WORKPLAN FOR CHARACTERIZATION OF SOIL LEAD AND MERCURY LEVELS IN SUPPORT OF RISK ASSESSMENT

Anclote Key Lighthouse, Anclote Key, Pinellas County, Florida

Florida Department of Environmental Protection
Bureau of Waste Cleanup
Tallahassee, FL

January 18, 2013

Table of Contents

Figures

Appendices

ACRONYMS AND ABBREVIATIONS

ATON	Aid to navigation
BWC	Bureau of Waste Cleanup
CSM	Conceptual site model
COC	Contaminants of concern
DQO	Data quality objectives
DU	Decision unit
FDEP	Florida Department of Environmental Protection
GPS	Global positioning system
HASP	Health and safety plan
HWS	Hazardous Waste Section
ID	Identification
ISM	Incremental sampling methodology
LCS	Laboratory control sample
MS	Matrix spike
MSD	Matrix spike duplicate
QA	Quality assurance
QC	Quality control
SCTL	Soil cleanup target level
SOP	Standard operating procedure
UCL	Upper confidence limit
UF	University of Florida

1.0 Introduction

This workplan was prepared for the assessment of lead and mercury in soil at the Anclote Key Lighthouse, Anclote Key, Pinellas County, Florida. The site is located in the Anclote Key Preserve State Park and includes the lighthouse and surrounding landscaped areas, as well as an adjacent residence for the Park Ranger. This workplan describes data available historically for mercury and lead concentrations in soil and provides a conceptual site model (CSM) from which potential exposure pathways have been identified. The primary scope of the site assessment is to characterize concentrations of lead and mercury in soil in the area northwest of the lighthouse and in the residential area. These areas are being sampled because there are limited data available regarding lead and mercury concentrations in soil there. Sampling efforts will focus on the upper six inches of soil, although several deeper samples will also be collected. The incremental sampling methodology (ISM) will be utilized because it has been shown to provide highly reliable estimates of the mean concentration of soil contaminants. Discrete sampling of soil in these areas will also be conducted for comparison with incremental sampling. The ISM and discrete samples will be analyzed for lead and mercury, and the grand mean and a 95% UCL will be calculated for comparison to residential soil cleanup target levels. The areas to the east and south of the lighthouse will not be sampled because lead and mercury concentrations in soil in these areas are being addressed by AECOM.

On January 7, 2013 FDEP and UF held a teleconference regarding the designations of the decision units (DUs), and on January 9th the FDEP planning team met again to talk about various decisions to be made during the systematic planning step. This work plan encompasses the discussions and agreements reached during that teleconference and meeting.

1.1 Site History and Background Information

The Anclote Key Lighthouse is a cast-iron lighthouse constructed in the southern area of the Anclote Key Island in 1887. The lighthouse was decommissioned as a navigation light in 1985 and is currently part of the Anclote Key Preserve State Park, located approximately three miles off the coast of Tarpon Springs. The paint used on this lighthouse was lead-based paint, which has eroded and chipped with time. In the 1960s the lighthouse became a battery-powered lighthouse. Throughout the years the casings from the depleted aid to navigation (ATON) batteries were discarded near the tower or stored in buildings adjacent to the lighthouse.

An initial assessment of this site was conducted in 1994. At the time, 100 batteries were found and removed from the site. The assessment found lead and mercury in soil at concentrations above their respective Cleanup Target Levels (CTLs), thus making them contaminants of potential concern (COPCs). The source of the mercury is presumed to be the batteries that were found at the site. No lead acid batteries were found at the site during the 1994 reconnaissance, but there is the possibility that lead-containing batteries were discarded onsite. Another potential source of lead in the soil is the lead-based paint used on the lighthouse.

The most recent sampling was conducted in October 2010, by AECOM to continue delineating the extent of lead and mercury in soil. The soil concentrations were evaluated using discrete sampling methodology. The surface soil (0-6 inches) results obtained from this delineation event (appendix figures: Figure A1 and Figure A4) indicate that further delineation of the contaminants is needed throughout, especially for the Park Ranger residence and the area to the northwest of the Lighthouse.

2.0 Sampling Methodology and Strategy

2.1 Overview

Previous sampling events on the Anclote Lighthouse property investigated the levels of lead and mercury in the soil using discrete sampling methodology. The data obtained during the previous investigations indicate that further characterization of the soil contaminants is necessary especially in areas of the property designated in this workplan as DU-1 and DU-2 (Figure 1). Soil will be sampled in these areas using ISM. The main goal of ISM is to obtain a mean analyte concentration representative of the smallest volume of soil for which a decision needs to be made. This defined volume of soil is specifically referred to as a DU. ISM is a systematic sampling protocol developed in order to reduce data variability and provide a more reliable estimate of the mean concentration of an analyte across an area/volume of concern. Inherent soil heterogeneity and variation of the contaminant distribution in the soil often lead to variability in measured analyte concentrations among discrete soil samples. ISM addresses sampling error and controls data variability through a well structured composite sampling protocol that involves planning, field collection of soil samples, and laboratory processing and analysis procedures (Draft DEP ISM Guidance, 2012 and ITRC, 2012). Using ISM, a better estimate of the grand mean for lead and a 95% UCL for mercury concentration within the DUs slated to be sampled at the Anclote Key Lighthouse area can be obtained to determine whether soil remediation/management is needed.

2.2 Sampling Objectives

The purpose of this assessment is to build upon the previous site investigation in order to obtain a reliable estimate of the grand mean and 95% UCL soil lead and mercury concentrations as appropriate at the two DUs through ISM sampling. These concentrations will be used to support an assessment of human health risk from existing lead and mercury contamination. In the case of mercury, a 95% UCL will be derived from replicate ISM samples for comparison with the default residential mercury CTL. In the case of lead, uncertainty in the estimate of the mean from soil data is addressed in the model relating soil lead concentration to blood lead concentration. Accordingly, a grand mean of the lead concentrations from the three replicates rather than the 95% UCL will be compared with the default residential lead CTL.

For comparison purposes, 30-32 discrete samples will also be collected from each DU with the mean or 95% UCL calculated for lead and mercury as appropriate.

.

2.3 Conceptual Site Model

The lead and mercury in the soil at the Anclote Key Lighthouse are believed to originate from batteries that were discharged in the area surrounding the lighthouse, and from lead-based paint used on the exterior of the lighthouse. It is plausible that metals, including mercury, leached into the soil from spent and un-used batteries that were stored and buried on the property. The source of lead on the property is believed to be the lead-based paint that chipped with time, or lead batteries that may have been used to power the lighthouse. It should be noted that lead batteries were not found during the 1994 investigation; however, that does not exclude the possibility that they were used.

The primary medium contaminated on this property is the soil. The property is a State Park, but the residence of the Park Ranger is on the property; therefore, current and future residents as well as park visitors could be exposed to the site-related contaminants in the surface soil. The potential routes of exposure considered for these receptors are: incidental ingestion, dermal contact and inhalation of particulates from the surface soil.

2.4 Decision Units

The designation of the two DUs (Figure 1) proposed for the ISM sampling was established based on the data previously obtained with discrete sampling (appendix Figures A1-A6), and on the discussions held on January 7th and 9th, 2013.

DU1 is approximately 0.18 acres (112 ft x 80 ft) and is located in the area to the northwest of the lighthouse structure. DU1 has been divided by grid into 32 cells of equal size measuring 16 x 16 ft (Figure 2). One 0 – 6 inch depth increment from each cell will be taken and combined to form a single ISM sample. This process will be repeated to generate three 0 – 6 inch depth ISM samples (3 replicates) from DU1. The locations for sampling within the cells for each replicate have been determined using systematic random sampling as described in the following section.

Thirty-two discrete samples will also be collected in the 0 – 6 inch interval (one per grid). The location of the sample within each grid cell has been determined using a systematic random sampling approach, and will be discussed in the next section. Ten additional samples will be collected from DU1 at the 6 – 24 inch interval or to the water table (whichever is reached first), using discrete sampling. Locations for the subsurface samples will be chosen at random.

The second DU, DU2 encompasses the area surrounding the Park Ranger's residence. This area is approximately half of an acre and has an irregular shape (Figure 1). DU2 was subdivided using a grid containing 30 grid cells with each cell measuring 28 ft x 28 ft (Figure 2). Thirty increment samples from a depth of 0 – 6 inches (one per grid) will be collected and combined into a single ISM sample. This process will be repeated to generate three replicate ISM samples. The locations for the sampling within cells for each replicate have been determined using a systematic random sampling approach, and are specified in the following section. Thirty discrete soil samples at the 0 – 6 inch interval will also be take from DU2, one from each grid cell. The location of the discrete sample from each cell was also determined using a systematic random sampling approach (Figure 5). Ten additional discrete samples will be collected from DU2 at the 6 – 24 inch interval or to the water table (whichever is reached first); with sample locations chosen at random.

