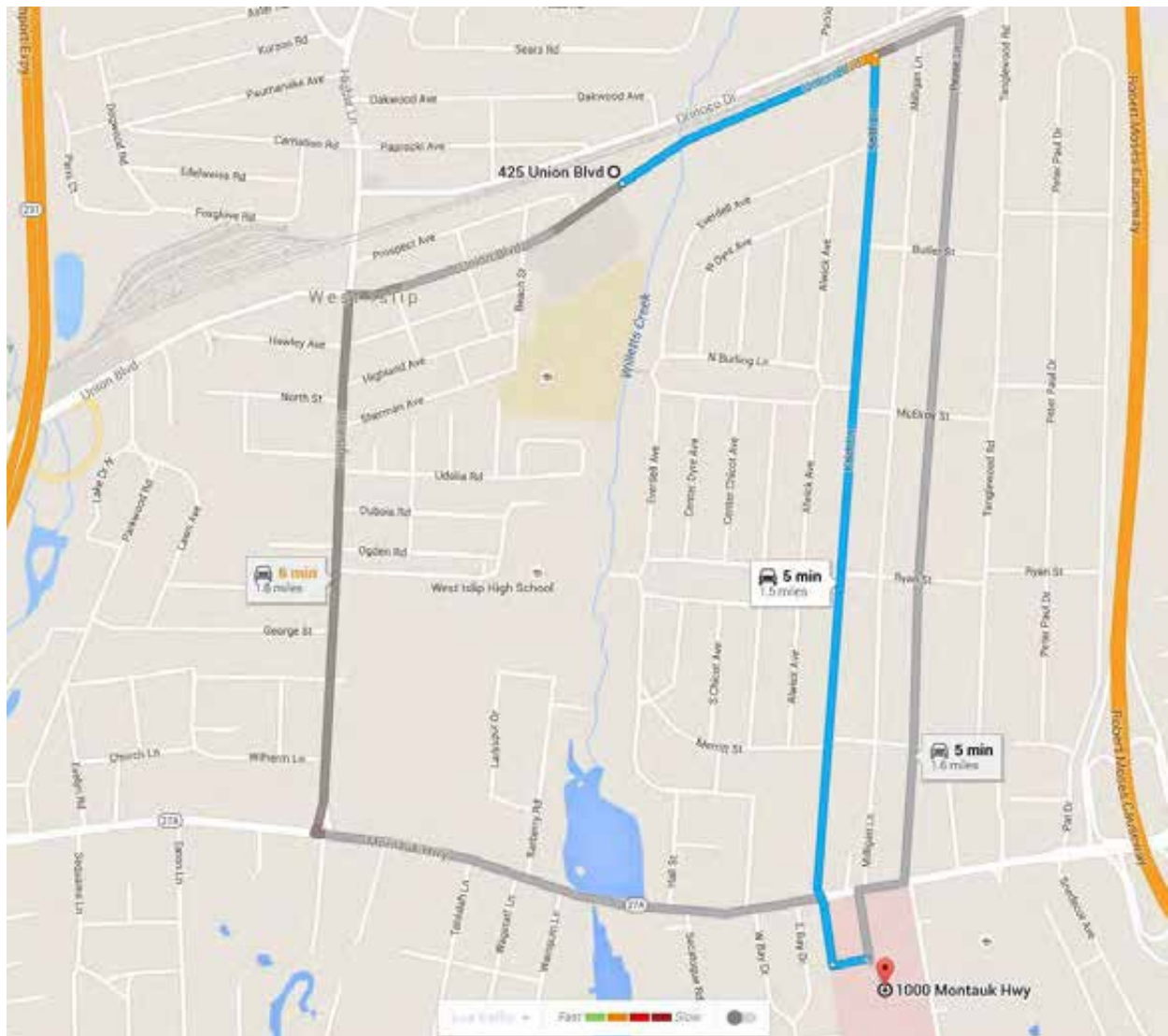
Attachment G

Map to Hospital

This page intentionally left blank

Attachment G**Map to Hospital****Directions to Good Samaritan Hospital Medical Center
(1000 Montauk Hwy, West Islip, New York 11795)**

Starting at 425 Union Boulevard, travel northeast 0.3 miles on Union Blvd. Turn right onto Keith Lane/Union Boulevard and continue for 1.1 miles. Turn left to stay on Keith Lane for 217 feet. Total distance to Good Samaritan Hospital Medical Center is approximately 1.5 miles and 5 minutes.



This page left intentionally blank

Attachment H

Personal Protective Equipment Activity Record

This page intentionally left blank

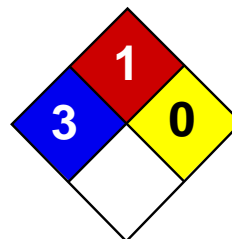
Attachment H**Personal Protective Equipment Activity Record**

SITE: Dzus Fastener Company, Inc., West Islip, New York		
Weather Condition:		Onsite Hours: From To
Changes in Personal Protective Equipment Levels ^(a)	Work Operations	Reasons for Change
Site Health and Safety Plan Violations	Corrective Action Specified	Corrective Action Taken (yes/no)
Observations and Comments:		
Completed by:		
Site Health and Safety Officer		Date
(a) Only the Site Health and Safety Officer may change personal protective equipment levels, using only criteria specified in the Health and Safety Plan Addendum.		

This page left intentionally blank

Attachment I
Safety Data Sheets

This page intentionally left blank



Health	3
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet Cadmium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cadmium

Catalog Codes: SLC3484, SLC5272, SLC2482

CAS#: 7440-43-9

RTECS: EU9800000

TSCA: TSCA 8(b) inventory: Cadmium

CI#: Not applicable.

Synonym:

Chemical Name: Cadmium

Chemical Formula: Cd

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Cadmium	7440-43-9	100

Toxicological Data on Ingredients: Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.

MUTAGENIC EFFECTS: Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance is toxic to kidneys, lungs, liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: No known effect on eye contact, rinse with water for a few minutes.

Skin Contact:

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 570°C (1058°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:

Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:

Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.01 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 112.4 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 765°C (1409°F)

Melting Point: 320.9°C (609.6°F)

Critical Temperature: Not available.

Specific Gravity: 8.64 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Reacts violently with potassium.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 890 mg/kg [Mouse]. Acute toxicity of the dust (LC50): 229.9 mg/m³ 4 hour(s) [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. The substance is toxic to kidneys, lungs, liver.

Other Toxic Effects on Humans:

Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans: May cause allergic reactions, exzema and/or dehydration of the skin.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport:

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium Pennsylvania RTK: Cadmium Massachusetts RTK: Cadmium TSCA 8(b) inventory: Cadmium SARA 313 toxic chemical notification and release reporting: Cadmium CERCLA: Hazardous substances.: Cadmium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R26- Very toxic by inhalation. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References:

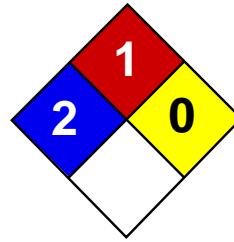
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 04:29 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet

Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chromium	7440-47-3	100

Toxicological Data on Ingredients: Chromium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.

MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:

Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:

Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:

Powdered Chromium metal +fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.5 (mg/m³) from ACGIH (TLV) [United States] TWA: 1 (mg/m³) from OSHA (PEL) [United States] TWA: 0.5 (mg/m³) from NIOSH [United States] TWA: 0.5 (mg/m³) [United Kingdom (UK)] TWA: 0.5 (mg/m³) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

pH (1% soln/water): Not applicable.

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Insoluble in cold water, hot water. Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Not available.

Special Remarks on Reactivity:

Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride. It may react violently or ignite with bromine pentafluoride. Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate. Potentially hazardous incompatibility with strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: May cause skin irritation. Eyes: May cause mechanical eye irritation. Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea. Chronic Potential Health Effects: Inhalation: The effects of chronic exposure include irritation, sneezing, redness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconiosis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur. Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information**Federal and State Regulations:**

Connecticut hazardous material survey.: Chromium Illinois toxic substances disclosure to employee act: Chromium Illinois chemical safety act: Chromium New York release reporting list: Chromium Rhode Island RTK hazardous substances: Chromium Pennsylvania RTK: Chromium Minnesota: Chromium Michigan critical material: Chromium Massachusetts RTK: Chromium Massachusetts spill list: Chromium New Jersey: Chromium New Jersey spill list: Chromium Louisiana spill reporting: Chromium California Director's List of Hazardous Substances: Chromium TSCA 8(b) inventory: Chromium SARA 313 toxic chemical notification and release reporting: Chromium CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

R40- Limited evidence of carcinogenic effect S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:16 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

Attachment J

**Corporate Vessel Operations Manual and Standard
Operating Procedure No. 035 for Small Boat
Operations**

This page intentionally left blank



Corporate Vessel Operations Manual



Prepared by

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle, Suite 400
Hunt Valley, Maryland 21031

www.eaest.com **EA Engineering, Science, and Technology, Inc., PBC** Offices Nationwide
IMPROVING THE QUALITY OF THE ENVIRONMENT IN WHICH WE LIVE, ONE PROJECT AT A TIME®

April 2017

This page intentionally left blank

CONTENTS

NOTE: Prior to beginning any EA vessel-related activities, copies of the checklists (Chapter 11) should be made available for easy access.

	<u>Page</u>
LIST OF TABLES	iii
LIST OF ACRONYMS AND ABBREVIATIONS.....	iv
1. INTRODUCTION	1-1
1.1 Purpose	1-1
1.2 Applicability	1-1
1.3 Disclaimer	1-1
1.4 References	1-1
2. BOATING LAWS AND REGULATIONS.....	2-1
2.1 Registration, Numbering, and Documentation	2-1
2.1.1 Display of Numbers.....	2-1
2.1.2 Notification of Changes to a Numbered Vessel.....	2-1
3. FEDERAL MANDATED SAFETY EQUIPMENT	3-1
3.1 Equipment Requirements – Personal Flotation Device.....	3-1
3.1.1 Personal Flotation Devices	3-1
3.2 Equipment Requirements – Fire Extinguishers	3-4
3.2.1 Fire Extinguisher Maintenance.....	3-5
3.2.2 Required Number of Fire Extinguishers.....	3-6
3.3 Equipment Requirements – Ventilation	3-6
3.4 Equipment Requirements – Backfire Flame Arrestor	3-8
3.5 Equipment Requirements – Sound-Producing Devices.....	3-8
3.5.1 Visual Distress Signals	3-8
3.5.2 Pyrotechnic Devices	3-9
3.5.3 Non-Pyrotechnic Devices	3-9
3.6 Equipment Requirements – Pollution Regulations.....	3-11
3.7 Equipment Requirements – Marine Sanitation Devices.....	3-12
3.8 Additional Recommended Equipment	3-12
4. NAVIGATION RULES	4-1

	<u>Page</u>
4.1 Navigation Lights	4-1
4.2 Power-Driven Vessels	4-1
4.3 Sailing Vessels	4-2
4.3.1 Vessel under Oars	4-2
4.3.2 Lights and Shapes	4-2
4.3.3 Anchored Vessels	4-3
4.3.4 Sailing Vessels under Power (Machinery).....	4-3
4.3.5 Restricted Maneuverability.....	4-3
5. INLAND “RULES OF THE WATER”	5-1
5.1 Meeting Situations.....	5-1
5.1.1 Meeting Head-On	5-1
5.1.2 Overtaking	5-2
5.1.3 Crossing.....	5-2
5.1.4 Sailing Craft and Vessels Propelled by Oars or Paddles	5-3
5.1.5 Navigating Narrow Channels	5-3
5.1.6 Commercial Vessel Situations	5-3
6. SEAMANSHIP.....	6-1
6.1 Anchoring	6-1
6.2 Weather	6-2
7. AIDS TO NAVIGATION	7-1
7.1 Lateral Aids	7-1
7.2 Nautical Charts	7-1
8. ELECTRONICS	8-1
8.1 Equipment Requirements – Radio Regulations.....	8-1
8.1.1 Carrying a Radio.....	8-1
8.1.2 Radio Licenses.....	8-1
8.1.3 Radio Listening Watch	8-1
9. TOWING AND LAUNCHING.....	9-1
9.1 Trailering Your Boat	9-1
9.1.1 Check Before You Go Out on the Highway	9-1
9.1.2 Towing Precautions	9-2
9.1.3 Pre-Launching Preparations.....	9-2

	<u>Page</u>
9.1.4 Retrieval.....	9-3
9.1.5 Storage.....	9-3
10. OFFSHORE OPERATION SAFETY EQUIPMENT	10-1
10.1 Equipment Requirements – Vessel Operating Offshore.....	10-1
10.1.1 Communications.....	10-1
10.1.2 Satellite Emergency Position Indicating Radio Beacons.....	10-1
10.1.3 Inflatable Life Rafts.....	10-2
10.1.4 Immersion Suits.....	10-2
10.2 Electrofishing Field Manual.....	10-2
11. CHECKLISTS	11-1
11.1 Equipment Requirements – Safety and Survival Tips.....	11-1
11.2 Small Craft Inspection List.....	11-2
11.3 Trailer Checklist.....	11-2
APPENDIX A: NAUTICAL TERMS	
APPENDIX B: “RULES OF THE WATER”	
APPENDIX C: ELECTROFISHING FIELD MANUAL AND CHECKLIST FOR ELECTROFISHING SAFETY AND HEALTH AUDIT	

LIST OF TABLES

<u>Number</u>	<u>Title</u>
2-1	Quick reference.
3-1	Minimum required equipment.
4-1	Lights for various types of vessels – 1980 inland rules.
4-2	Lights for various types of vessels – 1972 International rules.
6-1	Suggested rode and anchor sizes.
10-1	Required or recommended equipment for the vessel safety check decal.

LIST OF ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
EPIRB	Emergency Position Indicating Radio Beacon
FCC	Federal Communications Commission
ft	Foot (feet)
GPS	Global Positioning System
in.	Inch(es)
lb	Pound(s)
m	Meter(s)
MHz	Megahertz
mi	Mile(s)
MSD	Marine sanitation device
NA	Not applicable
NOS	National Ocean Service
PFD	Personal flotation device
USCG	U.S. Coast Guard
VHF	Very high frequency

1. INTRODUCTION

Personnel involved in activities associated with boating and watercraft are potentially exposed to a variety of hazards from activities including operations, maintenance, and transportation.

No person will be required or instructed to work in surroundings or under conditions that are unsafe or dangerous to his or her health.

Each individual employee is responsible for complying with applicable safety requirements, wearing prescribed safety equipment, and preventing avoidable accidents.

Safety and health programs, documents, signs, and tags will be communicated to employees in a language that they understand.

Adequate planning is needed before performing work at these sites to reduce the risk of employee injury or illness.

A partial listing of terms and phrases used during the operation of a vessel is provided in Appendix A. All members of the crew should be familiar with these terms.

1.1 PURPOSE

The purpose of this Manual is to communicate EA's basic policies and procedures regarding safety and health during the performance of work involving boating and watercraft activities. This Manual introduces the reader to EA's Boating and Watercraft Operations Program and critical references and definitions of terms used in this program.

1.2 APPLICABILITY

The procedures and requirements in this section apply to EA and subcontractor personnel involved in the boating and watercraft activities and operations. Visitors are required to follow these requirements.

1.3 DISCLAIMER

This Manual is not a comprehensive overview of all situations an operator may encounter, is not a substitute for common sense or experience, nor is it a substitute for a project- and/or site-specific Safety and Health Plan, as applicable.

1.4 REFERENCES

Maloney, E.S. 1981. Chapman Piloting, Seamanship and Small Boat Handling, 55th Edition. The Hearst Corporation, New York.

U.S. Coast Guard (USCG) safe boating website: www.uscgboating.org.

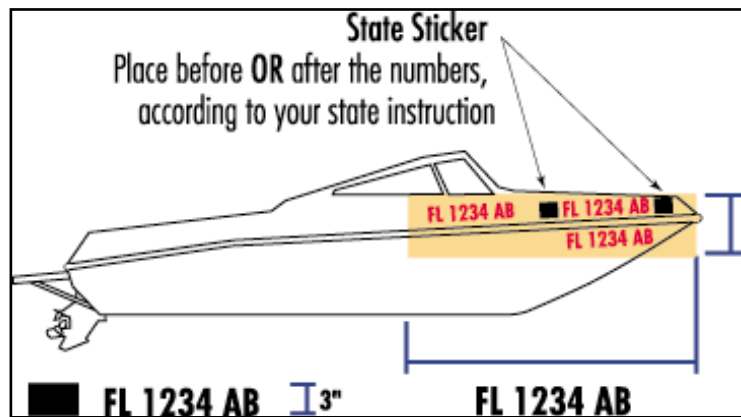
This page intentionally left blank

2. BOATING LAWS AND REGULATIONS

The purpose of this chapter is to acquaint the reader with different types of vessel registrations and numbering, according to the Federal Boat Safety Act of 1971, and adopted by Congress on 15 July 1997.

2.1 REGISTRATION, NUMBERING, AND DOCUMENTATION

All undocumented vessels equipped with propulsion machinery must be registered in the state of principal use. A Certificate of Number will be issued upon registering the vessel. These numbers must be displayed on your vessel. The owner/operator of a vessel must carry a valid Certificate of Number whenever the vessel is in use. When moved to a new state of principal use, the certificate is valid for 60 days. Check with your state boating authority for numbering requirements. Some states require all vessels to be numbered.



Some larger recreational vessels may be documented. The certificate of documentation MUST be on board a documented vessel at all times. A document serves as a certificate of nationality and an authorization for a specific trade. A documented vessel is not exempt from applicable state or federal taxes, nor is its operator exempt from compliance with federal or state equipment carriage requirements.

2.1.1 Display of Numbers

Numbers must be painted or permanently attached to each side of the forward half of the vessel. The validation stickers must be affixed within 6 inches (in.) of the registration number. With the exception of the vessel fee decal, no other letters or numbers may be displayed nearby.

2.1.2 Notification of Changes to a Numbered Vessel

The owner of a vessel must notify the agency that issued the Certificate of Number within 15 days if:

- The vessel is transferred, destroyed, abandoned, lost, stolen, or recovered
- The Certificate of Number is lost or destroyed, or the owner's address changes.

If the Certificate of Number becomes invalid for any reason, it must be surrendered in the manner prescribed to the issuing authority within 15 days.

A documented vessel must have the name of the vessel and hailing port plainly marked on the exterior part of the hull in clearly legible letters not less than 4 in. in height. In addition, the documented vessel must have the "Official Number" permanently affixed in block type, Arabic numerals, not less than 3 in. in height on some clearly visible interior structural part of the boat.

Table 2-1 provides a quick reference of vessel length and equipment requirements. The "Rules of the Water" are provided in Appendix B.

TABLE 2-1 QUICK REFERENCE

Vessel Length (in ft)				Equipment	Requirement
<16	16<26	26<40	40<65		
X	X	X	X	Certificate of Number (State Registration)	All undocumented vessels equipped with propulsion machinery must be State registered. Certificate of Number must be on board when vessel is in use. NOTE: Some states require all vessels to be numbered.
X	X	X	X	State Numbering	(a) Plain block letters/numbers not less than 3 in. in height must be affixed on each side of the forward half of the vessel (Contrasting color to boat exterior). (b) State validation sticker must be affixed within 6 in. of the registration number.
	X	X	X	Certificate of Documentation	Applies only to “Documented” vessels: (a) Original and current certificate must be on board. (b) Vessel name/hailing port marked on exterior part of hull – letters not less than 4 in. in height. (c) Official Number permanently affixed to interior structure – numbers not less than 3 in. in height.
X	X	X	X	Life Jackets (personal flotation devices)	(a) One Type I, II, III, or V wearable personal flotation device for each person on board (must be USCG approved).
	X	X	X		(b) In addition to Paragraph (a), must carry One Type IV (throwable) personal flotation device.
X				Visual Distress Signal	(a) One electric distress light or Three combination (day/night) red flares. NOTE: Only required to be carried on board when operating between sunset and sunrise.
	X	X	X		(b) One orange distress flag or one electric distress light; or three hand-held or floating orange smoke signals and one electric distress light; or three combination (day/night) red flares: hand -held, meteor, or parachute type.
X	X			Fire Extinguishers	(a) One B-I (when enclosed compartment).
		X			(b) One B-II or two B-I. NOTE: Fixed system equals one B-I.
			X		(c) One B-II and one B-I or three B-I. NOTE: Fixed system equals one B-I.
X	X	X	X	Ventilation	(a) All vessels built after 25 April 1940 that use gasoline as their fuel with enclosed engine and/or fuel tank compartments must have natural ventilation (at least two ducts fitted with cowls). (b) In addition to paragraph (a), a vessel built after 31 July 1980 must have rated power exhaust blower.
X	X	X	X	Backfire Flame Arrester	Required on gasoline engines installed after 25 April 1940, except outboard motors.
X	X	X	X	Sound Producing Devices	(a) Some means of making an “efficient” sound signal—audible for 0.5 mi/4-6 seconds (i.e., horn)
		X	X		(b) In addition to Paragraph (a), a vessel 39.4 feet (12 m) or greater, must carry on board a bell with clapper (bell size not less than-7.9 in.—based on the diameter of the mouth).
X	X	X	X	Navigational Lights	Required to be displayed from sunset to sunrise and in or near areas of reduced visibility.
NA	NA	NA	NA	FCC Radio License	Operator of a recreational vessel less than 65.6 ft (20 m) in length is not required to be licensed to operate VHF marine radios, emergency position indicating radio beacons, or any type of radar.

Chapter 2 – Boating Laws and Regulations

Corporate Vessel Operations Manual

April 2017

Vessel Length (in ft)				Equipment	Requirement
<16	16<26	26<40	40<65		
		X	X	Oil Pollution Placard	(a) Placard must be at least 5 × 8 in., made of durable material. (b) Placard must be posted in the machinery space or at the bilge station.
		X	X	Garbage Placard	(a) Placard must be at least 4 × 9 in., made of durable material. (b) Displayed in a conspicuous place notifying all on board the discharge restrictions.
X	X	X	X	Marine Sanitation Device	If installed toilet, vessel must have an operable Marine Sanitation Device Type I, II, or III.
		X	X	Navigational Rules (inland only)	The operator of a vessel 39.4 ft (12 m) or greater must have on board a copy of these rules.
NOTE: ft = Foot (feet). in. = Inch(es) m = Meter(s) mi = Mile(s) NA = Not applicable.					

This page intentionally left blank

3. FEDERAL MANDATED SAFETY EQUIPMENT

Federal mandated safety equipment is governed by the USCG Motor Boat Act of 1940 and retained by the Federal Boat Safety Act of 1971, which covers four classes of boats. Table 3-1 provides the minimum required equipment.

3.1 EQUIPMENT REQUIREMENTS – PERSONAL FLOTATION DEVICE

The USCG sets minimum safety standards for recreational boats and associated safety equipment. To meet these standards, some of the equipment must be USCG approved. “USCG-Approved Equipment” meets USCG specifications and regulations relating to performance, construction, or materials.

3.1.1 Personal Flotation Devices

All recreational boats must carry one wearable personal flotation device (PFD) (Type I, II, III, or V) for each person aboard. A Type V PFD provides performance of either a Type I, II, or III PFD (as marked on its label) and must be used according to the label requirements. Any boat 16 ft and longer (except canoes and kayaks) must also carry one throwable PFD (Type IV PFD).

PFDs must be USCG approved, in good and serviceable condition, and the appropriate size for the intended user.

Accessibility

- Wearable PFDs must be readily accessible.
- You must be able to put them on in a reasonable amount of time in an emergency (vessel sinking, on fire, etc.).
- They should not be stowed in plastic bags, in locked or closed compartments, or have other gear stowed on top of them.
- The best PFD is the one you will wear.
- Though not required, a PFD should be worn at all times when the vessel is underway; a wearable PFD may save your life, but only if you wear it.
- Throwable devices must be immediately available for use.

Inflatable Personal Flotation Devices

- Inflatable PFDs may be more comfortable to wear.
- The best PFD is the one you will wear.
- Inflatable PFDs require the user to pay careful attention to the condition of the device.
- Inflatable PFDs must have a full cylinder and all status indicators on the inflator must be green, or the device is NOT serviceable, and does NOT satisfy the requirement to carry PFDs.

USCG-approved inflatable PFDs are authorized only on recreational boats by a person at least 16 years of age.

Personal Flotation Device Requirements for Certain Boating Activities under State Laws

The USCG recommends, and many states require, wearing PFDs for the following activities:

- Water skiing and other towed activities (use a PFD marked for water skiing)
- While operating personal watercraft (use a PFD marked for water skiing or personal watercraft use)
- During white water boating activities
- While sailboarding (under federal law, sailboards are not “boats”).

Check with your state boating safety officials.

Federal law does not require PFDs on racing shells, rowing sculls, and racing kayaks. State laws vary. Check with your state boating safety officials.

If you are boating in an area under the jurisdiction of the U.S. Army Corps of Engineers, or a federal, state, or local park authority, other rules may apply.

Remember, PFDs will keep you from sinking, but not necessarily from drowning.

- Select a properly-sized PFD to ensure a safe and proper fit.
- Test your PFD by wearing it in shallow water or guarded swimming pool to see how it will float you.

U.S. Coast Guard Auxiliary U.S. Power Squadrons Vessel Safety Check Requirements for Personal Flotation Devices

- All boats must be equipped with a wearable PFD for each person on board.
- Boats 16 ft and over are required to have a minimum of two PFDs on board, one wearable PFD (Type I, II, III, or V) and one throwable (Type IV); in addition, a wearable PFD is required for each person on board.

Personal Flotation Device Flotation

There are three basic kinds of PFD flotation in the five types of PFDs with the following characteristics:

- **Inherently Buoyant (primarily Foam)**
 - The *most* reliable
 - Adult, youth, child, and infant sizes
 - For swimmers and non-swimmers

- Wearable and throwable styles
- Some designed for water sports

Minimum Buoyancy		
Wearable Size	Type	Inherent Buoyancy (Foam)
Adult	I	22 lb
	II and III	15.5 lb
	V	15.5-22 lb
Youth	II and III	11 lb
	V	11-15.5 lb
Child and Infant	II	7 lb
Throwable:		
Cushion	IV	20 lb
Ring Buoy		16.5 and 32 lb
NOTE: lb = Pound(s).		

• **Inflatable**

- The most compact
- Sizes only for adults
- Only recommended for swimmers
- Wearable styles only
- Some with the best in-water performance

Minimum Buoyancy		
Wearable Size	Type	Inherent Buoyancy
Adult	I and II	34 lb
	III	22.5 lb
	V	22.5-34 lb

• **Hybrid (Foam and Inflation)**

- Reliable
- Adult, youth, and child sizes
- For swimmers and non-swimmers
- Wearable styles only
- Some designed for water sports

Hybrid (Foam and Inflation)			
Wearable Size	Type	Inherent Buoyancy	Inflated Total Buoyancy
Adult	II and III	10 lb	22 lb
	V	7.5 lb	22 lb
Youth	II and III	9 lb	15 lb
	V	7.5 lb	15 lb
Child	II	7 lb	12 lb

Types of Personal Flotation Devices

A **Type I PFD, or offshore life jacket**, provides the most buoyancy. It is effective for all waters, especially open, rough, or remote waters where rescue may be delayed. It is designed to turn most unconscious wearers in the water to a face-up position.

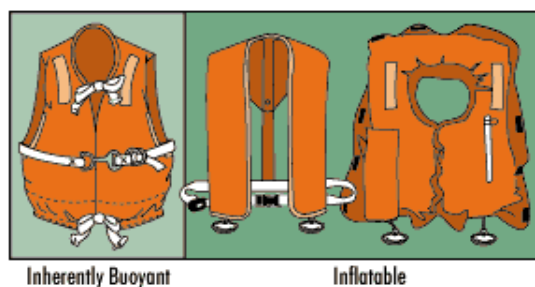
A **Type II PFD, or near-shore buoyancy vest**, is intended for calm, inland water or where there is a good chance of quick rescue. Inherent buoyant PFDs of this type will turn *some* unconscious wearers to a face-up position in the water, but the turning is not as pronounced as a Type I. This type of inflatable turns as well as a Type I foam PFD.

A **Type III PFD, or flotation aid**, is good for conscious users in calm, inland water, or where there is a good chance of quick rescue. It is designed so wearers can place themselves in a face-up position in the water. The wearer may have to tilt their head back to avoid turning face down in the water. The Type III foam vest has the same minimum buoyancy as a Type II PFD. It comes in many styles, colors, and sizes and is generally the most comfortable type for continuous wear. Float coats, fishing vests, and vests designed with features suitable for various sports activities are examples of this type PFD. This type inflatable turns as well as a Type II foam PFD.

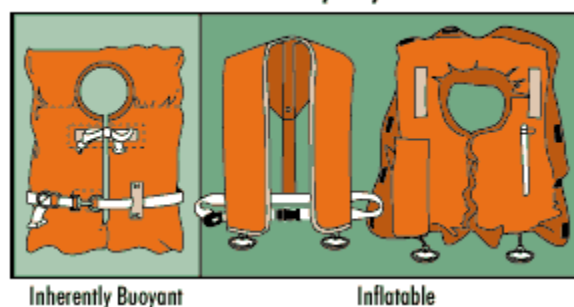
A **Type IV PFD, or throwable device**, is intended for calm, inland water with heavy boat traffic, where help is always present. It is designed to be thrown to a person in the water and grasped and held by the user until rescued—it is *not* designed to be worn. Type IV devices include buoyant cushions, ring buoys, and horseshoe buoys. There are no inflatable Type IV devices.

A **Type V PFD, or special use device**, is intended for specific activities and may be carried instead of another PFD only if used according to the approval condition(s) on its label. A Type V PFD provides performance of either a Type I, II, or III PFD (as marked on its label). If the label says the PFD is “approved only when worn,” the PFD must be worn, except for persons in enclosed spaces and used in accordance with the approval label, to meet carriage requirements. Some Type V devices provide significant hypothermia protection. Varieties include deck suits, work vests, and board sailing vests.

Off-Shore Life Jackets



Near-shore Buoyancy Vests



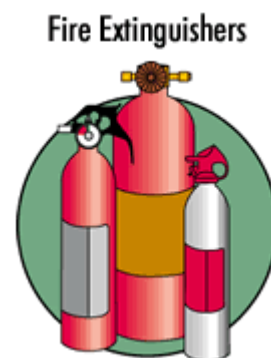
Throwable Devices



3.2 EQUIPMENT REQUIREMENTS – FIRE EXTINGUISHERS

USCG-approved fire extinguishers are required on boats where a fire hazard could be expected from the motors or the fuel system. Extinguishers are classified by a letter and number symbol. The letter indicates the type of fire the unit is designed to extinguish (Type B, for example, is designed to extinguish flammable liquids such as gasoline, oil, and grease fires). The number indicates the relative size of the extinguisher. The higher the number, the larger the extinguisher.

USCG-approved extinguishers required for boats are hand portable, either B-I or B-II classification, and have a specific marine type mounting bracket. The special bracket is required to securely hold the extinguisher in a moving boat. It is recommended the extinguishers be mounted in a readily accessible position, away from the areas where a fire could likely start such as the galley or the engine compartment.



Extinguisher markings can be confusing because extinguishers can be approved for several different types of hazards. For instance, an extinguisher marked “Type A, Size II, Type B:C, Size I” is a B-I extinguisher.

Look for the part of the label that reads “Marine Type USCG.”

- Make sure Type B is indicated.
- Portable extinguishers will be either Size I or II. Size III and larger are too big for use on most recreational boats.

Classes	Foam (gal)	Carbon Dioxide (lb)	Dry Chemical (lb)	Halon (lb)
B-I (Type B, Size I)	1.25	4	2	2.5
B-II (Type B, Size II)	2.5	15	10	10

Fire extinguishers are required on boats if any of the following conditions exist:

- Inboard engines are installed.
- There are closed compartments and compartments under seats where portable fuel tanks may be stored.
- There are double bottoms not sealed to the hull or which are not completely filled with flotation materials.
- There are closed living spaces.
- There are closed stowage compartments in which combustible or flammable materials are stored.
- There are permanently installed fuel tanks (fuel tanks secured so they cannot be moved in case of fire or other emergency are considered permanently installed). There are no gallon capacity limits to determine if a fuel tank is portable. If the weight of a fuel tank is such that persons on board cannot move it, the USCG considers it permanently installed.

3.2.1 Fire Extinguisher Maintenance

Inspect extinguishers monthly to make sure that:

- Seals and tamper indicators are not broken or missing.
- Pressure gauges or indicators read in the operable range (NOTE: Carbon dioxide extinguishers do not have gauges).

- There is no obvious physical damage, corrosion, leakage, or clogged nozzles.
- Weigh extinguishers annually to assure that the minimum weight is as stated on the extinguisher label.

Fire extinguishers that do not satisfy the above requirements or that have been partially emptied must be replaced or taken to a qualified fire extinguisher servicing company for recharge.

3.2.2 Required Number of Fire Extinguishers

The number of fire extinguishers required on a recreational boat is based on the overall length of the boat. The following chart lists the number of extinguishers that are required. In the case where a USCG-approved pre-engineered fire extinguishing system is installed for the protection of the engine compartment, the required number of units may be reduced in accordance with the chart.

Minimum number of hand portable fire extinguishers required:

Vessel Length	No Fixed System	With Approved Fixed Systems
Less than 26 ft	1 B-1	0
26 ft to less than 40 ft	2 B-1 or 1 B-II	1 B-1
40-65 ft	3 B-I or 1 B-II and 1 B-I	2 B-1 or 1 B-II

The pressure gauge alone is not an accurate indicator that Halon extinguishers are full. The weight of the units should be checked regularly. It is recommended that portable extinguishers be mounted in a readily accessible position.

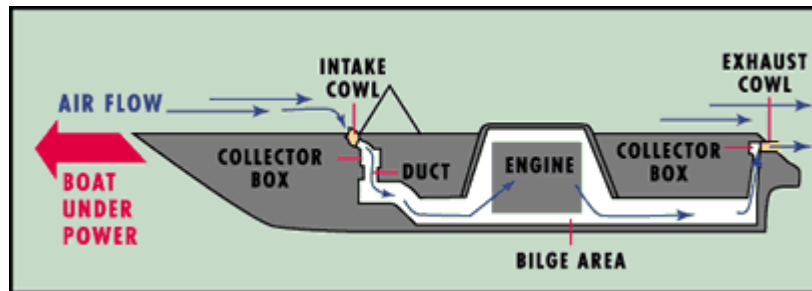
3.3 EQUIPMENT REQUIREMENTS – VENTILATION

All boats that use gasoline for electrical generation, mechanical power, or propulsion are required to be equipped with a ventilation system. A natural ventilation system is required for each compartment in a boat that:

- Contains a permanently installed gasoline engine
- Has openings between it and a compartment that requires ventilation
- Contains a permanently installed fuel tank and an electrical component that is not ignition-protected
- Contains a fuel tank that vents into that compartment (including a portable tank)
- Contains a non-metallic fuel tank.

A natural ventilation system consists of:

- A supply opening (duct/cowl) from the atmosphere (located on the exterior surface of the boat) or from a ventilated compartment or from a compartment that is open to the atmosphere
- An exhaust opening into another ventilated compartment or an exhaust duct to the atmosphere.



All blower motors installed in exhaust ducts must be in working condition of date of manufacture.

Each exhaust opening or exhaust duct must originate in the lower one-third of the compartment. Each supply opening or supply duct and each exhaust opening or duct in a compartment must be above the normal accumulation of bilge water.

A powered ventilation system is required for each compartment in a boat that has a permanently installed gasoline engine with a cranking motor for remote starting.

A powered ventilation system consists of one or more exhaust blowers. Each intake duct for an exhaust blower must be in the lower one-third of the compartment and above the normal accumulation of bilge water.

For boats built prior to 1980, there was no requirement for a powered ventilation system; however, some boats were equipped with a blower.

The USCG Ventilation Standard, a manufacturer requirement, applies to all boats built on or after 1 August 1980. Some builders began manufacturing boats in compliance with the Ventilation Standard as early as August 1978. If your boat was built on or after 1 August 1978, it might have been equipped with either: (1) a natural ventilation system, or (2) both a natural ventilation system and a powered ventilation system. If your boat bears a label containing the words “This boat complies with USCG safety standards,” etc., you can assume that the design of your boat’s ventilation system meets applicable regulations.

Manufacturers of boats built after 1980 with remote starters are required to display a label that contains the following information:

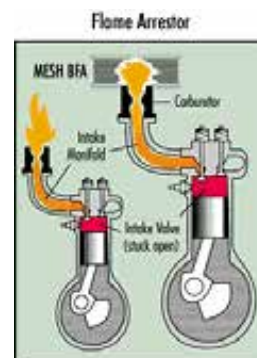
WARNING
Gasoline vapors can explode. Before starting engine, operate blower at least 4 minutes and check engine compartment bilge for gasoline vapors.

All owners of boats equipped with exhaust blowers are strongly encouraged to take the same precautions before starting a gasoline engine.

All owners are responsible for keeping their boat's ventilation systems in operating condition. This means making sure openings are free of obstructions, ducts are not blocked or torn, blowers operate properly, and worn components are replaced with equivalent marine type equipment.

3.4 EQUIPMENT REQUIREMENTS – BACKFIRE FLAME ARRESTOR

Gasoline engines installed in a vessel after 25 April 1940, except outboard motors, must be equipped with an acceptable means of backfire flame control. The device must be suitably attached to the air intake with a flame tight connection and is required to be USCG-approved or comply with SAE J-1928 or UL 1111 standards and marked accordingly.



3.5 EQUIPMENT REQUIREMENTS – SOUND-PRODUCING DEVICES

The navigation rules require sound signals to be made under certain circumstances. Meeting, crossing, and overtaking situations described in the Navigation Rules section are examples of when sound signals are required. Recreational vessels are also required to sound signals during periods of reduced visibility.



Vessels 39.4 ft/12 m or more in length are required to carry on board a whistle or horn, and a bell.

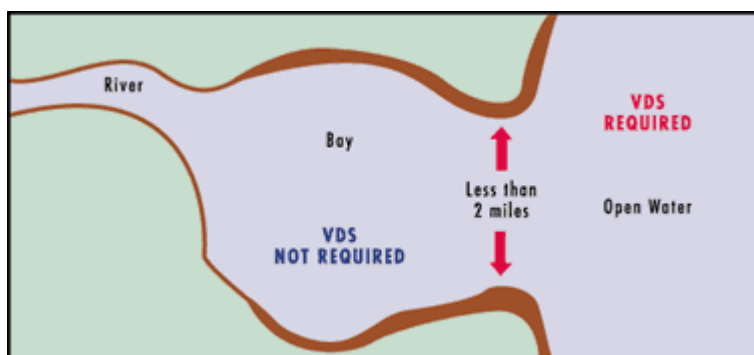
Any vessel less than 39.4 ft/12 m in length may carry a whistle or horn, or some other means to make an efficient sound signal to signal your intentions and to signal your position in periods of reduced visibility.

Therefore, any vessel less than 39.4 ft/12 m in length is required to make an efficient sound signal to signal intentions and to signal your position in periods of reduced visibility.

Vessel operators are required to carry some type of horn or whistle capable of a 4-second blast audible for 0.5 mi for all boats (athletic whistles are not acceptable on boats over 39.4 ft/12 m).

3.5.1 Visual Distress Signals

All vessels used on coastal waters, the Great Lakes, territorial seas, and those waters connected directly to them, up to a point where a body of water is less than 2 mi wide, must be equipped with USCG-approved visual distress signals. Vessels owned in the United States operating on the high seas must be equipped with USCG-approved visual distress signals.



The following vessels are not required to carry day signals but must carry night signals when operating from sunset to sunrise:

- Recreational boats less than 16 ft in length
- Boats participating in organized events such as races, regattas, or marine parades
- Open sailboats less than 26 ft in length not equipped with propulsion machinery
- Manually propelled boats.

3.5.2 Pyrotechnic Devices

Pyrotechnic visual distress signals must be USCG-approved, in serviceable condition, and readily accessible.

- They are marked with an expiration date. Expired signals may be carried as extra equipment, but cannot be counted toward meeting the visual distress signal requirement, since they may be unreliable.
- Launchers manufactured before 1 January 1981, intended for use with approved signals, are not required to be USCG-approved.
- If pyrotechnic devices are selected, a minimum of three is required; that is, three signals for day use and three signals for night. Some pyrotechnic signals meet both day and night use requirements.
- Pyrotechnic devices should be stored in a cool, dry location, if possible.
- A watertight container painted red or orange and prominently marked “DISTRESS SIGNALS” or “FLARES” is recommended.

USCG-approved pyrotechnic visual distress signals and associated devices include:

- Pyrotechnic red flares (hand-held or aerial)
- Pyrotechnic orange smoke (hand-held or floating)
- Launchers for aerial red meteors or parachute flares.

Each of these devices has a different operating (burning) time x seconds to y seconds. Check the label to see how long each pyrotechnic device will actually be illuminated. This will allow you to select a warning device better suited to the conditions where your boat will operate.

3.5.3 Non-Pyrotechnic Devices

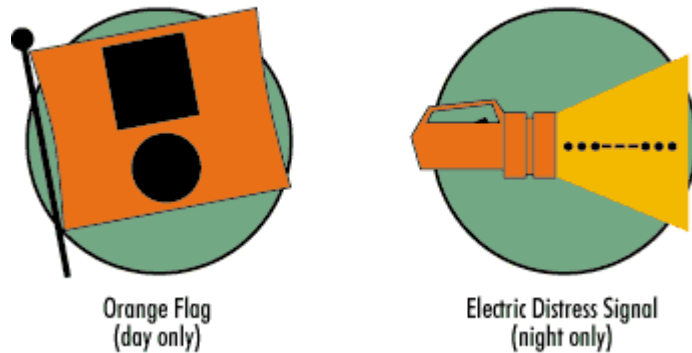
Non-pyrotechnic visual distress signals must be in serviceable condition, readily accessible, and certified by the manufacturer as complying with USCG requirements. They include the following:

Orange Distress Flag

- Day signal only
- Must be at least 3 × 3 ft with a black square and ball on an orange background

- Must be marked with an indication that it meets USCG requirements in 46 Code of Federal Regulations (CFR) 160.072
- Most distinctive when attached and waved on a paddle, boathook, or flown from a mast
- May also be incorporated as part of devices designed to attract attention in an emergency, such as balloons, kites, or floating streamers.

Non-Pyrotechnic Device Examples



Electric Distress Light

- Accepted for night use only
- Automatically flashes the international SOS distress signal (... --- ...)
- Must be marked with an indication that it meets USCG requirements in 46 CFR 161.013.

Under Inland Navigation Rules, a high intensity white light flashing at regular intervals from 50 to 70 times per minute is considered a distress signal. However, such devices do NOT count toward meeting the visual distress signal requirement.

Regulations prohibit display of visual distress signals on the water under any circumstances except when assistance is required to prevent immediate or potential danger to persons on board a vessel.

All distress signals have distinct advantages and disadvantages. No single device is ideal under all conditions or suitable for all purposes. Pyrotechnics are universally recognized as excellent distress signals. However, there is potential for injury and property damage if not properly handled. These devices produce a very hot flame and the residue can cause burns and ignite flammable materials.

Pistol launched and hand-held parachute flares and meteors have many characteristics of a firearm and must be handled with caution. In some states, they are considered a firearm and prohibited from use.

The following are just a few of the variety and combination of devices which can be carried in order to meet the requirements:

- Three hand-held red flares (day and night)
- One hand-held red flare and two parachute flares (day and night)
- One hand-held orange smoke signal, two floating orange smoke signals (day), and one electric distress light (night only).

All boaters should be able to signal for help. Boaters must have current dated USCG-approved day and night signals for all boats operating on coastal and open bodies of water.

3.6 EQUIPMENT REQUIREMENTS – POLLUTION REGULATIONS

The Refuse Act of 1899 prohibits throwing, discharging, or depositing any refuse matter of any kind (including trash, garbage, oil, and other liquid pollutants) into the waters of the United States.

The Federal Water Pollution Control Act prohibits the discharge of oil or hazardous substances that may be harmful into United States navigable waters. Vessels 26 ft in length and over must display a placard at least 5 × 8 in., made of durable material, fixed in a conspicuous place in the machinery spaces, or at the bilge pump control station, stating the following:

Discharge of Oil Prohibited

The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste upon or into any navigable waters of the United States. The prohibition includes any discharge that causes a film or discoloration of the surface of the water or causes a sludge or emulsion beneath the surface of the water. Violators are subject to substantial civil and/or criminal sanctions including fines and imprisonment.

Regulations issued under the Federal Water Pollution Control Act require all vessels with propulsion machinery to have a capacity to retain oil mixtures on board. A fixed or portable means to discharge oily waste to a reception facility is required. A bucket or bailer is suitable as a portable means of discharging oily waste on recreational vessels. No person may intentionally drain oil or oily waste from any source into the bilge of any vessel. You must immediately notify the USCG if your vessel discharges oil or hazardous substances in the water. Call toll-free 800-424-8802 (in Washington, D.C. [202] 267-3675).

Report the following information:

- Location
- Color
- Source
- Substances
- Size
- Time observed.

The Act to Prevent Pollution from Ships (MARPOL ANNEX V) places limitations on the discharge of garbage from vessels. It is illegal to dump plastic trash anywhere in the ocean or navigable waters of the United States. It is also illegal to discharge garbage in the navigable waters of the United States, including the Great Lakes. The discharge of other types of garbage is permitted outside of specific distances offshore as determined by the nature of that garbage.

Garbage Type	Discharge
Plastics- including synthetic ropes, fishing nets, and plastic bags	Prohibited in all areas
Floating dunnage, lining, and packing materials	Prohibited less than 25 mi from nearest land
Food waste, paper, rags, glass, metal, bottles, crockery, and similar refuse	Prohibited less than 12 mi from nearest land
Comminuted or ground food waste, paper, rags, glass, etc.	Prohibited less than 3 mi from nearest land

United States vessels of 26 ft or longer must display, in a prominent location, a durable placard at least 4 × 9 in. notifying the crew and passengers of the discharge restrictions.

United States oceangoing vessels of 40 ft or longer that are engaged in commerce or are equipped with a galley and berthing must have a written Waste Management Plan describing the procedures for collecting, processing, storing, and discharging garbage, and designate the person who is in charge of carrying out the plan.

3.7 EQUIPMENT REQUIREMENTS – MARINE SANITATION DEVICES

All recreational boats with installed toilet facilities must have an operable marine sanitation device (MSD) on board. Vessels 65 ft and under may use a Type I, II, or III MSD. Vessels over 65 ft must install a Type II or III MSD. All installed MSDs must be USCG certified. USCG-certified devices are so labeled, except for some holding tanks, which are certified by definition under the regulations.

When operating a vessel on a body of water where the discharge of treated or untreated sewage is prohibited, the operator must secure the device in a manner that prevents any discharge. Some acceptable methods are: padlocking overboard discharge valves in the closed position, using non-releasable wire tie to hold overboard discharge valves in the closed position, closing overboard discharge valves and removing the handle, and locking the door with padlock or keylock to the space enclosing the toilets (for Type I and Type II only.)

3.8 ADDITIONAL RECOMMENDED EQUIPMENT

Besides meeting the legal requirements, prudent boaters should carry additional safety equipment. The following additional items of equipment are suggested depending on the size, location, and use of your boat:

• Very high frequency (VHF) radio	• Chart and compass
• Boat hook	• Visual distress signals
• Spare anchor	• Spare propeller
• Heaving line	• Mooring line
• Fenders	• Food and water
• First aid kit	• Binoculars
• Flashlight	• Spare batteries
• Mirror	• Sunglasses
• Searchlight	• Marine hardware
• Sunburn lotion	• Extra clothing
• Tool kit	• Spare parts
• Ring buoy	• Alternate propulsion (paddles)
• Whistle or horn	• Dewatering device (pump or bailer)
• Fuel tanks	• Spare fuel
• Anchor	• Pumps must work or have manual bailer
• AM/FM radio	

TABLE 3-1 MINIMUM REQUIRED EQUIPMENT

Equipment	Class A (Less than 16 ft)	Class 1 (16 ft to less than 26 ft)	Class 2 (26 ft to less than 40 ft)	Class 3 (40 ft to not more than 65 ft)
PFDs	One Type I, II, III, or IV for each person.	One Type I, II, or III for each person on board or being towed on water skis, etc., plus one Type IV available to be thrown.		
Fire Extinguisher-Portable When NO fixed fire extinguishing system is installed in machinery space(s)	At least one B-1 type approved hand portable fire extinguisher (Not required on outboard motorboat less than 26 ft in length and not carrying passengers for hire if the construction of such motorboats will not permit the entrapment of explosive or flammable gases or vapors.)		At least two B-I type approved hand portable fire extinguishers; OR at least one B-II type approved hand portable fire extinguisher.	At least three B-I type approved hand portable fire extinguishers; OR at least one B-I type <i>Plus</i> one B-II type approved hand portable fire extinguisher.
Backfire Flame Arrestor	One approved device on each carburetor of all gasoline engines installed after 25 April 1940, except outboard motors.			
Ventilation	At least two ventilator ducts fitted with cowls or their equivalent for the purpose of properly and efficiently ventilating the bilges of every engine and fuel-tank compartment of boats constructed or decked over after 25 April 1940, using gasoline or other fuel having a flashpoint less than 110 degrees Fahrenheit. Boats built after 31 July 1981 must have operable power blowers.			
Whistle	Boats up to 12 m (39.4 ft) – any device capable of making an “efficient sound signal” audible 0.5 mi.	Boats up to 12 m (39.4 ft) – any device capable of making an “efficient sound signal” audible 0.5 mi.	Boats up to 12 m (39.4 ft) – any device capable of making an “efficient sound signal” audible 0.5 mi.	Boats 12-20 m (39.4-65.7 ft) – device meeting technical specifications of Inland Rules Annex III audible 0.5 mi.
Bell	Boats up to 12 m (39.4 ft) – any device capable of making an “efficient sound signal.”	Boats up to 12 m (39.4 ft) – any device capable of making an “efficient sound signal.”	Boats up to 12 m (39.4 ft) – any device capable of making an “efficient sound signal.”	Boats 12-20 m (39.4-65.7 ft) – bell meeting technical specifications of Inland Rules Annex III; mouth diameter of at least 200 m (7.9 in.).
When fixed fire extinguishing system is installed in machinery space(s).	None	None	At least one B-I type approved hand portable fire extinguisher.	At least two B-I type approved hand portable fire extinguishers; OR at least one B-II type approved hand portable fire extinguisher.
	NOTE: Dry chemical and carbon dioxide are the most widely used types, in that order. The others, while acceptable, are seldom seen on boats.			
(a) Not required by the Motorboat Act of 1940; however, the “Rules of the Water” require these vessels to sound proper signals (Appendix B).				
NOTE: Fire extinguishers manufactured after 1 January 1965 will be marked, “Marine Type, Size, Approval No. 162.028/EX.” Toxic vaporizing-liquid type fire extinguishers, such as those containing carbon tetrachloride or chlorobromomethane, are not accepted as required approved extinguishers on uninspected vessels (private pleasure craft).				

This page intentionally left blank

4. NAVIGATION RULES

Navigation rules require vessels to display lights and shapes under certain conditions.

4.1 NAVIGATION LIGHTS

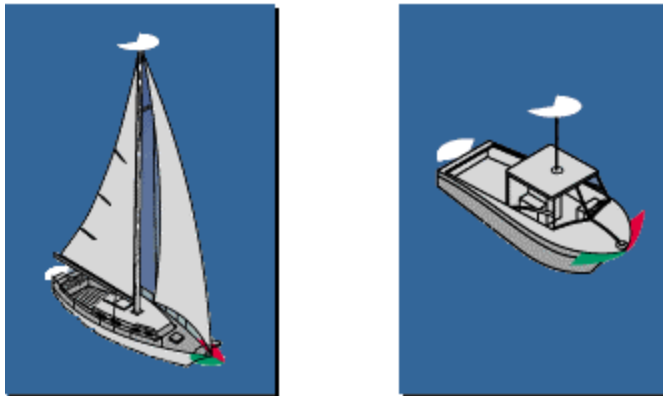
Recreational vessels are required to display navigation lights between sunset and sunrise and other periods of reduced visibility (fog, rain, hazy, etc.). The USCG Navigation Rules, International-Inland, specifies lighting requirements for every description of water craft. The information provided here is intended for power-driven and sailing vessels less than 65.5 ft/20 m in length.

4.2 POWER-DRIVEN VESSELS

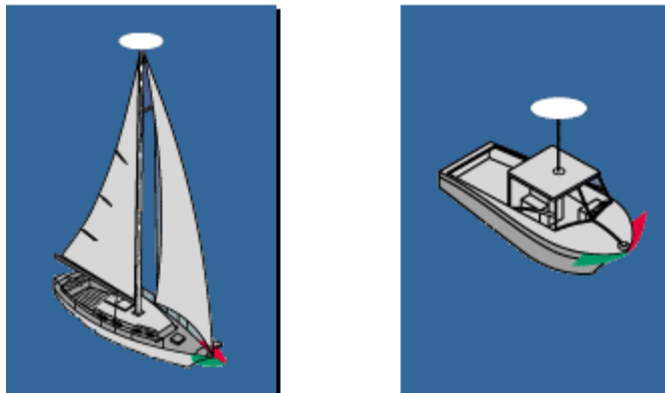
If your vessel is less than 65.5 ft/20 m in length, then it must display navigation lights per Photograph 4-1.

If your vessel is less than 39.4 ft/12 m in length, then it may display navigation lights per Photograph 4-2.

Photograph 4-1.



Photograph 4-2.



If your vessel is less than 23 ft/7 m in length and its maximum speed cannot exceed 7 knots, then it may display an all-around white light, and if practicable, sidelights instead of the lights prescribed previously (for international rules only).

For vessels less than 39.4 ft/12 m in length, the masthead or all-around white light must be at least 1 m above the sidelights.

Sidelights may be a combination light instead of two separate lights.

4.3 SAILING VESSELS

If your vessel is less than 65.6 ft/20 m in length, then it must display navigation lights shown on Photographs 4-3, 4-4, or 4-5.

Photograph 4-3.



Photograph 4-4.



Photograph 4-5.



If your vessel is less than 23 ft/7 m in length, then it should display lights for a sailboat (Photograph 4-3), if practicable. As an option, your vessel may carry a flashlight or lighted lantern that can show a white light in sufficient time to prevent collision (Photograph 4-6).

4.3.1 Vessel under Oars

If your vessel is under oars, then it should display lights for a sailboat (Photographs 4-3, 4-4, or 4-5), if practicable. As an option, your vessel may carry an electric torch (flashlight) or lighted lantern that can show a white light in sufficient time to prevent collision (Photograph 4-7).

Photograph 4-6.



Photograph 4-7.



4.3.2 Lights and Shapes

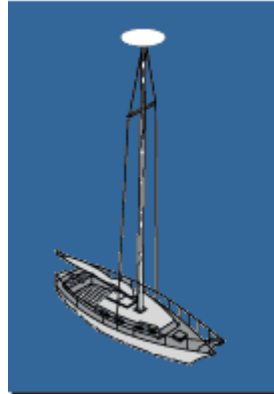
To alert other vessels of conditions that may be hazardous, there are requirements to display lights at night and shapes during the day.

4.3.3 Anchored Vessels

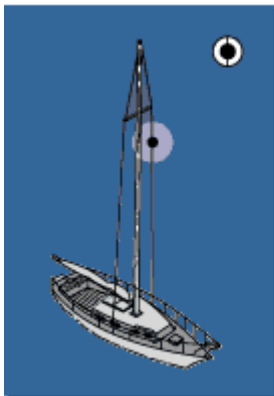
AT NIGHT: All vessels at anchor must display anchor lights. If your vessel is less than 164 ft/50 m in length, then its anchor light is an all-around white light visible where it can best be seen from all directions (Photograph 4-8).

DURING THE DAY: All vessels at anchor must display, forward where it can be best seen, a black ball shape conditions (Photograph 4-9).

Photograph 4-8.



Photograph 4-9.



EXCEPTIONS: If your vessel is less than 23 ft/7 m in length, then it is not required to display an anchor light or shape unless it is anchored in or near a narrow channel, fairway or anchorage, or where other vessels normally navigate. If your vessel is less than 65.6 ft/20 m in length, then it is not required to display an anchor light if it is anchored in Inland Waters in a special anchorage designated by the Secretary of Transportation.

4.3.4 Sailing Vessels under Power (Machinery)

During the day, vessels under sail also being propelled by machinery must exhibit forward, where best seen, a black conical shape with the apex pointing down (Photograph 4-10).

EXCEPTION: If your vessel is less than 39.4 ft/12 m in length, then it is not required to display the shape in Inland Waters.

REMINDER: If you are operating your sail vessel at night using machinery or sail and machinery, then your vessel must display lights required for a power-driven vessel (Photographs 4-1 or 4-2).

Photograph 4-10.



4.3.5 Restricted Maneuverability

The Navigation Rules require vessels restricted in their ability to maneuver to display appropriate day shapes or lights. To meet this requirement, if your vessel is engaged in diving activities during the day, then it must exhibit a rigid replica of the international code flag “Alpha” not less than 3.3 ft/1 m above deck.

If diving activities are at night, then your vessel must display the navigation lights shown on Photograph 4-11. This requirement does not affect the use of a red and white divers flag which may be required by state or local law to mark a diver's location. The "A" flag is a navigation signal indicating the vessel's restricted maneuverability and does not pertain to the diver.

All vessels 16 ft or greater must have operable navigation lights and an all around anchor light. Sailboats capable of both power and sail must be able to display navigation lights for both systems.

Tables 4-1 and 4-2 provide the required lights for various types of vessels for inland and international rules, respectively.

Photograph 4-11.

