Ditch at the HMTF

Section B. Facility Description

B-1 General Description [40 CFR 270.14]

Facility Name: University of Georgia

Mailing Address: Environmental Safety Division
240A Riverbend Road
Athens, Georgia 30602

Facility Location: 2450 South Milledge Avenue
Athens, Georgia 30605

Party Responsible: Associate Vice President
John McCollum
Section G-2b: Authorization

Between 1969 and 1979 the University of Georgia ("UGA") operated a solid waste landfill at the Botanical Garden property located in Athens, Clarke County Georgia. The Milledge Avenue Landfill ("Landfill") received various wastes, including deceased animals and animal parts, various laboratory chemicals, and some radioactive waste.

Corrective action implemented to address the Landfill include an impermeable cover (cap) on the landfill and a groundwater pump and treat system. Although the pump and treat system has been operated at the Landfill for over 25 years, contamination is still detectable in the groundwater down gradient of the Landfill. Surface water sampling has not detected any contamination above the Georgia In-Stream Water Quality Standards since the groundwater pump and treat system was installed in 2005.The plume is completely on UGA property and the nearest drinking water well is over one mile away. There is an onsite deep irrigation well located at the Botanical Garden Greenhouse; however, this well draws water from a separate drainage basin located southwest of the Site.

B-2 Topographic Map [40 CFR.14]

Figure B-1 is a topographic map of the landfill; Figure B-2 is an aerial photo of the Landfill and the surrounding area; Figure B-3 is a flood risk map; and Figure B-4 is a wind rose diagram for the area. There are no flood control or drainage barriers in the vicinity of the Landfill. There are no known drinking water wells within 1 mile of the Landfill and while there is an onsite deep irrigation well located at the Botanical Garden Greenhouse, this well draws water from a separate drainage basin located southwest of the Site.

B-2b Additional Topographical Requirements for Land Storage, Treatment and Disposal Facilities

This section is not applicable since there are no surface impoundments, waste piles, land treatment units or regulated landfills located at the facility.

B-3 Location Information [40 CFR 270.14]

B-3a Seismic Considerations

This section is not applicable since this is an existing facility that was sited before the enactment of RCRA.

B-3b Floodplain Standard

This section is not applicable since this is an existing facility that was sited before the enactment of RCRA. However, the Landfill is not located in the 100-year flood plain as defined by the National Flood Insurance Program. The 100-year flood plain is depicted on Figure B-3.

B-3b-(1) Demonstration of Compliance

This section is not applicable.

B-3b-(1)(a) Flood Proofing and Flood Protection

This section is not applicable.

B-3b-(1)(b) Flood Plain

This section is not applicable.

B-3b-(2) Plan for Future Compliance with Floodplain Standard

This section is not applicable.

B-3b-(3) Waiver for Land Storage Facilities (Existing Facilities Only)

This section is not applicable.

B-4 Traffic Information [40 CFR 270.14]

The Landfill is located in a remote area off of an unnamed dirt road within the UGA Botanical Gardens which is kept locked. The Botanical Garden main entrance is off South Milledge Avenue. Traffic within the Botanical Garden is mainly from UGA staff, students and researchers and from visitors to the Botanical Garden.

Section C-Waste Characteristics

This section is no longer applicable since hazardous waste is no longer stored or treated under a permit.

Section D- Process Information

This section is no longer applicable since hazardous waste is no longer stored or treated under a permit.

Low Level Mixed Radioactive Waste

UGA historically stored low level mixed radioactive waste under Hazardous Waste Permit No. HW-041 (S&T). On March 22, 2016 UGA provided the EPD with a Notification of Intent ("Notification") to claim a conditional exemption from RCRA for Low-level Mixed Waste ("LLMW") as allowed under the Georgia Rules for Hazardous Waste Management, Chapter 391-3-11.10(3) (which incorporates by reference 40 C.F.R. Part 266, Subpart N). This exemption allows LLMW to be exempt from the regulatory definition of hazardous waste if the mixed waste is managed under a single Nuclear Regulatory Commission ("NRC") Agreement State License. Mixed waste is then subject solely to the NRC Rules while there are radiation safety issues associated with the mixed wastes. The mixed waste only becomes subject to RCRA when the radioactivity has adequately decayed. Once the radiation has adequately decayed, the waste is a hazardous waste and is manifested to a permitted off-site hazardous waste treatment, storage or disposal facility. UGA is eligible for this exemption since LLMW at UGA is under a single NRC Agreement State License. This exemption specifically applies to the following:

Storage Units:	Liquid Radioactive Waste Storage Building 148 Will Hunter Road Athens, Georgia 30602-5681
NRC Agreement State License Number:	GA 103-1
RCRA Identification Number:	GAD073460941
Applicable RCRA Waste Codes:	D001, D002, D007, D009 F003, and D022.

Section E- Groundwater Monitoring

This section is not applicable since there are no Post-Closure units.

Section F- Procedures to Prevent Hazards

This section is no longer applicable since hazardous waste is no longer stored or treated under a permit.

Section G- Contingency Plan

This section is no longer applicable since hazardous waste is no longer stored or treated under a permit.

Section H- Personnel Training

This section is no longer applicable since hazardous waste is no longer stored or treated under a permit.

Section I- Corrective Action and Financial Requirements

Solid Waste Management Units Requiring further Investigation and Corrective Action

1. **Milledge Avenue Landfill (Landfill)**

The Landfill was approved prior to the enactment of the Georgia Hazardous Waste Management Act for laboratory waste from UGA. The Landfill operated from 1969 to 1979 under the Georgia Solid Waste Management Act. Laboratory waste was disposed in trenches approximately 10 to 12 feet below ground surface. The trenches were backfilled with native soil and compacted. The Landfill's operation and historical investigations are described, in detail, in reports previously submitted to the Georgia Environmental Protection Division (EPD).

The Landfill is located in an undeveloped wooded area about 0.55 miles west of Milledge Avenue on the State Botanical Gardens property in Athens-Clarke County Georgia. It is situated near the top of a steep slope adjacent to a power easement. Surface topography descends approximately 250 feet to the north to a north-northwest trending ravine. The headwaters of an unnamed stream form in the ravine along the western side of the power easement.

Groundwater at the site flows initially to the northwest and then westward towards an unnamed creek. The creek flows to the west and discharges to a wetland area near the Middle Oconee River located approximately .35 miles downstream. Groundwater,

surface water and sediment have been monitored semiannually since the RCRA Facilities Investigation (RFI) was conducted in 1989. These investigations confirmed that the Landfill has released specific volatile organic compounds (VOCs) into the groundwater, which have migrated down gradient within the stream basin.

Property Boundaries

Figure B-5 shows the property boundaries and the area extending one mile beyond the property boundary.

Drinking Water Wells

Figure B-6 shows the location of the site and all known domestic, public and unknown use water wells within three miles of the site. Based on water level measurements around the Landfill, the direction of groundwater flow is initially to the northwest and then westward toward the Middle Oconee River. The river is located approximately 0.5 miles from the site as measured along the presumed flow path.

UGA owns all of the property between the site and the Middle Oconee River. There are no drinking water wells located between the site and the Middle Oconee River. The site is located in a narrow drainage basin close to the river, and all of the land between the site and the river is undeveloped and wooded. There are no drinking water wells within one mile down gradient of the site. The nearest well to the site is an irrigation well located at the Botanical Gardens greenhouse, which is in a different drainage basin form the landfill. Both the Landfill and greenhouse areas drain to the Middle Oconee River. All other drinking water wells identified are over one mile away and are not down gradient of the site.

Clarke County and Oconee County do not require drinking water wells to be registered; however, both Health Departments do test well water as requested and are familiar with most of the wells in the area. Neither Clarke County nor Oconee County Health Departments are aware of any drinking water wells within a one-mile radius of the facility since City Water serves this area.

The Middle Oconee River in the vicinity of the site is not used as a drinking water supply. The Athens-Clarke County Water Department intakes are on the Middle Oconee River and the North Oconee River north of Athens.

