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DuPont Engineering

August 1, 2014

Ms. Julia Woosley, Chief
Hazardous Waste Section
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646

Re: Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

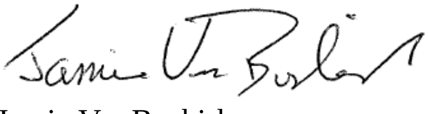
Dear Ms. Woosley:

Enclosed please find one (1) paper copy and one (1) electronic copy of the *Final Remedial Investigation Work Plan* that was prepared for the former DuPont Brevard Site (Site) located in Cedar Mountain, North Carolina.

The State and DuPont have recently agreed to work towards the eventual transfer of the Site property to the State, via the NC Department of Agriculture and Consumer Services. To facilitate the transfer of the Site in a safe, timely, and efficient manner, DuPont and the State have agreed to complete the remaining remedial activities under the State's Risk-Based Remediation of Industrial Sites pursuant to N.C.G.S. 130A-310.65 to 310.77 (House Bill 45 or the "Risk Bill"). This work plan presents the goals and objectives of the final remedial investigation that will be conducted at the Site pursuant to section 130A-310.69 of the Risk Bill and outlines the technical approach and procedures that will be used during the investigation.

If you have any questions or need additional information please feel free to contact me at 704-362-6626.

Sincerely,



Jamie VanBuskirk
Project Director
DuPont Corporate Remediation Group

cc: Mark Wilkins – Hazardous Waste Section, NCDENR
Keith Larick - Environmental Program Manager, NCDA&CS
File

PARSONS

FINAL REMEDIAL INVESTIGATION WORK PLAN

DUPONT BREVARD FACILITY
CEDAR MOUNTAIN, NORTH CAROLINA

Prepared for:

E. I. du Pont de Nemours and Company
Corporate Remediation Group
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August 1, 2014

DuPont PN 504646

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APPENDIX

ACRONYMS

Acronym	Definition / Description
º F	Degrees Fahrenheit
AFB	Alternate fuel boiler
AOC	Area of concern
bgs	Below ground surface
C&P	(DuPont) Chemical and Pigments Department
CA	Corrective Action
CAMU	Corrective Action Management Unit
CCR	Current Conditions Report
CEM	Conceptual exposure model
COPC	Constituent of potential concern
CRG	(DuPont) Corporate Remediation Group
CS	Confirmatory sampling
D&R	Demolition and removal
DERS	DuPont Environmental Remediation Services
DSRF	DuPont State Recreational Forest
DU	Decision unit
DuPont	E. I. du Pont de Nemours and Company
GAC	Granular activated carbon
HASP	Health and Safety Plan
HSWA	Hazardous and Solid Waste Amendments
IHSB	(NCDENR) Inactive Hazardous Site Branch
IM	Interim measure
IRM	Interim remedial measure
ISM	Incremental Sampling Methodology
MSL	Mean sea level
NC2B	NCAC 15A-2B (aquatic life)
NC2L	NCAC 15A-2L (groundwater)
NCAC	North Carolina Administrative Code
N.C.G.S.	North Carolina General Statute
NCDA&CS	NC Department of Agriculture and Consumer Services
NCDENR	North Carolina Department of Environment and Natural Resources
NCDSFS	North Carolina DuPont State Forest Service
NCNG	North Carolina National Guard
NFA	No Further Action (designation)
PCB	Polychlorinated biphenyl
PET	Polyethylene terephthalate
PPE	Personal protective equipment

Acronym	Definition / Description
psi	Pound(s) per square inch
PSRG	Preliminary Soil Remediation Goal
PWR	Partially weathered rock
QAPP	Quality Assurance Project Plan
QA/QC	Quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
Risk Bill	N.C.G.S. 130A-310.65 to 310.77 (House Bill 45)
RL	Remedial level
RWM	Remediation waste materials
SAP	Sampling and analysis plan
SCM	Site conceptual model
SSO	Site Safety Officer
Sterling	Sterling Diagnostic Imaging Inc.
SWMU	Solid waste management unit
TCE	Trichloroethylene
USEPA	United States Environmental Protection Agency
WMP	Waste Management Plan
WSW	Water supply well
WWTP	Wastewater treatment plant

1.0 INTRODUCTION

Parsons has prepared this *Final Remedial Investigation Work Plan* on behalf of E. I. du Pont de Nemours and Company (DuPont) for the Former DuPont Brevard Facility (Site) located in Cedar Mountain, North Carolina (Figure 1). This work plan presents the goals and objectives of the final remedial investigation that will be conducted at the Site and outlines the technical approach and procedures that will be used during the investigation. The proposed investigation activities are part of ongoing remedial activities being conducted at the Site and build upon data collected during previous investigations.

This work plan is organized into the following sections:

- Section 1.0 is the introduction, which includes site historical information and the project goals and objectives.
- Section 2.0 presents an overview of the Site, including summaries of previous investigations and the physical setting.
- Section 3.0 summarizes the current Site Conceptual Model (SCM) based on previous investigations completed at the Site.
- Section 4.0 details the scope of work to be conducted and the field investigation plan that will be followed during the investigation activities.
- Section 5.0 describes the supplemental plans that will be developed to support the implementation of the final field investigation.
- Section 6.0 summarizes the evaluation that will be conducted on the project analytical data.
- Section 7.0 describes the format and requirements for the *Remedial Investigation Report*.
- Section 8.0 describes the schedule for implementing the final field investigation and for preparing the report.
- Section 9.0 provides the references used during development of this work plan.

1.1 Site Background

The Site history and environmental setting is briefly summarized below. Information contained in this section was drawn from the *Phase III RCRA Facility Investigation Report* (Parsons 2009).

1.1.1 Plant Site Operations

DuPont began operations at the Site in 1957 producing high purity silicon under the Chemicals and Pigments (C&P) Department during the first five years of operation. The property was then transferred to the Imaging Department for production of medical imaging (x-ray) films. In addition to manufacturing processes, DuPont historically operated a powerhouse, a wastewater treatment facility, a Save-All System (silver recovery unit), the Alternate Fuel Boiler (AFB), and permitted solid waste landfills.

The manufacturing area was divested to Sterling Diagnostic Imaging Inc. (Sterling) on March 29, 1996. On May 14, 1999, Sterling divested the manufacturing facility to AGFA Corporation. Both AFGA and Sterling conducted the same operations as DuPont. AGFA discontinued operations at the DuPont Brevard Facility in December 2002.

Following closure of Site operations, AGFA and DuPont engaged in negotiations pertaining to future reacquisition of the property by DuPont. The purpose of this reacquisition was to maximize control of potential environmental liabilities that DuPont retained on this and the adjacent property that DuPont still owned. An agreement was reached with AGFA to perform demolition and removal (D&R) activities for major assets of the facility in February 2004, prior to DuPont reacquisition of the property. All required D&R activities were completed in May 2006, and ownership of the Site was divested to DuPont in July 2006.

1.1.2 Regulatory History

The Brevard facility has been in the Resource Conservation and Recovery Act (RCRA) hazardous waste program since 1980. RCRA Corrective Action (CA) at the Site has been conducted in accordance with the requirements set forth in the Site's permits. The current permit is the Hazardous and Solid Waste Amendments (HSWA)-only Hazardous Waste Management Permit No. NCD003152329 R-2 issued by the North Carolina Department of Environment and Natural Resources (NCDENR) on August 4, 2008, and revised on April 11, 2011. The current permit lists 20 solid waste management units (SWMUs) and 11 areas of concern (AOCs) as present on-site. The locations of these units are shown in Figure 2, and each unit is summarized in Table 1.

The CA program requires investigation and cleanup of releases of hazardous constituents that pose an unacceptable risk to people and the environment. Numerous historical investigations have been completed at the Site. In 2002, DuPont began conducting a RCRA Facility Investigation (RFI) in a phased approach in an effort to efficiently expedite the transition to remedial measures and closure. RFIs are designed to characterize releases of constituents from regulated units, SWMUs, or other areas at the facility through the collection and evaluation of data. The most recent phase (Phase III) of the RFI was completed in 2009, and the results and conclusions drawn from the Phase III activities were presented in the *Phase III RFI Report*, which was submitted to NCDENR on September 30, 2009.

The history associated with the submittal and approval of various RCRA CA documents has been discussed in previous reports submitted to NCDENR. A history of submittals can be found in the *Phase II RFI Report* (DuPont Corporate Remediation Group [CRG] 2004) and the *Phase III RFI Report* (Parsons 2009). Additional information about the investigations completed at the Site is presented below in Section 2.1.

In September 2012, an evaluation of the environmental indicator for "current human exposures under control" (EI RCRIS Code CA725) and an evaluation of the environmental indicator for corrective action "migration of contaminated groundwater under control" (EI RCRIS Code CA750) were prepared for the Site (Parsons 2012a, 2012b). The EI determination evaluations were completed in accordance with the guidance established by the United States Environmental Protection Agency (USEPA) (1999). The EI determination process concluded that releases or the potential for releases identified from RCRA CA units at the Site do not constitute a significant threat to human health. Reasonably expected exposures from potentially complete exposure pathways were found to be insignificant, and the potential for exposure is prevented or controlled. As a result, a positive EI determination for EI CA725 was reached. In addition, the EI determination process concluded that the migration of contaminated groundwater has stabilized and groundwater releasing to surface water is not significantly impacting surface water bodies at and adjacent to the Site. As a result, a positive EI determination for EI CA750 was also reached.

1.2 Project Goal and Objectives

1.2.1 Overall Site Remediation Goals

As stated above, DuPont has been conducting soil and groundwater investigation and remediation activities at the Site for many years under the Site's HSWA CA permit. DuPont developed several overall remedial goals for the Site to help drive and focus the CA activities. These goals included the following:

- Protection of people and the environment through the development and use of a SCM that is based on a thorough understanding of the Site constituents, release pathways, and exposure potential;
- Cost-effective management/minimization of long-term liabilities associated with the potential contaminant releases using a risk-based prioritization process;
- Compliance with regulatory requirements; and
- Coordination of CA activities with other business activities at the Site to minimize disruption to facility operations, maximize benefits and synergies with other, overlapping environmental initiatives, and ensure field efforts are conducted in a safe and efficient manner.

Since the start of CA activities in the 1990s, the Site has undergone significant changes, starting with the plant shut-down in 2002, continuing with the complete dismantling and removal of site structures in 2006, and culminating with the State and DuPont agreeing to work towards the eventual transfer of the Site property to the State, via the NC Department of Agriculture and Consumer Services (NCDA&CS). The NCDA&CS desires use and control of the Site consistent with the surrounding DuPont State Recreation Forest (DSRF) as well as for low-impact training use by the North Carolina National Guard (NCNG). The anticipated future land- and water-use conditions were presented to DuPont by the NCDA&CS and NCNG in a letter dated February 28, 2014.

Triggered by these changes, the overall remediation goals have been modified and updated to now include

- Ensuring ongoing protection of people and the environment through active and administrative measures;
- Ensuring the State can achieve desired future land use; and
- Meeting regulatory obligations and public expectations.

The State and DuPont have a mutual desire to affect a transfer of the Site in a safe, timely, and efficient manner. Assuming the Site property is ultimately transferred to the State, DuPont and the State have agreed that it is appropriate to complete the remaining remedial activities to meet these goals under the State's Risk-Based Remediation of Industrial Sites pursuant to N.C.G.S.[1] 130A-310.65 to 310.77 (House Bill 45 or the "Risk Bill").

1.2.2 Final Investigation Project Objectives

The Risk Bill requires the completion and submittal of a *Remedial Investigation Report* before final remedial decision-making is appropriate. Based on a review of the significant amount of historical information already collected during earlier phases of the CA

[1] N.C.G.S. – North Carolina General Statute

process, in context with an updated SCM utilizing the future use plans provided by the State, it is recognized that an additional phase of field investigation is necessary before the final *Remedial Investigation Report* can be developed. DuPont has developed the following project objectives for this final phase of investigation:

- Identification of remaining data gaps necessary to meet the overall remedial goals
- Development and implementation of a *Final Remedial Investigation Work Plan* to address the identified remaining data gaps
- Development of site-specific remedial levels (RLs) based on the Risk Bill requirements for use in future data evaluation
- Development and submittal of a final *Remedial Investigation Report* to support final remedial decision-making via the submittal of a proposed *Remedial Action Plan*

1.2.3 Remaining Investigation Data Gaps

This *Final Remedial Investigation Work Plan* has been developed to meet the first two objectives listed above (the remaining objectives will be addressed in future submittals). Based on the overall site remediation goals and the updated SCM, the project team has identified the remaining data gaps that should be addressed during this final phase of field investigation. The following sections outline the various field activities, data evaluation, and reporting tasks necessary to address each data gap and support the development of the *Remedial Investigation Report*.

The following six objectives have been developed to fill the remaining data gaps and will be addressed with the final field investigation. They are discussed in more detail in Section 4.0:

1. Fill surface soil data gaps to support future proposed land uses (includes recreational and low-impact training use by the NCNG)
2. Complete confirmation soil sampling at SWMU 14 (the former ball field)
3. Ensure that adequate surface covers are present at SWMUs 4, 12, 13, 15, 16, 19, and 18/20
4. Verify that groundwater concentrations are consistent with protection of sensitive surface waters
5. Investigate current conditions in Lake DERA, DERA Creek, and Little River
6. Verify SCM assumptions regarding absence of potential downgradient receptors of drinking water to support final risk evaluation

Although additional data gaps pertaining to SWMU 17 exist, this SWMU is currently the subject of ongoing consideration for implementation of a possible remedial measure. Therefore, while the groundwater surrounding SWMU 17 will be investigated during this final field effort as part of Objective 4 above, additional investigation of this SWMU will be conducted in a separate effort.

2.0 SITE OVERVIEW

This section presents an overview of the Site including a summary of the numerous investigations that have been conducted and information about the Site's physical setting. A site layout map depicting historical sampling locations is presented as Figure 3.

2.1 Previous Investigations

In February 1996, a *RCRA Facility Assessment* (RFA) was submitted to NCDENR that identified 20 SWMUs and three AOCs at the Site (DuPont Environmental Remediation Services [DERS] 1996b). Based on the RFA, six SWMUs were identified as needing confirmatory sampling (CS) to determine whether they were releasing regulated substances into the environment. As part of the original plant divestiture in 1996, DuPont completed closure activities on the permitted storage pad. DuPont closed the North Landfill in 1993 and received official approval of closure from NCDENR on August 22, 1996. In addition, DuPont completed closure activities at the East Landfill in late 1996 and the required five-year groundwater monitoring requirement in April 2003. An engineering evaluation (dated March 28, 1997) was used in lieu of CS at SWMU 10, and the status of the SWMU was changed to No Further Action (NFA) in a letter from NCDENR dated May 14, 1997.

A *Confirmatory Sampling Work Plan* was produced (originally submitted in October 1996, revised in September 1998) that provided the scope and schedule for completion of the outstanding CS activities. However, after the CS work plan was drafted, the RCRA CA program evolved to provide for more flexible, results-oriented approaches and became less focused on process-related activities. Since the CS work plan was written only to address a limited number of units and would have primarily satisfied a process requirement, a request was made by DuPont to take an alternative approach. A joint DuPont and NCDENR meeting was held in June 2001, and it was agreed that a more holistic approach was appropriate for the Site. In a letter dated July 13, 2001, DuPont requested that the formal approval of the draft CS work plan be withheld and a more risk-based, holistic approach, consistent with the current RCRA reforms efforts, be pursued instead.

On January 18, 2002, as the first step in this alternative approach, DuPont submitted a *Current Conditions Report* (CCR) to NCDENR (DuPont CRG 2002). The CCR summarized the data collected from historical investigations completed at the Site since 1986. A preliminary SCM was also presented, which indicated that the constituents present appeared to be stable and were not perceived as an immediate threat to human health or the environment. A risk-based approach using a phased RFI was initiated in lieu of the more focused and limited scope that had been originally proposed in the CS work plan.

Phase I of the RFI was completed in a two-stage effort. Stage I consisted of three elements completed to gain a better understanding of geologic and hydrogeologic conditions across the Site. These elements included installing soil borings and piezometers across the Site, installing two staff gauges at Lake DERA and Little River, and collecting water level data. A Technical Memorandum summarizing the findings of Stage I of the Phase I RFI and proposed recommendations for Stage II activities was submitted to NCDENR on December 31, 2002. Stage II field activities were completed on October 17, 2003, and consisted of filling data gaps identified from Stage I of the RFI. Background soil samples were collected, and a groundwater investigation of the surficial aquifer was conducted along with a release confirmation investigation of SWMU 17. The conclusions of the Phase I RFI can be found in the *Phase I RCRA Facility Investigation Report* (DuPont CRG 2003).

The RFI Phase II was conducted from May through August 2004. The goals of the Phase II were to investigate the CA units and former manufacturing areas and fill data gaps associated with the sitewide groundwater monitoring program. More groundwater monitoring wells and soil borings were installed, soil samples, groundwater samples and surface water samples were collected, and water levels were measured. The conclusions of the Phase II RFI can be found in the *Phase II RCRA Facility Investigation Report* (DuPont CRG 2004).

In 2006, DuPont initiated a number of investigative tasks to expand the hydrogeologic data set for the Site in order to facilitate planning the scope for the Phase III RFI. These investigative tasks included establishing a new geo-reference baseline for the Site, sampling select groundwater and surface water points, and completing fracture trace analysis and a borehole geophysical evaluation of bedrock wells on-site. Preliminary results of this work were discussed with NCDENR during a meeting held at the Site in October 2006. Based on the outcome of the meeting, DuPont submitted the *Phase III RFI Work Plan* to NCDENR on February 5, 2007. The work plan presented the goals for the next phase of the RFI and incorporated the newly-acquired investigation results from the activities described above.

A January 2007 sitewide groundwater sampling event was conducted, including the sampling of the North Carolina DuPont State Forest Service (NCDSFS) Visitor Center water supply well (WSW). Organic compounds were detected in the visitor center well during this event, and evaluations of the analytical results prompted completion of additional Phase III activities as outlined in the *Phase III RFI Work Plan Addendum*, which was submitted on May 14, 2007.

Following the Phase III work plan addendum submittal, several proposed Phase III RFI field activities commenced in fall 2007. These primarily consisted of SWMU 17 source-area and groundwater quality investigation activities. DuPont submitted an *Interim Phase III RFI Report* on February 29, 2008, which discussed the activities conducted to that point. The activities included a soil gas survey and groundwater and surface water sampling events. Resulting information from these activities was used to refine the SCM, which demonstrated that the Site remained protective of human health and the environment. Full analytical details and results can be found in the *Interim Phase III RFI Report* (DuPont CRG 2008).

The *Interim Phase III RFI Report* recommended the completion of follow-up activities related to SWMU 17 and the compounds (potentially related to SWMU 17) that had been detected in the NCDSFS Visitor Center WSW. The follow-up activities were conducted between early 2008 and 2009, and a discussion of the results was presented in the *DuPont State Forest Service Visitor Center Interim Measure Report*, which was submitted to NCDENR in June 2009 (DuPont CRG 2009). The completed activities included soil gas sampling and an evaluation of potential exposure points in surface water at locations topographically downgradient of SWMU 17. Concurrent with these activities, DuPont also designed a water treatment system for the NCDSFS Visitor Center WSW (see Section 2.1.2).

Remaining Phase III activities (sitewide) were continued in fall 2008. These activities included the installation of bedrock and residuum[2] groundwater monitoring wells, groundwater and surface water sampling, former manufacturing area investigations, background soil sampling, and vapor intrusion activities. On February 3, 2009, DuPont submitted the *Phase III RFI Project Update* letter to summarize the completed *Phase III RFI Work Plan* activities and completion of each proposed modification to the original work plan objectives. Results and conclusions drawn from these activities are discussed in the *Phase III RFI Report*, which was submitted on September 30, 2009.

2.1.1 Demolition and Removal Activities

Following closure of Site operations in 2002, AGFA and DuPont engaged in negotiations pertaining to future reacquisition of the property by DuPont. The purpose of this reacquisition was to maximize control of potential environmental liabilities that DuPont retained on this and the adjacent property that DuPont still owned. An agreement was reached with AGFA to perform D&R activities for major assets of the facility prior to DuPont's reacquisition of the property.

Throughout the D&R effort, site personnel documented preconstruction, area-specific preparation efforts and post-cleaning certifications. Photographic documentation of pre- and post-demolition conditions was also compiled. Special waste and other materials removed from the Site include asbestos, lead-based paint, mercury switches, light ballasts (polychlorinated biphenyl [PCB] and non-PCB), residual material in vessels, hydraulic fluids, gearbox oils, halons, and batteries. All debris was segregated into like material (e.g., concrete, aluminum, copper, carbon steel, and stainless steel). Sorted metal debris was removed from the Site and transported to a reclamation center. Other demolition debris was disposed offsite at a properly-permitted landfill.

During the D&R, it was determined that some sub-structures (e.g., slabs) would not be removed. To ensure that these assets did not create a potential for future hazards, some of the remaining slabs were cleaned based on process knowledge and visual inspection after the above-ground structures were demolished. Cleaning involved pressure washing at 3,000 pounds per square inch (psi) and using mechanical removal (scraping) followed by a clean water rinse. All wash and rinse water was collected, containerized, and sampled prior to disposal. These samples were analyzed for total concentrations of constituents determined based on operation knowledge of the area. Sample analyses were compared to applicable screening criteria (e.g., drinking water and surface water regulatory standards) to determine if the cleaning operation had removed potential contamination. Slabs where cleaning generated wash and rinse water that exceeded regulatory requirements were washed and rinsed a second time and sampled/analyzed again. This process was repeated until the regulatory criteria were met or until it was decided that the slab should be properly removed and disposed of. In total, approximately 16 slabs, pads, or foundations were completely removed from the Site during these activities.

All sewers within the Site were cleaned and closed during the effort. Three types of sewers were identified on the property (storm, process, and sanitary). The cleaning effort involved either power washing with a 3,000 psi pressure washer or gravity flushing with a large volume of water. The resulting water was sampled and analyzed for priority pollutant constituents for proper disposal. If the results were within site-specific NPDES[3]

[2] Residuum at the Site is defined as saprolite and partially weathered rock (PWR) zones.
[3] NPDES – National Pollutant Discharge Elimination System

limitations, then the water was discharged to the Wastewater Treatment Plant (WWTP). If the results were above the site-specific limitations, then the water was transported off-site for disposal. Sewer and manhole closure involved either abandoning the pipe and filling the pipe and manholes with an inert material or removal. All other underground piping (water, gas, fire protection) were capped at grade and abandoned. Remote inspection was performed on 30% of the total length of sewer pipe where inspection was possible using an electric remote-control robot equipped with a camera. In all, 3,500 linear feet of sewer pipe, 1,500 linear feet of process sewer, and 2,000 linear feet of storm sewer were inspected and videotaped. None of the inspection reviews indicated significant accumulation of debris or staining in the pipes, which led to the approval of closure activities.

The WWTP was closed during the D&R effort. Over 2,563 tons of biosolids were removed from the WWTP emergency spill, aeration and settling basins using a barge-mounted diesel dredge. In addition 1,085 tons were removed from the diversion basin. All removed solids were filtered and disposed offsite in a permitted landfill. Testing of residual solids and underlying soils did not indicate any potential future environmental concerns. Approximately 60,000 cubic yards of soil were used over nearly 25 acres to grade and cap the completed area to create proper drainage. Based on pre-closure sampling analysis, AGFA and DuPont determined that the biosolids in the Polishing Pond could remain in place. The Polishing Pond was drained, and the sludge was dewatered and solidified. A non-woven, needle punched geotextile fabric was installed over the solidified sludge. Three feet of cover soil was placed over the geotextile fabric and compacted. The final grade of the polishing pond is at a 1.2% slope to minimize accumulation of surface water.

The D&R project was performed in accordance with the Erosion and Sediment Control Plan approved by the North Carolina Soil Conservation District (Permit number TRANS-2005-012). Erosion and sediment controls were established at the beginning of the demolition effort and continued throughout the project. The three primary areas of erosion control efforts were around storm sewer intakes, the piles of demolition debris that could be eroded by water or wind, and the areas where demolition was completed. Following the D&R activities, areas that had been disturbed were stabilized by hydro-seeding and broadcast seeding. Areas of the Site receiving final grading included leftover parking lots, concrete slabs, gravel areas, and grass areas. The Site was inspected to identify and eliminate possible depressions where surface water could accumulate. All gravel areas were graded to achieve positive drainage of surface water. Any disturbed or borrow areas used in the effort were stabilized before project end.

All required D&R activities were completed in May 2006. Estimates indicate that approximately 32,370 tons (75,530 cubic yards) of material were removed from the Site in 2,158 truck loads. In July 2006, following completion of the D&R activities, ownership of the Site was divested to DuPont. Records of the D&R effort were incorporated into a report and are on file at the Site. These records include building inspections, photographic documentation of material removal, sewer video inspection reports, chemical analytical results, maps showing residual foundations/slabs, and final grading elevations.

2.1.2 NCDSFS Visitor Center Interim Remedial Measure

As part of the Phase III RFI effort and in accordance with DuPont's goal of protection of people and the environment, DuPont performed groundwater sampling in January 2007 on the off-site NCDSFS Visitor's Center WSW upon notification of future use by

NCDSFS personnel. Only one compound (trichloroethylene [TCE]) was detected at a concentration that exceeded the 15A North Carolina Administrative Code (NCAC) 2L .0200 (NC2L) value. This exceedance led to the initiation and completion of additional investigative and remedial activities. An addendum to the *Phase III RFI Work Plan* was submitted on May 14, 2007, communicating the results of the January 2007 sampling of the NCDSFS WSW and outlining additional activities proposed to be completed during the Phase III RFI with respect to the detection of site-related compounds (potentially related to SWMU 17) in the NCDSFS WSW. The work plan addendum recommendations included the collection of additional groundwater samples from the WSW to confirm the results of the January 2007 sampling event and installation of a carbon treatment unit (capable of removing constituents that exceeded NC2Ls) on the NCDSFS Visitor Center WSW, prior to placement of the well in service as a potable water source.

An *Interim Phase III RFI Report* was submitted on February 29, 2008, which presented the findings of the activities described in the work plan addendum. The results from a groundwater sample collected in September 2007 confirmed the detections observed in the NCDSFS WSW during the January 2007 sampling event. In addition, concentrations of TCE detected in the WSW did not exceed calculated indoor air screening levels protective of potential receptors (i.e., visitor center worker); therefore, indoor air was excluded as a media of concern at the NCDSFS Visitor Center. The report recommended implementation of remedial actions including the installation of a carbon treatment unit along with post-treatment groundwater monitoring prior to well use to address the concentration of TCE that exceeded the NC2L standards in the WSW.

DuPont voluntarily designed a granular activated carbon (GAC) water filtration treatment system for the NCDSFS Visitor Center WSW as an interim remedial measure (IRM) to ensure a safe water supply to Site workers, the visitor center, and restrooms. In January 2009, DuPont, in concert with the NC Forest Service, installed the GAC water treatment system at the NCDSFS Visitor Center. To confirm that the system is functioning as designed, DuPont implemented a proactive sampling regime. Confirmation samples of the water flowing from the treatment system were collected on a monthly basis for a four month period after the restrooms were opened to the public. Then the sampling frequency was reevaluated and adjusted accordingly. The current sampling program consists of annual GAC filter change-outs and semi-annual sampling of water from the system. The *DuPont State Forest Service Visitor Center Interim Measure Report* submitted to NCDENR in June 2009 presents additional details about the IRM activities (DuPont CRG 2009).

The GAC filters were last changed out on September 17, 2013, and the most recent semi-annual analytical samples were collected from the pre-filter, primary filter, and secondary filter locations of the system on April 15, 2014. A letter report summarizing these activities was submitted to NCDENR on June 12, 2014. The ongoing results of the semi-annual monitoring program indicate that the GAC system remains effective at removing VOC constituents in groundwater used as a water supply for the NCDSFS Visitor Center.

2.1.3 SWMU 11 and SWMU 14 Interim Measure Activities

One of the former Site processes was the manufacture of medical imaging (x-ray) film, also known as polyethylene terephthalate (PET). Nonhazardous, off-specification and process startup waste PET film produced at the facility was previously deposited into two SWMUs that were under investigation as part of the facility's CA program. These units are SWMU 11 (the former East Landfill) and SWMU 14 (the former ball field area), both of which are depicted in Figure 2.

The Site historically operated the East Landfill as a permitted landfill under Permit #88-06 issued pursuant North Carolina's RCRA Solid Waste Regulations (15A.13B.0505). The former East Landfill (now SWMU 11) was originally opened in 1972 under state approval as per the North Carolina Board of Health "Rules and Regulations Providing Standards for Solid Waste Disposal." The East Landfill stopped receiving waste in 1996 and was officially closed per the approved East Landfill Closure Plan (DuPont DERS 1996a). State approval of the closure was granted on August 22, 1996, and reaffirmed on May 21, 2001. Oversight of the post-closure activities was transferred from the NCDENR Solid Waste Section to the Hazardous Waste Section on June 30, 2004, in recognition of the RCRA CA permit designation of the landfill as a CA SWMU. The former ball field area (now SWMU 14) was an open area used to dispose of various wastes generated during the manufacturing process between 1958 and 1972. The area was reclaimed and used as a ball field during DuPont ownership. The ball field had not been used since DuPont reacquired the Site in 2006.

