



Wetland Restoration Final Monitoring Report – Operable Unit 1

**Revere Smelting & Refining Site
(Site #3-36-053)**

Ecobat Resources New York, LLC

August 22, 2024

Scope and Limitations

This report is subject to, and must be read in conjunction with, the limitations set out below and the assumptions and qualifications contained throughout the Report.

This report has been prepared by GHD for Ecobat Resources New York, LLC and may only be used and relied on by Ecobat Resources New York, LLC for the purpose agreed between GHD and Ecobat Resources New York, LLC as set out in this report.

GHD otherwise disclaims responsibility to any person other than Ecobat Resources New York, LLC arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Ecobat Resources New York, LLC and others who provided information to GHD, which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Acronyms

COCs	constituents of concern
GHD	GHD Consulting Services Inc.
GPS	global positioning system
I-84	Interstate Highway 84
NAD-83	North American Datum of 1983
NWP-38	Nationwide Permit No. 38
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
OU	Operable Unit
OU1	Operable Unit 1
PCN	pre-construction notification
RD/RA	Remedial Design/Remedial Action
ROD	Record of Decision
USACE	United States Army Corps of Engineers
WSP	WSP USA Inc.

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1. Introduction

On behalf of Ecobat Resources New York, LLC (Ecobat), GHD Consulting Services Inc. (GHD) has prepared this Wetland Restoration Final Monitoring Report - Operable Unit 1 (OU1; Report) for the Revere Smelting & Refining Site (Site #3-36-053) located at 65 Ballard Road in Middletown, Orange County, New York (Figure 1). The Ecobat facility is a secondary lead smelter, and historical environmental investigations have identified impacts to environmental media resulting from operations at the site. The site has been listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site #3-36-053. Lead and arsenic are the primary constituents of concern (COCs). This Report was prepared in accordance with requirements outlined in the February 1, 2011, Order on Consent (Index #3-20100528-80; Site #3-36-053; [Order]) entered into by Ecobat, among other parties, and the New York State Department of Environmental Conservation (NYSDEC). The Order, as modified by the 2017 Statement of Basis for the Ecobat site, defines Operable Units (OUs) 1 to 4 as follows:

- OU1 – which is comprised of nine contiguous tax parcels (Tax Parcels 41-1-70.22, 41-1-70.232, 41-1-71.22, 41-1-73.1, 41-1-73.22, 41-1-74.82, and 41-1-76 owned by Ecobat, and two offsite parcels 60-1-120 and 41-1-72.2) totaling 167 acres, less the plant facility and groundwater¹
- OU2 – which represents the groundwater contamination outside the barrier wall surrounding the facility
- OU3 – which represents all offsite media, other than groundwater, impacted by site activities
- OU4 – which represents the plant facility, including groundwater within the barrier wall surrounding the facility

A Record of Decision (ROD) dated September 19, 2011, was issued by the NYSDEC for OU1. The ROD required Ecobat to remove lead and arsenic-contaminated soil and sediment present in areas of OU1 at concentrations above site-specific remedial objectives, followed by restoration of impacted streams and wetlands after removal of contaminated material.

Excavation of OU1 affected streams, wetlands, and upland areas, and subsequent restoration activities were completed in 2014 and 2015 in accordance with the approved February 2013 *Phase II-B Remedial Design/Remedial Action (RD/RA) Workplan* (RD/RA Workplan) prepared by ENTACT LLC (ENTACT 2013). Remediation and restoration work in OU1 was performed under a United States Army Corps of Engineers (USACE) Nationwide Permit 38 (Permit Application Number NAN-2011-00720-WOR).

Stream and wetland restoration was completed in accordance with the June 25, 2014, *Stream and Wetland Restoration Design Report for Operable Unit 1 - Revision 2* (Design Report; WSP 2014a). The Design Report stipulated a minimum post-restoration monitoring period of 5 years, with monitoring beyond the 5-year period to be determined in consultation with the NYSDEC. As-built conditions were documented in 2016, with five years of post-restoration monitoring performed from 2017 to 2021. On March 24, 2022, WSP USA Inc. (WSP) submitted the *Stream and Wetland Restoration Year 5 Monitoring Report of Operable Unit 1* to the NYSDEC (Year 5 Report). In this report, WSP requested that the post-restoration monitoring be discontinued. This request was based on the achievement of post-restoration monitoring benchmarks, and the completion of maintenance activities, which included the treatment of invasive species in the fall of 2021 and planned stream repair activities in the spring of 2022. Completion of these maintenance activities would fulfill the remaining restoration success criteria established in the Design Report (WSP 2022).

In a letter response to the Year 5 Report dated May 24, 2022, the NYSDEC requested that a supplemental restoration maintenance and monitoring plan for continued OU1 post-restoration monitoring related to invasive species cover and stream morphology and bank stability (NYSDEC 2022). The *Supplemental Restoration Maintenance and Monitoring*

¹ The draft 2017 Statement of Basis modified the boundaries of OU4 to include areas where contaminated soil remains in the vicinity of the operating plant site that were not removed during the OU1 remedial action. OU4 was also expanded to include the main driveway entering the site from Ballard Road, to extend the boundary on the eastern and southern sides of the active facility to include those areas up to and including the barrier wall, and to add the wet electrostatic precipitator. In addition, groundwater within the barrier wall beneath the site is added to OU4. Based on these changes, OU1 and OU2 are subsequently reduced by the area added to OU4. OU1 and OU4 comprise approximately 167 acres, of which the modified OU4 is approximately 14.8 acres.

