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QUALITY ASSURANCE PROJECT PLAN FOR GOLF COURSE WITH TRANSMITTAL LETTER NAS CECIL FIELD FL
10/4/2002
U S EPA REGION IV

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4, SCIENCE and ECOSYSTEM SUPPORT DIVISION
ATHENS, GEORGIA 30605

OCT 0 4 2002

4SESD-EIB

MEMORANDUM

SUBJECT: Golf Course QAPP, NAS Cecil Field, Jacksonville, Florida.
SESD Project No. 03-0032

FROM: Fred Sloan
Superfund and Air Section

THRU: Archie Lee, Chief
Superfund and Air Section

To: Debbie Vaughn-Wright, RPM
BRAC Team
Federal Facilities Branch
Waste Management Division

The subject document is attached. The changes requested have been made, including moving all sample locations on green #8 approximately 6 feet north.

If you have any questions or comments, please call me at 706-355-8617, or email at sloan.fred@epa.gov.

United States Environmental Protection Agency, Region 4
Waste Management Division (WMD)
61 Forsyth Street, SW
Atlanta, GA 30303-8909

Science and Ecosystem Support Division (SESD)
980 College Station Road
Athens, GA 30605

QUALITY ASSURANCE PROJECT PLAN FOR THE NAS CECIL FIELD GOLF COURSE SITE, JACKSONVILLE, FLORIDA

Remedial Project Manager: Debbie Vaughn-Wright
Waste Management Division

SESD Project Leader: Fred Sloan
Science and Ecosystems Support Division

United States Environmental Protection Agency, Region 4
September, 2002

SIGNATURE PAGE

Project: NAS Cecil Field Golf Course Investigation
SESD Project Number: 03-0032

Management Approvals:

Antonio Quinones
Branch Chief, EIB

Signature 10/4/02 Date

Archie Lee
Section Chief, SAS

Signature 10/4 Date

Debbie Vaughn-Wright
Remedial Project Manager

Signature 10/8/02 Date

Extramural Project Personnel:

Fred Sloan
SESD Project Leader

Signature 10/4/02 Date

Executive Summary

The purpose of this investigation is to determine to determine if data collected from all greens is representative of individual greens. Specifically, if data collected from individual greens have similar ranges and variability, then the data collected from the Navy's initial investigation may be used to characterize the greens. This is to be accomplished by determining the range of concentration of arsenic, chlordane, dieldrin, and heptachlor epoxide across two of the greens. In discussions, a shorthand way of speaking of this assumption has developed. This shorthand speech states: "a green is a green." What is meant by this shorthand speech is what is stated above: that the range and variability of the four constituents are similar across two of the greens, and, if so, this fact will be sufficient to support the hypothesis that the range and variability are similar across all eighteen greens.

It was decided at the July Base Closure Team (BCT) meeting that the predicted range of the contaminants would be from the UCL90 on the 10th percentile to the LCL90 on the 90th percentile. Ted Simon of the USEPA Office of Technical Services (OTS) has calculated these ranges and the number of samples required to have a 95% probability of exceeding that predicted range. The number of samples required per green is 36.

To clarify, 36 soil samples will be collected from a green. Considering arsenic as an example, the predicted range of arsenic is 3.5 to 22 mg/kg. If the arsenic concentration of one or more of these 36 samples is 3.5 mg/kg or less, <u>and</u> one or more samples has a concentration that is 22 mg/kg or greater, then the predicted range for arsenic will have been exceeded for that green. If the predicted range for arsenic is exceeded, then the extant Navy sampling from all the greens should be considered representative of a single green. This comparison will be repeated for all four contaminants on both greens.

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1.0 INTRODUCTION

During the weeks of October 7 and October 15, 2002, the USEPA Region 4, Science and Ecosystem Support Division (SESD) will conduct a Field Investigation (FI) at the Facility 239, PSC-51 Golf Course Site (NAS Cecil Field Golf Course). The golf course is located in Duval County, Florida (see **Figure 1-1**). This investigation was requested by Dawn Taylor and Debbie Vaughn-Wright of the USEPA, Region 4, Waste Management Division, Federal Facilities Branch.