An important consideration to progress the Site toward completion of the original remediation goals was a plan to consolidate certain waste materials from other areas of the Site into the former East Landfill (SWMU 11). In order for this plan to be allowed, the State required DuPont to establish a Corrective Action Management Unit (CAMU) at SWMU 11 to act as the consolidation location for nonhazardous materials from other areas of the Site. DuPont submitted the SWMU 11 CAMU Application on April 20, 2010, and a revised application on October 29, 2010. NCDENR approved the establishment of the CAMU via a modification to the RCRA permit on April 21, 2011.

An interim measure (IM) removal/consolidation effort using the CAMU was carried out at the Site between June 2011 and July 2012 in accordance with the Interim Measures Work Plan (WRScompass 2011), which was approved in April 2011. Plastic material from SWMUs 11 and 14 was removed, and where possible, the waste PET material was recycled. The remaining acceptable remediation waste material (RWM) from SWMU 14 was then placed into the CAMU with the remaining RMW from SWMU 11. During the effort, approximately 9,771 in-place cubic yards of PET material from SWMU 11 and 6,140 in-place cubic yards of PET material from SWMU 14 were shipped off-site for recycling. Approximately 80,665 in-place cubic yards of acceptable RWM was removed from SWMU 14 and placed into the SWMU 11 CAMU.

An interim landfill cap had been constructed over the SWMU 11 CAMU by the end of July 2012 according to the specifications detailed in the CAMU application. The *Interim Measures Report* (Parsons 2012c) describes these activities in detail. Semi-annual, post-closure groundwater and surface water monitoring was started in the second half of 2012 and is ongoing.

The most recent *Interim CAMU Groundwater Monitoring Report* summarizing the ongoing semi-annual, post-closure groundwater and surface water monitoring was submitted on March 13, 2014. The data collected during the first three completed semi-annual interim CAMU sampling events confirms that the RWM that was placed into the CAMU has not affected the quality of the surrounding groundwater and is not adversely impacting human health or the environment.

2.2 Physical Setting

2.2.1 Site Location and Boundaries

The Site is located in Cedar Mountain, Transylvania County, North Carolina, approximately six miles southeast of the town of Brevard and three miles north of the South Carolina state line. The local area is characterized by relatively high relief, with local elevations ranging from 1,010 to 4,000 feet above mean sea level (MSL). The Site sits atop a plateau at 2,550 feet above MSL (Figure 1). It is bounded by the Little River on the south and east and heavily wooded mountain land to the north (DuPont CRG 2004). The property is entirely surrounded by the DSRF property.

2.2.2 Regional Physical Setting

Regional Climate

Transylvania County has a moderate climate with a relatively high average precipitation totals. The warmest month is July, with an average high of 83 degrees Fahrenheit (º F). The coolest month is January with an average low of 24º F. The winter months of December and January have the two highest average precipitation amounts at 6.38 and 6.4 inches, respectively. The average annual precipitation is approximately 64 inches.

Regional Geology

The DuPont Brevard facility is situated along the boundary between the Blue Ridge and Inner Piedmont Physiographic Provinces. The Brevard Fault Zone, a one-third to two-mile-wide zone of highly broken mylonitic rock, separates the Blue Ridge from Inner Piedmont rocks and trends along northern portions of the site (South Carolina Geological Survey 2007).

The property sits atop the largest granitic pluton in western North Carolina. Crystalline rocks approximately 438 to 447 million years old form this structure. Rocks north of the Slicking Gap Fault are classified as Henderson Granitic Gneiss. This rock is described as a medium gray, medium- to coarse-grained granoblastic matrix with large megacrysts (augens) of microcline, and lepidoblastic; layers are massive to well foliated and mylonitic in places. To the south of the fault, rocks are identified as belonging to the Table Rock Gneiss and described as white to medium gray, medium- to coarse-grained, granoblastic, weakly foliated to foliated, locally mylonitic (North Carolina Geological Survey 2011). Fracturing may be seen in both formations.

Regional Hydrogeology

A regolith consisting of soil, saprolite, and weathered rock commonly is found above crystalline rocks found near the DuPont facility. Porosity of this weathered material is much higher (between 20 to 30 percent) than the crystalline rock (except maybe along fracture zones in the rock); groundwater is therefore likely to be in greater storage in the regolith compared to fractured bedrock (U.S. Geological Survey 1997). Flow from the weathered material is mainly via pore space and follows topographic trends. Groundwater flow in the residuum is not hydraulically distinct from flow in the underlying bedrock because the source of groundwater within the fracture is believed to be drainage from the overlying residuum (Heath 1980). The crystalline nature of the granite and gneiss result in very low primary porosity. Groundwater flow direction and rate are governed by the orientation and size of fractures, faults and foliation planes within the bedrock. Fracture openings are generally less than one percent of the rock volume, and water-bearing fractures are uncommon at depths greater than 300 feet below surface.

2.2.3 Local Physical Setting

The following paragraphs describe the local physical setting for the Site based on the findings of previous investigations.

Site Topography

The DuPont Brevard Site rests on top of a granitic plateau that contains some undulations in slope and generally trends downslope from northwest to southeast. Higher land elevations (over 2600 feet above MSL) along the property occur along the northwest portion of the Site near Lake DERA, with elevation decreasing to less than 2525 feet above MSL eastward along Little River. Land along the river often is seen as reasonably flat outwash with slopes significantly increasing on off-site lands east and south of the river.

Site Geology

Overburden

The interval ranging from ground surface to the top of the saprolite unit has been described as the sitewide soils. According to the Soil Survey for Transylvania County (U.S. Department of Agriculture Soil Conservation Service and Forest Service 1974), the majority of the soils beneath the site are from the Ashe Series and Chester Series. Both series consists of very well drained soils "under forest vegetation in residuum derived from gneiss or granite." The overburden soil materials lack the obvious intact structural appearance of the underlying weathered-in-place bedrock (saprolite). Overall, material across the Site has been determined to consist of mostly silty sands and sandy silts with varying colors ranging from black or hydric in appearance, to tan, grayish, yellow-orange, and brown with intermixing and noted gradations. Historical borings advanced near Little River have yielded overbank deposits with more fine to medium sands, with a lesser silt content and abundant gravel (Parsons 2009).

Overburden material on Site ranges from 0.25 feet thick to approximately 20 feet thick. Thick overbank deposits have been found in close proximity to Little River. The thinnest sections located during the Phase III RFI were found along topographic high regions such as at SWMU 17. Additional borings more centrally located in the Western portion of the former manufacturing area have been found to have varying deposits ranging from less than one foot to approaching 20 feet. These borings, however, are subject to displaying a false representation of the actual thickness due to displacement of overburden during previous building construction and removal efforts (Parsons 2009).

Residuum

Residuum at the Site is defined as saprolite and PWR zones. The following sections discuss the composition and occurrence of both. Residuum thickness, combined with overburden, can easily be correlated to the relief of the underlying outcrop (Parsons 2009). Residuum is less thick where there is an elevated section of bedrock, such as near SWMU 17 and southeast and southwest of Lake DERA. The residuum is thicker in the valley sections of bedrock. This is most likely because the groundwater flow follows the topography of bedrock, with a saturated thickness being greater in the "valley" areas of the bedrock. These saturated conditions are favorable for in-situ chemical weathering and would therefore produce thicker residuum.

Saprolite

Saprolite is defined as weathered bedrock that is in-situ and maintains the mineral fabric of its parent material. Saprolite was observed in every monitoring well, piezometer and boring advanced at the Site. Saprolitic materials observed at the Site are defined by their characteristic banding of white and tan matrix materials (predominantly fine sands and silt) with dark banding materials (predominantly micas) as seen in the gneissic banding of the parent rock. As mentioned above, saprolite is observed to be thicker in the valley regions between elevated regions of bedrock. Saprolite exhibits more variability in the western half of the Site where there is considerably more relief in topography. The eastern area of the Site contains more valley topography and therefore thicker and more uniform distributions of saprolite.

Partially Weathered Rock

PWR is compositionally the same as the unconsolidated saprolite, but contains more competent material such as rock fragments. Thicknesses range from 4.5 feet to 26 feet across the Site, with the greatest thickness being below the former manufacturing area of the Site. The most recent cross-sections combining Phase III RFI and historical boring data do not support a pattern of PWR thickness in the valley regions (as with the saprolite and overburden) (Parsons 2009).

Bedrock

The installation of seven bedrock wells during the Phase III RFI activities provided an opportunity to observe notable distinctions in the fabric and mineral size that corresponded to three general categories of bedrock. North of SWMU 17, the gneiss was particularly phaneritic with large augens distributed throughout the matrix, occupying approximately 20% of the material. Biotite and feldspar were more abundant than quartz, making the rock more friable than that observed in the borings along Little River. The monitoring wells installed along the southeast and southern portions of Little River are located in gneiss that is more aphanitic. This rock was more durable and appeared more competent than that seen in the vicinity of SWMU 17. Bedrock material present in monitoring well BR-4 had a higher quartz content, and was very hard and competent. The minerals were larger than those seen in BR-1 through BR-3, and there were several pockets of large potassium feldspar.

Each boring contained at least one or two physically observable fractures coated in an iron-oxide or limonitic staining, indicating the presence of water. Most of the fractures were at an angle that roughly paralleled the foliations in bedrock, but some were nearly vertical (Parsons 2009).

Site Hydrogeology

Overall Site hydrogeology has been determined by reviewing potentiometric surface maps (Figures 4 through 6), along with unit thickness maps and the Bedrock Surface Contour Map generated during the Phase III RFI (Parsons 2009). In addition, data was assimilated from the slug testing conducted on 32 wells and a borehole geophysical investigation conducted on the seven new bedrock wells and data from past RFI events.

Groundwater Elevations

Groundwater elevations measured across the Site on March 18, 2009, ranged from 2566 to 2517 feet above MSL. Groundwater elevations are highest on the western portion of the Site; the lowest are along Little River, the eastern Site boundary.

As indicated from the 2009 vertical hydraulic gradient calculations in the Phase III RFI report, the western portion of the Site (west of the former manufacturing areas) experienced predominantly downward flow from the shallow aquifer to the bedrock aquifer. The eastern half of the Site showed predominately upward flow from deep soil/bedrock to shallow soils.

On the eastern portion of the Site, the upward flow may be due to recharge from the bedrock that could be under pressure in areas, or from the upgradient western portion of the Site. More details on hydraulic gradients are presented in the Phase III RFI report (Parsons 2009).

Surficial Aquifer

As discussed in previous RFI reports, the surficial aquifer is defined by the saprolite/partially weathered rock material and the overburden deposits adjacent to Little River. The overall flow pattern within the surficial aquifer continues to be across the Site in a previously defined east to southeasterly direction. Surficial groundwater also appears to flow radially from the bedrock mound beneath the SWMU 17 area. Groundwater gradients move in a manner that follows bedrock topography. Horizontal gradients are noted to be the steepest in areas where bedrock topography is greatest and lowest where the topography begins to level off in the presence of Little River. The thickest saturated zones of the surficial aquifer reside within the valleys between high points in the bedrock (Parsons 2009).

Bedrock Aquifer

Seven bedrock wells averaging in depth from 69 to 100 feet below ground surface (bgs) were installed during the Phase III RFI and were observed in conjunction with the six existing water supply wells (averaging in depth from 60 to 420 feet bgs). Flow patterns observed in the potentiometric surface maps depicted a relatively uniform horizontal gradient toward the southeast.

A borehole geophysical investigation was conducted by Golder Associates after the bedrock wells were installed in order to investigate the borehole fractures within the bedrock. The Golder report concluded that during flow-meter measurements, only a few individual fractures or sets of fractures produced virtually all inflow to these boreholes during pumping. Final results from the borehole geophysical analysis performed on the seven bedrock locations installed during the Phase III RFI (Golder Associates 2009) and WSWs (Golder Associates 2006) revealed the following interpolations:

- There are hundreds of possible permeable fractures in the wells; however, only a few were identified as sets of fractures that produce the majority of the inflow as determined by the tested boreholes.
- Such water producing fractures showed a tendency to be horizontal in nature, dipping toward the southwest at a moderate angle (Golder Associates 2006).
- Fractured zones are shallow dipping, sparsely concentrated, and typically run in a direction parallel to the surrounding geologic formation.
- Any particular areas with possible substantial transmissivity results are likely discontinuous and unconnected.
- The potential for horizontal flow within the known individual fractures is definitive, however extremely inferred due to the unknown lateral dimension of the discovered fractured zones.
- Large-scale vertical permeability of the geologic formation is low.

Surface Water

Lake DERA (elevation approximately 2566 feet above MSL) is an approximately 12-acre man-made lake located along the northwest quarter of the property. The lake is fed by small creeks along its northwest corner, surface water runoff, and possibly by shallow groundwater flowing in from the north. Overflow from Lake DERA is channeled through an unnamed creek across the property and drains into the Little River approximately 3500 feet to the east-northeast. The Little River originates south of the Site and flows northward along the south and east property boundary. The river receives overflow from Lake Julia located southeast of the DuPont property and runoff from surrounding highlands from the south. The Little River continues its northern run for six miles where it drains into the French Broad River (Google Earth 2012).

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3.0 CURRENT SITE CONCEPTUAL MODEL

During the historical RFI process, DuPont has strived to incorporate information from individual SWMUs and AOCs, along with more general Site data, into a facility-wide SCM. The SCM provides a means of documenting and periodically updating general facility information and data regarding potential releases to the environment (USEPA Region 6 2008). The SCM also provides a framework for problem definition, aids in the identification of data gaps that can then be addressed in the investigation, and assists in the identification of appropriate remedial technologies, if necessary.

The SCM for the Former DuPont Brevard Facility was developed and designed to assess the relative potential for the Site to impact human health and the environment and to facilitate the identification of data gaps that would aid in the assessment. The assessment is based on an integrated analysis of potential exposure pathways, hazardous substance release constituent concentrations, environmental fate and transport mechanisms, and risk to human health and the environment.

The SCM is dynamic and should be tested and refined from its original state as information, collected in a phased approach, is fed into it. Consequently, in support of the final phase of the Site investigation as presented in this work plan, the conceptual exposure model (CEM) component that has been presented in previous reports was updated. The CEM, which is included as Figure 7 in this work plan, depicts exposure pathways by which potential human and ecological receptors may be exposed to constituents in environmental media at the Site under reasonably anticipated future land- and water-use conditions as presented to DuPont by the NCDA&CS and NCNG in a letter dated February 28, 2014.

The CEM was developed with the following considerations:

- The Site is no longer used for manufacturing operations and has been dismantled. Planned future uses of the Site include low-impact military training and recreational uses consistent with land use plans identified by the NCDA&CS, the NCNG, and DSRF staff.
- A large amount of investigation work has been completed to define the SWMU/AOC boundaries and to characterize unit materials. In order to facilitate remedial decisions, some of the units have been proposed for additional investigation as part of the final field effort.
- Releases in soil (surface and subsurface) and groundwater have been identified.
- Potential migration pathways of constituents of potential concern (COPCs) identified in environmental media at the Site include:
    - Surface runoff during rain events into drainage ditches and storm sewers (historically before Site dismantlement);
    - Airborne transport of particulates generated by wind erosion and physical disturbance of soil (surface and subsurface) in SWMUs or AOCs to downwind locations;
    - Leaching of constituents in soil (surface and subsurface) to shallow groundwater;
    - Volatilization of constituents in shallow groundwater into indoor air; and

- Migration of dissolved constituents in shallow groundwater beneath the site vertically to the deeper bedrock aquifer and horizontally to downgradient locations, including the Little River.

- Currently, wooded areas and surface water bodies[4] adjacent to the Site are popular recreational locations for the surrounding community.
- Groundwater in the surficial aquifer is not currently used on or in the immediate vicinity of the Site as drinking water. Deed restrictions would prohibit its use on-site as drinking water in the future.
- Groundwater in the bedrock aquifer is currently used on-site for sanitary purposes and is used off-site at the NCDSFS Visitor Center for potable and sanitary uses. An IRM has been completed at the visitor center bedrock well.
- The environmental conditions of the Site as summarized in the previously-submitted RFI reports and the Environmental Indicator (EI) reports (CA725 [Parsons 2012a] and CA750 [Parsons 2012b]), and as confirmed by the ongoing NCDSFS Visitor Center and CAMU sampling programs, indicate that the Site is currently protective of human health and the environment.
- Consistent with the NCDENR document entitled “Establishing Remediation Goals for the DuPont Brevard Facility,” dated February 27, 2014, site-specific RLs for groundwater and soil have been developed for the protection of human health and the environment based on planned future uses as proposed by the DSRF and the NCNG. These RLs will be used to support the remedial approach for the Site. A review of existing Site data conducted during development of the site-specific RLs continues to show protectiveness for the intended future use.

[4] If the Site is transferred to the State of North Carolina, then the Little River and NCDSFS Visitor Center would be within the Site boundary.

4.0 FIELD INVESTIGATION PLAN

Six remaining Site data gaps have been identified (as listed in Section 1.2.3). The objectives of the final field investigation presented in this work plan are to fill each data gap in order to support the development of the *Remedial Investigation Report*. This section provides the field investigation approach to meet each objective. The proposed field activities for the final investigation will include collection of surface soil, surface water, sediment, pore water, and groundwater samples. The methodology that will be used by the field team to complete these activities is described in detail in the Sampling and Analysis Plan (SAP) (Appendix A). All of the soil, surface water, sediment, and pore water sampling locations shown on the figures referenced below are approximate proposed locations. The project team will select actual sampling locations based on field conditions at the time of the sampling event.

4.1 Objective 1 – Fill Surface Soil Data Gaps

To meet the state's current intended use of the property (as described in Section 1.2.1), it is critical to sufficiently understand conditions in surface soil (defined by NCDENR in Figure 3 of their *Guidelines for Establishing Remediation Goals at RCRA Hazardous Waste Sites* as soil less than 2 feet bgs). Supplementary Site surface soil data are needed for evaluation purposes to ensure the protection of future intended users. As such, additional surface soil data will be gathered during this investigation from within the former manufacturing area and other key locations (SWMUs 13, 15, 16, and 19) as needed for use in the assessment of future exposure scenarios.

Investigative Approach

Given the proposed use of the Site and to ensure that direct contact soil concentrations are protective of potential future land use scenarios (i.e., military and recreational where potential receptors are forest rangers, NCNG personnel, utility workers, and adult or child trail users), the development of an accurate mean concentration of COPCs is required. Soil is a highly heterogeneous solid with many components; therefore, sampling soil for the purpose of obtaining an estimate of the mean COPC concentration is highly susceptible to sampling errors from a variety of sources. Traditional sampling methods (e.g., discrete and composite sampling) do not adequately address this problem, especially when evaluating a large and potentially diffuse area without point sources (as in this case). In order to reduce these sampling errors, the project team will use the Incremental Sampling Methodology (ISM) to assess the surface soil in the former manufacturing area. ISM is described in detail in a document published by the Interstate Technology & Regulatory Council entitled *Incremental Sampling Methodology (*February 2012). This document briefly describes ISM as

> "…a structured composite sampling and processing protocol that reduces data variability and provides a reasonably unbiased estimate of mean contaminant concentrations in a volume of soil targeted for sampling. ISM provides representative samples of specific soil volumes defined as decision units (DUs) by collecting numerous increments of soil (typically 30–100 increments) that are combined, processed, and subsampled according to specific protocols."

ISM will be used to collect surface soil samples from DUs 1 through 10 (Figure 8). In order to confirm previous surface soil detections around AOC A and to meet other objectives, traditional soil sampling methods (discrete sampling) will be used in DU 11 and the remaining SWMUs (SWMUs 13, 15, 16, and 19).

Consistent with suggested sampling intervals in NCDENR Division of Waste Management Hazardous Waste Section Generator Closure Guidelines dated December 2, 2013, surface soil samples will be collected from the 6 to 18 inches bgs interval. Soil samples will be collected in DUs 1 through 10 using ISM (Figure 8 and at the discrete locations shown on Figure 9. A total of 75 soil samples will be collected and submitted to a NC-certified laboratory for analysis of area-specific parameters as listed in Table 2. Additional details about the specific soil sampling methods to be used in the investigation are included in the SAP (Appendix A).

4.2 Objective 2 – Complete SWMU 14 Soil Sampling

As described above in Section 2.1.2, the former ball field area (now SWMU 14) was reclaimed and used as a ball field during DuPont ownership but has not been used since DuPont reacquired the Site. A PET recycling project was completed at SWMU 14 in July 2012. Activities consisted of excavating PET for recycling and moving any unusable nonhazardous waste from SWMU 14 to the CAMU established at SWMU 11. The details of the proposed interim SWMU 14 remediation/recycling project were outlined in the revised *Interim Measures Work Plan* (WRScompass 2011).

Only a minimal amount of “unacceptable” material was encountered during the remediation of SWMU 14. Unacceptable material was defined as material that had to be transported off-site for proper disposal instead of being transferred to the CAMU. These materials included stained soils or liquids, metal containers (e.g., drums and cylinders), and other wastes (e.g., tires). The unacceptable material that was excavated from SWMU 14 included a truck tire (which was picked up for recycling), a corrugated metal pipe, a five gallon bucket of Thermon Heat Transfer Cement mastic later identified through the manufacturer’s material safety data sheet as nonhazardous material, three open-top drum carcasses containing PET and residual glycol that was solidified with concrete, and a gas cylinder transported for analysis and proper disposal. All of these materials were determined to be nonhazardous. A small amount of greenish-blue water that evaporated within a day was also noted in the excavation. The location in which each item was discovered is noted on the SWMU 14 topographic drawing (Figure 10). The findings of the IM activities are presented in the *Interim Measures Report* submitted to NCDENR on October 26, 2012 (Parsons 2012c).

The IM work plan called for post-excavation confirmatory soil samples to be collected from the bottom of the SWMU 14 excavation in a manner intended to document environmental conditions as they exist following excavation. Due to the expansion of the excavated area and issues with excess water present in the excavation, DuPont decided to postpone the collection of confirmatory samples and combine them with future investigation activities at the Site. Therefore, the post-excavation soil sampling of SWMU 14 will be conducted as part of this final field investigation.

As described in the IM work plan, the original proposed soil sampling pattern was approximate and could be modified based on Site conditions following excavation. The current confirmatory soil sampling plan has been developed to ensure that samples are collected from the areas where “unacceptable” material was uncovered and to meet the Site objectives for future intended use. Surface soil data will be gathered during this investigation from within the SWMU 14 excavated area for use in the assessment of future exposure scenarios based on the intended future use (as described in Section 1.2.1).

Investigative Approach

As part of the final field investigation, 10 surface soil samples will be collected from the 6 to 18 inches bgs interval at the locations shown on Figure 10. The proposed soil sample locations have been selected to ensure that one confirmatory sample is collected from each of the five areas where "unacceptable" material was encountered. Five additional samples will be collected from the interior of the excavation where no unacceptable material was uncovered.

All samples will be submitted to a NC-certified laboratory for analysis of the area-specific parameters listed in Table 2. Additional details about the specific soil sampling methods to be used in the investigation are included in the SAP (Appendix A).

4.3 Objective 3 – Ensure the Presence of Adequate Surface Covers

To meet the state's current intended use of the property, it may be necessary to further isolate subsurface materials that will remain on-site in some of the existing SWMUs. As such, the project team will investigate existing Site conditions as part of the final field event to ensure that adequate surface covers are present at SWMUs 4, 12, 13, 15, 16, 19, and 18/20 (Figure 2). These observations will be used, in part, to support the development of a *Soil Use/Excavation Management Plan* as part of the final Site remedial approach.

Investigative Approach

The existing cover material will be investigated by collecting several soil cores from various locations around the SWMUs to determine the thickness and condition of the cover. A small diameter coring device will be used to collect soil cores that are at least 24 inches long. The cores will then be inspected to determine if the cover material extends to this depth, and the physical description of each will be recorded. Additional details about the proposed approximate soil core locations and specific methods to be used in the surface cover investigation are included in the SAP (Appendix A).

4.4 Objective 4 – Verify Groundwater Concentrations

Existing groundwater data indicates that Site conditions are fully protective of the current and future intended use and the environment. It is assumed the State's current intended use of the property (as described in Section 1.2.1) will not require potable access to Site groundwater except, potentially, from the existing unimpacted WSWs. However, because the most recent sitewide round of groundwater sampling was conducted in 2009, one objective of this final field investigation is to verify that Site groundwater concentrations remain consistent with protection of sensitive surface waters.

During the final field investigation, a selection of the Site's monitoring wells and WSWs will be sampled to verify current sitewide groundwater conditions. The wells that will be sampled during this event are shown on Figure 11. The sampling plan was developed to meet the following requirements:

- Re-sample all of the WSWs
- Re-sample the monitoring wells downgradient of key areas/SWMUs and/or near surface waters

- Re-sample all of the bedrock monitoring wells
- Re-sample wells that have limited historical analytical data
- Confirm understanding of current Site groundwater conditions

Investigative Approach

Prior to initiation of groundwater sampling activities, static water level measurements will be collected from the wells and piezometers in the Site's well network (Figure 3) to provide an updated data set from which to analyze current groundwater flow conditions. Groundwater samples will then be collected from the 53 locations shown on Figure 11 using the procedures described in the SAP (Appendix A). All samples will be submitted to a NC-certified laboratory for analysis of the area-specific parameters listed in Table 3. In addition, the next round of regular semi-annual interim CAMU groundwater sampling activities will be conducted at the Site in conjunction with the final field investigation. The CAMU groundwater monitoring wells shown on Figure 12 will be sampled in accordance with the procedures described in the *Interim CAMU Groundwater Monitoring Plan* (Parsons 2010).

4.5 Objective 5 – Investigate Current Conditions in Lake DERA, DERA Creek, and Little River

To meet the state's current intended use of the property, it is also critical to sufficiently understand the current Site surface water and sediment conditions. The existing surface water and sediment data indicate that Site conditions are fully protective of future intended use and the environment. However, because these samples were not collected recently, additional samples will be collected to confirm the historical findings. In addition, supplementary surface water and sediment samples will be collected in areas where data gaps exist, and pore water samples will be collected from some locations to increase understanding of the connection between Site groundwater and the adjoining surface water bodies.

Investigative Approach

Surface water, sediment, and pore water samples will be collected from the locations shown on Figure 13. Four surface water samples will be collected from Little River at locations previously sampled. Nine surface water samples will be collected from Lake DERA, and three will be collected from the DERA Creek tributary. Surface water samples will also be collected from the runoff from SWMU 14 (ball field sample) and two locations that drain into Little River. Sediment will be collected from all of these locations except for the location in the DERA Creek tributary immediately adjacent to Lake DERA (location of SW-8). A total of 19 locations will be sampled for surface water, and 18 locations will be sampled for sediment. Pore water will also be sampled at 11 of these locations (see Figure 13).

All samples will be submitted to a NC-certified laboratory for analysis of the area-specific parameters listed in Table 2. Additional details about the specific surface water, sediment, and pore water sampling methods to be used in the investigation are included in the SAP (Appendix A).

4.6 Objective 6 – Verify Downgradient Drinking Water Receptors

As part of the final field event, the project team will investigate the surrounding area to determine if there are currently any potential drinking water receptors downgradient of the Site. This effort will support the final human health risk evaluation and will be used to confirm that Site conditions remain fully protective of the future intended use and people.

Investigative Approach

To help identify potential drinking water receptors in the vicinity of the Site, available well records will be searched. On-line archives of private and public well data records maintained by NCDENR, the South Carolina Department of Health and Environmental Control, the US Geological Survey, the US Department of Health and Human Services, and local, county, or municipal public works departments will be reviewed. Records of wells listed as being within a two-mile radius of the facility will be documented and will be included in the Remedial Investigation Report. In addition, the project team will work with NCDSFS personnel to identify wells on the DSRF property within the vicinity of the Site. If any additional well users are identified, wells that are deemed as potentially interconnected with on-site water regimes (wells set in saprolitic layers as well as those set in fractured bedrock) may be sampled if needed (pending approval of the well owners).

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5.0 PROJECT SUPPORT PLANS

The project team will prepare several project support plans prior to the implementation of the final field investigation at the DuPont Brevard Facility. The support plans will be developed as part of the pre-field mobilization effort to ensure that all field activities are completed safely and effectively. The following sections provide a brief description of the content to be included in each supporting plan.

5.1 Sampling and Analysis Plan

The SAP has been included with this work plan as Appendix A. The SAP describes the specific soil, surface water, sediment, pore water, and groundwater sampling methods that will be used in the final field investigation.

5.2 Health and Safety Plan

Prior to commencement of field activities associated with the final field investigation, an updated project-specific Health and Safety Plan (HASP) will be prepared. The purpose of the HASP is to assign responsibilities, establish personnel protection standards, specify safe operating procedures, and provide for contingencies that may arise during any of the field activities that take place as part of the investigation. The HASP will include sections pertaining to the following:

- Hazard evaluation
- Worker protection
- Air/workplace monitoring
- Personnel training
- Medical monitoring
- Site control
- Decontamination
- Illumination
- Sanitation
- Emergency contingency plan

The Field Team Leader and Site Safety Officer (SSO) have shared responsibility for implementing and enforcing the HASP. The SSO will continue to evaluate the HASP for completeness throughout the course of the field activities and will incorporate changes necessary as a result of changes in Site activities. All proposed revisions to the HASP will be reviewed by the Parsons Health and Safety Manager prior to implementation by the project team and annotated on a revision checklist provided with the HASP.