Work Plan (Work Plan; GHD 2022a) was submitted to the NYSDEC on July 1, 2022 and approved by the NYSDEC on July 7, 2022.

The Work Plan included three general components: an assessment of restored areas of the site that contained an estimated 5% or greater coverage of invasive species in Year 5 in the summer of Year 6 (2022) and Year 7 (2023), baseline photo documentation of repaired sections of the Western Stream during the summer of 2022, and subsequent monitoring of these sections in the fall/winter of 2022 and 2023. Due to the timing of potential additional treatment of the invasive species, the Year 6 and Year 7 monitoring reports proposed in the Work Plan were divided into two submittals: one related to presence of invasive species (GHD 2022b, GHD 2023b) and a second submittal focused on the stream restoration (GHD 2023a, GHD 2023c).

On January 12, 2024, the NYSDEC requested via email an additional monitoring report to document final restoration conditions and indicated that no further invasive species treatment would be required at the site (NYSDEC 2024). This Report documents the final conditions of the restored wetlands in OU1 and is organized into the following sections:

- Section 2 presents background information on the site, a description of remediation and restoration activities completed in OU1, a summary of the five years of post-restoration monitoring, and a discussion of maintenance activities and monitoring completed in the restored areas of OU1 during Years 6 and 7;
- Section 3 describes the final data collection activities;
- Section 4 documents the final conditions of invasive species in treated areas of OU1; and
- Finally, Section 5 includes a list of references cited throughout this report.

2. Site Description and History

The following sections provide a description of the site, a summary of remediation and restoration activities completed in OU1, the initial five years of post-restoration monitoring, and maintenance and monitoring activities completed in Years 6 and 7 in the restored ecological areas of OU1.

2.1 Site Location and History

Ecobat operates a secondary lead smelting facility at 65 Ballard Road, approximately seven miles east of Middletown, in the Town of Wallkill, Orange County, New York (Figure 1). The facility is located in a combined rural and industrial area of south-central New York, approximately 6,000 feet northwest of the Wallkill River. The Ecobat facility was constructed in 1970 and acquired by Ecobat in 1973. Ecobat manufactures lead and lead alloys. The major raw material is used lead acid batteries, such as the typical automotive battery. Other raw materials used in production include battery-manufacturing by-products, lead-bearing wastes from battery manufacturers, scrap metal from metal salvage yards, and virgin metal from metal brokers. In addition, Ecobat reclaims polypropylene from battery cases, and in the process, produces sodium sulfate.

The facility consists of several buildings, including the main smelter building, a crystallizer building, a containment building, a wastewater treatment building, six large storm water tanks, and employee and truck parking areas. In addition, a rail spur from the adjacent Norfolk and Southern Railroad right-of-way services the facility. The operational portion of the property (OU4) encompasses approximately 14.8 acres. Ecobat owns the operational property and contiguous undeveloped property to the north and east of the facility and undeveloped property south of the railroad right-of-way. The Ecobat properties consist of the tax parcels listed in the definition of OU1, which together with OU4 comprise approximately 167 acres.

The undeveloped areas of OU1 are in varying degrees of past disturbance that range from second growth forest, reverted farmlands, maintained lawns, and wetlands. North of OU4 are open, overgrown fields, wetlands, and mature woodlands. North of the woodlands is an Exxon service station. East of OU4 is a combination of open, overgrown fields, wetlands, and mature woodlands. Old Dominion Freight Line, Inc., operates in a facility located approximately 0.25-mile southeast of OU1. Interstate Highway 84 (I-84) is located approximately 0.6 mile south of the Ecobat property. A Ball Corporation aluminum can-manufacturing facility is located west across Ballard Road, and additional industrial development is located further west and south.

OU1 contains approximately 11,000 linear feet of stream comprised of seven unnamed reaches (Tetra Tech 2011). The Phase II-B RD/RA anticipated excavation and restoration of impacted streams across four of those reaches, which have historically been named the western stream, eastern stream, pond stream, and combined stream for identification purposes (Sheet 1)². The railroad pond is a man-made flow-through system with a strongly intermittent to perennial outlet stream channel (i.e., the pond stream). The pond stream converges with the western stream south of the railroad right-of-way.

2.2 Remediation and Restoration

In May 2011, Tetra Tech, Inc. of Buffalo, New York, delineated wetlands in OU1 (Tetra Tech 2011). Based on this delineation, lead and arsenic-contaminated soils and sediments subject to removal were located within waters and wetlands of the United States. Under the ROD, Ecobat was also required to restore the impacted waters and wetlands after removal of contaminated material.

Excavation of the affected streams, wetlands, and upland areas, and subsequent restoration activities were completed in 2014 and 2015 in accordance with the approved February 2013 Phase II-B Remedial Design/Remedial Action Workplan (RD/RA Workplan) prepared by ENTACT LLC, on behalf of Ecobat, for OU1 (ENTACT 2013). In Orange

² The combined stream was historically used to identify the reach of the western stream after merging with the pond stream south of the railroad tracks. However, for this document, this segment of the western stream is not identified as a separate reach.

County, New York, the New York District of the USACE has jurisdiction over activities in waters and wetlands of the United States pursuant to Section 404 of the Clean Water Act. Activities related to remediation are authorized under Nationwide Permit No. 38 (NWP-38) subject to the standards and conditions for Nationwide Permits. Under those conditions, parties doing work in freshwater wetlands under NWP-38 are required to submit a Pre-Construction Notification (PCN) to the New York District of the USACE to obtain authorization to commence work.

