



**US Army Corps
of Engineers®**
Buffalo District

**Seneca Bluffs Ecosystem Restoration Project
City of Buffalo
Erie County, New York**

Operations and Maintenance Manual



February 2020

DEPARTMENT OF THE ARMY
US ARMY ENGINEER DISTRICT, BUFFALO
1776 NIAGARA STREET
BUFFALO, N.Y. 14210

OPERATIONS AND MAINTENANCE MANUAL
SENECA BLUFFS ECOSYSTEM RESTORATION PROJECT

CITY OF BUFFALO
ERIE COUNTY, N.Y.

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SENECA BLUFFS ECOSYSTEM RESTORATION PROJECT

CITY OF BUFFALO

ERIE COUNTY, N.Y.

PREFACE

The Seneca Bluffs Ecosystem Restoration Project (Project) is located at the Seneca Bluffs Natural Habitat Park within the City of Buffalo (COB), Erie County, New York. The Project was funded by the U.S. Environmental Protection Agency (USEPA) through the Great Lakes Restoration Initiative (GLRI) program. It is an important component of the Buffalo River Area of Concern (AOC) Remedial Action Plan (RAP) and contributes to improvement of the Buffalo River AOC. The project was designed and constructed under the supervision of the United States Army Corps of Engineers (USACE), Buffalo District.

The Project restores 3,000 linear feet of shallow riverine habitat and 4.0 acres of floodplain habitat along the Buffalo River in the Seneca Bluffs Natural Habitat Park. Specifically, the Project addressed severe riverbank erosion along the Buffalo River and created riverine and riparian fish and wildlife habitat. The Project also removed dense infestations of invasive species (e.g. Japanese knotweed, common reed) and established native floodplain plant communities through plantings and seeding.

The successful functioning of the Project will depend in part upon continued maintenance of restored areas by Erie County. The most important aspect of this maintenance is related to invasive species management. With inspection and proper maintenance, the restored areas can flourish and continue providing important habitat for riparian and aquatic wildlife.

This manual has been compiled to assist Erie County with maintenance of this Project. The following sections provide recommendations for inspections and maintenance, and descriptions of project components. The appendices include project construction permits (Appendix A), a recommended Invasive Species Management Plan (Appendix B), an Inspection Checklist (Appendix C), As-built Drawings (Appendix D), Plans and Specifications (Appendix E), representative photos of project components (Appendix F), and a list of Plant Materials installed at the site (Appendix G).

I - INTRODUCTION

1. PROJECT AUTHORIZATION

The Project was funded by the U.S. Environmental Protection Agency (USEPA) through the Great Lakes Restoration Initiative (GLRI) Program. It was accomplished for USEPA by the U.S. Army Corps of Engineers (USACE) under the authority of the Economy Act (31 U.S.C. 1535).

2. LOCATION

The Project restores 3,000 linear feet of shallow riverine habitat and four acres of floodplain habitat along the Buffalo River in the Seneca Bluffs Natural Habitat Park (Seneca Bluffs). Seneca Bluffs measures approximately 20 acres in area and is located at river mile 6.0 on the Buffalo River. For the purpose of planning and design of this project, the 3,000 linear feet of riverbank was divided up into six reaches (Figure 1).

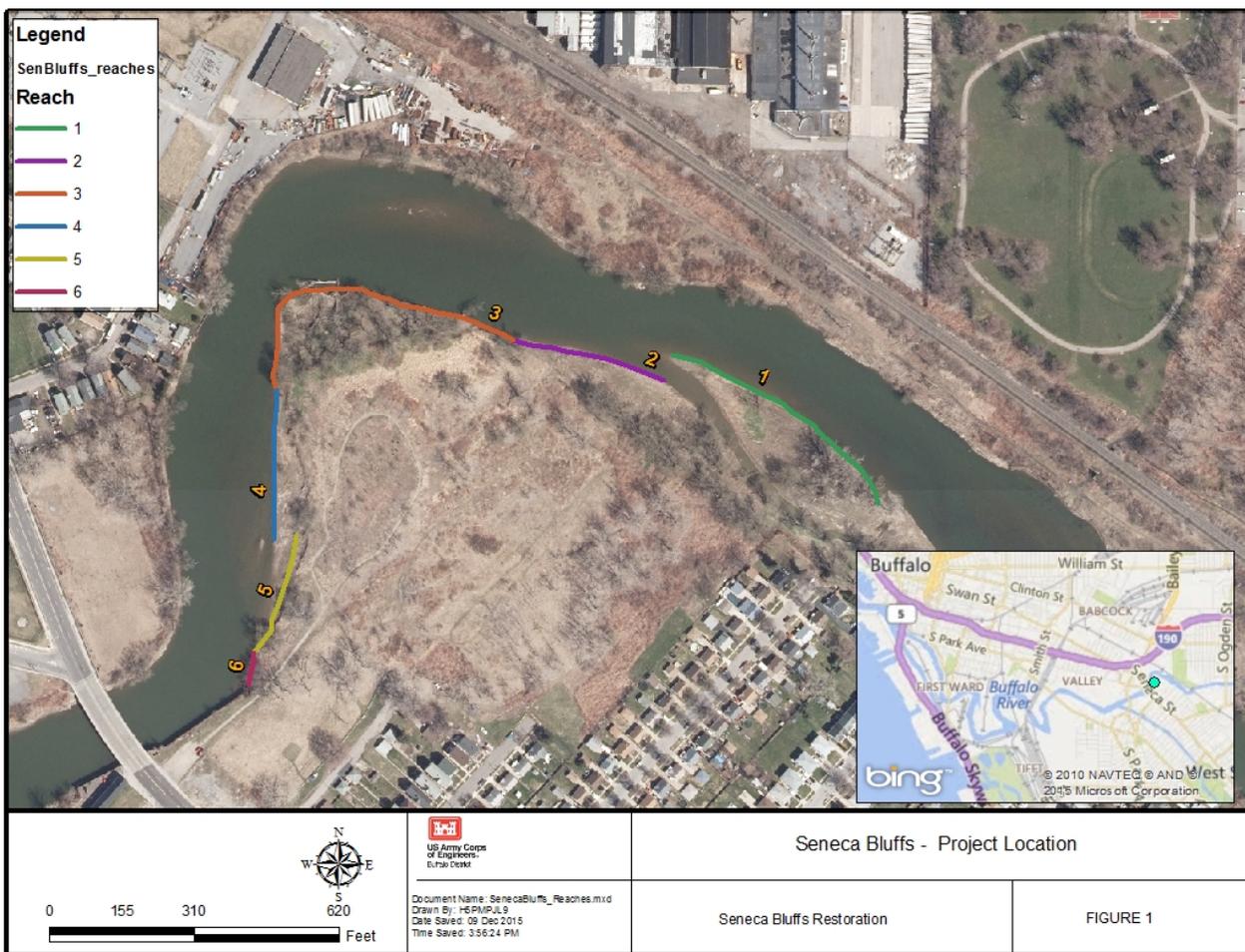


Figure 1. Seneca Bluffs Project Site and Designated Reaches.

3. PROJECT DESCRIPTION

The Project was undertaken to address severe shoreline erosion, invasive species infestation, and overall habitat degradation affecting the banks of the Buffalo River and its floodplain within Seneca Bluffs.

The purpose of the Project is to restore 3,000 linear feet of riverbank, and four acres of floodplain and aquatic habitat along the Buffalo River. Habitat restoration measures include bank stabilization with stone toe protection and bank cutback (Figure 1). Enhancement measures for in-channel and shallow water habitat include the installation of locked logs and single stone bendway weirs with root wads. Additionally, a backflow wetland approximately 0.2 acre in size was installed to create floodplain wetland habitat. Invasive plant species have been removed from the project footprint and have been replaced with native species. The Project will stabilize eroding river banks, create in-channel aquatic habitat, reduce invasive species, and restore native riparian vegetation communities.

The project components are further described in Section III.

4. PROJECT OBJECTIVES

The completed work was performed in order to achieve the following objectives:

- Restore in-channel and floodplain habitat for riparian and aquatic organisms of the Buffalo River
- Reduce bank erosion along the Buffalo River within Seneca Bluffs

5. CONSTRUCTION HISTORY

Construction activities were initiated in August of 2016 by Tidewater Inc. and completed in December of 2019. The work was completed under the direction of the USACE, Buffalo District via Construction Contract No. W912P4-16-C-0007.

Construction of the Project began with the cutting back (excavation) of river banks, installation of stone-toe protection, installation of bioengineering measures (coir fabric and live fascines), and installation of in-stream habitat features (rootwads, locked logs and single-stone Bendway weirs). In addition, restoration areas were seeded with a native plant species seed mix at this time. Live stakes of native shrub species were installed in April of 2017 and plugs of native wetland vegetation were installed in June 2017. Replanting of live stakes due to winter die-off occurred in March and April of 2018. Additionally, shrubs and trees were planted in herbivore enclosures in the fall of 2018. Three years (2016-2018) of intensive mechanical and chemical invasive species eradication treatments were followed by two years (2019-2020) of follow-up chemical spot-treatments. Complicating the re-vegetation effort, water level conditions during the

2019 season were 1.5 - two feet higher than average growing season water levels (572 feet IGLD 85).

6. LOCAL COOPERATION & RESPONSIBILITIES

Seneca Bluffs is owned and maintained by the County of Erie, New York. The restoration project was completed in coordination with Erie County Environment and Planning. Following project completion, all maintenance of project features will be the responsibility of Erie County. Recommended maintenance procedures and management strategies are provided in the following sections of this report.

The most important anticipated maintenance component associated with this project will be the management of invasive plant species. Recommendations for invasive species management are provided in Section III. An Invasive Species Management Plan is provided in Appendix B, and an inspection checklist for project components is provided in Appendix C.

II – PROCEDURES

1. GENERAL

This manual was written following the guidance contained in Engineering Regulation (ER) 1110-2-2902 Prescribed Procedures for the Maintenance and Operation of Shore Protection Works. The following paragraphs provide guidance from ER 1110-2-2902 for the maintenance of the project.

2. DUTIES OF THE SUPERINTENDENT

It is recommended that Erie County appoint a Project Superintendent and a responsible alternate for the Project. The Superintendent is responsible for the efficient inspection, operation, maintenance, and repair of the project features. The Superintendent will ensure that all maintenance measures or repairs deemed necessary to restore to before-incident project conditions are promptly remedied or completed.

In addition to specific duties outlined in other portions of this manual, the Superintendent will have the responsibility for developing and sustaining an organization capable of efficiently maintaining and restoring the project, particularly during and after project damage occurs.

3. PERIODIC INSPECTIONS

It is recommended that the Project condition inspections conducted by the Superintendent at the following times:

- a. At intervals not exceeding one (1) year,
- b. Immediately after each high-water event defined as >575 LWD (IGLD 85)
- c. Immediately after each major lake storm defined as storms with minimum 40 mph wind speeds for at least three hours or any lakeshore generated waves exceeding five feet in height,
and,
- d. At such times deemed necessary by the Superintendent.

4. INSPECTION REPORT CHECKLIST

Appendix C of this manual contains an inspection checklist that can be used to facilitate routine and emergency inspections. Any needed repairs and/or maintenance performed since the last inspection are recommended to be indicated thereon. Factors such as condition of the stone and evidence of structural deterioration should be rated in accordance with the annotated checklist criteria. Ratings for each checklist item will be either “A” (Acceptable), “M” (Minimally Acceptable), or “U” (Unacceptable). If an item doesn't apply, “N/A” (Not Applicable), can be used.

III - PROJECT FEATURES

1. General

The Project components are depicted in (Figure 2) and characterized briefly below:

- 1,200 linear feet of riverbank stabilization in the form of stone toe protection, tiebacks, bank shaping (one acre), slit trenching, and live stake installation.
- 3.9 acres of chemical and mechanical invasive plant species treatment, primarily targeting Japanese knotweed (*Fallopia japonica*) and common reed (*Phragmites*).
- 3,000 linear feet of in-channel riverine enhancement of fish and wildlife habitat utilizing locked logs, bend-way weirs, and root wads.
- 0.2 acres of off-channel floodplain wetland created through excavation and installation of emergent vegetation.
- Native vegetation plantings including emergent plugs, live stakes, shrubs, trees, and native seed mixes.

Additional description of project features by river reach is provided below. Further detail regarding project features can be found in As-Built Drawings (Appendix D), Plans and Specifications (Appendix E), and Project Photos (Appendix F). A listing of installed plant species is provided in Appendix G.

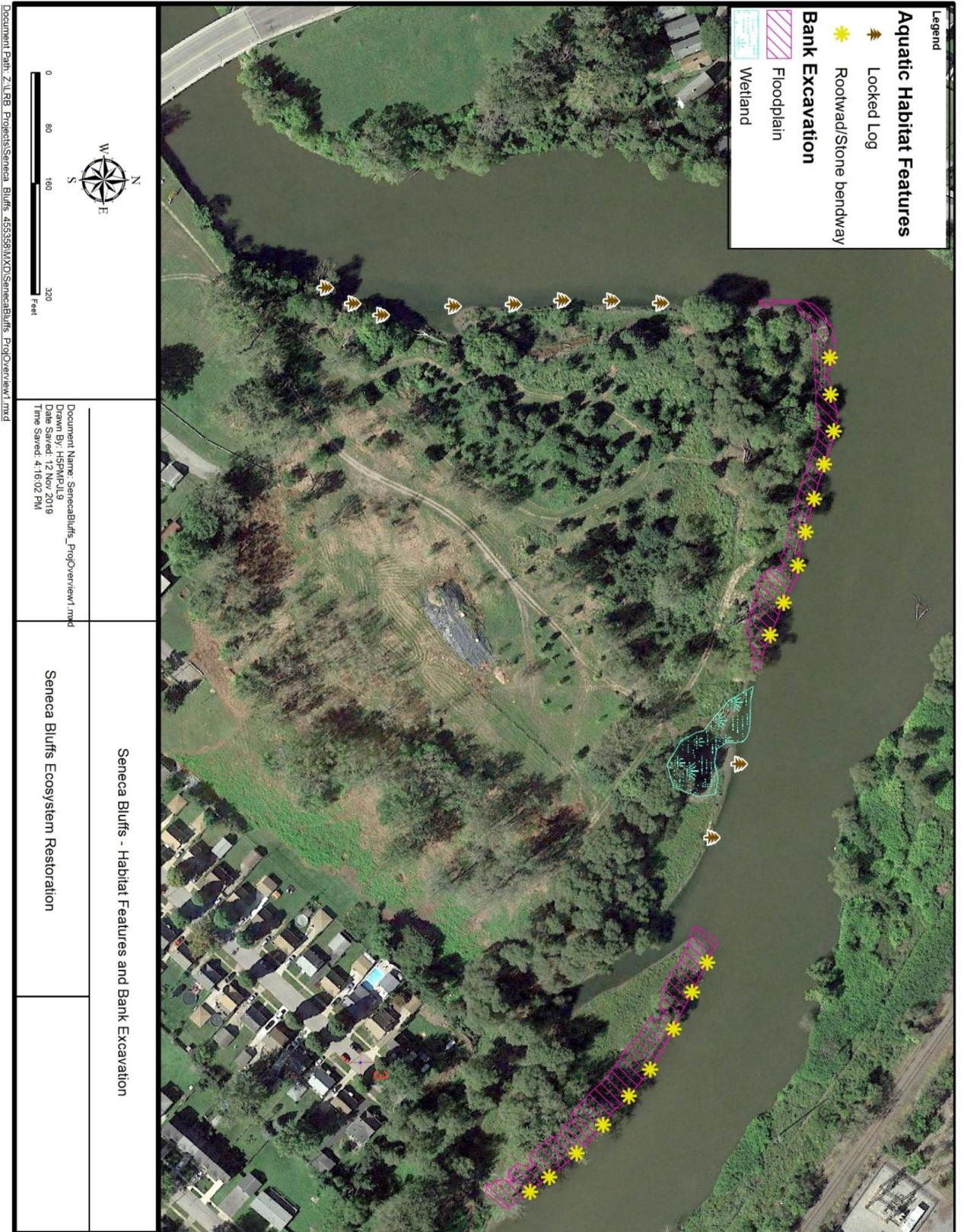


Figure 2. Seneca Bluffs Project Features

2. Project Features By Reach

A variety of restoration measures were applied at the various reaches (Figure 1) in order to accomplish specific restoration goals. Table 1 details the relation between project features built at the various reach locations and the specific restoration goals. General conceptual cross sections for the constructed features at each reach are presented below with a brief description of construction activities. Note the conceptual cross sections may differ slightly from final as-built features, but are provide to represent the project components.