2.5 Number and Mass of Increments

Three different ISM sample replicates, each consisting of 30 or 32 increments (from DU2 and DU1, respectively), will be collected from each DU using a systematic random sampling design. For systematic random sampling, a grid is used to divide the DU into cells of equal size. A random sampling location is established in the first grid cell. A soil increment is taken from that location and combined with increments taken from the same location in each of the other cells to produce a single ISM sample. The process is repeated with different random locations to produce replicate ISM samples for the DU.

The random sampling locations for each of the DUs were identified using an internet-based random integer generator (random.org). The input values in the software were selected to generate two random integers, corresponding to a location within the cell. The range of possible values for the integers, were based on the dimensions of the grid cells for each DU.

For DU1, the input values in the software were zero and 16 (the size of the cell in feet). The output was given in two columns. The number given in the first column was taken as the location (coordinate) to the East of the corner; the number given in the second column was taken as the location (coordinate) to the South of the corner. The three independent outputs were as follows: (15, 5), (5, 8), (2, 14). Sampling will begin in the grid cell in the northwest corner of DU1. The location of the initial incremental samples for the three replicates is (relative to the northwest corner of the grid cell) (15 ft over (East), 5 ft down (South)), (5 ft over (East), 8 ft down (South)), (2 ft over (East), 14 ft down (South)). A schematic representation of these is shown in Figure 3. Samples will then be taken from adjacent cells, at the same relative location within each cell. The samples from the adjacent cells will be collected sequentially, in a serpentine pattern (ITRC 2012, FDEP 2012), as depicted in Figure 4. For discrete sampling one sample will be collected from each cell. The coordinates for the samples were determined in the same way as for ISM, and are depicted in Figure 5A. The location of the first sample relative to the northwest corner of the DU is 9 ft over (East), 12 ft down (South). The remaining 31 samples will be collected at the same location within each grid cell (Figure 5B).

The sample coordinates for DU2 were determined in a similar manner as for DU1, with the exception that the input values in the random integer generator software were zero and 28 (the size of the cell in feet). The number given in the first column was taken as the location (coordinate) to the East of the corner; the number given in the second column was taken as the location (coordinate) to the North of the corner. The three independent outputs were as follows: (26, 8), (1, 19), (13, 16). Sampling will begin in the grid cell in the southwest corner of DU2. The location of the initial incremental samples for the three replicates is (relative to the southwest corner of the grid cell) (26 ft over (East), 8 ft (North)), (13 ft over (East), 16 ft up (North)), (1 ft over (East), 19 ft up (North)). A schematic representation of these is shown in Figure 6. Samples will then be taken from adjacent cells, at the same relative location within each cell. The samples from the adjacent cells will be collected sequentially, in a serpentine pattern (ITRC 2012), as depicted in Figure 7. For discrete sampling one sample will be collected from each cell. The coordinates for the samples were determined in the same way as for ISM, and are depicted in Figure 8A. The location of the first sample relative to the southwest corner of the DU is 5 ft over (East), 2 ft up (North). The remainder 29 samples will be collected at the same location within each grid cell (Figure 8B).

If field conditions do not allow for a given increment to be collected (e.g., building structures, trees), a new location will be chosen in the field as near as possible to the target location. Relevant data including increment locations (i.e., GPS coordinates when possible) will be recorded on field sheets for each sample.

Each of the increments should weigh approximately 50 g in order to achieve the target sample mass of approximately 1.5 kg for each replicate sample to be delivered to the analytical laboratory. This assumes a sample core diameter of approximately 2 cm.

Formula for estimating sampling equipment requirements based on a pre-determined ISM mass and number of increments

$M_s = \rho \bullet n \bullet D_s \bullet \pi \bullet (\theta / 2)^2$
M_s – targeted mass of sample (approx. 1,500 g)
D_s – increment length (15 cm)
n – number of increments (30)
ρ - soil or sediment density (1.5 g/cm^3)
θ - diameter of sample core (2 cm)

3.0 Sample Analysis

The ISM replicates will be sent to the FDEP laboratory qualified to process and analyze ISM samples. The laboratory will provide a copy of its internal standard operating procedure (SOP) for the processing for ISM samples, including sample preparation and subsampling methods.

After processing, each sample will be analyzed for total mercury based on EPA Method 7471A (*Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique*) and total lead by EPA Method 6020A. A copy of the laboratory data quality objective (DQO) summary for the analytical methods will be provided by the laboratory. This DQO summary must indicate that the analytical methods have detection limits for mercury and lead well below the FDEP default residential SCTL for the metals.

3.1 Data Analysis

The mercury and lead data obtained from the analytical laboratory will be compared with the FDEP current residential SCTL for mercury (3 mg/kg) and lead (400 mg/kg). The basis for comparison for mercury will be the 95% UCL concentration derived from the three replicate ISM samples. If the 95% UCL from the three replicates is below 3 mg/kg, no further action will be necessary from the human health perspective, once the assessment for the whole Site is complete (including the work that will be done by AECOM), the ecological evaluation will be accomplished. For lead, the basis of comparison will be the grand mean of the lead concentration from the three replicates for each DU. If the grand mean is below 400 mg/kg, no further action will be necessary from the standpoint of protection of human health. Discrete sample data from each DU will be used to determine the degree of heterogeneity of mercury and lead concentrations in the soil. If the coefficient of variation (CV) for the data is <1.5, Student's *t*-test will be used for calculating the 95% UCL. If a larger CV is observed, the Chebyshev method for calculating the 95% UCL will be used. The 95% UCL will be calculated using the Microsoft Excel-based ISM Calculator available on the ITRC website: http://www.itrcweb.org/ISM-1/4_2_2_UCL_Calculation_Method.html. Because both ISM and at least 30 discrete samples are available for each DU, all of the data will be used. If the ISM indicates that the decision unit fails, the discrete sample data will be utilized to determine the areas of exceedances for management or remediation decisions.

4.0 Field Procedures for Sampling

4.1 Soil Sampling Procedures for ISM

The field sampling will be performed under the supervision of personnel trained in ISM. The proposed location of the DUs and grid cell location are shown in Figure 1, Figure 3 and Figure 5. Prior to beginning the ISM fieldwork, a portable global positioning unit (GPS) will be used to record the grid intersections for each grid cell, while the location is flagged on the ground. The portable GPS unit will also be available in the field to assist in the sample collection and recording.

The upper six inches of soil will be collected at each incremental sampling location using appropriately sized PVC tubes (¾ inch diameter and 6 inches long). If the ground is too dry and loose, a trowel may be used to collect the same mass/volume of soil. Care will be taken to insure that the increments will be the same mass. The collected soil will be placed in a new container. All increments of soil from a single replicate ISM sample from the DU will be placed together in the container and sealed. Three replicates are required; therefore, three containers will be collected per DU, each composed of 30 or 32 increments (depending on the DU).

All field supplies will be transported to the site. The collected soil samples will be maintained in iced coolers prior to transport.

4.2 Discrete Sampling Procedures

Discrete soil sampling activities will be conducted in accordance with FDEP Standard Operating Procedures (SOP)-001/01 Field Sampling (FS) 3000. One discrete sample will be collected at the 0 – 6 inch interval from each cell in each DU. As with the ISM samples, the locations of the discrete samples have been determined utilizing the internet-based random integer generator. The input values in the software were selected to generate two random integers, based on the dimensions of the grid cells for each DU. The locations are displayed in the accompanying figures. Ten discrete soil samples will also be collected from each DU at the 6 – 24 ft interval (or the top of the water table, whichever is first encountered). These sample locations will be determined in the field.

All discrete samples will be collected in individual sample containers and properly sealed and labeled prior to placement in iced coolers for transport.

4.3 Equipment Decontamination in the Field

Because the increments will be combined, the tools used for increment collection will only be wiped clean of any soil or mud after collecting each of the increments. However, for each replicate ISM, the ISM sampling tool will be washed in a 5-gallon bucket filled with a solution of Liqui-nox, rinsed with deionized water, rinsed with 70% isopropyl alcohol, and rinsed again with deionized water. Decontamination of the tools between ISM replicates is important to ensure that there is no contamination between ISM replicates.

Sampling equipment used during discrete sampling activities will be decontaminated between sample collections. Four equipment blanks will be collected and analyzed to confirm the effectiveness of decontamination procedures.

4.4 Field Sample Documentation

Detailed logs of pertinent data will be maintained in the field and will include sample information and field activity logs, which are described in detail below. Field photographs should also be included and documented when appropriate.

4.4.1 Sample Identification and Documentation

The log will include detailed information about the samples as they are being taken. Sample labels, custody seals, and chain-of-custody forms are described below.

After sample collection, all sample containers will be labeled with an identification number that uniquely identifies the sample. This will include:

- the year the sample was taken;
- the month and day of sample collection;

- the replicate designation (for ISM samples); and
- the Decision Unit designation.

Each sample container will be labeled using permanent ink. The sample identification number will be logged in the field log book. The following information about the sampling event will also be documented into the field log book along with the sample identification number:

- Date and time of sample collection;
- Person(s) sampling;
- Sample location (i.e., GPS coordinates if possible)
- Method of sampling
- Analysis to be performed
- Observations on ambient conditions;

4.4.2 Custody Seals

No samples will be shipped. Members of the field sampling team will personally transport the samples to the lab for analyses and the samples will be in the custody of the team at all times. Custody seals that are customarily used during shipping will not be required.