This Quality Assurance Project Plan (QAPP) for conducting the FI at the Golf Course Site was developed by the United States Environmental Protection Agency (EPA), Region 4, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA), of 1986 (EPA 1986). The EPA Guidance for Quality Assurance Project Plans (EPA QA/G-5, 1998) was followed during the development of this QAPP.

The purpose of this investigation is not to determine whether the EPC was correctly specified but whether the data collected across all greens should be considered representative of data collected at individual greens.

1.1 Background/Site Location

The golf course at Cecil Field was developed approximately 56 years ago. It is located at 13715 Lake Newman Street, Jacksonville, Florida, on the site of the former NAS Cecil Field. The sod on the putting greens was replaced in 1991.

1.2 Previous Sampling Activities

During the Navy study, one to two soil samples were collected from each of the 18 putting greens. High levels of arsenic, dieldrin, chlordane, and heptachlor epoxide were found in some of these samples, while other samples had reported low or non-detectable concentrations.

1.3 Current Field Investigation

For this investigation, it is proposed that SESD will collect samples from the green with the lowest reported arsenic concentration (#15) and the highest reported concentration (#8).

Soil samples will be collected from 36 locations on green #15 and 36 locations on green #8. Samples will be analyzed for arsenic, chlordane, dieldrin, and heptachlor epoxide to determine the statistical distribution of these contaminants on the golf course putting greens. **Figure 1-2** shows the locations of the greens.

2.0 SAMPLING/DATA QUALITY OBJECTIVES

2.1 Data Quality Objectives

The Data Quality Objectives (DQO) process for Superfund has been used in developing this QAPP, in accordance with the Guidance for the DQO Process (EPA QA/G-4, 2000). DQOs are useful in identifying the study objectives and decisions to be made and the criteria by which the data will be assessed. These data are then used for decision making.

DQOs need to be established prior to data collection and integrated with the project planning process so that sufficient data of known quality are collected to support sound decision making. DQOs are developed using an interactive approach to decision-making based on seven steps detailed in the guidance. The seven steps are:

- Problem statement
- Identify the decisions
- Identify the inputs into the decision
- Define the boundaries of the study
- Develop decision rules
- Specify tolerable limits on decision errors
- Optimize the design for obtaining data

The DQOs for this project were developed by Dr. Ted Simon, USEPA, Region 4.

2.1.1 Problem Statement

The problem here is determining whether the data collected from greens across the entire golf course during the Navy's initial investigation are representative of data that would be collected from individual greens in terms of their ranges and variability. Because of the uncertainty in future land use, the areal density of sampling may not be sufficient to characterize smaller individual exposure units in the future residential scenario. Simply put, the problem is whether the existing Navy data can be used to determine the EPC for the 4 constituents in question.

2.1.2 Identify the Decision

The decision is as follows: if a constituent fails the "predicted range" test, then the Brown and Forsythe test will be applied to examine the range and variability of the data. If it is concluded that the data on the individual greens are dissimilar with regard to their ranges and variability, then additional activities or investigations may be conducted. Should additional work be needed, the nature of these activities will be specified further at that future time.

2.1.3 Decision Inputs

There are two inputs to this decision. The first input is the Navy's surface soil sampling results. The second input is the set of results that will be obtained from this proposed sampling.

2.1.4 Study Boundaries

For the range of the individual chemicals, the geographic study boundaries will be green #8, which had highest concentration of arsenic in the Navy study, and green #15 which had the lowest concentration of arsenic. The contaminants of interest are arsenic, chlordane, dieldrin, and heptachlor epoxide. Each of these contaminants had UCL95 values exceeding the FDEP soil clean-up target levels (SCTLs), based on the Navy study.

