# ANNEX H

## HAZARDOUS, TOXIC AND RADIOACTIVE WASTE

A-2 FEB Lands HTRW Audits
A-2 FEB Lands Correspondence
CERP Environmental Risk Assessment Protocol Documents

ANNEX H

PART 1

2012-2013 A2FEB LANDS HTRW AUDITS

# PHASE II
# ENVIRONMENTAL SITE ASSESSMENT

For the

**A-2 FLOW EQUALIZATION BASIN**
**PALM BEACH COUNTY, FLORIDA**

Prepared for

**SOUTH FLORIDA**
**WATER MANAGEMENT DISTRICT**
**ENVIRONMENTAL SCIENCE UNIT**
**MAINTENANCE MANAGEMENT SECTION**
**3301 GUN CLUB ROAD**
**WEST PALM BEACH, FLORIDA 33406**

Prepared by

**Professional Service Industries, Inc.**
**5801 Benjamin Center Drive**
**Tampa, FL 33634**
**Telephone (813) 886-1075**

**PSI PROJECT NO. 05521114**

**March 25, 2013**

Information To Build On
Engineering • Consulting • Testing

March 25, 2013

South Florida Water Management District
Environmental Science Unit
Maintenance Management Section
3301 Gun Club Road
West Palm Beach, Florida 33406

Attn: Mr. Robert Kukleski

Re: Phase II Environmental Site Assessment Report
A-2 Flow Equalization Basin
Palm Beach County, Florida
PSI Project No.: 05521114
SFWMD Work Order #8

Dear Mr. Kukleski:

In accordance with our agreement, Professional Service Industries, Inc. (PSI) has performed a Phase II Environmental Site Assessment for the above referenced project. The Phase II ESA Report is attached.

Thank you for choosing PSI as your consultant for this project. If you have any questions, or if we can be of additional service, please call us at (813) 886-1075.

Respectfully submitted,

**PROFESSIONAL SERVICE INDUSTRIES, INC.**

Stephen P. Long, P.E. P.G.
Chief Engineer

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**March 25, 2013**

Andrew Cadle
Project Scientist

Steve Long
Chief Engineer

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# 1. INTRODUCTION

## 1.1 PROPERTY/PROJECT DESCRIPTION

The proposed A-2 Flow Equalization Basin (FEB) project encompasses approximately 14,408 acres of agricultural land located between US Highway 27 and the Miami Canal, in southern Palm Beach County. A USGS Topographic Map and Site Vicinity Map showing the property boundaries are provided on **Figures 1 and 2**.

The property has been cultivated in sugar cane since the early 1960's. PSI has previously completed a draft Summary Environmental Report for the A-2 FEB, dated September 17, 2012. The report describes the due diligence assessment that was performed by the District when the property was acquired, as well as further assessment and remediation efforts that were performed by PSI, on behalf of Talisman Sugar Corporation. The Summary Environmental Report documents that all known point sources on the property have been addressed and the Florida Department of Environmental Protection (FDEP) has issued Site Rehabilitation Completion Orders (SRCOs) for all known point sources within the project boundary. However, no broad cultivated area sampling was performed on the property at the time the pre-acquisition assessment was completed. Therefore, sampling of the cultivated areas was requested by the United States Fish and Wildlife Service (USFWS) and FDEP.

## 1.2 AUTHORIZATION

This Phase II ESA was performed in substantive compliance with Work Order #8 under SFWMD Contract No. 4600002399.

## 1.3 SCOPE OF WORK

The scope of work for this Phase II ESA has been divided into three tasks, as follows:

Task 1 Phase II ESA Field and Laboratory Services
Task 2 SLERA and Geostatistical Analysis
Task 3 Report Preparation

A general description of the services included in these tasks is described below. A more detailed description is provided in Section 3.1 of this report.

**Task 1 Soil Sampling**

PSI collected soil samples in general accordance with the current *Protocol for Assessment, Remediation and Post-Remediation Monitoring for Environmental Contaminants on Everglades Restoration Projects*. The sampling procedures for composite sampling for large properties of greater than 1,000 acres was utilized, which required the collection of 50-acre composite samples from a representative fraction of

the property. Based upon agreement with SFWMD and USFWS, PSI collected samples from 10% of the property during the initial assessment.

All composite soil samples were analyzed for organochlorine pesticides by EPA method 8081, chlorinated herbicides by EPA method 8321, organophosphorus pesticides by EPA method 8270, total organic carbon (TOC), and RCRA 8 metals plus copper by EPA method 6010/7471.

## Task 2 SLERA and Geostatistical Analysis

PSI contracted with Formation Environmental to conduct a geostatistical analysis of the data and to prepare a Screening Level Ecological Risk Assessment (SLERA).

Once the composite soil sampling data was received, Formation performed standard statistical evaluation of the data to evaluate distribution, standard deviation, probability plots, and general statistical parameters.

The soil results were initially compared to human health cleanup target levels (e.g., SCTLs and GCTLs) and ecological screening values (e.g., SQAGs). Formation conducted a screening level ecological risk assessment (SLERA) on any constituents of potential ecological concern (COPECs) within the agricultural areas that exceeded the ecological screening levels. The SLERA was performed to determine whether the contaminant concentrations present a significant ecological concern. The SLERA consisted of the following tasks:

- A statistical evaluation of the sample results was prepared in order to calculate a mean and 95% upper confidence limit (UCL) estimate of the mean.
- 95% UCL values and maximum detected values of each COPEC were input into the USFWS/SFWMD Ecological Food Web Model (aka/ Goodrich model). Hazard quotients were calculated for each COPEC.
- Alternate cleanup target levels were proposed for any COPEC with a hazard quotient above one.
- The SLERA assumed worst-case conditions (i.e., that the property shall be flooded for significant portions of the year).
- The SLERA did not include any biological testing, bioaccumulation testing, desorption testing or other laboratory studies.

## Task 3 Report Preparation

Task 3 included the preparation of this written report. The primary objective for the written report is to describe the methodology and results of the Phase II ESA investigation. The report does not include significant discussion of point sources within the project footprint. These point source areas were all discussed in detail in the draft Summary Environmental Report, dated September 17, 2012. All of the point sources have been granted closure by the FDEP.

# 2. PROPERTY DESCRIPTION AND PHYSICAL SETTING

## 2.1 PROPERTY DESCRIPTION

The A-2 FEB project lands consist of eight separate parcels. The tract numbers, prior ownership, and acreage are shown in the table below.

| A-2 FEB | | |
|---|---|---|
| **Tract No.** | **Former Owner** | **Acreage** |
| D7100-044 | TALISMAN SUGAR CORPORATION | 2 |
| D7100-047 | TALISMAN SUGAR CORPORATION | 10 |
| D7100-066 | TALISMAN SUGAR CORPORATION | 12 |
| D7100-067 | TALISMAN SUGAR CORPORATION | 1 |
| D7100-104 | TALISMAN SUGAR CORPORATION | 14,371.53** |
| D7100-139 | TALISMAN SUGAR CORPORATION | 1 |
| D7100-141 | WEINLEIN, JOAN | 10 |
| D7200-005 | TALISMAN SUGAR CORPORATION | 1 |
| **A-2 Total** | | **14,408.53** |

** Note: Acreages shown include only the portion of the tract that is within the proposed limits of construction for the A-2 FEB project. The total acreage of Tract D7100-104 is 20,525 acres, and includes lands outside the current project footprint.

Most of the project area has been historically cultivated in sugar cane, with occasional rotational crops of rice or corn. The property is being leased to New Hope Sugar Corporation for sugar cane cultivation. There are no significant remaining structures on the property with the exception of a few pump stations, and all of the point sources on the property have been addressed and SRCOs have been issued by FDEP for all. A Site Plan is provided as **Figure 2**.

The primary parcel (Tract D7100-104) was acquired from Talisman Sugar Company in 1999 by the District. Several of the smaller parcels listed above were also owned and operated by Talisman Sugar Corporation, but these parcels were deferred from transfer during the original transaction until environmental concerns on these small areas could be addressed. The Weinlan parcel (Tract D7100-141) was leased to Talisman Sugar at the time of the 1999 acquisition and was evaluated with the remainder of Tract D7100-104.

Since the acquisition, the lands have been cultivated in sugar cane, with rotational crops of rice, beans, or corn. At the time of PSI's Phase II ESA, most of the sugar cane had been recently harvested from the fields, and replanting had been conducted. While agrochemical application may occur at any time during the life cycle of sugar cane, the agrochemical application schedule during replanting and early development is most intensive. Agrochemicals were being actively applied in some areas of the property

during the Phase II ESA, and PSI was instructed to refrain from sampling in fields that were marked with placards indicating application within the last two weeks.

The proposed project will consist of the construction of a Flow Equalization Basin (FEB) for water quality pre-treatment and storage. However, the project design is not yet complete and PSI was not provided with design details indicating the exact limits of the FEB or the expected depth to water or hydroperiod for the FEB. For the purposes of this document, PSI has assumed worst-case conditions that the entirety of the property will be inundated for at least a significant portion of each year.

## 2.2 PHYSICAL SETTING

### *2.2.1 REGIONAL GEOLOGY*

The region is overlain by layers of Peat known locally as "muck". Muck is an organically rich soil that forms when the rate of accumulation of organic matter exceeds the rate of decay. The accumulation rate can vary, but can be as much as 10 centimeters per 100 years. Much of the muck has been subjected to subaerial exposure since the dewatering of large areas of marshland through water drainage canals. This exposure has had the effect of causing the muck volume to steadily decrease through biochemical oxidation, compaction, erosion, and fire. It is estimated that the muck soil in these dewatered areas diminishes by as much as 1 inch per year.

Underlying the muck is the Fort Thompson Formation, which is locally referred to as the "cap rock" and is primarily dense, fossiliferous limestone. The Fort Thompson Formation is considered to be Pleistocene in age.

The Caloosahatchee Formation underlies the Fort Thompson Formation. The Caloosahatchee Formation is a marl that is composed of a sequence of sandy limestone lenses that are interbedded with layers of calcareous clays and sands. The Caloosahatchee Formation appears to straddle the Pliocene/Pleistocene boundary.

Underlying the Caloosahatchee Formation, the Tamiami Formation is a complex Pliocene age unit of sand, clay, and reef facies, all of which contain at least small amounts of phosphate. The Tamiami Formation occurs over much of southern Florida and is unconformably overlain by the Caloosahatchee and Fort Thompson Formations, which consist of highly fossiliferous carbonates and siliclastic sediments.

Underlying the Tamiami Formation is the Miocene-age Hawthorn Group, which is composed of a variety of sediments including carbonates, quartz sands, clay, and phosphate. The Hawthorn Group has been subdivided into two formations; the Peace River Formation forming the upper Hawthorn siliclastic section and the Arcadia Formation, which forms the lower Hawthorn carbonate section.

The Hawthorn Group is underlain by a 3000-feet thick carbonate sequence consisting of Oligocene and Eocene aged sediments. The Suwannee Limestone, the Ocala Limestone,

and the Avon Park Formation comprise the Oligocene sediments. The Eocene sediments are made up of the Oldsmar Formation.

### *2.2.2 Regional Hydrogeology*

The underlying hydrogeologic formations of the area may best be categorized as two aquifers separated by an impermeable confining zone.

The shallow, non-artesian aquifer system extends to a depth of approximately 150 feet BLS and is recognized as the northernmost extension of the Biscayne Aquifer. It consists primarily of the Fort Thompson, Caloosahatchee, and Tamiami Formations. The base of the shallow aquifer is marked by the top of the Hawthorn Group, which is the intermediate confining unit for the underlying Floridan aquifer.

The deep, artesian aquifer is known as the Floridan Aquifer and is the most productive aquifer in the area, with permeable zones as deep as 1,200 feet BLS. The Floridan Aquifer consists of the lower units of the Hawthorn Group, the Suwannee Limestone, the Ocala Group, and the Avon Park Limestone.

Groundwater levels throughout the area vary from one to six feet BLS. Groundwater flow in the surficial aquifer is generally to the south-southeast; however, flow direction is strongly influenced by the system of canals and pumping stations present throughout the area. When the canals are pumped and water levels in the canals are lowered, shallow groundwater tends to flow toward the canals.

# 3. PHASE II ESA METHODOLOGY

The intent of the Phase II ESA was to conduct sampling and laboratory analysis of representative soil samples from the cultivated areas of the subject property. No point source samples were collected as part of this assessment. PSI understands that data from this Phase II ESA will be used by SFWMD and USACE to evaluate whether residual agrochemicals are present in the surficial soils at concentrations that might pose potential human health and/or ecological risks associated with the use of these soils in the construction of the proposed A-2 Flow Equalization Basin.

## 3.1 SOIL SAMPLING METHODOLOGY

Field investigation and sampling activities were directed by Mr. Drew Cadle and Mr. Ryan Fetter of PSI during the days of January 22 through 25, 2013. The assessment was performed in general accordance with the authorized scope of work. All field sampling activities was performed in accordance with the FDEP Standard Operating Procedures for Field Investigation Activities (DEP-SOP 001/01).

Additionally, the U.S. Fish and Wildlife (FWS) has established a protocol for evaluation and sampling of historical agricultural properties in South Florida, titled *Protocol for Assessment, Remediation, and Post-Remediation Monitoring for Environmental Contamination on Everglades Restoration Projects (AKA/the ERA Protocol)*, which is an attachment to the Draft Memorandum of Agreement between United States Fish and Wildlife Service (USFWS or the Service) and SFWMD, dated March 13, 2008. PSI typically performs due diligence investigations on behalf of the District in strict accordance with the ERA Protocol. However, a less stringent investigation was agreed upon by SFWMD, FDEP, and USFWS in order to provide a general indication of large scale concerns on the property. The following requirements under the ERA Protocol were not met by this investigation:

- For very large properties (>1,000 acres), the ERA Protocol recommends dividing the property into 50 acre grids and collecting composite samples from a percentage of the grids. The percentage is not defined, but is to be agreed upon by SFWMD, USFWS, and FDEP, and has typically ranged from 25% to 50%. In this case, PSI sampled 10% of the grids. Based on previous experience with sugar cane cultivated areas with no history of row crops, we expected the chemical concentrations to be relatively uniform.

- For sites where composite samples are collected, the ERA Protocol requires analysis of discrete aliquots on a limited number of “clean grids”, as part of a false negative analysis. This false negative sampling was not performed as part of this investigation.

- For sites where composite samples are collected, the ERA Protocol requires analysis of discrete aliquots within sampling grids where composite results

indicate exceedances of the risk thresholds, in order to delineate the extent of impacted soil. This discrete sampling effort was not performed, therefore the entirety of any grids with exceeding results were assumed to be impacted.

The property was divided initially divided into 30 super-grids, each encompassing approximately 500 acres. Each super-grid was further subdivided into ten 50-acre grids. One grid was selected at random from each super-grid for sampling (i.e., 10%). In a few cases, the randomly selected grids were moved to another location within the super-grid due to remaining mature sugar cane or very recent agrochemical application within the selected grid. A composite sample was collected representing each selected 50-acre grid for laboratory analysis as described below:

- The samples were collected from the surficial soils at a depth of 0-6 inches. Samples were collected using a stainless steel hand auger and were composited in the field.
- In order to collect the composite samples, PSI further divided each 50-acre grid into ten, 5-acre sub-grids. PSI collected a close-proximity soil sample from approximately the center of each 5-acre sub-grid cell. Within each sub-grid cell, PSI collected a 5-point close-proximity composite sample by collecting equal aliquots from the center of the sub-grid cell, and five feet away in all four cardinal directions. The aliquots were homogenized in a stainless steel bowl using a stainless steel spatula or spoon. A 4-ounce aliquot of each sub sample was placed into a larger mixing bowl which was utilized to collect the composite samples. Once all ten subsamples were collected in the mixing bowl, the sample was further homogenized and a composite sample representing the entire 50-acre grid was collected in a 4 ounce glass laboratory container. The composite samples were labeled as Comp-1 through Comp-30. The soil sampling locations were recorded on a global positioning system (GPS) receiver with an accuracy of +/- 1 meter. The soil sampling locations are shown on **Figure 3**.
- The collected samples were placed in an iced cooler and shipped to the primary or secondary laboratory (splits) for laboratory analysis under chain of custody protocols. The soil samples were analyzed for organochlorine pesticides by EPA method 8081, chlorinated herbicides by EPA method 8321, organophosphorus pesticides by EPA method 8270, total organic carbon (TOC), and RCRA 8 metals plus copper and selenium by EPA method 6010/7471. The samples were immediately placed on ice and submitted to the analytical laboratory under chain of custody procedures.
- Duplicate and split soil samples and equipment blanks were collected for quality assurance purposes.
    - Duplicate samples were collected at a frequency of 10% of the collected samples by collecting an aliquot from the same mixing bowl as the primary sample. The duplicate samples were collected and analyzed using the

same procedures and methods as the primary sample, and were analyzed by the same laboratory.

- Split samples were collected at a frequency of 10% of the collected samples by collecting an aliquot from the same mixing bowl as the primary sample. The split samples were collected using the same methods as the primary samples, but the split samples were submitted to a different, secondary laboratory for analysis.

- One pre-cleaned equipment blank was collected prior to the initial sample collection event to evaluate the efficacy of the decontamination cleaning procedures used in PSI's office to pre-clean the equipment prior to mobilization. Field cleaned equipment blanks were also collected at a rate of one blank per sampling team per day during the sampling. The pre-cleaned and field cleaned equipment blanks were collected by running analyte free water over the decontaminated sampling equipment and then collecting the water in laboratory provided containers. The equipment blanks were analyzed for the same analytes as the soil samples.

# 4. PHASE II ESA RESULTS

## 4.1 REGULATORY GUIDANCE CONCENTRATIONS

Analyte concentrations in all media were compared to applicable or relevant and appropriate requirements, depending upon current and future proposed usage of each tract. These criteria are summarized below.

### *4.1.1 SOIL*

The following human-health based criteria are established by the FDEP in Chapter 62-777 of the Florida Administrative Code (FAC 62-777), for both direct exposure and leachability.

- ***Residential*** – The Soil Cleanup Target Level for direct exposure in a residential setting (SCTL-RDE) is the default standard for site screening purposes in Florida, and assumes potential contact with soils on a regular basis by adults and children.
- ***Industrial*** – The Soil Cleanup Target Level for direct exposure in a non-residential setting (SCTL-IDE) assumes extended contact with soils on a daily basis by adult workers at commercial/industrial sites, or on agricultural properties where farming practices result in frequent site contact. Use of this standard requires that a deed restriction be recorded against the property.
- ***Leaching to Groundwater*** – The Soil Cleanup Target Level for leaching to groundwater (SCTL-LGW) also represents a default standard for site screening purposes in Florida, and is based on soil concentrations which are considered likely to result in an exceedance of the groundwater quality standard for a particular chemical.
- ***Leaching to Surface Water*** – The Soil Cleanup Target Level for leaching to surface water (SCTL-LSW) is applicable where impacted soils may be in contact with a surface water body. These criteria were deemed appropriate for comparison because the entirety of the subject property may become inundated at the time of project construction. However, it should be noted that the SCTL-LSW criteria were developed based on soil proximity to Class III fresh water bodies. In this case, the FEB would not likely be considered as a Class III water body. While the SCTL-LSW are not directly applicable, they were used for comparison screening purposes.

### *4.1.2 SEDIMENT*

The FDEP has previously indicated that soils within proposed wetland or water storage areas should be regulated as sediments, as these soils will ultimately become inundated. For sediments, the Sediment Quality Assessment Guidelines (SQAGs) as defined in *Development and Evaluation of Sediment Quality Assessment Guidelines, Volumes 1-4*, (MacDonald, 2000) have generally been applied for screening purposes. The SQAGs are not a human health-based criteria, but are instead relevant only to the evaluation of ecological risk. The referenced guideline outlines two potential standards which were developed specifically with respect to benthic macroinvertebrate species, which represent the bottom of the food chain, as follows:

- ***No Observed Adverse Effects Level*** – The threshold effects concentration (SQAG-TEC) is the more conservative value and is utilized as a screening tool in evaluating sediments. Contaminant concentrations below the SQAG-TEC generally do not warrant further investigation.
- ***Lowest Observed Adverse Effects Level*** – The probable effects concentration (SQAG-PEC) represents the level above which adverse effects are likely to occur. It should also be noted here that SFWMD and FWS have agreed to an Interim Effects Concentration for copper only, which replaces the SQAG-PEC for copper recommended in MacDonald 2000.

However, it should be noted that SQAGs may not be established for all analytes of interest. FWS protocols for ecological risk assessment (FWS, March 2004) recommend consideration of Ecological Screening Values (ESV) established by EPA Region IV in *Ecological Screening Values or Surface Water, Sediment, and Soil* (WSRC, November 1998) when Florida SQAGs are not available.

In the case of copper, the USFWS utilizes an interim screening value (ISV) of 85 mg/kg, for protection of the endangered Everglades Snail Kite. Measured copper concentrations are compared with both the ISV and the SQAGs.

No SQAGs have been established for selenium. However, an ecological screening criterion of 4.2 mg/kg was negotiated with USFWS for organic soils on the C9/C11 project, and it appears that a similar level would be appropriate on the A-2 FEB project.

#### *4.1.3 Applicable Criteria*

All of the above criteria will be considered in evaluating the analytical results obtained during the soil sampling activities described herein. Since some portions of the site may not become inundated, it is appropriate to compare analyte concentrations in the soil to the human health-based SCTLs established in Chapter 62-777, FAC. Therefore, soil data were compared to both the SCTLs for residential direct exposure (SCTL-RDE) and to the SCTLs for leaching to groundwater (SCTL-LGW) and leaching to surface water (SCTL–LSW).

It is likely that most of the site will be inundated; at least for a portion of each year, and that important ecological receptors will utilize the property. Therefore, it is also necessary to compare the site data to the SQAGs. For most analytes of interest (arsenic being the notable exception), the SQAG-TEC criteria are more stringent than the SCTL-RDE criteria. Therefore, in most cases, a cleanup to SQAG-TEC criteria is also protective of human health. It should also be noted that the SQAGs are not standards or deterministic values (i.e., an exceedance does not indicate absolutely that adverse effects will occur); the SQAGs are merely screening values. Data exceeding the SQAG values generally indicate the need for further study. Conversely, chemical concentrations which do not exceed the SQAGs are generally screened out from any further consideration with respect to ecological risk.

Since the soils will also need to be handled by construction workers during project construction and may be relocated off-site or placed in areas of the proposed project that are not inundated and which are accessible to the public, the soil data was also compared to both the SCTLs for residential direct exposure (SCTL-RDE) and to the SCTLs for leaching to groundwater (SCTL-LGW) and leaching to surface water (SCTL–LSW).

### 4.2 SAMPLING RESULTS

Laboratory analytical results for the soil samples are summarized on **Table 1**. Laboratory reports are provided in **Appendix B**. These results have been evaluated by comparison with the appropriate human-health based SCTLs established in Chapter 62-777, FAC and the ecologically-based SQAG criteria recommendations for sediments.

Organics Results

- 2-4' D (2-4-Dichlorophenoxyacetic acid) was detected in one composite sample at a concentration of 940 µg/kg, which exceeds the SCTL-LGW criterion of 700 ug/kg and the SCTL-LSW criterion of 900 µg/kg. Another sample was detected at a concentration of 860 µg/kg, which exceeds only the SCTL-LGW criterion. Both concentrations were below the SCTL-RDE criteria and SQAG criteria have not been established. The analyte was detected in three other samples above the laboratory method detection limit (MDL) but below all applicable regulatory criteria. The remaining samples were all below the laboratory MDL.
- Metribuzin was detected in two composite samples at concentrations of 1,700 µg/kg and 1,100 µg/kg, which exceed the SCTL-LSW criteria of 800 µg/kg, but are below all other SCTL criteria. SQAG criteria have not been established for this analyte. The analyte was detected in ten other samples above the laboratory MDL but below all applicable regulatory criteria. The remaining samples were all below the laboratory MDL.
- Phorate was detected in two composite samples at concentrations of 120 µg/kg and 93 µg/kg, which exceed the SCTL-LSW criterion of 1 µg/kg, but are below all other SCTL criteria. SQAG criteria have not been established for this analyte. The analyte was detected in one other sample above the laboratory MDL but below all applicable regulatory criteria. The remaining samples were all below the laboratory MDL.
- Atrazine was detected in 16 composite samples (including 2 split samples and 1 duplicate sample) at concentrations exceeding the SQAG-TEC criterion of 0.30 µg/kg (no SQAG-PEC criterion has been established). The atrazine concentrations in the 16 samples ranged from 27 µg/kg to 3,500 µg/kg. Twelve of the sixteen samples were also detected at concentrations exceeding the SCTL-LSW and SCTL-LGW criteria of 40 µg/kg and 60 µg/kg, respectively. Atrazine was detected in another sample at a concentration of 55 µg/kg which exceeds the SCTL-LSW criteria of 40 µg/kg, but is below all other SCTL criteria. None of the detected atrazine concentrations exceed the SCTL-RDE.

- Dieldrin was detected in four samples at concentrations exceeding the SQAG-TEC criterion of 1.9 µg/kg, but below the SQAG-PEC criteria of 62 µg/kg. The dieldrin concentrations were also above the SCTL-LGW and SCTL-LSW criteria of 2 µg/kg and 0.1 µg/kg, respectively. The concentrations in the four samples ranged from 2.7 µg/kg to 5.1 µg/kg. Dieldrin was not detected in any of the other samples above the laboratory MDL.
- Due to the detection of multiple samples containing atrazine and dieldrin at concentrations significantly exceeding the SCTL-LGW and/or SCTL-LSW, PSI subsequently conducted Synthetic Precipitation Leaching Procedure (SPLP) in order to evaluate the potential for leaching of atrazine and dieldrin from the soils into surface water or groundwater. The SPLP test is intended to simulate the leaching of contaminants from soil into groundwater or surface water under typical acid rainfall conditions. PSI analyzed two soil samples containing the highest atrazine concentrations (Comp-8 and Comp-15) by the SPLP for atrazine and two samples containing the highest dieldrin concentrations (Comp-10 and Comp-15) by the SPLP for OCPs. The SPLP test is conducted by adding an acidic solution to the soil sample and mixing the slurry for an extended period of time, before re-extracting the liquid for analyses. The SPLP extract is subsequently analyzed for the constituents of concern (e.g., OCPs or OPPs) and the results are compared to the surface water and/or groundwater cleanup target levels in Chapters 62-302, FAC and 62-777, FAC, respectively.
    - Atrazine was detected in the SPLP extract at concentrations exceeding the Chapter 62-777, FAC Groundwater Cleanup Target Level (GCTL) and Chapter 62-302, FAC Surface water Cleanup Target Level (SwCTL) in both samples (Comp-8 and Comp-15).
    - Dieldrin was not detected in either sample above the laboratory MDL, which was below the GCTL. However, the laboratory MDL for Dieldrin is 0.0011 µg/L which is above the SwCTL criteria of 0.00014 µg/L.

<u>Metals Results</u>

- Arsenic was detected in all of the composite samples at concentrations exceeding the SCTL-RDE criterion of 2.1 mg/kg, but below all SQAG-TEC criterion of 9.8 mg/kg. The measured arsenic concentrations ranged from 3.1 mg/kg to 6.8 mg/kg. The highest arsenic concentration (6.8 mg/kg) was detected in sample Comp-1.
- Barium was detected in of the composite samples at concentrations exceeding the SQAG-PEC criterion of 60 mg/kg. The measured barium concentrations ranged from 69 mg/kg to 118 mg/kg. The highest barium concentration (118 mg/kg) was detected in sample Comp-11 Split (the barium concentration in the parent sample was 98 mg/kg). All of the barium concentrations are below the SCTL criteria.
- Chromium was detected in all of the samples at concentrations exceeding the SCTL-LSW criterion of 4.2 mg/kg, but below all other applicable criteria. The measured chromium concentrations ranged from 5.6 mg/kg to 29 mg/kg.

- Copper was identified in all of the composite soil samples collected from the property. Copper concentrations in seven of the composite samples exceeded the USFWS Interim Screening Level (ISL) for protection of the Everglades Snail Kite (85 mg/kg). The measured copper concentrations in the samples ranged from 53 mg/kg to 110 mg/kg. The measured copper concentrations in all of the samples exceeded the SQAG-TEC of 32 mg/kg. None of the copper concentrations exceeded the SQAG-PEC or SCTL-RDE criteria of 150 mg/kg. The extent of copper impacted soils exceeding the USFWS ISL is shown on **Figure 4**.
- Cadmium and lead were identified in one or more of the composite soil samples collected on the property but at concentrations which are below the applicable SCTLs and SQAG-TEC criteria.
- Mercury was detected in all of the samples at concentrations exceeding the SCTL-LSW criterion of 0.01 mg/kg, but below all other regulatory criteria. Mercury concentrations ranged from 0.077 mg/kg to 0.14 mg/kg. The measured concentrations in the samples appear to be consistent with regional background conditions from atmospheric deposition.
- Selenium was detected in 27 of the 36 composite samples (including duplicate and split samples) at concentrations exceeding the SCTL-LSW criteria of 0.05 mg/kg. The measured selenium concentrations in the samples ranged from 1.5 mg/kg to 3.7 mg/kg. Selenium concentrations were below the laboratory MDL in all of the other samples; however the laboratory MDLs ranged from 0.47 mg/kg to 0.66 mg/kg which are above the SCTL-LSW criteria, in all cases except one (one sample had an MDL of 0.47 mg/kg the other eight samples had MDLs above the SCTL-LSW criteria of 0.5 mg/kg). No SQAGs have been established for selenium. An action level of 4.2 mg/kg was negotiated with USFWS for organic soils on the C9/C11 project, and it appears that a similar action level would be appropriate on the A-2 FEB. None of the detected selenium concentrations exceeded 4.2 mg/kg.
- Silver was detected in all three split samples at concentrations exceeding the SCTL-LSW criteria of 0.01 mg/kg. The measured silver concentrations in the three split samples were 0.61 mg/kg, 0.61 mg/kg, and 0.64 mg/kg. The silver concentrations in all of the original samples were below the laboratory MDL. Silver was below the laboratory MDL in all of the other samples; however the laboratory MDLs ranged from 0.26 mg/kg to 0.42 mg/kg which are above the SCTL-LSW criteria.
- Total organic carbon measurements ranged from 198,000 mg/kg to 503,000 mg/kg in the samples analyzed by the primary and secondary laboratories.

### 4.3 DATA VALIDATION

Validation of the laboratory data was performed using the FDEP ADaPT program to ensure that all required quality control targets were met. ADaPT data validation forms are provided with the laboratory reports in **Appendix A**. The data generally met the

quality control requirements for both field and laboratory activities. Some of the data were qualified as noted in the laboratory report and in the summary tables, but none of the data were rejected due to quality control concerns.

- Comparison of the data for original and duplicate samples analyzed by the primary laboratory indicated good precision in measurement by the primary laboratory.

- Comparison of the data between the primary and secondary laboratory indicated good correlation between the laboratory results for the original and split samples.

- No target analytes were detected in the equipment blanks, indicating that laboratory and field decontamination procedures were effective.

- No target analytes were detected in the laboratory method blanks.

- A number of the primary samples had to be diluted for analysis of 4,4-DDT due to unknown matrix interference. The laboratory method detection limits for DDT ranged from about 0.9 ug/kg to 11 ug/kg, and exceeded the SQAG-TEC of 4.2 ug/kg, but were still below all regulatory criteria.

- The laboratory method detection limits for a number of chemicals exceeded the SCTL-LSW criteria. However, a review of the *FDEP Guidance for the Selection of Analytical Methods and for the Evaluation of Practical Quantitation Limits* indicates that the laboratory method detection limits are below the practical quantitation limits recommended in the FDEP guidance and generally represent the best commercially available detection limits for the methods.

- The laboratory method detection limits for dieldrin in the SPLP analysis leachate exceeds the FDEP Chapter 62-302, FAC surface water standard. However, the laboratory method detection limit is lower than the recommended practical quantitation limit in the FDEP guidance referenced above.

### 4.4 GEOSTATISTICAL EVALUATION

Since the density of sampling within the cultivated areas of the A-2 FEB was lower (10%) than composite sampling typically conducted under the ERA Protocol, the copper data was further evaluated to determine if it was adequate to make risk management decisions for the site.

As previously discussed, copper concentrations in the 30 composite soil samples ranged from 53 to 110 mg/kg, with an average concentration equal to 77.2 + 13.3 mg/kg and the 95% UCL copper concentration was equal to 83.1 mg/kg. In order to have confidence in the calculated 95% UCL, a sufficient number of samples must be collected to meet Type I and Type II error rate requirements for decision making. Type I

error (alpha) is the probability of incorrectly predicting that the average copper concentrations on the site are less than the snail kite benchmark when they are actually higher than the benchmark. In the case of a 95% UCL, the Type I error rate is set at 5%. Type II error (beta) is the probability of predicting that the average copper concentrations are greater than the snail kite benchmark when they are actually less. .

The sample size calculations provided in USEPAs ProUCL tool (ProUCL v 4.1, 2012) use established USPEA guidance for sample size calculations to provide a minimum number of samples necessary to meet Type I and Type II error rates at a given standard deviation and tolerable error margin (delta). The delta value provides a 'grey area' which represents a margin of error attributable to laboratory precision, laboratory reporting accuracy, sampling error, etc.

The ProUCL calculator was used in this case by setting the alpha equal to 0.05 and the beta equal to 0.1. The standard deviation of the copper concentrations in soil was equal to 13.3 mg/kg and the data were normally distributed allowing for the use of parametric statistics. The delta was set equal to 8.5 mg/kg or 10% of the 85 mg/kg benchmark. Using those parameters, the ProUCL calculator indicates that a minimum of 23 samples are required to meet the minimum requirements of a 95% UCL estimate of the mean with a 10% Type II error rate using the data collected at the A-2 FEB. This indicates that an adequate number of samples were collected to calculate a reliable estimate of the 95% UCL of the soil copper concentration.

# 5. SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

## 5.1 SLERA METHODOLOGY

PSI contracted with Formation Environmental, LLC to prepare a screening level ecological risk assessment (SLERA) for the subject property. The SLERA is provided in **Appendix B**. The purpose of the SLERA was to evaluate potential risks to benthic invertebrates and higher trophic species, particularly aquatic wading birds, associated with exposure to the site soils, assuming that a water quality project is implemented and the land is inundated. The SLERA was conducted in accordance with the SFWMD-USFWS-FDEP ERA Protocol.

Once flooded, aquatic organisms such as benthic invertebrates may inhabit the site and could be exposed to residual chemicals. Flooding changes the potential for ecological exposure because many contaminants are more mobile and bioavailable in aqueous environments, and may bio-accumulate more readily in aquatic systems than in terrestrial systems. For the purposes of this analysis, the receptors of greatest concern are aquatic-feeding wildlife, especially Federal or State Trust resources that could be attracted to the newly flooded parcels if an aquatic prey base becomes established. Bioaccumulation of residual chemicals in aquatic prey species could lead to toxic exposure of Trust resources feeding at newly formed aquatic environments. Also considered is the potential for effects to benthic invertebrate communities that could lead to loss of ecosystem function within the newly created aquatic system.

To evaluate potential effects to benthic invertebrates, soil data were compared to the SQAG-TEC and SQAG-PEC values. Risk to aquatic-feeding wildlife was evaluated by estimating the potential exposure of avian receptors to chemicals through the ingestion of aquatic prey species that might accumulate chemicals from soils after they have been flooded. Exposure and risks were calculated for aquatic-feeding wildlife using a model developed for the District specifically for the purposes of this program (Goodrich 2002 and NewFields 2006). The model provides conservative (i.e., protective) exposure estimates for key species of wildlife that are common in central and southern Florida. The model was developed to incorporate potential bioaccumulation of organic and inorganic chemicals into an aquatic food web that could develop at a flooded agricultural site. The model has been approved by the USFWS for use by the District in making decisions regarding property acquisition.

The SLERA was conducted using consistently conservative assumptions about toxicity, bioavailability, and exposure patterns. The combination of conservative assumptions can result in substantial uncertainty and overestimation of risks of adverse ecological effects. In most cases, the District has elected to use SLERA results as a basis for corrective actions, seeking to err on the side of environmental protection. In other cases where very large areas are involved, the District has sought to reduce uncertainty in exposure assessments by performing additional tests outlined in the ERA Protocol.

## 5.2 SLERA RESULTS

Formation Environmental generated the following conclusions based on the SLERA analysis:

**Benthic Invertebrates**

- Maximum detected concentrations of copper and dieldrin were greater than the SQAG-TEC only. Risks to the benthic invertebrate community due to exposure to both are predicted to be low but cannot be conclusively dismissed. The 95% UCL of both copper and dieldrin exceeded the SQAG-TEC. The very high levels of organic carbon in the soils likely mitigate the risk to both constituents of potential concern (COPCs) due to decreased bioavailability. Similarly, the mean PEC-HQ was lower than 0.5, indicating that cumulative risk from exposure to copper and dieldrin is expected to be low.
- All detected concentrations of barium, as well as the 95% UCL, exceeded the SQAG-PEC. However, no risk is predicted from exposure to barium because all of the samples collected from the A-2 FEB are within the range of barium concentrations defined by FDEP (Carvalho and Schropp 2002) as clean areas and areas established as a statewide reference for healthy biological communities.
- Concentrations of atrazine, 2,4-D, metribuzin, and phorate were also detected in several samples across the A-2 FEB. While elevated concentrations of each of these herbicides and insecticides were observed, communication with Florida Crystals farm managers indicates that all are actively applied as part of their general farming practice. All of the detected chemicals have relatively short half-lives and are not expected to persist for long periods after farming on the A-2 FEB is ceased. Best management practices should be followed to allow for sufficient time for the COPCs to degrade prior to completion of the A-2 FEB.

**Aquatic-Feeding Birds**

- Selenium concentrations in A-2 FEB soil samples exceeded the USFWS screening benchmark for effects to aquatic-feeding wildlife at a number of locations. Risks were subsequently evaluated using the SLERA model which resulted in no HQs greater than 1.0 using maximum detections. Risks were also predicted using the TTF model from Presser and Luoma (2010) and the data from the C9/C11 selenium study to estimate bird egg selenium concentrations. At maximum sediment concentrations, bird egg selenium concentrations were not predicted to be greater than the 95% lower confidence limit of the recommended egg tissue effect threshold concentrations. Based on these results and the results of the C9/C11 selenium study completed by the District, no unacceptable risk to aquatic-feeding birds is predicted in the A-2 FEB.
- Copper concentrations exceeded the 85 mg/kg interim benchmark for protection of the Everglade snail kite in just over 25% of the composite samples. However, the 95% UCL copper concentration was less than the benchmark. Given the relationship between organic carbon content in sediments and the bioavailability

of copper, the observed low magnitude exceedances of the benchmark are not expected to result in unacceptable levels of risk to the Everglade snail kite. The District should consider periodic monitoring of copper concentrations in surface water, periphyton, and apple snails following construction to provide data pertinent to the management of risks to the Everglade snail kite.

- All other HQs calculated via the food-web model using maximum detected composite sample concentrations were less than 1 indicating risks from these COIs are de minimus.

Overall, no evidence of elevated agrochemical contamination within the soils was found that would cause concern related to the construction of the A-2 FEB based on risk to the future aquatic community or to USFWS trust species that may utilize the future habitat provided by its construction. Due to the observed copper concentrations greater than the 85 mg/kg benchmark, monitoring of copper in surface water and apple snails following construction is recommended.

