Badin Business Park LLC

c/o Alcoa Corporation
201 Isabella Street
Suite 500
Pittsburgh, PA 15212-5858 USA
Tel: 1 412 315 2900

April 3, 2018

Mr. Robert C. McDaniel
Facility Management Branch
Hazardous Waste Section
North Carolina Department of Environmental Quality
1646 Mail Service Center
Raleigh, NC 27699-1646

Re: Revised Investigative Work Plan for the Phase 4 And 5 Corrective Measures Study, Alcoa/Badin Landfill, and Former Ball Field
Badin Business Park LLC, Badin, North Carolina; EPA ID: NCD 003 162 542

Dear Mr. McDaniel:

Badin Business Park LLC, in care of Alcoa Corporation, respectfully submits the attached revised Investigative Work Plan for the above referenced site for your review and approval. The Work Plan has been revised considering conditions of the January 31, 2018 conditional approval letter and the instream monitoring study requirements of the September 29, 2017 Final NPDES Permit, Condition A. (8.)

Should you have any questions or comments, please contact Jason Mibroda of Alcoa at (412) 315-2783 at your convenience.

Sincerely,

Ronald M. Morosky
Director, Corporate Remediation

Attachment

cc: Teresa Rodriguez, NCDEQ (email)
Robyn Gross, Alcoa (email)
Jason Mibroda, Alcoa (email)
Michael W. Worden, Environeering (email)

ENVIRONEERING, INC.

Investigative Work Plan

For The

Phase 4 And 5 Corrective Measures Study, Alcoa/Badin Landfill, And Former Ball Field Badin Business Park LLC f/k/a Alcoa Badin Works Facility Badin, North Carolina

Original: April 28, 2017
Revised: April 2, 2018

Prepared for:

Badin Business Park LLC
201 Isabella Street,
Pittsburgh, PA 15212

Prepared by:

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Houston, Texas 77084
832-674-8800

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1.0 INTRODUCTION

This work plan is provided as a guidance document in support of sampling and investigative activities at the Badin Business Park LLC, formerly known as the Alcoa Badin Works facility. The work plan has been prepared following receipt of the North Carolina Department of Environmental Quality (NCDEQ) January 23, 2017 correspondence concerning the review of Phase 4 and 5 of the Corrective Measures Study (CMS), the Expanded Pre-CERCLIS Screening Assessment (EPSA) for the Former Ball Field, and the Site Inspection Report (SIR) for the Alcoa/Badin Landfill. NCDEQ determined that further evaluation was warranted and requested that Alcoa demonstrate that identified items had been evaluated or prepare a work plan to evaluate those items. Select items were addressed in a March 3, 2017 written response from Alcoa and in a meeting with NCDEQ on March 28, 2017. The remaining items are the subject of this work plan which focus primarily on the Alcoa/Badin Landfill, the Main Plant area groundwater, and the Former Ball Field area.

The approach for the sampling and investigative activities has been developed based on information obtained from site reconnaissance, previous investigations, and remedial activities conducted at the facility. This work plan is intended to provide an update to the current conditions information and establish a baseline to support recommendations towards additional remedial activity and monitoring. The work plan is organized by the following sections:

- Section 1 – Introduction
- Section 2 – Scope of Work
- Section 3 – Field Procedures
- Section 4 – Schedule and Reporting

1.1 Site Overview

The facility is located on State Highway 740 within the Town of Badin, North Carolina, and occupies approximately 123 acres of land. Production at the Badin Works facility began in 1916 and continued through 2002. Principal products once manufactured at the facility included carbon cathodes and anodes, continuous cast sheets, and specialty metals. The facility was permanently closed in 2010 and several buildings were razed in 2012. In 2016, the legal owner and operator of the facility transferred from Alcoa Inc. to the Badin Business Park LLC, a subsidiary Alcoa Corporation (Alcoa).

The facility is currently subject to Resource Conservation and Recovery Act (RCRA) Corrective Action as a condition of an existing RCRA Permit (EPA ID: NCD 003 162 542). As a condition of the permit, the facility is required to identify Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs), assess the units for potential/confirmed releases, and provide remedies for those units where releases are identified and in need of corrective measures. To date, multiple investigations and interim measures have been completed across the facility. The RCRA Facility Investigation report identified groundwater in three areas of the facility as needing further actions. These areas were: groundwater at the Alcoa/Badin Landfill (SWMU No. 2); groundwater at the Old Brick Landfill (SWMU No. 3); and groundwater at the Main Plant. More recently, the EPSA for the Former Ball Field, and the SIR for the Alcoa/Badin Landfill identified questions warranting further investigation and constituted a majority of the comments provided in the NCDEQ correspondence dated January 23, 2017.

1.2 Project Objectives

This Work Plan provides guidance to address the items identified in the March 3, 2017 response to the January 23, 2017 NCDEQ letter and are summarized under the primary objectives to follow. Two additional objectives were identified during the March 28, 2016 NCDEQ meeting to address items identified by the NCDEQ Division of Water Resources and are annotated as such.

- Determine the contribution of cyanide and fluoride compounds from the eastern drainage ditch to Little Mountain Creek and examine the potential source of the PCBs and PAHs in and adjacent to the eastern drainage ditch.

- Assess the variation on constituent levels in Little Mountain Creek as intended by the instream monitoring study requirements of the September 29, 2017 Final NPDES Permit Renewal, Condition A. (8.) (NCDEQ Division of Water Resources Objective)

- Assess the contribution of groundwater discharge to the eastern drainage ditch.

- Evaluate the effects of the new trench collection system on the site-wide flow system and the constituent concentrations observed within the landfill interstitial pore water, the shallow groundwater unit, and the groundwater south of the landfill.

- Delineate the linear extent of elevated constituent levels in the wetland area downgradient of the Alcoa/Badin Landfill and monitor the effectiveness of the new trench collection system over an extended period of time.

- Determine the current jurisdictional status of the three drainage ditches upgradient of Little Mountain Creek (i.e., eastern, middle, and western) and the adjacent areas. (NCDEQ Division of Water Resources Objective)

- Determine if trichloroethylene (TCE) is present in monitoring well (MW-110) and update the delineation of TCE in groundwater at the Main Plant area.

- Assess subsurface conditions at the Former Ball Field area to determine if a disposal area is present.

The results of this study, as appropriate, will be used in support of recommending additional remedial activity and monitoring. In addition, the results will be used to develop a subsequent work plan regarding an evaluation of the long-term effectiveness of recent upgrade activities completed at the Alcoa/Badin Landfill.

2.0 SCOPE OF WORK

To satisfy the objectives of this work plan, the scope of work has been organized into three primary tasks; the Alcoa/Badin Landfill, the Main Plant area groundwater, and the Former Ball Field area. The Alcoa/Badin Landfill task is the only task that is further divided into individual subtasks. The scope of work for each of the tasks is summarized in this section with additional details on field procedures provided in Section 3.

2.1 Task 1 – Alcoa/Badin Landfill Area

In order to satisfy the objectives concerning the Alcoa/Badin Landfill and surrounding area, the scope of work for this task has been divided into four subtasks.

2.1.1 Subtask 1 – Surface Water Assessment

Subtask 1 is intended to address the first two objectives, specifically:

(1) Determine the contribution of cyanide and fluoride compounds from the eastern drainage ditch to Little Mountain Creek and examine the potential source of the PCBs and PAHs in and adjacent to the eastern drainage ditch; and,
(2) Assess the variation on constituent levels in Little Mountain Creek as intended by the instream monitoring study requirements of the September 29, 2017 Final NPDES Permit Renewal, Condition A. (8.).