Interim Corrective Action Measure

A groundwater extraction and treatment system (GWTS) was installed in 2005 to replace a surface water treatment system that was installed in 1999. The GWTS was an

interim remedial measure to prevent contamination from entering the surface water. A RCRA compliant cap was installed on the Landfill in 2001.
In 2020 EPD approved UGA's request to discontinue use of the GWTS system. In order to insure that the shutting down of the GWTS did not result in any adverse impact to the stream, UGA has continued to conduct surface water and sediment sampling program.

Ground Water Monitoring Program

The groundwater monitoring program changed from a summer-winter to a spring-fall cycle in 1997 with the renewal of the HMTF permit. Reporting requirements also changed in 1997 to include contour maps illustrating the groundwater potentiometric surface and chemical iso-concentration maps. In a December 15, 2003 meeting among EPD, UGA, and Brown and Caldwell (BC), the group agreed that certain volatile organic compounds (VOCs) and metals would be eliminated from the sampling schedule. Other monitoring requirements were also adjusted slightly based on a February 18, 2014 letter. The analysis of lead and mercury for all wells, and the sampling of MW-1 were discontinued for the site in March 2014. One new surface water sampling location (SW-5) was added. Well points, WP-3, and WP-4 were installed and added to the sampling program in 2014. One additional bedrock well (MW-9c) was installed in May 2019 for the purpose of vertical delineation.

The groundwater monitoring program was modified with the renewal of the HMTF permit, dated December 19, 2019. As discussed with EPD, the semiannual monitoring schedule was changed beginning in 2020 to a January and July schedule.

The list of site-specific COCs was expanded in September 2019 after sampling monitoring well MW-4, immediately downgradient of the former landfill, for the list of Appendix IX constituents at the request of EPD. Lindane (Gamma BHC) and 1,4 dioxane were detected at concentrations exceeding their respective USEPA Maximum Contaminant Levels (MCLs). Other BHC compounds (alpha-BHC, beta-BHC, delta-BHC) were also detected at concentrations similar to or less than Lindane, but these BHC compounds do not have MCLs. As a result of this September 2019 sampling, Lindane and 1,4-Dioxane were added to the list of site-specific COC analytes beginning in January 2020.

In April 2020, an additional bedrock groundwater monitoring well (MW-20) was installed for the purpose of horizontal delineation. In September 2020, EPD approved a modified groundwater sampling plan beginning in January 2021 (See Attachment 1).

Groundwater monitoring reporting requirements includes contour maps illustrating the groundwater potentiometric surface and chemical iso-concentration maps. As indicated in the 2019 HMTF permit, the January reports (Annual Report) include tabulated data and groundwater potentiometric surface and iso-concentration maps and text discussion

of the results and trends from the previous July and current January event. The July reports include an analytical data summary of the July sampling event, sample location map, and tabulated monitor well data with groundwater surface elevations. In addition, beginning in 2021, the approved revised groundwater sampling plan indicated select monitoring locations to be excluded from the July sampling event, and required only annually during the January sampling event. A copy of the approved 2020 Groundwater Sampling Plan is included in Attachment 1. These requirements were provided to the EPD in the May 2020, September 2020, March 2021, September 2021, and March 2022 monitoring reports.

The groundwater monitoring system consists of 36 groundwater monitoring wells (included five former recovery wells) and 10 piezometers. A listing of all monitoring locations including their depths, screened intervals and 2022 static water elevation in included in Attachment 2. Although the contaminate plume was delineated, contaminate detections have recently been measured in some of the outer most monitoring wells.

Additional work to address the landfill includes:

- Implement the Approved Final Remedy for Corrective Action

- Installation of three additional groundwater monitoring wells immediately downgradient of the permeable reactive barrier (PRB). Collecting of groundwater samples at these three wells will become part of the semi-annual sampling events in January and July once the current PRB pilot study is completed.

Monitoring Program

The currently approved monitoring program will be used to assess the final corrective action system. The currently approved semiannual monitoring program consists of collecting groundwater, surface water and sediment samples at the site. The ongoing monitoring program includes the following:

- Groundwater samples are collected from 21 monitoring wells and 3 well points (Attachment 1)
- Surface water and sediment samples are collected at five locations along the creek north and northeast of the landfill (Figure 1).
- The locations of these monitoring wells and sampling locations are shown on Figure 1, and Table 1 below.
- Collect groundwater samples from three PRB performance wells

Table 1. Monitoring Locations				
Monitoring Wells [a,b]	MW-1 MW-2 MW-3 MW-4 MW-5b MW-5c MW-6a MW-6b	MW-7a MW-7b MW-8a MW-8b MW-9a MW-9b MW-9c MW-10a MW-10b	MW-11 MW-12a MW-12b MW-13 MW-14a MW-14b MW-14c MW-15	MW-16a MW-16b MW-17 MW-18 MW-19 MW-20 WP-1 WP-2 WP-3 WP-4
Piezometers (GW elevation only)	P1 P3 P4	P6 P7 P8	P9 P10 P11	P12
Surface Water	SW-A1	SW-A2	SW-A3	SW-A4 and SW-A5
Sediment	S-A1	S-A2	S-A3	S-A4 and S-A5
Other [c]	PRB 1 PRB 2 PRB 3			

[a] Per the EPD revised GW Monitoring Plan in 2020, in MW-1, MW-8a, MW-8b, MW-11, MW-15, MW-16a, MW-16b, MW-17, MW-18, MW-19, and the piezometers, the water level will be gauged, but no water sample will be collected and analyzed.

[b] Per the EPD revised GW Monitoring Plan in 2020, groundwater sampling and analysis in the following wells are not included in the July event, but only collected once per year: MW-9c, MW-10a, MW10b, MW-12a, MW-12b, MW14b, MW14c, WP-1, WP-3.

[c] Groundwater monitoring wells PRB1, PRB2, PRB3, are collected in January and July as part of monitoring the performance of the permeable reactive barrier after the PRB pilot study is complete.

Water Level Gauging

The depth to groundwater will be measured in each monitoring well and piezometer prior to any purging or other monitoring activities. The water levels will be recorded in a dedicated field book. The monitoring wells and piezometers will also be inspected during each monitoring event to ensure that they are marked and in good working order.

Sampling Methods

Groundwater sampling will be conducted in accordance with the U.S. Environmental Protection Agency (USEPA) Region 4 SESD Operating Procedure ***Groundwater Sampling*** dated April 26 2017. Water level data and well purging data will be recorded in aproject field book.

Surface water sampling and sediment sampling will be conducted in accordance with the USEPA Region 4 SESD Operating Procedures ***Surface Water Sampling*** dated December 16, 2016. Surface water and sediment sampling observations will be recorded in a project field book.

Monitoring Parameters

The groundwater, surface water and sediment samples will be analyzed for VOCs according to USEPA Method 8260B, 1,4-Dioxane by 8260B SIM, and BHC Compounds by Method 8081. In accordance with the April 5, 2004 letter from the EPD, the VOCs will not be analyzed as follows:

Volatile Organic Compounds that will not be analyzed

1,1,1-trichloroethane	4-methyl-2-pentanone	Freon-113
1,1,2-trichloroethane	Bromodichloromethane	Isopropybenzene
1,1-dichloroethane	Bromoform	Methyl Acetate
1,2,4-trichlorobenzene	Bromomethane	Methyl tert-butyl ether
1,2-dibromoethane	Carbon disulfide	Methlycyclohexane
1,2-dichlorobenzene	Chloromethane	Styrene
1,3-dichlorobenzene	Cis-1,3-dichloropropene	trans-1,3-dichloropropene
1,4-dichlorobenzene	Cyclohexane	trichlorofluoromethane
2-butanone	Dibromochloromethane	
2-hexanone	Dichlorodifluoromethane	

Water quality parameters (specific gravity, pH, temperature, oxidation, reduction potential, dissolved oxygen, and turbidity) will also be measured during well purging in accordance with the USEPA Region 4 SESD Field Branches Quality System and Technical Procedures dated April 26, 2017.