All participants involved in the field activities will be briefed on the HASP and afforded the opportunity to raise any questions. In addition, Parsons and any subcontractor personnel who will be on-site during the investigation will sign the HASP Compliance Form provided in the HASP. All personnel will be responsible for compliance with the HASP and any other regulatory requirements set forth by federal and/or state regulations.

5.3 Waste Management Plan

In order to ensure coverage for the final field investigation activities described in this work plan, the existing site-specific Waste Management Plan (WMP) will be reviewed and updated if needed. The WMP establishes a system for managing, documenting, and monitoring the handling, storage, and disposal of wastes generated during investigation activities. The following types of generated wastes are anticipated as a result of the investigation activities:

- Personal protective equipment (PPE)
- Decontamination water
- Groundwater from investigation activities

During the investigation activities, wastes generated at various locations will constitute “new” wastes of known (process knowledge), unknown, or variable composition. Wastes generated during the investigation will be characterized to determine disposal options. Wastewater (e.g., decontamination water and well purge water) will be handled separately from other wastes (e.g., PPE and disposable sampling debris). Drums or tanks may be used for wastewater storage, depending on the volume and similarity of the wastes. All investigation-derived waste material will be disposed in accordance with the WMP at a DuPont-approved waste disposal facility.

5.4 Quality Assurance Project Plan

A Quality Assurance Project Plan (QAPP) will be developed prior to implementation of the final field investigation sampling activities. The QAPP will present the policies, project organization, functional activities, and quality assurance/quality control (QA/QC) measures intended to achieve the project data quality objectives for sampling and analysis activities associated with the final field investigation to be conducted at the Site. The QAPP is intended to meet requirements for conducting the work in accordance with QA/QC field procedural protocols for environmental measurement data.

6.0 DATA EVALUATION

The environmental analytical data collected during the RFI will be compared to site-specific RLs to evaluate the data collected during the investigation and provide information to support remedial-decision making based on planned future land uses.

6.1 Soil and Groundwater

Consistent with the NCDENR document entitled "Establishing Remediation Goals for the DuPont Brevard Facility," dated February 27, 2014, site-specific RLs for soil and groundwater have been developed for the protection of human health and the environment based on planned future uses as proposed by the DSRF and the NCNG. The technical approach and calculations are detailed in a separate submittal[5].

In developing the site-specific RLs, receptors and routes of exposure were refined based on the currently proposed uses. COPCs were identified based on comparison of existing RFI data against screening levels for appropriate media and exposure pathways. As a result, RLs were developed for the following:

- Groundwater concentrations protective of receptors in Little River (human and ecological)
- Soil concentrations protective of potential groundwater receptors (Little River)
- Direct contact soil concentrations protective of potential future land use scenarios, i.e., military and recreational.

Consistent with Section § 130A-310.68 (b)(9) of House Bill 45 (the Risk Bill), direct contact soil RLs were derived using the range of acceptable target cancer risk levels (10^{-6} to 10^{-4}) and a target hazard quotient of 1.

6.2 Surface Water and Sediment

Site-specific RLs for surface water and sediment may be developed in the future for protection of human and ecological receptors based on the results of the investigation.

6.3 Confirmation/Identification of COPCs

In addition, the new data may be screened in the same/similar manner as used to develop the site-specific RLs. The purpose of this screening step is to confirm relevant COPCs in soil and groundwater and to potentially identify relevant COPCs in surface water and sediments.

6.3.1 Groundwater

Constituents detected in groundwater will be compared to North Carolina groundwater standards established in 15A NCAC6 2L .0200 (NC2L standards) or NC Interim Maximum Allowable Concentrations.

[5] URS, 2014. Site-Specific Remedial Levels, Former DuPont Brevard Facility, Cedar Mountain, North Carolina. July 2014.

[6] NCAC – North Carolina Administrative Code

6.3.2 Soil

Soil concentrations will be compared to NC DENR Inactive Hazardous Site Branch (IHSB) Preliminary Soil Remediation Goals (PSRGs) for unrestricted land use. The PSRGs represents a combined exposure including inhalation of particulates and volatile compounds, dermal absorption, and ingestion. The PSRGs are based on a cancer risk of 1 x 10-6 and a HQ of 0.2 (for non-carcinogens). Soil concentrations will also be compared to PSRGs for protection of migration to groundwater. In addition, soil concentrations for inorganics will be compared to site-specific background concentrations determined during the RFI (Parsons, 2012a).

6.3.3 Sediment

Sediment concentrations will be compared to PSRGs for unrestricted land use. This is considered a very conservative screening for sediment because exposure to sediment would be less frequent than the assumptions used in the development of the PSRGs.

The results of sediment chemistry analyses will be compared to sediment quality benchmarks (SQBs) to evaluate the potential for adverse effects to benthic macroinvertebrate communities resulting from exposure to sediment-associated constituents. Consistent with NC DFW guidance, sediment analytical results will be initially compared to USEPA Region 4 sediment screening values (http://www.epa.gov/region4/superfund/programs/riskassess/ecolbul.html). If a sediment screening value is not available from USEPA Region 4, SQBs will be obtained from literature-based sources, including but not limited to

- Consensus-based threshold effects concentrations (TECs) and probable effects concentrations (PECs) developed by MacDonald et al. (2000)
- Lowest effects level (LEL) and severe effects level (SEL) developed by Persaud et al. (1992)
- USEPA Region 5 Ecological Screening Benchmarks (USEPA, 2003)
- Canadian Interim Sediment Quality Guidelines (ISQG) and Probable Effects Level (PEL) as developed by CCME (2013)
- Risk Assessment Information System (RAIS; http://rais.ornl.gov/)

Additional sources of sediment quality benchmarks from federal and state agencies, as well as literature studies may be consulted as needed to identify benchmarks for comparisons with bulk sediment results. Sediment concentrations of site-related constituents measured in the study area may also be compared to concentrations measured in reference areas to provide appropriate regional context to sediment results.

6.3.4 Surface Water

Surface water concentrations in Little River, Lake DERA and DERA Creek will be compared to the 15A NCAC 2B (NC2B standards) for protection of freshwater organisms (chronic), protection of trout waters and protection of human health (organism only). Where NC2B standards are not available, National Recommended Water Quality Criteria (USEPA 2012) will be used. For constituents that do not have criteria established in the aforementioned sources, surface water screening values will be proposed from alternate sources consistent with 15A NCAC 02B.0208. Pore water concentrations will also be compared to NC 2B standards for protection of aquatic life (chronic).

7.0 PROJECT REPORTING

The Risk Bill requires the completion and submittal of a *Remedial Investigation Report* before final remedial decision-making is appropriate. The final field investigation described in this work plan has been developed to gather all remaining data necessary for completion of this final report. Once the investigation is complete, the project team will prepare the *Remedial Investigation Report* which, as required, will contain the following items (at a minimum):

- A legal description of the location of the Site
- A map showing the location of the Site
- A description of the contaminants involved and their concentration in the media of the Site
- A narrative description of the methodology used in the investigation
- A description of all on-site releases of contamination
- A Site map, drawn to scale, showing benchmarks, directional arrow, location of property boundaries, buildings, structures, all perennial and non-perennial surface water features, drainage ditches, dense vegetation, contaminant spill or disposal areas, underground utilities, storage vessels, and existing on-site wells
- Identification of adjacent property owners and adjacent land uses
- A description of local geologic and hydrologic conditions
- An evaluation of the Site and adjacent properties for the existence of environmentally sensitive areas
- A description of groundwater monitoring well design and installation procedures
- A map, drawn to scale, that shows all groundwater sample locations
- A description of field and laboratory QA/QC procedures followed during the remedial investigation
- A description of methods used to manage investigation-derived wastes
- Tabulation of analytical results for all sampling
- Copies of all laboratory reports
- A description of procedures and the results of any special assessments
- Any other information required by the department or considered relevant by the project team

The report will also include a summary of the data evaluation described in Section 6.0 and an updated SCM that will include any modifications necessary based on the results and conclusions of the final remedial investigation.

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8.0 PROJECT SCHEDULE

The activities described in this work plan will commence upon approval of the work plan by NCDENR. The following is a list of anticipated scheduling time separated by task. The tasks will be completed in sequential order as indicated in the following table.

Activity	Duration	Current Anticipated Schedule
Work Plan Submittal		August 1, 2014
NCDENR Work Plan Approval	Eight to twelve weeks	October 2014
Field Planning	Two to four weeks after approval	October 2014
Field Work (surface water, sediment, pore water, soil, and groundwater sampling)	Eight to ten weeks	October/November/ December 2014
Laboratory Analyses/Data Validation	Four to eight weeks from field work completion	January 2015
Data Evaluation and final Remedial Investigation Report Preparation	Fourteen weeks from receipt of analytical data	January through March 2015
Remedial Investigation Report Submittal		April 1, 2015

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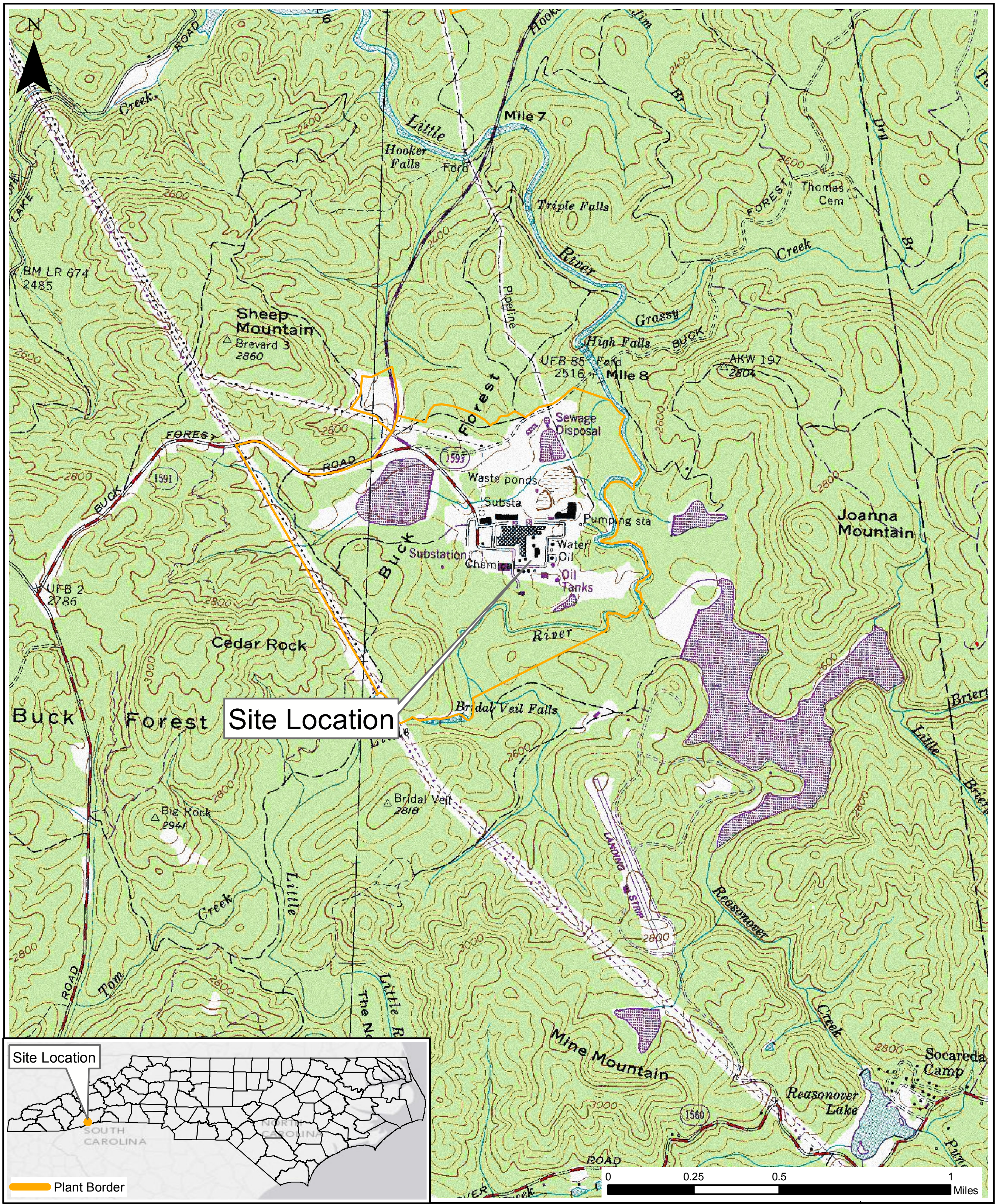
FIGURES



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Site Location Map
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 6/2/2014	Parsons Project No.: 447499
Revision: TO	Figure No.: 1
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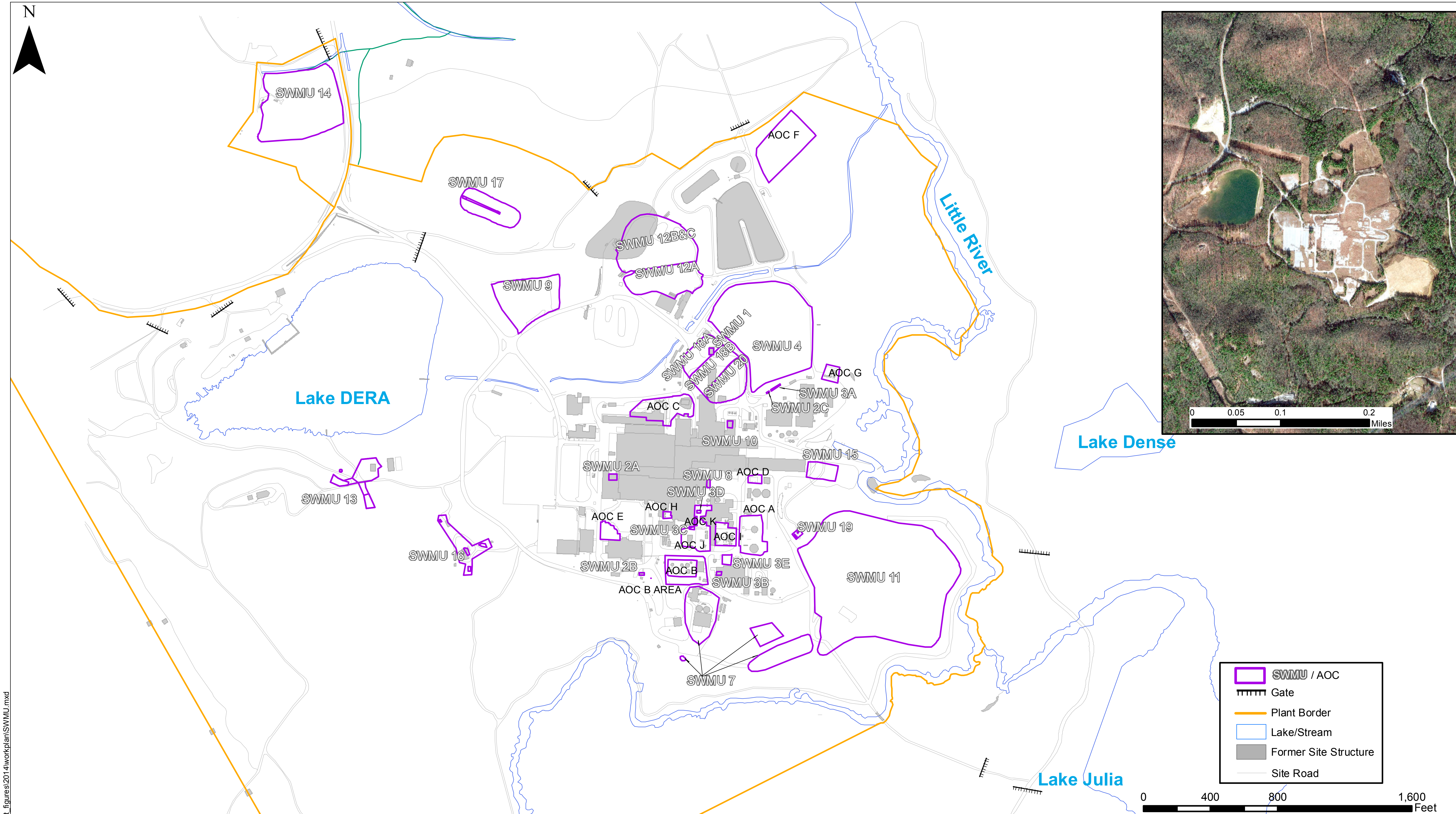

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SWMU Location Map
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 8/1/2014	Parsons Project No.: 446664.01000
Revision:	Figure No.: 2
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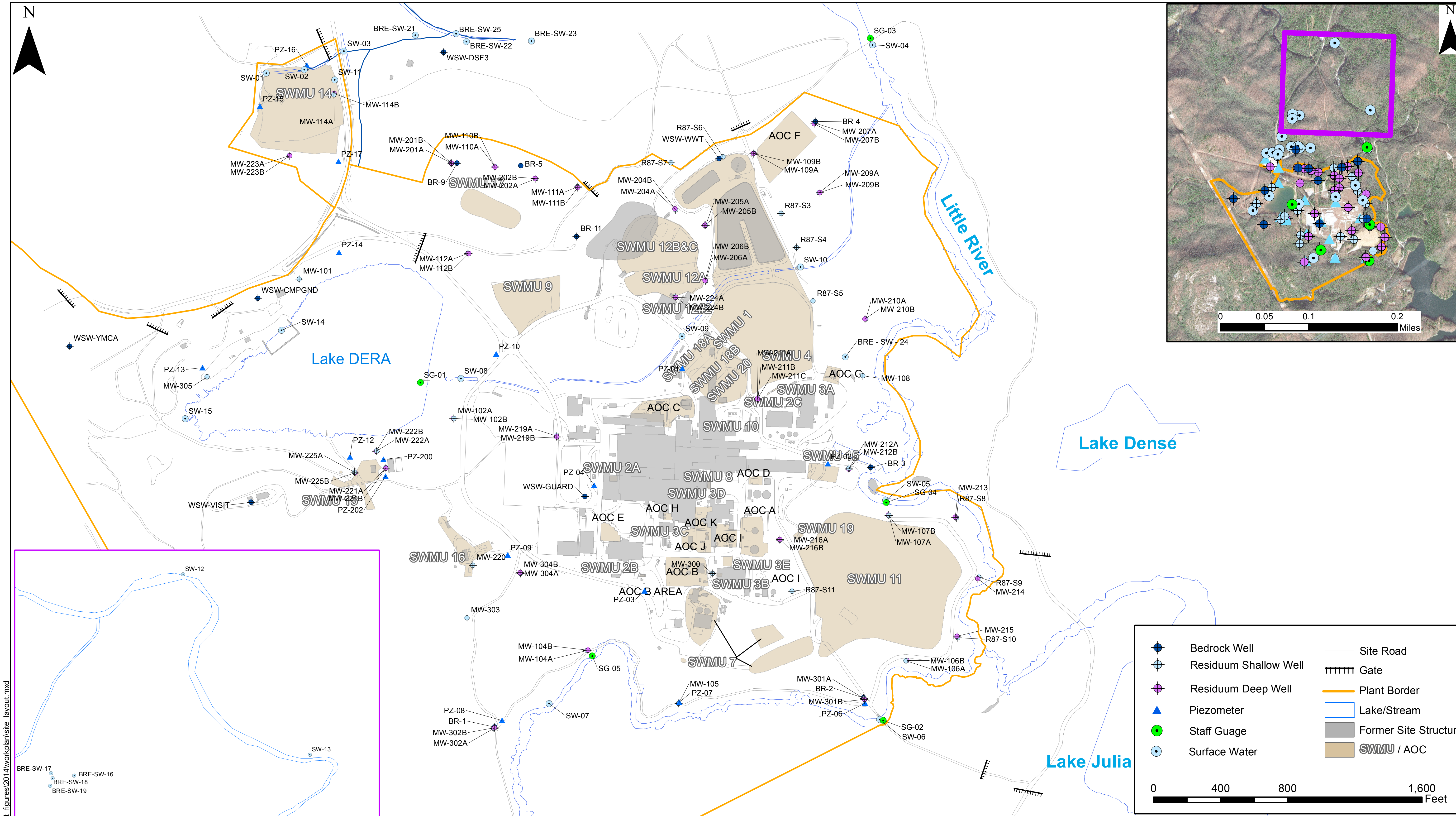

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Site Layout Map
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 6/3/2014	Parsons Project No. 446664.01000
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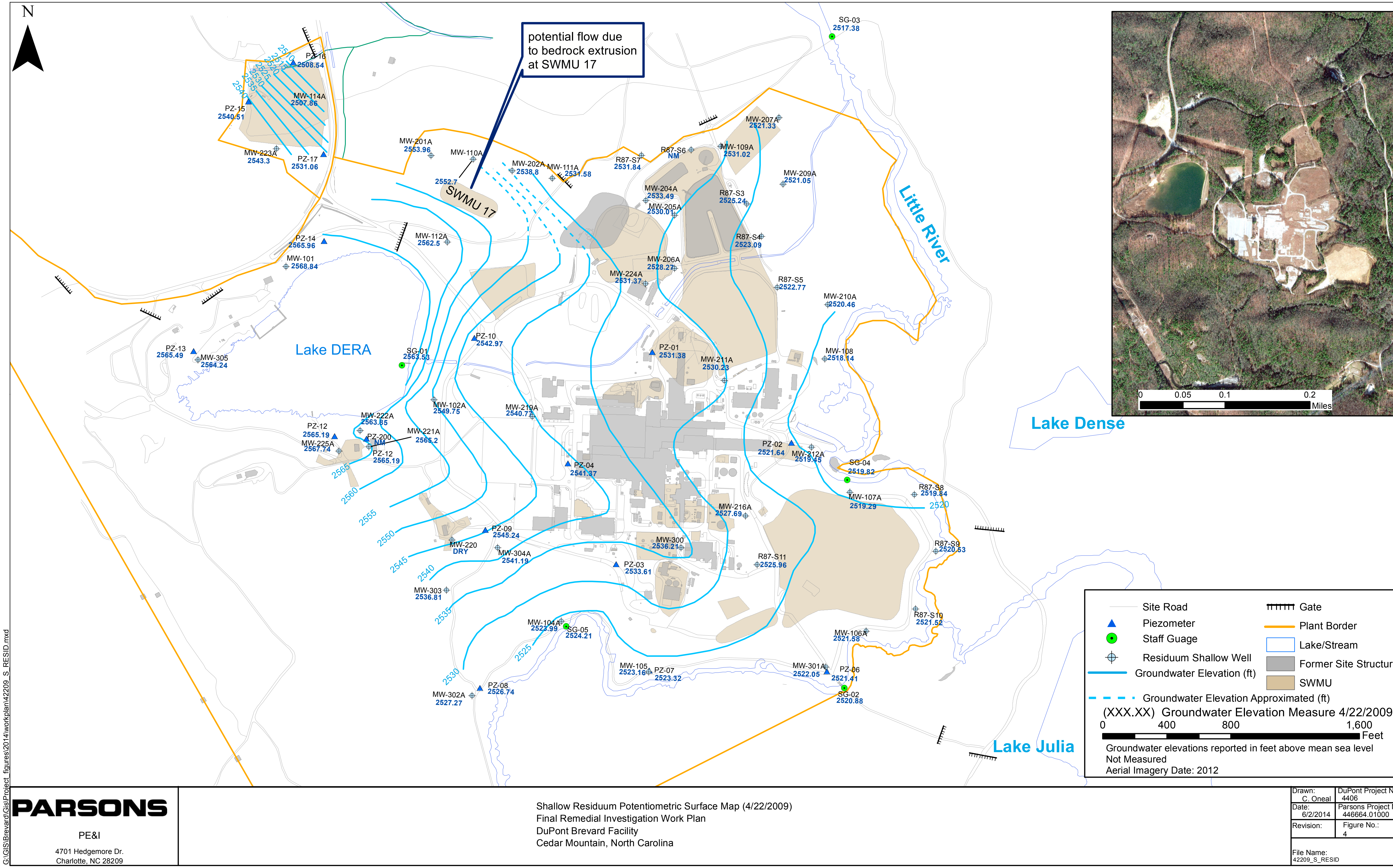

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Shallow Residuum Potentiometric Surface Map (4/22/2009)
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 6/2/2014	Parsons Project No.: 446664.01000
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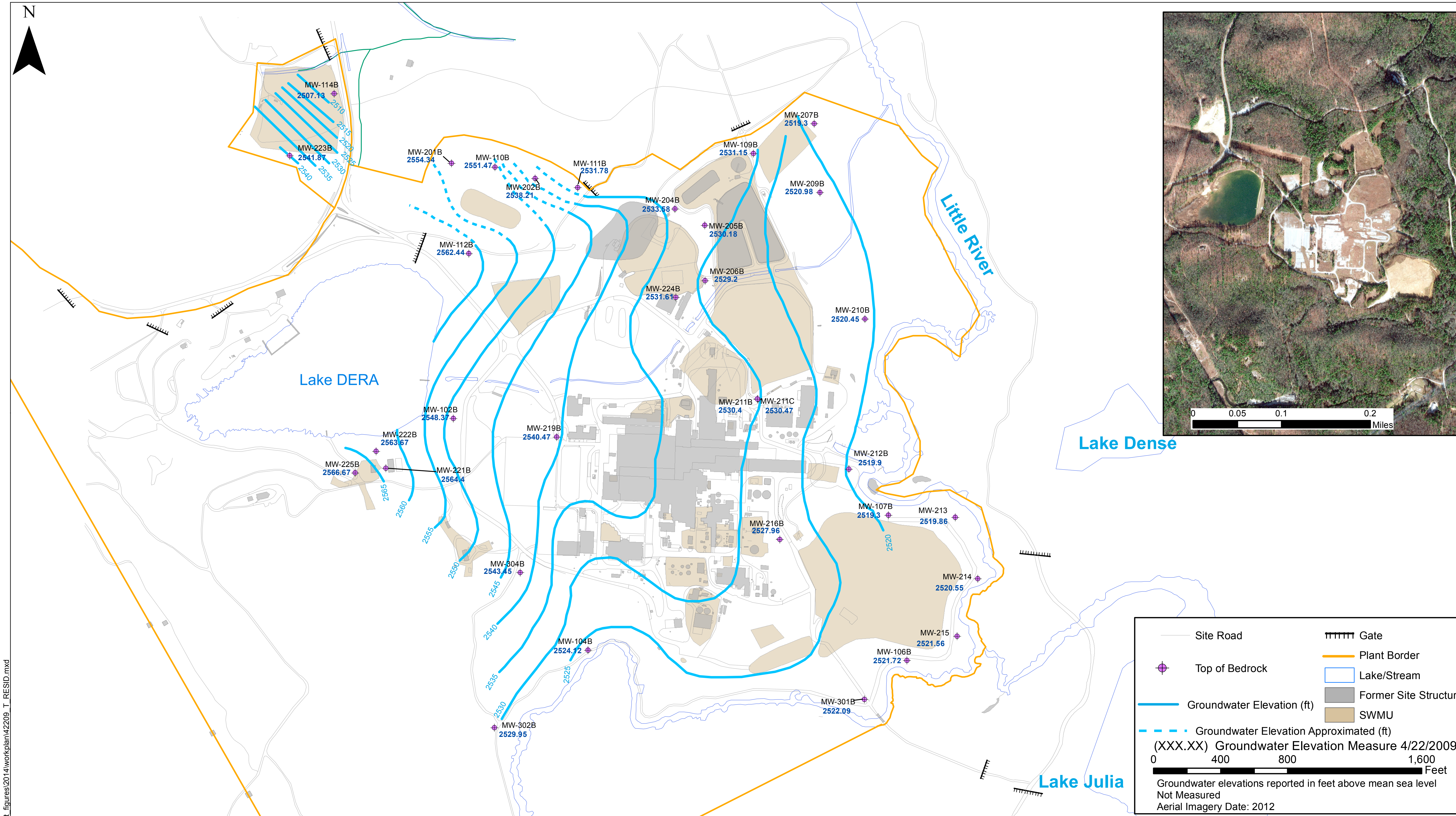

