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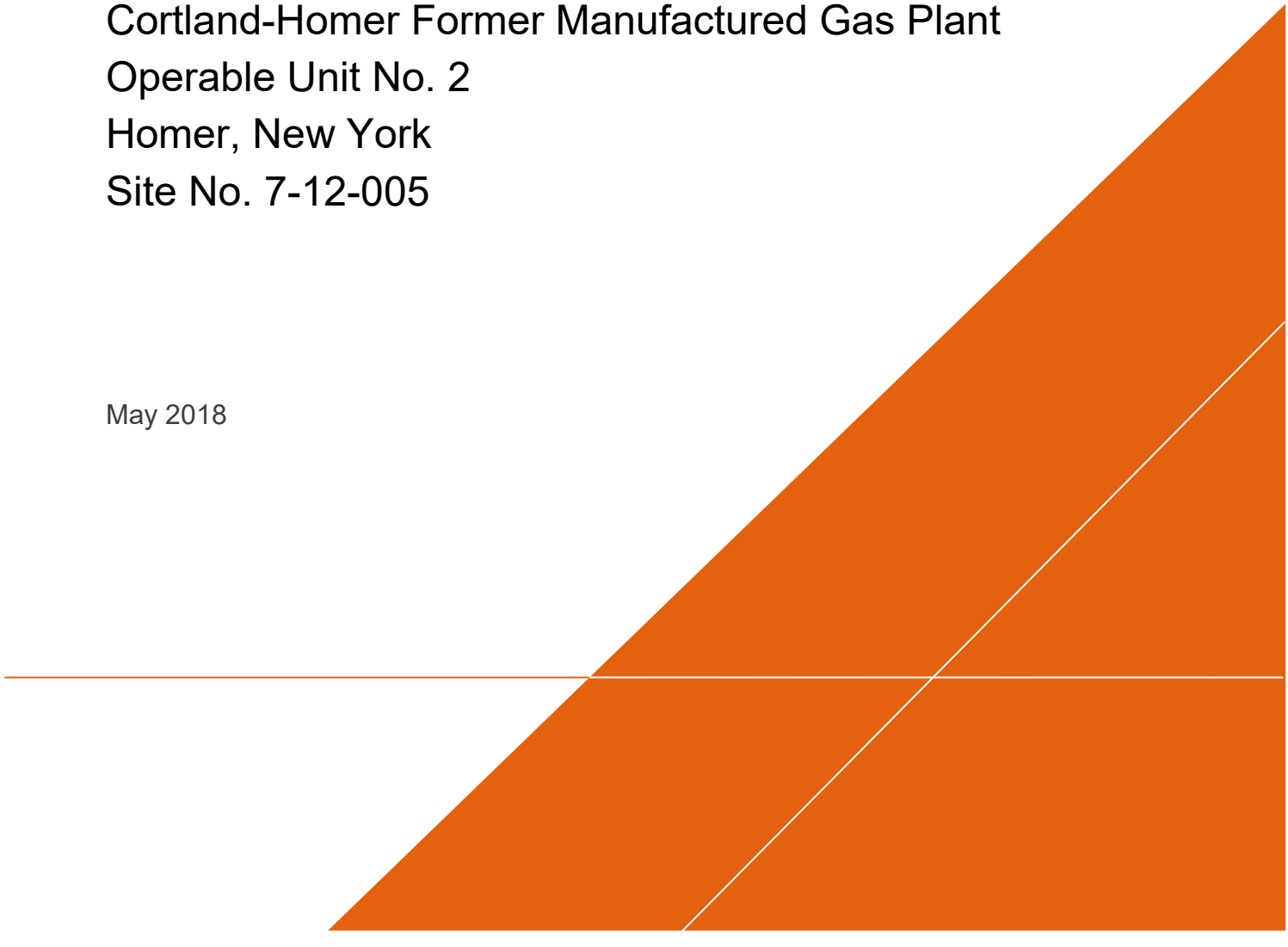
NYSEG

MUSSEL SURVEY WORK PLAN

Cortland-Homer Former Manufactured Gas Plant
Operable Unit No. 2
Homer, New York
Site No. 7-12-005

May 2018



MUSSEL SURVEY WORK PLAN

Cortland-Homer Former MGP Site
Operable Unit No. 2
Homer, New York
Site No. 7-12-005

Prepared for:

NYSEG

Prepared by:

Arcadis of New York, Inc.
One Lincoln Center
110 West Fayette Street
Suite 300
Syracuse
New York 13202
Tel 315 446 9120
Fax 315 449 0017

Our Ref.:

B013137.0006 #10

Date:

May 2018

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TABLES (IN TEXT)

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APPENDICES

ACRONYMS AND ABBREVIATIONS

cm	centimeter
CWCS	Comprehensive Wildlife Conservation Strategy
DFWMR	Division of Fish and Wildlife
ETSSCI	Endangered and Threatened Species Scientific Application
ESA	Endangered Species Act
FSP	Field Sampling Plan
HASP	Health and Safety Plan
LCPSCI	License to Collect or Possess Scientific Application
MGP	manufactured gas plant
m	meter
m^2/min	square meters per minute
MSWP	Mussel Survey Work Plan
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
OU	operable unit
PDI	pre-design investigation
RDWP	Remedial Design Work Plan
SGCN	Species of Greatest Conservation Need
SCUBA	Self Contained Breathing Apparatus
T&E	Threatened and Endangered
USFWS	United States Fish and Wildlife Service

1 INTRODUCTION

This *Mussel Survey Work Plan* (MSWP) presents the proposed survey activities for rare, threatened or endangered (T&E) mussel species in the Tioughnioga River for Operable Unit No. 2 (OU-2) of the Cortland-Homer Former Manufactured Gas Plant (MGP) Site (the site) located in Homer, New York (Site No. 7-12-005) (Figure 1). The mussel survey is being conducted in support of previously completed investigations and forthcoming remedial construction activities.

Additional information on site location/history, nature and extent of impacts, pre-design investigation (PDI) activities, and anticipated scope of the remedial design/remedial construction can be found in the May 2010 *Draft Remedial Design Work Plan* (draft RDWP) (Arcadis 2017).

1.1 MSWP Organization

This MSWP has been organized as described in the following table.

Table 1.1 MSWP Organization

Section	Description
Section 1 – Introduction	Presents the rationale for the mussel survey and references previous work conducted in support of the remedial design.
Section 2 – Mussel Survey	Presents the scope of the mussel survey.
Section 3 – Permits and Approvals	Identifies the permits and approvals necessary to conduct the mussel survey.
Section 4 – Work Documents and Schedule	Identifies the work documents to be prepared in support of the mussel survey and presents the anticipated schedule for implementation.
Section 5 – References	Lists documents used to support the preparation of this MSWP.

1.2 Survey Rationale

As part of previously scoped and approved PDI activities, Arcadis conducted a habitat assessment for in-river portions of OU-2 (Areas 1 and 2) in October 2017 (Figure 2). Representatives from the New York State Department of Environmental Conservation (NYSDEC) Division of Fish and Wildlife (DFW) were on-site during the assessment to review site conditions first-hand. While on-site, DFW observed relic shells of the green floater mussel (*Lasmigona subviridis*). The green floater is a threatened mussel species in New York State that is in “imminent danger of extirpation or extinction” (section 182.2[h] of 6NYCRR Part 182) and is known to occur at select locations and watersheds within the region.

Accordingly, NYSDEC requested that mussel surveys be conducted to further assess the presence/absence and abundance of the green floater or other mussel species in the anticipated remediation areas (Figure 2). If listed species are found, NYSEG would be required to apply for an incidental take permit and the remedial work plan/remedial design would need to comply with 6NYCRR Part 182 requirements. Mussel species listed at the federal level would be protected under the Endangered Species Act (ESA)

and a Section 7 consultation with the United States Fish and Wildlife Service (USFWS). However, no federally-listed mussel species occur within the vicinity of the site based on NYSDEC's review of their Natural Heritage database (as discussed during a December 1, 2017 conference call).

In addition to the green floater, NYSDEC's database also showed that several other mussel species of interest may occur in the vicinity of the site, including the brook floater (*Alasmidonta varicosa*), which is also listed as threatened in New York State. The other mussels of interest may include the elktoe (*Alasmidonta marginata*), yellow lampmussel (*Lampsilis cariosa*), and Eastern pearlshell *(Margaritifera margaritifera*). These mussels are designated as Species of Greatest Conservation Need (SGCN) as part of New York's Comprehensive Wildlife Conservation Strategy (CWCS). By definition, "these species are experiencing some level of population decline, have identified threats that may put them in jeopardy, and need conservation actions to maintain stable population levels or sustain recovery" (NYSDEC 2018).

2 MUSSEL SURVEY

As recommended by NYSDEC, the mussel survey will be performed in two phases, following the general protocols outlined in Smith et al. (2001) and NYSDEC (2017).

- The initial survey will include a qualitative, timed-area visual search to document the mussel species present at the site, including T&E mussels and their general relative abundance.
- The second survey would include a quantitative search using visual and excavation search techniques in areas where state-listed T&E mussel species are found, if any, during the first survey (e.g. green floater, brook floater) to provide an estimate of the density and number of T&E mussels that may be impacted by remedial activities.

The mussel surveys will be conducted using in-water workers using snorkeling and/or diving techniques. In water less than 1 meter (m) deep, snorkeling may be employed using teams of at least two observers with masks and snorkels to systematically search each cell. For water depths greater than 1 m deep, or when deemed necessary, divers using self-contained breathing apparatus (SCUBA) equipment will be used. The details of the two mussel surveys are provided in the following subsections.

2.1 Qualitative Survey

Procedures for the qualitative mussel survey will generally follow those recommended by NYSDEC (2017) and described by Smith et al. (2001) and consist of timed-area visual searches for live mussels in Areas 1 and 2 (direct effects), including buffer zones (indirect effects) located 100 m upstream and 200 m downstream of the anticipated remediation areas (Figures 3 and 4). Each of the two areas will be divided into smaller cells to more accurately assess where mussel beds may be found. Cells will measure the width of the river (approximately 20 m on average) by 25 to 50 m river lengths (or a different interval, as needed). Each cell will be searched by in-water observers using an effective search rate of approximately 0.5 square meters per minute (m^2/min) and an effective sampling fraction of 5% of the area of the cell (Smith et al 2001). The area of each cell will be calculated beforehand to standardize search times.

Search cells will be assessed visually by direct observation but may also include fanning loose sediment or raking/probing the substrate surface gently with fingers. Any observed live mussel will be removed from the sediment and stored in mesh bags attached to the observer or placed in buckets with fresh water by the assisting processing team. After completing a cell, all mussels collected will be identified and counted. A subset of up to 10 individuals of each species will be measured and photographed over the duration of the project, and up to 5 individuals of each species may be vouchered for verification purposes. Once processing is complete, mussels will be returned to the approximate area in the cell from where they were collected, and the dive team will move to the next cell. If T&E species are encountered, GPS points will be recorded to mark their release location.

The qualitative mussel survey will not include a shoreline search for midden piles or dead relict shells, as some protocols require. A shoreline search was already conducted by NYSDEC during the previously completed habitat assessment (October 2017); dead shells of several mussel species, including a T&E species, were observed. As such, this survey will focus on the search for live mussels.

2.2 Quantitative Survey

If T&E species are observed during qualitative sampling, quantitative sampling will be conducted in the areas where species were observed in Areas 1 and 2 only (direct effects) to estimate species abundance. The design of the quantitative sampling will generally follow the procedures identified by Smith et al. (2001) and NYSDEC (2017) and will consist of visually searching 0.25 square meter (m^2) quadrats with random start points systematically placed in areas where T&E mussel species were observed, then followed by excavating a random subset of those 0.25 m^2 quadrats. The population estimates produced from the quantitative sampling will be used to determine the mitigation measures that may be needed.