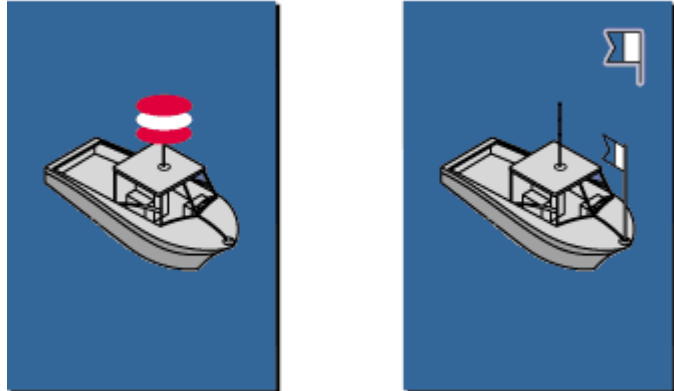


TABLE 4-1 LIGHTS FOR VARIOUS TYPES OF VESSELS – 1980 INLAND RULES

No.	Vessel	Masthead (Forward)	Side	Stern	Additional Lights or Remarks
1	Power-driven vessel 12 m but less than 20 m in length	White, 225 degrees, visibility 3 mi; at least 2.5 m above gunwale ^(a)	Separate red and green 112 ½ degrees or combination, visibility 2 mi; above hull at least 1 m below masthead light ^(b)	White 135 degrees, visibility 2 mi	---
2	Power-driven vessel less than 12 m in length	White, 225 degrees, visibility 2 mi; can be less than 2.5 m above gunwale, but at least 1 m above side lights ^{(a),(c)}	Separate red and green 112 ½ degrees or combination, visibility 1 mi; above hull at least 1 m below masthead light ^{(b),(c)}	White 135 degrees, visibility 2 mi	---
3	Sailing vessel under 20 m in length	None	Separate red and green, 112 ½ degrees or combination, visibility 2 mi ^{(b),(d)}	White 135 degrees, visibility 2 mi	Optional—two all-round lights at or near top of mast, red over green, separated at least 1 m, visibility 2 mi
4	Sailing vessel under 12 m in length	None	Separate red and green, 112 ½ degrees or combination, visibility 1 mi ^{(b),(d),(e)}	White 135 degrees, visibility 2 mi ^{(d),(e)}	---
5	Vessel propelled by oars	None	Separate red and green, 112 ½ degrees, or combination, visibility 1 mi ^(f)	May show white, 135 degrees, visibility 2 mi ^(f)	---
6	Power-driven vessel 20 m but less than 50 m in length	White, 225 degrees, visibility 5 mi; not more than ½ of length aft from stem; 6 m or beam (up to 10 m) above hull	Red and green, 112 ½ degrees, visibility 2 mi; at or near sides of vessel; above hull at least 1 m below masthead light	White, 135 degrees, visibility 2 mi	After masthead light may be shown; at least 4.5 m higher than forward masthead light
7	Power-driven vessel 50 m or more in length	White, 225 degrees, visibility 6 mi; not more than ½ of length aft from stem; 6 m or beam (up to 10 m) above hull	Red and green, 112 ½ degrees, visibility 3 mi; at or near sides of vessel; above hull at least 1 m below masthead light	White, 135 degrees, visibility 3 mi	After masthead light required; at least 4.5 m higher and ¼ of vessel length (up to 50 m) aft of forward masthead light
8	Vessel towing: tow less than 200 m overall from stern of towing vessel; (also towing alongside or pushing ahead)	Two white, arranged vertically, 225 degrees, visibility determined by length of vessel (not required pushing ahead or towing alongside on western rivers)	Normal for size of vessel	Normal for size of vessel	Towing astern: towing light ^(g) over stern light; pushing ahead or towing alongside: two towing lights ^(g) vertically
9	Vessel towing: tow 200 m or more overall length	Three white, arranged vertically, 225 degrees, visibility determined by length of vessel	Normal for size of vessel	Normal for size of vessel	Towing light: yellow, 135 degrees, above sternlight ^(g)
10	Vessel being towed astern, if manned	None	Normal for size of vessel	Normal for size of vessel	
11	Vessel being towed alongside or pushed ahead	None	Normal for size of vessel; at forward end	Normal for size of vessel (not used for pushed ahead)	Also “special flashing light” at center or forward end; a group of vessels is lighted as a single vessel

(a) After masthead light may be shown but not required (exception allowed on Great Lakes).
(b) Fitted with inboard screens if necessary to prevent being seen across bow.
(c) Less than 12 m in length, need only have all-round white light, visibility 2 mi but should have side lights.
(d) May be combined into triple combination light at masthead.
(e) Less than 7 m, need only have flashlight or lantern to show.
(f) Need only have flashlight or lantern to show white light.
(g) Visibility 3 mi for vessels 50 m or more in length; 2 mi for shorter vessels.

No.	Vessel	Masthead (Forward)	Side	Stern	Additional Lights or Remarks
12	Vessel engaged in trolling or drift fishing	(h)	(h)	(h)	---
13	Vessel engaged in trawling	None ^{(a)(b)}	When making way through the water, normal for size of vessel	When making way through the water, normal for size of vessel	Underway or at anchor, two all-round lights, green over white ^{(g),(i),(j),(k)}
14	Vessel engaged in fishing, other than trawling (or trolling)	None ^(l)	When making way through the water, normal for size of vessel	When making way through the water, normal for size of vessel	Underway or at anchor, two all-round lights, red over white ^{(g),(i),(j),(k)(l)} ; when not actually fishing, show normal masthead lights for vessel its size
15	Vessel at anchor, less than 50 m in length	None	None	None	White, all-round light where can best be seen; visibility 2 mi (not required if less than 7 m in length and not anchored in a narrow channel or where vessels normally navigate)
16	Vessel at anchor; 50 m or more in length	None	None	None	White, all-round light in fore part of vessel not less than 6 m above hull; a second white, all-round light in after part, not less than 4.5 m lower than forward anchor light; visibility 3 mi
17	Vessel aground	None	None		Anchor light(s) as line 15 or 16 plus two red all-round lights of same visibility range ^{(g),(i),(j)} (not required if less than 12 m in length)
18	Pilot vessel	None if on pilot duty; normal if underway and not on pilot duty	When underway, normal for size of vessel	When underway, normal for size of vessel	Two all-round lights, white over red, at masthead ^{(g),(i),(j)} ; if at anchor, normal anchor light(s); line 15 or 16
19	Vessel not under command	None	If making way through the water, normal for size of vessel	If making way through the water, normal for size of vessel	Two red all-round lights vertically where best can be seen ^{(g),(i),(j)}
20	Vessel restricted in ability to maneuver	None	When making way through the water, normal for size of vessel	When making way through the water, normal for size of vessel	Three all-round lights vertically, red-white-red ^{(g),(i)} ; if at anchor, normal anchor light(s) (not required if less than 12 m in length)
<p>(h) Show only normal lights of power-driven or sailing vessel. (i) Vertical spacing 1 m. (j) Lower light not less than 4 m (2 m if under 20 m in length) above hull. (k) Lower light above sidelights at least twice vertical spacing. (l) When not actually fishing, show normal masthead lights for vessel its size.</p>					

TABLE 4-2 LIGHTS FOR VARIOUS TYPES OF VESSELS –1972 INTERNATIONAL RULES

No.	Vessel	Masthead (Forward)	Side	Stern	Additional Lights or Remarks
A	Power-driven vessel 12 m but less than 20 m in length	White, 225 degrees, visibility 3 mi. At least 2.5 m above gunwale ^(a)	Separate red and green, 112 ½ degrees, or combination, visibility 2 m; above hull at least 1 m below masthead light ^(b)	White, 135 degrees, visibility 2 mi	---
B	Power-driven vessel less than 12 m in length	White, 225 degrees, visibility 2 mi. Can be less than 2.5 m above gunwale, but at least 1 m above side lights ^(c)	Separate red and green, 112 ½ degrees, or combination, visibility 1 mi; above hull at least 1 m below masthead light ^(b)	White, 135 degrees, visibility 2 mi	---
C	Sailing vessel under 20 m in length	None	Separate red and green, 112 ½ degrees, or combination, visibility 2 mi	White, 135 degrees, visibility 2 mi	Optional – two all-round lights at or near top of mast, red over green, separated at least 1 m, visibility 2 mi.
D	Sailing vessel under 12 m in length	None	Separate red and green, 112 ½ degrees, or combination, visibility 1 mi ^{(b)(d)}	White, 135 degrees, visibility 2 mi ^{(d)(e)}	---
E	Vessel propelled by oars	None	May show separate red and green, 112 ½ degrees, or combination, visibility 1 mi ^(f)	May show white, 135 degrees, visibility 2 mi ^(f)	---
F	Power-driven vessel 20 m but less than 50 m in length	White, 225 degrees, visibility 5 mi. Not more than ¼ of length aft from stem; 6 m or beam (up to 12 m) above hull.	Red and green, 112 ½°, visibility 2 mi. At or near sides of vessel; not more than ¾ height of masthead light	White, 135 degrees, visibility 2 mi	After masthead light may be shown; at least 4.5 m higher than forward masthead light
G	Power-driven vessel 50 m or more in length	White, 225 degrees, visibility 6 mi. Not more than ¼ of length aft from stem; 6 m or beam (up to 12 m) above hull.	Red and green, 112 ½ degrees, visibility 3 mi. At or near sides of vessel; not more than ¾ height of forward masthead light	White, 135 degrees, visibility 3 mi	After masthead light required; at least 4.5 m higher and half of vessel length (up to 100 m) aft of forward masthead light
H	Vessel towing; tow from stern of towing less than 200 m overall vessel. (also towing alongside or pushing ahead)	Two white, arranged vertically, 225 degrees, visibility determined by length of vessel.	Normal for size of vessel	Normal for size of vessel	Towing light ^(g) over sternlight (not shown when towing alongside or pushing ahead)
I	Vessel towing; tow 200 m or more overall length	Three white, arranged vertically, 225 degrees, visibility determined by length of vessel	Normal for size of vessel	Normal for size of vessel	Towing light ^(g) over stern light

(a) After masthead light may be shown but not required.

(b) Fitted with inboard screens if necessary to prevent being seen across bow.

(c) Less than 7 m and less than 7 knots maximum speed need only have all-round white light, visibility 2 mi but should have sidelights.

(d) May be combined into triple combination light at masthead.

(e) Less than 7 m need only have flashlight or lantern to show.

(f) Need only have flashlight or lantern to show white light.

(g) Visibility 3 mi for vessels 50 m or more in length; 2 mi for shorter vessels.

No.	Vessel	Masthead (Forward)	Side	Stern	Additional Lights or Remarks
J	Vessel being towed astern, if manned	None	Normal for size of vessel	Normal for size of vessel	
K	Vessel being towed alongside or pushed ahead	None	Normal for size of vessel; at forward end	Normal for size of vessel (not used for pushed ahead)	A group of vessels is lighted as a single vessel
L	Vessel engaged in trolling or drift fishing	^(h)	^(h)	^(h)	---
M	Vessel engaged in trawling	None ⁽ⁱ⁾	When making way through the water, normal for size of vessel	When making way through the water, normal for size of vessel	Underway or at anchor, two all-round lights, green over white ^{(g)(j)(k)(l)}
N	Vessel engaged in fishing, other than trawling (or trolling)	None ⁽ⁱ⁾	When making way through the water, normal for size of vessel	When making way through the water, normal for size of vessel	Underway or at anchor, two all-round lights, red over white ^{(g)(j)(k)(l)}
O	Vessel at anchor, less than 50 m in length	None	None	None	White, all-round light where can best be seen; visibility 2 mi (not required if less than 7 m in length and not anchored in a narrow channel or where vessels normally navigate)
P	Vessel at anchor; 50 m or more in length	None	None	None	White, all-round light in fore part of vessel not less than 6 m above hull; a second white all-round light in after part, not less than 4.5 m lower than forward anchor light; visibility 3 mi.
Q	Vessel aground	None	None		Normal anchor light(s) plus two red all-round lights of same visibility range
R	Pilot vessel	None if on pilot duty; normal if underway and not on pilot duty	When underway, normal for size of vessel	When underway, normal for size of vessel	Two all-round lights, white over red, at masthead ^{(g)(j)(k)} ; if at anchor, normal anchor light(s)
S	Vessel not under command	None	If making way through the water, normal for size of vessel	If making way through the water, normal for size of vessel	Two red all-round lights vertically where best can be seen ^{(g)(j)(k)}
T	Vessel constrained by her draft	Normal for size of vessel	Normal for size of vessel	Normal for size of vessel	Three red all-round lights, arranged vertically and equally spaced. ^{(g)(j)(k)}

- (h) Show only normal lights of power-driven or sailing vessel.
 (i) When not actually fishing, show normal masthead lights for vessel its size.
 (j) Vertical spacing 2 m for vessels 20 m or more in length, 1 m for shorter vessels.
 (k) Lower light not less than 4 m (2 m if under 20 m in length) above hull.
 (l) Lower light above sidelights at least twice vertical spacing.

5. INLAND “RULES OF THE WATER”

5.1 MEETING SITUATIONS

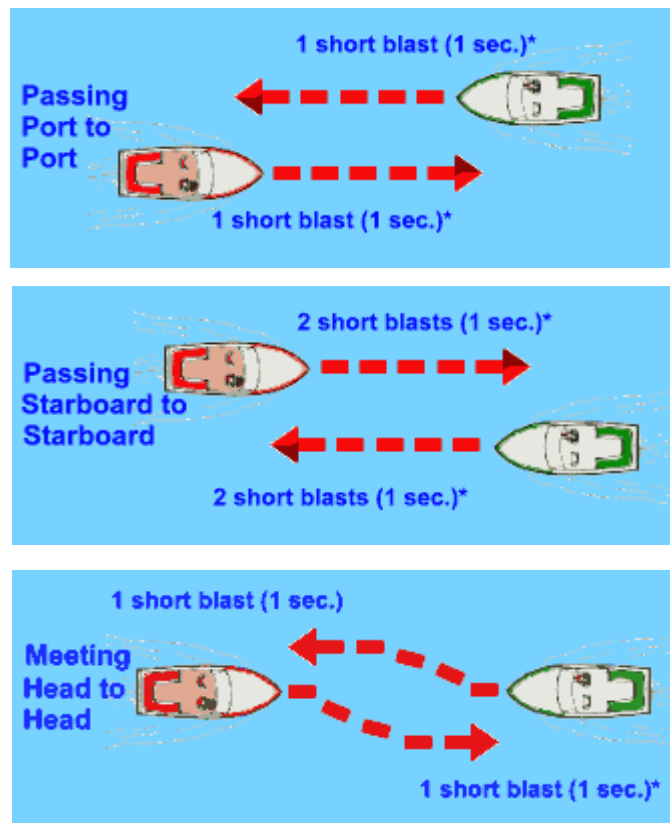
In the following situations, the give-way vessel must take action to keep well clear. The stand-on vessel should maintain its course and speed. If it becomes apparent that the actions taken (or not taken) by the give-way vessel are dangerous or insufficient, you should take action to avoid collision.

5.1.1 Meeting Head-On

When two power-driven vessels are approaching head-on or nearly so, either vessel will indicate its intent, which the other vessel will answer promptly. In a meeting situation, neither vessel is the stand-on vessel.

It is generally accepted that you should alter course to starboard and pass port-to-port. The accompanying sound signal is one short blast. If you cannot pass port-to-port due to an obstruction or other vessels, you should sound two short blasts to indicate your intention to pass starboard-to-starboard. Make sure the other vessel understands your intent before proceeding. The other vessel should return your two-short-blast signal.

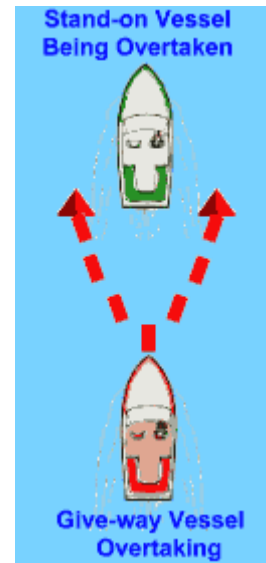
- Not sounded on International Waters



5.1.2 Overtaking

When two vessels are moving in the same direction, and the astern vessel wishes to pass, it must initiate the signal to pass as shown in the diagram. The vessel passing is the give-way vessel and should keep out of the way of the vessel being passed. The vessel being passed is the stand-on vessel and must maintain its course and speed. If the stand-on vessel realizes that the course intended by the give-way vessel is not safe, it should sound the danger or doubt signal.

If you are the overtaking vessel, remember that you are the give-way vessel until well past, and safely clear of, the passed vessel. Do not cut in front, impede, or endanger another vessel.

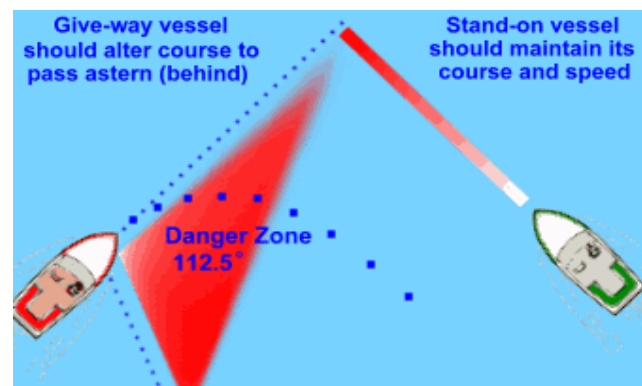
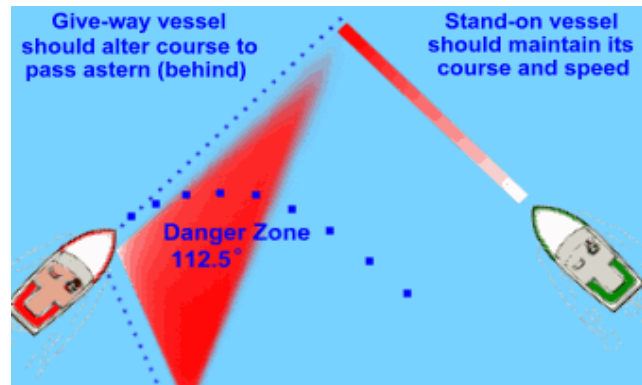


<p>Inland Rules:</p> <p>“I intend to pass you on your port side” <i>2 short blasts (1 second)</i></p> <p>“Agreement” <i>2 short blasts (1 second)</i></p>	<p>Inland Rules:</p> <p>“I intend to pass you on your starboard side” <i>1 short blast (1 second)</i></p> <p>“Agreement” <i>1 short blast (1 second)</i></p>
<p>International Rules:</p> <p>“I intend to pass you on your port side” <i>2 prolonged blasts/2 short</i></p> <p>“Agreement” <i>1 prolonged/1 short/1 prolonged/1 short</i></p>	<p>International Rules:</p> <p>“I intend to pass you on your starboard side” <i>2 prolonged blasts/1 short</i></p> <p>“Agreement” <i>1 prolonged/1 short/1 prolonged/1 short</i></p>

5.1.3 Crossing

When two power-driven vessels are approaching at right angles or nearly so, and risk of collision exists, the vessel on the right is the stand-on vessel and must hold its course and speed. The other vessel, the give-way vessel, will maneuver to keep clear of the stand-on vessel and will pass it by its stern. If necessary, slow or stop or reverse until the stand-on vessel is clear.

In the example above, the red vessel is the give-way vessel and should alter course and speed to pass behind the green vessel. If the skipper of the green vessel does not observe the red vessel taking action to avoid collision, then he/she must take the required action to avoid a collision.



5.1.4 Sailing Craft and Vessels Propelled by Oars or Paddles

Sailing craft and boats propelled by oars or paddles have the right-of-way over power-driven vessels. An exception to this is if the sailing craft or self-propelled vessel is passing a power-driven vessel. In an overtaking situation, the overtaking vessel is the give-way vessel, even if it is not propelled by an engine.

5.1.5 Navigating Narrow Channels

The rules tell you to stay to the starboard side of narrow channels. Make sure that you do not impede a vessel that is constrained by draft (i.e., a large vessel that must operate within the channel in order to make way safely). When crossing a channel, do so at a right angle and in such a way as to avoid causing the traffic in the channel to make course or speed changes. Do not anchor in a channel unless you cannot make way (broken down, etc.).

When operating on the Great Lakes, Western rivers, and other designated rivers, the down bound vessel (going with the current) has the right of way over a vessel going upstream. This is because a vessel going upstream can maneuver better than a vessel going downstream.

If you approach a bend in a river around which you cannot see, sound one prolonged blast to alert vessels approaching from the other side of the bend that you are there. If another vessel is around the bend, it should answer with one prolonged blast. Conversely, if you hear a prolonged blast as you approach the bend, answer with a prolonged blast.

5.1.6 Commercial Vessel Situations

If at all possible, stay out of areas where there is commercial vessel traffic such as shipping lanes or traffic separation zones. Large ships and barges have special problems in maneuvering and **cannot and will not** get out of your way.

If you must operate around commercial vessels, take heed of the following:

- Avoid ship channels; if you must cross, do so at right angles and as quickly as possible.
- Be alert; watch for traffic.
- Be seen, especially at night.
- Know the sound signals, especially the danger or doubt signal.
- Keep your VHF radio tuned to Channel 16 and listen carefully.
- Order all aboard to wear PFDs.
- Be familiar with the area and have current navigation charts.
- Do not be a non-survivor of a collision with a large ship.



This page intentionally left blank

6. SEAMANSHIP

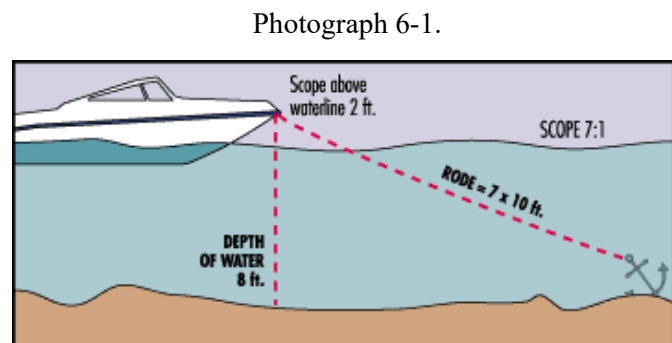
Seamanship is defined as “the knowledge of and skill in all things pertaining to the operation, navigation, and maintenance of a ship.” This knowledge may include; handling and working with rope, wire, and various boat hardware. Basic engine and boat electrical layout maintenance and troubleshooting. Piloting including boat handling, engine operation, proper use of charts, and use of navigation equipment (i.e., depth finders, compass, Global Positioning System [GPS] or loran units, speedometer). A fundamental knowledge of weather (wind, fronts, and cloud types) and the water environment (wave action, tides, and currents). Proper emergency preparation training, basic first aid knowledge, and survival techniques are an integral part of seamanship.

Seamanship skills are developed through training courses, such as the USCG Auxiliary Training course, through training manuals, regulatory handbooks, instructional guides and videos, and most importantly through actual hands on experience and working with people who have developed the skills.

6.1 ANCHORING

Anchoring is done for two principal reasons: first, to stop for fishing, lunch, or an overnight stay and second, to keep you from running aground in bad weather or as a result of engine failure. Anchoring can be a simple task if you follow these guidelines:

- Make sure you have the proper type of anchor (danforth/plow/mushroom).
- A 3- to 6-ft length of galvanized chain should be attached to the anchor. The chain will stand up to the abrasion of sand, rock, or mud on the bottom much better than a fiber line.
- A suitable length of nylon anchor line should be attached to the end of the chain (this combination is called the “Rode”). The nylon will stretch under heavy strain cushioning the impact of the waves or wind on the boat and the anchor.
- Select an area that offers maximum shelter from wind, current, and boat traffic.
- Determine depth of water and type of bottom (preferably sand or mud).
- Calculate the amount of anchor line you will need. General rule: 5-7 times as much anchor line as the depth of water plus the distance from the water to where the anchor will attach to the bow. For example, if the water depth is 8 ft and it is 2 ft from the top of water to your bow cleat, you would multiply 10 ft by 5-7 to get the amount of anchor line to put out (Photograph 6-1).



- Secure the anchor line to the bow cleat at the point you want it to stop.
- Bring the bow of the vessel into the wind or current.

- When you get to the spot you want to anchor, place the engine in neutral.
- When the boat comes to a stop, slowly lower the anchor. Do not throw the anchor over, as it will tend to entangle the anchor.
- When all anchor line has been let out, back down on the anchor with engine in idle reverse to help set the anchor.
- When anchor is firmly set, use reference points (landmarks) in relation to the boat to make sure you are not drifting. Check these points frequently.
- Maximum anchoring is achieved at an angle of less than 8 degrees.

The following table provides anchor weights:

Boat Length (Maximum)	Lunch Hook	Working Anchor	Storm Anchor
20 ft	4 (10)	5 (20)	12 (40)
30 ft	5 (15)	12 (30)	18 (60)
40 ft	12 (20)	18 (40)	28 (80)

NOTES: lb = Pound(s).
 Bold indicates figures based on modern lightweight burial-type anchors of efficient design. Figures in parentheses show how weights would be increased, using a formula of 0.5 lb, 1 lb, and 2 lb per foot for certain kedges.

Table 6-1 provides suggested rode and anchor sizes.

6.2 WEATHER

You should never leave the dock without first checking the local weather forecast. You can get the weather information from the TV, radio, local, newspaper, on-line, or from one of the weather channels on your VHF radio.

At certain times of the year weather can change rapidly and you should continually keep a “weather eye” out. While you are out in a boat, here are a few signs you can look for that indicate an approaching weather change:

- Weather changes generally come from the west. Scan the sky with your weather eye, especially to the west.
- Watch for cloud to build up, especially rapid vertically rising clouds.
- Sudden drop in temperature.
- Sudden change in wind direction and/or speed.
- If you have a barometer on your boat, check it every 2-3 hours. A rising barometer indicates fair weather and rise in wind velocity; a falling barometer indicates stormy or rainy weather.

TABLE 6-1 SUGGESTED RODE AND ANCHOR SIZES^(a)

Length Overall	Beam		Rode		Anchor		
	Sail	Power	Nylon	Chain	Northill	Standard	Hi-Tensile
FOR STORM ANCHOR (WINDS UP TO 60 KNOTS)							
10 ft	5 ft	5 ft	100 ft-1/4 in.	3 ft-3/16 in.	12 lb (6-R)	8-S	5-H
15 ft	7 ft	7 ft	125 ft-1/4 in.	3 ft-3/16 in.	12 lb (6-R)	8-S	5-H
20 ft	8 ft	9 ft	150 ft-3/8 in.	4 ft-1/4 in.	27 lb (12-R)	13-S	12-H
25 ft	9 ft	10 ft	200 ft-3/8 in.	4 ft-1/4 in.	27 lb (12-R)	22-S	12-H
30 ft	10 ft	11 ft	250 ft-7/16 in.	5 ft-5/16 in.	46 lb (20-R)	22-S	20-H
35 ft	12 ft	13 ft	300 ft-1/2 in.	6 ft-3/8 in.	46 lb (20-R)	40-S	35-H
40 ft	13 ft	14 ft	400 ft-5/8 in.	8 ft-7/16 in.	80 lb (30-R)	65-S	60-H
50 ft	14 ft	16 ft	500 ft-5/8 in.	8 ft-7/16 in.	105 lb (50-R)	130-S	60-H
60 ft	16 ft	19 ft	500 ft-3/4 in.	8 ft-1/2 in.	105 lb (50-R)	180-S	90-H
FOR WORKING ANCHOR (WINDS UP TO 30 KNOTS)							
10 ft	5 ft	5 ft	80 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	4-S	5-H
15 ft	7 ft	7 ft	100 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	8-S	5-H
20 ft	8 ft	9 ft	120 ft-1/4 in.	3 ft-3/16 in.	12 lb (6-R)	8-S	5-H
25 ft	9 ft	10 ft	150 ft-3/8 in.	3 ft-3/16 in.	12 lb (6-R)	8-S	5-H
30 ft	10 ft	11 ft	180 ft-3/8 in.	4 ft-1/4 in.	27 lb (12-R)	13-S	12-H
35 ft	12 ft	13 ft	200 ft-3/8 in.	4 ft-1/4 in.	27 lb (12-R)	22-S	12-H
40 ft	13 ft	14 ft	250 ft-7/16 in.	5 ft-5/16 in.	46 lb (20-R)	22-S	20-H
50 ft	14 ft	16 ft	300 ft-1/2 in.	6 ft-3/8 in.	46 lb (20-R)	40-S	35-H
60 ft	16 ft	19 ft	300 ft-1/2 in.	6 ft-3/8 in.	80 lb (30-R)	65-S	35-H
FOR LUNCH HOOK							
10 ft	5 ft	5 ft	70 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	2 ½ -S	5-H
15 ft	7 ft	7 ft	80 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	2 ½ -S	5-H
20 ft	8 ft	9 ft	90 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	2 ½ -S	5-H
25 ft	9 ft	10 ft	100 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	4-S	5-H
30 ft	10 ft	11 ft	125 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	4-S	5-H
35 ft	12 ft	13 ft	150 ft-1/4 in.	3 ft-3/16 in.	12 lb (6-R)	4-S	5-H
40 ft	13 ft	14 ft	175 ft-3/8 in.	4 ft-1/4 in.	12 lb (6-R)	8-S	5-H
50 ft	14 ft	16 ft	200 ft-3/8 in.	4 ft-1/4 in.	12 lb (6-R)	8-S	12-H
60 ft	16 ft	19 ft	200 ft-3/8 in.	4 ft-1/4 in.	27 lb (12-R)	13-S	12-H
<p>(a) Suggested sizes assume fair holding ground, scope of at least 7-to-1 and moderate shelter from heavy seas.</p> <p>NOTES: Plow Anchors—Woolsey, manufacturer of the Plowright anchor, makes the following recommendations for winds up to 30 knots: for <i>working anchors</i>, 10-21 ft, 6 lb; 22-32 ft, 12 lb; 32-36 ft, 18 lb; 36-39 ft, 22 lb; and 39-44 ft, 35 lb. For <i>lunch hooks</i>, they advise stepping down one size. For <i>storm anchors</i>, up one size.</p> <p>Kedges—Holding powers vary widely with the type. Best to consult manufacturer for individual recommendations.</p>							

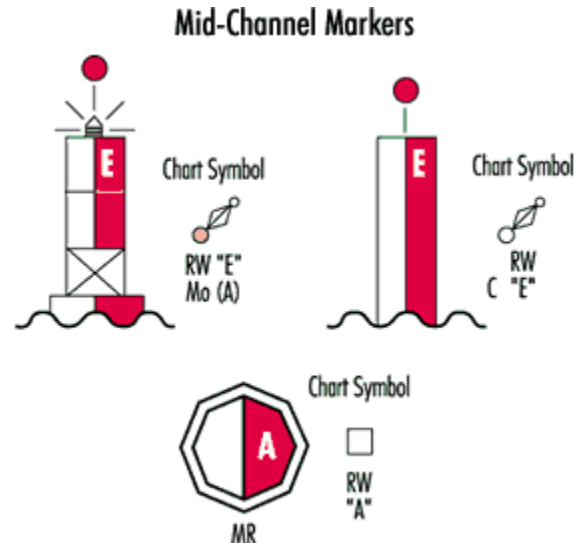
This page intentionally left blank

7. AIDS TO NAVIGATION

Aids to navigation are placed along coasts and navigable waters as guides to mark safe water and to assist mariners in determining their position in relation to land and hidden dangers. Each aid to navigation is used to provide specific information.

Several aids to navigation are usually used together to form a local aid to navigation system that helps the mariner follow natural and improved channels. Such aids to navigation also provide a continuous system of charted marks for coastal piloting. Individual aids to navigation are used to mark landfall from seaward, and to mark isolated dangers.

Lateral markers are buoys or beacons that indicate the port and starboard sides of a route to be followed. Virtually all U.S. lateral marks follow the traditional 3R rule of “red, right, returning.” This means, when returning from sea, keep red marks on the right-hand (starboard) side of the vessel.



Mariners must NOT rely on buoys alone for determining their position. Storms and wave action can cause buoys to move.

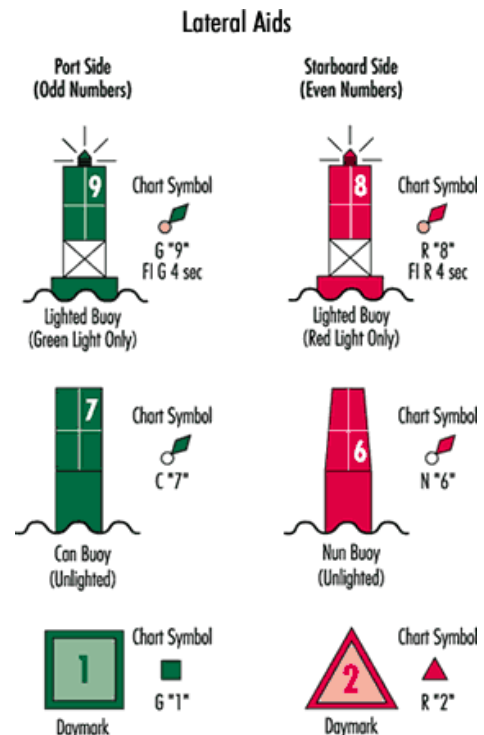
7.1 LATERAL AIDS

Lateral aids marking the sides of channels as seen when entering from seaward.

Do not tie up to Aids to Navigation; it is dangerous and illegal.

7.2 NAUTICAL CHARTS

One of the most important tools used for safely navigating waterways are Nautical Charts. Nautical Charts show the nature and shape of the coast, depths of water, general configuration and character of the bottom, prominent landmarks, port facilities, aids to navigation, marine hazards, and other pertinent information. Changes brought about by people and nature require that nautical charts be constantly maintained and updated to aid safe navigation.

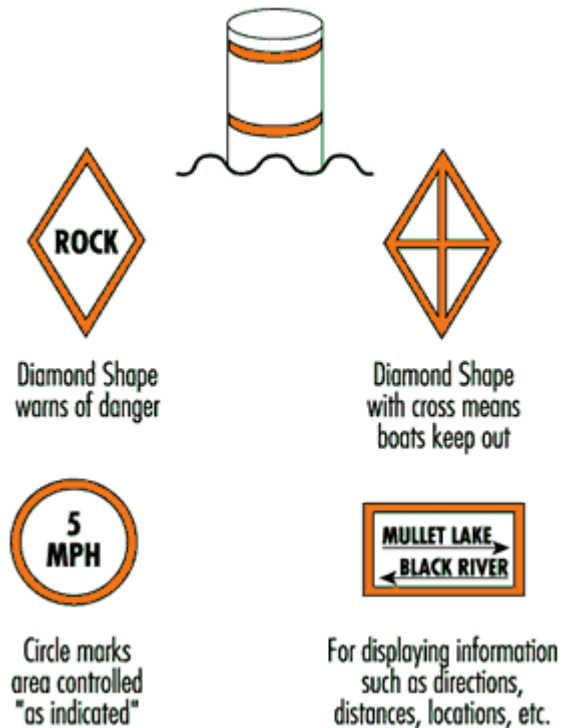


To meet the needs of the boaters, the National Ocean Service (NOS) produces a variety of nautical charts and chart products. The date of a nautical chart is critical to the boater. Only up-to-date charts should be used for navigation. Nautical charts vary in scale and format. For coastal navigation, for instance, boaters should use the largest chart scale available. Chart updating information can be obtained from “Local Notice to Mariners” published by the USCG.

NOS nautical charts may be purchased either directly by mail from the NOS Distribution Branch or through an authorized agent. There are more than 1,700 nautical chart agents that sell NOS charts.

Other charts available consist of tide and current charts for various localities and a local notice to mariners. These local charts should be used with NOS Charts.

Information and Regulatory Markers



8. ELECTRONICS

8.1 EQUIPMENT REQUIREMENTS – RADIO REGULATIONS

8.1.1 Carrying a Radio

Most recreational vessels under 65.6 ft/20 m in length do not have to carry a marine radio. Any vessel that carries a marine radio must follow the rules of the Federal Communications Commission (FCC).

8.1.2 Radio Licenses

The FCC does not require operators of recreational vessels to carry a radio or to have an individual license to operate VHF marine radios (with or without digital selective calling capability), Emergency Position Indicating Radio Beacons (EPIRBs), or any type of radar. Operators must, however, follow the procedures and courtesies that are required of licensed operators specified in FCC Rules. You may use the name or registration number of your vessel to identify your ship station.

Users of a VHF marine radio equipped with digital selective calling will need to obtain a maritime mobile service identity number from the FCC. It is unlawful to use digital selective calling without obtaining this identity.

The following vessels are still required to be licensed:

- Vessels that use medium frequency/high frequency single side-band radio, satellite communications, or telegraphy
- Power driven vessels over 65.6 ft/20 m in length
- Vessels used for commercial purposes including:
 - Vessels documented for commercial use, including commercial fishing vessels
 - USCG-inspected vessels carrying more than 6 passengers
 - Towboats more than 7.8 m in length
 - Vessels of more than 100 tons certified to carry at least 1 passenger
 - Cargo ships over 300 tons
- Any vessel, including a recreational vessel, on an international voyage.

8.1.3 Radio Listening Watch

Vessels not required to carry a marine radio (e.g., recreational vessels less than 20-m length), but which voluntarily carry a radio, must maintain a watch on Channel 16 (156.800 megahertz [MHz]) whenever the radio is operating and not being used to communicate. Such vessels may alternatively maintain a watch on VHF Channel 9 (156.450 MHz), the boater calling channel.

U.S. vessels required to carry a VHF marine radio, such as commercial fishing vessels, must maintain a watch on Channel 16 (156.800 MHz) while underway whenever the radio is not being used for exchanging communications.

False Distress Alerts

It is unlawful to intentionally transmit a false distress alert, or to unintentionally transmit a false distress alert without taking steps to cancel that alert.

Very High Frequency Marine Radio Channels

The chart below contains a partial listing of channels recreational boaters should be familiar with:

Channel	Type of Message and Use
06	Intership Safety —Used for ship-to-ship safety messages and search messages and ships and aircraft of the USCG.
09	Boater Calling —FCC has established this channel as a supplementary calling channel for non-commercial vessels (recreational boaters). The purpose is to relieve congestion on VHF Channel 16. The USCG announces urgent marine information broadcasts and storm warnings on Channel 9 in the First USCG District (waters off the coast of northern New Jersey, New York, and New England) and USCG Group Grand Haven, Milwaukee and Sault Ste. Maria (Lake Michigan). For that reason, EA strongly urges boaters to use Channel 9 in these waters. Use of Channel 9 in other waters is optional, and EA recommends boaters keep turned to and use Channel 16 in those waters unless otherwise notified by the USCG.
13,67	Navigation Safety (also known as Bridge-to-Bridge channel) —Ships greater than 20 m in length maintain a listening watch on this channel in United States waters. This channel is available to all ships. Messages must be about ship navigation (i.e., passing or meeting other ships). You must keep your messages short. Your power output must not be more than 1 watt. This is also the main working channel at most locks and drawbridges. Channel 67 is for lower Mississippi River only.
16	International Distress, Safety and Calling —Use this channel to get the attention of another station (calling) or in emergencies. Ships required to carry a radio maintain a listening watch on this channel. USCG and most coast stations also maintain a listening watch on this channel.
21A, 23A, 83A	USCG only.
22A	USCG Liaison and Maritime Safety Information Broadcasts —Announcements of urgent marine information broadcasts and storm warnings (Broadcasts announced on Channel 16).
24,25,26, 27,28,84, 85,86,87	Public Correspondence (Marine Operator) —Use these channels to call the marine operator at a public station. By contacting a public coast station, you can make and receive calls from telephones on shore. Except for distress calls, public coast stations usually charge for this service.
70	Digital Selective Calling —Use this channel for distress and safety calling and for general purpose calling using only digital selective calling techniques. Voice communications not allowed. NOTE: The USCG will not be equipped to respond to digital selective calling distress calls on Channel 70 until 2006 – use Channel 16.

Distress Calls

The radiotelephone distress call consists of:

- Distress signal MAYDAY spoken three times
- Words THIS IS
- Call sign (or vessel registration number or name if no call sign is assigned) of the mobile station in distress, spoken three times.

Other electronic gear available is GPS, fathometer, and radar. The user should refer to individual operator manuals for proper orientation in the use of the gear.

9. TOWING AND LAUNCHING

9.1 TRAILERING YOUR BOAT

Choose the proper trailer for your boat. More damage can be done to a boat by the stress of road travel than by normal water operation. A boat hull is designed to be supported evenly by water. When transported on a trailer, your boat should be supported structurally as evenly across the hull as possible. This will allow for even distribution of the weight of the hull, engine and equipment. It should be long enough to support the whole length of the hull but short enough to allow the lower unit of the boat's engine to extend freely.

- Rollers and bolsters must be kept in good condition to prevent scratching and gouging of the hull.
- Tie-downs and lower unit supports must be adjusted properly to prevent the boat from bouncing on the trailer. The bow eye on the boat should be secured with either rope, chain or turnbuckle in addition to the winch cable. Additional straps may be required across the beam of the boat.
- The capacity of the trailer should be greater than the combined weight of the boat, motor, and equipment.
- The tow vehicle must be capable to handling the weight of the trailer, boat, equipment, as well as weight of the passengers and equipment which will be carried inside. This may require that the tow vehicle may need to be specially equipped with an:
 - Engine of adequate power
 - Transmission designed for towing
 - Larger cooling systems for the engine and transmission
 - Heavy duty brakes
 - Load bearing hitch attached to the frame, not the bumper.

Check your vehicle owner's manual for specific information.

9.1.1 Check Before You Go Out on the Highway

- The tow ball and coupler are the same size and bolts with washers are tightly secured. (The vibration of road travel can loosen them.)
- The coupler is completely over the ball and the latching mechanism is locked down.
- The trailer is loaded evenly from front to rear as well as side to side. Too much weight on the hitch will cause the rear wheels of the tow vehicle to drag and may make steering more difficult. Too much weight on the rear of the trailer will cause the trailer to "fishtail" and may reduce traction or even lift the rear wheels of the tow vehicle off the ground. The safety chains are attached crisscrossing under the coupler to the frame of the tow vehicle. If the ball were to break, the trailer would follow in a straight line and prevent the coupler from dragging on the road.
- The lights on the trailer function properly.

- Check the brakes. On a level parking area, roll forward and apply the brakes several times at increasing speeds to determine a safe stopping distance.
- The side view mirrors are large enough to provide an unobstructed rear view on both sides of the vehicle.
- Check tires (including spare) and wheel bearings. Improper inflation may cause difficulty in steering. When trailer wheels are immersed in water (especially salt water), the bearings should be inspected and greased after each use.
- Make certain that water from rain or cleaning has been removed from the boat. Water weighs approximately 8 lb per gallon and can add weight that will shift with the movement of the trailer.

9.1.2 Towing Precautions

- Allow more time to brake, accelerate, pass, and stop.
- Remember the turning radius is also much greater; curbs and roadside barriers must be given a wide berth when negotiating corners.
- Prior to operating on the road, practice turning, backing up, etc. on a level, uncongested parking area.

9.1.3 Pre-Launching Preparations

- For the courtesy of others and to prevent rushing, prepare your boat for launching away from the ramp.
- Check the boat to ensure that no damage was caused by the trip.
- Raise the lower unit (remove supports) to proper height for launching so that it will not hit bottom.
- Remove tie-downs and make sure that the winch is properly attached to the bow eye and locked in position.
- Put the drain plug in securely.
- Disconnect the trailer lights to prevent shorting of electrical system or burning out a bulb.
- Attach a line to the bow and the stern of the boat so that the boat cannot drift away after launching and it can be easily maneuvered to a docking area.
- Visually inspect the launch ramp for hazards such as a steep drop off, slippery area, and sharp objects.
- When everything has been double checked, proceed slowly to the ramp remembering that your boat is just resting on the trailer and attached only at the bow. The ideal situation is to have one person in the boat and one observer at the water's edge to help guide the driver of the tow vehicle.

- Keep the rear wheels of the tow vehicle out of the water. This will generally keep the exhaust pipes out of the water. If the exhaust pipes become immersed in the water, the engine may stall.
- Set the parking brake and place tire chocks behind the rear wheels.
- Make sure someone else on shore is holding the lines attached to the boat.
- Lower the motor and prepare to start the engine (after running blowers and checking for fuel leaks).
- Start the boat motor and make sure that water is passing through the engine cooling system.
- Release the winch and disconnect the winch line from the bow when the boat operator is ready.
- At this point, the boat should be able to be launched with a light shove or by backing off the trailer under power. Finish loading your boat at a sufficient distance from the ramp so that others may use it.

9.1.4 Retrieval

The steps for removing your boat from the water are basically the reverse of those taken to launch it. However, keep in mind that certain conditions may exist during retrieval that did not exist during launching. As you approach the takeout ramp, take special care to note such factors as:

- Change in wind direction and/or velocity
- Change in current and/or tide
- Increase in boating traffic
- Visibility, etc.

First, unload the boat at a dock or mooring if possible. Next, maneuver the boat carefully to the submerged trailer, and raise the lower unit of the engine. Then, winch the boat onto the trailer and secure it. Finally, drive the trailer with the boat aboard carefully out of the ramp to a designated parking area for cleanup, reloading, and an equipment safety check. Practice will make launch and retrieval a simple procedure. The best advice is just, “do it cautiously with safety as your main concern.”

9.1.5 Storage

Since your boat may be sitting on its trailer for quite some time before it is used again, it is important that it be stored properly. To avoid damage from sun and weather, cover the boat with a tarp. To remove weight from the wheels, put cinderblocks or wood beams under the tongue and all four corners of the trailer frame.

The safety chains are attached crisscrossing under the coupler to the frame of the tow vehicle. If the ball were to break, the trailer would follow in a straight line and prevent the coupler from dragging on the road.

This page intentionally left blank

10. OFFSHORE OPERATION SAFETY EQUIPMENT

10.1 EQUIPMENT REQUIREMENTS – VESSEL OPERATING OFFSHORE

If you operate offshore, you should seriously consider carrying additional equipment beyond the minimum federal requirements. This equipment should include appropriate communications gear, an EPIRB, a means of accurately determining your location, and an inflatable life raft. In cold waters, an immersion suit should be carried for everyone on board.

10.1.1 Communications

Carry communications gear, marine VHF-FM, and/or HF transceiver(s) appropriate to your operating area. Cellular phone coverage is available in many coastal areas. However, cellular phones should not be considered a substitute for VHF-FM marine band radios for emergency purposes.

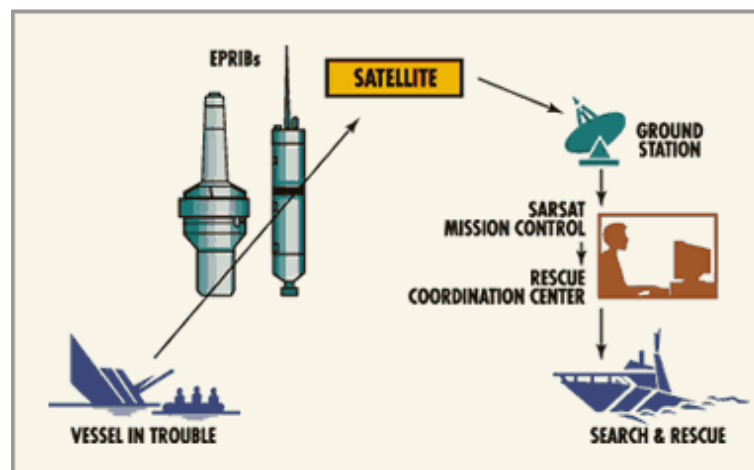
10.1.2 Satellite Emergency Position Indicating Radio Beacons

Satellite EPIRBs (406 MHz) are designed to quickly and reliably alert rescue forces, indicate an accurate distress position, and guide rescue units to the distress scene, even when all other communications fail.

Satellite EPIRBs operate as part of a worldwide distress system. An international satellite constellation maintains a vigilant, global “listening” watch for satellite EPIRB distress signals. The National Oceanic and Atmospheric Administration operates satellites, ground stations, and an alert distribution system serving the United States and a wide segment of the international community.

When activated, the satellite EPIRB transmits a distress signal with a beacon-unique identifying code. The system detects the signal, calculates an accurate distress position, checks the unique identifying code against the EPIRB registration database (vessel and point-of-contact information supplied by the owner), and routes the distress alert with registration information to the responsible USCG (or international) Rescue Coordination Center; 406 MHz EPIRBs with GPS (internal or attached) also provide an immediate GPS position in the information passed to the Rescue Coordination Center.

How the System Works



Geostationary satellites make detection almost immediate. If the EPIRB does not have the ability to provide a GPS position, the process to determine a position takes about an hour on average and almost always less than 2 hours. Satellite EPIRBs also include a homing beacon and strobe to help rescue forces quickly locate the distress scene.

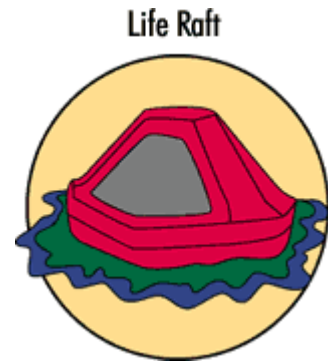
Satellite beacons have significant coverage, alerting timeliness, position accuracy, and signaling advantages over other types of EPIRBs (121.5 MHz). Before purchasing or using an other-than-406 MHz EPIRB, be sure you understand its capabilities and limitations.

Mount the EPIRB to float free according to the manufacturer’s instructions, if possible. Otherwise, make

sure it is **readily accessible**. Register the EPIRB with the National Oceanic and Atmospheric Administration, according to the instructions provided with the beacon. Registration is mandatory, improves response, and reduces false alarms.

10.1.3 Inflatable Life Rafts

An inflatable life raft can provide a survival platform for an extended period of time. Make sure the life raft is large enough for everyone on board when the boat operates offshore. It should have the appropriate emergency equipment pack, and should be professionally serviced periodically, according to the manufacturer’s instructions. USCG-approved life rafts must meet a number of stringent material and performance standards.



10.1.4 Immersion Suits

Immersion suits will delay the effects of hypothermia in cold water. They should be stored and maintained according to the manufacturer’s instructions. Table 10-1 provides the required or recommended equipment for the vessel safety check decal.

10.2 ELECTROFISHING FIELD MANUAL

The electrofishing field manual and a checklist for a safety and health audit are provided in Appendix C.

TABLE 10-1 REQUIRED OR RECOMMENDED EQUIPMENT FOR THE VESSEL SAFETY CHECK DECAL

Numbering	Proper spacing, contrasting color, minimum 3-in. block letters.
Registration/Documentation	Must be on board.
Navigation Lights	Must operate and show proper configuration.
Sound Producing Device	Horn, whistle, or other; bell on boats over 12 m (39.4 ft) or longer.
Personal Flotation Device	One wearable for each passenger, Type IV on boats 16 ft or longer.
Fire Extinguishers	Minimum for size of boat, HALON, FE241/CO ₂ -current tag.
Visual Distress Signals	Inland —Visual Distress Signals, Flag, Signal Light, etc.; International —Minimum flares, aerial rockets, or approved signals, not expired.
Backfire Flame Arrestor	Approved, tight, and clean.
Ventilation	For closed compartments with potential for explosive vapors and an ignition source. Blower must work. Warning Posted. Fuel System tanks secure, over 7 gal considered permanent and must be grounded/vented. Hoses in good condition, no leaks.
Anchor and Tackle	Suitable to boat and the area.
Alternate Propulsion	Under 16 ft, paddle or oar; if mechanical, separate fuel tank and starting source.
Dewatering Device	Pumps must work, extra manual bailer.
Overall Vessel Condition	Bilge and equipment area clean, well maintained. Not overloaded, overpowered, or no automotive parts.
Electrical System	Batteries secure, terminals covered, well organized wiring, proper fuses/circuit breakers.
Galley/Heating Systems	Secure system, proper tank installation. No flammable material nearby.
State Requirements	Compiles with state safety requirements. Contact state boating regulators for current state boating regulations.
Marine Sanitation Device	Approved device, overboard discharge sealed.
MARPOL Trash Placard	Boats 26 ft and longer, written plan over 40 ft.
Pollution Placard	Boats 26 ft and longer with machinery compartment.
Navigation Rules	Boats 12 m (39.4 ft) and longer.

11. CHECKLISTS

11.1 EQUIPMENT REQUIREMENTS – SAFETY AND SURVIVAL TIPS

Boater's Checklist	Yes	No
State Numbering Displayed		
Certificate of Number (State Registration)		
Certificate of Documentation/Display		
Official Number Displayed		
Personal Flotation Devices		
Throwable Personal Flotation Device		
Visual Distress Signals		
Fire Extinguishers		
Ventilation		
Backfire Flame Arrester		
Sound Producing Device		
Bell		
Navigation/Anchor Lights		
Oil Pollution Placard		
Garbage Placard		
Marine Sanitation Device		
Ring Buoy ^(a)		
VHF Radio ^(a)		
Heaving Line ^(a)		
Fenders ^(a)		
First Aid Kit ^(a)		
Flashlight ^(a)		
Mirror ^(a)		
Search Light ^(a)		
Tool Kit ^(a)		
Chart and Compass ^(a)		
Boat Hook ^(a)		
Spare Propeller ^(a)		
Mooring Line ^(a)		
Food and Water ^(a)		
Binoculars ^(a)		
Spare Batteries ^(a)		
Marine Hardware ^(a)		
Sunscreen (SPF 30+) ^(a)		
Extra Clothing ^(a)		
Spare Parts ^(a)		
Spare Fuel ^(a)		
AM-FM Radio ^(a)		
Anchor and Tackle ^(a)		
Dewatering Device ^(a)		
Alternate Propulsion ^(a)		
Overall Boat Condition ^(a)		
Electrical Systems ^(a)		
Fuel Systems ^(a)		
Galley/Heating Systems ^(a)		
State Safety Requirements ^(a)		
File Float Plan ^(a)		
Weather Forecast ^(a)		
(a) Recommended.		

11.2 SMALL CRAFT INSPECTION LIST

Boater's Checklist	Yes	No
Maintenance Records		
Hull Soundness		
Metal Visual Cracks/Date of Last Ultrasound		
Wood Rot and Loose Planking		
Fiberglass Stress Cracks and Delamination		
Soundness of Deck and Superstructure		
Standing Rigging and Frames		
Stays		
Cleats		
Bits		
Shackles		
Thimbles		
Lines		
Running Rigging		
Lines		
Shackles		
Blocks		
Thimbles		
Engine Compartment		
Belts		
Hoses		
Fuel Lines		
Seacocks		
Bilge Blowers		
Deck Machinery		
Hydraulics		
Wire		
Winches		
Occupational Safety and health Administration and EA		

11.3 TRAILER CHECKLIST

Trailer Checklist	Yes	No
Prior to On-Road/Boat Retrieval		
Vehicle is appropriate for trailering weight of trailer and boat (e.g., pickup, suburban, or similar)		
Trailer is appropriate for boat		
Tow ball and light system are in good working order		
Safety chains are in good working order		
Vessel tie-downs (if needed) are attached to trailer		
Trailer lights operate (brake and turn signals)		
If outboard engine, engine is in secured up position		
Trailer tires are inflated and suspension in good working order		
Pre-Launch		
Ensure drain plugs are in position		
Trailer lights are disconnected		
Tie-downs removed		
Line attached to bow and is tended		
Inspect ramp for hazards, steep drops, etc.		
Ensure engine starts and cooling system are properly working		

Appendix A
Nautical Terms

This page intentionally left blank

APPENDIX A

NAUTICAL TERMS

A	
ABAFT	Toward the rear (stern) of the boat; behind.
ABEAM	At right angles to the keel of the boat, but not on the boat.
ABOARD	On or within the boat.
ABOVE DECK	On the deck (not over it – see ALOFT).
AFT	Toward the stern of the boat.
AGROUND	Touching or fast to the bottom.
AHEAD	In a forward direction.
AIDS TO NAVIGATION	Artificial objects to supplement natural landmarks to indicate safe and unsafe waters.
ALOFT	Above the deck of the boat.
AMIDSHIPS	In or toward the center of the boat.
ANCHOR	A heavy metal device, fastened to a chain or line, to hold a vessel in position, partly because of its weight, but chiefly because the designed shape digs into the bottom.
ANCHORAGE	A place suitable for anchoring in relation to the wind, seas, and bottom.
ASTERN	In back of the boat, opposite of ahead.
ATHWARTSHIPS	At right angles to the centerline of the boat; rowboat seats are generally athwartships.
B	
BATTEN DOWN	Secure hatches and loose objects both within the hull and on deck.
BEACON	A lighted or unlighted fixed aid to navigation attached directly to the earth's surface (lights and day beacons both constitute "beacons").
BEAM	The greatest width of the boat.
BEARING	The direction of an object expressed either as a true bearing as shown on the chart, or as a bearing relative to the heading of the boat.
BELOW	Beneath the deck.
BIGHT	The part of the rope or line between the end and the standing part on which a knot is formed. A shallow bay.
BILGE	The interior of the hull below the floor boards.
BITTER END	The last part of a rope or chain. The inboard end of the anchor rode.
BLOCK	A wooden or metal case enclosing one or more pulleys and having a hook, eye, or strap by which it may be attached.
BOAT	A fairly indefinite term. A waterborne vehicle smaller than a ship. One definition is a small craft carried aboard a ship.
BOAT HOOK	A short shaft with a fitting at one end shaped to facilitate use in putting a line over a piling, recovering an object dropped overboard, or in pushing or fending off.
BOW	The forward part of a boat.
BOW LINE	A docking line leading from the bow.
BOW SPRING LINE	A bow pivot line used in docking and undocking, or to prevent the boat from moving forward or astern while made fast to a pier.
BOWLINE KNOT	A knot used to form a temporary loop in the end of a line.
BOWSPRIT	A spar extending forward from the bow.