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Top of Bedrock Residuum Potentiometric Surface Map (4/22/2009)
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 6/2/2014	Parsons Project No.: 446664.01000
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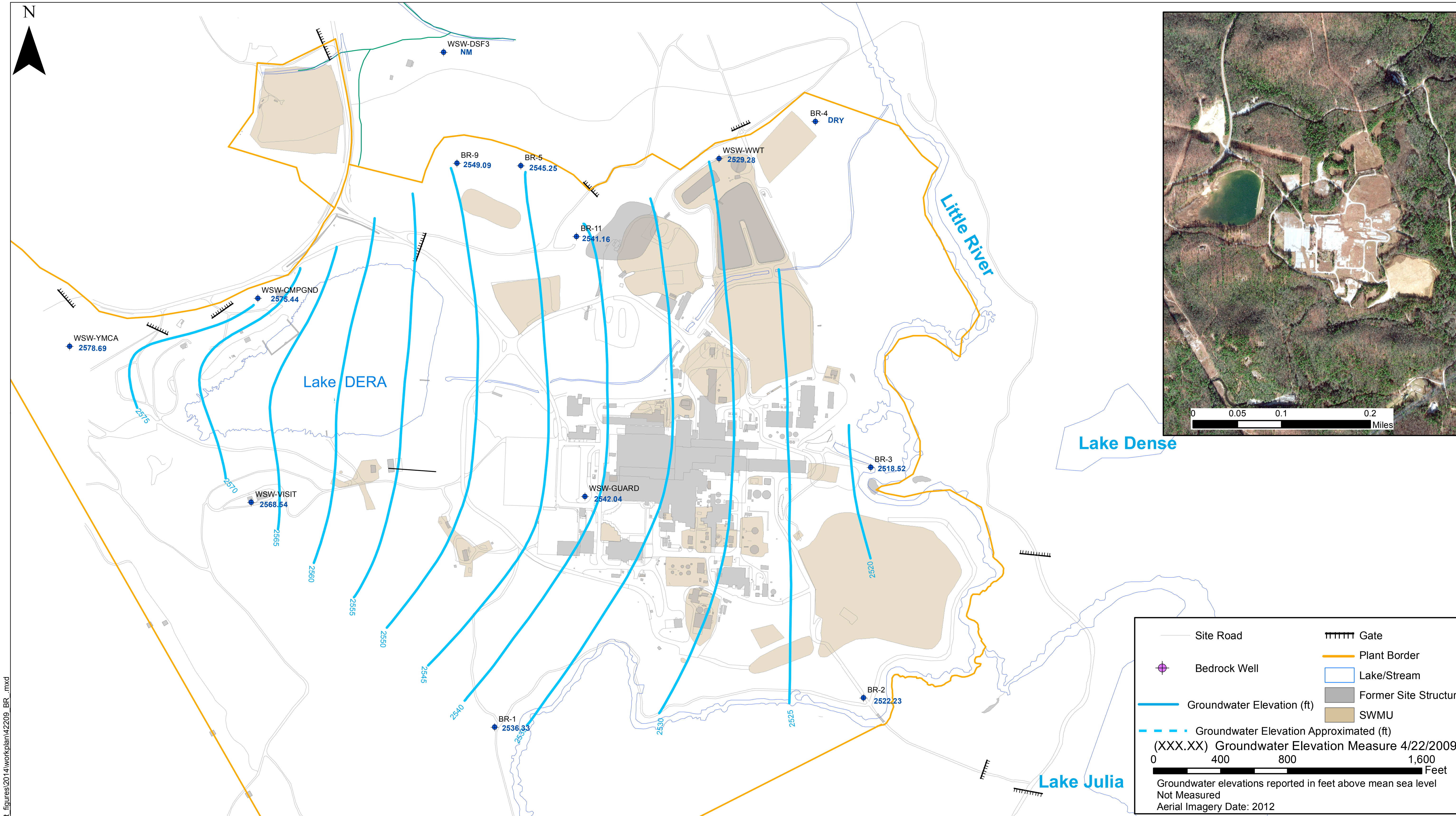

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Bedrock Potentiometric Surface Map (4/22/2009)
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 6/2/2014	Parsons Project No.: 446664.01000
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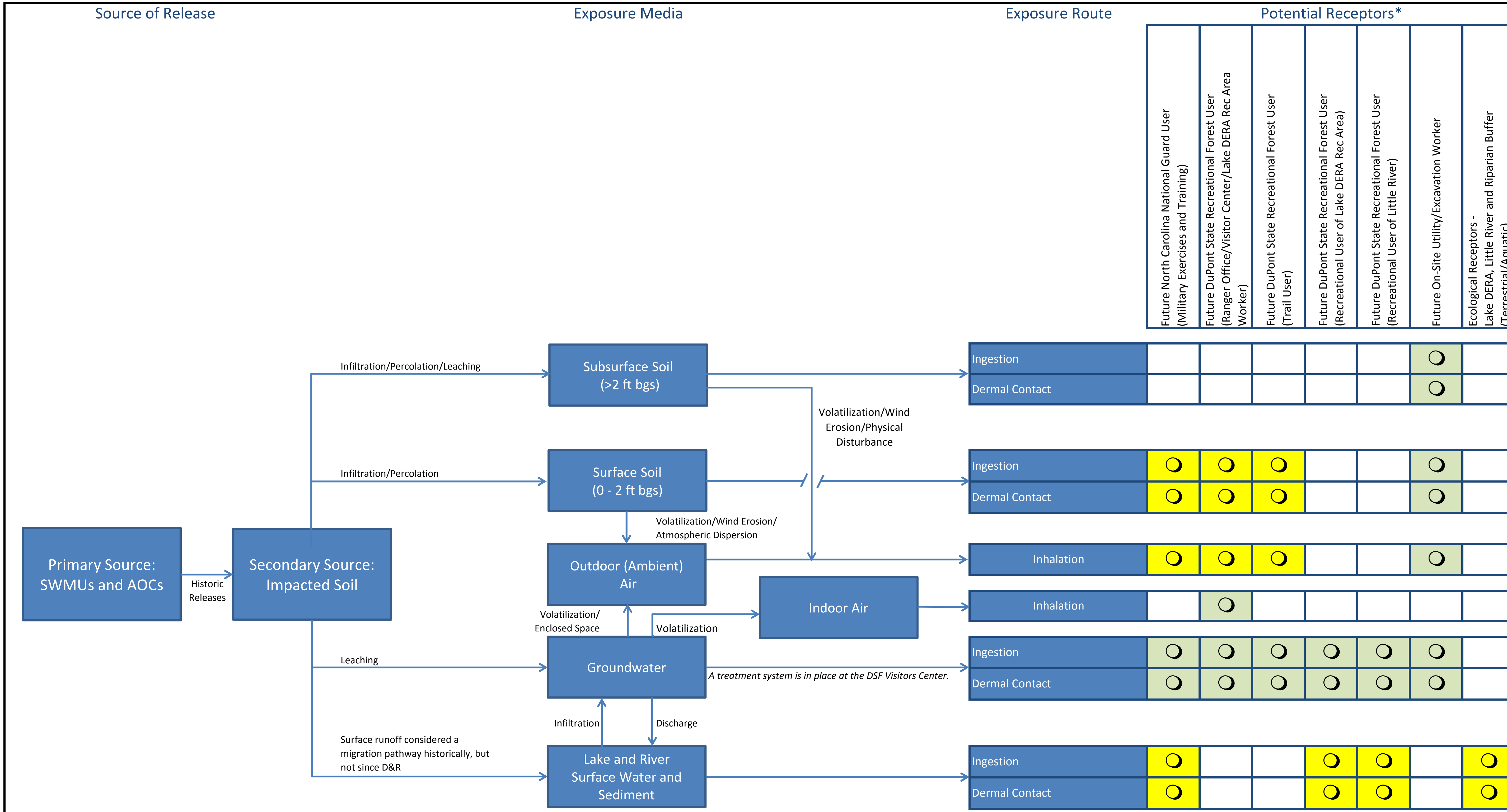

* Potential receptors based on NC Department of Agriculture February 25, 2014 memorandum titled *Proposed North Carolina National Guard (NCNG) and North Carolina Forest Service (NCFS) uses on the DuPont Corporation Property*. Potential groundwater exposure pathways consider installation of a well in the bedrock aquifer for potable and non-potable use.

Legend

- ⊗ Not a media or pathway of concern
- (white) Incomplete pathway, receptors would not be in contact with affected media
- (yellow) ○ Potentially complete pathway; receptors may be in contact with affected media
- (green) ○ Potentially complete pathway that could be addressed with adminstrative or engineering controls.

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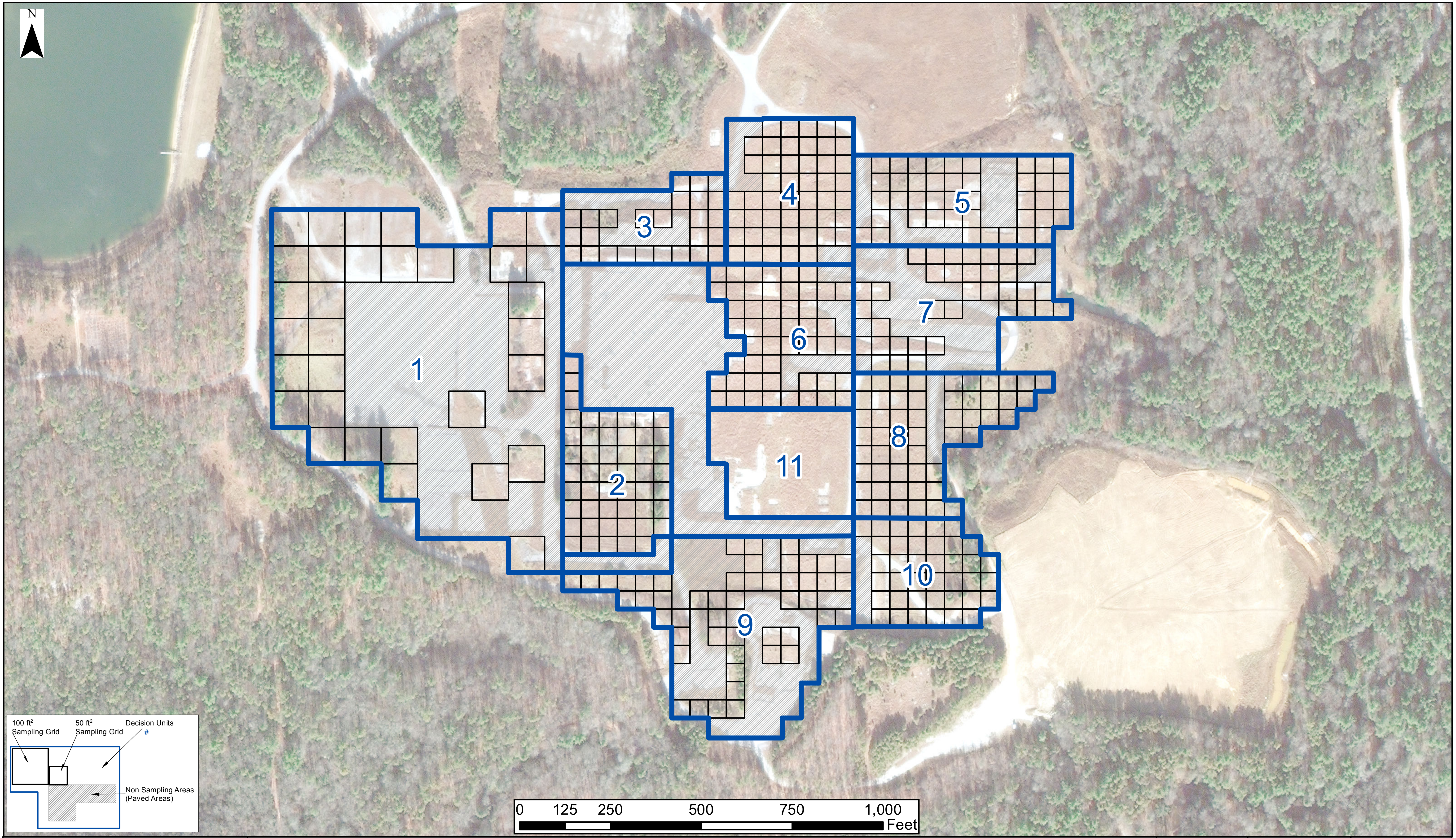
Conceptual Exposure Model

Former DuPont Brevard Facility,
Cedar Mountain, NC

07/01/2014 Figure 7



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Proposed Decision Units
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, NC

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Revision:	Figure: 8	Parsons Project No: 445241.01000

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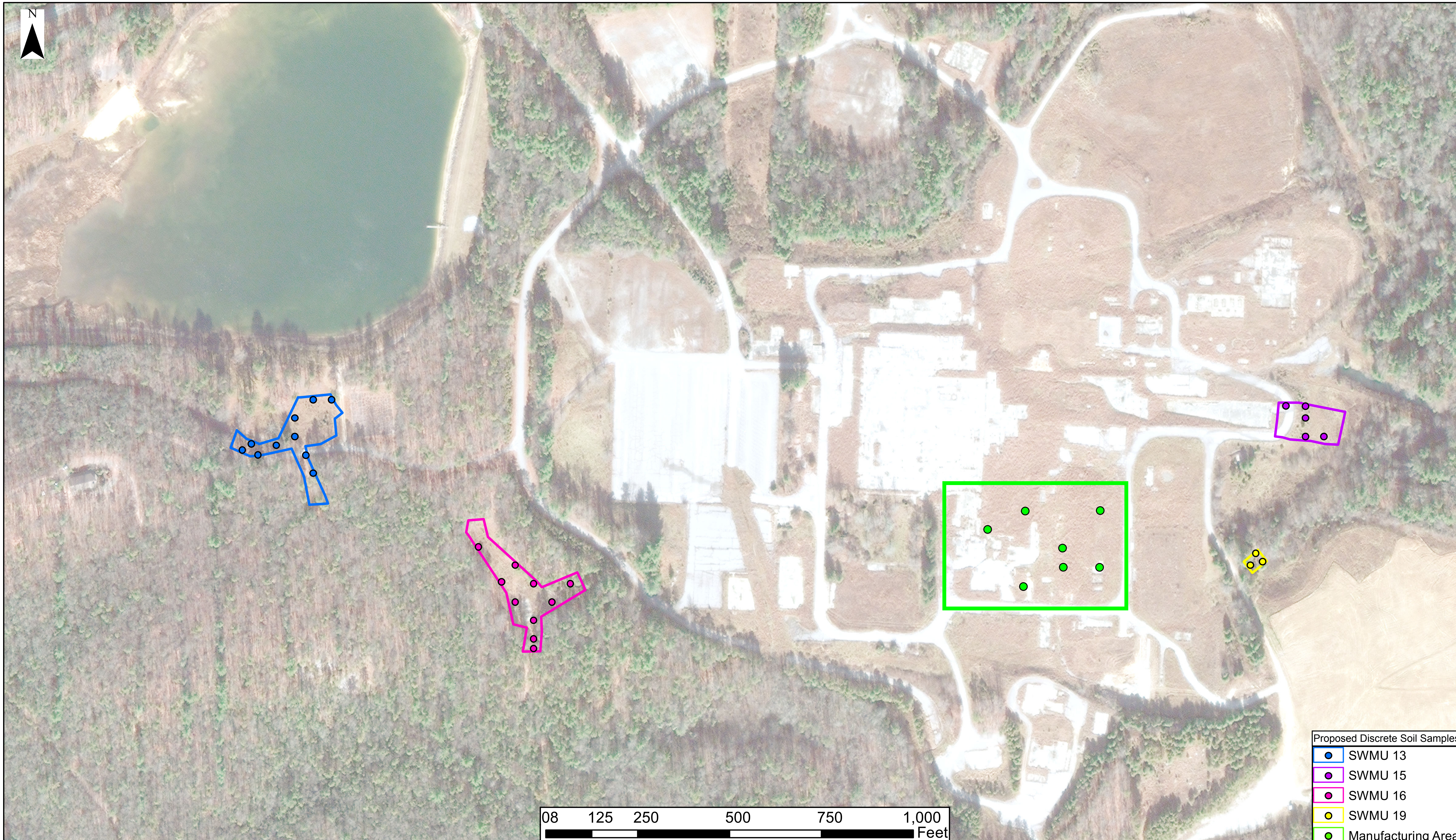

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Proposed Discrete Surface Soil Sampling Map
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Created: C. Oneal	Date: 8/04/09	DuPont Project No: 4423
Revision:	Figure: 9	Parsons Project No: 445241.01000

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SWMU 14 Proposed Soil Sampling Location Map
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

CREATED: M. ROBINSON	DUPONT PROJECT NO.:
DATE: 2014-07-01	PARSONS PROJECT NO.: 447499.01050
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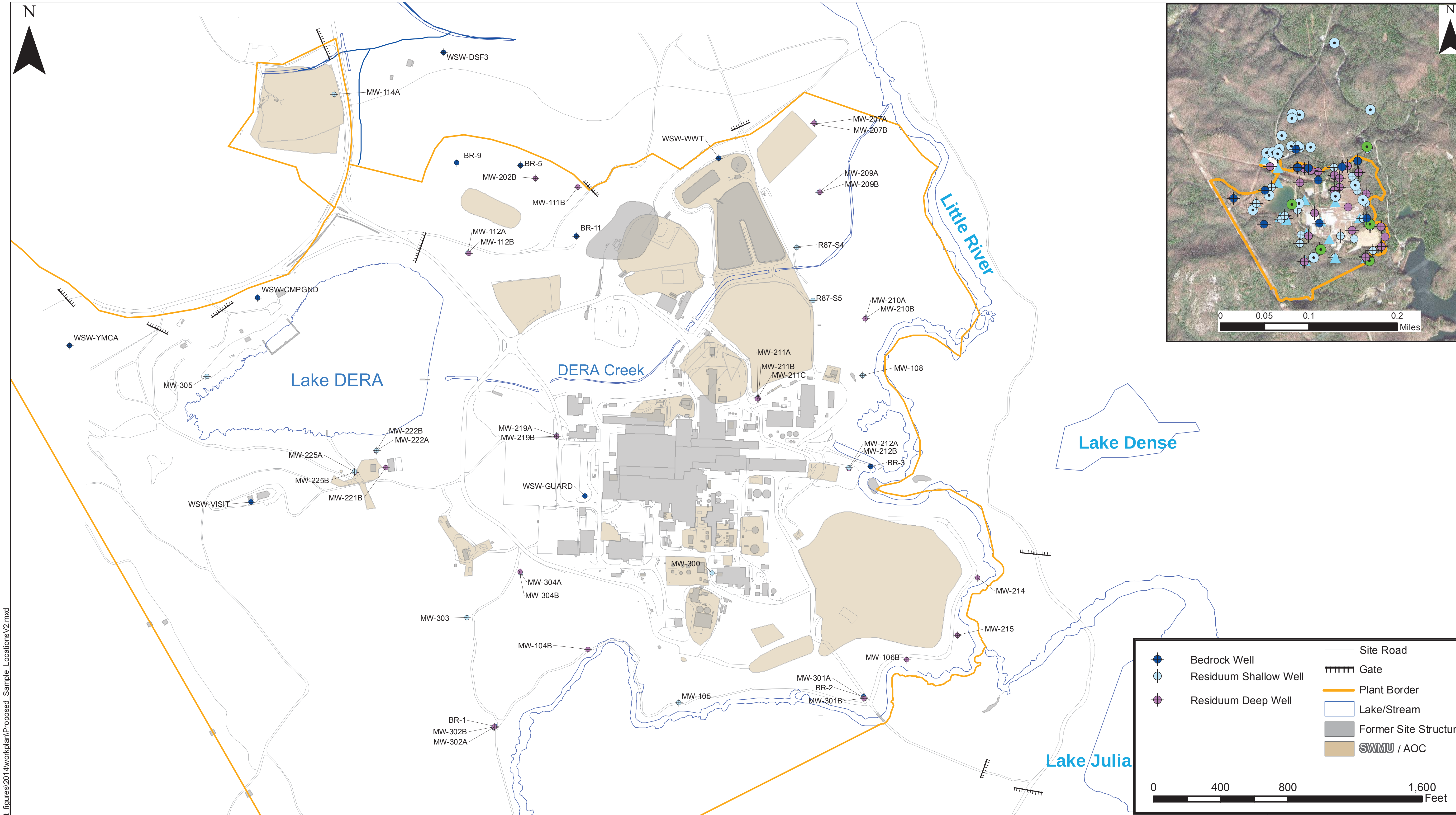

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Propsed Groundwater and WSW Sampling Location Map
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 8/1/2014	Parsons Project No.: 446664.01000
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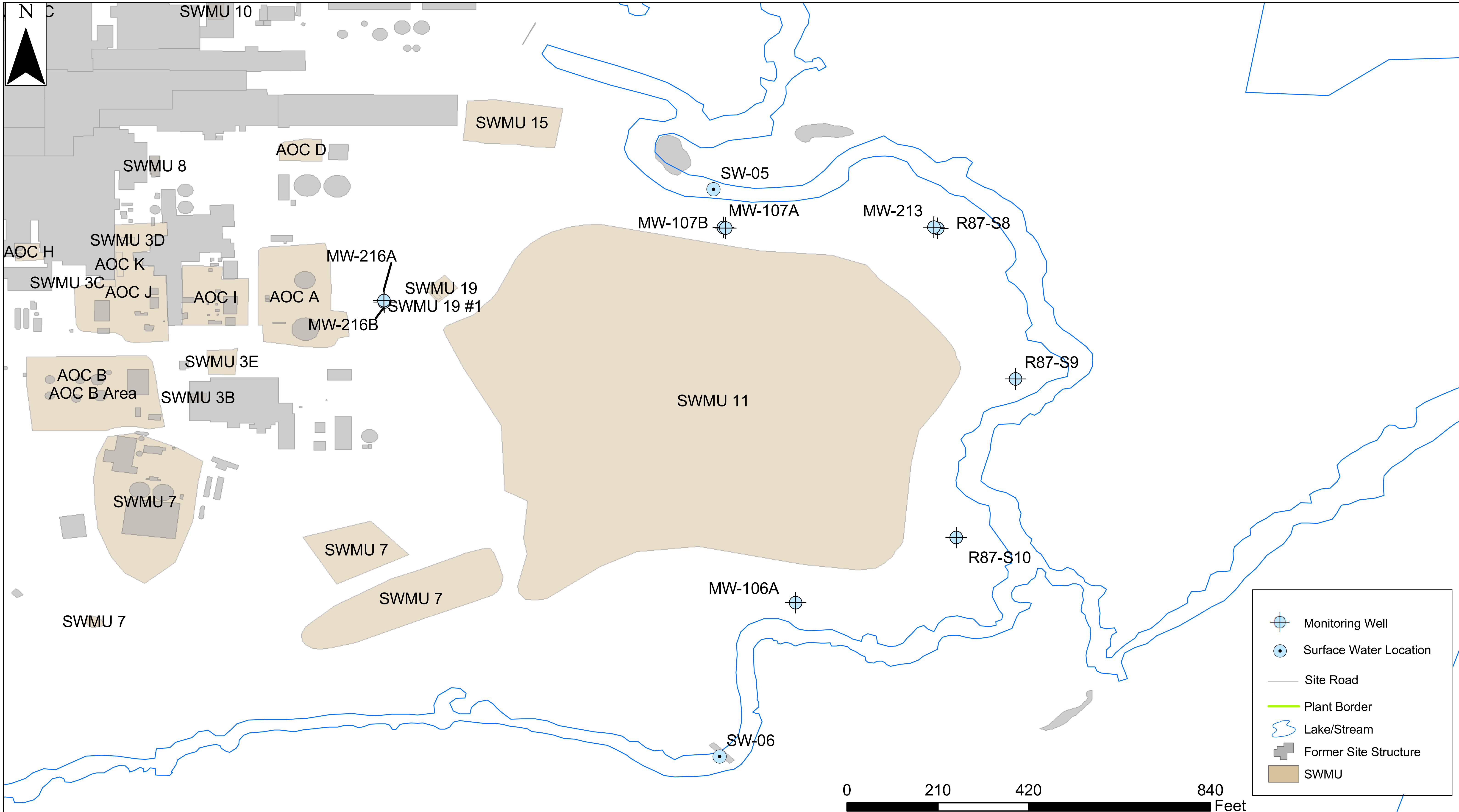

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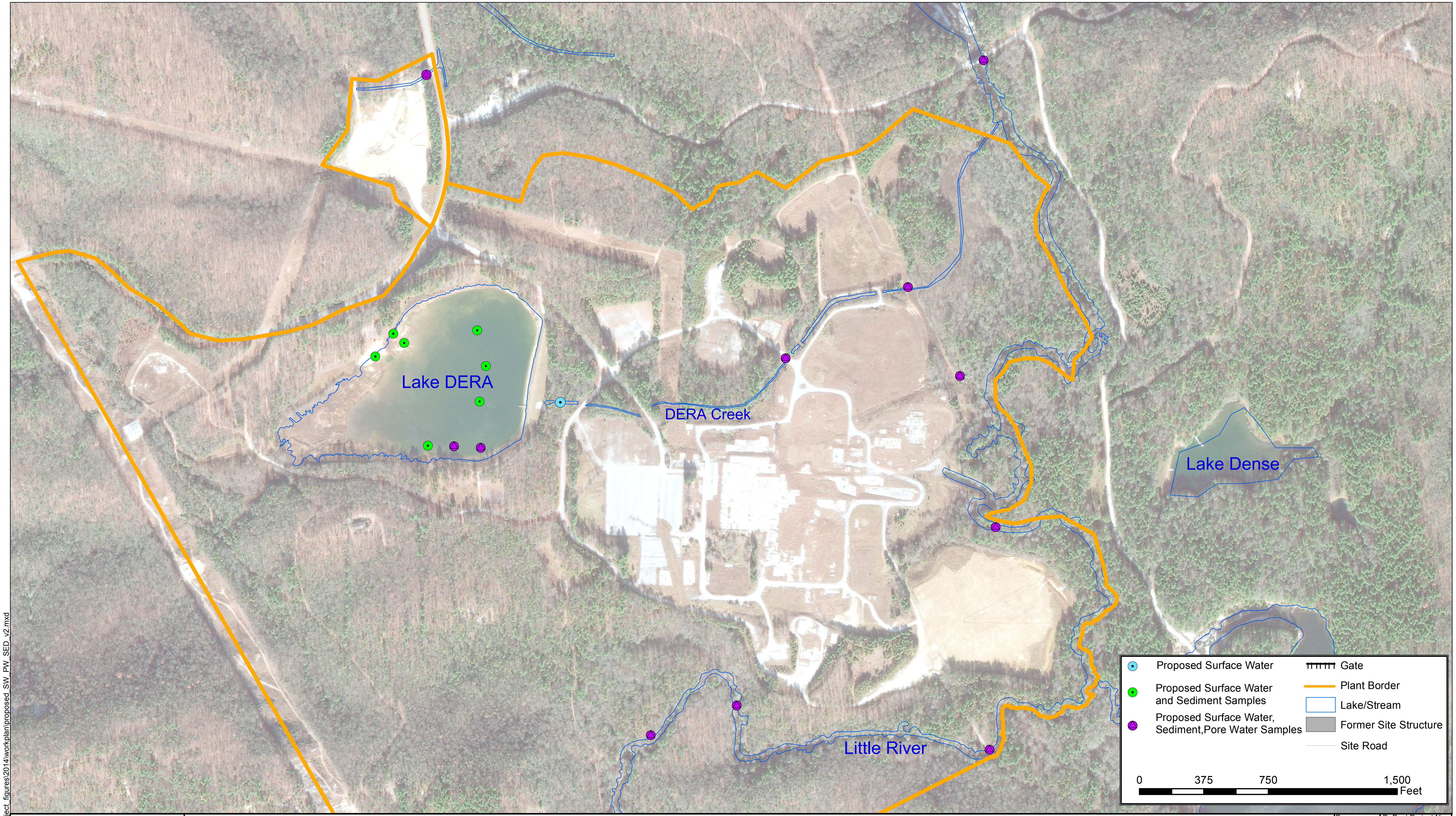
Title: CAMU Groundwater and Surface Water Sampling Location Map
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Created: C. Oneal	Date: 01/29/2013	DuPont Project Number: 504681
Revision:	Figure: 12	Parsons Project Number: 447822



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Proposed Surface Water, Pore Water, and Sediment Sampling Location Map
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 6/26/2014	Parsons Project No. 446664.01000
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TABLES

Table 1
SWMU and AOC Summary Table
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Unit Number	Unit Name	Unit Description	Dates of Operation
SWMU 1	Hazardous Waste Storage Pad	55-gallon drums stored on wooden pallets. The storage area is on a reinforced concrete pad, covered by a rood and enclosed on three sides. The pad is sloped toward a 16-inch trench with a 6-inch curb around the sides and rear.	1980-1996
SWMU 2A	HW Satellite Accumulation Area	A 55 gallon drum located inside the manuafacturing building for the Finishing Area Maintenance Shop and the Machine Shop which was used to store solvent-tainted rags. The storage area rests on the shop's concrete floor and was clearly marked as hazardous waste.	1957-2003
SWMU 2B	HW Satellite Accumulation Area	Consists of a drum used to store laboratory solvents. Storage area is shed with the drum on a steel grate pad over a 12 inch trench surrounded for secondary containment.	1957-2003
SWMU 2C	HW Satellite Accumulation Area	A drum used to store paint thinners in the construction area. The drum was stored in an enclosed storage shed on a steel grate over a 12 inch trench surrounded by a 6 inch concrete dike for secondary containment.	1957-2003
SWMU 3A	Waste Hydrocarbon Accumulation Areas	Outdoor storage area for drums of motor oil and lubricating oil consisting of a wooden pallet sitting on a concrete pad with no secondary containment curb. Located south of the polishing pond, adjacent to SWMU 2C.	1957-2003
SWMU 3B	Waste Hydrocarbon Accumulation Areas	Storage area for drums of motor oil, oil filters, and anti-freeze. The storage area consists of wooden pallets which sit on gravel located under a roof between the P&O shop and the adjacent warehouse.	1957-2003
SWMU 3C	Waste Hydrocarbon Accumulation Areas	A collection area for one drum of Dowtherm. The collection area consists of a concrete pad with a wooden pallet located west of the Power House.	1957-2003
SWMU 3D	Waste Hydrocarbon Accumulation Areas	Is an accumulation area for drums of ethylene glycol from the Polymerization process. The storage area consists of a concrete pad located on the east side of the Casting and Stretching section of the main plant building.	1957-2003
SWMU 3E	Waste Hydrocarbon Accumulation Areas	Is a storage area for drums of triethylene glycol and Dowtherm. The storage area consists of a concrete pad located on the north side of the warehouse that is situated south of the Power House.	1957-2003
SWMU 4	Waste Water Treatment Plant Area	Consists of a horseshoe shaped pond, emergency spill basin, secondary clarification, and settling ponds. All units open-topped and unlined except the spill (emergency diversion) basin which is clay lined.	1987 to Site Demolition in 2005 (secondary clarifier 1990-2005))