Monitoring Frequency

Site-wide groundwater, surface water and sediment sampling will be conducted semi-annually. The sampling events will be conducted during the months of January and July.

Landfill Cap Inspection

The landfill cap area will be inspected monthly using the checklist included in Attachment 3. Records of all inspections and any repairs or corrective action needed will be kept on file at the ESD offices for a minimum of three years.

Reporting

Reports will be submitted to the EPD semiannually.

Proposed Corrective Action Plan (CAP)

UGA will implement the CAP as detailed in the 100% Remedial Design for Corrective Action dated May 31, 2022 in accordance with the schedules, conditions, and specifications contained therein.

UGA may request an extension to these deadlines for cause in writing to the EPD and UGA and the EPD may meet and discuss the reasons for any delay and that EPD may grant an extension. Any extension and/or changes to the permit may require a formal permit modification.

2. HMTF Septic Tank and Ditch

During the 2018 closure of the HMTF, mercury was detected in a septic tank that serviced the sanitary waste needs for the HMTF. Although the tank was cleaned, the mercury is still present at a very low concentration (0.00377 milligram per liter). The closure of the HMTF also included sampling of a drainage ditch that collects storm water from the roof and areas immediately adjacent to the HMTF. This sampling revealed detections of arsenic and other SVOCs in the shallow soil.

Work Completed

The location of the Septic Tank 1 outlet pipe, the drain line and the connection from the outlet pipe to the drain line were verified by excavating the soil around the structures with a backhoe. Soil samples were collected with a stainless-steel hand auger at the locations summarized below and shown in Figure B-8.

- ST-1A – below septic tank on south side of tank (Photo Nos. 4 and 5).
- ST-1B – below septic tank outlet pipe (5-inch PVC) on west side of tank (Photo Nos. 6 and 7).
- ST-1D – below connection of 5-inch PVC and 5-inch black corrugated piping (Photo Nos 7 and 8).
- DL-1 and DL-2 – below 5-inch black corrugated pipe (Photo No. 9 [DL-1]).

The soil samples were analyzed for volatile organic compounds (VOCs) by EPA Method 8260B, semivolatile organic compounds (SVOCs) by EPA Method 8270C, organochlorine pesticides by EPA Method 8081, herbicides by EPA Method 8151 and total RCRA metals (arsenic, barium, cadmium, chromium, lead, selenium and silver) by EPA Method 6020B and mercury by EPA Method 7471.

Sample Results

The soil results were compared to EPA's Residential and Industrial Regional Screening Levels (RSLs). Although there were some contaminant detections above the "Hypothetical Future Resident" Target Action Levels, as shown on the Table 2 below, all samples are below the recently revised "Construction/Utility Workers-Industrial" Target Action Levels.

Due to detections occurring at depth and the industrial use of the facility, impacted on-site soil, identified as all constituents of potential concern (COPCs) with detections (or detection limits) above the applicable residential soil RSLs, will be addressed to industrial action levels. This will eliminate the need for soil removal. However, exceedance of the residential action levels, or site background, triggers the need for land use controls (e.g., institutional controls prohibiting residential development). UGA has submitted a proposed a proposal for land use controls to the EPD.

Table 2

Constituent	Maximum Detected Value (mg/kg)	Target Action Levels (mg/kg)[1]	
		Hypothetical Future Resident	Construction/Utility Workers - Industrial
Arsenic	13.9	0.68 (cancer effects)	45.6 (cancer effects)
Mercury (elemental)	1.33	10.9 (non-cancer effects)	6.8 (non-cancer effects)
1,2-Dibromo-3-chloropropane (DBCP)	<0.0066	0.0053 (cancer effects)	0.49 (cancer effects)
2,6-Dinitrotoluene	<0.52	0.36 (cancer effects)	24.1 (cancer effects)

4,6-Dinitro-2-methylphenol (used 4,6-Dinitro-o-cresol)	<2.7	5.1 (non-cancer effects)	206 (non-cancer effects)
Benzo(a)pyrene	<0.52	0.12 (cancer effects)	33.6 (cancer effects)
bis(2-Chloroethyl)ether	<0.52	0.23 (cancer effects)	9.31 (cancer effects)
Dibenz(a,h)anthracene	<0.52	0.12 (cancer effects)	33.6 (cancer effects)
Hexachlorobenzene	<0.52	0.21 (cancer effects)	3.4 (non-cancer effects)
Hexachlorocyclopentadiene	<1	1.8 (non-cancer effects)	613 (non-cancer effects)
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	<5.2	31.6 (non-cancer effects)	128 (non-cancer effects)
N-Nitroso-di-N-propylamine	<0.52	0.078 (cancer effects)	5.2 (cancer effects)
Pentachlorophenol	<2.7	1 (cancer effects)	66.1 (cancer effects)

[1]Based on target risk of 1E-06 for carcinogens and hazard quotient of 1 for non-carcinogens. Note that the action level for construction/utility (excavation) workers assume an exposure frequency of 130 days/year for a duration of 1 year, soil ingestion rate of 330 mg/day, particulate emission factor of 1.36E+9 m^3/kg, soil adherence factor of 0.3 mg/cm^2, and skin surface area of 3,527 cm^2. Sub-chronic toxicity values used as available for construction/utility workers.

Since all sample are below the Industrial Action Level, UGA will pursue an environmental covenant for the property that will prohibit the use of the property for any residential purposes. The environmental covenant will be submitted to the EPD and will include a revised property description that will insure that the property that contains the ditch and septic tank are not used for residential purposes as described in the Georgia Uniform Environmental Covenants Act O.C.G.A. § 44-16-1 *et seq.*

Financial Assurance Mechanism for Corrective Action [40 CFR 264.101]

This facility is owned by the State of Georgia; therefore, this section is not applicable

Section J- Other Federal Laws

The UGA Milledge Avenue Site is in compliance with all applicable federal laws and regulations. Such rules and regulation include the federal Clean Water Act, Clean Air Act (CAA), and CAA Amendments, Resource Conservation and Recovery Act (RCRA), Endangered Species Act, National Historic Preservation Act of 1966, and the Safe Drinking Water Act. The facility is also in compliance with the Georgia Hazardous Response Act.

Financial Assurance Mechanism for Corrective Action [40 CFR 264.101]

This facility is owned by the State of Georgia; therefore, this section is not applicable

Section J- Other Federal Laws

The UGA Milledge Avenue Site is in compliance with all applicable federal laws and regulations. Such rules and regulation include the federal Clean Water Act, Clean Air Act (CAA), and CAA Amendments, Resource Conservation and Recovery Act (RCRA), Endangered Species Act, National Historic Preservation Act of 1966, and the Safe Drinking Water Act. The facility is also in compliance with the Georgia Hazardous Response Act.