Appendix A – Nautical Terms

Corporate Vessel Operations Manual

April 2017

BRIDGE	The location from which a vessel is steered and its speed controlled. “Control Station” is really a more appropriate term for small craft.
BULKHEAD	A vertical partition separating compartments.
BUOY	An anchored float used for marking a position on the water or a hazard or a shoal and for mooring.
C	
CABIN	A compartment for passengers or crew.
CAPSIZE	To turn over.
CAST OFF	To let go.
CATAMARAN	A twin-hulled boat, with hulls side-by-side.
CHAFING GEAR	Tubing or cloth wrapping used to protect a line from chafing on a rough surface.
CHANNEL	<ol style="list-style-type: none"> 1. That part of a body of water deep enough for navigation through an area otherwise not suitable. It is usually marked by a single or double line of buoys and sometimes by range markers. 2. The deepest part of a stream, bay, or strait through which the main current flows. 3. A name given to a large strait, for example, the English Channel.
CHART	A map for use by navigators.
CHINE	The intersection of the bottom and sides of a flat or v-bottomed boat.
CHOCK	A fitting through which anchor or mooring lines are led. Usually U-shaped to reduce chafe.
CLEAT	A fitting to which lines are made fast. The classic cleat to which lines are belayed is approximately anvil-shaped.
CLOVE HITCH	A knot for temporarily fastening a line to a spar or piling.
COAMING	A vertical piece around the edge of a cockpit, hatch, etc. to prevent water on deck from running below.
COCKPIT	An opening in the deck from which the boat is handled.
COIL	To lay a line down in circular turns.
COMPASS	Navigation instrument, either magnetic (showing magnetic north) or gyro (showing true north).
COMPASS CARD	Part of a compass, the card is graduated in degrees, to conform with the magnetic meridian-referenced direction system inscribed with direction which remains constant; the vessel turns, not the card.
COMPASS ROSE	The resulting figure when the complete 360° directional system is developed as a circle with each degree graduated upon it, and with the 000° indicated as True North. True North is also known as true rose. This is printed on nautical charts for determining direction.
CURRENT	The horizontal movement of water.
D	
DAYBEACON	A fixed navigation aid structure used in shallow waters upon which is placed one or more daymarks.
DAYMARK	A signboard attached to a daybeacon to convey navigational information presenting one of several standard shapes (square, triangle, rectangle) and colors (red, green, orange, yellow, or black). Daymarks usually have reflective material indicating the shape, but may also be lighted.
DEAD AHEAD	Directly ahead.
DEAD ASTERN	Directly aft or behind.
DEAD RECKONING	A plot of courses steered and distances traveled through the water.

Appendix A – Nautical Terms

Corporate Vessel Operations Manual

April 2017

DECK	A permanent covering over a compartment, hull, or any part of a ship serving as a floor.
DISPLACEMENT	The weight of water displaced by a floating vessel.
DISPLACEMENT HULL	A type of hull that plows through the water, displacing a weight of water equal to its own weight, even when more power is added.
DOCK	A protected water area in which vessels are moored. The term is often used to denote a pier or a wharf.
DRAFT	The depth of water a boat draws.
E	
EASE	To slacken or relieve tension on a line.
EBB TIDE	A receding tide.
EVEN KEEL	When a boat is floating on its designed waterline, it is said to be floating on an even keel.
EYE OF THE WIND	The direction from which the wind is blowing.
EYE SPLICE	A permanent loop spliced in the end of a line.
F	
FAST	Said of an object that is secured to another.
FATHOM	6 ft.
FENDER	A cushion, placed between boats, or between a boat and a pier, to prevent damage.
FIGURE EIGHT KNOT	A knot in the form of a figure eight, placed in the end of a line to prevent the line from passing through a grommet or a block.
FLAME ARRESTER	A safety device, such as a metal mesh protector, to prevent an exhaust backfire from causing an explosion; operates by absorbing heat.
FLARE	The outward curve of a vessel's sides near the bow. A distress signal.
FLYING BRIDGE	An added set of controls above the level of the normal control station for better visibility. Usually open, but may have a collapsible top for shade.
FOLLOWING SEA	An overtaking sea that comes from astern.
FORE AND AFT	In a line parallel to the keel.
FORWARD	Toward the bow of the boat.
FOULED	Any piece of equipment that is jammed or entangled, or dirtied.
FOUNDER	When a vessel fills with water and sinks.
FREEBOARD	The minimum vertical distance from the surface of the water to the gunwale.
G	
GAFF	A spar to support the head of a gaff sail.
GALLEY	The kitchen area of a boat.
GANGWAY	The area of a ship's side where people board and disembark.
GEAR	A general term for ropes, blocks, tackle, and other equipment.
GIVE-WAY VESSEL	A term, from the Navigational Rules, used to describe the vessel which must yield in meeting, crossing, or overtaking situations.
GRAB RAILS	Hand-hold fittings mounted on cabin tops and sides for personal safety when moving around the boat.
GROUND TACKLE	Anchor, anchor rode (line or chain), and all the shackles and other gear used for attachment.
GUNWALE	The upper edge of a boat's sides.
H	
HARBOR	A safe anchorage, protected from most storms; may be natural or man-made, with breakwaters and jetties; a place for docking and loading.
HATCH	An opening in a boat's deck fitted with a watertight cover.
HEAD	A marine toilet. Also the upper corner of a triangular sail.

Appendix A – Nautical Terms

Corporate Vessel Operations Manual

April 2017

HEADING	The direction in which a vessel's bow points at any given time.
HEADWAY	The forward motion of a boat. Opposite of sternway.
HEAVE TO	To bring a vessel up in a position where it will maintain little or no headway, usually with the bow into the wind or nearly so.
HEEL	To tip to one side.
HELM	The wheel or tiller controlling the rudder.
HITCH	A knot used to secure a rope to another object or to another rope, or to form a loop or a noose in a rope.
HOLD	A compartment below deck in a large vessel, used solely for carrying cargo.
HULL	The main body of a vessel.
HYPOTHERMIA	A life-threatening condition in which the body's warming mechanisms fail to maintain normal body temperature and the entire body cools.
I	
INBOARD	More toward the center of a vessel; inside; a motor fitted inside the boat.
J	
There are no boating terms under this heading.	
K	
KEDGE	To use an anchor to move a boat by hauling on the anchor rode; a basic anchor type.
KEEL	The centerline of a boat running fore and aft; the backbone of a vessel.
KETCH	A two-masted sailboat with the smaller after mast stepped ahead of the rudder post.
KNOT	A measure of speed equal to one nautical mile (6,076 ft) per hour. A fastening made by interweaving rope to form a stopper, to enclose or bind an object, to form a loop or a noose, to tie a small rope to an object, or to tie the ends of two small ropes together.
L	
LEEWARD	The direction away from the wind. Opposite of windward.
LEEWAY	The sideways movement of the boat caused by either wind or current.
LINE	Rope and cordage used aboard a vessel.
LOG	A record of courses or operation. Also, a device to measure speed.
LUBBER'S LINE	A mark or permanent line on a compass indicating the direction forward; parallel to the keel when properly installed.
M	
MAST	A spar set upright to support rigging and sails.
MONOHULL	A boat with one hull.
MOORING	An arrangement for securing a boat to a mooring buoy or a pier.
MOORING BUOY	A buoy secured to a permanent anchor sunk deeply into the bottom.
N	
NAUTICAL MILE	One minute of latitude; approximately 6,076 ft – about 1/8 longer than the statute mile of 5,280 ft.
NAVIGATION	The art and science of conducting a boat safely from one point to another.
O	
OUTBOARD	Toward or beyond the boat's sides. A detachable engine mounted on a boat's stern.
OUTDRIVE	A propulsion system for boats with an inboard engine operating an exterior drive, with drive shaft, gears, and propeller; also called stern-drive and inboard/outboard.
OVERBOARD	Over the side or out of the boat.

P	
PAINTER	A line attached to the bow of a boat for use in towing or making fast.
PAY OUT	To ease out a line, or let it run in a controlled manner.
PENNANT (sometimes PENDANT)	The line by which a boat is made fast to a mooring buoy.
PERSONAL FLOTATION DEVICE	Personal flotation device (PFD) is official terminology for life jacket. When properly used, the PFD will support a person in the water. Available in several sizes and types.
PIER	A loading/landing platform extending at an angle from the shore.
PILOTING	Navigation by use of visible references, the depth of the water, etc.
PITCH	1. The alternate rise and fall of the bow of a vessel proceeding through waves. 2. The theoretical distance advanced by a propeller in one revolution. 3. Tar and resin used for caulking between the planks of a wooden vessel.
PITCHPOLING	A small boat being thrown end-over-end in very rough seas.
PLANING HULL	A type of hull shaped to glide easily across the water at high speed.
PORT	The left side of a boat looking forward. A harbor.
PROPELLER	A rotating device, with two or more blades, that acts as a screw in propelling a vessel.
Q	
QUARTER	The sides of a boat aft of amidships.
QUARTERING SEA	Sea coming on a boat's quarter.
R	
REEF	To reduce the sail area.
RIGGING	The general term for all the lines of a vessel.
RODE	The anchor line and/or chain.
ROLL	The alternating motion of a boat, leaning alternately to port and starboard; the motion of a boat about its fore-and-aft axis.
ROPE	In general, cordage as it is purchased at the store. When it comes aboard a vessel and is put to use, it becomes a line.
RUDDER	A vertical plate or board for steering a boat.
RUNNING LIGHTS	Lights required to be shown on boats underway between sundown and sunup.
S	
SCOPE	The ratio of the length of an anchor line, from a vessel's bow to the anchor, to the depth of the water.
SCREW	A boat's propeller.
SEA ANCHOR	Any device used to reduce a boat's drift before the wind.
SECURE	To make fast.
SHACKLE	A U-shaped connector with a pin or bolt across the open end.
SHEAR PIN	A safety device used to fasten a propeller to its shaft; it breaks when the propeller hits a solid object, thus preventing further damage.
SHEET BEND	A knot used to join two ropes. Functionally different from a square knot in that it can be used between lines of different diameters.
SHIP	A larger vessel usually used for ocean travel. A vessel able to carry a "boat" on board.
SHOAL	An offshore hazard to navigation at a depth of 16 fathoms (30 meters or 96 ft) or less, composed of unconsolidated material.
SLACK	Not fastened; loose. Also, to loosen.
SLOOP	A single masted vessel with working sails (main and jib) set fore and aft.
SPLICE	To permanently join two ropes by tucking their strands alternately over and under each other.

SPRING LINE	A pivot line used in docking, undocking, or to prevent the boat from moving forward or astern while made fast to a dock.
SQUALL	A sudden, violent wind often accompanied by rain.
SQUARE KNOT	A knot used to join two lines of similar size. Also called a reef knot.
STANDING PART	That part of a line which is made fast. The main part of a line as distinguished from the bight and the end.
STAND-ON VESSEL	That vessel which continues its course in the same direction at the same speed during a crossing or overtaking situation, unless a collision appears imminent (was formerly called “the privileged vessel”).
STARBOARD	The right side of a boat when looking forward.
STERN	The after part (back) of the boat.
STERN LINE	A docking line leading away from the stern.
STOW	To pack or store away; especially, to pack in an orderly, compact manner.
SWAMP	To fill with water, but not settle to the bottom.
T	
TACKLE	A combination of blocks and line to increase mechanical advantage.
THWART	A seat or brace running laterally across a boat.
TIDE	The periodic rise and fall of water level in the oceans.
TILLER	A bar or handle for turning a boat’s rudder or an outboard motor.
TOPSIDES	The sides of a vessel between the waterline and the deck; sometimes referring to onto or above the deck.
TRANSOM	The stern cross-section of a square-sterned boat.
TRIM	Fore and aft balance of a boat.
TRIMARAN	A boat with three hulls.
TRIPLINE	A line fast to the crown of an anchor by means of which it can be hauled out when dug too deeply or fouled; a similar line used on a sea anchor to bring it aboard.
TRUE NORTH POLE	The north end of the earth’s axis. Also called North Geographic Pole. The direction indicated by 000° (or 360°) on the true compass rose.
TRUE WIND	The actual direction from which the wind is blowing.
TURNBUCKLE	A threaded, adjustable rigging fitting, used for stays, lifelines, and sometimes other rigging.
U	
UNDERWAY	Vessel in motion, i.e., when not moored, at anchor, or aground.
V	
V BOTTOM	A hull with the bottom section in the shape of a “V.”
VARIATION	The angular difference between the magnetic meridian and the geographic meridian at a particular location.
VHF RADIO	A very high frequency electronic communications and direction finding system.
W	
WAKE	Moving waves, track, or path that a boat leaves behind when moving across the waters.
WATERLINE	A line painted on a hull which shows the point to which a boat sinks when it is properly trimmed.
WAY	Movement of a vessel through the water, such as headway, sternway, or leeway.
WHARF	A man-made structure bonding the edge of a dock and built along or at an angle to the shoreline, used for loading, unloading, or tying up vessels.
WINCH	A device used to increase hauling power when raising or trimming sails.
WINDWARD	Toward the direction from which the wind is coming. Opposite of leeward.

Appendix A – Nautical Terms

Corporate Vessel Operations Manual

April 2017

X	
There are no boating terms under this heading.	
Y	
YAW	To swing off course, as when due to the impact of a following or quartering sea.
YAWL	A two-masted sailboat with the small mizzen mast stepped abaft the rudder post.
Z	
There are no boating terms under this heading.	

This page intentionally left blank

Appendix B
“Rules of the Water”

This page intentionally left blank

APPENDIX B

“RULES OF THE WATER”

PART A – GENERAL

Rule 1 – Application

- (a) These Rules shall apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels.
- (b) Nothing in these Rules shall interfere in the operation of special rules made by an appropriate authority for roadsteads, harbors, rivers, lakes, or inland waterways connected with the high seas and navigable by seagoing vessels. Such special rules shall conform as closely as possible to these Rules.
- (c) Nothing in these Rules shall interfere with the operation of any special rules made by the Government of any State with respect to additional station or signal lights or shapes or whistle signals for ships of war and vessels proceeding under convoy, or with respect to additional station or signal lights for fishing vessels fishing as a fleet. These additional station or signal lights or whistle signals shall, so far as possible, be such that they cannot be mistaken for any light, shape, or signal authorized elsewhere under these Rules.
- (d) Traffic separation schemes may be adopted by the Organization for the purpose of these Rules.
- (e) Whenever the Government concerned shall have determined that a vessel of special construction or purpose cannot comply fully with the provisions of any of these Rules with respect to number, position, range, or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signaling appliances, such vessel shall comply with such other provisions in regard to number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signaling appliances, as her Government shall have determined to be the closest possible compliance with these Rules in respect to that vessel.

Rule 2 – Responsibility

- (a) Nothing in these Rules shall exonerate any vessel, or the owner, master, or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.
- (b) In construing and complying with these Rules, due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger.

Rule 3 – General Definitions

For the purpose of these Rules, except where the context otherwise requires:

- (a) The word “vessel” includes every description of watercraft, including non-displacement craft and seaplanes, used or capable of being used as a means of transportation on water.

- (b) The term “power driven vessel” means any vessel propelled by machinery.
- (c) The term “sailing vessel” means any vessel under sail provided that propelling machinery, if fitted, is not being used.
- (d) The term “vessel engaged in fishing” means any vessel fishing with nets, lines, trawls, or other fishing apparatus which restrict maneuverability, but does not include a vessel fishing with trolling lines or other fishing apparatus which do not restrict maneuverability.
- (e) The term “seaplane” includes any aircraft designed to maneuver on the water.
- (f) The term “vessel not under command” means a vessel which through some exceptional circumstance is unable to maneuver as required by these Rules and is, therefore, unable to keep out of the way of another vessel.
- (g) The term “vessel restricted in her ability to maneuver” means a vessel which from the nature of her work is restricted in her ability to maneuver as required by these Rules and is, therefore, unable to keep out of the way of another vessel. The term “vessel restricted in her ability to maneuver” shall include but not be limited to:
 - (i) A vessel engaged in laying, servicing, or picking up a navigational mark, submarine cable, or pipeline
 - (ii) A vessel engaged in dredging, surveying, or underwater operations
 - (iii) A vessel engaged in replenishment or transferring persons, provisions, or cargo while underway
 - (iv) A vessel engaged in the launching or recovery of aircraft
 - (v) A vessel engaged in mine clearance operations
 - (vi) A vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course.
- (h) The term “vessel constrained by her draft” means a power-driven vessel which because of her draft in relation to the available depth and width of navigable water is severely restricted in her ability to deviate from the course she is following.
- (i) The word “underway” means a vessel is not at anchor, or made fast to the shore, or aground.
- (j) The words “length” and “breadth” of a vessel mean her length overall and greatest breadth.
- (k) Vessels shall be deemed to be in sight of one another only when one can be observed visually from the other.
- (l) The term “restricted visibility” means any condition in which visibility is restricted by fog, mist, falling snow, heavy rainstorms, sandstorms, and any other similar causes.

PART B – STEERING AND SAILING RULES

Section I – Conduct of Vessels in any Condition of Visibility

Rule 4 – Application

Rules in this section apply to any condition of visibility.

Rule 5 – Look-Out

Every vessel shall at all times maintain a proper look-out by sight as well as by hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.

Rule 6 – Safe Speed

Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions.

In determining a safe speed, the following factors shall be among those taken into account:

(a) By all vessels:

- (i) The state of visibility
- (ii) The traffic density including concentrations of fishing vessels or any other vessels
- (iii) The manageability of the vessel with special reference to stopping distance and turning ability in the prevailing conditions
- (iv) At night the presence of background light such as from shore lights or from back scatter from her own lights
- (v) The state of wind, sea, and current, and the proximity of navigational hazards
- (vi) The draft in relation to the available depth of water.

(b) Additionally, by vessels with operational radar:

- (i) The characteristics, efficiency, and limitations of the radar equipment
- (ii) Any constraints imposed by the radar range scale in use
- (iii) The effect on radar detection of the sea state, weather, and other sources of interference
- (iv) The possibility that small vessels, ice, and other floating objects may not be detected by radar at an adequate range
- (v) The number location and movement of vessels detected by radar

- (vi) The more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity.

Rule 7 – Risk of Collision

- (a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt, such risk shall be deemed to exist.
- (b) Proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects.
- (c) Assumptions shall not be made on the basis of scanty information, especially scanty radar information.
- (d) In determining if risk of collision exists, the following considerations shall be among those taken into account:
 - (i) Such risk shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change.
 - (ii) Such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large vessel or a tow or when approaching a vessel at close range.

Rule 8 – Action to Avoid Collision

- (a) Any action taken to avoid collision shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.
- (b) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar; a succession of small alterations of course and/or speed shall be avoided.
- (c) If there is sufficient sea room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.
- (d) Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear.
- (e) If necessary to avoid collision or allow more time to assess the situation, a vessel may slacken her speed or take all the way off by stopping or reversing her means of propulsion.
- (f) (i) A vessel which, by any of these rules, is required not to impede the passage or safe passage of another vessel shall, when required by the circumstances of the case, take early action to allow sufficient sea room for the safe passage of the other vessel.

- (ii) A vessel required not to impede the passage or safe passage of another vessel is not relieved of this obligation if approaching the other vessel so as to involve risk of collision and shall, when taking action, have full regard to the action which may be required by the rules of this part.
- (iii) A vessel, the passage of which is not to be impeded, remains fully obliged to comply with the rules of this part when the two vessels are approaching one another so as to involve risk of collision.

Rule 9 – Narrow Channels

- (a) A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.
- (b) A vessel of less than 20 meters (m) in length or a sailing vessel shall not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway.
- (c) A vessel engaged in fishing shall not impede the passage of any other vessel navigating within a narrow passage or fairway.
- (d) A vessel shall not cross a narrow passage or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway. The latter vessel may use the sound signal prescribed in Rule 34(d) if in doubt as to the intention of the crossing vessel.
- (e) (i) In a narrow channel or fairway when overtaking can take place only when the vessel to be overtaken has to take action to permit safe passing, the vessel intending to overtake shall indicate her intention by sounding the appropriate signal prescribed in Rule 34(c)(i). The vessel to be overtaken shall, if in agreement, sound the appropriate signal prescribed in Rule 34(c)(ii) and take steps to permit safe passing. If in doubt, she may sound the signals prescribed in Rule 34(d).
 - (ii) This rule does not relieve the overtaking vessel of her obligation under Rule 13.
- (f) A vessel nearing a bend or an area of a narrow channel or fairway where other vessels may be obscured by an intervening obstruction shall navigate with particular alertness and caution and shall sound the appropriate signal prescribed in Rule 34(e).
- (g) Any vessel shall, if the circumstances of the case admit, avoid anchoring in a narrow channel.

Rule 10 – Traffic Separation Schemes

- (a) This rule applies to traffic separation schemes adopted by the Organization and does not relieve any vessel of her obligation under any other rule.
- (b) A vessel using a traffic separation scheme shall:
 - (i) Proceed in the appropriate traffic lane in the general direction of traffic flow for that lane.
 - (ii) So far as is practicable keep clear of a traffic separation line or separation zone.

- (iii) Normally join or leave a traffic lane at the termination of the lane, but when joining or leaving from either side shall do so at as small an angle to the general direction of traffic flow as practicable.
- (c) A vessel shall so far as practicable avoid crossing traffic lanes, but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow.
- (d) (i) A vessel shall not use an inshore traffic zone when she can safely use the appropriate traffic lane within the adjacent traffic separation scheme. However, vessels of less than 20 m in length, sailing vessels and vessels engaged in fishing may use the inshore traffic zone.

(ii) Notwithstanding subparagraph (d)(i), a vessel may use an inshore traffic Zone when en route to or from a port, offshore installation or structure, pilot station or any other place situated within the inshore traffic zone, or to avoid immediate danger.
- (e) A vessel, other than a crossing vessel or a vessel joining or leaving a lane shall not normally enter a separation zone or cross a separation line except:
 - (i) in cases of emergency to avoid immediate danger
 - (ii) to engage in fishing within a separation zone.
- (f) A vessel navigating in areas near the terminations of traffic separation schemes shall do so with particular caution.
- (g) A vessel shall so far as practicable avoid anchoring in a traffic separation scheme or in areas near its terminations.
- (h) A vessel not using a traffic separating scheme shall avoid it by as wide a margin as is practicable.
- (i) A vessel engaged in fishing shall not impede the passage of any vessel following a traffic lane.
- (j) A vessel of less than 20 m in length or a sailing vessel shall not impede the safe passage of a power-driven vessel following a traffic lane.
- (k) A vessel restricted in her ability to maneuver when engaged in an operation for the maintenance of safety of navigation in a traffic separating scheme is exempted from complying with this Rule to the extent necessary to carry out the operation.
- (l) A vessel restricted in her ability to maneuver when engaged in an operation for the laying, servicing or picking up a submarine cable, within a traffic separating scheme, is exempted from complying with this Rule to the extent necessary to carry out the operation.

Section II – Conduct of Vessels in Sight of One Another

Rule 11 – Application

Rules in this section apply to vessels in sight of one another.

Rule 12 – Sailing Vessels

- (a) When two sailing vessels are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other as follows:
 - (i) When each of them has the wind on a different side, the vessel which has the wind on the port side shall keep out of the way of the other
 - (ii) When both have the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward
 - (iii) If the vessel with the wind on the port side sees a vessel to windward and cannot determine with certainty whether the other vessel has the wind on the port or the starboard side, she shall keep out of the way of the other.
- (b) For the purposes of this Rule the windward side shall be deemed to be the side opposite that on which the mainsail is carried or, in the case of a square rigged vessel, the side opposite to that on which the largest fore-and-aft sail is carried.

Rule 13 – Overtaking

- (a) Notwithstanding anything contained in the Rules of Part B, Sections I and II, any vessel overtaking any other shall keep out of the way of the vessel being overtaken.
- (b) A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5 degrees abaft her beam, that is, in such a position with reference to the vessel she is overtaking, that at night she would be able to see only the sternlight of that vessel but neither of her sidelights.
- (c) When a vessel is in any doubt as to whether she is overtaking another, she shall assume that this is the case and act accordingly.
- (d) Any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel a crossing vessel within the meaning of these Rules or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

Rule 14 – Head-On Situation

- (a) When two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision, each shall alter her course to starboard so that each shall pass on the port side of the other.
- (b) Such a situation shall be deemed to exist when a vessel sees the other ahead or nearly ahead and by night she could see the masthead lights in line or nearly in line and/or both sidelights and by day she observes the corresponding aspect of the other vessel.
- (c) When a vessel is in any doubt as to whether such a situation exists, she shall assume that it does exist and act accordingly.

Rule 15 – Crossing Situation

When two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.

Rule 16 – Action by Give-way Vessel

Every vessel which is directed to keep out of the way of another vessel shall, so far as possible, take early and substantial action to keep well clear.

Rule 17 – Action by Stand-on Vessel

- (a) (i) Where one of two vessels is to keep out of the way of the other shall keep her course and speed.
 - (ii) The latter vessel may, however, take action to avoid collision by her maneuver alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in accordance with these Rules.
- (b) When, from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.
- (c) A power-driven vessel which takes action in a crossing situation in accordance with subparagraph (a)(ii) of this Rule to avoid collision with another power-driven vessel shall, if the circumstances of the case admit, not alter course to port for a vessel on her own port side.
- (d) This Rule does not relieve the give-way vessel of her obligation to keep out of the way.

Rule 18 – Responsibilities between Vessels

Except where Rules 9, 10, and 13 otherwise require:

- (a) A power-driven vessel underway shall keep out of the way of a:
 - (i) Vessel not under command
 - (ii) Vessel restricted in her ability to maneuver
 - (iii) Vessel engaged in fishing
 - (iv) Sailing vessel
- (b) A sailing vessel under way shall keep out of the way of a:
 - (i) Vessel not under command
 - (ii) Vessel restricted in her ability to maneuver
 - (iii) Vessel engaged in fishing
- (c) A vessel engaged in fishing when underway shall, so far as possible, keep out of the way of a:
 - (i) Vessel not under command
 - (ii) Vessel restricted in her ability to maneuver.

- (d) (i) Any vessel other than a vessel not under command or a vessel restricted in her ability to maneuver shall, if the circumstances of the case admit, avoid impeding the safe passage of a vessel constrained by her draft, exhibiting the signals in Rule 28.
- (ii) A vessel constrained by her draft shall navigate with particular caution having full regard to her special condition.
- (e) A seaplane on the water shall, in general, keep well clear of all vessels and avoid impeding their navigation. In circumstances, however, where risk of collision exists, she shall comply with the Rules of this Part.

Section III – Conduct of Vessels in Restricted Visibility

Rule 19 – Conduct of Vessels in Restricted Visibility

- (a) This rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.
- (b) Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and condition of restricted visibility. A power-driven vessel shall have her engines ready for immediate maneuver.
- (c) Every vessel shall have due regard to the prevailing circumstances and conditions of restricted visibility when complying with the Rules of Section I of this Part.
- (d) A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration in course, so far as possible the following shall be avoided:
 - (i) An alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken
 - (ii) An alteration of course toward a vessel abeam or abaft the beam.
- (e) Except where it has been determined that a risk of collision does not exist, every vessel which hears apparently forward of her beam the fog signal of another vessel, or which cannot avoid a close-quarters situation with another vessel forward of her beam, shall reduce her speed to be the minimum at which she can be kept on her course. She shall if necessary take all her way off and in any event navigate with extreme caution until danger of collision is over.

PART C – LIGHTS AND SHAPES

Rule 20 – Application

- (a) Rules in this part shall be complied with in all weathers.
- (b) The Rules concerning lights shall be complied with from sunset to sunrise, and during such times no other lights shall be exhibited, except such lights which cannot be mistaken for the lights specified in

these Rules or do not impair their visibility or distinctive character, or interfere with the keeping of a proper look-out.

- (c) The lights prescribed by these rules shall, if carried, also be exhibited from sunrise to sunset in restricted visibility and may be exhibited in all other circumstances when it is deemed necessary.
- (d) The Rules concerning shapes shall be complied with by day.
- (e) The lights and shapes specified in these Rules shall comply with the provisions of Annex I to these Regulations.

Rule 21 – Definitions

- (a) “Masthead light” means a white light placed over the fore and aft centerline of the vessel showing an unbroken light over an arc of horizon of 225 degrees and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on either side of the vessel.
- (b) “Sidelights” means a green light on the starboard side and a red light on the port side each showing an unbroken light over an arc of horizon of 112.5 degrees and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on the respective side. In a vessel of less than 20 m in length the sidelights may be combined in one lantern carried on the fore and aft centerline of the vessel.
- (c) “Stern light,” means a white light placed as nearly as practicable at the stern showing an unbroken light over an arc of horizon of 135 degrees and so fixed as to show the light 67.5 degrees from right aft on each side of the vessel.
- (d) “Towing light” means a yellow light having the same characteristics as the “stern light” defined in paragraph (c) of this Rule.
- (e) “All round light” means a light showing an unbroken light over an arc of horizon of 360 degrees.
- (f) “Flashing light” means a light flashing at regular intervals at a frequency of 120 flashes or more per minute.

Rule 22 – Visibility of Lights

The lights prescribed in these Rules shall have an intensity as specified in Section 8 of Annex I to these Regulations so as to be visible at the following minimum ranges:

- (a) In vessels of 50 m or more in length:
 - A masthead light, 6 miles (mi)
 - A sidelight, 3 mi
 - A towing light, 3 mi
 - A white, red, green, or yellow all-around light, 3 mi.
- (b) In vessels of 12 m or more in length but less than 50 m in length

- A masthead light, 5 mi; except that where the length of the vessel is less than 20 m, 3 mi
- A sidelight, 2 mi
- A stern light, 2 mi, A towing light, 2 mi
- A white, red, green or yellow all-round light, 2 mi.

(c) In vessels of less than 12 m in length:

- A masthead light, 2 mi
- A sidelight, 1 mi
- A towing light, 2 mi
- A white, red, green, or yellow all-around light, 2 mi.

(d) In inconspicuous, partly submerged vessels or objects being towed

- A white all-round light; 3 mi.

Rule 23 – Power-Driven Vessels Underway

(a) A power-driven vessel underway shall exhibit:

- (i) A masthead light forward
- (ii) A second masthead light abaft of and higher than the forward one; except that a vessel of less than 50 m in length shall not be obliged to exhibit such a light but may do so;
- (iii) Sidelights
- (iv) A stern light.

(b) An air-cushion vessel when operating in non-displacement mode shall, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit an all-round flashing yellow light.

- (i) A power-driven vessel of less than 12 m in length may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and sidelights.
- (ii) A power-driven vessel of less than 7 m in length whose maximum speed does not exceed 7 knots may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and shall, if practicable, also exhibit sidelights.
- (iii) The masthead light or all-round white light on a power-driven vessel of less than 12 m in length may be displaced from the fore and aft centerline of the vessel if centerline fitting is not practicable, provided the sidelights are combined in one lantern which shall be carried on the fore and aft centerline of the vessel or located as nearly as practicable in the same fore and aft line as the masthead light or all-round white light.

Rule 24 – Towing and Pushing

(a) A power-driven vessel when towing shall exhibit:

- (i) Instead of the light prescribed in Rule 23(a)(i) or (a)(ii), two masthead lights in a vertical line. When the length of the tow measuring from the stern of the towing vessel to the after end of the tow exceeds 200 m, three such lights in a vertical line
 - (ii) Sidelights
 - (iii) A stern light
 - (iv) A towing light in a vertical line above the stern light
 - (v) When the length of the tow exceeds 200 m, a diamond shape where it can best be seen.
- (b) When a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and exhibit the lights prescribed in Rule 23.
- (c) A power-driven vessel when pushing ahead or towing alongside, except in the case of a composite unit, shall exhibit:
- (i) Instead of the light prescribed in Rule 23(a)(i) or (a)(ii), two masthead lights in a vertical line. When the length of the tow measuring from the stern of the towing vessel to the after end of the tow exceeds 200 m, three such lights in a vertical line
 - (ii) Sidelights
 - (iii) A stern light.
- (d) A power-driven vessel to which paragraph (a) or (c) of this Rule apply shall also comply with rule 23(a)(ii).
- (e) A vessel or object being towed, other than those mentioned in paragraph (g) of this Rule, shall exhibit:
- (i) Sidelights
 - (ii) A stern light
 - (iii) When the length of the tow exceeds 200 m, a diamond shape where it can best be seen.
- (f) Provided that any number of vessels being towed alongside or pushed in a group shall be lighted as one vessel:
- (i) A vessel being pushed ahead, not being part of a composite unit, shall exhibit at the forward end, sidelights
 - (ii) A vessel being towed alongside shall exhibit a stern light and at the forward end, sidelights.
- (g) An inconspicuous, partly submerged vessel or object, or combination of such vessels or objects being towed, shall exhibit:
- (i) If it is less than 25 m in breadth, one all-round white light at or near the front end and one at or near the after end except that dracones need not exhibit a light at or near the forward end

- (ii) If it is 25 m or more in breadth, two or more additional all-round white lights at or near the extremities of its breadth
 - (iii) If it exceeds 100 m in length, additional all-round white lights between the lights prescribed in subparagraphs (i) and (ii) so that the distance between the lights shall not exceed 100 m.
 - (iv) A diamond shape at or near the aftermost extremity of the last vessel or object being towed and if the length of the tow exceeds 200 m an additional diamond shape where it can best be seen and located as far forward as is practicable.
- (h) When from any sufficient cause it is impracticable for a vessel or object being towed to exhibit the lights or shapes prescribed in paragraph (e) or (g) of this Rule, all possible measures shall be taken to light the vessel or object being towed or at least indicate the presence of such vessel or object.
- (i) Where from any sufficient cause it is impracticable for a vessel not normally engaged in towing operations to display the lights prescribed in paragraph (a) or (c) of this Rule, such vessel shall not be required to exhibit those lights when engaged in towing another vessel in distress or otherwise in need of assistance. All possible measures shall be taken to indicate the nature of the relationship between the towing vessel and the vessel being towed as authorized by Rule 36, in particular by illuminating the towline.

Rule 25 – Sailing Vessels Underway and Vessels Under Oars

- (a) A sailing vessel underway shall exhibit:
- (i) Sidelights
 - (ii) A stern light.
- (b) In a sailing vessel of less than 20 m in length the lights prescribed in paragraph (a) of this Rule may be combined in one lantern carried at or near the top of the mast where it can best be seen.
- (c) A sailing vessel underway may, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit at or near the top of the mast, where they can best be seen, two all-round lights in a vertical line, the upper being red and the lower Green, but these lights shall not be exhibited in conjunction with the combined lantern permitted by paragraph (b) of this Rule.
- (d) (i) A sailing vessel of less than 7 m in length shall, if practicable, exhibit the lights prescribed in paragraph (a) or (b) of this Rule, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision.
- (ii) A vessel under oars may exhibit the lights prescribed in this rule for sailing vessels, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision.
- (e) A vessel proceeding under sail when also being propelled by machinery shall exhibit forward where it can best be seen a conical shape, apex downwards.

Rule 26 – Fishing Vessels

- (a) A vessel engaged in fishing, whether underway or at anchor, shall exhibit only the lights and shapes prescribed by this rule.
- (b) A vessel when engaged in trawling, by which is meant the dragging through the water of a dredge net or other apparatus used as a fishing appliance, shall exhibit:
 - (i) Two all-round lights in a vertical line, the upper being green and the lower white, or a shape consisting of two cones with their apexes together in a vertical line one above the other; a vessel of less than 20 m in length may instead of this shape exhibit a basket
 - (ii) A masthead light abaft of and higher than the all-round green light; a vessel of less than 50 m in length shall not be obliged to exhibit such a light but may do so
 - (iii) When making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a stern light.
- (c) A vessel engaged in fishing, other than trawling, shall exhibit:
 - (i) Two all-round lights in a vertical line, the upper being red and the lower white, or a shape consisting of two cones with their apexes together in a vertical line one above the other; a vessel of less than 20 m in length may instead of this shape exhibit a basket
 - (ii) When there is outlying gear extending more than 150 m horizontally from the vessel, an all-round white light or a cone apex upwards in the direction of the gear
 - (iii) When making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a stern light.
- (d) A vessel engaged in fishing in close proximity to other vessels engaged in fishing may exhibit the additional signals described in Annex II to these Regulations.
- (e) A vessel when not engaged in fishing shall not exhibit the lights or shapes prescribed in this Rule, but only those prescribed for a vessel of her length.

Rule 27 – Vessels Not Under Command or Restricted in Their Ability to Maneuver

- (a) A vessel not under command shall exhibit:
 - (i) Two all-round red lights in a vertical line where they can best be seen
 - (ii) Two balls or similar shapes in a vertical line where they can best be seen
 - (iii) When making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a stern light.
- (b) A vessel restricted in her ability to maneuver, except a vessel engaged in mine clearance operations, shall exhibit:

- (i) Three all-round lights in a vertical line where they can best be seen. The highest and lowest of these lights shall be red and the middle light shall be white
 - (ii) Three shapes in a vertical line where they can best be seen. The highest and lowest of these shapes shall be balls and the middle one a diamond.
 - (iii) When making way through the water, a masthead light, sidelights and a stern light in addition to the lights prescribed in subparagraph (i)
 - (iv) When at anchor, in addition to the lights or shapes prescribed in subparagraphs(i) and (ii), the light, lights, or shape prescribed in Rule 30.
- (c) A power-driven vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course shall, in addition to the lights or shapes prescribed in Rule 24(a), exhibit the lights or shapes prescribed in subparagraph (b)(i) and (ii) of this Rule.
- (d) A vessel engaged in dredging or underwater operations, when restricted in her ability to maneuver, shall exhibit the lights and shapes prescribed in subparagraphs (b)(i),(ii) and (iii) of this Rule and shall in addition when an obstruction exists, exhibit:
- (i) Two all-round red lights or two balls in a vertical line to indicate the side on which the obstruction exists
 - (ii) Two all-round green lights or two diamonds in a vertical line to indicate the side on which another vessel may pass
 - (iii) When at anchor, the lights or shapes prescribed in this paragraph instead of the lights or shapes prescribed in Rule 30.
- (e) Whenever the size of a vessel engaged in diving operations makes it impracticable to exhibit all lights and shapes prescribed in paragraph (d) of this Rule, the following shall be exhibited:
- (i) Three all-round lights in a vertical line where they can best be seen. The highest and lowest of these lights shall be red and the middle light shall be white
 - (ii) a rigid replica of the code flag “A” not less than 1 m in height. Measures shall be taken to ensure its all-round visibility.
- (f) A vessel engaged in mine clearance operations shall in addition to the lights prescribed for a power-driven vessel in Rule 23 or to the light or shape prescribed for a vessel at anchor in Rule 30 as appropriate, exhibit three all-round green lights or three balls. One of these lights or shapes shall be exhibited near the foremast head and one at each end of the fore yard. These lights or shapes indicate that it is dangerous for another vessel to approach within 1,000 m of the mine clearance vessel.
- (g) Vessels of less than 12 m in length, except those engaged in diving operations, shall not be required to exhibit the lights prescribed in this Rule.
- (h) The signals prescribed in this Rule are not signals of vessels in distress and requiring assistance. Such signals are contained in Annex IV to these Regulations.

Rule 28 – Vessels Constrained by their Draft

A vessel constrained by her draft may, in addition to the lights prescribed for power-driven vessels in Rule 23, exhibit where they can best be seen three all-round red lights in a vertical line, or a cylinder.

Rule 29 – Pilot Vessels

(a) A vessel engaged on pilotage duty shall exhibit:

- (i) At or near the masthead, two all-round lights in a vertical line, the upper being white and the lower red
- (ii) When underway, in addition, sidelights and a stern light
- (iii) When at anchor, in addition to the lights prescribed in subparagraph (i), the light, lights, or shape prescribed in Rule 30 for vessels at anchor.

(b) A pilot vessel when not engaged on pilotage duty shall exhibit the lights or shapes prescribed for a similar vessel of her length.

Rule 30 – Anchored Vessels and Vessels Aground

(a) A vessel at anchor shall exhibit where it can best be seen:

- (i) In the fore part, an all-round white light or one ball
- (ii) At or near the stern and at a lower level than the light prescribed in subparagraph (i), an all-round white light.

(b) A vessel of less than 50 m in length may exhibit an all-round white light where it can best be seen instead of the lights prescribed in paragraph (a) of this Rule.

(c) A vessel at anchor may, and a vessel of 100 m and more in length shall, also use the available working or equivalent lights to illuminate her decks.

(d) A vessel aground shall exhibit the lights prescribed in paragraph (a) or (b) of this Rule and in addition, where they can best be seen

- (i) Two all-round red lights in a vertical line
- (ii) Three balls in a vertical line.

(e) A vessel of less than 7 m in length, when at anchor not in or near a narrow channel, fairway or where other vessels normally navigate, shall not be required to exhibit the shape prescribed in paragraphs (a) and (b) of this Rule.

(f) A vessel of less than 12 m in length, when aground, shall not be required to exhibit the lights or shapes prescribed in subparagraphs (d)(i) and (ii) of this Rule.

Rule 31 – Seaplanes

Where it is impracticable for a seaplane to exhibit lights or shapes of the characteristics or in the positions prescribed in the Rules of this Part she shall exhibit lights and shapes as closely similar in characteristics and position as is possible.

PART D – SOUND AND LIGHT SIGNALS

Rule 32 – Definitions

- (a) The word “whistle” means any sound signaling appliance capable of producing the prescribed blasts and which complies with the specifications in Annex III to these Regulations.
- (b) The term “short blast” means a blast of about one second’s duration.
- (c) The term “prolonged blast” means a blast from four to six seconds’ duration.

Rule 33 – Equipment for Sound Signals

- (a) A vessel of 12 m or more in length shall be provided with a whistle and a bell and a vessel of 100 m or more in length shall, in addition be provided with a gong, the tone and sound of which cannot be confused with that of the bell. The whistle, bell and gong shall comply with the specifications in Annex III to these Regulations. The bell or gong or both may be replaced by other equipment having the same respective sound characteristics, provided that manual sounding of the prescribed signals shall always be possible.
- (b) A vessel of less than 12 m in length shall not be obliged to carry the sound signaling appliances prescribed in paragraph (a) of this Rule but if she does not, she shall be provided with some other means of making an efficient signal.

Rule 34 – Maneuvering and Warning Signals

- (a) When vessels are in sight of one another, a power-driven vessel under way, when maneuvering as authorized or required by these Rules, shall indicate that maneuver by the following signals on her whistle:
 - One short blast to mean “I am altering my course to starboard”
 - Two short blasts to mean “I am altering my course to port”
 - Three short blasts to mean “I am operating astern propulsion.”
- (b) Any vessel may supplement the whistle signals prescribed in paragraph (a) of this Rule by light signals, repeated as appropriate, whilst the maneuver is being carried out:
 - (i) These signals shall have the following significance:
 - One flash to mean “I am altering my course to starboard”
 - Two flashes to mean “I am altering my course to port”
 - Three flashes to mean “I am operating astern propulsion.”

- (ii) The duration of each flash shall be about one second, the interval between flashes shall be about 1 second, and the interval between successive signals shall not be less than 10 seconds.
 - (iii) The light used for this signal shall, if fitted, be an all-round white light, visible at a minimum range of 5 mi, and shall comply with the provisions of Annex I to these Regulations.
- (c) When in sight of one another in a narrow channel or fairway:
- (i) A vessel intending to overtake another shall in compliance with Rule 9 (e)(i) indicate her intention by the following signals on her whistle.
 - Two prolonged blasts followed by one short blast to mean “I intend to overtake you on your starboard side”
 - Two prolonged blasts followed by two short blasts to mean “I intend to overtake you on your port side”
 - (ii) The vessel about to be overtaken when acting in accordance with 9(e)(i) shall indicate her agreement by the following signal on her whistle:
 - One prolonged, one short, one prolonged and one short blast, in that order.
- (d) When vessels in sight of one another are approaching each other and from any cause either vessel fails to understand the intentions or actions of the other, or is in doubt whether sufficient action is being taken by the other to avoid collision, the vessel in doubt shall immediately indicate such doubt by giving at least five short and rapid blasts on the whistle. Such signal may be supplemented by at least five short and rapid flashes.
- (e) A vessel nearing a bend or an area of a channel or fairway where other vessels may be obscured by an intervening obstruction shall sound one prolonged blast. Such signal shall be answered with a prolonged blast by any approaching vessel that may be within hearing around the bend or behind the intervening obstruction.
- (f) If whistles are fitted on a vessel at a distance apart of more than 100 m, one whistle only shall be used for giving maneuvering and warning signals.

Rule 35 – Sound Signals in Restricted Visibility

In or near an area of restricted visibility, whether by day or night the signals prescribed in this Rule shall be used as follows:

- (a) A power-driven vessel making way through the water shall sound at intervals of not more than 2 minutes one prolonged blast.
- (b) A power-driven vessel underway but stopped and making no way through the water shall sound at intervals of no more than 2 minutes two prolonged blasts in succession with an interval of about 2 seconds between them.

- (c) A vessel not under command, a vessel restricted in her ability to maneuver, a vessel constrained by her draft, a sailing vessel, a vessel engaged in fishing and a vessel engaged in towing or pushing another vessel shall, instead of the signals prescribed in paragraph (a) or (b) of this Rule, sound at intervals of not more than 2 minutes three blasts in succession, namely one prolonged followed by two short blasts.
- (d) A vessel engaged in fishing, when at anchor, and a vessel restricted in her ability to maneuver when carrying out her work at anchor, shall instead of the signals prescribed in paragraph (g) of this Rule sound the signal prescribed in paragraph (c) of this Rule.
- (e) A vessel towed or if more than one vessel is being towed the last vessel of the tow, if manned, shall at intervals of not more than 2 minutes sound four blasts in succession, namely one prolonged followed by three short blasts. When practicable, this signal shall be made immediately after the signal made by the towing vessel.
- (f) When a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and shall give the signals prescribed in paragraphs (a) or (b) of this Rule.
- (g) A vessel at anchor shall at intervals of not more than 1 minute ring the bell rapidly for ten seconds. In a vessel 100 m or more in length the bell shall be sounded in the forepart of the vessel and immediately after the ringing of the bell the gong shall be sounded rapidly for about 5 seconds in the after part of the vessel. A vessel at anchor may in addition sound three blasts in succession, namely one short, one long and one short blast, to give warning of her position and of the possibility of collision to an approaching vessel.
- (h) A vessel aground shall give the bell signal and if required the gong signal prescribed in paragraph (g) of this Rule and shall, in addition, give three separate and distinct strokes on the bell immediately before and after the rapid ringing of the bell. A vessel aground may in addition sound an appropriate whistle signal.
- (i) A vessel of less than 12 m in length shall not be obliged to give the above mentioned signals but, if she does not, shall make some other efficient sound signal at intervals of not more than 2 minutes.
- (j) A pilotage vessel when engaged on pilotage duty may in addition to the signals prescribed in paragraph (a), (b) or (g) of this Rule sound an identity signal consisting of four short blasts.

Rule 36 – Signals to Attract Attention

If necessary to attract the attention of another vessel, any vessel may make light or sound signals that cannot be mistaken for any signal authorized elsewhere in these Rules, or may direct the beam of her searchlight in the direction of the danger, in such a way as not to embarrass any vessel. Any light to attract the attention of another vessel shall be such that it cannot be mistaken for any aid to navigation. For the purpose of this Rule the use of high intensity intermittent or revolving lights, such as strobe lights, shall be avoided.

Rule 37 – Distress Signals

When a vessel is in distress and requires assistance, she shall use or exhibit the signals described in Annex IV to these Regulations.

PART E – EXEMPTIONS

Rule 38 – Exemptions

Any vessel (or class of vessel) provided that she complies with the requirements of the International Regulations for the Preventing of Collisions at Sea, 1960, the keel of which is laid or is at a corresponding stage of construction before the entry into force of these Regulations may be exempted from compliance therewith as follows:

- (a) The installation of lights with ranges prescribed in Rule 22, until 4 years after the date of entry into force of these regulations.
- (b) The installation of lights with color specifications as prescribed in Section 7 of Annex I to these Regulations, until 4 years after the entry into force of these Regulations.
- (c) The repositioning of lights as a result of conversion from Imperial to metric units and rounding off measurement figures, permanent exemption.
- (d)
 - (i) The repositioning of masthead lights on vessels of less than 150 m in length, resulting from the prescriptions of Section 3 (a) of Annex I to these regulations, permanent exemption.
 - (ii) The repositioning of masthead lights on vessels of 150 m or more in length, resulting from the prescriptions of Section 3 (a) of Annex I to these regulations, until 9 years after the date of entry into force of these Regulations.
- (e) The repositioning of masthead lights resulting from the prescriptions of Section 2(b) of Annex I to these Regulations, until 9 years after the date of entry into force of these Regulations.
- (f) The repositioning of sidelights resulting from the prescriptions of Section 2(g) and 3(b) of Annex I to these Regulations, until 9 years after the date of entry into force of these Regulations.
- (g) The requirements for sound signal appliances prescribed in Annex II to these Regulations, until 9 years after the date of entry into force of these Regulations.
- (h) The repositioning of all-round lights resulting from the prescription of Section 9(b) of Annex I to these Regulations, permanent exemption.

Appendix C

Electrofishing Field Manual

C.1 Checklist for Electrofishing Safety and Health Audit

This page intentionally left blank

1. INTRODUCTION

This Electrofishing Field Manual describes basic concepts and safety issues of electrofishing systems. The information in this document should also increase an understanding of how the systems work and how to properly operate them to increase their effectiveness and reduce unnecessary harm to fish.

2. BASIC CONCEPTS

2.1 ELECTROFISHING

In many cases, electrofishing is the most effective means of collecting fish for scientific purposes. Electrical current is placed in the water to immobilize fish, allowing them to be collected with dipnets. It involves the use of either alternating current (AC) or direct current (DC) to immobilize fish for capture. These two types of current have very different effects on fish. The choice of current to use is dependent on the type of study being performed and the importance of returning healthy fish to the water.

2.2 ALTERNATING AND DIRECT CURRENT

AC current typically has the most violent effect on fish. Once in the electrical field, a fish will immediately “take a posture transverse to the current in such a way as to receive a minimum of voltage” (Coffelt Electronics). This action is called **oscillotaxis**. Fish will be immobilized quickly and the effect will last longer than that of DC current. Great care must be taken in the collection of fish in this manner. If AC current is applied for too long of a period, the fish may not recover. Another drawback to this type of collection is that since fish usually become immobilized almost immediately when hit by the current, some may be missed because they are shocked while several feet below the surface and out of sight.

DC current, in most cases, will be the preferred method of collection. Fish react in three ways to DC current. First, they line up with the direction of the electrical current, then swim toward the anode (positive electrode). This reaction is called **galvanotaxis**. Finally, when fish near the anode, they are stunned, roll belly up, and collection becomes possible. The effects of DC current do not last as long as those of AC current. When the power is turned off, the fish recover quickly. Mortality is far more limited than with the use of AC. This, along with the fact that fish swim to the anode, makes DC current the more effective means of electrofishing.

2.3 CONTROL BOX

AC or DC current can be selected with electrofishing control boxes. In addition to controlling the type of current, a control box allows adjustments to how the current acts. Most equipment will allow you to select for standard or pulsed output and to vary the pulse width and frequency of pulses, which allows for more efficient collections and limits the risk and stress to fish.

The control box also allows selection of voltage output. Depending on the electrofishing system used (i.e., Smith-Root or Coffelt), this selector should be positioned at the lowest possible setting that allows 5-10 amps to be obtained by adjusting the pulse width and rate, or a minimum of 190 volts.

Pulsed output means that the electrical current going from the system into the water comes in pulses or waves. When the pulse rate is low and the width of the field is narrow, less current is required to collect fish. This results in less stress to fish. Since conductivity of water (the ease with which an electrical

charge passes through it) varies, it is necessary to have the ability to adjust the pulse rate and width for optimum collection with minimum harm to the fish being collected.

2.4 CONDUCTIVITY

Electrofishing works by passing electrical current through a fish's body causing the effects described above. Several factors affect the amount of current passing through the fish's body and, thus, the effectiveness of electrofishing. If the conductivity of the fish's body is equal to or slightly above the conductivity of the surrounding water, the electricity will choose the path of least resistance and pass through the fish. The greater the conductivity of the fish's body in relation to the surrounding water, the greater the effect of the electricity on the fish. The conductivity of fish flesh differs among species. When shocking, you may observe catfish floating up as far as 50 feet from the anode. At the same time, scaled fish may not succumb to the current until they pass within a few feet of the anode. Due to increased surface area, larger fish, particularly large and deep-bodied fish, tend to receive a larger charge of electricity than do smaller fish.

Another factor that influences the effectiveness of electroshocking is the conductivity of the water. Pure distilled water will act as an insulator in an electrical current. This is because there are few electrolytes or dissolved solids to conduct the electricity. It would take a great deal of current to pass through this type of water. Conversely, the water of a typical lake or river may be very high in dissolved solids. This water will readily conduct very low amounts of current. In all cases, the conductivity of the water must be equal to or below the conductivity of the fish's body for electrofishing to be effective. It is not effective to shock in salt water because it is an electrolyte solution. The conductivity of the water is so much higher than that of a fish that an electrical current will find that the path of least resistance is around the fish rather than through it.

Conductivity of the water being surveyed should always be checked before attempting electrofishing. If it is very low (<50 microsiemens per centimeter [$\mu\text{S}/\text{cm}$]) or extremely high (>4,500 $\mu\text{S}/\text{cm}$), a different type of collection should be considered. When backpack, pram (tow barge), or long line (bank unit) shocking small streams, it may be possible to increase the conductivity of the water by placing a block of salt upstream of the study area several hours before beginning the survey. This, however, should only be considered in controlled conditions.

2.5 TYPES OF EQUIPMENT

There are several types of electrofishing equipment available. EA typically uses boat, backpack, pram, or long line units. These units differ in the type of power source used and in their application.

Boat electrofishing is utilized where water depths and characteristics make maneuvering the boat possible. EA primarily uses this type of electroshocking in lakes, reservoirs, and navigable rivers. Boat electrofishing usually involves the use of a large generator (i.e., 5,000 watt+) as an electrical power source. The generator sends electricity through a control box, which allows the operator to adjust the type of electrical current being placed in the water.

Pram, long line, and backpack electrofishing are designed for use in areas where boat electrofishing may not be possible or practical. Backpack units consist of a power source (a small generator or battery) and a control box mounted on a backpack frame. A hand-held positive electrode (anode) and trail behind negative electrode (cathode) are utilized by the operator to place electrical current in the water. The user is protected from the current by rubber waders and electrical gloves.

Pram shocking involves the use of a power source and electroshocking unit placed in a barge or small boat. Like backpack electrofishing, the operator utilizes a hand-held anode and trail behind cathode to place current in the water. The methods differ in that the operator is not required to carry the power source.

Long line electrofishing involves the use of a power source and electroshocking unit deployed on the bank. Like the other wadeable methods, the operator utilizes a hand-held anode. However, the cathode is stationary, typically deployed in the middle of an electrofishing zone near the control box and power source, to place current in the water. As with the pram unit, the operator is not required to carry the power source and control box. Cables up to 100 meters long allow mobility over a large section of water.

In all types of electrofishing, current is passed through the water between a positive electrode (anode) and a negative electrode (cathode). EA typically uses a boom-mounted anode and the boat hull as a cathode when boat electrofishing. You may, however, see different arrangements. In backpack electrofishing, the anode is a hand-held probe or dipnet and the cathode is a trail behind cable. In pram shocking, the cathode may be the hull of either the barge or boat carrying the equipment; and, in long line shocking, the cathode is a cable or plate deployed from a bank-mounted power source.

2.6 EQUIPMENT OPERATION

A typical boat shocking survey would be comprised of two or three team members. The team leader or an experienced technician will operate the boat and shocking system while the other crew member(s) will stand at a bow-mounted railing and collect fish with properly insulated dipnets. Either the operator or the netter will operate a foot switch that will immediately cut the power output if released. This is a very important safety feature and no electroshocking boat should be operated without a safety switch.

Backpack, pram, and long line shocking are slightly more hazardous than boat shocking because of the user's position in the water with the electrical charge. Field training sessions should be completed with an experienced wadeable electrofishing operator before attempting this technique. Basically, a wadeable system is a miniaturized version of the boat electrofishing system. At least two operators are required for backpack and pram electrofishing while three operators are preferable when using the long line method. For backpack and pram shocking, the operator handles the anode, which consists of a probe or a combination of probe and dipnet, depending on conditions. The second person monitors the equipment while assisting with the collection, transfer, and care of fish. For long line electrofishing, a third person typically maintains the cable and manages the live car.

The operator wades in an upstream direction through the water sweeping the anode 2-3 feet ahead. A thumb switch on the handle of the probe serves the same safety function as the foot switch on the boat. With a net probe, when a fish is shocked, the operator collects it with the dipnet, releases (i.e., turns off) the switch on the handle, and places the fish in a bucket, live-well, or live car. If the anode is not operated with an attached net, the second person will closely follow the operator and anode with a dipnet to collect fish. When pram shocking, special attention should be paid by all crew members to the size of the electrical field. If the cathode is mounted on a barge, boat, or bank, the electrical field will reach from that point to the anode held by the operator. When backpack shocking, this field is concentrated only around two probes.

3. SAFETY

3.1 SAFETY AWARENESS

When performed by trained field crews, with well-maintained equipment, electrofishing can be a very safe means to collect fish for biological study. Nonetheless, attention to safety must be paramount for all crew members in order to conduct a successful electrofishing survey. The amount of current in the water may be in excess of 250 volts. The amount of amperage generated during typical shocking operations averages 8 amps. This is enough to **kill** you if you come in direct skin contact with an electrical source such as a cathode, anode, or improperly grounded boat or generator. This hazard is compounded by the fact that the boat and other equipment may be wet.

3.2 HAZARD AWARENESS

Various physical hazards will potentially be present during electrofishing activities. These physical hazards may include, but not be limited to:

- Working over, near, or in the water
- Slip, trip, and fall
- Weather
- Material handling, moving, lifting
- Fire/explosion
- Exposure (e.g., cold stress, heat stress, sun burn)
- Noise
- Electrical
- Biological (e.g., fish spine puncture wounds, poisonous insects, and plants).

3.3 SAFETY RULES

Always follow the manufacturer's instructions when installing or operating electrical equipment. It is each crew leader's responsibility to familiarize crew members with the equipment and how to operate it. Furthermore, it is the responsibility of each crew member to assure that others are following proper procedures. If you are asked to do something that you feel is improper or unsafe, you have the authority to refuse. Don't depend on someone else to look out for you. Look out for yourself.

Despite all of this, as mentioned above, electroshocking surveys can be conducted in a safe manner. All that is required is proper attention to detail and the use of the safety equipment provided to you.

The following are the primary common sense rules that **must** be followed by all crew members at all times:

1. Prior to initiating a survey, the crew leader will conduct a safety briefing to instruct support personnel on basic operation, safety, and hazard awareness. Prior to electrofishing at a given site, the crew will survey the study zone for potential hazards.
2. Wear rubber gloves when operating/touching electroshocking equipment.
3. Rubber boots will be worn when boat electrofishing and non-breathable chest waders will be worn by all crew members for wadeable electrofishing.