2.1.5 Decision Rule

The null hypothesis is that the proposed samples will have the same range as the Navy study. The alternative hypothesis is that the proposed sample will have a lower range than the Navy study. To be more explicit, the null hypothesis is that the data from a green fall outside the predicted range (i.e., at least one point is less than the minimum and at least one point is greater than the maximum of the predicted range). The alternate hypothesis is all data fall within the predicted range or only one of the extremes of the predicted range is exceeded. If the data for the four constituents from both greens have concentrations outside both ends of the predicted range, then the greens data collected from the initial investigation can be used to determine the exposure point concentration for the greens. If the null hypothesis is not true, then the Brown & Forsythe test will be run for those constituents that fail. If the Brown and Forsythe test indicates that variability of both sets of green data is similar, then the data from the initial investigation can be used. If the variability between the greens is not similar, additional evaluation or investigation may be necessary.

The decision rule functions to determine whether the existing Navy data may be used to characterize exposure units smaller than the entire golf course, e.g. a future residential scenario.

2.1.6 Error Limits

The specification of the error limits requires (1) a choice about the percentiles of the contaminants identified in the Navy study that represent the two ends of the range and (2) a choice about the confidence limits on these percentiles. For the first, the 5th percentile and the 95th percentile of the Navy Data will be used to represent the range. There is a 90% range of variability in samples used to represent the true range. Second, the upper 90th confidence limit of the 10th percentile of the proposed sample and the lower 90th confidence limit of the 90th percentile of the data from this investigation will be used as tolerable limits on this range. These will be called the "inner" confidence limits percentiles. The concentration range between the inner confidence limits is called the predicted range.

2.1.7 Optimize Sampling Design

The choice of the null hypothesis allows the use of a predicted range determined from confidence limits on percentiles from the Navy study data as representative of the proposed sample. A nonparametric method to obtain the optimum number of samples was used to determine whether the Navy data is representative of all greens and hence, any single green.

Predicted Range of Contaminant Concentrations on a Single Green

Estimated quantiles can be obtained by interpolation. Gilbert (1987) provides a method for nonparametric estimation of confidence limits on quantiles:

$$LCL = p(n+1) - Z_{1-\alpha/2}\sqrt{np(1-p)}$$

$$UCL = p(n+1) + Z_{1-\alpha/2}\sqrt{np(1-p)}$$

Where p = percentile or quantile of interest
N = sample size
$Z_{1-\alpha/2}$ = Z-score corresponding to the level of confidence

Using arsenic as an example, the lower confidence limit of the 90th percentile of the arsenic concentrations on the greens is:

$$LCL = 0.90(22+1) - 1.96\sqrt{22*0.90(1-0.90)} = 21.48$$

Linear interpolation between the 21st and 22nd ranked values indicates a value of 22.3 ppm is the lower 90 percent confidence limit on the 90th percentile.

For the upper confidence limit of the 10th percentile of the arsenic concentrations on the greens is:

$$UCL = 0.10(22+1) - 1.96\sqrt{22*0.10(1-0.10)} = 4.52$$

Linear interpolation between the 4th and 5th ranked values indicates a value of 3.5 ppm is the upper 90 percent confidence limit on the 10th percentile. Therefore, 3.5 ppm to 22.3 ppm is the predicted range for arsenic. However, practical limitations in sample analysis limit data reporting to only two significant digits. Therefore the predicted range that will be used for arsenic is 3.5 ppm to 22 ppm.

Table 2.1 shows the LCL and UCL (as a rank), the interpolation (as a concentration), and the predicted range (including any necessary rounding) for all four contaminants.

Nonparametric Method for Power Calculation and Sample Number

A nonparametric bootstrap estimation method was used to obtain the probability that another random sample from the same data set (fictively, a single green according to the null hypothesis) would have a 95% probability of exceeding the predicted range of 3.5 to 22 ppm.

If every green has similar arsenic concentrations for example (the null hypothesis), then how many samples would be needed to be 95% confident that the greens were indeed similar. Note this is a measure of the power of this statistical procedure. If the concentrations of arsenic occurred in a normal or lognormal distribution, standard statistical methods could be used to estimate power.