Section K- Certification

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who managed the system, or those directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

John McCollum
Associate Vice President for Environmental Safety

9/26/2022
Date

Attachment 1
2020 Approved Groundwater Monitoring Program
Milledge Avenue Site
Athens, Georgia

Monitoring Well	2020 Semi-Annual Sampling		Rationale	Total Depth		Screened Interval feet BGS[c]
	January	July		feet TOC[a]	feet BGS[b]	
MW-1			Excluded: Upgradient, consistently ND	50.28	48.60	40.2 - 50.1
MW-2	X	X	Downgradient edge of landfill	44.66	42.39	31.2 - 41.1
MW-3	X	X	Downgradient edge of landfill	42.96	40.78	30.4 - 40.3
MW-4	X	X	Downgradient edge of landfill	42.71	40.36	30 - 40
MW-5b	X	X	Downgradient edge of landfill	79.53	78.40	66 - 76
MW-5c	X	X	Downgradient edge of landfill	97.31	94.95	87.5 - 97.5
MW-6a	X	X	Sidegradient, historical detections	32.53	30.00	18 - 28
MW-6b	X	X	Sidegradient, historical detections	47.32	43.64	34.5 - 44.5
MW-7a	X	X	Sidegradient edge of impact	37.73	33.90	22 - 32
MW-7b	X	X	Sidegradient edge of impact	67.80	65.77	53 - 63
MW-8a			Excluded: Too far sidegradient, consistently ND, edge of impact already monitored by MW-7 cluster	57.22	54.96	48 - 58
MW-8b			Excluded: Too far sidegradient, consistently ND, edge of impact already monitored by MW-7 cluster	82.63	80.38	70.5 - 80.5
MW-9a	X	X	Centerline, shallow, impacted	24.39	21.82	12.5 - 22.5
MW-9b	X	X	Centerline, bedrock, impacted	49.98	47.86	37.8-47.8
MW-9c	X		Annual: Vertical extent in bedrock established, continued purging stress on very limited fractures may draw impacted groundwater downward	141.66	139.72	129.7-139.7
MW-10a	X		Shallow, unimpacted, but next well downgradient of impacted MW-14A and WP-2	25.10	23.52	11 - 21
MW-10b	X		Excluded: bedrock downgradient of unimpacted wells MW-14b & -14c	47.36	44.89	32.5 - 42.5
MW-11			Excluded: Too far sidegradient, topographically upgradient, consistently ND	44.86	41.94	32 - 42
MW-12a	X		Sidegradient of impact, consistently ND	37.67	34.49	22 - 32
MW-12b	X		Sidegradient of impact, consistently ND	50.23	47.74	37.5 - 47.5
MW-13	X	X	Centerline, bedrock, impacted	87.88	85.13	75 - 85
MW-14a	X	X	Shallow, impacted	20.49	18.80	8 - 18
MW-14b	X		Bedrock, sidegradient edge, consistently ND	53.21	50.65	40 - 50
MW-14c	X		Bedrock, sidegradient edge, consistently ND	82.38	80.11	70 - 80
MW-15			Excluded: Too far sidegradient, topographically upgradient, consistently ND	88.60	85.86	75 - 85
MW-16a			Excluded: Too far sidegradient, consistently ND, area already monitored by MW-14 cluster	23.10	21.35	13 - 23
MW-16b			Excluded: Too far sidegradient, consistently ND, area already monitored by MW-14 cluster	62.17	60.56	50 - 60
MW-17			Excluded: Too far side- & downgradient, consistently ND, bedrock already monitored by well MW-14c	55.41	53.39	44 - 54

MW-18			Excluded: Too far side- & downgradient, consistently ND, bedrock already monitored by well MW-14c	124.21	121.54	111.5 - 121.5
MW-19			Excluded: Far upgradient, consistently ND	50.98	48.23	39 - 49
MW-20	X	X	Horizontal extent in bedrock established	70.50	68.0	58 - 68
WP-1	X		Unimpacted well point downgradient of MW-9a, consistently ND	10.42	8.0	3 - 8
WP-2	X	X	Impacted, downgradient edge	11.90	8.0	3 - 8
WP-3	X		Unimpacted, consistently ND, but next well point downgradient of WP-2	11.36	10.0	5-10
WP-4			Excluded: WP-3 consistently ND, reinstate WP-4 if WP-3 shows detections	11.01	10.0	5-10

Notes:

Wells in the Groundwater Monitoring Program will be sampled and anaylzed for site-specific list of VOCs by Method 8260B, 1,4-dioxane by Method 8260B-SIM, and BHC compounds by Method 8081.

a Depth below top of casing

b Depth below ground surface, calculated value.

c Depth below ground surface measured at time of well construction.

Completed by SKW 9/18/20

Checked by JB 9/23/20

Attachment 2
Monitoring Well Data
January 2022
Milledge Avenue Site
Athens, GA

Monitoring Well ID	Depth to Groundwater Below TOC (ft)	Total Depth Below TOC (ft)	Total Depth BGS (ft)	Screened Interval (ft BGS)	Top of Casing Elevation (ft NGVD)	Ground Surface Elevation (ft NGVD)	Groundwater Elevation (ft NGVD)
MW-1	39.99	50.28	48.6	40.2-50.1	661.16	659.48	621.17
MW-2	28.82	44.66	42.39	31.2-41.1	638.76	636.49	609.94
MW-3	28.28	42.96	40.78	30.4-40.3	638.06	635.88	609.78
MW-4	29.21	42.71	40.36	30 - 40	637.78	635.43	608.57
MW-5b	28.03	79.53	78.4	66 - 76	635.93	634.80	607.90
MW-5c	27.15	97.31	94.95	87.5 - 97.5	636.66	634.30	609.51
MW-6a	17.66	32.53	30	18 - 28	618.98	616.45	601.32
MW-6b	20.43	47.32	43.64	34.5 - 44.5	620.64	616.96	600.21
MW-7a	23.71	37.73	33.9	22 - 32	617.23	613.40	593.52
MW-7b	22.70	67.8	65.77	53 - 63	615.26	613.23	592.56
MW-8a	43.27	57.22	54.96	48 - 58	633.89	631.63	590.62
MW-8b	44.00	82.63	80.38	70.5 - 80.5	633.18	630.93	589.18
MW-9a	7.71	24.39	21.82	12.5 - 22.5	588.85	586.28	581.14
MW-9b	8.38	49.98	47.86	38.5 - 48.5	588.98	586.86	580.60
MW-9c	10.15	140	138	130-140	581.30	580.19	571.15
MW-10a	12.93	25.1	23.52	11 - 21	576.21	574.63	563.28
MW-10b	15.27	47.36	44.89	32.5 - 42.5	578.07	575.60	562.80
MW-11	34.71	44.86	41.94	32 - 42	596.73	593.81	562.02
MW-12a	24.07	37.67	34.49	22 - 32	629.88	626.70	605.81
MW-12b	23.59	50.23	47.74	37.5 - 47.5	628.81	626.32	605.22
MW-13	24.20	87.88	85.13	75 - 85	614.43	611.68	590.23
MW-14a	10.75	20.49	18.8	8 - 18	585.44	583.75	574.69
MW-14b	15.55	53.21	50.65	40 - 50	586.27	583.71	570.72
MW-14c	17.87	82.38	80.11	70 - 80	587.45	585.18	569.58
MW-15	21.01	88.6	85.86	75 - 85	602.66	599.92	581.65
MW-16a	12.07	23.1	21.35	13 - 23	590.89	589.14	578.82
MW-16b	15.00	62.17	60.56	50 - 60	590.11	588.50	575.11
MW-17	9.00	55.41	53.39	44 - 54	568.84	566.82	559.84
MW-18	22.27	124.21	121.54	111.5 - 121.5	584.90	582.23	562.63
MW-19	32.78	50.98	48.23	39 - 49	668.00	665.25	635.22
MW-20	3.21	72.44	69.56	62.44 - 72.44	559.14	556.26	555.93
WP-1	3.25	10.42	8	3 - 8	571.61	569.37	568.36
WP-2	5.06	11.9	8	3 - 8	571.33	567.91	566.27
WP-3	5.81	11.36	10	5-10	562.94	559.46	557.13
WP-4	6.80	11.01	10	5-10	558.63	555.27	551.83
RW-1	3.38	59.91	57.82	--	583.93	582.48	580.55
RW-2	7.82	64.42	62.83	--	588.18	586.59	580.36
RW-3	3.42	62.86	60.92	--	584.43	582.49	581.01
RW-4	3.50	54.84	51.76	--	582.09	579.01	578.59
RW-5	3.78	55.61	53.21	--	583.34	580.94	579.56

Notes:

TOC - Top of Casing

BGS - Below Ground Surface

NGVD - National Geodectic Vertical Datum

Attachment 2
Piezometer Data
January 2022
Milledge Avenue Site
Athens, Georgia

Monitoring Well ID	Depth to Groundwater Below TOC (ft)	Total Depth Below TOC (ft)	Total Depth (ft BGS)	Screened Interval (ft BGS)	Top of Casing Elevation (ft NGVD)	Ground Surface Elevation (ft NGVD)	Groundwater Elevation (ft NGVD)
P-1	13.54	28.51	26.31	16 -26	637.90	635.70	624.36
P-3	25.42	39.56	37.36	28 - 38	629.66	627.46	604.24
P-4	34.25	50.34	48.94	38.5 - 48.5	627.21	625.81	592.96
P-6	37.24	57.75	56.16	43.5 - 53.5	639.39	637.80	602.15
P-7	40.75	55.22	54.57	45 - 55	620.74	620.09	579.99
P-8	2.56	15.34	14.49	3.5 - 13.5	582.57	581.72	580.01
P-9	15.14	25.31	23.91	13.5 - 23.5	587.75	586.35	572.61
P-10	18.01	30.33	28.12	18.5 - 28.5	584.87	582.66	566.86
P-11	10.30	25.28	22.97	13.5 - 23.5	567.68	565.37	557.38
P-12	17.74	30.26	28.60	18.5 - 28.5	572.34	570.68	554.60

Notes:

TOC - Top of Casing

BGS - Below Ground Surface

NGVD - National Geodectic Vertical Datum

ATTACHMENT 1

Milledge Avenue Landfill Cap
Maintenance/Inspection Checklist

Inspector _____ Date _____

Affiliation _____ Weather _____

INSTRUCTIONS:

- *Note yes or no for each item.*
- *Provide written descriptions as indicated noting both conditions observed and planned action. For planned actions, complete Attachment 2.*
- *Note locations of pertinent observations on attached site plan.*
- *Photograph areas of issue.*

Yes / No

_____ 1. Is the grass in good condition (free of bare ground or patches of dead grass)? If no, explain and document with photo.

_____

_____

_____ 2. Has the grass been mowed to allow for proper inspection? If no, explain.

_____

_____

_____ 3. Are shrubs/seedlings present? If yes, explain.

_____

_____

_____ 4. Are there any landfill areas with depressions (exhibiting ponded water after rainfall events)? If yes, explain and document with photo.

_____

_____

_____ 12. Are the gas vents in good condition (e.g., no damaged pipes or tees)? If no, explain.

_____

_____

_____ 13. Is the site access road in good condition? If no, explain.

_____

_____

_____ 14. Are the fence, entrance gates, and warning signs in good condition? If no, explain.

_____

_____

_____ 15. Are there signs of animals burrowing or any other type of animal-related disturbance within the landfill area? If yes, explain.

_____

_____

_____ 16. Is there anything unusual on the landfill grounds (e.g., signs of vehicular traffic, fire, digging or other disturbance of soil)? If yes, explain.

_____

_____

_____ 17. Is the benchmark still in good condition? If no, explain.

_____

_____

_____ 18. Additional comments, if any.

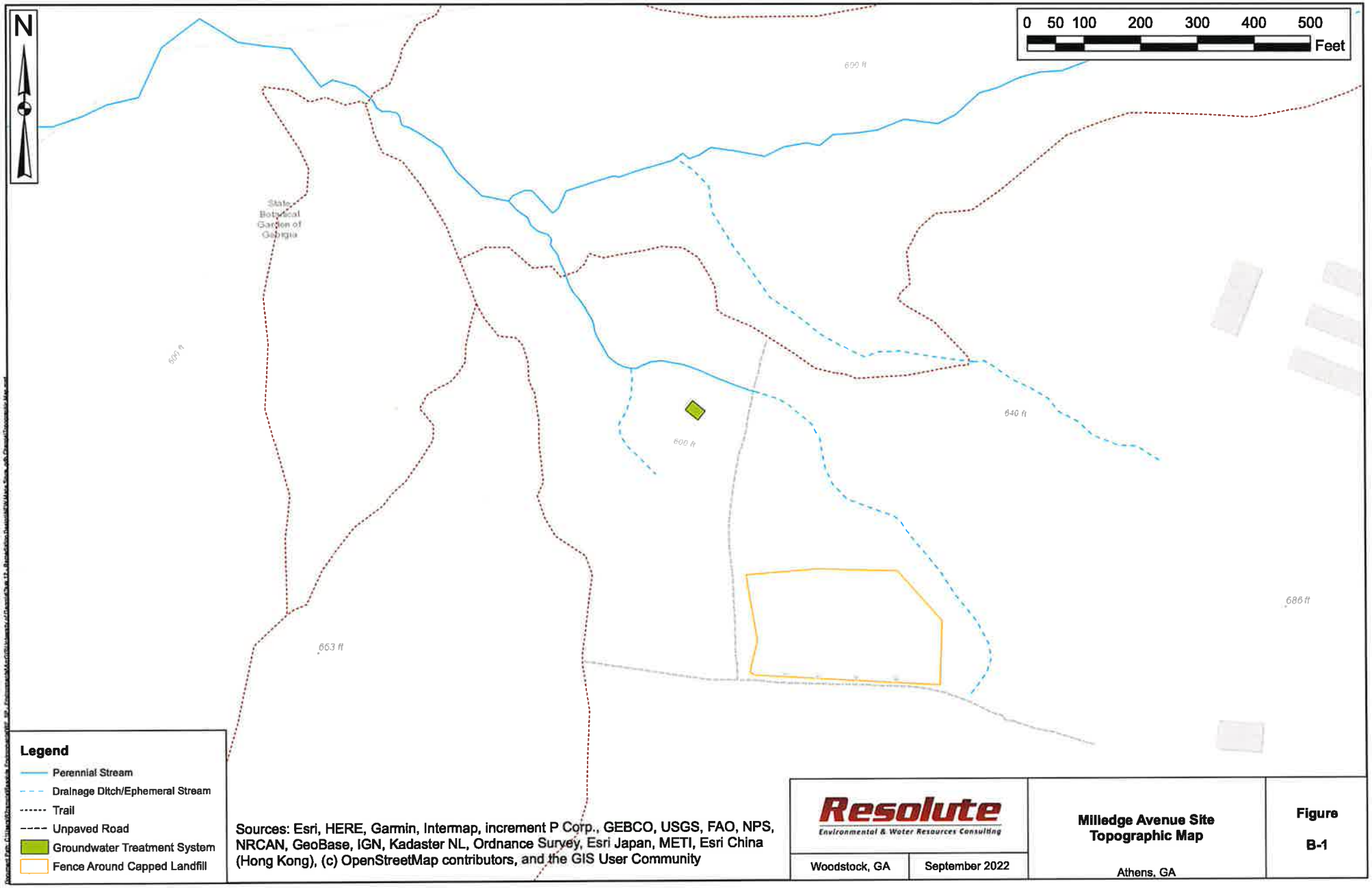
_____

_____

_____

FIGURE B-1

TOPOGRAPHIC MAP



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Resolute
Environmental & Water Resources Consulting