# 6. CONCLUSIONS AND RECOMMENDATIONS

## 6.1 CONCLUSIONS

- Very few organic agrochemicals were detected in the site soil at concentrations exceeding ecological or human health risk screening criteria. The majority of the detected chemicals, including 2,4-D, atrazine, metribuzin, and phorate are being actively applied on the property and soil concentrations are likely to dissipate rather quickly once the agricultural use of the property is ceased, given these chemicals relatively low persistence in the soil.
- Dieldrin is the only persistent organic chemical that was detected, but it was only sporadically detected at concentrations exceeding the SQAG-TEC, but below the SQAG-PEC. The hazard quotients for dieldrin that were calculated in the SLERA for a number of aquatic-feeding birds were well below one; thus, potential impacts to Trust species from exposure to residual dieldrin are likely to be very low.
- Copper was the primary constituent of potential ecological concern that was detected in the site soils.
    - Copper was detected in approximately 27% of the composite samples at concentrations exceeding the USFWS ISL of 85 mg/kg. The detected copper concentrations ranged as high as 110 mg/kg and exhibited a normal data distribution with a mean concentration of 77.2 mg/kg and a 95% upper confidence limit (UCL) of 81.3 mg/kg. Spatially, the data present a random pattern, and no discernible areas of higher concentrations could be interpreted from the maps.
    - Based on the copper data from the 10% sampling coverage, it is estimated that on the order of 3,850 acres of the property may contain copper concentrations exceeding the USFWS ISL. However, most of the exceedances are likely to only marginally exceed the ISL, and would be within the 85-95 mg/kg range.
    - The USFWS ISL for copper was developed for protection of the endangered Everglades snail kite and the ISL was derived using a standard bioaccumulation model that is thought to be generally applicable for the sandy soils, containing only small amounts of organic carbon, associated with citrus groves where copper sulfate is liberally applied as a fungicide in south Florida. Organic carbon concentrations in sandy soils are typically less than 1% while the organic carbon content in the A-2 FEB soils ranges from about 20% to about 50%. Metals, including copper are known to bind tightly with organic matter in the soil, and would be less bioavailable in these organic soils than they would be in sandy soils. A review of available published studies relating bioavailability to organic content in the soil was performed as part of the SLERA. These previous studies suggest a strong correlation between increased organic content

and decreased bioavailability; however, no direct numeric correlation could be gained from these studies that would allow us to calculate an alternate ISL for these soils based on the increased carbon content. Qualitatively, copper concentrations that only marginally exceed the ISL of 85 mg/kg in these highly organic soils are not likely to represent a significantly increased risk to the Everglades snail kite. As low as a 10 – 20% reduction in bioavailability would be expected to reduce uptake into the apple snails to levels equal to or less than predicted by the 85 mg/kg benchmark over the large majority of the A-2 FEB footprint.

- The Everglades snail kite could be exposed to copper concentrations in its primary food source, the apple snail, which may accumulate copper in its tissue from direct contact with the soil, or through ingestion of periphyton. The model makes certain assumptions regarding the bioaccumulation of copper up through the food chain and the degree to which ingested copper would be adsorbed by the Everglades snail kite. Apple snail bioaccumulation, Everglades snail kite exposure, and copper bioavailability studies are currently being conducted by both USFWS and SFWMD to evaluate these critical assumptions in the model. These results are not yet available. Bioaccumulation studies currently being performed by SFWMD suggest that copper concentrations in the surface water are likely to peak shortly after initial filling of the A-2 FEB, but would decline rapidly following the completion of the FEB. Since apple snails are not likely to establish a population large enough to support the foraging requirements of one or more snail kites immediately upon filling of the FEB, the snails and therefore, the Everglades snail kite, are not likely to be exposed to the peak concentrations of copper. The initial study data combined with the consideration of copper bioavailability discussed in the previous bullet suggest that the impacts to the Everglades snail kite to copper concentrations only marginally exceeding the ISL are not likely to be significant.
- PSI does not believe that corrective action to address copper impacted soils is warranted based on:
    - the marginal exceedance of the ISL,
    - the fact that the 95% UCL copper concentration across the site is less than 85 mg/kg,
    - the low likelihood of impacts from exposure to these soils given the decreased bioavailability associated with these soils, and
    - the interim study results indicating that the model assumptions used to develop the ISL may be overly conservative,.
- Based on the presumption that no corrective action is warranted for marginally impacted soils, PSI does not believe that further soil sampling for copper is warranted. Given the normal distribution and low standard

deviation of the data set, additional sampling is not likely to result in increased power or increased confidence in the data set.

- Arsenic concentrations across the majority of the A-2 FEB footprint are likely to exceed the FDEP Soil Cleanup Target Level for Residential Direct Exposure, but the detected concentrations are all below the SQAG-TEC criterion. Arsenic concentrations are not likely to represent a human health or ecological risk, as long as the soil is managed on-site and is not disposed off-site at an uncontrolled site.
- A number of chemicals, including 2,4-D, atrazine, metribuzin, phorate, dieldrin, chromium, mercury, selenium, and silver were detected in one of more of the composite soil samples at concentrations exceeding the soil cleanup target levels for leaching to surface water (SCTL-LSW). However, it should be noted that the SCTL-LSW criteria are based on leaching of chemicals from the soil into a Class III surface water body. In this case, the soils will be in direct contact with surface water once the project is constructed; however, the overlying surface water body would be classified as a treatment cell, and not as a Class III surface water. Therefore, the Class III surface water criteria and the SCTL-LSW criteria do not apply to these soils.
- Class III surface water criteria must be met for waters that are discharged from the A-2 FEB and therefore, comparison of the chemical concentrations in the soil with the SCTL-LSW criteria may be beneficial in evaluating whether exceedances of the Class III surface water criteria are likely at the A-2 FEB discharge point. An evaluation of the chemical data indicates that exceedances of the Class III surface water at the discharge of the A-2 FEB are very unlikely due to the following factors:
    - A number of the chemicals such as 2,4-D, atrazine, metribuzin, and phorate are relatively short-lived in the environment and were recently applied during active crop management. These chemicals are not likely to be present in the soil at significant concentrations when the reservoir is constructed.
    - Dieldrin is biologically persistent, but was only detected sporadically in the A-2 FEB footprint. The effect of dilution from incoming surface water and water overlying clean areas of the FEB are likely to dilute any leaching of these chemicals within these limited areas.
    - Chromium, mercury, and selenium were consistently detected and silver was detected at a few locations at concentrations exceeding the SCTL-LSW criteria. However, these metals all sorb strongly to organic matter in the soil and are not likely to leach to a significant degree from the highly organic soils in the A-2 FEB. Default SCTL-LSW criteria are based on soils with a much lower organic content than the soils on the subject property.

Overall, no evidence of elevated agrochemical contamination within the soils was found that would cause concern related to the construction of the A-2 FEB based on risk to the future aquatic community or to USFWS trust species that may utilize the future habitat provided by its construction.

### 6.2 RECOMMENDATIONS

- Based on the exceedances of the USFWS ISL for copper in a number of the soil samples, PSI recommends that the District conduct a monitoring program at start-up of the FEB to verify copper concentrations in the surface water, periphyton ,and in any apple snails that may occupy the FEB in the early stages of habitat development. This monitoring may be discontinued once it is verified that copper concentrations in the surface water, periphyton, and apple snails are below acceptable risk thresholds for protection of the Everglades snail kite.
- Based on the exceedance of the SCTL-LSW for atrazine, 2,4-D, metribuzin, phorate, dieldrin, chromium, mercury, and selenium in a number of soil samples, one-time surface water sampling for these parameters is recommended during start-up of the FEB to verify that these chemicals are not leaching into the surface water.
- An agrochemical best management practices (BMP) plan is recommended to address the use of agrochemicals on the property in the interim use period prior to project construction, assuming that the property will continue to be used for agricultural purposes in the interim. The intent of the BMP plan is to ensure that further agrochemical application does not result in increased concentrations for the chemicals of concern that were identified in the Phase II ESA. Further application of copper-containing fertilizers will need to be particularly scrutinized. A ramp-down period for some of the readily degradable agrochemicals (e.g., atrazine) may be warranted to ensure that the concentrations of these chemicals are below ecological risk thresholds at the time of project construction.
- Based on the presence of arsenic in the site soils at concentrations exceeding the SCTL-residential criteria, these soils should not be transported off-site for uncontrolled disposal. A soil management plan should be developed for project construction to ensure proper handling and disposal of the soils.

# 7. WARRANTY

PSI warrants that the findings and conclusions reported herein were conducted in general accordance with good commercial and customary practice for conducting a Phase II Environmental Site Assessment. However, these findings and conclusions contain all of the limitations inherent in these methodologies.

The Phase II Environmental Site Assessment has been developed to provide the client with information regarding apparent indications of chemical impacts to the subject property. It is necessarily limited to the conditions observed and to the information available at the time of the work. The assessment and conclusions presented herein were based upon the subjective evaluation of limited data. They may not represent all conditions at the subject site as they reflect the information gathered from specific locations. PSI warrants that the findings and conclusions contained herein have been promulgated in accordance with generally accepted environmental investigation methodology and only for the site described in this report.

Due to the limited nature of the work, there is a possibility that there may exist conditions which could not be identified within the scope of the assessment or which were not apparent at the time of report preparation. It is also possible that the testing methods employed at the time of the report may later be superseded by other methods. The description, type, and composition of what are commonly referred to as "hazardous materials or conditions" can also change over time. PSI does not accept responsibility for changes in the state of the art, nor for changes in the scope of various lists of hazardous materials or conditions. PSI believes that the findings and conclusions provided in this report are reasonable. However, no other warranties are implied or expressed.

# TABLES

**TABLE 1: SOIL ANALYTICAL DATA SUMMARY - COMPOSITE SAMPLES (detected constituents only)**
**PROJECT NAME: A-2 Flow Equalization Basin**
**PSI PROJECT NO.: 05521114**

| | | | Chlorinated Herbicides (ug/kg) | OPPs (ug/kg) | | | OCPs (ug/kg) | Metals (mg/kg) | | | | | | | | | TOC (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | Date Collected | Sample Interval (ft bls) | D, 2-4' | Atrazine | Metribuzin | Phorate | Dieldrin | Arsenic | Barium | Cadmium | Chromium | Copper | Lead | Mercury | Selenium | Silver | Total Organic Carbon |
| | | SCTL-RDE | 770,000 | 4,300 | 54,000 | 16,000 | 60 | 2.1 | 120 | 82 | 210 | 150 | 400 | 3 | 440 | 410 | *** |
| | | SCTL-LGW | 700 | 60 | 2,200 | 300 | 2 | SPLP | 1600 | 7.5 | 38 | *** | SPLP | 2.1 | 5.2 | 17 | *** |
| | | SCTL-LSW | 900 | 40 | 800 | 1 | 0.1 | SPLP | *** | *** | 4.2 | *** | *** | 0.01 | 0.5 | 0.01 | *** |
| | | SQAG-PEC | *** | *** | *** | *** | 62 | 33 | 60 | 5.0 | 110 | 150 | 130 | 1.1 | *** | 2.2 | *** |
| | | SQAG-TEC | *** | 0.30 | *** | *** | 1.9 | 9.8 | 20 | 1.0 | 43 | 85* | 36 | 0.18 | *** | 1.0 | *** |
| Comp-1 012313 | 1/23/2013 | 0-0.5 | 58 U | 99 I | **41 I** | 3.6 U | 1.7 U | 6.8 | 110 | 0.11 U | 19 | 110 | 7.8 | 0.1 | 1.7 I | 0.33 U | **320,000** |
| Comp-2 012513 | 1/25/2013 | 0-0.5 | 65 U | 29 U | 20 U | 4.1 U | 1.9 U | 5.2 | 93 | 0.11 U | 15 | 59 | 6.7 | 0.098 | 2.0 I | 0.33 U | **383,000** |
| Comp-3 012313 | 1/23/2013 | 0-0.5 | 65 U | 29 U | 20 U | 4.1 U | 1.9 U | 4.3 | 91 | 0.11 U | 16 | 82 | 5.4 | 0.11 | 2.5 | 0.33 U | **440,000** |
| Comp-4 012413 | 1/24/2013 | 0-0.5 | 65 U | 29 U | 20 U | **9.6 I** | 1.9 U | 4.7 | 95 | 0.12 U | 5.6 | 91 | 5.9 | 0.14 | 2.3 I | 0.36 U | **354,000** |
| Comp-4 DUP 012413 | 1/24/2013 | 0-0.5 | 74 U | 33 U | 23 U | 4.7 U | 1.1 U | 4.1 | 93 | 0.14 U | 6.8 | 80 | 5.7 | 0.13 | 1.8 I | 0.42 U | **259,000** |
| Comp-5 012513 | 1/25/2013 | 0-0.5 | 63 U | 27 U | 20 U | 3.9 U | 1.8 U | 4.6 | 94 | 0.11 U | 15 | 53 | 5.5 | 0.12 | 2.1 I | 0.33 U | **423,000** |
| Comp-6 012513 | 1/25/2013 | 0-0.5 | 70 U | 30 U | 22 U | 4.3 U | 0.99 U | 4.5 | 110 | 0.12 U | 18 | 75 | 6.1 | 0.12 | 0.66 U | 0.36 U | **440,000** |
| Comp-7 012313 | 1/23/2013 | 0-0.5 | 57 U | 25 U | 18 U | 3.6 U | 1.6 U | 6.4 | 97 | 0.10 U | 20 | 75 | 6.3 | 0.11 | 0.55 U | 0.30 U | **389,000** |
| Comp-7 DUP 012313 | 1/23/2013 | 0-0.5 | 58 U | 25 U | 18 U | 3.6 U | 1.7 U | 5.7 | 97 | 0.11 U | 19 | 74 | 7.1 | 0.11 | 2.8 | 0.33 U | **329,000** |
| Comp-8 012313 | 1/23/2013 | 0-0.5 | 62 U | 1,100 | **240** | 3.8 U | 1.8 U | 3.8 | 96 | 0.12 U | 14 | 87 | 6.3 | 0.13 | 0.62 U | 0.34 U | **358,000** |
| Comp-9 012213 | 1/22/2013 | 0-0.5 | **200 I** | 380 | **280** | 3.9 U | 1.8 U | 3.9 | 92 | 0.12 U | 13 | 67 | 5.3 | 0.12 | 2.4 I | 0.35 U | **430,000** |
| Comp-9 DUP 012213 | 1/22/2013 | 0-0.5 | **170 I** | 440 | **280** | 4.4 U | 1.0 U | 3.5 | 110 | 0.14 U | 17 | 65 | 5.8 | 0.12 | 3 | 0.40 U | **419,000** |
| Comp-10 012313 | 1/23/2013 | 0-0.5 | 57 U | 25 U | 18 U | 3.6 U | 4.5 I | 4.9 | 95 | 0.11 U | 12 | 68 | 5.9 | 0.13 | 1.6 I | 0.31 U | **384,000** |
| Comp-11 012413 | 1/24/2013 | 0-0.5 | 63 U | 27 U | 20 U | 3.9 U | 1.8 U | 3.6 | 98 | 0.11 U | 15 | 79 | 5.6 | 0.14 | 0.58 U | 0.31 U | **450,000** |
| Comp-11 SPLIT | 1/24/2013 | 0-0.5 | 70 U | 30 U | NA | 4.3 U | 10.5 U | 6.4 | 118 | 0.10 I | 14.2 | 83.5 | 6.2 | 0.087 | 2.4 | 0.61 I | **461,000** |
| Comp-12 012513 | 1/25/2013 | 0-0.5 | 63 U | 27 U | 20 U | 3.9 U | 1.8 U | 3.8 | 100 | 0.11 U | 13 | 87 | 6.8 | 0.14 | 3.7 | 0.32 U | **470,000** |
| Comp-13 012213 | 1/22/2013 | 0-0.5 | 59 U | 110 I | 19 U | 3.7 U | 1.7 U | 6.2 | 100 | **0.15 I** | 29 | 90 | 6.7 | 0.13 | 2.3 | 0.32 U | **400,000** |
| Comp-14 012213 | 1/22/2013 | 0-0.5 | 60 U | 26 U | 19 U | 3.8 U | 1.7 U | 5.5 | 80 | **0.18 I** | 16 | 68 | 6.6 | 0.11 | 2.2 I | 0.34 U | **374,000** |
| Comp-15 012213 | 1/22/2013 | 0-0.5 | **290** | 3,500 | **730** | 4.3 U | 4.9 I | 3.4 | 87 | **0.12 I** | 7.8 | 75 | 7 | 0.11 | 2.6 | 0.35 U | **477,000** |
| Comp-15 SPLIT | 1/22/2013 | 0-0.5 | 860 | 1,600 | NA | 4.1 U | 9.91 U | 5.46 | 103 | 0.02 U | 7.36 | 86.0 | 7.36 | 0.077 | 1.99 | 0.61 I | **461,000** |
| Comp-16 012313 | 1/23/2013 | 0-0.5 | 52 U | 330 | **58 I** | 120 I | 5.1 I | 4 | 91 | 0.096 U | 23 | 96 | 6.1 | 0.13 | 2.3 | 0.29 U | **388,000** |
| Comp-17 012313 | 1/23/2013 | 0-0.5 | 60 U | 160 I | **600** | 3.8 U | 1.7 U | 3.8 | 99 | 0.12 U | 17 | 85 | 6.4 | 0.13 | 2.6 | 0.33 U | **409,000** |
| Comp-18 012513 | 1/25/2013 | 0-0.5 | 940 | 3,300 | 1,100 | 3.9 U | 1.8 U | 3.4 | 97 | 0.11 U | 11 | 88 | 4.7 | 0.15 | 1.5 I | 0.32 U | **450,000** |
| Comp-19 012413 | 1/24/2013 | 0-0.5 | 55 U | 24 U | 17 U | 3.4 U | 1.6 U | 5.5 | 88 | 0.11 U | 17 | 59 | 6.5 | 0.12 | 0.57 U | 0.31 U | **198,000** |
| Comp-20 012413 | 1/24/2013 | 0-0.5 | 57 U | 25 U | **140** | 3.6 U | 1.6 U | 5 | 90 | 0.10 U | 14 | 70 | 6.3 | 0.11 | 0.55 U | 0.30 U | **361,000** |
| Comp-21 012213 | 1/22/2013 | 0-0.5 | 52 U | 55 I | **200** | 93 I | 1.5 U | 3.5 | 69 | **0.17 I** | 9.4 | 79 | 8.4 | 0.099 | 0.47 U | 0.26 U | **308,000** |
| Comp-22 012313 | 1/23/2013 | 0-0.5 | 63 U | 27 U | 20 U | 3.9 U | 1.8 U | 4.3 | 100 | **0.16 I** | 12 | 83 | 6.2 | 0.14 | 2.5 | 0.35 U | **448,000** |
| Comp-23 012413 | 1/24/2013 | 0-0.5 | 59 U | 26 U | 19 U | 3.7 U | 2.7 I | 4.2 | 82 | 0.11 U | 13 | 59 | 5.4 | 0.12 | 2.6 | 0.32 U | **384,000** |
| Comp-24 012413 | 1/24/2013 | 0-0.5 | 64 U | 28 U | 20 U | 4.0 U | 1.8 U | 4.1 | 99 | **0.14 I** | 28 | 82 | 6.6 | 0.14 | 2.5 | 0.35 U | **464,000** |
| Comp-25 012513 | 1/25/2013 | 0-0.5 | 58 U | 31 I | **120** | 3.6 U | 1.7 U | 6.4 | 100 | 0.11 U | 19 | 67 | 5.6 | 0.11 | 2.5 | 0.32 U | **392,000** |
| Comp-26 012413 | 1/24/2013 | 0-0.5 | 57 U | 25 U | 18 U | 3.6 U | 1.6 U | 5.5 | 98 | 0.11 U | 17 | 78 | 6.4 | 0.13 | 0.58 U | 0.32 U | **355,000** |
| Comp-27 012213 | 1/22/2013 | 0-0.5 | 70 U | 35 I | 22 U | 4.3 U | 0.99 U | 3.5 | 89 | 0.12 U | 9.1 | 74 | 5.9 | 0.14 | 2.9 | 0.36 U | **503,000** |
| Comp-28 012313 | 1/23/2013 | 0-0.5 | 58 U | 190 | 1,700 | 3.6 U | 1.7 U | 3.1 | 83 | **0.14 I** | 26 | 69 | 5.8 | 0.13 | 1.8 I | 0.30 U | **415,000** |
| Comp-28 SPLIT | 1/23/2013 | 0-0.5 | 60 U | 130 I | NA | 3.8 U | 9.47 U | 4.79 | 98.2 | 0.02 U | 22.6 | 78.9 | 6.23 | 0.085 | 2.08 | 0.64 I | **433,000** |
| Comp-29 012413 | 1/24/2013 | 0-0.5 | 74 U | 33 U | 23 U | 4.7 U | 1.1 U | 4.3 | 86 | 0.14 U | 7.2 | 60 | 5.2 | 0.13 | 2.3 I | 0.42 U | **485,000** |
| Comp-30 012513 | 1/25/2013 | 0-0.5 | 63 U | 27 I | 20 U | 3.9 U | 1.8 U | 3.2 | 96 | 0.12 U | 21 | 100.0 | 6.9 | 0.15 | 0.65 U | 0.35 U | **424,000** |

**Notes:**

U = Less than the method detection limit

I = The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit

J= Estimated value

**Bold** type indicates that the compound was detected above the laboratory method detection limits. The font color indicates the highest of the listed regulatory limits that was exceeded. Black **Bold** indicates a detection above the laboratory Method Detection Limit (MDL) but below all regulatory criteria.

* = interim cleanup target level for protection of Everglades Snail Kite

*** = No Standard

**TABLE 2: Summary of SPLP Results**
**PROJECT NAME: A-2 Flow Equalization Basin**
**PSI PROJECT NO.: 05521114**

| | | | OPPs (ug/L) | OCPs (ug/L) |
|---|---|---|---|---|
| **Sample ID** | **Date Collected** | **Sample Interval (ft bls)** | **Atrazine** | **Dieldrin** |
| | | **GCTL** | **3** | **0.002** |
| | | **SwCTL** | **1.9** | **0.00014** |
| **Comp-8 012313** | 1/23/2013 | 0-0.5 | **7.2** | NA |
| **Comp-10 012313** | 1/23/2013 | 0-0.5 | NA | 0.0011 U |
| **Comp-15 012213** | 1/22/2013 | 0-0.5 | **14** | 0.0011 U |

**Notes:**

NA = Not Analyzed

*** = No Standard

**Bold** indicates value exceeds the applicable GCTL or SwCTL. The font color indicates the highest regulatory limit that is exceeded.

# FIGURES

REFERENCE: THE "SOUTH OF OKEELANTA, FLA." AND "NORTH OF DEEM CITY, FLA." USGS QUADRANGLES WERE OBTAINED FROM THE LAND BOUNDARY INFORMATION SYSTEM (LABINS)

0 1,500 3,000 6,000 9,000 12,000 Feet

| | |
|---|---|
| PROJECT NO. | 05521114 |
| DRAWN BY | SMD |
| DATE CREATED | 2-15-2013 |
| SCALE: | 1 inch = 3,000 feet |

psi Information To Build On
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5801 Benjamin Center Drive Suite 112
Tampa, Florida 33634
(813)886-1075
(813)249-0301 fax

# USGS TOPO MAP

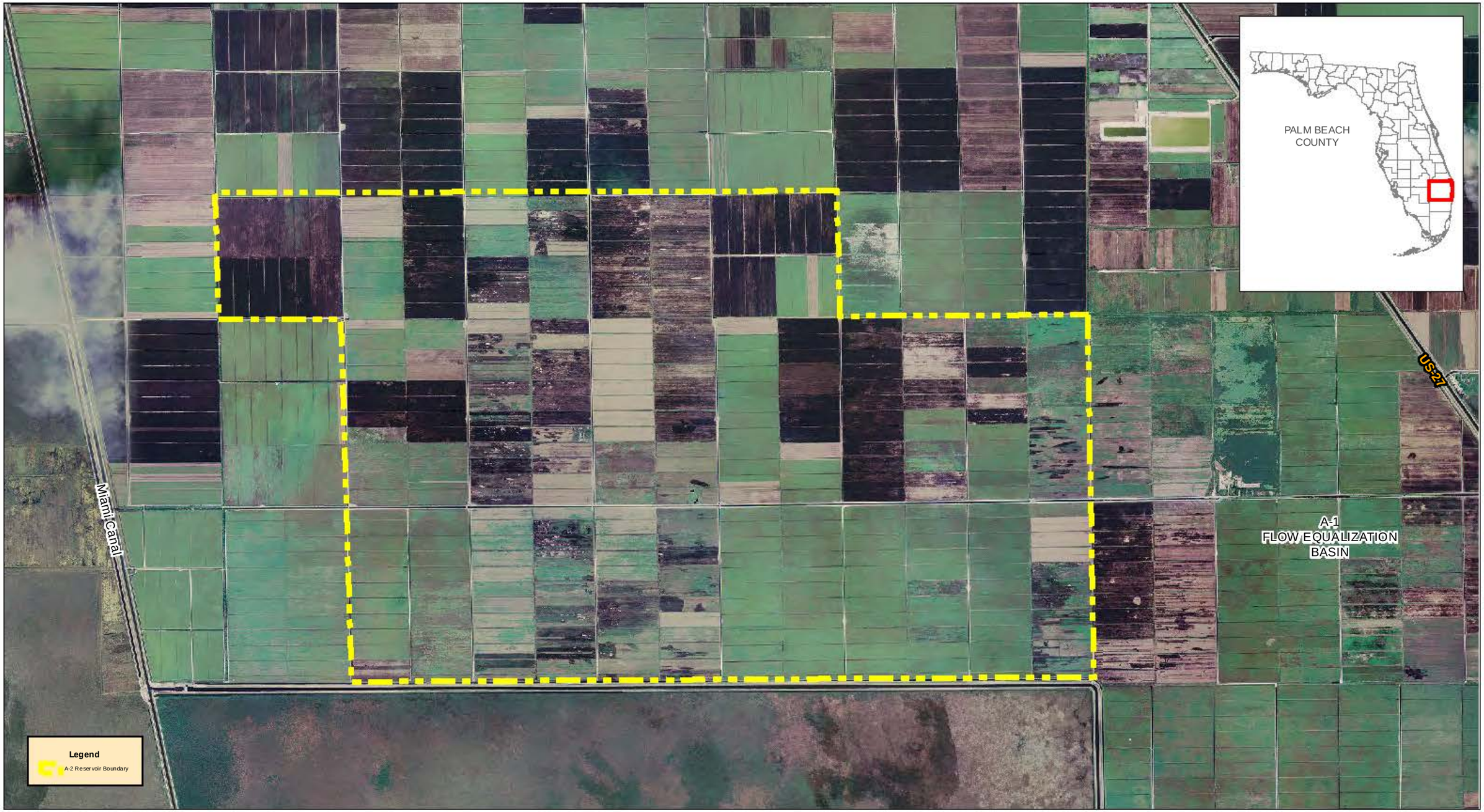
## A-2 FLOW EQUALIZATION BASIN PROJECT

EVERGLADES AGRICULTURAL AREA (EAA) BASIN

PALM BEACH COUNTY, FLORIDA

FIGURE 1

P:\52-Env\SFWMD\WO#2 (05521\2) - A-1, A-2 Reservoir\GIS\Version 9.3




REFERENCE: THE AERIAL WAS OBTAINED FROM THE LAND BOUNDARY INFORMATION SYSTEM (LABINS)

0 2,000 4,000 8,000 12,000 16,000 Feet

| | |
|---|---|
| PROJECT NO. | 05521114 |
| DRAWN BY | SMD |
| DATE CREATED | 2-15-2013 |
| SCALE: | 1 inch = 4,000 feet |

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# SITE VICINITY MAP

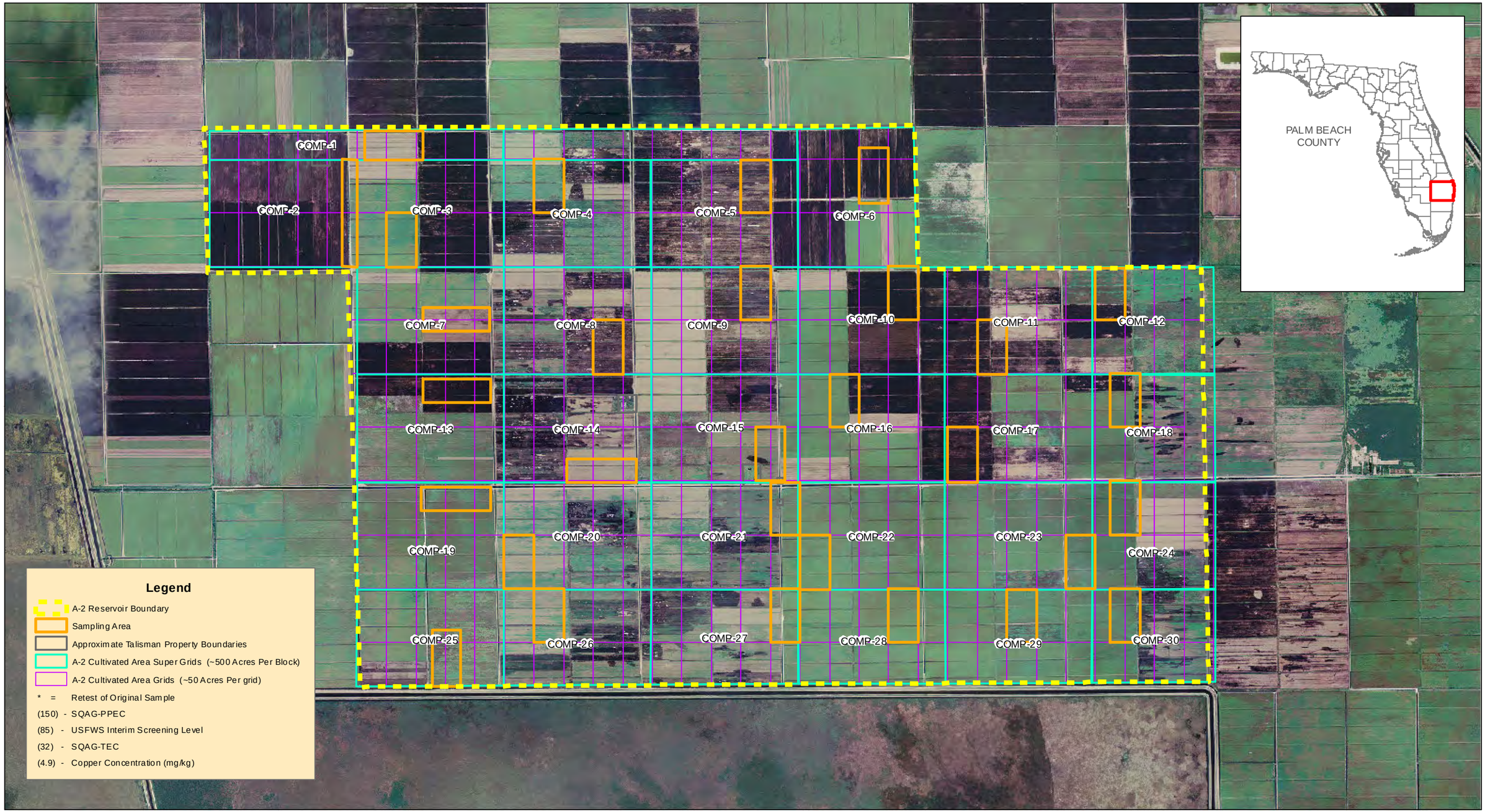
## A-2 FLOW EQUALIZATION BASIN PROJECT

EVERGLADES AGRICULTURAL AREA (EAA) BASIN

PALM BEACH COUNTY, FLORIDA

FIGURE 2

P:\552-Env\SFWMD\WO#2 (05521B.2) - A-1, A-2 Reservoir\GIS\Version 9.3




REFERENCE: THE AERIAL WAS OBTAINED FROM THE LAND BOUNDARY INFORMATION SYSTEM (LABINS)

0 2,750 5,500 11,000 Feet

| | |
|---|---|
| PROJECT NO. | 05521114 |
| DRAWN BY | SMD |
| DATE CREATED | 2-22-2013 |
| SCALE: | 1 inch = 3,500 feet |

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# COMPOSITE SOIL SAMPLING LOCATION MAP

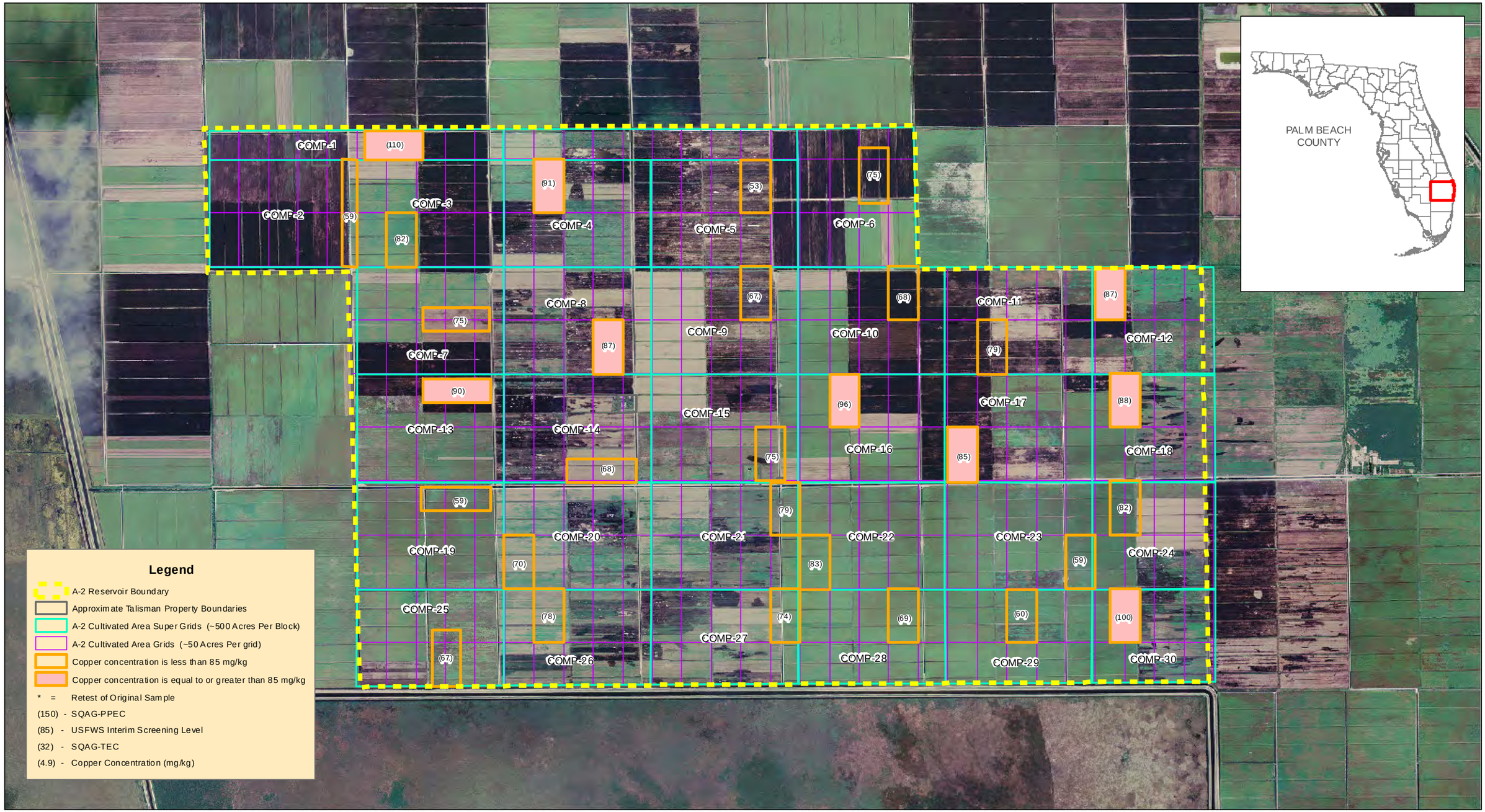
## A-2 FLOW EQUALIZATION BASIN PROJECT

EVERGLADES AGRICULTURAL AREA (EAA) BASIN

PALM BEACH COUNTY, FLORIDA

FIGURE 3

P:\5521 Env\SFWMD\WO\F2 (05521 B.2) - A-1, A-2 Reservoir\GIS\Version 9.3




REFERENCE: THE AERIAL WAS OBTAINED FROM THE LAND BOUNDARY INFORMATION SYSTEM (LABINS)

0 2,750 5,500 11,000 Feet

| | |
|---|---|
| PROJECT NO. | 05521114 |
| DRAWN BY | SMD |
| DATE CREATED | 2-22-2013 |
| SCALE: | 1 inch = 3,500 feet |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N

# A-2 COPPER CONCENTRATION MAP

## A-2 FLOW EQUALIZATION BASIN PROJECT

EVERGLADES AGRICULTURAL AREA (EAA) BASIN

PALM BEACH COUNTY, FLORIDA

FIGURE 4

P:\552-Env\SFWMD\WO\F2 (05521812) - A-1, A-2 Reserve\GIS\Version 9.3

# SUMMARY ENVIRONMENTAL REPORT

For the

**CENTRAL EVERGLADES STUDY**
**A-2 RESERVOIR**
**PALM BEACH COUNTY, FLORIDA**

Prepared for

**SOUTH FLORIDA**
**WATER MANAGEMENT DISTRICT**
**ENVIRONMENTAL SCIENCE UNIT**
**MAINTENANCE MANAGEMENT SECTION**
**3301 GUN CLUB ROAD**
**WEST PALM BEACH, FLORIDA 33406**

Prepared by

**Professional Service Industries, Inc.**
**5801 Benjamin Center Drive**
**Tampa, FL 33634**
**Telephone (813) 886-1075**

**PSI PROJECT NO. 0552812**

**August 21, 2012**

August 21, 2012

South Florida Water Management District
Environmental Science Unit
Maintenance Management Section
3301 Gun Club Road
West Palm Beach, Florida 33406

Attn: Mr. Robert Kukleski

Re: A-2 Reservoir Summary Environmental Report
Central Everglades Study
Palm Beach County, Florida
PSI Project No.: 0552812

Dear Mr. Kukleski:

In accordance with our agreement, Professional Service Industries, Inc. (PSI) has completed the summary of previous environmental investigations for the above referenced project.

Thank you for choosing PSI as your consultant for this important project. If you have any questions, or if we can be of additional service, please call us at (813) 886-1075.

Respectfully submitted,

**PROFESSIONAL SERVICE INDUSTRIES, INC.**

Steve Long, P.E., P.G.
Chief Engineer

# SUMMARY ENVIRONMENTAL REPORT

For the

**CENTRAL EVERGLADES STUDY**
**A-2 RESERVOIR**
**PALM BEACH COUNTY, FLORIDA**

Prepared for

**SOUTH FLORIDA**
**WATER MANAGEMENT DISTRICT**
**ENVIRONMENTAL SCIENCE UNIT**
**MAINTENANCE MANAGEMENT SECTION**

Prepared by

**Professional Service Industries, Inc.**
**5801 Benjamin Center Drive**
**Tampa, FL 33634**
**Telephone (813) 886-1075**

**PSI PROJECT NO. 0552812**

_____
Stephen P. Long, PE, PG
Chief Engineer

**August 21, 2012**

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# 1 INTRODUCTION

## 1.1 Property Description

The proposed A-2 Reservoir project is located along the west side of US 27 South in unincorporated Palm Beach County and encompasses on the order of 14,408 acres. The project location is shown on **Figure 1-1**. The project lands consist of 8 separate parcels. The tract numbers, prior ownership, and acreage are shown in the table below.

| A-2 Reservoir | | |
|---|---|---|
| D7100-044 | TALISMAN SUGAR CORPORATION | 2 |
| D7100-047 | TALISMAN SUGAR CORPORATION | 10 |
| D7100-066 | TALISMAN SUGAR CORPORATION | 12 |
| D7100-067 | TALISMAN SUGAR CORPORATION | 1 |
| D7100-104 | TALISMAN SUGAR CORPORATION | 14,371.53 |
| D7100-139 | TALISMAN SUGAR CORPORATION | 1 |
| D7100-141 | WEINLEIN, JOAN | 10 |
| D7200-005 | TALISMAN SUGAR CORPORATION | 1 |
| **A-2 Total** | | 14,408.53 |

Most of the project area has been historically cultivated in sugar cane, with occasional rotational crops of rice or corn. The property is being leased to New Hope Sugar Corporation for sugar cane cultivation. A Site Plan is provided as **Figure 1-2**.

The primary parcel (Tract D7100-104) was acquired from Talisman Sugar Company in 1999 by the District. Several of the smaller parcels listed above were also owned and operated by Talisman Sugar Corporation, but these parcels were deferred from transfer during the original transaction until environmental concerns on these small areas could be addressed. The Weinlan parcel (Tract D7100-141) was leased to Talisman Sugar at the time of the 1999 acquisition and was evaluated with the remainder of Tract D7100-104. It is acknowledged that the assessment methods and protocols that were utilized at the time of the original acquisition are not entirely consistent with the current protocols for environmental risk assessment that were jointly developed by United States Fish and Wildlife (USFWS), the Florida Department of Environmental Protection (FDEP) and the South Florida Water Management District (SFWMD).