During the visual survey, all 0.25 m^2 quadrats will be searched by direct observation. A subset of quadrats will then be excavated to a depth of 10 centimeters (cm) (if possible) or until sediments are not suitable for mussel burrowing (e.g. hardpan, bedrock, anoxic sediments, etc.). The sediment will be sieved using a coarse mesh screen (e.g. ½ inch or similar) to separate the mussels from the substrate matrix. All mussels from the quantitative visual and excavation surveys will be identified and counted. A subset of up to 10 individuals of each species will be measured and photographed, and up to 5 individuals of each species may be vouchered for verification purposes. Following processing, the mussels will be released back to the quadrat area from where they were collected. If T&E species are encountered, the GPS location of the quadrat will be recorded.

As recommended by Smith et al. (2001) for mid-Atlantic and northeastern rivers, a minimum of 100 quadrats are selected for the visual searches. Of these, a subset is excavated based on the proportion of mussels visible at the surface (i.e. the relationship between surface and total counts is approximately linear). Smith et al. (2001) recommendations for excavating are as follows:

- 25% of quadrats if > 60% of the mussels were visible at the surface
- 33% of quadrats if 50-60% were visible at the surface
- 50% of the quadrats if 40-50% were visible at the surface
- 100% of the quadrats if less than 40% were visible at the surface

3 PERMITS AND APPROVALS

This section describes the necessary permits and approvals that will be needed to conduct the mussel survey, and any subsequent requirements if T&E mussel species are present at the site.

3.1 Collection and Take Permits

Permits will be required from the NYSDEC DFW Special Licenses Unit in Albany, New York to perform the mussel survey, including the following:

- a License to Collect or Possess (Scientific Application; LCPSCI) permit
- an Endangered and Threatened Species (Scientific Application; ETSSCI) permit

The LCPSCI permit allows the collection of common freshwater mussel species (Unionids), while the ETSSCI permit allows the collection of T&E mussel species. In this case, as previously discussed, both the green floater and brook floater, which are threatened species in New York State, are known to occur in the vicinity of the site. If other state-listed mussel species are found during the survey, the NYSDEC will be contacted immediately.

The need for a NYSDEC Incidental Take Permit under 6NYCRR Part 182 (in support of remedial construction activities) will be determined based on the results of the mussel surveys. An Incidental Take Permit is required if T&E mussels are present and the proposed activity is likely to result in the take or taking of any listed species. A take is broadly defined as any action that might impact a listed species or negatively affects its behavior. In this case, a mitigation plan would be developed. Potential mitigation efforts could include relocating T&E mussels and/or re-establishing mussel habitat.

Permits from the USFWS will not be needed as no federal T&E mussel species protected under the ESA occur at the site.

3.2 Authorization

All work associated with the collection, handling and/or taking of state-listed T&E mussel species is authorized by the NYSDEC. Determinations are made based on the species' capability to survive and reproduce in consideration of: known population trends; known threats to the species; and reasonably foreseeable impacts on the species from project-related activities. .

4 WORK DOCUMENTS AND SCHEDULE

This section outlines the content of the work documents and schedule for completing the mussel survey.

4.1 Work Documents

This MSWP is supported by the following documents:

- Field Sampling Plan (FSP, Appendix A) – details the specific methods and procedures to be followed by field personnel during the mussel survey.
- Dive Safety Plan (Appendix B) – provides dive-specific health and safety protocols, along with personnel qualifications/experience, dive site conditions, hazards and controls, and an emergency response plan.
- Health and Safety Plan (HASP, see the May 2017 *Draft Remedial Design Work Plan*) – provides general health and safety protocols to be followed by field personnel during investigation activities.

A Mussel Survey Report will be prepared and submitted to NYSDEC upon conclusion of the mussel survey work. The report will present the results and findings of the study.

The need for an Incidental Take Permit will be assessed during the development of the Mussel Survey Report. If required, a Migration Plan would be developed as part of the remedial design to detail the conservation needs of the T&E mussel species present at the project site prior to implementing the NYSDEC-required remedial activities.

4.2 Schedule

The anticipated schedule for completing the mussel survey activities identified in this MSWP is presented in the following table.

Table 4.1 Anticipated Mussel Survey Schedule

Schedule Component	Date
Approval of MSWP	May 2018
Conduct Qualitative Mussel Survey	July 2018
Assess Survey Data	July/August 2018
Conduct Quantitative Mussel Survey (if necessary)	August 2018
Submit Mussel Survey Report	January 2019

The project schedule is subject to change based on NYSDEC timing for review/approval of this MSWP and associated documents. The schedule for completing the mussel surveys is also subject to weather and flow conditions. For example, mussel surveys are expected to take place during low-flow and low-turbidity conditions and conducted when water temperatures are greater than 55°F but before October 1

(NYSDEC, 2017). It should be noted, and as discussed previously, if no T&E mussel species are found during the qualitative survey, additional mussel work, such as the quantitative survey, incidental take permit, and/or mitigation plan, would not be required.

As indicated in the draft RDWP, remedial activities are tentatively scheduled to begin in 2020, but the construction schedule is subject to change.

5 REFERENCES

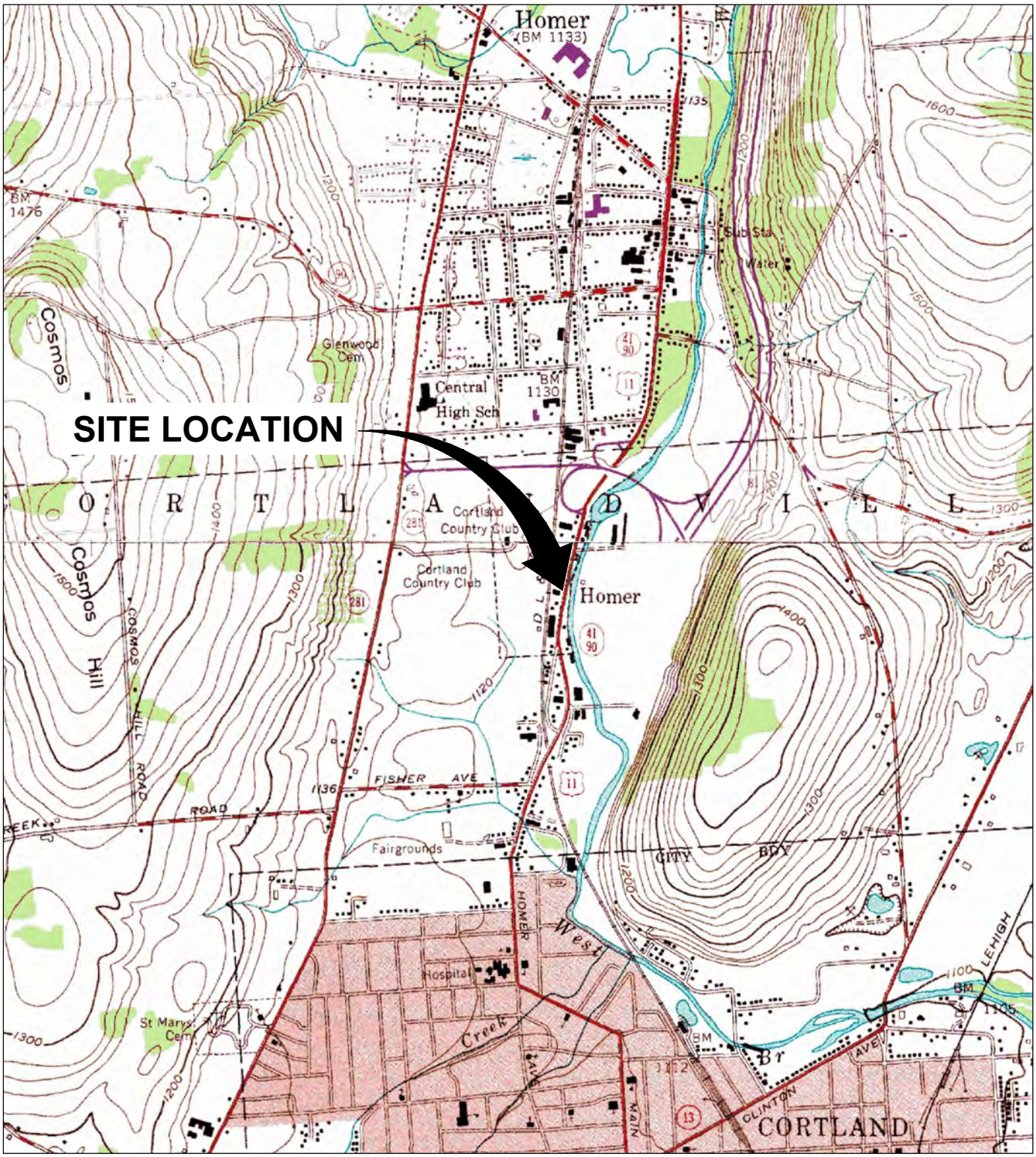
Arcadis. 2017. Draft Remedial Design Work Plan. May 2017.

NYSDEC. 2017. *General Guidelines for Mussel Surveys and Surveyor List.* Transmitted via email on October 26 by Mary Jo Crance of NYSDEC to Tracy Blazicek of NYSEG.

NYSDEC. 2018. Species of Greatest Conservation Need (SGCN). http://www.dec.ny.gov/animals/9406.html. January 19.

Smith, D.R., R.F. Villella, and D.P. Lemarie. 2001. *Survey Protocol for Assessment of Endangered Freshwater Mussels in the Allegheny River, Pennsylvania.* Journal of the North American Benthological Society. Vol. 20 (No. 1):118-132.

FIGURES



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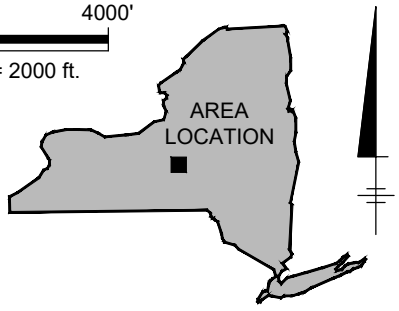

NYSEG - CORTLAND-HOMER FORMER MGP
HOMER, NEW YORK

OU-2 MUSSEL SURVEY WORK PLAN

SITE LOCATION MAP

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FIGURE
1

CITY:SYRACUSE, NY DIV/GROUP:ENV/IM-DV DB:D. HOWES, R. ALLEN LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
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HomerNY_2016_M100x.jpg
HomerNY_2016_N100xa.jpg
HomerNY_2016_S100x.jpg

LEGEND:

- APPROXIMATE BOUNDARY OF NYSEG–OWNED PROPERTY
- 2013 PROBING TRANSECTS
- REMOVAL AREA
- FLOW DIRECTION

NOTES:

1. ALL LOCATIONS APPROXIMATE.
2. AERIAL PHOTOGRAPHY OBTAINED FROM Google Earth Pro™ DATED 2016.
3. HISTORICAL SEDIMENT SAMPLING LOCATIONS FROM FIGURES 5–16 THROUGH 5–19 AND DESCRIPTIONS ON TABLE 5–19 FROM STEARNS AND WHELER COMPANIES 2002 SRI REPORT.