4.4.3 Chain-of-Custody Forms

Chain-of-custody is a chronological documentation used to trace sample possession from the time of sample collection until receipt by the laboratory. One chain-of-custody form will be filled out for each shipping container and will list all the samples contained within. One copy of the completed form will be placed in a plastic bag and taped to the inside lid of the transportation container and one copy will be kept with the project files.

4.5 Field Activity Logs

Detailed records of the sampling events will be made on site. Field sampling logs will include the following information, as applicable:

- date and time;
- personnel;
- sample medium;
- sample collection technique(s);
- sample containers;
- sample number, location, and depth;

- any pertinent field observations.

4.5.1 Corrections in Field Activity Logs

The field documents will be completed using permanent ink and mistakes will be crossed out using a single line. The correction will be dated and initialed. The field documents shall not be thrown away or destroyed, even in the event that the document needs to be replaced. The field documents remain on the site for the duration of the fieldwork.

5.0 Quality Assurance/Quality Control (QA/QC)

5.1 Field Operations

The Project Manager will ensure that control of field operations and sampling methods will be discussed and will ensure that each field team member is familiar with the provisions of the workplan as well as the health and safety program (HASP), prior to commencement of field operations. The Project Manager will provide a QA review of field activities at the beginning of the sampling event to ensure that all procedures are followed. The Project Manager will regularly check field notebooks and forms.

5.2 Control Parameters

ISM requires that QC measures are taken both in the field as well in the laboratory. Field QA/QC involves the collection of field QC samples, as well as control of field operations, sampling, and measurements. Field QA/QC requirements are described below.

5.3 QC Samples in the Field

For every 20 environmental samples, there needs to be one field duplicate sample for QC. Since this work plan requires a total of three ISM samples per DU, no field duplicate is necessary for this ISM sampling event. For the discrete soil samples, one duplicate will be collected for each DU.

No trip blanks or equipment rinsate blanks will be collected or analyzed. Trip blanks are typically used for volatile analytes and therefore are not relevant in this case. Equipment rinsate blanks are used to evaluate the effectiveness of equipment decontamination between samples. Because ISM requires less sample handling due to less total number of samples submitted to the laboratory, there are fewer opportunities for cross-contamination. Therefore, no equipment blanks are needed for this procedure. However, the sampling equipment utilized to collect the discrete soil samples will be decontaminated between each location. Four equipment rinsate blanks will be collected. These samples will be analyzed for mercury (EPA Method 7470A) and lead (EPA 6020A).

6.0 Data Reporting

Data deliverables from the analytical laboratory will consist of the following items:

- Case Narrative;
- Laboratory Final Reports;
- Surrogate Recovery Summary;
- Method Blank Summary;
- Laboratory Control Sample (LCS) Recovery Summary;
- Initial Calibration Summary Gas Chromatograph (GC) Method Printout;
- Continuing Calibration Summary;
- Analytical Sequence Printout;
- Chromatographs and Quantification Reports for all Samples, Standards, and QC Samples;
- Copies of Extraction Log Page and Copies of Chain-of-Custody Document;
- LCS;
- Extraction Logbook Pages and Chain-of-Custody Documents;

References

FDEP 2005. Technical Report: Development of Cleanup Target Levels (CTLs) for Chapter 62-777, F.A.C. Division of Waste Management, Florida Department of Environmental Protection, Tallahassee, Florida.

FDEP 2008. DEP-SOP-001/01, FS 3000 Soilpublicfiles.dep.state.fl.us/dear/sas/sopdoc/2008sops/fs3000.pdf

FDEP 2012. Draft Incremental Sampling Methodology (ISM) Guidance, Bureau of Waste Cleanup, Florida Department of Environmental Protection, Tallahassee, FL.

Interstate Technology and Regulatory Council (ITRC) 2012. Incremental Sampling Methodology. (Washington, D.C.: Interstate Technology & Regulatory Council, Incremental Sampling Methodology Team, (www.itrcweb.org),

Figure 1. Designation of DUs. Anclote Key Lighthouse, Pinellas County, Florida. Figure was modified from aerial map of Anclote Key Preserve State Park obtained from Google maps (http://maps.google.com/).

Figure 2. Schematic representation of the sampling grids for DU1 and DU2. Anclote Key Lighthouse, Pinellas County, Florida. Figure was modified from aerial map of Anclote Key Preserve State Park obtained from Google maps (http://maps.google.com/).

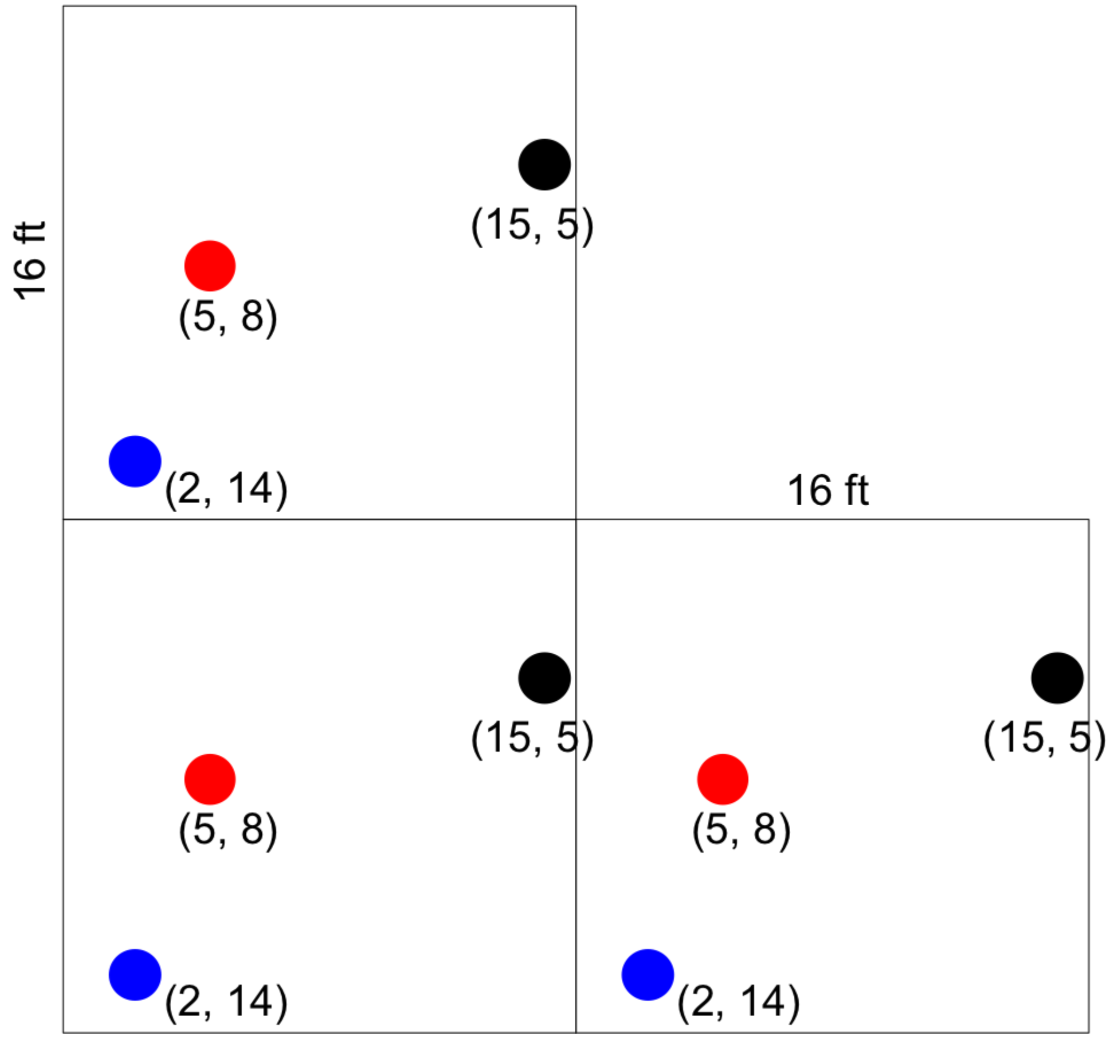


Figure 3. Schematic representation of the proposed sampling coordinates within the grid cells of Decision Unit 1 (DU1) for ISM. The sampling coordinates were obtained using an internet-based random number generator. The coordinates represent the distance in feet relative to the northwest corner of the cell.