A requirement of the NWP-38 PCN is the submittal of a wetland restoration plan. Appendix E of the RD/RA Workplan included a separate work plan for determining the final design and restoration details implemented during completion of the Phase II-B RD/RA, including specifications on completing a vegetation survey; topographic and bathymetric surveys; a stream sediment capping plan; and a natural stream restoration design (WSP 2013). This work plan satisfied the NWP-38 PCN requirement and was incorporated into the NWP-38 PCN documentation submitted to the USACE (Permit Application Number NAN-2011-00720-WOR). In a letter dated November 26, 2013, the USACE determined that an individual permit was not required and that the proposed excavation/restoration work could be performed without further authorization under the NWP-38. The data were collected and compiled within the Design Report. The NYSDEC approved the Design Report in a letter dated July 1, 2014.

From 2014 through 2016, approximately 24 acres of wetlands and over 3,500 linear feet of streams in OU1 were remediated and restored as part of the Phase II-B RA (WSP 2020b). Figure 2 depicts the wetlands and stream reaches within OU1 cross-referenced with the area of excavation conducted as part of the Phase II-B RD/RA. Details regarding pre-restoration conditions for the streams and wetlands are included in the Design Report and associated Addendum No. 1 (WSP 2014b).

2.3 Post-Restoration Monitoring (Baseline to Year 5)

OU1 stream and ecological area restoration activities were completed in May 2016. Following the completion of restoration activities, baseline monitoring (as-built conditions) of the restored streams and excavation areas was performed in September 2016 in accordance with the Design Report. Following the baseline event, five years of post-restoration monitoring were conducted between 2017 and 2021. Per the Design Report, the following post-restoration monitoring was performed in OU1:

- As-built construction completion conditions were documented in September 2016, and Year 1 conditions documented in July 2017 (WSP 2018).
- Year 2 wetlands monitoring was conducted in September 2018, while the Year 2 stream survey was completed in November 2018 after the foliage was reduced (WSP 2020c).
- Year 3 wetlands monitoring was conducted in July 2019, while the stream monitoring was completed in December 2019 (WSP 2020a).
- Year 4 wetlands monitoring was conducted in August 2020, with the Year 4 stream monitoring completed in December 2020 (WSP 2021).
- Year 5 wetlands monitoring was performed in July 2021, with the Year 5 stream monitoring completed in December 2021 (WSP 2022).

The Design Report included benchmark criteria to determine the success of the reestablishment of vegetative communities within the disturbed ecological areas (WSP 2014a). Key benchmarks, and their status at the end of the Year 5 monitoring event, are presented below:

- *90-percent or greater survival of trees, to be assessed no later than one-year post-planting.*
 - This benchmark was assessed and met during the 2016 and 2017 monitoring events.
- *Total vegetative cover (defined as ground and canopy cover) of 85-percent within one growing season.*
 - This benchmark was assessed and met during the 2016 monitoring event.
- *Total vegetative cover (defined as ground and canopy cover) of 90-percent by Year 3 of monitoring.*
 - This benchmark was assessed and met during the 2019 monitoring event.

- *Total vegetative cover (defined as ground and canopy cover) of 95-percent by Year 5 of monitoring. Undesirable invasive species cover less than 5-percent of the ground surface in replanted areas after Year 5 of monitoring.*
 - This benchmark was not fully met at the completion of the Year 5 monitoring event. Data collected during the Year 5 monitoring event in 2021 indicated ground cover understory plant community with near 100 percent coverage at almost all wetland survey plot locations and tree survival rates of greater than 85 percent (WSP 2022). However, the Year 5 Report estimated a weighted invasive species³ coverage of 33% in the restored ecological areas. The most prevalent invasive species identified in OU1 included Japanese Stiltgrass (*Microstegium vimineum*), Common Reed (*Phragmites australis*), Thistle (*Cirsium spp.*), Common Mugwort (*Artemisia absinthium*), and Purple Loosestrife (*Lythrum salicaria*). Following the Year 5 monitoring event, corrective action was taken to address invasive species within the restored ecological areas (see Section 2.4 for details).

In their May 24, 2022, comment letter (NYSDEC 2022), the NYSDEC noted that the Year 5 benchmark of 5% invasive species had not been met at the time of the Year 5 monitoring event⁴. As a result, the NYSDEC requested that Ecobat submit the Work Plan. Estimates of invasive species coverage by restored OU1 excavation area post-restoration survey plot at the time of the July 2021 Year 5 monitoring event are presented on Table 1.

2.4 Post-Restoration Monitoring and Maintenance Activities

To evaluate restored wetland and upland areas as described in the Design Report, at total of 43 survey plot locations⁵ were established in accordance with the 1987 USACE Wetlands Delineation Manual and the vegetative sampling work plan provided in the February 7, 2013, *Phase II-B Wetlands Design and Restoration Plan for Operable Unit 1* (Environmental Laboratory 1987 and WSP 2013). Each restored excavation area was assigned one sampling location per acre, with a minimum of one sampling location per excavation area. These survey plot locations were monitored over the five-year post-restoration monitoring period as described in Section 2.3.

Following completion of the Year 4 monitoring event, Ecobat contracted Solitude Lake Management LLC (Solitude) to address invasive species identified within the restored ecological areas of OU1. Solitude is a NYSDEC-registered pesticide business (NYSDEC registration number 16506). To treat the identified invasive species, Solitude recommended application of Aquaneat® herbicide.