10000 bootstrap iterations of a range of sample sizes from n=26 through n=40 were constructed using Excel and Crystal Ball software. A cell with a conditional statement assigned a value of 1 to a forecast if any of the predicted ranges were exceeded in any given bootstrap iteration at a given sample size. If none of the ranges were exceeded, the cell was assigned the value of zero. With many iterations, the mean of this forecast cell (with values of either one or zero) would equal the probability of exceeding the range given that the samples were obtained from identical populations. The probability of exceeding the predicted ranges will be greater than 95% if 36 samples from a single green are taken.

3.0 INVESTIGATION MANAGEMENT PLAN

3.1 Field Project Responsibilities

The overall field investigation/sampling phase of the project and any field decisions will be the responsibility of the Field Project Leader, Fred Sloan. The site safety officer will be responsible for monitoring health and safety of the sampling/investigative personnel. The Field Project Leader will be responsible for the following field activities:

- Ensure that all field activities are communicated and coordinated with the Remedial Project Manager, Debbie Vaughn-Wright.
- Monitoring overall field project quality control.
- Coordinating field scheduling of work with other Section and Division activities.
- Overseeing and managing field technical resources including non-sampling field activities.
- Coordinating sample analyses with the laboratory.

The following is a partial list of the personnel that will be involved in the field operations for this investigation and their responsibilities:

• Debbie Vaughn-Wright	RPM
• Fred Sloan	Field Project Leader
• Jon Vail	GPS/Sample Team Leader
• Don Hunter	Safety Officer/Sample Team Leader
• Sandee Wewers	Sampler
• ESAT	FORMS II Lite Support

This list may be supplemented by other resources, including contract personnel, to be provided on an as-needed basis. All field investigators are required to have 40 hours of hazardous waste site safety training, and specific knowledge and expertise of sample collection and safety techniques in accordance with the EISOPQAM.

3.2 Site Control and Access

Since investigation activities will be conducted on an active golf course, it is anticipated that golfers may be present during investigation activities and site control and access will be unrestricted. However, investigation personnel will be required to conduct activities so as not to pose any threat or endangerment to golfers and others in the area. Golfers will be asked to remain clear of sampling activities for their own safety. If investigation activities cannot, in the

opinion of the field project leader, safety officer, or sample team leaders, be conducted due to the proximity of area residents, then operations will cease until such time as they can be safely resumed.

The Greens Keeper and the General Manager will be contacted for access approval prior to the commencement of sampling. Access arrangements will be made by the Remedial Project Manager, Debbie Vaughn-Wright. If SESD is refused access to the site, this will be recorded in the field log book and sampling personnel will immediately leave the property until such time as permission or authority to sample can be obtained.

During the investigation, field vehicles will be located such that they do not interrupt the day to day activities that are conducted at the golf course. Each field vehicle will maintain a copy of this QAPP and the Field Health and Safety Plan during all investigation activities.

3.3 Sample Collection and Handling Procedures

All samples will be containerized, preserved, handled, and documented in accordance with the EISOPQAM. A copy of the manual, in addition to the Field Health and Safety Plan, will be maintained by the field project leader for reference during all phases of the field sampling activities. If any deviations in sampling procedures are used, these deviations will be recorded in the field log books.

Samples will be collected using the same procedures used by the Navy contractor: the cup-cutter (6" diameter turf cutting auger used for boring cup holes) will be used to remove approximately 4" of turf. The turf will then be set aside to plug the hole at the completion of sampling. The sample will then be collected from the open hole using a spoon (approximately 3" depth). The sample will then be thoroughly mixed and containerized.

3.4 Sample Analysis and Validation

Samples will be analyzed by the SESD laboratory. Samples for arsenic analysis will have a Quantitation Limit less than 3.5 mg/kg. Samples for chlorinated pesticide analysis will have a Quantitation Limit less than 22 ug/kg for dieldrin and heptachlor epoxide, and less than 450 ug/kg for chlordane.

Completeness will be achieved for 99 percent of all the samples collected (1 percent may be lost as a result of sample breakage in the laboratory or during transport). It is also anticipated that 99 percent of the samples analyzed will result in valid data. Using sampling and analytical procedures as outlined in the Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM, EPA 2001) and the Analytical Support Branch Operations and Quality Control Manual (ASBOQCM, EPA 2001) errors introduced in the decision making process will be minimized.