Woodstock, GA | September 2022

Milledge Avenue Site
Topographic Map

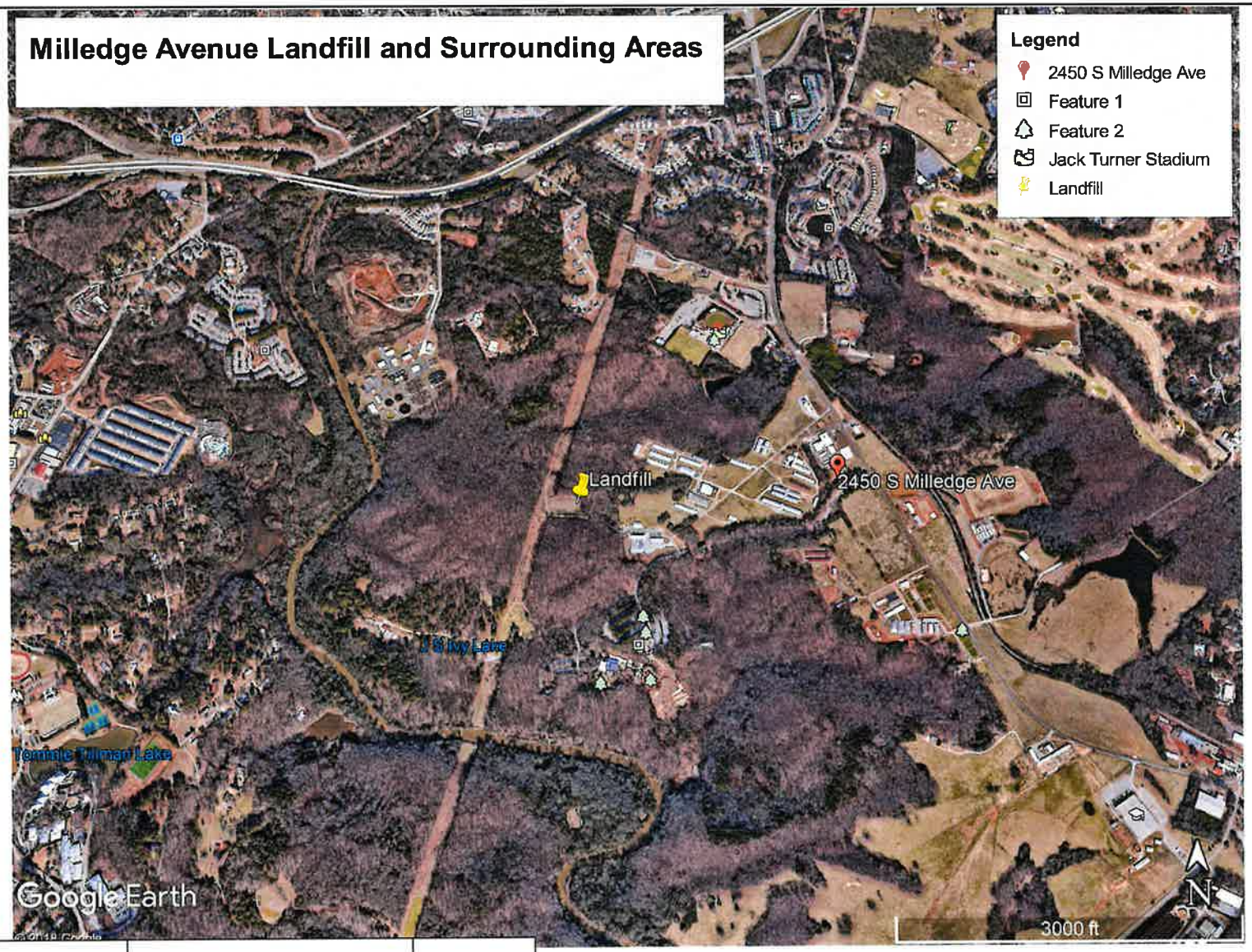
Athens, GA

Figure
B-1

FIGURE B-2

AERIAL PHOTO AND SURROUNDING AREAS

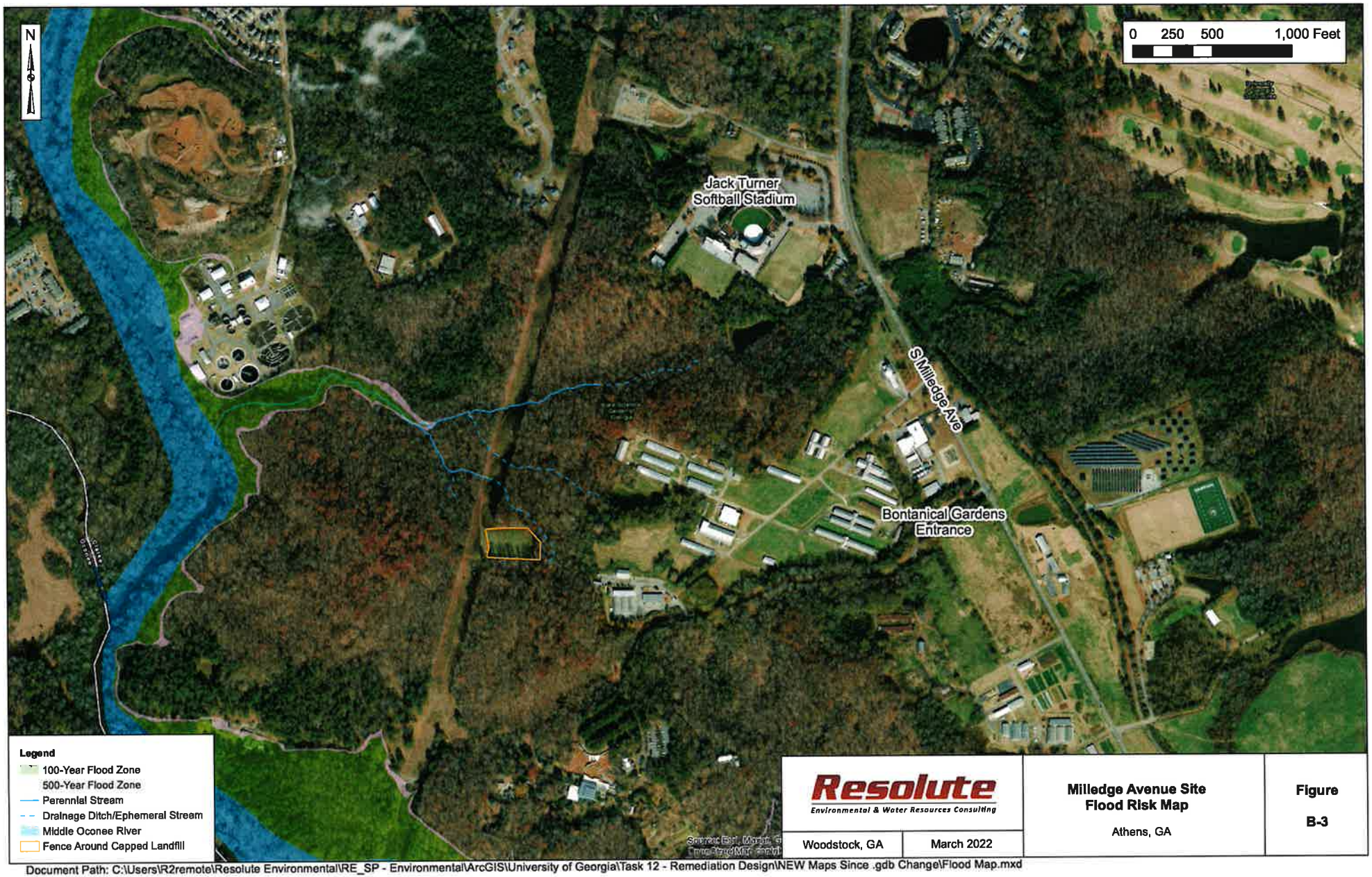
Milledge Avenue Landfill and Surrounding Areas



Resolute Environmental & Water Resources Consulting		Milledge Avenue Site and Surrounding Areas	Figure B-2
Woodstock, GA	September 2022	Athens, GA	

FIGURE B-3

FLOOD RISK MAP



Resolute
Environmental & Water Resources Consulting

Woodstock, GA | March 2022

Milledge Avenue Site
Flood Risk Map

Athens, GA

Figure
B-3

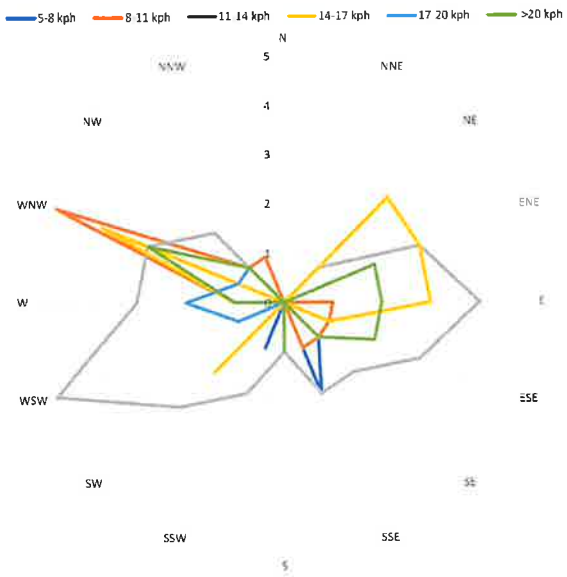
Document Path: C:\Users\R2remote\Resolute Environmental\RE_SP - Environmental\ArcGIS\University of Georgia\Task 12 - Remediation Design\NEW Maps Since .gdb Change\Flood Map.mxd