0 350' 700'
GRAPHIC SCALE

NEW YORK

NYSEG - CORTLAND-HOMER FORMER MGP
HOMER, NEW YORK
OU-2 MUSSEL SURVEY WORK PLAN

REMEDIATION AREAS IN TIOUGHNIOGA RIVER

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FIGURE
2

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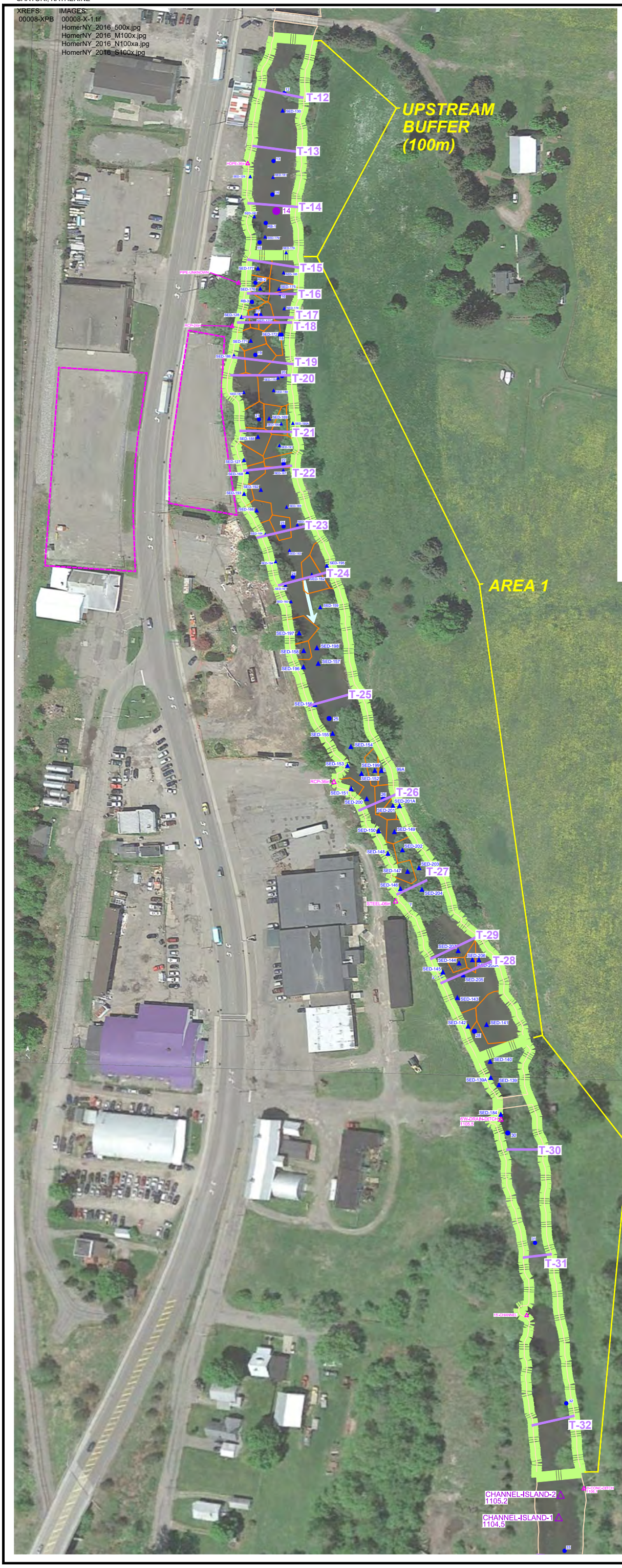

LEGEND:

- MUSSEL SURVEY AREA
- HISTORICAL SEDIMENT BORING LOCATION
- OUTFALL/GROUNDWATER SEEP
- PHASE I AND II SEDIMENT BORING LOCATION
- APPROXIMATE BOUNDARY OF NYSEG–OWNED PROPERTY
- 2013 PROBING TRANSECTS
- REMOVAL AREA

NOTES:

1. ALL LOCATIONS APPROXIMATE.
2. AERIAL PHOTOGRAPHY OBTAINED FROM Google Earth Pro™ DATED 2016.
3. HISTORICAL SEDIMENT SAMPLING LOCATIONS FROM FIGURES 5–16 THROUGH 5–19 AND DESCRIPTIONS ON TABLE 5–19 FROM STEARNS AND WHELER COMPANIES 2002 SRI REPORT.

0 150' 300'

GRAPHIC SCALE

NYSEG - CORTLAND-HOMER FORMER MGP
HOMER, NEW YORK

OU-2 MUSSEL SURVEY WORK PLAN

MUSSEL SURVEY AREA 1

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FIGURE 3

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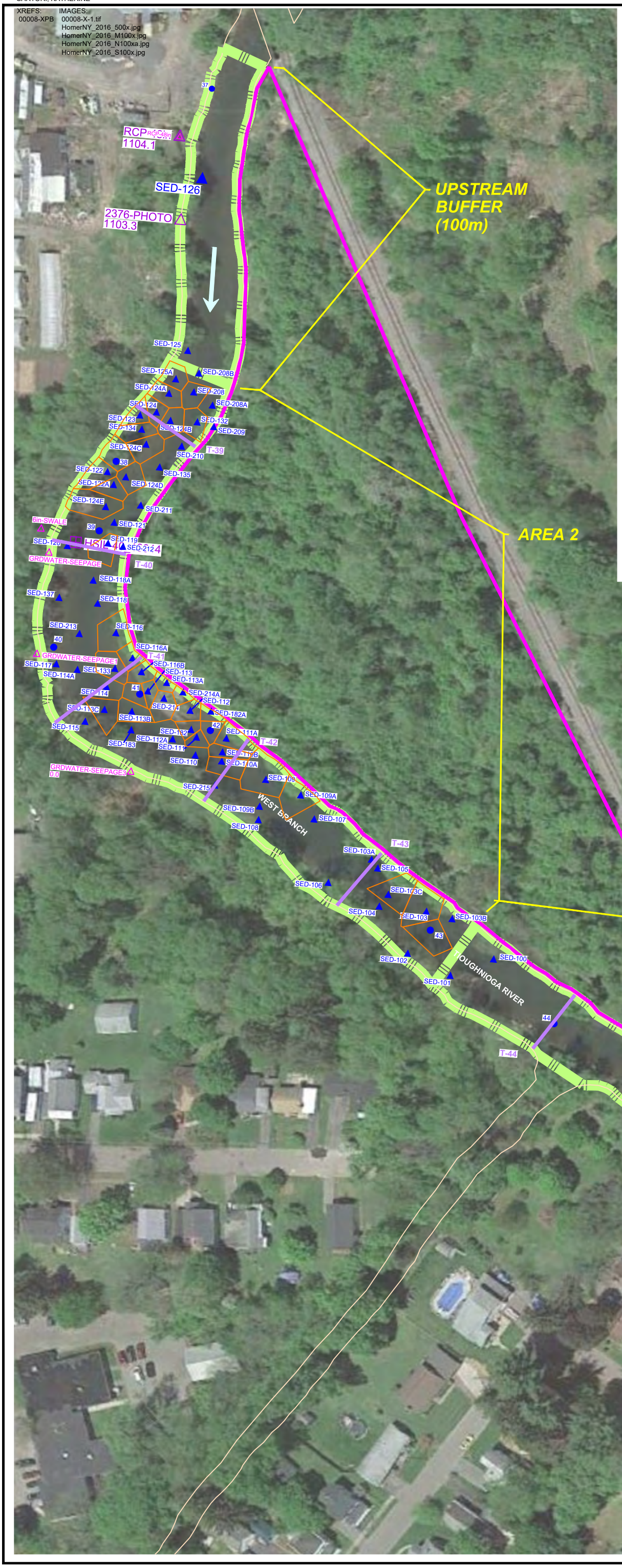

LEGEND:

- MUSSEL SURVEY AREA
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- PHASE I AND II SEDIMENT BORING LOCATION
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NOTES:

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0 100’ 200’
GRAPHIC SCALE

NYSEG - CORTLAND-HOMER FORMER MGP
HOMER, NEW YORK
OU-2 MUSSEL SURVEY WORK PLAN

MUSSEL SURVEY AREA 2

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FIGURE
4

APPENDIX A

Field Sampling Plan

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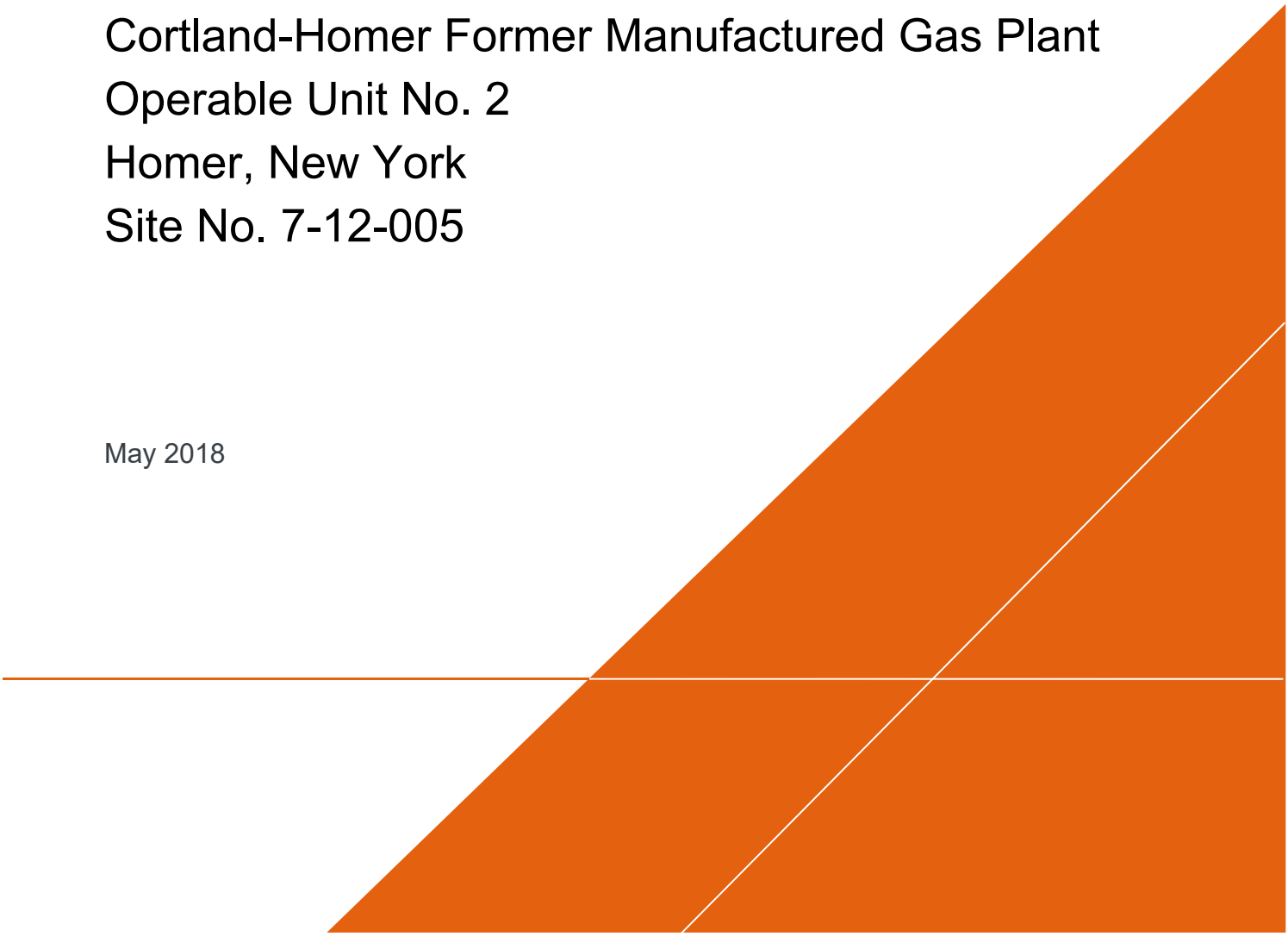
NYSEG

FIELD SAMPLING PLAN

Cortland-Homer Former Manufactured Gas Plant
Operable Unit No. 2
Homer, New York
Site No. 7-12-005

May 2018



FIELD SAMPLING PLAN

Cortland-Homer Former MGP Site
Operable Unit No. 2
Homer, New York
Site No. 7-12-005

Prepared for:

NYSEG

Prepared by:

Arcadis of New York, Inc.