Table 1. Seneca Bluffs Restoration Methods by Reach

Reach	Goals	Restoration Methods
1	Bank stabilization	Stone toe protection and tiebacks, bank shaping, slit trenching, live stakes, live fascines
	Create in-channel and riverbank habitat	Single-stone bend-way weirs, root wads
	Native riparian species establishment	Native species plantings, invasive species treatment
2	Create in-channel and riverbank habitat	Locked logs
	Wetland restoration	Floodplain wetland excavation/creation
	Native riparian species establishment	Native species plantings, invasive species treatment
3	Bank stabilization	Stone toe protection and tiebacks, bank shaping, slit trenching, live stakes, live fascines
	Create in-channel and riverbank habitat	Single-stone bend-way weirs, root wads
	Native riparian species establishment	Native species plantings, invasive species treatment
4	Create in-channel and riverbank habitat	Locked logs
	Native riparian species establishment	Native species plantings, invasive species treatment
5	Create in-channel and riverbank habitat	Locked logs
	Native riparian species establishment	Native species plantings, invasive species treatment
6	None	None

Reach 1

Construction activities at this reach included cutting back (excavating) the existing bank to a stable slope and installing stone toe protection, rootwads, live fascine bundles, native shrubs and trees, and livestakes (Figure 3). Wire fencing was installed as herbivore protection around tree and shrub plantings. This area was also seeded and underwent invasive species treatment. Additionally, plugs of American waterwillow (*Justicia american*) were installed at the downstream end of the island, and emergent vegetation plugs were installed along the backwater channel.

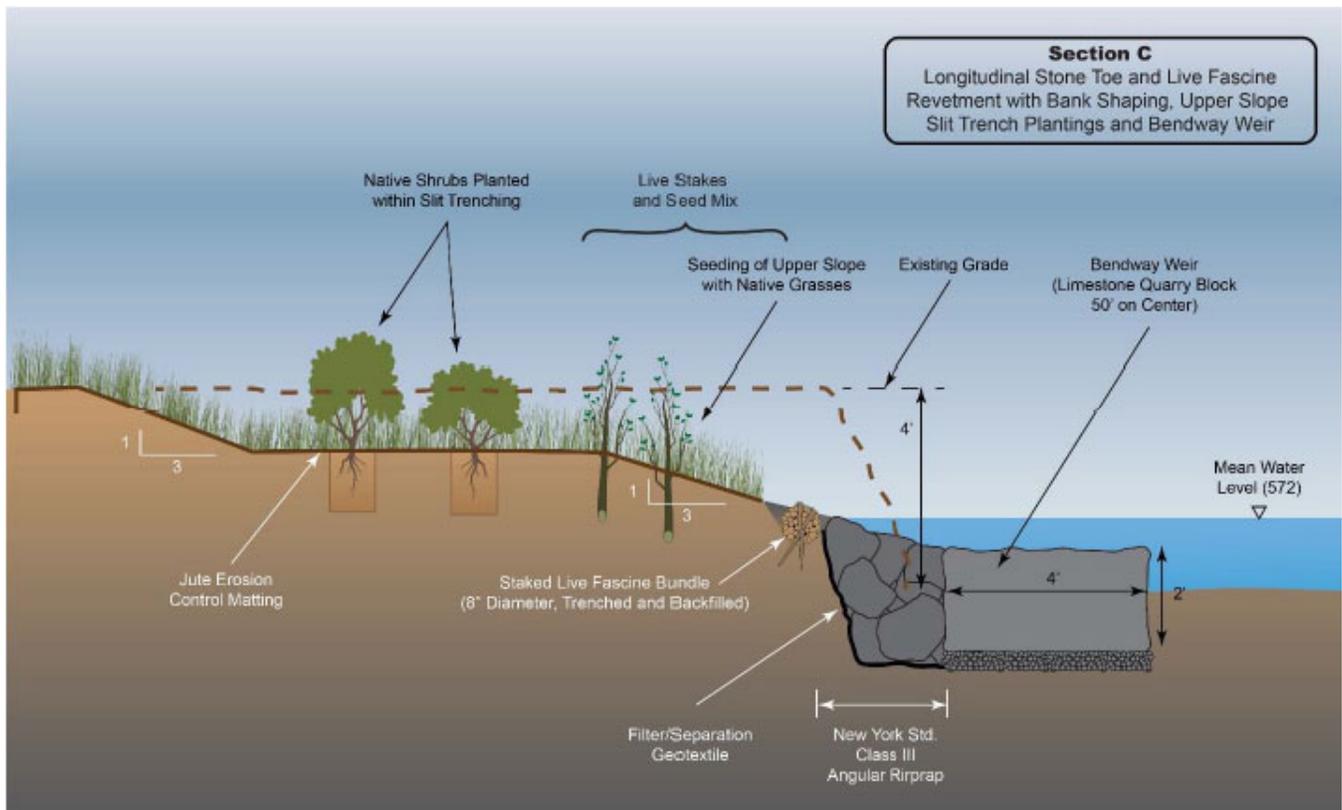


Figure 3. Reach 1 Conceptual Cross Section

Reach 2

Construction activities at this reach included the excavation of a 0.2-acre floodplain depressional wetland and installation of locked logs along the existing riverbank (Figure 4). Native emergent vegetation was installed in the created wetland. Native trees and shrubs were planted on the adjacent floodplain. Wire fencing was installed as herbivore protection around tree and shrub plantings. This area was also seeded and underwent invasive species treatment.

Reach 3

Construction activities at this reach were similar to Reach 1 and included cutting back (excavating) the existing bank to a stable slope and installing stone toe protection, rootwads, and live fascine bundles, native trees and shrubs, and livestakes (Figure 5). Wire fencing was installed as herbivore protection around tree and shrub plantings. This area was also seeded and underwent invasive species treatment.

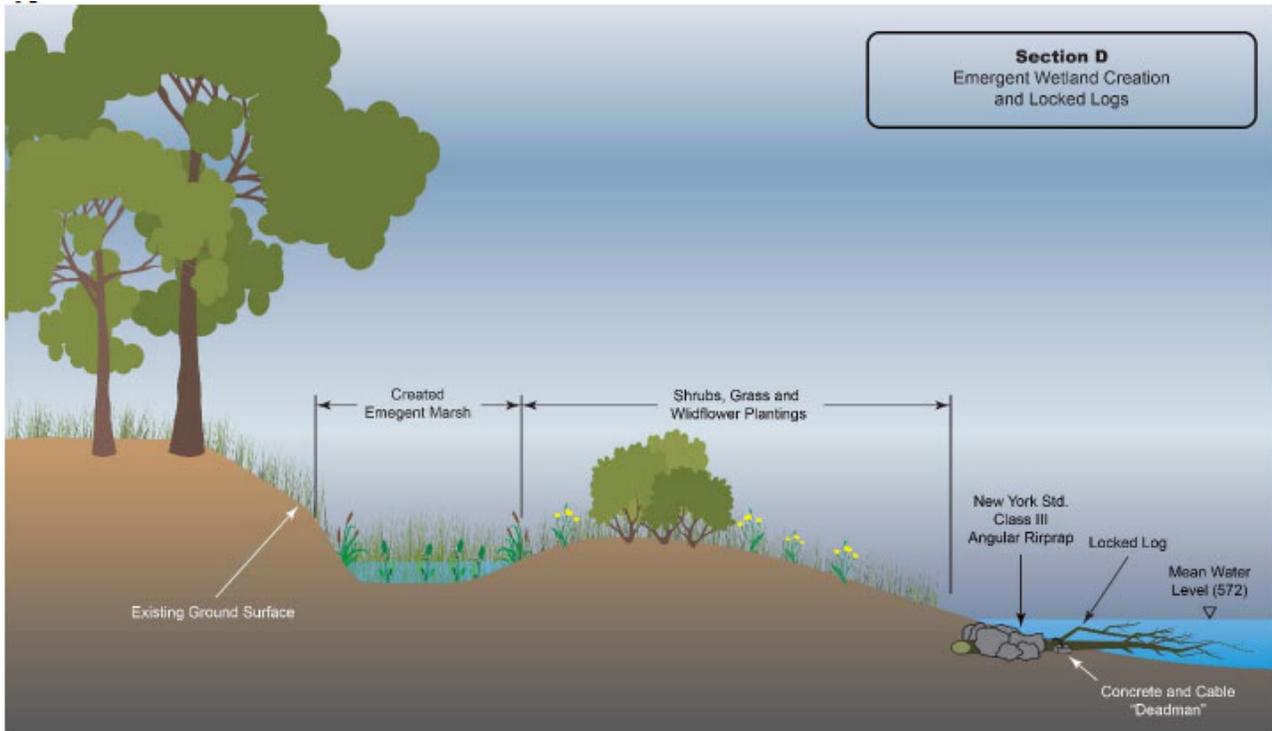


Figure 4. Reach 2 Conceptual Cross Section

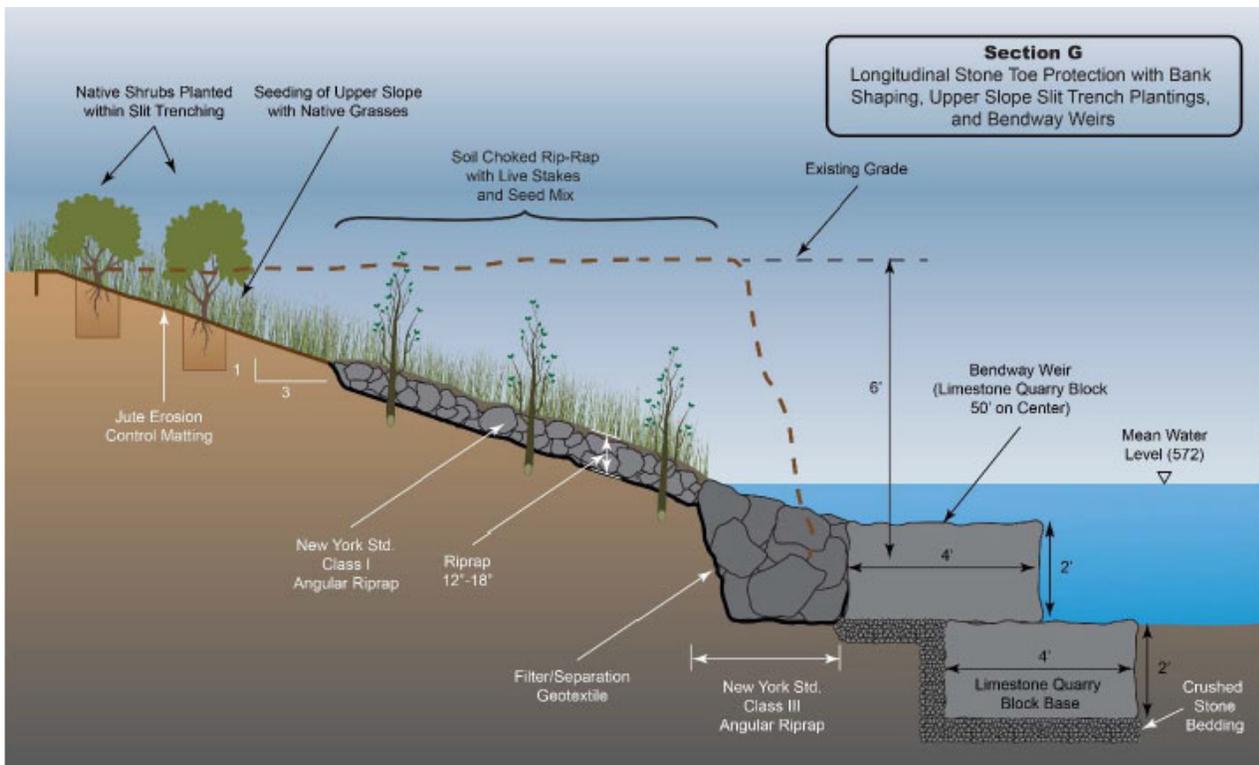


Figure 5. Reach 3 Conceptual Cross Section

Reaches 4 and 5

Construction activities at these reaches consisted of the installation of locked logs along the existing gravel bar island and installation of native shrubs. Wire fencing was installed as herbivore protection around shrub plantings. This area was also seeded and underwent invasive species treatment.

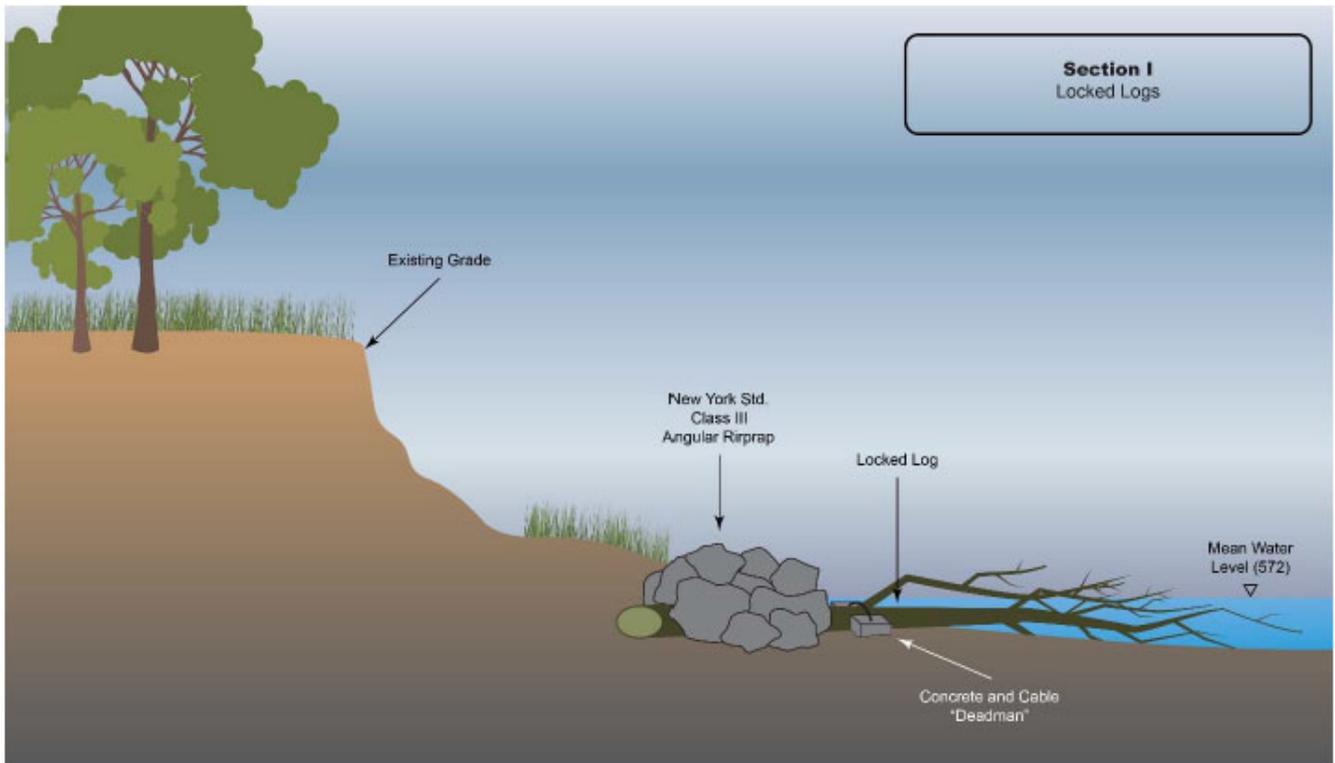


Figure 6. Reach 4 and 5 Conceptual Cross Section

Reach 6

No activities were completed at reach 6.