Table 1
SWMU and AOC Summary Table
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

SWMU 5	Process Sewer System	Consists of a system of underground pipes and manholes that convey untreated process wastewater from the main plant area to the plant wastewater treatment system. Pipes are constructed of various materials including vitrified clay, reinforced concrete, and steel.	1957-2005
SWMU 6	Storm Sewer System	Consists of a system of drains and ditches that are generally unlined but constructed of concrete in some areas.	1957-2006
SWMU 7	AFB Settling Basin	An asphalt covered area consisting of the alternate fuels boiler unit and building, waste material empty drums, clarifier, used oil storage area, and a separate unlined sedimentation basin. Most of area covered in asphalt pavement.	1991-2003
SWMU 8	PET Recycle Storage Area	Waste PET flake generated by the manufacturing process is stored in dumpsters situated on asphalt north of the power house and the east side of the C&S building.	1987-2003
SWMU 9	Former Silver Recovery Drying Bed	An area where sludges from the former evaporation basin area containing silver bromide were spread out on a plastic liner and allowed to air dry. The dried material was then removed for reclamation.	1972-1991
SWMU 10	Former Sedimentation Basin	Consists of an inground open topped, concrete lined basin approx. 20x20x6 located north of the 3B coating building and east of the 3BX coater. The unit received sanitary and process waste before the horse-shoe pond was constructed to allow sediment settlement prior to discharge to SWMU 20.	1957-1997
SWMU 11	Disposal Area Number 1 (former East Landfill)	An inactive and unlined permitted solid waste landfill which has been capped and three adjacent unlined open-topped basins. Two of the basins were replaced with rip-wrapped drainage swales. From June 2011 to July 2012 waste film was removed from SWMU 11 and SWMU 14 (The Ballfield) (The Former Disposal Area number 4 [West Landfill]?) and recycled offsite. The remaining waste which was not recycled at both landfills was added to SWMU 11. A small portion of waste material remains under Stanton Road at SWMU-14.	1972-1996 and 2011-2012
SWMU 12A-C	Former North Landfill	A permitted landfill that has three distinct cells; SWMU 12A contains asbestos; SWMU 12B includes demolition waste such as concrete, gravel, scrap metal, wood, cardboard; SWMU 12C contains food waste from the cafeteria. Area also consisted of a sediment-settling basin. The extents of SWMU 12 cover an area of 0.20 acre (SWMU 12A) and 0.6. acre (SWMU 12B&C).	12A -1973-1992 12B-1973-1992 12C-1973-1996

Table 1
SWMU and AOC Summary Table
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

SWMU 13	Former Disposal Area - Tennis Courts	An unlined landfill which has been capped. Disposed of domestic garbage, film scraps, weak acids, glycol, digester sludge. The landfill was capped with soil of unspecified thickness and permeability.	1972-1974
SWMU 14	Former Disposal Area Number 4 (West Landfill)	An unlined landfill which was capped and formerly used as a baseball field. Used to dispose plant trash, scrap film, glycol, process liquid wastes. From June 2011 to July 2012 waste film was removed from SWMU 14 and recycled offsite. The remaining waste which was not recycled at the unit was added to SWMU 11(The Disposal Area number 1 [Former East Landfill]) . A small portion of waste material remains under Stanton Road at SWMU-14.	1958-1972 and 2011-2012
SWMU 15	Former Silicon Disposal Area	An unlined disposal area that stored scrap elemental silicon and it has been capped.	1958-1962
SWMU 16	Former Disposal Area 6 - Equipment Sludge Disposal	Consists of one 40 by 40 foot area and two 10 by 30 foot areas. The areas are unlined and capped with soil and exhibit vegetative cover. Consisted of a disposal area for weak acids, glycols, resins, process wastes, sanitary wastes, carbon black and glycol dimethyl terapthalate.	1974-1976
SWMU 17	Former Power Hill Disposal Area	Six unlined disposal areas ranging from approximately 20 feet by 65 feet to 16 feet by 22 feet. The areas have been capped with soil. Used to dispose of neutralized wasted hydrofluoric acid and miscellaneous waste liquids such as glycols, solvents, degraded polymer, resin and gel and broken thermometers.	1958-1977
SWMU 18A & B	Former Disposal Area 8 - Evaporation Basin	Two earthen-lined, open-topped ponds approximately 130 feet by 270 feet and five feet deep. An extension to the 3B Coater building was constructed over part of these ponds. Used as settling ponds for process wastewater containing zinc chloride.	1957-1963
SWMU 19	Former Disposal Area #12 - Digester Sludge Disposal Area	An unlined disposal area which has been covered with soil and extends less than one half of an acre. Used for the disposal of digester pit sludge which contained glycol and carbon black.	1971 -1972
SWMU 20	Former WWTP Settling Pond	An earthen-lined, open-topped pond approximately 120 feet by 240 feet and five feet in depth. Prior to being discharged to the Little River, waters from the WWTP were collected in the pond and sediments were allowed to settle.	1957-1990

Table 1
SWMU and AOC Summary Table
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

AOC A	Fuel Oil Tank Farm	One 300,000 gallon tank, one 500,000 gallon tank, and one one-million gallon tank. The above-ground tanks were located in a bermed, gravel-lined area.	300,000 gallons of No. 2 fuel oil, 1962-2003 500,000 gallons of No. 6 fuel oil, 1973-2003 1,000,000 gallons of No. 6 fuel oil, 1974-1992
AOC B	CP Tank Farm	Seven above-ground tanks located within a diked, gravel-lined area. Two 65,000 gallon tanks, one 25,500 gallon tank, two 26,500 gallon tanks, one 8,000 gallon tank, and one 25,000 gallon tank.	Tank #1 contained 65,000 gallons of virgin ethylene glycol, 1963-2004 Tank #2 contained 65,000 gallons of virgin ethylene glycol, 1976-2004 Tank #3 contained 25,500 gallons of recovered ethylene glycol, 1963-2004 Tank #4 contained 25,500 gallons of methanol, Unknown to 2004 Tank #5 contained 25,500 gallons of methanol, Unknown to 2004 Tank #6 contained 8,000 gallons of diethylene glycol, Unknown to 2004 Tank #7contained 25,000 gallons of carbon slurry, Unknown to 2004
AOC C	Save All System - Silver recovery unit	Two 10,000 gallon tanks located within a concrete-lined pit. Used to recover silver bromide from process waste.	1963-2003
AOC D	Jet Water Cooling Tower	Unit used to circulate water potentially contaminated with acid aldehyde vapors and other catalysts.	Unknown-Early 1990's
AOC E	Silver Recovery Transfer Line	An underground transfer line that runs from the R&D building, along the west side of the manufacturing building to the Save-all silver recovery unit.	Unknown-Early 1990's
AOC F	Construction and Demolition Disposal Area	Disposal area located in the northeast corner of the Site near SWMU4.	July 25, 1996 - December 2, 2005

AOC G	Former Sand Blasting Area	Area located off the southeastern corner of the polishing pond and north of the construction area. The area was used in the sand blasting of metal parts relating to construction and maintenance activities.	Early 1970's-1996
AOC H	Glycol Satellite Storage Tanks	Consists of 2 tri-ethylene glycol above-ground storage tanks located adjacent to the south side of the manufacturing building east of the courtyard for the administration building. The area was observed to be lined with concrete materials.	1970's-2002
AOC I	Powerhouse Gravel Area	A graveled area along the southeastern corner of the powerhouse located on the south side of the manufacturing building. This area was used to generate steam for the manufacturing process through the combustion of natural gas and fuel oils.	1950's-2002

Table 2
Soil, Surface Water, Sediment, and Pore Water Sampling Plan
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Sample Location	No. of Samples	Analyses															
		Ap IX VOCs	VOCs + 1,4-dioxane	VC (SIM)	Ap IX SVOCs + 1,4-dioxane	Ap IX Metals	Diss. Metals (inc Fe, Mn)	PCBs	Diphenyl Ether + Biphenyl	Hex. Cr.	Glycols	Total Hardness	TSS	Acid Volatile Sulfides	TOC	Grain Size	% Moisture
SURFACE SOIL - Manufacturing Area (ISM)	27	X			X	X		X	X		X						X
SURFACE SOIL - Manufacturing Area	7	X			X	X		X	X		X						X
SURFACE SOIL - Ballfield (SWMU 14)	10	X			X	X			X		X						X
SURFACE SOIL - AFB Area (DU #9 - ISM)	3	X			X	X		X	X	X	X						X
SURFACE SOIL - SWMU 13	10	X			X	X			X		X						X
SURFACE SOIL - SWMU 15	5	X			X	X			X		X						X
SURFACE SOIL - SWMU 16	10	X			X	X			X		X						X
SURFACE SOIL - SWMU 19	3	X			X	X			X		X						X
SEDIMENT	18	X			X	X			X		X			X	X	X	X
SURFACE WATER	19		X	X		X	X		X		X	X	X				
PORE WATER	11		X	X													

Notes:
VOC = Volatile Organic Compounds
VC = Vinyl Chloride
SVOC = Semi-Volatile Organic Compounds
SIM = Selected Ion Monitoring
Ap IX = Appendix 9
Diss. Metals = Dissolved Metals
PCBs = Polychlorinated Biphenyls
Hex. Cr. = Hexavalent Chromium
TSS = Total Suspended Solids
TOC = Total Organic Carbon
ISM = Incremental Sampling Methodolgy
SWMU = Solid Waste Management Unit
DU = Decision Unit

Table 3
Groundwater Sampling Plan
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Well ID	VOCs	VC (SIM)	SVOCs + 1,4-dioxane	Metals (inc Fe, Mn)	Diphenyl Ether + Biphenyl	Glycols	1,4-dioxane Only	Nitrate	Ammonia	Monitoring Purpose
MW-104B	X	X		X	X					SWMU 16
MW-105	X	X		X	X	X				AOC B, Manufacturing Areas
MW-106B	X	X		X	X	X				SWMU 11
MW-108	X	X		X				X	X	SWMU 4
MW-111B	X	X		X						SWMU 17
MW-112A	X	X		X						SWMU 17
MW-112B	X	X		X						SWMU 17
MW-114A	X	X		X	X					SWMU 14
MW-114B	X	X		X						SWMU 14
MW-202B	X	X		X						SWMU 17
MW-207A	X	X	X	X	X			X	X	SWMU 4
MW-207B	X	X	X	X	X			X	X	SWMU 4
MW-209A	X	X	X	X	X					SWMU 12
MW-209B	X	X	X	X	X					SWMU 12
MW-210A	X	X	X	X				X	X	SWMU 4
MW-210B	X	X	X	X	X			X	X	SWMU 4
MW-211A	X	X		X				X	X	SWMU 4
MW-211B	X	X		X				X	X	SWMU 4
MW-211C	X	X		X				X	X	SWMU 4
MW-212A	X	X	X	X	X					SWMU 11
MW-212B	X	X	X	X	X					SWMU 11
MW-214	X	X	X	X	X	X				SWMU 11
MW-215	X	X	X	X	X	X				SWMU 11
MW-219A	X	X		X	X					SWMU 13
MW-219B	X	X		X	X					SWMU 13
MW-221B	X	X		X	X					SWMU 13
MW-222A	X	X		X	X					SWMU 13
MW-222B	X	X		X	X					SWMU 13
MW-225A	X	X		X	X					SWMU 13
MW-225B	X	X		X	X					SWMU 13
R87-S4	X	X		X	X		X			SWMU 12
R87-S5	X	X		X	X		X	X	X	SWMU 4
MW-300	X	X	X	X	X	X				2nd time this well is sampled, AOC B
MW-301A	X	X	X	X	X	X				2nd time this well is sampled, SWMU 11
MW-301B	X	X	X	X	X	X				2nd time this well is sampled, SWMU 11
MW-302A	X	X	X	X	X	X				2nd time this well is sampled, SWMU 13
MW-302B	X	X	X	X	X	X				2nd time this well is sampled, SWMU 13
MW-303	X	X	X	X	X	X				2nd time this well is sampled, SWMU 13
MW-304A	X	X	X	X	X	X				2nd time this well is sampled, SWMU 16
MW-304B	X	X	X	X	X	X				2nd time this well is sampled, SWMU 16
MW-305	X	X	X	X	X	X				2nd time this well is sampled
BR-1	X	X	X	X	X	X				2nd time this bedrock well is sampled
BR-2	X	X	X	X	X	X				2nd time this bedrock well is sampled

Table 3
Groundwater Sampling Plan
Final Remedial Investigation Work Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Well ID	VOCs	VC (SIM)	SVOCs + 1,4-dioxane	Metals (inc Fe, Mn)	Diphenyl Ether + Biphenyl	Glycols	1,4-dioxane Only	Nitrate	Ammonia	Monitoring Purpose
BR-3	X	X	X	X	X	X				2nd time this bedrock well is sampled
BR-5	X	X	X	X	X	X				2nd time this bedrock well is sampled
BR-9	X	X	X	X	X	X				2nd time this bedrock well is sampled
BR-11	X	X	X	X	X	X				2nd time this bedrock well is sampled
WSW-YMCA	X	X	X	X	X	X				WSW
WSW-CMPGND	X	X	X	X	X	X				WSW
WSW-VISIT	X	X	X	X	X	X				WSW
WSW-GUARD	X	X	X	X	X	X				WSW
WSW-WWT	X	X	X	X	X	X				WSW
WSW-DSF3	X	X	X	X	X	X				WSW

Notes:
VOC = Volatile Organic Compounds
VC = Vinyl Chloride
SVOC = Semi-Volatile Organic Compounds
SIM = Selected Ion Monitoring
SWMU = Solid Waste Management Unit
Fe = Iron
Mn = Manganese
WSW = Water Supply Well
AOC = Area of Concern

APPENDIX A
SAMPLING AND ANALYSIS PLAN

PARSONS

SAMPLING AND ANALYSIS PLAN

FOR THE FINAL REMEDIAL INVESTIGATION

DUPONT BREVARD FACILITY

CEDAR MOUNTAIN, NORTH CAROLINA

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August 1, 2014

DuPont PN 504646

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1.0 INTRODUCTION

Parsons has prepared this *Sampling and Analysis Plan* (SAP) on behalf of E. I. du Pont de Nemours and Company (DuPont) for the Former DuPont Brevard Facility (Site) located in Cedar Mountain, North Carolina (Figure 1). This SAP covers the field activities that will be conducted as part of the final remedial investigation at the Site and outlines the methodology and procedures that will be used during the investigation field sampling activities. The proposed field investigation is part of ongoing remedial activities being conducted at the Site and is described in detail in the *Final Remedial Investigation Work Plan* (work plan) dated August 1, 2014.

The following six objectives will be addressed with field work conducted during the final field investigation and are included in this SAP:

1. Fill surface soil data gaps to support future proposed land uses (includes recreational and low-impact training use by the NCNG)
2. Complete confirmation soil sampling at SWMU 14 (the former ball field)
3. Ensure that adequate surface covers are present at SWMUs 4, 12, 13, 15, 16, 19, and 18/20
4. Verify that groundwater concentrations are consistent with protection of sensitive surface waters
5. Investigate current conditions in Lake DERA, DERA Creek, and Little River
6. Verify SCM assumptions regarding absence of potential downgradient receptors of drinking water to support final risk evaluation

To meet these objectives, surface soil, surface water, sediment, pore water, and groundwater samples will be collected at the Site during the final investigation field sampling activities.

2.0 GENERAL FIELD PROCEDURES

2.1.1 Project Planning/Organization

Prior to commencement of field activities several planning/organization steps will be conducted to prepare for the sampling event. These steps include the following:

1. The Project Manager or Project Analytical Chemist will notify the laboratory of the upcoming sampling event so that the laboratory can prepare the appropriate type and number of sample containers. The anticipated number of sampling locations, list of parameters to be analyzed, and number of sample bottles needed for quality control (QC) testing shall be specified to the laboratory manager.
2. All equipment to be used during the sampling event will be inspected by the field sampling team.
3. Field instrumentation to be used during sampling (e.g., pH, temperature, water level, and specific conductance meters) will be checked to ensure proper calibration and precision response.
4. All forms to be used in the field (including the field logbook, chain-of-custody sheets and seals, and sample analysis request forms) will be assembled.
5. New pre-preserved sample containers will be provided by the laboratory, and shipped to the Site or other designated location in coolers or insulated sample "shuttles". All sample containers will be examined by the field sampling team upon receipt, and containers will be "pre-labeled" when possible to reduce confusion in the field. Sample identification information (e.g., well number, sample point, sample identification number, preservative, and analytical parameters) will be pre-printed on sample labels at the time the empty containers are prepared and shipped to the Site or will be printed on the bottle label with permanent ink during the pre-field activities. Other information (e.g., sample time and date, samplers' names, etc.) may be added to the label after the sample is collected. A cross-reference to the information contained on the label will be documented in the field logbook to correspond with the well number or sample location.
6. The field team will review proper sampling protocols for the specific matrices to be sampled. In addition, proper health and safety protocols will be reviewed prior to the sampling event.

2.1.2 Calibration of Field Equipment

Calibration of equipment will occur daily prior to its use in the field. The Field Team Leader is responsible for maintaining adherence to the calibration schedule and for ensuring that the operator understands the proper usage, maintenance, and storage of each instrument. Calibration information will be recorded in the field logbook and will include: the date of calibration, the operator's name/initials, the calibration measurements, and observations about the instrument or calibration procedures (if needed).

All field measurement equipment will be calibrated according to the manufacturers' recommend guidelines. If any meter exhibits unacceptable error (according to manufacturer specifications), it will be recalibrated. If after recalibration, the meter still exhibits unacceptable error, it will be replaced. All field equipment will be supplied and maintained by a manufacturer-approved supplier.

2.1.3 Decontamination of Field Equipment

All non-disposable equipment, materials, and tools will be thoroughly cleaned before each use to avoid cross-contamination. Sampling equipment will also be decontaminated between sample locations and following completion of sampling. Waste products produced by the decontamination procedures such as rinse liquids, solids, paper towels, gloves, etc. will be collected and disposed of in accordance with the site-specific Waste Management Plan (WMP).

The following steps or equivalent will be used to decontaminate all sampling equipment:

- Wash with potable water and phosphate-free laboratory detergent (e.g., Alconox);
- Rinse with potable water;
- Rinse with distilled or deionized water; and
- Repeat entire procedure or any part of the procedure, as necessary.

If the equipment is not to be used again immediately, it will be packaged and properly stored to protect the equipment from dust and dirt. Clean sampling equipment will not be placed on the ground or on other contaminated surfaces following decontamination and prior to being used.

3.0 SAMPLING METHODOLOGY

To meet the objectives listed in the work plan and in Section 1.0 above, surface soil, surface water, sediment, pore water, and groundwater samples will be collected at the Site and additional field investigation activities will be conducted. This section describes the methodology that will be used to complete these activities. All of the soil, surface water, sediment, and pore water sampling locations shown on the figures referenced below are approximate proposed locations. The project team will select actual sampling locations based on field conditions at the time of the sampling event. At time of collection, the exact sample locations will be surveyed by use of a commercial grade hand-held GPS unit.

3.1 Surface Soil Investigation

3.1.1 Incremental Sampling Methodology

As indicated in the work plan, the project team will use Incremental Sampling Methodology (ISM) to assess the majority of the surface soil in the former manufacturing area. ISM is described in detail in a document published by the Interstate Technology & Regulatory Council (ITRC) entitled *Incremental Sampling Methodology (*February 2012). ISM provides representative samples from designated areas of the Site defined as decision units (DUs) through the collection of numerous increments of soil (typically 30–100 increments) that are combined, processed, and subsampled in the laboratory according to specific established protocols.

The ISM samples are composed of increments collected from specific points throughout the DU. The positioning of the collection points can be set using one of three approaches: simple random sampling (SRS), random sampling within a grid, and systematic random sampling. SRS involves determining random locations across the entire DU. A formal approach to pre-determining the random increment locations must be used. Random sampling within a grid involves placing a grid over the DU and collecting soil increments from random locations determined in each grid cell. Systematic random sampling is similar to random sampling in a grid except that only the initial grid cell sampling location is randomly determined and then subsequent increments are collected from the same relative location within each of the other grid cells. The three methods are described in more detail in the ITRC guidance document.

For relatively homogeneous sites, all three sampling patterns can yield unbiased parameter estimates. All three sampling patterns yield equivalent DU coverage and are statistically defensible. Using simple random sampling is theoretically most likely to generate an unbiased estimate of the mean and variance; however, it is the most difficult to implement in the field and may leave large parts of the DU unsampled. Systematic random sampling can avoid the appearance that areas are not adequately represented, and it is relatively straightforward to implement in the field. Random sampling within a grid is a compromise approach, with elements of both simple random and systematic sampling.

The incremental soil samples are prepared by collecting multiple increments of soil (typically 30 or more) from the DU and physically combining these increments into a single sample. If the mass of each individual increment is adequate, this generally results in a soil sample with a contaminant concentration representative of the estimate of the mean contaminant level within a DU (a representative sample). As a DU gets larger, the amount of distributional heterogeneity may increase. It may then be necessary to increase the number of increments per DU to 50 or more. In general, the higher the number of increments, the greater the reduction in variation among replicate samples. However, unless the DU is believed to have significant heterogeneity, it is not normally necessary to increase the number of increments beyond 50 or 60.

Additional replicate ISM samples must be collected in order to statistically evaluate sampling precision for each DU. The increments for these samples are collected separately from the initial sample and the samples are made of the same number of increments collected in the initial ISM sample. A minimum of three replicate samples (the initial ISM sample plus two additional samples) should be collected, prepared, and analyzed in the same manner as the initial sample.

Proposed Decision Units

For the final field investigation, the former manufacturing area of the Site has been divided into 11 DUs (Figure 2). Ten of the units (DUs 1 through 10) will be sampled using the ISM technique. Several constituents were previously detected in soil samples collected at DU 11. Therefore, this area will be sampled using traditional sampling methodologies (see Section 3.1.2). The results from this proposed sampling plan will be used to develop a mean concentration for each of the DUs to confirm the protection of future intended users.

With the exception of DU 1, the units are sized to result in approximately the same number of increments. Decision unit 1 covers an area that was mostly used for parking or office areas and is unlikely to show any evidence of site-related impacts; therefore, this DU was made larger.

Sample Collection and Analysis

Parsons proposes to use the systematic random sampling approach at the Site. This approach will provide statistically defensible data and will be relatively easy to implement. Decision unit 1 will be divided into a 100-foot by 100-foot grid, while the remaining units will be divided into 50-foot by 50-foot grids. Parsons proposes to collect three replicate ISM samples made up of approximately 40 to 60 increments each. A random location will be pre-selected within the initial grid location and subsequent grids will be sampled in the same relative location. Each of the replicates will be sampled in a similar manner.

Figures 3A through 3J present the proposed incremental sample locations for each DU. The site geographical information system (GIS) was utilized to randomly locate the three increment locations for the starting grid at each decision unit. Following the systematic random sampling technique, these locations were then replicated to each grid within the decision unit. No samples will be collected under paved areas in any of the DUs. If an increment falls within a paved area or an obstruction is encountered preventing sample collection, the sampling team will adjust the increment slightly to move it off the paved area or other obstruction. The sample will be collected as close to the designated sample location as possible. The revised location of the increment will be recorded. This adjustment will not impact the remaining increments collected at the DU.

Increments will be collected from 6 to 18 inches bgs using a hand coring device. The diameter of the coring device will be sized to provide the appropriate volume for each increment. Two separate cores will be collected at each increment location. The first core will be used to collect samples for non-volatiles organic compound (VOC) analysis, and the entire soil core will be placed in the container for processing at the laboratory. The second core will be used to collect samples for VOC and percent moisture analysis.

The VOC soil core will be subsampled by collecting several 5-gram plugs along the length of the core to be sampled. A Terra-Core® or similar sampling device will be used to collect 6 subsamples that are spaced approximately every 2-inches along the soil core. After the VOC sample is collected, the entire remaining volume of soil will be collected in a separate container for percent moisture analysis. The ISM VOC approach is similar to that described for sampling ISM non-VOCs in the subsurface, except that numerous soil increments are placed directly into an adjusted volume of extraction solvent in the field (e.g., methanol). An alternate VOC sampling and preservation method as described in the ITRC Guidance document may be utilized depending on laboratory and shipping requirements. This may include extracting the VOC sample in the field or placing each individual plug in individual pre-weighed and pre-preserved 40 milliliter vials.

An equal volume of soil will be collected from each increment to ensure a representative sample. The incremental volume will be calculated based on the total volume requested by the laboratory for each ISM sample using the procedures outlined in the ITRC guidance document.

The samples will be submitted for laboratory analysis of the constituents listed in Table 1. The non-VOC sample will be air dried (if required), dry mixed, and sieved using a standard #10 sieve (<2 millimeters) to remove vegetation and larger particles following the procedures outlined in the ITRC guidance document.

3.1.2 Discrete Surface Soil Sampling Methodology

As described in the work plan, discrete surface soil samples will be collected in DU 11 in order to confirm previous surface soil detections around AOC A and at and the remaining SWMUs (SWMUs 13, 14, 15, 16, and 19) to meet other objectives. Surface soil samples in these areas will be collected with a hand coring device (e.g., hand auger) from the 6 to 18 inches bgs interval at the approximate discrete locations shown on Figures 4 and 5. The samples will be submitted for laboratory analysis of the constituents listed in Table 1.

The surface soil samples to be analyzed for VOCs will be collected directly from the sample collection device with a small coring tool (an EnCore® or equivalent sampling device) and then capped and/or preserved as appropriate. For all additional parameters, soil from the depth interval to be sampled will be transferred from the collection device to a stainless steel mixing bowl for homogenization. The homogenized sample will then be transferred to the appropriate laboratory-supplied sample collection bottles using decontaminated stainless steel spoons or trowels. A separate aliquot of each sample will be placed in a re-sealable plastic bag and field screened for VOCs/SVOCs with a Photo Ionization Detector. All non-disposable sampling equipment will be decontaminated between sample depths and borehole locations using the procedures outlined in Section 2.1.3.

3.1.3 Surface Cover Investigation Methodology

The existing cover material will be investigated by collecting several soil cores from SWMUs 4, 12, 13, 15, 16, 19, and 18/20 to determine the thickness and condition of the cover. The cores from SWMUs 13, 15, 16, and 19 will be collected at approximately the same locations as the borings for the discrete surface soil samples shown on Figure 4. The approximate locations of the cores to be collected from SWMUs 4, 12, 18, and 20 are shown on Figure 6.

A small diameter coring device will be used to collect soil cores that are at least 24 inches long. The cores will then be inspected to determine if the cover material extends to this depth, and the physical description of each will be recorded.

3.2 Groundwater Sampling

Prior to initiation of groundwater sampling activities, static water level measurements will be collected from the wells and piezometers in the Site's well network (Figure 1) to provide an updated data set from which to analyze current groundwater flow conditions. Groundwater samples will then be collected from the 53 locations shown on Figure 7 using the standard procedures described below.

Groundwater samples will be obtained (where possible) using low-flow groundwater sampling techniques. However, if necessary, conventional well sampling methods (e.g. three-well-volume purging) may also be used.

For wells with a static water level that will allow (usually less than 30 feet from top of well casing) the following procedures may be used:

- Chemically-inert tubing will be placed into the well water column to the midpoint of the screened interval. This tubing will be connected with flexible chemically-inert tubing to a peristaltic pump head.
- Water will then be removed from the well with the peristaltic pump into a bottom-filling flow through cell that houses the field parameter (pH, temperature, oxidation reduction potential, dissolved oxygen, turbidity, and conductivity) probes.
- The water level in the well will be measured during purging to ensure that minimum draw-down of the water column in the well is achieved.
- Field parameters will be recorded until stabilization. Field parameter stabilization is defined as measurements being within 10% over a five-minute time interval. For turbidity – if three values are less than 10 Nephelometric Turbidity Units (NTU) then the values will be considered as stabilized. For dissolved oxygen – if three values are less than 0.5 milligrams per liter (mg/L) then the values will be considered as stabilized.
- To ensure a representative sample, the water intake position at the midpoint of the screened interval will remain constant throughout the sampling process. Sampling flow rate will not exceed purging flow rate.
- Once field parameter stabilization has been achieved, the sample containers will be filled directly from the pump discharge tubing.
- If the well becomes dry during purging activities, it will be noted in the logbook, and samples will be collected as quickly as recharge will allow, preferably within the next 24 hours. If stabilization is not reached after 1 hour of well purging, the field may elect to collect the sample or switch to an alternative sampling method.