4. When conducting wadeable electrofishing, all equipment in the water (e.g., nets, live cars, live wells, buckets) must be non-conductive, insulated, and/or isolated.
5. Due to the conductive nature and added weight, steel-toed boots and/or weight belts must never be worn while electrofishing.
6. Lug-soled boots are appropriate when wading in soft and or fine substrates (e.g., silt, much, gravel, cobble). However, large and firm substrates (e.g., bedrock, boulder, large cobble) may be especially slippery and may require felt-soled wading boots or corkers to safely wade.
7. Never touch a loose wire or make an adjustment while the unit is in operation. Rubber gloves must be worn, safety switches must be released, and the control box turned off before making any output adjustments. For all other system adjustments, beyond source, output, and other fine tuning at the control box, the power source and system must be shut down, completely.
8. Always use safety switches. Never disable a safety switch or use equipment with an inoperable safety switch.
9. Never over-extend yourself when netting fish.
10. When wading, walk deliberately and carefully with a shuffling, wide stance to avoid unseen trip hazards.
11. Communicate hazards to boat operator or fellow wading crew members. Each crew member has limits to their view. Don't assume everyone sees what you see. If noise level restricts normal conversation, establish hand signals.
12. Never place your bare hand in the water.
13. Keep the boat deck as dry and clear of obstacles as possible.
14. Look up from the water from time to time to assure that overhanging branches or other items do not pose a risk.
15. If necessary, particularly for boat or pram operated equipment, wear hearing protection.
16. Maintain the equipment through routine maintenance checks. If repairs are needed, get them fixed immediately. Don't wait for the next person to do it.
17. For boat electrofishing, a personal floatation device (PFD) must be worn by all crew members at all times when dockside or aboard the vessel. PFDs are not recommended for wadeable electrofishing in water primarily less than waist deep as they restrict movement and, in certain conditions, may contribute to heat stress. In doing so, PFDs with wadeable electrofishing present a greater hazard than wading without a PFD. Waters greater than waist deep should be boat electrofished.

18. In cold weather, dress warmly in layers of reasonably tight-fitting materials. Additional protections may include glove liners, hats, and hand and foot warmers. For warm weather, light colored and light weight fabrics should be worn. Hydrate constantly and use sunscreen to protect from sun burn.

Appendix C.1

Checklist for Electrofishing Safety and Health Audit

This page intentionally left blank

APPENDIX C.1

**CHECKLIST FOR ELECTROFISHING
SAFETY AND HEALTH AUDIT**

Item	Remarks	Yes	No
Safety Equipment	• Life preservers on board for each individual		
	• Leak-free electrical insulating gloves and boots available for each individual (NOTE: Gloves and boots should extend above the knees and elbows)		
	• Radio available for emergency contacts		
	• Radio properly charged		
	• First aid kit in boat		
	• Burn Jel bandages available in first aid kit		
	• Personnel trained in first aid/cardiopulmonary resuscitation		
	• Fire extinguisher in boat (Type ABC 5 pounds)		
	• Emergency air horn on board		
	• Funnel available for adding gasoline to generate or pump (NOTE: Gasoline should not be added to a hot motor)		
• Polarized sun glasses			
Boat Safety	Lights available and working for night-time fishing		
	Boat equipped with an anchor		
	Boat in good repair free from sharp edges and weak or broken areas		
	Fuel tanks positioned a safe distance from the generator and battery (NOTE: Gasoline vapor cannot be allowed to contact hot surfaces or sparks)		
	Fuel tanks properly capped and lines leak-free		
	Generator/pump shut-off switch available to eliminate grounding the spark plug		
	Generator/pump muffler facing outside the boat and shielded to prevent contact in rough seas		
	Foot pedal “dead man” switch controlling the flow of electricity in place in bow of boat (NOTE: Device must be operating for netter[s] to control)		
	If no netter foot pedal exists, is there another means of emergency generator shut off?		
	Probes used to extend the electrodes to the water made of non-conducting material		
	Electrical connections weather-proof and water tight		
	Electrical conducting surfaces connected to create one circuit on board (NOTE: Separate circuits create “floating metal” that can cause electrocution)		
	Surfaces checked with an OHM meter prior to launching the boat		

Appendix C.1 – Checklist for Electrofishing Safety and Health Audit

Corporate Vessel Operations Manual

April 2017

Item	Remarks	Yes	No
Trailer	• Trailer frame free of significant rust and structurally sound		
	• Hitch on trailer solid and working properly with locking hasp		
	• Two safety chains present that can be properly connected to the towing vehicle hitch		
	• Training stand secured properly and can be locked in the vertical and horizontal position		
	• Trailer stand and winch handles present and working property		
	• Safety chains present to secure boat to trailer during transportation (other than winch)		
	• Winch secure and in good working order		
	• Winch cable or rope free of broken strands		
	• Winch hook a locking type		
	• Trailer tires in good shape with adequate tread		
	• Trailer wheel bearings were greased (if not sealed)		
	• Lights on trailer working properly (brake and turning indicator)		
	• Trailer brakes working properly		
Motor	• Motor bolted to boat with four bolts		
	• Motor equipped with proper handles		
	• Motor can be properly locked in the “up” or travel position		
	• Emergency motor shut-off connected to operator in case operator falls from boat		
Post-Fishing Checklist	• Generator shut off during rain		
	• Boat operated free of sudden turns or changes in direction		
	• Comments and items needed for next trip		



Standard Operating Procedure No. 035 for Small Boat Operations

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle, Suite 400
Hunt Valley, Maryland 21031

Revision: 1
December 2014

This page intentionally left blank

CONTENTS

	<u>Page</u>
1. BACKGROUND.....	1
1.1 Purpose.....	1
1.2 Scope	1
1.3 Definitions.....	1
1.4 References.....	1
1.5 Responsibilities.....	2
2. SMALL BOAT REQUIREMENTS.....	2
2.1 Work Over or Near Water.....	3
2.2 Personal Floatation Devices.....	3
2.3 Safety Emergency Drill.....	4
2.4 Float Plan	4
2.5 Emergency Plan	4
2.6 Communications	4
2.7 Ocean Requirements	4
2.8 Severe Weather Precautions	4
2.9 Cold Water and Drowning Hazards.....	5
2.10 Job Hazard Analysis	5
APPENDIX A: FLOAT PLAN	
APPENDIX B: JOB HAZARD ANALYSIS FORM	

This page intentionally left blank

1. BACKGROUND

The threat from working on or near surface water bodies comes from both chemical hazards and physical hazards such as drowning. When there is a need for sampling to be conducted using small boats, EA will provide necessary safety gear, i.e., life vests, nets, and other floating devices and appropriate training.

1.1 PURPOSE

This Standard Operating Procedure (SOP) establishes the operating requirements for small boats conducting inland and coastal marine work.

1.2 SCOPE

This SOP applies to the operation of small boats, including launches, motorboats, working platforms, and skiffs, for inland (rivers, lakes, and bays) and coastal marine work. This SOP applies to EA personnel operating a small boat or working on a subcontractor-operated small boat. This SOP covers small boat requirements, work over or near bodies of water, personal flotation devices (PFDs), lifesaving and safety skiffs, severe weather precautions, and cold water and drowning hazards. This SOP is mandatory for EA personnel. Subcontractors are responsible for analyzing the hazards of activities they control and for preparing job hazard analysis and maintaining equivalent safety requirements.

1.3 DEFINITIONS

Small Boat—Includes dinghies, 1- or 2-man rowboats, up to and including larger vessels typically up to 50 ft in length, and work barges.

Float Plan—A written summary of the details of the trip, including route, type of vessel, persons aboard, and other salient information which may be useful in the event of an emergency.

Job Hazard Analysis—A concise analysis of the specific task considering the body of water, vessel, unique job requirements, training and experience of crew, and other circumstances as may be appropriate.

1.4 REFERENCES

EA Corporate Vessel Operations Manual. 2004. December.

Federal Requirements and Safety Tips for Recreational Boats. 1994. Boating Education Branch. April.

U.S. Army Corps of Engineers. 2003. Safety and Health Requirements Manual. Volume EM 385-1-1. September.

U.S. Coast Guard. 1994. Federal Requirements and Safety Tips for Recreational Boats.

1.5 RESPONSIBILITIES

The Project Health and Safety Officer is responsible for review and approval of small boat operations as described in the Health and Safety Plan. The Project Health and Safety Officer provides any necessary safety requirements to the project team. The Project Health and Safety Officer shall review the job hazard analysis prepared by project personnel.

Onsite Health and Safety Officer—The Health and Safety Officer is responsible for ensuring proper use of small boats at field locations. The Health and Safety Officer ensures that only trained personnel operate small boats, subcontractors implement safety programs, and that all equipment is properly maintained. The Onsite Safety Officer is responsible for filing or maintaining a float plan.

Small Boat Operators—EA personnel working on small boats will follow this procedure and any applicable health and safety procedures identified in the Health and Safety Plan and the vessel rules. Small boat operators will identify any conflicts in procedures or any problems or equipment failures to the Health and Safety Officer. Small boat operators shall demonstrate training, experience, and compliance with state requirements for operator education and licensing prior to operating any vessel. For larger bodies of water, or rapidly moving water, knowledge of local conditions shall be obtained prior to embarkation.

2. SMALL BOAT REQUIREMENTS

All small boats used by EA personnel must meet the minimum requirements in the U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1 and the applicable Occupational Safety and Health Administration or state plan requirements, as well as meeting applicable U.S. Coast Guard Regulations. These requirements include the following:

- Small boats will meet the minimum floatation requirements of the U.S. Coast Guard, and must have a certification tag affixed to the hull.
- The maximum number of passengers and weight that may be safely transported must be posted on all small boats.
- The number of personnel on the small boat cannot exceed the number of Type I PFDs onboard.
- Each small boat will have sufficient room freeboard, and stability to safely carry the allowable number of personnel and cargo.

- Each motored boat measuring less than 26 ft in length will carry one 1A-10 BC fire extinguisher; motored boats measuring greater than 26 ft will carry two 1A-10 BC fire extinguishers.

Operators and occupants of small craft shall review Federal Requirements and Safety Tips for Recreational Boats (U.S. Coast Guard 1994) before engaging in work from rafts, dinghies, canoes, rowboats, or Jon boats.

2.1 WORK OVER OR NEAR WATER

Work over or near water, where the potential exists for personnel to fall in and possibly drown, will be conducted in accordance with the requirements of applicable Occupational Safety and Health Administration standards and the U.S. Army Corps of Engineers EM 385-1-1 standards. This includes work from shore, bridges, work platforms, and vessels. Work within 15 ft of unobstructed access to water is within the requirements of this section. Personnel will follow the guidelines listed below except where personnel are protected by continuous guardrails, safety belts, or nets, or are conducting work along beaches or similar shorelines:

- Personnel will use the buddy system at all times.
- Swimming is prohibited, with the following exceptions: (1) certified divers performing their duties, and (2) personnel entering water to prevent injury or loss of life.
- All personnel will wear a U.S. Coast Guard-approved PFD of the type able to support an unconscious person (Type 1 with 32-lb floatation).
- At least one Type IV throwable device (ring buoy, horseshoe buoy) will be available on the small boat. Throwable devices should be U.S. Coast Guard-approved and equipped with 150 ft of 600-lb capacity rope.
- If specified in the Health and Safety Plan, at least one person will provide a dedicated safety watch/look-out.

2.2 PERSONAL FLOATATION DEVICES

All EA personnel will wear a U.S. Coast Guard-approved, Type 1 PFD when working over or near bodies of water. PFDs should meet the following requirements:

- Before and after each use, the PFD will be inspected for defects that would alter its strength or buoyancy.
- All PFDs will be equipped with retro reflective tape.

PFDs need not be donned when working on larger craft (>26 ft) except when working over water or outside railing. PFDs should be worn at all times when working on smaller craft.

2.3 SAFETY EMERGENCY DRILL

The vessel operator shall provide a list of crew duties for normal operations and emergencies. Emergencies which shall be covered include man-overboard, vessel fire, and vessel emergency.

The vessel operator shall provide an orientation and emergency drill. An emergency drill shall be conducted at the start of each task, and monthly thereafter, or as provided for in U.S. Coast Guard regulations.

2.4 FLOAT PLAN

A float plan provides essential information to enable the U.S. Coast Guard or other emergency search and rescue teams to initiate a search in the event of personnel not reporting in on schedule. The vessel operator will file a daily float plan with the site representative and with the project health and safety representative listed in the Health and Safety Plan. Upon daily completion of on-water work, the vessel operator will check in with the designated on shore individual. The float plan is provided in Appendix A.

2.5 EMERGENCY PLAN

The emergency plan should list a main dock and an alternate dock, and provide emergency medical support contact for each location.

2.6 COMMUNICATIONS

A marine VHF radio shall be maintained onboard and in operable condition. At least one of the boat personnel shall have a mobile telephone onboard during operations.

2.7 OCEAN REQUIREMENTS

Contact the Corporate Health and Safety Officer and Project Health and Safety Officer prior to planning any work which requires work in open ocean.

2.8 SEVERE WEATHER PRECAUTIONS

During field operations involving small boats, EA personnel will make provisions for severe weather. Severe weather includes sudden and locally severe storms, high winds, hurricanes, and floods. Before beginning work over water, the Health and Safety Officer will evaluate weather reports and conditions to ascertain local weather and prevent personnel exposure to severe weather. In the event that severe weather is encountered, personnel will cease field operations and immediately return to shore.

2.9 COLD WATER AND DROWNING HAZARDS

EA personnel conducting field operations with a small boat may be exposed to cold water and drowning hazards. When water temperature is below 45°F, hypothermia is a serious hazard. A person can lose feeling in extremities within 5 minutes. Under no circumstances will EA personnel enter the water from a small boat unless conducting diving operations or performing a rescue.

Symptoms of hypothermia are discussed during standard first aid training and in the EA Health and Safety Program Plan. If a person who has fallen into the water displays symptoms of hypothermia, he or she should be treated immediately and the field operations canceled. Under no circumstances should the victim be given hot liquids, since they can accelerate shock. Drinks no warmer than body temperature are acceptable. If symptoms are severe and rapid evacuation is not possible, remove the victim's wet clothing and cover the victim with a blanket. Continue to treat the victim for shock.

When a high risk of cold water and drowning hazards exists, all field staff members should be familiar with cold water survival techniques. If a team member falls into the water, he or she should not remove any clothing in the water because all clothing will provide insulation. Although clothing creates added drag while swimming, the added insulation of the clothing outweighs the disadvantage of the additional drag.

If a team member falls into the water, another team member should try to reach the person in the water with an oar, paddle, pole, or similar object. The victim should try to grab the extended item. If the victim is unconscious, the rescuer should try to hook the victim's PFD, clothing, or hair and pull him or her toward the boat. Once the victim is retrieved, the other team members should begin any necessary emergency medical procedures. If no emergency medical procedures are necessary, the victim should change into dry clothing.

2.10 JOB HAZARD ANALYSIS

The requirements for preparing a job hazard analysis apply specifically to all on-water operations. Appendix B provides a sample job hazard analysis; however, an actual job hazard analysis shall consider the specific task including the body of water, vessel type, unique job requirements, training and experience of crew, and other circumstances such as tides, weather, water temperature, access of rescue craft, and other factors as may be appropriate. Job hazard analysis must be prepared specifically for each task and crew in accordance with the U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1.

This page intentionally left blank

Appendix A

Float Plan

This page intentionally left blank

APPENDIX A

FLOAT PLAN

- 1 Name and phone number of person filing plan.
- 2 Description of boat (type, color, trim, registration number, length, name, make, other).
- 3 Engine type (horsepower, fuel capacity, number of engines, and fuel [diesel or gasoline]).
4. Survival—Equipment onboard (check):
 - Anchor
 - Flares
 - Flashlight
 - Food
 - Life ring with 150 ft of line.
 - Paddles
 - PFDs
 - Smoke signals
 - Water.
5. Marine Radio onboard (type, frequencies):
6. Automobile (tag number, type, color, make, trailer tag number, where parked)
7. Persons aboard (name, affiliation, and telephone number)
8. Do any of the persons aboard have a medical problem (identify type)
9. Trip plan (depart from @ time, arrive to @ time; via waypoints; expect to return no later than time)
10. Operational area (attach map)
11. If not returned by (a.m./p.m. time), call the U.S. Coast Guard or onshore contact.
12. Onshore contact:

Alternate Other Numbers

Contact	Number

This page intentionally left blank

Appendix B

Job Hazard Analysis Form

This page intentionally left blank

APPENDIX B

JOB HAZARD ANALYSIS FORM

Activity Hazard Analysis		
Task	Potential Hazards	Hazard Control Measures
MOBILIZATION/ DEMOBILIZATION	Physical Hazards (slips, trips, falls, cuts, etc.)	<ul style="list-style-type: none"> • Clear walkways/work areas of equipment, tools, and debris. • Watch for accumulation of water work surfaces. • Mark, identify, or barricade obstructions. • Wear cut-resistant work gloves when the possibility of lacerations or other injury caused by sharp or protruding objects occurs.
	Physical Hazards (material handling moving, lifting)	<ul style="list-style-type: none"> • Observe proper lifting techniques. • Obey sensible lifting limits (60-lb maximum per person manual lifting). • Use mechanical lifting equipment (hand carts, trucks, etc.) to move large awkward loads. • Use two or more persons for heaving bulk lifting.
	Physical Hazards (vehicle and pedestrian traffic)	<ul style="list-style-type: none"> • Use orange traffic cones where necessary. • Use reflective warning vests if exposed to vehicular traffic. • Locate staging areas in locations with minimal traffic.
	Physical Hazards (cold/heat stress)	<ul style="list-style-type: none"> • Monitor cold/heat stress as recommended in Section 6 of the Generic Health and Safety Plan.
	Munitions and Explosives of Concern (MEC) Hazard	<ul style="list-style-type: none"> • Practice site reconnaissance with a trained, experienced MEC specialist capable of recognizing MEC hazards. • If MEC is discovered, use existing access roads to retract from the MEC.
	Biological Hazards (insects, poisonous plants, ticks)	<ul style="list-style-type: none"> • Wear protective outer clothing and insect repellent to avoid insect bites and ticks. • Wear long sleeve shirts when working in areas with poison ivy or oak. • Workers with allergies should carry antidote kits, if necessary.
SAMPLING ACTIVITIES	Physical Hazards (slips, trips, falls, cuts, etc.)	<ul style="list-style-type: none"> • Clear walkways/work areas of equipment, tools, and debris. • Watch for accumulation of water work surfaces. • Mark, identify, or barricade obstructions. • Wear cut-resistant work gloves when the possibility of lacerations or other injury caused by sharp or protruding objects occurs.
	Physical Hazards (electrical)	<ul style="list-style-type: none"> • Identify electrical utility hazards prior to sampling. • Inspect work areas for spark sources, maintain safe distances, properly illuminate work areas, and provide barriers to prevent inadvertent contact. • Maintain minimum clearance distances for overhead energized electrical lines as specified in the Generic Health and Safety Plan.
	Physical Hazards (weather)	<ul style="list-style-type: none"> • Monitor radio for up-to-date severe weather forecasts. • Discontinue work during thunderstorms and severe weather events.
	Physical Hazards (vehicle and pedestrian traffic)	<ul style="list-style-type: none"> • Establish an exclusion zone around the drilling location. • Use orange traffic cones (if necessary). • Use reflective warning vests if exposed to vehicular traffic. • Locate staging areas in locations with minimal traffic.

Activity Hazard Analysis		
Task	Potential Hazards	Hazard Control Measures
SAMPLING ACTIVITIES (continued)	Physical Hazards (cold/heat stress)	<ul style="list-style-type: none"> Monitor cold/heat stress as recommended in Section 6 of the Generic Health and Safety Plan.
	MEC Hazards	<ul style="list-style-type: none"> Follow established MEC avoidance protocols when performing intrusive sampling activities. If MEC is discovered or suspected, use existing access roads to retract from the MEC.
	Chemical Hazards (including MEC)	<ul style="list-style-type: none"> Perform environmental monitoring as required in the Site-Specific Health and Safety Plan. Where appropriate, personal protective equipment as indicated in the Site-Specific Health and Safety Plan.
	Biological Hazards (bloodborne pathogens)	<ul style="list-style-type: none"> Wear proper personal protective equipment, including nitrile gloves and a face shield or goggles when sampling sludge. Wash with soap and water as soon as personal protective equipment is removed or when contact or exposure has occurred.
	Biological Hazards (insects, poisonous plants, and ticks)	<ul style="list-style-type: none"> Wear protective outer clothing and insect repellent to avoid insect bites and ticks. Wear long sleeve shirts when working in areas with poison ivy or oak. Worker with allergies should carry antidote kits, if necessary.
BOATING ACTIVITIES	Physical Hazards (weather)	<ul style="list-style-type: none"> Monitor radio for up-to-date severe weather forecasts. Boat operators will be trained by the site supervisor and/or the senior boat operator. Discontinue work during thunderstorms and severe weather events.
	Physical Hazard (slips, trips, and falls, including falls overboard)	<ul style="list-style-type: none"> Boat operator will inspect the boat prior to operation. The operator will ensure the number of personal floatation devices is equal to or greater than the number of passengers onboard. No personnel will embark or disembark the vessel without the direction of the vessel operator. Vessel operator will ensure passengers are wearing personal floatation devices while on deck. At the request of the operator, personnel will be seated. Passengers will stay seated until boat is docked. Ensure three-point contact whenever possible or practical. A Type IV throwable device will be readily available onboard.

Appendix G

Site Management Forms

This page left intentionally blank

SITE-WIDE INSPECTION

Date: _____

Dzus Fastener Company Inc. Site (152033)		Temperature: (°F)		(am)		(pm)
Site Owner: _____		Wind Direction/Speed:		(am)		(pm)
Current Site Use:						
		Weather:	(am)			
			(pm)			
		Arrival Time		(am)		
		Departure Time		(pm)		
		Inspection conducted by:				

Site Appearance and Condition

Is there evidence of vandalism or unauthorized entry?

Is there evidence of erosion or digging?

Is there evidence of illegal disposal? Is there uncontrolled vegetative growth?

Additional Comments:

Asphalt Cap (OU1)

Are there any visible cracks in the asphalt surface? Is there damage to the asphalt surface?

Is there evidence of uneven settling or ponding of water?

Additional Comments:

Willetts Creek Corridor

Site Appearance: Is there evidence of vandalism? Is there any damage to the fence? Are there any signs of erosion, digging, or disposal?

Vegetation and Wildlife: Are there any signs of inadequate coverage in the grassy areas? Does any of the vegetation look stressed or withered? Is there any evidence of invasive species? Are there any signs of ground-burrowing animals, insects, or nests?

Drainage Pipes: Is there any evidence of damage to drainage pipes or outfall areas? Is there any debris, buildup, or obstructions in the drainage pipes? Is there any overgrown or unwanted vegetation in the outfall areas? Are there any signs of erosion around the outfall areas?

Additional Comments:

Lake Capri Southern Shoreline

Site Appearance: Are there any signs of erosion or digging in the bank along Montauk Highway? Is the vegetation on the bank stressed or withered?

Additional Comments:

Operable Unit 5 (only after major storm event)

Inspection: conduct a visual inspection of areas inundated by major storm surge. If sediment been deposited on the floodplain, document extents. Are there any areas of erosion or scour? Have any bulkheads been compromised?

Additional comments:

Appendix H

Permits and/or Permit Equivalent and Mitigation Plan

This page left intentionally blank



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NEW YORK DISTRICT
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK NEW YORK 10278-0090

MAR 26 2019

REGULATORY BRANCH

SUBJECT: Permit File Number NAN-2018-01009-EME by the New York State Department of Environmental Conservation (NYSDEC) for activities associated with site remediation in Willets Creek and Lake Capri, in the Town of West Islip, Suffolk County, New York.

1. PERMITTEE:

New York State Department of Environmental Conservation
Attn: Sarah Saucier
625 Broadway Street
Albany, NY 12233
(518) 402-9675

2. On July 25, 2018, the New York District of the U.S. Army Corps of Engineers received a request for Department of the Army authorization for the following work:

Remediation of a former industrial site, including Operable Units 3 (OU3) and 4 (OU4), in order to remove cadmium and chromium contaminated sediment and soil, under the direction of the New York State Department of Environmental Conservation. The overall project work would remove up to a total of 12,200 cubic yards of contaminated material from approximately six-acres of Willets Creek, and adjacent wetlands, and up to 18,400 cubic yards of material from approximately eight-acres of Lake Capri and adjacent wetlands. The depth of sediment to be removed is an average of 30-inches. During the soil excavation work, Willets Creek would be temporarily diverted using pumps. Dredged material would be dewatered in a contained, upland location near the project area, stabilized, and transported to a DEC-approved off-site disposal area. Impacts to waters of the United States resulting from the excavation include a total of approximately 8.63-acres, including 1.05-acres of wetland, 4,128-linear feet of stream in Willets Creek, and 7.58-acres of open water in Lake Capri.

Under Nationwide Permit No. 38 (CLEANUP OF HAZARDOUS AND TOXIC WASTE), re-establish the stream channel and wetlands permanently impacted by the remediation work. Upon completion of the removal of contaminated material, approximately 10,500 cubic yards of certified clean material will be imported from a commercial source and placed below the Ordinary High Water (OHW) in order to facilitate re-establishment of 4,128-linear feet of Willets Creek and 0.6-acre of forested wetland. The project would result in temporary impacts to 1.05-acres of wetland and 4,128-linear feet of stream, and the permanent loss of approximately 0.45-acres of wetland, including 0.09-acre of

SUBJECT: Permit File Number NAN-2018-01009-EME by the New York State Department of Environmental Conservation (NYSDEC) for activities associated with site remediation in Willets Creek and Lake Capri, in the Town of West Islip, Suffolk County, New York.

- 2 -

forested wetland and 0.36-acre of emergent wetland.

The project is located in Willets Creek/Lake Capri, tributary of Great South Bay, at the former Dzus Fastener Company site at 425 Union Boulevard, in the Town of West Islip, Suffolk County, New York.

3. The specific applicant-provided details are as shown on the attached permit drawings, titled "Dzus Fastener Company, Inc. Restoration and Remediation of Willets Creek and Lake Capri", dated January 2019 and December 2018, prepared by EA Engineering, Science, and Technology, Inc. PBC, and "Dzus Fastener Company, Inc. (152033) Operable Unit 3-Willets Creek Area, Operable Unit 4-Lake Capri, Phase II Non-Tidal Wetland/Waterways Mitigation Plan, West Islip, New York", dated March 2019, prepared by EA Engineering, P.C and its affiliate EA Science, and Technology.

4. This determination covers only the work described in the submitted material. Any major changes in the project may require additional authorizations from the New York District of the U.S. Army Corps of Engineers.

5. Based on the information submitted to this office and accomplishment of any required notification in accordance with the applicable federal requirements, our review of the subject work indicates that an individual Department of the Army permit is not required. **It appears that the activities within the jurisdiction of this office could be accomplished under Department of the Army Nationwide General Permit No. 38 (CLEANUP OF HAZARDOUS AND TOXIC WASTE), in accordance with Section 404 of the Clean Water Act (33 U.S.C. 1344).** The nationwide permits are prescribed at Reissuance of Nationwide Permits in the Federal Register dated January 6, 2017 (82 FR 1860). The subject work may be performed without further authorization from this office provided it complies with Sections B through C for NWP Number 38 (CLEANUP OF HAZARDOUS AND TOXIC WASTE); New York District regional conditions; the following work-specific Special Conditions listed below; and any applicable regional conditions added by the State of New York.

6. Other than the work-specific Special Conditions listed below, the 2017 nationwide general permits in the State of New York, including their final regional conditions, water quality certifications, and coastal zone concurrence statements are available at:

www.nan.usace.army.mil/Portals/37/docs/regulatory/publicnotices/Regional%20Gen%20Permit/PN-RB%20NAN%20FinalRegionalConditionsWQC%20CZMforNYdated%2021-MAR-2017.pdf

If you require a specific paper copy, please contact our Regulator-of-the-Day at 917-790-

SUBJECT: Permit File Number NAN-2018-01009-EME by the New York State Department of Environmental Conservation (NYSDEC) for activities associated with site remediation in Willets Creek and Lake Capri, in the Town of West Islip, Suffolk County, New York.

- 3 -

8511 to request one be mailed to you. Please be sure to have the above eighteen-character file number readily available when you call.

7. Work-specific Special Conditions:

- (A) The permittee shall sign and submit the attached compliance certification form to this office within 30 days of COMPLETION of the regulated activity authorized by this permit and any mitigation work required by Special Conditions of this DA authorization.
- (B) The permittee shall not remove any trees >3-inches diameter (at breast height) between June 1st and July 31st of any year in order to avoid impacts to summer habitat for the ESA-listed Northern long-eared bat.
- (C) The permittee shall undertake the authorized filling activities in a manner aimed at reducing impacts upon the general environment. In addition, the permittee shall not stockpile fill or other materials in a manner conducive to erosion, or in areas likely to cause high turbidity runoff during storm events. All exposed soils shall be re-vegetated in a timely manner to further reduce potential effects. The permittee shall also fence off all wetlands and other sensitive ecological areas during construction periods to prevent equipment and personnel from entering these areas.
- (D) The permittee shall ensure that all synthetic erosion control features (e.g., silt fencing, netting, mats), which are intended for temporary use during construction, are completely removed and properly disposed of after their initial purpose has been served. Only natural fiber materials, which will degrade after time, may be used as permanent measures, or if used temporarily, may be abandoned in place.
- (E) The permittee shall mitigate impacts to waters through site restoration, including successful re-establishment of 0.6-acre of forested wetlands and 4,128-linear feet of Willets Creek within the project area, as described and depicted on the attached permit drawings and in the report "Dzus Fastener Company, Inc. (152033) Operable Unit 3-Willets Creek Area, Operable Unit

SUBJECT: Permit File Number NAN-2018-01009-EME by the New York State Department of Environmental Conservation (NYSDEC) for activities associated with site remediation in Willets Creek and Lake Capri, in the Town of West Islip, Suffolk County, New York.

- 4 -

4-Lake Capri, Phase II Non-Tidal Wetland/Waterways Mitigation Plan, West Islip, New York”, dated March 2019, prepared by EA Engineering, P.C and Its Affiliate EA Science, and Technology, Inc. The permittee shall ensure that the newly established wetlands meet the federal wetland technical guidance and indicators outlined in the following documents (or current versions): U.S. Army Corps of Engineers. 2011. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0), ed. J.S. Wakeley, R.W. Lichvar, C.V. Noble, and J.F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center; and Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

- (F) The permittee shall ensure that all proposed wetland and stream mitigation plantings have an eighty-five (85) percent survival rate and all established wetland areas in conjunction with the compensatory mitigation shall have an eighty-five (85) percent coverage of hydrophytic plants (those with a regional indicator status of FAC, FACW, or OBL as outlined in the document, Lichvar, R.W. 2012. The National Wetland Plant List. ERDC/CRREL TR-12-11. Hanover, NH: U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory).
- (G) The permittee shall ensure that the vegetation in the newly established wetlands and within the stream mitigation areas do not consist of more than a total of 5% areal coverage of common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), Japanese knotweed (*Polygonum cuspidatum*), Tartarian honeysuckle (*Lonicera tatarica*), Eurasian water-milfoil (*Myriophyllum spicata*), and/or other invasive species.
- (H) The permittee shall provide to this office annual reports, in hard copy, on the status of the wetland mitigation activities no later than October 31 of each year over a 5-year period. If this office determines that the success criteria outlined in Special Conditions (E) through (G) above has not been met for at least three

SUBJECT: Permit File Number NAN-2018-01009-EME by the New York State Department of Environmental Conservation (NYSDEC) for activities associated with site remediation in Willets Creek and Lake Capri, in the Town of West Islip, Suffolk County, New York.

- 5 -

consecutive years, this period will be extended and the permittee shall continue to submit monitoring reports every year until this office determines that the success criteria has been met for three consecutive years. Your responsibility to complete the required mitigation as set forth in Special Conditions (E) through (G) will not be considered fulfilled until you have demonstrated compensatory mitigation project success and have received written verification of that success from this office. These reports shall include the following at a minimum:

1. A list of dominant plant species, along with their estimated relative frequency and percent aerial cover, shall be identified by using plots measuring 10 feet by 10 feet with at least one representative plot located in each of the cover types within the mitigation site. The location of each plot shall be identified on the plan view engineering drawing;
2. Vegetation cover maps, at a scale of one inch equals 100 feet, or larger scale, shall be prepared for each growing season;
3. Photographs showing all representative areas of the mitigation site shall be taken at least once each reporting year during the period between June 1 and August 15;
4. A Corps of Engineers approved wetland delineation data sheet for all representative areas of the mitigation site;
5. Surface water and groundwater elevations in representative areas of the mitigation site shall be recorded twice a month during April through September of each year. The location of the monitoring well or gauge shall be shown on the plan view engineering drawing.
6. A remedial plan, if necessary, outlining all practicable steps taken or proposed to be taken to ensure the success criteria outlined in Special Conditions (E) through (G) above are met by the specified due date of the next monitoring report.

SUBJECT: Permit File Number NAN-2018-01009-EME by the New York State Department of Environmental Conservation (NYSDEC) for activities associated with site remediation in Willets Creek and Lake Capri, in the Town of West Islip, Suffolk County, New York.

- 6 -

7. If the stream mitigation activities are causing new scour or deposition in the stream above, within, or below the project area, or causing an impediment to the upstream and downstream movement of the aquatic species through the reach, provide a description of any corrective measures necessary to assure the stability of the channel as well as a schedule for implementing these measures. The corrective measures shall not be undertaken until they are approved by the New York District, U.S. Army Corps of Engineers.
8. A written description of existing conditions in the project vicinity, including the condition of the restored sections of channel, conditions upstream and downstream from the permit area, observed usage by fish and wildlife, and how the restored and enhanced sections of stream channel and associated features are accomplishing the primary goals of improving water quality and habitat.
 - (I) All grading, planting and seeding in conjunction with the wetlands and stream mitigation work shall be completed prior to one year from the date of this authorization. Also, within 30 days of the completion of the grading within the wetland establishment area, the permittee shall install at least two groundwater monitoring wells on the site within the wetland establishment area and submit to the New York District Corps of Engineers, Regulatory Branch, Eastern Section an as-built drawing and photographs of the site. This as-built shall consist of a field-surveyed drawing, at 1" = 50' scale, with one-foot contours and appropriate spot elevations, in addition to showing the submitted photograph locations, installed monitoring wells and gauge locations.
 - (J) The permittee shall ensure that no mowing of the mitigation areas shall occur.
 - (K) The permittee shall assume all liability for accomplishing the corrective work should the New York District determine that the mitigation has not been fully satisfactory. If the New York District does not find the mitigation satisfactory,

SUBJECT: Permit File Number NAN-2018-01009-EME by the New York State Department of Environmental Conservation (NYSDEC) for activities associated with site remediation in Willets Creek and Lake Capri, in the Town of West Islip, Suffolk County, New York.

- 7 -

an extension of monitoring time may be required to cover any necessary remedial work.

- (L) All reports and correspondence shall indicate the DA permit number and be mailed to the following address:

U.S. Army Corps of Engineers - New York District
Attn: Regulatory Branch, Room 1937
26 Federal Plaza
New York, NY 10278-0090

8. Please note that this nationwide permit (NWP) verification is based on a preliminary jurisdictional determination (JD). A preliminary JD is not appealable. If you wish, prior to commencement of the authorized work you may request an approved JD, which may be appealed, by contacting the New York District, U.S. Army Corps of Engineers for further instruction. To assist you in this decision and address any questions you may have on the differences between preliminary and approved jurisdictional determinations, please review U.S. Army Corps of Engineers Regulatory Guidance Letter No. 16-01, which can be found at:

http://www.usace.army.mil/Portals/2/docs/civilworks/RGLS/rgl_16-01_app1-2.pdf

9. **This verification is valid until March 18, 2022**, unless the nationwide permit is modified, reissued, or revoked. This verification will remain valid until March 18, 2022, if the activity complies with the terms of any subsequent modifications of the nationwide permit authorization. If the nationwide permits are suspended, revoked, or modified in such a way that the activity would no longer comply with the terms and conditions of a nationwide permit, and the proposed activity has commenced, or is under contract to commence, the permittee shall have 12 months from the date of such action to complete the activity.

11. In order for us to better serve you and others, please complete our Customer Service Survey located at:

<http://www.nan.usace.army.mil/Missions/Regulatory/CustomerSurvey.aspx>

12. If any questions should arise concerning this authorization, please contact Ms. Lisa Grudzinski, of my staff, at (917)790-8428. If you have general questions or require a specific paper copy, please contact our Regulator-of-the-Day at (917)790-8511 to request

REGULATORY BRANCH

MAR 26 2019

SUBJECT: Permit File Number NAN-2018-01009-EME by the New York State Department of Environmental Conservation (NYSDEC) for activities associated with site remediation in Willets Creek and Lake Capri, in the Town of West Islip, Suffolk County, New York.

- 8 -

one be mailed to you. Please be sure to have the above eighteen-character file number readily available when you call.

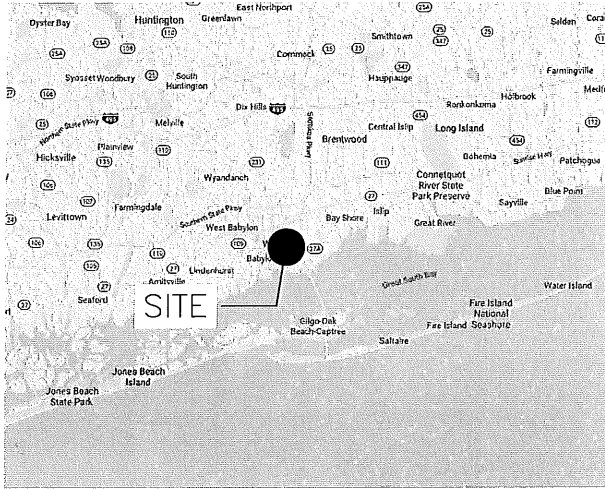
Sincerely,



Ronald R. Pinzon
Chief, Eastern Section

Enclosures

DZUS FASTENER CO., INC. REMEDICATION & RESTORATION OF WILLETTS CREEK AND LAKE CAPRI



VICINITY MAP
NTS



SITE MAP
NTS

IMPACTS SUMMARY			
SYSTEM	IMPACT TYPE	IMPACT AMOUNT (ACRES)	MITIGATION PROPOSED (ACRES)
WETLAND A	FORESTED WETLAND	0.15	0.54
WETLAND B	FORESTED WETLAND	0.04	0.06
WETLAND C	FORESTED WETLAND	0.09	0.00
WETLAND D	FORESTED WETLAND	0.05	0.00
WETLAND E	FORESTED WETLAND	0.36	0.00
WETLAND F	EMERGENT WETLAND	0.36	0.00
WETLAND G	EMERGENT WETLAND	0.00	0.00
WETLAND H	FORESTED WETLAND	0.00	0.00
LAKE CAPRI	OPEN WATER	7.58	7.58
STREAM #1	PERENNIAL STREAM	4,128 LF	4,128 LF
TOTAL IMPACTS = 8.63 ACRES		TOTAL RESTORATION PROPOSED = 8.18 ACRES	
CUMULATIVE WETLAND IMPACTS = -0.45 ACRES			
EXISTING PERENNIAL STREAM = 4.128 LINEAR FEET (LF)			
PROPOSED PERENNIAL STREAM – 4.128 LF			
CUMULATIVE PERENNIAL STREAM IMPACT = 0 LF			

FILE PATH: \\WAWRICK\FPI\WAWRICK\FPROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\SECTIONS_8X11.DWG (SHT 1 COVER) ALLEN, DANIEL 3/8/2019 12:32 PM

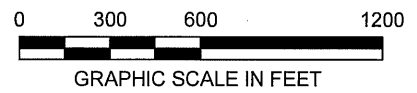
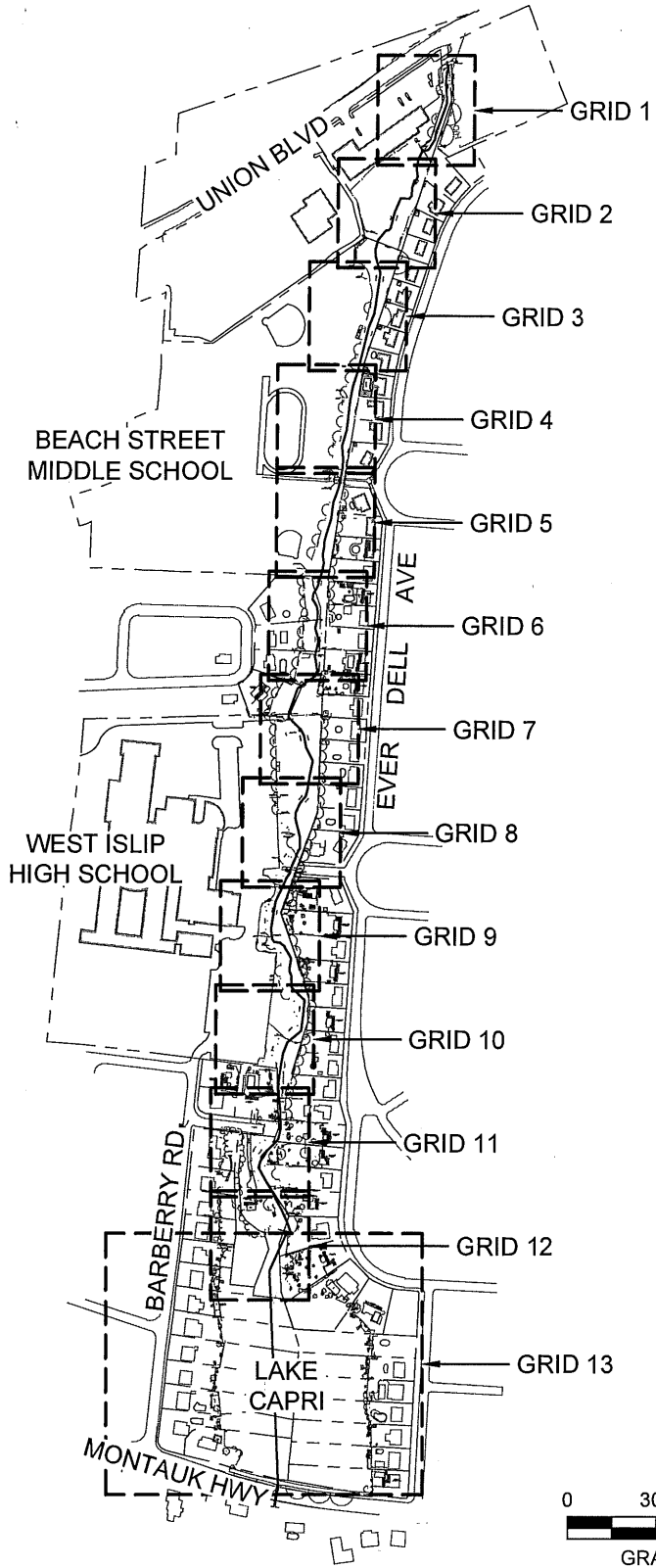


DZUS FASTENER CO., INC.
REMEDICATION & RESTORATION OF WILLETTS CREEK
AND LAKE CAPRI PERMITTING FIGURES
WEST ISLIP, SUFFOLK COUNTY, NEW YORK

TITLE SHEET

DESIGNED BY: AE	DRAWN BY: STAFF	CHECKED BY: RC	PROJECT MGR.: FD	DATE: JANUARY 2019	PROJECT NUMBER: 14907.39	SHEET NUMBER: 1 OF 15	FIGURE: 1
--------------------	--------------------	-------------------	---------------------	-----------------------	-----------------------------	--------------------------	--------------

FOR PERMITTING



FILE PATH: \\WARWICK\FPI\WARWICK\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\GXSECTIONS_BOX11.DWG [SHT 2 KEY] ALLEN, DANIEL 12/26/2018 12:41 PM

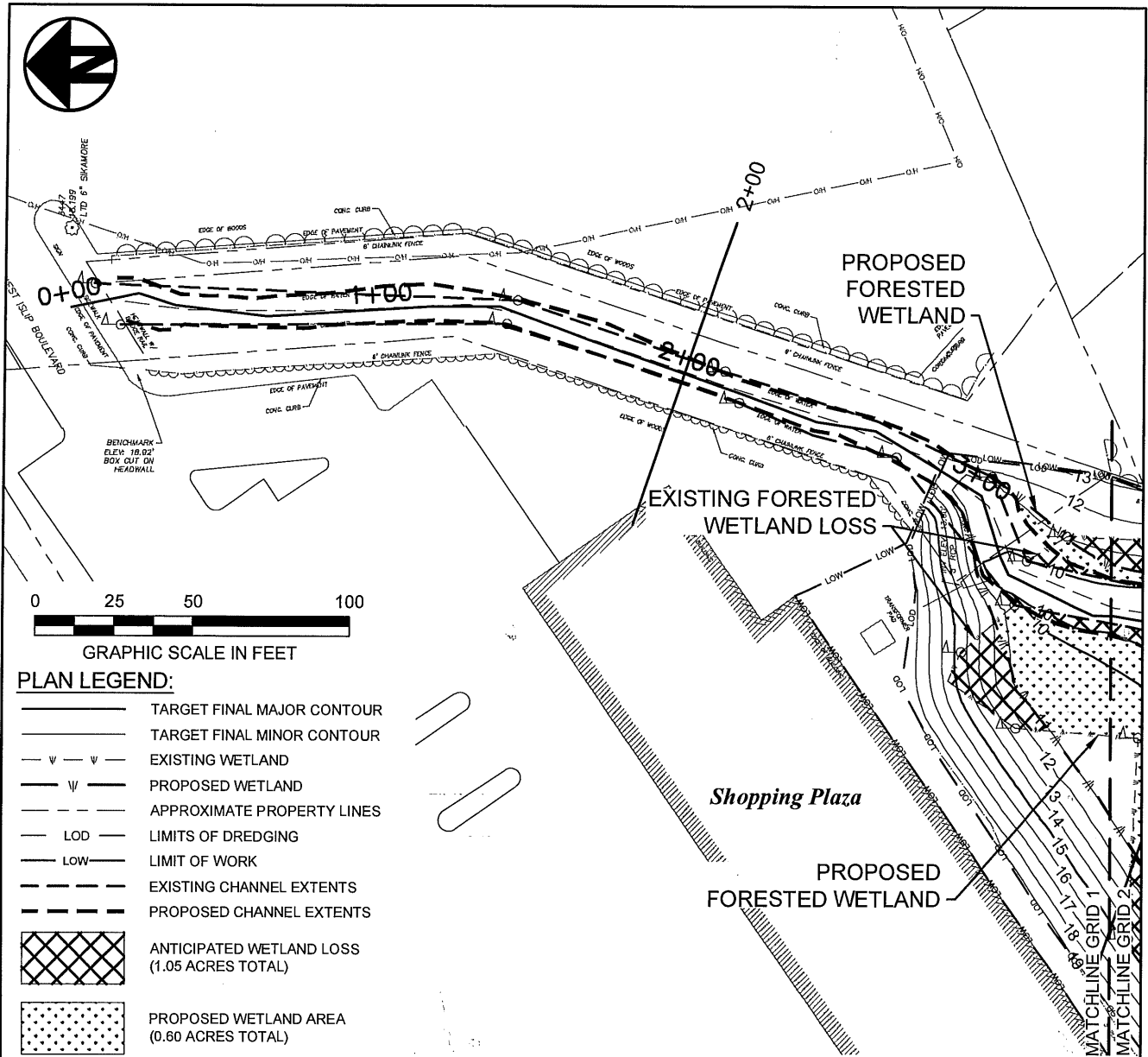


DZUS FASTENER CO., INC.
 REMEDIATION & RESTORATION OF WILLETTS CREEK
 AND LAKE CAPRI PERMITTING FIGURES
 WEST ISLIP, SUFFOLK COUNTY, NEW YORK

KEY SHEET

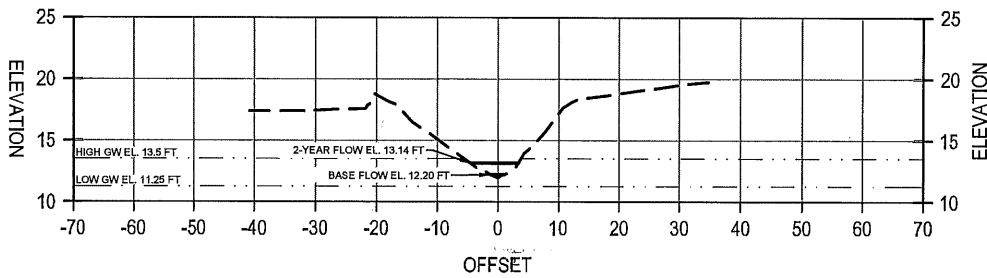
DESIGNED BY: AE	DRAWN BY: STAFF	CHECKED BY: RC	PROJECT MGR.: FD	DATE: DECEMBER 2018	PROJECT NUMBER: 14907.39	SHEET NUMBER: 2 OF 15	FIGURE: 2
--------------------	--------------------	-------------------	---------------------	------------------------	-----------------------------	--------------------------	--------------

FOR PERMITTING

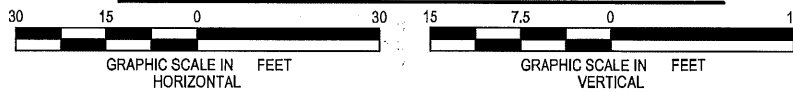


PLAN LEGEND:

- TARGET FINAL MAJOR CONTOUR
- TARGET FINAL MINOR CONTOUR
- EXISTING WETLAND
- PROPOSED WETLAND
- APPROXIMATE PROPERTY LINES
- LOD - LIMITS OF DREDGING
- LOW - LIMIT OF WORK
- EXISTING CHANNEL EXTENTS
- PROPOSED CHANNEL EXTENTS
- ANTICIPATED WETLAND LOSS (1.05 ACRES TOTAL)
- PROPOSED WETLAND AREA (0.60 ACRES TOTAL)



WILLETTS CREEK STA. 2+00 CROSS SECTION



FILE PATH: \\WARWICK\FP\WARWICK\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\XSECTIONS_BX11.DWG [SHT 3] ALLEN, DANIEL 12/26/2018 12:41 PM



DZUS FASTENER CO., INC.
REMEDATION & RESTORATION OF WILLETTS CREEK
AND LAKE CAPRI PERMITTING FIGURES
 WEST ISLIP, SUFFOLK COUNTY, NEW YORK

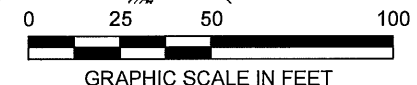
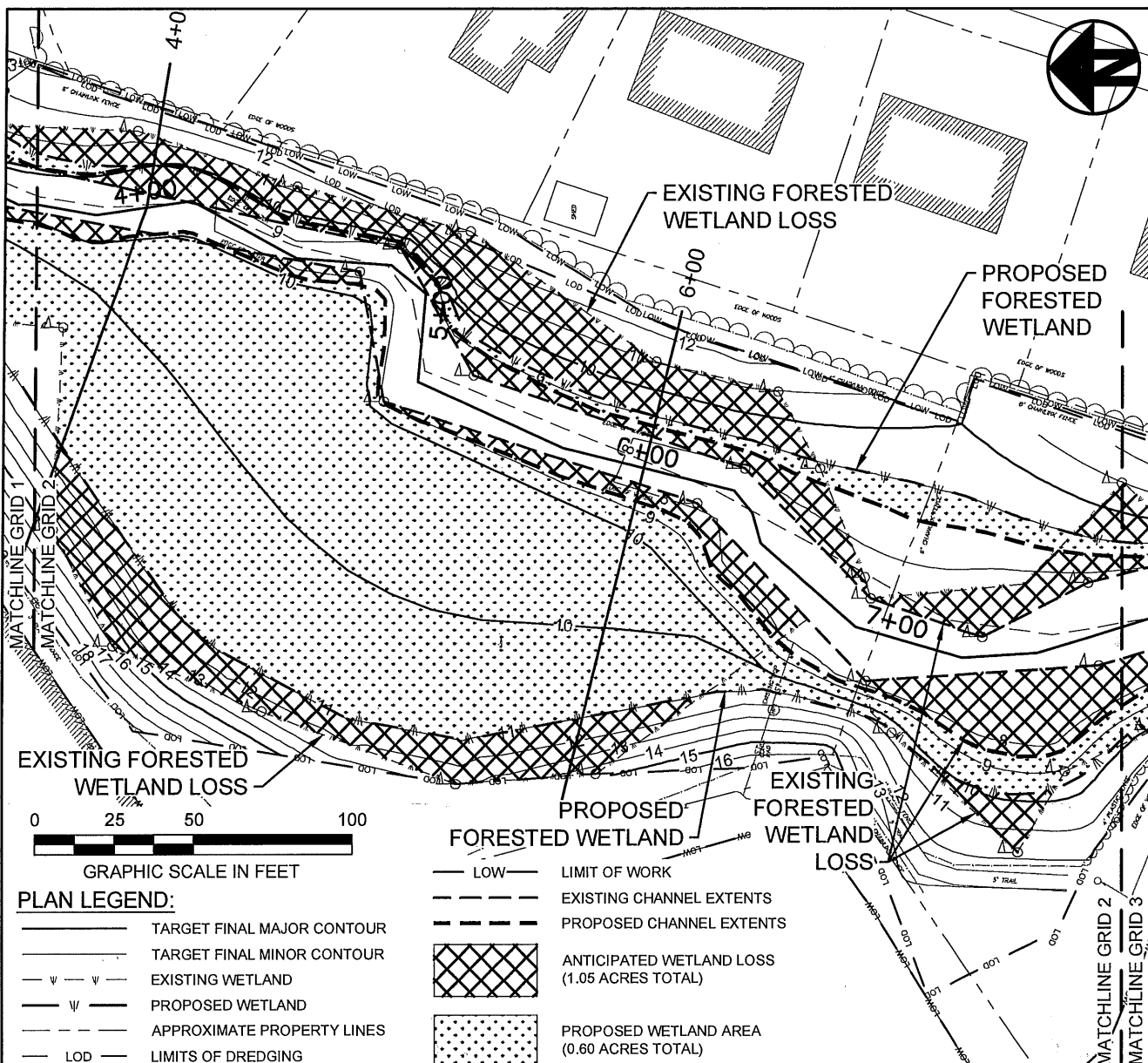
GRID 1
 STA. 2+00

DESIGNED BY: AE	DRAWN BY: STAFF	CHECKED BY: RC	PROJECT MGR.: FD	DATE: DECEMBER 2018	PROJECT NUMBER: 14907.39	SHEET NUMBER: 3 OF 15	FIGURE: 3
--------------------	--------------------	-------------------	---------------------	------------------------	-----------------------------	--------------------------	--------------

MAR 26 2019

FOR PERMITTING

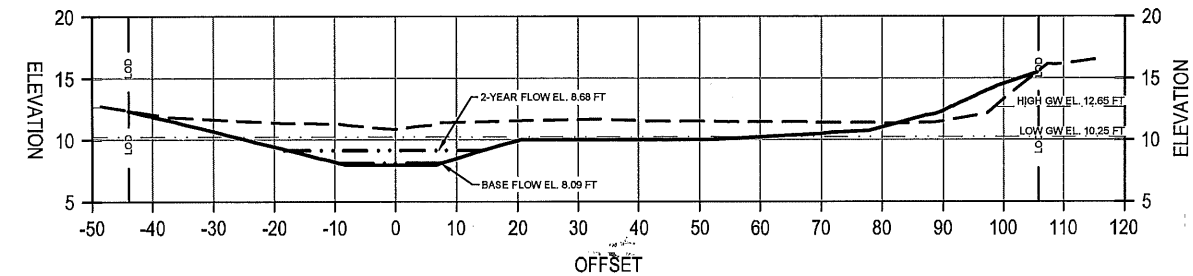
FILE PATH: \\WARWICK\FP\WARWICK\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\XSECTIONS_0X11.DWG (SHT 4) ALLEN, DANIEL, 12/26/2018 12:41 PM



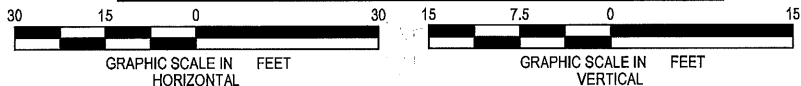
PLAN LEGEND:

- TARGET FINAL MAJOR CONTOUR
- TARGET FINAL MINOR CONTOUR
- EXISTING WETLAND
- PROPOSED WETLAND
- APPROXIMATE PROPERTY LINES
- LIMITS OF DREDGING

- LOW LIMIT OF WORK
- EXISTING CHANNEL EXTENTS
- PROPOSED CHANNEL EXTENTS
- ANTICIPATED WETLAND LOSS (1.05 ACRES TOTAL)
- PROPOSED WETLAND AREA (0.60 ACRES TOTAL)



WILLETTS CREEK STA. 6+00 CROSS SECTION



DZUS FASTENER CO., INC.
REMEDATION & RESTORATION OF WILLETTS CREEK AND LAKE CAPRI PERMITTING FIGURES
 WEST ISLIP, SUFFOLK COUNTY, NEW YORK