3. Invasive Species Treatment

An intensive invasive species treatment schedule of chemical herbicide application and mechanical removal was implemented across all restoration areas to reduce the cover and extent of aggressive, non-native vegetation in restoration areas (Figure 7). Treatments primarily targeted common reed and Japanese knotweed.

In 2016, 2017, and 2018, common reed was treated chemically in September and mechanically in October. Chemical treatment consisted of foliar application of herbicide. Mechanical treatment consisted of cutting standing biomass with hand tools and removing the biomass from site for disposal. Japanese knotweed underwent two mechanical and two chemical treatments each year during this time period. Biomass was initially cut with hand tools and removed from site in June, herbicide was applied to new growth in August, remaining biomass was cut a second time in

September, and a final late season application of herbicide was conducted in early October. The timing of these treatments is important for effective removal of knotweed.

In 2019 and 2020, spot treatments were conducted throughout the restoration areas. Spot treatments targeted all invasive plants including common reed, Japanese knotweed, tree-of-heaven (*Ailanthus altissima*), purple-loosestrife (*Lythrum salicaria*), mugwort (*Artemisia vulgaris*) and others. Based on monitoring, the invasive plant treatments had substantially reduced the coverage of Japanese knotweed and *Phragmites* compared to the pre project condition. Coverage of non-native species in the restored areas was estimated at less than ten percent.

Continued treatment of invasive species will be required to prevent Japanese knotweed and *Phragmites* from reestablishing across the restored areas.

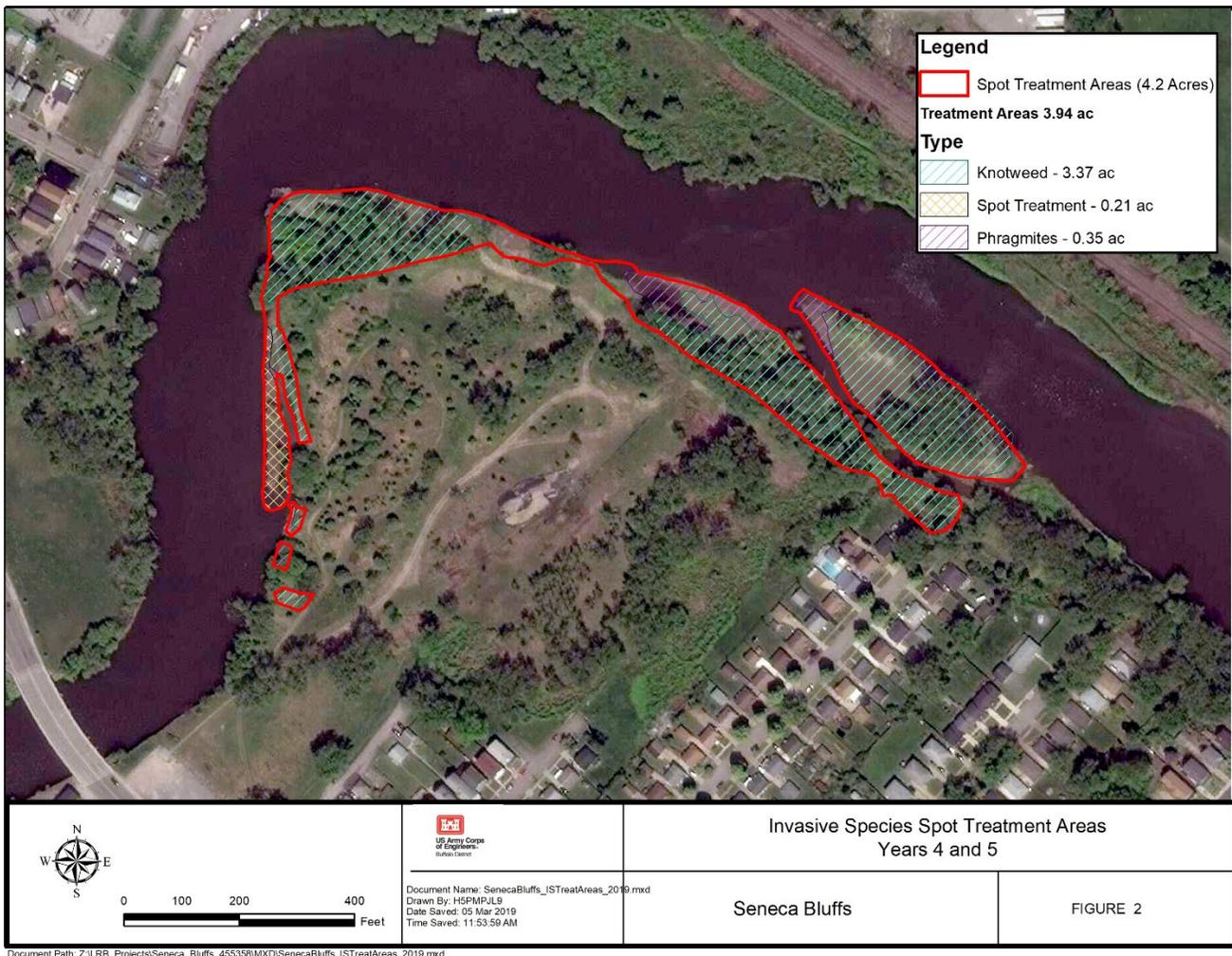


Figure 7. Invasive Species Treatment Areas

IV – MAINTENANCE

1. GENERAL

It is recommended that Erie County maintain the Project in a manner that ensures it will meet its intended objectives. The Erie County appointed Superintendent should make periodic inspections and take steps to correct any adverse conditions revealed by such inspections. The Superintendent is to provide for any periodic repairs or adjustments that may be required to restore the project to its original and/or improved present-day condition. Emergency repairs shall be completed immediately when there is a danger of considerable Project damage due to major project component/measure failure.

2. CONTRACT SPECIFICATIONS

Where maintenance of any Project feature requires its repair or replacement, materials and installation methods used should match those as specified in the original contract specifications or if specifications were field modified, as shown on the “As-Built” drawings (Appendix D). Plans and specifications for the Project are included in Appendix E of this manual. A summary of the specifications are listed below:

- Seeding and Plantings
- Invasive species Treatments
- Excavations
- Stone, Rootwads, and Locked Log Materials
- Biodegradable Stabilization Fabric

3. Riverbank Stabilization Measures and Habitat Features

Riverbank stabilization measures and habitat features were designed to be resilient to the conditions that exist within the Buffalo River; however, these features should be inspected annually so that potential problems can be documented and addressed.

A. Inspection

The riverbank stabilization measures and habitat features shall be inspected in accordance with the paragraph entitled Periodic Inspections within this document. Localized riverbank erosion and/scouring due to storms, ice action, or debris will be noted. Where riverbank settlement and/or slide is observed, a detailed inspection shall be conducted to determine cause.

B. Maintenance and Repair

When damage occurs such that a Project feature no longer fulfills its intended purpose, the feature shall be rebuilt or repaired to the “As-Constructed” condition.

All repair efforts should include stone and materials that are equal to the materials specified in Appendix E of this manual.

4. Invasive Species Management

The most important component of maintenance for ensuring project success is continued invasive species management. It is recommend that Erie County monitor and manage any Project area invasive plant species in accordance with the Invasive Species Management Plan (Appendix B). This report contains detailed requirements for monitoring and managing invasive plant species at the project site.

OPERATIONS AND MAINTENANCE, MANUAL
FOR THE
SENECA BLUFFS ECOSYSTEM RESTORATION PROJECT

CITY OF BUFFALO
ERIE COUNTY, N.Y.

APPENDIX A - Permits

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Permits, Region 9
270 Michigan Avenue, Buffalo, NY 14203-2915
P: (716) 851-7165 | F: (716) 851-7168
www.dec.ny.gov

June 13, 2016

Mr. Thomas Hersey
Erie County Department of Environment & Planning
95 Franklin Street, 10th Floor
Buffalo, New York 14202

PERMIT TRANSMITTAL LETTER
Permit No. 9-1402-01119/00001

Dear Mr. Hersey:

Enclosed is your permit which was issued in accordance with applicable provisions of the Environmental Conservation Law. The permit is valid for only that project, activity or operation expressly authorized. If modifications are desired after permit issuance, you must submit the proposed revisions and receive written approval from the Permit Administrator prior to initiating any change. If the Department determines that the modification represents a material change in the scope of the authorized project, activity, operation or permit conditions, you will be required to submit a new application for permit.

PLEASE REVIEW ALL PERMIT CONDITIONS CAREFULLY. IN PARTICULAR, IDENTIFY YOUR INITIAL RESPONSIBILITIES UNDER THIS PERMIT IN ORDER TO ASSURE TIMELY ACTION IF REQUIRED. SINCE FAILURE TO COMPLY PRECISELY WITH PERMIT CONDITIONS MAY BE TREATED AS A VIOLATION OF THE ENVIRONMENTAL CONSERVATION LAW, YOU ARE REQUESTED TO PROVIDE A COPY OF THE PERMIT TO THE PROJECT CONTRACTOR, FACILITY OPERATOR, AND OTHER PERSONS DIRECTLY RESPONSIBLE FOR PERMIT IMPLEMENTATION (IF ANY).

If you have any questions, please contact this office at the above address.

Respectfully,
David S. Denk
Regional Permit Administrator

MRW

Attachments

ecc: Captain Frank Lauricella, NYSDEC Division of Law Enforcement
Mr. Timothy DePriest, NYSDEC Division of Fish, Wildlife and Marine Resources
Mr. Christopher Legard, NYSDEC Division of Fish, Wildlife and Marine Resources
Ms. Vicki Haas, Erie County Department of Environment & Planning
Mr. Eric Hannes, United States Army Corps of Engineers, Buffalo District



Department of
Environmental
Conservation



PERMIT
Under the Environmental Conservation Law (ECL)

Permittee and Facility Information

Permit Issued To:
ERIE COUNTY
95 FRANKLIN ST
BUFFALO, NY 14202-3904
(716) 898-4488

Facility:
SENECA BLUFFS PARK
BEHIND 1670 SENECA ST
BUFFALO, NY 14202

Facility Location: in BUFFALO in ERIE COUNTY

Facility Principal Reference Point: NYTM-E: 188.063 NYTM-N: 4752.913
Latitude: 42°51'54.4" Longitude: 78°49'06.6"

Authorized Activity: Streambank stabilization and habitat restoration along 2,400 linear feet of the Buffalo River. The riverbank will be stabilized through bank reshaping and the use of bendway weirs, locked logs, root wads, and stone toe protection with tie-back trenches. The project will also include the creation of a floodplain wetland, native plantings and the mechanical and chemical treatment of invasive species.

Permit Authorizations

Excavation & Fill in Navigable Waters - Under Article 15, Title 5

Permit ID 9-1402-01119/00001

New Permit Effective Date: 6/13/2016 Expiration Date: 6/12/2019

Water Quality Certification - Under Section 401 - Clean Water Act

Permit ID 9-1402-01119/00002

New Permit Effective Date: 6/13/2016 Expiration Date: 6/12/2019

NYSDEC Approval

By acceptance of this permit, the permittee agrees that the permit is contingent upon strict compliance with the ECL, all applicable regulations, and all conditions included as part of this permit.

Permit Administrator: DAVID S DENK, Regional Permit Administrator
Address: NYSDEC Region 9 Headquarters
270 Michigan Ave
Buffalo, NY 14203 -2915

Authorized Signature: _____

Date 6, 13, 2016



Distribution List

NYSDEC Division of Law Enforcement
Mr. Timothy DePriest, NYSDEC DFWMR
Mr. Chris Legard, NYSDEC DFWMR
Mr. Eric Hannes, USACE Buffalo District
Ms. Vicki Haas, ECDEP

Permit Components

NATURAL RESOURCE PERMIT CONDITIONS
WATER QUALITY CERTIFICATION SPECIFIC CONDITION
GENERAL CONDITIONS, APPLY TO ALL AUTHORIZED PERMITS
NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

NATURAL RESOURCE PERMIT CONDITIONS - Apply to the Following Permits: EXCAVATION & FILL IN NAVIGABLE WATERS; WATER QUALITY CERTIFICATION

- 1. Conformance With Plans** All activities authorized by this permit must be in strict conformance with the approved plans submitted by the applicant or applicant's agent as part of the permit application. Such approved plans were prepared by the United States Army Corps of Engineers and were received by the Division of Environmental Permits on March 22, 2016.
- 2. Conditions Prevail Over Plans** If any condition of this permit conflicts with the approved plans, the permit condition shall prevail over the plans.
- 3. Work Prohibition Period** Construction activities in the water body are prohibited during the period of April 15 and June 30.
- 4. Isolate Work Area** In-water work areas must be isolated from the river by a floating turbidity curtain or coffer dam before work begins.
- 5. Siltation Prevention Measures** Siltation prevention measures, such as silt fencing, sediment traps or settling basins, shall be installed and maintained during the project, to prevent movement of silt and turbid waters from the project site into any watercourse, stream, water body or wetland.
- 6. Control Erosion During Construction** Provisions shall be made to minimize erosion during the construction of the project and to prevent increased sedimentation in any water body on or adjacent to the project.