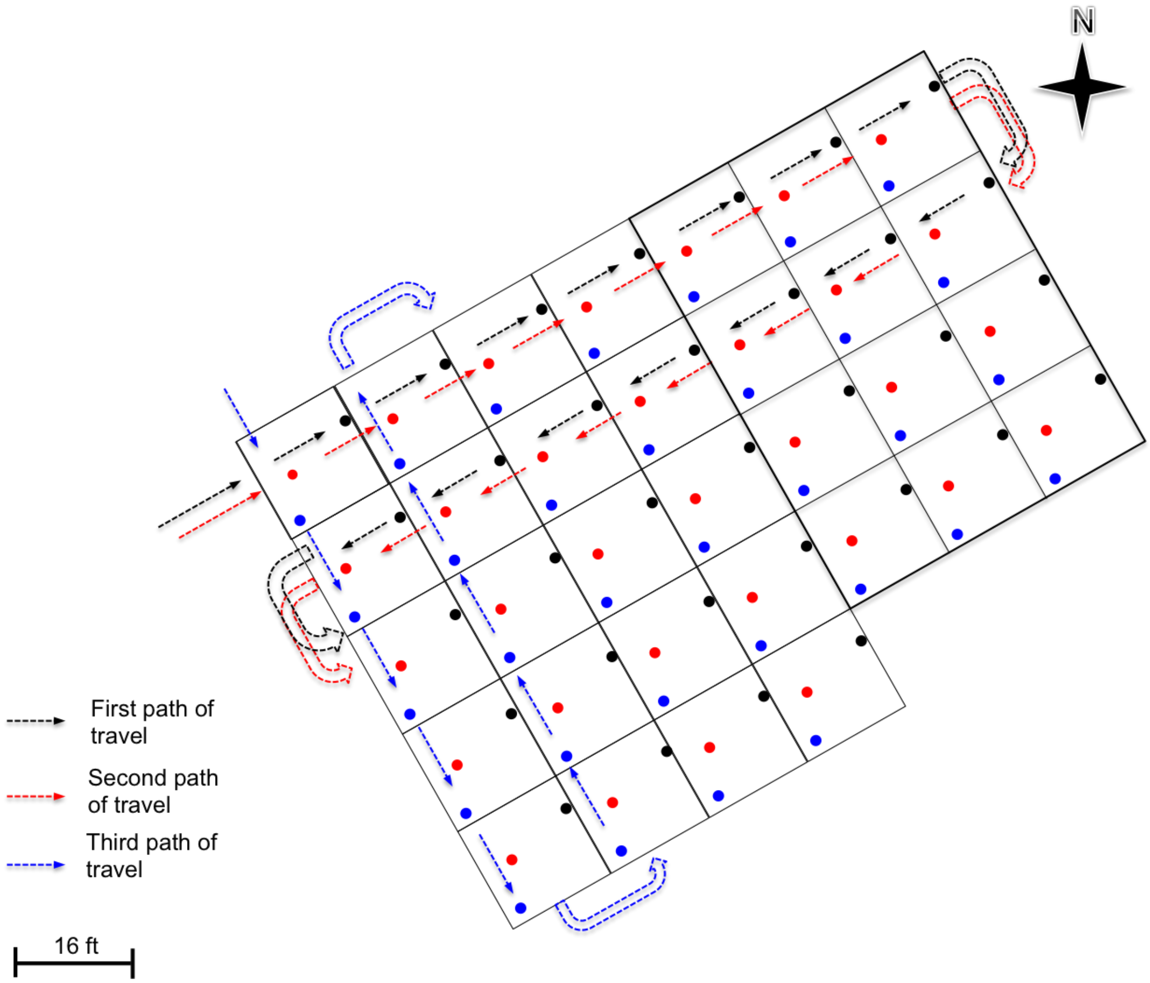
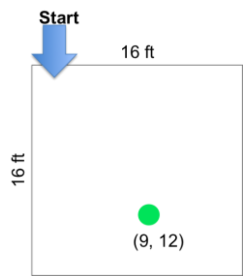


Figure 4. Proposed Decision Unit 1 (DU1), with 32 sampling grid cells. Anclote Key Lighthouse, Pinellas County, Florida. DU1 encompasses the area northwest of the lighthouse structure. Each cell grid measures 16 feet by 16 feet.

A)



B)

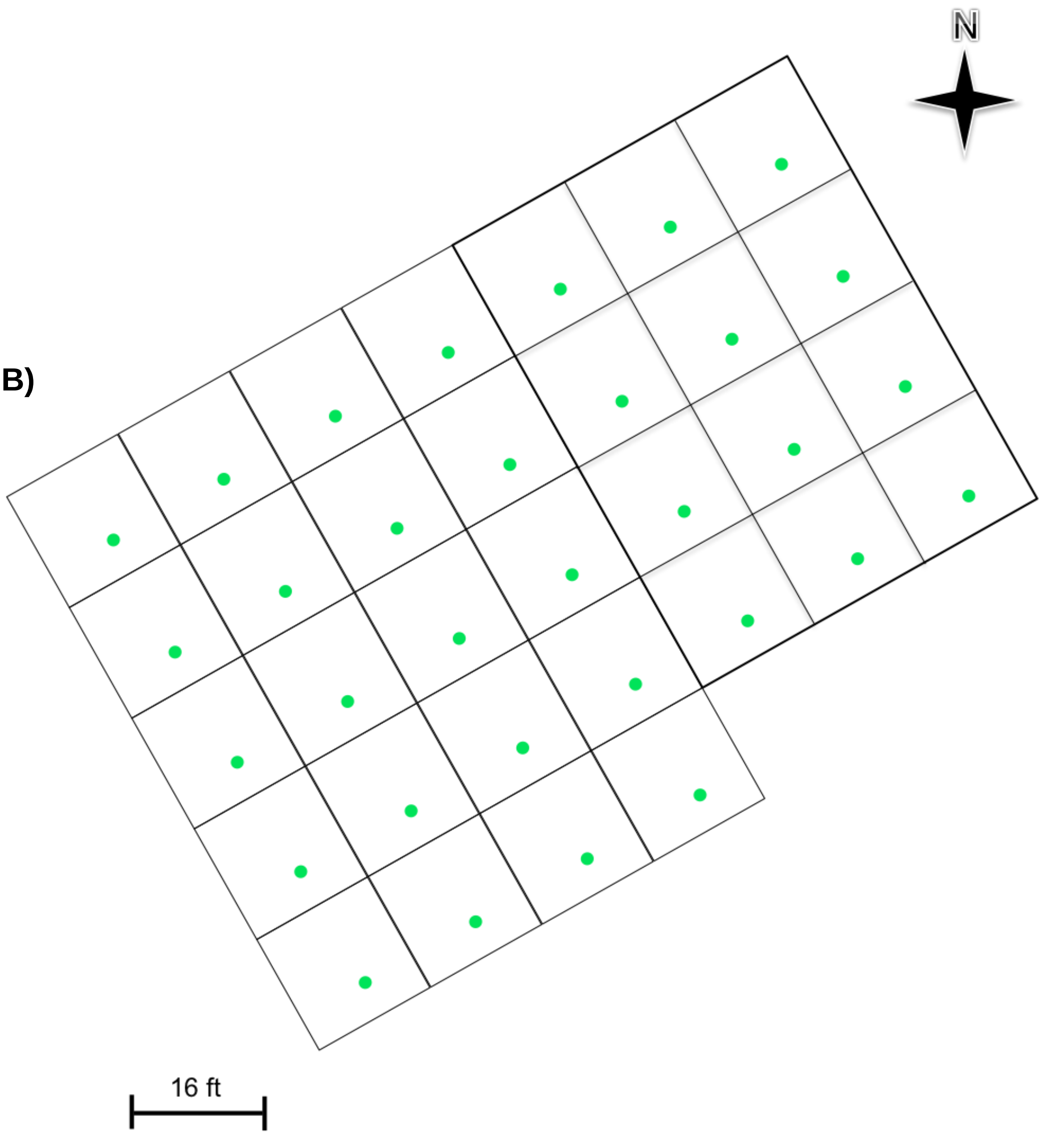


Figure 5. Schematic representation of the proposed sampling coordinates within the grid cells of Decision Unit 1 (DU1) for discrete sampling. The sampling coordinates (A) represent the distance in feet relative to the nothwest corner of the cell. One sample will be taken from each grid cell (B).