One Lincoln Center

110 West Fayette Street

Suite 300

Syracuse

New York 13202

Tel 315 446 9120

Fax 315 449 0017

Our Ref.:

B0013137.0006 #10

Date:

May 2018

CONTENTS

FIGURES*

** Referenced figures are included with the Mussel Survey Work Plan*

1 INTRODUCTION

This *Field Sampling Plan* (FSP) supports the *Mussel Survey Work Plan* (MSWP) for Operable Unit No. 2 (OU-2) of the Cortland-Homer Former Manufactured Gas Plant (MGP) Site (the site) located in Homer, New York. Refer to Figures 1 and 2 of the MSWP for site location and a site plan.

This FSP presents field procedures and sample collection methods to be used during implementation of mussel survey field activities in the Tioughnioga River. The FSP will be implemented in conjunction with the MSWP and a site-specific *Health and Safety Plan* (HASP) and *Dive Safety Plan* (DSP) (included as attachments to the MSWP). Sampling locations and rationale for the mussel survey are described in the MSWP.

2 FIELD ACTIVITIES

This section describes field procedures and methods potentially used for performance of the mussel surveys.

2.1 General Field Guidelines

2.1.1 Utilities

Underground utilities in the Tioughnioga River will be identified prior to any subsurface excavation as needed. Public and privately-owned utilities will be located by contacting responsible agencies by phone so that their underground utilities can be marked at the site. During the mussel survey, disturbances of bank and river substrates are only anticipated to occur during stake or rebar placement to mark locations (up to 2 ft) and excavation of mussel quadrats (up to six inches).

2.1.2 Equipment

The following is a general list of equipment necessary for mussel surveys:

- License to Collect or Possess (Scientific Application; LCPSCI) permit and an Endangered and Threatened Species (Scientific Application; ETSSCI) permit
- MSWP, HASP, DSP, field log book, field sampling records, and indelible ink pens and markers
- Taxonomic keys and supplies to identify and take voucher specimens
- Digital camera and extra batteries
- Rangefinder and or survey tape to measure distance and river width
- GPS unit
- Water quality meter
- Flow meter
- Graduated rod for sediment depth measurements, surveyor's rod, measuring tape
- Stakes, pin flags, and/or flagging to identify sampling locations
- Snorkeling and SCUBA gear (wetsuit, booties, gloves, mask, snorkel, BCD, SCUBA tanks, full face mask with communication system, weight belt etc.)
- Mesh bags to hold mussels
- Calipers to measure mussels
- Buckets, plastic wash bins, and scrub brushes
- 0.25 m^2 PVC quadrats
- Shovels

- ½" mesh screen sieve
- Safety auto-retract knife
- Strapping, clear plastic, and duct tape

2.1.3 Field Book

Field log books will be maintained by the field team leader and other team members to provide a daily record of significant events, observations, and measurements during the mussel survey. Information pertinent to the field investigation and/or survey activities will also be recorded in the log books. Entries in the log book will include, at a minimum, the following information:

- Name of author, date of entry, and physical/environmental conditions during field activity
- Name of field crew members
- Name of any site visitors
- Survey method
- Description of survey location(s)
- Date and time of activities
- Field observations and measurements

All original data recorded in field log books will be written with indelible ink. If an error is made on an original document assigned to one individual, that individual will make all corrections simply by crossing a single line through the error and entering the correct information. The erroneous information will not be erased. Any subsequent error discovered on an original document will be corrected by the person who made the entry. All subsequent corrections will be initialed and dated.

2.2 Equipment Decontamination

2.2.1 Sampling Equipment Decontamination

The following equipment will be required for use during survey equipment cleaning procedures as needed:

- Appropriate PPE, as required in the site HASP
- Potable water
- Non-phosphate detergent such as Alconox (or equivalent)
- Rinsate collection plastic containers
- USDOT-approved waste shipping container(s)
- Brushes
- Large heavy-duty garbage bags

- Spray bottles
- (Optional) – Methanol and/or nitric acid
- Ziploc-type bags
- Plastic sheeting or aluminum foil

No chemical analyses are anticipated as part of the mussel survey. All equipment in contact with site sediment will be rinsed with river water. However, if further decontamination steps are necessary to remove potential site-related constituents, the following procedures may apply. Decontamination may take place at the sampling location as long as all liquids are containerized. For organics, equipment will be washed and rinsed with Alconox and potable water, followed by a 10 percent methanol rinse, and another potable water rinse. For inorganics, an additional rinse step will be added prior to the rinse with methanol, which will entail a rinse with a 10 percent nitric acid followed by a potable water rinse. Between rinses, equipment will be placed on polyethylene sheets or aluminum foil, if needed. Survey equipment will either be used immediately or transported from the designated decontamination area to the next survey location.

2.3 Mussel Survey

As recommended by NYSDEC and as presented in the MSWP, the survey activities will be performed in two phases following the general protocols outlined in Smith et al. (2001) and NYSDEC (2017).

- The initial survey will include a qualitative timed-area visual search of Areas 1 and 2 (area of direct effects) and the buffer zones (area of indirect effects) to document the mussel species present at the site, including T&E mussels (e.g. green floater, brook floater), and their general relative abundance. The general location of mussel beds or mussel concentration areas, if present, will be documented at this time.
- The second survey will include a quantitative search of Areas 1 and 2 only (area of direct effects), or a portion of these, as needed, using visual and excavation search techniques, only in areas where state-listed T&E mussel species are found, if any, during the qualitative survey. The purpose of the quantitative survey is to provide an estimate of the density (per quadrat) and abundance (number) of T&E mussels that may be impacted by remedial activities.

2.3.1 Qualitative Mussel Survey

The following procedure will be used to complete the qualitative mussel survey:

- Verify that water conditions are appropriate for mussel surveys prior to starting (i.e. low flow, low turbidity, good visibility). Use USGS stream gage information, rainfall amounts, weather predictions / forecasts, etc. to help make determinations prior to mobilizing.
- Identify the areas to be surveyed: Area 1 (Figure 3) and Area 2 (Figure 4) including buffer zones located 100 m upstream and 200 m downstream of each area.
- Divide each Area 1 and Area 2 (including buffers) into 25 or 50-meter-long (or different interval as needed) river segments (cells) and measure the river width with a range finder or survey tape to calculate approximate cell surface area (m^2). This may be done in advance using mapping software.

Note that the total surface area of each cell will be used to determine the amount of time observers will search for mussels based on an anticipated search rate (see below).

- Record the general habitat and substrate conditions per cell by visually estimating the percent contribution of each particle grain size (i.e. boulder, cobble, gravel, sand, silt and clay) along with any other pertinent physical habitat information.
- Measure the water depth and flow of each cell in the main channel.
- Use a water quality meter to record water quality parameters (temperature, dissolved oxygen, turbidity, pH, and conductivity) in the main channel once per day, and more frequently if needed based on water quality differences.
- Don appropriate PPE and gear (either snorkeling or SCUBA equipment depending on water depths and conditions).
- Work in teams to perform a visual search of each cell providing representative spatial coverage. In water observers should visually search for mussels at the sediment surface but may also fan or probe sediments with their fingers to look for mussels.
- Following the guidance in Smith et al. (2001), the effective sampling fraction should be at least 5%. That is, at least 5% of the total cell area should be thoroughly searched by in water observers with roughly equal spatial distribution throughout the cell. Search rate should be approximately 0.5 square meters per minute (m^2/min) but may vary depending on mussel density.
- Remove any observed live mussels from the sediment and store in mesh bags attached to the observer or place in buckets with fresh water by the assisting processing team. Mussels shall be kept cool and out of sunlight and processed as soon as possible.
- Identify and count all collected mussels after completing a survey cell. Once processing is complete, release mussels to the approximate area in the cell from where they were collected. If T&E species are encountered, record a GPS point to mark release location to facilitate future survey, if needed.
- Move to the next cell and repeat the same procedures until all of Areas 1 and 2, including buffer zones, have been searched.
- Record the following information in the field log book: date, time, location, personnel, weather, and any other pertinent comments, in addition to the information required above.
- Measure and photograph a subset of up to 10 individuals of each species over the duration of the qualitative survey and, if necessary, retain up to 5 individuals of each species to voucher for verification purposes.

2.3.2 Quantitative Mussel Survey

If T&E species are observed during the qualitative surveys, quantitative sampling will be conducted to estimate species density and abundance. The design of the quantitative sampling will generally follow the procedures identified by Smith et al. (2001), NYSDEC (2017) and/or Clayton et al. (2016). Quantitative survey locations will be identified using following rationale.

- If T&E mussel species are observed, transects will be established where the T&E mussels were located (as observed during the qualitative survey) in Areas 1 or 2 (or both), or a portion of the area, as applicable. Along each transect, quadrats (0.25 m^2) will be established and visually searched to conduct the quantitative mussel survey. A subset of the quadrats will be excavated. Note that Areas 1 and 2 (areas of direct effect) will be treated as two separate areas. If T&E mussel species are observed in Area 2 but not in Area 1 during the qualitative survey, then a quantitative survey would occur only in Area 2, or a portion of Area 2 only (and vice versa, or both).
- A minimum length of 500 meters of transects is recommended by Clayton et al. (2016). However, transect lengths may be adjusted based on the size of the survey area. Transects will be placed perpendicular to the river flow but may be placed parallel to the river flow if conditions warrant.
- Transects will be evenly spaced approximately 10 m apart. Quadrats will be placed along the transects following a random systematic start and spaced approximately 5 or 10 m apart. Smith et al. (2001) recommends a minimum of 100 quadrats (per area) to provide a reliable population estimate, with a quadrat size is 0.25 m^2.

The following procedures will be used to conduct the quantitative mussel survey.

- Verify that water conditions are appropriate for mussel surveys prior to starting (i.e. low flow, low turbidity, good visibility). Use USGS stream gage information, rainfall amounts, weather predictions/ forecasts, etc. to help make determinations prior to mobilizing.
- Identify the transects and quadrats to be surveyed.
- Use a water quality meter to record water quality parameters (temperature, dissolved oxygen, turbidity, pH, and conductivity) in the main channel once per day, and more if needed based on water quality differences.
- Don appropriate PPE and gear (either snorkeling or SCUBA equipment depending on water depths and conditions).
- Perform a visual search of each 0.25 m^2 quadrat by direct observation of an in-water observer. In water observers should visually search for mussels at the sediment surface but may also fan or probe sediments with their fingers to look for mussels. Remove and count all observed live mussels.
- Excavate a subset of the 0.25 m^2 quadrats to a depth of approximately 10 centimeters (cm) (if possible) or until sediments are not suitable for mussel burrowing (e.g. hardpan, bedrock, anoxic sediments, etc.). The excavated sediment will be sieved using a coarse mesh screen (e.g. ½ inch [in] or similar) to separate the mussels from the substrate matrix. The number of quadrats excavated will be based on the number of mussels identified visually at the surface compared to those found below the surface during excavation to calculate a percent visible at the surface as outlined in Smith et. al (2001). Test plots will be evaluated during the qualitative survey, if time allows, of up to 25 randomly-selected quadrats to provide the percent estimate prior to performing the quantitative survey.
    - Excavate 25% of the visual quadrats if > 60% of the mussels were visible at the surface
    - Excavate 33% of the visual quadrats if 50-60% were visible at the surface
    - Excavate 50% of the visual quadrats if 40-50% were visible at the surface

  - Excavate 100% of the visual quadrats if less than 40% were visible at the surface

- Remove any observed live mussels from the sediment and store in mesh bags attached to the observer or place in buckets with fresh water by the assisting processing team. Mussels shall be kept cool and out of sunlight and processed as soon as possible.
- Identify and count all quantitative visual and excavated mussels from the survey separately. Once processing is complete, release mussels to the area where they were collected.
- Record the general habitat and substrate conditions by the quadrat where the T&E species was collected (if encountered). Visually estimate the percent contribution of each particle grain size (i.e. boulder, cobble, gravel, sand, silt and clay) and measure water depth and flow. If many T&E species are found, record the general habitat and substrate conditions on a subset of locations (i.e. enough to document habitat use by that species).
- Move to the next quadrat and repeat the same procedures until all transects and quadrats have been surveyed.
- Record the following information in the field log book: date, time, location, personnel, weather, and any other pertinent comments, in addition to the information required above.
- Measure and photograph a subset of up to 10 individuals of each species over the duration of the quantitative survey, and if necessary retain up to 5 individuals of each species to voucher for verification purposes.