The scope of Subtask 1 includes collecting the following samples:

- Once per quarter for a period of four quarters, five surface water samples will be collected from instream monitoring at five locations within Little Mountain Creek as shown on Figure 2-1.
- During one of the four quarterly sampling events, two sediment samples will be collected from two of the Little Mountain Creek sample locations, the furthest upstream sample location and the sample location immediately downstream of the eastern drainage ditch.
- During one of the four quarterly sampling events, three surface water and sediment samples will be collected from upper, middle, and lower reaches of the eastern drainage ditch as shown on Figure 2-1.

For the first quarterly Little Mountain Creek sampling event, the surface water samples will be analyzed for the following constituents:

<u>Little Mountain Creek</u>
- pH,
- Total Cyanide,
- Total Fluoride,
- PCBs (Aroclors and Congeners),
- Priority Pollutant List (upstream and downstream locations only)

- Total Hardness (upstream location only),
- Total Lead, and
- Total Arsenic.

Subsequent quarters will include pH, total cyanide, total fluoride, total hardness, total lead, and total arsenic.

The surface water samples from the Eastern Drainage Ditch will be analyzed for the following constituents:

Eastern Drainage Ditch
- Total Cyanide,
- Available Cyanide,
- Total Fluoride,
- PCBs (Aroclors and Congeners), and
- PAHs (via SVOCs).

The sediment samples will be analyzed for the following constituents:

- PCBs (Aroclors and Congeners), and
- PAHs (via SVOCs).

The Subtask 1 sampling results and recommendations for future activities, including the potential need to examine for additional potential source(s) of PCBs and PAHs, will be provided in a quarterly progress report.

2.1.2 Subtask 2 – Hydrological Conditions Evaluation

Subtask 2 is intended to address the second two objectives, specifically:

(1) Assess the contribution of groundwater discharge to the eastern drainage ditch; and,
(2) Evaluate the effects of the new trench collection system on the site-wide flow system and the constituent concentrations observed within the landfill interstitial pore water, the shallow groundwater unit, and the groundwater south of the landfill.

An analysis of current hydrological conditions will be accomplished through monitoring the water levels and constituent concentrations in several groundwater monitoring wells and piezometers associated with the landfill's existing monitoring well network, as shown on Figure 2-2 and summarized in Table 2-1. Additionally, surface water elevation data will be collected from Little Mountain Creek and the eastern drainage ditch.

For the purposes of assessing flow at the site, water level data will be collected from the landfill's shallow and deep flow systems. The investigation strategy for the assessment will consist of the following:

- Pressure dataloggers will be installed in wells strategically placed throughout the Alcoa/Badin Landfill site. The pressure dataloggers will be used to determine water levels in wells by recording a hydraulic head above the placement of the pressure sensor. Each datalogger will be set up to collect pressure data on thirty minute intervals. The pressure data will be converted to water level data, and adjusted, as necessary, to compensate for barometric pressure fluctuations. A Diver® datalogger by Schlumberger Water Services (Diver) or equivalent will be deployed in the following wells:

Table 2-1 Task 1-Subtask 2 Selected Wells

MW-1	PZ-1S	PZ-3S	PZ-16
MW-2	PZ-1I	PZ-3I	PZ-17
MW-3	PZ-1D	PZ-3D	PZ-19
MW-4	PZ-2S	PZ-13	
MW-5	PZ-2I	PZ-14	
MW-6	PZ-2D	PZ-15	

The collected data will be compiled and used to determine the maximum, minimum, and median potentiometric levels observed in each well over the period of one year. Potentiometric surface maps will be generated using this data and quarterly water elevations will be manually obtained to confirm the comprehensive datalogger data collection. Data will be used to determine the groundwater gradient and flow direction and to provide a better understanding of the interaction of the interstitial pore water within the landfill, the shallow groundwater unit, and the groundwater south of the landfill.

- Stage monitoring points will be installed in Little Mountain Creek and the eastern drainage ditch. Pressure dataloggers will be installed at monitoring points for the collection of water level data. All data will be used to develop stream flow hydrographs to separate base flow from surface run off components in determining the contribution of groundwater to Little Mountain Creek and the Eastern Drainage Ditch.

For the purpose of assessing the groundwater constituent concentrations, water samples will be collected once per quarter for four (4) quarters from the monitoring wells (MW-1 through MW-6) listed in Table 2-1. The water samples will be analyzed for the following constituents:

- Total Cyanide,
- Available Cyanide, and
- Total Fluoride.

Analytical sample results and water levels will be provided in quarterly updates and may include a reduction in frequency based on quarterly analytical results.

After completion of four quarters of monitoring, a comprehensive report will be prepared describing the scope of services performed including results of any sampling performed as well as recommendations for future activities.

2.1.3 Subtask 3 – Geophysical Baseline Establishment

Subtask 3 is intended to address the objective to delineate the linear extent of elevated constituent levels in the wetland area downgradient of the Alcoa/Badin Landfill and monitor the effectiveness of the new trench collection system over an extended period of time.

The task will be accomplished through the use of electromagnetics (EM), a geophysical method, to evaluate the electrical conductance in soil pore water downgradient of the Alcoa/Badin Landfill. This methodology was supported by Benson et al[1] as a means to correlate between inorganic water chemistry data and data from electrical-based geophysical methods. These methods can also be used for time-series measurements to obtain data on concentration dynamics[2]. The location of the targeted geophysical survey area is provided on Figure 2-3.

Due to a potential for seasonal variability, the baseline geophysical survey will be conducted quarterly for a period of one year. The quarterly surveys will be used to establish a reference baseline condition. A longer-term assessment of the area will be assessed through a subsequent work plan following the establishment of the baseline conditions.

A summary of Subtask 3 accomplishments will be included in the quarterly update letter. A more complete assessment will be included in the comprehensive report following completion of four quarters of monitoring.

2.1.4 Subtask 4 – Jurisdictional Determination

Subtask 4 scope of work is intended to address the objective to determine the current jurisdictional status of the three drainage ditches (eastern, middle, and western) and adjacent areas.

The scope will be accomplished by conducting a stream and wetland delineation to classify conditions at the base of the Alcoa/Badin Landfill. The location of each wetland and non-wetland boundary will be flagged in the field and located with a sub-meter GPS unit. Stream channels will be flagged and GPS locations acquired at representative intervals. Wetland delineation will be performed in accordance with the 1987 US Army Corps of Engineers (USACE) Wetland Delineation Manual and subsequent regional supplements. Stream delineation will be performed using indicators of ordinary high-water mark and current North Carolina stream identification methodology.

A Request for Preliminary Jurisdictional Determination summarizing the findings of the delineation will be prepared for submission to the USACE. The Request will include the following:

[1] Benson, R.C., M.S. Turner, W.D. Vogelsong and P.P. Turner, Correlation between field geophysical measurements and laboratory water sample analysis, Proceedings of the Conference on Surface and Borehole Geophysical Methods in Ground Water Investigations, National Water Well Association, Worthington, OH, pp. 178–197, 1985.

[2] Benson, R.C., M.S. Turner, P.P. Turner and W.D. Vogelsong, In situ, time-series measurements for long-term ground-water monitoring, in Ground Water Contamination: Field Methods, ASTM STP 963, Collins, A.G. and Johnson, A.I. Eds., American Society for Testing and Materials, Philadelphia, PA, 1988, pp. 58–72.

- Jurisdictional Request Form
- Table of potential jurisdictional resources including estimates of area/size and classification
- Vicinity Map
- USGS and Soil Survey maps
- Aerial photography map of the site depicting the location of potential Clean Water Act jurisdictional and non-jurisdictional resources
- USACE wetland data forms documenting the characteristics of the wetland and upland areas investigated including vegetation, soils, and hydrology
- NC Division of Water Resources Stream Identification forms for each of the drainage ditches including benthic assessment.
- NC Stream Assessment Method and NC Wetland Assessment Method forms for each drainage and type of adjacent wetland.
- Relevant background information including historical mapping, site plans (if available)
- Site photographs

If necessary, a site visit will be scheduled with the USACE to verify the delineation results. Upon conclusion of the visit, any required revisions will be made to the mapping as well as a memo summarizing the changes.