7. **Water Clarity** Stream reaches downstream of construction areas shall always remain as clear (non-turbid) as the reaches upstream of the construction areas.
8. **Reach 3a** The rock revetment at Reach 3a must be sufficiently choked with soil to provide adequate rooting of vegetation above the ordinary high water level.
9. **Invasive Species (Non-native Vegetation)** To prevent the spread of invasive plants, all excavated material must be stockpiled and must remain on site.
10. **No Work During High Water and Waves** No work shall occur during periods of high water and wave conditions. No work shall occur during or immediately after a storm, which may cause high water conditions or flooding.
11. **Work in Adverse Weather** In the event of adverse weather conditions, the project shall be adequately protected, and construction activities shall be temporarily suspended if necessary.
12. **Minimize Adverse Impacts to Wetlands, Wildlife, Water** All work must be performed in a manner which minimizes adverse impacts to wetlands, wildlife, water quality and natural resources.
13. **Seed, Mulch Disturbed Areas** All areas of soil disturbance resulting from this project shall be seeded with an appropriate perennial grass, and mulched with straw immediately upon completion of the project, within two days of final grading, or by the expiration of the permit, whichever is first.
14. **No Interference With Navigation** There shall be no unreasonable interference with navigation by the work herein authorized.
15. **Precautions Against Contamination of Waters** All necessary precautions shall be taken to preclude contamination of any wetland or waterway by suspended solids, sediments, fuels, solvents, lubricants, epoxy coatings, paints, concrete, leachate or any other environmentally deleterious materials associated with the project.
16. **Prior Approval of Changes** If the Permittee desires to make any changes in construction techniques, species to be planted, the site plan, any mitigation plan, scheduling or staging of construction, or any other aspect of this project, the Permittee shall submit a written request to the Regional Permit Administrator to make such proposed changes and shall not make such changes unless authorized in writing by the Department.
17. **State Not Liable for Damage** The State of New York shall in no case be liable for any damage or injury to the structure or work herein authorized which may be caused by or result from future operations undertaken by the State for the conservation or improvement of navigation, or for other purposes, and no claim or right to compensation shall accrue from any such damage.



18. State May Order Removal or Alteration of Work If future operations by the State of New York require an alteration in the position of the structure or work herein authorized, or if, in the opinion of the Department of Environmental Conservation it shall cause unreasonable obstruction to the free navigation of said waters or flood flows or endanger the health, safety or welfare of the people of the State, or cause loss or destruction of the natural resources of the State, the owner may be ordered by the Department to remove or alter the structural work, obstructions, or hazards caused thereby without expense to the State, and if, upon the expiration or revocation of this permit, the structure, fill, excavation, or other modification of the watercourse hereby authorized shall not be completed, the owners, shall, without expense to the State, and to such extent and in such time and manner as the Department of Environmental Conservation may require, remove all or any portion of the uncompleted structure or fill and restore to its former condition the navigable and flood capacity of the watercourse. No claim shall be made against the State of New York on account of any such removal or alteration.

19. State May Require Site Restoration If upon the expiration or revocation of this permit, the project hereby authorized has not been completed, the applicant shall, without expense to the State, and to such extent and in such time and manner as the Department of Environmental Conservation may lawfully require, remove all or any portion of the uncompleted structure or fill and restore the site to its former condition. No claim shall be made against the State of New York on account of any such removal or alteration.

WATER QUALITY CERTIFICATION SPECIFIC CONDITIONS

1. Water Quality Certification The authorized project, as conditioned pursuant to the Certificate, complies with Section 301, 302, 303, 306, and 307 of the Federal Water Pollution Control Act, as amended and as implemented by the limitations, standards, and criteria of state statutory and regulatory requirements set forth in 6 NYCRR Section 608.9(a). The authorized project, as conditioned, will also comply with applicable New York State water quality standards, including but not limited to effluent limitations, best usages and thermal discharge criteria, as applicable, as set forth in 6 NYCRR Parts 701, 702, 703, and 704.

GENERAL CONDITIONS - Apply to ALL Authorized Permits:

1. Facility Inspection by The Department The permitted site or facility, including relevant records, is subject to inspection at reasonable hours and intervals by an authorized representative of the Department of Environmental Conservation (the Department) to determine whether the permittee is complying with this permit and the ECL. Such representative may order the work suspended pursuant to ECL 71- 0301 and SAPA 401(3).

The permittee shall provide a person to accompany the Department's representative during an inspection to the permit area when requested by the Department.



A copy of this permit, including all referenced maps, drawings and special conditions, must be available for inspection by the Department at all times at the project site or facility. Failure to produce a copy of the permit upon request by a Department representative is a violation of this permit.

2. Relationship of this Permit to Other Department Orders and Determinations Unless expressly provided for by the Department, issuance of this permit does not modify, supersede or rescind any order or determination previously issued by the Department or any of the terms, conditions or requirements contained in such order or determination.

3. Applications For Permit Renewals, Modifications or Transfers The permittee must submit a separate written application to the Department for permit renewal, modification or transfer of this permit. Such application must include any forms or supplemental information the Department requires. Any renewal, modification or transfer granted by the Department must be in writing. Submission of applications for permit renewal, modification or transfer are to be submitted to:

Regional Permit Administrator
NYSDEC Region 9 Headquarters
270 Michigan Ave
Buffalo, NY14203 -2915

4. Submission of Renewal Application The permittee must submit a renewal application at least 30 days before permit expiration for the following permit authorizations: Excavation & Fill in Navigable Waters, Water Quality Certification.

5. Permit Modifications, Suspensions and Revocations by the Department The Department reserves the right to exercise all available authority to modify, suspend or revoke this permit. The grounds for modification, suspension or revocation include:

- a. materially false or inaccurate statements in the permit application or supporting papers;
- b. failure by the permittee to comply with any terms or conditions of the permit;
- c. exceeding the scope of the project as described in the permit application;
- d. newly discovered material information or a material change in environmental conditions, relevant technology or applicable law or regulations since the issuance of the existing permit;
- e. noncompliance with previously issued permit conditions, orders of the commissioner, any provisions of the Environmental Conservation Law or regulations of the Department related to the permitted activity.

6. Permit Transfer Permits are transferrable unless specifically prohibited by statute, regulation or another permit condition. Applications for permit transfer should be submitted prior to actual transfer of ownership.



NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

Item A: Permittee Accepts Legal Responsibility and Agrees to Indemnification

The permittee, excepting state or federal agencies, expressly agrees to indemnify and hold harmless the Department of Environmental Conservation of the State of New York, its representatives, employees, and agents ("DEC") for all claims, suits, actions, and damages, to the extent attributable to the permittee's acts or omissions in connection with the permittee's undertaking of activities in connection with, or operation and maintenance of, the facility or facilities authorized by the permit whether in compliance or not in compliance with the terms and conditions of the permit. This indemnification does not extend to any claims, suits, actions, or damages to the extent attributable to DEC's own negligent or intentional acts or omissions, or to any claims, suits, or actions naming the DEC and arising under Article 78 of the New York Civil Practice Laws and Rules or any citizen suit or civil rights provision under federal or state laws.

Item B: Permittee's Contractors to Comply with Permit

The permittee is responsible for informing its independent contractors, employees, agents and assigns of their responsibility to comply with this permit, including all special conditions while acting as the permittee's agent with respect to the permitted activities, and such persons shall be subject to the same sanctions for violations of the Environmental Conservation Law as those prescribed for the permittee.

Item C: Permittee Responsible for Obtaining Other Required Permits

The permittee is responsible for obtaining any other permits, approvals, lands, easements and rights-of-way that may be required to carry out the activities that are authorized by this permit.

Item D: No Right to Trespass or Interfere with Riparian Rights

This permit does not convey to the permittee any right to trespass upon the lands or interfere with the riparian rights of others in order to perform the permitted work nor does it authorize the impairment of any rights, title, or interest in real or personal property held or vested in a person not a party to the permit.

OPERATIONS AND MAINTENANCE, MANUAL
FOR THE
SENECA BLUFFS ECOSYSTEM RESTORATION PROJECT

CITY OF BUFFALO
ERIE COUNTY, N.Y.

APPENDIX B – Invasive Plant Species Management Plan

INVASIVE PLANT SPECIES MANAGEMENT PLAN
OPERATIONS AND MAINTENANCE MANUAL

SENECA BLUFFS HABITAT RESTORATION PROJECT
CITY OF BUFFALO
ERIE COUNTY, NEW YORK

Section 1. – Invasive Plant Species Spot-Treatment Plan

It is recommended that invasive plant species monitoring and treatment be completed annually in order to maintain vegetative diversity and habitat quality. Without diligent annual monitoring and timely treatment, invasive species will likely proliferate and displace native species, greatly reducing vegetative diversity and negatively impacting that riparian habitats of Seneca Bluffs.

a. General Actions

Erie County should plan to conduct monitoring and treatment of invasive species in the restored areas (Figure 1) as part of yearly operation and maintenance. Generally, this will require surveying the restored areas during the growing season and applying spot treatments of herbicide (glyphosate and triclopyr) to remnant invasive species as they are encountered. A proposed treatment schedule is provided in (Table 1) and reflects the time of spot treatments that were implemented as part of the 2019 and 2020 spot treatments.

Table 1. Recommended Annual Invasive Species Treatment Schedule

Annual Invasive Treatment Schedule						
Annually						
	May	Jun	July	Aug	Sept	Oct
1 st Spot Treatment			■			
2 nd Spot Treatment				■		
3 rd Spot Treatment					■	

b. Location and Description of Treatment Areas

The entire area restored thru the Seneca Bluffs Habitat Restoration Project will be include in the Invasive Species Treatment Area (Treatment Area; Figure 1). The Treatment Area is approximately 4.2 acres in size and is located within the Seneca Bluffs Natural Habitat Park, in the City of Buffalo, New York (42° 51' 57.79", 78° 49' 8.43"). The site is owned and maintained by Erie County.

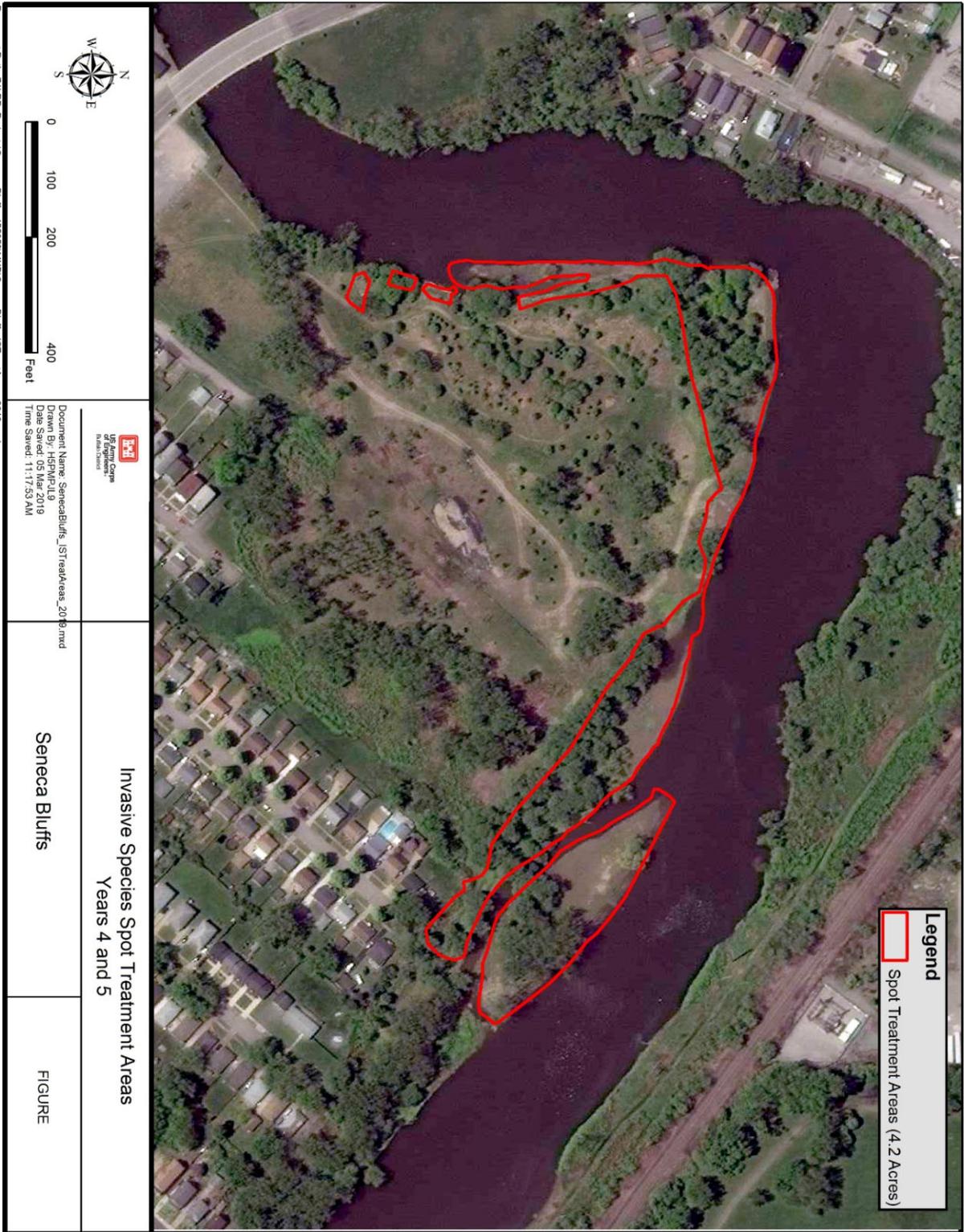


Figure 1. Invasive Species Treatment Area Delineated with Red Boundary

c. Spot-Treatments Procedure

Currently, the coverage of target invasive species (Japanese knotweed and common reed) is relatively low, <10%, as a result of chemical and mechanical treatment that occurred from 2016 – 2020. The remaining invasive species are sparse and intermixed with native vegetation communities; therefore, future invasive treatments must occur on a spot-treatment basis. Spot-treatments will consist of Erie County staff surveying the Treatment Area and applying herbicide to any invasive plant species that are encountered.

For best results, Erie County should plan to survey the Treatment Areas and apply herbicide to any invasive plants encountered three (3) times per year between June 1st and Sept 31st (Table 1). The applicator must select an appropriate herbicide for the target species and avoid impacts to adjacent native species communities. Spot-treatments should be completed as part of O&M indefinitely, however, the timing and level of effort required may change as treatments continue to reduce the coverage of invasive species.

The primary invasive species targets for treatment are Japanese knotweed (*Fallopia japonica*), Common Reed (*Phragmites spp.*) and purple loosestrife (*Lythrum salicaria*). Other species that should also be treated include mugwort (*Artemisia vulgaris*), bush honeysuckle (*Lonicera spp.*), tree of heaven (*Ailanthus altissima*), common buckthorn (*Ramnus cathartica*), and European black alder (*Alnus glutinosa*).

Chemical herbicides used previously include glyphosate and triclopyr. The herbicides and the invasive species they will be used on are presented below (Table 2). Chemical application should not occur within 24 hours of a major precipitation event (before or after).

Table 2. Herbicides and Treatment Methodology

Herbicide/Method	Surfactant	Invasive Species
Glyphosate/Foliar Spray	Li-700 or equivalent	Japanese knotweed, mugwort,
Glyphosate/Cut Stump	Li-700 or equivalent	European black alder, bush honeysuckle,
Triclopyr/ Cut Stump	Li-700 or equivalent	tree of heaven, common buckthorn

d. Post-Treatment Assessment

In order to track the effectiveness of annual treatment efforts, it is recommended that Erie County compile a brief post-treatment assessment that documents field conditions immediately preceding (24 hours), during, and immediately following the treatment (24 hours); type and performance of equipment that was used; total gallons of each herbicide applied; total number of acres treated; invasive plant species treated with approximate areas of ground coverage (square feet); total man-hours of actual treatment time; any other information specifically required by New York State law; and identify potential areas for improved treatment methods (lessons learned).