## 1.2 Authorization

This Summary Report was prepared in substantive compliance with PSI Proposal No. 552-58094 dated November 28, 2011, which was authorized by SFWMD Contract and Work Order No. 4600002399-WO#02.

## 1.3 Purpose/Objectives

The District requires a summary report for the A-2 Reservoir project, which compiles the results of the previous investigations performed on the properties within the project footprint. The primary purposes of the report are:

- Compile and summarize the results of previous environmental studies within the project area;
- Document and map known point source and non-point source areas of impact which might present increased ecological or human health risk upon construction of the project.

## 1.4 Proposed Construction

The proposed project will consist of the construction of a large reservoir for water storage. The design has not yet been initiated so details on the use of each parcel are not yet available. However, for the purposes of this document, PSI has assumed worst-case conditions that the entirety of the property will be inundated. If portions of the property are ultimately not flooded, the ecological risks discussed herein for those areas would be overstated.

# 2. REGULATORY FRAMEWORK

## 2.1 Regulatory Oversight

The FDEP, FWS, and SFWMD jointly developed a protocol, entitled "*Protocol for Assessment, Remediation, and Post-Remediation Monitoring for Environmental Contaminants on Everglades Restoration Projects* for conducting environmental assessments on agricultural lands proposed for use in water resources projects. This protocol has commonly been referred to as the Ecological Risk Assessment (ERA) Protocol. The ERA Protocol includes separate evaluation of potential point source areas (e.g., underground storage tanks, pesticide mix/load areas, etc.) and residual chemical impacts across agricultural areas associated with routine application of agrochemicals as a normal farming practice. The ERA Protocol is intended to be a dynamic document which is revised as improvements in science or regulatory framework change. The ERA Protocol was initially drafted in 2000 and the most recent revisions are reflected in the August 2008 version of the document.

As previously noted, some of the assessment work conducted on parcels within the project footprint was conducted prior to the initial version of the ERA Protocol or using earlier drafts of the document. Prior to the 2000 ERA Protocol most of the assessments focused solely on evaluation of risks associated with point source areas, and little investigation work was performed to evaluate potential non-point source risks associated with residual chemical concentrations in soil associated with routine application of agrochemicals across widespread cultivated areas.

All of the work conducted by the SFWMD for the Project was performed under the direct supervision of both FDEP (Bureau of Waste Cleanup) and the USFWS and completed in accordance with the ERA Protocol in place at the time of the assessment. Additionally, FDEP applied the following point source contamination specific rules, including:

- Chapter 62-770, FAC (Petroleum Contamination Site Cleanup Criteria)
- Chapter 62-780, F.A.C. (Contaminated Sites Rule)
- Chapter 62-777, FAC (Contaminant Cleanup Levels), F.A.C.

The ERA Protocol acknowledges that the lands are being acquired for conversion to storm water treatment areas, engineered wetlands, reservoirs, and other aquatic features. Both human health concerns and ecological risks are evaluated concurrently as part of the protocol. Human health risks evaluation was performed by comparing contaminant concentrations in all media (e.g., soil, groundwater, surface water, sediment) to human health-based cleanup target levels (CTLs) promulgated by FDEP in Chapter 62-777, F.A.C. Ecological risks were concurrently evaluated by comparing chemical concentrations to the Sediment Quality Assessment Guidelines (SQAGs) developed by FDEP for inland waters and the copper and selenium ecological restoration target established by the USFWS.

While the ERA Protocol evaluates both human health and ecological risks, in most cases the contaminant concentration thresholds for ecological risks are significantly lower than human health risk thresholds for the current and proposed future land use. For example, the USFWS ecological restoration target for copper is 85 mg/kg compared with the CTL for commercial /industrial land use which is 89,000 mg/kg. In many cases, the need for corrective action was solely driven by the need to minimize ecological risks for the aquatic environment being created

by the project. This fact is critical because USACE Regulation ER 1165-2-132 prohibits recommending projects or features implementation that would "… result in treating or otherwise abating pollution problems caused by other parties where those parties have, or are likely to have, a legal responsibility for remediation or other compliance responsibility". Contaminant concentrations in the soils within the project boundary are low enough that the landowner would not be subject to any enforcement by FDEP or Environmental Protection Agency (EPA) as long as the property continues in agricultural use.

It should be noted that site characterization and corrective actions on the Talisman parcels were performed by the property owner, rather than directly by SFWMD. Talisman performed the detailed site assessment and corrective action tasks on all "exclusion areas" which were identified based on the SFWMD Phase II ESA (Dames and Moore, 1998). Talisman's work was conducted under the oversight of both SFWMD and FDEP. However, since the assessment/corrective action work was conducted solely on point source areas, USFWS was not involved in the oversight of this work. EPA Region IV did provide concurrence on the Dames and Moore 1998 Phase II ESA. The end point for all of these exclusion areas was issuance of a No Further Action letter or Site Rehabilitation Completion Order (SRCO) from FDEP. It was previously noted that some of the SRCOs on specific point sources on the Talisman parcels are based upon recording of a deed restriction to prevent residential and other sensitive uses on these parcels.

The format and process for regulatory agency approval and concurrence of the assessment and corrective actions conducted on the site varies between point sources and non-point source issues. FDEP is the lead agency for assessment and corrective action for point sources where contaminant concentrations are high enough to exceed the CTLs for the current and future land use as outlined in Chapter 62-777, F.A.C. In these cases, FDEP issues a No Further Action Letter or Site Rehabilitation Completion Order (SRCO) upon completion of the assessment and/or corrective action process.

For non-point source areas and point source areas where contaminant concentrations exceed ecological thresholds but are below the FDEP CTLs, FDEP rules do not apply. In these situations, FDEP provides review and approval through memoranda or letter responses provided by their Bureau of Waste Cleanup. Although USFWS does not have jurisdiction over point sources with contaminant concentrations exceeding the FDEP CTLs (except to the extent Trust Species are affected), they have generally provided comment on an informal basis with regard to these issues. USFWS has generally concentrated on non-point source issues with the potential to affect Trust Species.

As a final point, neither the FDEP nor FWS review process for the assessment and corrective action work requires public comment. However, both of these agencies were involved in the permitting process for the abandoned EAA Reservoir Project, reviewing the project documents and providing the necessary permit approvals. The permit approvals were subject to public notice and all related environmental cleanup documents and approvals were included in the administrative record.

## 2.2 ARARs

As part of the assessment process on each parcel, chemical concentrations in all media were compared to applicable or relevant and appropriate requirements (ARARs), depending upon future proposed usage of each tract. It is acknowledged that numeric cleanup criteria have changed over time, and may not have been identical for each parcel that was assessed.

Additionally, in 1999, the FDEP shifted the cleanup target levels for soil and groundwater from individual cleanup rules (e.g., Chapter 62-770, FAC – Petroleum Cleanup Rule, Chapter 62-785, FAC – Brownfields Rule, etc.) into a separate rule, Chapter 62-777, FAC - Contaminant Cleanup Target Levels, which included the numeric cleanup criteria that applied universally to all of the cleanup rules.

For this report, chemical concentrations have been compared to current ARARs. It is acknowledged that some of the Site Rehabilitation Completion Orders (SRCOs) issued by FDEP on parcels or individual point source locations within the project footprint were based on the cleanup target levels in place at the time the SRCOs were issued, and these cleanup target levels may have been higher or lower than the current criteria. For example, all of the point sources on the Talisman property were remediated based on a commercial soil cleanup target level (SCTL) for arsenic of 3.7 mg/kg; however, the current SCTL for arsenic is 12 mg/kg.

The current ARARs for each media are summarized below.

### 2.2.1 Soil

The following human-health based criteria are established by the FDEP in Chapter 62-777 of the Florida Administrative Code (FAC). Chapter 62-777, FAC includes soil cleanup target levels (SCTLs) for both direct exposure and leaching to groundwater/surface water. Both the direct contact and leaching criteria must be considered to determine the need for corrective action.

- ***Residential*** – The Soil Cleanup Target Level for direct exposure in a residential setting (SCTL-RDE) is the default standard for site screening purposes in Florida, and assumes potential contact with soils on a regular basis by adults and children.

- ***Industrial/Commercial*** – The Soil Cleanup Target Level for direct exposure in a non-residential setting (SCTL-IDE) assumes extended contact with soils on a daily basis by adult workers at commercial/industrial sites, or on agricultural properties where farming practices result in frequent site contact. Use of this standard requires that a deed restriction be recorded against the property. It should be noted that a number of point source locations on the Talisman properties were closed with deed restrictions and these parcels are specifically identified throughout the report. Copies of the deed restrictions for any restricted closure areas are also included in the report appendix.

- ***Leaching to Groundwater*** – The Soil Cleanup Target Levels for leaching to groundwater (SCTL-LGW) represent default criteria for site screening purposes in Florida, and are based on soil concentrations which are considered likely to result in an exceedance of the groundwater quality standard for a particular chemical. In cases where the default SCTL-LGW criterion is exceeded, FDEP cleanup rules allow the responsible party to conduct follow up testing by the Synthetic Precipitation Leaching Procedure (SPLP) to evaluate the leaching potential. The results of the SPLP test are compared to the Chapter 62-777, FAC Groundwater Cleanup Target Levels (GCTL) discussed below. If the SPLP results are below the applicable GCTL, the soils are not considered to present a leaching concern and only the direct contact SCTL needs to be considered.

  Several heavy metals (e.g., arsenic) do not have numeric SCTL-LGW criteria and instead FDEP requires testing by the SPLP method and comparison to the GCTLs.

- ***Leaching to Surface Water*** – The Soil Cleanup Target Levels for leaching to surface water (SCTL-LSW) are applicable where impacted soils may be in contact with a surface water body. Soils within proposed upland areas or outside the area to be inundated by the project do not need to consider the SCTL-LSW criteria. FDEP also allows the responsible party to test any soil samples exceeding the default SCTL-LSW criteria by the SPLP method and the results are compared to the Surface Water Cleanup Target Levels, discussed below.

### 2.2.2 Sediment Ecological Risk Criteria

The FDEP has previously indicated that soils within proposed wetland or water storage areas should be regulated as sediments, as these soils will ultimately become inundated. For sediments, the Sediment Quality Assessment Guidelines (SQAGs) as defined in *Development and Evaluation of Sediment Quality Assessment Guidelines, Volumes 1-4*, (MacDonald, 2000) have generally been applied for screening purposes. The SQAGs are not a human health-based criteria, but are instead relevant only to the evaluation of ecological risk. The referenced guideline outlines two potential standards which were developed specifically with respect to benthic macro invertebrate species, which represent the bottom of the food chain, as follows:

- ***No Observed Adverse Effects Level*** – The threshold effects concentration (SQAG-TEC) is the more conservative value and is utilized as a screening tool in evaluating sediments. Contaminant concentrations below the SQAG-TEC generally do not warrant further investigation.
- ***Lowest Observed Adverse Effects Level*** – The probable effects concentration (SQAG-PEC) represents the level above which adverse effects are likely to occur. Contaminant concentrations exceeding the SQAG-PEC generally require corrective action, except when exceedences are very limited in areal extent (e.g., point sources).

It should be noted that the SQAGs are predictive of potential adverse effects to benthic invertebrates and may not adequately predict ecological risks to higher trophic level species. USFWS has generally tolerated some predicted risks to benthic invertebrates as long as the perceived risks are not predicted to affect the health of the overall ecosystem that will develop upon project construction. On previous projects, USFWS has agreed that some exceedences of the SQAG-TEC criteria are acceptable, as long as the 95% upper confidence level (UCL) estimate of the mean analyte concentrations across the site do not exceed the SQAG-TEC. USFWS has generally required corrective actions where the chemical concentrations exceed the SQAG-PEC criteria over more than an extremely limited area.

It should also be noted that SQAGs may not be established for all analytes of interest. USFWS protocols for ecological risk assessment (USFWS, March 2008) recommend consideration of Ecological Screening Values (ESV) established by EPA Region IV in *Ecological Screening Values or Surface Water, Sediment, and Soil* (WSRC, November 1998) when Florida SQAGs are not available.

Finally, it should also be noted that SQAGs are not regulatory benchmarks and do not carry the force of law like SCTLs. They are screening benchmarks that may be used in making risk management decisions.

### 2.2.3 Sediment – Interim Screening Levels for Ecological Risk

USFWS has established specific screening levels for certain chemicals based on specific risks. Screening levels for copper and selenium are discussed below.

For copper, the USFWS utilizes an interim screening value of 85 mg/kg for protection of the endangered Snail Kite, in addition to comparison with the SQAG-TEC.

No SQAG values have been established for selenium. However, selenium has historically been screened for potential ecological effects under the protocol using 2 mg/kg as a benchmark. The potential for effects to aquatic-feeding wildlife and/or benthic invertebrates and fish at this benchmark is uncertain.

### 2.2.4 Sediment – Site Specific Ecological Risk Based Concentrations

As previously stated, the SQAGs are intended to be protective of benthic invertebrates, but are not necessarily reflective of risks to higher trophic level species, included migratory bird species and wading birds, which are protected as Federal Trust Species. Where contaminant concentrations exceed the SQAGs or where potentially bioaccumulative chemicals are detected, the ERA Protocol typically requires preparation of a Screening Level Ecological Risk Assessment (SLERA) in order to develop site specific ecological Risk-Based Screening Concentrations (RBCs).

To evaluate potential effects to benthic invertebrates, soil data were compared to the SQAG-TEC and SQAG-PEC values. Risk to aquatic-feeding wildlife are typically evaluated by estimating the potential exposure of avian receptors to chemicals through the ingestion of aquatic prey species that might accumulate chemicals from soils after they have been flooded. Exposure and risks are calculated for aquatic-feeding wildlife using a model developed for the District specifically for the purposes of this program (Goodrich 2002 and NewFields 2006).

### 2.2.5 Groundwater

Groundwater analyte concentrations were compared to the Groundwater Cleanup Target Levels (GCTLs) found in Chapter 62-777, FAC.

### 2.2.6 Surface water

Surface water analyte concentrations were compared to the Surface Water Cleanup Target Levels (SwCTLs) found in Chapters 62-302 and 62-777, FAC.

### 2.2.7 Applicable Criteria

All of the above criteria have been considered in evaluating the analytical results obtained during the assessment activities described herein. Since some portions of the site may not become inundated, it is appropriate to compare analyte concentrations in the soil to the human health-based SCTLs established in Chapter 62-777, FAC. Therefore, soil data was compared to both the SCTLs for residential direct exposure (SCTL-RDE) and to the SCTLs for leaching to groundwater (SCTL-LGW) and leaching to surface water (SCTL–LSW).

It is likely that most of the site will be inundated; at least for a portion of each year, and that important ecological receptors will utilize the property. Therefore, it is also necessary to

compare the site data to the SQAGs and the Site-Specific Ecological RBCs generated from the SLERAs. For most analytes of interest (arsenic being the notable exception), the SQAG-TEC criteria are more stringent than the SCTL-RDE criteria. Therefore, in most cases, a cleanup to SQAG-TEC criteria is also protective of human health. It should also be noted that the SQAGs are not standards or deterministic values (i.e., an exceedance does not indicate absolutely that adverse affects will occur); the SQAGs are merely screening values. Data exceeding the SQAG values generally indicate the need for further study. Conversely, chemical concentrations which do not exceed the SQAGs are generally screened out from any further consideration with respect to ecological risk.

The SCTLs for leaching to surface water (SCTL-LSW) have also been considered for soils which are, or may become inundated.

### 2.2.8 USACE HTRW

Because the project may be completely or partially constructed under the direction of USACE, Engineering Regulation (ER) 1165-2-132 – Hazardous Toxic and Radioactive Wastes (HTRW) was considered to be applicable to project construction. ER 1165-2-132.prohibits USACE Districts from executing construction projects with known HTRW and assigns 100% of the cost and responsibility associated with remediation to the local sponsor.

HTRW is defined to include any material listed as a "hazardous substance" under the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9601 et seq (CERCLA). (See 42 U.S.C. 9601(14)). Hazardous substances regulated under CERCLA include "hazardous wastes" under Sec. 3001 of the Resource Conservation and Recovery Act, 42 U.S.C. 6921 et seq; "hazardous substances" identified under Section 311 of the Clean Air Act, 33 U.S.C. 1321, "toxic pollutants" designated under Section 307 of the Clean Water Act, 33 U.S.C. 1317, "hazardous air pollutants" designated under Section 112 of the Clean Air Act, 42 U.S.C. 7412; and "imminently hazardous chemical substances or mixtures" on which EPA has taken action under Section 7 of the Toxic Substance Control Act, 15 U.S.C. 2606; these do not include petroleum or natural gas unless already included in the above categories. (See 42 U.S.C. 9601(14).)

The concentration at which the presence of a hazardous substance in the soil or groundwater would render that media as HTRW is not specifically defined in ER 1165-2-132. On a previous project (Indian River Lagoon South – C-44 Component), USACE acknowledged that the presence of hazardous substances at concentrations below all regulatory criteria did not constitute HTRW.

Therefore, for the purposes of this document PSI has considered HTRW soils to be any soils at point source locations exhibiting concentrations of target analytes exceeding any of the following criteria:

- FDEP Soil Cleanup Target Levels
- SQAG-PEC criteria
- USFWS Interim Screening Criteria for Copper (85 mg/kg)
- USFWS Interim Screening Criteria for Selenium (2 mg/kg)

PSI has considered HTRW groundwater to include any groundwater associated with a point source release exhibiting concentrations of target analytes exceeding the FDEP Chapter 62-

777, FAC Groundwater Cleanup Target Levels or Federal Maximum Concentration Levels (MCLs) for drinking water.

It should be noted that it is the District's position that the residual agrochemicals that are not associated with a spill, but are associated with purposeful application of these chemicals. These agrochemicals are not CERCLA regulated substances, and therefore are not subject to the USACE HTRW policy because:

1. Historical evidence shows long-term agricultural production on the site,
2. The chemicals found on site are active ingredients found in commercially available products registered under the 1947 Federal Insecticide, Fungicide and Rodenticide Act (FIFRA),
3. The concentrations of these chemicals found on site are within a range reflecting long-term application of chemicals on the cultivated lands in a customary manner, and
4. The site specific research has revealed no evidence of illegal activities causing the presence of these chemicals on site,

Therefore, it is reasonable to surmise that these chemicals were legally applied as part of farming activities for their intended purpose and that they were not the result of a spill or waste management action.

### 2.2.9 Hazardous Waste Criteria

While none of the media within the project footprint are considered to be hazardous wastes under the Resource Conservation and Recovery Act (RCRA), the hazardous waste rules under 40 CFR 260-265, and Chapter 62-730, FAC were considered applicable and were considered in our evaluation of the data.

As discussed below, none of the residual agricultural chemicals on the project site exhibit any of the hazardous waste characteristics even though none of the residual agricultural chemicals on site are considered a solid waste (chemicals were lawfully applied for their intended purpose and not discarded). For soil or groundwater to be considered a RCRA hazardous waste, it would first need to be classified as a solid waste.

Per Subpart C (40 CFR 261.20 et seq.) the four (4) RCRA characteristics of hazardous waste are: ignitability, corrosivity, reactivity, and toxicity. Ignitable wastes readily catch fire, sustain combustion, and when ignited, burn so vigorously and persistently that it creates a hazard. Corrosive wastes are a liquid and are acidic or alkaline wastes that readily corrode or dissolve flesh, metal, or other materials. Reactive wastes are unstable, readily explode or undergo violent reactions.

The fourth characteristic is toxicity. Toxic wastes leach toxic compounds or elements into underlying soils or groundwater supplies. For a toxic constituent in 40 CFR 261, Subpart C, demonstration of the RCRA toxicity characteristics can be determined by utilizing the Toxicity Characteristics Leachate Procedure (TCLP) test or by analyzing for total constituent concentration and applying the "Rule of 20" to infer whether the RCRA Toxicity Characteristics regulatory limits would be exceeded. The "Rule of 20" allows a toxicity determination to be made by comparing the total concentration analysis (dry weight) to the TCLP regulatory concentration (wet weight). The rule is used by multiplying the RCRA TCLP limit (mg/l) by 20 and then comparing this value to the measured total constituent concentration (mg/kg). If the measured total constituent concentration value is less than the TCLP concentration multiplied by 20, the

material cannot be a RCRA characteristic waste based on toxicity as determined by analytical procedures. Additionally, if the constituent is not listed in Table 1 of Subpart C, the material is not a RCRA characteristic waste based on toxicity.

Based on the “Rule of 20” none of the soil or groundwater containing residual agricultural chemicals on the project site are classified as a RCRA toxic hazardous waste. Therefore, the remaining residual agricultural chemical soils on site are not hazardous waste under RCRA.

None of the soils or groundwater within the project boundary exhibit any of the hazardous waste characteristics. The concentrations of the remaining residual agricultural chemicals are not sufficient to render the soil or groundwater toxic, corrosive, ignitable or reactive. Therefore, testing for these characteristics is not necessary.

# 3. SUMMARY OF PREVIOUS REPORTS

All of the properties within the A-2 Reservoir project area have been previously investigated through a series of environmental investigations. The primary parcel (Tract D7100-104) was initially investigated as a part of the Talisman Ranch, which was acquired by SFWMD in 1999. It should be noted that the Talisman reports include a far greater area than is contained within the current reservoir footprint. Only those portions of the Talisman Ranch within the current A-2 Reservoir project footprint are discussed below.

At the time of the initial investigation, several point source areas of concern were identified, and these areas were deferred from the transfer in 1999. These areas were surveyed and legal descriptions were created. SFWMD has assigned tract numbers D7100-044, D7100-047, D7100-066, D7100-139, and D7200-005 to these deferred parcels. Each of these areas was separately investigated and remediated and closure obtained from FDEP. These parcels were transferred to SFWMD in 2009. It should also be noted that the 10-acre Weinlan property, Tract D7100-141 was also included within the Talisman investigations as this parcel is completely surrounded by the Talisman Ranch, and was being leased by Talisman at the time that the initial investigations were completed. The deferred parcel locations are shown on **Figure 3-1.**

## 3.1 Former Talisman South Ranch

The Talisman South Ranch property consists of approximately 20,525 acres that has been used for the cultivation of sugar cane since the mid-1960s. Prior to that it was undeveloped wetlands. The property was continually operated by Talisman from the 1960's until 1999 when the property was acquired by SFWMD. Subsequent to the SFWMD acquisition the section of the property within the A-2 Reservoir footprint has been operated under a lease agreement by New Hope Sugar Corporation from 1999 to present. Tract # D7100-104 lies within portions of Sections 4, 5, and 6, Township 45 South Range 37 East, a portion of Section 13, Township 46 South, Range 35 East, Sections 15 – 36, Township 46 South, Range 36 East, Sections 5 – 9, 16 – 22, 26 – 30, and portions of Sections 4, 10, 14, 23 – 25, 31- 36, Township 46 South, Range 37 East, and a portion of Section 31, Township 46 South, Range 38 East.

A summary of assessment and corrective actions performed on the Former Talisman South Ranch is provided in **Table 1**. A summary of previous environmental reports prepared for the subject property is provided in **Table 2**, and each of these reports is further described in the following sections.

### 3.1.1 Summary of Phase I/II ESA

<u>Environmental Concerns Summary Report, 1996, (Dames & Moore)</u>

Dames & Moore conducted a preliminary site assessment of the Talisman Sugar Corporation farm (Tract D7100-104) and sugar mill (Tract D7100-029) in 1996. The sugar mill parcel is outside the current project footprint and is not discussed herein. Additionally, only the western portion of Tract D7100-104 is within the project footprint and only this section of the parcel is discussed herein.

PSI was unable to obtain a copy of this report; however, the report was summarized in the Phase II Environmental Site Assessment described below, which was also prepared by Dames

and Moore. The scope of work for the Environmental Concerns Summary Report was similar in nature to a Phase I Environmental Site Assessment (ESA) and included site reconnaissance, interviews with the property owner and government officials, review of governmental databases for regulated facilities and spill sites, and a review of available historical resources. The Phase I ESA identified the following areas of concern on Tract D7100-104, which are within the A-2 Reservoir Footprint:

- A solid waste disposal area within a former borrow pit
- Seven point source areas within a former labor camp
- Three diesel powered pump stations
- An electric pump station
- A pesticide mix/load area

The areas of concern are summarized in **Table 1**. Dames and Moore identified each area of concern with a unique identification number, which included the farm name code, followed by a numeric id number. For example, the Talisman Farm labor camp was designated as T-3, and smaller areas of concern within the labor camp were designated as T-3.1-Pesticide Mix-Load Area, T-3.2-Burn Area, etc.

These areas of concern, shown on were all investigated during the Phase II ESA discussed below.

Volume 1 – Acquisition Properties Phase II Environmental Site Assessment Talisman Sugar Corporation Properties, Palm Beach and Hendry Counties, for South Florida Water Management District, November 9, 1998, (Dames & Moore). **(See Appendix A-1)**

Dames & Moore (D&M) conducted a Phase II Environmental Site Assessment (ESA) in 1998 at the Talisman Farm. This assessment included the entirety of Tracts D7100-104 and D7100-029 (sugar mill), as well as multiple tracts that are outside the project footprint. Only results from investigation conducted within Tract D7100-104 are discussed herein.

D&M conducted an extensive Phase II investigation to evaluate all of the areas of concern listed in **Table 1**. These areas included:

- T-2 Borrow Pit Landfill
- T-3 Labor Camp
    - T-3.1 Pesticide mix/load area
    - T-3.2 Aircraft Refueling Area/Runway
    - T-3.3 Burn Pit
    - T-3.4 Drum Storage Area
    - T-3.5 Aircraft Maintenance Building
    - T-3.6 Water Treatment Plant
    - T-3.7 Miscellaneous Area
- T-6 Electric Pump Station
- T-7 Diesel Pump Station
- T-8 Diesel Pump Station
- T-21 Pesticide mix/load area
- T-24 Diesel Pump Station

The Phase II ESA included the collection of soil and groundwater samples from each of the areas of concern. Test trenching was also completed in a number of areas where suspect buried debris was identified. D&M conducted a comprehensive evaluation of current and historical agrochemical use on the property in order to determine the list of chemicals of potential concern. The analytical testing methods varied between locations, depending upon the specific concern. For example, analysis for total petroleum hydrocarbons (TPH) was conducted for pump stations, but more extensive analysis, including RCRA metals, copper, chlorinated pesticides and herbicides, triazine herbicides, and organophosphorus pesticides were conducted at pesticide mix load areas, equipment staging areas, and burn pits. The analyses did not include selenium, as this metal was not yet identified as a potential concern in 1998.

Based on the Phase II investigation, D&M eliminated T-3.5, T-3.6, T-3.7, and T-24 as concerns. The remaining areas where impacts were detected are discussed below.

D&M conducted an electromagnetic survey and test trenching to determine the extent and type of waste disposal in this area. The extent of the former borrow pit was defined, and D&M determined that the pit had been backfilled with agricultural wastes (e.g., bagasse) and agricultural equipment parts. Some oil containing equipment, hydraulic hoses, etc. were identified in the test trenches. Five soil samples and twelve groundwater samples were collected from the solid waste borrow pit area. The soil analytical results reported detectable concentrations of TRPH while the groundwater analytical results detected m&p cresol and phenol above the Groundwater Cleanup Target Levels (GCTLs). D&M recommended further assessment of the groundwater and removal of the solid waste from the pit.

Eighteen soil samples and sixteen groundwater samples were collected from the Talisman labor camp. The soil analytical results indicated elevated levels of TRPH at the burn pit and drum storage area. Elevated levels of atrazine were detected in groundwater samples collected from the pesticide storage / mix & load area and the airplane refueling area / runway. The groundwater analytical results also indicated concentrations of PAHs above the GCTLs. Further investigations were recommended at the pesticide storage / mix & load area and refueling area / runway, burn pit, and the drum storage area.

D&M obtained one soil sample and installed two groundwater monitoring wells at T-21 Pesticide Mix/Load Area. The soil and groundwater results indicated the presence of arsenic at concentrations above the applicable regulatory standards. The arsenic concentration detected in Soil Sample, T-21SC-1 was reported at 100 mg/kg. Monitoring Well T-21-MW-45 had a reported arsenic concentration of 448 micrograms per liter (μg/L), while T-21-MW-52 had a reported arsenic concentration level of 122 μg/L. Both analytical results are above regulatory guidelines. Further site assessment was recommended to delineate the impacted soil and groundwater.

D&M conducted visual observations at T-7 and excavated one test trench on the southwest side of the pump station. The test trench log indicated the presence of stained soils, but no Organic Vapor Analyzer (OVA) measurements were recorded. No laboratory testing of soil or groundwater was performed at this pump station and it was included as an Exclusion Area based on visual evidence only.

D&M conducted visual observation and exploratory trenching around the pump station at T-8. D&M excavated two test trenches along the east and west sides of the AST; no staining or evidence of environmental concerns were noted in the trench log. D&M did not conduct

laboratory analysis of soil or groundwater at this location; however, T-8 was included as an Exclusion Area.

Soil analytical results revealed elevated concentrations of chlorinated pesticides at concentrations exceeding the SQAG-TEC criteria at electric pump station T-6. No groundwater samples were collected from this location. Further site assessment was recommended to determine the extent of pesticide impacts in soil.

Six areas of concern (T-2, T-3, T-6, T-7, T-8, and T-21) were identified as "Exclusion Areas" with known impacts in the D&M Phase II ESA. These exclusion areas are shown on **Figure 3-1**. D&M defined a buffer area around each area of concern, and legal descriptions were created for these areas. The Exclusion Areas were deferred during the land transfer from Talisman to SFWMD until such time as Talisman obtained SRCOs on these Exclusion Areas from FDEP. Talisman was required to assess and remediate these areas to the lower of the SCTL criteria or the SQAG-TEC criteria, whichever was lower. The assessment and remediation activities performed on these Exclusion Areas is described below in Section 3.1.2. Talisman did obtain SRCO's for all of these Exclusion Areas and they were eventually transferred to SFWMD.

Site Inspections/Environmental Assessment Deferred Parcels – Former Talisman Property, Palm Beach County, Florida, dated July 17, 2007 (URS Corporation). **(See Appendix A-2)**

The deferred parcels were conveyed to the District as part of the purchase and exchange agreement between the District and U.S. Sugar Corporation. URS reviewed regulatory files to confirm that the deferred parcels had received regulatory closures from the State and conducted site inspections of each parcel. URS concluded that each parcel had received either a No Further Action or a Site Rehabilitation Completion Order and that no obvious impacts had occurred at the parcels since 1999.

Final Site Inspections/Environmental Assessment Deferred Parcels – Former Talisman Ranch Report, Palm Beach County, Florida, January 21, 2009 (URS Corporation). **(See Appendix A-3)**

Final inspections were conducted of the deferred parcels that were conveyed to the District as part of the purchase and exchange agreement between the District and U.S. Sugar Corporation. URS conducted site inspections of each parcel and concluded that no obvious impacts had occurred at the deferred parcels since 1999.

Everglades Agricultural Area Basin Reservoir – Phase I Environmental Assessment Summary Document, March 18, 2003 (URS Corporation). **(See Appendix A-4)**

URS summarized all of the historical assessments and corrective actions on the Talisman Sugar Corporation Farm conducted as of 2002. This summary report was developed as part of the EAA Basin Reservoir – Phase I for the Project Delivery Team (PDT). One comment was received from the PDT and subsequently addressed.

### 3.1.2 Summary of Corrective Actions

A Corrective Actions Location Map is included as **Figure 3-2.** A summary of the corrective actions performed is included in **Table 1**. More detailed information regarding the corrective actions performed on this tract is summarized below:

Site Rehabilitation Completion Report – Talisman Sugar Corporation T-2 (Borrow Pit), February 2002 (PSI) **(See Appendix A-5)**

The Talisman Borrow Pit was a former rock quarry that was filled with vegetative matter, debris, tires, and equipment from farm and sugar mill operations. The former Borrow Pit is located within the former Talisman South Ranch property. More specifically it is located six miles west of US Highway 27 and approximately 16 miles south of the City of South Bay. The pit lies within Section 28, Township 46 South, Range 36 East, as referenced on the USGS "Everglades NW, Florida" Topographic Map. The location of the former Borrow Pit is shown of **Figure 3-2**. A summary table of the range of detected concentrations, after any corrective actions, is provided in **Table 3**.

During PSI's initial assessment of the Borrow Pit, twelve soil samples were collected from the Pit and a test pit was excavated on the southern portion of the Pit. Low levels of TPH and various PAHs were detected in all of the samples. Several metals were also detected in the soil samples, but were below their respective regulatory criteria. Metal debris was encountered in the test pit and was hauled off-site.

PSI conducted a source removal to remove the metal debris and petroleum contaminated soil from the pit. Based on an agreement with FDEP, the bagasse was allowed to remain in the pit. Prior to excavation activities, PSI constructed haul roads, soil and debris staging areas, an infiltration pond, a water treatment system, and excavated a de-watering trench. During the excavation of the Pit, debris was separated from the soil using various forms of heavy equipment. The miscellaneous debris was hauled off-site to a land fill or recycling center. The remaining soil was transported to a soil stockpile staging area. Clean soil, which was defined as all contaminants of potential concern (COPCs) were below the soil cleanup target levels for leaching to groundwater (SCTL-LGW) criteria, was set aside to be used as backfill upon completion of the excavation. The SCTL-LGW criteria was used as the determining factor for clean vs. dirty soil, due to the fact that the excavation area was going to be covered with at least 2 ft. of clean fill.

As a result of the excavation activities, approximately 1,009 tons of steel, 473 tons of tires, 3,895 tons of construction and demolition (C&D) debris, and 3,735 tons of soil which did not meet the clean soil criteria was transported off-site to a disposal facility. In addition to the excavation activities, PSI installed a groundwater treatment system. Due to the inability of the system to filter out lead from the groundwater, the treatment system operation was abandoned after several trials.

Once excavation activities were complete, PSI removed the equipment staging areas, the impoundment berm, decommissioned the soil stockpile staging area and backfilled the Borrow Pit. As previously mentioned, almost all of the soil removed from the borrow pit was transported off-site for disposal. Only a small amount of soil met clean soil standards which allowed for use as backfill. This small amount of soil was returned to the southeast corner of the former borrow bit and covered with at least 2 ft. of clean, overburden soils. After completion of the backfilling and grading, two small ponds remained in the south and northwest portions of the Pit.

Surface water samples were collected from varying depths from the two remaining ponds. The samples were analyzed for TPH and total lead, as those were the only analytes detected in the soil or groundwater. Several sampling events occurred from June 2000 to October 2001, and the final results indicated the water in both ponds was below the groundwater and surface water standard for lead.

Lead was identified as the only COPC in the groundwater and surface water at the site. The removal of significant quantities of metal waste and lead-impacted soil has effectively removed the source of this contamination. The most recent surface water sampling results indicate that lead concentrations in the surface water in both the north and south ponds are below the Chapter 62-777, FAC groundwater and surface water criteria for lead.

PSI recommended that FDEP issue a Site Rehabilitation Completion Order (SRCO) with a non-residential use deed restriction for this exclusion area. As part of the deed restriction, the engineered cover over the site must remain in place. The FDEP issued an SCRO with conditions on July 21, 2006. A copy of the SRCO is included in **Appendix B-1**.

Site Rehabilitation Completion Report – Talisman Sugar Corporation T-3 (Labor Camp), March 2003 (PSI) **(See Appendix A-6)**

The former Labor Camp is located within the former Talisman South Ranch property. More specifically it is located approximately seven (7) miles west of US Highway 27 and approximately 16 miles south of the City of South Bay. The camp lies within Section 20, Township 46 South, Range 36 East, as referenced on the USGS "East of Little Cypress, Florida" Topographic Map. The location of the former Labor Camp is shown of **Figure 3-2**. A summary table of the range of detected concentrations, after any corrective actions, is provided in **Table 4**.

The T-3 exclusion area encompasses 10 acres and formerly operated as residential housing for farm workers (aka a labor camp). The labor camp ceased operation in about 1971 and the property was then utilized by a crop-dusting operation until 1999. The exclusion area includes four former concrete buildings used as residential quarters, an aircraft landing strip, and a pesticide mixing/loading area for loading agrichemicals into aircraft. All of the buildings were demolished down to the slab by PSI. Fueling and minor maintenance of single engine aircraft was also performed at the site. Four ASTs were also located within the exclusion area. Other areas of interest on the site included a wastewater treatment plant for domestic wastes associated with the former labor camp and a concrete burn pit for burning of empty agrichemical containers. All of the site features are shown on Figure 2 of the SRCR for the T-3 Labor Camp found in **Appendix A-6**.

All of the structures on the property were demolished in 2000. The fuel ASTs were removed and PSI submitted a Storage Tank Closure Report, dated April 9, 2001, which is discussed separately below. All of the drums and containers were removed from the buildings and disposed off-site under manifest. The concrete sump and trench drain in the pesticide mix/load area were cleaned and demolished. The trailers used for agrichemical storage were demolished or sold for use elsewhere. The concrete buildings were demolished down to the slab and the concrete rubble was crushed and used off-site for road base. Currently the concrete slabs and foundations are the only structures remaining in place.

The Dames and Moore Phase I/II identified seven (7) areas of potential concern. These areas are shown on Figure 2 of the SRCR and listed below:

- Runway Area
- Re-Fueling Area
- Pesticide Mix/Load Area
- Burn Pit Area

- Drum Storage Area
- Aircraft Maintenance Area
- Wastewater Treatment Plant

Dames and Moore conducted Phase II activities at each of these locations. The scope of work varied between each location, but generally consisted of exploratory test pits, soil sampling, and groundwater sampling. Based on the results of these investigations, PSI established the following list of COPC for the former Labor Camp:

- Organophosphorus pesticides (including atrazine)
- Organochlorine pesticides
- RCRA Metals (including arsenic, cadmium, and lead)
- VOCs (Re-Fueling Area only)
- Dioxins and furans (Burn Pit only)

Based on the results from the Dames and Moore investigation only five (5) areas (mix/load, burn pit, drum storage, aircraft maintenance, and wastewater treatment plant) required additional soil investigation and only two (2) areas (re-fueling, and mix/load) required additional groundwater investigation. The additional investigation generally consisted of additional soil samples to delineate soil impacts and the installation of an additional monitoring well to delineate groundwater impacts.

Based on the site characterization data collected by both PSI and D&M, PSI determined that remediation of five areas would be required. These areas are listed below and shown on Figure 5 of the SRCR for the T-3 Labor Camp found in **Appendix A-6**.

| | |
|---|---|
| Area #1: | Pesticide and metals impacted soils in the pesticide mix/load area centered around soil sample location SS-18; |
| Area #2: | Atrazine-impacted soils in the pesticide mix/load area centered around SS-17; |
| Area #3: | Atrazine-impacted soils in the pesticide mix/load area centered around D&M sample T-3.2SC-7. |
| Area #4: | Pesticide and metals impacted soils in the drum storage area (Building D) centered around SS-5 and SS-27; and, |
| Area #5: | Lower concentration pesticide and metals impacted soils around the north and east sides of Building C extending east of SB-4. |

The extent of excavation for each of these areas is shown on Figures 5 and 6 of the SRCR for the T-3 Labor Camp found in **Appendix A-6**. Soils were excavated using a trackhoe and temporarily stockpiled on plastic sheeting adjacent to the excavation area pending laboratory analysis and disposal facility acceptance. The excavation and post-excavation confirmation soil sampling strategy for each of these areas varied according to the amount of site characterization data available. A total of 1038.5 tons of pesticide and metal impacted soils were excavated and disposed off-site at WMI-Okeechobee. An additional 1,890 cubic yards of impacted soil was excavated and transported to the Talisman Sugar Mill Ash Pit for disposal. Upon completion of the excavations, PSI collected confirmation soil samples from the sidewalls and base of each excavation. The confirmation soil sampling results indicated that no soils exceeding either the SQAG-TEC or applicable SCTL criteria for any COPC remained on site, except for a single soil sample in Area #1 which contained an atrazine concentration (93 μg/kg), which slightly

exceeded the SCTL-LGW criteria of 60 μg/kg. However, PSI did not believe this single detection warranted further excavation given the high organic content of the soils and the fact that the concentration only slightly exceeded the SCTL-LGW criterion in the upper 1 foot of soil column. Atrazine concentrations were shown in the site characterization phase to attenuate rapidly with depth.