2.2 Task 2 – Main Plant Groundwater

To address the objective of determining if TCE is present in monitoring well (MW-110) and to update the delineation of TCE in groundwater at the Main Plant area, groundwater samples will be collected from monitoring wells (MW-4, MW-9, MW-16, and MW-110). The locations of the wells to be sampled are provided on Figure 2-4. The groundwater samples will be analyzed for volatile organic compounds (VOCs).

After completion of the Main Plant Groundwater task, an interim report will be prepared providing a summary of the services performed including results of any sampling as well as recommendations for future activities.

2.3 Task 3 – Additional Former Ball Field Assessment

In order to satisfy the objectives concerning the Former Ball Field and surrounding area, the scope of work for this task has been divided into three subtasks.

2.3.1 Subtask 1 – Geophysical Survey

To address the objective of determining if a disposal area is present at the Former Ball Field, geophysical methods such as EM and ground penetrating radar (GPR) will be employed. The location of the geophysical survey area is provided on Figure 2-5.

For the Former Ball Field, the EM technology will be useful in characterizing buried material (either metal bearing or conductive). Buried carbon material typically exhibits very high quadrature (apparent conductivity) values when compared with a non-carbon bearing host material. The high conductivity values are generally exhibited across all EM frequencies. Metal bearing materials (such as steel) tend to have lower conductivity responses and higher in-phase responses. As a result, a comparison of apparent conductivity values with the in-phase (metal detection mode) values provides insight as to the composition and extent of buried material with anomalous high in-phase and apparent conductivity values.

The GPR technology allows for high resolution, continuous profiling of the subsurface. Changes in conductivity and in dielectric properties are associated with natural hydrogeologic conditions such as bedding, cementation, moisture, clay content, voids, and fractures. Therefore, an interface between two soil or rock layers that have a sufficient contrast in electric properties or a large ditch, backfilled with suspected plant waste materials, will show up in the radar profile.

Contingency Plan: If the results of the geophysical survey(s) indicate the presence of buried materials, borings will be installed and soil samples will be collected from the area(s) of interest and analyzed for the following constituents:

- Total Cyanide,
- Total Fluoride,
- RCRA Metals, and
- PAHs (via SVOCs).

2.3.2 Subtask 2 – Surface Soil Assessment

The objective of Subtask 2 is to assess the drainage swales for constituents in excess of screening levels found in the sediment in the catch basin. The scope of work will include collecting six surface soil samples from drainage swales as shown on Figure 2-6.

The soil samples will be analyzed for the following constituents:

- PCBs (Aroclors and Congeners),
- PAHs (via SVOCs).

2.3.3 Subtask 3 – Sediment Sample

The objective of Subtask 3 is to corroborate that concentrations of constituents in Badin Lake sediments near the concrete culvert discharge are consistent with historical Lake studies and assessments. The scope of work will include collecting one sediment sample from Badin Lake between the concrete culvert and the barrier as shown on Figure 2-6.

The sediment samples will be analyzed for PAHs (via SVOCs).

An interim report will be prepared to provide a summary of the investigation to include results of the geophysical survey and any sampling preformed as well as recommendations for future activities following the completion of the Former Ball Field Assessment subtasks 1 through 3.

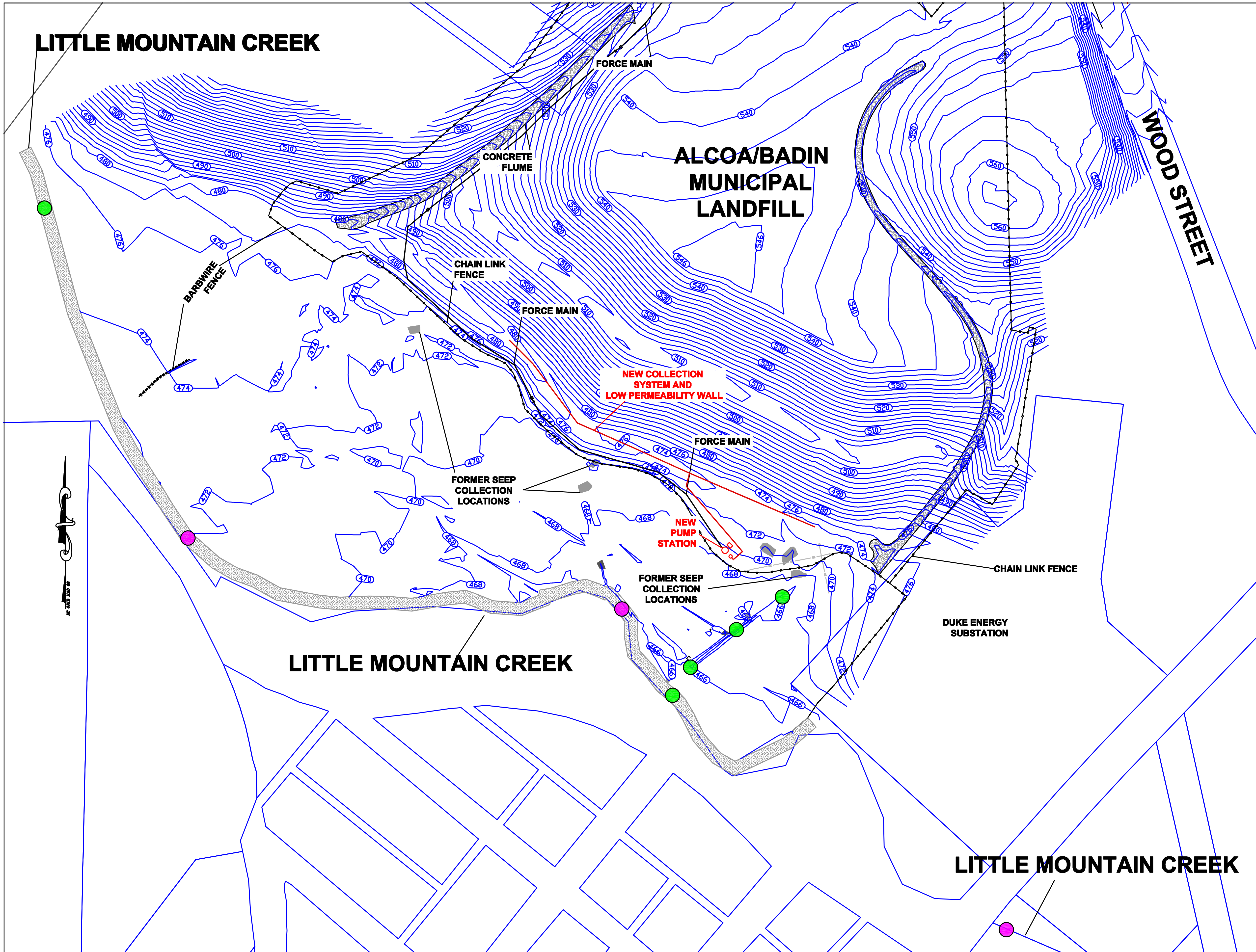

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FIGURE 2-1
ALCOA/BADIN LANDFILL
SURFACE WATER & SEDIMENT SAMPLING LOCATIONS
FORMER ALCOA BADIN WORKS FACILITY
BADIN, NORTH CAROLINA