Future treatment method recommendations from 2019 treatments include:

1. In addition to the use of Glyphosate, Triclopyr could be used to target broad-leaf invasive species in areas where native grasses have established. Being that it is a broadleaf specific herbicide, Triclopyr will have less of a detrimental impact in those areas. Other chemicals such as Stinger or Milestone could be used as more effective treatment options for species such as: Canada Thistle and Mugwort.
2. During future treatments, it is proposed that treating all invasive species that are observed at the time of application. Current primary target species: mugwort, Japanese knotweed, tree of heaven, European black alder, honeysuckle, and common buckthorn. Other invasive species observed & treated include: reed canary grass, common reed, coltsfoot, burdock, teasel, bull thistle, Canada thistle, knapweed, garlic mustard, giant hogweed, & dames rocket.
3. It is recommended for improved treatment efficacy to conduct spring treatment applications for early growth season invasive species such as Japanese Knotweed.

Over the 2019 growing season, completion of spot-treatments across the 4.2 acre Treatment Area required a total of 134 man-hours. A breakdown of these hours by month are provided below:

- July 2019 59.0 man-hours 7 Personnel
- August 2019 46.5 man-hours 6 Personnel
- September 2019 28.5 man-hours 3 Personnel

It is assumed that as seasonal treatments proceed and invasive species plant numbers are reduced, less resources may be subsequently required after each successive herbicide application.

e. Permitting Requirements

In order to comply with state 6 NYCRR Part 325.23 (a), any contractor hired to perform pesticide application activities must be registered directly with the New

York Department of Environmental Conservation (NYSDEC) and have personnel certified by the NYSDEC as a Certified Commercial Pesticide Applicator (CCPA) or a Certified Commercial Pesticide Technician (CCPT). Herbicide may only be applied by CCPAs or CCPTs. A minimum of one CCPA is required and must have the responsibility for supervising all CCPT. Copies of registrations with NYSDEC must be provided to USACE. The CCPT must be able to contact the supervising CCPA within 30 minutes. The CCPA must inspect all treatment areas to verify that no standing water is present in the treatment areas. If standing water is present, then the supervising CCPA must be on-site. See the NYSDEC web site for requirements (<http://www.dec.ny.gov/permits/45618.html>).

OPERATIONS AND MAINTENANCE, MANUAL
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CITY OF BUFFALO
ERIE COUNTY, N.Y.

APPENDIX C – Inspection Report Checklist



**US Army Corps
of Engineers®**

River Bank Erosion Protection Systems Inspection Report

Name of Project: Seneca Bluffs Eco-Restoration Project, City of Buffalo

Public Sponsor(s): _____

Public Sponsor Representative: _____

Sponsor Phone: _____

Sponsor Email: _____

Inspector: _____ Inspection Start Date: _____

Inspection End Date: _____

Inspection Report Prepared By: _____ Date Report Prepared: _____

Notes: _____

Type of Inspection: **Routine Inspection**
 Other

Overall Project Rating: **Acceptable**
 Minimally Acceptable
 Unacceptable

Contents of Report: **Project Inspection Checklist**

Note: In addition to the report contents indicated here, a plan view drawing of the system, with stationing, should be included with this report to reference locations of items rated less than acceptable. Photos of general system condition and any noted deficiencies should also be attached.

River Bank Erosion Protection Systems¹

For use during Routine Inspections

Rated Item	Rating	Rating Guidelines		Location/Remarks/Recommendations
1. Unwanted Vegetation Growth		A	The erosion protection systems have no unwanted vegetation (trees displacing structures or invasive species).	
		M	Minimal unwanted vegetation growth is present within the zones described above. Vegetation must be removed but does not currently threaten the integrity of the erosion protection systems.	
		U	Significant unwanted vegetation growth is present within the zones described above and must to be removed to reestablish desired structure integrity.	
2. Encroachments		A	No trash, debris, structures, excavations, or other obstructions are present within the erosion protection systems. Encroachments have been previously reviewed, and it was determined that they do not diminish proper functioning of the project.	
		M	Trash, debris, structures, excavations, or other obstructions present, or inappropriate activities are noted that should be corrected but will not adversely affect desired erosion protection systems integrity.	
		U	Unauthorized encroachments or inappropriate activities noted that are likely to adversely affect erosion protection systems integrity.	
3. Longitudinal Stone Toe Protection (LSTP)		A	None or very little displacement or deterioration of LSTP is observed. Any observed displacement or deterioration of the LSTP is such that it will not threaten the integrity of the structure.	
		M	A moderate amount of displacement or deterioration of LSTP is observed but integrity of the LSTP is not immediately threatened.	
		U	Significant amounts of displacement or deterioration of LSTP is observed and is immediately threatening the integrity of the structure.	
4. Bendway Weirs		A	None or very little displacement or deterioration of the bendway weirs is observed. Any observed displacement or deterioration of the bendway weirs is such that it will not threaten the integrity of the structures.	
		M	A moderate amount of displacement or deterioration of bendway weirs is observed but integrity of the bendway weirs is not immediately threatened.	
		U	Significant amounts of displacement or deterioration of bendway weirs is observed and is immediately threatening the integrity of the structure.	
5. RipRap Bank Protection (note: riprap is buried beneath Reach 3A slope)		A	None or very little exposure, displacement or deterioration of the riprap bank protection is observed. Any observed exposure, displacement or deterioration of the riprap bank protection is such that it will not threaten the integrity of the system.	
		M	A moderate amount of exposure, displacement or deterioration of the riprap bank protection is observed but integrity of the riprap bank protection is not immediately threatened.	
		U	Significant amounts of exposure, displacement or deterioration of riprap bank protection is observed and is immediately threatening the integrity of the system.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable.



River Bank Erosion Protection Systems¹

For use during Routine Inspections

Rated Item	Rating	Rating Guidelines		Location/Remarks/Recommendations
6. Stone Tieback Trench (note: stone tieback trench material is buried beneath slopes of Reach 1, 3, and 3A)	A	None or very little exposure, displacement or deterioration of the stone tieback trench material is observed. Any observed exposure, displacement or deterioration of the stone tieback trench material is such that it will not threaten the integrity of the structure.		
	M	A moderate amount of exposure, displacement or deterioration of the stone tieback trench material is observed but integrity of the structure is not immediately threatened.		
	U	Significant amounts of exposure, displacement or deterioration of the stone tieback trench material is observed and is immediately threatening the integrity of the structure.		
7. Other Observed Items	A			
	M			
	U			
	N/A			
8. Other Observed Item	A			
	M			
	U			
	N/A			
9. Other Observed Item	A			
	M			
	U			
	N/A			

¹ Inspectors should have as-built drawings available during the inspection to allow structure identification in the field.

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable.



OPERATIONS AND MAINTENANCE, MANUAL
FOR THE
SENECA BLUFFS ECOSYSTEM RESTORATION PROJECT

CITY OF BUFFALO
ERIE COUNTY, N.Y.

APPENDIX D – As-built Drawings

Buffalo River

Buffalo River



General Notes

- Legend:**
- ⊕ Utility Pole
 - Fence
 - ⊥ Bendway Weir Stone
 - ⊥ Root Wad
 - ⊥ Locked Log
 - Gas Marker
 - ⊕ Gas Valve

Notes:

This survey was prepared for an As-built of Seneca Bluffs for Tidewater.

This map of survey dated November 25, 2019, was prepared from an instrument survey, with field work completed on November, 2018.

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This plan NOT valid with an Affidavit of No Change.

Symbols are graphical representations and not to scale.

Only visible utility services and/or encumbrances were located and shown.

Survey by William J Tucker, II PLS #050369
 Clear Creek Land Surveying, L.L.C.
 7449 Mill Street, Cananda, NY 14717
 Phone 716-592-5800 Fax 716-592-5566

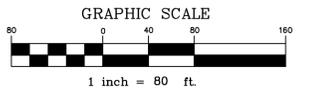
Project	2016/Tidewater/ Seneca Bluffs
Date	November 25, 2019
Scale	1" = 80'

Clear Creek Land Surveying, LLC
 7449 Mill Street
 Cananda, NY 14717
 ph. 716-592-5800
 fax 716-592-5566

As-Built of Seneca Bluffs Habitat Restoration Project
 Buffalo River
 Town of Buffalo
 Erie County
 State of New York

Contract No. W912PA-16-C-0007

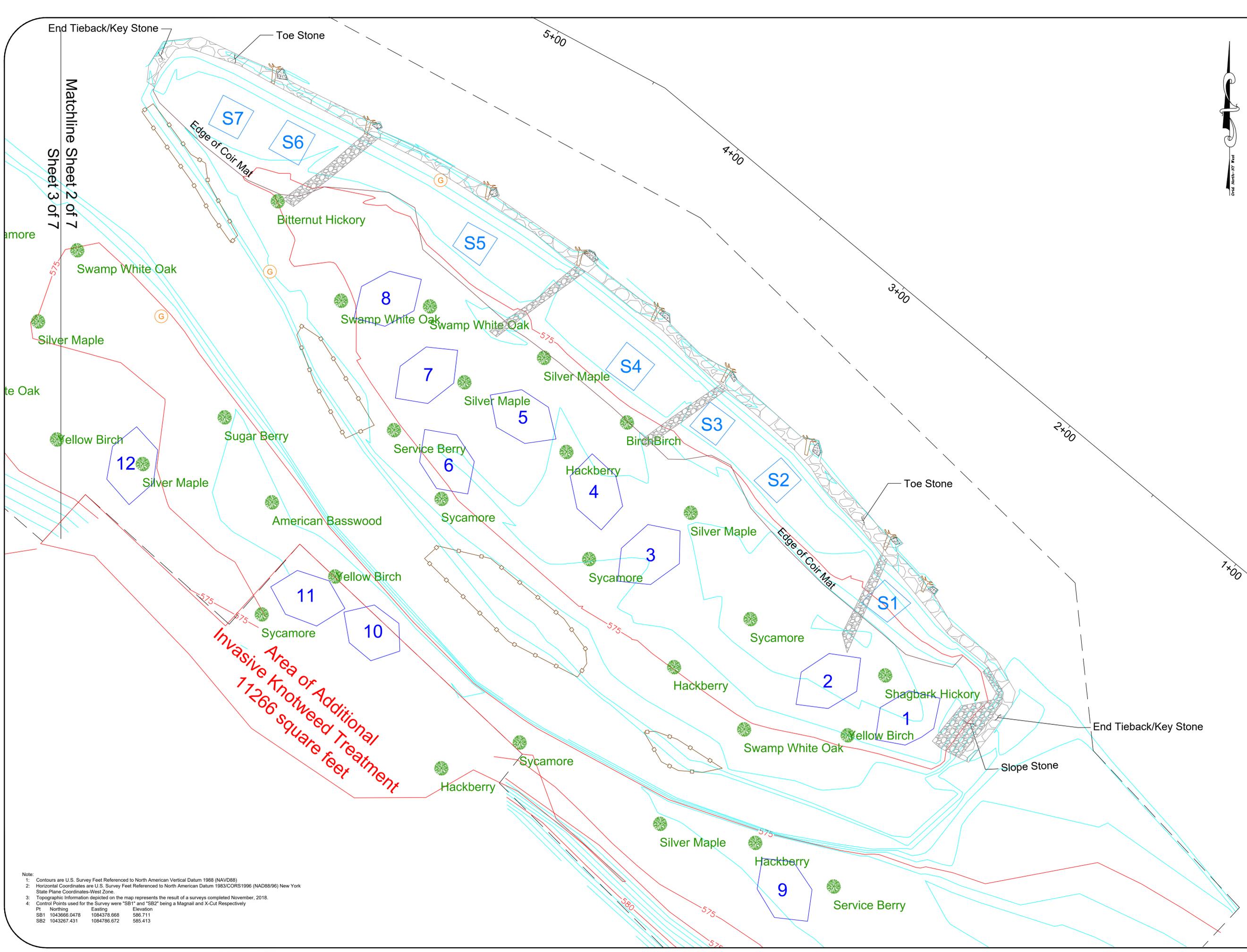
Sheet 1 of 7



Point	Northing	Easting
WL1	1043437.59	1084617.35
WL2	1043451.00	1084660.62
WL3	1043573.00	1084839.14
WL4	1043615.80	1084838.60
WL5	1043621.30	1084808.47
WL6	1043689.82	1084841.57
WL7	1044374.62	1084852.07
WL8	1044429.79	1084852.07
WL9	1044466.43	1084905.24
WL10	1044477.99	1085102.48
WL11	1044292.42	1085698.14
WL12	1044305.79	1085834.34
WL13	1044179.41	1086068.52
WL14	1044010.77	1086242.01
WL15	1043934.29	1086249.83
WL16	1043861.08	1086317.42
WL17	1043707.78	1086177.40
WL18	1043793.92	1086080.82
WL19	1043803.68	1086089.79
WL20	1043917.11	1085972.63
WL21	1043931.61	1085985.88
WL22	1044028.69	1085882.75
WL23	1043990.92	1085848.32
WL24	1044051.61	1085783.41
WL25	1044029.98	1085763.60
WL26	1044138.51	1085649.33
WL27	1043975.79	1085509.41
WL28	1044045.29	1085436.91
WL29	1043932.60	1085333.57
WL30	1044000.79	1085261.22
WL31	1043442.59	1084750.72
WL32	1043377.16	1084824.35
WL33	1043401.90	1084847.07
WL34	1043334.28	1084921.38
WL35	1043236.47	1084831.79
WL36	1043368.09	1084682.57

Note:
 1: Contours are U.S. Survey Feet Referenced to North American Vertical Datum 1988 (NAVD88)
 2: Horizontal Coordinates are U.S. Survey Feet Referenced to North American Datum 1983/CORS1996 (NAD88/96) New York State Plane Coordinates-West Zone.
 3: Topographic Information depicted on the map represents the result of a surveys completed November, 2018.
 4: Control Points used for the Survey were "SB1" and "SB2" being a Magnail and X-Cut Respectively

Pt	Northing	Easting	Elevation
SB1	1043666.0478	1084378.668	586.711
SB2	1043267.431	1084786.572	585.413



General Notes

Legend:

- ♂ Utility Pole
- Fence
- ⊥ Bendway Weir Stone
- ⊥ Root Wad
- ⊥ Locked Log
- Gas Marker
- ⊕ Gas Valve
- 27 Area of Type E Riparian Shrubs
- 510 Supplemental Area of Type E Riparian Shrubs

Notes:

This survey was prepared for an As-Built of Seneca Bluffs for Tidewater.