In the fall of 2020, in preparation for treatment of invasive species within the restored OU1 wetlands, Ecobat applied to the NYSDEC for an Article 15, Title 3 Aquatic Pesticides Permit and an Article 24 Freshwater Wetlands Permit. Both the Article 15 (Permit ID 3-3352-00145/00070) and Article 24 (3-3352-00145/0069) permits were issued by the NYSDEC, effective November 2, 2020. However, seasonal weather conditions, (freezing/frost), at the time that the permits were issued were no longer favorable for the Aquaneat® herbicide application. Accordingly, invasive species were not treated in 2020, and the Article 15 permit application was resubmitted to the NYSDEC in February 2021. Following approval and permit issuance by the NYSDEC, treatment of invasive species was performed in the fall of 2021 within the restored OU1 ecological areas.

On October 5th and 6th, 2021 (following completion of the Year 5 wetland monitoring event) Solitude treated the site utilizing a marsh master and with backpack sprayers. The backpack sprayers were utilized to treat smaller pockets of invasive vegetation and areas of difficult terrain. Solitude submitted a post-treatment report which detailed the invasive species treatment to the NYSDEC on December 1, 2021 (Solitude 2021).

For years 6 and 7, supplemental monitoring of only those survey plots containing an estimated 5% or greater coverage of invasive species during Year 5 monitoring event was proposed in the Work Plan. As of the Year 5

³ Invasive species are those listed as such in the NYSDEC Prohibited and Regulated Invasive Species list, 6 NYCRR Part 575.

⁴ The NYSDEC comment letter also noted that the Year 5 monitoring event had been conducted prior to treatment of invasive species in OU1. The Year 5 field monitoring event was performed in July 2021, while the invasive species treatment was conducted in October 2021.

⁵ Originally, 35 survey plots were established. Starting with the 2019 monitoring event (Year 3) an additional eight survey plots were added to the annual monitoring program.

monitoring, 10 of the 43 survey plots contained an estimated invasive species coverage of less than 5%. Therefore, 33 of the original 43 survey plots (listed in Table 1) were proposed for monitoring in Years 6 and 7.

In July, 2022, GHD completed the Year 6 monitoring event to assess the effectiveness of the 2021 treatment (GHD 2022). Results from the Year 6 monitoring indicate that while the application of an aquatic herbicide reduced the percent coverage of invasive species in 39% of the plots treated in Year 5, invasive species coverage was still greater than 5% (Table 1). The predominant invasive species identified was again common reed (*Phragmites australis*).

Therefore, Ecobat applied for and received approval to modify the existing permits to add additional target invasive species and change application dates, and again retained Solitude to treat invasive species with herbicides in the fall of Year 6 (2022) utilizing a marsh master and with backpack sprayers. On October 27th and 28th, each of the 33 Year 6 survey plots, as well as nearby survey plots, were assessed for dominate patches of invasive vegetation that are anticipated to spread, and then selectively treated via herbicide application. The backpack sprayers were utilized to treat smaller pockets of invasive vegetation and areas of difficult terrain. Solitude submitted a subsequent post-treatment report that detailed the invasive species treatment to the NYSDEC on November 30, 2022 (Solitude 2022).

GHD completed the Year 7 monitoring event on June 20 and 21, 2023, to assess the effectiveness of the 2022 treatment (GHD 2023). Of the 24 areas that were treated with an aquatic herbicide in October 2022, approximately 46% of the treated areas (11 monitoring locations) demonstrated a decrease in invasive species coverage from Year 6. Six locations (EA-5 [41%], EA-6 [2%], EA-7 [30%], EA-29-A [40%], EA-29-B [40%], and EA-AZ-5 [41%]) were not treated but also exhibited a decrease in invasive species coverage from Year 6. The remaining areas either demonstrated an increase in overall invasive species coverage or no change (Table 1).

Ecobat again applied for and received approval from the NYSDEC to modify the existing Article 24 permit to include additional invasive species and extend the expiration date through November 15, 2023. However, because Aquaneat® was not approved for treatment of the additional invasive species identified, an Article 15 permit was obtained for use of the commercial herbicide Rodeo®. Ecobat again retained Solitude to treat invasive species with herbicides in the fall of Year 7 (2023) utilizing a marsh master and with backpack sprayers. Target invasive species included Common Reed (*Phragmites australis*), Thistle (*Cirsium spp.*), Purple Loosestrife (*Lythrum salicaria*), Autumn Olive (*Elaeagnus umbellata*), garlic mustard (*Alliaria petiolata*), Japanese stiltgrass (*Microstegium vimineum*), Common Mugwort (*Artemisia absinthium*), multiflora rose (*Rosa multiflora*), tree of heaven (*Ailanthus altissima*), and wineberry (*Rubus phoenicolasius*). On September 21st and 28th, 2023, the survey plots, as well as nearby survey plots, were assessed for dominate patches of invasive vegetation that are anticipated to spread. Again, the backpack sprayers were utilized to treat smaller pockets of invasive vegetation and areas of difficult terrain. Solitude submitted a subsequent post-treatment report that detailed the invasive species treatment to the NYSDEC on November 30, 2023 (Solitude 2023).

3. Final Monitoring

As requested by the NYSDEC, a monitoring event to document final restoration conditions of the excavation areas that were treated with an aquatic herbicide in the fall of 2023 was conducted in June 2024. The following sections presents the final post-restoration monitoring activities completed in OU1 related to restored ecological areas in June 2024.