3.5 Chain of Custody

All chain-of-custody and record keeping procedures will be in accordance with the EISOPQAM. Chain-of-custody procedures are comprised of the following elements; 1) maintaining sample custody and 2) documentation of samples for evidence.

As defined in the EISOPQAM, a sample or other physical evidence is in custody if:

- it is in the actual possession of an investigator;
- it is in the view of an investigator, after being in their physical possession;
- it was in the physical possession of an investigator and then it was secured to prevent tampering; and/or
- it is placed in a designated secure area.

3.5.1 Sample Tags

A sample tag will be completed for each of the samples sent to the SESD laboratory using waterproof, non-erasable ink as specified in Section 3 of the EISOPQAM. The completed tags will be signed by the either the sampler, designated sample team leader, or the project leader and attached to the appropriate samples.

3.5.2 Sample Custody Seals

The SESD samples will be sealed as soon as possible following collection as specified in the EISOPQAM. An investigator custodian will write the date and their signature or initials on the seal.

3.5.3 Chain-of-Custody Record

The field Chain-Of-Custody Record is used to record the custody of all samples sent to the laboratory. All of these samples shall be accompanied by a Chain-Of-Custody Record. The Chain-Of-Custody Record documents transfer of custody of samples from the sample custodian to another person, the laboratory, or other organizational elements. To simplify the Chain-of-Custody Record and eliminate potential litigation problems, as few people as possible should have custody of the samples or physical evidence during the investigation.

The Chain-Of-Custody Record also serves as a sample logging mechanism for the laboratory sample custodian. A Chain-of-Custody Record will be completed for all samples or physical evidence collected. A separate Chain-of-Custody Record should be used for each final destination or laboratory utilized during the investigation.

3.6 Station and Sample Identification

Sample identification numbers will be assigned using the following format:

##XXZZZ where:

##	A two digit number indicating the green sampled (08 or 15).
XX	A two digit number (assigned sequentially) to identify the sample (01-36).
ZZZ	An three letter code assigned to the sample as needed to identify it as a split (SPL).

3.7 Site Mapping

The location of all sampling stations will be horizontally located in the field (1 meter accuracy) using Global Positioning System (GPS) techniques and placed on the base maps. In areas of the site where a GPS signal cannot be received, sampling stations will be located using a tape and compass from a known point.

3.8 Sample Containers

Sample containers will be obtained from the SESD Field Equipment Center in Athens, Georgia. These 8 oz. glass containers comply with the requirements specified in Appendix A of the EISOPQAM.

3.9 Investigation Schedule

The field investigation is scheduled to occur during the weeks of October 7 and 15, 2002. During the investigation SESD will:

- Collect soil samples from greens 8 and 15 at the former NAS Cecil Field golf course.

- Collect location data for sampling points using GPS techniques (Section 3.7). This data will be used to produce site map with sampling locations.

- Collect and dispose of any IDW generated.

4.0 SAMPLING DESIGN AND RATIONALE

Surface soil samples will be collected during this field investigation. The purpose of this sampling is to determine the range and variability of the four constituents in question at individual greens.

4.1 Sampling Design

Seventy-two sampling locations were selected as follows. The area of each green was divided by the number of samples (36) to provide the area of each sample grid. The square root of the area in turn provided the dimensions of the sample grid. Sample locations are at the center of each of the 36 sample grids. The grid centers were then placed on the greens manually to ensure that each sample location fell within the boundary of the green. Proposed sampling locations are shown on **Figures 4-1** and **4-2**.

4.2 Data Validation/Usability

The data generated from the samples will be validated in accordance with the ASBOCQM.

A case narrative and data qualifier report will be generated for the data. The case narrative provides a summary of any deficiencies associated with each data set. The data qualifier report alerts the project leader of quality control problems identified during the data validation process. The field project leader will review the data qualifier report to determine any data limitations and may consult with the Office of Quality Assurance (OQA) staff to determine the impact of any qualified data on overall data usability for the project. Detailed guidance for data assessment may be found in the Guidance for Data Quality Assessment (EPA QA/G-9 1996). The RPM, in consultation with the field project leader, will make a determination if the data are acceptable for decision making at the site.