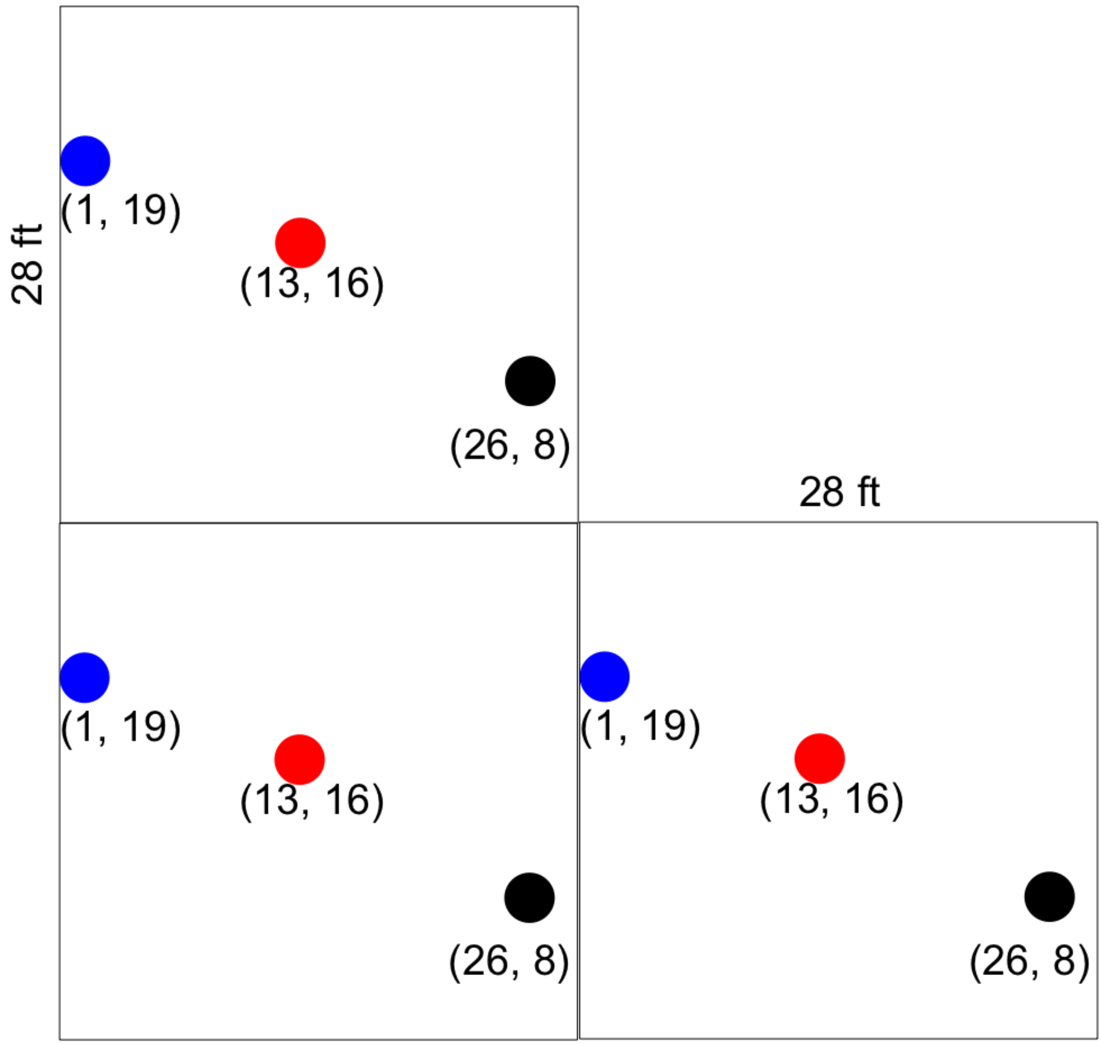


Figure 6. Schematic representation of the proposed sampling coordinates within the grid cells of Decision Unit 2 (DU2) for ISM. The sampling coordinates were obtained using an internet-based random number generator. The coordinates represent the distance in feet relative to the southwest corner of the cell.

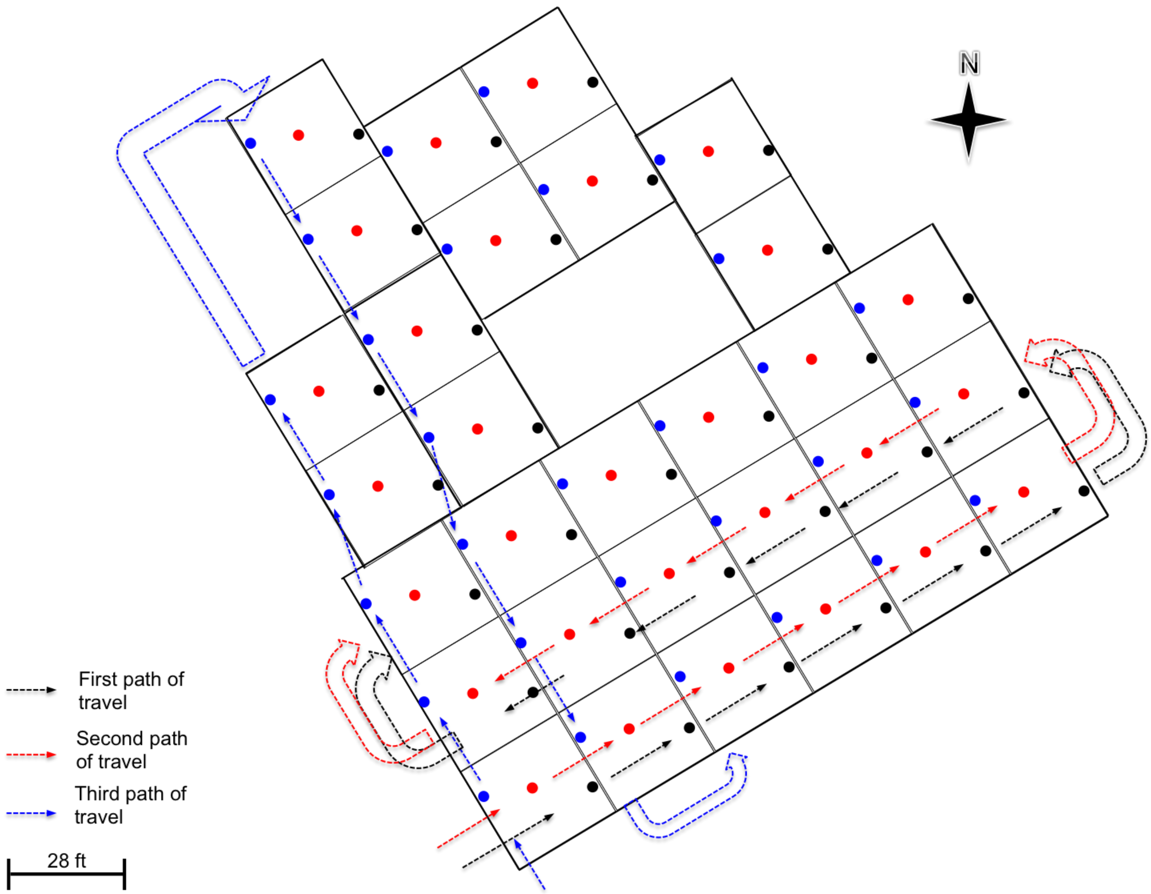
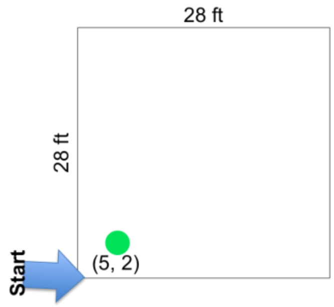


Figure 7. Proposed Decision Unit 2 (DU2), with 30 sampling grid cells, and the sampling pattern. Anclote Key Lighthouse, Pinellas County, Florida. DU2 encompasses the area surrounding the Park Ranger's residence. Each cell grid measures 28 feet by 28 feet.

A)



B)

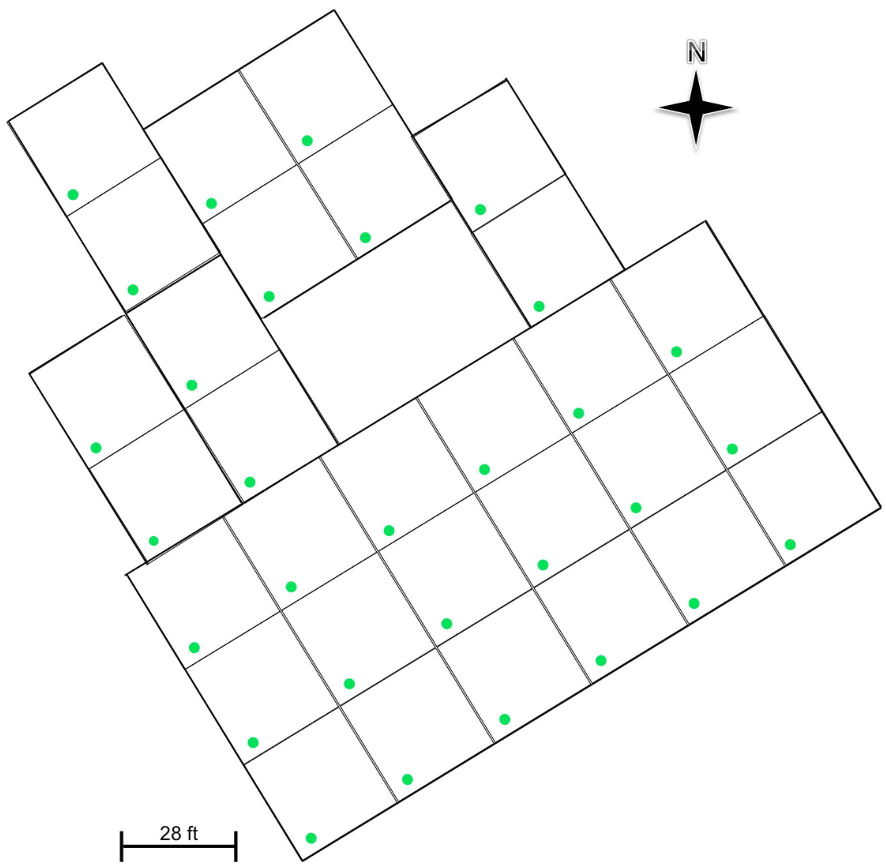


Figure 8. Schematic representation of the proposed sampling coordinates within the grid cells of Decision Unit 2 (DU2) for discrete sampling. The sampling coordinates (A) represent the distance in feet relative to the southwest corner of the cell. One sample will be taken from each grid cell (B).