2.4 Emergency Response and Notifications

Specific procedures for responding to site emergencies will be detailed in the HASP and DSP. In the event of a fire, explosion, or other release which could threaten human health outside of the site or when NYSEG or Arcadis has knowledge of a spill that has reached surface water, NYSEG or Arcadis will immediately notify the National Response Center (800-424-8802) in accordance with 40 CFR Part 262.34. Other notifications to state agencies may also be necessary.

3 FIELD INSTRUMENTS

All electronic field equipment that can be calibrated will be done so prior to each day's use. Additional calibration may be required if measurements appear erroneous. The calibration procedures will conform to the manufacturer's standard instructions. Records of all instrument calibration will be maintained by the field personnel. Copies of all the instrument manuals will be available on site to field personnel.

4 REFERENCES

Clayton, J.L.[1], B. Douglas[2], and P. Morrison[2]. 2016. West Virginia Mussel Survey Protocols. April. 1 = West Virginia Department of Natural Resources (WVDNR). 2 = United States Fish and Wildlife Service (USFWS).

NYSDEC. 2017. *General Guidelines for Mussel Surveys and Surveyor List.* Transmitted via email on October 26 by Mary Jo Crance of NYSDEC to Tracy Blazicek of NYSEG.

Smith, D.R., R.F. Villella, and D.P. Lemarie. 2001. *Survey Protocol for Assessment of Endangered Freshwater Mussels in the Allegheny River, Pennsylvania.* Journal of the North American Benthological Society. Vol. 20 (No. 1):118-132.

APPENDIX B

Dive Safety Plan

ARCADIS Design & Consultancy for natural and built assets

NYSEG

SITE-SPECIFIC DIVE PLAN AND HEALTH AND SAFETY PLAN SUPPLEMENT

2018 Cortland-Homer Former MGP Site
West Branch Tioughnioga River Surveys

May 2018

SITE-SPECIFIC DIVE PLAN AND HEALTH AND SAFETY PLAN SUPPLEMENT

2018 Cortland-Homer Former MGP Site
West Brand Tioughnioga River Surveys

Prepared for:

New York State Electric & Gas Company

Prepared by:

Arcadis of New York, Inc.
One Lincoln Center
110 West Fayette Street
Suite 300
Syracuse
New York 13202
Tel 315 446 9120
Fax 315 449 0017

Our Ref.:

B0013137.0006.00008 #10

Date:

May 2018

CONTENTS

ATTACHMENT

A Scientific Dive JSA

1 SCOPE

Arcadis Scientific Divers will perform qualitative and quantitative mussel surveys within the West Branch of the Tioughnioga River in Homer, New York. Diving operations will be conducted according to this Dive Plan. Additional guidance is available in the Arcadis Dive Safety Manual and the site-specific Health and Safety Plan (copies of these documents will be available on site in field vehicles).

West Branch Tioughnioga River Surveys – Homer, New York **New York State Electric & Gas Company**		
Project Personnel:		
Principal in Charge (PIC)	Keith White – Arcadis	(o) 315.671.9530
Project Manager (PM)	Jason Golubski – Arcadis	(o) 315.671.9437
New York Gas & Electric Company (NYSEG) Responsible Person	Tracy Blazicek – NYSEG	(c) 607.237.5325
Project Health and Safety	Daniel Zuck – Arcadis	(c) 516.369.2741
Diving Supervisor	Dave Buys – Arcadis	(c) 315.263.6192 (c) 773.251.7285
Lead Diver/Scientific Diving Safety Officer	Dave Buys – Arcadis	(o) 315.671.9400 (c) 315.263.6192
Scientific Divers	Matt Frackelton – Arcadis	(c) 315.430.5294
	Mike Long – Arcadis	(c) 609.240.5646
	Nick Firman – Arcadis	(c) 315.559.6075
Quality Assurance/Quality Control Support	Jason Vogel – Arcadis	(c) 315.289.7865

TIMELINE: May to October 2018 (tentative)

2 DIVERS/EXPERIENCE

Arcadis:

- Dave Buys – Lead Diver/Scientific Diving Safety Officer: 4 years diving for Arcadis, 20 years aquatic ecology experience; familiar with riverine conditions and biota, low visibility, cold water
- Matt Frackelton – Scientific Diver: 4 years diving for Arcadis, 14 years aquatic ecology experience; familiar with riverine conditions and biota, low visibility, cold water
- Mike Long – Scientific Diver: 3 years diving for Arcadis, 8 years aquatic ecology experience; familiar with riverine conditions and biota, low visibility, cold water
- Nick Firman – Scientific Diver: 2 years diving for Arcadis, 2 years aquatic ecology experience; familiar with riverine conditions and biota, low visibility, cold water

3 GENERAL SITE CONDITIONS AND SCOPE OF WORK

Project: West Branch Tioughnioga River – Mussel Surveys

NYSEG - Cortland-Homer Former MGP Site, Homer, New York

The Cortland-Homer Former MGP Site (Study Area or Site) is located in the Village of Homer, Cortland County, New York. The Site consists of two operable units (OUs): OU-1 encompasses the former MGP plant west of US Route 11; and OU-2 includes a portion of the NYSEG property east of US Route 11 that is hydraulically downgradient from OU-1 (Figure 1). OU-2 also includes sediments in the West Branch of the Tioughnioga River containing MGP-related impacts. The upland portion of OU-2 parcel is bordered by US Route 11 to the west, and commercial properties to the north and south, and includes the West Branch of the Tioughnioga River to the east. The West Branch of the Tioughnioga River flows south past OU-2 toward the City of Cortland with Interstate 81 to the east and various private, commercial, and County-owned properties west of the downstream portion of the river. The river bends to the southeast approximately 3,600 feet downstream of the upland portion of OU-2 to the confluence of Dry Creek with the Tioughnioga River known as the “sediment trap” which is considered the downstream extent of OU-2. NYSEG owns the wooded parcel of land at this bend, end of Front Street, west of the railroad and east of the West Branch of the Tioughnioga River. OU-2 has been investigated for the past 33 years based on the potential migration of MGP-related impacts to sediment.

As part of continuing Pre-Design Investigation (PDI) assessment activities, Arcadis conducted a habitat assessment for in-river portions of OU-2 (Areas 1 and 2) in October 2017 (Figure 2). Representatives from the New York State Department of Environmental Conservation (NYSDEC) Division of Fish and Wildlife (DFW) were on-site during the assessment to review site conditions first-hand. While on-site, DFW observed relic shells of the green floater mussel (Lasmigona subviridis). The green floater is a threatened mussel species in New York State that is in “imminent danger of extirpation or extinction” (section 182.2[h] of 6NYCRR Part 182) and is known to occur at select locations and watersheds within the region.

Accordingly, NYSDEC requested that mussel surveys be conducted to further assess the presence and/or absence, and abundance of the green floater or other mussel species in the remediation area of the Tioughnioga River (Figure 2).

Under the current draft Mussel Survey Work Plan (Arcadis 2018), the mussel survey at the site will be performed in two phases following the general protocols outlined in Smith et al. (2001) and NYSDEC (2017). The first survey will include a qualitative timed-area visual search for mussels in Areas 1 and 2, and in 100 meter (m) upstream and 200 m downstream buffer zones (Figures 3 and 4). This survey intends to document the mussel species present at the site, including T&E mussels, and their general relative abundance. The second survey will include a quantitative search using visual and excavation search techniques in 0.25 m2 quadrats. This survey will occur only in areas where state-listed T&E mussel species are found, if any, during the first survey (e.g. green floater, brook floater). It is intended to provide a better estimate of the number of T&E mussels present at the site that may be impacted by remedial activities.

The mussel surveys will be conducted using in-water workers using snorkeling and/or diving techniques. In water less than 1 m deep, snorkeling may be employed using teams of at least two scientists with

masks and snorkels to systematically search each cell. For water depths greater than 1 meter deep, or when deemed necessary, divers using SCUBA equipment will be used. The details of the two mussel surveys are provided below.

Qualitative Survey – Procedures for the qualitative mussel survey will generally follow those recommended by NYSDEC (2017) and described by Smith et al. (2001). This will involve timed-area visual searches for live mussels in Areas 1 and 2 and in 100 m upstream and 200 m downstream buffer zones (Figures 3 and 4). Each of the two areas (Area 1 and buffers, Area 2 and buffers) will be divided into smaller cells to get better resolution on where mussel beds may be found in each (e.g. the width of the river [approximately 20 m on average] by 25 to 50 m river lengths downstream). Each cell will be searched for mussels by in-water observers using an effective search rate of approximately 0.5m2/min and an effective sampling fraction of 5% of the area of the cell (Smith et al 2001). The area of each cell will be calculated beforehand to determine the sampling time so that survey search times are standardized.

Cells will be assessed visually for mussels by direct observation during the qualitative survey but may also include fanning loose sediment or raking/probing the substrate surface gently with fingers. Any observed live mussel will be removed from the sediment and stored in mesh bags attached to the observer or placed in buckets with fresh water by the assisting processing team. After completing a cell, all mussels collected will be identified and counted. A subset of up to 25 individuals of each species will be measured and photographed over the duration of the project, and up to 5 individuals of each species may be vouchered for verification purposes. Once processing is complete, mussels will be returned to the approximate area in the cell from where they were collected, and the dive team will move to the next cell. If T&E species are encountered, GPS points will be recorded to mark their release location.

Quantitative Survey - If T&E species are observed during qualitative sampling, quantitative sampling will be conducted in the areas they were observed to estimate species abundance and to assess uncertainty in the population estimate. The design of the quantitative sampling will generally follow the procedures identified by Smith et al. (2001) and NYSDEC (2017) and will consist of visually searching 0.25 m2 quadrats with random start points systematically placed in areas where T&E mussel species were observed, then followed by excavating a random subset of those 0.25 m2 quadrats. The population estimates produced from the quantitative sampling will be used to determine the mitigation measures that may be needed to preserve the species based on the number of T&E individuals present.

During the visual survey, all 0.25 m2 quadrats will be searched for mussels by direct observation but may also include fanning loose sediment or raking/probing the substrate surface gently with fingers. A subset of quadrats will then be excavated to a depth of 10 centimeters (cm) (if possible) or until sediments are not suitable for mussel burrowing (e.g. hardpan, bedrock, anoxic sediments, etc.). The sediment will be sieved using a coarse mesh screen (e.g. ½ inch [in]) to separate the mussels from the substrate matrix. All mussels from the quantitative visual and excavation surveys will be identified and counted. A subset of up to 25 individuals of each species will be measured and photographed, and up to 5 individuals of each species may be vouchered for verification purposes. Following processing, the mussels will be released back to the quadrat from where they were collected. If T&E species are encountered, the GPS location of the quadrat it came from will be recorded.