The D&M Phase II ESA identified only three monitoring wells on the site which were impacted by petroleum hydrocarbon constituents and/or atrazine. The impacts were defined by the remaining wells installed by D&M and PSI, in which no COPC were detected. PSI conducted several rounds of monitoring at the affected wells and found that both the atrazine and the petroleum constituent concentrations attenuated rapidly over time. The petroleum constituents attenuated to below the GCTLs without the need for any remediation. The atrazine concentrations were significantly reduced, but a source removal was required to further reduce the concentrations to below the GCTL at MW-51. Upon completion of the excavation around MW-51, PSI installed and sampled a replacement well MW-51R and the results indicated that the source removal was sufficient to remediate the atrazine concentrations in the groundwater to below the GCTL.

Based on this information, PSI recommended that FDEP issue a Site Rehabilitation Completion Order (SRCO) with a non-residential use deed restriction for this exclusion area. The FDEP issued an SCRO with conditions on July 21, 2006. A copy of the SRCO is included in **Appendix B-2**.

<u>Tank Closure Report – Talisman Sugar Corporation – Talisman Labor Camp (Abel's Flying Service), April 2001 (PSI)</u> **(See Appendix A-7)**

This report was prepared to document tank closure activities associated with two 4,000-gallon steel aviation gasoline (AV-Gas) aboveground storage tanks (ASTs) located within the former Labor Camp described above. The ASTs were mounted on concrete saddles within secondary containment and located in the northeast quadrant of the Labor Camp.

The ASTs and containment basin were inspected and were deemed to be in good condition with no holes, cracks or leaks. PSI excavated two test trenches adjacent to each side of the secondary containment basin. Six soil samples were collected from the sides of the test trenches for field screening using an OVA and no readings were above 10 ppm. PSI collected two confirmation soil samples for laboratory analysis for PAHs and VOAs.

A groundwater monitoring well was previously installed as part of the site wide assessment performed by D&M in 1998. The well was installed approximately 18 feet southeast of the ASTs containment basin and was deemed suitable for the tank closure assessment. The well was sampled in 1999 for OPPs, VOAs, and TPH.

PSI concluded that no contaminated soil was detected within the excavation around the secondary containment basin either visually or by the OVA. Confirmation laboratory analyses indicated no concentrations above detection limits. Groundwater samples were collected from the well located 18 feet southeast of the containment basin and indicated no analytes were detected above GCTLs. Based on this data PSI recommended the FDEP grant No Further Action status for the tank. FDEP accepted the closure report in a letter dated May 23, 2001; a copy of the FDEP letter is provided in **Appendix B-3.**

Limited Contamination Assessment Report/No Further Action Request – Talisman Sugar Corporation – Talisman Sugar Farm – T-6 (Electric Pump Station), August 1999 (PSI) **(See Appendix A-8)**

This Electric Pump Station (T-6) was part of the former Talisman Sugar Corporation property. The site lies within Section 25, Township 46 South, Range 36 East, as referenced on the United States Geological Survey (USGS) "South of Okeelanta", Florida" 7.5 minute quadrangle map. A Site Location Map is included as **Figure 3-2**. This site consists of an electric pump station that includes two electric pumps, two breaker boxes on a concrete slab, a valve platform, valve pipes, and various drainage pipes. A Site Map is included as Figure 2 of the LCAR/NFA Request for the T-6 Pump Station found in **Appendix A-8**. The property was utilized by Talisman as an electric pump station to maintain the water level in the adjacent canal. The pump station is located on fill material which bridges the canal and serves as a canal crossing for vehicles and equipment.

While D&M did not note any potential environmental concerns at this pump station, they did collect a soil sample from the T-6 area for the intended purpose of obtaining background levels for the Talisman Sugar Farm. The sample was analyzed for RCRA Metals, OCPs, OPPs, and chlorinated herbicides. DDE, DDT, and dieldrin were detected at concentrations exceeding the SQAG-TEC criteria. Arsenic was also detected at a concentration slightly exceeding the SCTL-RDE criteria. However, since the site is scheduled for flooding and residential use of the property will not be permitted, PSI determined that the Soil Cleanup Goal for direct residential exposure is not an Applicable or Relevant and Appropriate Requirement (ARAR) for this site. Therefore, arsenic was not further considered as a COC at this site. PSI did not conduct any testing for arsenic at T-6.

In February and May 199, PSI performed a soil investigation at this site consisting of collecting 20 soil samples from various locations and depths. The soil samples were analyzed for organochlorine pesticides by USEPA Method 8081. The initial analytical results were below the laboratory detection limits for all of the constituents included in USEPA Method 8081. However, the laboratory detection limits were above the SQAG-TEC criteria for a number of the COC. A second set of soil samples was collected from approximately the same locations as the original data points. All of the EPA Method 8081 analytes were below the laboratory detection limits. Although the laboratory detection limits were above the SQAG-TEC criteria for a few of the COC, the detection limits represent the best available technology.

Based on the site characterization soil analytical results, it appears that no soils exceeding the SQAG-TEC and/or SCTL-IDE or SCTL-LGW criteria are present at this site. No groundwater sampling was conducted at the site by either D&M or PSI. However, groundwater sampling did not appear warranted at this site given the absence of COC in soil at concentrations exceeding the SCTL-LGW criteria.

PSI believed that the information contained within the report was sufficient to conclude that no further action is required for the subject site. Therefore, on behalf of Talisman, PSI recommended that the FDEP issue a “No Further Action” letter for the subject site. The FDEP issued a No Further Action for this site on December 21, 1999; a copy of the letter is included in **Appendix B-4**.

Limited Contamination Assessment Report/No Further Action Request – Talisman Sugar Corporation – Talisman Farm – T-7 (Pump Station), September 1999 (PSI) **(See Appendix A-9)**

This Pump Station (T-7) was part of the Talisman Sugar Corporation property. This site lies within Section 27, Township 46 South, Range 36 East, as referenced on the United States Geological Survey (USGS) "Everglades 1 NW", Florida" 7.5 minute quadrangle map. A Site Location Map is included as **Figure 3-2**.

This site consists of an agricultural pump station which is used to maintain water levels in an adjacent irrigation canal. The pump station was identified by Talisman personnel as Pump Station PS-4. The pump station includes a 500-gallon capacity diesel fuel AST inside a concrete containment basin, a diesel-powered pump engine, and a vertical shaft turbine pump. The storage capacity of the AST at this pump station is less than 550 gallons and is therefore not regulated under Chapter 62-761, FAC. The pump station is located by the side of the canal and is fully enclosed (AST and motor) in a concrete containment basin with a roof. Fuel is transferred from the tank to the motor via above-ground, one inch diameter steel-mesh rubber coated diesel supply and return lines. An on-demand vacuum system is used to transfer fuel to the pump engine. There was no obvious staining around the outside of the containment basin. However, there were small stains located inside the containment area. Figure 2 of the LCAR/NFA Request for the T-7 Pump Station found in **Appendix A-9** illustrates the site layout.

In April 1999, PSI personnel conducted preliminary site characterization activities at T-7. PSI did not note any evidence of soil staining or petroleum odors during our site investigation. Fourteen surficial soil samples were collected from around the pump station for OVA-FID screening. No OVA-FID readings in excess of 10 ppm were recorded. Therefore, PSI selected four surficial soil samples for laboratory analysis by laboratory method FL-PRO for TPH and EPA Method 8100 for PAHs. No PAHs were detected in these soil samples and the highest measured TPH concentration was 15 mg/kg. This TPH concentration is well below the SCTL-residential direct exposure I and SCTL-leachability criteria. No SQAG-TEC criteria has been established for TPH. Additionally, PAHs were not detected above the LMDLs (5 ug/kg) in the second set of soil samples collected on July 1, 1999.

Based on the soil screening and analytical results, it appears that no soils exceeding the SQAG-TEC criteria or SCTL criteria are present. Based on the lack of COCs in the soil at T-7, PSI did not believe that installation of a monitoring well for the purpose of groundwater sampling was warranted at this location.

PSI recommended that the FDEP issue a “No Further Action” letter for the subject site. The FDEP issued a No Further Action for this site on December 21, 1999; a copy of the letter is included in **Appendix B-5**.

<u>Site Rehabilitation Completion Report – Talisman Sugar Corporation – Talisman Farm – T-8 (Pump Station), September 1999 (PSI)</u> **(See Appendix A-10)**

This Pump Station (T-8) was part of the Talisman Sugar Corporation property. This site lies within Section 27, Township 46 South, Range 36 East, as referenced on the United States Geological Survey (USGS) "South of Okeelanta, Florida" 7.5 minute quadrangle map. A Site Location Map is included as **Figure 3-2**.

This site consists of an agricultural pump station which is used to maintain water levels in an adjacent irrigation canal. The pump station was identified by Talisman personnel as Pump Station PS-5. The pump station includes an approximately 500-gallon capacity, AST inside a steel containment basin, a diesel-powered pump engine, and a vertical shaft turbine pump. The storage capacity of the AST at this pump station is less than 550 gallons and is therefore not

regulated under Chapter 62-761, FAC. The AST and its steel containment structure are located on a concrete slab with the pump engine and turbine pump. Flexible 1" diameter steel-mesh rubber coated diesel supply and return lines run above-grade between the AST and pump engine. An on-demand vacuum system is used to transfer fuel to the pump engine. The containment basin also has a metal corrugated roof structure. The pump engine for the station rests on a concrete slab, which extends over the northeast edge of the canal. The concrete slab was covered by a metal corrugated roof structure, but is not surrounded by a berm to prevent run-off. Figure 2 of the SRCR for the T-8 Pump Station found in **Appendix A-10** illustrates the site layout.

PSI conducted site characterization soil sampling around the concrete pad containing the AST containment and the pump engine. Soil samples collected from all sides of the pump station indicated no OVA-FID readings in excess of 5 PPM and no surficial staining or petroleum odors were noted by PSI. However, laboratory analysis of soil samples collected from a depth of 0-2 feet BLS on all sides of the pump station indicated the presence of several PAH compounds at concentrations exceeding the SQAG-TEL criteria, but significantly below the SCTL-leachability criteria. As stated in the SRA, the SQAG-TEL criteria apply only to the upper 6 inches of soil column within the proposed reservoir area.

In order to remove soils containing PAH concentrations exceeding the SQAG-TEL criteria within the upper six inches of soil column, PSI conducted excavation around the north, east, and west sides of the pump station to a depth of at least 6 inches BLS. A total of 6.36 tons of petroleum impacted soil was removed. Upon completion of the excavation, four soil confirmation samples were collected. The laboratory results did not indicate the presence of any PAH compounds at concentrations exceeding the SQAG-TEL criteria. Based on the lack of soils containing TPH or PAH concentrations exceeding the SCTL-leachability criteria, PSI did not believe investigation of the groundwater was warranted at this location.

PSI recommended that the FDEP issue a SRCO for the subject site. The FDEP issued a SRCO for this site on December 21, 1999; a copy of the SRCO is included in **Appendix B-6**.

<u>Site Rehabilitation Completion Report – Talisman Sugar Corporation – Talisman Farm – T-21 (Pesticide Mix/Load Area), May 2002 (PSI)</u> **(See Appendix A-11)**

This Pesticide Mix/Load area (T-21) was part of the Talisman Sugar Corporation property. This site lies within Section 17, Township 46 South, Range 36 East, as referenced on the United States Geological Survey (USGS) "East of Little Cypress Swamp" 7.5 minute quadrangle map. A Site Location Map is included as **Figure 3-2**. A summary table of the range of detected concentrations, after any corrective actions, is provided in **Table 5**.

This site consists of a pesticide mixing and loading area also utilized for storing and staging of farm equipment. The site is developed with a small corrugated metal shed, approximately 30 feet by 12 feet, with an overhang. The interior of the storage shed was concrete floored. The shed appeared to have been utilized for storing pesticides in the dry granular form. However, it is possible that liquid pesticides may have been stored there as well. A Site Map is included as Figure 2 of the SRCR for the T-21 Pesticide Mix / Load Area in **Appendix A-11**. The property was utilized by Talisman for mixing and loading of pesticides in addition to storing farm equipment. It was also used as a collection point for sugar cane during harvest activities. No significant staining was noted during this fieldwork; however, pesticide odors were detected. The pesticides appeared to have been used in ground application. No water wells, restroom facilities, septic systems or fueling facilities were located on-site.

Potential constituents of concern (COC) at the subject site which were identified in the D&M Phase II ESA, included arsenic in soil and groundwater. At the request of the FDEP, groundwater analytical testing was performed for dioxins.

PSI collected 49 surface soil samples (0-2 feet bls) and nine deep soil samples (two to four feet bls) on a grid basis across the site. The highest arsenic concentration detected was 48.0 mg/kg. Four separate arsenic impacted areas were defined encompassing a total of approximately 13,500 square feet. Soils within these areas were excavated to a depth of six inches below original grade and transported to Magnum Environmental Services, Inc. for thermal treatment and incorporation into asphalt products. A total of 686.25 tons of arsenic-impacted soil was excavated on May 3 through 7, 1999 for treatment by Magnum.

Following excavation activities, 24 confirmation soil samples (T-21SS-50 – T-21SS-73) were collected from the base of the excavation on a grid basis. Based upon the results, concentrations of arsenic above the SCTL-LGW screening criteria of 10 mg/kg were detected in five of the samples. These samples were analyzed by EPA Method 1312/6010 for SPLP arsenic. The results indicated that an SPLP arsenic concentration exceeding the GCTL was detected in one of the samples (T-21-SS-52).

Based on the SPLP arsenic concentration detected in confirmation sample T-21SS-52, PSI excavated an additional 6.35 tons of soil from around this location on July 1, 1999. The excavation was continued vertically to a depth of about 2 feet bls. After completion of the excavation, three additional confirmation soil samples (T-21SS-74 – T-21SS-76) were collected from the base of the excavation for arsenic analysis. The measured arsenic concentrations in these samples were below all regulatory criteria. Following this excavation, the area was backfilled to grade.

PSI also installed five additional monitoring wells and collected groundwater samples for analyses for arsenic. Groundwater samples were also collected from D&M wells T-21-MW-45 and T-21-MW-52 on two separate dates for analysis for arsenic. In addition, groundwater samples from D&M well T-21-MW-45 were analyzed for dioxins/furans, TPH, PAHs and VOAs. The results indicated that arsenic concentrations above GCTLs were detected in T-21MW-45, T-21MW-52, and T-21-MW-3. The highest arsenic concentration detected was 120 μg/L in the groundwater sample collected from T-21-MW-52. All other parameters were either below detection limits or below applicable GCTLs.

Based upon the groundwater analytical results, PSI installed and operated a groundwater pump and treat remediation system in order to reduce the arsenic concentrations in the groundwater. The treatment system consisted of two recovery wells, tray stripper aeration and filtering with granular aluminum oxide. Following treatment, the water was sprayed over the northwestern portion of the site via low flow sprinkler heads mounted on five-feet tall poles. The treatment system was operated for a period of about 3 months and was shut down when arsenic concentrations in the influent were consistently below the GCTL for four consecutive sampling events.

Following system operation, groundwater samples were collected on multiple occasions from previously impacted monitoring wells and analyzed for arsenic. Results of the last sampling event indicate that the groundwater meets the GCTL for arsenic concentrations.

PSI requested a SRCO with non-residential deed restrictions for this site; The FDEP issued a SRCO for this site on July 21, 2006; a copy of the SRCO is included in **Appendix B-7**.

Site Rehabilitation Completion Report – Talisman Sugar Corporation – Talisman Farm – T-24 (Pump Station), October 1999 (PSI) **(See Appendix A-12)**

Pump Station T-24 was part of the Talisman Sugar Corporation property. This site lies within Section 26, Township 46 South, Range 36 East, as referenced on the United States Geological Survey (USGS) "South of Okeelanta, Florida" 7.5 minute quadrangle map. A Site Location Map is included as **Figure 3-2**. A summary table of the range of detected concentrations, after any corrective actions, is provided in **Table 6**.

This site consists of an agricultural pump station which is used to maintain water levels in an adjacent irrigation canal. The pump station was identified by Talisman personnel as Pump Station IPS-3. The pump station includes a 3,000-gallon capacity diesel fuel AST inside a concrete containment basin, a diesel-powered pump engine, and a vertical shaft turbine pump. The storage capacity of the AST at this pump station is greater than 550 gallons and is therefore regulated under Chapter 62-761 FAC. The AST is registered under facility I.D. # 8623252. The pump station is situated on a fill material dike or plug which bridges the main east-west canal on the lower Talisman Farm. The dike is approximately 25 feet wide and includes the pump station and a gravel canal crossing access road. The AST is located on an approximate 8 inch thick concrete slab surrounded with a 2.5 feet high masonry block wall and is covered with a corrugated metal roof. The pump engine is located on an approximate eight (8) inch thick concrete pad. Figure 2 of the SRCR for the T-24 Pump Station found in **Appendix A-12** illustrates the site layout.

During the Phase II ESA investigation activities, D&M conducted visual reconnaissance and soil sampling at T-24. No evidence of soil staining was noted, but one soil sample was collected for laboratory analysis for TPH, which was not detected in the soil sample. Therefore, T-24 was not identified as an Exclusion Area in the Phase II ESA. However, a follow-up investigation performed by D&M and SFWMD in March, 1999 identified stained soil around the west side of the pump station due to a recent discharge. No soil samples were collected during this investigation.

Based upon visual observation and OVA-FID screening, a small amount of soil (0.68 tons) was excavated and removed from the site. A total of eight confirmatory soil samples were collected following excavation activities. The highest reported TPH concentration was 290 mg/kg. While, no SQAG-TEC has been established for TPH, the reported TPH concentration is well below the SCTL-LGW and SCTL-RDE criteria. PAH concentrations within the upper 6 inches of soil (the depth defined as “sediment”) were below laboratory detection limits. PAH concentrations in the soil below 6 inches BLS are below the SCTL-LGW and SCTL-RDE criteria. The SQAG-TEC criteria does not apply to the soils below 6 inches bls.

Based upon the limited impact to the soil at the site no groundwater samples were collected. It does not appear that the referenced petroleum release could have affected groundwater at the subject site.

PSI recommended that the FDEP issue a SRCO for the subject site. The FDEP issued a SRCO for this site on December 24, 1999; a copy of the SRCO is included in **Appendix B-8**.

## 3.2 Summary of Restrictive Covenants

Restrictive covenants or deed restrictions exist on several of the parcels within the footprint of Talisman South Ranch (D7100-104), as shown on **Figure 3-3.** Tract D7100-066 (Former Borrow Pit – T-3), Tract D7100-047 (Talisman Labor Camp - T-2), and Tract D7100-044 (Pesticide Mix/Load Area – T-21) are all protected by deed restrictions preventing use of the property for residential or other sensitive purposes. Additionally the deed restrictions all include prohibitions on use of groundwater within the restricted areas. The deed restriction for the labor camp also includes provisions preventing excavation or disturbance of a clean soil cap that was placed over portions of the borrow pit.

Copies of all of the deed restrictions are provided in **Appendix C**.

## 3.3 Summary of Remaining HTRW Areas

The known HTRW soil areas remaining within the project footprint are located within the T-2 (D7100-047), T-3 (D7100-066) and T-21 (D7100-044) exclusion areas. These areas consist of point source areas where cleanup was completed and a conditional SRCO was issued, but contaminant concentrations remain at concentrations exceeding the SCTL-RDE criteria. Arsenic is the predominant COPC which is present at concentrations exceeding the SCTLs in these areas.

# 4. GEOLOGY/HYDROGEOLOGY

## 4.1 Regional Geology

The region is overlain by layers of Peat known locally as “muck”. Muck is an organically rich soil that forms when the rate of accumulation of organic matter exceeds the rate of decay. The accumulation rate can vary, but can be as much as 10 centimeters per 100 years. Much of the muck has been subjected to subaerial exposure since the dewatering of large areas of marshland through water drainage canals. This exposure has had the effect of causing the muck volume to steadily decrease through biochemical oxidation, compaction, erosion, and fire. It is estimated that the muck soil in these dewatered areas diminishes by as much as 1 inch per year.

Underlying the muck is the Fort Thompson Formation, which is locally referred to as the “cap rock” and is primarily dense, fossiliferous limestone. The Fort Thompson Formation is considered to be Pleistocene in age.

The Caloosahatchee Formation underlies the Fort Thompson Formation. The Caloosahatchee Formation is a marl that is composed of a sequence of sandy limestone lenses that are interbedded with layers of calcareous clays and sands. The Caloosahatchee Formation appears to straddle the Pliocene/Pleistocene boundary.

Underlying the Caloosahatchee Formation, the Tamiami Formation is a complex Pliocene age unit of sand, clay, and reef facies, all of which contain at least small amounts of phosphate. The Tamiami Formation occurs over much of southern Florida and is unconformably overlain by the Caloosahatchee and Fort Thompson Formations, which consist of highly fossiliferous carbonates and siliclastic sediments.

Underlying the Tamiami Formation is the Miocene-age Hawthorn Group, which is composed of a variety of sediments including carbonates, quartz sands, clay, and phosphate. The Hawthorn Group has been subdivided into two formations; the Peace River Formation forming the upper Hawthorn siliclastic section and the Arcadia Formation, which forms the lower Hawthorn carbonate section.

The Hawthorn Group is underlain by a 3000-feet thick carbonate sequence consisting of Oligocene and Eocene aged sediments. The Suwannee Limestone, the Ocala Limestone, and the Avon Park Formation comprise the Oligocene sediments. The Eocene sediments are made up of the Oldsmar Formation.

## 4.2 Regional Hydrologeology

The underlying hydrogeologic formations of the area may best be categorized as two aquifers separated by an impermeable confining zone.

The shallow, nonartesian aquifer system extends to a depth of approximately 150 feet BLS and is recognized as the northernmost extension of the Biscayne Aquifer. It consists primarily of the Fort Thompson, Caloosahatchee, and Tamiami Formations. The base of the shallow aquifer is marked by the top of the Hawthorn Group, which is the intermediate confining unit for the underlying Floridan aquifer.

The deep, artesian aquifer is known as the Floridan Aquifer and is the most productive aquifer in the area, with permeable zones as deep as 1,200 feet BLS. The Floridan Aquifer consists of the lower units of the Hawthorn Group, the Suwannee Limestone, the Ocala Group, and the Avon Park Limestone.

Groundwater levels throughout the area vary from one to six feet BLS. Groundwater flow in the surficial aquifer is generally to the south-southeast; however, flow direction is strongly influenced by the system of canals and pumping stations present throughout the area. When the canals are pumped and water levels in the canals are lowered, shallow groundwater tends to flow toward the canals.

## 4.3 Site Specific Geology

Based on the lithology encountered during installation of monitoring wells and excavation of impacted soils, the soil profile across the project area varies between locations. In general, the near-surface geology consists of a 3-5 foot layer of organic muck soils, overlying a dense sandy limestone (cap rock) of 1-2 feet in thickness. The cap rock is underlain by a light tan limestone unit which extends to a depth of at least 13 feet bls. The near surface geology has been altered significantly in areas that have been developed, such as the Talisman Sugar Mill. In most of the developed areas, the muck layer has been removed and replaced with crushed limerock. Within the cooling canal system, infiltration ponds and waste lake areas at the Talisman Sugar Mill, the muck layer was partially removed to create the berms to contain the water. In these areas a thin muck layer is present overlying the cap rock. The deeper canals across the property were created by blasting away the cap rock and excavating the underlying limestone to the desired depth.

## 4.4 Site Specific Hydrogeology

Groundwater is encountered across the project area at depths ranging from about 1-6 feet BLS, depending upon the surface elevation. The project area is sub-divided and surrounded by a series of drainage canals, which control the water level within the area to prevent flooding. The groundwater flow direction was not calculated. However, it is likely that groundwater flow in the vicinity of the subject site is largely controlled by the water level in the adjacent canals. During periods of pumping (when the water level in the canals is mechanically lowered), groundwater flow is likely toward the canals.

# 5. GOVERNMENTAL DATABASE REVIEW

PSI reviewed an environmental database report, provided by Environmental Data Resources, Inc. (EDR) to determine whether any open regulatory enforcement cases (e.g., leaking tanks, spills, etc.) were present on the subject property. The EDR report can be found in **Appendix D**. Some of the sites listed in the EDR report are discussed in previous sections of this report (e.g., Talisman Sugar Corporation – Abel's Flying Service); therefore they are not mentioned in this section. All of the other sites listed in the EDR are outside the boundary of the A-2 Reservoir and will also not be discussed in further detail as they do not represent an environmental concern to the future construction of the reservoir.

No sites were listed in the EDR Report within the A-2 Reservoir boundary that have not been previously addressed.

# 6. OVERVIEW OF ASSESSMENT AND REMEDIATION

The A-2 Reservoir project area is made up of 8 individual tracts of land comprising approximately 14,408 acres, located within the south portion of the Everglades Agricultural Area (EAA). The EAA has a long history of farming dating back to the early 1960's for most of the project area. Most of the property has been in use primarily for the cultivation of sugar cane, and occasional rotational crops such as corn and rice. Phase I-II ESAs have been performed on all of the tracts according to the protocols that were in place that the time that each of the parcels were acquired. Additional investigations have been performed to define the extent of contaminants within point source areas, and corrective actions have been performed to address point sources where necessary. No significant sampling of the cultivated area has been performed to date.

## 6.1 Point Source Areas

The Phase I ESAs performed on the project parcels identified the presence of seven separate potential source areas, including pump stations, pesticide mix load areas, storage tanks, a former borrow pit, a crop-dusting operation and landing strip. **Table 1** summarizes the disposition of all of the point source areas on the subject property. Based on PSI's review of the reports, all of these point sources have been investigated and corrective actions have been performed as necessary to remediate these areas to the required levels for project construction. In a few areas, deed restrictions were utilized to allow levels exceeding the SCTL-RDE to remain in place. All of the assessment and remediation work for the point sources was conducted under oversight from FDEP and the Department has granted unconditional or conditional SRCOs for all of the point sources.

There are no known point sources on the subject property that remain open with FDEP. PSI also researched governmental records for open enforcement cases, and there are no open cases with FDEP within the project area.

## 6.2 Regional Evaluation of Cultivated Areas

Since much of the assessment of the project area was performed before the development of the ERA Protocol, the level of assessment of cultivated areas is not consistent with current requirements. No significant sampling of cultivated areas was performed within the A-2 Reservoir Footprint.

## 6.3 Outstanding Corrective Actions

The following corrective actions have been proposed but not completed:

- None

## 6.4 Outstanding Regulatory Issues

Since no cultivated area sampling has been performed on the A-2 Reservoir footprint, the USFWS and FDEP have not provided any input on potential residual agrochemicals in cultivated areas.

# 7. REFERENCES


1. Protocol for Assessment, Remediation and Post-Remediation Monitoring for Environmental Contaminants for Everglades Restoration Projects, 13 March 2008, SFWMD, FWS, and FDEP

2. Phase I and Phase II Environmental Risk Assessment for the Stormwater Treatment Areas Tract Nos. 100-009, 100-020, and 103-108, Palm Beach County, Florida 1995 and 1996 Ayres Associates

3. Phase I – Phase II Environmental Site Assessment, Florida Crystals Corporation, Palm Beach County, March 30, 1999, Dames & Moore

4. Everglades Agricultural Area Basin Reservoir – Phase I Environmental Assessment Summary Document, March 18, 2003, URS Corporation

5. Volume 1 – Acquisition Properties, Phase II Environmental Site Assessment, Talisman Sugar Corporation Properties, Palm Beach and Hendry Counties, for South Florida Water Management District, November 9, 1998, Dames & Moore

6. Site Inspections/Environmental Assessment Deferred Parcels – Former Talisman Property, Palm Beach County, Florida, July 17, 2007, URS Corporation

7. Final Site Inspections/Environmental Assessment 8 Deferred Parcels – Former Talisman Ranch Report, Palm Beach County, Florida, January 21, 2009, URS Corporation

8. Site Rehabilitation Completion Report, Talisman Sugar Corporation T-2 (Borrow Pit), Palm Beach County, Florida, 4 February 2002, PSI

    a. 7-21-06 DEP issued CSRCO

9. Site Rehabilitation Completion Report, Talisman Sugar Corporation T-3 (Labor Camp), Palm Beach County, Florida, 25 March 2003, PSI

    a. 7-21-06 DEP issued CSRCO

10. Tank Closure Report, Talisman Sugar Corporation, Talisman Labor Camp (Abel's Flying Service), Palm Beach County, Florida, 9 April 2001, PSI

11. Limited Contamination Assessment Report / No Further Action Request, Talisman Sugar Corporation, Talisman Sugar Farm, T-6 (Electric Pump Station), Palm Beach County, Florida, 27 August 1999, PSI

    a. 5-30-99 PSI Response to Comments

    b. 12-21-99 DEP issued SRCO

12. Limited Contamination Assessment Report / No Further Action Request, Talisman Sugar Corporation, Talisman Farm – T-7 (Pump Station), Palm Beach County, Florida, 28 September 1999, PSI

    a. 12-21-99 DEP issued SRCO

13. Site Rehabilitation Completion Report, Talisman Sugar Corporation, Talisman Farm – T-8 (Pump Station), Palm Beach County, Florida, 28 September 1999, PSI

    a. 12-21-99 DEP issued SRCO

14. Site Rehabilitation Completion Report, Talisman Sugar Corporation, Talisman Farm – T-21 (Pesticide Mix/Load Area), Palm Beach County, Florida, 20 May 2002, PSI

    a. 7-21-06 DEP issued CSRCO

15. Site Rehabilitation Completion Report, Talisman Sugar Corporation, Talisman Farm – T-24 (Pump Station), Palm Beach County, 15 Florida, October 1999, PSI

    a. 12-29-99 DEP issued SRCO

# 8. WARRANTY

PSI warrants that the findings and conclusions reported herein were conducted in general accordance with good commercial and customary practice for conducting a Phase II Environmental Site Assessment. However, these findings and conclusions contain all of the limitations inherent in these methodologies.

This summary report has been developed to provide the client with information regarding apparent indications of chemical impacts to the subject property. It is necessarily limited to the conditions observed and to the information available at the time of the work. The assessment and conclusions presented herein were based upon the subjective evaluation of limited data. They may not represent all conditions at the subject site as they reflect the information gathered from specific locations. PSI warrants that the findings and conclusions contained herein have been promulgated in accordance with generally accepted environmental investigation methodology and only for the site described in this report.

Due to the limited nature of the work, there is a possibility that there may exist conditions which could not be identified within the scope of the assessment or which were not apparent at the time of report preparation. It is also possible that the testing methods employed at the time of the report may later be superseded by other methods. The description, type, and composition of what are commonly referred to as "hazardous materials or conditions" can also change over time. PSI does not accept responsibility for changes in the state of the art, nor for changes in the scope of various lists of hazardous materials or conditions. PSI believes that the findings and conclusions provided in this report are reasonable. However, no other warranties are implied or expressed.

# TABLES

**Table 1** **Summary of Assessment and Corrective Actions**
**A-2 Reservoir Project**
**Palm Beach County, Florida**

| Tract Nos. | Previous Name(s) | Acreage | Reports | Phase I Summary | Phase II Summary | Corrective Action Summary | Regulatory Concurrence | HTRW | Restrictive Covenant | Exit Assessment Results | Recent Spills |
|---|---|---|---|---|---|---|---|---|---|---|---|
| D7100-104, D7100-044, D7100-047, D7100-066, D7100-067, D7100-139, D7100-141, D7200-005 | **Talisman South Ranch** | 14,408 | See Table 2 for list of Reports performed on these parcels | Point source RECs identified at eight (8) areas within these parcels, listed below: | Soil and / or groundwater exceedances were identified, in the following areas: | Corrective Action Activities, included the following: | CSRCO, 7-21-06 | | | The labor camp, borrow pit, pesticide mix and load area, and four pump stations were visually inspected in 2007 and 2009. No stained soils, stressed vegetation or other environmental impairments were observed. No soil or groundwater samples were collected. | No |
| | | | | Borrow Pit (T-2) | Arsenic and petroleum hydrocarbons detected above SCTLs, phenols and m & p cresol detected above GCTLs | Excavated: 1,009 tons of steel, 473 tons of tires, 3,895 tons of C & D debris, 3,735 tons of soil. Also installed GW treatment system (operation was abandoned due to inability to filter out lead) | | Soil above SCTL | Non-residential Deed Restriction | | |
| | | | | Labor Camp (T-3) | Arsenic and petroleum hydrocarbons detected above SCTLs at burn pit area and drum storage area within labor camp. Petroleum hydrocarbons / solvents and atrazine detected in GW above GCTLs at pesticide mix / load area and refueling area / runway within labor camp. | Excavated approximately 3,590 tons of soil from 5 areas within labor camp. Petroleum impacts in GW naturally attenuated below GCTLs. Source removal reduced atrazine GW concentrations below GCTL. | CSRCO, 7-21-06 | Soil above SCTL | Non-residential Deed Restriction | | |
| | | | | Pump Station (T-6) | OCPs detected above SQAGs | 20 soil samples collected around pump station; no OCPs detected above SQAGs of SCTLs | SRCO, 12-21-99 | No | No | | |
| | | | | Pump Station (T-7) | No soil or groundwater samples collected; Visual evidence of soil staining | 14 surficial soil samples collected around pump station; no exceedances above SQAGs or SCTLs | SRCO, 12-21-99 | No | No | | |
| | | | | Pump Station (T-8) | No soil or groundwater samples collected; No visual evidence of soil staining; Still included as Exclusion Area | Excavated approximately 6.36 tons of petroleum impacted soil | SRCO, 12-21-99 | No | No | | |
| | | | | Pump Station (T-24) | No soil or groundwater samples collected; No visual evidence of soil staining; Still included as Exclusion Area | Excavated approximately 0.68 tons of soil | SRCO, 12-29-99 | No | No | | |
| | | | | Pesticide Mix/Load Area (T-21) | Arsenic detected above SCTL and GCTL | Excavated approximately 692 tons of arsenic impacted soil. Installed GW pump and treat system, operated for 3 mths., effectively lowered the arsenic concentrations below the GCTL | CSRCO, 7-21-06 | Soil above SCTL | Non-residential Deed Restriction | | |

**Table 2.** **Summary of Environmental Reports**
**A-2 Reservoir**
**Palm Beach County, FL**

| Consultant | Report Type | Report Title | Report Date | Tract Nos. | Previous Name(s) |
|---|---|---|---|---|---|
| URS/Dames & Moore | Phase I / II | Talisman Sugar Corp.- Vol. 1 - Acquisition Properties | November-98 | 100-104* | Talisman South Ranch |
| PSI | SRCR | Talisman Sugar Corp. - T-2 Borrow Pit | February-02 | 100-104* | Talisman South Ranch |
| PSI | Tank Closure Report | Talisman Sugar Corp. - Labor Camp (Abel's Flying Service | April-01 | 100-104* | Talisman South Ranch |
| PSI | SRCR | Talisman Sugar Corp. - T-3 (Labor Camp | March-03 | 100-104* | Talisman South Ranch |
| PSI | LCAR / NFA Request | Talisman Sugar Corp. - T-6 (Electric Pump Station) | August-99 | 100-104* | Talisman South Ranch |
| PSI | LCAR / NFA Request | Talisman Sugar Corp. - T-7 (Pump Station) | September-99 | 100-104* | Talisman South Ranch |
| PSI | SRCR | Talisman Sugar Corp. - T-8 (Pump Station) | September-99 | 100-104* | Talisman South Ranch |
| PSI | SRCR | Talisman Sugar Corp. - T-24 (Pump Station) | October-99 | 100-104* | Talisman South Ranch |
| PSI | SRCR | Talisman Sugar Corp. - T-21 Pesticide Mix/Load Area | May-02 | 100-104* | Talisman South Ranch |
| URS | Site Inspections/Environmental Assessment | Deferred Parcels - Former Talisman Property | July-07 | 100-104* | Talisman South Ranch |
| URS | Final Site Inspections/Environmental Assessment | Eight Deferred Parcels - Former Talisman Ranch Property | January-09 | 100-104* | Talisman South Ranch |
| URS | Environmental Assessment Summary Document | Everglades Agricultural Area Basin Reservoir Project | March-03 | -- | Talisman South Ranch |

SRCR = Site Rehabilitation Completion Report
LCAR = Limited Contamination Assessment Report
* = Tract Nos. 100-149, 100-044, 100-047, 100-066, 100-067, 100-139, 100-141, 200-005, 100-143

**Table 3.** **Range of Concentrations Measured vs. Regulatory Requirements**
**T-2 Exclusion Area (Former Borrow Pit)**
**Former Talisman South Ranch**
**Tract No. D7100-066**
**A-2 Reservoir**
**Palm Beach County, FL**

| | | | | | State Regulatory Limits (mg/Kg) | | | |
|---|---|---|---|---|---|---|---|---|
| **Parameter** | **CAS #'s[1]** | **CERCLA[2] Regulated (Y/N)** | **Range[3] Observed (mg/Kg)** | **EPA Regulatory Limits[4] (mg/Kg)** | **SCTL-CDE[5]** | **SCTL-RDE[6]** | **SQAG-PEC[7]** | **SQAG-TEC[8]** |
| Arsenic | 7440-38-2 | Y | <0.5 - 5.3 | 1.6 | 12 | 2.1 | 33 | 9.8 |
| Barium | 7440-39-3 | Y | 24 - 37 | 190,000 | 130,000 | 120 | 60 | 20 |
| Cadmium | 7440-43-9 | Y | 0.83 - 6.2 | 800 | 1,700 | 82 | 5.0 | 1.0 |
| Chromium | 7440-47-3 | Y | 1.1 - 24.0 | NG | 470 | 210 | 110 | 43 |
| Lead | 7439-92-1 | Y | 1.3 - 93 | 800 | 1,400 | 400 | 130 | 36 |
| Mercury | 7439-97-6 | Y | 0.011 - 0.034 | 43 | 17 | 3 | 1.1 | 0.18 |
| Benzo(a)anthracene | 56-55-3 | Y | 0.028 - 0.042 | 2.1 | # | # | 1.1 | 0.11 |
| Benzo(ghi)perylene | 191-24-2 | Y | 0.032 - 0.050 | NG | 52,000 | 2,500 | NG | NG |
| Chrysene | 218-01-9 | Y | 0.032 -0.064 | 210 | # | # | 1.3 | 0.17 |
| Dibenzofuran | 132-64-9 | Y | 0.033 - 0.097 | 1,000 | 6,300 | 320 | NG | NG |
| Fluoranthene | 206-44-0 | Y | 0.065 - 1.250 | 22,000 | 59,000 | 3,200 | 2.2 | 0.42 |
| Naphthalene | 91-20-3 | Y | 0.065 - 3.0 | 18 | 300 | 55 | 0.56 | 0.18 |
| Phenanthrene | 85-01-8 | Y | 0.066 - 1.6 | NG | 36,000 | 2,200 | 1.2 | 0.2 |
| Pyrene | 129-00-0 | Y | 0.050 - 1.160 | 17,000 | 45,000 | 2,400 | 1.5 | 0.2 |
| TPH | NO CAS | N | 43.0 - 305 | NG | 2,700 | 460 | NG | NG |

Notes:
mg/Kg - milligrams per Kilogram
NG - No guideline
# - Site concentrations for carcinogenic polycyclic aromatic hydrocarbons must be converted to Benzo(a)pyrene equivalents before comparison with the appropriate direct exposure SCTL for Benzo(a)pyrene using the approach described in the February 2005 'Final Technical Report: Development of Cleanup Target Levels (CTLs) for Chapter 62-777, F.A.C.'
[1]CAS Registry Number (CAS#'s) - unique numeric identifier which designates one substance and has no chemical significance
[2]40 Code of Federal Regulations (CFR) 302.4, Designation of Hazardous Substances - Comprehensive Environmental Response, Compensation, Liability Act
[3]Range of chemical concentrations observed in all the samples collected within the T-2 Exclusion Area (Former Borrow Pit)
[4]USEPA - Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites - Industrial Soil
[5]Chapter 62-777, FAC, Table 2 - Technical Background Document, SCTLs, Direct Exposure - Commercial / Industrial
[6]Chapter 62-777, FAC, Table 2 - Technical Background Document, SCTLs, Direct Exposure - Residential
[7]Development and Evaluation of Sediment Quality Assessment Guidelines, Volumes 1-4 (MacDonald, 2000), Sediment Quality Assessment Guidelines-Probable Effects Concentration
[8]Development and Evaluation of Sediment Quality Assessment Guidelines, Volumes 1-4 (MacDonald, 2000), Sediment Quality Assessment Guidelines-Threshold Effects Concentration