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Survey by William J Tucker, II PLS #050369
 Clear Creek Land Surveying, L.L.C.
 7449 Mill Street, Cananda, NY 14717
 Phone 716-592-5800 Fax 716-592-5566

Project: 2016/Tidewater/ Seneca Bluffs

Date: November 25, 2019

Scale: 1" = 20'

Clear Creek Land Surveying, LLC
 7449 Mill Street
 Cananda, NY 14717
 ph. 716-592-5800
 fax 716-592-5566

As-Built of Reach No. 1
 0+00 to 7+50
 Seneca Bluffs Habitat Restoration Project
 Buffalo River
 Town of Buffalo
 Erie County
 State of New York

Contract No. W912PA-16-C-0007
 Sheet 2 of 7

GRAPHIC SCALE

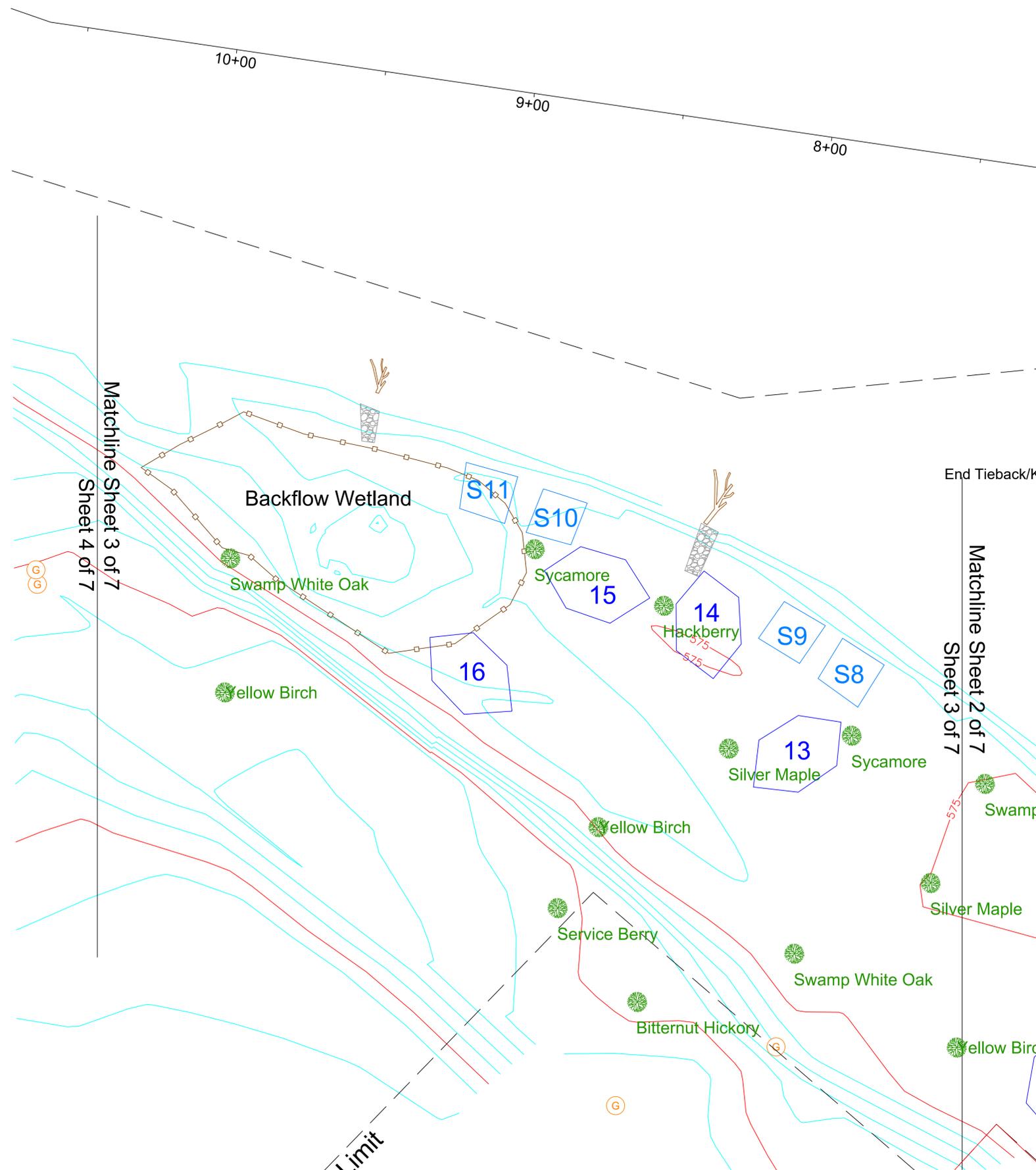
1 inch = 20 ft.

Note:

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Pt	Northing	Easting	Elevation
SB1	1043266.0478	1084378.668	586.711
SB2	1043287.431	1084766.672	585.413

Area of Additional
 Invasive Knotweed Treatment
 11266 square feet



General Notes

Legend:

- ♂ Utility Pole
- Fence
- ⊥ Bendway Weir Stone
- ⊥ Root Wad
- ⊥ Locked Log
- Gas Marker
- ⊕ Gas Valve
- 27 Area of Type E Riparian Shrubs
- S10 Supplemental Area of Type E Riparian Shrubs

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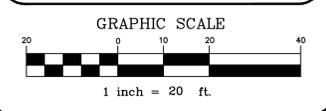
Only visible utility services and/or encumbrances were located and shown.

Survey by William J Tucker, II PLS #050369
 Clear Creek Land Surveying, L.L.C.
 7449 Mill Street, Canadota, NY 14717
 Phone 716-592-5800 Fax 716-592-5566

Project	2016/Tidewater/ Seneca Bluffs
Date	November 25, 2019
Scale	1" = 20'

Clear Creek Land Surveying, LLC
 7449 Mill Street
 Canadota, NY 14717
 ph. 716-592-5800
 fax 716-592-5566

As-Built of Reach No. 2
 7+50 to 10+75
 Seneca Bluffs Habitat
 Restoration Project
 Buffalo River
 Town of Buffalo
 Erie County
 State of New York
 Contract No. W912PA-16-C-0007
 Sheet 3 of 7



Note:
 1: Contours are U.S. Survey Feet Referenced to North American Vertical Datum 1988 (NAVD88)
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Pt	Northing	Easting	Elevation
SB1	1043686.0478	1084378.668	586.711
SB2	1043267.431	1084786.872	585.413

General Notes

Legend:

- σ Utility Pole
- Fence
- Bendway Weir Stone
- Root Wad
- Locked Log
- Gas Marker
- ⊕ Gas Valve
- 21 Area of Type E Riparian Shrubs
- S10 Supplemental Area of Type E Riparian Shrubs

Notes:

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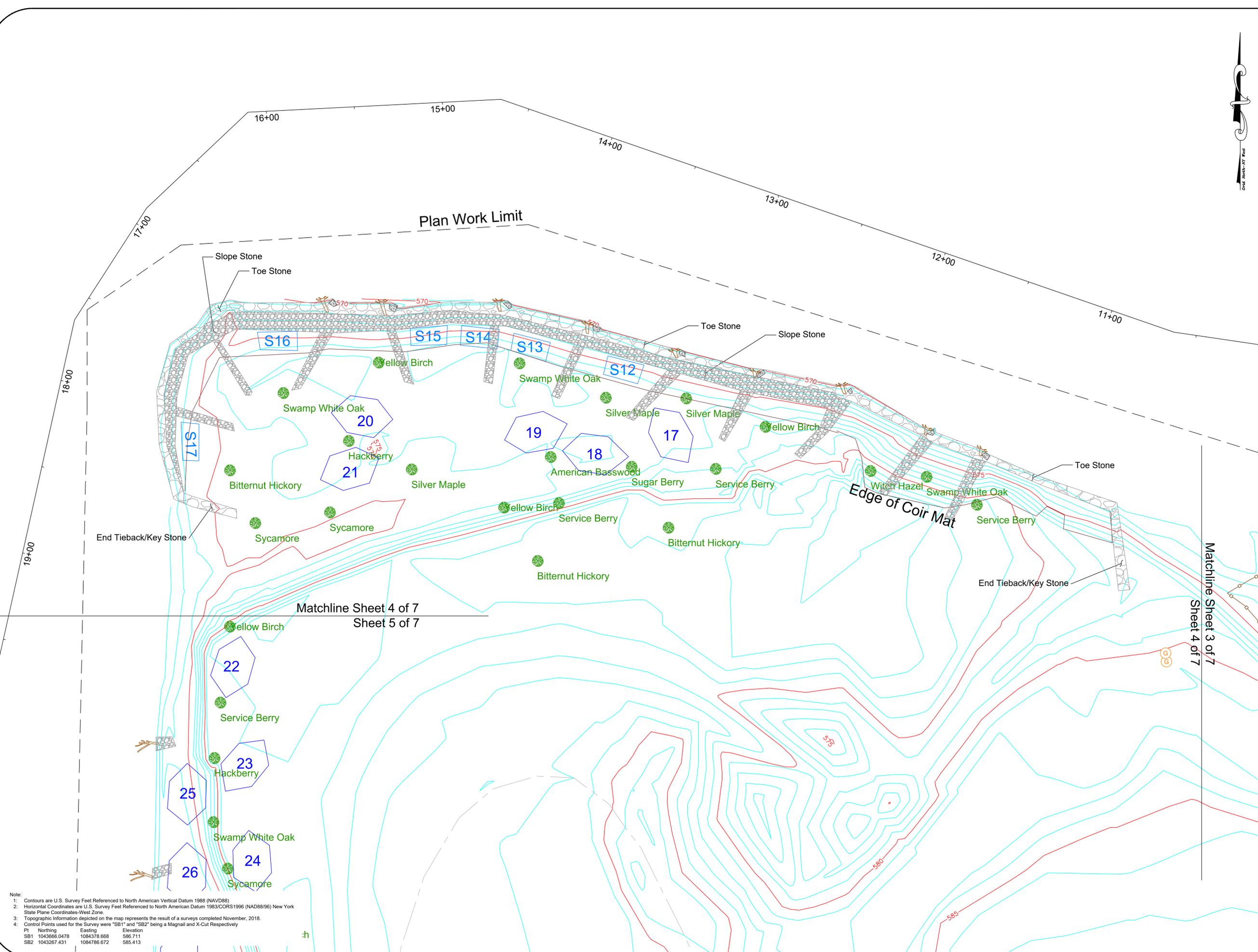
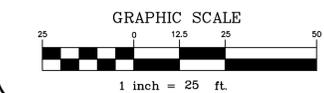
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Survey by William J Tucker, II PLS #050369
 Clear Creek Land Surveying, L.L.C.
 7449 Mill Street, Cananda, NY 14717
 Phone 716-592-5800 Fax 716-592-5566

Project	2016/Tidewater/ Seneca Bluffs
Date	November 25, 2019
Scale	1" = 25'

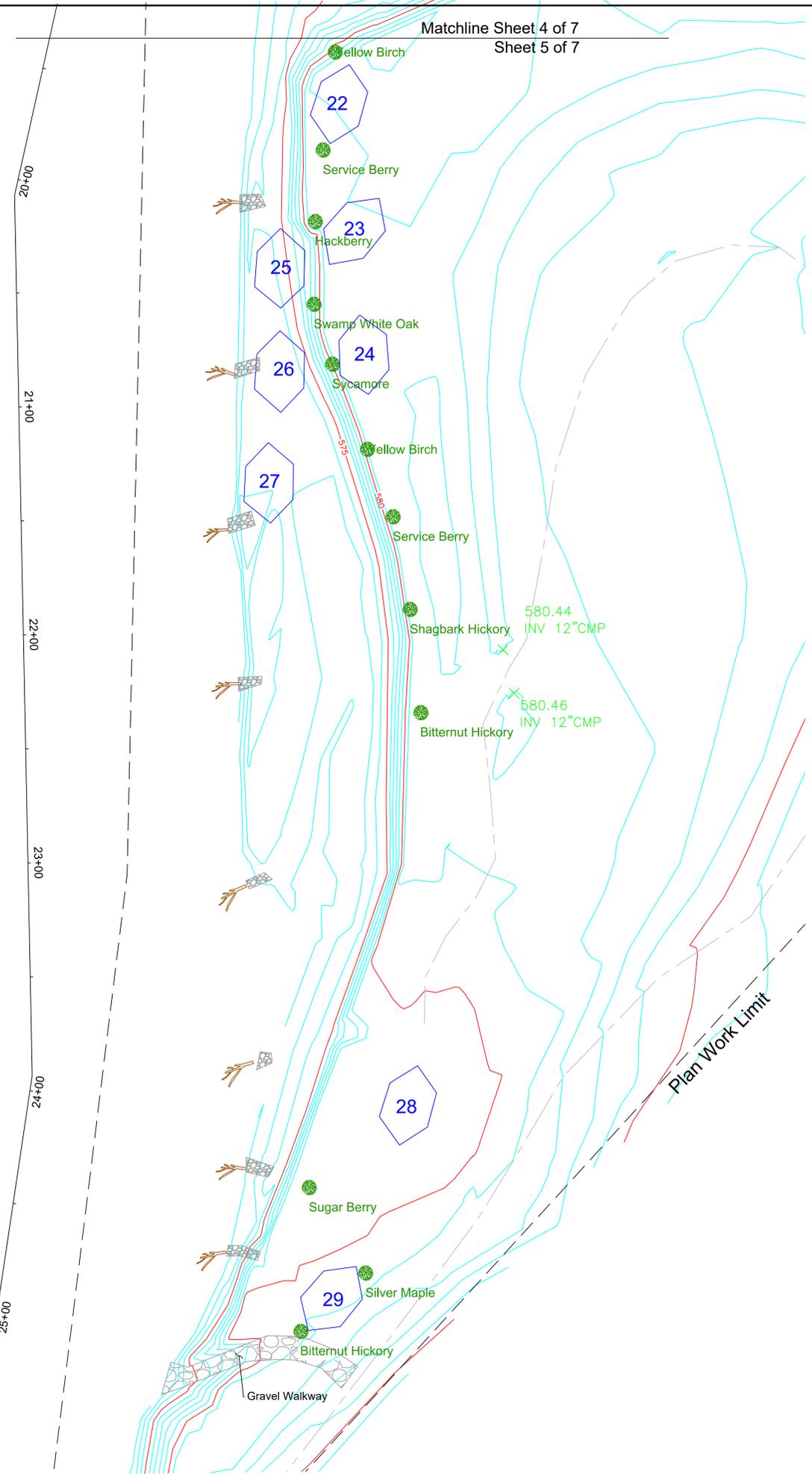
Clear Creek Land Surveying, LLC
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 Cananda, NY 14717
 ph. 716-592-5800
 fax 716-592-5566

As-Built of Reach No. 3&3A
 10+75 to 18+75
 Seneca Bluffs Habitat Restoration Project
 Buffalo River
 Town of Buffalo
 Erie County
 State of New York
 Contract No. W912PA-16-C-0007
 Sheet 4 of 7



Note:
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PI	Northing	Easting	Elevation
SB1	1043666.0478	1084378.668	586.711
SB2	1043267.431	1084786.672	585.413



- General Notes
- Legend:
- Utility Pole
 - Fence
 - Bendway Weir Stone
 - Root Wad
 - Locked Log
 - Gas Marker
 - Gas Valve
 - Area of Type E Riparian Shrubs
 - Supplemental Area of Type E Riparian Shrubs

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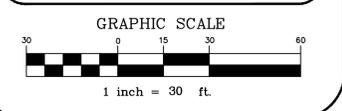
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Survey by William J Tucker, II PLS #050369
Clear Creek Land Surveying, L.L.C.
7449 Mill Street, Cananda, NY 14717
Phone 716-592-5800 Fax 716-592-5566

Project	2016/Tidewater/ Seneca Bluffs
Date	November 25, 2019
Scale	1" = 30'

Clear Creek Land Surveying, LLC
7449 Mill Street
Canadea, NY 14717
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As-Built of Reach No. 4
19+75 to 28+00
Seneca Bluffs Habitat Restoration Project
Buffalo River
Town of Buffalo
Erie County
State of New York
Contract No. W912PA-16-C-0007
Sheet 5 of 7



Note:

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PI	Northing	Easting	Elevation
SB1	1043666.0478	1084378.668	586.711
SB2	1043267.431	1084786.672	585.413

General Notes

Legend:

- As-Built Existing Ground
- As-Built Excavation
- As-Built Stone

Notes:

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Only copies of this survey marked with an original signature and an original embossed or ink seal are the product of the land surveyor.