DRAWN BY: MWW	DATE: 03/07/2018	PROJ. NO. 137-261

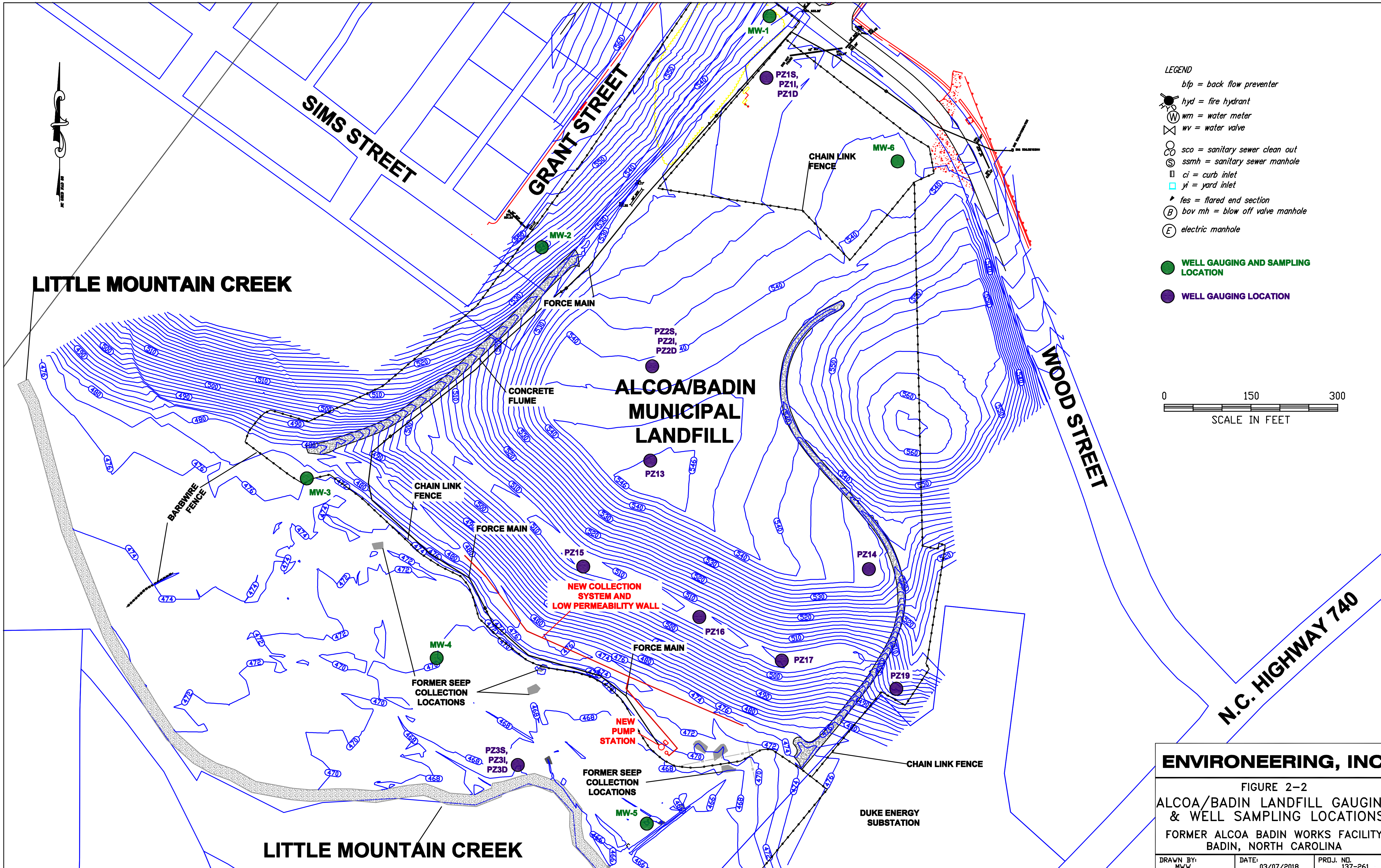

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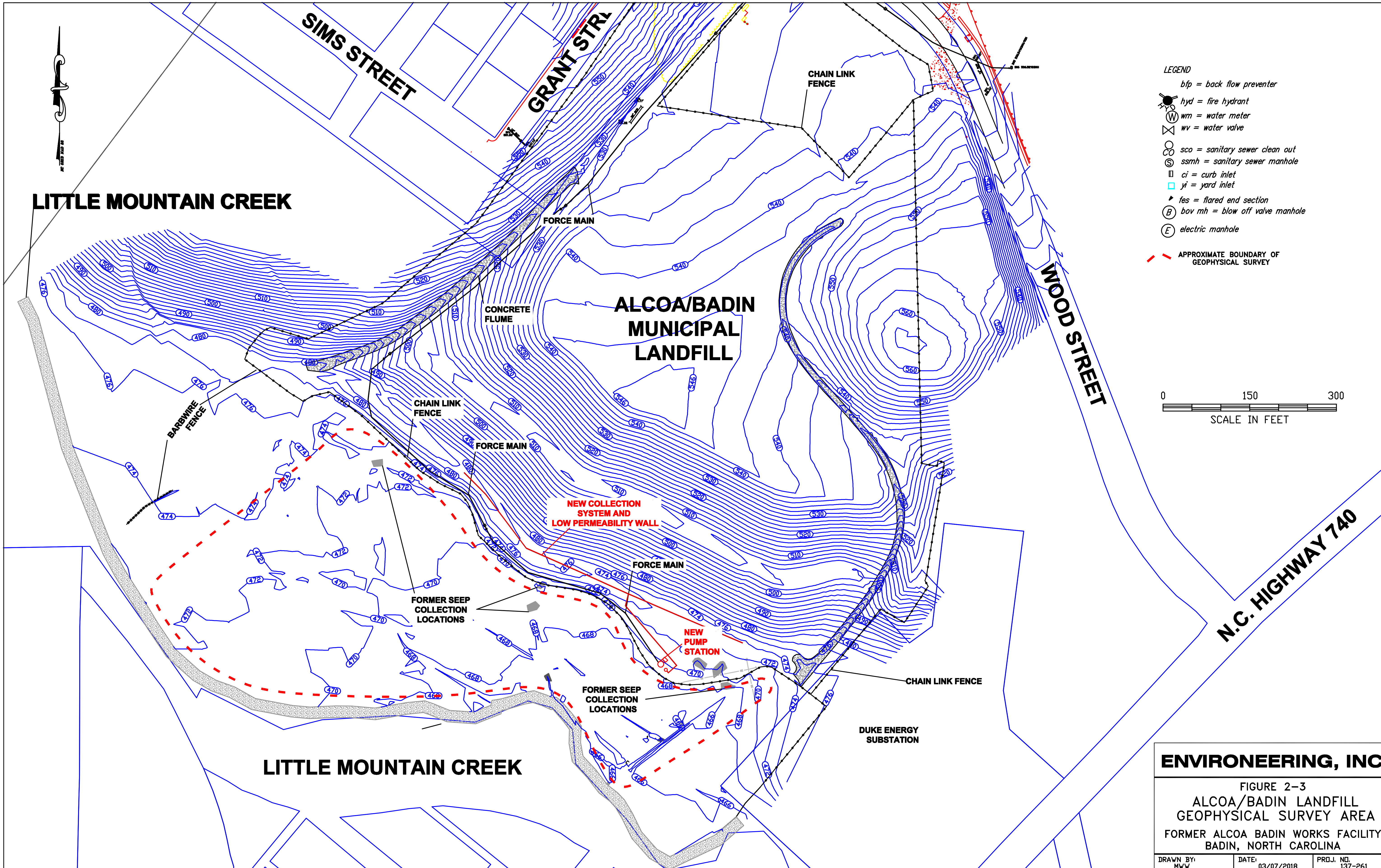
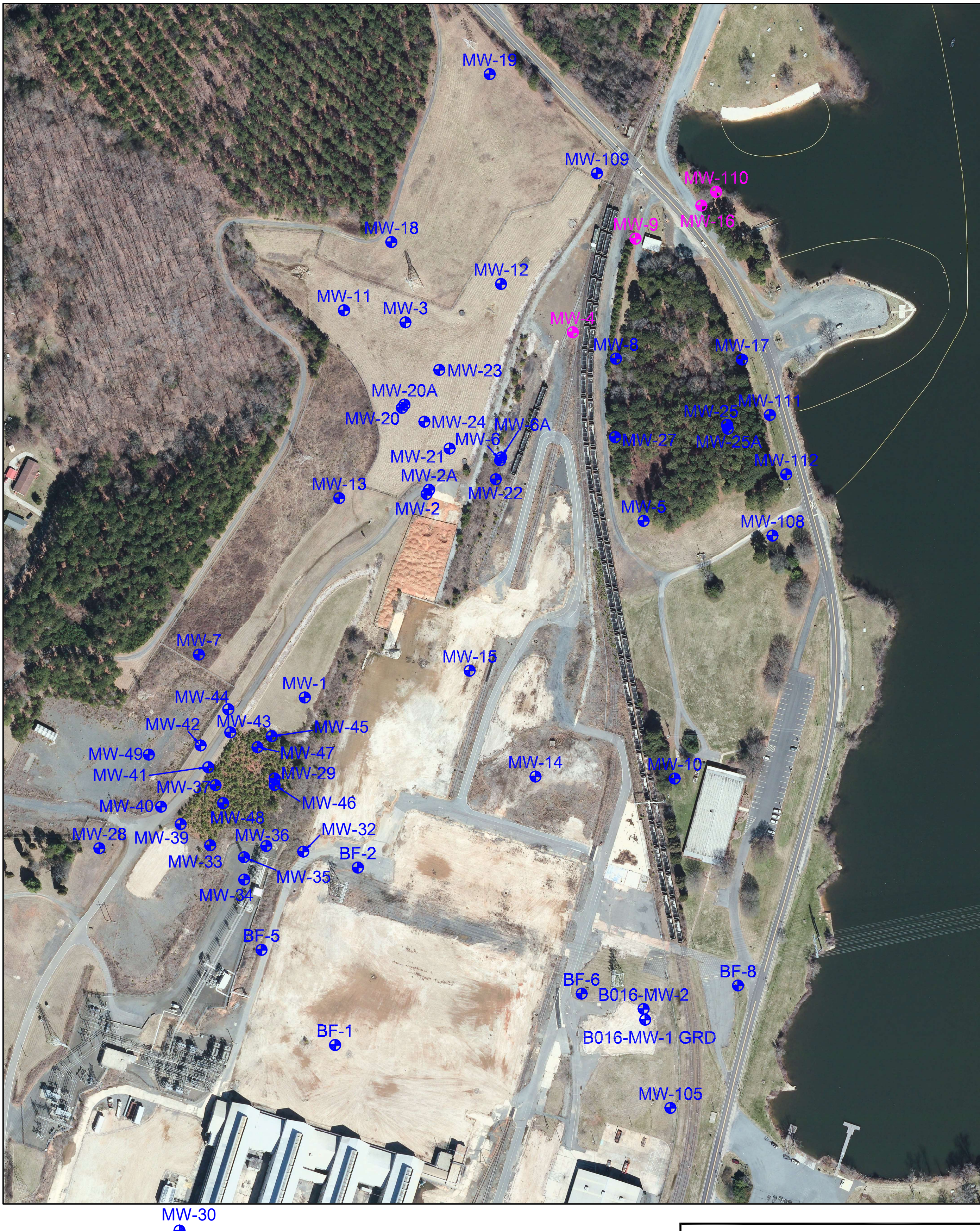
FIGURE 2–2
ALCOA/BADIN LANDFILL GAUGING & WELL SAMPLING LOCATIONS
FORMER ALCOA BADIN WORKS FACILITY
BADIN, NORTH CAROLINA