Review and validation of all data should be completed within 45 working days upon receipt of the samples. The data review and validation is scheduled for completion the week of December 2, 2002. SESDs procedures for data validation may be found in the ASBOCQM.

4.3 Data Management/Document Control

A final report will be written at the conclusion of the investigation in accordance with the EISOPQAM. All environmental and QA/QC data will be evaluated and data sheets will be attached to the report. Significant QA/QC issues regarding sample collection, handling, and analysis will be identified in the report. Results of any audits will also be included in the report. Project files will be maintained in accordance to the EISOPQAM. The field project leader will review the file at the conclusion of the project to ensure completeness. The final report is expected to be completed within three weeks of the receipt of the validated data, which is

December 23, 2002. Laboratory will be released to the Remedial Project Manager as it becomes available, if desired.

5.0 QUALITY ASSURANCE

Quality assurance (QA) procedures must begin in the planning stage and continue through sample collection, analyses, reporting and final review. The methods that will be used to ensure data quality are discussed below.

5.1 Organization and Responsibilities

The field project leader has overall responsibility for field QA. The precision, comparability and accuracy of sample analyses will be addressed in accordance with the ASBOCQM.

5.2 Field QA/QC Samples

5.2.1 Matrix Spike/Matrix Spike Duplicate

Samples for laboratory quality control analyses (matrix spike/matrix spike duplicate, ms/msd) will be designated as specified in the EISOPQAM. One ms/msd sample will be designated for every 20 samples split to the SESD laboratory.

5.2.2 Sample Handling - On-Site Splits

At station locations designated 10, 20, and 30 split samples will be collected on each green to assess sample handling variability.

Two 8 oz. glass containers will be filled from the mixing pan. The letters "SPL" will then be appended to the sample ID of one of the containers being sent to the SESD laboratory.

5.3 Audits

Routine audits of laboratory activities may be conducted by the Inorganic and Organic Chemistry Section Chiefs. Independent laboratory audits may be conducted by the Region 4, QA Officer or his representative(s). Field audits may be conducted by the Chief of the Superfund and Air Section. Any problems identified during these audits will be addressed in a memo to the Field Project Leader who will take immediate steps to correct the identified discrepancies.

6.0 REFERENCES

1. Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA).