FIGURE B-4

WIND ROSE MAP

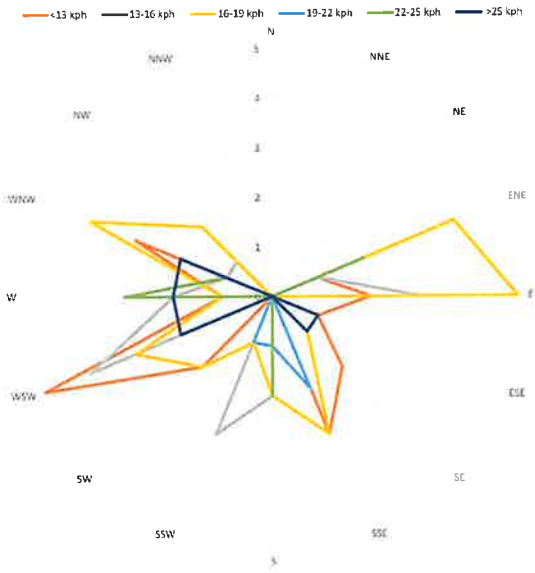
Figure B-4
Wind Rose Diagram
Milledge Avenue Site
Athens, GA

September - November 2021



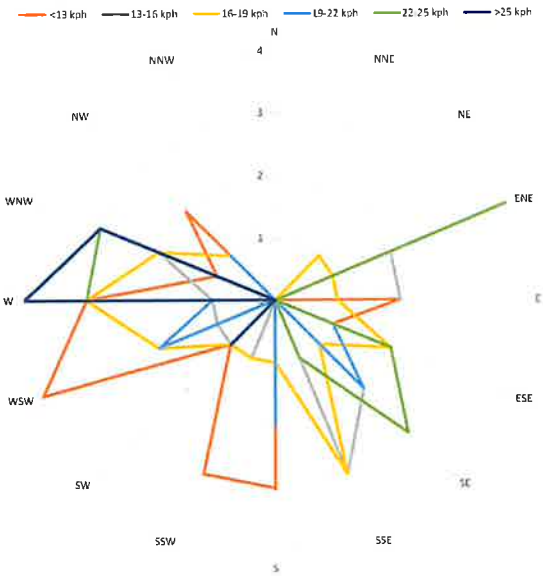
Average Wind Speed = 13.84 kph
Maximum Wind Speed = 25.9 kph (10/16/2021)
Minimum Wind Speed = 5.08 kph (11/30/2021)

December 2021 - February 2022



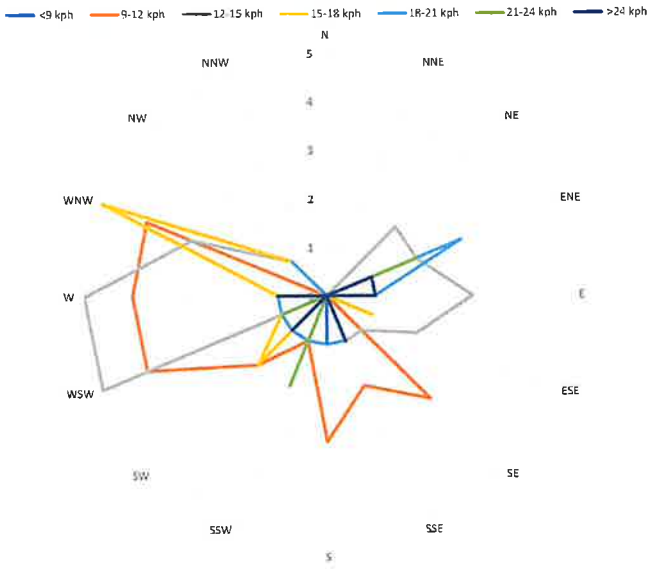
Average Wind Speed = 17.47 kph
Maximum Wind Speed = 37.8 kph (01/16/2022)
Minimum Wind Speed = 7.6 kph (12/16/2021)

March - May 2022



Average Wind Speed = 17.72 kph
Maximum Wind Speed = 37.1 kph (03/12/2022)
Minimum Wind Speed = 7.6 kph (05/31/2022)

June - August 2022



Average Wind Speed = 13.84 kph
Maximum Wind Speed = 29.3 kph (07/10/2022)
Minimum Wind Speed = 5.5 kph (08/25/2022)

Notes:
Data obtained from: https://www.visualcrossing.com/weather/weather-data-services#
Data from following stations located in/around Athens, GA: 72311013873, KGVL, AFRG1, WKSG1, 72089799999, 0761W, 74948300394, KAHN, KLZU

Resolute
Environmental & Water Resources Consulting

FIGURE B-5

PROPERTY BOUNDARIES

Resolute
Environmental & Water Resources Consulting

Woodstock, GA	September 2022	**Milledge Avenue Site Adjacent Parcel Boundaries** Athens, GA	**Figure B-5**

Document Path: C:\Users\R2remote\Resolute Environmental\RE_SP - Environmental\ArcGIS\University of Georgia\Task 12 - Remediation Design\NEW Maps Since .gdb Change\Areial Property Boundaries.mxd

FIGURE B-6

WATER WELL MAP

Roads
State and US Highways
Interstate Highways
Rivers/Streams
Lake/Pond
Swamp/Marsh
Census Block Group Boundaries
Census Block Group with >zero domestic well

Domestic Well
Well of Unknown Use
Public Supply
UGA Irrigation Well
INDUSTRIAL
UNUSED

University of Georgia Milledge Avenue Site
HSI # 10269
2450 South Milledge Avenue
Athens, Clarke County