Appendix A

Maps of Historical Sampling

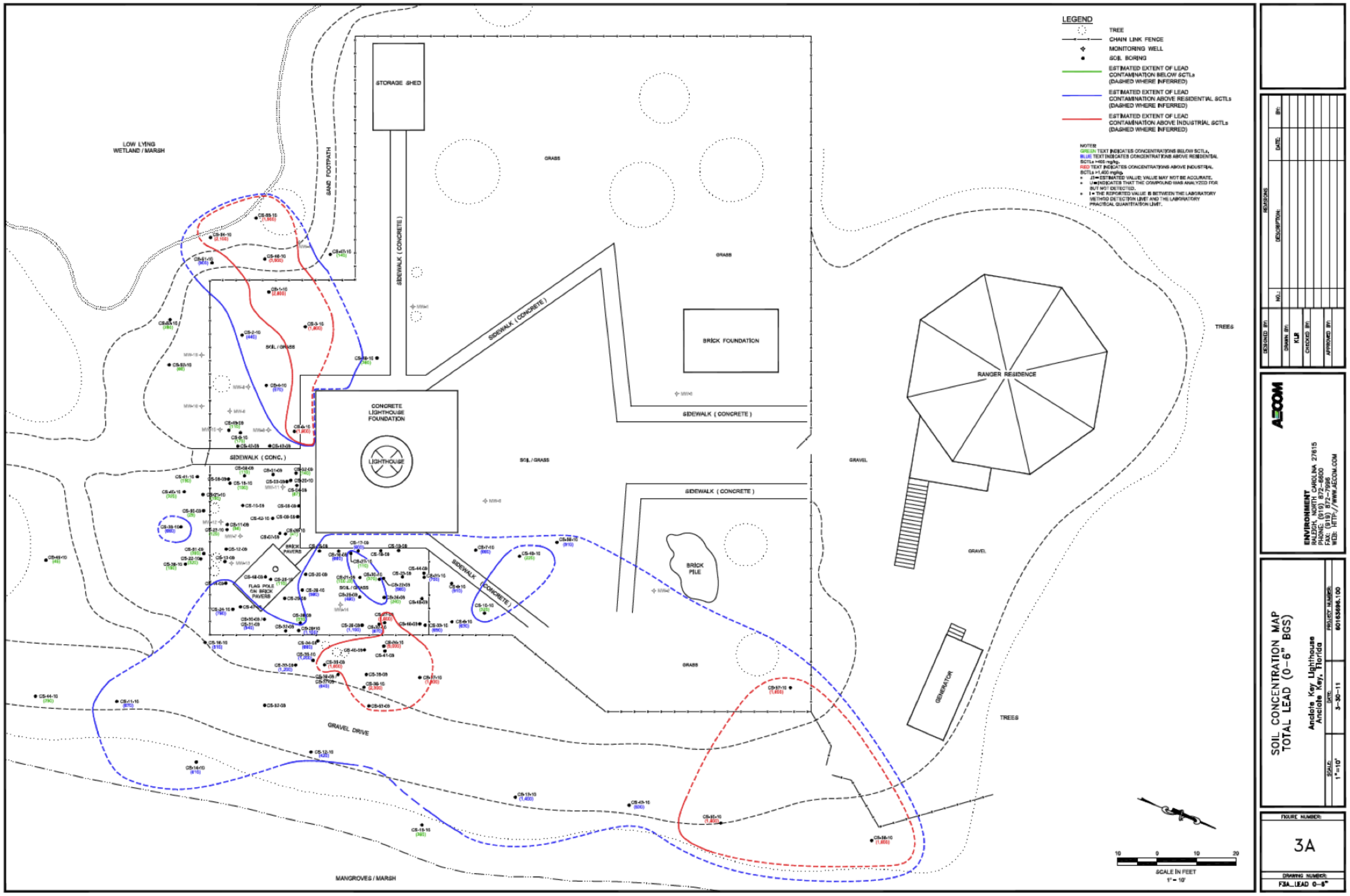


Figure A1. Concentrations of lead in soil 0-6''. The blue line represents the extent of lead contamination exceeding the residential SCTLs, The red line represents the extent of lead contamination exceeding the industrial SCTLs. Map was provided by AECOM, in the Site Assessment Report Addendum #2, June 16, 2011.

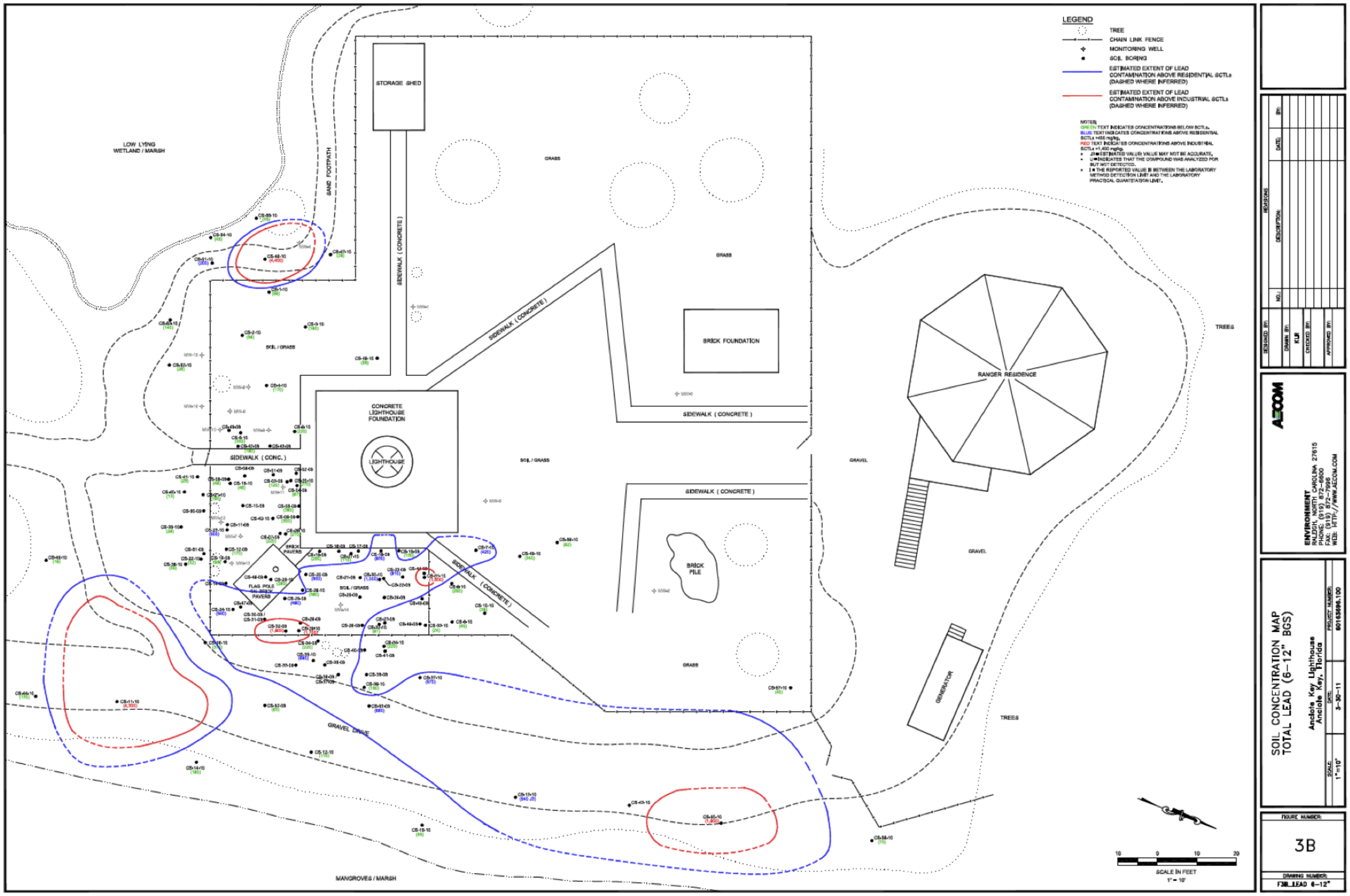


Figure A2. Concentrations of lead in soil 6-12''. The blue line represents the extent of lead contamination exceeding the residential SCTLs. The red line represents the extent of lead contamination exceeding the industrial SCTLs. Map was provided by AECOM, in the Site Assessment Report Addendum #2, June 16, 2011.