**Table 4.** **Range of Concentrations Measured vs. Regulatory Requirements**
**T-3 Exclusion Area (Former Labor Camp)**
**Former Talisman South Ranch**
**Tract No. D7100-047**
**A-2 Reservoir**
**Palm Beach County, FL**

| | | | | | State Regulatory Limits (mg/Kg) | | | |
|---|---|---|---|---|---|---|---|---|
| **Parameter** | **CAS #'s[1]** | **CERCLA[2] Regulated (Y/N)** | **Range[3] Observed (mg/Kg)** | **EPA Regulatory Limits[4] (mg/Kg)** | **SCTL-CDE[5]** | **SCTL-RDE[6]** | **SQAG-PEC[7]** | **SQAG-TEC[8]** |
| Arsenic | 7440-38-2 | Y | 0.95 - 18.5 | 1.6 | 12 | 2.1 | 33 | 9.8 |
| Barium | 7440-39-3 | Y | 13.9 - 66.9 | 190,000 | 130,000 | 120 | 60 | 20 |
| Chromium | 7440-47-3 | Y | 1.5 - 22.3 | NG | 470 | 210 | 110 | 43 |
| Lead | 7439-92-1 | Y | 0.76 - 82.0 | 800 | 1,400 | 400 | 130 | 36 |
| Mercury | 7439-97-6 | Y | <0.010 - 0.032 | 43 | 17 | 3 | 1.1 | 0.18 |
| Selenium | 7782-49-2 | Y | <0.030 - 1.2 | 5,100 | 11,000 | 440 | N/A | N/A |
| 4,4-DDE | 72-55-9 | Y | <0.00025 - 0.0021 | 5.1 | 15 | 2.9 | 0.031 | 0.0032 |
| Atrazine | 1912-24-9 | Y | <0.017 - 0.093 | 7.5 | 19 | 4 | NG | 0.0003 |
| Dieldrin | 60-57-1 | Y | <0.00036 - 0.0016 | 0.11 | 0.3 | 0.06 | 0.062 | 0.0019 |
| Endrin | 72-20-8 | Y | <0.00050 - 0.017 | 180 | 510 | 25 | 0.210 | 0.0022 |
| Endrin Aldehyde | 7421-93-4 | Y | <0.00037 - 0.00220 | NG | NG | NG | NG | NG |

Notes:
mg/Kg - milligrams per Kilogram
NG - No guideline
[1]CAS Registry Number (CAS#'s) - unique numeric identifier which designates one substance and has no chemical significance
[2]40 Code of Federal Regulations (CFR) 302.4, Designation of Hazardous Substances - Comprehensive Environmental Response, Compensation, Liability Act
[3]Range of chemical concentrations observed in all the samples collected within the T-3 Exclusion Area (Former Labor Camp)
[4]USEPA - Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites - Industrial Soil
[5]Chapter 62-777, FAC, Table 2 - Technical Background Document, SCTLs, Direct Exposure - Commercial / Industrial
[6]Chapter 62-777, FAC, Table 2 - Technical Background Document, SCTLs, Direct Exposure - Residential
[7]Development and Evaluation of Sediment Quality Assessment Guidelines, Volumes 1-4 (MacDonald, 2000), Sediment Quality Assessment Guidelines-Probable Effects Concentration
[8]Development and Evaluation of Sediment Quality Assessment Guidelines, Volumes 1-4 (MacDonald, 2000), Sediment Quality Assessment Guidelines-Threshold Effects Concentration

**Table 5.** **Range of Concentrations Measured vs. Regulatory Requirements**
**T-21 Exclusion Area (Mix/Load Area)**
**Former Talisman South Ranch**
**Tract No. D7100-044**
**A-2 Reservoir**
**Palm Beach County, FL**

| | | | | | State Regulatory Limits (mg/Kg) | | | |
|---|---|---|---|---|---|---|---|---|
| **Parameter** | **CAS #'s[1]** | **CERCLA[2] Regulated (Y/N)** | **Range[3] Observed (mg/Kg)** | **EPA Regulatory Limits[4] (mg/Kg)** | **SCTL-CDE[5]** | **SCTL-RDE[6]** | **SQAG-PEC[7]** | **SQAG-TEC[8]** |
| Arsenic | 7440-38-2 | Y | <0.5 - 7.0 | 1.6 | 12 | 2.1 | 33 | 9.8 |

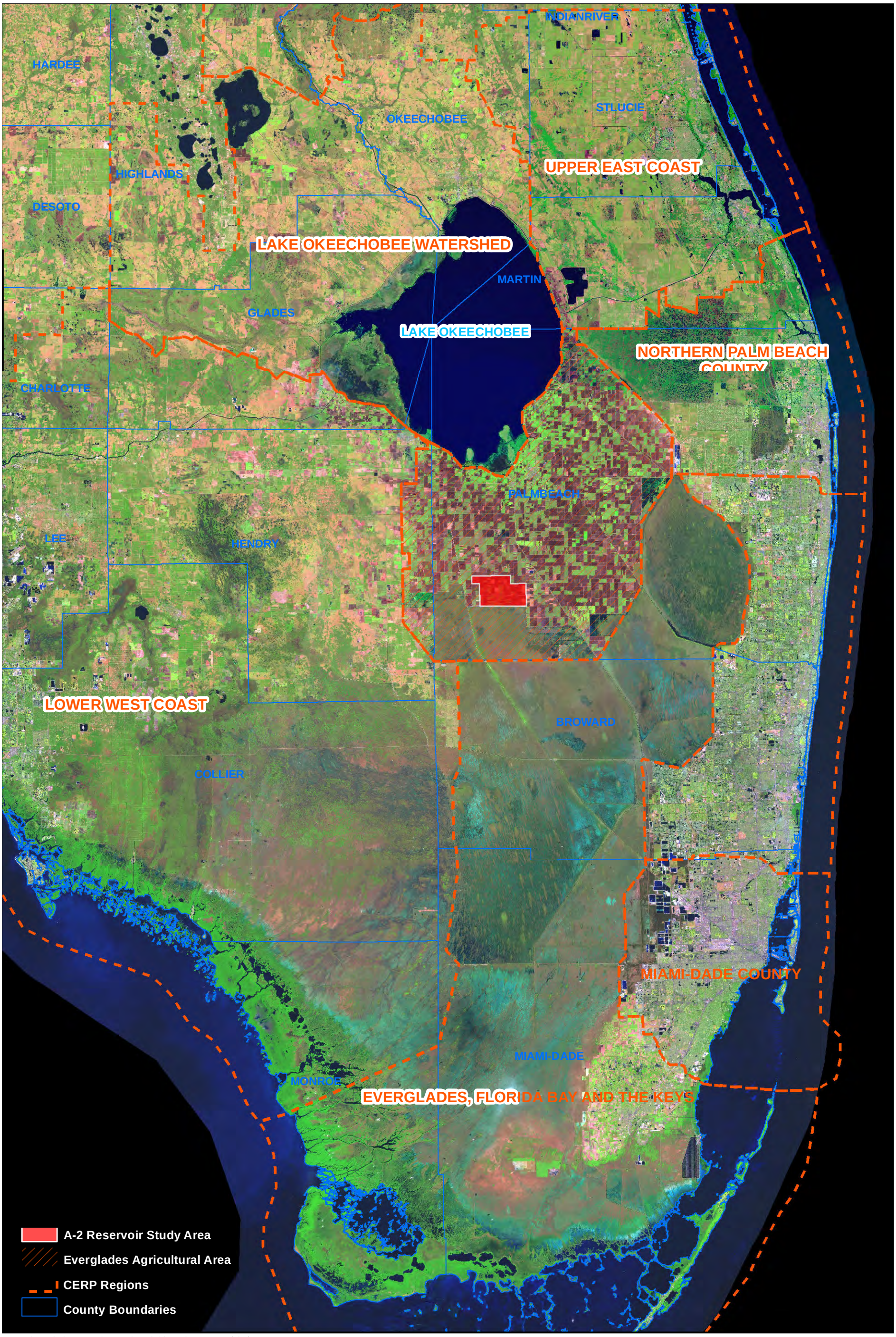
Notes:
mg/Kg - milligrams per Kilogram
NG - No guideline
[1]CAS Registry Number (CAS#'s) - unique numeric identifier which designates one substance and has no chemical significance
[2]40 Code of Federal Regulations (CFR) 302.4, Designation of Hazardous Substances - Comprehensive Environmental Response, Compensation, Liability Act
[3]Range of chemical concentrations observed in all the samples collected within the T-21 Exclusion Area (Mix/Load Area)
[4]USEPA - Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites - Industrial Soil
[5]Chapter 62-777, FAC, Table 2 - Technical Background Document, SCTLs, Direct Exposure - Commercial / Industrial
[6]Chapter 62-777, FAC, Table 2 - Technical Background Document, SCTLs, Direct Exposure - Residential
[7]Development and Evaluation of Sediment Quality Assessment Guidelines, Volumes 1-4 (MacDonald, 2000), Sediment Quality Assessment Guidelines-Probable Effects Concentration
[8]Development and Evaluation of Sediment Quality Assessment Guidelines, Volumes 1-4 (MacDonald, 2000), Sediment Quality Assessment Guidelines-Threshold Effects Concentration

**Table 6.** **Range of Concentrations Measured vs. Regulatory Requirements**
**T-24 Exclusion Area (Pump Station)**
**Former Talisman South Ranch**
**Tract No. 100-104**
**A-2 Reservoir**
**Palm Beach County, FL**

| | | | | | State Regulatory Limits (mg/Kg) | | | |
|---|---|---|---|---|---|---|---|---|
| **Parameter** | **CAS #'s[1]** | **CERCLA[2] Regulated (Y/N)** | **Range[3] Observed (mg/Kg)** | **EPA Regulatory Limits[4] (mg/Kg)** | **SCTL-CDE[5]** | **SCTL-RDE[6]** | **SQAG-PEC[7]** | **SQAG-TEC[8]** |
| Acenaphthene | 83-32-9 | Y | <0.0050 - 0.155 | 33,000 | 20,000 | 2,400 | 0.089 | 0.0067 |
| Acenaphthylene | 208-96-8 | Y | <0.0050 - 0.048 | NG | 20,000 | 1,800 | 0.130 | 0.0059 |
| Benzo(a)anthracene | 56-55-3 | Y | <0.0050 - 1.650 | 2.1 | # | # | 1.1 | 0.11 |
| Benzo(a)pyrene | 50-32-8 | Y | <0.0050 - 0.250 | 0.21 | 0.7 | 0.1 | 1.5 | 0.15 |
| Benzo(ghi)perylene | 191-24-2 | Y | <0.0050 - 1.430 | NG | 52,000 | 2,500 | NG | NG |
| Chrysene | 218-01-9 | Y | <0.0050 - 1.480 | 210 | # | # | 1.3 | 0.17 |
| Fluoranthene | 206-44-0 | Y | <0.0050 - 0.086 | 22,000 | 59,000 | 3,200 | 2.2 | 0.42 |
| Fluorene | 86-73-7 | Y | <0.0050 - 0.320 | 22,000 | 33,000 | 2,600 | 0.54 | 0.077 |
| Indeno(123-cd)pyrene | 193-39-5 | Y | <0.0050 - 0.830 | 2.1 | # | # | NG | NG |
| Phenanthrene | 85-01-8 | Y | <0.0050 - 0.185 | NG | 36,000 | 2,200 | 1.2 | 0.2 |
| TPH | NO CAS | N | <15.3 - 290 | NG | 2,700 | 460 | NG | NG |

Notes:
mg/Kg - milligrams per Kilogram
NG - No guidline
# - Site concentrations for carcinogenic polycyclic aromatic hydrocarbons must be converted to Benzo(a)pyrene equivalents before comparison with the appropriate direct exposure SCTL for Benzo(a)pyrene using the approach described in the February 2005 'Final Technical Report: Development of Cleanup Target Levels (CTLs) for Chapter 62-777, F.A.C.'
[1]CAS Registry Number (CAS#'s) - unique numeric identifier which designates one substance and has no chemical significance
[2]40 Code of Federal Regulations (CFR) 302.4, Designation of Hazardous Substances - Comprehensive Environmental Response, Compensation, Liability Act
[3]Range of chemical concentrations observed in all the samples collected within the T-24 Exclusion Area (Pump Station)
[4]USEPA - Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites - Industrial Soil
[5]Chapter 62-777, FAC, Table 2 - Technical Background Document, SCTLs, Direct Exposure - Commercial / Industrial
[6]Chapter 62-777, FAC, Table 2 - Technical Background Document, SCTLs, Direct Exposure - Residential
[7]Development and Evaluation of Sediment Quality Assessment Guidelines, Volumes 1-4 (MacDonald, 2000), Sediment Quality Assessment Guidelines-Probable Effects Concentration
[8]Development and Evaluation of Sediment Quality Assessment Guidelines, Volumes 1-4 (MacDonald, 2000), Sediment Quality Assessment Guidelines-Threshold Effects Concentration

# FIGURES




REFERENCE: IMAGE OBTAINED FROM THE FLORIDA GEOGRAPHIC DATA LIBRARY (FGDL)

0 5 10 20 30 40 50 Miles

| | |
|---|---|
| PROJECT NO. | 0552812 |
| DRAWN BY: | KAB |
| DATE CREATED: | 02-28-2012 |
| SCALE: | 1 : 750,000 |

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(813)886-1075
(813)249-0301 fax

# SITE LOCATION MAP

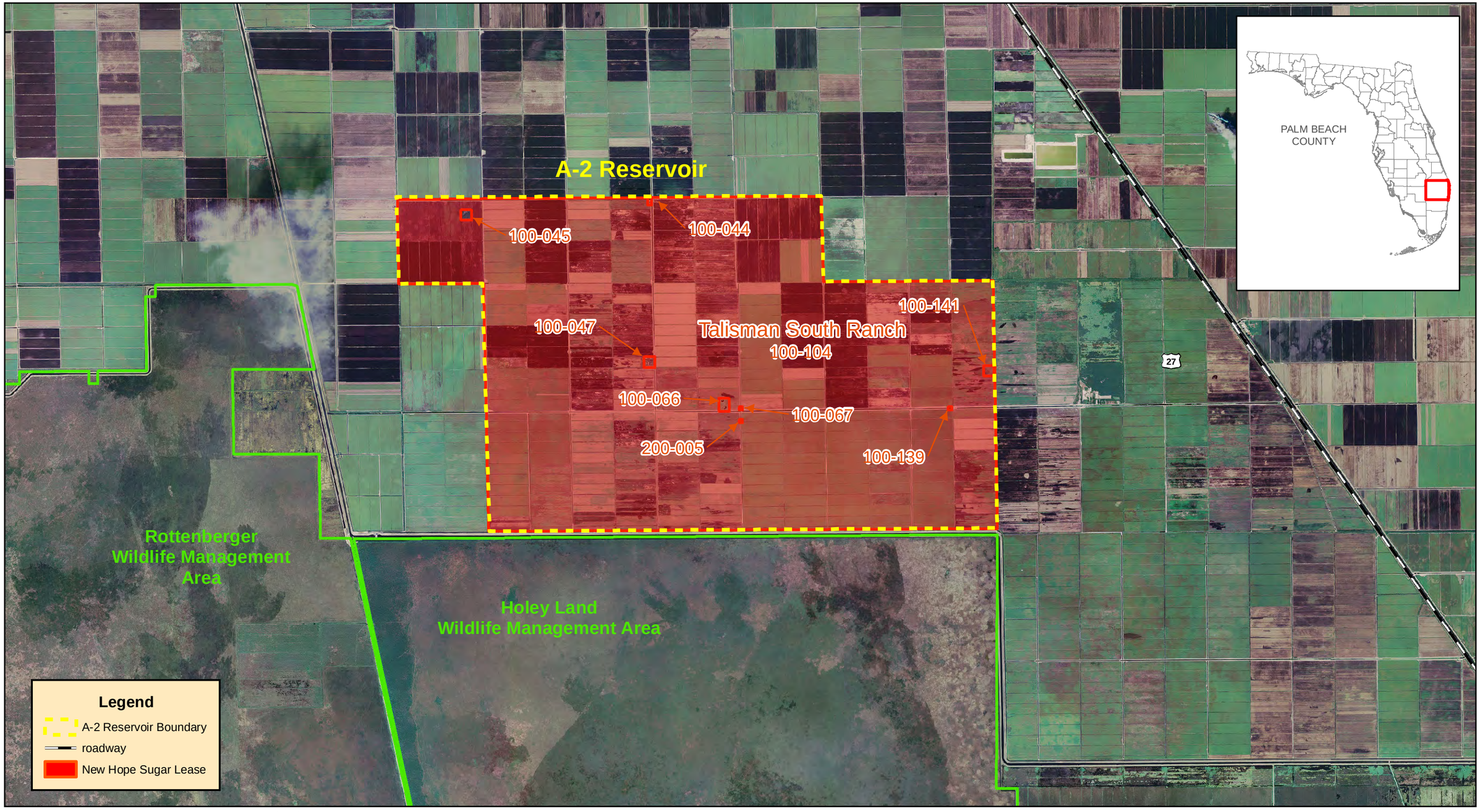
## A-2 RESERVOIR PROJECT

EVERGLADES AGRICULTURAL AREA (EAA) BASIN

PALM BEACH COUNTY, FLORIDA

FIGURE 1-1

E:\PSI\Everglades STA Project\Final Maps\Fig 1 - Site Location Map (9.3)




REFERENCE: THE AERIAL WAS OBTAINED FROM THE LAND BOUNDARY INFORMATION SYSTEM (LABINS)

0 0.5 1 2 3 4 Miles

| | |
|---|---|
| PROJECT NO. | 0552812 |
| DRAWN BY | KAB |
| DATE CREATED | 8/17/2012 |
| SCALE: 1 : 70,000 | |

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Tampa, Florida 33634
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(813)249-0301 fax

# SITE PLAN - AERIAL PHOTOGRAPH

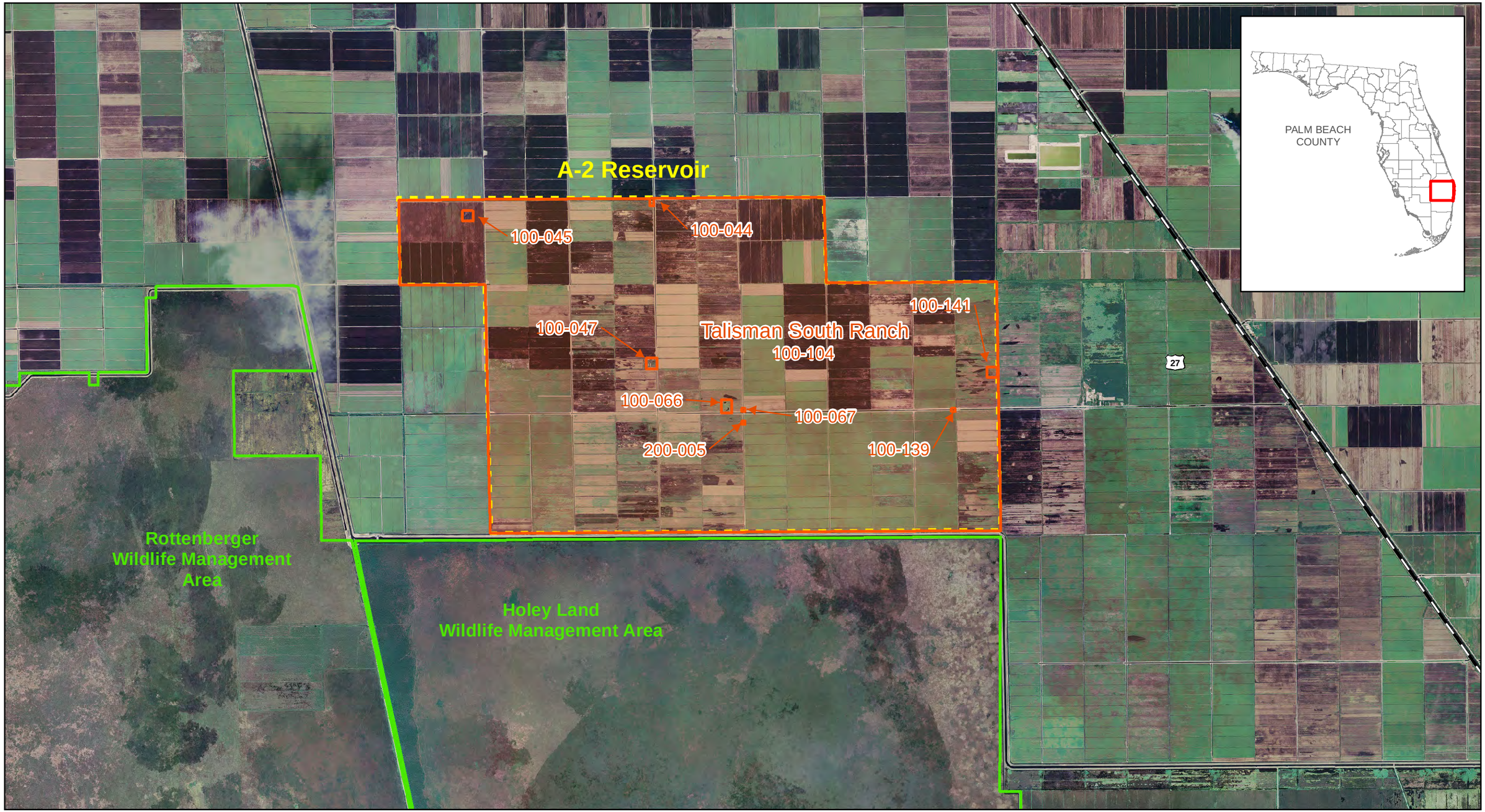
## A-2 RESERVOIR PROJECT

EVERGLADES AGRICULTURAL AREA (EAA) BASIN

PALM BEACH COUNTY, FLORIDA

FIGURE 1-2

P:\552-Env\SFWMD\WO#2 (0552812) - A-1, A-2 Reservoir\GIS\Version 9.3




REFERENCE: THE AERIAL WAS OBTAINED FROM THE LAND BOUNDARY INFORMATION SYSTEM (LABINS)

0 0.5 1 2 3 4 Miles

| | |
|---|---|
| PROJECT NO. | 0552812 |
| DRAWN BY | KAB |
| DATE CREATED | 8/17/2012 |
| SCALE: 1 : 70,000 | |

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# DEFERRED PARCEL MAP

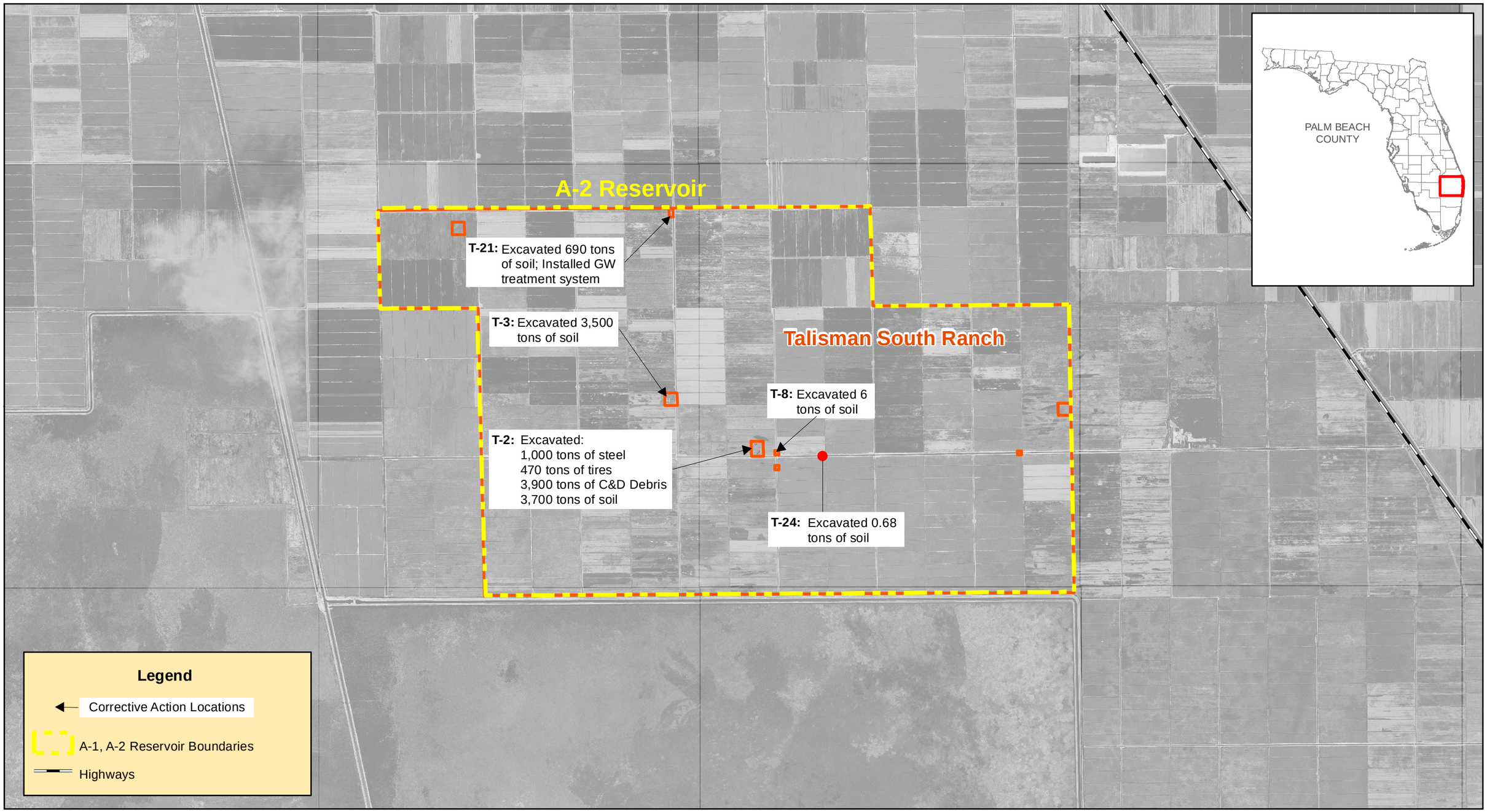
## A-2 RESERVOIR PROJECT

EVERGLADES AGRICULTURAL AREA (EAA) BASIN

PALM BEACH COUNTY, FLORIDA

FIGURE 3-1

P:\552-Env\SFWMD\WO#2 (0552812) - A-1, A-2 Reservoir\GIS\Version 9.3




REFERENCE: THE AERIAL WAS OBTAINED FROM THE LAND BOUNDARY INFORMATION SYSTEM (LABINS)

0 0.5 1 2 3 4 Miles

| | |
|---|---|
| PROJECT NO. | 0552812 |
| DRAWN BY | KAB |
| DATE CREATED | 02-28-2012 |
| SCALE: 1 : 60,000 | |

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# CORRECTIVE ACTIONS LOCATION MAP

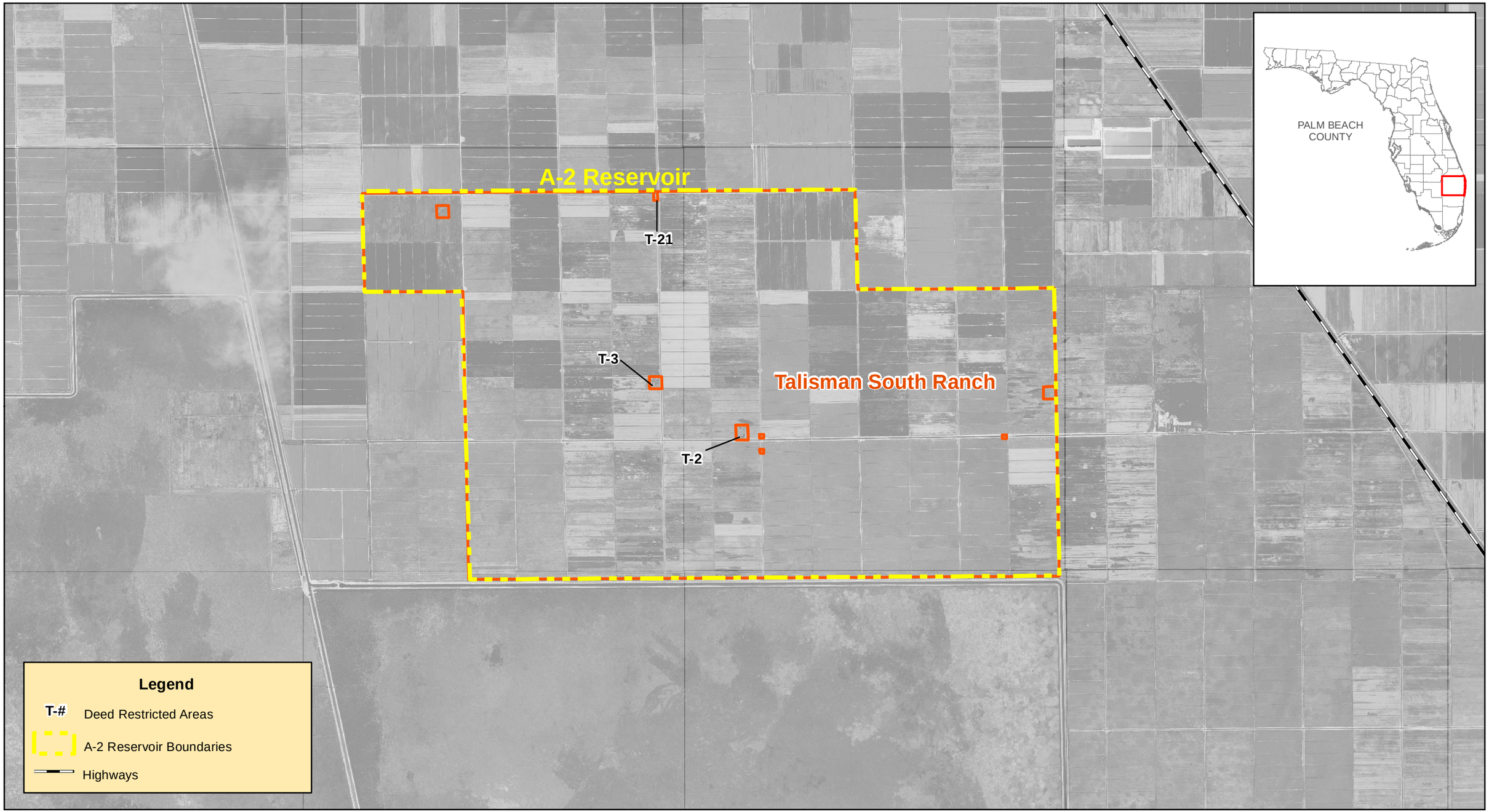
A-2 RESERVOIR PROJECT

EVERGLADES AGRICULTURAL AREA (EAA) BASIN

PALM BEACH COUNTY, FLORIDA

FIGURE 3-2

P:\552-Env\SF\WMD\WO\r2 (0552812) - A-1, A-2 Reservoir\GIS\Version 9.3\Fig 7 - Corrective Actions Location Map BW - 11by17 (9.3)




REFERENCE: THE AERIAL WAS OBTAINED FROM THE LAND BOUNDARY INFORMATION SYSTEM (LABINS)

0 0.5 1 2 3 4 Miles

| | |
|---|---|
| PROJECT NO. | 0552812 |
| DRAWN BY | KAB |
| DATE CREATED | 02-28-2012 |
| SCALE: | 1 : 60,000 |

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# DEED RESTRICTIONS MAP

## A-2 RESERVOIR PROJECT

EVERGLADES AGRICULTURAL AREA (EAA) BASIN

PALM BEACH COUNTY, FLORIDA

FIGURE 3-3

P:\552-Env\SFWMD\WO\2 (0552812) - A-1, A-2 Reservoir\GIS\Version 9.3\Fig 4 - Point Source Location Map BW - 11by17 (9.3)

May 3, 2013

**South Florida Water Management District**
3301 Gun Club Road
West Palm Beach, Florida 33406

Attn: Mr. Robert Kukleski
Lead Environmental Engineer

Re: Phase II Environmental Site Assessment (ESA) – Addendum #1
A-2 Flow Equalization Basin (FEB) Project
Palm Beach County, Florida
Work Order #13

Dear Mr. Kukleski:

Professional Service Industries, Inc. (PSI) is pleased to submit this addendum to the Phase II Environmental Site Assessment (ESA) for the A-2 Flow Equalization Basin (FEB) dated March 25, 2013. This addendum is intended to address comments/requests for clarification that were received from the United States Army Corps of Engineers (USACE). PSI received comments from USACE via e-mail from Mark Shafer on April 2, 2013 and from Lisa Gued on April 11, 2013. We have provided each of the USACE comments below, followed by PSI's response:

***Mark Shafer Comments***

*Provide documentation of:*
*a. FWS review of A2 sampling results.*
*b. Documentation of FDEP review of A2 Sampling results.*
*c. Letter from SFWMD to USACE requesting application of Sep 2011 AG-Chem policy to this project.*

**PSI Response:** Concurrence letters from USFWS and FDEP are provided in **Attachment A** herein. SFWMD will separately provide a letter to USACE requesting application of the September 2011 USACE Ag-Chem Policy to this project.

*In addition to USFWS review, this report must be reviewed by FDEP to satisfy USACE Ag-Chem policy.*

**PSI Response:** FDEP has reviewed the Phase II ESA for the A-2 FEB and provided a concurrence letter, which is included in **Attachment A**.

*Page 1. In reviewing the A2 Phase II report of March 25th, 2012, it references on page 1 the draft Summary Env. Report for the A-2 FEB, dated September 17, 2012. I have a copy of that report and it does not include much of the information that was originally included in the August 21st, 2012 version. I believe that the WMD solution to USACE concerns about the Sep 17 version was to revert back to the August 21st, 2012 version. I will be referencing the August 21st 2012 version in the CEPP PIR. To do this, page 1 of the March 25 report should be changed to reference the August 21st Summary report and the August 21st report should be provided with a signature from Steve Long.*

**PSI Response:** A signed copy of the August 21, 2012 version of the Summary Environmental Report (SER) is included in **Attachment B**. Please note that PSI provided draft versions of the report on August 21, 2012 and September 17, 2012; however, we had not received previous instruction from SFWMD to finalize the report. Based on your comment and discussion with the District, the August 21 version of the report will be considered as the final version.

*Page 6. Section 3.1. Should provide statement that USFWS and USACE reviewed the sampling scope of work and approved the sampling plan. Provide copy of USFWS review letter in appendix.*

**PSI Response:** USFWS and FDEP were both provided with the scope of work and sampling plan. We received concurrence on the proposed plan from USFWS in a letter dated January 8, 2013. A copy of the USFWS concurrence is provided in **Attachment C**. We did not receive any written response from FDEP on the proposed sampling plan, but did receive a concurrence letter from FDEP on the Phase II ESA.

*Page 4.1.1 Soil, 4th bullet. Second sentence says SCTL-LSW is appropriate. Third sentence essentially says SCTL-LSW not relevant. Please confirm with FDEP that FEB would not be a class III water though since the FEB eventually discharges to Class III water body don't know of relevance. Also, a discussion that FEB will discharge to STA34 or STA2B before being discharged to a Class III water.*

**PSI Response:** Based on further discussions with SFWMD management, the District does not intend to pursue classification of the FEB as a treatment works as they have done for previous STA projects. The District intends to permit the FEB as a Class III surface water body; however, the FEB will discharge into either STA-3/4 or STA-2B, which are both classified as treatment works. In any case, it appears that the SCTL-LWS is an applicable and relevant and appropriate screening standard for the A-2 FEB project.

*Page 12. Metals Results. Chromium exceeded the SCTL-LSW in all samples. Add discussion of why was this analyte not tested using SPLP protocol.*

**PSI Response:** Chromium did exceed the SCTL-LSW of 4.2 milligrams per kilogram (mg/kg) in all of the composite soil samples, with concentrations ranging from 5.6 mg/kg to 28 mg/kg. The detected chromium concentrations appear to be representative of background soil conditions within the EAA and do not exceed any other ecological or

human health screening criteria. Given the high organic content of the soils, PSI does not expect the chromium to leach into surface water to a significant degree. However, based on your comment, PSI subsequently analyzed two samples containing the highest chromium concentrations by the SPLP method to evaluate the potential for leaching. These results are tabulated and discussed on page 4 of this addendum. The SPLP analysis indicates only limited potential for leaching of chromium to surface water, and we do not believe that chromium would exceed the Class III surface water standards in the water impounded within the A-2 FEB due to extensive dilution and other factors. In any case, PSI recommended sampling of the surface water for chromium at start-up as a precaution. This recommendation was accepted by both USFWS and FDEP in lieu of further pre-construction studies.

*Page 21. Arsenic: Concentrations do exceed the residential exposure criteria. The FEB may be open to the public for recreation. Some discussion of risks associated with public access should be provided in text. Perhaps a reference to other sites where FDEP has developed a "recreational" exposure criteria (Lake Okeechobee Scenic Trail for instance.)*

**PSI Response**: Arsenic concentrations exceeded the Soil Cleanup Target Level for Residential Direct Exposure (SCTL-RDE) in all of the composite soil samples, and ranged from 3.1 mg/kg to 6.8 mg/kg. The mean arsenic concentration is 4.6 mg/kg. PSI utilized EPA ProUCL to calculate the 95% upper confidence limit (UCL) for the data set. The software package recommends a 95% UCL value of 4.895 mg/kg. A copy of the 95% UCL calculation sheet is provided in **Attachment D**.

While the FDEP does not have a promulgated SCTL for arsenic in a recreational setting, the Department has utilized 5.5 mg/kg as an appropriate SCTL for a number of other recreational projects across the state, including active parks with a significantly higher public exposure frequency than is likely for the FEB. Human health risks for arsenic exposure are primarily driven by ingestion of arsenic in the soil, and children are the most sensitive receptors. For the FEB, any direct contact with arsenic contaminated soils is likely to occur only on the bermed surfaces, where the muck soils may be used for surface dressing. Contact frequency for the general public or workers is likely to be minimal, in comparison to the frequency of use assumed by FDEP in the active park scenario which was used to develop the alternate SCTL for recreational use. PSI believes this alternate recreational SCTL is appropriate for this project and that no protections are necessary for protection of the public related to exposure to arsenic impacted soils in the FEB project.

*Page 21. Chromium. Not sure that it is relevant that the planned FEB will or will not be classified as a Class III water body. The FEB will discharge to the STAs and eventually a class III water body. By the way, this paragraph on the SCTL-LSW exceedances is in direct contrast to the discussion that begins in the next paragraph that follows which begins "Class III surface water criteria".*

**PSI Response**: The classification of the FEB as a Class III water body is relevant because since the Class III surface water standards will apply to the water body, then

the SCTL-LSW criteria also apply to the soils within the A-2 FEB footprint. This discussion is now not relevant because the District has elected to permit the A-2 FEB as a Class III surface water.

*Page 21. Bullet on Chromium, mercury, and selenium were.... Actual testing of these analytes using the SPLP test procedure would have been useful so you could say for sure if these "leach to a significant degree". This lack of testing should be further justified or corrected by additional testing.*

**PSI Response**: Since the chromium, mercury and selenium concentrations in the soil appeared to be consistent with background conditions in the EAA, and the leaching potential of the highly organic soils was not considered to be high, PSI did not initially elect to perform SPLP analysis on any of the soil samples. However, pursuant to your request we analyzed two samples representing the highest range of these three metals by the SPLP method to evaluate leaching potential. The SPLP results are provided in **Attachment E** and are tabulated below.

| Sample ID | Date Collected | Chromium | Mercury | Selenium |
|---|---|---|---|---|
| SPLP Leachate/163830 (Comp-7) | 4/5/2013 | 3.5 U | 0.062 U | 2.3 U |
| SPLP Leachate/163832 (Comp-12) | 4/5/2013 | 18 | 0.062 U | 2.3 U |

The results indicate limited potential for leaching of any of these three metals. It is acknowledged that the chromium concentration detected in Comp-12 slightly exceeds the Class III surface water standard of 11 ug/L and that while mercury was not detected in the samples, the method detection limits for mercury are higher than the Class III surface water standard. However, the SPLP results do not account for the extensive dilution that will occur in the FEB as fresh water enters the system. The results indicate that the underlying soils are not likely to leach to the overlying surface water to a degree that would cause an exceedence of the Class III surface water criteria. In any case, PSI has recommended surface water sampling for these metals at start-up to verify this conclusion. Both FDEP and USFWS have accepted the start-up sampling in lieu of conducting further pre-construction studies.