3.1 Invasive Species Monitoring Field Activities

GHD completed the final monitoring event on June 18 and 19, 2024. Survey plots were located using a hand-held global positioning system (GPS) unit. New York State Plane coordinates (NAD-83) of each survey plot are included in Table 1. Survey plots within excavation areas that were treated during Year 7 maintenance activities were the focus of this monitoring event. Once located, each survey plot location was assessed using the same procedures employed during the original five-year post-restoration monitoring period and Years 6 and 7. Monitoring procedures included the following:

- Photographs of each survey plot facing both the north and the south, were taken at each location.
- Invasive species composition and percent cover within a one square meter quadrat were recorded at each survey plot.
- Percent coverage of invasive species was recorded within a 50 to 100-foot radius of each survey plot, depending on access.

The data collected during the final monitoring event are included in Tables 1 and 2, while photographs are included in Appendix A.

3.2 Invasive Species Monitoring Results

The vegetation within the restored wetland areas and adjacent survey plots that were treated in 2023 were assessed as described above in June 2024 as shown on Figure 2⁶. The data recorded at each of the 23 survey plot locations included species composition and percent cover within a one square meter quadrat and percent coverage of invasive species within the 50 to 100-foot radius.

During the final monitoring event, invasive species were documented at greater than 5% coverage at each of the 23 survey plots, 18 of which were treated with an aquatic herbicide in September 2023. The most prevalent invasive species found throughout the site included Japanese Stiltgrass (*Microstegium vimineum*), common reed (*Phragmites australis*), Thistle (*Cirsium spp.*), Common Mugwort (*Artemisia absinthium*), and Purple Loosestrife (*Lythrum salicaria*).

Of the 18 treated monitoring locations treated in 2023, approximately 94% (17 monitoring locations) demonstrated a decrease in invasive species coverage from Year 7. Two locations (EA-2-E [21%] and EA-2-H [22%]) were not treated but also exhibited a decrease in invasive species coverage from Year 7. The remaining areas either demonstrated an increase in overall invasive species coverage or no change.

⁶ If a survey plot was not monitored in 2024 (because it was not selected for treatment in 2023), the 2023 invasive species coverage is considered the final condition.

4. Final Restoration Conditions

As described in Section 2.3, all benchmark criteria to determine the success of the reestablishment of vegetative communities within the disturbed ecological areas were met by Year 5 except invasive species coverage at less than 5 percent (WSP 2022). Following the Year 5 monitoring event, corrective action (treatment with and aquatic herbicide) was taken in Years 5, 6, and 7 to address invasive species within the restored ecological areas. As stated in the Year 5 report, the weighted average of the invasive species across the site after Year 5 was approximately 33%.

At the completion of the Year 7 treatment, invasive species coverage in the survey plots ranged from 2 to 100%. The invasive species identified in 2023 included Common Reed (*Phragmites australis*), Thistle (*Cirsium spp.*), Purple Loosestrife (*Lythrum salicaria*), Autumn Olive (*Elaeagnus umbellata*), garlic mustard (*Alliaria petiolata*), Japanese stiltgrass (*Microstegium vimineum*), Common Mugwort (*Artemisia absinthium*), multiflora rose (*Rosa multiflora*), tree of heaven (*Ailanthus altissima*), and wineberry (*Rubus phoenicolasius*) (GHD2023b). After the application of the aquatic herbicide in 2023, the invasive species coverage ranged from 8 to 81%. Autumn Olive (*Elaeagnus umbellata*), garlic mustard (*Alliaria petiolata*), multiflora rose (*Rosa multiflora*), tree of heaven (*Ailanthus altissima*), and wineberry (*Rubus phoenicolasius*) were no longer identified in the survey plots. Of the 43 plot locations established for monitoring, 11 plots were less than 5% coverage at the end of the monitoring period. Of the remaining 32 plots that were above 5%, 20 plots exhibited a decrease in invasive species from Year 5 through the final monitoring event.

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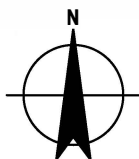
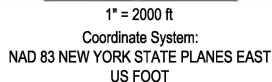
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- WSP. 2022. Stream and Wetland Restoration Year 5 Monitoring Report for Operable Unit 1, Revere Smelting & Refining Site. March 24.