As recommended by Smith et al. (2001) for mid-Atlantic and northeastern rivers, a minimum of 100 quadrats are selected initially for the visual searches. This number can be modified based on pre-existing

survey data (variance estimates are needed) or from the findings of the qualitative survey. Of these, a subset is excavated based on the proportion of mussels visible at the surface (i.e. the relationship between surface and total counts is approximately linear). Smith et al. (2001) recommended excavating 25% of quadrats if > 60% of the mussels were visible at the surface, 33% of quadrats if 50-60% were visible at the surface, 50% of the quadrats if 40-50% were visible at the surface and 100% of the quadrats if less than 40% were visible at the surface.

4 DIVE SITE HAZARDS AND CONTROLS

The potential hazards associated with dive operations are summarized below, followed by dive protocols to be following during site work. For reference, a Scientific Dive Job Safety Analysis (JSA) is included as Attachment A.

4.1 Physical Hazards

4.1.1 Poor Visibility

Visibility may be compromised by turbidity in the water or from sediment stirred up by divers. If flows/turbidity are too high to safely complete the work divers will not enter the water and work will be postponed. All diving work will be performed using the buddy system and with communications between the down divers and the safety diver and/or support staff on the surface. Divers will maintain visual or tactile contact at all times, if contact is lost, divers will notify each other and the safety diver and surface. If possible, divers will orient themselves downstream of the location while working so that flow will carry disturbed sediment away from their work area.

4.1.2 Obstructions and Debris

The presence of obstructions and debris in the sediment itself is unknown; however, given the experiences during past habitat assessment, debris is limited primarily to natural large woody debris; however, given human use observations other man-made debris (e.g., broken glass, cans) is likely to be encountered. Gloves will be worn by divers at all times and care will be taken when placing hands on substrate and debris. Gloves will be cut-resistant to protect against punctures/abrasion. All personnel not outfitted in buoyant diving gear (i.e., wetsuit) will wear a PFD within 15 feet of water's edge.

In addition, the presence of logs and other debris within slope areas of the creek result in potential engulfment and entrapment hazards. Divers will review underwater conditions and will avoid diving in areas that appear unstable. All diving work will be performed with a buddy and communications between the down divers and the safety diver and/or support staff on the surface in the event of diver(s) becoming trapped. In areas with more potential for difficulty (faster current, potential obstructions, etc.) more experienced divers will perform the in-water work at that location. Crews will discuss what to do in the event of entanglement during the daily safety meeting.

4.1.3 Boating Traffic

Boat traffic is not anticipated due to the lack of boat launches and water navigable by boat at the Site. Kayaks and canoeists may be able to float this portion of the Tioughnioga River; therefore, a dive flag will be prominently displayed, either floating on the surface above the dive team or flown from a high point on the support vessel, whenever diving is conducted. Multiple means of communicating with other vessel operators will be maintained, including, at a minimum an air horn. A support boat/canoe (if used) will position themselves between the active channel and divers, and anchor until the divers surface.

4.1.4 Currents and Wave Energy

The West Branch of the Tioughnioga River flows are typically low without standing waves or rapids, with the velocity less than 1,000 cubic feet per second (cfs). Historic stream gaging station information indicates historic annual mean flows ranging from 90 to 179 cubic feet per second (cfs) (USGS 2018 – StreamStats online at: https://streamstats.usgs.gov/ss/). Peak flow months typically occur from late fall to early spring (November to April). Historic flows from 1967 to 19868 (USGS 2018 – StreamStats online at: https://streamstats.usgs.gov/ss/) are based on a discontinued stream gage station 01508803; which was located on the left bank at downstream side of bridge on Wall Street at Homer and 3.4 miles upstream from the confluence with the East Branch. Once seasonal precipitation slows, during the late spring and early summer months, flows drop to less than 1,000 cfs reaching as low as approximately 30 cfs during July through September. Wave action is not anticipated as the West Branch is relatively narrow and protected by vegetation in Area 1 and is more incised in Area 2 to shelter the water surface from high winds which would cause wave action.

If flows/turbidity are judged to be too high to safely complete the work divers will not enter the water and work will be postponed. No diving will be performed if flow conditions exceed 5,000 cfs measured at USGS gage station 0150900 for Tioughnioga River at Cortland, New York. In areas with more potential for difficulty (faster current, potential obstructions, etc.) the more experienced divers will perform the in-water work at that location. The support staff and/or safety diver will alert down divers to nearby kayak or canoe traffic via the established communication systems.

4.1.5 Weather-Related Hazards

Potential weather-related hazards include heavy rain, electrical storms, increased flow/current, and warm/cold temperatures. These situations have the potential to cause dangerous diving conditions and may impair equipment performance. If unfavorable conditions arise, the Lead Diver will evaluate the safety and performance effects of the conditions. Any member of the dive team can exercise Stop Work authority if unsafe conditions are observed. All work will be suspended if there is a high potential for thunderstorms or other severe weather events. During these conditions, all personnel will immediately seek shelter. In the event that inclement weather is expected, NOAA weather radio (VHF WX Channel) and/or weather apps like Weatherbug and Spark will be monitored to obtain weather condition updates. If divers are in water at the time of weather deterioration, the appropriate command will be communicated between in-water and surface divers via the established communication systems. A daily weather briefing will be discussed during the safety meeting and surface staff will monitor real-time weather information via cell phone and/or VHF marine forecasts throughout the day.

Heat stress is a potential hazard. Hydration will be available, and breaks will be taken as needed. All personnel will monitor each other for signs of heat stress. Anyone with signs will be moved to a cooler location, protected from the sun (e.g., umbrella) and monitored.

Hypothermia is also a potential hazard since work will be potentially conducted in spring and fall. Divers will have adequate insulating dive gear (minimum wetsuit thickness of 3 mil) to maintain body temperature in cold water temperatures (50s and 60s) and will take warming breaks between dives. Water temperatures below 50 will result in a stop work, and discussion of diving efforts with the Site Safety Officer to determine if work can proceed safely and effectively.

4.1.6 Biological Hazards

Biological hazards associated with this dive site are anticipated to be limited to microorganisms (organisms typical of any water body) and potentially aggressive aquatic organisms. Hazards from microorganisms will be addressed through general housekeeping, gear maintenance, and personal hygiene (e.g., equipment cleaning, post-dive hydrogen peroxide/isopropyl douche in your ears, etc.). Fish and other organisms may be present at the site. Resident fish species are not aggressive nor of sufficient size to pose a threat to diver safety. Biota such as turtles or snakes may be a hazard and will be avoided if observed. The "buddy system" will be maintained underwater at all times. Dives will not occur during darkness or twilight hours. As a general rule, no jewelry will be worn during dives and divers will not enter water if bleeding from an open wound. All diving crew members will note daily to boat support personnel any breathing problems (e.g., cold, asthma, etc.).

4.1.7 MGP-Related Constituents-Containing Sediment Hazards

Diving activities will be performed in areas of the river with MGP-related constituents-containing sediment. Divers will clean PPE and personal gear to remove sediment using river water prior to leaving the water each day. Divers will make sure to wash hands or use hand sanitizer after diving and before eating or drinking.

4.2 Diving Operations

Vessel Required: At downstream locations only

Vessel(s) Description: Arcadis Dive vessels: Arcadis 1 –john boat and/or canoe

Equipment Storage: Equipment needed daily will be stored on the boat and in field vehicles, with other equipment stored at offsite facility in Syracuse, New York for use as needed. Filled tanks must be stored in a spot where it will be less than 130 degrees and they are secure. Tanks requiring filling will be stored at the fill location or in a secure location.

River Access: Shoreline access points will be used to portage portable vessels to target survey areas. Area 1 is entirely wadeable. In Area 2, there may be several portions of the target survey areas that are non-wadeable. For non-wadeable areas, the dive vessel will be used to support diver access. At wadeable locations (less than 5-foot water depths), divers will enter the river from the shore and proceed to the sampling location.

Diving Tasks: (X) Science ( ) Oversight ( ) Training ( ) Work.

Mussel Survey: Qualitative Survey

A. Verify that water conditions are appropriate for mussel surveys prior to starting (i.e. low flow, low turbidity, good visibility).
B. Identify the areas to be surveyed: Area 1 (Figure 3) and Area 2 (Figure 4) including buffer zones located 100 m upstream and 200 m downstream of each area.
C. Divide each Area 1 and Area 2 (including buffers) into 25 or 50-meter-long (or different interval as needed) river segments (cells) and measure the river width with a range finder or survey tape to calculate approximate cell surface area (m2). This may be done in advance using mapping software.

Note that the total surface area of each cell will be used to determine the amount of time observers will search for mussels based on an anticipated search rate (see below).

D. Record the general habitat and substrate conditions per cell by visually estimating the percent contribution of each particle grain size (i.e. boulder, cobble, gravel, sand, silt and clay) along with any other pertinent physical habitat information.
E. Measure the water depth and flow of each cell in the main channel.
F. Use a water quality meter to record water quality parameters (temperature, dissolved oxygen, turbidity, pH, and conductivity) in the main channel once per day, and more frequently if needed based on water quality differences.
G. Don appropriate PPE and gear (either snorkeling or SCUBA equipment depending on water depths and conditions).
H. Work in teams to perform a visual search of each cell providing representative spatial coverage. In water observers should visually search for mussels at the sediment surface but may also fan or probe sediments with their fingers to look for mussels.
I. Following the guidance in Smith et al. (2001), the effective sampling fraction should be at least 5%. That is, at least 5% of the total cell area should be thoroughly searched by in water observers with roughly equal spatial distribution throughout the cell. Search rate should be approximately 0.5 square meters per minute (m2/min) but may vary depending on mussel density.
J. Remove any observed live mussels from the sediment and store in mesh bags attached to the observer or place in buckets with fresh water by the assisting processing team.
K. Identify and count all collected mussels after completing a survey cell. Once processing is complete, release mussels to the approximate area in the cell from where they were collected. If T&E species are encountered, record a GPS point to mark release location to facilitate future survey, if needed.
L. Move to the next cell and repeat the same procedures until all of Areas 1 and 2, including buffer zones, have been searched.
M. Record the following information in the field log book: date, time, location, personnel, weather, and any other pertinent comments, in addition to the information required above.
N. Measure and photograph a subset of up to 10 individuals of each species over the duration of the qualitative survey and, if necessary, retain up to 5 individuals of each species to voucher for verification purposes.

Mussel Survey: Quantitative Survey

If T&E species are observed during the qualitative surveys, quantitative sampling will be conducted to estimate species density and abundance. The design of the quantitative sampling will generally follow the procedures identified by Smith et al. (2001), NYSDEC (2017) and/or Clayton et al. (2016). Quantitative survey locations will be identified using following rationale.

A. If T&E mussel species are observed, transects will be established where the T&E mussels were located (as observed during the qualitative survey) in Areas 1 or 2 (or both), or a portion of the area, as applicable. Along each transect, quadrats (0.25 m2) will be established and visually searched to conduct the quantitative mussel survey. A subset of the quadrats will be excavated. Note that Areas 1 and 2 (areas of direct effect) will be treated as two separate areas. If T&E mussel species are observed in Area 2 but not in Area 1 during the qualitative survey, then a quantitative survey would occur only in Area 2, or a portion of Area 2 only (and vice versa, or both).