*Page 22. Arsenic: The recommendation should indicate whether the results for Arsenic should warrant measures taken in the soil management plan to reduce possible human exposure due to potential for arsenic on levee soils. (Blending or capping with low-arsenic soils, for instance.)*

**PSI Response**: Because the 95% UCL arsenic concentrations in the site soil are below the alternate SCTL for recreational use that has been used by FDEP on similar projects, PSI does not believe that any additional protective measures, such as blending or capping of arsenic impacted soils is warranted to reduce possible exposure to arsenic in the soil.

***<u>Lisa Gued Comments on Phase II ESA</u>***

*Page 2: 1st bullet: How were ND values incorporated in the statistical analyses?*

**PSI Response**: One-half of the detection limit was used to represent non-detect values in the data set.

*Page 2: 1st bullet: A table listing the mean and the standard deviation of detected compounds would be useful*.

**PSI Response**: A table showing the mean concentrations and standard deviations for detected compounds that exceeded screening criteria is provided in **Attachment F**.

Page 7: 2nd paragraph: Which chemicals were recently applied?

**PSI Response**: PSI was informed that Atrazine, 2, 4, D, Dimetric, Calisto, Thimet, and Asolan were in use on the property and had been recently applied. We did not obtain a specific field by field application schedule for these chemicals. Through coordination with Florida Crystals Corporation, we did ensure that we did not sample any fields where chemicals had been applied within the last two weeks.

*Page 8: 2nd bullet: Split samples were not accomplished with OP pesticides and herbicides because the primary split laboratory subcontracted these analyses to Sunlabs. Sunlabs was the primary laboratory.*

**PSI Response**: Primary and split samples for organophosphorous pesticides and herbicides were inadvertently run by the same laboratory on this project. The A-2 FEB was the first project where Sun Labs served as a primary laboratory. We were aware that the secondary laboratory, ALS had previously subcontracted these analyses to SunLabs and we would have been better served to select a different secondary laboratory and this issue will be corrected for the next project. The split samples do serve a function in evaluating the precision of the primary laboratory, as the split samples were analyzed on a different day and in a different batch than the original samples. Split samples were analyzed for OCPs and metals by separate laboratories.

*Page 10: 3rd paragraph: FWS protocols recommend consideration of ESV established by EPA Region IV when Florida SQAGs are not available. Were these values considered in this assessment?*

**PSI Response:** This statement is correct; however, in this case no ESVs were published for any of the chemicals which were detected that do not have SQAGs. Atrazine, 2,4-D, metribuzin, phorate and selenium do not have either SQAGs or ESVs.

*Pages 11-13: In the discussion of the results, the mean and the standard deviation should be reported.*

**PSI Response:** Mean chemical concentrations and standard deviations are reported in the table provided in **Attachment F.**

*Pages 11-13: For compounds where the detection limit was higher than the criteria, this should be reported.*

**PSI Response:** A data table showing all target analytes, the method detection limits and all of the regulatory criteria is provided in **Attachment G**.

*Page 11: Last paragraph. The MDL that the laboratory reported is approximately 100 times the SQAG-TEC for atrazine.*

**PSI Response:** PSI acknowledges that the MDLs reported for atrazine, which generally ranged from 24-30 ug/kg, are higher than the SQAG-TEC, but are below all other regulatory criteria. The method detection limits reported by SunLabs are consistent with those reported for other labs that are listed on the District's approved list for this contract and meet the MDLs outlined in the SFWMD standard ADaPT library. For example, E-Labs (Pace) reported an MDL for atrazine using EPA Method 8141 of 33 ug/kg and Jupiter Environmental Laboratories reported an MDL of 25 ug/kg using EPA method 8141.

*Page 12: 2nd paragraph: The text fails to state that the holding times for SPLP analyses per method EPA 1312 were exceeded. This makes the data questionable.*

**PSI Response:** PSI agrees that the holding times for atrazine and dieldrin were exceeded for the SPLP analyses; however, we do not agree with the assertion that the data is questionable due to the exceedence of hold times. We typically run SPLP analyses as a follow-up when analytes are detected in the composite soil samples at concentrations exceeding the leaching to groundwater or leaching to surface water criteria. By necessity, these samples are not analyzed until the initial results are reported and we determine the specific analytes of concern and the samples with the highest range of these chemicals. It would be cost prohibitive to run all of the samples for SPLP analyses for all analytes or to run all of the composite samples on a rush basis in order to be able to run the SPLP analyses within hold times. Additionally, it would be prohibitive to the schedule and budget to return to the field to re-collect samples for SPLP analysis. In the past, both FDEP and USFWS have accepted that the SPLP results would be slightly beyond hold time for organic analytes and we do not believe that the analysis of these samples a few days beyond the hold time would significantly impact the results.

*Page 13: 4.3 Data validation: ADaPT data validation forms were not provided with the laboratory reports in Appendix A.*

**PSI Response:** The ADaPT data validation forms are provided herein in **Attachment H**.

*Page 13: 4th paragraph: Does USFWS concur with the value used of 4.2 mg/kg selenium?*

**PSI Response:** Yes.

*Page 14: 4th bullet: A spot check of the data indicate that this statement is inaccurate. The method blank run 1/30/13 by CAS has barium, cadmium, copper, mercury in it.*

**PSI Response:** The statement should read that no target analytes were detected in the laboratory method blanks which caused the sample data to be qualified. PSI acknowledges that estimated concentrations ("I" qualified) of barium, cadmium, copper, and mercury were detected in the method blank for the secondary laboratory. The sample data were not qualified as the samples contained concentrations of these metals in excess of 10 times the blank contamination.

*Page 14: Bullets 6&7: There are a wide variety of MDLs being reported by commercial laboratories. Were the labs told which criteria the data was going to be compared to? Were different labs contacted?*

**PSI Response:** PSI is aware that individual laboratories may have different method detection limits for any given chemical. The District has established a list of subcontract laboratories that are acceptable for use under the Ecological Risk Assessment contract. Each of these laboratories has been provided with a standard ADAPT library stating the required method detection limits and quality control requirements for each analyte/method/media. The method detection limit requirements listed in the ADAPT library were developed by HSW Engineers based on performance capabilities, regulatory guidance concentrations, and the FDEP Practical Quantitation Limits Guidance.

*Page 14: It should be noted that the laboratory did not achieve the SQAGs TEC concentrations for any of the organophosphate pesticides (OPP), the triazine herbicides (including atrazine) or toxaphene. The SOW that this assessment was supposed to follow named EPA 8140 as the method for OPP. The chain of custody from the field requested EPA 8141 + atrazine for the split samples; the chain of custody between ALS and their subcontractor, Sunlabs was changed to EPA 8270. The chain of custody from the field produced to Sunlabs (the primary laboratory) requested EPA 8141. The data was reported out from EPA 8270 which did not conform to the scope. Typically, EPA 8140 provides lower detection limits than EPA 8270 due to use of a more selective detector.*

**PSI Response:** EPA Method 8140 was not specified in the SOW and is no longer included in SW-846. None of the laboratories that are in use by the District are certified by the Florida Department of Health for this method. EPA Method 8141 was specified in the proposal SOW; however, after preparation of the SOW we began experiencing difficulty with the primary laboratory (Jupiter Environmental Laboratory) that we had proposed to use on the project, and we elected to utilize SunLabs as the primary laboratory. SunLabs does not utilize EPA Method 8141, but instead runs the analysis

for OPPs by EPA method 8270. We believe that EPA method 8270 is preferable to EPA method 8141 because it offers mass spec confirmation of identified compounds. PSI has reviewed the MDLs for these compounds using the 8270 method vs. the MDLs reported by the other District-approved laboratories running EPA method 8141 and we found that the MDLs using EPA method 8270 are generally equivalent or better than those identified by the laboratories running EPA 8141. PSI did approve the use of EPA 8270 for OPP analysis, and the method should have been reflected on the chain of custody.

PSI acknowledges that the MDLs for diazinon, azinphos atrazine, simazine, and toxaphene exceed the SQAG TECs. It should be noted that the SQAG-TECs were calculated by an extrapolation of available toxicity data without reference to whether these calculated values were technically achievable by commercial laboratories using available equipment and methods. However, the MDLs reported by SunLabs using EPA 8270 are generally consistent or lower than those reported by other District laboratories using EPA Method 8141. Additionally, practical quantitation limits (PQLs) for a number of these compounds are included in the FDEP Guidance for the Selection of Analytical Methods and Evaluation of Practical Quantitation Limits (FDEP 2004) and the MDLs reported by SunLabs were lower than the FDEP PQLs in most instances. A comparison of the SQAG-TEC criteria, FDEP recommended PQLs, and the SunLabs average MDLs is presented below.

| **Analyte** | **SQAG-TEC (ug/kg)** | **Adapt Library MDL (ug/kg)** | **FDEP PQL (ug/kg)** | **SunLabs MDL (ug/kg)** |
|---|---|---|---|---|
| Azinphos, ethyl | 0.018 | 25 | No goal | 44 |
| azinphos, methyl | 0.062 | 50 | 7 | 29 |
| chlorpyriphos | No standard | 50 | 20 | 40 |
| cuomaphos | No standard | 30 | 40 | 38 |
| diazinon | 0.38 | 30 | 50 | 31 |
| dimethoate | No standard | 50 | 70 | 20 |
| ethion | No standard | 30 | 7 | 29 |
| ethoprop | No standard | 30 | 20 | 22 |
| EPN | No standard | 30 | 40 | 24 |
| fensulfothion | No standard | 30 | 50 | 27 |
| fonofos | No standard | 30 | 20 | 22 |
| methyl parathion | No standard | 100 | 20 | 16 |
| mevinphos | No standard | 30 | 30 | 22 |
| naled | No standard | 50 | 300 | 27 |
| parathion | No standard | 100 | 50 | 18 |
| phorate | No standard | 30 | 7 | 4.4 |
| terbufos | No standard | 30 | 7 | 4.4 |

| Analyte | SQAG-TEC (ug/kg) | Adapt Library MDL (ug/kg) | FDEP PQL (ug/kg) | SunLabs MDL (ug/kg) |
|---|---|---|---|---|
| atrazine | 0.3 | No goal | 10 | 25 |
| simazine | 0.34 | No goal | 20 | 24 |
| toxaphene | 0.1 | 30 | 100 | 57 |

*Page 17: 1st bullet: Please confirm that the 95% UCL of dieldrin exceeds the SQAG-TEC.*

**PSI Response:** The calculated 95% UCL for dieldrin is 2.15 ug/kg, which does slightly exceed the SQAG-TEC of 1.9 ug/kg.

Page 17: 2nd bullet: Does the FWS concur with no risk for barium?

**PSI Response:** Yes.

*Page 17: 2nd bullet: The range of barium concentration defined by FDEP (Carvalho and Schropp, 2002) in the Florida DEPs Interpretive Tool for Assessment of Metal Enrichment in Florida Freshwater Sediment warns of the limitation that "the majority of the freshwater sediment systems used to build the sediment metals database from which this tool was developed came from central peninsular and north Florida. Therefore, this tool should be used to evaluate sediments from the same region". It goes on to say in the Recommendations: "… the interpretive tool should be used with a cautionary note outside of central peninsular and north Florida."*

**PSI Response:** Comment noted. The Interpretive Tool was not used per se for the assessment. Rather, the concentrations of barium observed in the reference locations used in the Interpretive Tool were used to indicate that the barium concentrations observed at A-2 were not likely to be toxic to benthic invertebrates.

*Table 1: SPLP should have a footnote.*

**PSI Response:** This comment does not appear to be complete. Please indicate what the footnote should document.

*Tables: A complete table listing the criteria and the found value and or detection limit would be useful to see at a glance the detection limit vs the criteria.*

**PSI Response**: We do not typically provide tables showing all analytes, as USFWS and FDEP have indicated a preference to see only detected analytes. The method detection limits for all analytes are shown in the laboratory reports, which were included in Appendix A of the Phase II ESA. At your request, we have provided a table showing all analytes, the detection limits and the applicable regulatory criteria in **Attachment G**.

***<u>Lisa Gued Comments re: Appendix B Screening Level Ecological Risk Assessment</u>***

*Page 3: 4th paragraph I have been unable to locate the full dataset.*

**PSI Response:** The full dataset (i.e., all of the laboratory reports) was included on a CD ROM in Appendix A of the Phase II ESA Report.

*Page 3: 5th paragraph: Which samples are discrete?*

**PSI Response:** Only composite samples were collected for this assessment.

*Page 4: 3.1.1 Does USFWS concur with this?*

**PSI Response:** Yes.

*Page 4: 3.1.1 The range of barium concentration defined by FDEP (Carvalho and Schropp, 2002) in the Florida DEPs Interpretive Tool for Assessment of Metal Enrichment in Florida Freshwater Sediment warns of the limitation that "the majority of the freshwater sediment systems used to build the sediment metals database from which this tool was developed came from central peninsular and north Florida. Therefore, this tool should be used to evaluate sediments from the same region". It goes on to say in the Recommendations: "… the interpretive tool should be used with a cautionary note outside of central peninsular and north Florida."*

**PSI Response:** Comment noted. The Interpretive Tool was not used per se for the assessment. Rather, the concentrations of barium observed in the reference locations used in the Interpretive Tool were used to indicate that the barium concentrations observed at A-2 were not likely to be toxic to benthic invertebrates.

*Page 5: 1st paragraph: Does the USFWS concur with the barium concentrations are not likely to cause effects?*

**PSI Response:** Yes.

*Page 5: 4th paragraph: Does the USFWS concur with the lack of PEC exceedance in any sample and the unique properties of muck soils with the A-2 cultivated area suggest that the potential for toxic effects would be lower than predicted by SQAGs?*

**PSI Response:** Yes.

*Page 5: 4th paragraph: Define unique properties.*

**PSI Response:** The unique properties of muck soils are associated with the exceptionally high organic carbon content of the soils (20 – 50%) which is expected to reduce the bioavailability of copper once flooded versus soils containing lower amounts of organic material.

*Page 6: 3.1.3: The information is in conflict with the ESA assertion on page 13. The recommended value for selenium should be inserted in to the detected table 1 and footnoted.*

**PSI Response:** The USFWS has recommended a screening benchmark equal to 2 mg/kg for use in SFWMD SLERAs. The value is not experimentally derived and is not equivalent to a SQAG, so it is not appropriate for inclusion on Table 1. The 4.2 mg/kg value cited in the Phase II ESA is not a screening benchmark recommended by USFWS, but is rather an experimentally derived benchmark that may be applicable for use in South Florida in certain situations where selenium is present at concentrations greater than the 2.0 mg/kg screening benchmark in highly organic soils such as those found at this Site.

*Page 6: 3.1.4 I am unable to identify a Figure 2 in the hard copy report.*

**PSI Response:** Figure 2 was included in the SLERA; however, we have included a copy for your use in **Attachment I**.

Page 6: Does USFWS concur with the recalculation of the 0.0003 ug/kg TEC value for atrazine to 587 ug/kg TEC for atrazine?

**PSI Response:** Yes.

*Page 6: 3.1.5 What is the half-life for 2,4-D?*

**PSI Response:** According to EXTOXNET (http://extoxnet.orst.edu/pips/24-D.htm) the average half-life of 2,4-D in soils is less than 7 days.

*Page 6: 3.1.5: Does USFWS concur with the calculation of the site-specific SQAGs for 2,4-D?*

**PSI Response:** Yes.

*Table 1: comp-10 should be shaded for dieldrin concentration*

**PSI Response:** A corrected version of Table 1 reflecting dieldrin concentrations exceeding the SQAG by shading is provided in **Attachment J**.

*Page 8: 2nd paragraph Does USFWS concur?*

**PSI Response:** Yes.

*Page 8:5th paragraph: Was metribuzin applied recently or not?*

**PSI Response:** Yes.

*Page 8:6th paragraph: Was phorate applied recently or not?*

**PSI Response:** Yes.

*Page 9: 3.2 The cumulative risk did not include the data for barium. Barium data were not used because it was considered background. It those data were left in the average PEC-HQ would be greater than 0.5. Does USFWS concur with deletion of barium data? Table 2: The value for SQAG PEC for dieldrin is incorrect in this table. The correct value is 0.062 mg/kg.*

**PSI Response:** Barium was not included in the cumulative risk calculations because the PEC for barium is not based on the proper type of benchmark for average PEC calculation as discussed on Page 9 of the SLERA: "In order to calculate the potential for cumulative risk, MacDonald et al. (2003) recommends the use of the average PEC quotient (PEC-HQ) which represents the average ratio of the site chemical concentration to the PEC SQAG. This measure is only meant for use for those chemicals that have consensus-based SQAGs derived in the SQAG guidance document."

Review of the SQAG guidance document provides no information regarding the derivation of the TEC and PEC benchmarks for barium. The barium SQAGs are not representative of the typical consensus-based benchmarks provided for most of the metal contaminants in the guidance and no discussion regarding the underlying assumptions behind the benchmark is provided. A review of the referenced source for the benchmarks indicates that the author of the benchmark guidance obtained the benchmarks from a secondary source which was itself a draft document (SAIC 1991). Neither the secondary nor the primary source (USEPA 1977) were located after an extensive search for both documents. Some information on the barium benchmarks was located in the Washington State Sediment Quality Guidelines document (WADOE 1997). The Washington document indicated that the benchmarks cited in the USEPA (1977) guidance developed by USEPA Region V in order to classify Great Lakes harbor sediments. The document notes that the values are 'somewhat arbitrary and are not well founded scientifically' and that they were only adequate for 'determining the suitability of dredged material for open water disposal'. The barium benchmarks appear to be based not on benthic toxicity but on an unknown general 'contamination classification' scheme. As a result, their use in calculation of average PEC-HQs meant for consensus-based benchmarks would be inappropriate.

MacDonald, D.D., C.G. Ingersoll, D.E. Smorong, R.A. Lindskoog, G. Sloane, and T. Biernacki. 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Florida Department of Environmental Protection, Tallahassee, FL.

SAIC (Science Application International Corporation). 1991. Draft compilation of sediment quality guidelines for EPA Region 5 inventory of contaminated sediment sites. Prepared by Science Application International Corporation. Chicago, Illinois. 48 pp.

USEPA (United States Environmental Protection Agency). 1977. Guidelines for the pollution classification of Great Lakes Harbor sediments. United States Environmental Protection Agency. Region V. Chicago, Illinois. (As cited in SAIC 1991).

Washington State Department of Ecology. 1997. Creation and Analysis of Freshwater Sediment Quality Values in Washington. Publication Number 97-323a. July 1997.

*Page 10: 2nd paragraph: The text says that "a screening-level approach was used to identify COPCs by using the maximum composite sample concentration from the discrete sediment samples…" This does not make sense. There were no discrete samples.*

**PSI Response:** The comment is correct, discrete samples were not available and the sentence should read: **...***a screening-level approach was used to identify COPCs by using the maximum composite sample concentration ~~from the discrete sediment samples~~…"*

*Page 10: 3rd paragraph: Treatment of barium is inconsistent through this report. It was not used in Table 2 to calculate PECs-HQ but it was used in Table 3 to calculate HQs for aquatic – feeding birds.*

**PSI Response:** The treatment of barium is consistent throughout the document according to the Protocol.

Calculation of the average PEC-HQ (Table 2) was conducted using those COPCs whose concentration exceeded a consensus-based PEC from the MacDonald et al. (2003) document as previously discussed. This calculation is used to assess the potential to the benthic invertebrate community only and has no bearing on or relationship to the HQs calculated for aquatic-feeding birds.

HQs calculated for aquatic-feeding birds use a food web model as described in the Protocol that estimates the daily intake of COPCs, including barium. The estimated intake is then compared to laboratory-derived toxicity reference values (TRVs) to calculate the HQs shown in Table 3.

*Page 10: 3rd paragraph: The text says that atrazine is a chemical with low toxicity. How do the authors reconcile the 0.0003 mg/kg SQAG-TEC values; it is the lowest concentration of TEC for the compounds detected.*

**PSI Response:** SQAGs are screening-level benchmarks for predicting the potential for toxicity to benthic invertebrates and the comment is correct in that atrazine can be toxic to aquatic life. As a result, the potential for risk to benthic invertebrates was discussed in Section 3.1.4. However, Section 3.3 in which the quoted text is found discusses risk to aquatic-feeding birds. Atrazine is described by EXTOXNET

(http://extoxnet.orst.edu/pips/atrazine.htm) as “practically nontoxic to birds” as indicated in the referenced text.

*Page 11: 3.3.1 Does USFWS concur with this position?*

**PSI Response**: Yes.

∞ ∞ ∞

We trust that these responses will be satisfactory to address the USACE’s concerns regarding the report. If you have any additional questions, please do not hesitate to contact me at 303-424-5578.

Respectfully submitted,
**PROFESSIONAL SERVICE INDUSTRIES, INC.**

Stephen P. Long, PE, PG
Chief Engineer

Michael Rothenburg, PE
Env. Dept. Manager

Attachments:

A- USFWS and FDEP Concurrence Letters for Phase II ESA
B- Final Summary Environmental Report for A-2 FEB, dated 8/21/12
C- USFWS Concurrence Letter for Phase II ESA SOW
D- 95% UCL Calculations
E- SPLP Results
F- Mean analyte concentrations and standard deviations
G- Laboratory Analytical Data Table for Soil
H- ADaPT Data Validation Forms
I- SLERA Figure 2
J- SLERA Table 1(rev.)

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**ATTACHMENT A**

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960


April 17, 2013

Robert Kukleski
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

Dear Mr. Kukleski:

The U.S. Fish and Wildlife Service (Service) has reviewed the document entitled "Phase II Environmental Site Assessment for the A-2 Flow Equalization Basin, Palm Beach County, Florida," prepared by Professional Service Industries, Incorporated (PSI). This report summarizes sampling results for the approximately 14,408 acre Talisman property.

Previous due diligence assessments were performed on the A-2 Flow Equalization Basin (FEB) parcels prior to the creation of the current "Protocol for Assessment, Remediation, and Post-Remediation. Monitoring for Environmental Contaminants on Everglades Restoration Projects", therefore a reduced sampling density of 10 percent was agreed to prior to the current assessment of previously cultivated areas in the project footprint. All point source concerns within the A-2 FEB were previously assessed and remediated as necessary. A total of 30, fifty acre grids were sampled using composite samples. Analytical results were compared to the Florida Department of Environmental Protection Sediment Quality Assessment Guidelines (SQAG) and the Florida Administrative Code Soil Cleanup Target Levels (SCTL).

Results

Barium concentrations (69 to 118 mg/kg) exceeded the SQAG threshold effect concentration (20 mg/kg) and probable effect concentration (PEC) (60 mg/kg) in all of the samples. Copper (53 to 110 mg/kg) was detected at concentrations that exceeded the recommended interim screening level for protection of the Everglade snail kite (*Rostrhamus sociabilis plumbeus*) (85 mg/kg) in eight of the samples collected. The calculated 95 percent upper confidence level (UCL) of the mean copper concentrations (83.1 mg/kg) was below 85 mg/kg. The metals chromium, mercury, and selenium exceeded the SCTL for leaching to surface water in several of the sample locations. The herbicides 2,4-D, metribuzin, phorate, and atrazine were detected at some locations with concentrations above the SCTL for leaching to surface water or ground water. Atrazine (27 to 3,500 μg/kg) was relatively widespread, with detections at 16 of the sampling locations above the SQAG threshold effect concentration (TEC) (0.30 μg/kg). The pesticide dieldrin was detected above the SQAG TEC (1.9 μg/kg) in four samples, ranging from 2.7 to 5.1 μg/kg. Atrazine and dieldrin were also analyzed with the synthetic precipitation leaching procedure (SPLP). Atrazine was detected in SPLP extract at concentrations above the Florida Administrative Code (FAC) groundwater cleanup target level (GCTL) and the FAC

Surface water Cleanup Target Level (SwCTL). The detection limits for the dieldrin SPLP extracts were above the SwCTL.

Copper concentrations within the A-2 FEB did show some exceedances above the recommended interim screening level, but sitewide they are calculated to be below 85 mg/kg. In addition, the total organic carbon (TOC) content of the soils at the proposed A-2 FEB are high (20-50 percent) and will act to decrease the bioavailability of copper. The recommended interim screening level was generally established for sandy soils with roughly 1 percent TOC. To verify that copper does not present a risk to snail kites, PSI recommended a sampling program at the start-up of the A-2 FEB to monitor copper concentrations in surface water, periphyton, and any apple snails that may establish onsite. To address the exceedances of 2,4-D, atrazine, metribuzin, phorate, dieldrin, chromium, mercury, and selenium above the SCTL for leaching to surface water PSI recommended sampling surface water after start-up operations at the A-2 FEB.

Summary and Recommendations

After reviewing the analytical data, the Service concurs that the detected contaminant concentrations are unlikely to pose risk to Service trust resources at the proposed A-2 FEB. We agree that the proposed monitoring for copper is necessary to verify predictions of reduced copper bioavailability due to the high TOC. While the detected levels of barium could potentially impact the benthic community, it is unlikely that they would pose risk to federally listed species.

The Service agrees that an agrochemical best management practices (BMP) plan is appropriate to address the use of agrochemicals, if the property is used for agricultural purposes prior to project construction. We strongly recommend restricting any further use of copper and discontinuing use of atrazine a minimum of one year prior to project construction. If agrochemicals are applied during the interim use, then further sampling may be necessary to ensure that agrochemical concentrations are below thresholds for ecological risk.

Thank you for the opportunity to provide comments regarding the assessment in the A-2 FEB project area. If you have any questions, please contact Emily Bauer at 772-469-4335.

Sincerely yours,

for Larry Williams
Field Supervisor
South Florida Ecological Services Office

cc: electronic only

Corps, West Palm Beach, Florida (Tori White)
Service, Vero Beach, Florida (Sharon Kocis, Steve Mortellaro)
PSI, Tampa, Florida (Stephen Long)

DEPARTMENT OF ENVIRONMENTAL PROTECTION

# MEMORANDUM

**TO:** **Joe Lurix, Air/Waste/WF Program Administrator** JL

**FROM:** **William Rueckert, Environmental Manager, Waste Compliance Assistance & Enforcement Section** WAR

**DATE:** **April 4, 2013**

**SUBJECT:** **Phase II Environmental Site Assessment, A-2 Flow Equalization Basin, Palm Beach County; Site No. COM_157258 (Talisman); Tract Numbers: D7100-044; -047; -066; -067; -104; -139; -141; and D7200-005.**

As requested by the Department's Office of Ecosystem Projects in Tallahassee, I have reviewed the document prepared for the South Florida Water Management District (District) by Professional Service Industries, Inc. (PSI) dated March 25, 2013 (received April 1, 2013) *Phase II Environmental Site Assessment, A-2 Flow Equalization Basin (Report), Palm Beach County, Florida*. The Department's review was performed following the "Protocol for Assessment, Remediation and Post Remediation Monitoring for Environmental Contaminants on Everglades Restoration Projects" known as the White Paper. The Waste Compliance Assistance & Enforcement Section has the following comments:

1. Based on the information and representations as presented, this Report adequately addresses the concerns of the Department's Waste Compliance Assistance & Enforcement Section with further discussion below. Therefore, the property addressed in this Report should be capable of being utilized for the intended end use as a flow equalization basin.

2. Start Up Operations - the Department concurs that during the start up operation a one-time surface water and sediment sampling event should be performed. This sampling event should be performed at the 30- or 60-day period from inundation. **In addition,** after one year of operations, an additional surface water sampling event should be performed. Sample location, minimum of three, determinations should be based upon the highest concentrations of the listed parameters presented in this Report. The Department suggests three locations with the highest copper concentrations for the metals analyses. For example, sample collection should be in the vicinity of Comp-1, Comp-16, and Comp-30.

Sample locations, minimum of three, for the pesticide and herbicide analyses should be in the areas of Comp-9, Comp-18, and Comp-28. The following parameters should be laboratory analyzed: pesticides and herbicides (2,4-D; atrazine; metribuzin; phorate) and metals (barium, chromium, copper, mercury and selenium).

3. Arsenic is not suggested for additional analyses but these soils should not be transported off site for uncontrolled disposal. As presented in Section 6.2, Recommendations, a soil management plan should be developed for project construction to ensure proper handling and disposal of the soils.

4. Also as presented in Section 6.2 of the Report, an agrochemical best management practices plan should be instituted during the continued use of agrochemicals on the property.

If you have any questions, feel free to contact William Rueckert at (561) 681-6679 or at William.Rueckert@dep.state.fl.us.

cc: (RPPS_Comp@dep.state.fl.us)

130267

## ATTACHMENT B

Note: Attachment B is too large to include in electronic file. A hard copy of this report is being separately transmitted.

**ATTACHMENT C**

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

January 8, 2013

Robert Kukleski
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

Dear Mr. Kukleski:

The U.S. Fish and Wildlife Service (Service) has reviewed the document entitled "Proposal for Phase II Environmental Site Assessment, A-2 Flow Equalization Basin (FEB) Project, Palm Beach County, Florida, Proposal No. 552-80246," prepared by Professional Service Industries, Incorporated (PSI). This proposal summarizes planned sampling for the 14,408-acre property located between US Highway 27 and the Miami Canal in southern Palm Beach County.

Due diligence assessments were performed on the A-2 FEB parcels prior to the creation of the current "Protocol for Assessment, Remediation, and Post-Remediation, Monitoring for Environmental Contamination of Everglades Restoration Projects", so reduced sampling density is satisfactory for providing a general indication of large scale concerns in the project area. Approximately 10% of the formerly cultivated sugarcane area will be sampled using composite samples from 50-acre grids. It is agreed that if exceedances based on ecological screening criteria are identified, then additional investigation will be required.

The Service concurs with the proposed sampling plan for the A-2 FEB project area. We look forward to reviewing sampling results once they become available.

Thank you for the opportunity to provide comments regarding this sampling proposal for the A-2 FEB project. If you have any questions, please contact Emily Bauer at 772-469-4335.

Sincerely yours,

for Larry Williams
Field Supervisor
South Florida Ecological Services Office

cc: electronic only
Corps, West Palm Beach, Florida (Tori White)
Service, Vero Beach, Florida (Kevin Palmer)
PSI, Tampa, Florida (Stephen Long)

TAKE PRIDE® IN AMERICA

**ATTACHMENT D**

General UCL Statistics for Full Data Sets

| User Selected Options | |
|---|---|
| From File | WorkSheet.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

C0

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 36 | Number of Distinct Observations | 24 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 3.1 | Minimum of Log Data | 1.131 |
| Maximum | 6.8 | Maximum of Log Data | 1.917 |
| Mean | 4.593 | Mean of log Data | 1.501 |
| Geometric Mean | 4.484 | SD of log Data | 0.221 |
| Median | 4.3 | | |
| SD | 1.036 | | |
| Std. Error of Mean | 0.173 | | |
| Coefficient of Variation | 0.226 | | |
| Skewness | 0.556 | | |

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.93 | Shapiro Wilk Test Statistic | 0.952 |
| Shapiro Wilk Critical Value | 0.935 | Shapiro Wilk Critical Value | 0.935 |
| Data not Normal at 5% Significance Level | | Data appear Lognormal at 5% Significance Level | |
| | | | |
| **Assuming Normal Distribution** | | **Assuming Lognormal Distribution** | |
| 95% Student's-t UCL | 4.885 | 95% H-UCL | 4.903 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 5.335 |
| 95% Adjusted-CLT UCL (Chen-1995) | 4.894 | 97.5% Chebyshev (MVUE) UCL | 5.656 |
| 95% Modified-t UCL (Johnson-1978) | 4.888 | 99% Chebyshev (MVUE) UCL | 6.288 |
| | | | |
| **Gamma Distribution Test** | | **Data Distribution** | |
| k star (bias corrected) | 19.29 | Data appear Gamma Distributed at 5% Significance Level | |
| Theta Star | 0.238 | | |
| MLE of Mean | 4.593 | | |
| MLE of Standard Deviation | 1.046 | | |
| nu star | 1389 | | |
| Approximate Chi Square Value (.05) | 1303 | **Nonparametric Statistics** | |
| Adjusted Level of Significance | 0.0428 | 95% CLT UCL | 4.877 |
| Adjusted Chi Square Value | 1299 | 95% Jackknife UCL | 4.885 |
| | | 95% Standard Bootstrap UCL | 4.873 |
| Anderson-Darling Test Statistic | 0.537 | 95% Bootstrap-t UCL | 4.922 |
| Anderson-Darling 5% Critical Value | 0.747 | 95% Hall's Bootstrap UCL | 4.894 |
| Kolmogorov-Smirnov Test Statistic | 0.117 | 95% Percentile Bootstrap UCL | 4.862 |
| Kolmogorov-Smirnov 5% Critical Value | 0.147 | 95% BCA Bootstrap UCL | 4.924 |
| Data appear Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL | 5.346 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 5.672 |

| | | | |
|---|---|---|---|
| Assuming Gamma Distribution | | 99% Chebyshev(Mean, Sd) UCL | 6.311 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 4.895 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 4.909 | | |
| | | | |
| Potential UCL to Use | | Use 95% Approximate Gamma UCL | 4.895 |

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

**ATTACHMENT E**

April 11, 2013

Andrew Cadle
PSI
5801 Benjamin Center Dr, #112
Tampa, FL 33634

Re: SunLabs Project Number: **130404.09**
Client Project Description: **A-2 FEB SPLP**

Dear Mr. Cadle:

Enclosed is the report of laboratory analysis for the following samples:

| Sample Number | Sample Description | Date Collected | | Date Received |
|---|---|---|---|---|
| 163830 | Comp-7 012313 | 01/23/13 | 15:30 | 01/28/13 |
| 163831 | SPLP Leachate/163830 (Comp-7) | 04/05/13 | 9:00 | |
| 163832 | Comp-12 012513 | 01/25/13 | 13:20 | 01/28/13 |
| 163833 | SPLP Leachate/163832 (Comp-12) | 04/05/13 | 9:00 | |

**Narrative:**

Unless otherwise noted below or in the report and where applicable:
- Samples were received at the proper temperature and analyzed as received.
- Sample condition upon receipt is recorded on the chain-of-custody attached to this report.
- Results for all solid matrices are reported on a dry weight basis.
- Appropriate calibration and QC criteria were satisfactorily met.
- All applicable holding times for analytes have been met.
- Copies of the chains-of-custody, if received, are attached to this report.

Samples 163830 (Comp-7 012313) and 163832 (Comp-12 012513) were leached outside of hold time for Mercury. All other metals were leached within holding times.

If you have any questions or comments concerning this report, please do not hesitate to contact us.