Figures



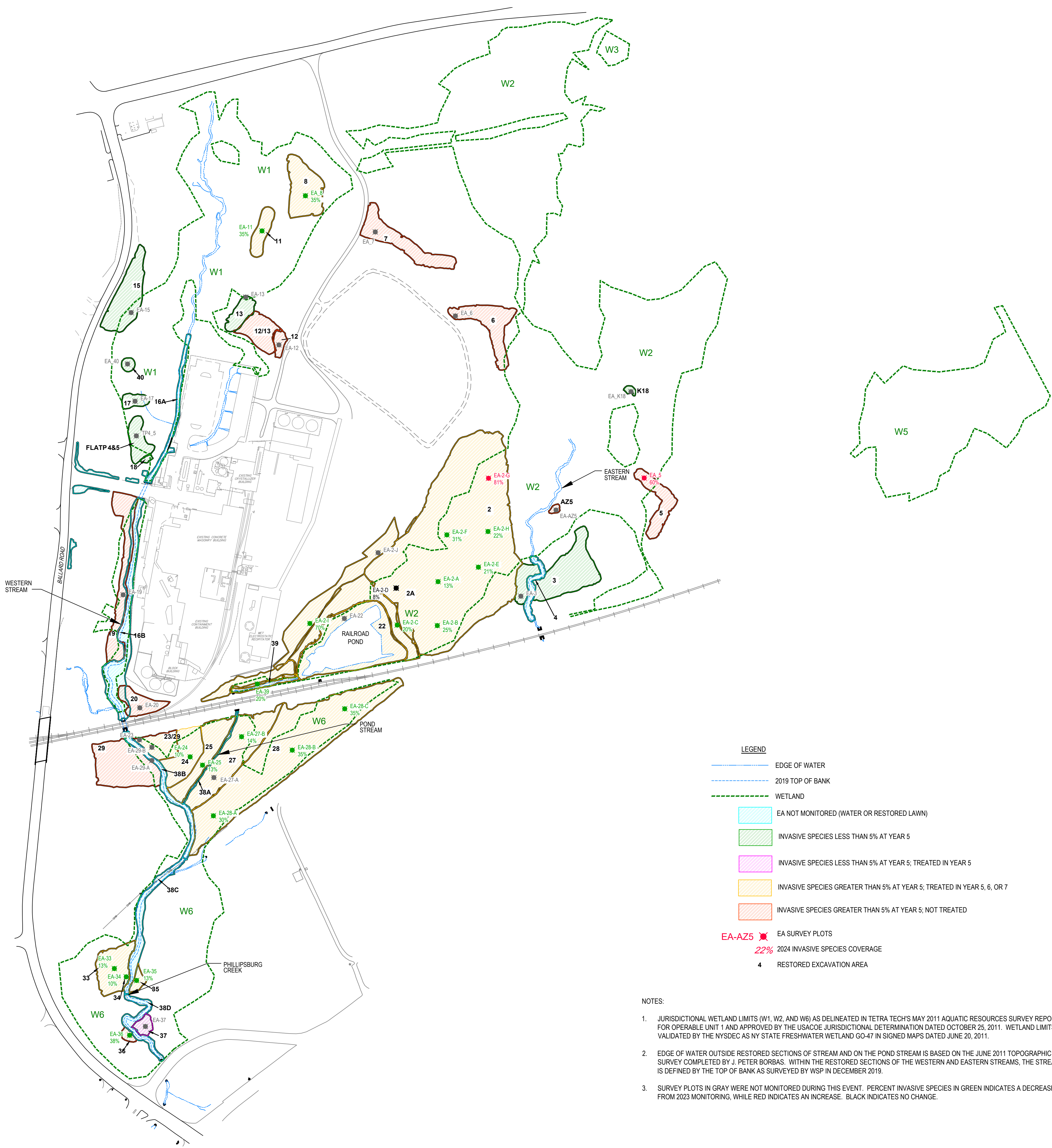
NOTES:

1. OU2 REPRESENTS GROUNDWATER CONTAMINATION OUTSIDE THE BARRIER WALL SURROUNDING THE FACILITY AND IS NOT SHOWN.
2. CONTOUR INTERVAL: 20 FEET

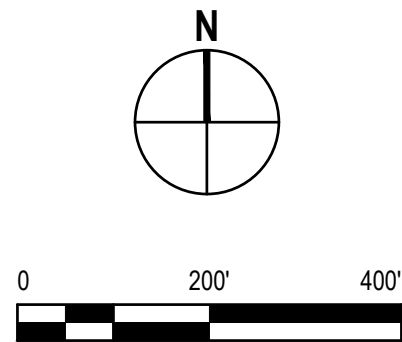


REVERE SMELTING & REFINING SITE - OPERABLE UNIT 1 SITE LOCATION MAP

FIGURE 1



- NOTES:
- JURISDICTIONAL WETLAND LIMITS (W1, W2, AND W6) AS DELINEATED IN TETRA TECH'S MAY 2011 AQUATIC RESOURCES SURVEY REPORT FOR OPERABLE UNIT 1 AND APPROVED BY THE USACOE JURISDICTIONAL DETERMINATION DATED OCTOBER 25, 2011. WETLAND LIMITS VALIDATED BY THE NYSDEC AS NY STATE FRESHWATER WETLAND GO-47 IN SIGNED MAPS DATED JUNE 20, 2011.
 - EDGE OF WATER OUTSIDE RESTORED SECTIONS OF STREAM AND ON THE POND STREAM IS BASED ON THE JUNE 2011 TOPOGRAPHIC SURVEY COMPLETED BY J. PETER BORBAS. WITHIN THE RESTORED SECTIONS OF THE WESTERN AND EASTERN STREAMS, THE STREAM IS DEFINED BY THE TOP OF BANK AS SURVEYED BY WSP IN DECEMBER 2019.
 - SURVEY PLOTS IN GRAY WERE NOT MONITORED DURING THIS EVENT. PERCENT INVASIVE SPECIES IN GREEN INDICATES A DECREASE FROM 2023 MONITORING, WHILE RED INDICATES AN INCREASE. BLACK INDICATES NO CHANGE.