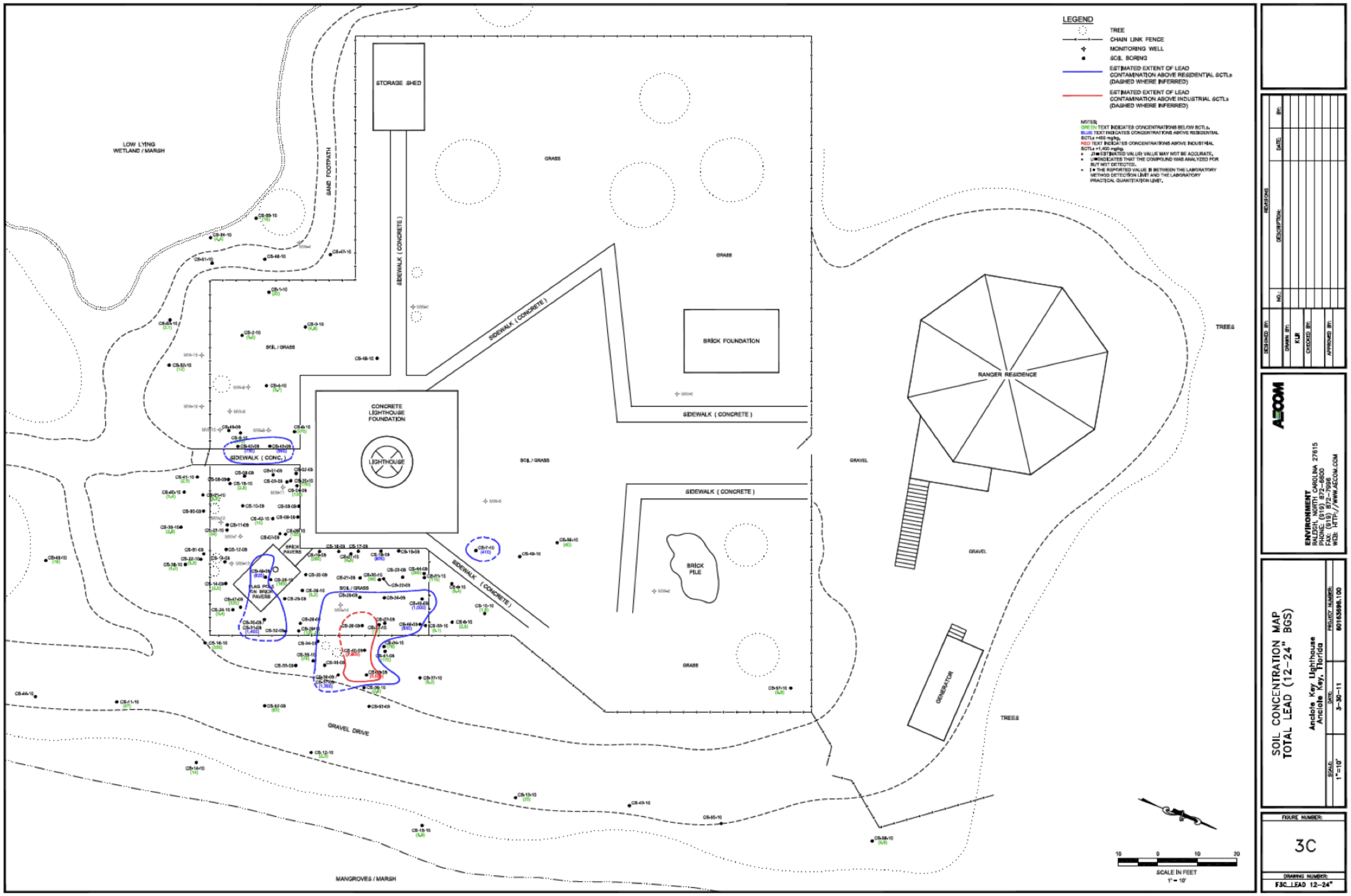


Figure A3. Concentrations of lead in soil 12-24''. The blue line represents the extent of lead contamination exceeding the residential SCTLs. The red line represents the extent of lead contamination exceeding the industrial SCTLs. Map was provided by AECOM, in the Site Assessment Report Addendum #2, June 16, 2011.

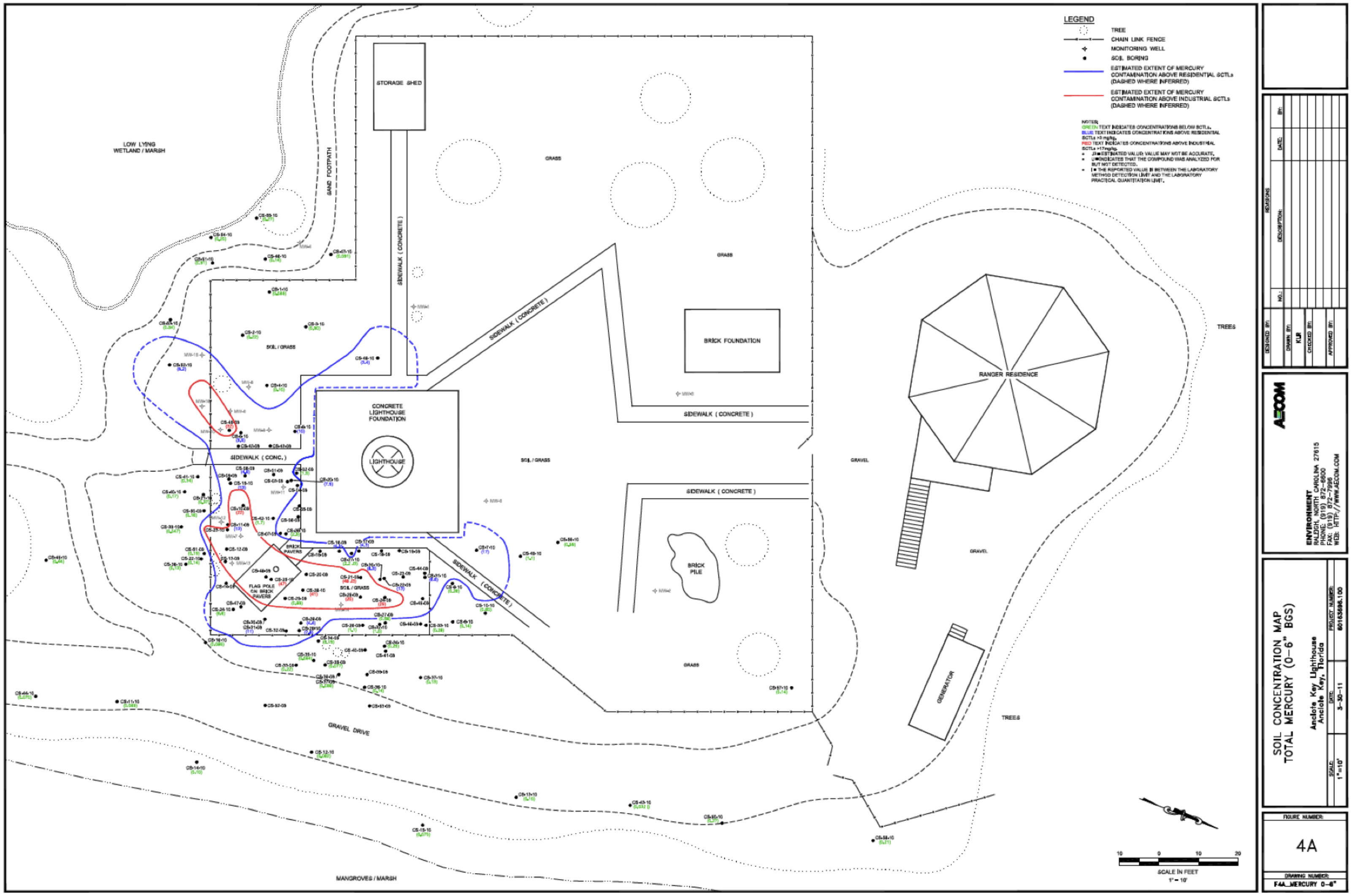


Figure A4. Concentrations of mercury in soil 0-6''. The blue line represents the extent of mercury contamination exceeding the residential SCTLs. The red line represents the extent of mercury contamination exceeding the industrial SCTLs. Map was provided by AECOM, in the Site Assessment Report Addendum #2, June 16, 2011.