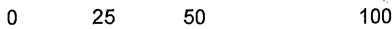
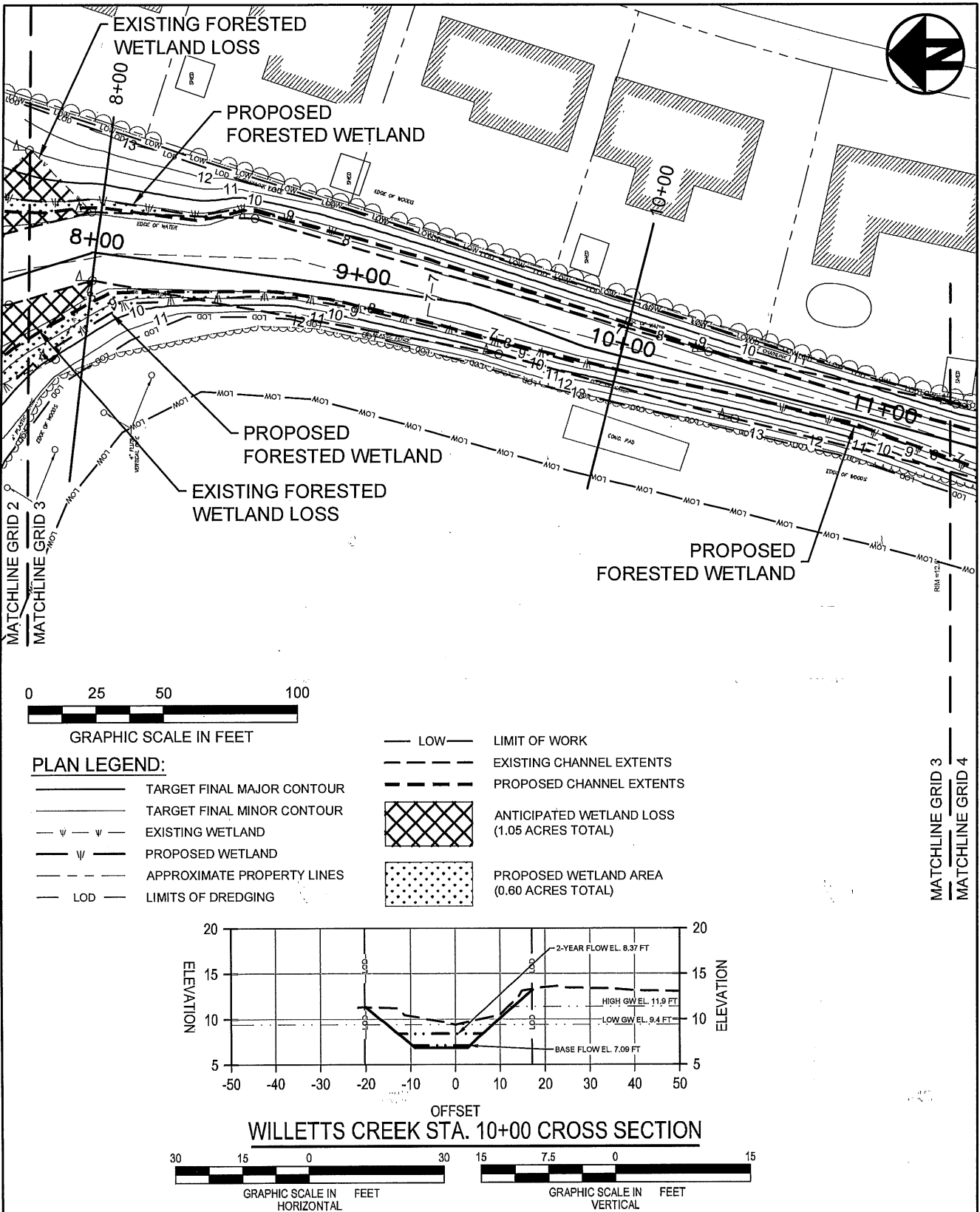
GRID 2
 STA. 6+00

DESIGNED BY: AE	DRAWN BY: STAFF	CHECKED BY: RC	PROJECT MGR.: FD	DATE: DECEMBER 2018	PROJECT NUMBER: 14907.39	SHEET NUMBER: 4 OF 15	FIGURE: 4
--------------------	--------------------	-------------------	---------------------	------------------------	-----------------------------	--------------------------	--------------

MAR 26 2019

FOR PERMITTING

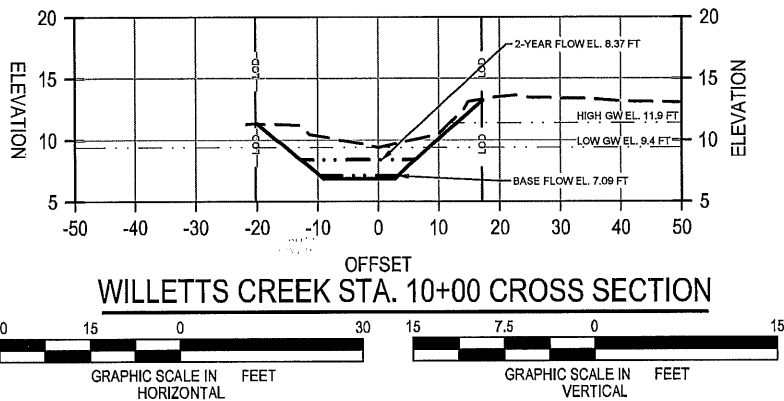
FILE PATH: \\WAWRICK\FPI\WARWICK\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\SECTIONS_8X11.DWG [SHT 5] ALLEN, DANIEL 12/26/2018 12:41 PM



GRAPHIC SCALE IN FEET

PLAN LEGEND:

- TARGET FINAL MAJOR CONTOUR
- TARGET FINAL MINOR CONTOUR
- EXISTING WETLAND
- PROPOSED WETLAND
- APPROXIMATE PROPERTY LINES
- LOD — LIMITS OF DREDGING
- LOW — LIMIT OF WORK
- — — EXISTING CHANNEL EXTENTS
- — — PROPOSED CHANNEL EXTENTS
- [Cross-hatched box] ANTICIPATED WETLAND LOSS (1.05 ACRES TOTAL)
- [Dotted box] PROPOSED WETLAND AREA (0.60 ACRES TOTAL)

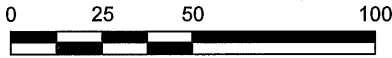
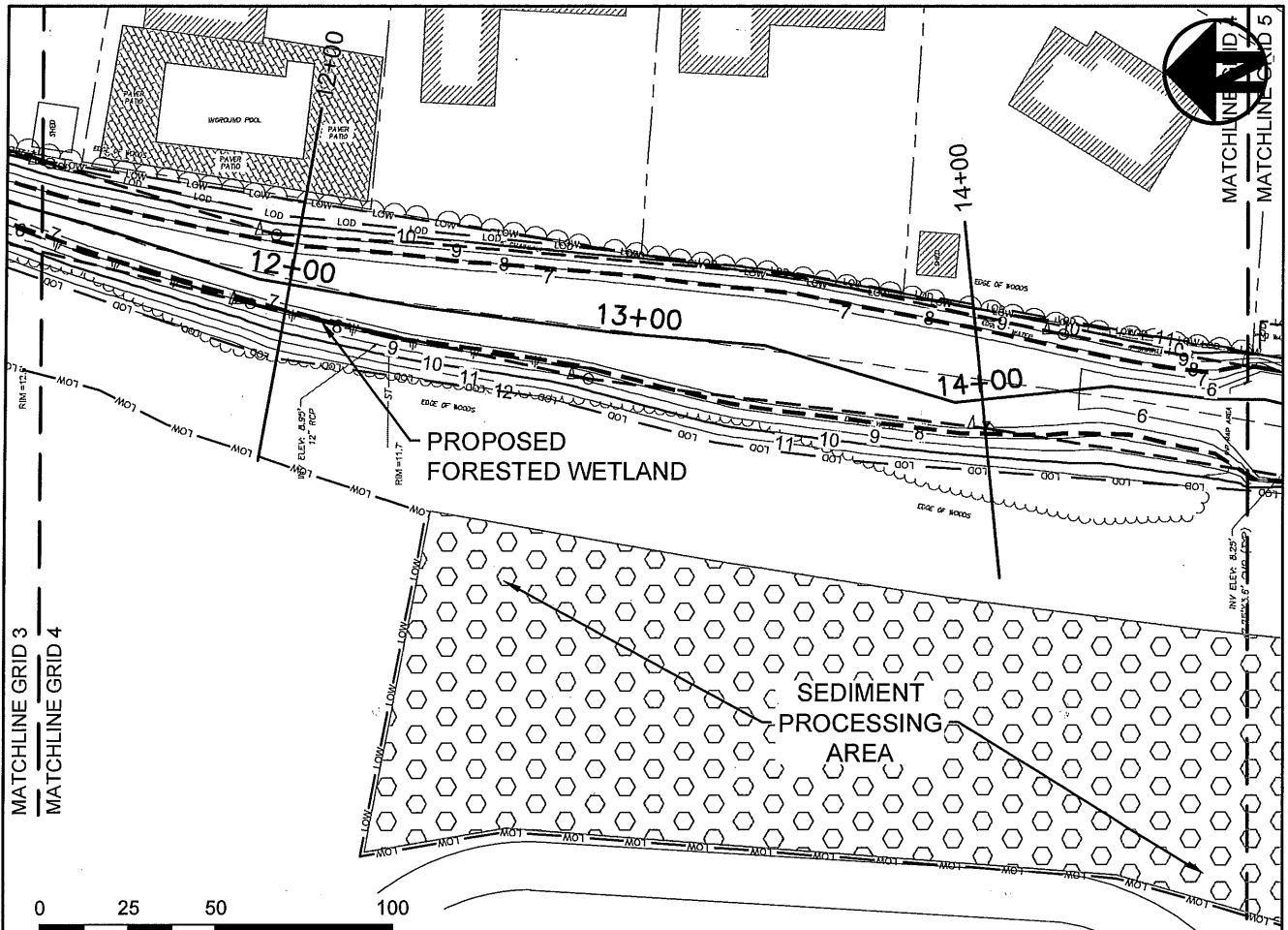


DZUS FASTENER CO., INC.
REMEDIATION & RESTORATION OF WILLETTS CREEK AND LAKE CAPRI PERMITTING FIGURES
 WEST ISLIP, SUFFOLK COUNTY, NEW YORK

GRID 3
 STA. 10+00

DESIGNED BY: AE	DRAWN BY: STAFF	CHECKED BY: RC	PROJECT MGR.: FD	DATE: DECEMBER 2018	PROJECT NUMBER: 14907.39	SHEET NUMBER: 5 OF 15	FIGURE: 5
--------------------	--------------------	-------------------	---------------------	------------------------	-----------------------------	--------------------------	--------------

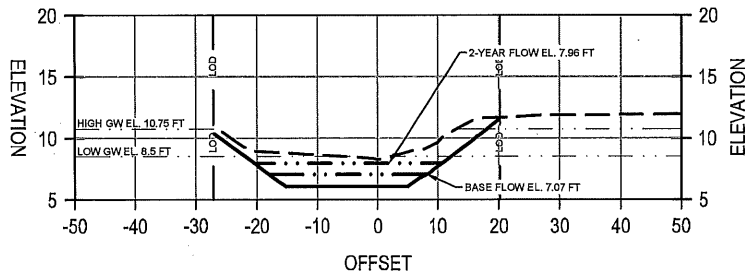
FOR PERMITTING



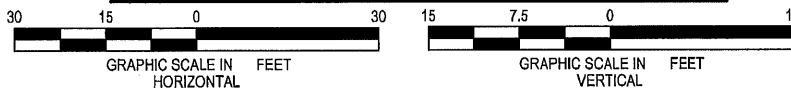
GRAPHIC SCALE IN FEET

PLAN LEGEND:

- TARGET FINAL MAJOR CONTOUR
- TARGET FINAL MINOR CONTOUR
- ψ — ψ — EXISTING WETLAND
- ψ — PROPOSED WETLAND
- — — APPROXIMATE PROPERTY LINES
- LOD — LIMITS OF DREDGING
- — — LIMIT OF WORK
- — — EXISTING CHANNEL EXTENTS
- — — PROPOSED CHANNEL EXTENTS
- [Cross-hatched pattern] ANTICIPATED WETLAND LOSS (1.05 ACRES TOTAL)
- [Dotted pattern] PROPOSED WETLAND AREA (0.60 ACRES TOTAL)



WILLETTS CREEK STA. 14+00 CROSS SECTION



GRAPHIC SCALE IN HORIZONTAL FEET

GRAPHIC SCALE IN VERTICAL FEET

FILE PATH: \\WARWICK\PIW\ARWICK\PROJECTS\14907.39-DZUS-FASTENER\PERMITTING\SECTIONS_BOX1.DWG [SHT 6] ALLEN, DANIEL 12/26/2018 12:41 PM

EA Engineering, Science, and Technology, Inc., PBC

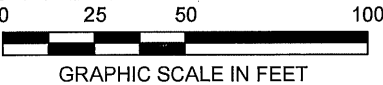
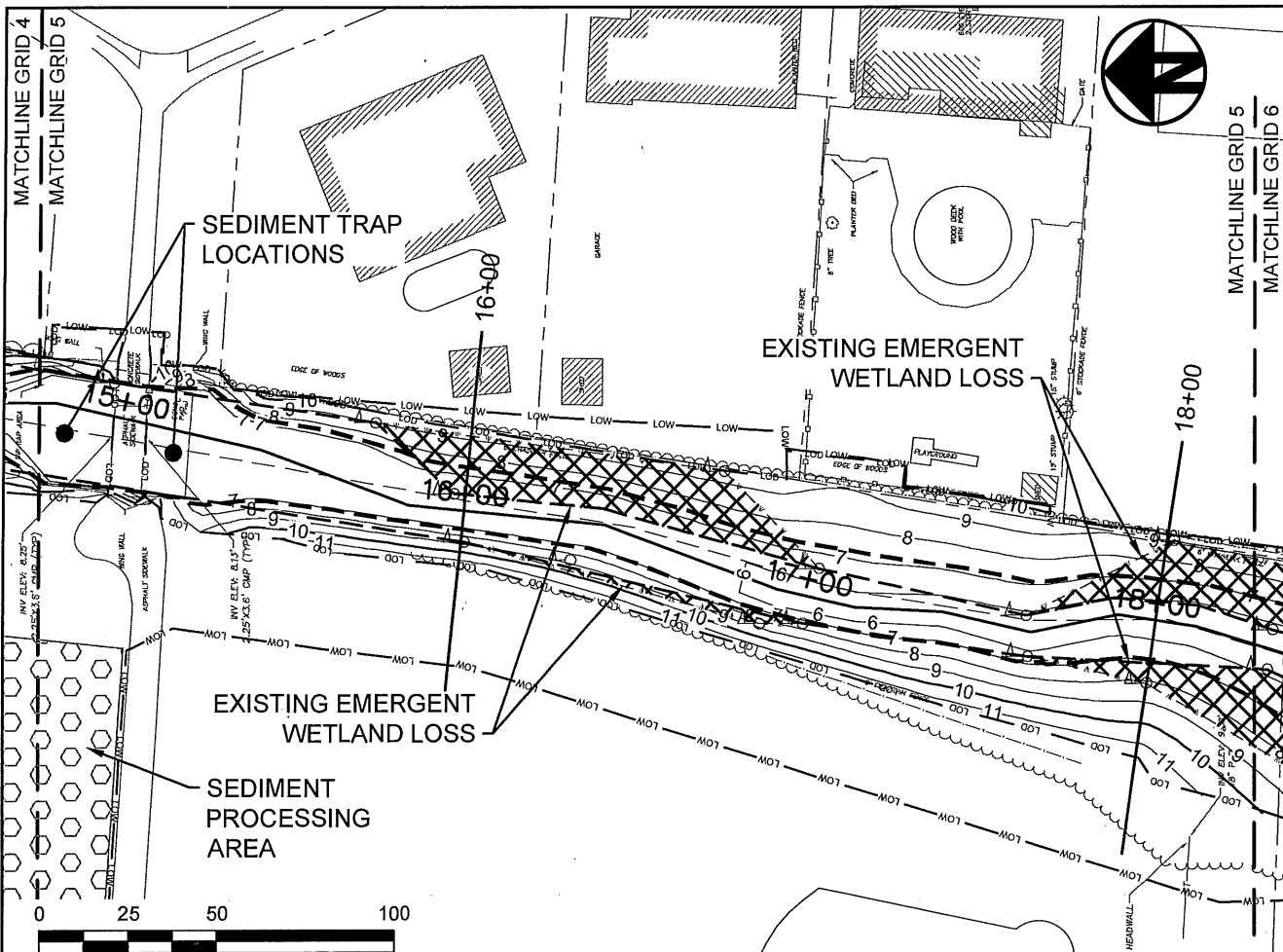
DZUS FASTENER CO., INC.
 REMEDIATION & RESTORATION OF WILLETTS CREEK
 AND LAKE CAPRI PERMITTING FIGURES
 WEST ISLIP, SUFFOLK COUNTY, NEW YORK

GRID 4
 STA. 14+00

DESIGNED BY: AE	DRAWN BY: STAFF	CHECKED BY: RC	PROJECT MGR.: FD	DATE: DECEMBER 2018	PROJECT NUMBER: 14907.39	SHEET NUMBER: 6 OF 15	FIGURE: 6
--------------------	--------------------	-------------------	---------------------	------------------------	-----------------------------	--------------------------	--------------

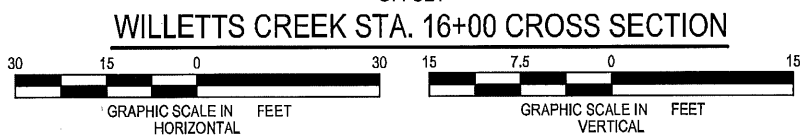
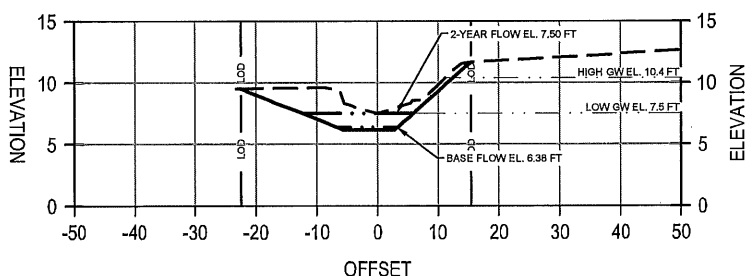
MAR 26 2019

FOR PERMITTING



PLAN LEGEND:

- TARGET FINAL MAJOR CONTOUR
- TARGET FINAL MINOR CONTOUR
- EXISTING WETLAND
- PROPOSED WETLAND
- APPROXIMATE PROPERTY LINES
- LIMITS OF DREDGING
- LIMIT OF WORK
- EXISTING CHANNEL EXTENTS
- PROPOSED CHANNEL EXTENTS
- ANTICIPATED WETLAND LOSS (1.05 ACRES TOTAL)
- PROPOSED WETLAND AREA (0.60 ACRES TOTAL)



FILE PATH: \\WARWICK\FP\WARWICK\FP\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\XSECTIONS_BX11.DWG [SHT 7] ALLEN, DANIEL 12/26/2018 12:41 PM



DZUS FASTENER CO., INC.
REMEDATION & RESTORATION OF WILLETTS CREEK
AND LAKE CAPRI PERMITTING FIGURES
 WEST ISLIP, SUFFOLK COUNTY, NEW YORK

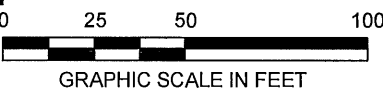
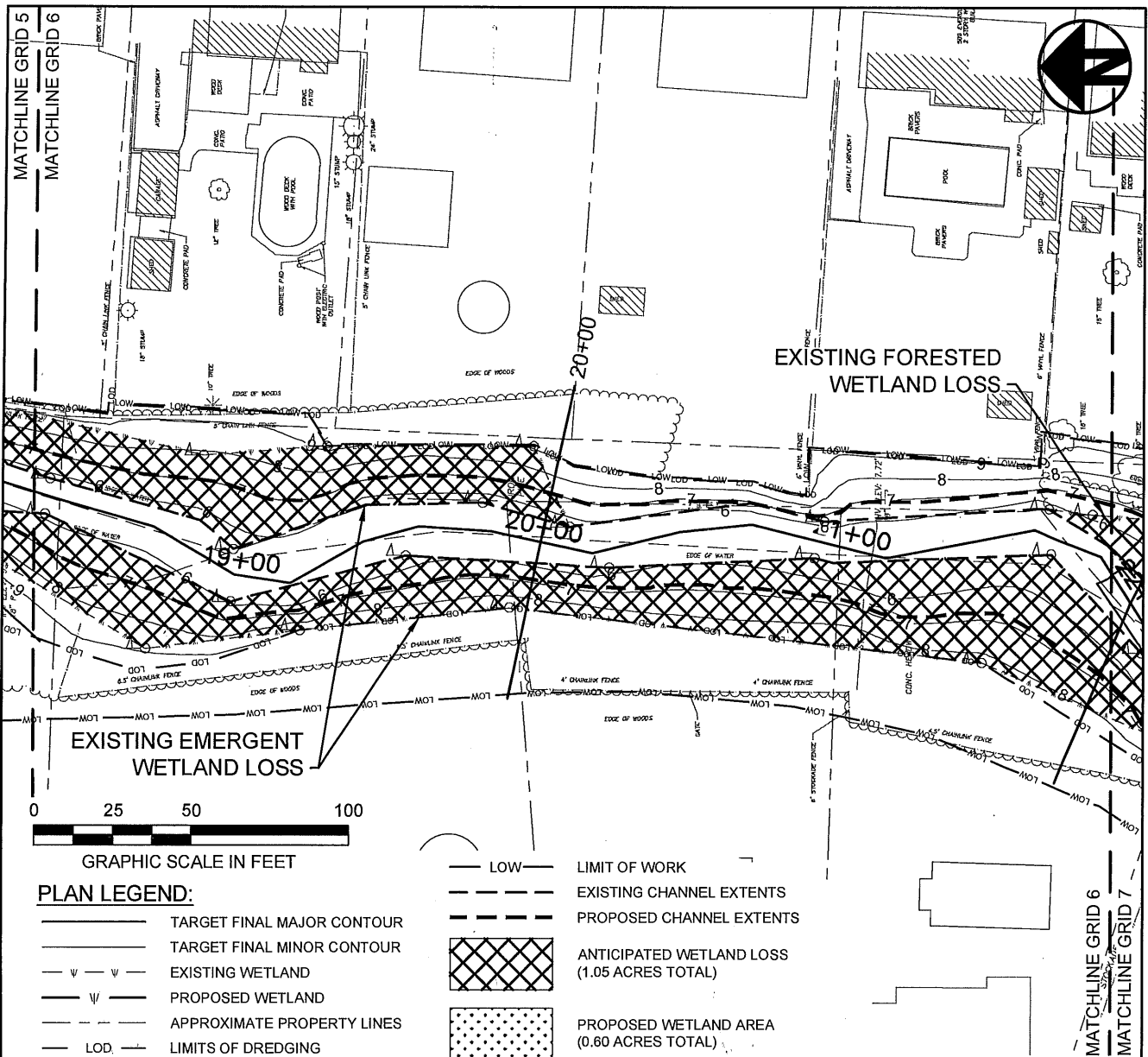
GRID 5
 STA. 16+00

DESIGNED BY: AE	DRAWN BY: STAFF	CHECKED BY: RC	PROJECT MGR.: FD	DATE: DECEMBER 2018	PROJECT NUMBER: 14907.39	SHEET NUMBER: 7 OF 15	FIGURE: 7
--------------------	--------------------	-------------------	---------------------	------------------------	-----------------------------	--------------------------	--------------

FOR PERMITTING

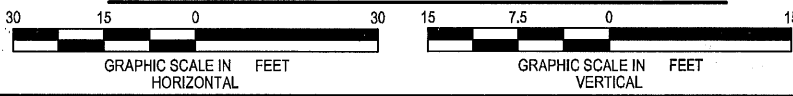
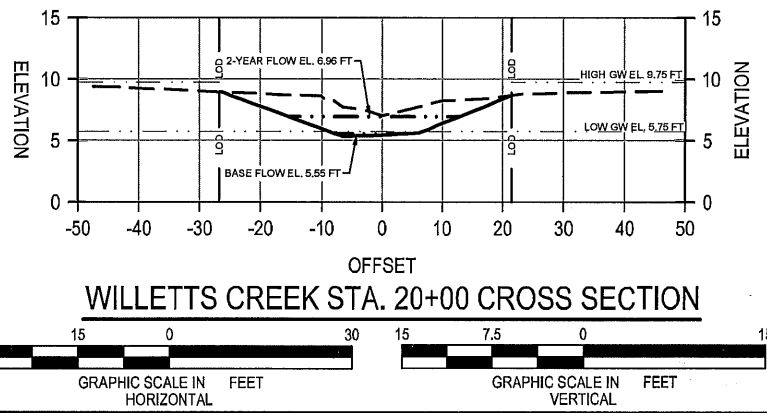
MAR 26 2019

FILE PATH: \\WARWICK\FP\WARWICK\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\SECTIONS_8X11.DWG (SHT 8) ALLEN, DANIEL 12/28/2018 12:42 PM



PLAN LEGEND:

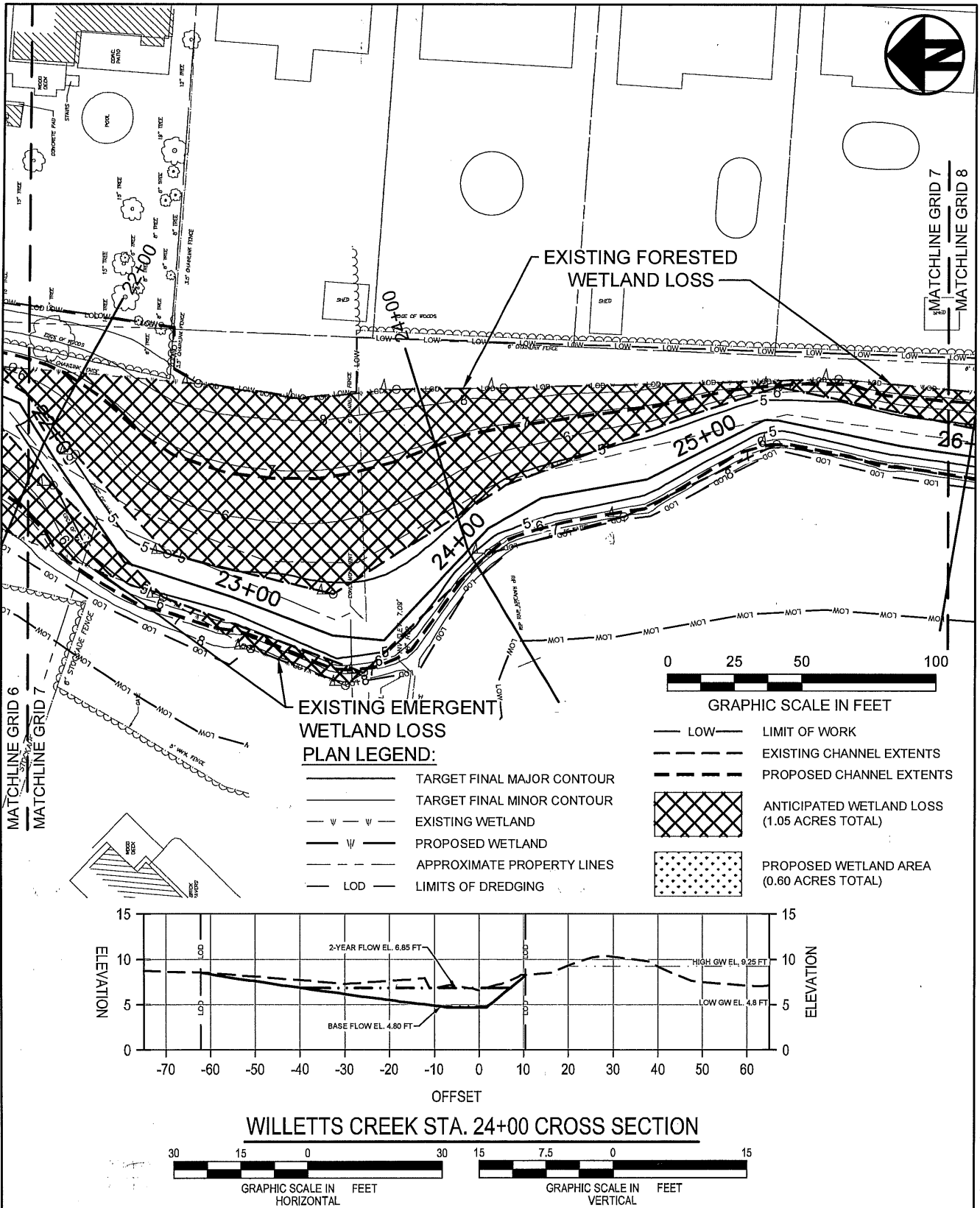
- TARGET FINAL MAJOR CONTOUR
- TARGET FINAL MINOR CONTOUR
- EXISTING WETLAND
- PROPOSED WETLAND
- APPROXIMATE PROPERTY LINES
- LIMITS OF DREDGING
- LOW LIMIT OF WORK
- EXISTING CHANNEL EXTENTS
- PROPOSED CHANNEL EXTENTS
- ANTICIPATED WETLAND LOSS (1.05 ACRES TOTAL)
- PROPOSED WETLAND AREA (0.60 ACRES TOTAL)



 EA Engineering, Science, and Technology, Inc., PBC	DZUS FASTENER CO., INC. REMEDIATION & RESTORATION OF WILLETTS CREEK AND LAKE CAPRI PERMITTING FIGURES WEST ISLIP, SUFFOLK COUNTY, NEW YORK				GRID 6 STA. 20+00			
	DESIGNED BY: AE	DRAWN BY: STAFF	CHECKED BY: RC	PROJECT MGR.: FD	DATE: DECEMBER 2018	PROJECT NUMBER: 14907.39	SHEET NUMBER: 8 OF 15	FIGURE: 8

FOR PERMITTING

FILE PATH: \\WAWRICKP\WAWRICKP\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\XSECTIONS_BX11.DWG (SHT 9) ALLEN, DANIEL 12/26/2018 12:42 PM

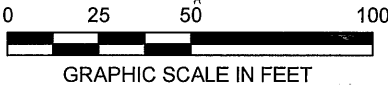
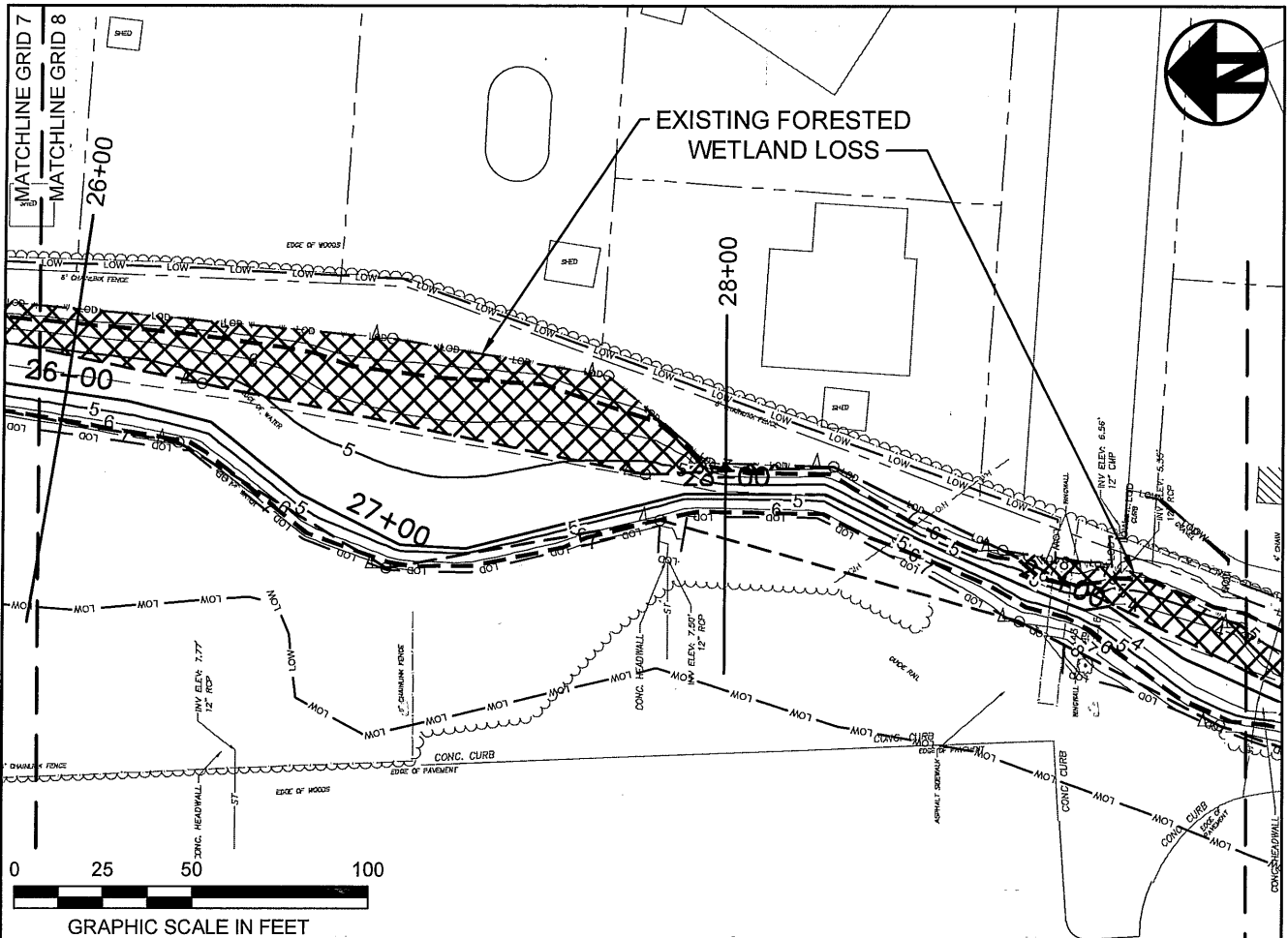


<p>EA Engineering, Science, and Technology, Inc., PBC</p>	<p>DZUS FASTENER CO., INC. REMEDIATION & RESTORATION OF WILLETTS CREEK AND LAKE CAPRI PERMITTING FIGURES</p>				<p>GRID 7 STA. 24+00</p>			
	<p>WEST ISLIP, SUFFOLK COUNTY, NEW YORK</p>							
DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT MGR.:	DATE:	PROJECT NUMBER:	SHEET NUMBER:	FIGURE:	
AE	STAFF	RC	FD	DECEMBER 2018	14907.39	9 OF 15	9	

MAR 26 2019

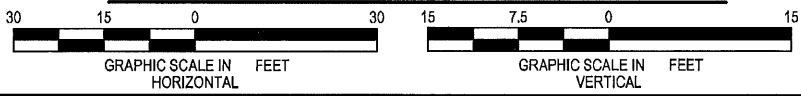
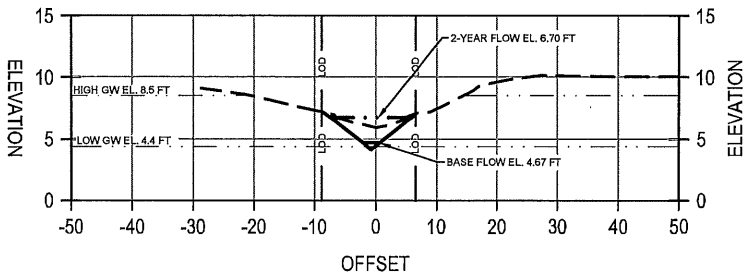
FOR PERMITTING

FILE PATH: \\WAWICK\FPI\WAWICK\FPI\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\SECTIONS_BX1.DWG (SHT 10) ALLEN, DANIEL 12/26/2018 12:42 PM



PLAN LEGEND:

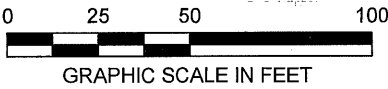
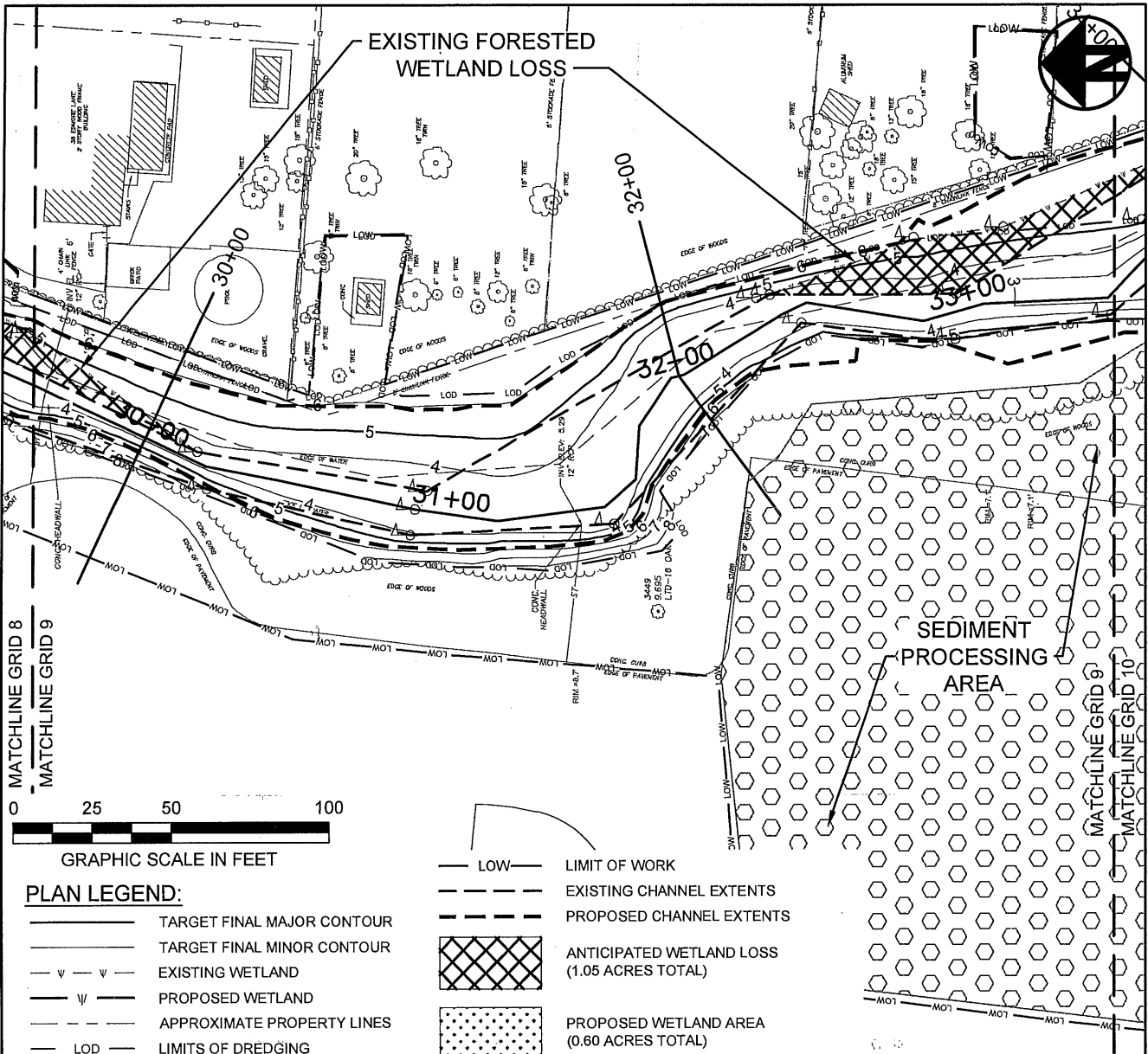
- TARGET FINAL MAJOR CONTOUR
- TARGET FINAL MINOR CONTOUR
- Ψ — EXISTING WETLAND
- Ψ — PROPOSED WETLAND
- — — APPROXIMATE PROPERTY LINES
- LOD — LIMITS OF DREDGING
- — — LOW — LIMIT OF WORK
- — — EXISTING CHANNEL EXTENTS
- — — PROPOSED CHANNEL EXTENTS
- [Cross-hatched pattern] ANTICIPATED WETLAND LOSS (1.05 ACRES TOTAL)
- [Dotted pattern] PROPOSED WETLAND AREA (0.60 ACRES TOTAL)



		DZUS FASTENER CO., INC. REMEDIATION & RESTORATION OF WILLETTS CREEK AND LAKE CAPRI PERMITTING FIGURES WEST ISLIP, SUFFOLK COUNTY, NEW YORK				GRID 8 STA. 28+00	
		DESIGNED BY: AE	DRAWN BY: STAFF	CHECKED BY: RC	PROJECT MGR.: FD	DATE: DECEMBER 2018	PROJECT NUMBER: 14907.39

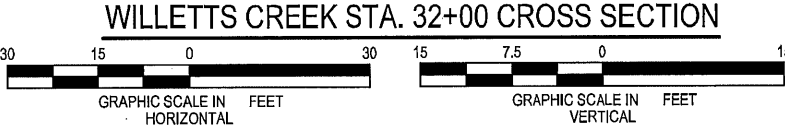
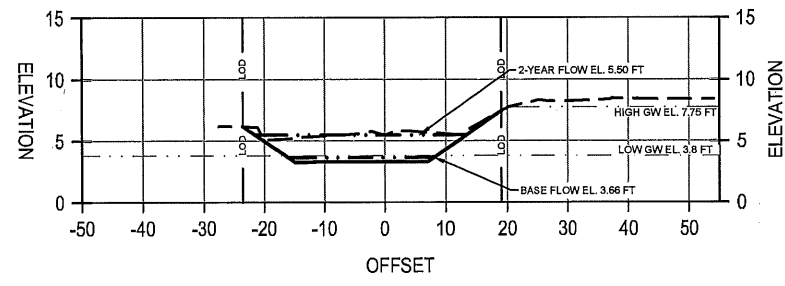
FOR PERMITTING

FILE PATH: \\WARWICK\FPI\WARWICK\FPI\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\GXSECTIONS.BX11.DWG [SHT 11] ALLEN, DANIEL 12/26/2018 12:42 PM



PLAN LEGEND:

- TARGET FINAL MAJOR CONTOUR
- TARGET FINAL MINOR CONTOUR
- EXISTING WETLAND
- PROPOSED WETLAND
- APPROXIMATE PROPERTY LINES
- LIMITS OF DREDGING
- LIMIT OF WORK
- EXISTING CHANNEL EXTENTS
- PROPOSED CHANNEL EXTENTS
- ANTICIPATED WETLAND LOSS (1.05 ACRES TOTAL)
- PROPOSED WETLAND AREA (0.60 ACRES TOTAL)



DZUS FASTENER CO., INC.
REMEDIATION & RESTORATION OF WILLETTS CREEK
AND LAKE CAPRI PERMITTING FIGURES
 WEST ISLIP, SUFFOLK COUNTY, NEW YORK

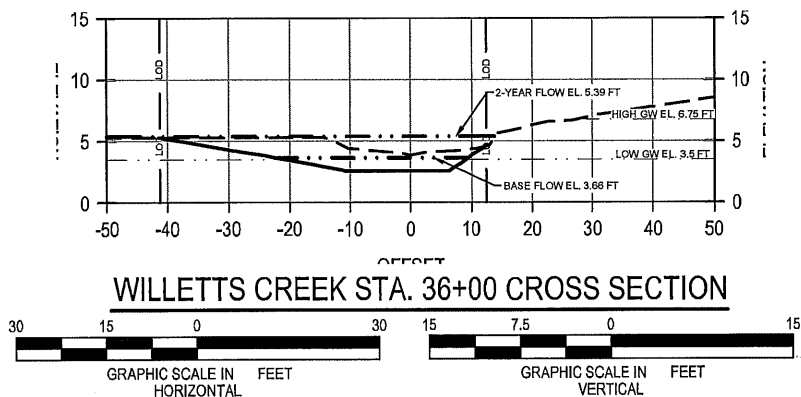
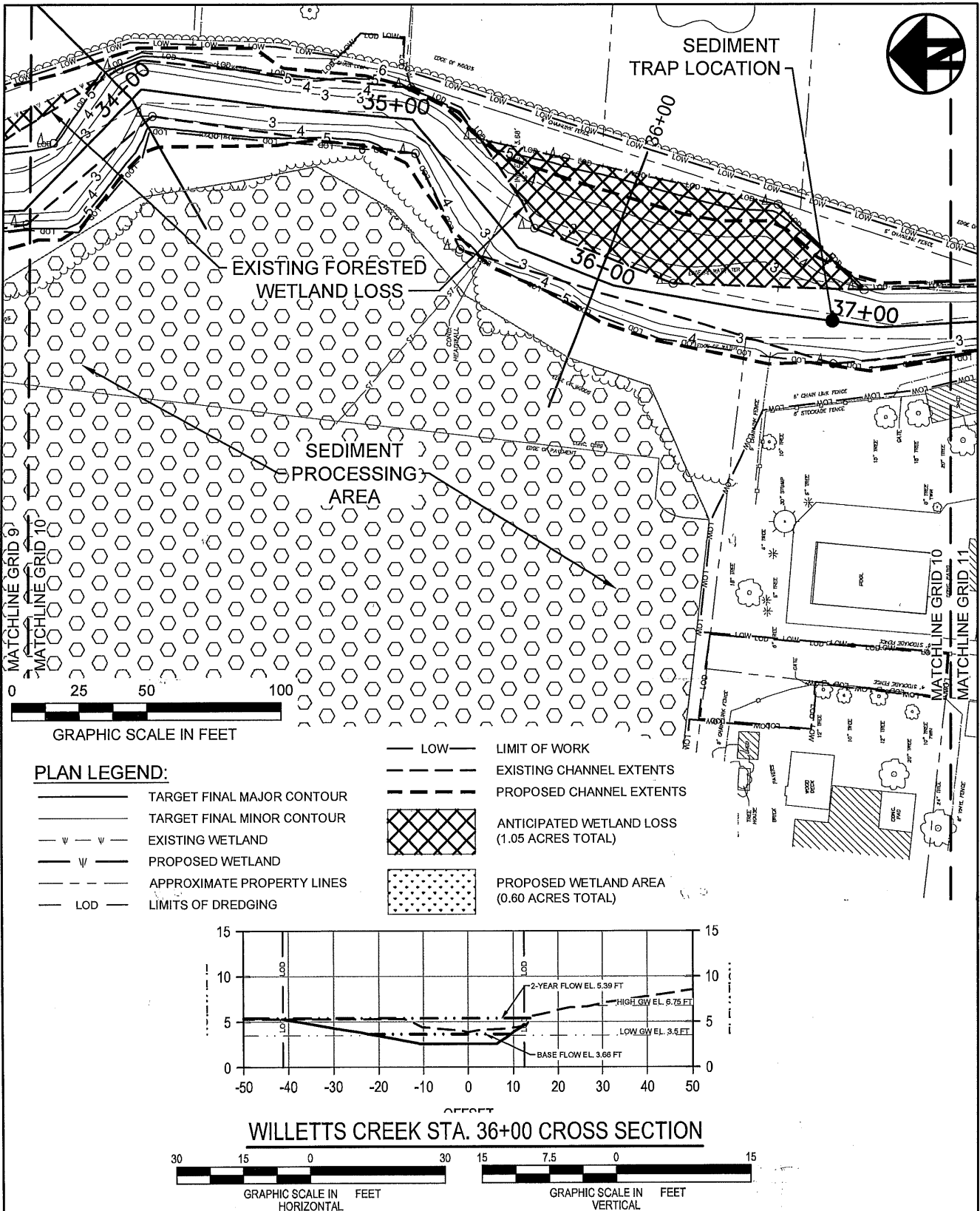
GRID 9
 STA. 32+00

DESIGNED BY: AE	DRAWN BY: STAFF	CHECKED BY: RC	PROJECT MGR.: FD	DATE: DECEMBER 2018	PROJECT NUMBER: 14907.39	SHEET NUMBER: 11 OF 14	FIGURE: 11
--------------------	--------------------	-------------------	---------------------	------------------------	-----------------------------	---------------------------	---------------

MAR 26 2019

FOR PERMITTING

FILE PATH: \\WARWICK\FP\WARWICK\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\XSECTIONS_BOX11.DWG [SHT 12] ALLEN, DANIEL - 12/26/2018 12:42 PM

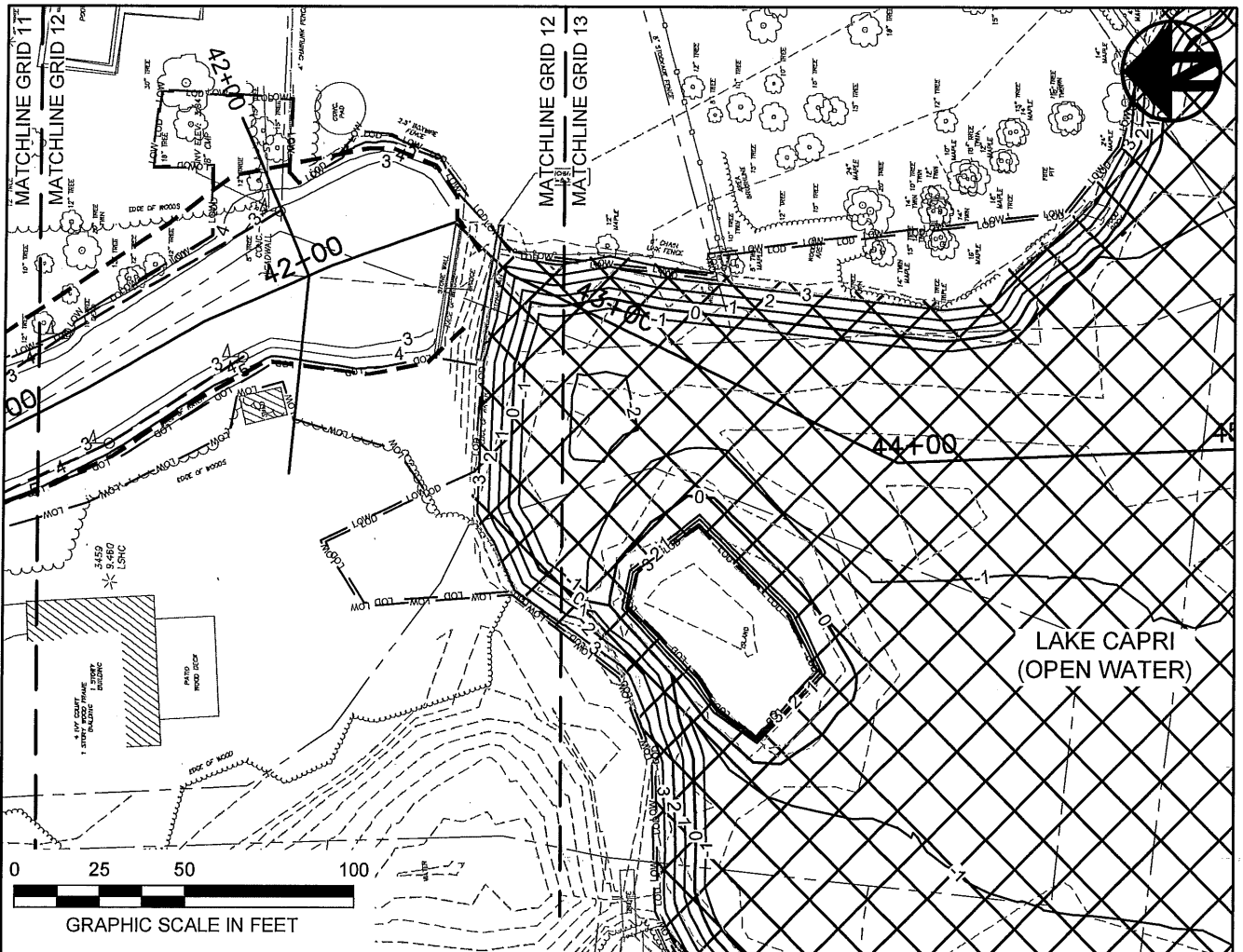


<p>EA Engineering, Science, and Technology, Inc., PBC</p>	<p>DZUS FASTENER CO., INC. REMEDIATION & RESTORATION OF WILLETTS CREEK AND LAKE CAPRI PERMITTING FIGURES</p>				<p>GRID 10 STA. 36+00</p>		
	<p>WEST ISLIP, SUFFOLK COUNTY, NEW YORK</p>						
DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT MGR.:	DATE:	PROJECT NUMBER:	SHEET NUMBER:	FIGURE:
AE	STAFF	RC	FD	DECEMBER 2018	14907.39	12 OF 15	12

FOR PERMITTING

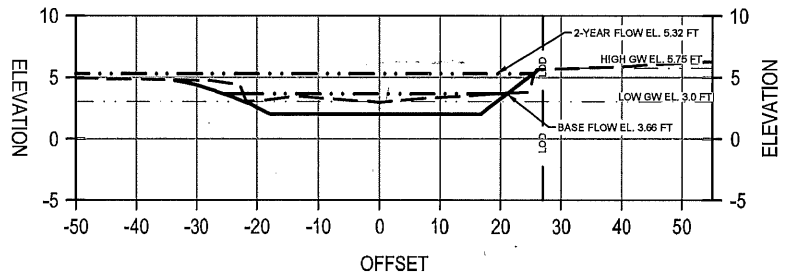
MAR 26 2019

FILE PATH: \\WARWICK\FP\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\SECTIONS_BX1.DWG (SHT 14) ALLEN, DANIEL 12/26/2018 12:42 PM

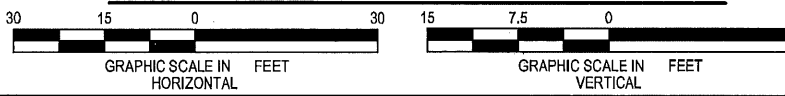


PLAN LEGEND:

- | | | | |
|--|----------------------------|--|---|
| | TARGET FINAL MAJOR CONTOUR | | LOW LIMIT OF WORK |
| | TARGET FINAL MINOR CONTOUR | | EXISTING CHANNEL EXTENTS |
| | EXISTING WETLAND | | PROPOSED CHANNEL EXTENTS |
| | PROPOSED WETLAND | | OPEN WATER IMPACT AREA (7.58 ACRES TOTAL) |
| | APPROXIMATE PROPERTY LINES | | |
| | LOD LIMITS OF DREDGING | | |



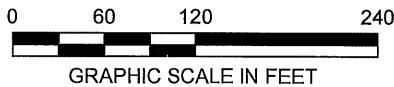
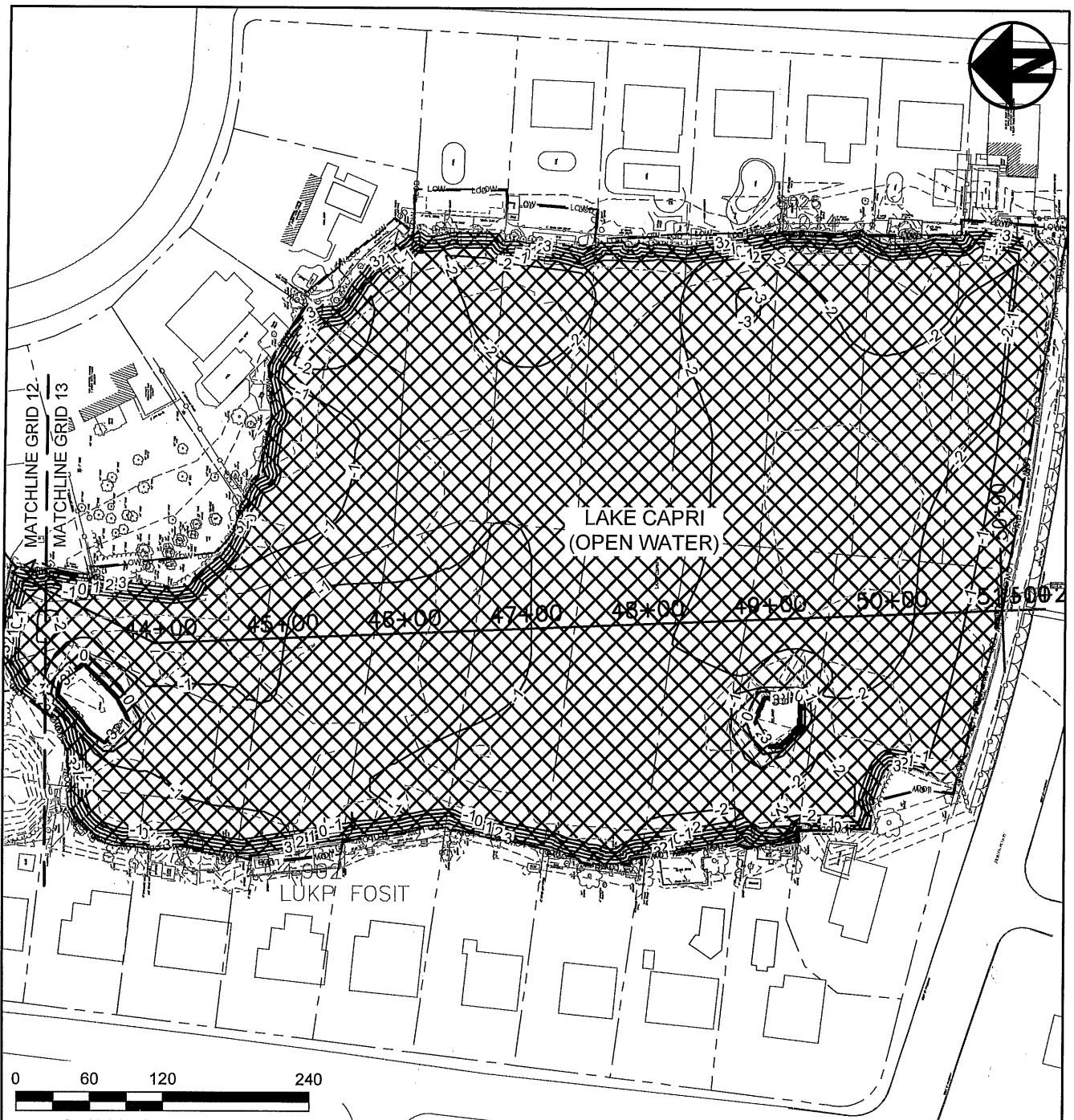
WILLETTS CREEK STA. 42+00 CROSS SECTION



<p>EA Engineering, Science, and Technology, Inc., PBC</p>	<p>DZUS FASTENER CO., INC. REMEDATION & RESTORATION OF WILLETTS CREEK AND LAKE CAPRI PERMITTING FIGURES</p>				<p>GRID 12 STA. 42+00</p>		
	<p>WEST ISLIP, SUFFOLK COUNTY, NEW YORK</p>						
DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT MGR.:	DATE:	PROJECT NUMBER:	SHEET NUMBER:	FIGURE:
AE	STAFF	RC	FD	DECEMBER 2018	14907.39	14 OF 15	14

FOR PERMITTING

MAR 26 2019



PLAN LEGEND:

- TARGET FINAL MAJOR CONTOUR
- TARGET FINAL MINOR CONTOUR
- v - v - EXISTING WETLAND
- ψ - PROPOSED WETLAND
- - - APPROXIMATE PROPERTY LINES
- LOD - LIMITS OF DREDGING
- LOW — LIMIT OF WORK
- OPEN WATER IMPACT AREA (7.58 ACRES TOTAL)

FILE PATH: \\WAWICK\FW\WARWICK\PROJECTS\14907.39 - DZUS WEST ISLIP\CAD\FIGURES\14907.39-DZUS-PERMITTING\SECTIONS_8X11.DWG (SHT 15) ALLEN, DANIEL 12/26/2018 12:42 PM



DZUS FASTENER CO., INC.
REMEDIATION & RESTORATION OF WILLETTS CREEK
AND LAKE CAPRI PERMITTING FIGURES
 WEST ISLIP, SUFFOLK COUNTY, NEW YORK

GRID 13
LAKE CAPRI

DESIGNED BY: AE	DRAWN BY: STAFF	CHECKED BY: RC	PROJECT MGR.: FD	DATE: DECEMBER 2018	PROJECT NUMBER: 14907.39	SHEET NUMBER: 15 OF 15	FIGURE: 15
--------------------	--------------------	-------------------	---------------------	------------------------	-----------------------------	---------------------------	---------------

MAR 26 2019

FOR PERMITTING

NATIONWIDE GENERAL PERMIT
COMPLIANCE CERTIFICATION
AND REPORT FORM

Permit File Number: NAN-2018-01009-EME

Permittee: New York State Department of Environmental Conservation

Location: 425 Union Boulevard, in the Town of West Islip, Suffolk County, New York

Date Permit Letter Issued: MAR 26 2019

Within 30 days of the completion of the activity authorized by this nationwide general permit and any mitigation required in the verification letter, please sign this certification and return it to the address at the bottom of this form.