2. U.S. EPA, EPAQA/G-4, Guidance for the Data Quality Objectives Process, EPA/600/R-96/055, August 2000.

3. U.S. EPA, EPAQA/G-5, EPA Guidance for Quality Assurance Project Plans, EPA/600/R-98/018, February 1998.

4. U.S. EPA, Region 4, Analytical Support Branch Operations and Quality Control Manual Revision 1, (ASBOQCM). July 2001.

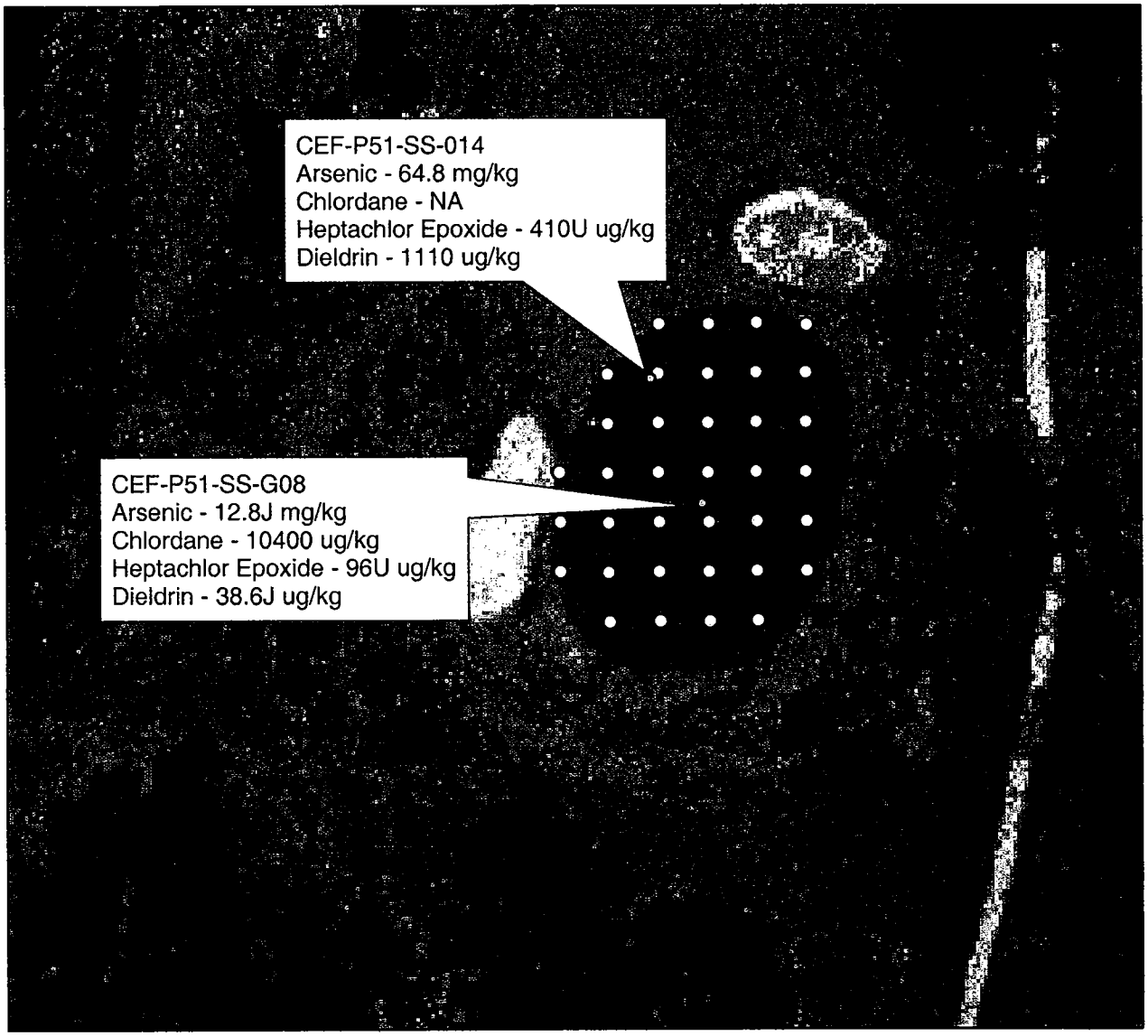
5. U.S. EPA, Region 4, Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM). November 2001.

6. Technical Memorandum For No Further Action, Facility 239, Potential Source of Contamination 51 - Golf Course. May 2002.