This plan NOT valid with an Affidavit of No Change.

Symbols are graphical representations and not to scale.

Only visible utility services and/or encumbrances were located and shown.

*Survey by William J Tucker, II PLS #050369
Clear Creek Land Surveying, L.L.C.
7449 Mill Street, Cananda, NY 14717
Phone 716-592-5800 Fax 716-592-5566*

Project
2016/Tidewater/ Seneca Bluffs

Date
November 25, 2019

Scale
1" = 20'

*Clear Creek Land Surveying, LLC
7449 Mill Street
Cananda, NY 14717*

*ph. 716-592-5800
fax 716-592-5566*

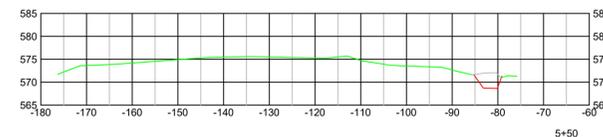
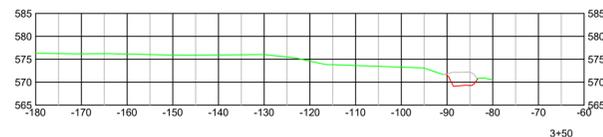
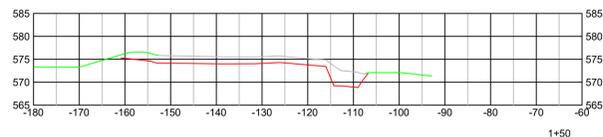
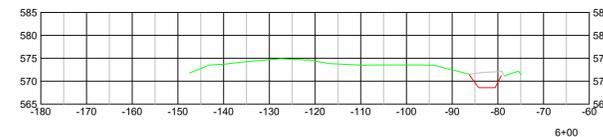
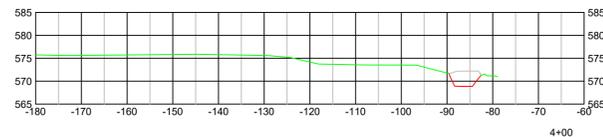
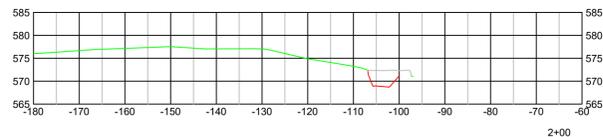
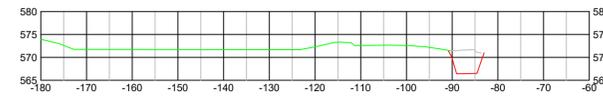
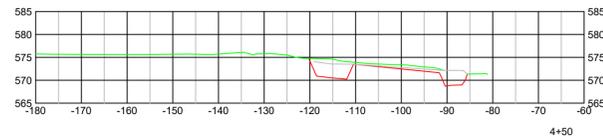
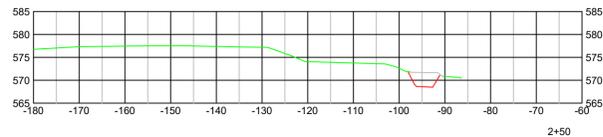
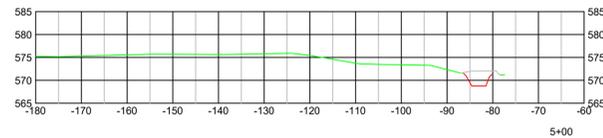
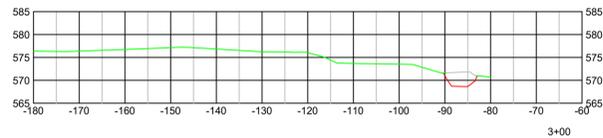
*As-Built Sections
1+50 to 6+50
Seneca Bluffs Habitat
Restoration Project
Buffalo River
Town of Buffalo
Erie County
State of New York*

*Contract No. W912PA-16-C-0007
Sheet 6 of 7*

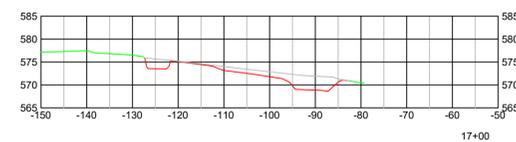
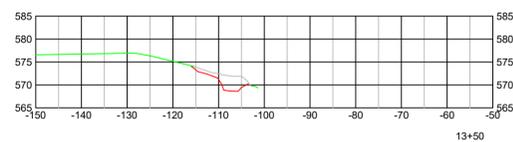
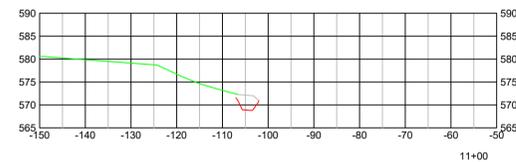
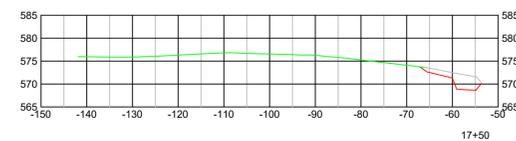
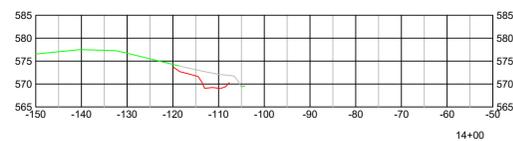
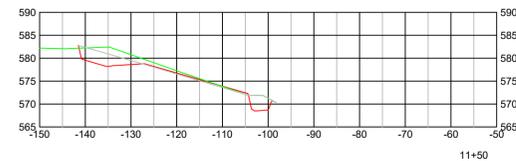
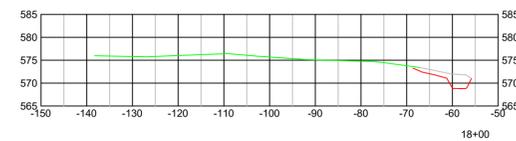
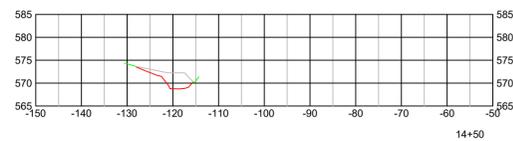
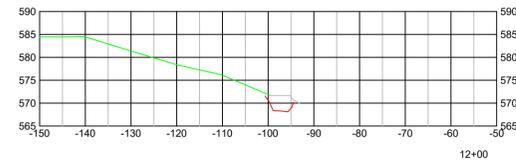
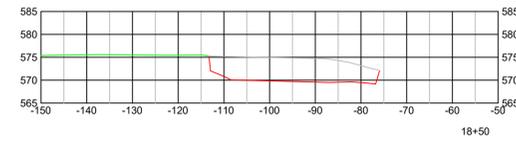
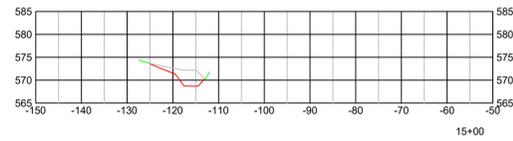
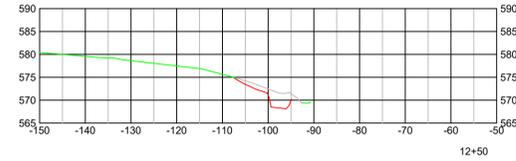
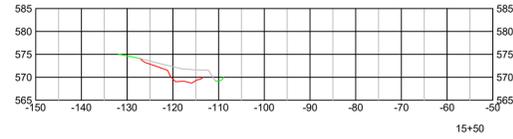
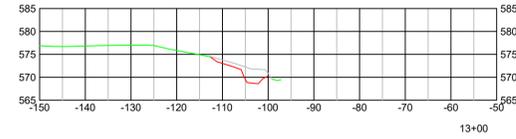
GRAPHIC SCALE



1 inch = 20 ft.



- Note:
- 1: Contours are U.S. Survey Feet Referenced to North American Vertical Datum 1988 (NAVD88)
 - 2: Horizontal Coordinates are U.S. Survey Feet Referenced to North American Datum 1983/CORS1996 (NAD88/96) New York State Plane Coordinates-West Zone.
 - 3: Topographic Information depicted on the map represents the result of a surveys completed November, 2018.
 - 4: Control Points used for the Survey were "SB1" and "SB2" being a Magnall and X-Cut Respectively
- | Pt | Northing | Easting | Elevation |
|-----|-------------|-------------|-----------|
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Project	2016/Tidewater/ Seneca Bluffs
Date	November 25, 2019
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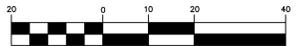
*Clear Creek Land Surveying, LLC
7449 Mill Street
Cananda, NY 14717*

*ph. 716-592-5800
fax 716-592-5566*

*As-Built of Reach No. 3&3A
11+00 to 18+50
Seneca Bluffs Habitat
Restoration Project
Buffalo River
Town of Buffalo
Erie County
State of New York*

*Contract No. W912PA-16-C-0007
Sheet 7 of 7*

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OPERATIONS AND MAINTENANCE, MANUAL
FOR THE
SENECA BLUFFS ECOSYSTEM RESTORATION PROJECT

CITY OF BUFFALO
ERIE COUNTY, N.Y.

APPENDIX E – Plans and Specifications

OPERATIONS AND MAINTENANCE, MANUAL
FOR THE
SENECA BLUFFS ECOSYSTEM RESTORATION PROJECT

CITY OF BUFFALO
ERIE COUNTY, N.Y.

APPENDIX F - Photographs

Seneca Bluffs Project Photos

Reach 1



Photo 1. Reach 1 Looking Upstream; 30 Nov 2016



Photo 2. Reach 1 Looking Upstream; 08 Dec 2016



Photo 3. Reach 1 Looking Upstream; 13 April 2017. Initial indications of sedimentation on floodplain bench.



Photo 4. Reach 1 Looking Downstream; 13 April 2017. Sedimentation apparent on floodplain bench.



Photo 5. Reach 1. Stone toe protection and rootwad.



Photo 6. Reach 1 Aerial Image. 14 April 2017



Photo 7. Reach 1 Looking Downstream. August 20, 2019



Photo 8. Reach 1 Looking downstream. August 20, 2019



Photo 9. Reach 1. Looking downstream. 20 August 2019



Photo 10. Reach 1. Invasive Species Treatment Area. 20 August 2019.

Reach 2



Photo 11. Reach 2. Excavated Wetland; 30 Nov 2016.



Photo 12. Reach 2. Excavated Wetland; 14 April 2017



Photo 13. Reach 2. Aerial Imagery; 13 April 2017



Photo 14. Reach 2. Excavated wetland. 21 Aug 2019.



Photo 15. Reach 2. Excavated Wetland. Fringe emergent vegetation. 21 August 2019.

Reach 3



Photo 16. Reach 3a. Looking upstream; 30 November 2016. Toe protection and rootwads shown near river edge.



Photo 17. Reach 3. Looking downstream. 30 November 2016. Toe protection and rootwads shown near river edge.



Photo 18. Reach 3. Looking upstream; 30 November 2016. Toe protection and rootwads shown near river edge.



Photo 19. Reach 3. Looking downstream; 08 December 2016. Fiber matting, hay compost roll, and live fascines shown on cutback slope.



Photo 20. Reach 3a. Looking upstream; 13 April 2017. Live stake installation.



Photo 21. Reach 3. Looking upstream; 13 April 2017. Rootwads seen in river edge areas. Livestakes installed on cutback slope.



Photo 22. Reach 3. Aerial image; 14 April 2017.



Photo 23. Reach 3. Aerial image; 14 April 2017.



Photo 24. Reach 3. Looking upstream. 21 August 2019.



Photo 25. Reach 3. Invasive species treatment area. 21 August 2019.



Photo 26. Reach 3a. Looking upstream; 21 August 2019.

Reach 4



Photo 27. Reach 4. Locked Log. 30 November 2016.

OPERATIONS AND MAINTENANCE, MANUAL
FOR THE
SENECA BLUFFS ECOSYSTEM RESTORATION PROJECT

CITY OF BUFFALO
ERIE COUNTY, N.Y.

APPENDIX G – Plant Materials

TYPE A - FLOODPLAIN SEED MIX

Scientific Name	Qty.	Unit	Percentage
Andropogon gerardii	100.80	oz.	9.00%
Bromus ciliatus	33.60	oz.	3.00%
Carex lurida	112.00	oz.	10.00%
Carex scoparia	44.80	oz.	4.00%
Carex vulpinoidea	112.00	oz.	10.00%
Elymus riparius	33.60	oz.	3.00%
Elymus virginicus	224.00	oz.	20.00%
Eupatorium perfoliatum	11.20	oz.	1.00%
Euthamia graminifolia	11.20	oz.	1.00%
Eutrochium maulatum	11.20	oz.	1.00%
Eutrochium purpureum	11.20	oz.	1.00%
Heliopsis helianthoides	11.20	oz.	1.00%
Juncus effusus	22.40	oz.	2.00%
Lobelia siphilitica	11.20	oz.	1.00%
Panicum clandestinum	112.00	oz.	10.00%
Panicum virgatum	56.00	oz.	5.00%
Pycnanthemum tenuifolium	11.20	oz.	1.00%
Spartina pectinata	112.00	oz.	10.00%
Symphotrichum lanceolatum	11.20	oz.	1.00%
Verbena hastata	44.80	oz.	4.00%
Vernonia fasciculata	22.40	oz.	2.00%
TOTAL	1,120.00	oz.	

TYPE B - WETLAND SEED MIX

Scientific Name	Qty.	Unit	Percentage
Alisma subcordatum	0.80	oz.	0.52%
Angelica atropurpurea	0.80	oz.	0.52%
Bolboschoenus fluviatilis	8.00	oz.	5.24%
Carex comosa	11.20	oz.	7.33%
Carex grayii	0.60	oz.	0.39%
Carex lupulina	4.80	oz.	3.14%
Carex lurida	12.80	oz.	8.38%
Carex vulpinoidea	48.00	oz.	31.41%
Cinna arundinacea	5.60	oz.	3.66%
Doellingeria umbellata	1.60	oz.	1.05%
Elymus virginicus	32.00	oz.	20.94%
Eupatorium perfoliatum	0.80	oz.	0.52%
Eutrochium purpureum	1.60	oz.	1.05%
Glyceria canadensis	1.60	oz.	1.05%
Heliopsis helianthoides	3.20	oz.	2.09%
Juncus effusus	4.80	oz.	3.14%
Juncus tenuis	0.80	oz.	0.52%
Ludwigia alternifolia	0.80	oz.	0.52%
Mimulus ringens	0.80	oz.	0.52%
Penthorum sedoides	0.80	oz.	0.52%
Polygonum pennsylvanica	1.60	oz.	1.05%
Pycnanthemum tenuifolium	0.20	oz.	0.13%
Sparganium eurycarpum	3.20	oz.	2.09%
Verbena hastata	6.40	oz.	4.19%
TOTAL	152.80	oz.	