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with the permit's terms and conditions you are subject to permit suspension, modification or revocation.

I hereby certify that the work authorized by the above referenced nationwide general permit has been completed in accordance with the terms and conditions of said permit, and required mitigation was completed in accordance with the permit conditions.

Signature of Permittee

Date

**FOLD THIS FORM INTO THIRDS, WITH THE BOTTOM THIRD FACING OUTWARD.
TAPE IT TOGETHER AND MAIL TO THE ADDRESS BELOW OR FAX (212) 264-4260.**

**PLACE
STAMP
HERE**

**DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
ATTN: CENAN-OP-RE
NEW YORK, NEW YORK 10278-0090**



**Dzus Fastener Company, Inc. (152033)
Operable Unit 3 – Willetts Creek Area
Operable Unit 4 – Lake Capri
Phase II Nontidal Wetland/Waterways Mitigation Plan
West Islip, New York**

Prepared for

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7012



Prepared by

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

March 2019
Version: FINAL 2
EA Project No.: 14907.39

TABLE OF CONTENTS

	<u>Page</u>
LIST OF FIGURES	ii
LIST OF TABLES	ii
LIST OF ACRONYMS AND ABBREVIATIONS	iii
EXECUTIVE SUMMARY	iv
1.0 INTRODUCTION	1
2.0 MITIGATION GOALS AND OBJECTIVES	2
3.0 SITE SELECTION	3
4.0 BASELINE INFORMATION	4
4.1 STREAM #1	4
4.2 WETLANDS A, B, D, AND E	4
4.3 WETLAND C	5
4.4 WETLAND F	5
4.5 STREAM #2	6
4.6 WETLAND G AND H	6
4.7 LAKE CAPRI	6
5.0 MITIGATION CREDIT ACCOUNTING	7
5.1 REQUIRED WETLAND MITIGATION CREDITS	7
6.0 WORK PLAN	8
6.1 STREAM RESTORATION WORK DESCRIPTION	8
6.2 WETLAND AND UPLAND RESTORATION WORK DESCRIPTION	8
6.3 WETLAND MITIGATION PLANTING PLAN	8
6.4 PHRAGMITES MANAGEMENT PLAN	11
7.0 SITE PROTECTION INSTRUMENT	11
8.0 PERFORMANCE STANDARDS	12
9.0 POST-CONSTRUCTION MONITORING	12
10.0 LONG-TERM MANAGEMENT RESPONSIBILITIES	13
11.0 ADAPTIVE MANAGEMENT PLAN	14
12.0 FINANCIAL ASSURANCE	15
13.0 REFERENCES	16
APPENDIX A: FIGURES	
APPENDIX B: PHASE II MITIGATION DESIGN PLANS	

LIST OF FIGURES

<u>Number</u>	<u>Title</u>
1	Vicinity Map
2	Project Location Map

LIST OF TABLES

<u>Number</u>	<u>Title</u>
1	Wetland Mitigation Credit Summary
2	Proposed Planting List Identified by Planting Zone
3	Proposed Seed Mixes Identified by Planting Zone

LIST OF ACRONYMS AND ABBREVIATIONS

AOR	Area of review
EA	EA Engineering, P.C. and its Affiliate EA Science and Technology
EPA	Environmental Protection Agency
in.	inch(es)
JAF	Joint Application Form
lf	linear feet
LOD	Limit of Disturbance
NYSDEC	New York Department of Environmental Conservation
OHWM	Ordinary high-water mark
OU	Operable unit
RA	Remedial Action
RGL	Regulatory Guidance Letter
ROD	Record of Decision
SGV	Sediment Guidance Value
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

EXECUTIVE SUMMARY

The New York Department of Environmental Conservation (NYSDEC) is proposing remediation at the former Dzus Fastener Inc. Site located in West Islip, New York. Associated with Permit Application Number NAN-2018-01009-EME, EA Engineering, P.C. and its affiliate EA Science and Technology (EA) has been retained to develop the Final Phase II Nontidal Wetland Mitigation Plan in accordance with the Final Compensatory Mitigation Rule issued by the U.S. Army Corps of Engineers (USACE) and the Environmental Protection Agency (EPA), published 10 April 2008.

The remediation of contaminated soils requires the unavoidable impacts (both temporary and permanent) to wetlands and waterways throughout the project site. The overall goal of the Phase II Mitigation Plan is to replace functions and values lost due to the proposed remediation project. The proposed remediation design includes only temporary impacts to the stream channels onsite as no net loss to stream is expected and the proposed impact to the stream channels is to enhance stream function by the removal of contaminated sediments. Furthermore, the proposed mitigation plan includes the replacement of wetlands along the stream corridor which will be impacted during the remediation process. The creation of nontidal wetlands is being proposed to enhance habitat, as well as provide functional replacement for impacted wetlands to the greatest extent practicable.

The Phase II Mitigation for the project includes the restoration of stream channel in place and the restoration of forested and open water wetland areas onsite. The wetland mitigation site shall be monitored and maintained to ensure stream stability, wetland plant survival and minimize invasive species presence. The compensatory mitigation is proposed to be onsite and the mitigation area shall be protected by a Site Management Plan.

After the onsite wetland creation activities are complete, a 5-year annual monitoring program will be implemented in accordance with the guidance provided in Regulatory Guidance Letter (RGL) No. 08-03 (USACE, October 2008). Performance standards for monitoring will be within accepted guidelines.

1.0 INTRODUCTION

The New York Department of Environmental Conservation (NYSDEC) is proposing remediation at the former Dzus Fastener Inc. Site located at 425 Union Boulevard in West Islip (**Appendix A: Figure 1**). Wastes generated during historical operation of the facility resulted in contamination (principally cadmium and chromium) to soil, groundwater, and sediment adjacent to the site. Several cleanup actions have taken place over the years, but contamination remains in sediments of Willetts Creek and Lake Capri, and in limited floodplain soils. The proposed remedy is being managed by the New York State Department of Environmental Conservation, as part of the state Superfund Program (Site No. 152033). The remediation is proposed per the October 2017 Record of Decision (ROD) for Operable Unit 3 (OU3; Willetts Creek and floodplain), and November 2018 ROD for OU4 (Lake Capri and floodplain) (**Appendix A: Figure 2**). The remediation is tentatively expected to begin in April 2019 and continue through December 2019. Final restoration will be completed in 2020. The remediation will consist of the following elements.

- Dredging of contaminated sediment from Willetts Creek; in an area between the shopping plaza at 448-476 Union Boulevard, and the outlet to Lake Capri.
- Dredging of sediment from Lake Capri.
- Excavation of floodplain soil adjacent to Willetts Creek and Lake Capri.
- Dewatering, stabilization, transportation and disposal of contaminated sediment and soil.
- Material processing areas will be established on the High School and Middle School properties along the west bank of Willetts Creek.
- Truck traffic will be directed through residential neighborhoods before reaching state roads to travel to the disposal facilities
- Areas dredged or excavated will be restored with backfill and/or plantings as dictated by the final remedial design.

Associated with Permit Application Number NAN-2018-01009-EME, EA Engineering, P.C. and its affiliate EA Science and Technology (EA) has prepared this Final Phase II Nontidal Wetland Mitigation Plan in accordance with the Final Compensatory Mitigation Rule issued by the U.S. Army Corps of Engineers (USACE) and the Environmental Protection Agency (EPA), published 10 April 2008. Federal and state regulations require that unavoidable losses of wetlands and streams be compensated through mitigation. Wetland and stream mitigation is defined as the creation, restoration, enhancement, or preservation of wetlands or streams, to compensate for the wetlands and streams that will be lost. This document provides supporting details for the wetland and waterways mitigation plan proposed for the Dzus Fastener Company, Inc. Project.

EA has prepared this Phase II Mitigation Plan to present the proposed design (**Appendix B**) for the wetland and waterways mitigation site for review and approval by USACE and NYSDEC in

order to facilitate the final permit authorization for the proposed impacts to existing wetlands and waterways as documented in the Joint Application Form (JAF) associated with this project.

The Phase II Mitigation Plan has been prepared in accordance with the USACE Regulatory Guidance Letter (RGL) No. 08-03, dated 10 October 2008, and documents the 12 critical elements as required by the Final Compensatory Mitigation Rule. The 12 critical elements outlined in this Mitigation Plan include the following:

- Introduction
- Objectives
- Site selection
- Baseline information (for impact and compensation sites)
- Credit determination
- Mitigation work plan
- Site Protection Instrument
- Performance standards
- Monitoring requirements
- Long-term management plan
- Adaptive management plan
- Financial assurances

2.0 MITIGATION GOALS AND OBJECTIVES

As documented in the JAF, the remediation of contaminated soils requires the unavoidable impacts (both temporary and permanent) to wetlands and waterways throughout the project site.

The overall goal of the Phase II Mitigation Plan is to replace functions and values lost due to proposed remediation project. The proposed remediation design includes only temporary impacts to the stream channels onsite as no net loss to stream is expected and the proposed impact to the stream channels is to enhance stream function by the removal of contaminated sediments.

Furthermore, the proposed mitigation plan includes the replacement of wetlands along the stream corridor, to the greatest extent practicable, which will be impacted during the remediation process. The creation of nontidal wetlands is being proposed to enhance habitat, as well as provide functional replacement for impacted wetlands where grades and adjacent property boundaries allow.

3.0 SITE SELECTION

The Dzus Fastener Company, Inc. site (NYSDEC Site Number No. 152033) located in West Islip, Suffolk County, New York is listed as a Class “2” in the State Registry of Inactive Hazardous Waste Sites (list of State Superfund sites) and this site represents a significant threat to public health or the environment, and therefore action is required.

There are four operable units (OUs) which comprise the Dzus Fasteners Company, Inc. site. These include one onsite OU (OU1), and three offsite OUs (OU2, OU3, and OU4). These OUs were created as a portion of the overall remedial program for either technical or administrative purposes to investigate, mitigate, or eliminate a threat of release or exposure pathway resulting from site contamination. Initially, two OUs (OU1 and OU2) were created to manage onsite contamination (OU1) and offsite impacts (OU2), but subsequent investigations have triggered the creation of additional OUs to manage site investigations and remedial efforts. The scale and number of the OUs has transformed over the history of the site as the investigations revealed a widening scope of impacts from the original source. OUs 3 and 4 are the subject of the current remediation project.

After the remedial actions (RAs) for OU1 and OU2 were completed, post-remedial monitoring of Willetts Creek sediment exhibited concentrations of cadmium that exceeded both the remedial goals established in the OU2 ROD as well as the NYSDEC Sediment Guidance Values (SGVs). As a result, OU3 was designated to manage the area of offsite impacted wetlands located behind the shopping plaza on Union Boulevard including a portion of the Willetts Creek channel extending approximately 2,700 ft toward Lake Capri. A ROD for OU3 was issued by the NYSDEC in August 2017, which designated the following RAs and site cleanup objectives:

- The selected remedy includes excavation and offsite disposal of Willetts Creek bank soil that exceed the residential use SCOs for cadmium and chromium
- Removal and offsite disposal of sediment to native material in the portion of Willetts Creek (and floodplain) where cadmium and chromium were observed above the residential SCOs for soil and for sediments above the lowest end of the NYSDEC Class B SGVs.
- Confirmation sampling of soil and restoration of creek and excavated soil areas.

OU4 was established at the completion of the OU3 RI, to address elevated cadmium and chromium concentrations in and around Lake Capri, and the southern portion of Willetts Creek (between OU3 and Lake Capri). A ROD for OU4 was issued in November 2018, and designated the following Ras and site cleanup objectives:

- Excavation and offsite disposal of residential soils exceeding the unrestricted SCOs.
- Clearing, chipping, and grubbing of woody material and subgrade preparation of the zone of impact.
- Removal of all sediment above Class A SGVs in Willetts Creek and Lake Capri. Existing structures will be protected where feasible or replaced.
- Willetts Creek and Lake Capri bathymetry and topography will be restored with appropriate material meeting Class A SGVs. Wetland habitat will be restored to the

maximum extent possible while allowing sufficient flood capacity and appropriate stream flow.

As the soils within Willetts Creek, Lake Capri, and associated wetlands needed to be remediated, no additional sites were considered for mitigation.

4.0 BASELINE INFORMATION

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 in a mixed residential, commercial, and industrial area (**Figure 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 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.

EA conducted a wetland delineation on 11 and 12 March 2018 as well as 14 September 2018 to identify the limits of the existing streams and wetlands within the remediation and mitigation area. The wetlands and stream have been flagged in the field and the boundaries were overlaid on the attached Design Plans (**Appendix B**).

4.1 STREAM #1

Stream #1 was identified as a perennial channel originating at the northern end of the Area of Review (AOR) from a large culvert. Stream #1 flows in a southerly direction through the AOR for approximately 4,033 feet before contributing to the northern end of Lake Capri. This stream is depicted as a blue-line stream on United States Geological Society (USGS) Maps and is identified as Willetts Creek. EA's wetland scientists observed a defined bed and bank and an OHWM within the limits of the stream channel throughout the entire AOR and has an average estimated base flow less than 1 cubic foot per second, based on an installed pressure transducer monitored between March and May 2018. Multiple wetlands were identified along Stream #1, within the AOR and described in the following sections. Stream #1 was flagged in the field along the OHWM and depicted on the Wetland Delineation Maps.

4.2 WETLANDS A, B, D, AND E

Wetlands A, B, D, and E were identified as forested wetlands located directly along the banks of Stream #1. Wetlands A and B are located along the northern portion of the AOR, Wetland D is located on the southern portion of the AOR, and Wetland E is located on the central portion of the AOR. These wetlands were identified along lower benches along the stream channel and generally followed the toe of the slope along the urbanized areas to the east and west.

The primary source of hydrology for these four wetlands appear to be from groundwater. These forested wetlands consist of predominantly hydrophytic vegetation including red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), coastal sweet pepperbush (*Clethra alnifolia*), highbush blueberry (*Vaccinium corymbosum*), and skunk cabbage (*Symplocarpus foetidus*). The soil matrix within this area had a chroma value of two or less as well as redox features in the matrix. Wetland hydrology indicators within these four wetlands included saturated soils, water marks on trees, inundation, drainage patterns, and water stained leaves. These four wetlands were identified as directly abutting Stream #1.

These four wetlands are located between the existing stream and the upland urbanized areas. In general, the upland/wetland interface along the private properties and schools included a 1-3 foot slope and abrupt change in vegetation cover. The upland areas along the wetland interface consisted primarily of mowed lawns dominated by non-hydrophytic vegetation (common dandelion, white and red clover, fescue species, etc.).

4.3 WETLAND C

Wetland C is located on a low bench feature along the left bank of Stream #1 on the southern end of the AOR. Wetland C was identified as a narrow, forested wetland. Wetland C is dominated by red maple and sweet gum in the overstory with little to no understory with the exception of a dense stand of common reed (*Phragmites australis*). Wetland C appears to receive hydrology from surficial runoff from the surrounding residential properties as well as flood flow from Stream #1. The soil within Wetland C had a chroma value of 2 with redox features around the pore linings.

Wetland hydrology indicators within Wetland C included saturated soils and drainage patterns. Wetland C was identified as a forested wetland directly abutting Stream #1. This wetland is bound by upland mowed residential yards to the east and Stream #1 to the west.

4.4 WETLAND F

Wetland F is located on the central portion of the AOR, along the left and right banks of Stream #1. Wetland F was identified as an emergent wetland. Wetland F is dominated a dense stand of common reed. Wetland F appears to receive hydrology from surficial runoff from the surrounding residential properties as well as flood flow from Stream #1. The soil within Wetland F had a chroma value of 2 with redox features around the pore linings. Wetland hydrology indicators within Wetland F included oxidized rhizospheres on living roots and drainage patterns. Wetland F was identified as an emergent wetland directly abutting Stream #1.

This wetland is located on a low benchlike feature along the stream with high steep slopes along the wetland/upland interface. The slopes along the wetland edge were dominated by common reed but lacked hydrologic indicators and did not contain hydric soils.

4.5 STREAM #2

Stream #2 was identified as an intermittent channel originating from a small concrete culvert near the northwest corner of Lake Capri along Ivy Court. Stream #2 flows in a southerly direction through the AOR for approximately 165 feet before contributing to the northwestern corner of Lake Capri. This stream is depicted as a portion of the open water lake on USGS Maps and is identified as Lake Capri. EA's wetland scientists observed a defined bed and bank and an OHWM within the limits of the stream channel. At the time of the site visit no baseflow was observed in the channel. Two wetlands (Wetland G and H) were identified as directly abutting Stream #2, within the AOR and described below. Stream #2 was flagged in the field along the OHWM and depicted on the Wetland Delineation Maps.

4.6 WETLAND G AND H

Wetland G is located between Stream #2 and Lake Capri on the southern end of the AOR. Wetland G was identified as an emergent and open water wetland which has formed from a constriction and backwater affect at the north end of Lake Capri. Wetland G is dominated by jewel weed (*Impatiens capensis*), sensitive fern (*Onoclea sensibilis*), and false nettle (*Bohemeria cylindrica*). A small elevated wetland bench dominated by larger trees and shrubs was identified along the eastern portion of the open water feature associated with Wetland G. Due to the change in vegetation cover this area was identified as Wetland H. Wetland H is a narrow, forested wetland bench along the open water of Wetland G. Wetland G and H appear to receive hydrology from surficial runoff from the surrounding residential properties as well as backwater from Lake Capri. The soil within Wetland G and H had a chroma value of 1 with redox features around the pore linings in the upper 12 inches.

Wetland hydrology indicators within Wetland G and H included inundation of 0-2 inches, saturated soils at the surface, and drainage patterns. Wetland G was identified as an emergent wetland directly abutting Stream #2 and Wetland H was identified as forested.

These two wetlands transition to upland areas which are comprised of mowed/maintained residential yards and are dominated by upland grasses and weeds. No indicators of hydrology were identified within the upland areas along the wetland/upland interface and soils consisted of brighter brown matrix colors with no redox features.

4.7 LAKE CAPRI

One large lacustrine wetland was identified at the southern end of the AOR and is identified as Lake Capri. This lacustrine wetland was delineated along the OHWM and is confined to the bank of the lake with no adjacent emergent features above the OHWM. Most of the lake is surrounded by residential properties with mowed maintained lawns up to the bank of the lake. The southernmost end of the lake is bound by Montauk Highway and flows through an existing riser structure where it outfalls on the southern side of the highway to the tidal portion of Willetts Creek.

5.0 MITIGATION CREDIT ACCOUNTING

5.1 REQUIRED WETLAND MITIGATION CREDITS

The Limit of Disturbance (LOD) for the remediation of the contaminated soils was developed based on the extent of contamination and therefore could not be designed to avoid and minimize impacts to wetlands and waterways to the greatest extent practical while still meeting the project needs. The remediation project would not be possible without temporarily impacting waters of the United States, including federally regulated wetlands.

Based on the proposed remedial design, the project anticipates 4,128 linear feet of temporary stream channel impact and 8.63 acres of impacts to nontidal wetlands.

In order to meet a “minimal cumulative impact” goal of nontidal wetland and waterway mitigation, the 4,128 linear feet of stream impacted by the remediation will be mitigated in place and impacts will be offset by the restoration of the channel after contaminants are removed. The 8.63 acres of nontidal wetland impacts caused by the remediation will also be restored to the greatest extent possible but based on the proposed design plans, will result in a loss of wetland acreage from permanent impacts. The impact and mitigation acreages are provided in Table 1 below.

Table 1. Wetland Mitigation Credit Summary

System	Impact Type	Impact Amount (acres)	Mitigation Proposed (acres)
Wetland A	Forested Wetland	0.15	0.54
Wetland B	Forested Wetland	0.04	0.06
Wetland C	Forested Wetland	0.09	0.00
Wetland D	Forested Wetland	0.05	0.00
Wetland E	Forested Wetland	0.36	0.00
Wetland F	Emergent Wetland	0.36	0.00
Wetland G	Emergent Wetland	0.00	0.00
Wetland H	Forested Wetland	0.00	0.00
Lake Capri	Open Water	7.58	7.58
Stream #1	Perennial Stream	4,128 lf	4,128 lf
	Total Impacts = 8.63 acres		Total Restoration Proposed = 8.18 acres
	Cumulative Wetland Impact = -0.45 acres		

During the development of the Phase II Mitigation Plan, it was determined that the potential to meet a no net loss goal through onsite restoration was unlikely and that the remediation and mitigation would result in a minimal cumulative impact of -0.45 acres.

6.0 WORK PLAN

The proposed Mitigation Plan described below was prepared in accordance with our Goals and Objectives, as stated in Section 2.0. Onsite mitigation for the stream and wetland restoration within the limits of disturbance is being proposed in order to meet a “minimal cumulative impact” goal of nontidal wetland and waterways mitigation. The Phase II Mitigation for the project includes the restoration of stream channel in place and the restoration of forested and open water wetland areas onsite.

6.1 STREAM RESTORATION WORK DESCRIPTION

In general, the stream is being excavated to remove contaminated soils within the channel and banks as well as the immediate riparian buffer. Typical stream excavation is proposed between at an average depth of 27 inches and will be replaced with clean native backfill material. The banks along the stream will be graded to a 2:1 or flatter slope throughout the project site and the proposed stream channel will have a typical cross-sectional area of 18.2 square feet with a bankfull width of 19.1 feet. Detailed stream grading including channel profile and cross-sections, as well as proposed riparian planting are provided in the attached design plans (**Appendix B**).

6.2 WETLAND AND UPLAND RESTORATION WORK DESCRIPTION

Wetland creation will be accomplished through the creation of a riparian wetlands on each side of the existing stream channel. The remedial activities will include excavations within the wetlands and the existing stream channel. The areas will be excavated as depicted on the design plans (approximately 30 inches) to remove the contaminated materials. Once the remedial excavation activities are complete, clean fill will be brought into the site and the stream channel and wetland areas will be restored and planted.

Wetland fill material will be deposited within the wetland riparian areas to create microtopography features that will diversify habitat for wetland flora and fauna. The surface of the placed soil will not be compacted, as this may limit plant establishment and microbial activity.

6.3 WETLAND MITIGATION PLANTING PLAN

The proposed wetland mitigation areas will be planted with native hydrophytic vegetation as detailed on the attached Design Plans provided in **Appendix B** (Sheets 20-24).

Overall tree and shrub spacing for the proposed wetland is indicated in Table 2. The plant materials selected for this project are representative of the species composition of the wetlands within the project area and native to the region.

Table 2. Proposed Planting List Identified by Planting Zone

UPLAND PLANTING ZONE				
SCIENTIFIC NAME	COMMON NAME	TYPE (FEET)	SPACING (FEET)	QUANTITY
<i>Populus tremuloides</i>	Quaking Aspen	4 - 6	20 - 30	21
<i>Acer rubrum</i>	Red Maple	4 - 6	20 - 30	46
<i>Betula nigra</i>	River Birch	4 - 6	20 - 30	88
<i>Pinus strobus</i>	Eastern White Pine	4 - 6	15 - 25	61
<i>Pinus rigida</i>	Pitch Pine	4 - 6	20 - 30	42
<i>Quercus ilicifolia</i>	Scrub Oak	4 - 6	10 - 20	6
<i>Alnus serrulata</i>	Hazel Alder	3 - 4 (live stakes)	8 - 12	62
<i>Prunus Maritima</i>	Beach Plum	3 - 4	2 - 6	4
<i>Vaccinium corymbosum</i>	High Bush Blueberry	3 - 4	2 - 6	38
WETLAND PLANTING ZONE 1 (Potential high velocity area)				
Plugs to be planted in a 48" triangular grid pattern				
SCIENTIFIC NAME	COMMON NAME	TYPE	SPACING (FEET)	QUANTITY
<i>Chamaecyparis thyoides</i>	Atlantic White Cedar	3 - 4	20 - 30	108
<i>Betula nigra</i>	River Birch	4 - 6	20 - 30	23
<i>Alnus serrulata</i>	Hazel Alder	3 - 4 (live stakes)	8 - 12	36
<i>Vaccinium corymbosum</i>	High Bush Blueberry	3 - 4	2 - 6	12
<i>Catha palustris</i>	Marsh Marigold	Plug	4	556
<i>Andropogon virginicus</i>	Broom Sedge	Plug	4	556
<i>Carex lupliformis</i>	Hop Sedge	Plug	4	556
<i>Carex comosa</i>	Beard Sedge	Plug	4	556
<i>Eleocharis palustris</i>	Spike Sedge	Plug	4	556
<i>Eupatorium maculatum</i>	Joe-Pye Weed	Plug	4	556
<i>Asclepias incarnata</i>	Swamp Milkweed	Plug	4	556
<i>Acorus americana</i>	Sweet Flag Iris	Plug	4	556

Table 3. Proposed Seed Mixes Identified by Planting Zone

UPLAND PLANTING ZONE – NEW ENGLAND EROSION CONTROL/RESTORATION MIX	
SCIENTIFIC NAME	COMMON NAME
<i>Elymus riparius</i>	Riverbank Wild Rye
<i>Schizachyrium scoparium</i>	Little Bluestem
<i>Festuca rubra</i>	Red Fescue
<i>Andropogon gerardii</i>	Big Bluestem
<i>Panicum virgatum</i>	Switch Grass
<i>Vernonia noveboracensis</i>	New York Ironweed
<i>Agrostis perennans</i>	Upland Bentgrass
<i>Bidens frondosa</i>	Beggar Ticks
<i>Eupatorium maculatum (Eutrochium maculatum)</i>	Spotted Joe Pye Weed
<i>Eupatorium perfoliatum</i>	Boneset
<i>Aster novae-angliae (Symphyotrichum novae-angliae)</i>	New England Aster
<i>Scirpus cyperinus</i>	Wool Grass

<i>Juncus effusus</i>	Soft Rush
Note: Recommended application rate is: 1lb/1,250 sq. ft	
WETLAND PLANTING ZONE 1 & 2 – WETLAND SEED MIX	
SCIENTIFIC NAME	COMMON NAME
<i>Carex vulpinoidea</i>	Fox Sedge
<i>Carex scoparia</i>	Blunt Broom Sedge
<i>Carex lurida</i>	Lurid Sedge
<i>Carex lupulina</i>	Hop Sedge
<i>Poa palustris</i>	Fowl Bluegrass
<i>Bidens frondosa</i>	Beggar Ticks
<i>Scirpus atrovirens</i>	Green Bulrush
<i>Asclepias incarnata</i>	Swamp Milkweed
<i>Carex crinita</i>	Fringed Sedge
<i>Vernonia noveboracensis</i>	New York Ironweed
<i>Juncus effusus</i>	Soft Rush
<i>Aster lateriflorus (Symphyotrichum lateriflorum)</i>	Starved/Calico Aster
<i>Iris versicolor</i>	Blue Flag
<i>Glyceria grandis</i>	American Mannagrass
<i>Mimulus ringens</i>	Square Stemmed Monkey Flower
<i>Eupatorium maculatum (Eutrochium maculatum)</i>	Spotted Joe Pye Weed
Note: Recommended application rate is 1lb/2,500 sq. ft	

The number of each species proposed for planting is shown on the attached design plans (**Appendix B**). Live Stakes can be substituted for any of the above trees or shrubs if the species is the same, and the size is comparable. All upland and wetland areas experiencing ground disturbing activities during the project will be planted with the identified plants, and over seeded with corresponding seed mix. Areas of standing water will not be planted.

The final selection of plant stock will be determined by availability, and any deviations from the plats listed above will need to be approved by NYSDEC. The selected plant species will consist of containerized plants, plugs, and seed mixes. Trees will be protected with tree shelters to provide protection from wildlife predation, wind, or other damaging influences.

During construction activities, soil and erosion control best management practices (BMPs) will be used as prescribed on the design drawings. Areas will either be planted or covered with straw/hay to protect soil from eroding during construction. A temporary soil stabilization seed mix typically includes: annual ryegrass (*Lolium multiflorum*), millet (*Setaria italica*), barley (*Horedeum sp.*), oats (*Uniola sp.*), and/or rye (*Secale cereale*). These species will provide rapid stabilization of the site until final grading, planting, and seeding is completed, while allowing for planted material and other native wetland species to establish.

6.4 PHRAGMITES MANAGEMENT PLAN

Phragmites is a large, coarse, perennial grass that usually forms large, dense stands reducing the diversity of plant and wildlife species. Flowering and seed set occur between July and September. Germination occurs in spring on exposed moist soils. Vegetative spreading by belowground rhizomes (roots) can result in dense patches with up to 20 stems per square foot. Phragmites is capable of vigorous vegetative reproduction and often forms dense, nearly monotypic stands.

Monotypic stands and pockets of Phragmites were observed along the edge of the existing stream channel within the mitigation area. Phragmites and associated belowground rhizomes will be removed as part of excavations associated with remedial activities.

Phragmites may continue to re-establish from the existing seed bank and neighboring populations without annual maintenance. Follow-up spot treatments will be required in order to control Phragmites reestablishment and allow new plants and native seed stock to successfully populate the wetland area.

7.0 SITE PROTECTION INSTRUMENT

The Phase II Mitigation Plan includes the restoration of stream channels and nontidal wetlands and is proposed to be onsite and shall be protected in perpetuity. Therefore, the mitigation areas will be protected in the future to prohibit activities including construction, grading, filling, excavating, ditching, draining, as well as the removal, cutting, mowing, burning, or harming of vegetation unless otherwise approved by both USACE and NYSDEC. Exceptions to this protection include the removal of invasive plant species within wetlands and riparian areas where necessary. Any activity in the protected areas must be approved by USACE and NYSDEC.

The permittee proposes to use a Site Management Plan in order to ensure the protection of the streams and wetlands included in the Phase II Mitigation Plan. A Draft Site Management Plan will be submitted to USACE by NYSDEC for review upon approval of the Phase II Mitigation Plan.

Upon approval of the Final Phase II Mitigation Plan, the permittee will draft and submit the appropriate protection document for review and approval by USACE to be pursuant to the institutional control recorded for the Dzus Fastener site. This document will not be finalized prior to approval from both agencies.

The protection document utilized for the mitigation areas for the proposed project will also include language granting the recipient agency, or any successor agency, access to the mitigation sites for inspections during the monitoring period and for construction of the mitigation project. The protection documents will also include appropriate language to allow monitoring activities, as well as any remediation activities that may be required by the regulatory agencies.

8.0 PERFORMANCE STANDARDS

Compensatory mitigation plans are required to provide written performance standards for assessing whether mitigation is achieving planned goals. The performance standards will become part of the permits as special conditions and be used for performance monitoring. Project performance evaluations will be performed by USACE, as specified in the permits or special conditions, based upon monitoring reports. Adaptive management activities may be required to adjust to unforeseen or changing circumstances, and responsible parties may be required to adjust mitigation projects or rectify deficiencies. The project performance evaluations will be used to determine whether the environmental benefits or “credit(s)” for the entire project equal or exceed the environmental impact(s) or “debit(s)” of authorized activities. Performance standards for compensatory mitigation sites will be based on quantitative or qualitative characteristics that can be practicably measured. The performance standards will be indicators that demonstrate that the mitigation is developing or has developed into the desired habitat.

As the stream channel is being restored in place the performance standards are required in order to determine the success of the restoration and will include:

- a. The length of restored stream must not be less than the pre-remedial length of 4,128 linear feet.
- b. No more than 15 percent of the surface area coverage from the Ordinary Highwater Mark to the outer edge of the established riparian buffer shall be bare ground.
- c. The cross-sectional area of the mitigation stream channel must not be less than the impact stream and not larger than 25 percent from the design plan(s).
- d. Pool/riffle complexes shall exist as described and depicted in the mitigation plan.

The success criteria for the proposed wetland mitigation site will include:

- 85 percent wetland vegetation coverage of the wetland mitigation site (planted and naturally regenerated/recruited stems).
- 75 percent planted vegetation survivability.
- The appearance of positive growth indicators for planted species, such as height and/or ground level diameter.
- A value of no more than 10 percent areal cover of invasive species within the treated wetland mitigation site.
- The site exhibits evidence of wetland hydrology indicators.

9.0 POST-CONSTRUCTION MONITORING

The following monitoring plan is proposed for the implementation of this mitigation plan. After the onsite restoration activities are complete, as-built design plans will be submitted to NYSDEC

and USACE within 120 days of completion and a monitoring program will be implemented for the project. The permittee is proposing a 5-year monitoring program in accordance with the guidance provided in RGL No. 08-03 (USACE, October 2008). The mitigation monitoring effort will include the collection of specific data for reporting, including the following:

- The growth and vitality of the planted hydrophytic species;
- Current site conditions at fixed photographic points;
- The species composition of recruited, desirable plant species;
- The species composition and areal cover of nuisance/non-native plant species;
- Wildlife utilization and depredation; and
- Descriptions of hydrology indicators observed and hydric soils development.

The monitoring procedure will include a baseline monitoring event (Year 0), conducted immediately following the completion of the mitigation site construction activities and included in the submittal of the as-built design plans. Following the completion of the baseline monitoring event, a 5-year monitoring schedule will be conducted. Year 1 of the monitoring effort will be conducted during the fall of the same year of completion of the mitigation planting, unless the plantings are completed after July 1st. If the wetland mitigation areas are not completed prior to July 1st, the first-year monitoring event will be performed the following year. Each monitoring event will be followed by an annual monitoring report which will be submitted before December 31st of each monitoring year.

Annual monitoring and sampling events will be performed between May and September of each year in order to appropriately measure vegetation. The success criteria for the monitoring program will include, at a minimum, the success of the planted vegetation, as measured through survivorship counts and observations of vitality and growth, and the existence of wetland hydrology for the created wetlands. Plot vegetation density measurement techniques will be utilized and conducted each monitoring year.

If success criteria have been satisfied at the completion of the 5-year monitoring program, a request for release from monitoring will be made to USACE and NYSDEC. It is understood that NYSDEC and/or USACE may require a monitoring period longer than 5 years. Additional monitoring may be required as a special condition of the issued permits or after reviewing the success of the mitigation sites during the initial monitoring period. If at any time the compensatory mitigation project cannot be maintained in accordance with the approved mitigation plan, it is the responsibility of the permittee (NYSDEC) to notify USACE.

10.0 LONG-TERM MANAGEMENT RESPONSIBILITIES

Long-term management and maintenance of the wetland mitigation sites will be assured through the the Site Management Plan for the mitigation area. If the mitigation area should ever be sold, all appropriate protective mechanisms (which will have been recorded) will remain in effect and will remain with the site into perpetuity.

Appropriate measures to address deficiencies identified during monitoring will be developed by USACE in consultation with the permittee (NYSDEC). These appropriate measures will be part of the adaptive management plan discussed in Section 11.0 and will ensure that the modification of the mitigation project provides ecological resource functions comparable to the project objectives. Extended monitoring of the mitigation sites, for a period longer than proposed in Section 9.0, may be required by USACE. Additional monitoring may be required as a special condition of the issued permits or after reviewing the success of the mitigation sites during the initial monitoring period.

11.0 ADAPTIVE MANAGEMENT PLAN

The permittee recognizes that the mitigation may require more advanced management and modification in order to be viable due to the nature of the surrounding land use. Therefore, the permittee proposes an adaptive management and monitoring plan for use at this site.

In accordance with Final Mitigation Rule 332.7(c)(4), the performance standards outlined in this report can be revised through the adaptive management procedure to consider appropriate measures implemented to address deficiencies. The performance standards may also be modified to reflect changes in management strategies and objectives so long as the modifications lead to ecological benefits comparable to or superior to the approved compensatory mitigation project. For example, the tree protection used onsite may not prevent deer grazing on the new plants, preventing the vegetation from establishing. The adaptive management to replace the plants using a new method to reduce grazing may be utilized. Adaptive management procedure can be implemented under any circumstances in which the function of the impacted wetlands and streams are not being performed by the mitigation project and secondary impacts are not being prevented.

If monitoring or other information identifies a deficiency in the compensatory mitigation project, at any time during or following construction of the project, the USACE and NYSDEC must be notified within a month of the discovery of the deficiency through a formal report or other documentation, identifying the deficiencies to be addressed.

If it is found that the deficiencies have significantly impaired the progress of the mitigation project, then the participating parties will consult to produce appropriate measures in coordination with the permittee. USACE and NYSDEC have final approval over the measure implemented to address the mitigation project deficiencies. The proposal of appropriate measures should take place within 8 weeks following the agency decision that the deficiencies need to be addressed and the final course of action decided on within 4 weeks following the presentation of appropriate measures. During the 4 weeks following the presentation of appropriate measures, the consulting stake-holders will participate in a review and revision process until the plans are approved by USACE and NYSDEC. Corrective action will be taken as soon as possible following the adaptive management decision, within the constraints of growing seasons, the special conditions of the permit, and weather conditions.

12.0 FINANCIAL ASSURANCE

Based on the anticipation of the site being placed on the inactive hazardous waste site registry as a Class 4 Site (requiring continued management) under the State Superfund Program, financial assurance will not be required.

13.0 REFERENCES

U.S. Army Corps of Engineers. 2008. *Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources*. Regulatory Guidance Letter No. 08-03. 10 October.

———. and Environmental Protection Agency. 2008. *Compensatory Mitigation for Losses of Aquatic Resources*. Code of Federal Regulations (33 CFR Part 332). April.

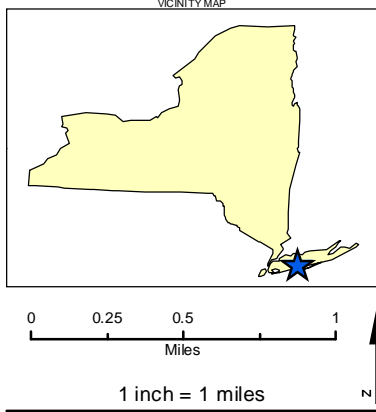
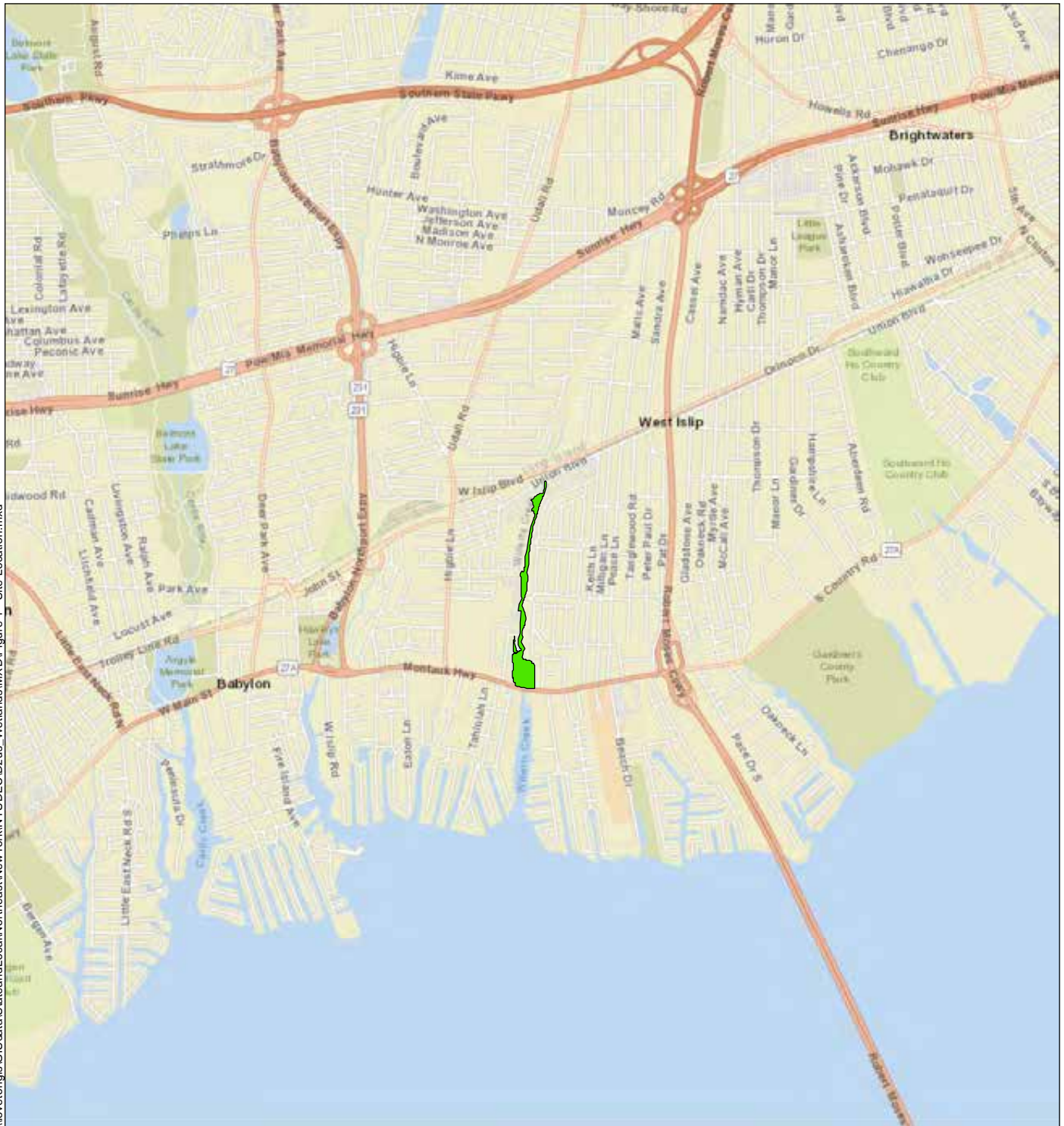
This page intentionally left blank

Appendix A

Figures

This page intentionally left blank

\\lovetongis\GIS\data\stateand\local\Northeast\NewYork\NYDEC\Dzus_Wetlands\MXD\Figure 1 - Site Location.mxd




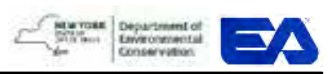
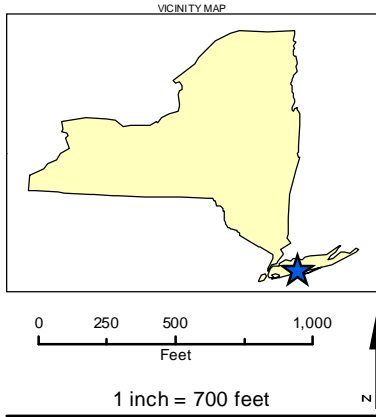
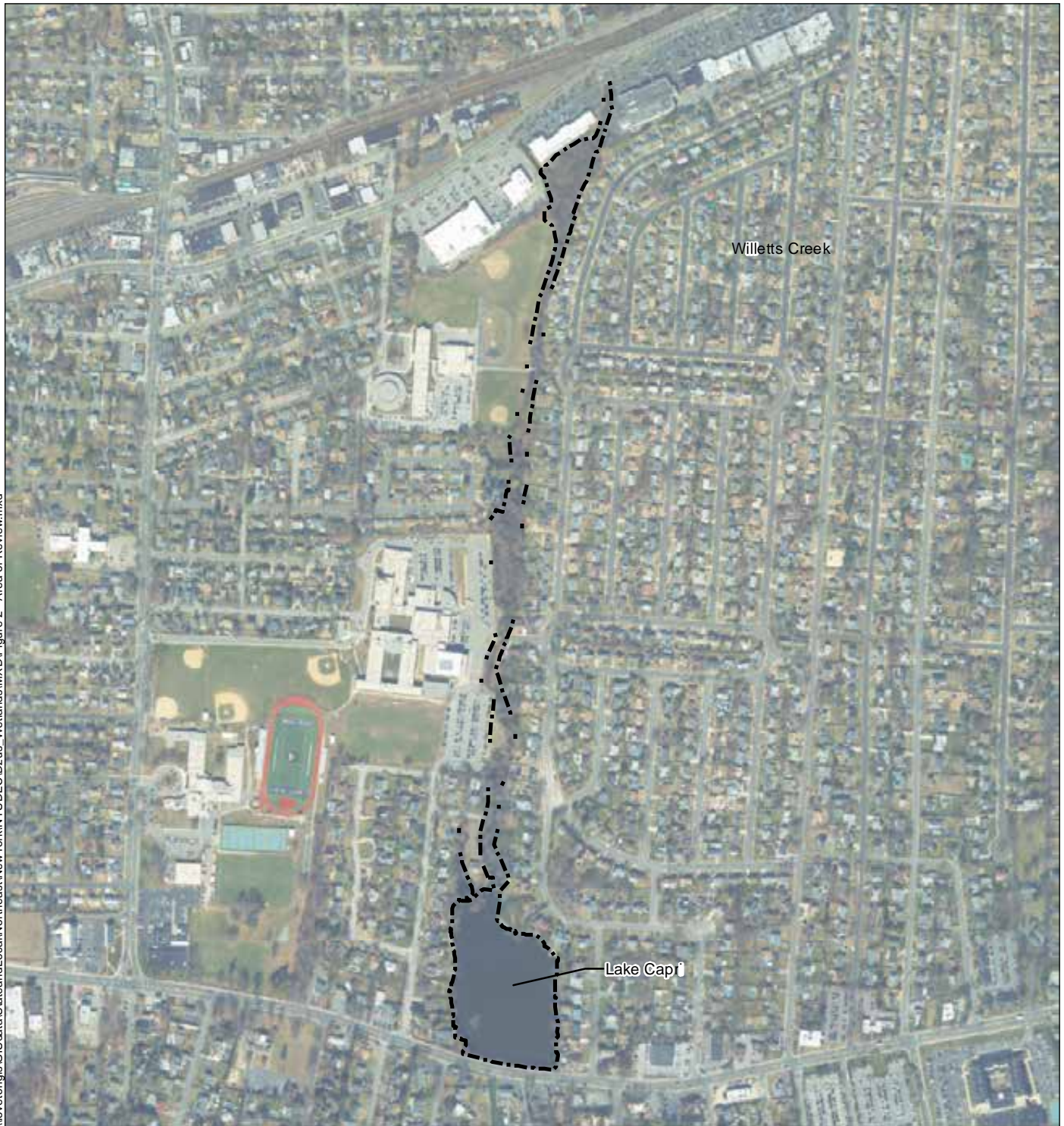
Legend
 Area of Review (AOR)

Figure 1
Site Location
Work Assignment Number D007624-33
Operable Unit 3 – Willetts Creek Area
and Operable Unit 4 - lake Capri (152033)
West Islip, New York

Map Date: 10/16/2018
Source: ESRI 2016
Projection: NAD 1983 State Plane New York
Long Island FIPS 3104 Feet



\\ovetongis\GIS\data\stateand\local\Northeast\NewYork\NYDEC\Dzus_Wetlands\MXD\Figure 2 - Area of Review.mxd



Legend
[Dashed Line] Area of Review (AOR)

Figure 2
Area of Review
Work Assignment Number D007624-33
Operable Unit 3 – Willetts Creek Area
and Operable Unit 4 - lake Capri (152033)
West Islip, New York

Map Date: 10/16/2018
Source: ESRI 2016
Projection: NAD 1983 State Plane New York
Long Island FIPS 3104 Feet

Appendix B

Phase II Mitigation Design Plans

This page intentionally left blank



Legend

	Scrub Oak		River Birch		Upland Zone
	Beach Plum		White Spruce		Wetland Zone
	Atlantic White Cedar		Pitch Pine		River
	Quaking Aspen		Alder		Proposed Wetland Line
	Red Maple		Blueberry		Limit of Work

NO.	DATE	DESCRIPTION
0	4/28/18	30% DESIGN SUBMITTAL
1	6/26/18	60% DESIGN SUBMITTAL
2	8/29/18	60% DESIGN REVISIONS
3	10/19/18	DESIGN REVIEW
4	12/03/18	FOR BIDS DUE

WILLETTS CREEK
 RESTORATION PLAN
 AND CROSS SECTIONS
 STA. 0+00 TO 11+00

EA ENGINEERING, P.C.
 14907.39-DZUS-Plense

PREPARED BY:
 EA ENGINEERING, P.C.
 AND ITS AFFILIATE
 EA SCIENCE AND

EA #	14907.39-DZUS-Plense
FILE	STA -
DATE	D=CEMB-R 2018
SCALE	AS SHOWN



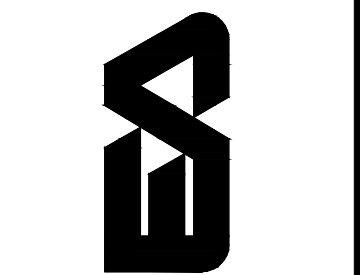
Legend

NO.	DATE	DESCRIPTION
0	4/28/18	30% DESIGN SUBMITTAL
1	6/26/18	60% DESIGN SUBMITTAL
2	8/29/18	60% DESIGN REVISIONS
3	10/19/18	DESIGN REVIEW
4	12/03/18	FOR BIDS DUE

WILLETTS CREEK RESTORATION
PLAN AND CROSS SECTIONS
STA. 11+00 TO 22+00

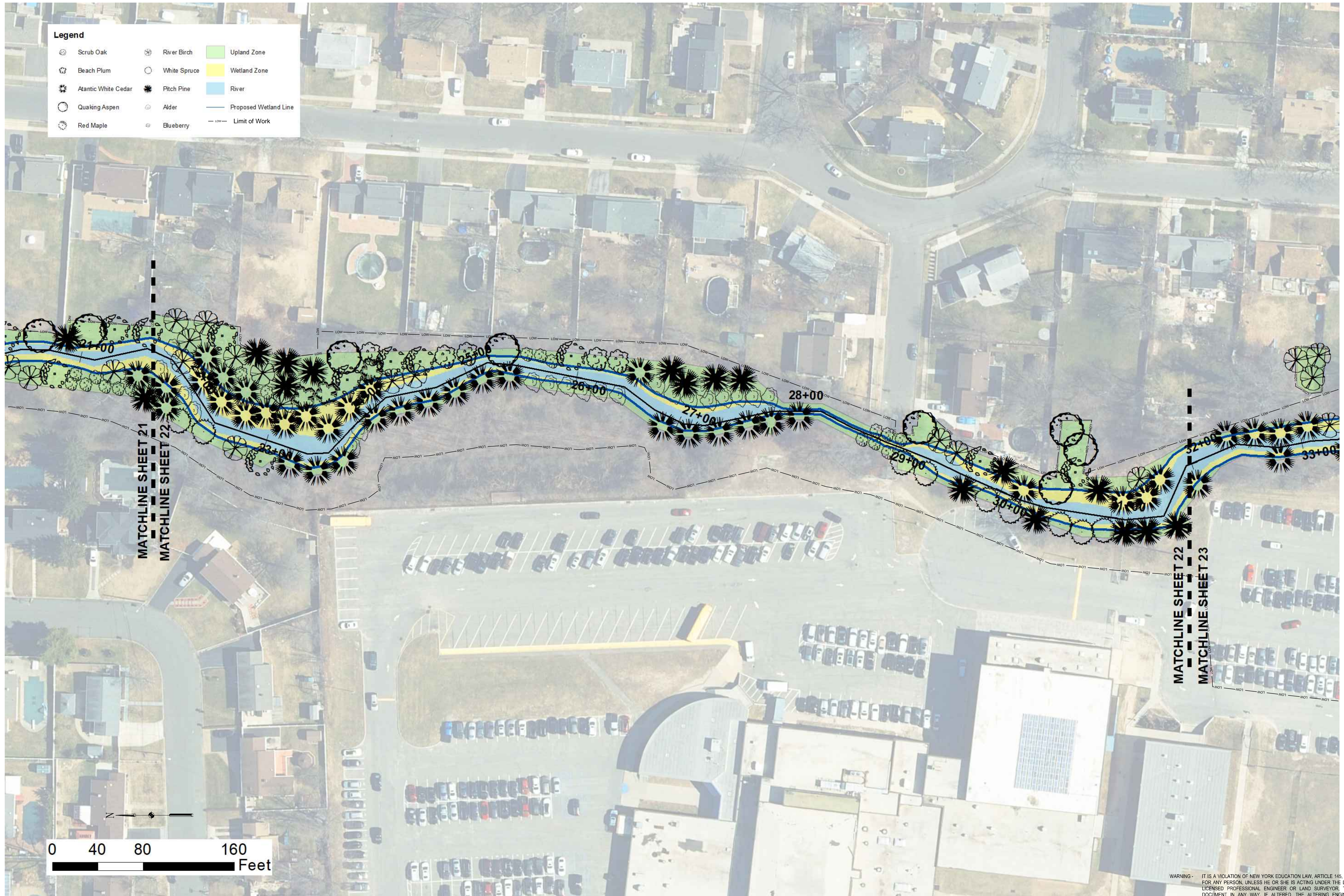
-FASTNER CO., INC.
R-MEDIATION AND R-RESTORATION OF
WILLETTS CREEK AND LAKE CAPRI
WEST ISLIP, SU--OLK COUNTY, NEW YORK

PREPARED BY:
EA ENGINEERING, P.C.
AND ITS AFFILIATE
EA SCIENCE AND



EA #	- ILE 14907.39-DZUS-Plense
DR- STA	-
DATE	D-CEMB-R 2018
SCALE	AS SHOWN

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, ARTICLE 145, SECTION 7209.2, FOR ANY PERSON, UNLESS HE OR SHE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING ENGINEER OR LAND SURVEYOR SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK EDUCATION LAW, ARTICLE 145, SECTION 7209.2.



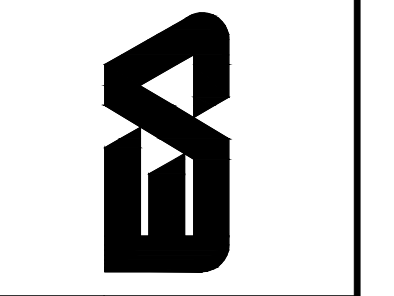
Legend

NO.	DATE	DESCRIPTION
0	4/28/18	30% DESIGN SUBMITTAL
1	6/26/18	60% DESIGN SUBMITTAL
2	8/29/18	60% DESIGN REVISIONS
3	10/19/18	DESIGN REVIEW
4	12/03/18	FOR BIDS DUE

WILLETTS CREEK RESTORATION
PLAN AND CROSS SECTIONS
STA. 22+00 TO 32+00

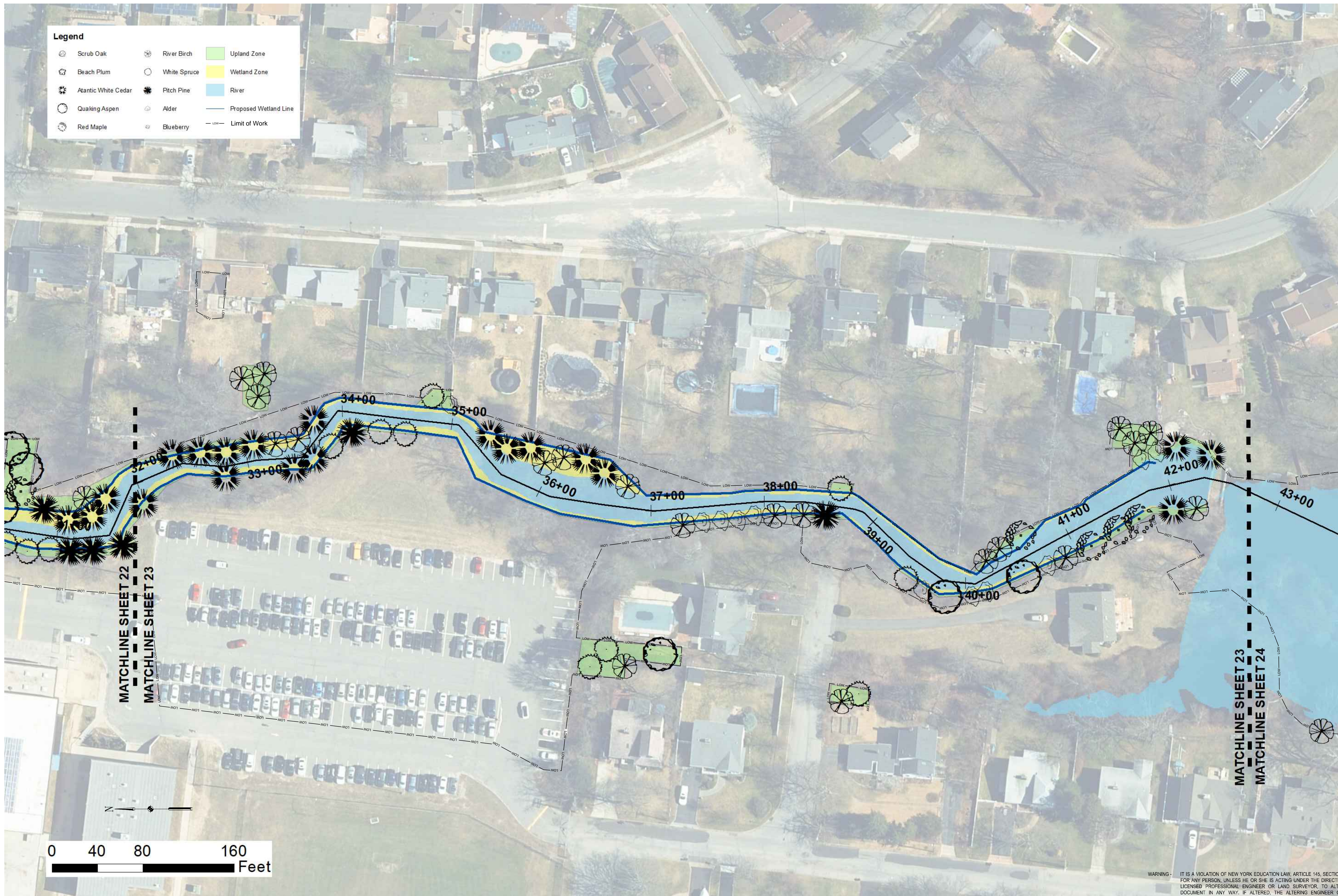
-FASTNER CO., INC.
R-MEDIATION AND RESTORATION OF
WILLETTS CREEK AND LAKE CAPRI
WEST ISLIP, SU-SULK COUNTY, NEW YORK

PREPARED BY:
EA ENGINEERING, P.C.
AND ITS AFFILIATE
EA SCIENCE AND



EA #	14907.39-DZUS-Plense
DR- STA	
DATE	D-CEMB-R 2018
SCALE	AS SHOWN

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, ARTICLE 145, SECTION 7209.2, FOR ANY PERSON, UNLESS HE OR SHE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING ENGINEER OR LAND SURVEYOR SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK EDUCATION LAW, ARTICLE 145, SECTION 7209.2.