For wells with a static water level that is too deep for use of a peristaltic pump (usually greater than 30 feet from top of well casing) the following procedures may be used:

- Chemically inert tubing will be attached to a submersible pump. The submersible pump will then be placed into the well water column with the pump intake at the midpoint of the screened interval.

- Water will be pumped from the well into a bottom-filling flow through cell that houses the field parameter (pH, temperature, oxidation reduction potential, dissolved oxygen, turbidity, and conductivity) probes.
- The water level in the well will be measured during purging to ensure that minimum draw-down of the water column in the well is achieved.
- Field parameters will be recorded until stabilization. Field parameter stabilization is defined as measurements being within 10% over a five-minute time interval. For turbidity – if three values are less than 10 NTU then the values will be considered as stabilized. For dissolved oxygen – if three values are less than 0.5 mg/L then the values will be considered as stabilized.
- To ensure a representative sample, the water intake position at the midpoint of the screened interval will remain constant throughout the sampling process. Sampling flow rate will not exceed purging flow rate.
- Once field parameter stabilization has been achieved, the sample containers will be filled directly from the pump discharge tubing.
- If the well becomes dry during purging activities, it will be noted in the logbook, and samples will be collected as quickly as recharge will allow, preferably within the next 24 hours. If stabilization is not reached after 1 hour of well purging, the field may elect to collect the sample or switch to an alternative sampling method.
- Unless dedicated, the submersible pump and any other non-disposable sampling equipment will be decontaminated using the procedures outlined in Section 2.1.3.

Groundwater samples may also be collected using hand-bailing techniques as follows:

- A disposable bailer will be lowered using new cord/string into the well until the bailer reaches the bottom.
- The bailer will be allowed to fill and then will be removed from the well and emptied into a waste container.
- This will be repeated until three well bore volumes have been purged from the well or until the well is dry. Field parameters will be collected after each well volume has been removed.
- Sample containers will then be filled directly from the bailer.

If a well has been purged dry, it will be allowed to recharge (until there is sufficient volume for sample collection) before being sampled. Wells with a slow recharge will be noted in the log and sampled as quickly as recharge will allow. Individual sample aliquots will be collected in the following order: volatile organics, semivolatile organics, and inorganics. The analytical laboratory will supply all necessary sample containers with appropriate preservatives along with shipping containers. The samples will be submitted for laboratory analysis of the constituents listed in Table 2.

3.3 Surface Water, Sediment, and Pore Water Sampling

Surface water samples will be collected from 19 locations across the Site, 9 are within and around the perimeter of Lake DERA; the others are located within DERA Creek, Little River, or other drainages. Sediment samples will be collected at 18 of the 19 surface water locations. In addition, 11 pore water samples will be collected. The approximate sample locations are shown on Figure 8, and the samples will be submitted for laboratory analysis of the constituents listed in Table 1.

Sampling will begin at the most downstream location and move upstream to minimize cross contamination between sample locations. In addition, wherever sediment and surface water samples are collected together, field personnel will collect surface water grabs prior to the corresponding sediment samples to minimize sediment disturbance. Wading is the preferred method for reaching each sampling location, particularly if the stream has a noticeable current (i.e., is not impounded). However, if the stream/lake sample location is too deep to wade (>4 feet deep), the sample may be collected from a boat.

3.3.1 Surface Water Sampling Methodology

Surface water samples will be collected with a peristaltic pump attached to tubing secured to a pole or other weight. The pole with attached tubing will be lowered to the desired sampling depth beneath the water surface. The surface water samples will be pumped directly into the appropriate laboratory-supplied sample containers. Samples collected for VOC analyses will be directly pumped into laboratory-supplied, 40-milliliter (mL) sample vials. When entering the stream, Parsons field personnel will approach the water sampling location from downstream so as not to increase the turbidity in the water sample during collection.

If the water depth at the sampling point is less than 0.5 meter (m), the samples will be collected at a depth equal to one-third of the water depth measured from the water surface. If the water depth is greater than 0.5 m, the samples will be collected at a depth of 0.3 m below the surface. All samples collected for dissolved metals analyses will be filtered following EPA Method 1669 for *Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels* (EPA, 1995). These samples will be passed through a 0.45 micron filter attached to the peristaltic pump to remove additional suspended particulates from the sample and subsequently placed in a laboratory-supplied sample bottle. All tubing and filter devices will be dedicated, single-use equipment to eliminate cross-contamination.

3.3.2 Sediment Sampling Methodology

Sediment samples will be collected with a stainless steel Ponar, Eckman, or Peterson dredge (or equivalent sampling device). Prior to collection at each sample location, the dredge and any additional sampling equipment (e.g., stainless steel spoon, polyethylene or stainless steel tray) will be rinsed with de-ionized or distilled water, then ambient water. Samples will be collected and deposited into a stainless steel bucket. A minimum of three grab samples will be composited using only the top 5 centimeters of sediment, mixed thoroughly with a clean stainless steel spoon, and deposited into a laboratory-supplied sample container.

Creek/river grab samples will be collected from the middle and from a third of the distance from each of the banks of the stream and composited. Grab samples from the lake will be collected at three different locations separated by a distance of approximately two feet from the lake bottom and composited.

3.3.3 Pore Water Sampling Methodology

Sediment pore water will be collected using a PushPoint™ or equivalent sampler. A PushPoint™ sampler typically consists of a pointed tubular stainless steel tube with a screened zone at one end and a sampling port at the other. The pointed end with the screened zone consists of a series of very fine interlaced machined slots to allow pore water to enter the sampler. A removable guard rod adds rigidity to the sampler during sediment insertion. Pore water will be collected through the opposite end of the device by connecting flexible tubing and using a syringe or peristaltic pump to extract the sample. The PushPoint™ sampler will be cleaned after each use by rinsing with de-ionized or distilled water. Equipment cleaning will take place after each sample is collected. All tubing will be dedicated, single-use equipment to eliminate cross-contamination.

3.4 Verify Downgradient Drinking Water Receptors

To help identify potential drinking water receptors in the vicinity of the Site, available well records will be searched. On-line archives of private and public well data records maintained by NCDENR, the South Carolina Department of Health and Environmental Control, the US Geological Survey, the US Department of Health and Human Services, and local, county, or municipal public works departments will be reviewed. Records of wells listed as being within a two-mile radius of the facility will be documented and investigated, if possible. In addition, the project team will work with NCDSFS personnel to identify wells on the DSRF property within the vicinity of the Site. If any additional well users are identified, wells that are deemed as potentially interconnected with on-site water regimes (wells set in saprolitic layers as well as those set in fractured bedrock) may be sampled if needed (pending approval of the well owners).

4.0 SAMPLE HANDLING, CUSTODY, AND ANAYSIS PROCEDURES

4.1 Sample Handling

Samples will be collected into the laboratory-supplied pre-preserved (if needed) sample containers using the procedures outlined in Section 3. Each individual sample container will be sealed according to laboratory specifications after sampling. Clean, disposable gloves will be worn during the handling of all samples and sampling devices.

4.1.1 Preservation of Samples

Each containerized sample will be labeled and placed as soon as possible into an insulated sample cooler. The cooler will serve as a shipping container and should be provided by the laboratory along with the appropriate sample containers. Wet ice will be placed directly in contact with the sample containers within a heavy-duty Polyethylene bag. Samples will be maintained at a cool temperature (optimum 4°C ± 2°C) from the time of collection until the coolers arrive at the laboratory. Plastic “bubble wrap” and/or polystyrene foam may also be used to protect the samples during shipping.

4.1.2 Identification and Labeling

Samples collected for laboratory analyses will be identified by using standard sample labels, which will be attached to the sample containers. The labels will be durable and water-resistant so they remain legible when wet and will be attached securely to the sample container. The labels will be prepared as arranged by the Project Analytical Chemist.

The following information will be included on the sample label, as appropriate:

- Sample ID
- Sample type
- Analysis requested
- Filtration/preservatives used

4.1.3 Packaging and Shipping Procedures

All samples will be packaged carefully to eliminate accidental breakage and generally sent to the laboratory on the day of sample collection. All samples will be tightly sealed and labeled prior to packaging. Each sample container should be wrapped with protective material to prevent breakage and packaged in an upright position. Samples will be packed in a covered cooler with additional packaging material spread throughout the voids between the sample bottles. Ice will be placed in double-bagged heavy-duty zip lock bags over the top of the samples to maintain sample temperature below 4 degrees Celsius (C). Samples will be sent via courier to the laboratory under custody seal. A copy of the COC will be retained upon relinquishing the samples to the courier. If the laboratory provides courier service, all samples will be stored in an ice chest on-site before the courier takes custody. The laboratory will pack and ship the samples appropriately to meet the quality objectives.

4.2 Sample Custody

4.2.1 Field Custody Procedures

The custody of samples collected during the field investigation will be traceable at all times. Prior to shipment of the samples to the laboratory, a chain-of-custody form will be completed by the field sample custodian. The field sample custodian will sign and date the chain-of-custody form and will retain a copy for the project records (if available). The original chain-of-custody form will record possession of the samples from the time of collection until disposing or archiving the sample. A sample is considered under custody if:

- It is in the investigator's possession
- It is in the investigator's view after possession has been established
- The investigator locks up the sample after possession
- It is in a designated secure area

Chain-of-custody forms are not required for samples analyzed in the field; however, custody must be maintained at all times prior to analysis.

Prior to shipment by a registered courier, the sample shipping container (cooler, box, etc.) will be sealed with signed chain-of-custody forms inside. The authorized laboratory custodian that receives the samples will sign the chain-of-custody forms, thus terminating custody of the field sample custodian.

The chain-of-custody form also serves as the primary sample logging mechanism. The following information must be supplied on the chain-of-custody form when it accompanies the samples to the laboratory:

- Project name and client;
- Sample ID;
- Sample type;
- Date and time sampled;
- Number and type of containers;
- Analysis requested;
- Filtration/preservatives used;
- Special handling or analysis information; and
- Signatures of every person, in sequential order, involved in handling the samples.

Unless determined otherwise on an event-specific basis, the chain-of-custody forms will indicate that the samples will be analyzed with standard turnaround time.

4.2.2 Laboratory Custody Procedures

Sample custody at the analytical laboratory is maintained through systematic sample control procedures composed of the following items:

- Sample receipt

- Sample log-in
- Sample storage
- Sample archival/disposal

As samples are received by the laboratory, they will be entered into a sample management system. The following minimum information will be provided:

- Laboratory sample number/identification
- Field sample designation
- List of analyses requested for each sample container

Immediately after receipt, samples will be transferred to a secure storage area with appropriate temperature control to await preparation and analysis. The laboratory's chain-of-custody procedures are documented in the laboratory's Quality Assurance plan, which can be provided upon request.

4.3 Analytical Methods

The analysis of soil and water samples will be performed by a North Carolina-certified laboratory. All laboratories that may be used are under contract to DuPont to provide analytical services, and as such, are routinely audited and monitored for technical performance. Tables 1 and 2 list the proposed sampling target analytes and analytical methods.

5.0 QUALITY ASSURANCE/QUALITY CONTROL CHECKS

Quality Assurance/Quality Control (QA/QC) samples shall be collected during sampling to quantitatively measure and ensure the quality of the sampling effort and the analytical data. QC samples are to be handled in the same manner as the environmental samples collected. Equipment blanks, method/preparation blanks, field duplicates, matrix spike/matrix spike duplicates (MS/MSD)/replicate (REP) samples, and laboratory control samples (LCSs) will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs. They will be used to evaluate precision of sampling and the potential for field contamination.

5.1.1 Field Quality Assurance/Quality Control Samples

Field QA/QC samples (blanks, duplicates and MS/MSDs) will be analyzed along with the investigative samples to determine the variability introduced in sampling, handling, shipping, and analysis as well as the inherent spatial variability (background) of the Site. The frequency and types of field QA/QC samples to be collected are discussed below:

Trip Blanks

Trip blanks will be transported with sample coolers when sampling for VOCs in aqueous samples and will be used to assess possible contamination during sample transport. They will consist of a series of certified-clean sample containers filled with analyte-free water. The trip blanks will be prepared by the laboratory analyzing the samples and will travel to the Site with the empty sample bottles and back from the Site with the collected samples in an effort to simulate sample handling conditions. Trip blanks will not be opened in the field. At least one trip blank will accompany every shipping container that has sample bottles specified for aqueous volatile analysis.

Equipment Blanks

Equipment blanks (field rinsate blanks) will be used to evaluate equipment cleaning or decontamination procedures. At the sample location, laboratory-supplied analyte-free water will be poured over/through cleaned or new sampling equipment, collected in a sample container, and preserved as appropriate. The equipment blank samples will then be handled with the other samples and will be analyzed for the same parameters as other samples collected using the same device. In the event that dedicated sampling equipment is used at each sampling location, one field blank consisting of the direct transfer of laboratory-supplied analyte-free water to the sample containers will be collected for each matrix (aqueous and solid). The maximum frequency for equipment blanks is one per 20 samples or one per sampling event.

Field Duplicates

A field duplicate is a second sample collected at the same time as a routine monitoring (original) sample using identical sampling techniques. Field duplicate samples are used to monitor the variance of sampling and analysis, and they will be collected at a frequency of one duplicate for every 20 (non-QA/QC) samples. The duplicate samples will be analyzed for the same parameters as the original samples, and the analytical results will be compared with those of the original samples. The analytical results of the original sample and the duplicate sample should be used to evaluate the cumulative precision because of the limitations of the analytical method, sample matrix, and sample collection techniques. Sample IDs for field duplicates and their associated primary sample will be recorded and tracked in the field logbook. Field duplicates are not required for ISM samples as the replicate samples collected as part of the standard procedure fulfill this objective.

Matrix Spike / Matrix Spike Duplicate (MS/MSD)

An MS/MSD is a subsample of an investigatory sample to which the laboratory adds a spike containing analytes at known concentrations prior to extraction/analysis of the sample to assess the effect of sample matrix on the extraction and analysis methodology. The MS/MSD pair are subjected to the entire analytical procedure in order to indicate both accuracy and precision of the method for the matrix by measuring the percent recovery and relative percent difference (RPD) of the two spike samples. A matrix spike and matrix spike duplicate sample (or a laboratory replicate) will be analyzed by the laboratory once for each sample group (of the same matrix) or at a minimum of one in every 20 samples analyzed.

5.1.2 Handling of Field QA/QC Samples

All field QA/QC samples are handled, transported, and analyzed in the same manner as the actual field samples. If possible, the QA/QC samples should not be held on site for more than four calendar days. The temperature of all the blanks, except the trip blanks, must be maintained at 4°C while on site and during shipment. The trip blank is not shipped to the Site on ice, but must be maintained at 4°C when accompanying collected samples. Holding times for individual parameters are dictated by the specific analytical method used.

5.1.3 Laboratory Quality Control

The quality and integrity of samples collected and analyzed during the investigation will be monitored by equipment calibration documentation, equipment decontamination documentation, and the routine preparation of various QA/QC samples. The laboratory will prepare and analyze the QA/QC samples specified in the analytical methods and according to their in-house Standard Operating Procedures (SOPs).

The methods and procedures for monitoring the laboratories' QA/QC programs are documented in the laboratory QA Plans, which are available for review upon request.

6.0 DATA MANAGEMENT PLAN

This Data Management Plan (DMP) presents a program for managing information acquired during the final remedial investigation. The DMP describes procedures for recording the data, evaluating the data, and displaying the data.

6.1 Data Record

A data record for information collected during the investigation will be developed to provide all information needed to subsequently analyze and assess the results of the fieldwork. Data records will have consistent labeling and recording of field observations to facilitate future data reduction and analysis and to eliminate the need for speculation concerning the quality of observations or the influence of environmental factors on an ultimate result. For each sample or measurement collected as part of the data record, the following information will be provided:

- Unique sample number
- Sampling or field measurement location and sample or measurement type
- Sampling date
- Sampling or field measurement raw data
- Property or component measured
- Results of analysis (concentration)
- Detection limit
- Reporting units

All laboratory data will be provided to the project team in both hard copy standard report and electronic deliverables. Laboratory data will be reviewed via the DuPont In-house Data Review (DDR) process. The DDR is an automated internal review process used by the DuPont Analytical Data Quality Management group to perform a series of checks on the data in order to determine if the data is usable. The data is evaluated against hold time criteria and checked for blank contamination, and the QA/QC sample results are assessed.

6.2 Field Documentation

Organized and accurate written records contribute to the reliability and comparability of field data. The primary means of record keeping will be the field logbook, field log sheets, and photos. Additional field documentation (e.g., labels, chains-of-custody) has been previously discussed above as part of the sample handling procedures.

6.2.1 Field Sampling Records

Information will be recorded in field notebooks/logbooks to document the procedures used and the prevailing conditions during the field investigation. Previous field records will be reviewed at each Site visit, and any unusual Site conditions encountered during the field investigation will be described. Field documentation of activities will be comprehensively recorded, so data may be easily interpreted at a later date. For example, when sampling is conducted, the following types of information may be recorded:

- Name of sampler
- Purpose of sampling
- Date and time of sampling*
- Sample type*
- Sampling location description and/or grid coordinates (including photographs, if needed)*
- Sampling method, sample containers, and preservatives used*
- Sample weight or volume (if applicable)
- Number of samples taken
- Unique sample identification numbers*
- Amount of water purged (for groundwater sampling)
- Field observations (prevailing weather conditions and other relevant factors that might influence sample integrity)
- Field measurements conducted*
- Name/initials of person responsible for observation

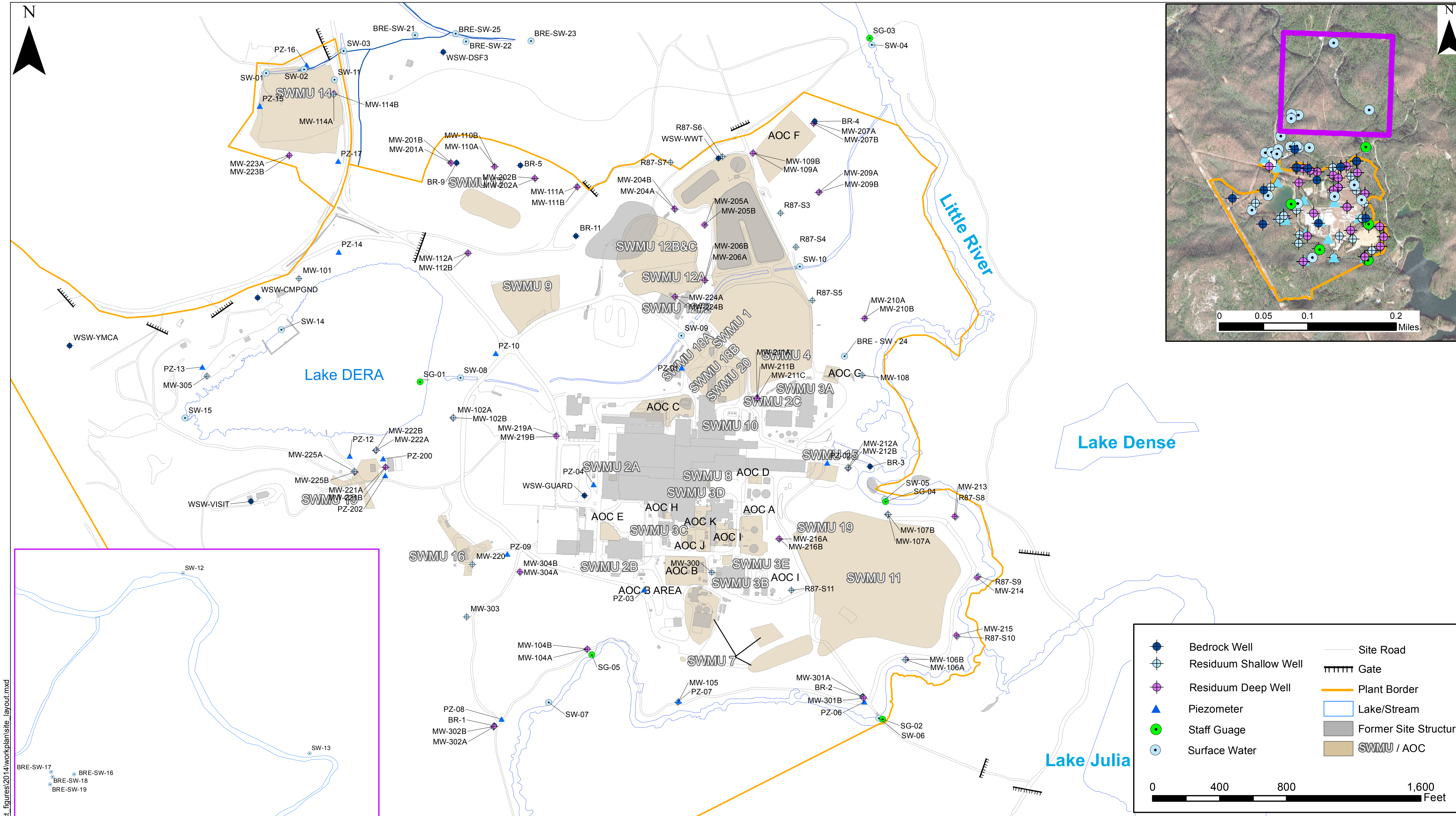
*** *Information required for data record***

Copies of these field observations and records will be submitted to the project file after each field activity.

6.3 Field Logbook

Field information shall be maintained in field logbooks as a written record. The field logbooks shall contain consecutively numbered, bound, and water-resistant pages. Data shall be entered in permanent, waterproof black ink, in a legible fashion. Corrections will be made by crossing out the initial entry and writing the correction beside it with initials and date. Field observations shall be recorded in the field logbook including any deviations from this work plan and key decisions made. All conversations of importance with project personnel will be documented, and so will any significant agreements, discussions or decisions by the project field team. Health and Safety events, including tailgate meetings, Near Misses, Stop Work, etc., will also be documented in the field logbook. The logbook will be used to note these items, and each entry will be dated and assigned a time. The field logbooks will provide sufficient data and observations to enable one to reconstruct the field investigation.

FIGURES



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Site Layout Map
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 6/3/2014	Parsons Project No.: 446664.01000
Revision:	Figure No.: 1
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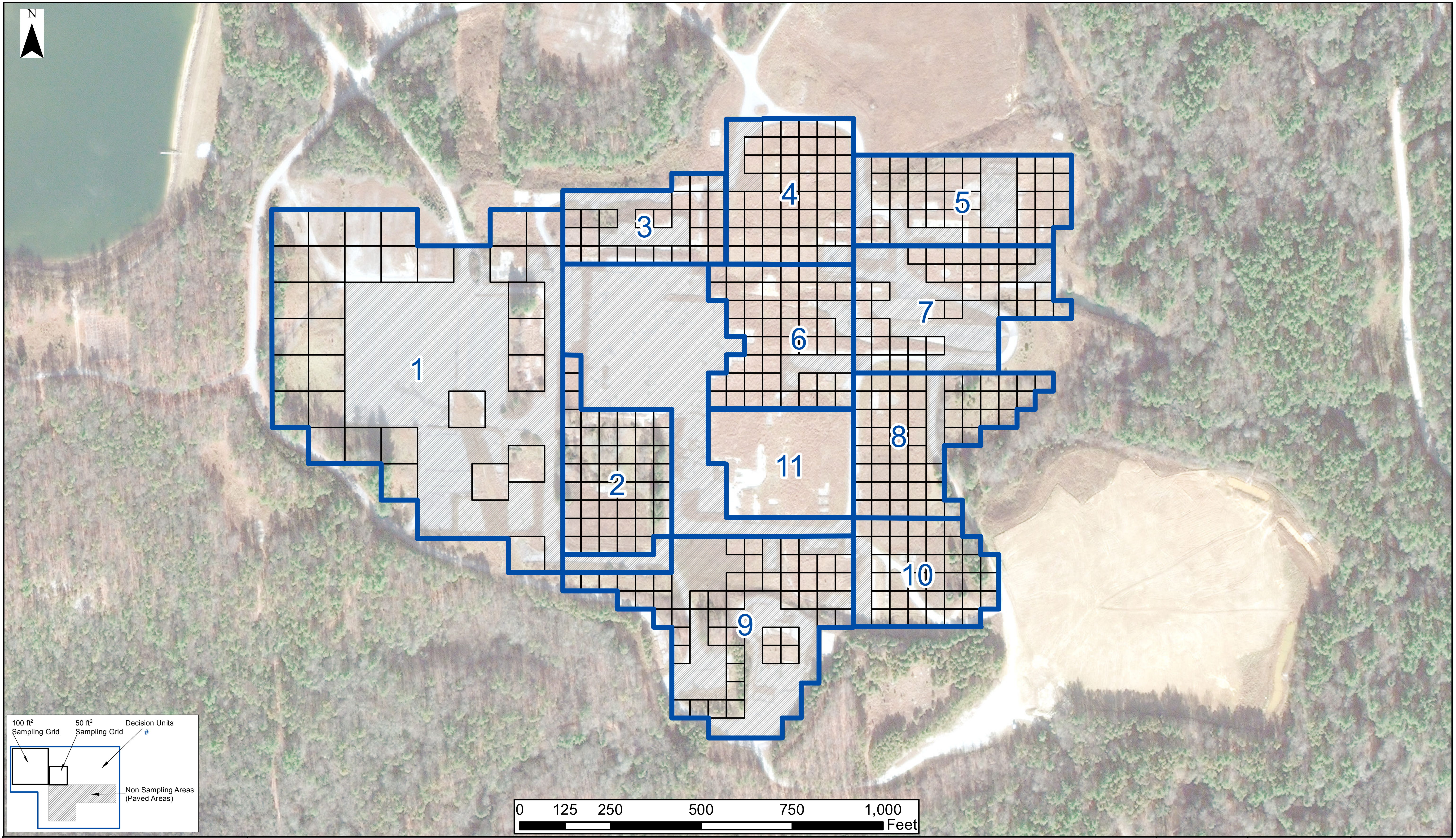

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Proposed Decision Units
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, NC

Created: C. Oneal	Date: 7/22/2014	DuPont Project No: 4423
Revision:	Figure: 2	Parsons Project No: 445241.01000

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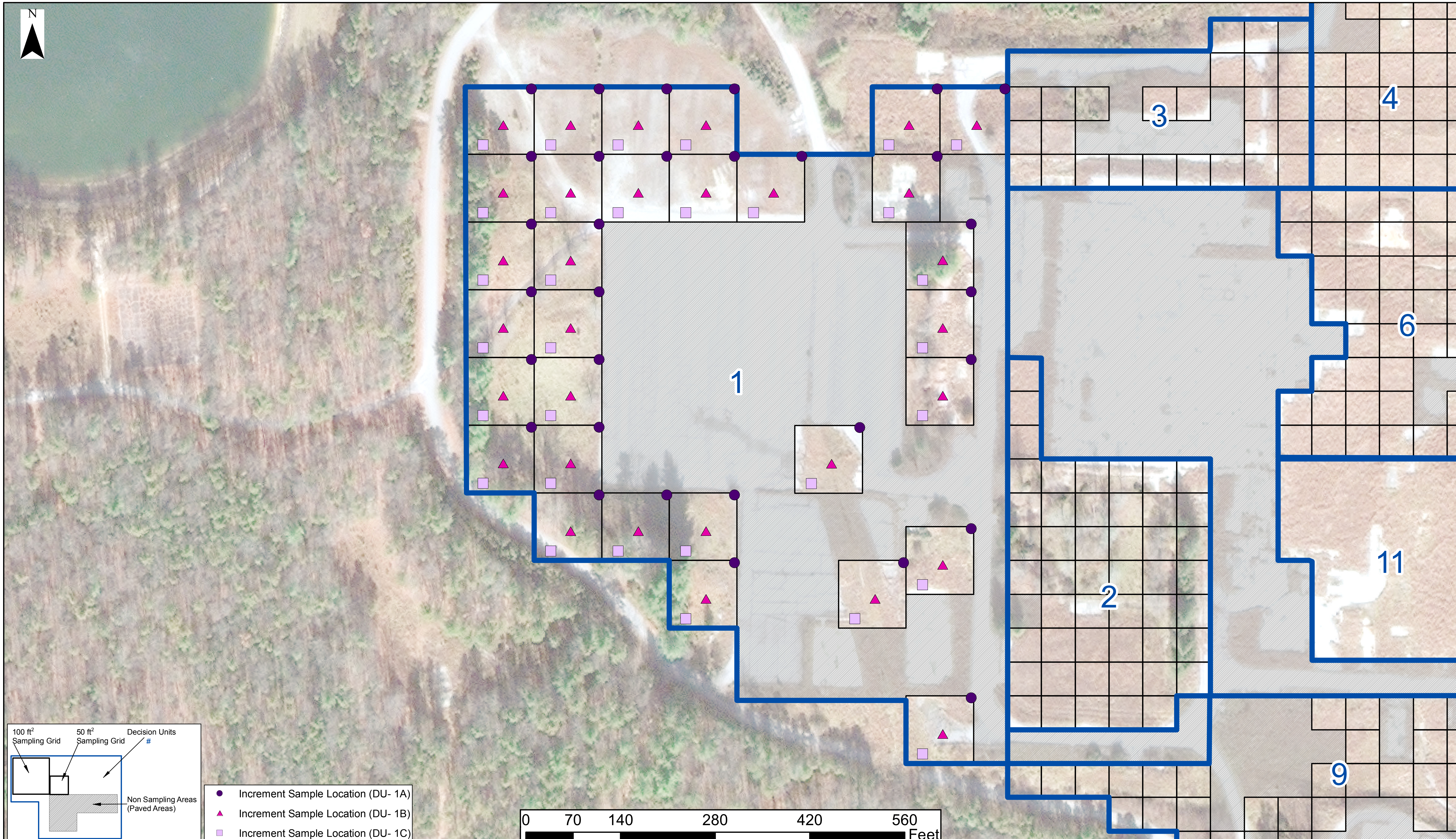