Sincerely,

Michael W. Palmer
Vice President, Laboratory Operations

Enclosures

**Unless Otherwise Noted and Where Applicable:**

The results herein relate only to the items tested or to the samples as received by the laboratory • This report shall not be reproduced except in full, without the written approval of SunLabs • All samples will be disposed of within 60 days of the date of receipt of the samples • All results meet the requirements of the NELAC standards • Uncertainty values are available upon request

# Report of Laboratory Analysis

| SunLabs Project Number | PSI |
|---|---|
| 130404.09 | Project Description |
| | A-2 FEB SPLP |

April 11, 2013

| | | | |
|---|---|---|---|
| SunLabs Sample Number | 163830 | Matrix | Soil |
| Sample Designation | Comp-7 012313 | Date Collected | 01/23/13 15:30 |
| | | Date Received | 01/28/13 13:20 |

| Parameters | Method | Units | Results | Dil Factor | MDL | PQL | CAS Number | Date/Time Analyzed | Date/Time Prep | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Synthetic Precipitation Leaching Procedure | | | | | | | | | | |
| SPLP - Date Leached | 1312 | | 04/05/13 | 1 | | | | 04/05/13 | 04/05/13 | REB |

SunLabs, Inc.
5460 Beaumont Center Blvd., Suite 520
Tampa, FL 33634

*Laboratory ID Number - E84809*

Phone: (813) 881-9401
Email: Info@SunLabsInc.com
Website: www.SunLabsInc.com

# Report of Laboratory Analysis

| SunLabs Project Number | PSI |
|---|---|
| 130404.09 | Project Description |
| | A-2 FEB SPLP |

April 11, 2013

| | | | |
|---|---|---|---|
| SunLabs Sample Number | 163831 | Matrix | SPLP Leachate |
| Sample Designation | SPLP Leachate/163830 (Comp-7) | Date Collected | 04/05/13 09:00 |
| | | Date Received | |

| Parameters | Method | Units | Results | | Dil Factor | MDL | PQL | CAS Number | Date/Time Analyzed | Date/Time Prep | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mercury** | | | | | | | | | | | |
| Date Digested | 7470 | | 04/10/13 | | | | | | | 04/10/13 12:20 | CLG |
| Date Analyzed | 7470 | | 04/11/13 | | 1 | | | | 04/11/13 14:27 | | CLG |
| Mercury | 7470 | ug/L | 0.062 | U | 1 | 0.062 | 0.25 | 7439-97-6 | 04/11/13 14:27 | 04/10/13 12:20 | CLG |
| **RCRA Metals** | | | | | | | | | | | |
| Date Digested | 3005 | | 04/10/13 | | | | | | | 04/10/13 14:45 | CLG |
| Date Analyzed | 6010 | | 04/10/13 | | 1 | | | | 04/10/13 23:18 | | CAM |
| Chromium | 6010 | ug/L | 3.5 | U | 1 | 3.5 | 14 | 7440-47-3 | 04/10/13 23:18 | 04/10/13 14:45 | CAM |
| Selenium | 6010 | ug/L | 2.3 | U | 1 | 2.3 | 9.2 | 7782-49-2 | 04/10/13 23:18 | 04/10/13 14:45 | CAM |

# Report of Laboratory Analysis

| SunLabs Project Number | PSI |
|---|---|
| 130404.09 | Project Description |
| | A-2 FEB SPLP |

April 11, 2013

| | | | |
|---|---|---|---|
| SunLabs Sample Number | 163832 | Matrix | Soil |
| Sample Designation | Comp-12 012513 | Date Collected | 01/25/13 13:20 |
| | | Date Received | 01/28/13 13:20 |

| Parameters | Method | Units | Results | Dil Factor | MDL | PQL | CAS Number | Date/Time Analyzed | Date/Time Prep | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Synthetic Precipitation Leaching Procedure | | | | | | | | | | |
| SPLP - Date Leached | 1312 | | 04/05/13 | 1 | | | | 04/05/13 | | REB |

SunLabs, Inc.
5460 Beaumont Center Blvd., Suite 520
Tampa, FL 33634

*Laboratory ID Number - E84809*

Phone: (813) 881-9401
Email: Info@SunLabsInc.com
Website: www.SunLabsInc.com

# Report of Laboratory Analysis

| SunLabs Project Number | PSI |
|---|---|
| 130404.09 | Project Description |
| | A-2 FEB SPLP |

April 11, 2013

| | | | |
|---|---|---|---|
| SunLabs Sample Number | 163833 | Matrix | SPLP Leachate |
| Sample Designation | SPLP Leachate/163832 (Comp-12) | Date Collected | 04/05/13 09:00 |
| | | Date Received | |

| Parameters | Method | Units | Results | | Dil Factor | MDL | PQL | CAS Number | Date/Time Analyzed | Date/Time Prep | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mercury** | | | | | | | | | | | |
| Date Digested | 7470 | | 04/10/13 | | | | | | | 04/10/13 12:20 | CLG |
| Date Analyzed | 7470 | | 04/11/13 | | 1 | | | | 04/11/13 14:29 | | CLG |
| Mercury | 7470 | ug/L | 0.062 | U | 1 | 0.062 | 0.25 | 7439-97-6 | 04/11/13 14:29 | 04/10/13 12:20 | CLG |
| **RCRA Metals** | | | | | | | | | | | |
| Date Digested | 3005 | | 04/10/13 | | | | | | | 04/10/13 14:45 | CLG |
| Date Analyzed | 6010 | | 04/10/13 | | 1 | | | | 04/10/13 23:21 | | CAM |
| Chromium | 6010 | ug/L | 18 | | 1 | 3.5 | 14 | 7440-47-3 | 04/10/13 23:21 | 04/10/13 14:45 | CAM |
| Selenium | 6010 | ug/L | 2.3 | U | 1 | 2.3 | 9.2 | 7782-49-2 | 04/10/13 23:21 | 04/10/13 14:45 | CAM |

# Report of Laboratory Analysis

| SunLabs Project Number | PSI |
|---|---|
| 130404.09 | Project Description |
| | A-2 FEB SPLP |

April 11, 2013

## Footnotes

| | |
|---|---|
| ** | SunLabs is not currently NELAC certified for this analyte. |
| I | The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit. |
| J | The reported value failed to meet the established quality control criteria for either precision or accuracy(see cover letter for explanation) |
| LCS | Laboratory Control Sample |
| LCSD | Laboratory Control Sample Duplicate |
| MB | Method Blank |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| NA | Sample not analyzed at client's request. |
| Q | Sample held beyond the accepted holding time. |
| RPD | Relative Percent Difference |
| U | Compound was analyzed for but not detected. |
| U,Q | Compound was anaylzed for but not detected. Sample was analyzed beyond the accepted holding time. |
| V | Indicates that the analyte was detected in both the sample and the associated method blank. |
| Y | The laboratory analysis was from an improperly preserved sample. The data may not be accurate. |
| Z | Too many colonies were present (TNTC); the numeric value represents the filtration volume. |

# Quality Control Data

| Project Number | PSI |
|---|---|
| 130404.09 | Project Description: A-2 FEB SPLP |

April 11, 2013

## Batch No: F1460

Test: Mercury

TestCode: Hg-L

Associated Samples: 163831, 163833

| Compound | Blank | LCS Spike | LCS %Rec | LCSD %Rec | RPD % | ---QC Limits--- RPD | LCS | MS Spike | MS %Rec | MSD %Rec | RPD % | ---QC Limits--- RPD | MS | Dup RPD | Qualifiers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Parent Sample Number* | | | | | | | | | *163831* | *163831* | | | | | |
| Date Digested | 04/10/13 | | | | | | | | | | | | | | |
| Date Analyzed | 04/11/13 | | | | | | | | | | | | | | |
| Mercury | 0.062 U ug/L | 5.0 | 93 | 97 | 4 | 20 | 80-120 | 5.0 | 94 | 97 | 3 | 20 | 75-125 | | |

## Batch No: F1463

Test: RCRA Metals

TestCode: RCRA-7-w-ug/L

Associated Samples: 163831, 163833

| Compound | Blank | LCS Spike | LCS %Rec | LCSD %Rec | RPD % | ---QC Limits--- RPD | LCS | MS Spike | MS %Rec | MSD %Rec | RPD % | ---QC Limits--- RPD | MS | Dup RPD | Qualifiers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Parent Sample Number* | | | | | | | | | *163833* | *163833* | | | | | |
| Chromium | 3.5 U ug/L | 1000 | 100 | 98 | 2 | 20 | 80-120 | 1000 | 97 | 96 | 1 | 20 | 75-125 | | |
| Selenium | 2.3 U ug/L | 1000 | 95 | 95 | 0 | 20 | 80-120 | 1000 | 97 | 96 | 1 | 20 | 75-125 | | |

* indicates value is outside control limits for %Recovery or greater than acceptance criteria for RPD

*Footnotes*

*U* *Compound was analyzed for but not detected.*

Pg 1 of 3

# SunLabs, Inc. Chain of Custody

130404.09

№ 37587

Client Name: PSI
Contact: Drew Cadle
Address:
Phone / Fax: on file
E-Mail :

SunLabs Project # 130128.010 apb

Project Name: A-2 Fe P
Project #: 05521114
PO #:
Alt Bill To:

| SunLabs Sample # | Sample Description | Sampled Date | Sampled Time | # of Bottles | EPA 8081 | EPA 8141 | EPA 8151 | RCRA 8 + Copper + Total Organic Carbon (TOC) | EPA 8081 PCB | EPA 8 AP |
|---|---|---|---|---|---|---|---|---|---|---|
| | Bottle Type | | | | S | S | S | S | S | |
| | Preservative | | | | 1 | 1 | 1 | 1 | 1 | |
| | Matrix | | | | SO | SO | SO | SO | SO | |
| 1591070 | Comp-15 012213 | 1-22-13 | 1355 | 3 | X | X | X | X | X | |
| | ~~Comp-15 Sp~~ RF | | | | | | | | | |
| 1071 | COMP-21 012213 | 1-22-13 | 1545 | 3 | X | X | X | X | X | |
| 1072 | COMP-27 012213 | 1-22-13 | 1710 | 3 | X | X | X | X | X | |
| 1073 | Comp-14 012213 | 1-22-13 | 1330 | 3 | X | X | X | X | X | |
| 1074 | Comp-13 012213 | 1-22-13 | 1500 | 3 | X | X | X | X | X | |
| 1075 | Comp-9 012213 | 1-22-13 | 1700 | 3 | X | X | X | X | X | |
| 1076 | Comp-9 DUP 012213 | 1-22-13 | 1700 | 3 | X | X | X | X | X | |
| 1077 | Comp-22 012313 | 1-23-13 | 1115 | 3 | X | X | X | X | X | |
| 1078 | Comp-28 012313 | 1-23-13 | 1240 | 3 | X | X | X | X | X | |
| 1079 | Comp-16 012313 | 1-23-13 | 1400 | 3 | X | X | X | X | X | |
| 1080 | Comp-17 012313 | 1-23-13 | 1545 | 3 | X | X | X | X | X | |
| 1081 | Comp-10 012313 | 1-23-13 | 1720 | 3 | X | X | X | X | X | |
| 1082 | Comp-3 012313 | 1-23-13 | 1100 | 3 | X | X | X | X | X | |

Due Date Requested*:

☐ FDEP PreApproval site
☒ ADaPT EDD (PGM:_____)
Facility/Site ID:

Remarks / Comments:
3 Coolers
ADaPT EDD

Length of Record Retention if other than 5 years:*

Sampler Signature / Date: Ryan Fetter / 1-28-13

Printed Name / Affiliation: Ryan Fetter / PSI

SUNLABS, INC. RESERVES THE RIGHT TO BILL FOR DISPOSAL OF UNUSED/ UNRETURNED SAMPLES AND TO RETURN UNUSED SAMPLES.

| Relinquished By: | Relinquished To: | Date: | Time: |
|---|---|---|---|
| [signature] | Ryan Fetter | 1-17-13 | 15:00 |
| Ryan Fetter | [signature] | 1-28-13 | 13:20 |
| | | | |
| | | | |

*Bottle Type Codes:*
GV = Glass Vial; GVS = Low Level Volatile Kit
GA = Glass Amber; T = Tedlar Bag
P = Plastic; O = Other (Specify)
S = Soil Jar

*Preservative Codes:*
H = Hydrochloric Acid + Ice; S = Sulfuric Acid + Ice
I = Ice only; VS = NaHSO4, MeOH, + Ice
N = Nitric Acid; T = Sodium thiosulfate + Ice
B = Sodium bisulfate + Ice; O = Other (Specify)

*Matrix Codes:*
SO = Soil; SOL = Solid
A = Air; SW = Surface Water
DW = Drinking Water; WS = Waste; WW = Waste Water
GW = Ground Water; W = Water (Blanks)
SE = Sediment; O = Other (Specify:_____)

Internal Use Only

*Sample Condition Upon Receipt:*

| | |
|---|---|
| Custody Seals present? | Y / N / NA |
| Custody Seals intact? | Y / N / NA |
| Shipping Bills attached? | Y / N / NA |
| Sample containers intact? | Y / N / NA |
| Samples within holding times? | Y / N / NA |
| Sufficient volume for all analyses? | Y / N / NA |
| Are vials head-space free? | Y / N / NA |
| Proper containers and preservatives? | Y / N / NA |

Internal Use Only
Temp upon receipt: 5.0 °C
Received on Ice? Y / N / NA

**SunLabs, Inc.**
5460 Beaumont Center Blvd., Suite 520, Tampa, Florida 33634
Phone: 813-881-9401 / Fax: 813-354-4661
e-mail: info@SunLabsInc.com www.SunLabsInc.com



* See General Terms and Conditions on Reverse

Pg 2 of 3

130404.09

# SunLabs, Inc. Chain of Custody

№ 37586

Client Name: PSI
Contact: Drew Cadle
Address:
Phone / Fax: on file
E-Mail :

SunLabs Project # 130128.06

Project Name: A-2 Feld
Project #: 05521114
PO #:
Alt Bill To:

| SunLabs Sample # | Sample Description | Sampled Date | Sampled Time | # of Bottles | EPA 8081 | EPA 8141 | EPA 8151 | RCRA 8 + Cadmium | TPH Organics Carbon Chain |
|---|---|---|---|---|---|---|---|---|---|
| Bottle Type | | | | | S | S | S | S | S |
| Preservative | | | | | 1 | 1 | 1 | 1 | 1 |
| Matrix | | | | | SO | SO | SO | SO | SO |
| 159083 | Comp-1 012313 | 1-23-13 | 1340 | 3 | X | X | X | X | X |
| 084 | Comp-7 012313 * | 1-23-13 | 1530 | 3 | X | X | X | X | X |
| 085 | Comp-7 DUP 012313 | 1-23-13 | 1530 | 3 | X | X | X | X | X |
| 086 | Comp-8 012313 | 1-23-13 | 1725 | 3 | X | X | X | X | X |
| 087 | Comp-11 012413 | 1-24-13 | 1145 | 3 | X | X | X | X | X |
| 088 | Comp-23 012413 | 1-24-13 | 1330 | 3 | X | X | X | X | X |
| 089 | Comp-29 012413 | 1-24-13 | 1610 | 3 | X | X | X | X | X |
| 090 | Comp-24 012413 | 1-24-13 | 1730 | 3 | X | X | X | X | X |
| 091 | Comp-4 012413 | 1-24-13 | 1150 | 3 | X | X | X | X | X |
| 092 | Comp-4 DUP 012413 | 1-24-13 | 1150 | 3 | X | X | X | X | X |
| 093 | Comp-20 012413 | 1-24-13 | 1400 | 3 | X | X | X | X | X |
| 094 | Comp-26 012413 | 1-24-13 | 1630 | 3 | X | X | X | X | X |
| 095 | Comp-19 012413 | 1-24-13 | 1800 | 3 | X | X | X | X | X |
| 096 | Comp-30 012513 | 1-25-13 | 1020 | 3 | X | X | X | X | X |

Due Date Requested*:

☐ FDEP PreApproval site
☒ ADaPT EDD (PGM:_____)
Facility/Site ID:

Remarks / Comments:

3 Coolers
ADaPT EDD
* SPLP Cr, Hg, Se
4/4/13

Length of Record Retention if other than 5 years:*

Sampler Signature / Date: Ryan Fetter / 1-28-13

Printed Name / Affiliation: Ryan Fetter / PSI

SUNLABS, INC. RESERVES THE RIGHT TO BILL FOR DISPOSAL OF UNUSED/ UNRETURNED SAMPLES AND TO RETURN UNUSED SAMPLES.

| Relinquished By: | Relinquished To: | Date: | Time: |
|---|---|---|---|
| [signature] | Ryan Fetter | 1-17-13 | 15:00 |
| Ryan Fetter | [signature] | 1-28-13 | 13:20 |
| | | | |
| | | | |

*Bottle Type Codes:*
GV = Glass Vial; GVS = Low Level Volatile Kit; GA = Glass Amber; T = Tedlar Bag; P = Plastic; O = Other (Specify); S = Soil Jar

*Preservative Codes:*
H = Hydrochloric Acid + Ice; S = Sulfuric Acid + Ice; I = Ice only; VS = NaHSO4, MeOH, + Ice; N = Nitric Acid; T = Sodium thiosulfate + ice; B = Sodium bisulfate + Ice; O = Other (Specify)_____

*Matrix Codes:*
SO = Soil; SOL = Solid; A = Air; SW = Surface Water; DW = Drinking Water; WS = Waste; WW = Waste Water; GW = Ground Water; W = Water (Blanks); SE = Sediment; O = Other (Specify:_____)

Internal Use Only

Temp upon receipt: 5.0 °C

Received on Ice? (Y) / N / NA

Internal Use Only

*Sample Condition Upon Receipt:*

| | |
|---|---|
| Custody Seals present? | Y / (N) / NA |
| Custody Seals intact? | Y / N / (NA) |
| Shipping Bills attached? | Y / (N) / NA |
| Sample containers intact? | (Y) / N / NA |
| Samples within holding times? | (Y) / N / NA |
| Sufficient volume for all analyses? | (Y) / N / NA |
| Are vials head-space free? | Y / N / (NA) |
| Proper containers and preservatives? | (Y) / N / NA |


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Pg 3 of 3

# SunLabs, Inc. Chain of Custody

130404.09

№ 37585

Client Name: PSI
Contact: Drew Cadle
Address: -
Phone / Fax: [illegible]
E-Mail:

SunLabs Project # 130128.06

Project Name: A-2 Feb
Project #: 05521114
PO #:
Alt Bill To:

| Bottle Type | S | S | S | S | S | | GA | GA | GA | P |
|---|---|---|---|---|---|---|---|---|---|---|
| Preservative | I | I | I | I | I | | | | | |
| Matrix | SO | SO | SO | SO | SO | | W | W | W | W |
| Analysis / Method Requested | EPA 8081 | EPA 8141 | EPA 8151 | RCRA 8 + Ecoliter | Total Organic Carbon (TOC) | | EPA 8081 | EPA 8141 | EPA 8151 | RCRA 8 + Ecoliter |

| SunLabs Sample # | Sample Description | Sampled Date | Sampled Time | # of Bottles | EPA 8081 | EPA 8141 | EPA 8151 | RCRA 8 + Ecoliter | Total Organic Carbon (TOC) | | EPA 8081 | EPA 8141 | EPA 8151 | RCRA 8 + Ecoliter |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 159697 | Comp-18 012513 | 1-25-13 | 1150 | 3 | X | X | X | X | X | | | | | |
| 1698 | Comp-12 012513 | 1-25-13 | 1320 | 3 | X | X | X | X | X | | | | | |
| 1699 | Comp-6 012513 | 1-25-13 | 1430 | 3 | X | X | X | X | X | | | | | |
| 700 | Comp-23 012513 | 1-25-13 | 1030 | 3 | X | X | X | X | X | | | | | |
| 701 | Comp-2 012513 | 1-25-13 | 1215 | 3 | X | X | X | X | X | | | | | |
| 702 | Comp-5 012513 | 1-25-13 | 1330 | 3 | X | X | X | X | X | | | | | |
| 703 | Equip Blank-1 | 1-22-13 | 1130 | 4 | | | | | | | X | X | X | X |
| 704 | FCEB-2 | 1-23-13 | 1735 | 4 | | | | | | | X | X | X | X |
| 705 | FCEB-3 | 1-24-13 | 1015 | 4 | | | | | | | X | X | X | X |

Due Date Requested*:

☐ FDEP PreApproval site
☒ ADaPT EDD (PGM: _____)
Facility/Site ID:

Remarks / Comments:

3 coolers
ADaPT EDD
SPLP Cr, Hg, Se
4/4/13

Length of Record Retention if other than 5 years:* _____

Sampler Signature / Date: Ryan Fetter / 1-28-13

Printed Name / Affiliation: Ryan Fetter / PSI

SUNLABS, INC. RESERVES THE RIGHT TO BILL FOR DISPOSAL OF UNUSED/ UNRETURNED SAMPLES AND TO RETURN UNUSED SAMPLES.

| Relinquished By: | Relinquished To: | Date: | Time: |
|---|---|---|---|
| [illegible] | Ryan Fetter | 1-17-13 | 15:00 |
| Ryan Fetter | [illegible] | 1-28-13 | 13:20 |
| | | | |
| | | | |

*Bottle Type Codes:*

GV = Glass Vial; GVS = Low Level Volatile Kit; GA = Glass Amber; T = Tedlar Bag; P = Plastic; O = Other (Specify); S = Soil Jar

*Preservative Codes:*

H = Hydrochloric Acid + Ice; S = Sulfuric Acid + Ice; I = Ice only; VS = NaHSO4, MeOH, + Ice; N = Nitric Acid; T = Sodium thiosulfate + ice; B = Sodium bisulfate + Ice; O = Other (Specify) _____

*Matrix Codes:*

SO = Soil; SOL = Solid; A = Air; SW = Surface Water; DW = Drinking Water; WS = Waste; WW = Waste Water; GW = Ground Water; W = Water (Blanks); SE = Sediment; O = Other (Specify: _____)

Internal Use Only

Temp upon receipt: 5.0 °C

Received on Ice? (Y) / N / NA

Internal Use Only

*Sample Condition Upon Receipt:*

| | |
|---|---|
| Custody Seals present? | Y / (N) / NA |
| Custody Seals intact? | Y / N / (NA) |
| Shipping Bills attached? | Y / (N) / NA |
| Sample containers intact? | (Y) / N / NA |
| Samples within holding times? | (Y) / N / NA |
| Sufficient volume for all analyses? | (Y) / N / NA |
| Are vials head-space free? | Y / N / (NA) |
| Proper containers and preservatives? | (Y) / N / NA |


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# ATTACHMENT F

**Mean Concentrations and Standard Deviation for Detected Chemicals of Interest**
**PROJECT NAME: A-2 Flow Equalization Basin**
**PSI PROJECT NO.: 05521114**

| | Chlorinated Herbicides (ug/kg) | OPPs (ug/kg) | | | OCPs (ug/kg) | Metals (mg/kg) | | | | | | | | | TOC (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D, 2-4' | Atrazine | Metribuzin | Phorate | Dieldrin | Arsenic | Barium | Cadmium | Chromium | Copper | Lead | Mercury | Selenium | Silver | Total Organic Carbon |
| **Mean Concentration** | 30.75 | 333.2 | 172.6 | 7.97 | 1.53 | 4.59 | 95.12 | 0.00 | 15.53 | 77.29 | 6.24 | 0.12 | 2.58 | NA | 401,056 |
| **Standard Deviation** | 2.48 | 832.6 | 366.8 | 24.48 | 1.54 | 1.04 | 9.20 | 0.00 | 5.79 | 12.47 | 0.74 | 0.02 | 0.40 | NA | 64,198 |

**ATTACHMENT G**

# Summary of Soil Analytical Results
# A-2 Flow Equalization Basin Project
# (All Results in milligrams per kilogram [mg/kg])

| Sample ID | Date Collected | Aldrin | Arsenic | Aspon | Atrazine | Azinphos ethyl | Azinphos methyl | Barium | BHC, a- | BHC, b- | BHC, d- | Bolstar | Cadmium | Carbophenothion | Chlordane, a- | chlordane, g- | Chlorfenvinphos | Chlorpyrifos | Chlorpyrifos Methyl | Chromium | Copper | Coumaphos | Crotoxyphos | D, 2,4- |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCTL-RDE | | 0.06 | 2.1 | *** | 4.3 | *** | 120 | 120 | 0.1 | 0.5 | 24 | *** | 82 | 11 | 2.8 | 2.8 | *** | 250 | *** | 210 | 150 | 21 | *** | 770 |
| SCTL-LGW | | 0.2 | *** | *** | 0.06 | *** | 0.2 | 1600 | 0.0003 | 0.001 | 0.2 | *** | 7.5 | 13 | 9.6 | 9.6 | *** | 15 | *** | 38 | *** | 0.3 | *** | 0.7 |
| SCTL-LSW | | 0.01 | *** | *** | 0.04 | *** | 0.0002 | *** | 0.0003 | 0.003 | *** | *** | *** | 1.5 | 0.003 | 0.003 | *** | 0.001 | *** | 4.2 | *** | 0.0007 | *** | 0.9 |
| SQAG-TEC | | *** | 9.8 | *** | 0.0003 | 0.000018 | 0.000062 | 20 | *** | *** | *** | *** | 1 | *** | 0.0032 | *** | *** | *** | *** | 43 | 85 | *** | *** | *** |
| Comp-1 012313 | 1/23/2013 | 0.00014 U | **6.8** | 0.011 U | **0.099 I** | 0.036 U | 0.024 U | **110** | 0.00080 U | 0.00085 U | 0.00064 U | 0.022 U | 0.11 U | 0.011 U | 0.0013 U | 0.0033 U | 0.020 U | 0.033 U | 0.022 U | **19** | **110** | 0.031 U | 0.031 U | 0.058 U |
| Comp-10 012313 | 1/23/2013 | 0.00013 U | **4.9** | 0.011 U | 0.025 U | 0.036 U | 0.023 U | **95** | 0.00079 U | 0.00084 U | 0.00062 U | 0.021 U | 0.11 U | 0.011 U | 0.0012 U | 0.0032 U | 0.020 U | 0.032 U | 0.021 U | **12** | **68** | 0.030 U | 0.030 U | 0.057 U |
| Comp-11 012413 | 1/24/2013 | 0.00015 U | **3.6** | 0.012 U | 0.027 U | 0.039 U | 0.025 U | **98** | 0.00086 U | 0.00092 U | 0.00069 U | 0.024 U | 0.11 U | 0.012 U | 0.0014 U | 0.0035 U | 0.022 U | 0.035 U | 0.024 U | **15** | **79** | 0.033 U | 0.033 U | 0.063 U |
| Comp-12 012513 | 1/25/2013 | 0.00015 U | **3.8** | 0.012 U | 0.027 U | 0.039 U | 0.025 U | **100** | 0.00086 U | 0.00092 U | 0.00069 U | 0.024 U | 0.11 U | 0.012 U | 0.0014 U | 0.0035 U | 0.022 U | 0.035 U | 0.024 U | **13** | **87** | 0.033 U | 0.033 U | 0.063 U |
| Comp-13 012213 | 1/22/2013 | 0.00014 U | **6.2** | 0.011 U | **0.110 I** | 0.037 U | 0.024 U | **100** | 0.00081 U | 0.00087 U | 0.00065 U | 0.022 U | **0.15 I** | 0.011 U | 0.0013 U | 0.0033 U | 0.020 U | 0.033 U | 0.022 U | **29** | **90** | 0.031 U | 0.031 U | 0.059 U |
| Comp-14 012213 | 1/22/2013 | 0.00014 U | **5.5** | 0.011 U | 0.026 U | 0.038 U | 0.025 U | **80** | 0.00083 U | 0.00089 U | 0.00066 U | 0.023 U | **0.18 I** | 0.011 U | 0.0013 U | 0.0034 U | 0.021 U | 0.034 U | 0.023 U | **16** | **68** | 0.032 U | 0.032 U | 0.060 U |
| Comp-15 012213 | 1/22/2013 | 0.00016 U | **3.4** | 0.013 U | **3.5** | 0.043 U | 0.028 U | **87** | 0.00096 U | 0.0010 U | 0.00076 U | 0.026 U | **0.12 I** | 0.013 U | 0.0015 U | 0.0039 U | 0.024 U | 0.039 U | 0.026 U | **7.8** | **75** | 0.037 U | 0.037 U | **0.29** |
| Comp-16 012313 | 1/23/2013 | 0.00012 U | **4** | 0.0098 U | **0.33** | 0.033 U | 0.021 U | **91** | 0.00072 U | 0.00077 U | 0.00057 U | 0.020 U | 0.096 U | 0.0098 U | 0.0011 U | 0.0030 U | 0.018 U | 0.030 U | 0.020 U | **23** | **96** | 0.028 U | 0.028 U | 0.052 U |
| Comp-17 012313 | 1/23/2013 | 0.00014 U | **3.8** | 0.011 U | **0.160 I** | 0.038 U | 0.025 U | **99** | 0.00083 U | 0.00089 U | 0.00066 U | 0.023 U | 0.12 U | 0.011 U | 0.0013 U | 0.0034 U | 0.021 U | 0.034 U | 0.023 U | **17** | **85** | 0.032 U | 0.032 U | 0.060 U |
| Comp-18 012513 | 1/25/2013 | 0.00015 U | **3.4** | 0.012 U | **3.3** | 0.039 U | 0.025 U | **97** | 0.00086 U | 0.00092 U | 0.00069 U | 0.024 U | 0.11 U | 0.012 U | 0.0014 U | 0.0035 U | 0.022 U | 0.035 U | 0.024 U | **11** | **88** | 0.033 U | 0.033 U | **0.94** |
| Comp-19 012413 | 1/24/2013 | 0.00013 U | **5.5** | 0.010 U | 0.024 U | 0.034 U | 0.022 U | **88** | 0.00076 U | 0.00081 U | 0.00060 U | 0.021 U | 0.11 U | 0.010 U | 0.0012 U | 0.0031 U | 0.019 U | 0.031 U | 0.021 U | **17** | **59** | 0.029 U | 0.029 U | 0.055 U |
| Comp-2 012513 | 1/25/2013 | 0.00015 U | **5.2** | 0.012 U | 0.029 U | 0.041 U | 0.027 U | **93** | 0.00090 U | 0.00096 U | 0.00071 U | 0.024 U | 0.11 U | 0.012 U | 0.0014 U | 0.0037 U | 0.022 U | 0.037 U | 0.024 U | **15** | **59** | 0.035 U | 0.035 U | 0.065 U |
| Comp-20 012413 | 1/24/2013 | 0.00013 U | **5** | 0.011 U | 0.025 U | 0.036 U | 0.023 U | **90** | 0.00079 U | 0.00084 U | 0.00062 U | 0.021 U | 0.10 U | 0.011 U | 0.0012 U | 0.0032 U | 0.020 U | 0.032 U | 0.021 U | **14** | **70** | 0.030 U | 0.030 U | 0.057 U |
| Comp-21 012213 | 1/22/2013 | 0.00012 U | **3.5** | 0.0097 U | **0.055 I** | 0.032 U | 0.021 U | **69** | 0.00071 U | 0.00076 U | 0.00056 U | 0.019 U | **0.17 I** | 0.0097 U | 0.0011 U | 0.0029 U | 0.018 U | 0.029 U | 0.019 U | **9.4** | **79** | 0.027 U | 0.027 U | 0.052 U |
| Comp-22 012313 | 1/23/2013 | 0.00015 U | **4.3** | 0.012 U | 0.027 U | 0.039 U | 0.025 U | **100** | 0.00086 U | 0.00092 U | 0.00069 U | 0.024 U | **0.16 I** | 0.012 U | 0.0014 U | 0.0035 U | 0.022 U | 0.035 U | 0.024 U | **12** | **83** | 0.033 U | 0.033 U | 0.063 U |
| Comp-23 012413 | 1/24/2013 | 0.00014 U | **4.2** | 0.011 U | 0.026 U | 0.037 U | 0.024 U | **82** | 0.00081 U | 0.00087 U | 0.00065 U | 0.022 U | 0.11 U | 0.011 U | 0.0013 U | 0.0033 U | 0.020 U | 0.033 U | 0.022 U | **13** | **59** | 0.031 U | 0.031 U | 0.059 U |
| Comp-24 012413 | 1/24/2013 | 0.00015 U | **4.1** | 0.012 U | 0.028 U | 0.040 U | 0.026 U | **99** | 0.00088 U | 0.00094 U | 0.00070 U | 0.024 U | **0.14 I** | 0.012 U | 0.0014 U | 0.0036 U | 0.022 U | 0.036 U | 0.024 U | **28** | **82** | 0.034 U | 0.034 U | 0.064 U |
| Comp-25 012513 | 1/25/2013 | 0.00014 U | **6.4** | 0.011 U | **0.031 I** | 0.036 U | 0.024 U | **100** | 0.00080 U | 0.00085 U | 0.00064 U | 0.022 U | 0.11 U | 0.011 U | 0.0013 U | 0.0033 U | 0.020 U | 0.033 U | 0.022 U | **19** | **67** | 0.031 U | 0.031 U | 0.058 U |
| Comp-26 012413 | 1/24/2013 | 0.00013 U | **5.5** | 0.011 U | 0.025 U | 0.036 U | 0.023 U | **98** | 0.00079 U | 0.00084 U | 0.00062 U | 0.021 U | 0.11 U | 0.011 U | 0.0012 U | 0.0032 U | 0.020 U | 0.032 U | 0.021 U | **17** | **78** | 0.030 U | 0.030 U | 0.057 U |
| Comp-27 012213 | 1/22/2013 | 0.00016 U | **3.5** | 0.013 U | **0.035 I** | 0.043 U | 0.028 U | **89** | 0.00096 U | 0.0010 U | 0.00076 U | 0.026 U | 0.12 U | 0.013 U | 0.0015 U | 0.0039 U | 0.024 U | 0.039 U | 0.026 U | **9.1** | **74** | 0.037 U | 0.037 U | 0.070 U |
| Comp-28 012313 | 1/23/2013 | 0.00014 U | **3.1** | 0.011 U | **0.19** | 0.036 U | 0.024 U | **83** | 0.00080 U | 0.00085 U | 0.00064 U | 0.022 U | **0.14 I** | 0.011 U | 0.0013 U | 0.0033 U | 0.020 U | 0.033 U | 0.022 U | **26** | **69** | 0.031 U | 0.031 U | 0.058 U |
| Comp-29 012413 | 1/24/2013 | 0.00017 U | **4.3** | 0.014 U | 0.033 U | 0.047 U | 0.030 U | **86** | 0.0010 U | 0.0011 U | 0.00081 U | 0.028 U | 0.14 U | 0.014 U | 0.0016 U | 0.0042 U | 0.026 U | 0.042 U | 0.028 U | **7.2** | **60** | 0.040 U | 0.040 U | 0.074 U |
| Comp-3 012313 | 1/23/2013 | 0.00015 U | **4.3** | 0.012 U | 0.029 U | 0.041 U | 0.027 U | **91** | 0.00090 U | 0.00096 U | 0.00071 U | 0.024 U | 0.11 U | 0.012 U | 0.0014 U | 0.0037 U | 0.022 U | 0.037 U | 0.024 U | **16** | **82** | 0.035 U | 0.035 U | 0.065 U |
| Comp-30 012513 | 1/25/2013 | 0.00015 U | **3.2** | 0.012 U | **0.027 I** | 0.039 U | 0.025 U | **96** | 0.00086 U | 0.00092 U | 0.00069 U | 0.024 U | 0.12 U | 0.012 U | 0.0014 U | 0.0035 U | 0.022 U | 0.035 U | 0.024 U | **21** | **100** | 0.033 U | 0.033 U | 0.063 U |
| Comp-4 012413 | 1/24/2013 | 0.00015 U | **4.7** | 0.012 U | 0.029 U | 0.041 U | 0.027 U | **95** | 0.00090 U | 0.00096 U | 0.00071 U | 0.024 U | 0.12 U | 0.012 U | 0.0014 U | 0.0037 U | 0.022 U | 0.037 U | 0.024 U | **5.6** | **91** | 0.035 U | 0.035 U | 0.065 U |
| Comp-4 DUP 012413 | 1/24/2013 | 0.00017 U | **4.1** | 0.014 U | 0.033 U | 0.047 U | 0.030 U | **93** | 0.0010 U | 0.0011 U | 0.00081 U | 0.028 U | 0.14 U | 0.014 U | 0.0016 U | 0.0042 U | 0.026 U | 0.042 U | 0.028 U | **6.8** | **80** | 0.040 U | 0.040 U | 0.074 U |
| Comp-5 012513 | 1/25/2013 | 0.00015 U | **4.6** | 0.012 U | 0.027 U | 0.039 U | 0.025 U | **94** | 0.00086 U | 0.00092 U | 0.00069 U | 0.024 U | 0.11 U | 0.012 U | 0.0014 U | 0.0035 U | 0.022 U | 0.035 U | 0.024 U | **15** | **53** | 0.033 U | 0.033 U | 0.063 U |
| Comp-6 012513 | 1/25/2013 | 0.00016 U | **4.5** | 0.013 U | 0.030 U | 0.043 U | 0.028 U | **110** | 0.00096 U | 0.0010 U | 0.00076 U | 0.026 U | 0.12 U | 0.013 U | 0.0015 U | 0.0039 U | 0.024 U | 0.039 U | 0.026 U | **18** | **75** | 0.037 U | 0.037 U | 0.070 U |
| Comp-7 012313 | 1/23/2013 | 0.00013 U | **6.4** | 0.011 U | 0.025 U | 0.036 U | 0.023 U | **97** | 0.00079 U | 0.00084 U | 0.00062 U | 0.021 U | 0.10 U | 0.011 U | 0.0012 U | 0.0032 U | 0.020 U | 0.032 U | 0.021 U | **20** | **75** | 0.030 U | 0.030 U | 0.057 U |
| Comp-7 DUP 012313 | 1/23/2013 | 0.00014 U | **5.7** | 0.011 U | 0.025 U | 0.036 U | 0.024 U | **97** | 0.00080 U | 0.00085 U | 0.00064 U | 0.022 U | 0.11 U | 0.011 U | 0.0013 U | 0.0033 U | 0.020 U | 0.033 U | 0.022 U | **19** | **74** | 0.031 U | 0.031 U | 0.058 U |
| Comp-8 012313 | 1/23/2013 | 0.00014 U | **3.8** | 0.012 U | **1.1** | 0.038 U | 0.025 U | **96** | 0.00085 U | 0.00090 U | 0.00067 U | 0.023 U | 0.12 U | 0.012 U | 0.0013 U | 0.0035 U | 0.021 U | 0.035 U | 0.023 U | **14** | **87** | 0.033 U | 0.033 U | 0.062 U |
| Comp-9 012213 | 1/22/2013 | 0.00015 U | **3.9** | 0.012 U | **0.38** | 0.039 U | 0.025 U | **92** | 0.00086 U | 0.00092 U | 0.00069 U | 0.024 U | 0.12 U | 0.012 U | 0.0014 U | 0.0035 U | 0.022 U | 0.035 U | 0.024 U | **13** | **67** | 0.033 U | 0.033 U | 0.200 I |
| Comp-9 DUP 012213 | 1/22/2013 | 0.00017 U | **3.5** | 0.013 U | **0.44** | 0.044 U | 0.029 U | **110** | 0.00098 U | 0.0010 U | 0.00078 U | 0.027 U | 0.14 U | 0.013 U | 0.0015 U | 0.0040 U | 0.024 U | 0.040 U | 0.027 U | **17** | **65** | 0.038 U | 0.038 U | **0.170 I** |

# Summary of Soil Analytical Results
# A-2 Flow Equalization Basin Project
# (All Results in milligrams per kilogram [mg/kg])