DRAWN BY:	DATE:	PROJ. NO.
MWW	03/07/2018	137-261



SIMS STREET
GRANT STREET
LITTLE MOUNTAIN CREEK
CHAIN LINK FENCE
FORCE MAIN
CONCRETE FLUME
ALCOA/BADIN MUNICIPAL LANDFILL
WOOD STREET
BARBWIRE FENCE
CHAIN LINK FENCE
FORCE MAIN
NEW COLLECTION SYSTEM AND LOW PERMEABILITY WALL
FORCE MAIN
FORMER SEEP COLLECTION LOCATIONS
NEW PUMP STATION
FORMER SEEP COLLECTION LOCATIONS
CHAIN LINK FENCE
DUKE ENERGY SUBSTATION
LITTLE MOUNTAIN CREEK
N.C. HIGHWAY 740
LEGEND
bfp = back flow preventer
hyd = fire hydrant
wm = water meter
wv = water valve
sco = sanitary sewer clean out
ssmh = sanitary sewer manhole
ci = curb inlet
yi = yard inlet
fes = flared end section
bov mh = blow off valve manhole
electric manhole
APPROXIMATE BOUNDARY OF GEOPHYSICAL SURVEY
0 150 300
SCALE IN FEET
ENVIRONEERING, INC
FIGURE 2-3
ALCOA/BADIN LANDFILL GEOPHYSICAL SURVEY AREA
FORMER ALCOA BADIN WORKS FACILITY
BADIN, NORTH CAROLINA
DRAWN BY: MWW
DATE: 03/07/2018
PROJ. NO. 137-261



0 300 600

SCALE IN FEET

MONITORING WELL TO BE SAMPLED

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FIGURE 2–4

MAIN PLANT

GROUNDWATER SAMPLING

FORMER ALCOA – BADIN WORKS FACILITY

BADIN, NORTH CAROLINA

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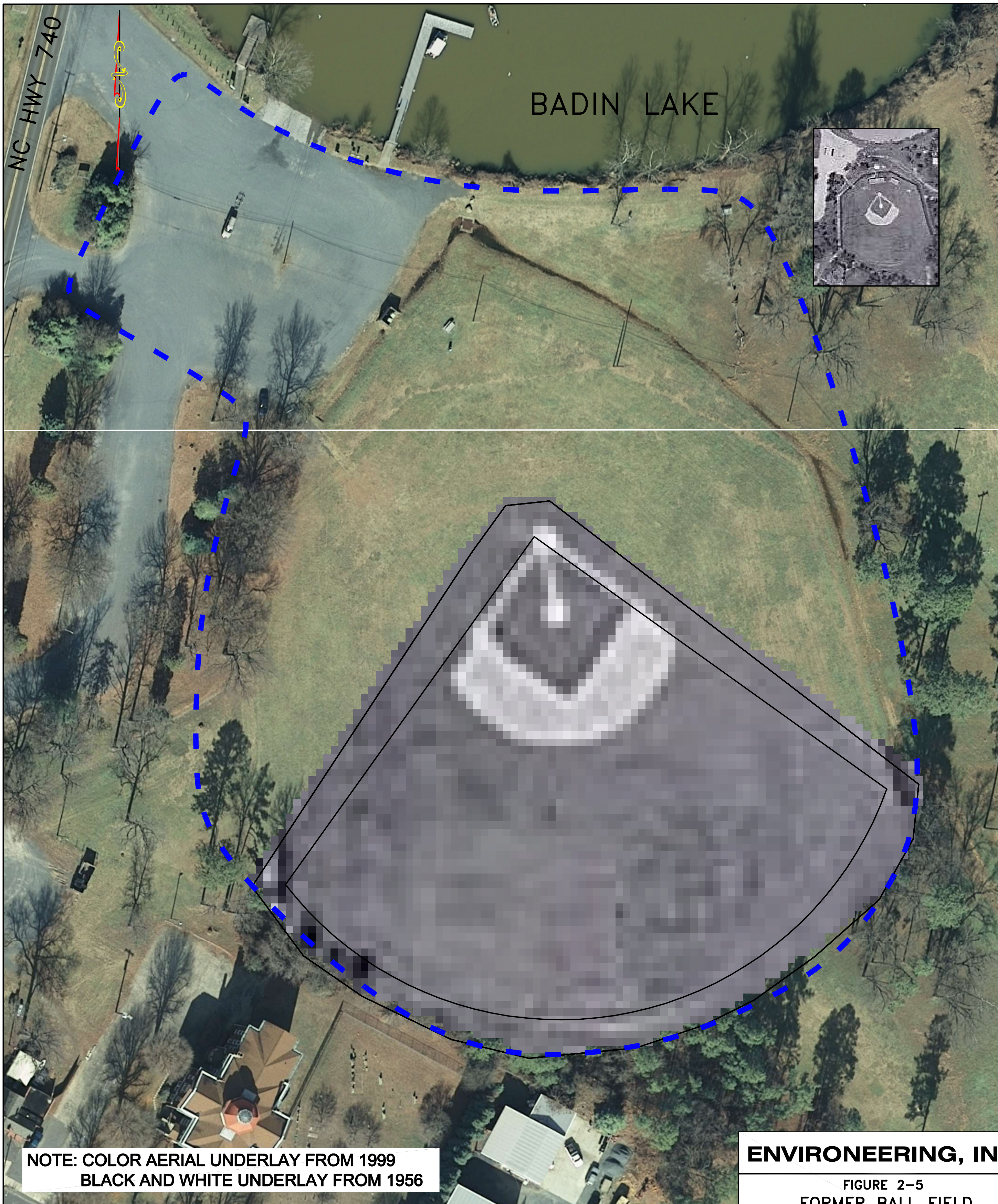