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Proposed Systematic Random Sampling Location Map - Decision Unit 1
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, NC

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Revision:	Figure: 3A	Parsons Project No: 445241.01000

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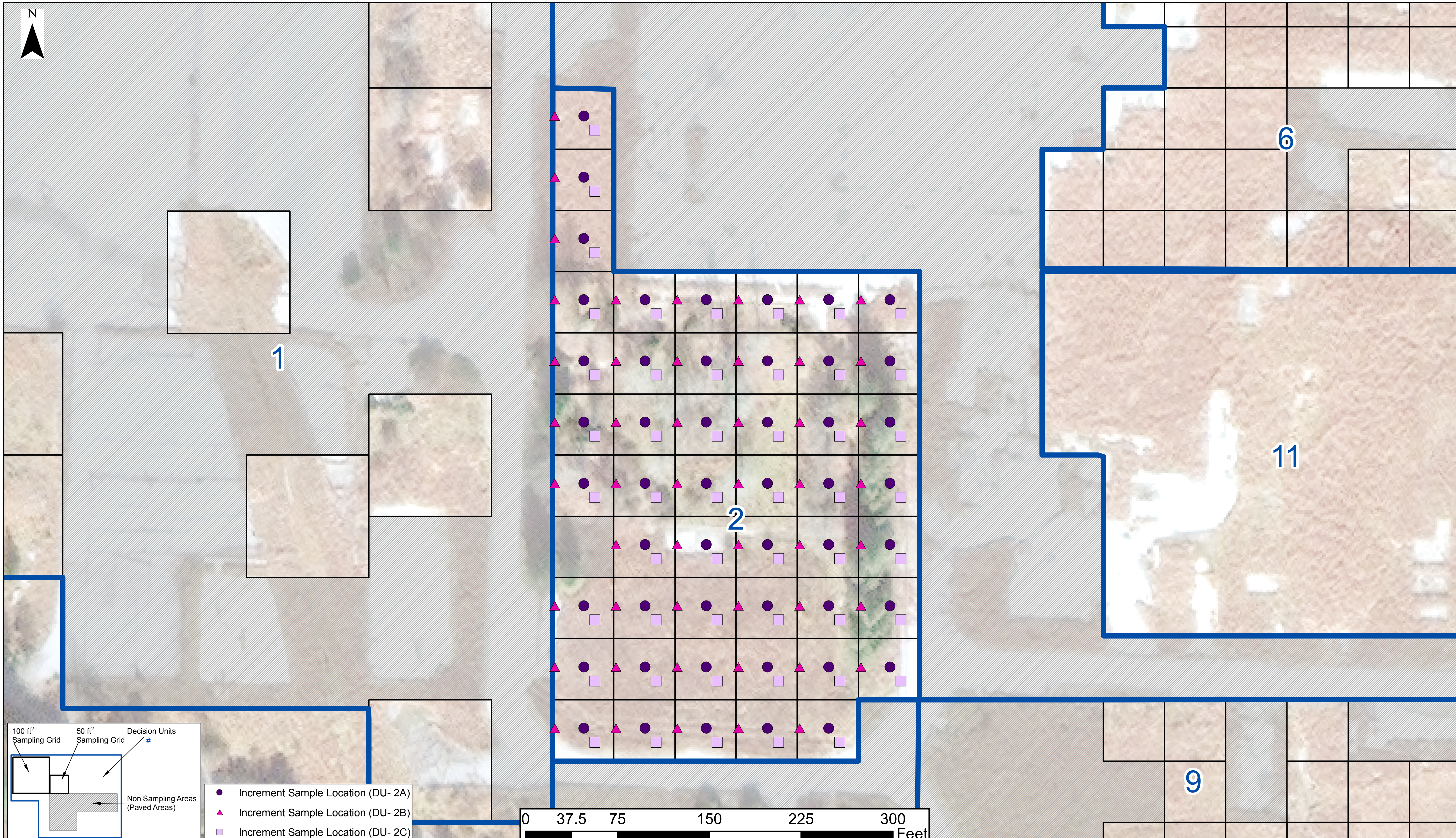

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Proposed Systematic Random Sampling Location Map - Decision Unit 2
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, NC

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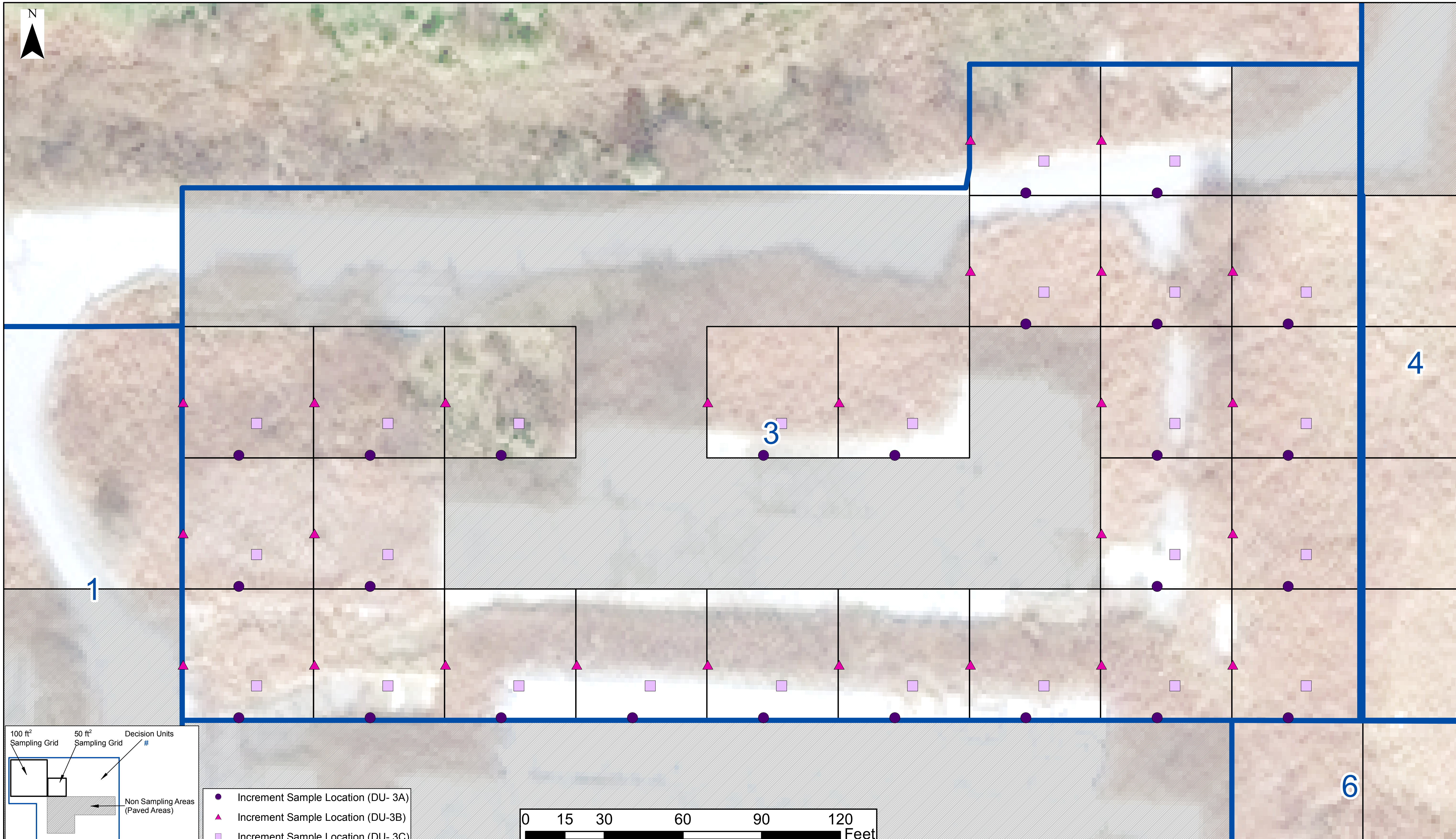

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Proposed Systematic Random Sampling Location Map - Decision Unit 3
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, NC

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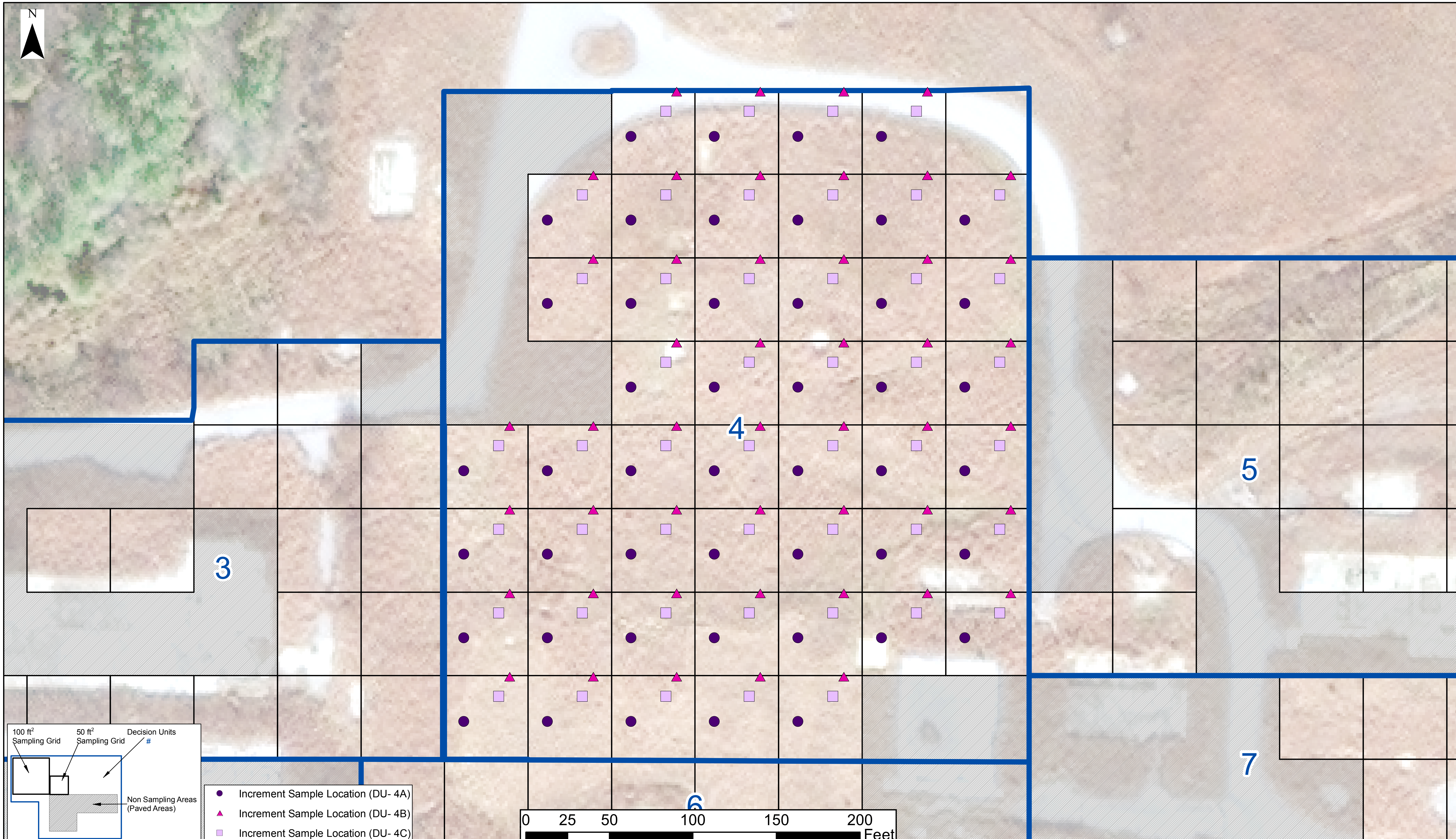

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Proposed Systematic Random Sampling Location Map - Decision Unit 4
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, NC

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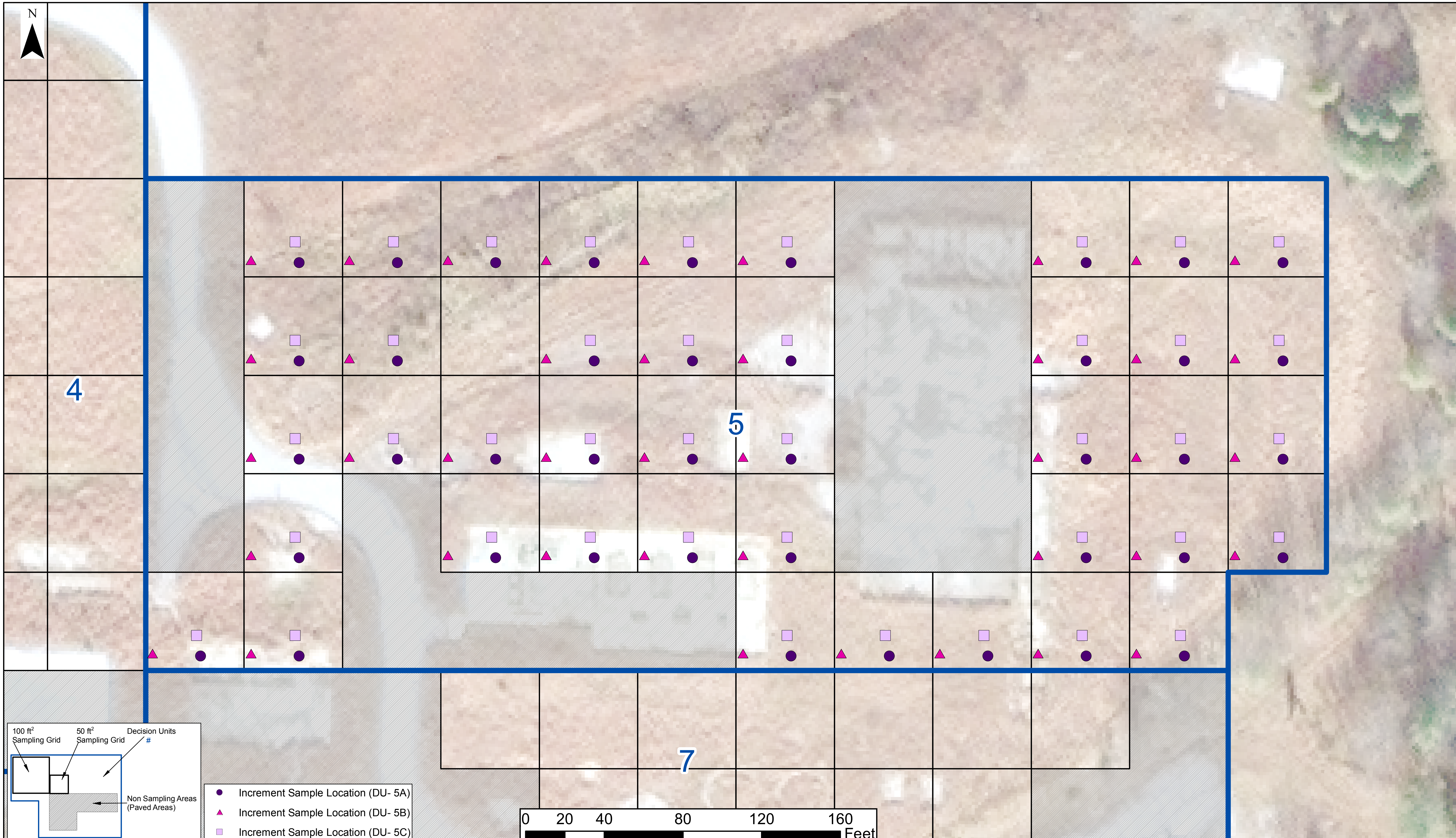

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Proposed Systematic Random Sampling Location Map - Decision Unit 5
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, NC

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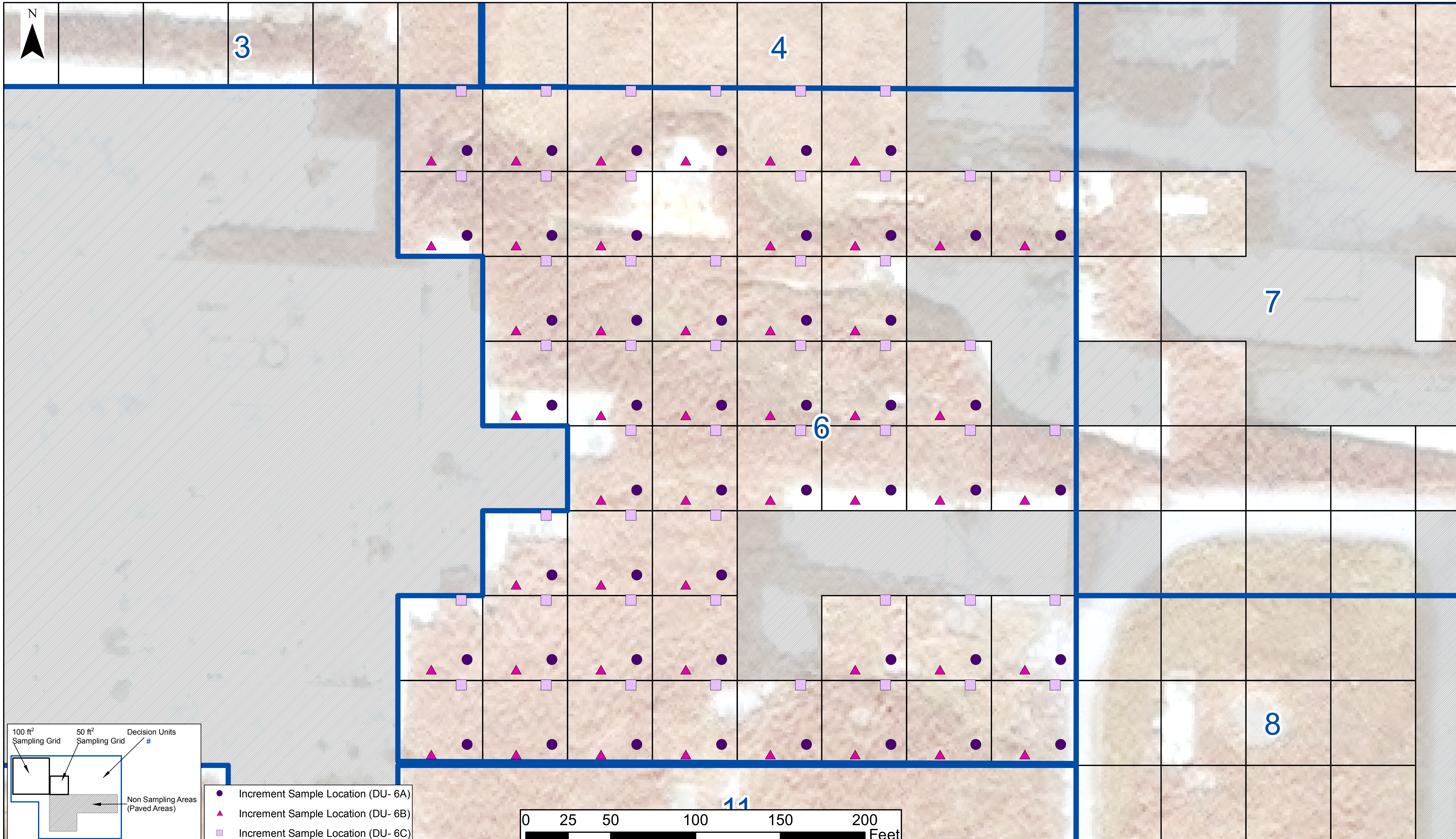

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Proposed Systematic Random Sampling Location Map - Decision Unit 6
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, NC

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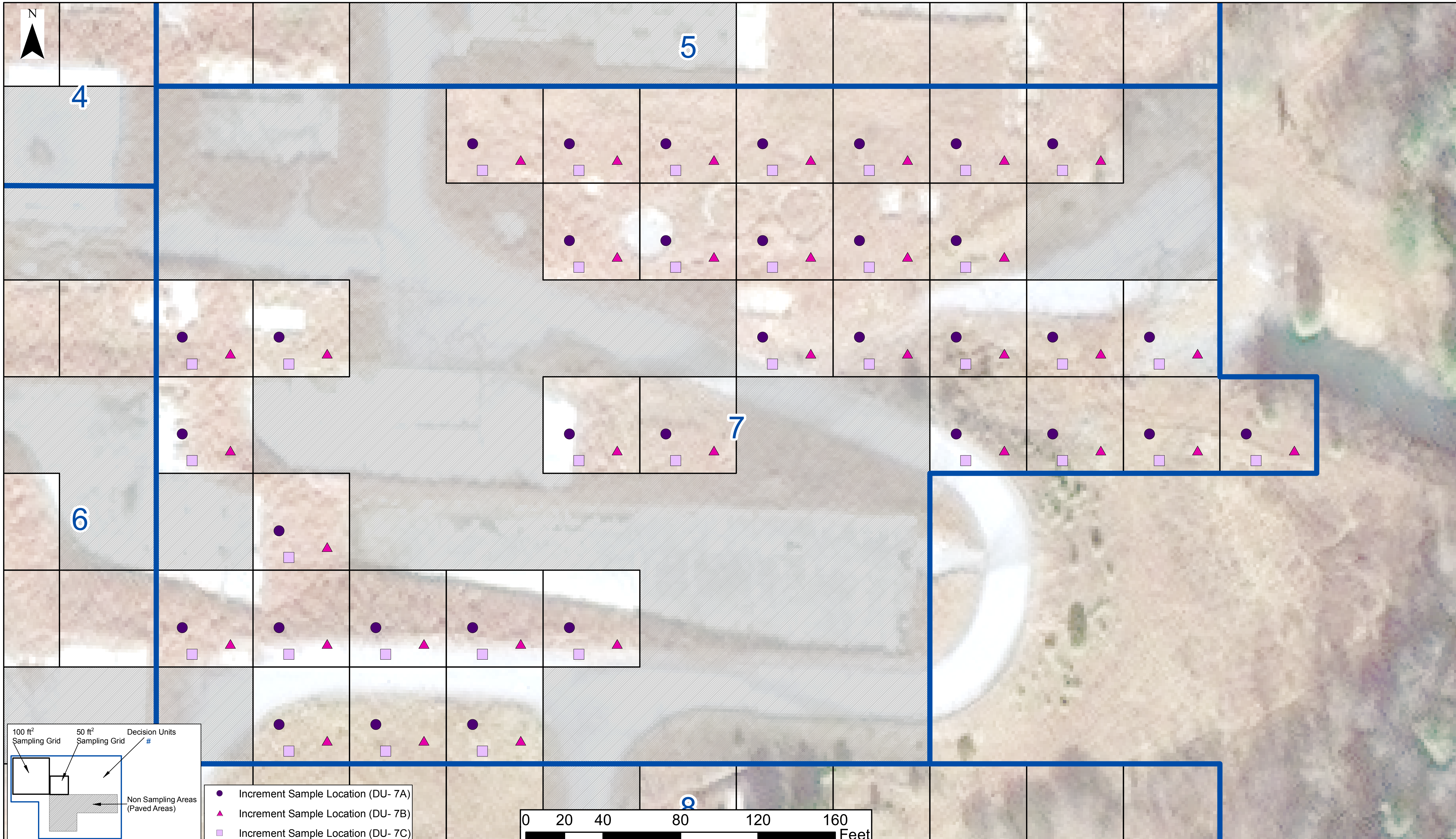

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Proposed Systematic Random Sampling Location Map - Decision Unit 7
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, NC

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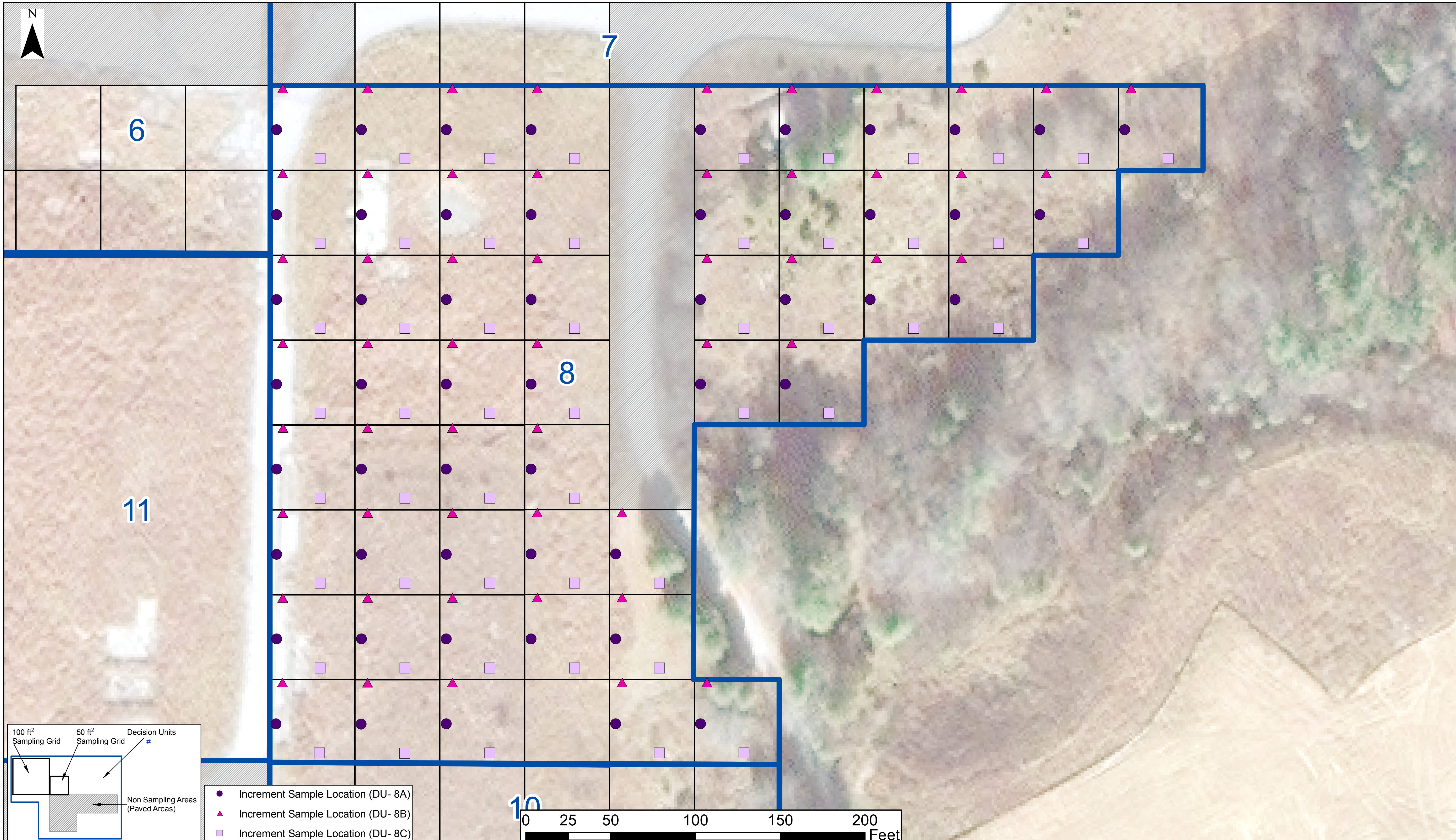

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Proposed Systematic Random Sampling Location Map - Decision Unit 8
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, NC

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Revision:	Figure: 3H	Parsons Project No: 445241.01000