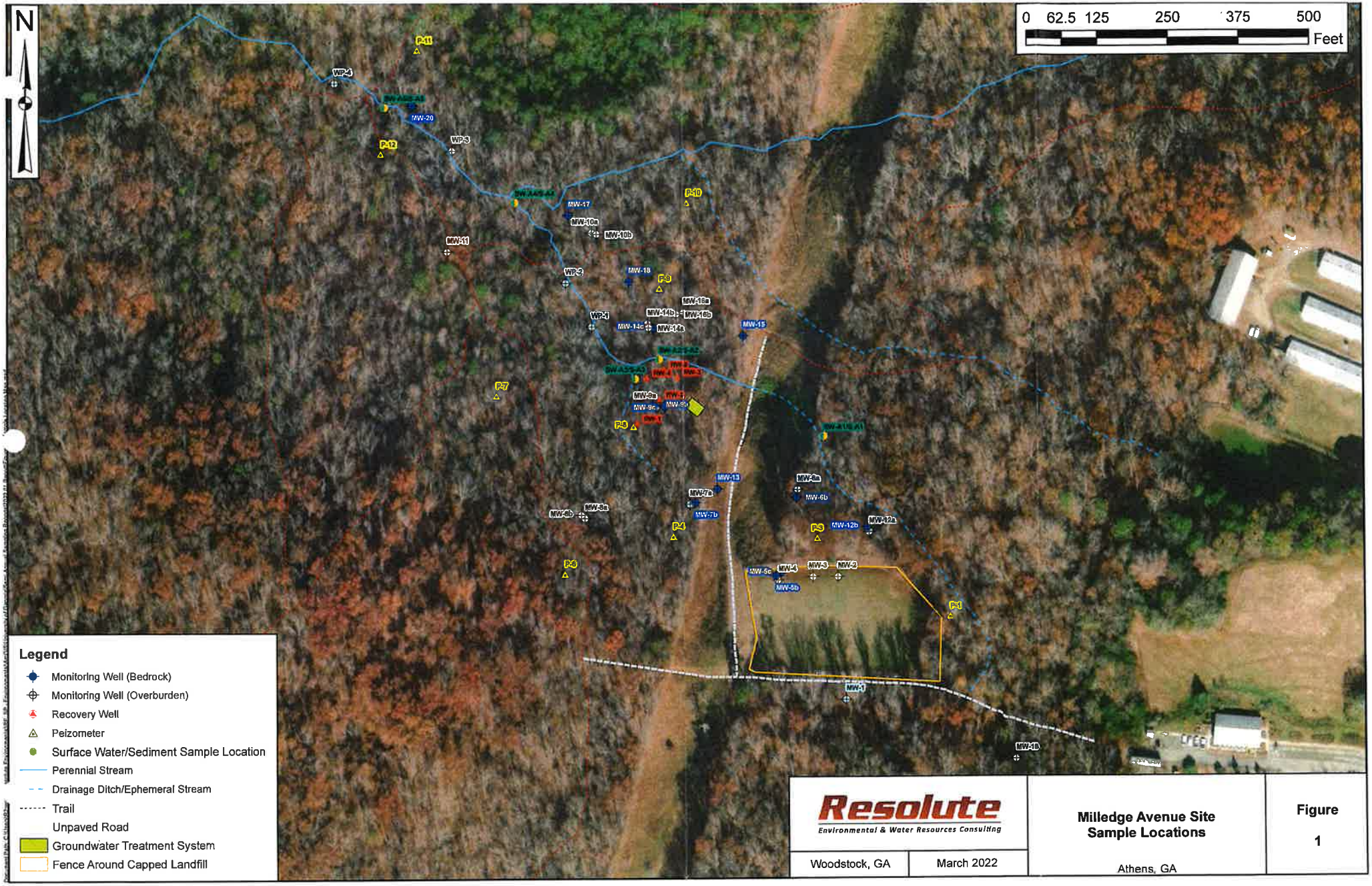
33 54' 21 83 23' 07

Scale: 1 inch = 1 mile

Sources: Wells from USGS GWSI (1999); EPD WRB Non-Municipal Wells (1997), EPD HWMB field surveys (2002), Surface Water Intakes from EPD GSB DR96-27(1996), Roads, Rivers, Wetlands from Georgia DOT (1993); Census data from U.S. Bureau of Census (1990)

1/18/19

FIGURE B-6 Water Well Map



Resolute
Environmental & Water Resources Consulting

Woodstock, GA | March 2022

Milledge Avenue Site Sample Locations

Athens, GA

Figure 1

Resolute
Environmental & Water Resources Consulting

1003 Weatherstone Parkway, Suite 320
Woodstock, GA 30188
Telephone: 678-398-9942
Fax: 888-881-8219

September 19, 2022

Environmental Safety Division
University of Georgia
240A Riverbend Road
Athens, Georgia 30602

Subject: Summary Review of Remedial Design for Corrective Action Report
Milledge Avenue Site
University of Georgia
Athens, Georgia 31523

The purpose of this document is the provide a general summary review of the above mentioned report to aid in public review.

The Milledge Avenue Site ("Site") is a former landfill located near Milledge Avenue and Will Hunter Road, in Athens, Georgia. On December 17, 2019, EPD issued Hazardous Waste Facility Permit No. HW-041 [CA] ("the Permit") for the investigation and corrective action of releases from the former landfill including Volatile Organic Compounds, 1,4-Dioxane, and Lindane. The current Groundwater Protection Standards (GWPS) for the Site are the respective Primary Drinking Water Maximum Concentration Limits (MCLs) for the Constituents of Concern (COCs), and screening level for 1,4-Dioxane. Currently, only Chloroform and 1,4-Dioxane are detected in groundwater beyond the landfill above GWPS. Additional information can be found in **Section 1.0 Introduction of the Report**.

As presented to the EPD in the 2020 Pilot Study Workplan, a Permeable Reactive Barrier (PRB), with a potential funnel-and-gate, is the intended remedial approach to be evaluated for the area immediately downgradient of the landfill, and a technically appropriate treatment of a dissolved phase plume farther downgradient in the saturated zone and bedrock. A bench study was performed evaluating In-Situ Chemical Reduction (ISCR) and In-Situ Biological Remediation (ISBR) technologies using two proven PRB candidate products (Geoform ER and EHC Plus) to evaluate their effectiveness on the site COCs. Results showed Geoform is not effective in reducing concentrations of 1,4-Dioxane, but was effective in-situ injection groundwater treatment for Lindane (Gama BHC), Chloroform, Carbon Tetrachloride and other site COCs. A Base Activated Sodium Persulfate (BASP) study was performed and revealed a 5 g/l dose can effectively reduce site COCs by > 98.6 %, except for Carbon Tetrachloride. Additional information can be found in **Section 2.1 and 2.2 of the Report**.

Section 3.0 Pilot Scale Test Methods discusses the additional remedial investigation activities including subsurface activities, PRB Pilot Study, BASP Pilot Study, and a Modified Fenton's Reagent (MFR) Pilot Study of the dissolved phased impacted groundwater in the overburden.

A multiphase remedial investigation **(Section 3.1)** was performed to obtain information necessary to complete a remedial design for the proposed PRB and funnel and gate system. These subsurface activities included Hydraulic Profile Investigation (**Section 3.1.1**) resulting in understanding the subsurface groundwater velocity was suitable for the proposed design, a Geotechnical Investigation **(Section 3.1.2**) to provide data for groundwater modeling and evaluating reactive barrier design criteria, a Soil Vapor Investigation **(Section 3.1.3)** revealing reduction in concentrations of the vapor plume may reduce concentrations and size of the groundwater plume, a Geophysical Investigation **(Section 3.1.4)** revealing density of rock needed for design criteria and methods, Discrete Groundwater Sampling **(Section 3.1.5)** revealing impacted groundwater requiring treatment were limited to approximately 20 feet below the groundwater surface immediately outside the landfill, Groundwater Modeling **(Section 3.1.6)** which simulated the groundwater velocities and elevation resulting in the proposed PRB, and a Phase III soil boring investigation **(Section 3.1.7)** immediately upgradient of the nearest surface water tributary to better understand remediation implementation.

Resolute installed a Based Activated Persulfate (BAP) pilot PRB on the downgradient edge of the landfill in December 2021. As of the time of this summary, it continues treating the groundwater migrating from the landfill. The dosage used during the pilot study achieves the Remedial Goals for Chloroform, 1,4-Dioxane and other site VOC COCs. See **Section 3.2** in the report for more details.

Section 3.3 discusses two pilot studies conducted immediately upgradient of the nearest surface water tributary farther downgradient from the landfill. One pilot study included the injection of BAP and the other included injection of a Modified Fenton's Reagent (MFR) into the groundwater. The results of the pilot study indicated variable effectiveness in reducing groundwater impacts and provided valuable information with how to implement and design treatment for the groundwater in this area. See **Section 3.3** of the report for additional details.

Section 4.0. discusses the final design for implementing corrective action at the downgradient edge of the landfill, and the dissolved groundwater plume farther downgradient in the overburden and bedrock. **The proposed final remedy for the downgradient edge of the landfill is a PRB** using Based Activated Persulfate (**discussed in Section 4.1**). Performance monitoring will continue with the PRB pilot currently installed at the downgradient edge of the landfill. The performance monitoring will evaluate the effectiveness of the treatment and monitor the PRB for breakthrough. Breakthrough is determined as the time at which the potassium persulfate no longer effectively treats the COCs and additional injection is required. Once breakthrough has occurred, the PRB will be recharged (additional injection of potassium persulfate). Based on existing data, the dosage applied during the PRB pilot study is sufficient to progress the site toward compliance with existing GWPS. During recharge, the PRB may be extended approximately 15 feet to the west. Based on the effectiveness of corrective action