0 100 200
SCALE IN FEET

APPROXIMATE BOUNDARY OF GEOPHYSICAL SURVEY

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FIGURE 2-5

FORMER BALL FIELD
GEOPHYSICAL SURVEY AREA

FORMER ALCOA BADIN WORKS FACILITY
BADIN, NORTH CAROLINA

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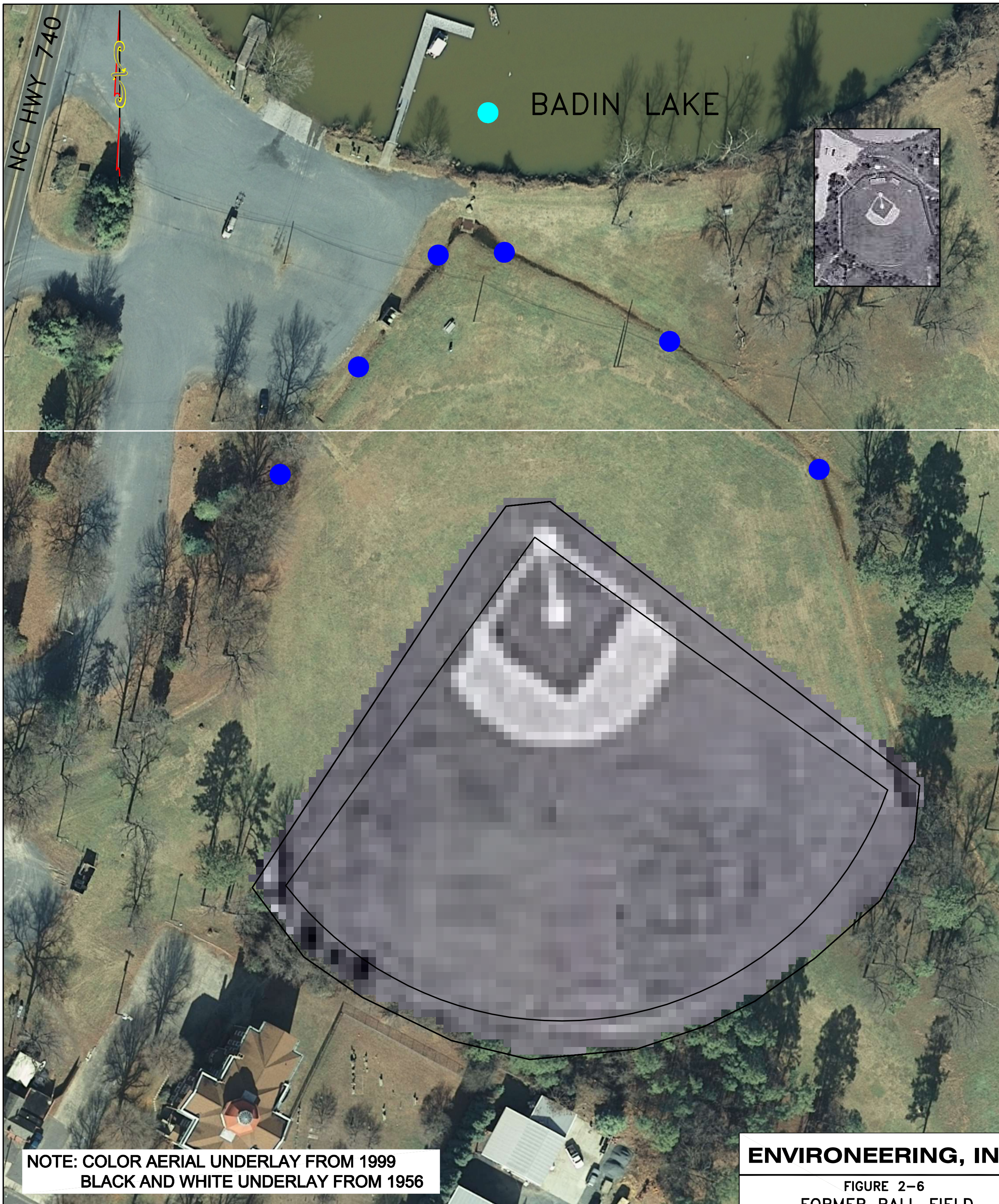

0 100 200
SCALE IN FEET

SEDIMENT SAMPLE LOCATION (APPROXIMATE)

SURFACE SOIL SAMPLE LOCATION (APPROXIMATE)

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FIGURE 2-6
FORMER BALL FIELD SAMPLING LOCATIONS

FORMER ALCOA BADIN WORKS FACILITY
BADIN, NORTH CAROLINA

DRAWN BY:	DATE:	PROJ. NO.
MWW	02/22/2018	137-261

3.0 FIELD PROCEDURES

3.1 Pressure Datalogger Deployment

Pressure dataloggers have the capacity to determine water levels in wells by recording a hydraulic head above the placement of the pressure sensor. For the Site, the Diver® datalogger by Schlumberger Water Services or equivalent will be deployed. Diver units will be decontaminated prior to deployment utilizing the procedures outlined in Section 3.2.1 and will be installed in the locations identified in Table 2-1. Each Diver unit will be installed suspended from the top of the well using a non-stretch suspension cable on the basis of the lowest potential water level.

The Diver-Office desktop application will be used to calibrate, read, and program all Diver units. Pressure data will be downloaded from the Diver onto a PC. The Diver-Office application performs barometric compensation using the Baro-Diver as well as calculations of absolute water levels based on top of casing elevations measured in relation to the vertical reference datum. This calculation is performed using either a known cable length and confirmed with a manual measurement of the water level in the well.