TYPE C - RIPARIAN SEED MIX

Scientific Name	Qty.	Unit	Percentage
<i>Andropogon gerardii</i>	56.00	oz.	11.11%
<i>Chamaecrista fasciculata</i>	56.00	oz.	11.11%
<i>Elymus canadensis</i>	67.20	oz.	13.33%
<i>Eragrostis spectabilis</i>	16.80	oz.	3.33%
<i>Panicum virgatum</i>	56.00	oz.	11.11%
<i>Poa palustris</i>	28.00	oz.	5.56%
<i>Schizachyrium scoparium</i>	56.00	oz.	11.11%
<i>Sorghastrum nutans</i>	56.00	oz.	11.11%
<i>Tripsacum dactyloides</i>	112.00	oz.	22.22%
TOTAL	504.00	oz.	

TYPE D - LIVE STAKES

Scientific Name	Qty.	Unit	Percentage
Cornus amomum	1,100	ea	25.00%
Cornus sericea	1,100	ea	25.00%
Physocarpus opulifolius	440	ea	10.00%
Salix exigua	1,320	ea	30.00%
Sambucus canadensis	440	ea	10.00%
TOTAL	4,400	ea	

TYPE E - RIPARIAN SHRUBS

Scientific Name	Qty.	Unit	Percentage
Alnus incana	40	ea	10.61%
Aronia arbutifolia	35	ea	9.28%
Cornus ammomum	37	ea	9.81%
Cornus racemosa	35	ea	9.28%
Physocarpus opulifolius	35	ea	9.28%
Salix bebbiana	20	ea	5.31%
Sambucus canadense	35	ea	9.28%
Vaccinium corymbosum	35	ea	9.28%
Viburnum lentago	35	ea	9.28%
Viburnum nudum	35	ea	9.28%
Viburnum recognitum	35	ea	9.28%
TOTAL	377	ea	

TYPE F - RIPARIAN TREES

Scientific Name	Qty.	Unit	Percentage
Platanus occidentalis	15	ea	20.83%
Acer saccharinum	12	ea	16.67%
Betula alleghaniensis	12	ea	16.67%
Quercus bicolor	8	ea	11.11%
Celtis laevigata	8	ea	11.11%
Carya cordiformis	7	ea	9.72%
Amelanchier canadensis	7	ea	9.72%
Carya ovata	1	ea	1.39%
Tilia americana	1	ea	1.39%
Hamamelis virginiana	1	ea	1.39%
TOTAL	72	ea	

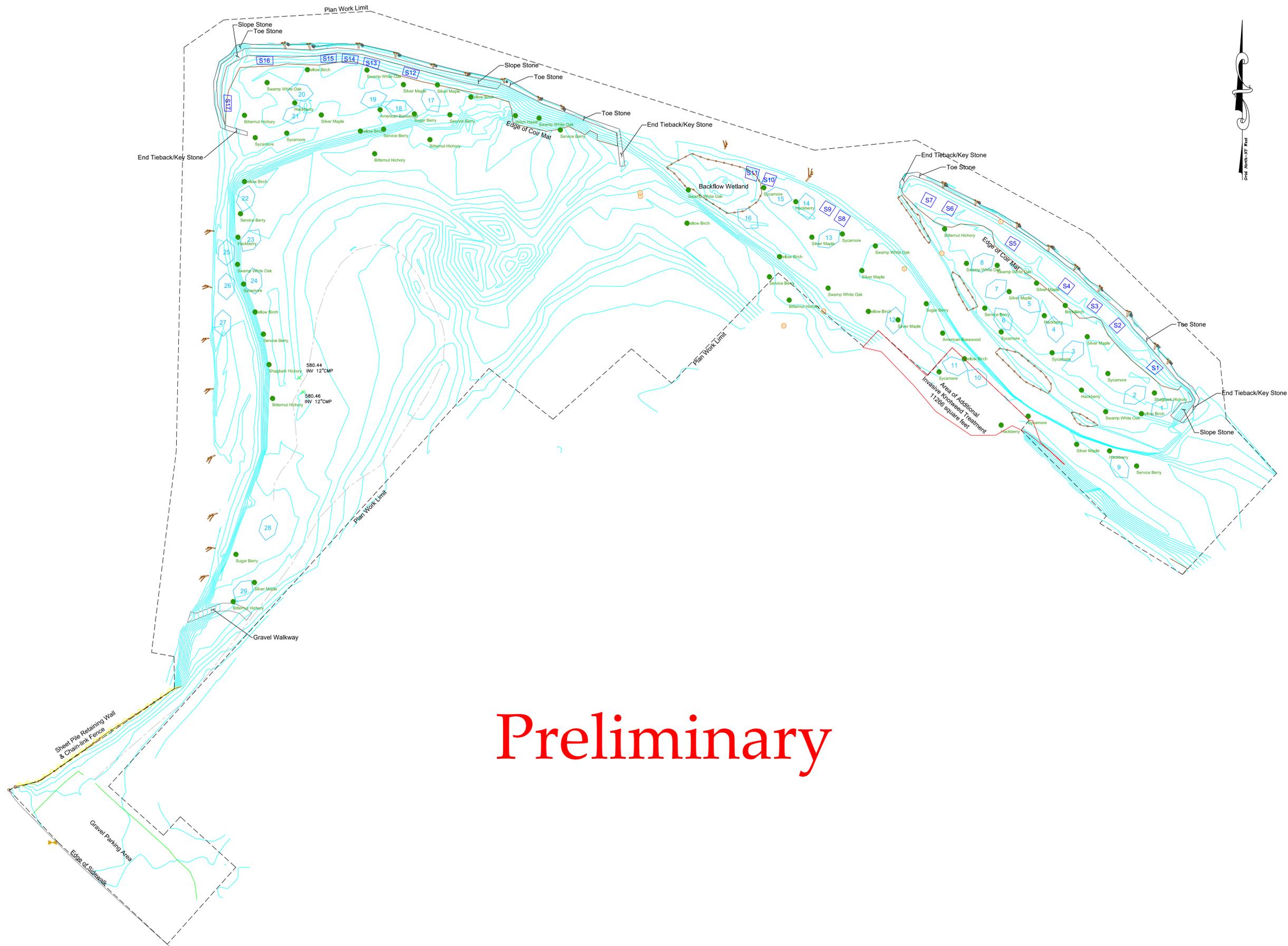
TYPE G - WETLAND PLUGS

Scientific Name	Qty.	Unit	Percentage
Carex crinita	700	ea	20.59%
Glyceria striata	700	ea	20.59%
Carex lupulina	300	ea	8.82%
Carex comosa	300	ea	8.82%
Sagittaria latifolia	300	ea	8.82%
Sparganium eurycarpum	250	ea	7.35%
Scirpus validus	250	ea	7.35%
Iris versicolor	150	ea	4.41%
Juncus effusus	150	ea	4.41%
Lobelia cardinalis	150	ea	4.41%
Onoclea sensibilis	50	ea	1.47%
Rosa palustris	50	ea	1.47%
Cephalanthus occidentalis	50	ea	1.47%
TOTAL	3400	ea	

SENECA BLUFFS 2018 WOODY PLANTING AS-BUILT TABLE

Date	Reach	Enclosure	Type	Platanus occidentalis	Acer saccharinum	Betula alleghaniensis	Quercus bicolor	Celtis laevigata	Celtis occidentalis	Amelanchier canadensis	Carya ovata	Tilia americana	Hamamelis virginiana	Carya cordiformis	Alnus incana	Aronia arbutifolia	Cornus amomum	Cornus racemosa	Physocarpus opulifolius	Salix nigra	Sambucus canadensis	Vaccinium corymbosum	Viburnum lentago	Viburnum nudum	TOTAL	
2-Nov-18	na	1	Shrub												2	1	1		2	2	1	2		1	12	
9-Nov-18	na	1	Shrub																			1	1			2
2-Nov-18	na	2	Shrub												1	2	2		3	1	1	1		1	12	
9-Nov-18	na	2	Shrub																			1	1			2
2-Nov-18	na	3	Shrub												1	1	2		2	1	2	1		1	11	
9-Nov-18	na	3	Shrub																		1		1			2
2-Nov-18	na	4	Shrub												1	2	2			1	2	2		1	11	
9-Nov-18	na	4	Shrub																		1		1			2
2-Nov-18	na	5	Shrub												2	1	1		2	1	1	2		1	11	
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6-Nov-18	na	26	Shrub											1	1	2		3	1	3				11	
6-Nov-18	na	27	Shrub											2	1	3		2	1	2				11	
5-Nov-18	na	28	Shrub											1	1	2		2	1	2	1		2	12	
5-Nov-18	na	29	Shrub											3	1	1		1	1	1	2		2	12	
7-Nov-18	na	10S	Shrub (LS sub)													4	4	4		4				16	
8-Nov-18	na	11S	Shrub (LS sub)													4	4	4		4				16	
8-Nov-18	na	12S	Shrub (LS sub)													4	4	4		4				16	
9-Nov-18	na	13S	Shrub (LS sub)													1	9	2		2				14	
9-Nov-18	na	14S	Shrub (LS sub)													1	10	2		1				14	
9-Nov-18	na	15S	Shrub (LS sub)													2	10	2		1				15	
9-Nov-18	na	16S	Shrub (LS sub)													2	9	2		2				15	
9-Nov-18	na	17S	Shrub (LS sub)													2	10	1		2				15	
8-Nov-18	na	1S	Shrub (LS sub)													4	4	4		4				16	
8-Nov-18	na	2S	Shrub (LS sub)													4	4	4		4				16	
8-Nov-18	na	3S	Shrub (LS sub)													4	4	4		4				16	
8-Nov-18	na	4S	Shrub (LS sub)													4	4	4		4				16	
8-Nov-18	na	5S	Shrub (LS sub)													4	4	4		4				16	
8-Nov-18	na	6S	Shrub (LS sub)													4	4	4		4				16	
8-Nov-18	na	7S	Shrub (LS sub)													4	4	4		4				16	
8-Nov-18	na	8S	Shrub (LS sub)													4	4	4		4				16	
8-Nov-18	na	9S	Shrub (LS sub)													4	4	4		4				16	
12-Nov-18	1	na	Tree										1											1	
12-Nov-18	2	na	Tree										1											1	
12-Nov-18	3	na	Tree										3											3	
12-Nov-18	4	na	Tree										2											2	
2-Nov-18	1	na	Tree	3	3	2	1		2	1	1													0	
7-Nov-18	1 & 2	na	Tree	4	4	4	3	1	3	2		1												22	
7-Nov-18	3	na	Tree				1			1			1											3	
7-Nov-18	3A	na	Tree	2	3	3	3	1	1	2		1												16	
7-Nov-18	4	na	Tree	1	1	1	1	1	1	1	1		1											9	
8-Nov-18	1	na	Tree				1																	1	
20-Nov-18	3A	na	Tree				1																	1	
TOTAL				10	11	11	10	3	7	7	2	2	2	7	40	40	106	96	107	27	106	40	40	40	714
DELIVERED				10	11	11	10	3	7	7	2	2	2	7	40	40	106	96	107	27	106	40	40	40	714



Preliminary



General Notes

Legend:

- Utility Pole
- Fence
- Bendway Weir Stone
- Root Wad
- Locked Log
- Gas Marker
- Gas Valve
- Area of Type E Riparian Shrubs
- Supplemental Area of Type E Riparian Shrubs

Notes:

This survey was prepared for an As-Built of Seneca Bluffs for Tidewater.

This map of survey dated January 3, 2019, was prepared from an instrument survey, with field work completed on November, 2018.

This survey was prepared for the parties and purpose indicated hereon. Any extension of the use beyond the purpose agreed to, exceeds the scope of the engagement.

It is a violation of New York State Education Law for any person, unless acting under the direction of a licensed surveyor, to alter an item in any way.

Only copies of this survey marked with an original signature and an original embossed or ink seal are the product of the land surveyor.

This plan NOT valid with an Affidavit of No Change.

Symbols are graphical representations and not to scale.

Only visible utility services and/or encumbrances were located and shown.

Survey by William J Tucker, IL PLS #050369
 Clear Creek Land Surveying, L.L.C.
 7449 Mill Street, Cananda, NY 14717
 Phone 716-592-5800 Fax 716-592-5566

Project: 2016/Tidewater/ Seneca Bluffs

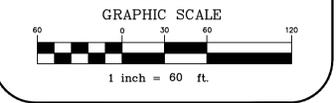
Date: January 3, 2019

Scale: 1" = 60'

Clear Creek Land Surveying, LLC
 7449 Mill Street
 Cananda, NY 14717

ph. 716-592-5800
 fax 716-592-5566

As-Built of Seneca Bluffs Habitat Restoration Project
 Buffalo River
 Town of Buffalo
 Erie County
 State of New York



Go Native Tree Farm
 2310 Chestnut View Drive
 Lancaster, PA 17603

Packing Slip

Date	Invoice #
9/25/2018	1571

Ship To
Cardno Trey Smith 1037 South Park Avenue Buffalo NY 14210 219-363-7315

20

P.O. No.	Ship	Via	FOB	Project
	9/25/2018			

Quantity	Item Code	Description
		SHRUBS
40	Alnus incana	Speckled/Gray Alder 2-3gal.
40	Aronia arbutifolia	Red Chokeberry 2gal.
40	Cornus amomum	Silky Dogwood 2gal.
30	Cornus racemosa	Gray Stem Dogwood 2gal.
40	Physocarpus opulifolius	Eastern Ninebark 2gal.
27	Salix nigra	Black Willow 2gal. (Substitute)
40	Sambucus canadensis	Black Elderberry 2gal.
40	Vaccinium corymbosum	High-Bush Blueberry 1gal. (only size available)
40	Viburnum lentago	Nannyberry Viburnum 3gal.
40	Viburnum nudum	Possumhaw Viburnum 3gal.
		TREES
10	Platanus occidentalis	American Sycamore 3/4" caliper 3gal.
11	Acer saccharinum	Silver Maple 3/4" caliper 5gal.
11	Betula alleghaniensis	Yellow Birch 36-48" 2gal. (Only size available)
10	Quercus bicolor	Swamp White Oak 3/4" caliper 5gal.
3	Celtis laevigata	Sugarberry/Southern Hackberry 36-60" 2gal. (only 3 available, only size available)
7	Celtis occidentalis	Hackberry 5-6' 3gal. (Substitute; Only size available)
7	Carya cordiformis	Bitternut Hickory 6-8" 3/4" caliper 2gal tall <i>not on truck, will ship</i>
7	Amelanchier canadensis	Shadbush "Shrub" Serviceberry 5gal. *Limited quantity
2	Carya ovata	Shagbark Hickory 12-24" 2gal tall (largest available)
2	Tilia americana	American Basswood 5gal.
2	Hamamelis virginiana	Witch-Hazel 24" 3gal. (Only size available)
	Delivery	Delivery to Buffalo NY
-1	Deposit	deposit made by customer
		Out-of-state sale, exempt from sales tax

Sign & Return:

Native Tree Farm
 110 Chestnut View Drive
 Lancaster, PA 17603

Packing Slip

Date	Invoice #
9/25/2018	1572

Ship To
1037 South Park Avenue Buffalo NY 14210 219-363-7315

P.O. No.	Ship	Via	FOB	Project
	10/26/2018			

Quantity	Item Code	Description
66	Cornus amomum	Silky Dogwood 1gal.
66	Cornus sericea	Redosier Dogwood 1gal.
66	Sambucus canadensis	Black Elderberry 1gal.
67	Physocarpus opulifolius	Eastern Ninebark 1gal.
1	Delivery	Delivery to Buffalo NY
-1	Deposit	deposit made by customer
		Out-of-state sale, exempt from sales tax