B. A minimum length of 500 meters of transects is recommended by Clayton et al. (2016). However, transect lengths may be adjusted based on the size of the survey area. Transects will be placed perpendicular to the river flow but may be placed parallel to the river flow if conditions warrant.
C. Transects will be evenly spaced approximately 10 m apart. Quadrats will be placed along the transects following a random systematic start and spaced approximately 5 or 10 m apart. Smith et al. (2001) recommends a minimum of 100 quadrats (per area) to provide a reliable population estimate, with a quadrat size is 0.25 m2.
D. Verify that water conditions are appropriate for mussel surveys prior to starting (i.e. low flow, low turbidity, good visibility). Use USGS stream gage information, rainfall amounts, weather predictions/forecasts, etc. to help make determinations prior to mobilizing.
E. Identify the transects and quadrats to be surveyed.
F. Use a water quality meter to record water quality parameters (temperature, dissolved oxygen, turbidity, pH, and conductivity) in the main channel once per day, and more if needed based on water quality differences.
G. Don appropriate PPE and gear (either snorkeling or SCUBA equipment depending on water depths and conditions).
H. Perform a visual search of each 0.25 m2 quadrat by direct observation of an in-water observer. In water observers should visually search for mussels at the sediment surface but may also fan or probe sediments with their fingers to look for mussels. Remove and count all observed live mussels
I. Excavate a subset of the 0.25 m2 quadrats to a depth of approximately 10 centimeters (cm) (if possible) or until sediments are not suitable for mussel burrowing (e.g. hardpan, bedrock, anoxic sediments, etc.). The excavated sediment will be sieved using a coarse mesh screen (e.g. ½ inch [in] or similar) to separate the mussels from the substrate matrix. The number of quadrats excavated will be based on the number of mussels identified visually at the surface compared to those found below the surface during excavation to calculate a percent visible at the surface as outlined in Smith et. al (2001). Test plots will be evaluated during the qualitative survey, if time allows, of up to 25 randomly-selected quadrats to provide the percent estimate prior to performing the quantitative survey

    - Excavate 25% of the visual quadrats if > 60% of the mussels were visible at the surface
    - Excavate 33% of the visual quadrats if 50-60% were visible at the surface
    - Excavate 50% of the visual quadrats if 40-50% were visible at the surface
    - Excavate 100% of the visual quadrats if less than 40% were visible at the surface

J. Remove any observed live mussels from the sediment and store in mesh bags attached to the observer or place in buckets with fresh water by the assisting processing team.
K. Identify and count all quantitative visual and excavated mussels from the survey separately. Once processing is complete, release mussels to the area where they were collected.
L. Record the general habitat and substrate conditions by the quadrat where the T&E species was collected (if encountered). Visually estimate the percent contribution of each particle grain size (i.e. boulder, cobble, gravel, sand, silt and clay) and measure water depth and flow. If many T&E species are found, record the general habitat and substrate conditions on a subset of locations (i.e. enough to document habitat use by that species).
M. Move to the next quadrat and repeat the same procedures until all transects and quadrats have been surveyed.

N. Record the following information in the field log book: date, time, location, personnel, weather, and any other pertinent comments, in addition to the information required above.
O. Measure and photograph a subset of up to 10 individuals of each species over the duration of the quantitative survey, and if necessary retain up to 5 individuals of each species to voucher for verification purposes.

Diving Equipment

SCUBA – SCUBA cylinders will be purchased or rented from a reputable dive shop (Aquatic World, Syracuse NY). The cylinders will be fully serviced and full upon arrival. Subsequent tank fills will be performed by a reputable dive shop or will be filled by a portable air compressor by trained members of the crew. Two of the dive team members (Dave Buys, Matt Frackelton) on site have been trained through a PADI shop to fill tanks. Tanks will be transported to/from the fill stations by DOT trained staff. Divers will inspect the air fill system and verify that they hold proper testing results and certifications. Tanks will be tested using the carbon monoxide gas analyzer prior to use by divers.

Each diver will bring his/her personal gear or rent from a reputable dive shop – certification/maintenance records will be provided upon request.

Refill Station:	1) Aquatic World (114 Kreischer Rd, North Syracuse, NY 13212) 2) Portable air compressor
Tank Diving:	Arcadis: Dave Buys, Matt Frackelton, Mike Long and Nick Firman
Special Equipment Required:	Full face masks with communication capabilities and sampling equipment
Dive Time per Day:	Cumulative dive time ≤ 10 hours per day* * Divers will abide by dive computers that will take into account depth, total dive time, and time in between dives. Each diver will have their own computer; therefore, two dive computers per team.
Number of Divers per dive:	Minimum personnel requirements for each of the studies are provided below: Mussel Surveys: 3-person team including two divers and one boat tender/safety diver
Night Dives:	No
Decompression Required:	No

5 EMERGENCY MANAGEMENT

5.1 Equipment Checklist

- Save a Dive Kits and back up regulators and hoses
- Dive Plan
- HASP
- First Aid Kit
- AED
- Cellular phone
- Extra set of dry clothes/protective clothes
- USCG-approved life jackets

5.2 Training

- Check out dive

5.3 Transport Plan

In the event of an emergency the police and emergency medical services will be contacted immediately via telephone (9-1-1). The survey area is located along the West Branch of Tioughnioga River, and designated emergency access points will be identified along the river and used as necessary. Depending on the nature of the emergency, Divers Alert Network (DAN) will be contacted.

Name	Telephone Number
Off-Site Fire, Police, and Ambulance	9-1-1
Cortland Regional Medical Center	607.756.3500
Poison Control Center	800.222.1222
Divers Alert Network	919.684.2948
Arcadis Project Health & Safety (Daniel Zuck)	516.369.2741
Arcadis Project Manager (Jason Golubski)	315.671.9437
NYSEG Responsible Person (Tracy Blazicek)	607.762.8839

5.4 Check-In Plan

At the conclusion of each day a designated representative on the team will call Jason Golubski (Arcadis Project Manager) at 315.671.9437 to let him know that crew is safely off the water.

Each evening a member of the crew will send out an email to the project team detailing what was accomplished that day, any notable events or near misses and the plan for the following day including what time and where the team anticipates working.

5.5 Emergency Response Plan

5.5.1 Emergency Recognition

Prior to work start-up, project personnel will review and sign this emergency response plan. The site safety officer will make this plan available for review and photocopying. Employees shall also become familiar with site features relevant to this plan (telephones, facilities, emergency equipment, etc.).

In emergency situations, personnel will stop work immediately, shut down operations, evacuate the incident area, and report to the SSO for further assistance and instructions. Appropriate first aid will be administered. Emergency contacts will be made immediately. Emergency situations will be handled by offsite support personnel; however, initial response and first aid will be available from qualified onsite personnel.

The following shall be considered emergency situations:

- Medical emergencies – Diving
- Fire/Explosion
- Exposure/Hypothermia
- Heat stroke
- Unanticipated Hazards

5.5.2 Procedures for Handling Emergencies

In the event of an emergency, the information available at the time must be properly evaluated and the appropriate steps taken to implement the emergency response plan.

The emergency response procedure is as follows: 1) contact 9-1-1 first if life threatening 2) contact Jason Golubski (315.671.9385), Denis Balcer (614.778.9171), and Tracy Blazicek (607.762.8839). A field crew member will call 9-1-1 from the nearest phone, notify authorities of your location and the point at which you will meet them, evacuate personnel as needed, and take other steps needed to gain control of the emergency.

The following information shall be given when reporting an emergency:

1. Name and Location of person reporting the incident
2. Location of accident/incident
3. Name and affiliation of injured party(s)
4. Description of injuries, spill, fire, or explosion
5. Status of medical aid and/or other emergency control measures
6. Details of chemicals involved (if applicable)
7. Summary of accident, including suspected cause and time it occurred
8. Temporary control measures taken to minimize further risk

Once emergency response agencies have been notified, the appropriate project personnel (PM, PIC, client contact) will be notified immediately.

5.5.3 Medical Emergencies

Personnel should always be on the alert for signs and symptoms of illnesses related to chemical, physical, and biological factors onsite. Severe injuries resulting from accidents must be recognized as emergencies and treated as such. All divers on site shall be currently trained in First Aid, CPR, and automated external defibrillator use.

If a medical emergency occurs, the Diving Supervisor will announce the emergency or sound the emergency alarm (e.g., air horn), upon which all work must stop. Personnel with current first aid training will evaluate the injury or illness and determine its severity. First aid should only be performed to limit further injury or stabilize the victim. Personnel are not to move or transport victims unless doing so does not pose an immediate threat to their life, or if timely emergency medical response is impossible due to the remoteness of the site. The routes to the nearest medical facilities are described below.

5.5.4 Emergency First Aid Procedures

If an employee is physically injured, Red Cross (or equivalent) first aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the employee can be moved, they will be taken to a stable and secure area where emergency first aid can be administered and transportation to local emergency facility awaited.

5.5.5 First Aid Procedures

- Remove the injured or exposed person(s) from immediate danger
- Render first aid if necessary
- If necessary, call an ambulance for transport to local hospital immediately
- Report the accident to the project team and client contact immediately

5.5.6 Directions to Hospital/Emergency Transport Plan

In the event of an on-water emergency, the injured diver will be brought onboard the vessel or taken to shore and transported to the nearest creek access point. Once at the access point, the injured diver will be transferred to the care of emergency medical technicians/paramedics (if the injury merits emergency medical attention) or taken by other team members in an Arcadis vehicle to the hospital (if emergency attention is not needed but professional medical attention is necessary).

Directions from potential access routes along the creek to the hospital are provided below. The hospital address is Cortland Regional Medical Center, 134 Homer Avenue, Cortland, New York, 13045.

- From Area 1 access point: Take US-11 South (South Main Street), which will become Homer Avenue. The Cortland Regional Medical Center will be approximately 1 mile south on the right.
- From Area 2 access point: Take Front street southeast towards Willow Avenue Extension. Front Street becomes North Street. Make right onto Rickard Street. Take first right onto Grant Street. Turn right onto US-11 N / NY-41 / North Main Street. Turn right onto Homer Avenue / US-11 N / NY-41.

The Cortland Regional Medical Center is ahead on the left (before Alvena Avenue/ North Main Street intersection).

6 REFERENCES

Clayton, J.L.1, B. Douglas2, and P. Morrison2. 2016. West Virginia Mussel Survey Protocols. April. 1 = West Virginia Department of Natural Resources (WVDNR). 2 = United States Fish and Wildlife Service (USFWS).

NYSDEC. 2017. General Guidelines for Mussel Surveys and Surveyor List. Transmitted via email on October 26 by Mary Jo Crance of NYSDEC to Tracy Blazicek of NYSEG.

Smith, D.R., R.F. Villella, and D.P. Lemarie. 2001. Survey Protocol for Assessment of Endangered Freshwater Mussels in the Allegheny River, Pennsylvania. Journal of the North American Benthological Society. Vol. 20 (No. 1):118-132.