3.2 Sample Collection Procedures

3.2.1 <u>Sample Collection and Decontamination</u>

Surface water and sediment samples will be collected starting with the farthest downstream sampling location. Surface water samples will be collected using a device constructed of non-reactive material (i.e. glass, stainless steel or Teflon) and transferred to the laboratory provided sample containers. Water samples will be collected from the wells utilizing a peristaltic pump and disposable tubing. Sediment samples will be collected using a stainless-steel hand corer, scoop, trowel, spoon or ladle. Soil samples will be collected using either a stainless-steel hand trowel or hand auger, or using a small portable Geoprobe®-like system. All equipment used will be decontaminated between each sample.

Decontamination of Equipment

Decontamination of sampling equipment will be per EPA Region IV Standard Operating Procedures. For sample collection equipment contaminated with environmental media, one or more of the following options will be used for field cleaning based on the condition of the sampling equipment:

1. Clean with tap water and Liquinox® or Luminox® detergent using a brush, if necessary, to remove particulate matter and surface films. Equipment may be steam cleaned (detergent and high pressure hot water) as an alternative to brushing. Sampling equipment that is steam cleaned should be placed on racks or saw horses at least two feet above the floor of the decontamination pad. PVC or plastic items should not be steam cleaned.
2. Rinse thoroughly with tap or distilled water.
3. Rinse thoroughly with distilled water and place on a clean foil-wrapped surface to air-dry.
4. All equipment must be wrapped with foil. If the equipment is to be stored overnight before it is wrapped in foil, it should be covered and secured with clean, unused plastic sheeting.

For well sounders (water level indicators) and tapes, the following procedures will be followed:

1. Wash with detergent and tap water.
2. Rinse with tap water.
3. Rinse with distilled water.

Unless conditions warrant, it is only necessary to decontaminate the wetted portion of the sounder or tape.

For downhole drilling equipment (augers, drill stems, rods, tools, and associated equipment) used for drilling activities involving the collection of soil samples for trace organic and inorganic constituent analyses and for the construction of monitoring wells to be used for the collection of groundwater, the following procedures will be followed:

1. Cleaning and decontamination of all equipment should occur at a designated area (decontamination pad) on the site. Tap water brought on the site for drilling and cleaning purposes should be contained in a pre-cleaned tank. A steam cleaner and/or high pressure hot water washer capable of generating a pressure of at least 2500 PSI and producing hot water and/or steam (200° F plus), with a detergent compartment, should be obtained.
2. Prior to arrival, drilling equipment should be clean of any contaminants that may have been transported from off-site to minimize the potential for cross-contamination.
3. Equipment will be washed with tap water and detergent, using a brush if necessary, to remove particulate matter and surface films. Steam cleaning (high pressure hot water with detergent) may be necessary to remove matter that is difficult to remove with the brush. Drilling equipment that is steam cleaned should be placed on racks or saw horses at least two feet above the floor of the decontamination pad. Hollow-stem augers, drill rods, etc., that are hollow or have holes that transmit water or drilling fluids, should be cleaned on the inside with vigorous brushing.
4. Rinse thoroughly with tap water.
5. Remove from the decontamination pad and cover with clean, unused plastic. If stored overnight, the plastic should be secured to ensure that it stays in place.

For downhole drilling equipment that contacts the sample media (piston sampler points and shoes, screen point sampler screens and sheaths, and the drive rods when used for groundwater sampling), the following procedures will be followed:

1. Clean with tap water and Alconox® detergent using a brush, if necessary, to remove particulate matter and surface films. Equipment may be steam cleaned (detergent and high pressure hot water) as an alternative to brushing. Sampling equipment that is steam cleaned should be placed on racks or saw horses at least two feet above the floor of the decontamination pad. PVC or plastic items should not be steam cleaned.
2. Rinse thoroughly with tap or distilled water.
3. Rinse thoroughly with distilled water and place on a clean foil-wrapped surface to air-dry.
4. All equipment must be wrapped with foil. If the equipment is to be stored overnight before it is wrapped in foil, it should be covered and secured with clean, unused plastic sheeting.

After decontamination, sampling equipment will be handled only by personnel wearing clean gloves to prevent re-contamination. In addition, the equipment should be moved away (preferably upwind) from the decontamination area to prevent re-contamination. If the equipment is not to be immediately re-used it should be covered with plastic sheeting to prevent re-contamination. The area where the equipment is kept prior to re-use must be free of contaminants.

Sample Collection

Precautions will be taken so that sampling materials do not contact the ground or other potentially impacted surfaces. Each soil, sediment, surface water, and water sample will be retrieved from the sampling location and placed into a clean sample container. Upon completion of the field measurements, samples will be collected from the sample location for laboratory analyses, and placed in laboratory-prepared containers appropriate for the analyses to be performed. Each sample container will be labeled with the sample number; the identity of the sampler; the time and date of collection; the preservatives (if any); and the required analyses. All samples collected will be placed into laboratory-prepared containers and preserved as noted on Table 3-1.

Table 3-1 Bottling and Preservative Parameters

Analyte	Bottle	Preservative	Holding Time
Sediment			
SVOCs (for PAHs)	4 oz. Glass	0-4ºC	14 days
PCBs (Aroclors)	4 oz. Glass	0-4ºC	1 year
PCBs (Congeners)	4 oz. Amber Glass	None	1 year
Soil			
Total Cyanide	4 oz. Glass	0-4ºC	14 days
Fluoride	4 oz. Glass	0-4ºC	28 days
RCRA Metals	4 oz. Glass	0-4ºC	28 days
PAHs	4 oz. Glass	0-4ºC	14 days
Surface Water			
Total Cyanide	250 ml Plastic	NaOH, 0-4ºC	14 days
Available Cyanide	250 ml Amber Plastic	Lead Carbonate/ Filtration, NaOH, 0-4ºC	14 days
Fluoride	250 ml Plastic	0-4ºC	28 days
PCBs (Aroclors)	Two x 1-liter Amber Glass	0-4ºC	None
PCBs (Congeners)	Two x 1-liter Amber Glass	None	1 year
PAHs	Two x 1-liter Amber Glass	0-4ºC	7 days
PPL - VOCs	Three x 40mL amber vials	HCl, 0-4°C	14 days
PPL - SVOCs	Two x 1-liter Amber Glass	0-4ºC	7 days
PPL – Metals	250 ml Plastic	HNO_3, 0-4ºC	28 days

Analyte	Bottle	Preservative	Holding Time
PPL – Cyanide	250 ml Plastic	NaOH, 0-4ºC	14 days
PPL – Phenols	250 mL Amber Glass	H_2SO_4, 0-4°C	28 days
PPL – Asbestos	1-liter Plastic	0-4°C	48 hours
PPL – Dioxins	Two x 1-liter Amber Glass	0-4°C	1 year
PPL – Pesticides/PCBs	Two x 1-liter Amber Glass	0-4ºC	None
Total Hardness	250 ml Plastic	HNO_3, 0-4ºC	180 days
Total Lead/Arsenic	250 ml Plastic	HNO_3, 0-4ºC	180 days
pH	Field Procedure	None	None
Water (Via Wells)			
Total Cyanide	250 ml Plastic	NaOH, 0-4ºC	14 days
Available Cyanide	250 ml Amber Plastic	Lead Carbonate/ Filtration, NaOH, 0-4ºC	14 days
Fluoride	250 ml Plastic	0-4ºC	28 days
VOCs	3 x 40ml V-TSL	HCl, 0-4ºC	14 days

ml – milliliters

V-TSL – Glass Vial Teflon-lined Septum

PPL – Priority Pollutant List

Sample collection points will be geolocated and placed on an aerial photograph base map and incorporated into a georeferenced database for the site. The ArcView® visualization program will be used to integrate the database and geo-referenced aerial photographs and topographic map set.