Legend

	Scrub Oak		River Birch		Upland Zone
	Beach Plum		White Spruce		Wetland Zone
	Atlantic White Cedar		Pitch Pine		River
	Quaking Aspen		Alder		Proposed Wetland Line
	Red Maple		Blueberry		Limit of Work

Department of Environmental Conservation

NEW YORK
OPPORTUNITY

NO.	DATE	DESCRIPTION	REVISIONS
0	4/28/18	30% DESIGN SUBMITTAL	
1	6/26/18	60% DESIGN SUBMITTAL	
2	8/29/18	60% DESIGN REVISIONS	
3	10/19/18	DESIGN REVIEW	
4	12/03/18	FOR BIDS DUE	

PREPARED BY:
EA ENGINEERING, P.C.
AND ITS AFFILIATE
EA SCIENCE AND TECHNOLOGY

WILLETTS CREEK
RESTORATION PLAN AND
CROSS SECTIONS STA.
32+00 TO 42+50

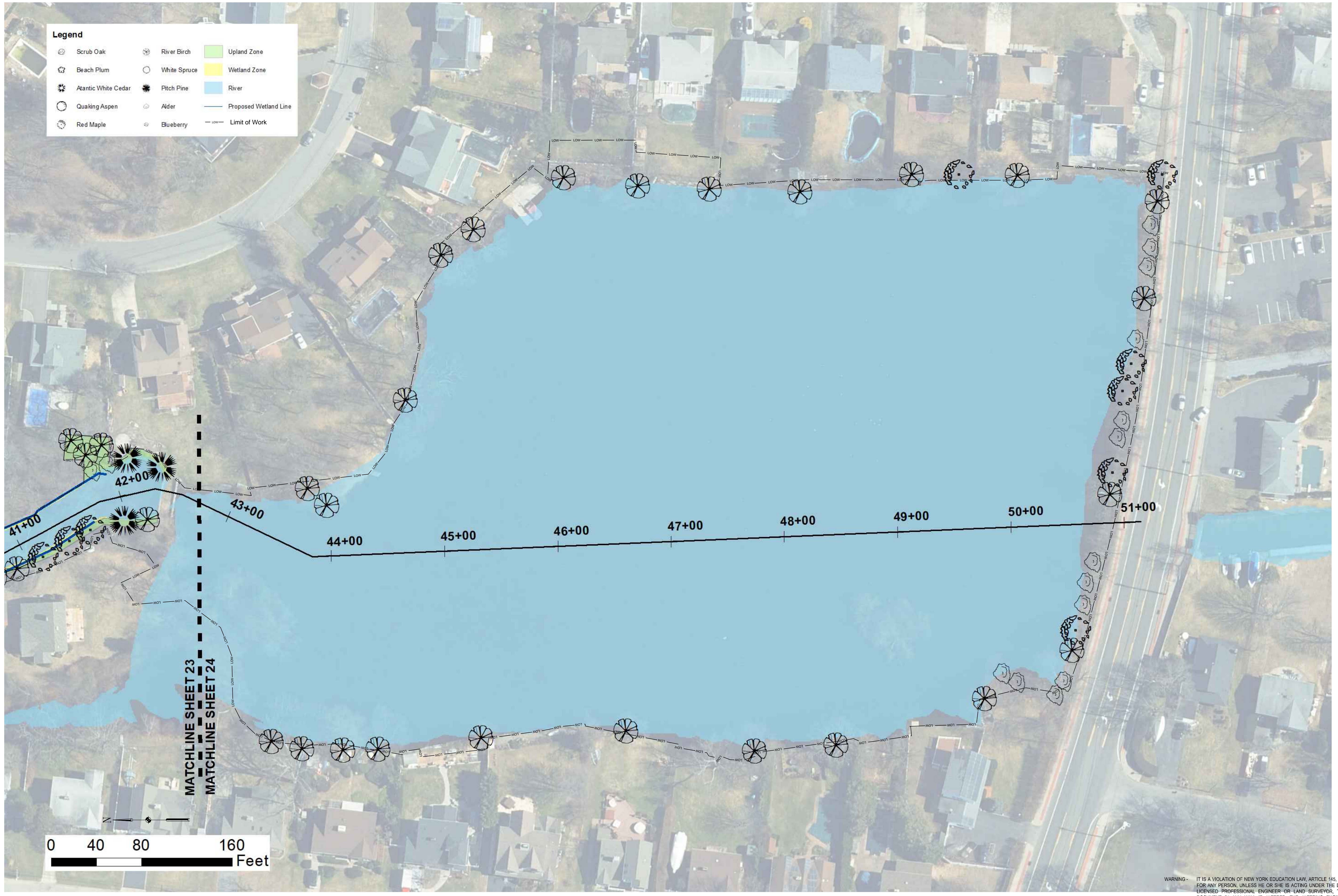
- EASTNER CO., INC.
- REMEDIATION AND RESTORATION OF
WILLETTS CREEK AND LAKE CAPRI
WEST ISLIP, SU-SOLK COUNTY, NEW YORK

EA #	14907.39-DZUS-Plense
FILE	STA -
DATE	D=CEMB=R 2018
SCALE	AS SHOWN

WARNING - IT IS A VIOLATION OF NEW YORK EDUCATION LAW, ARTICLE 145, SECTION 7209.2, FOR ANY PERSON, UNLESS HE OR SHE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR, TO ALTER THIS DOCUMENT IN ANY WAY. IF ALTERED, THE ALTERING ENGINEER OR LAND SURVEYOR SHALL COMPLY WITH THE REQUIREMENTS OF NEW YORK EDUCATION LAW, ARTICLE 145, SECTION 7209.2.

Sheet #

23



Legend

NO.	DATE	DESCRIPTION
0	4/28/18	30% DESIGN SUBMITTAL
1	6/26/18	60% DESIGN SUBMITTAL
2	8/29/18	60% DESIGN REVISIONS
3	10/19/18	DESIGN REVIEW
4	12/03/18	FOR BIDS DUE

LAKE CAPRI RESTORATION PLAN

PREPARED BY:
EA ENGINEERING, P.C.
AND ITS AFFILIATE
EA SCIENCE AND

EA # 14907.39-DZUS-Plonser

DR- STA -

DATE D=CEMB-R 2018

SCALE AS SHOWN

REVISIONS

EA ENGINEERING, P.C.
14907.39-DZUS-Plonser

EA SCIENCE AND

EA ENGINEERING, P.C.
AND ITS AFFILIATE
EA SCIENCE AND

EA #	14907.39-DZUS-Plonser
DR-	STA -
DATE	D=CEMB-R 2018
SCALE	AS SHOWN

This page intentionally left blank

Appendix I

Dzus Climate Resiliency Assessment Report

This page left intentionally blank



**Dzus Climate Resiliency Assessment Report
Dzus Fastener Company, Inc. (152033)
West Islip, New York**

Willetts Creek and Lake Capri

Prepared for

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



Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
269 West Jefferson Street
Syracuse, New York 13202
(315) 431-4610

July 2020
Version: FINAL
EA Project No. 1602501

This page left intentionally blank

TABLE OF CONTENTS

	<u>Page</u>
LIST OF FIGURES	iii
LIST OF TABLES	iv
LIST OF ACRONYMS AND ABBREVIATIONS	v
EXECUTIVE SUMMARY	ES-1
1. INTRODUCTION AND PROJECT OVERVIEW	1-1
2. PROJECT SITE CHARACTERIZATION.....	2-1
2.1 PHYSICAL SETTING	2-1
2.1.1 Site Geology.....	2-5
2.1.2 Site Hydrology/Hydrogeology.....	2-5
2.2 HISTORY OF OPERATIONS	2-5
2.3 CONTAMINANTS OF CONCERN	2-6
2.4 REMEDIAL ACTION.....	2-6
3. POST REMEDIAL ACTION SITE.....	3-1
3.1 RESIDUAL CONTAMINATION.....	3-1
3.1.1 OU1 and OU6 Areas.....	3-1
3.1.2 OU3 and OU4 Areas.....	3-1
3.1.3 OU5 Area.....	3-2
3.2 GROUNDWATER PLUME.....	3-2
3.3 POSSIBLE EXPOSURE PATHWAYS	3-2
3.3.1 Human Health Risk Assessment.....	3-2
3.3.2 Ecological Risk Assessment	3-2
4. CLIMATE CHANGE PROJECTIONS.....	4-1
4.1 PRECIPITATION.....	4-2
4.1.1 Surface water	4-4
4.1.2 Groundwater	4-4
4.2 SEA LEVEL RISE.....	4-4
4.2.1 Surface water	4-10

4.2.2	Groundwater	4-10
4.3	TEMPERATURE	4-10
4.4	WIND.....	4-10
5.	CLIMATE CHANGE SENSITIVITY ASSESSMENT	5-1
5.1	REMEDICATION SYSTEM COMPONENTS	5-3
5.2	REMEDICATION OPERATIONS	5-3
5.3	CONTAMINANTS OF CONCERN	5-3
6.	ADAPTATION MEASURES	6-1
6.1	REMEDICATION SYSTEM COMPONENTS	6-3
6.2	REMEDICATION OPERATIONS	6-3
6.3	CONTAMINANTS OF CONCERN	6-3
6.4	CLIMATE ADAPTATION PLAN.....	6-4
7.	SUMMARY AND CONCLUSIONS	7-1
8.	REFERENCES	8-1

LIST OF FIGURES

<u>Number</u>	<u>Title</u>
2-1	Site Features and Surrounding Area
2-2	Operable Units
3-1	Residual Cadmium in Willetts Creek Floodplain
3-2	Residual Cadmium in Lake Capri
3-3	Residual Cadmium in Groundwater
3-4	Willetts Creek Typical Backfill Detail
4-1	Observed and Projected Annual Temperature, Precipitation, and Sea Level Rise for New York City
4-2	Mean Future Return Periods: 1-Day 100-Year Rainfall Amounts, High Emission Scenario, 1970–1999 Versus 2040–2069
4-3	Current Conditions for MHHW, Major Storm Stage and Sandy Storm Stage
4-4	2050 Mid Relative SLR for MHHW, Major Storm Stage and Sandy Storm Stage
4-5	2050 High Relative SLR for MHHW, Major Storm Stage and Sandy Storm Stage
6-1	Conceptual Model for Adaptation Plan

LIST OF TABLES

<u>Number</u>	<u>Title</u>
2-1	Soil-Specific RAOs
2-2	Sediment-Specific RAOs
3-1	Residual Contaminants
4-1	Mean Annual Precipitation Changes in Region 4
4-2	Extreme Precipitation Event Projections in Region 4
4-3	Sea Level Rise Scenarios
4-4	Temperature Mean Annual Changes in Region 4
5-1	Possible Climate Change Impacts for Remediation
5-2	Summary of Possible Climate Change Impacts on Residual Contaminants of Concern
6-1	Implemented Strategies
6-2	Draft Climate Adaptation Plan

LIST OF ACRONYMS AND ABBREVIATIONS

°F	Degrees Fahrenheit
COC	Contaminant of concern
DOC	Dissolved organic carbon
EA	EA Engineering, P.C. and Its Affiliate EA Science and Technology
EPA	U. S. Environmental Protection Agency
FS	Feasibility Study
ft	Feet (foot)
in.	Inch(es)
MHHW	Mean higher high water
NAVD88	North American Vertical Datum of 1988
No.	Number
NOAA	National Oceanic and Atmospheric Administration
NYSDEC	New York State Department of Environmental Conservation
OU	Operable unit
RAO	Remedial action objectives
RCP	Representative concentration pathway
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SCO	Soil Cleanup Objective
SGV	Sediment Guidance Value
SLR	Sea level rise
SOC	Soil organic carbon
SVE	Soil vapor extraction
TCE	Trichloroethene

This page left intentionally blank

ES. EXECUTIVE SUMMARY

EA Engineering, P.C. and its affiliate EA Science and Technology, under Contract to the New York State Department of Environmental Conservation (NYSDEC) completed a Climate Resiliency Assessment for the Dzus Fastener Company, Inc. site (NYSDEC Site Number No. 152033) located in West Islip, Suffolk County, New York. The Climate Resiliency Assessment includes an assessment of projected climate change impacts, associated vulnerabilities, and both implemented and potential adaptation measures that could be undertaken now or in the future. Due to the ever-growing understanding of climate change, the information provided within the report should be revisited as climate change projections are refined over time.

Dzus Fasteners, including Willetts Creek and Lake Capri, had remedial work performed in 1999. However, periodic monitoring during site management found that the creek and lake sediments had increased levels of cadmium since the work was completed in 1999.

One possible explanation for the increased levels of cadmium in sediments was that given the historical accumulation of cadmium in creek sediments, it appears the organic-rich or fine-grained sediments in the creek that were not removed during the 1999 cleanup may have been mobilized during storm events (such as Superstorm Sandy in 2012) and contaminants were likely redistributed as floodwaters receded. It is believed that the conditions which may have led to the recontamination will no longer exist after the proposed remedial work is completed. To ensure this potential recontamination scenario was fully evaluated, this climate resiliency plan was developed.

To address metals contamination downstream of the former Dzus Fastener facility, NYSDEC performed a remedial action to address cadmium and chromium impacted media. This action involved the removal of approximately 42,200 cubic yards of sediment and soil from Willetts Creek (Operable Unit [OU] 3) and Lake Capri (OU4). Groundwater is under a long-term monitoring program to monitor residual cadmium levels in groundwater. On the slope behind the Captree Plaza building located along Willetts Creek, a 2 to 1 (horizontal to vertical) slope was maintained as a slope stability protective measure due to the nearby building, resulting in some residual cadmium levels slightly above soil cleanup objectives being left in place. A demarcation layer and clean backfill material was placed above residual levels to ensure these materials do not migrate. Similarly, to protect the timber bulkhead along Montauk Highway, no sediment removal was performed in Lake Capri within 30 ft of the bulkhead. In addition, a demarcation layer and clean backfill was placed to ensure these materials do not migrate. The Site Management Plan will identify and monitor the presence of these materials.

Climate change impacts such as increases in temperatures, frequency and severity of precipitation events, and sea level rise are included in site remediation and long-term management to ensure the site remains stable in the future. By 2050, projected impacts in West Islip include increases in average temperature by 5 degrees Fahrenheit (°F) and in precipitation by 5 inches per year. The sea level at West Islip is projected to rise by 1.3 to 2.5 feet without storm surge considerations. If a storm equivalent in size to the 2012 Super Storm Sandy were to occur in 2050 the resulting storm surge could be 9.6 to 10.8 feet greater than present day sea level. This would create significant

changes to the local area such as inundating lands in the project area. Sea level rise, increased precipitation, and heavy rainfall events may cause localized flood related damage to the Dzus site.

In general, remedies at contaminated sites may be vulnerable to the implications of climate change and extreme weather events. The Superfund program developed an approach that raises awareness of these vulnerabilities and applies climate change and weather science as a standard operating practice in cleanup projects. The approach involves periodic screening of Superfund remedy vulnerabilities, prioritizing the Superfund program's steps to adapt to a changing climate and identifying adaptation measures to assure climate resilience of Superfund sites.

The topic of climate change defines several key terms:

- **Vulnerability:** The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity.
- **Resilience:** A capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment.
- **Adaptation:** Adjustment or preparation of natural or human systems to a new or changing environment which moderates harm or exploits beneficial opportunities.
- **Adaptive Capacity:** The ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities or to cope with the consequences.

As part of the resiliency assessment, an adaptation plan has been created which will be integrated with the Site Management Plan. This adaptation plan incorporates strategies and measures already implemented or planned for the site and defines impact thresholds and monitoring for exceedance of these thresholds. If a set threshold is surpassed, appropriate action will be taken to ensure the remedy remains in place and is effective. A new set of thresholds and plan may be created to decrease risks associated with climate change impacts.

1. INTRODUCTION AND PROJECT OVERVIEW

This report provides an assessment of the projected climate change impacts on the remedies implemented to address cadmium and chromium contamination in sediment, soil, and groundwater. These impacts were reviewed to assess possible site vulnerabilities. The report provides a list of adaptation measures being implemented now or that could be implemented in the future as climate change projections are refined to address any identified vulnerabilities. This resiliency plan along with the site management program will employ a strategic monitoring approach to ensure the effectiveness of the implemented remedies. The remedial program also addresses the goal of the West Islip NY Rising Community Reconstruction Plan of March 2014 to reduce flooding in the Willetts Creek drainage basin through removal of sedimentation and redesign of one culvert (NY Rising Community Reconstruction (NYRCR) 2014).

This report includes current climate impact projections as of 2019. Due to the ever-growing understanding of climate change, this report can be viewed as a living document, with information to be updated as climate change projection data is refined.

This page left intentionally blank

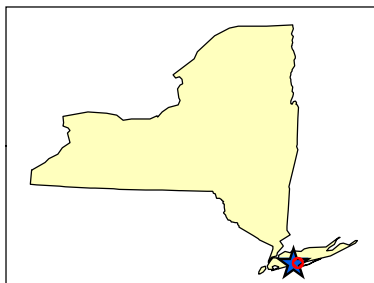
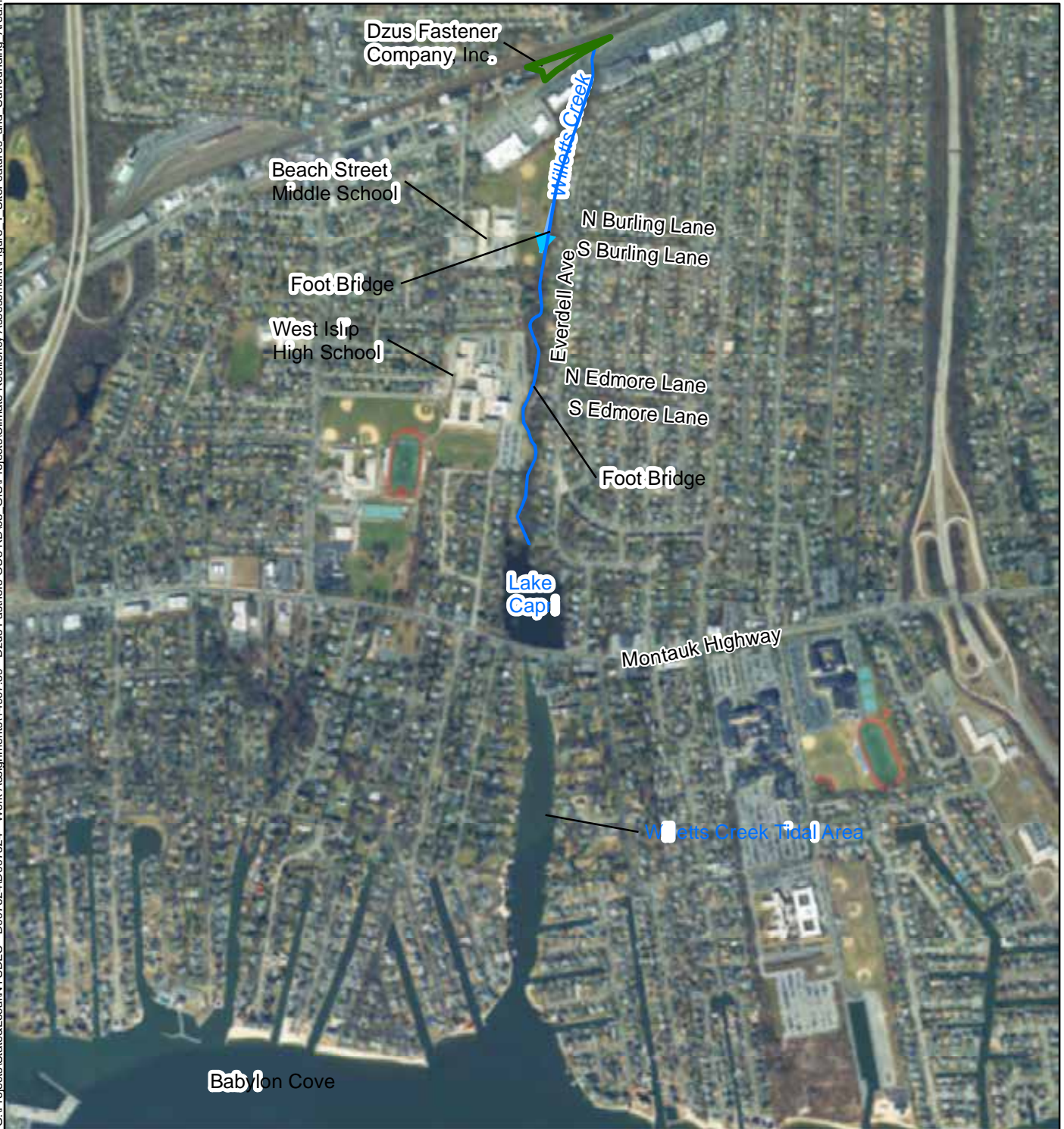
2. PROJECT SITE CHARACTERIZATION

2.1 PHYSICAL SETTING

The Dzus Fastener Company, Inc. (NYSDEC Site No. 152033) is located in West Islip, Suffolk County, New York (**Figure 2-1**). Willets Creek is east of the former Dzus Fastener facility and flows south between housing developments and schools for 0.75 mile before reaching Lake Capri. Lake Capri flows into the tidal portion of Willetts Creek under Montauk Highway, which ultimately flows into Babylon Cove and Great South Bay of the Atlantic Ocean. The site was listed as a Class 2 Inactive Hazardous Waste Sites in the State Registry and represented a significant threat to public health or the environment. Complex sites such as this are often divided into distinct areas, called operable units (OUs), to facilitate investigation and cleanup. The site is broken into six OUs (OU1, OU2, OU3, OU4, OU5, and OU6), some of which are overlapping. These areas are shown in **Figure 2-2** and described below:

- OU1 – The former Dzus property source of contamination. NYSDEC completed a Record of Decision (ROD) for treatment of OU1 in 1995. The implemented remedy consisted of in situ stabilization/solidification of cadmium impacted soils through mixing of Portland cement. Additional remedial components included installation of a topsoil/asphalt cover system at the eastern portion of the facility, which protects the stabilized area from erosion, as well as a deed restriction to prevent disturbance of the stabilized area. The facility continued operations until 2015, with the facility closure leading to the designation of OU6.
- OU2 – Lake Capri and a portion of Willetts Creek and soil and water contamination. NYSDEC completed a ROD in 1997. The implemented remedy included removal of contaminated sediments from Lake Capri and areas of Willetts Creek, and a long-term monitoring program to monitor the groundwater, sediment, and surface water. In 2016, monitoring under the long-term program found levels of cadmium in sediment within Lake Capri and Willetts Creek that exceeded both the goals established in the OU2 ROD and NYSDEC Sediment Guidance Values (SGVs) (NYSDEC 2014). These exceedances and subsequent investigations led to the designation of OU3 (Willetts Creek) and OU4 (Lake Capri).
- OU3 – Willetts Creek and associated floodplain, from Union Boulevard to West Islip High School. NYSDEC completed a ROD in 2017. Clean-up of this area was completed in 2019-2020 and included contaminated sediment and soil removal and associated restoration.
- OU4 – Willetts Creek from West Islip High School to Lake Capri, Lake Capri, and the surrounding floodplains. NYSDEC completed a ROD in 2018. The implemented remedy for this area was completed in 2019-2020 and included contaminated sediment and soil removal and associated restoration.
- OU5 – Tidal area of Willetts Creek south of Montauk Highway. This area is currently being investigated to determine the extent of contamination.

- OU6 – The closed former Dzus facility buildings and property. The implemented remedy for this area was completed in 2018 and included decontamination of the building, removal of the remaining contaminated soils, operation and subsequent decommissioning of a soil vapor extraction (SVE) system, and a deed restriction. The building was demolished in November 2019 as part of a planned redevelopment of the property.



Legend
~ Willetts Creek

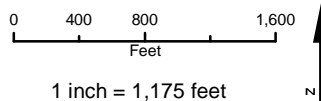
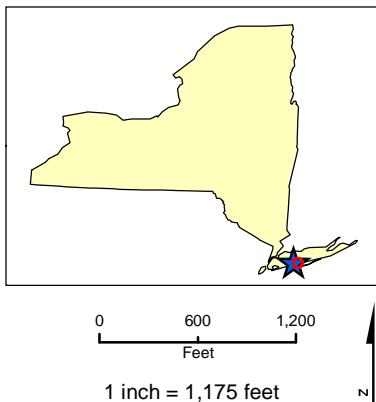
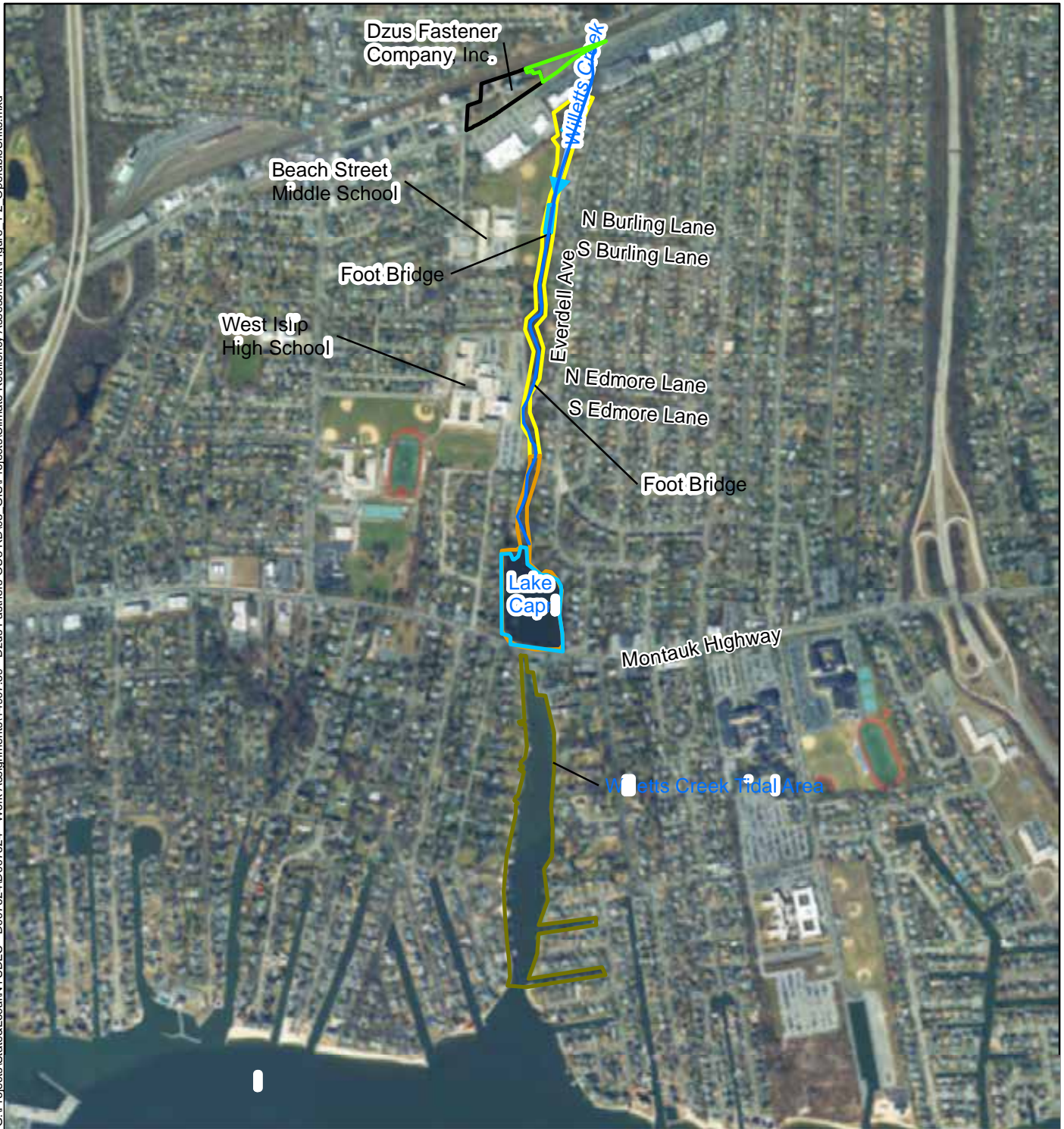


Figure 2-1
Site Features and Surrounding Area
Dzus Climate Resiliency Assessment Report
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 5/29/2019
Projection: NAD83 State Plane New York Long Island



- Legend**
- Willletts Creek
 - Approximate Operable Unit Boundary
 - Operable Unit 1
 - Operable Unit 2
 - Operable Unit 3
 - Operable Unit 4
 - Operable Unit 5
 - Operable Unit 6

Figure 2-2
Operable Units
 Dzus Climate Resiliency Assessment Report
 Dzus Fastener Company, Inc.
 West Islip, NY

Map Date: 7/29/2019
 Projection: NAD83 State Plane New York Long Island

2.1.1 Site Geology

The site is in the Atlantic Coastal Plain Physiographic Province and is underlain by the Upper Glacial Aquifer. Groundwater beneath the site is 0 to 14 ft below ground surface and flows to the south-southwest.

The sediment in Willetts Creek and Lake Capri is medium to coarse sand and gravel overlain by a shallow layer of fine silt and organic debris. The Willetts Creek tidal area sediments are generally very fine silt with little amounts of clay underlain by fine to medium grain, moderately sorted sand with little amounts of gravel and trace pebbles. The sand is typically observed at a depth of 0.1 to 3 ft below the sediment surface.

2.1.2 Site Hydrology/Hydrogeology

Willetts Creek is a slow-moving creek, located east of the Dzus facility which flows approximately 4,500 ft to the south toward Lake Capri. It is generally 16 to 23 ft wide and less than 8 inches (in.) in depth. The creek is fed by both surface water runoff and groundwater infiltration. Upstream of Lake Capri the creek is freshwater, while downstream of Lake Capri the creek is tidally influenced.

Lake Capri is a privately owned, 8-acre man-made lake formed by impoundment of the Willetts Creek estuary upon construction of the embankment for Montauk Highway (Route 27A). The northwest corner of the lake is a small ¼-acre lagoon, fed in part by a short intermittent stream. Lake Capri is surrounded by low-lying residential properties, except for the fenced south end that fronts Montauk Highway. The freshwater lake is relatively shallow, with a depth of 3 ft over broad areas. Willetts Creek is divided into an upper and a lower reach. The upper portion is the freshwater reach located upstream of Lake Capri; the lower portion is the tidal channelized reach downstream of Lake Capri. Lake Capri is fed primarily by Upper Willetts Creek, stormwater runoff from local streets, and groundwater.

A structure at the south end of the lake controls overflow under Montauk Highway to Lower Willetts Creek. From Lake Capri, the creek flows another 3,000 ft to Babylon Cove. This tidal portion of Willetts Creek has an average daily tidal range of approximately 1 ft. 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 to groundwater.

Historical groundwater studies calculate groundwater flow in the Upper Glacial Aquifer to average 2.4 to 24 ft per year.

2.2 HISTORY OF OPERATIONS

Dzus Fastener Company, Inc. produced fasteners and springs beginning in 1932. Wastes from metal operations consisted of oils, heavy metals, volatile organic compounds, and salts. Leaching pools onsite were used to dispose of hazardous wastes. NYSDEC completed hazardous waste investigations of the facility in 1984 and 1990. An Interim Remedial Measure (IRM) was completed by Dzus Fastener Company, Inc. in 1991, which included the closure of one leaching

pool on the eastern portion of the facility and the removal of approximately 1,960 cubic yards of contaminated soil. A small pipe was discovered during activities in this leach field and is believed to have been used to discharge waste directly into upper Willetts Creek. These operations led to soil and groundwater contamination at the Dzus facility and downstream soil, groundwater, sediment, and surface water contamination of Willetts Creek and Lake Capri.

The facility changed its name from Dzus Fastener Company, Inc. to DFCI Solutions, Inc. in 2001, but operations did not change. In 2015, DFCI Solutions, Inc. ceased operations and moved all equipment out of the facility.

2.3 CONTAMINANTS OF CONCERN

Historical site data and the findings of numerous investigations have identified cadmium and chromium (III) as the primary contaminants of concern (COCs). Cadmium and chromium (III) were detected above guidance values, while detections of volatile organic compounds were not observed above screening levels (NYSDEC 1998). Both contaminants of concern were found in groundwater, soil, and sediment. Historically, cadmium exceeded guidance values in Willetts Creek surface water, but not in Lake Capri.

2.4 REMEDIAL ACTION

Under the State Superfund Program, the NYSDEC initiated a Remedial Investigation (RI)/Feasibility Study (FS) in 1992 to determine the nature and extent of contamination attributable to the Dzus Fasteners Company, Inc. site and develop an appropriate remedy. During RI activities, soil was found to be contaminated with cadmium, chromium (III), and cyanide and groundwater was found to be contaminated with cadmium, chromium (III), cyanide, and volatile organic compounds (primarily trichloroethene [TCE], tetrachloroethene, and 1,1,1-trichloroethane).

Resource Conservation and Recovery Act (RCRA) closure activities were conducted at the facility and a Closure Certification Report was completed in 2018. The activities performed as part of the RCRA closure included the decontamination and washing of the building floors, removal of contaminated soils, installation and operation of a SVE system, and remediation and closure of remaining contaminated leaching pools. The property is planned for commercial redevelopment.

RODs for OU3 and OU4 were issued by NYSDEC in August 2017 and 2018, respectively. The implemented remedy included removal of contaminated sediment and soil from Willetts Creek, Lake Capri, and surrounding floodplain. Post-remedy, sediment meets Class A SGVs, presenting little or no potential for risk to aquatic life (NYSDEC 2016). Similarly, post-remedy soil meets “unrestricted use” Soil Cleanup Objectives (SCOs) indicating that soil can be used without imposed restriction, such as environmental easements or other land use controls (6 New York Codes, Rules and Regulations Part 375). The specific remedial action objectives (RAOs) for OU3 and OU4 are provided in **Tables 2-1 and 2-2**.

Table 2-1 Soil-Specific RAOs

Soil	Specific RAOs
RAOs for Public Health Protection	<ul style="list-style-type: none"> • Prevent ingestion/direct contact with contaminated soil. • Prevent inhalation exposure to contaminants through particulates in airborne dust.
RAOs for Environmental Protection	<ul style="list-style-type: none"> • 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.

Table 2-2. Sediment-Specific RAOs

Sediment	Specific RAOs
RAOs for Public Health Protection	<ul style="list-style-type: none"> • Prevent direct contact with contaminated sediments.
RAOs for Environmental Protection	<ul style="list-style-type: none"> • 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.

Under the remedial action completed in 2020, approximately 42,200 cubic yards of soil and sediment was removed from Willets Creek, Lake Capri, and the associated floodplain. The average depths of removal were 30 inches in Willets Creek and 12 inches in Lake Capri. All areas disturbed during construction were restored by adding clean soil, plantings, and replacement of infrastructure, where necessary.

Willetts Creek was restored to increase the amount of flow the creek channel could handle to reduce the extent of significant flooding and erosion during storm events.

This page left intentionally blank

3. POST REMEDIAL ACTION SITE

Sediment and groundwater sampling results historically indicated elevated levels of cadmium in groundwater. Since the remedy has been implemented and the plume has attenuated over the last 20 years, groundwater is not likely to result in further migration of residual contamination to soils or sediments. Residual materials remain in areas as listed below.

3.1 RESIDUAL CONTAMINATION

Table 3-1 Residual Contaminants

Operating Unit	Location/Remedy	Contaminants
OU1 / OU-6	Residual materials are addressed by a deed restriction and long-term monitoring program.	Cadmium, chromium (III), TCE
OU2	Included in OU3 and OU4; see below.	
OU3	Residual materials in slope behind the Captree Plaza, west of the creek, covered with a demarcation layer and clean backfill, are addressed by a long-term monitoring program.	Cadmium,
OU4	Residual materials within 30 ft of bulkhead along Montauk Highway, covered with a demarcation layer and clean backfill, are addressed by long-term monitoring program.	Cadmium,
OU5	RI/FS process is ongoing at the time of this report to determine the nature and extent of potential impacts and complete an alternatives analysis.	Cadmium, chromium (III)
Groundwater	Low-level groundwater levels are being monitored as part of the long-term monitoring program.	Cadmium, chromium (III)

3.1.1 OU1 and OU6 Areas

OU1/OU6 included decontamination of the building, removal of an oil water separator, leach field and associated infrastructure, operation and subsequent decommissioning of a SVE system, stabilization/solidification of contaminated soils, covering with a parking lot cover system, removal of all other contaminated soils, and implementation of a deed restriction and long-term site monitoring program. Long-term monitoring of this area will be conducted under the Site Management Plan to ensure the implemented remedy remains protective.

3.1.2 OU3 and OU4 Areas

As a slope stability protective measure due to the nearby structure a 2 to 1 (horizontal to vertical) slope was maintained during soil removal behind the Captree Plaza. As a result, residual materials were left in place (**Figure 3-1**). This residual material was covered with orange demarcation fabric, followed by clean soil to ensure these materials do not migrate.

To protect the retaining wall along Montauk Highway, no sediment removal was performed in Lake Capri within 30 ft of the structure. Clean stone was placed over residual materials to ensure

these materials do not migrate (**Figure 3-2**). Long-term monitoring in both locations is underway through the Site Management Plan to ensure the implemented remedy remains protective.

3.1.3 OU5 Area

The RI/FS process is ongoing in the OU5 area of Willets Creek south of Lake Capri at the time of this report.

3.2 GROUNDWATER PLUME

The levels of cadmium and chromium in groundwater have attenuated to the point that the migration of these metals to soils or sediments is not anticipated to result in exceedances of SCOs or SGVs (**Figure 3-3**). Long-term monitoring will continue to evaluate the effectiveness of the remedy. Other than cadmium, there have historically been a few other detections of iron, manganese, and sodium, but these are typically found in Long Island groundwater and are representative of background conditions and not site related.

3.3 POSSIBLE EXPOSURE PATHWAYS

3.3.1 Human Health Risk Assessment

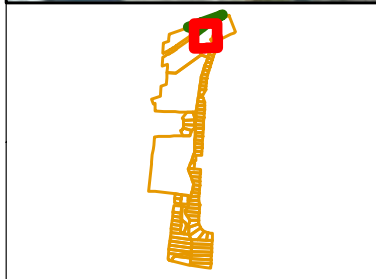
Post remedial action risks to human health are low. Human exposure to COCs through inhalation, touch, or ingestion is not expected as the majority of impacted material has been removed from the site. According to the Long Island Region Fish Advisories published by the New York State Department of Health, women under 50 and children under 15 should not eat any fish from Lake Capri. Men over 50 and women over 15 are advised to not eat more than one meal per month of American eel or carp, and not more than four meals per month of all other fish. These guidelines are based on chlordane and cadmium, with only cadmium associated with the former Dzus facility. Chlordane is a pesticide that was banned in the late 1980's and was often used for termite-treatment.

Two Declarations of Covenants and Restrictions have been filed with the Suffolk County Clerk's office for the site. These documents require maintenance of the parking lot cover system, NYSDEC notification and approval for soil disturbance, and control of potential vapor intrusion before occupancy of any new buildings. Additionally, groundwater is monitored under a long-term monitoring program to ensure that it does not impact public health or the environment. Surrounding neighborhoods are serviced by a municipal potable water supply.

3.3.2 Ecological Risk Assessment

Post remedial action risks to fish and wildlife are low. Zones of impacted soils which exceed unrestricted SCOs, as defined by 6 NYCRR Part 375-6.8, were excavated and transported from the zone of impact for disposal. The project removed sediment above Class A Sediment Standards in Willets Creek and Lake Capri and the creek was restored with clean backfill materials (**Figure 3-4**).

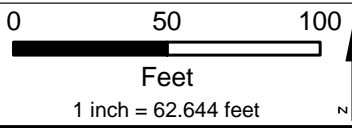
G:\Projects\State & Local\NYSDEC - D007624\D007624 - Work Assignments\14907.39 - Dzus Fasteners OU3 RD\05_GIS\Projects\PDI_Residential\CapTree_residual.mxd



Legend

- Residual Confirmation Sampling Location

Figure 3-1
 Residual Cadmium in Willetts Creek Floodplain
 Dzus Fastener Company, Inc.
 Climate Resiliency Assessment Report
 West Islip, NY



G:\Projects\State&Local\NYSDEC - D007624\D007624 - Work Assignments\14907.39 - Dzus Fasteners OU3 RD\05 - GIS\Projects\PDI - Residential\MontaukHWY - residual.mxd

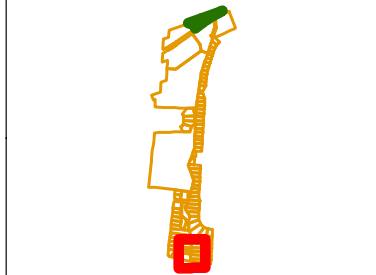
Sampling Program	Location ID	Start Depth (in)	End Depth (in)	Cadmium (mg/kg)
Remedial Investigation (2018)	LC50	0	6	52
		6	12	19
	LC51	0	6	27
	LC52	0	6	11
	LC55	0	6	3.9
		0	6	92
		6	12	58
LC56	12	18	5.6	
	SED-3	Surface Grab		53
		LE-1	Surface Grab	
Historical Sediment Sampling (2013)	LE-4	Surface Grab		140

Notes
in = inches
mg/kg = milligrams per kilogram or parts per million



Lake Capri

Montauk Highway



- Legend**
- Rip Rap/Armor Placement Area
 - 2018 Sampling Location
 - 2017 Sampling Location
 - 2013 Sampling Location

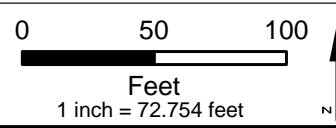


Figure 3-2
Residual Cadmium in Lake Capri
Dzus Fastener Company, Inc.
Climate Resiliency Assessment Report
West Islip, NY

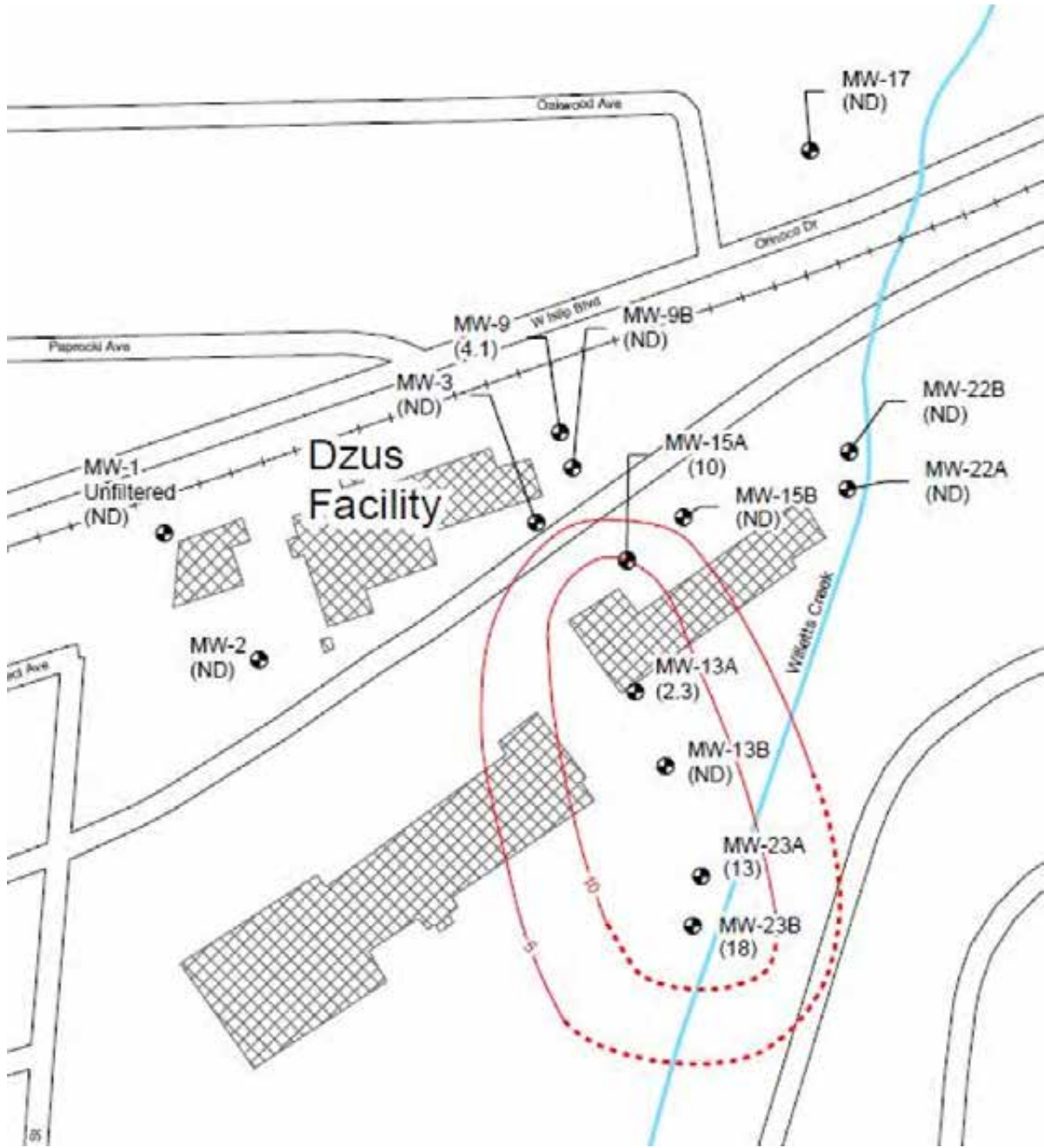
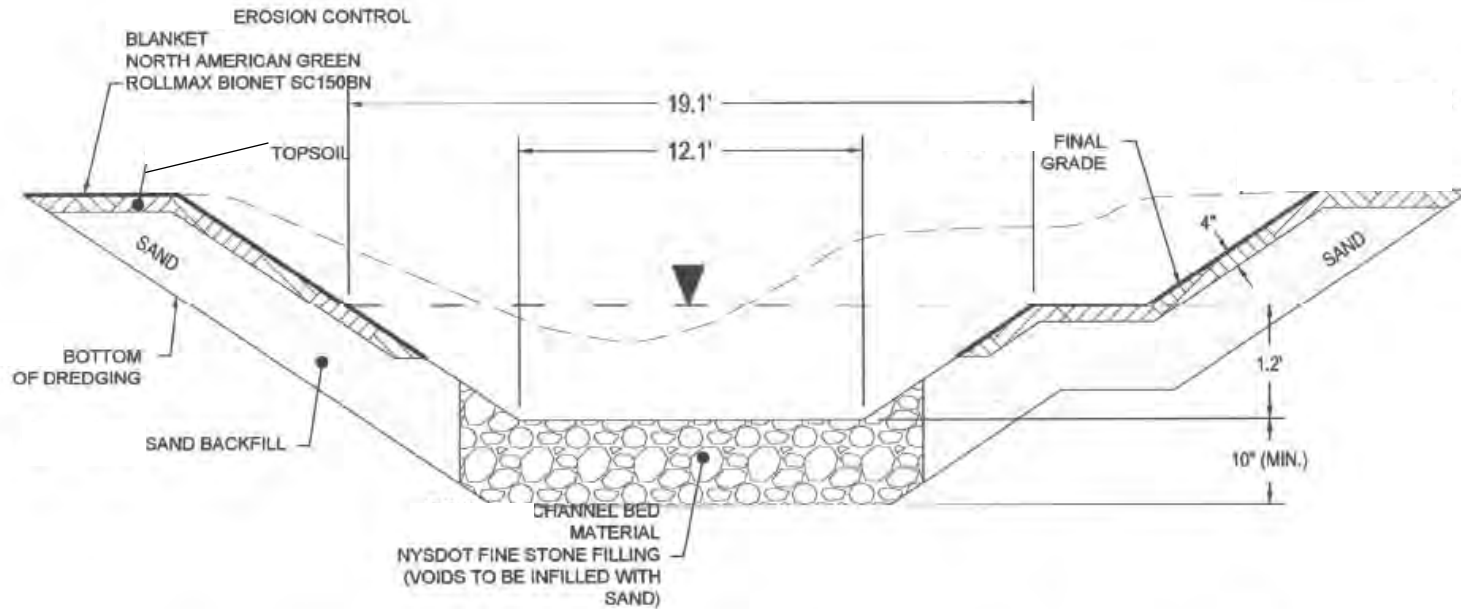


Figure 3-3

Residual Cadmium in Groundwater
Dzus Fastener Company, Inc.
Climate Resiliency Assessment Report
West Islip, NY

Note: Figure from AECOM. 2019. Groundwater Sampling Report (November 2018 Sampling Event) Dzus Fasteners Site, Site #1-52-033. Final. May



SAND BACKFILL GRADATION

Sieve	Percent Passing by Weight
1/2 inch	100
1/4 inch	90 to 100
No. 200	5

TOPSOIL GRADATION

Sieve	Percent Passing by Weight
2 inch	100
1 inch	85 - 100
1/4 inch	65 - 100
No. 40	45 - 65
No. 200	5 - 10

CHANNEL BED MATERIAL GRADATION

Stone Size	Percent of Total by
Smaller than 8 inch	90 - 100
Larger than 3 inch	50 - 100
Smaller than No. 10 Sieve	0 - 10

TOPSOIL NOTES:

1. THE PH OF THE MATERIAL SHALL BE BETWEEN 5.5 AND 7.5.
2. THE ORGANIC CONTENT SHALL BE NOT LESS THAN 3% OR MORE THAN 8%, (DRY WEIGHT BASIS).



EA Engineering, P.C. and Its Affiliate
EA Science and Technology

FIGURE 3-4

Willet's Creek Typical Backfill Detail
Dzus Fastener Company, Inc.
Climate Resiliency Assessment Report
West Islip, NY



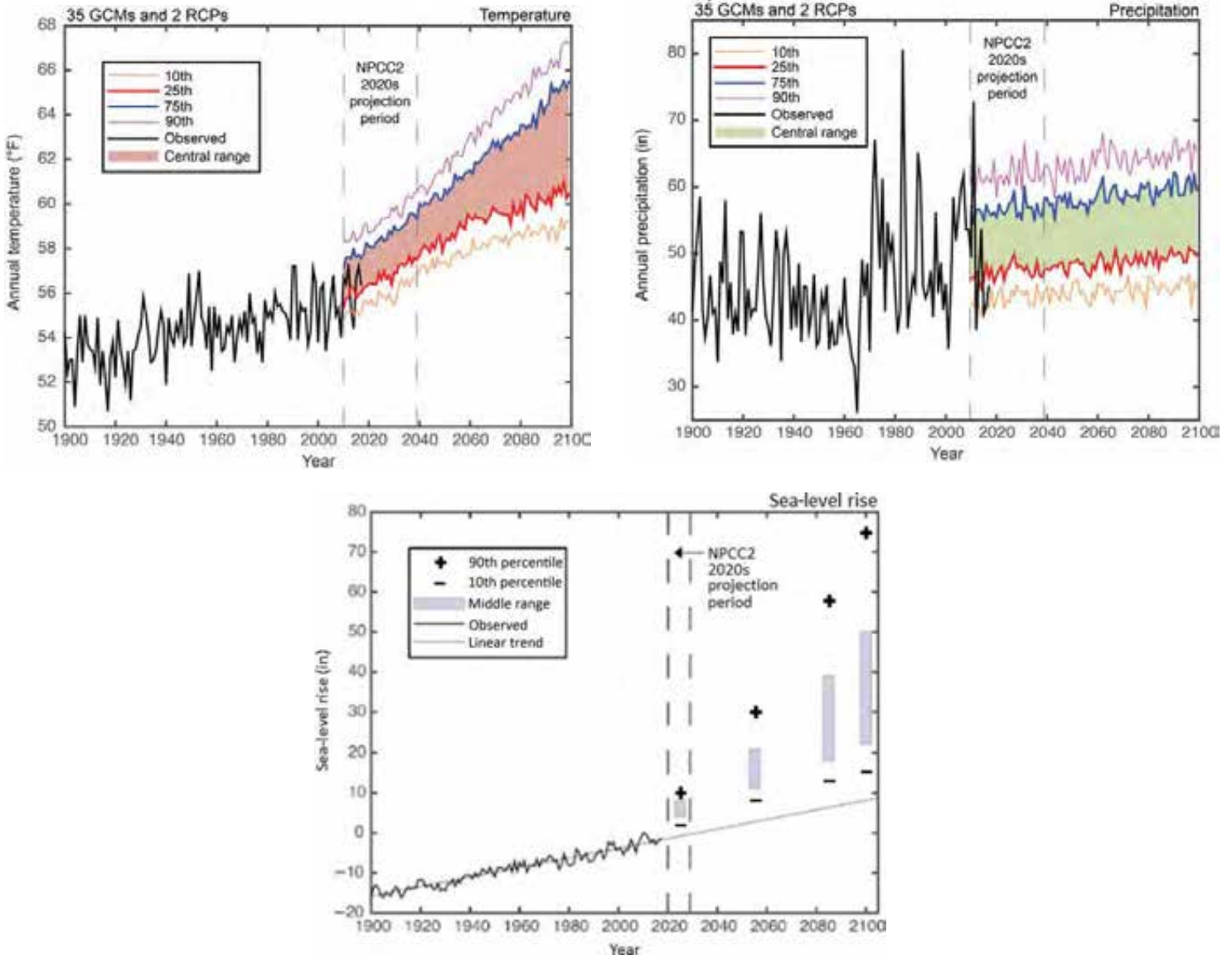
Department of
Environmental
Conservation

4. CLIMATE CHANGE PROJECTIONS

A review of the information regarding the projected climate impacts was performed, focusing on impacts projected to the year 2050. Impacts investigated included sea level rise scenarios and associated possible saltwater intrusion to groundwater; precipitation intensity and quantity along with associated impacts to surface water, stormwater, and groundwater; temperature; and wind.

Climate change impacts have already been observed in the state of New York, including increases in temperature, precipitation, and sea-level (**Figure 4-1**). The current rate of sea level rise in New York is almost twice the observed global rate, due in part to a high rate of land subsidence (National Oceanic and Atmospheric Administration [NOAA] 2017). Future modeling predicts current climate change trends will continue. The climate change projections used in the Dzus analysis are derived from a New York State climate change report prepared in 2011, with updates in 2014, as well as the 2019 New York City Panel on Climate Change Report (Rosenzweig et al. 2011; Horton et al. 2014; Rosenzweig and Solecki 2019). These reports include historical, current, and future projections of climate change scenarios for several distinct regions within New York. The Dzus project site falls in the report's Region 4, which encompasses New York City and Long Island. These data were compared to site-specific conditions to evaluate impacts and vulnerabilities at the site. To capture some of the uncertainty associated with climate change predictions, a range of five projections are provided. The medium prediction is likely to occur, while the high prediction represents a possible worst-case scenario. Based on the models, there is a 50 percent probability that actual future conditions will meet or exceed the medium projection. The high prediction has a 1 percent probability that actual future conditions will meet or exceed the projection.

Projections are based on both global climate models and representative concentration pathways (RCPs). A global climate model is a mathematical representation of the Earth's climate, which uses atmospheric greenhouse gases and aerosols, as well as land use changes, to simulate physical exchanges between the ocean, atmosphere, land, and ice (Rosenzweig and Solecki 2019). RCPs are varying trends of greenhouse gases, aerosols, and land use changes included as inputs to global climate models. The New York City Panel on Climate Change report used two RCPs: (1) "RCP 4.5," defined as a medium-emissions scenario; and (2) "RCP 8.5," defined as a high-emissions scenario.



Source: Rosenzweig and Solecki 2019.

Figure 4-1 Observed and Projected Annual Temperature, Precipitation, and Sea Level Rise for New York City

4.1 PRECIPITATION

Since 1900, average precipitation in New York State has increased each year. From 1958 to 2010, the amount of precipitation in the northeastern United States falling in heavy events (over 1 in. of precipitation in a day) increased by more than 70 percent. During this time frame, winter precipitation increased, while summer precipitation decreased. Modeling of future conditions predicts both precipitation quantities and variability will continue to increase. In the middle range projection, Region 4 precipitation may increase by as much as 11 percent, approximately 5

in. per year, by 2050 (**Table 4-1**). Heavy rainfall events may increase by as much as 16 percent, or 2 days per year, by 2050 (**Table 4-2**).