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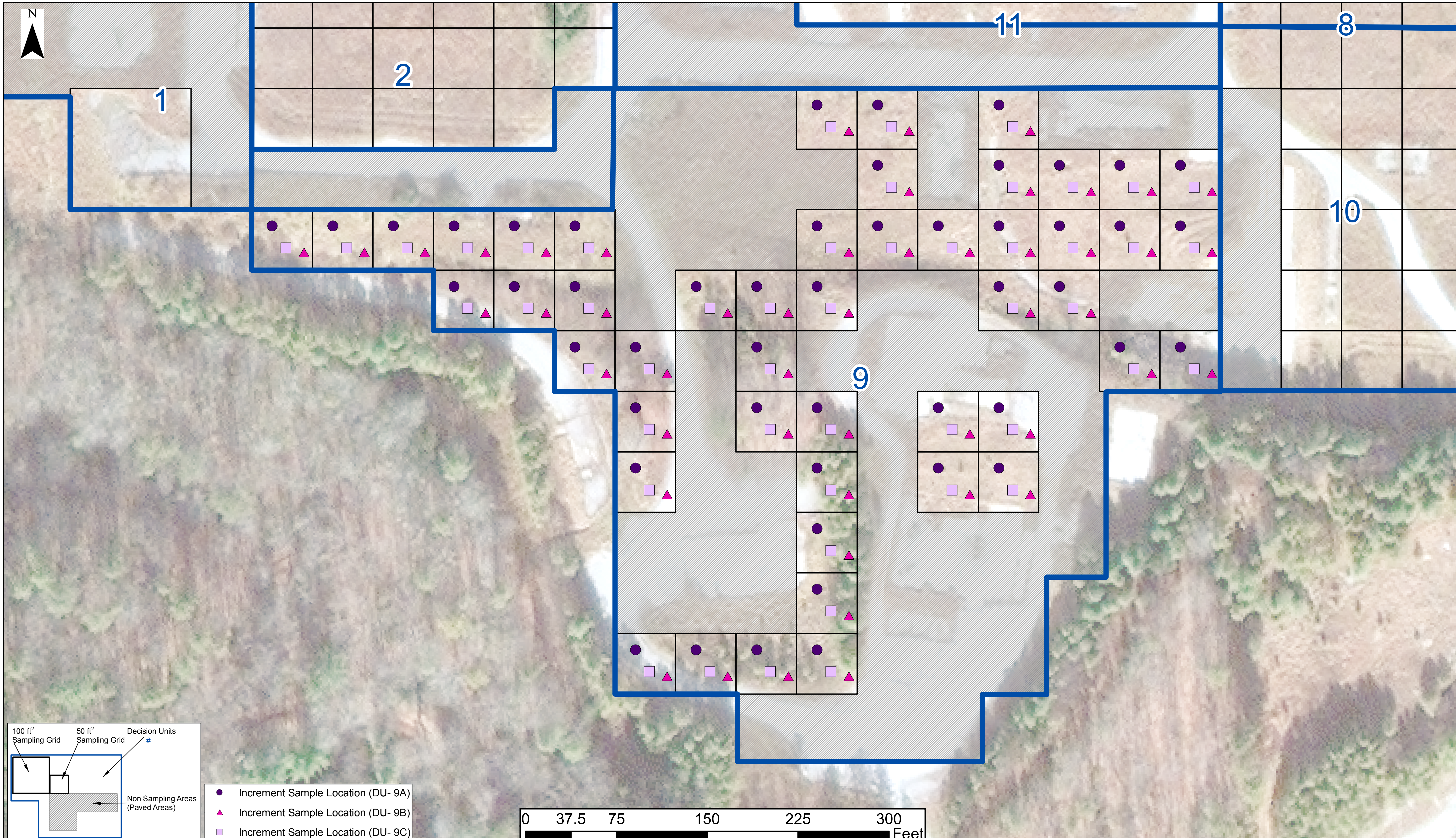

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PARSONS PE&I 4701 Hedgemore Dr. Charlotte, NC 28209	Proposed Systematic Random Sampling Location Map - Decision Unit 9 Sampling and Analysis Plan DuPont Brevard Facility Cedar Mountain, NC	Created: C. Oneal	Date: 7/31/2014
		DuPont Project No: 4423	
		Revision:	Figure: 3I
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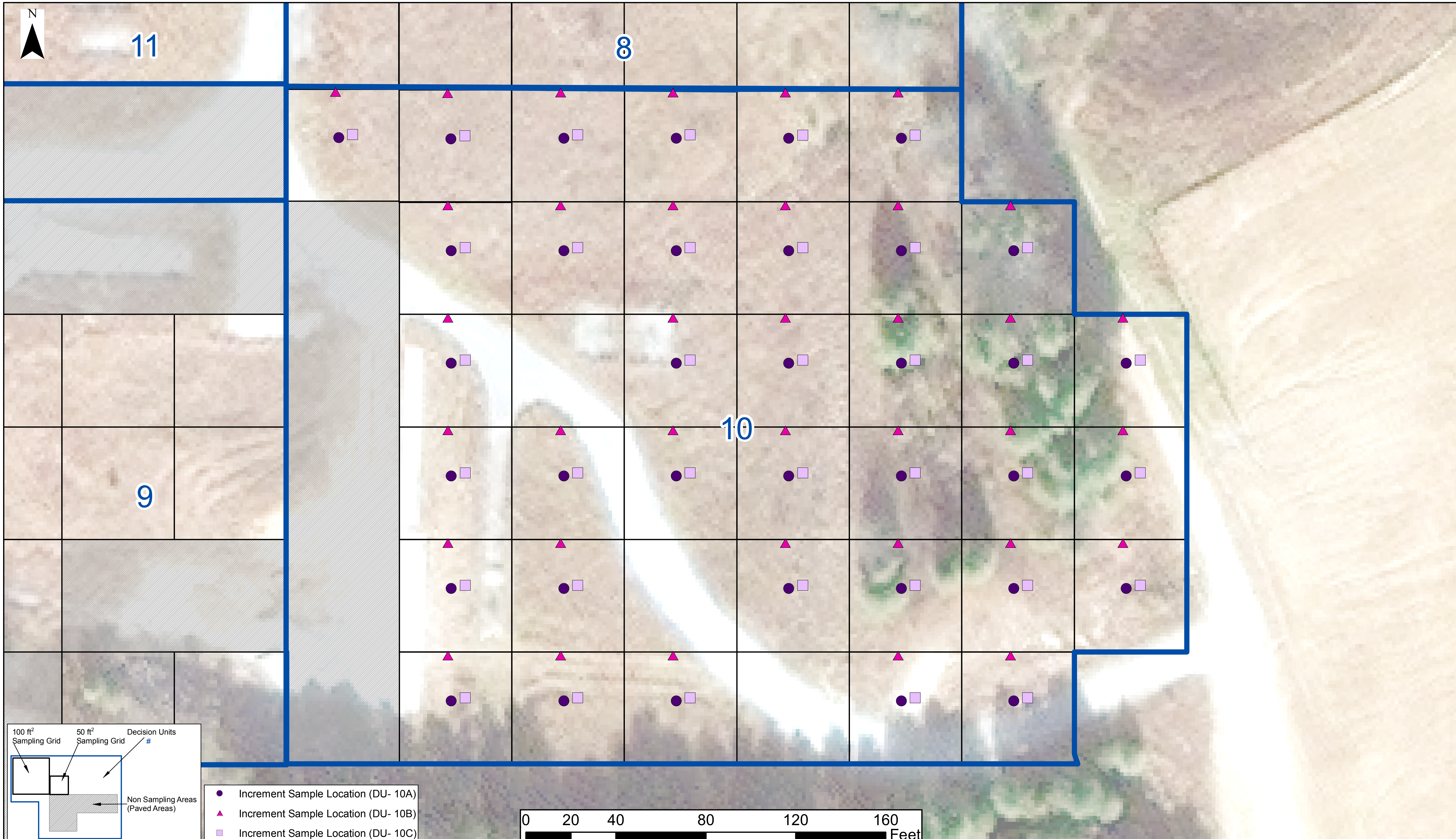

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Proposed Systematic Random Sampling Location Map - Decision Unit 10
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, NC

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Proposed Discrete Surface Soil Sampling Map
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

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Revision:	Figure: 4	Parsons Project No: 445241.01000

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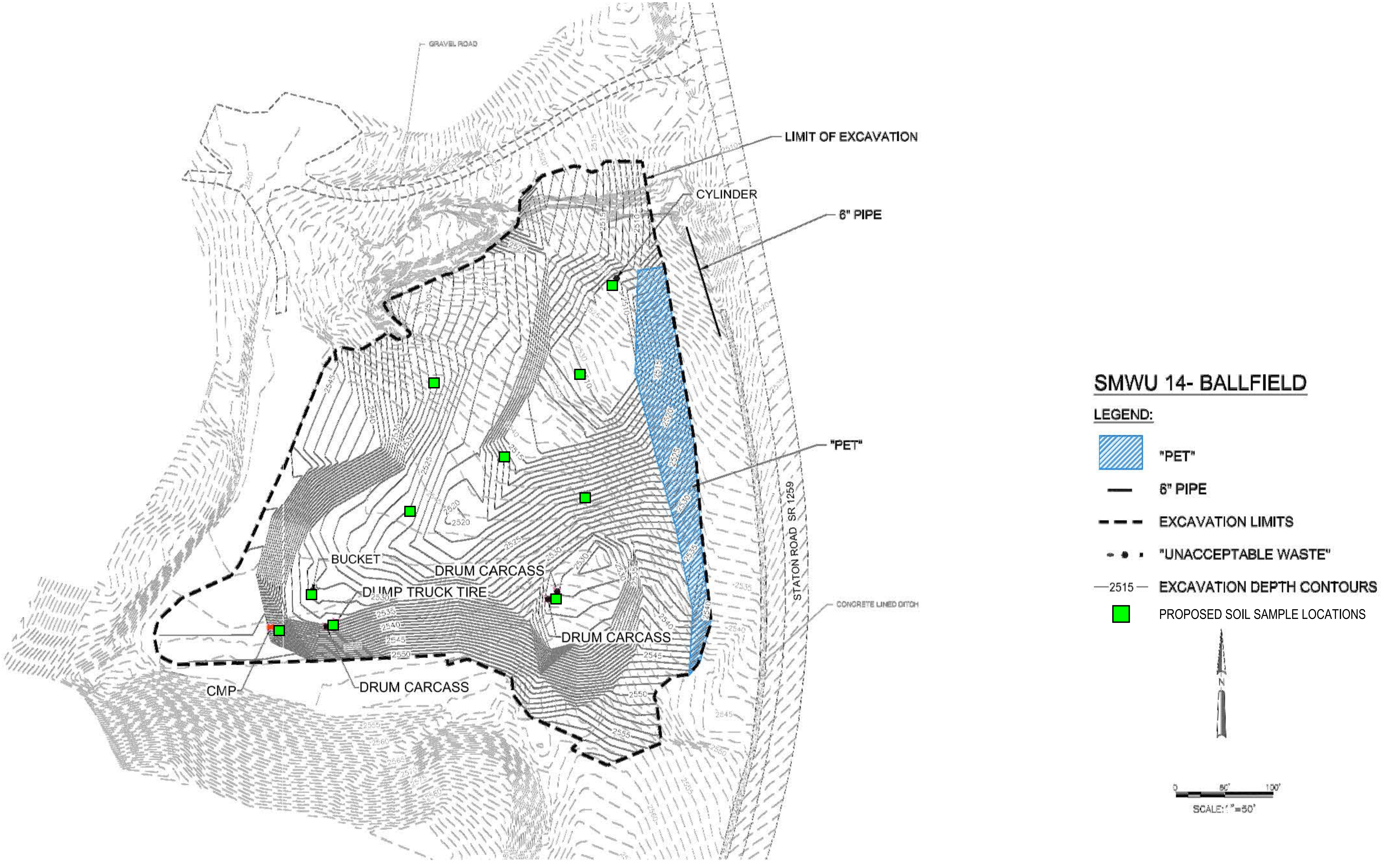

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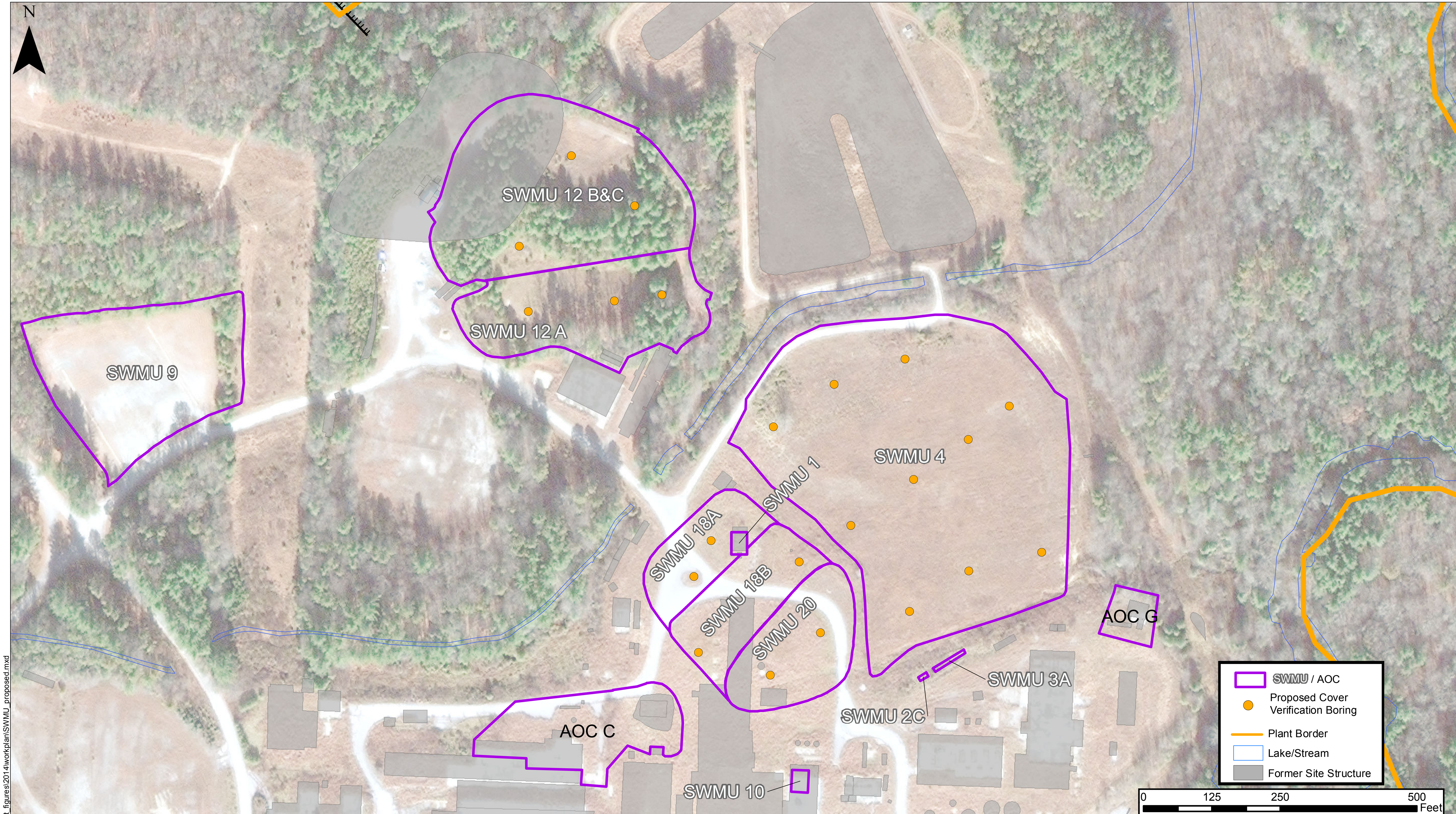
SWMU 14 Proposed Soil Sampling Location Map
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

CREATED: M. ROBINSON	DUPONT PROJECT NO.:
DATE: 2014-07-01	PARSONS PROJECT NO.: 447499.01050
REVISION:	FIGURE NO.: 5
FILE NAME:	



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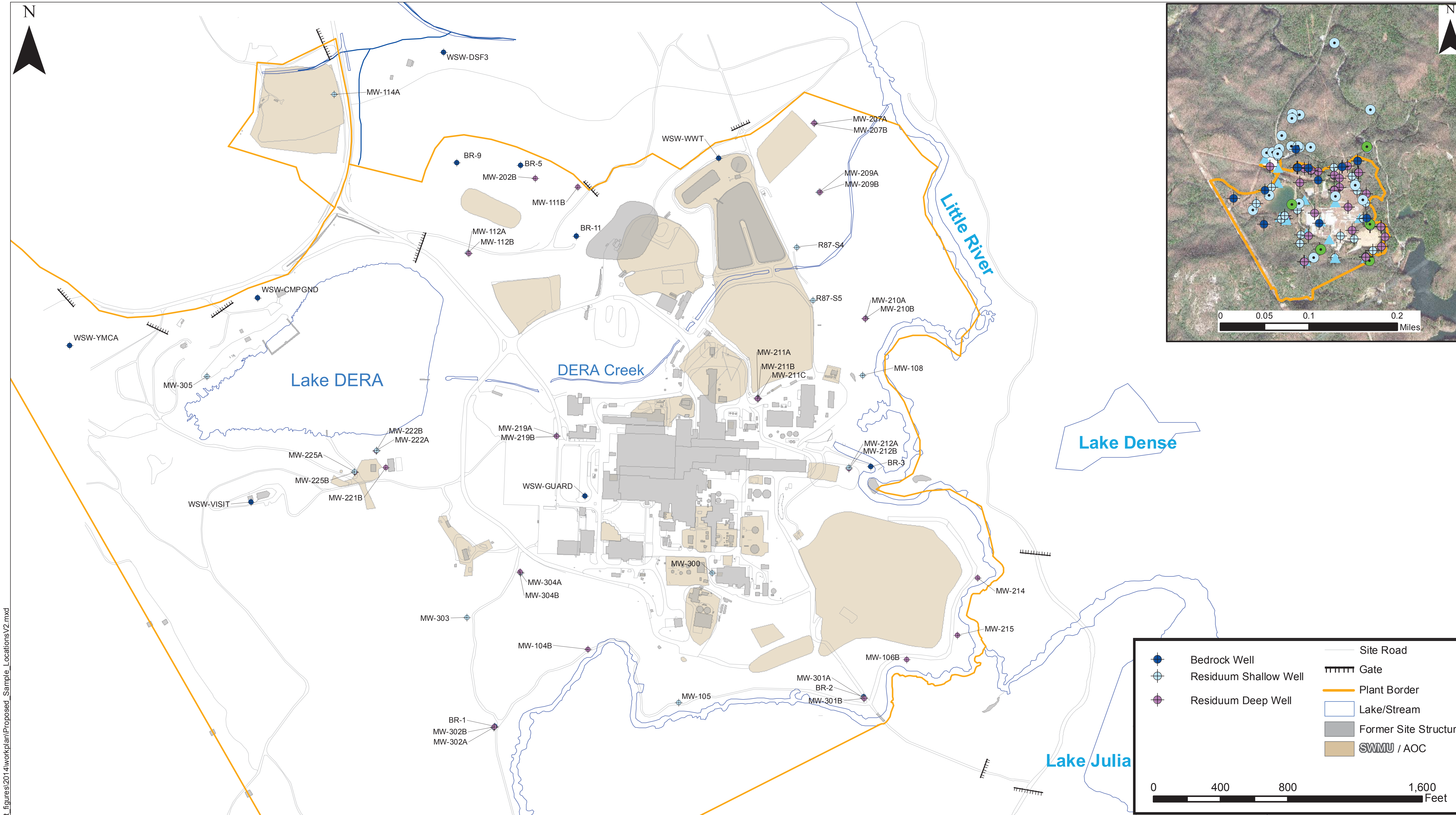
Proposed Soil Cores - SWMUs 4, 12, 18, and 20
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 8/1/2014	Parsons Project No.: 446664.01000
Revision:	Figure No.: 6
File Name: SWMU_proposed	



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Propsed Groundwater and WSW Sampling Location Map
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 8/1/2014	Parsons Project No.: 446664.01000
Revision:	Figure No.: 7
File Name: Proposed_Sample_LocationsV2	

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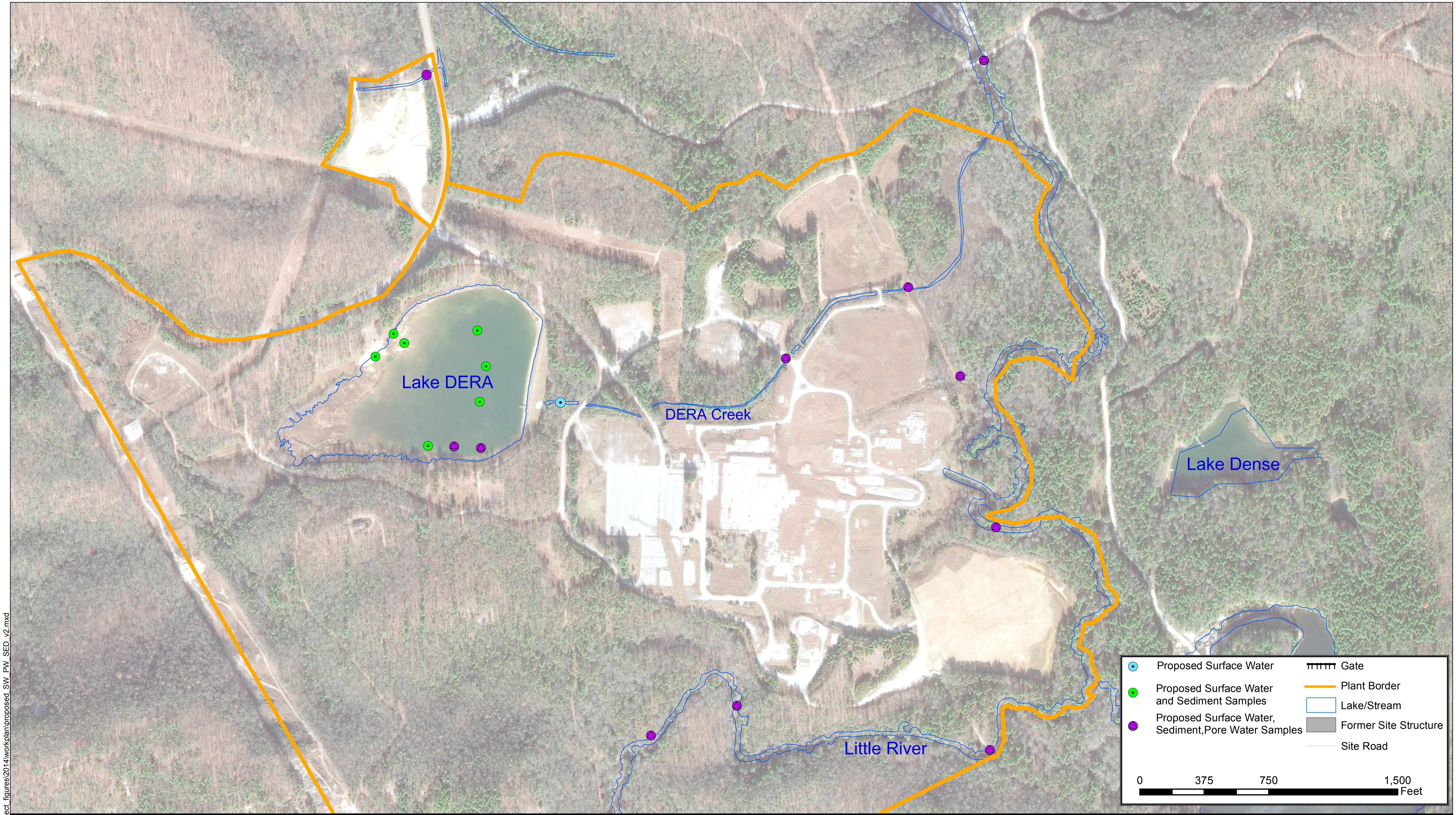

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Proposed Surface Water, Pore Water, and Sediment Sampling Location Map
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Drawn: C. Oneal	DuPont Project No.: 4406
Date: 6/26/2014	Parsons Project No. 446664.01000
Revision:	Figure No.: 8
File Name: proposed_SW_PW_SED_v2	

TABLES

Table 1
Soil, Surface Water, Sediment, and Pore Water
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

		ANALYSIS AND METHOD															
Sample Location	No. of Locations	Ap IX VOCs SW-846 8260B	VOCs + 1,4-dioxane SW-846 8260B	VC (SIM) SW-846 8260B SIM	Ap IX SVOCs + 1,4-dioxane SW-846 8270D	Ap IX Metals SW-846 6010C/6020A/7471B	Diss. Metals (with Fe, Mn) SW-846 6010C/6020A/7471B	PCBs SW-8082A	Diphenyl Ether + Biphenyl SW-846 8270D	Hex. Cr. SW 7196A	Glycols SW 8015C	Total Hardness SM 2340 C-1997	TSS SM 2540 D-1997	Acid Volatile Sulfides EPA-821-R-91-100	TOC SW 9060A mod	Grain Size ASTM D422	% Moisture SM 2540 G-1997
SURFACE SOIL - Manufacturing Area (ISM)	54	X			X	X		X	X		X						X
SURFACE SOIL - Manufacturing Area	7	X			X	X		X	X		X						X
SURFACE SOIL - Ballfield (SWMU 14)	4	X			X	X			X		X						X
SURFACE SOIL - AFB Area (DU #9 - ISM)	6	X			X	X		X	X	X	X						X
SURFACE SOIL - SWMU 13	10	X			X	X			X		X						X
SURFACE SOIL - SWMU 15	5	X			X	X			X		X						X
SURFACE SOIL - SWMU 16	10	X			X	X			X		X						X
SURFACE SOIL - SWMU 19	3	X			X	X			X		X						X
SEDIMENT	18	X			X	X			X		X			X	X	X	X
SURFACE WATER	19		X	X		X	X		X		X	X	X				
PORE WATER	11		X	X													

Notes:
VOC = Volatile Organic Compounds
VC = Vinyl Chloride
SVOC = Semi-Volatile Organic Compounds
SIM = Selected Ion Monitoring
SWMU = Solid Waste Management Unit
Fe = Iron
Mn = Manganese
ISM = Incremental Sampling Methodology
Hex. Cr. = Hexavalent Chromium

Table 2
Groundwater Sampling Plan
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

	ANALYSIS AND METHOD								
Well ID	VOCs SW-846 8260B LL	VC (SIM) SW-846 8260B SIM	SVOCs + 1,4-dioxane SW-846 8270D	Metals (inc Fe, Mn) SW-846 6010C/6020A/7470A	Diphenyl Ether + Biphenyl SW-846 8270D	Glycols SW-846 8015C	1,4-dioxane Only SW-846 8270D and 8260B	Nitrate 300	Ammonia 4500-NH3 C or D
MW-104B	X	X		X	X				
MW-105	X	X		X	X	X			
MW-106B	X	X		X	X	X			
MW-108	X	X		X				X	X
MW-111B	X	X		X					
MW-112A	X	X		X					
MW-112B	X	X		X					
MW-114A	X	X		X	X				
MW-114B	X	X		X					
MW-202B	X	X		X					
MW-207A	X	X	X	X	X			X	X
MW-207B	X	X	X	X	X			X	X
MW-209A	X	X	X	X	X				
MW-209B	X	X	X	X	X				
MW-210A	X	X	X	X				X	X
MW-210B	X	X	X	X	X			X	X
MW-211A	X	X		X				X	X
MW-211B	X	X		X				X	X
MW-211C	X	X		X				X	X
MW-212A	X	X	X	X	X				
MW-212B	X	X	X	X	X				
MW-214	X	X	X	X	X	X			
MW-215	X	X	X	X	X	X			
MW-219A	X	X		X	X				
MW-219B	X	X		X	X				
MW-221B	X	X		X	X				
MW-222A	X	X		X	X				
MW-222B	X	X		X	X				
MW-225A	X	X		X	X				
MW-225B	X	X		X	X				
R87-S4	X	X		X	X		X		
R87-S5	X	X		X	X		X	X	X
MW-300	X	X	X	X	X	X			
MW-301A	X	X	X	X	X	X			
MW-301B	X	X	X	X	X	X			
MW-302A	X	X	X	X	X	X			
MW-302B	X	X	X	X	X	X			

Table 2
Groundwater Sampling Plan
Sampling and Analysis Plan
DuPont Brevard Facility
Cedar Mountain, North Carolina

Well ID	ANALYSIS AND METHOD								
	VOCs SW-846 8260B LL	VC (SIM) SW-846 8260B SIM	SVOCs + 1,4-dioxane SW-846 8270D	Metals (inc Fe, Mn) SW-846 6010C/6020A/7470A	Diphenyl Ether + Biphenyl SW-846 8270D	Glycols SW-846 8015C	1,4-dioxane Only SW-846 8270D and 8260B	Nitrate 300	Ammonia 4500-NH3 C or D
MW-303	X	X	X	X	X	X			
MW-304A	X	X	X	X	X	X			
MW-304B	X	X	X	X	X	X			
MW-305	X	X	X	X	X	X			
BR-1	X	X	X	X	X	X			
BR-2	X	X	X	X	X	X			
BR-3	X	X	X	X	X	X			
BR-5	X	X	X	X	X	X			
BR-9	X	X	X	X	X	X			
BR-11	X	X	X	X	X	X			
WSW-YMCA	X	X	X	X	X	X			
WSW-CMPGND	X	X	X	X	X	X			
WSW-VISIT	X	X	X	X	X	X			
WSW-GUARD	X	X	X	X	X	X			
WSW-WWT	X	X	X	X	X	X			
WSW-DSF3	X	X	X	X	X	X			

Notes:
VOC = Volatile Organic Compounds
VC = Vinyl Chloride
SVOC = Semi-Volatile Organic Compounds
SIM = Selected Ion Monitoring
SWMU = Solid Waste Management Unit
Fe = Iron
Mn = Manganese
WSW = Water Supply Well
AOC = Area of Concern