7. Statistical Methods For Environmental Monitoring. Gilbert, Richard O. 1987

APPENDIX A

Figures



Legend

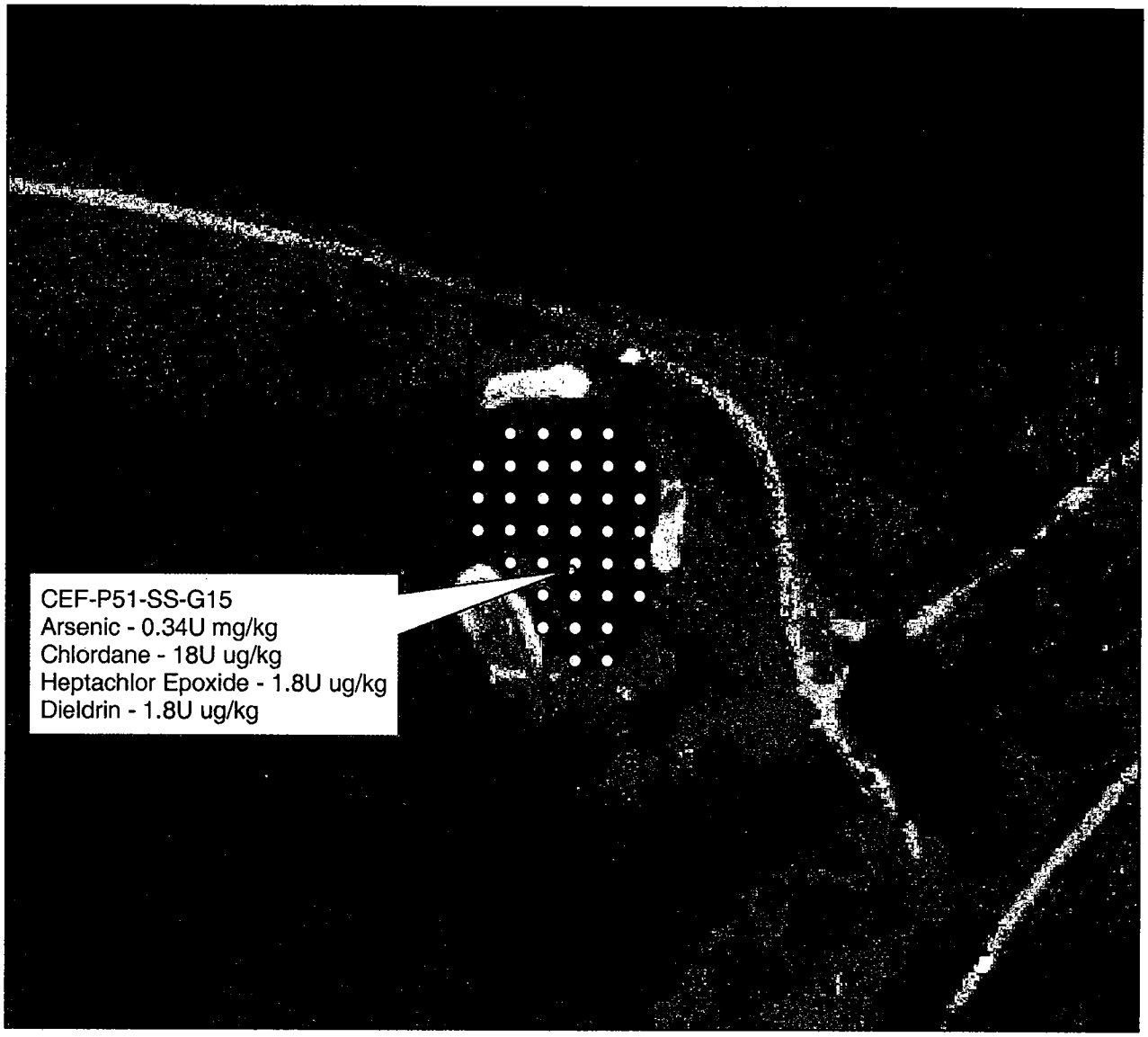
- Navy Samples
- Proposed Samples

Feet

0 25 50 100

N

Figure 4-1
Proposed Sampling Locations
Green #8
NAS Cecil Field
Jacksonville, Florida



Legend

- Navy Greens
- Proposed Samples

Feet
0 50 100 200

N

Figure 4-2
Proposed Sampling Locations
Green #15
NAS Cecil Field
Jacksonville, Florida

APPENDIX B

Tables

Table 2-1 Calculated Contaminant Ranges				
	Arsenic (mg/kg)	Chlordane (ug/kg)	Dieldrin (ug/kg)	H. Epoxide (ug/kg)
LCL90 on 90%ile as a rank	21.48	24.07	26.66	26.66
UCL90 on 10%ile as a rank	4.52	4.93	5.34	5.34
LCL90 on 90%ile as a concentration	22.3	59000	448.5	522
UCL90 on 10%ile as a concentration	3.5	450	22.4	22.2
Final predicted range (with rounding)	3.5 - 22	450 - 59000	22 - 450	22 - 520

Table 3-1 Sample Collection Summary	
Sample Description	No. of Samples
Surface Soil	72

Table 4-1 Projected Schedule	
Begin Field Investigation	October 7, 2002
Complete Field Investigation	October 18, 2002
Lab Analysis/Data Validation Complete	December 2, 2002
Final Report	December 23, 2002