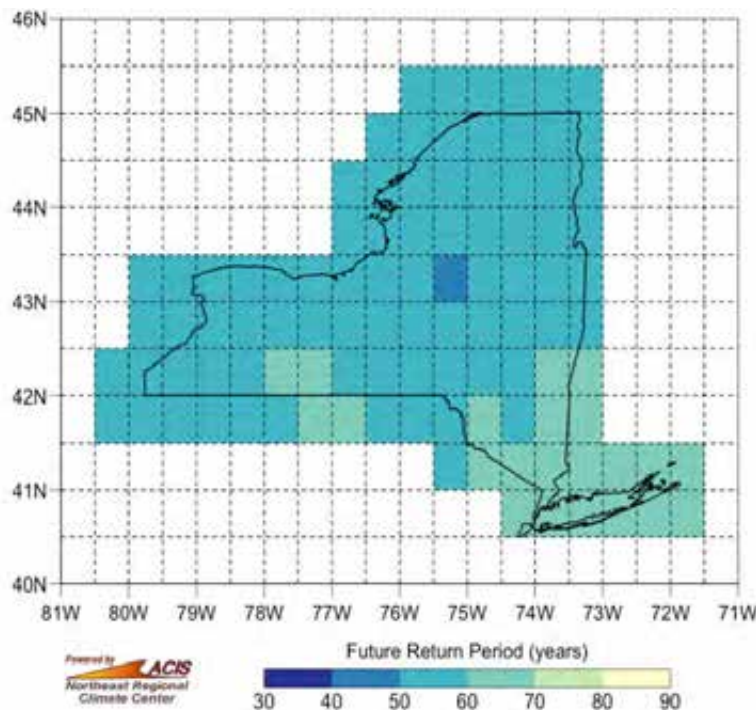
Table 4-1 Mean Annual Precipitation Changes in Region 4

Baseline (1971–2000) 49.7 in.	Low Estimate (10 th Percentile)	Middle Range (25 th to 75 th Percentile)	High Estimate (90 th Percentile)
2020s	- 1 percent	+ 1 to + 8 percent	+ 10 percent
2050s	+ 1 percent	+ 4 to + 11 percent	+ 13 percent
Source: Horton et al. 2014.			

Table 4-2 Extreme Precipitation Event Projections in Region 4

Baseline Days over 1 in. Rainfall (13 days)	Low Estimate (10 th Percentile)	Middle Range (25 th to 75 th Percentile)	High Estimate (90 th Percentile)
2020s	13	14 to 15	16
2050s	13	14 to 16	17
Source: Horton et al. 2014.			

The current 100-year rainfall event is projected to equal a 60- to 70-year event in Long Island by 2040-2069, according to both the high and low projections (**Figure 4-2**, Northeast Regional Climate Center 2015).



Source: Northeast Regional Climate Center 2015.

Figure 4-2 Mean Future Return Periods: 1-Day 100-Year Rainfall Amounts, High Emission Scenario, 1970–1999 Versus 2040–2069

4.1.1 Surface water

Precipitation and heavy rainfall event increases are likely to decrease water quality and increase flooding within Willetts Creek and Lake Capri. Heavy rainfall events may be cause for greater concern, as intense short events limit infiltration of water and increase flooding. During intense precipitation events the modest topographical relief in the project area generally mitigates runoff velocities.

Post-remedial action conditions in Willetts Creek were evaluated to ensure stability of the channel velocities and shear stress values. Water surface elevations are relatively similar or decreased from pre- to post-remedial action conditions. Areas with greater risk for scour and erosion were protected with rock sized to withstand the current 100-year storm event. These areas include the upstream extent of Willetts Creek and areas directly upstream and downstream of footbridge crossings. Stormwater flow in Willetts Creek and Lake Capri has a southward flow to the ocean, with a maximum velocity of approximately 7.25 miles per hour during the present day 10-year storm. Velocity increases will be mitigated by the modest channel slope of approximately 0.25%. As discussed in Section 4.2 below, selection and placement of stone materials considered the northward coastal storm surge as well.

Vertical or horizontal degradation of the stream channel would require the replacement of fill materials placed during remediation.

4.1.2 Groundwater

The Upper Glacial Aquifer underlying the site is an unconfined aquifer that is not a potable water source. Decreases in precipitation during summer months may reduce annual recharge, but impacts are expected to be minimal to the Upper Glacial Aquifer as the majority of recharge typically occurs during the late winter and early spring (Rosenzweig et al. 2011).

4.2 SEA LEVEL RISE

The greatest potential climate impact at the Dzus site is an increase in sea level. Factors that affect sea level include thermal expansion, melting of glaciers, melting of land ice, vertical land movement, and changes in ocean circulations. An increase in sea level impacts is primarily driven by: (1) sea level rise from climate change, and (2) storm surge from significant storm events. Both factors are described in the following sections. Areas where the existing topography is overlapped by the predicted future sea level elevation are expected to be impacted. Predicted sea level elevations are calculated with current sea level at mean higher high water (MHHW) in terms of the North American Vertical Datum of 1988 (NAVD88) and combinations of water level increases from sea level rise and storm surge. These combinations are termed sea level scenarios (**Table 4-3**). The sea level scenarios are presented for the year 2050, representing potential boundaries for water level impacts.

Reference Sea Level (MHHW)

To calculate the sea level scenarios presented in this report, a reference sea level was needed as sea levels change within a day (e.g., tides). This reference sea level is MHHW in NAVD88. The water in the project coastal area has two high tides and two low tides that continue in a cycle. The MHHW is the average of the highest tides within each tidal day (two high tides and two low tides) calculated over a specified 19-year period (National Tidal Datum Epoch). Therefore, sea level scenarios include the highest sea level within a tidal day.

Relative Sea Level Rise from Climate Change

In the context of this report, relative sea level rise refers to projected water level increases estimated from climate change for Long Island, New York. Since 1900, average coastal sea levels in New York have risen more than a foot, at a rate of 1.2 in. per decade (**Figure 4-1**). The rate of rise in New York is almost twice the global rate over the same period. This is due to several local factors including subsidence of the land mass in relation to the earth's crust. Modeling predicts the medium projection of sea level rise in Region 4 (New York City and Long Island) from baseline conditions to the year 2050 to be 1.3 ft. The predominant factor driving the rate and extent of sea level rise is greenhouse gas emissions. To capture some of the uncertainty associated with sea level rise predictions, a range of water level increases is presented in the current report. The medium sea level rise prediction for the range presented in this report is likely to occur, while the high sea level rise prediction represents a possible worst-case scenario. Based on the probabilistic models, there is a 50 percent probability that sea level rise will meet or exceed the medium projection. The high sea level rise prediction has a 1 percent probability that sea level will meet or exceed the projection. The increases in sea level from climate change are predicted to result in a "new normal" and, therefore, are anticipated to result in relatively permanent flooding, except for tides. According to the high projection, sea level rise could be 2.5 ft above the current elevation by the year 2050.

Flooding from Storm Events

The water level increases from flooding in **Table 4-3** are the 2019 major flood stages. The major flood stages are determined by NOAA and the National Weather Service. Major flooding is defined as extensive inundation of structures and roads resulting in significant evacuations of people. These major flooding events occur infrequently. In this report, the major flood stage provides an estimate of water inundation from a storm event, although the flood stages are anticipated to change with sea level rise from climate change in the future.

An important consideration for design of resiliency measures besides the expected water elevation of the storm surge is the velocity which the surge will likely move inland. In the case of storm surge, it will move onshore at the forward velocity of the storm. In the case of a hurricane this can be highly variable but is often from 10 to 15 miles per hour.

For comparison purposes the reference impact of Hurricane Sandy in 2012 is also provided to compare the predicted water level increase from sea level rise scenarios outlined in **Table 4-3**

relative to a historic event that caused significant flooding in the area. In 2012, Hurricane Sandy inundated portions of the project area with a storm surge of 6.1 ft and peak storm tide between 6.5 and 7.7 ft (Schubert et al. 2015; National Weather Service Lindenhurst Gauging Station). This storm was estimated to have a recurrence interval of approximately 500 years for the peak storm surge. Considering the projections for sea level rise, future storms equal in magnitude to Hurricane Sandy will result in greater flooding (Shrestha et al. 2014).

It is also important to note in the context of climate change impacts that severe storms similar to Hurricane Sandy are likely to occur more often as warmer oceans may contribute to a more northerly track of severe storms. Warmer ocean water will also lead to increased water vapor in the atmosphere, increased energy which can translate into more powerful hurricanes, and an extended hurricane season.

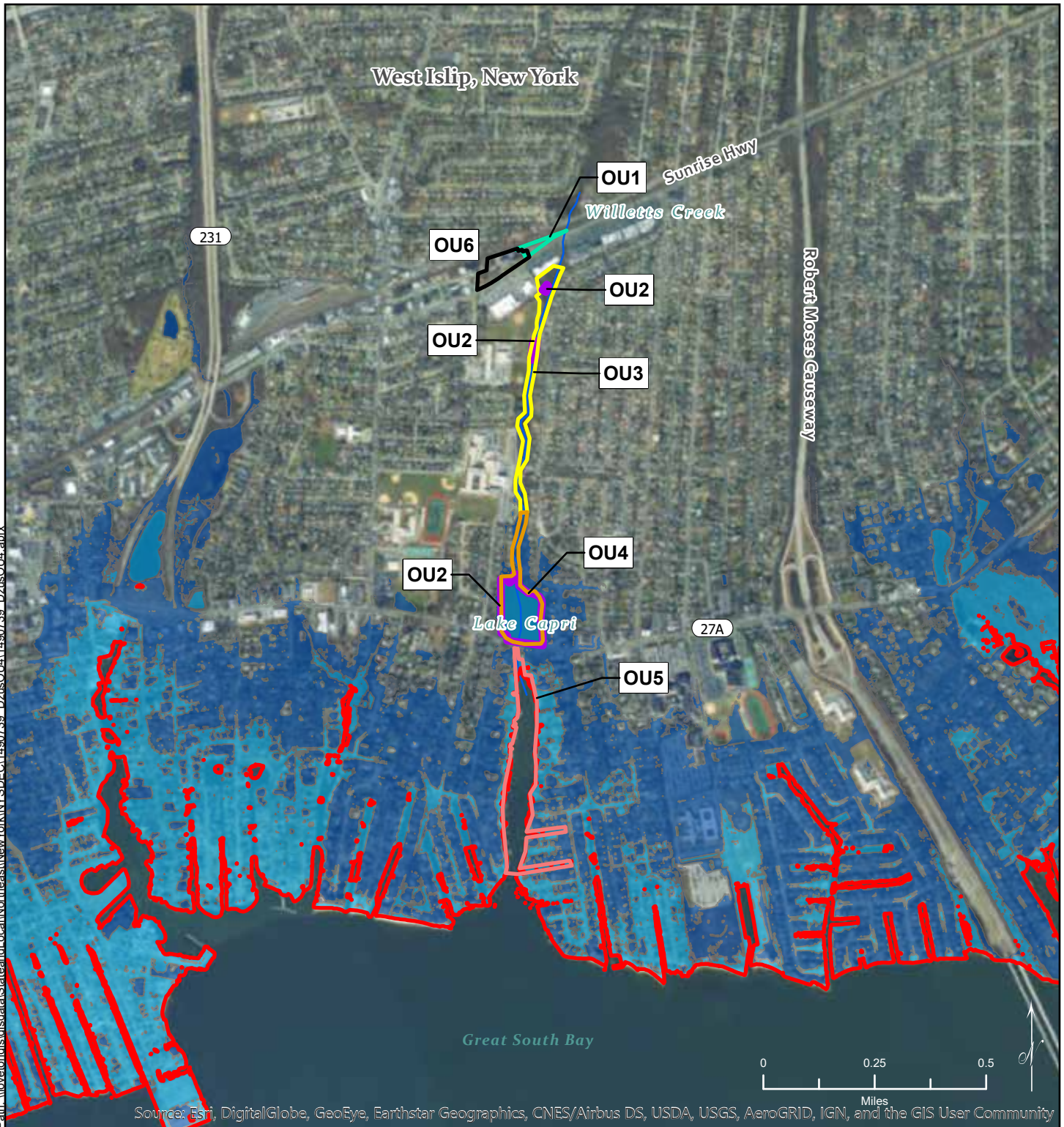
Table 4-3 Sea Level Rise Scenarios

Year	Relative SLR Scenario Range	Water Level Increase from SLR (ft)	Predicted MHHW Elevation with SLR (ft)	Major Storm Stage with SLR (ft)	Sandy Storm Stage with SLR (ft)
	Present Day	0	0.6	4.1	7.7
2050	Mid	1.3	1.9	6.0	9.6
	High	2.5	3.1	7.2	10.8

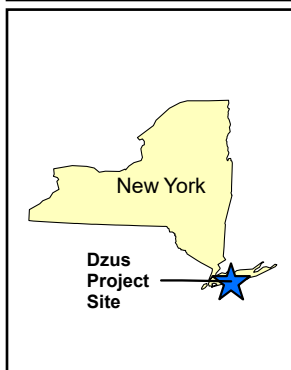
Note: SLR = Sea Level Rise.
Source: USGS Tide Station/Gauge = 01309225/Great South Bay at Lindenhurst NY, NAVD88 Datum.

Figures 4-3 to 4-5 provide a visual representation of the Sea Level Rise Scenarios presented in **Table 4-3**. **Figure 4-3** provides a presentation of the current conditions with current MHHW, water level impacts from a NOAA event categorized as a major storm stage, and the effects of a storm equal to the magnitude of Sandy. This figure depicts the actual extent of water level impact from the 2012 Hurricane Sandy. As can be seen, these events impact OU5 and have the potential to impact Lake Capri and uplands to the adjacent east of OU2/OU4.

The next two figures present the medium (50 percent chance of occurrence) and worst case (1 percent chance of occurrence) scenarios for the year 2050 (**Figures 4-4 and 4-5**). In reference to **Table 4-3**, this equates to 1.3 ft and 2.5 ft in addition to the current water level, respectively. In the 2050 mid-range scenario, the inland penetration of storm surge impacts is similar to present day impacts. The 2050 worst-case scenario shows storm surge inundation moving further inland along the banks of Willetts Creek up to West Islip High School. In both 2050 scenarios a storm of the magnitude of Sandy would cause significant flooding to the lands adjacent to OU5, the tidal portion of Willetts Creek.



Path: \\loveland\gis\data\StateandLocal\Northeast\NewYork\NY\SDEC\1490739_Dzus\OU4.aprx



Legend

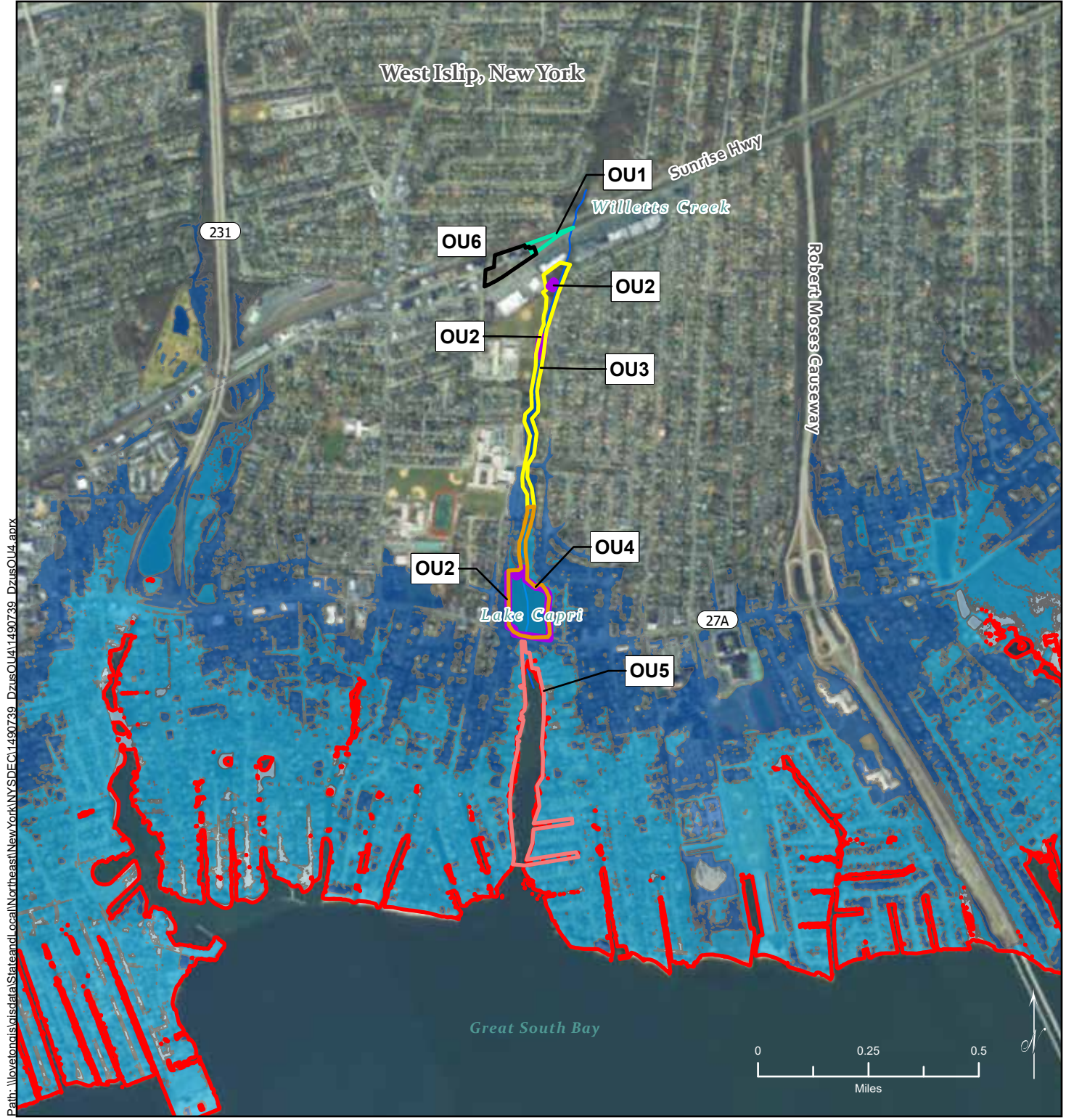
- Willetts Creek
 - OU1
 - OU2
 - OU3
 - OU4
 - OU5
 - OU6
- SLR Scenario**
- Major Storm Stage
 - Sandy Storm Stage
 - Current MHHW Line

Notes:
 OU - Operable Unit
 MHHW - Mean Higher High Water
 SLR - Sea Level Rise
 Data Source: NYS GIS 2018, Imagery: ESRI 2018

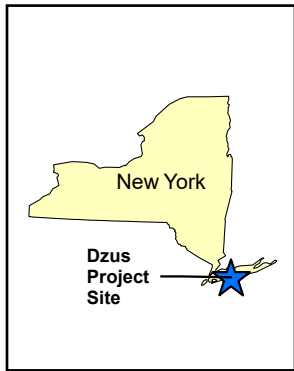
Figure 4-3
Current Conditions for MHHW,
Major Storm Stage and
Sandy Storm Stage

Operable Unit 3- Willetts Creek Area
 Operable Unit 4- Lake Capri
 West Islip, New York





Path: \\loveland\gis\data\StateandLocal\Northeast\NewYork\NY\SDEC\1490739_Dzus\OU4.aprx



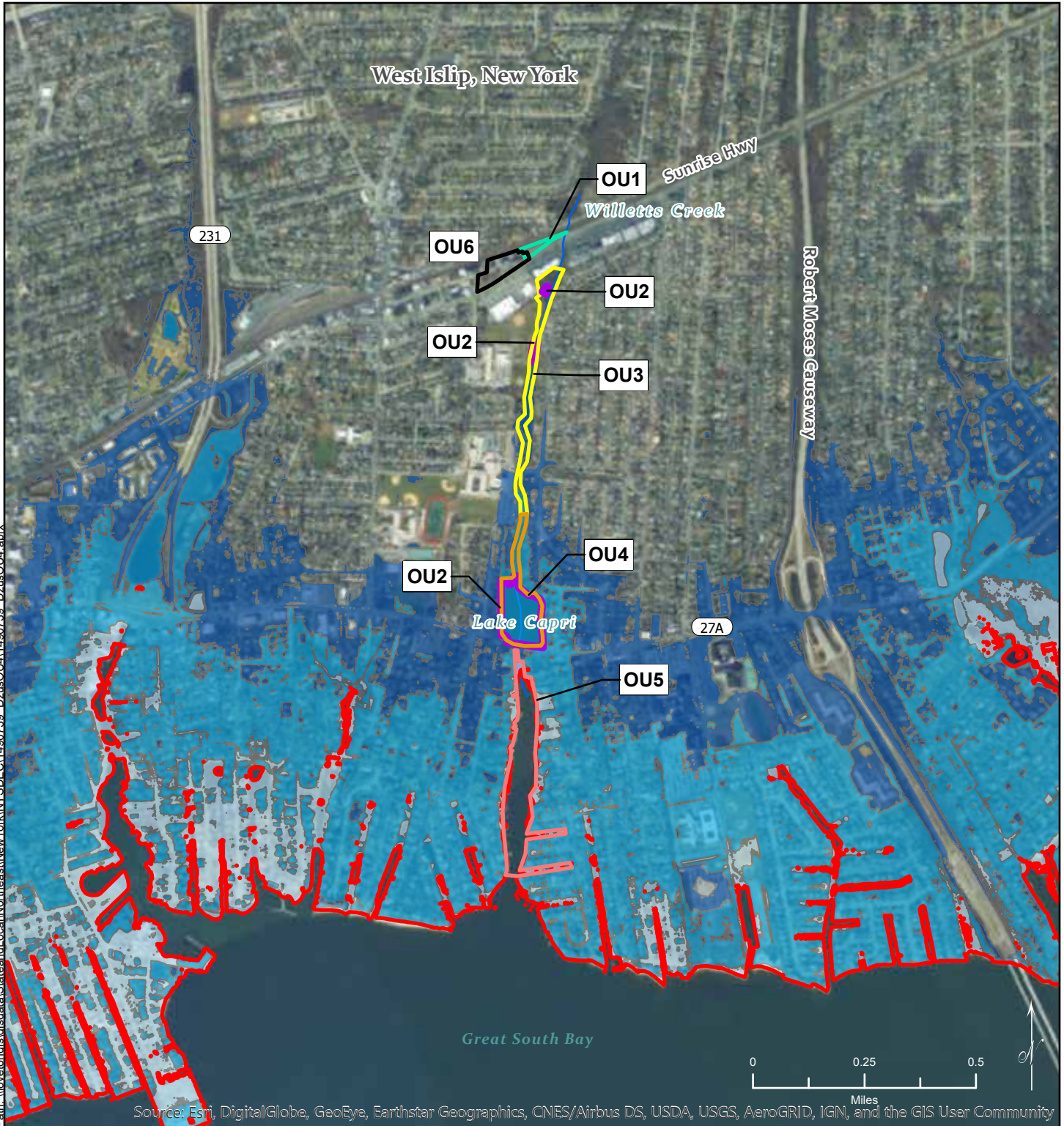
Legend

Willetts Creek	SLR Scenario
OU1	Sandy Storm Stage
OU2	Major Storm Stage
OU3	MHHW
OU4	Current MHHW Line
OU5	
OU6	

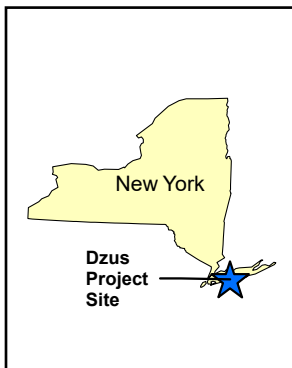
Notes:
 OU - Operable Unit
 MHHW - Mean Higher High Water
 SLR - Sea Level Rise
 Data Source: NYS GIS 2018, Imagery: ESRI 2018

Figure 4-4
2050 Mid Relative SLR for MHHW,
Major Storm Stage and
Sandy Storm Stage

Operable Unit 3- Willetts Creek Area
 Operable Unit 4- Lake Capri
 West Islip, New York



Path: \\loveland\gis\data\StateandLocal\Northeast\NewYork\NY\SDEC\1490739_Dzus\OU4.aprx



Legend

- Willetts Creek
- OU1
- OU2
- OU3
- OU4
- OU5
- OU6

SLR Scenario

- Sandy Storm Stage
- Major Storm Stage
- MHHW
- Current MHHW Line

Notes:

OU - Operable Unit
 MHHW - Mean Higher High Water
 SLR - Sea Level Rise

Data Source: NYS GIS 2018, Imagery: ESRI 2018

Figure 4-5
2050 High Relative SLR for MHHW,
Major Storm Stage and
Sandy Storm Stage

Operable Unit 3- Willetts Creek Area
 Operable Unit 4- Lake Capri
 West Islip, New York



4.2.1 Surface water

The culvert invert elevation at Lake Capri's outlet is 0.8 ft above mean sea level and the adjustable control structure is located at 3.3 ft above mean seal level. Montauk Highway is at an elevation ranging from 7 to 8 ft above mean sea level (NAVD88 Datum). These elevations are important to determining sea level impacts at the site. It is not anticipated that MHHW will exceed 3.3 ft above mean sea level by 2050.

4.2.2 Groundwater

The dynamic of the Upper Glacial Aquifer may be permanently affected by sea level rise. Saltwater intrusion has been documented in the eastern portion of Suffolk County since 1974 (Nemaska's and Koszalka 1982). The Upper Glacial Aquifer is noted to be in direct contact with the ocean. Saline water will enter the aquifer if the freshwater head is lower than the saline-water head. Encroachment of saline water may also occur by movement of saline water in other aquifers or vertical coning due to groundwater withdrawals. Hydraulic conductivity of the Upper Glacial Aquifer is 350 ft per day and transmissivity ranges from 5,350 to 22,725 square ft per day.

4.3 TEMPERATURE

Since 1970, the average state temperature has risen 2.4 degrees Fahrenheit (°F) overall annually and 4.4 °F for the winter months. Temperature has increased in all regions of New York, equating to about a 0.25 °F increase each decade. Modeling shows that temperatures are anticipated to continue to increase, with Region 4 (New York City and Long Island) middle range projection average temperatures expected to be approximately 4 to 5 °F warmer by the 2050s (**Table 4-4**). Summers are expected to intensify with extreme heat and heat waves, while winters are expected to become milder.

Table 4-4 Temperature Mean Annual Changes in Region 4

Baseline (1971–2000) 54.6 °F	Low Estimate (10 th Percentile)	Middle Range (25 th to 75 th Percentile)	High Estimate (90 th Percentile)
2020s	+ 1.5 °F	+ 2.0 to 2.9 °F	+ 3.2 °F
2050s	+ 3.1 °F	+ 4.1 to 5.7 °F	+ 6.6 °F

Source: Horton et al. 2014.

4.4 WIND

Quantitative information for projected wind impacts is not currently available. It is not known how the number of tropical cyclones will change in the North Atlantic Basin, but it is likely that intense hurricanes and associated extreme winds will increase (Horton et al. 2014).

5. CLIMATE CHANGE SENSITIVITY ASSESSMENT

Based upon the review of the existing site information and the projected impacts from climate change at the project site, the project team has assembled a list of site climate-related sensitivities and vulnerabilities. This assessment includes a review of site components including but not limited to surface water, groundwater, and any planned remedial structures. This information has been used to identify the sensitivity of these site components to identified climate impacts over time. This information is presented in text, table, and map format for ease of review.

Review of Possible Climate-Related Impacts to Remedial Efforts at Hazardous Sites

Before reviewing the possible impacts at the project site, it is beneficial to provide a brief survey of the possible effects of climate change on remedial efforts at sites containing hazardous materials in general. At sites with legacy contamination and ongoing remedial efforts, climate change and extreme weather events can potentially impact the effectiveness of site remediation design and can also impact contaminant toxicity, exposure, organism sensitivity, fate and transport, and long-term operations, management, and stewardship of remediation sites.

Higher temperature and lower pH can potentially increase the availability of contaminants in the environment. For example, the speciation and availability of metals changes with environmental pH, and the fate and transport of persistent organic contaminants changes with temperature and precipitation. Increasing temperatures can also change the water cycle, influencing the local water budget. Warmer temperatures can result in altered precipitation, increased evaporation rates of surface water, increased rates of water uptake by vegetation, and reduced rates of water recharge to soils and groundwater reservoirs (Famiglietti 2014).

Increased temperatures and changes to the water cycle may also result in more frequent and severe weather events, such as the occurrence of the 100-year storm event, as well as contribute to more frequent nuisance flooding due to the prevalence of supersaturated soils. Both events are exacerbated by sea level rise resulting in shoreline encroachment and increased nuisance flooding during high tide if the site is situated near enough to the tidal range.

Additional vulnerabilities of water resources include, but are not limited to, changes to water supplies; subsidence; increased amounts of water contamination, erosion, and related risks to water and wastewater infrastructure and operations; degradation of watersheds; alteration of aquatic ecosystems and loss of habitat, creating multiple impacts in coastal areas. These hydrological changes are happening at the same time as groundwater extraction is increasing as heat also increases demand for various water needs, including drinking, irrigation, and industrial uses (Famiglietti 2014).

A recent study showed a potential impact of such climatic shifts on residual contaminants in soil and groundwater (Libera et al., 2018). The study found that the hydrological shifts influence contaminant concentrations in a complex manner, since increased infiltration, for example, could cause conflicting effects of both diluting and mobilizing contaminants. The study showed that, in

general, higher infiltration events could mobilize vadose-zone residual contaminants, raising contaminant concentrations in groundwater for a prolonged period.

Similarly, the sensitivity of organisms and ecosystems can be affected by environmental change. Higher temperatures increase the metabolic rate of certain organisms, which can increase the rate at which they absorb or process contaminants (Noyes et al., 2009). Behavioral changes in response to environmental change may also alter exposure and sensitivity as organisms react to new stresses.

For context, a list of possible climate change sensitivity and vulnerabilities associated with remedial activities at sites in general terms is presented in **Table 5-1** derived from Maco et al., 2018.

Table 5-1 Possible Climate Change Impacts for Remediation

Climate Impact	Secondary Effect	Relevant remediation effect
Altered precipitation pattern	Wetter: Flooding, storms, more runoff	<ul style="list-style-type: none"> Mobilization of contaminants (e.g., from vadose zone to groundwater) → Higher contaminant concentration/export, overpowering significant degradation rate in groundwater zone could remove natural protective barriers or cause infill subsidence in low-lying areas
		<ul style="list-style-type: none"> Dilution → Lower contaminant concentration/export
		<ul style="list-style-type: none"> Damage to cover systems
	Drier: Drought	<ul style="list-style-type: none"> Oxidation of soils Increased volatility
		<ul style="list-style-type: none"> Less dilution → Higher contaminant concentration/export
		<ul style="list-style-type: none"> Reduced mobilization → Higher contaminant persistence (higher contaminant concentration/export)
		<ul style="list-style-type: none"> Insufficient water for remediation; Overuse of groundwater Possible enhanced natural attenuation, expedited contaminant removal
Altered salinity	<ul style="list-style-type: none"> Altered degradation rates (physical, microbial) 	
Sea level rise	Erosion	<ul style="list-style-type: none"> Damage to site integrity
	Site inundation	<ul style="list-style-type: none"> Increased mobilization of contaminants, possible dilution, or compromised site with mixing or loss of contaminated materials, increased bioavailability of contaminants
	Mobilization of sediment	<ul style="list-style-type: none"> Clean sediments transported on top of contaminated sediments
	Surface water elevations increase	<ul style="list-style-type: none"> Changing footprint of floodplains, river boundaries, and coastal shoreline encroachment → Impact on regulations (e.g., dredging, cleanup levels, negotiation of water levels, monitoring)
Extreme weather	Scour (wind/wave action; surface water flow velocity)	<ul style="list-style-type: none"> Damage to site integrity, cover systems
	Flooding	<ul style="list-style-type: none"> Possible dilution (lower contaminant concentration/export), or compromised site with mixing or loss of contaminated materials, damage to cover systems
	Extreme heat	<ul style="list-style-type: none"> Increased volatility → Mobilization of contaminants from site through soil and air Changes in use of site by wildlife

Table 5-1 Possible Climate Change Impacts for Remediation

Climate Impact	Secondary Effect	Relevant remediation effect
		<ul style="list-style-type: none"> Melting permafrost → Mobilization of contaminants from site through water, soil, and air
	Freezing conditions	<ul style="list-style-type: none"> Damage to cover systems and in situ stabilization systems
Extreme weather: Fire	Increased use of fire retardants	<ul style="list-style-type: none"> Spread of contaminants
	Damage to site infrastructure	<ul style="list-style-type: none"> Loss of function of remediation systems
Decreasing pH of surface water, soil and sediment		<ul style="list-style-type: none"> Increased availability, mobilization, toxicity
		<ul style="list-style-type: none"> Increased sensitivity of species due to pH stress
		<ul style="list-style-type: none"> Altered transformation rates
Increasing temperature	Altered transformation or degradation	<ul style="list-style-type: none"> Increased or decreased toxicity
	Decreased dissolved oxygen/anoxic conditions	<ul style="list-style-type: none"> Altered transformation, decreased species resilience
	Increased species heat stress and associated conditions	<ul style="list-style-type: none"> Increased sensitivity to contaminants
Human impact and responses	Vulnerable communities commonly comprised of low socioeconomic and minority populations	<ul style="list-style-type: none"> Cardiopulmonary illness; Food, water, and vector-borne diseases Loss of homes, drinking water, and livelihoods; Mental health consequences and stress

Source: Maco et al. 2018.

5.1 REMEDIATION SYSTEM COMPONENTS

There will not be any long-term active remedial systems in place at the site.

5.2 REMEDIATION OPERATIONS

As noted previously there have been ongoing remedial efforts at the subject site since the 1990s. In the context of this document the focus is on long-term management of the implemented remedies and planned remedial operations related to OU5.

5.3 CONTAMINANTS OF CONCERN

Primary contaminants of concern that remain onsite (**Table 3-1**) include cadmium and trivalent chromium found in the in-situ stabilized/solidified soils in OU1, soil located behind the shopping plaza and in sediment along the Montauk Highway retaining wall beneath clean backfill materials. A potential climate change vulnerability includes scour of the clean backfill materials to expose covered material. Both the chemical form of contaminants and abiotic factors affect mobility and bioavailability. Climate change can increase exposure to contaminants due to changes in processes involving soil organic carbon, surface runoff, redox state, and microbial community (Biswas et al. 2018). Specifically, trivalent chromium solubility and toxicity varies with water quality characteristics such as hardness and alkalinity and cadmium vary with hardness and organic

carbon. Both trivalent chromium and cadmium are more toxic in soft water than in hard water, as the presence of calcium and other ions reduces toxicity. Cadmium tends to become strongly adsorbed to clays, muds, humic and organic material, and is typically not bioavailable except to benthic feeders and bottom dwellers (U.S. Environmental Protection Agency [EPA] 2016). It may be re-suspended or return to the water column via turbulent flow of surface water associated with future storms. **Table 5-2** below provides a summary of the possible climate change impacts to residual contaminants of concern at the subject site.

Table 5-2 Summary of Possible Climate Change Impacts on Residual Contaminants of Concern

Climate Impact	Secondary Effect	Relevant Remediation Effect
Altered precipitation pattern	Flooding, storms, more runoff	Possible additional groundwater monitoring to assess impacts groundwater
		Lower contaminant concentration via dilution
		Increased inspection for erosion or other damage
Sea level rise	Altered salinity	Decreased toxicity of both trivalent chromium and cadmium
	Erosion	Damage to site integrity
	Site inundation	Need for increased monitoring to assess cover condition
	Elevations increase	Changing footprint of floodplains, creek boundaries, and coastal shoreline encroachment may impact regulations

The following section describes the possible climate sensitivities and/or vulnerabilities of these materials:

Precipitation

Increased flooding due to precipitation can lead to the mobilization of contaminants and increase concentrations in soils and surface waters. Increased infiltration can both dilute and mobilize contaminants. Higher infiltration events have been shown to raise contaminant concentrations in groundwater for a prolonged period (Maco et al. 2018). This is the case due to increased movement of the contaminant to groundwater from the vadose zone. Increased precipitation may result in increased use of chemicals (such as contained in fertilizers or pesticides), as chemicals may require repeated applications to provide the intended effect. The potential increased use of chemicals may increase chemical contamination in the project area, potentially interacting with exposed residual contaminants.

Sea Level Rise

Altered salinity due to sea level rise may change physical and microbial degradation rates (Maco et al. 2018). Trivalent chromium is less soluble in saltwater than freshwater. Although trivalent chromium may be ingested and bioconcentrated by filter and deposit-feeding bivalve mollusk and polychaetae species, general toxicity occurs at greater concentrations in saltwater. Cadmium is also less toxic with increasing salinity. Additionally, erosion from sea level rise may cause damage to the site integrity and may require additional monitoring and management activities.

Extreme Weather

As noted within the other sections, extreme weather at the site can impact any remaining contaminants of concern through a variety of ways. These include increased scour, wave action, and surface water flow velocity, which can all act to mobilize contaminated sediment. Flooding can also cause possible dilution of the contaminants in an area as they are mobilized and moved to other areas. (Maco et al. 2018).

This page left intentionally blank

6. ADAPTATION MEASURES

The evaluation includes implemented or planned adaptation measures for the project site. These were generated by cross-referencing site conditions related to expected climate impacts with identified vulnerabilities and sensitivities. The climate adaptation measures identified are characterized within a frame of reference for the overall strategic adaptation goal for the particular site component. In the context of climate resiliency, this could be either to provide resistance to the impact (or protection); to provide resilience (or accommodation); or to provide a response-based measure.

Climate Adaptation Plan Framework – General Overview

Climate change occurs within a temporal scale so that a robust adaptation plan is warranted. There are several factors that drive climate change today and are projected to have lasting impacts on sea levels, storm events, temperature, etc. that may be altered over time. Predictions of climate change impacts may become more precise with time; emissions of gases that contribute to climate change may be altered. These alterations would result in differences in predicted and actual climate change impacts. Therefore, an adaptation plan is needed that can be changed as conditions are altered. A robust plan is one that can be used without failure given a wide range of conditions. The components of a typical climate adaptation plan are outlined below.

The conceptual model (**Figure 6-1**) and the following sections outline a series of steps to develop a robust adaptation plan.

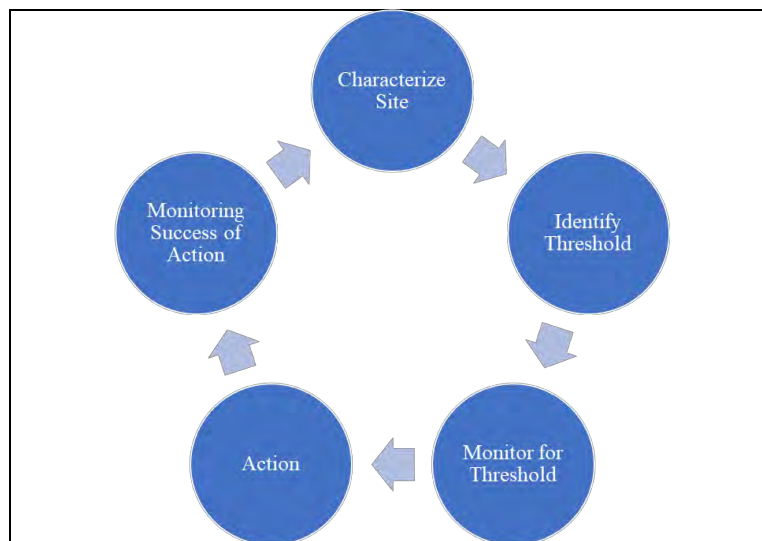


Figure 6-1 Conceptual Model for Adaptation Plan

Characterize Site

The first step of the adaptation plan is to characterize vulnerabilities and sensitivities at the site as has been completed in the previous sections. This data collection step answers the general questions:

1. Where are the issues (e.g., smaller scale – location)?
2. What are the issues (e.g., flooding, erosion, changes to groundwater transport)?
3. How severe are the issues?

These data can be used to inform further data collection and identification of thresholds.

Identify Threshold

A threshold is a parameter or parameters that are measured as indicators to implement or execute the next step of the management plan. Thresholds indicate that the issue at the site is no longer acceptable and the next step of the adaptation plan must be implemented. The thresholds will be specific to the vulnerabilities and sensitivities at a site and will need to be as concise as possible to quantify that the threshold has been achieved. Thresholds will have characteristics of frequency, magnitude, and duration.

Monitoring

Monitoring is used to evaluate if the specific threshold has been achieved. Monitoring data that need to be collected will be specific to the threshold. The sampling plan for data collection must have the specificity in spatial and temporal scale to capture frequency, magnitude, and duration.

Threshold and Subsequent Action

When a threshold is achieved, a specific action to limit risks and adverse outcomes should be executed.

Iterative Approach

The adaptation plan for each area will consist of a series of steps informed by events and monitoring that precede an action. Once a threshold is exceeded and a management action is implemented, monitoring should be continued to ensure that the action is and continues to be effective. As climate change impacts at the site change in the future, this action may no longer be effective. A new set of thresholds and a new monitoring plan should be initiated following implementation of an action.

To decrease risks associated with climate change at the Dzus site, multiple and combinations of adaptation strategies and measures may be implemented. An adaptation strategy is a broader term

describing a general approach that may be used at the site. Adaptation measures are used to describe specific actions that can be implemented to decrease climate risks.

Three principle adaptation strategies that can be considered are (Maco et al. 2018):

- Resistance or ‘Protection’ strategies
- Resilience or ‘Accommodate’ strategies
- Response strategies – which may include managed retreat from a site.

Once a principal strategy is identified then one or a variety of measures can be deployed to accomplish the overall adaptation management strategy for the site. As climatic conditions change over time, the Adaptation Plan may be accomplished using different measures. Strategies and measures should be implemented based on known and projected impacts as well as the goals and objectives for the area. Additionally, the measures chosen may need to change over time as conditions change and as previous areas of uncertainty and unknown variables become more certain (ESA 2018).

6.1 REMEDIATION SYSTEM COMPONENTS

There will not be any long-term active remedial systems in place at the site.

6.2 REMEDIATION OPERATIONS

There are no remediation operations anticipated at this time; however, OU5 is currently being investigated.

6.3 CONTAMINANTS OF CONCERN

Remedial actions addressed cadmium in sediments and soils in operable units other than OU5 through removal of materials above soil or sediment cleanup objectives or institutional controls. Residual levels of cadmium are listed in **Table 3-1**. **Table 6-1** provides a list of implemented adaptation strategies and associated vulnerability addressed.

Table 6-1 Implemented Strategies

Adaptation Strategy	Sensitivities/Vulnerabilities Addressed
Clean Fill Resilience, Monitoring of Residual Levels of Cadmium, and Movement of Material	Erosion of fill materials
	Damage to clean fill
	Increased bioavailability of cadmium
	Mixing or loss of residual materials

Implemented adaptation measures are further discussed below:

Clean Fill Resilience— Clean material was placed on top of residual materials in certain areas since the residual materials were inaccessible due to structural concerns. The goal was to minimize mobilization of the residual materials.

Portions of the site have been restored with clean material. The climate resilience strategy for these areas was approached in a variety of ways depending on the overall objective for the location. Certain locations need to be able to withstand storm flow from precipitation flowing southward but also potential flow northward from coastal storm surge. The resilient fill strategy includes a monitoring program in place through the Interim Site Management Plan. If the fill system was damaged by a storm or freeze/thaw event(s) then the fill could be restored to the same configuration in place prior to the damage. If, based upon future climate projections or impact, a resistance-based strategy is needed, then the cover could be re-designed and installed to implement further protection. This could include armoring through the addition of stone or paving systems.

As described in the opening section of this chapter, within an adaptation plan the strategy for a particular location may change over time as climate impacts increase. Using the Montauk Highway location as an example it makes sense to employ a strategy of resilience at first. Through this strategy, a threshold is set, and monitoring employed to identify a point in the future when the strategy of resistance (installation of an armored and/or submersible fill system) will be implemented.

Monitoring of Concentrations and Movement of Material—This is an integral part of the ‘resilience’ or accommodate strategy and is implemented through the Interim Site Management Plan. Each location will be monitored periodically to ascertain if any damage or degradation has occurred and repair is needed. In addition, if a threshold point has been reached then this would also be a possible trigger to move to a different strategy for a location.

Monitoring may involve either, or both, a post storm event inspection of covered areas (looking for signs of erosion and demarcation fabric), and if warranted a post-storm survey of the fill areas. The post-storm survey would be compared to As-Built survey elevations to determine any impacts to fill thickness.

6.4 CLIMATE ADAPTATION PLAN

Based on available information and a review of most likely climate impacts as discussed within this report, a climate adaptation plan is presented below. This adaptation plan focuses on the following items and is included as **Table 6-2**.

- Residual levels of cadmium covered by clean backfill along the banks of OU3 and OU4
- Residual levels of cadmium in groundwater

The climate adaptation plan, **Table 6-2**, provides the suggested details for the threshold levels and success measures for each.

Table 6-2 Draft Climate Adaptation Plan

Item	Project Location	COC	Existing Measure	Potential Climate Change Impact	Potential Effect	Adaptation Measure	Threshold Level	Monitoring for Threshold	Success Measure
1	OU5	Cadmium in soil and sediment	Remedial investigation/feasibility study currently being conducted at OU5.	Storm surge flow from Babylon Cove and Great South Bay northward.	Scour and erosion of sediment bed; deposition of sediment on adjacent floodplain.	To be determined in a future revision to this plan	Storm surge equal to or exceeding the mid-range projection for major storm surge in 2050, defined as 6.0 ft in NAVD88 Datum	Review United States Geological Service Tide Station 01309225 Great South Bay at Lindenhurst, New York, after major storm event to assess if storm surge surpasses threshold.	A visual assessment of areas inundated by major storm surge reveals minimal sediment deposition in the floodplain.
2	OU3 and OU4	Cadmium in sediment and soil	COC covered with demarcation fabric and clean material in specific areas following 2019-2020 remedial action	Storm surge flow northward along Willetts Creek	Scour and erosion of stream bed and banks	Size rip rap stone on the banks and creek bed to prevent erosion from design storm surge flowing north up Willetts Creek. Design based upon large coastal storm (such as Hurricane Sandy) type impact. As climate impacts increase, this design storm level will likely increase. Size of storm to inundate this area at the present time would be significant.	Storm surge equal to or exceeding the mid-range projection for major storm surge in 2050, defined as 6.0 feet in NAVD88 Datum.	Review USGS Tide Station 01309225 Great South Bay at Lindenhurst, NY after major storm event to assess if storm surge surpasses threshold.	An assessment of areas inundated by major storm surge reveals minimal erosion within project limits. Backfill elevations over residual materials verified by survey.
3	OU3 and OU4	Cadmium in sediment and soil	COC covered with demarcation fabric and clean material in specific areas following 2019-2020 remedial action	Storm runoff flow south along Willetts Creek	Scour and erosion of stream bed and banks	Implemented Adaptation Measure - Size rip rap stone on the banks and creek bed to prevent erosion from design storm. Current stone sized for present day 100-year storm level.	On an annual basis, three storm events equal to or exceeding the current 10-year recurrence interval event or one storm event equal to or exceeding the current 100-year recurrence interval event. The 10-year event is defined as 5.25 inches of precipitation in a 24-hour period. The 100-year event is defined as 9.00 inches of precipitation in a 24-hour period.	Review local precipitation gages after major storm event to assess if precipitation surpasses threshold.	An assessment of Willetts Creek reveals minimal erosion within project limits. Backfill elevations over residual materials verified by survey.
4	OU1 to OU3	Cadmium and chromium in groundwater	In situ stabilization (ISS) and an asphalt/vegetation cover	Increased groundwater flow and weathering of asphalt cover and ISS mass due to higher runoff in the future	Mobilization of cadmium and chromium in groundwater with migration to surface water at Willetts Creek	Maintenance of asphalt and vegetative cover	Increasing concentrations of cadmium and chromium in groundwater.	Monitor for cadmium and chromium concentrations in groundwater at OU1 to evaluate temporal trends.	An assessment of cadmium and chromium in groundwater reveals continual declining/stable concentrations.

This page intentionally left blank

7. SUMMARY AND CONCLUSIONS

Impacts from climate change are anticipated to increase in the future and site management at the Dzus site may be altered by the changing climate. According to the middle range projection, precipitation on Long Island may increase by as much as 5 inches per year by 2050, with heavy rain events increasing by 16 percent over that time period. Higher precipitation totals and heavy rainfall events could lead to additional monitoring for erosion and contaminant concentrations in soils and surface waters related to the remedy.

Impacts from sea level rise provide for the most potentially significant climate impacts at the site. Flooding from sea level rise may cause damage to the site integrity and additional monitoring may need to be considered over time. Sea level rise projections for the site range from a mid-level projection of 1.3 feet in 2050 while the high projection, with a 1% probability of occurring, is 2.5 feet by 2050. Storm surge impacts in conjunction with sea level rise provide for a much greater potential impact. Considering a storm surge like Super Storm Sandy, in addition to the mid-level projection in 2050 would provide a 9.6-foot surge over present-day sea level.

As part of this resiliency assessment a draft climate adaptation plan, **Table 6-2**, has been completed and is to be incorporated into the Interim Site Management Plan with an associated periodic review process. This draft adaptation plan incorporates strategies and measures already implemented or planned for the site and defines impact thresholds and monitoring for exceedance of these thresholds. If a set threshold is surpassed, an action will be taken to protect the public and the environment. A new set of thresholds and plan would then be created to decrease risks associated with climate change impacts.

In conclusion, the plan demonstrates and concludes that any potential vulnerability of the remedy to climate change such as severe weather events can be managed and mitigated through proactive monitoring of the remedy and, if appropriate, corrective measures. Accordingly, the long-term monitoring program incorporates findings and recommendations of this climate resiliency evaluation as well as requiring periodic updates to the assessment.

This page left intentionally blank

8. REFERENCES

- Akbari, H., D.M. Kurn, S.E. Bretz, J.W. Hanford. 1997. Peak power and cooling energy savings of shade trees. *Energy and Buildings* 25(2): 139-148 doi:10.1016/S0378-7788(96)01003-1.
- Biswas, B., F. Qi, J.K. Biswas, A. Wijayawardena, M.A.I. Khan, and R. Naidu. 2018. The fate of chemical pollutants with soil properties and processes in the climate change paradigm – A review. *Soil Syst.* 2(51) doi:10.3390/soilsystems2030051.
- NY Rising Community Reconstruction (NYRCR) West Islip Planning Committee. Jacobs and Cameron Engineering & Associates, LLP. March 2014. *West Islip NY Rising Community Reconstruction Plan*.
- EA Engineering, P.C. and its affiliate EA Science and Technology (EA). 2017a. *Interim Remedial Measure, Construction Completion Report, Former Dzus Fastener Site (152033), Suffolk County, West Islip, New York*. February.
- ESA. 2018. *City of Del Mar Sea-Level Rise Adaptation Plan, Del Mar, California*. Revised Draft. Prepared for City of Del Mar.
- Famiglietti, J.S. 2014. The global groundwater crisis. *Nat. Clim. Change* 4(11), 945–948.
- Horton, R., D.A. Bader, C. Rosenzweig, A. DeGaetano, and W. Solecki. 2014. *Climate Change in New York State; Updating the 2011 ClimAID Climate Risk Information*. New York State Energy Research and Development Authority, Albany, New York. September.
- Jaffe, P.R., P.A. Kallin, S.L. Smith. 1998. Modelling trace metal dynamics in wetland sediments: The effect of the rhizosphere on the sediment redox profile. *Mineralogical Magazine* 62(A): 699-700.
- Kimberly, D. and C.J. Salice. 2013. Interactive effects of contaminants and climate-related stressors: High temperature increases sensitivity to cadmium. *Environ. Toxicol. Chem.* 32(6):1337–13753. <https://doi.org/10.1002/etc.2198>.
- Libera, A., F.P.J. de Barros, B. Faybishenko, C. Eddy-Dilek, K.M. Denham Lipnikov, D. Moulton, and H.M. Wainwright, H. M. 2018. *Climatic controls on residual contaminants under sustainable remediation*. *Environ. Sci. Technol.* Manuscript submitted for publication.
- Lowman, M.D., T.D. Schowalter. 2012. Plant science in forest canopies – the first 30 years of advances and challenges (1980-2010). *New Phytologist* 194(1): 12-27 doi:10.1111/j.1469-8137.2012.04076.x.
- Lytle, C.M., F.W. Lytle, N. Yang, J. Qian, D. Hansen, A. Zayed, N. Terry. 1998. Reduction of Cr(VI) to Cr(III) by wetland plants: Potential for in situ heavy metal detoxification. *Environmental Science and Technology* 32(20): 3087-3093 doi:10.1021/es980089x.

- Maco, B., P. Bardos, F. Coulon, E. Erickson-Mulanax, L.J. Hansen, M. Harclerode, D. Hou, E. Mielbrecht, H.M T. Yasutaka, and W.D. Wick. 2018. Resilient remediation: Addressing extreme weather and climate change, creating community value. *Remediation* 29(1):7–18.
- Mahajan, P., J. Kaushal. 2018. Role of phytoremediation in reducing cadmium toxicity in soil and water. *Journal of Toxicology* 2018 doi:10.1155/2018/4864365.
- Mattuck, R., N.P. Nikolaidis. 1996. Chromium mobility in freshwater wetlands. *Journal of Contaminant Hydrology* 23(3): 213-232 doi:10.1016/0169-7722(95)00097-6.
- National Oceanic and Atmospheric Administration (NOAA). 2017. *Global and Regional Sea Level Rise Scenarios for the United States*. NOAA Technical Report NOS CO-OPS 083.
- Nemickas, B. and E.J. Koszalka. 1982. *Geohydrologic Appraisal of Water Resources of the South Fork, Long Island, New York*. Geological Survey Water-Supply Paper 2073.
- New York State Department of Environmental Conservation (NYSDEC). 1998. *NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards (Class GA)*. June.
- New York State Department of Environmental Conservation (NYSDEC). 2016. *NYSDEC Division of Environmental Remediation. Hudson River Sediment and Off-site Areas State Superfund Project Record of Decision*. March.
- . 2014. *Screening and Assessment of Contaminated Sediment (June 24)*.
- Northeast Regional Climate Center. 2015. *Intensity duration frequency curves for New York State: Future projections for a changing climate*. http://ny-idf-projections.nrcc.cornell.edu/map_viewer.html
- Noyes, P.D., M.K. McElwee, H.D. Miller, B.W. Clark, L.A. Van Tiem, K.C. Walcott, K.N. Erwin and E.D. Levin. 2009. The toxicology of climate change: Environmental contaminants in a warming world. *Environ. Int.* 35(6), 971– 986.
- Ong, S.K., R. Surampalli, A. Bhandari, P. Champagne, R. Tyagi, I. Lo. 2008. Remediation Wetlands. In book: *Natural Process and Systems for Hazardous Waste Treatment*, Chapter: 7. *American Society of Civil Engineers* doi:10.1061/9780784409398.
- Palmer, C.D. and R.W. Puls. 1994. Natural attenuation of hexavalent chromium in groundwater and soils. *EPA Ground Water Issue*. EPA 540/5-94/505. EPA Office of Solid Waste and Emergency Response. October.

- Rai, D., L.E. Eary, and J.M Zachara. 1989. Environmental chemistry of chromium. *Sci. Total Environ.* 86(1–2):15–23. Doi: 10.1016/0048-9697(89)90189-7.
- Rosenzweig, C. and W. Solecki. 2019. *Advancing Tools and Methods for Flexible Adaptation Pathways and Science Policy Integration*. New York City Panel on Climate Change. Annals of the New York Academy of Sciences 1439(1). doi: 10.1111/nyas.14008.
- Rosenzweig, C., W. Solecki, A. DeGaetano, M. O’Grady, S. Hassol, P. Grabhorn (Eds.). 2011. *Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation*. Technical Report. New York State Energy Research and Development Authority, Albany, New York.
- Sandrint, T.R. and R.M. Maier. *Effect of pH on cadmium toxicity, speciation, and accumulation during naphthalene biodegradation*. *Environ. Toxicol. Chem.* 21(10):2075–2079. Doi: 10.1002/etc.5620211010.
- Schubert, C.E., R.J. Busciolano, P.P. Hearn Jr, A.N. Rahav, R. Behrens, J.S. Finkelstein, J. Monti Jr, and A.E. Simonson. 2015. *Analysis of Storm-Tide Impacts from Hurricane Sandy in New York*. Scientific Investigations Report 2015-5036. U.S. Department of the Interior, U.S. Geological Survey. doi:10.3133/sir20155036.
- Shrestha, P.L., S.C. James, P.J. Shaller, and M. Doroudian. 2014. Estimating the storm surge recurrence interval for Hurricane Sandy. *World Environ. Water Resour. Congr. 2014*. doi:10.1061/9780784413548.191.
- . 2016. *Aquatic life ambient water quality criteria: Cadmium – 2016*. EPA 820-R-16-002. Office of Water, Health and Ecological Criteria Division. March.
- USGS. 2019. *USGS Current Conditions for New York - USGS 01309225 Great South Bay at Lindenhurst NY*. https://waterdata.usgs.gov/ny/nwis/uv?site_no=01309225.
- University of North Carolina at Charlotte. 2006. Oysters can take heat and heavy metals, but not both. *ScienceDaily*. www.sciencedaily.com/releases/2006/12/061213174728.htm.
- Xu, S., P.R. Jaffe. 2006. Effects of plants on the removal of hexavalent chromium in wetland sediments. *Journal of Environmental Quality Abstract – Wetlands and Aquatic Processes* 35(1): 334-341 doi:10.2134/jeq2005.0181.

This page left intentionally blank

Appendix J

Summary of Green Remediation Metrics

This page left intentionally blank

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
 Address: _____ City: _____
 State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)

Start Date: _____

Current Reporting Period

Reporting Period From: _____ To: _____

Contact Information

Preparer's Name: _____ Phone No.: _____

Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	Total to Date
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	Total to Date (tons)
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	Total to Date (miles)
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	Total to Date (gallons)
Total quantity of water used on-site		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	Total to Date (acres)
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

<p>Description of green remediation programs reported above (Attach additional sheets if needed)</p>
<p>Energy Usage:</p>
<p>Waste Generation:</p>
<p>Transportation/Shipping:</p>
<p>Water usage:</p>
<p>Land Use and Ecosystems:</p>
<p>Other:</p>

<p>CERTIFICATION BY CONTRACTOR</p> <p>I, _____ (Name) do hereby certify that I am _____ (Title) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application.</p> <p>_____</p> <p style="text-align: center;">Date Contractor</p>

This page intentionally left blank