3.2.2 Sample Analysis

Samples will be analyzed in accordance with the EPA methods, listed in Table 3-2 or an equivalent procedure, by a North Carolina-certified laboratory:

Table 3-2 Analytical Parameters

Analyte	Method Number	Laboratory Reportable Detection Limit
Sediment		
SVOCs (with PAHs)	8270	0.33-1.7 mg/kg
PCBs (Aroclors)	8082	0.033 mg/kg
PCBs (Congeners)	1668	$2.5x10^{-5}$ - $3x10^{-4}$ mg/kg
Soil		
Total Cyanide	9012	0.25 mg/kg
Fluoride	9056	5 mg/kg
RCRA Metals (with Hg)	6020/7471	0.006 - 5 mg/kg
PAHs	8270	0.33-1.7 mg/kg

Analyte	Method Number	Laboratory Reportable Detection Limit
Surface Water		
Total Cyanide	4500 CN-E	0.01 mg/l
Available Cyanide	OIA-1677-09	0.002 mg/l
Fluoride	300	0.5 mg/l
PCBs (Aroclors)	608	0.0005 mg/l
PCBs (Congeners)	1668	$2.5x10^{-7}$ - $3x10^{-6}$ mg/l
PAHs	625	0.010-0.060 mg/l
PPL - VOCs	624	0.002 - 0.05 mg/l
PPL - SVOCs	625	0.010-0.060 mg/l
PPL – Metals	200.7/245.1	0.0002 - 0.050 mg/l
PPL – Cyanide	4500 CN-E	0.01 mg/l
PPL – Phenols	420.4	0.01mg/l
PPL – Asbestos	100.2	<10 micron
PPL – Dioxins	1613	10 pg/l
PPL – Pesticides/PCBs	608	0.00005 - 0.0005mg/L
Total Hardness	200.7	0.7 mg/l
Total Lead/Arsenic	200.7	0.0001 - 0.050 mg/l
pH	Field procedure	
Water (Via Wells)		
Total Cyanide	9012	0.01 mg/l
Available Cyanide	OIA-1677-09	0.002 mg/l
Fluoride	4500FL-C	0.5 mg/l
VOCs	8260	0.001-0.025 mg/l

3.2.3 Field Quality Control

The quality of data for the collection of samples will be ensured by the use of trip blanks, and equipment blanks (not required if dedicated materials are used), and replicate samples. Trip blanks measure any cross-contamination of the samples during transport, handling, and storage. Equipment blanks demonstrate that the sample equipment is free of contamination and that adequate decontamination was performed after the use of the sample equipment. Replicate samples indicate the precision of the sampling process by calculating the relative percent difference in the results for a sample and its replicate. Each sampling event will include at least one trip blank, and one equipment blank (if required), and one replicate sample. Trip blanks will be analyzed for VOCs in the same manner as the accompanying samples. Equipment blanks and replicate samples will be analyzed for the same analytes and in the same manner as the accompanying samples.

3.2.4 Sample Shipment

All samples will be packaged securely and placed on ice to cool (reduce the sample temperature to below 4° C), and transported to the analytical laboratory following strict chain-of-custody protocol.

3.2.5 Chain-Of-Custody

Each sample container will be individually identified as to sample number, date and time collected, and source of sample. A chain-of-custody record will be prepared which will include:

- The name of the person collecting the samples;
- The identity of each sample;
- Analytical requirements; and
- Name of person accepting sample.

Custody transfers of samples will be recorded on the chain-of-custody form by signatures of the transferor (relinquisher) and the transferee (receiver). This procedure will be repeated, as necessary, until final delivery is made to the analytical laboratory.

3.2.6 Laboratory Quality Control

The quality of data from the laboratory will be ensured by the use of instrument tuning, initial calibration, continuing calibration, internal standards, method blanks, surrogate recoveries, and matrix spike/spike duplicate analyses.

3.3 Geophysical Survey Procedures

3.3.1 EM Field Procedures

The EM in-phase and conductivity data are typically collected simultaneously at five varying frequencies (1530 Hz, 5010 Hz, 9990 Hz, 20010 Hz, and 47010 Hz). By varying the collection frequencies, the geophysicist is able to better characterize the makeup of buried debris (i.e., distinguish between highly conductive carbon and other metal bearing material), if present.

The GEM-2 may be operated in remote control configuration while evaluating the landfill area (using a sled) and wetlands (carried by hand). In this mode, the GEM-2 unit is mounted on PVC tubular sled positioned approximately 0.75 meters from the ground surface, or is held by hand while the land is traversed on foot. The receiving coil (detector coil) is situated directly above the exposed ground surface.

Data is typically collected at the rate of approximately six samples per second. The position of each sample point is measured utilizing a CSI Wireless SERES global positioning system (GPS) with a data update rate of 6 Hz. This data can be transferred from the GEM-2 unit to a portable laptop computer that was carried on board a 4WD vehicle (Polaris Ranger with covered cab area). The sample spacing is thus a function of rate of travel of the sled or pace rate of the person carrying the GEM-2 and rate of data sampling.

The EM data will be transferred from the field data collection unit to a laptop computer using the WinGEM software provided by the manufacturer. During the transfer process, the WinGEM software assigns UTM metric coordinates to each data collection station, and calculates the apparent conductivity, sum of conductivity, and magnetic susceptibility for each frequency collected using the system software.

These data will be transferred to a Microsoft Excel Spread Sheet and reviewed for data anomalies such as poor GPS confidence levels that would likely result in poor coordinate assignments. All data with GPS confidence levels of less than 1 are typically rejected. The UTM Coordinates are transformed into the North Carolina State Plane System (in survey feet) using the Corpscon software, and then used to compile a series of maps illustrating various responses using a simple 3D mapping program (such as Golden Software's Surfer software).

3.3.2 GPR Field Procedures

The GPR data will be collected on the SIR 3000 data collection unit using a 400 and 200 MHz antennas, and reviewed in the field for completeness and reliability. The SIR 3000 unit uses a digital survey wheel to determine the distance between each vertical survey GPR sounding. This data is collected with the time domain records of the GPR, and post-processed using GSSI Radar Radan software.

4.0 SCHEDULE AND REPORTING

All activities shall be implemented according to a schedule agreed upon by Alcoa and NCDEQ. Within 90 days of the NCDEQ's approval of the WP, Alcoa will begin implementation of the plan. Field activities will be completed within the following estimated timeframe:

- Task 1 – Alcoa/Badin Landfill Sampling consisting of:
  - Subtask 1 – Surface Water Assessment completed in six weeks;
  - Subtask 2 – Hydrological Conditions Evaluation completed in fifty-six weeks;
  - Subtask 3 – Geophysical Baseline Establishment completed in fifty-six weeks;
  - Subtask 4 – Jurisdictional Determination completed in thirty-six weeks;
- Task 2 – Main Plant Groundwater Sampling completed in four weeks; and
- Task 3 – Additional Ball Field Assessment completed in eight weeks.

4.1 Reporting and Notifications

NCDEQ will be notified no earlier than seven (7) days prior to commencing field activities. The best available effort will be made to submit results and findings of the work plan to the Division of Waste Management within six weeks of completion of field activities. Should unforeseen delays occur, Alcoa Division of Waste Management will be notified and presented with a revised schedule.

4.1.1 Quarterly Update Reports

Progress Reports will be submitted quarterly to provide a summary of work completed, document findings, and provide recommendations for future activities. The interim reports for the main plant groundwater and ball field investigations may be provided as an attachment to a quarterly progress report or under separate cover.

4.1.2 Comprehensive Report

After completion of the Alcoa/Badin Landfill tasks, a comprehensive report will be prepared describing the scope of services performed including results of any sampling performed. A screening level ecological risk assessment and recommendations for future activities will be provided to DWM at the completion of the investigative activities and if warranted, may include a recommendation for a site-specific baseline ecological risk assessment. The site-specific baseline ecological risk assessment work plan would follow the comprehensive report under a separate cover.