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Bar is one inch on original size sheet
0 1"

No.	Issue	Checked	Approved	Date
Author	Designer			
Drafting	Design			
Check	Check			
Project Manager	D.BASICH	Project Director	C. ALBERTIN	

Client
ECOBAT RESOURCES NEW YORK, LLC
MIDDLETOWN, NEW YORK

Project
WETLAND RESTORATION FINAL
MONITORING - OPERABLE UNIT 1

Date	Scale
AUGUST 2024	1" = 200'
Project No.	
12586936	

Title
INVASIVE SPECIES
SURVEY PLOT
LOCATIONS

Sheet No.
FIGURE 2

Size
ARCH D

Tables



TABLE 1
Final Invasive Species Monitoring Results
Revere Smelting & Refining Site
Middletown, New York

Excavation Area	Acreage (a)	Survey Plot ID	Easting	Northing	Survey Plot Type	Invasives Species	Treated in Year 5 (October 2021)	Invasives Species	Treated in Year 6 (November 2022)	Invasives Species	Treated in Year 7 September (2023)	Invasives Species	Species 1	Species 2	Species 3
						Coverage July 2021 - Year 5 (Percent)		Coverage July 2022 - Year 6 (Percent)		Coverage July 2023 - Year 7 (Percent)		Coverage June 2024 - Final (Percent)			
2A	6.79	EA-2-A	531434	956977	Wetland	25	X	48	X	35	X	13	PH, 8	PL, 5	
		EA-2-B	531431	956807	Wetland	40	X	73	X	58	X	25	PH, 20	PL, 5	
		EA-2-C	531276	956809	Wetland	60	X	25	X	30	X	20	PL, 20		
		EA-2-D	531272	956952	Wetland	60	X	30	X	8	X	8	PL, 5	PH, 3	
2	1.88	EA-2-E	531590	957033	Wetland	10	X	20	X	47		21	PH, 10	SG, 10	1, PL
		EA-2-F	531468	957158	Wetland	15	X	37	X	34	X	31	PH, 30	PL, 1	
		EA-2-G	531629	957377	Wetland	20	X	30	X	71		81	SG, 45	PH, 35	MW, 1
		EA-2-H	531627	957171	Wetland	25	X	46	X	49		22	PH, 10	SG, 10	PL, 2
		EA-2-I	530938	956815	Upland	6	X	87	X	70		70	MW, 70		
5	0.36	EA-5	532231	957378	Wetland	60		46		41					
6	0.53	EA-6	531501	958005	Upland	5		25		2					
7	0.57	EA-7	531191	958330	Upland	30		50		30					
8	0.59	EA-8	530921	958470	Wetland	90	X	100	X	40	X	35	PH, 35		
11	0.22	EA-11	530753	958334	Wetland	50	X	82	X	67	X	35	PH, 35		
12/13	0.44	EA-12	530818	957893	Upland	20		38		40					
19	0.58	EA-19	530216	956926	Wetland	5		40		45					
20	0.22	EA-20	530281	956489	Upland	100		32		100					
22	0.84	EA-22	531071	956834	Wetland	51		56	X	70					
24	0.51	EA-24	530475	956299	Wetland	30		40	X	40	X	10	PH, 5	PL, 5	
25	0.51	EA-25	530523	956267	Wetland	51	X	36	X	53	X	13	PL, 10	PH, 3	
27	1.06	EA-27-B	530674	956377	Wetland	61	X	21	X	65	X	14	PL, 10	PH, 3	CT, 1
28	3.17	EA-28-A	530565	956071	Wetland	41	X	36	X	44	X	30	MW, 30		
		EA-28-B	530870	956325	Wetland	63	X	53	X	66	X	35	PL, 20	PH, 15	
		EA-28-C	531073	956485	Wetland	95	X	36	X	51	X	35	PH, 30	PL, 5	
23		EA-23	530279	956365	Wetland	10		20	X	27					
29	1.14	EA-29-A	530327	956285	Wetland	40		60		40					
		EA-29-B	530327	956336	Wetland	35		45		40					
33	0.49	EA-33	530182	955480	Wetland	31	X	61	X	43	X	13	PH, 10	PL, 3	
34		EA-34	530228	955448	Wetland	30		49	X	41	X	10	PH, 5	PL, 5	
35	0.08	EA-35	530268	955434	Wetland	35	X	58	X	37	X	13	PL, 8	PH, 5	
36	0.05	EA-36	530241	955222	Wetland	40		52	X	56	X	38	PH, 20	MW, 10	PL, 8
39	0.14	EA-39	530735	956581	Wetland	100		55	X	53	X	20	PH, 15	PL, 5	
AZ-5	0.02	EA-AZ-5	531890	957254	Wetland	22		60		41					

- a) Based on total acres reseeded in Year 1 and As-Built Report.
b) Shaded results indicate a decrease in percent invasive species coverage from July 2023.
c) CT = Canada Thistle; MW = Mugwort; PH = Phragmites; PL = Purple Loosestrife; SG = Japanese Stiltgrass



TABLE 2
Final Vegetative Coverage Monitoring (1 Meter Quadrats)
Revere Smelting & Refining Site
Middletown, New York

Quadrat EA-2-A	
Common Name	Percent Cover
Phragmites	8
Purple loosestrife	5

Quadrat EA-2-E	
Common Name	Percent Cover
Phragmites	10
Japanese stiltgrass	10
Purple loosestrife	1

Quadrat EA-2-I	
Common Name	Percent Cover
Mugwort	70

Quadrat EA-25	
Common Name	Percent Cover
Purple loosestrife	10
Phragmites	3

Quadrat EA-28-C	
Common Name	Percent Cover
Phragmites	30
Purple loosestrife	5

Quadrat EA-36	
Common Name	Percent Cover
Phragmites	5
Purple loosestrife	5

Quadrat EA-2-B	
Common Name	Percent Cover
Phragmites	20
Purple loosestrife	5

Quadrat EA-2-F	
Common Name	Percent Cover
Phragmites	30
Purple loosestrife	1

Quadrat EA-8	
Common Name	Percent Cover
Phragmites	35

Quadrat EA-27B	
Common Name	Percent Cover
Purple loosestrife	10
Phragmites	3
Canada Thistle	1