ATTACHMENT A

Scientific Dive JSA

JOB SAFETY ANALYSIS – Scientific SCUBA Diving

JSA Type: Environmental Operations	**JSA #**: 2018-04-01	☐ New ☒ Revised	**Date**: 04/01/2018
Work Type: Ecological	**Work Activity**: NYSEG Mussel Survey		

Development Team	Position/Title	Reviewed By	Position/Title
Matt Frackelton	Project Scientist	Dave Buys	Sr. Scientist
Allison Chapin	Project Scientist	Kurt Merkle	Health and Safety Officer
		Allison Chapin	Project Scientist

Job Steps	Potential Hazard(s)	Critical Action(s)
1. Verify that field crew has completed/reviewed necessary paperwork and are current on required training	Administrative function - no hazards anticipated	1. Employees must have required training (i.e., OSHA 40-Hour HAZWOPER/8-hour refresher, First Aid/CPR, LPS, medical/diving clearance, activity specific – vehicle/vessel operation, requisite SCUBA certifications). **STOP: Do not mobilize to site if required training/certifications (or path forward for completion) not complete and confirmed with Project Manager.**
2. Gather field equipment, PPE and supplies	Slips/trips/falls, lifting hazards (sprains/strains)	1. Use care and proper lifting techniques when transporting and loading heavy items (lift with legs, not back). Use the toe test to determine weight of equipment. If you can't move equipment with your toe, get a buddy to help lift/move. Use dollies, carts, sleds, etc. to move material. 2. Keep work area free of debris and hazards. 3. Awareness of foot placement - be deliberate about where you step. Wear appropriate footwear with non-slip soles. Minimize gear to the extent possible and store appropriately. Maintain housekeeping. Never carry a load that impairs your vision. Walk with hands out of your pockets in case you have to catch your balance. If falling, roll with head tucked into the body to avoid impact on arm or wrist. **STOP: Do not lift/carry heavy or oversized equipment without a buddy.**
3. Fill SCUBA tanks and verify that tanks were properly inspected, filled, and tested for carbon monoxide (CO) contamination	Struck-by injuries, caught between injuries, eye/face injuries	1. Verify that the refill station has a current compressor certification stating that it meets specifications set forth by the Compressed Gas Association (CGA Pamphlet G-7.1) and referenced in OSHA 29 CFR 1910.134. 2. Tanks must be inspected annually for signs of stress cracks, rust, corrosion, or other causes of failure. Current annual visual inspection sticker should be on tank. 3. Tanks must be hydrostatically tested every 5 years to verify that the tank is safe to transport and use at its recommended operating pressure (verify test stamp is within 5 years). 4. Inspect tank O-ring. If in good condition proceed, if worn, repair or replace. 5. Ensure that the span calibration of the Analox EII CO analyzer is within date (6 months), that it has been zero calibrated, and bump tested before use. 6. Test the CO of each tank by pushing the sampling dome of the Analox EII CO analyzer into the sensor aperture and slowly opening the tank valve with hand while looking away from tank (protecting face/eyes from accidental rupture) allowing air to flow through valve. 7. Close the pillar valve after 30 seconds when a stable reading is observed on the EII CO and press the "ON" button to hold the reading. 8. Carbon monoxide should not exceed 3 ppm. If under, CO test is negative and you can proceed. If over 3 ppm, CO test is positive, and all of the air must be bled from the tank, the tank must be refilled and retested.

		STOP: Do not proceed if air source is compromised or if equipment is found to be in poor repair.
4. Mobilize to the site (also applies to demobilization)	Traffic and emergency hazards (vehicular accident in transit to site, flat tire)	1. Verify that all employees have accurate and understandable directions to the site. 2. Obey applicable traffic laws and regulations. 3. Avoid driving when tired. 4. Use cell phones for emergency contact when pulled over. Do not use cell phones while driving. 5. Drivers of vehicles/trailer exceeding 10,001 lbs must meet CMV requirements and complete associated training. 6. Inspect vehicle and trailer lights, assure boat and trailer are properly attached and secure. Field personnel are responsible for checking and inspecting equipment in advance of mobilization for field activities. Complete vehicle inspection checklist. 7. Maintain extra driving distance when pulling a trailer. **STOP: Do not travel until CMV requirements, if needed, and ARCADIS Vehicle Inspection Checklist are confirmed/completed.**
5. Inspect work boat, pre-work preparation.	Non-seaworthy boat, system failure, drowning, fire hazard from gasoline on board, employees unfamiliar with work, temperature extremes/hazards, and extreme weather (e.g., lightening)	1. A complete boat inspection checklist must be conducted by the boat operator in accordance with accepted USCG and applicable state boating safety inspection procedures. 2. The inspection must verify that necessary safety equipment is aboard, functioning properly, and all members of the crew are aware of proper procedures that are to be followed upon the water. Boat must have a functioning set of oars and an anchor that is sized to the boat with an anchor line based upon maximum anticipated water depth. 3. All powerboats shall have a valid state registration. This registration shall be maintained on the boat, and as necessary be made available for USCG or Marine police inspection. 4. At a minimum, each powerboat shall be equipped with a Type 4-A, 10-B, C rated fire extinguisher, and proper stowage of flammable materials. **STOP: If equipment is found to be in poor repair or missing. Equipment found in poor repair will be taken out of service and replaced with appropriately functioning equipment.** 5. Each employee working from a boat is required to participate in a boating safety training session conducted during the daily safety meeting. The training session shall provide instruction on proper boat and safety equipment inspections; content and frequency of equipment safety inspections; proper use of on-board safety equipment, including fire extinguisher, horn, throw ring, etc.; appropriate boating “rules-of-the-road”; emergency procedures in the event of capsizing or being thrown overboard; different types of PFD and their proper inspection and use. 6. Prior to work, employees should check the following: weather forecast to prepare for anticipated conditions; to determine if river flows are at safe levels USGS website: https://waterdata.usgs.gov/usa/nwis/uv?ite_no=01509000 **STOP: No work if flows are unsafe** 7. Monitor for heat stress. Take breaks and consume fluids as necessary. Wear appropriate clothes for the weather including rain suits, hat, and use sunscreen as necessary. Employees should dress for the weather and potential weather changes (e.g., dress in layers so that cloths can be removed/added as needed for heat, cold, or moisture). (Cold temperatures not anticipated, re-evaluate/TRACK if encountered.) 8. Check local weather forecasts daily prior to commencement of work. Avoid work in extreme weather conditions. Utilize mobile app feature on weather bug (Spark) which provides warnings and updates on the distance to nearest lightning strikes and has a live radar to check for impending rain/thunderstorms. **STOP: No work during severe rain or lightning; wait 30 minutes after lightning sighting to resume work.**
6. Launch boat(s) for in-water activities (also applies to pulling boat from water)	Physical hazards (caught between, struck-by), drowning, vehicular accident	1. A spotter will be used whenever the truck/trailer is being backed into position, or being maneuvered in tight and/or restricted areas. Keep hands away from pinch points as boat is being launched. Do not stand on the tongue of the trailer to launch the boat.

		2. All personnel must wear personal floatation device within 15 feet of water. **STOP: No truck backing without spotter in place.**
7. Gear up and enter the water	Slips/trips/falls, hand/eye/foot injuries (cuts/lacerations), lifting hazards (sprains/strains), asphyxiation, drowning	1. Divers and dive tenders will review the dive plan. 2. Divers will put on dive gear onboard and make sure to turn air tanks on. Not all gear has to be donned onboard (for example, communication masks or regulators may not need to be put on until divers are in the water. 3. Dive buddy teams will perform a predive inspection to verify that gear was donned properly and that they are familiar with their buddy's alternate air source and weight release locations. If gear donned on deck, this check will occur once while on deck and again once divers have entered the water and adjusted their rig. 4. Enter the water either from shore or boat. Watch for underwater obstructions while entering – if encountered, enter the water in a different location. 5. Use proper lifting techniques to lower an inflated BCD/tank/reg setup into the water to the diver. 6. Dive support staff will always maintain visual contact with the divers while they are on the surface. **STOP: Do not enter water without buddy check on gear.**
8. Conduct predive inspection and descent.	Equipment malfunction, puncture injuries, communication failure	1. Review the dive plan, communication signals (visual, tactile, and audible) and surface orientation prior to descending. 2. Divers will conduct diver-to-diver and diver-to-surface communication checks from just below the water surface prior to descent. 3. Prior to descending, divers will look below to make sure the visible portion of their descent is free from obstructions. Should an obstacle be encountered, the dive team will assess the situation and either safely ascend or move laterally into a safe descent corridor. 4. Divers will maintain visible or tactile communication during the descent. 5. Surface tender will perform a check between the surface and both divers for round-robin communications. 6. If any of the communications equipment is not functioning the dive will be terminated and all divers will be brought back to surface. 7. Should communication to the divers not be possible the dive will be temporarily terminated until communication can be re-established. **STOP: If communication to the divers is not possible the dive will be terminated and all divers will be brought back to surface.**
9. Conduct scientific SCUBA diving.	Drowning, hand/foot injuries (cuts, punctures, lacerations), overexertion. Sampling specific hazards include sharp objects (e.g., metal) on the bottom, debris, fishing line on the bottom. Potential biological hazards include potentially aggressive biota (snakes, turtles).	1. Deploy dive flag at water surface above dive team or on support vessel. Set buoys no more than 75 yards from divers. Position support vessel between divers and boat traffic if applicable. 2. Follow safe diving procedures. 3. Limit dives to the capabilities of the least experienced/comfortable dive team member. 4. Move slowly and deliberately. 5. Dive your planned dive. 6. Maintain communications with dive buddy and surface. 7. All divers will carry a knife capable of cutting through monofilament fishing line or nylon rope. 8. Diver PPE will include cut-resistant gloves, knee pads (only if sharp or unknown debris is expected), and dive boots. Do a site-water rinse of gear after daily diving activities. 9. If potentially aggressive biota (snakes, turtles, etc.) are observed divers will maintain a safe distance or leave the area. 10. Divers will maintain buoyancy to minimize bottom contact as possible. **STOP: Any diver is uncomfortable or not performing appropriately.**

10. Conduct mussel survey	Drowning, hand/foot injuries (cuts, punctures, lacerations), slips/trips/falls, overexertion. Sampling specific hazards include sharp objects (e.g., metal) on the bottom, debris, fishing line on the bottom. Potential biological hazards include potentially aggressive biota (snakes, turtles).	1. Keep divers clear of survey demarcation ropes/lines from entanglement. 2. Maintain buddy system at all times while diving, look for potential hazards in sample location before proceeding. 3. Use cut-resistant gloves while conducting tactile surface searches and excavations for mussels. 4. Use buddy system to carry weights or survey equipment if heavy/awkward. 5. Place/retrieve survey equipment carefully to maintain visibility and avoid sediment disturbance. 6. Use appropriate tools for field processing and identification of mussels. 7. Maintain balance and wade carefully over uneven surfaces when returning mussels to the river.
11. Ascend and board the boat from the water or get out on bank	Head injury (cut, concussion, contusion), slips/trips/falls, hand/eye/foot injuries (cuts/lacerations), lifting hazards (sprains/strains)	6. Prior to beginning your ascent look up to make sure your path is clear. 7. Look up periodically throughout your ascent to ensure your path remains clear. 8. In reduced visibility situations, raise one hand above your head during your ascent to reduce the risk of head trauma. 9. Maintain visual contact with your dive buddy. 10. When possible, doff gear in the water and hand to a dive support staff member or secure to an over-side downline. 11. Always remove fins prior to boarding the boat or getting out of the water. 12. If it is necessary to board the boat with gear on, request assistance from a dive support staff member to help relieve the weight of your gear as you ascend the ladder. 13. Dive support staff use proper lifting technique when bringing diver's gear on board, maintain three points of contact on the boat, avoid pinching delicate gear between tank and gunwale as gear is brought onboard. 14. Secure gear to maintain clear workspace on deck. **STOP: Visual contact lost with dive buddy.**

Personal Protective Equipment (PPE):
Diver support staff and divers when not suited up for diving operations:
- USCG-approved life jacket or buoyant work vests (PFD) required within 15 feet of water

Divers involved in diving operations:
- Dive gear (wetsuit, BCD/tank/reg setup)
- Cut resistant gloves, knee pads (optional, as needed), and dive boots

Arcadis of New York, Inc.

One Lincoln Center

110 West Fayette Street

Suite 300

Syracuse, New York 13202

Tel 315 446 9120

Fax 315 449 0017

www.arcadis.com