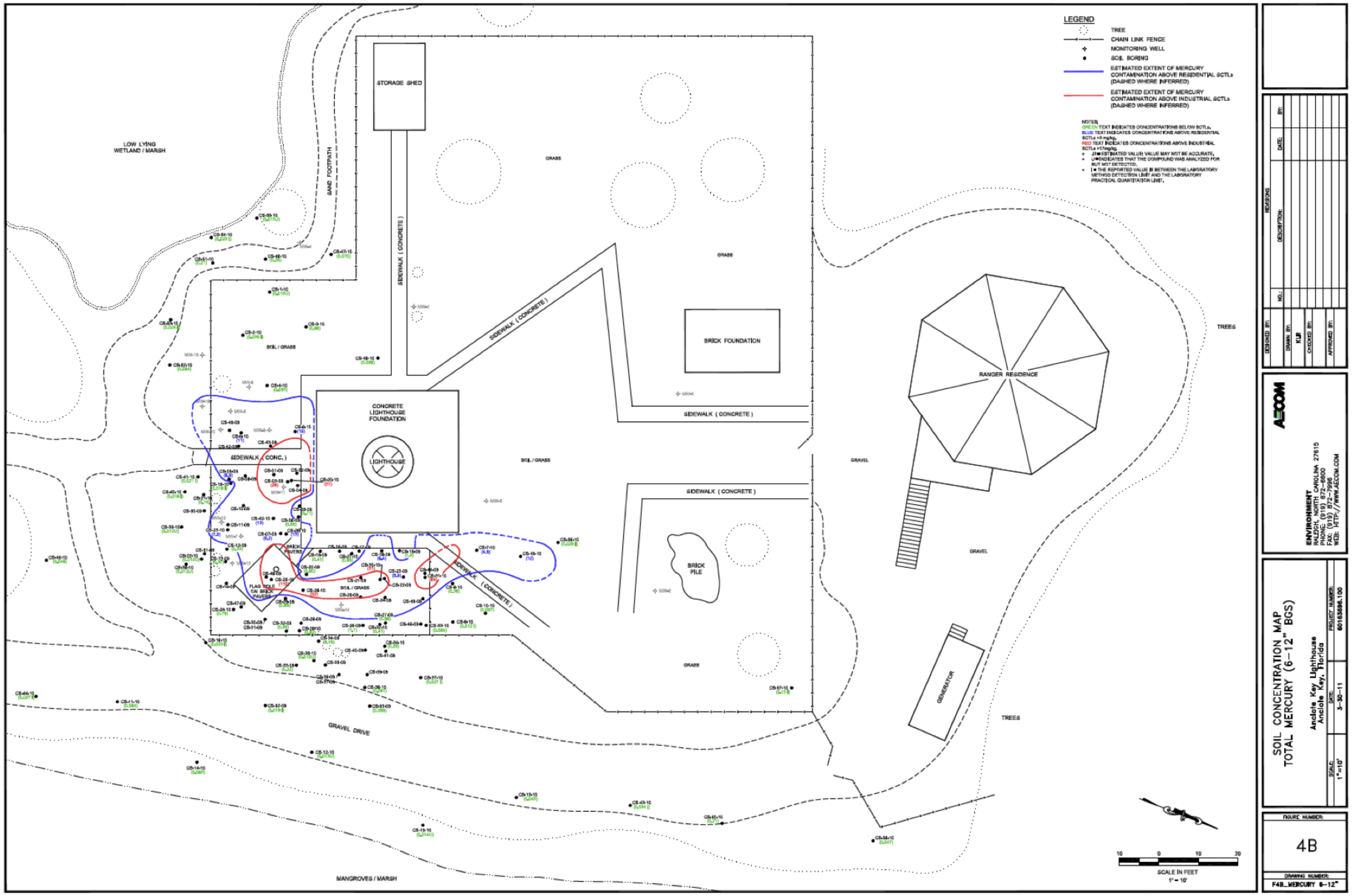


Figure A5. Concentrations of mercury in soil 6-12''. The blue line represents the extent of mercury contamination exceeding the residential SCTLs. The red line represents the extent of mercury contamination exceeding the industrial SCTLs. Map was provided by AECOM, in the Site Assessment Report Addendum #2, June 16, 2011.

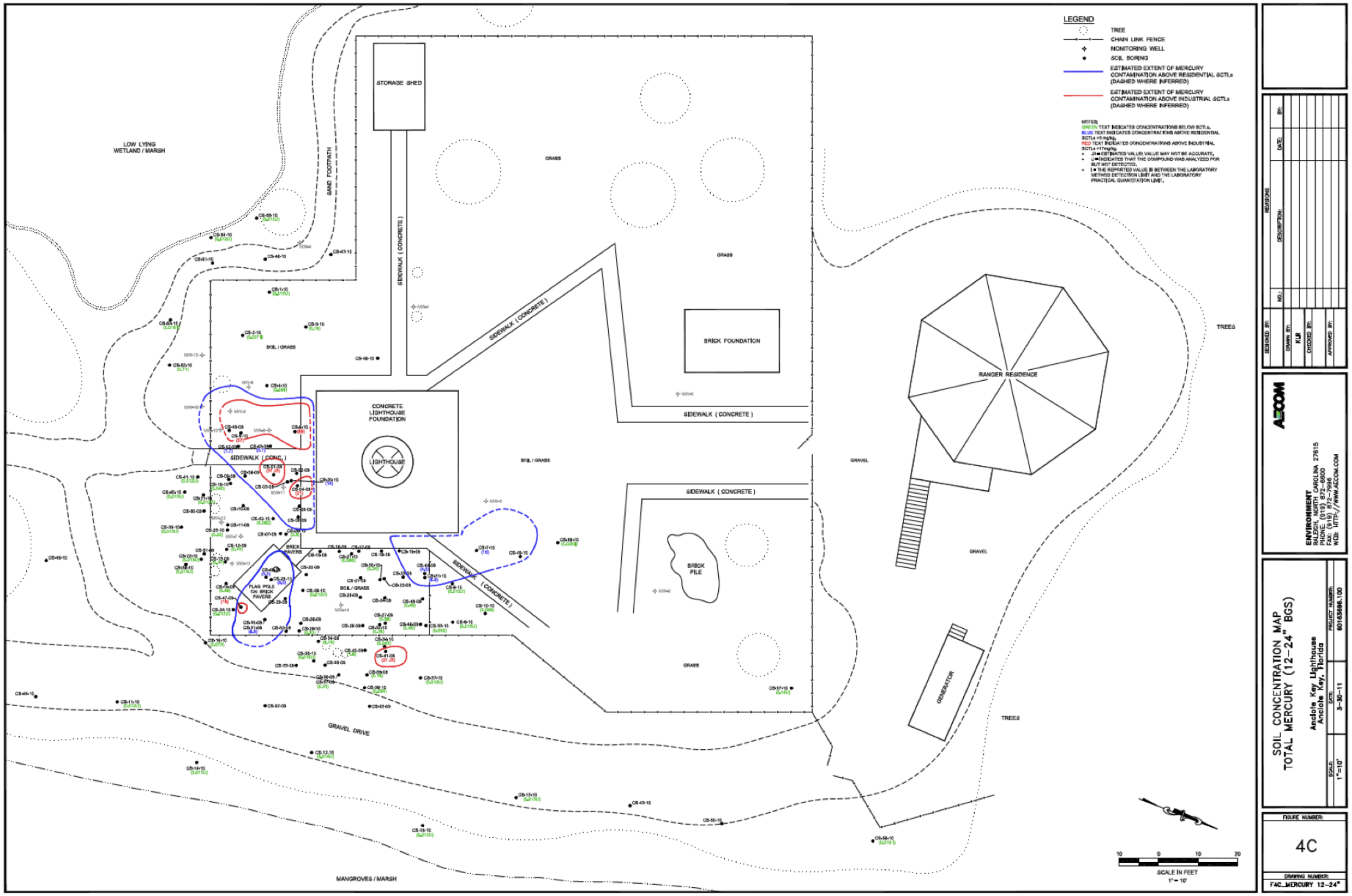


Figure A6. Concentrations of mercury in soil 12-24''. The blue line represents the extent of mercury contamination exceeding the residential SCTLs. The red line represents the extent of mercury contamination exceeding the industrial SCTLs. Map was provided by AECOM, in the Site Assessment Report Addendum #2, June 16, 2011.

Appendix B

Incremental Sampling Checklist

Incremental Sampling Checklist

General Items

Pens and Sharpies
Coolers
Ice, water, Gatorade
Documentation supplies (e.g. field book, camera, field activity logs)
Workplan and figures
Trash bags
HASP

Sampling Equipment

Stainless steel rods, handles and coring tips
Pry bar
Mallet and block
Drill, auger bit, generator, gas, extension cord, paper plates
Stainless spoons and scoops
Scale (requires 6 AA batteries)
PVC sections and PVC pipe cutter
Funnel
1-gallon and 2-gallons bags
1-gallon containers (6) and labels
Work gloves, sampling gloves
Trays and aluminum foil
Clean 5-gallon bucket
Sampling coolers
Custody seals
Chain-of-custody paperwork

Decon Supplies

5-gallon buckets and brushes
Gloves
Liquid soap
Organic-free water, DI water
Alcohol and squeeze bottle
Handy-wipes

Survey Equipment

Tripod, transit, both types of rods and rod level
Plumb-bob and string

Compass
Two tape measures (300’ and 100’)
Pin flags (four colors, 50 each)
Maps
Walkie-talkies
GPS unit and extension
Spray paint