Quadrat EA-33	
Common Name	Percent Cover
Phragmites	5
Purple loosestrife	5

Quadrat EA-39	
Common Name	Percent Cover
Phragmites	15
Purple loosestrife	5

Quadrat EA-2-C	
Common Name	Percent Cover
Purple loosestrife	20

Quadrat EA-2-G	
Common Name	Percent Cover
Japanese stiltgrass	45
Phragmites	35
Mugwort	1

Quadrat EA-11	
Common Name	Percent Cover
Phragmites	35

Quadrat EA-28-A	
Common Name	Percent Cover
Mugwort	30

Quadrat EA-34	
Common Name	Percent Cover
Phragmites	10
Purple loosestrife	3

Quadrat EA-2-D	
Common Name	Percent Cover
Phragmites	5
Purple loosestrife	3

Quadrat EA-2-H	
Common Name	Percent Cover
Phragmites	10
Japanese stiltgrass	10
Purple loosestrife	2

Quadrat EA-24	
Common Name	Percent Cover
Phragmites	5
Purple loosestrife	5

Quadrat EA-28-B	
Common Name	Percent Cover
Purple loosestrife	20
Phragmites	15

Quadrat EA-35	
Common Name	Percent Cover
Phragmites	10
Purple loosestrife	3

Appendices

Appendix A

Site Photographs



Photo 1: View of excavation area survey plot EA-2-A facing north (photo taken 6/18/2024).



Photo 2: View of excavation area survey plot EA-2-A facing south (photo taken 6/18/2024).



Photo 3: View of excavation area survey plot EA-2-B facing north (photo taken 6/18/2024).



Photo 4: View of excavation area survey plot EA-2-B facing south (photo taken 6/18/2024).



Photo 5: View of excavation area survey plot EA-2-C facing north (photo taken 6/18/2024).



Photo 6: View of excavation area survey plot EA-2-C facing south (photo taken 6/18/2024).



Photo 7: View of excavation area survey plot EA-2-D facing north (photo taken 6/18/2024).



Photo 8: View of excavation area survey plot EA-2-D facing south (photo taken 6/18/2024).



Photo 9: View of excavation area survey plot EA-2-E facing north (photo taken 6/18/2024).



Photo 10: View of excavation area survey plot EA-2-E facing south (photo taken 6/18/2024).



Photo 11: View of excavation area survey plot EA-2-F facing north (photo taken 6/18/2024).



Photo 12: View of excavation area survey plot EA-2-F facing south (Photo taken 6/18/2024).



Photo 13: View of excavation area survey plot EA-2-G facing north (photo taken 6/18/2024).



Photo 14: View of excavation area survey plot EA-2-G facing south (photo taken 6/18/2024).



Photo 15: View of excavation area survey plot EA-2-H facing north (photo taken 6/18/2024).



Photo 16: View of excavation area survey plot EA-2-H facing south (photo taken 6/18/2024).



Photo 17: View of excavation area survey plot EA-2-I facing north (photo taken 6/18/2024).



Photo 18: View of excavation area survey plot EA-2-I facing south (photo taken 6/18/2024).



Photo 19: View of excavation area survey plot EA-8 facing north (photo taken 6/18/2024).



Photo 20: View of excavation area survey plot EA-8 facing south (photo taken 6/18/2024).



Photo 21: View of excavation area survey plot EA-11 facing north (photo taken 6/18/2024).



Photo 22: View of excavation area survey plot EA-11 facing south (photo taken 6/18/2024).



Photo 23: View of excavation area survey plot EA-24 facing north (photo taken 6/19/2024).



Photo 24: View of excavation area survey plot EA-24 facing south (photo taken 6/19/2024).



Photo 25: View of excavation area survey plot EA-25 facing north (photo taken 6/19/2024).



Photo 26: View of excavation area survey plot EA-25 facing south (photo taken 6/19/2024).



Photo 27: View of excavation area survey plot EA-27-B facing north (photo taken 6/19/2024).



Photo 28: View of excavation area survey plot EA-27-B facing south (photo taken 6/19/2024).



Photo 29: View of excavation area survey plot EA-28-A facing north (photo taken 6/19/2024).



Photo 30: View of excavation area survey plot EA-28-A facing south (photo taken 6/19/2024).



Photo 31: View of excavation area survey plot EA-28-B facing north (photo taken 6/19/2024).



Photo 32: View of excavation area survey plot EA-28-B facing south (photo taken 6/19/2024)



Photo 33: View of excavation area survey plot EA-28-C facing north (photo taken 6/19/2024).



Photo 34: View of excavation area survey plot EA-28-C facing south (photo taken 6/19/2024).



Photo 35: View of excavation area survey plot EA-33 facing north (photo taken 6/19/2024).



Photo 36: View of excavation area survey plot EA-33 facing south (photo taken 6/19/2024).



Photo 37: View of excavation area survey plot EA-34 facing north (photo taken 6/19/2024).



Photo 38: View of excavation area survey plot EA-34 facing south (photo taken 6/19/2024).



Photo 39: View of excavation area survey plot EA-35 facing north (photo taken 6/19/2024).



Photo 40: View of excavation area survey plot EA-35 facing south (photo taken 6/19/2024).



Photo 41: View of excavation area survey plot EA-36 facing north (photo taken 6/19/2024).



Photo 42: View of excavation area survey plot EA-36 facing south (photo taken 6/19/2024).



Photo 43: View of excavation area survey plot EA-39 facing north (photo taken 6/18/2024).



Photo 44: View of excavation area survey plot EA-39 facing south (photo taken 6/18/2024).