| Sample ID | Date Collected | DB, 2,4- | DDD, 4,4'- | DDE, 4,4'- | DDT, 4,4'- | Demeton-O+S | Diazinon | Dicamba | Dichlorofenthion | Dichlorprop | Dichlorvos | Dicrotophos | Dieldrin | Dimethoate | Dinoseb | Disulfoton | Endosulfan I | Endosulfan II | Endosulfan sulfate | Endrin | Endrin aldehyde | Endrin ketone | EPN | Ethion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCTL-RDE | | *** | 4.2 | 2.9 | 2.9 | *** | 70 | 2300 | *** | *** | 0.3 | 7.4 | 0.06 | 13 | 65 | 3.3 | *** | *** | *** | 25 | *** | *** | 0.8 | 42 |
| SCTL-LGW | | *** | 5.8 | 18 | 11 | *** | 0.2 | 2.6 | *** | *** | 0.0006 | 0.005 | 0.002 | 0.006 | 0.03 | 0.09 | *** | *** | *** | 1 | *** | *** | 0.02 | 1.7 |
| SCTL-LSW | | *** | 0.01 | 0.04 | 0.06 | *** | 0.00005 | 2.4 | *** | *** | 0.00002 | 0.1 | 0.0001 | 0.0004 | 0.03 | 0.1 | *** | *** | *** | 0.001 | *** | *** | 0.003 | 0.003 |
| SQAG-TEC | | *** | 0.0049 | 0.0032 | 0.0042 | *** | 0.00038 | *** | *** | *** | *** | *** | 0.0019 | *** | *** | *** | *** | *** | *** | 0.0022 | 0.0011 | *** | *** | *** |
| Comp-1 012313 | 1/23/2013 | 0.016 U | 0.00053 U | 0.0024 U | 0.0093 U | 0.040 U | 0.025 U | 0.036 U | 0.0036 U | 0.013 U | 0.022 U | 0.024 U | 0.0017 U | 0.016 U | 0.0042 U | 0.038 U | 0.0017 U | 0.00024 U | 0.00069 U | 0.00062 U | 0.0033 U | 0.0013 U | 0.020 U | 0.024 U |
| Comp-10 012313 | 1/23/2013 | 0.016 U | 0.00052 U | 0.0023 U | 0.0091 U | 0.039 U | 0.025 U | 0.036 U | 0.0036 U | 0.013 U | 0.021 U | 0.023 U | **0.0045 I** | 0.016 U | 0.0041 U | 0.038 U | 0.0016 U | 0.00023 U | 0.00068 U | 0.00061 U | 0.0032 U | 0.0013 U | 0.020 U | 0.023 U |
| Comp-11 012413 | 1/24/2013 | 0.017 U | 0.00057 U | 0.0025 U | 0.010 U | 0.043 U | 0.027 U | 0.039 U | 0.0039 U | 0.014 U | 0.024 U | 0.025 U | 0.0018 U | 0.018 U | 0.0045 U | 0.041 U | 0.0018 U | 0.00025 U | 0.00075 U | 0.00067 U | 0.0035 U | 0.0014 U | 0.022 U | 0.025 U |
| Comp-12 012513 | 1/25/2013 | 0.017 U | 0.00057 U | 0.0025 U | 0.010 U | 0.043 U | 0.027 U | 0.039 U | 0.0039 U | 0.014 U | 0.024 U | 0.025 U | 0.0018 U | 0.018 U | 0.0045 U | 0.041 U | 0.0018 U | 0.00025 U | 0.00075 U | 0.00067 U | 0.0035 U | 0.0014 U | 0.022 U | 0.025 U |
| Comp-13 012213 | 1/22/2013 | 0.016 U | 0.00054 U | 0.0024 U | 0.0094 U | 0.041 U | 0.026 U | 0.037 U | 0.0037 U | 0.013 U | 0.022 U | 0.024 U | 0.0017 U | 0.017 U | 0.0043 U | 0.039 U | 0.0017 U | 0.00024 U | 0.00070 U | 0.00063 U | 0.0033 U | 0.0013 U | 0.020 U | 0.024 U |
| Comp-14 012213 | 1/22/2013 | 0.017 U | 0.00055 U | 0.0025 U | 0.0096 U | 0.042 U | 0.026 U | 0.038 U | 0.0038 U | 0.013 U | 0.023 U | 0.025 U | 0.0017 U | 0.017 U | 0.0043 U | 0.040 U | 0.0017 U | 0.00025 U | 0.00072 U | 0.00064 U | 0.0034 U | 0.0014 U | 0.021 U | 0.025 U |
| Comp-15 012213 | 1/22/2013 | 0.019 U | 0.00063 U | 0.0028 U | 0.011 U | 0.048 U | 0.030 U | 0.043 U | 0.0043 U | 0.015 U | 0.026 U | 0.028 U | **0.0049 I** | 0.020 U | 0.0050 U | 0.046 U | 0.0020 U | 0.00028 U | 0.00083 U | 0.00074 U | 0.0039 U | 0.0016 U | 0.024 U | 0.028 U |
| Comp-16 012313 | 1/23/2013 | 0.014 U | 0.00048 U | 0.0021 U | 0.0084 U | 0.036 U | 0.023 U | 0.033 U | 0.0033 U | 0.012 U | 0.020 U | 0.021 U | **0.0051 I** | 0.015 U | 0.0038 U | 0.034 U | 0.0015 U | 0.00021 U | 0.00062 U | 0.00056 U | 0.0030 U | 0.0012 U | 0.018 U | 0.021 U |
| Comp-17 012313 | 1/23/2013 | 0.017 U | 0.00055 U | 0.0025 U | 0.0096 U | 0.042 U | 0.026 U | 0.038 U | 0.0038 U | 0.013 U | 0.023 U | 0.025 U | 0.0017 U | 0.017 U | 0.0043 U | 0.040 U | 0.0017 U | 0.00025 U | 0.00072 U | 0.00064 U | 0.0034 U | 0.0014 U | 0.021 U | 0.025 U |
| Comp-18 012513 | 1/25/2013 | 0.017 U | 0.00057 U | 0.0025 U | 0.010 U | 0.043 U | 0.027 U | 0.039 U | 0.0039 U | 0.014 U | 0.024 U | 0.025 U | 0.0018 U | 0.018 U | 0.0045 U | 0.041 U | 0.0018 U | 0.00025 U | 0.00075 U | 0.00067 U | 0.0035 U | 0.0014 U | 0.022 U | 0.025 U |
| Comp-19 012413 | 1/24/2013 | 0.015 U | 0.00050 U | 0.0022 U | 0.0088 U | 0.038 U | 0.024 U | 0.034 U | 0.0034 U | 0.012 U | 0.021 U | 0.022 U | 0.0016 U | 0.016 U | 0.0040 U | 0.036 U | 0.0016 U | 0.00022 U | 0.00066 U | 0.00059 U | 0.0031 U | 0.0012 U | 0.019 U | 0.022 U |
| Comp-2 012513 | 1/25/2013 | 0.018 U | 0.00059 U | 0.0027 U | 0.010 U | 0.045 U | 0.029 U | 0.041 U | 0.0041 U | 0.014 U | 0.024 U | 0.027 U | 0.0019 U | 0.018 U | 0.0047 U | 0.043 U | 0.0019 U | 0.00027 U | 0.00078 U | 0.00069 U | 0.0037 U | 0.0015 U | 0.022 U | 0.027 U |
| Comp-20 012413 | 1/24/2013 | 0.016 U | 0.00052 U | 0.0023 U | 0.0091 U | 0.039 U | 0.025 U | 0.036 U | 0.0036 U | 0.013 U | 0.021 U | 0.023 U | 0.0016 U | 0.016 U | 0.0041 U | 0.038 U | 0.0016 U | 0.00023 U | 0.00068 U | 0.00061 U | 0.0032 U | 0.0013 U | 0.020 U | 0.023 U |
| Comp-21 012213 | 1/22/2013 | 0.014 U | 0.00047 U | 0.0021 U | 0.0082 U | 0.035 U | 0.023 U | 0.032 U | 0.0032 U | 0.011 U | 0.019 U | 0.021 U | 0.0015 U | 0.015 U | 0.0037 U | 0.034 U | 0.0015 U | 0.00021 U | 0.00061 U | 0.00055 U | 0.0029 U | 0.0012 U | 0.018 U | 0.021 U |
| Comp-22 012313 | 1/23/2013 | 0.017 U | 0.00057 U | 0.0025 U | 0.010 U | 0.043 U | 0.027 U | 0.039 U | 0.0039 U | 0.014 U | 0.024 U | 0.025 U | 0.0018 U | 0.018 U | 0.0045 U | 0.041 U | 0.0018 U | 0.00025 U | 0.00075 U | 0.00067 U | 0.0035 U | 0.0014 U | 0.022 U | 0.025 U |
| Comp-23 012413 | 1/24/2013 | 0.016 U | 0.00054 U | 0.0024 U | 0.00094 U | 0.041 U | 0.026 U | 0.037 U | 0.0037 U | 0.013 U | 0.022 U | 0.024 U | **0.0027 I** | 0.017 U | 0.0043 U | 0.039 U | 0.0017 U | 0.00024 U | 0.00070 U | 0.00063 U | 0.0033 U | 0.0013 U | 0.020 U | 0.024 U |
| Comp-24 012413 | 1/24/2013 | 0.018 U | 0.00058 U | 0.0026 U | 0.0010 U | 0.044 U | 0.028 U | 0.040 U | 0.0040 U | 0.014 U | 0.024 U | 0.026 U | 0.0018 U | 0.018 U | 0.0046 U | 0.042 U | 0.0018 U | 0.00026 U | 0.00076 U | 0.00068 U | 0.0036 U | 0.0014 U | 0.022 U | 0.026 U |
| Comp-25 012513 | 1/25/2013 | 0.016 U | 0.00053 U | 0.0024 U | 0.0093 U | 0.040 U | 0.025 U | 0.036 U | 0.0036 U | 0.013 U | 0.022 U | 0.024 U | 0.0017 U | 0.016 U | 0.0042 U | 0.038 U | 0.0017 U | 0.00024 U | 0.00069 U | 0.00062 U | 0.0033 U | 0.0013 U | 0.020 U | 0.024 U |
| Comp-26 012413 | 1/24/2013 | 0.016 U | 0.00052 U | 0.0023 U | 0.0091 U | 0.039 U | 0.025 U | 0.036 U | 0.0036 U | 0.013 U | 0.021 U | 0.023 U | 0.0016 U | 0.016 U | 0.0041 U | 0.038 U | 0.0016 U | 0.00023 U | 0.00068 U | 0.00061 U | 0.0032 U | 0.0013 U | 0.020 U | 0.023 U |
| Comp-27 012213 | 1/22/2013 | 0.019 U | 0.00063 U | 0.0028 U | 0.011 U | 0.048 U | 0.030 U | 0.043 U | 0.0043 U | 0.015 U | 0.026 U | 0.028 U | 0.00099 U | 0.020 U | 0.0050 U | 0.046 U | 0.0020 U | 0.00028 U | 0.00083 U | 0.00074 U | 0.0039 U | 0.0016 U | 0.024 U | 0.028 U |
| Comp-28 012313 | 1/23/2013 | 0.016 U | 0.00053 U | 0.0024 U | 0.0093 U | 0.040 U | 0.025 U | 0.036 U | 0.0036 U | 0.013 U | 0.022 U | 0.024 U | 0.0017 U | 0.016 U | 0.0042 U | 0.038 U | 0.0017 U | 0.00024 U | 0.00069 U | 0.00062 U | 0.0033 U | 0.0013 U | 0.020 U | 0.024 U |
| Comp-29 012413 | 1/24/2013 | 0.020 U | 0.00067 U | 0.0030 U | 0.0012 U | 0.051 U | 0.033 U | 0.047 U | 0.0047 U | 0.017 U | 0.028 U | 0.030 U | 0.0011 U | 0.021 U | 0.0053 U | 0.049 U | 0.0021 U | 0.00030 U | 0.00088 U | 0.00079 U | 0.0042 U | 0.0017 U | 0.026 U | 0.030 U |
| Comp-3 012313 | 1/23/2013 | 0.018 U | 0.00059 U | 0.0027 U | 0.010 U | 0.045 U | 0.029 U | 0.041 U | 0.0041 U | 0.014 U | 0.024 U | 0.027 U | 0.0019 U | 0.018 U | 0.0047 U | 0.043 U | 0.0019 U | 0.00027 U | 0.00078 U | 0.00069 U | 0.0037 U | 0.0015 U | 0.022 U | 0.027 U |
| Comp-30 012513 | 1/25/2013 | 0.017 U | 0.00057 U | 0.0025 U | 0.010 U | 0.043 U | 0.027 U | 0.039 U | 0.0039 U | 0.014 U | 0.024 U | 0.025 U | 0.0018 U | 0.018 U | 0.0045 U | 0.041 U | 0.0018 U | 0.00025 U | 0.00075 U | 0.00067 U | 0.0035 U | 0.0014 U | 0.022 U | 0.025 U |
| Comp-4 012413 | 1/24/2013 | 0.018 U | 0.00059 U | 0.0027 U | 0.010 U | 0.045 U | 0.029 U | 0.041 U | 0.0041 U | 0.014 U | 0.024 U | 0.027 U | 0.0019 U | 0.018 U | 0.0047 U | 0.043 U | 0.0019 U | 0.00027 U | 0.00078 U | 0.00069 U | 0.0037 U | 0.0015 U | 0.022 U | 0.027 U |
| Comp-4 DUP 012413 | 1/24/2013 | 0.020 U | 0.00067 U | 0.0030 U | 0.012 U | 0.051 U | 0.033 U | 0.047 U | 0.0047 U | 0.017 U | 0.028 U | 0.030 U | 0.0011 U | 0.021 U | 0.0053 U | 0.049 U | 0.0021 U | 0.00030 U | 0.00088 U | 0.00079 U | 0.0042 U | 0.0017 U | 0.026 U | 0.030 U |
| Comp-5 012513 | 1/25/2013 | 0.017 U | 0.00057 U | 0.0025 U | 0.010 U | 0.043 U | 0.027 U | 0.039 U | 0.0039 U | 0.014 U | 0.024 U | 0.025 U | 0.0018 U | 0.018 U | 0.0045 U | 0.041 U | 0.0018 U | 0.00025 U | 0.00075 U | 0.00067 U | 0.0035 U | 0.0014 U | 0.022 U | 0.025 U |
| Comp-6 012513 | 1/25/2013 | 0.019 U | 0.00063 U | 0.0028 U | 0.011 U | 0.048 U | 0.030 U | 0.043 U | 0.0043 U | 0.015 U | 0.026 U | 0.028 U | 0.00099 U | 0.020 U | 0.0050 U | 0.046 U | 0.0020 U | 0.00028 U | 0.00083 U | 0.00074 U | 0.0039 U | 0.0016 U | 0.024 U | 0.028 U |
| Comp-7 012313 | 1/23/2013 | 0.016 U | 0.00052 U | 0.0023 U | 0.0091 U | 0.039 U | 0.025 U | 0.036 U | 0.0036 U | 0.013 U | 0.021 U | 0.023 U | 0.0016 U | 0.016 U | 0.0041 U | 0.038 U | 0.0016 U | 0.00023 U | 0.00068 U | 0.00061 U | 0.0032 U | 0.0013 U | 0.020 U | 0.023 U |
| Comp-7 DUP 012313 | 1/23/2013 | 0.016 U | 0.00053 U | 0.0024 U | 0.0093 U | 0.040 U | 0.025 U | 0.036 U | 0.0036 U | 0.013 U | 0.022 U | 0.024 U | 0.0017 U | 0.016 U | 0.0042 U | 0.038 U | 0.0017 U | 0.00024 U | 0.00069 U | 0.00062 U | 0.0033 U | 0.0013 U | 0.020 U | 0.024 U |
| Comp-8 012313 | 1/23/2013 | 0.017 U | 0.00056 U | 0.0025 U | 0.0098 U | 0.042 U | 0.027 U | 0.038 U | 0.0038 U | 0.014 U | 0.023 U | 0.025 U | 0.0018 U | 0.017 U | 0.0044 U | 0.040 U | 0.0018 U | 0.00025 U | 0.00073 U | 0.00065 U | 0.0035 U | 0.0014 U | 0.021 U | 0.025 U |
| Comp-9 012213 | 1/22/2013 | 0.017 U | 0.00057 U | 0.0025 U | 0.010 U | 0.043 U | 0.027 U | 0.039 U | 0.0039 U | 0.014 U | 0.024 U | 0.025 U | 0.0018 U | 0.018 U | 0.0045 U | 0.041 U | 0.0018 U | 0.00025 U | 0.00075 U | 0.00067 U | 0.0035 U | 0.0014 U | 0.022 U | 0.025 U |
| Comp-9 DUP 012213 | 1/22/2013 | 0.020 U | 0.00064 U | 0.0029 U | 0.011 U | 0.049 U | 0.031 U | 0.044 U | 0.0044 U | 0.016 U | 0.027 U | 0.029 U | 0.0010 U | 0.020 U | 0.0051 U | 0.047 U | 0.0020 U | 0.00029 U | 0.00084 U | 0.00076 U | 0.0040 U | 0.0016 U | 0.024 U | 0.029 U |

# Summary of Soil Analytical Results
# A-2 Flow Equalization Basin Project
# (All Results in milligrams per kilogram [mg/kg])

| Sample ID | Date Collected | Ethoprop | Famphur | Fenitrothion | Fensulfothion | Fenthion | Fonophos | Heptachlor | Heptachlor epoxide | Lead | Leptophos | Lindane | Malathion | MCPA | MCPP | Mercury | Merphos | Methoxychlor | Methyl Parathion | Metribuzin | Mevinphos | Mirex | Monocrotophos | Naled |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCTL-RDE | | 7.4 | *** | *** | 19 | *** | *** | 0.2 | 0.1 | 400 | *** | 0.7 | 1500 | 35 | 64 | 3 | 2.5 | 420 | 20 | 54 | 18 | *** | *** | 150 |
| SCTL-LGW | | 0.005 | *** | *** | 0.01 | *** | *** | 23 | 0.6 | *** | *** | 0.009 | 4.2 | 0.02 | 0.03 | 2.1 | 0.5 | 160 | 0.06 | 2.2 | 0.01 | *** | *** | 0.1 |
| SCTL-LSW | | 0.002 | *** | *** | 0.004 | *** | *** | 0.01 | 0.0001 | *** | *** | 0.003 | 0.003 | 0.4 | *** | 0.01 | *** | 0.1 | 0.0003 | 0.8 | 0.0003 | *** | *** | 0.0002 |
| SQAG-TEC | | *** | *** | *** | *** | *** | *** | *** | 0.0025 | 36 | *** | 0.0024 | *** | *** | *** | 0.18 | *** | *** | *** | *** | *** | *** | *** | *** |
| Comp-1 012313 | 1/23/2013 | 0.018 U | 0.033 U | 0.170 U | 0.022 U | 0.018 U | 0.018 U | 0.00078 U | 0.0010 U | **7.8** | 0.022 U | 0.00064 U | 0.020 U | 0.0053 U | 0.016 U | **0.1** | 0.029 U | 0.017 U | 0.013 U | **0.041 I** | 0.018 U | 0.0013 U | 0.020 U | 0.022 U |
| Comp-10 012313 | 1/23/2013 | 0.018 U | 0.032 U | 0.170 U | 0.021 U | 0.018 U | 0.018 U | 0.00077 U | 0.0010 U | **5.9** | 0.021 U | 0.00062 U | 0.020 U | 0.0052 U | 0.016 U | **0.13** | 0.029 U | 0.017 U | 0.012 U | 0.018 U | 0.018 U | 0.0012 U | 0.020 U | 0.021 U |
| Comp-11 012413 | 1/24/2013 | 0.020 U | 0.035 U | 0.190 U | 0.024 U | 0.020 U | 0.020 U | 0.00084 U | 0.0011 U | **5.6** | 0.024 U | 0.00069 U | 0.022 U | 0.0057 U | 0.017 U | **0.14** | 0.031 U | 0.019 U | 0.014 U | 0.020 U | 0.020 U | 0.0014 U | 0.022 U | 0.024 U |
| Comp-12 012513 | 1/25/2013 | 0.020 U | 0.035 U | 0.190 U | 0.024 U | 0.020 U | 0.020 U | 0.00084 U | 0.0011 U | **6.8** | 0.024 U | 0.00069 U | 0.022 U | 0.0057 U | 0.017 U | **0.14** | 0.031 U | 0.019 U | 0.014 U | 0.020 U | 0.020 U | 0.0014 U | 0.022 U | 0.024 U |
| Comp-13 012213 | 1/22/2013 | 0.019 U | 0.033 U | 0.180 U | 0.022 U | 0.019 U | 0.019 U | 0.00080 U | 0.0010 U | **6.7** | 0.022 U | 0.00065 U | 0.020 U | 0.0054 U | 0.016 U | **0.13** | 0.030 U | 0.018 U | 0.013 U | 0.019 U | 0.019 U | 0.0013 U | 0.020 U | 0.022 U |
| Comp-14 012213 | 1/22/2013 | 0.019 U | 0.034 U | 0.180 U | 0.023 U | 0.019 U | 0.019 U | 0.00081 U | 0.0011 U | **6.6** | 0.023 U | 0.00066 U | 0.021 U | 0.0055 U | 0.017 U | **0.11** | 0.030 U | 0.018 U | 0.013 U | 0.019 U | 0.019 U | 0.0013 U | 0.021 U | 0.023 U |
| Comp-15 012213 | 1/22/2013 | 0.022 U | 0.039 U | 0.210 U | 0.026 U | 0.022 U | 0.022 U | 0.00093 U | 0.0012 U | **7** | 0.026 U | 0.00076 U | 0.024 U | 0.0063 U | 0.019 U | **0.11** | 0.035 U | 0.021 U | 0.015 U | **0.73** | 0.022 U | 0.0015 U | 0.024 U | 0.026 U |
| Comp-16 012313 | 1/23/2013 | 0.016 U | 0.030 U | 0.160 U | 0.020 U | 0.016 U | 0.016 U | 0.00070 U | 0.00092 U | **6.1** | 0.020 U | 0.00057 U | 0.018 U | 0.0048 U | 0.015 U | **0.13** | 0.026 U | 0.016 U | 0.011 U | **0.058 I** | 0.016 U | 0.0011 U | 0.018 U | 0.020 U |
| Comp-17 012313 | 1/23/2013 | 0.019 U | 0.034 U | 0.180 U | 0.023 U | 0.019 U | 0.019 U | 0.00081 U | 0.0011 U | **6.4** | 0.023 U | 0.00066 U | 0.021 U | 0.0055 U | 0.017 U | **0.13** | 0.030 U | 0.018 U | 0.013 U | **0.6** | 0.019 U | 0.0013 U | 0.021 U | 0.023 U |
| Comp-18 012513 | 1/25/2013 | 0.020 U | 0.035 U | 0.190 U | 0.024 U | 0.020 U | 0.020 U | 0.00084 U | 0.0011 U | **4.7** | 0.024 U | 0.00069 U | 0.022 U | 0.0057 U | 0.017 U | **0.15** | 0.031 U | 0.019 U | 0.014 U | **1.1** | 0.020 U | 0.0014 U | 0.022 U | 0.024 U |
| Comp-19 012413 | 1/24/2013 | 0.017 U | 0.031 U | 0.160 U | 0.021 U | 0.017 U | 0.017 U | 0.00074 U | 0.00097 U | **6.5** | 0.021 U | 0.00060 U | 0.019 U | 0.0050 U | 0.015 U | **0.12** | 0.028 U | 0.016 U | 0.012 U | 0.017 U | 0.017 U | 0.0012 U | 0.019 U | 0.021 U |
| Comp-2 012513 | 1/25/2013 | 0.020 U | 0.037 U | 0.190 U | 0.024 U | 0.020 U | 0.020 U | 0.00088 U | 0.0011 U | **6.7** | 0.024 U | 0.00071 U | 0.022 U | 0.0059 U | 0.018 U | **0.098** | 0.033 U | 0.019 U | 0.014 U | 0.020 U | 0.020 U | 0.0014 U | 0.022 U | 0.024 U |
| Comp-20 012413 | 1/24/2013 | 0.018 U | 0.032 U | 0.170 U | 0.021 U | 0.018 U | 0.018 U | 0.00077 U | 0.0010 U | **6.3** | 0.021 U | 0.00062 U | 0.020 U | 0.0052 U | 0.016 U | **0.11** | 0.029 U | 0.017 U | 0.012 U | **0.14** | 0.018 U | 0.0012 U | 0.020 U | 0.021 U |
| Comp-21 012213 | 1/22/2013 | 0.016 U | 0.029 U | 0.150 U | 0.019 U | 0.016 U | 0.016 U | 0.00069 U | 0.00090 U | **8.4** | 0.019 U | 0.00056 U | 0.018 U | 0.0047 U | 0.014 U | **0.099** | 0.026 U | 0.015 U | 0.011 U | **0.2** | 0.016 U | 0.0011 U | 0.018 U | 0.019 U |
| Comp-22 012313 | 1/23/2013 | 0.020 U | 0.035 U | 0.190 U | 0.024 U | 0.020 U | 0.020 U | 0.00084 U | 0.0011 U | **6.2** | 0.024 U | 0.00069 U | 0.022 U | 0.0057 U | 0.017 U | **0.14** | 0.031 U | 0.019 U | 0.014 U | 0.020 U | 0.020 U | 0.0014 U | 0.022 U | 0.024 U |
| Comp-23 012413 | 1/24/2013 | 0.019 U | 0.033 U | 0.180 U | 0.022 U | 0.019 U | 0.019 U | 0.00080 U | 0.0010 U | **5.4** | 0.022 U | 0.00065 U | 0.020 U | 0.0054 U | 0.016 U | **0.12** | 0.030 U | 0.0018 U | 0.013 U | 0.019 U | 0.019 U | 0.0013 U | 0.020 U | 0.022 U |
| Comp-24 012413 | 1/24/2013 | 0.020 U | 0.036 U | 0.190 U | 0.024 U | 0.020 U | 0.020 U | 0.00086 U | 0.0011 U | **6.6** | 0.024 U | 0.00070 U | 0.022 U | 0.0058 U | 0.018 U | **0.14** | 0.032 U | 0.0019 U | 0.014 U | 0.020 U | 0.020 U | 0.0014 U | 0.022 U | 0.024 U |
| Comp-25 012513 | 1/25/2013 | 0.018 U | 0.033 U | 0.170 U | 0.022 U | 0.018 U | 0.018 U | 0.00078 U | 0.0010 U | **5.6** | 0.022 U | 0.00064 U | 0.020 U | 0.0053 U | 0.016 U | **0.11** | 0.029 U | 0.017 U | 0.013 U | **0.12** | 0.018 U | 0.0013 U | 0.020 U | 0.022 U |
| Comp-26 012413 | 1/24/2013 | 0.018 U | 0.032 U | 0.170 U | 0.021 U | 0.018 U | 0.018 U | 0.00077 U | 0.0010 U | **6.4** | 0.021 U | 0.00062 U | 0.020 U | 0.0052 U | 0.016 U | **0.13** | 0.029 U | 0.017 U | 0.012 U | 0.018 U | 0.018 U | 0.0012 U | 0.020 U | 0.021 U |
| Comp-27 012213 | 1/22/2013 | 0.022 U | 0.039 U | 0.210 U | 0.026 U | 0.022 U | 0.022 U | 0.00093 U | 0.0012 U | **5.9** | 0.026 U | 0.00076 U | 0.024 U | 0.0063 U | 0.019 U | **0.14** | 0.035 U | 0.021 U | 0.015 U | 0.022 U | 0.022 U | 0.0015 U | 0.024 U | 0.026 U |
| Comp-28 012313 | 1/23/2013 | 0.018 U | 0.033 U | 0.170 U | 0.022 U | 0.018 U | 0.018 U | 0.00078 U | 0.0010 U | **5.8** | 0.022 U | 0.00064 U | 0.020 U | 0.0053 U | 0.016 U | **0.13** | 0.029 U | 0.017 U | 0.013 U | **1.7** | 0.018 U | 0.0013 U | 0.020 U | 0.022 U |
| Comp-29 012413 | 1/24/2013 | 0.023 U | 0.042 U | 0.220 U | 0.028 U | 0.023 U | 0.023 U | 0.0010 U | 0.0013 U | **5.2** | 0.028 U | 0.00081 U | 0.026 U | 0.0067 U | 0.021 U | **0.13** | 0.037 U | 0.0022 U | 0.016 U | 0.023 U | 0.023 U | 0.0016 U | 0.026 U | 0.028 U |
| Comp-3 012313 | 1/23/2013 | 0.020 U | 0.037 U | 0.190 U | 0.024 U | 0.020 U | 0.020 U | 0.00088 U | 0.0011 U | **5.4** | 0.024 U | 0.00071 U | 0.022 U | 0.0059 U | 0.018 U | **0.11** | 0.033 U | 0.019 U | 0.014 U | 0.020 U | 0.020 U | 0.0014 U | 0.022 U | 0.024 U |
| Comp-30 012513 | 1/25/2013 | 0.020 U | 0.035 U | 0.190 U | 0.024 U | 0.020 U | 0.020 U | 0.00084 U | 0.0011 U | **6.9** | 0.024 U | 0.00069 U | 0.022 U | 0.0057 U | 0.017 U | **0.15** | 0.031 U | 0.019 U | 0.014 U | 0.020 U | 0.020 U | 0.0014 U | 0.022 U | 0.024 U |
| Comp-4 012413 | 1/24/2013 | 0.020 U | 0.037 U | 0.190 U | 0.024 U | 0.020 U | 0.020 U | 0.00088 U | 0.0011 U | **5.9** | 0.024 U | 0.00071 U | 0.022 U | 0.0059 U | 0.018 U | **0.14** | 0.033 U | 0.019 U | 0.014 U | 0.020 U | 0.020 U | 0.0014 U | 0.022 U | 0.024 U |
| Comp-4 DUP 012413 | 1/24/2013 | 0.023 U | 0.042 U | 0.220 U | 0.028 U | 0.023 U | 0.023 U | 0.0010 U | 0.0013 U | **5.7** | 0.028 U | 0.00081 U | 0.026 U | 0.0067 U | 0.021 U | **0.13** | 0.037 U | 0.022 U | 0.016 U | 0.023 U | 0.023 U | 0.0016 U | 0.026 U | 0.028 U |
| Comp-5 012513 | 1/25/2013 | 0.020 U | 0.035 U | 0.190 U | 0.024 U | 0.020 U | 0.020 U | 0.00084 U | 0.0011 U | **5.5** | 0.024 U | 0.00069 U | 0.022 U | 0.0057 U | 0.017 U | **0.12** | 0.031 U | 0.019 U | 0.014 U | 0.020 U | 0.020 U | 0.0014 U | 0.022 U | 0.024 U |
| Comp-6 012513 | 1/25/2013 | 0.022 U | 0.039 U | 0.210 U | 0.026 U | 0.022 U | 0.022 U | 0.00093 U | 0.0012 U | **6.1** | 0.026 U | 0.00076 U | 0.024 U | 0.0063 U | 0.019 U | **0.12** | 0.035 U | 0.021 U | 0.015 U | 0.022 U | 0.022 U | 0.0015 U | 0.024 U | 0.026 U |
| Comp-7 012313 | 1/23/2013 | 0.018 U | 0.032 U | 0.170 U | 0.021 U | 0.018 U | 0.018 U | 0.00077 U | 0.0010 U | **6.3** | 0.021 U | 0.00062 U | 0.020 U | 0.0052 U | 0.016 U | **0.11** | 0.029 U | 0.017 U | 0.012 U | 0.018 U | 0.018 U | 0.0012 U | 0.020 U | 0.021 U |
| Comp-7 DUP 012313 | 1/23/2013 | 0.018 U | 0.033 U | 0.170 U | 0.022 U | 0.018 U | 0.018 U | 0.00078 U | 0.0010 U | **7.1** | 0.022 U | 0.00064 U | 0.020 U | 0.0053 U | 0.016 U | **0.11** | 0.029 U | 0.017 U | 0.013 U | 0.018 U | 0.018 U | 0.0013 U | 0.020 U | 0.022 U |
| Comp-8 012313 | 1/23/2013 | 0.019 U | 0.035 U | 0.180 U | 0.023 U | 0.019 U | 0.019 U | 0.00083 U | 0.0011 U | **6.3** | 0.023 U | 0.00067 U | 0.021 U | 0.0056 U | 0.017 U | **0.13** | 0.031 U | 0.018 U | 0.013 U | **0.24** | 0.019 U | 0.0013 U | 0.021 U | 0.023 U |
| Comp-9 012213 | 1/22/2013 | 0.020 U | 0.035 U | 0.190 U | 0.024 U | 0.020 U | 0.020 U | 0.00084 U | 0.0011 U | **5.3** | 0.024 U | 0.00069 U | 0.022 U | 0.0057 U | 0.017 U | **0.12** | 0.031 U | 0.019 U | 0.014 U | **0.28** | 0.020 U | 0.0014 U | 0.022 U | 0.024 U |
| Comp-9 DUP 012213 | 1/22/2013 | 0.022 U | 0.040 U | 0.210 U | 0.027 U | 0.022 U | 0.022 U | 0.00096 U | 0.0012 U | **5.8** | 0.027 U | 0.00078 U | 0.024 U | 0.0064 U | 0.020 U | **0.12** | 0.036 U | 0.021 U | 0.016 U | **0.28** | 0.022 U | 0.0016 U | 0.024 U | 0.027 U |

# Summary of Soil Analytical Results
# A-2 Flow Equalization Basin Project
# (All Results in milligrams per kilogram [mg/kg])

| Sample ID | Date Collected | Parathion | Phorate | Phosmet | Phosphamidon | Ronnel | Selenium | Silver | Silvex | Simazine | Stirofos | Sulfotepp | T, 2,4,5- | TEPP | Terbufos | Thionazin | Tokuthion | Total Organic Carbon | Toxaphene | Trichloronate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCTL-RDE | | 500 | 16 | 1600 | *** | 4200 | 440 | 410 | 660 | 7.8 | *** | 35 | 690 | *** | 1.9 | *** | *** | *** | 0.9 | *** |
| SCTL-LGW | | 1 | 0.3 | 5 | *** | 1300 | 5.2 | 17 | 5.4 | 0.08 | *** | 0.1 | 0.4 | *** | 0.02 | *** | *** | *** | 31 | *** |
| SCTL-LSW | | 0.01 | 0.001 | 0.004 | *** | 0.2 | 0.5 | 0.01 | *** | 0.1 | *** | *** | 0.8 | *** | 0.001 | *** | *** | *** | 0.002 | *** |
| SQAG-TEC | | *** | *** | *** | *** | *** | *** | 1 | *** | 0.00034 | *** | *** | *** | *** | *** | *** | *** | *** | *** | *** |
| Comp-1 012313 | 1/23/2013 | 0.015 U | 0.0036 U | 0.013 U | 0.031 U | 0.022 U | 1.7 I | 0.33 U | 0.013 U | 0.024 U | 0.022 U | 0.022 U | 0.013 U | 0.022 U | 0.0036 U | 0.022 U | 0.024 U | **320000** | 0.053 U | 0.022 U |
| Comp-10 012313 | 1/23/2013 | 0.014 U | 0.0036 U | 0.012 U | 0.030 U | 0.021 U | 1.6 I | 0.31 U | 0.013 U | 0.023 U | 0.021 U | 0.021 U | 0.013 U | 0.021 U | 0.0036 U | 0.021 U | 0.023 U | **384000** | 0.052 U | 0.021 U |
| Comp-11 012413 | 1/24/2013 | 0.016 U | 0.0039 U | 0.014 U | 0.033 U | 0.024 U | 0.58 U | 0.31 U | 0.014 U | 0.025 U | 0.024 U | 0.024 U | 0.014 U | 0.024 U | 0.0039 U | 0.024 U | 0.025 U | **450000** | 0.057 U | 0.024 U |
| Comp-12 012513 | 1/25/2013 | 0.016 U | 0.0039 U | 0.014 U | 0.033 U | 0.024 U | **3.7** | 0.32 U | 0.014 U | 0.025 U | 0.024 U | 0.024 U | 0.014 U | 0.024 U | 0.0039 U | 0.024 U | 0.025 U | **470000** | 0.057 U | 0.024 U |
| Comp-13 012213 | 1/22/2013 | 0.015 U | 0.0037 U | 0.013 U | 0.031 U | 0.022 U | **2.3** | 0.32 U | 0.013 U | 0.024 U | 0.022 U | 0.022 U | 0.013 U | 0.022 U | 0.0037 U | 0.022 U | 0.024 U | **400000** | 0.054 U | 0.022 U |
| Comp-14 012213 | 1/22/2013 | 0.015 U | 0.0038 U | 0.013 U | 0.032 U | 0.023 U | **2.2 I** | 0.34 U | 0.014 U | 0.025 U | 0.023 U | 0.023 U | 0.013 U | 0.023 U | 0.0038 U | 0.023 U | 0.025 U | **374000** | 0.055 U | 0.023 U |
| Comp-15 012213 | 1/22/2013 | 0.017 U | 0.0043 U | 0.015 U | 0.037 U | 0.026 U | **2.6** | 0.35 U | 0.016 U | 0.028 U | 0.026 U | 0.026 U | 0.015 U | 0.026 U | 0.0043 U | 0.026 U | 0.028 U | **477000** | 0.063 U | 0.026 U |
| Comp-16 012313 | 1/23/2013 | 0.013 U | **0.120 I** | 0.011 U | 0.028 U | 0.020 U | **2.3** | 0.29 U | 0.012 U | 0.021 U | 0.020 U | 0.020 U | 0.012 U | 0.020 U | 0.0033 U | 0.020 U | 0.021 U | **388000** | 0.048 U | 0.020 U |
| Comp-17 012313 | 1/23/2013 | 0.015 U | 0.0038 U | 0.013 U | 0.032 U | 0.023 U | **2.6** | 0.33 U | 0.014 U | 0.025 U | 0.023 U | 0.023 U | 0.013 U | 0.023 U | 0.0038 U | 0.023 U | 0.025 U | **409000** | 0.055 U | 0.023 U |
| Comp-18 012513 | 1/25/2013 | 0.016 U | 0.0039 U | 0.014 U | 0.033 U | 0.024 U | 1.5 I | 0.32 U | 0.014 U | 0.025 U | 0.024 U | 0.024 U | 0.014 U | 0.024 U | 0.0039 U | 0.024 U | 0.025 U | **450000** | 0.057 U | 0.024 U |
| Comp-19 012413 | 1/24/2013 | 0.014 U | 0.0034 U | 0.012 U | 0.029 U | 0.021 U | 0.57 U | 0.31 U | 0.012 U | 0.022 U | 0.021 U | 0.021 U | 0.012 U | 0.021 U | 0.0034 U | 0.021 U | 0.022 U | **198000** | 0.050 U | 0.021 U |
| Comp-2 012513 | 1/25/2013 | 0.016 U | 0.0041 U | 0.014 U | 0.035 U | 0.024 U | **2.0 I** | 0.33 U | 0.015 U | 0.027 U | 0.024 U | 0.024 U | 0.014 U | 0.024 U | 0.0041 U | 0.024 U | 0.027 U | **383000** | 0.059 U | 0.024 U |
| Comp-20 012413 | 1/24/2013 | 0.014 U | 0.0036 U | 0.012 U | 0.030 U | 0.021 U | 0.55 U | 0.30 U | 0.013 U | 0.023 U | 0.021 U | 0.021 U | 0.013 U | 0.021 U | 0.0036 U | 0.021 U | 0.023 U | **361000** | 0.052 U | 0.021 U |
| Comp-21 012213 | 1/22/2013 | 0.013 U | **0.093 I** | 0.011 U | 0.027 U | 0.019 U | 0.47 U | 0.26 U | 0.012 U | 0.021 U | 0.019 U | 0.019 U | 0.011 U | 0.019 U | 0.0032 U | 0.019 U | 0.021 U | **308000** | 0.047 U | 0.019 U |
| Comp-22 012313 | 1/23/2013 | 0.016 U | 0.0039 U | 0.014 U | 0.033 U | 0.024 U | **2.5** | 0.35 U | 0.014 U | 0.025 U | 0.024 U | 0.024 U | 0.014 U | 0.024 U | 0.0039 U | 0.024 U | 0.025 U | **448000** | 0.057 U | 0.024 U |
| Comp-23 012413 | 1/24/2013 | 0.015 U | 0.0037 U | 0.013 U | 0.031 U | 0.022 U | **2.6** | 0.32 U | 0.013 U | 0.024 U | 0.022 U | 0.022 U | 0.013 U | 0.022 U | 0.0037 U | 0.022 U | 0.024 U | **384000** | 0.054 U | 0.022 U |
| Comp-24 012413 | 1/24/2013 | 0.016 U | 0.0040 U | 0.014 U | 0.034 U | 0.024 U | **2.5** | 0.35 U | 0.014 U | 0.026 U | 0.024 U | 0.024 U | 0.014 U | 0.024 U | 0.0040 U | 0.024 U | 0.026 U | **464000** | 0.058 U | 0.024 U |
| Comp-25 012513 | 1/25/2013 | 0.015 U | 0.0036 U | 0.013 U | 0.031 U | 0.022 U | **2.5** | 0.32 U | 0.013 U | 0.024 U | 0.022 U | 0.022 U | 0.013 U | 0.022 U | 0.0036 U | 0.022 U | 0.024 U | **392000** | 0.053 U | 0.022 U |
| Comp-26 012413 | 1/24/2013 | 0.014 U | 0.0036 U | 0.012 U | 0.030 U | 0.021 U | 0.58 U | 0.32 U | 0.013 U | 0.023 U | 0.021 U | 0.021 U | 0.013 U | 0.021 U | 0.0036 U | 0.021 U | 0.023 U | **355000** | 0.052 U | 0.021 U |
| Comp-27 012213 | 1/22/2013 | 0.017 U | 0.0043 U | 0.015 U | 0.037 U | 0.026 U | **2.9** | 0.36 U | 0.016 U | 0.028 U | 0.026 U | 0.026 U | 0.015 U | 0.026 U | 0.0043 U | 0.026 U | 0.028 U | **503000** | 0.063 U | 0.026 U |
| Comp-28 012313 | 1/23/2013 | 0.015 U | 0.0036 U | 0.013 U | 0.031 U | 0.022 U | 1.8 I | 0.30 U | 0.013 U | 0.024 U | 0.022 U | 0.022 U | 0.013 U | 0.022 U | 0.0036 U | 0.022 U | 0.024 U | **415000** | 0.053 U | 0.022 U |
| Comp-29 012413 | 1/24/2013 | 0.019 U | 0.0047 U | 0.016 U | 0.040 U | 0.028 U | **2.3 I** | 0.42 U | 0.017 U | 0.030 U | 0.028 U | 0.028 U | 0.017 U | 0.028 U | 0.0047 U | 0.028 U | 0.030 U | **485000** | 0.067 U | 0.028 U |
| Comp-3 012313 | 1/23/2013 | 0.016 U | 0.0041 U | 0.014 U | 0.035 U | 0.024 U | **2.5** | 0.33 U | 0.015 U | 0.027 U | 0.024 U | 0.024 U | 0.014 U | 0.024 U | 0.0041 U | 0.024 U | 0.027 U | **440000** | 0.059 U | 0.024 U |
| Comp-30 012513 | 1/25/2013 | 0.016 U | 0.0039 U | 0.014 U | 0.033 U | 0.024 U | 0.65 U | 0.35 U | 0.014 U | 0.025 U | 0.024 U | 0.024 U | 0.014 U | 0.024 U | 0.0039 U | 0.024 U | 0.025 U | **424000** | 0.057 U | 0.024 U |
| Comp-4 012413 | 1/24/2013 | 0.016 U | **0.0096 I** | 0.014 U | 0.035 U | 0.024 U | **2.3 I** | 0.36 U | 0.015 U | 0.027 U | 0.024 U | 0.024 U | 0.014 U | 0.024 U | 0.0041 U | 0.024 U | 0.027 U | **354000** | 0.059 U | 0.024 U |
| Comp-4 DUP 012413 | 1/24/2013 | 0.019 U | 0.0047 U | 0.016 U | 0.040 U | 0.028 U | 1.8 I | 0.42 U | 0.017 U | 0.030 U | 0.028 U | 0.028 U | 0.017 U | 0.028 U | 0.0047 U | 0.028 U | 0.030 U | **259000** | 0.067 U | 0.028 U |
| Comp-5 012513 | 1/25/2013 | 0.016 U | 0.0039 U | 0.014 U | 0.033 U | 0.024 U | **2.1 I** | 0.33 U | 0.014 U | 0.025 U | 0.024 U | 0.024 U | 0.014 U | 0.024 U | 0.0039 U | 0.024 U | 0.025 U | **423000** | 0.057 U | 0.024 U |
| Comp-6 012513 | 1/25/2013 | 0.017 U | 0.0043 U | 0.015 U | 0.037 U | 0.026 U | 0.66 U | 0.36 U | 0.016 U | 0.028 U | 0.026 U | 0.026 U | 0.015 U | 0.026 U | 0.0043 U | 0.026 U | 0.028 U | **440000** | 0.063 U | 0.026 U |
| Comp-7 012313 | 1/23/2013 | 0.014 U | 0.0036 U | 0.012 U | 0.030 U | 0.021 U | 0.55 U | 0.30 U | 0.013 U | 0.023 U | 0.021 U | 0.021 U | 0.013 U | 0.021 U | 0.0036 U | 0.021 U | 0.023 U | **389000** | 0.052 U | 0.021 U |
| Comp-7 DUP 012313 | 1/23/2013 | 0.015 U | 0.0036 U | 0.013 U | 0.031 U | 0.022 U | **2.8** | 0.33 U | 0.013 U | 0.024 U | 0.022 U | 0.022 U | 0.013 U | 0.022 U | 0.0036 U | 0.022 U | 0.024 U | **329000** | 0.053 U | 0.022 U |
| Comp-8 012313 | 1/23/2013 | 0.015 U | 0.0038 U | 0.013 U | 0.033 U | 0.023 U | 0.62 U | 0.34 U | 0.014 U | 0.025 U | 0.023 U | 0.023 U | 0.014 U | 0.023 U | 0.0038 U | 0.023 U | 0.025 U | **358000** | 0.056 U | 0.023 U |
| Comp-9 012213 | 1/22/2013 | 0.016 U | 0.0039 U | 0.014 U | 0.033 U | 0.024 U | **2.4 I** | 0.35 U | 0.014 U | 0.025 U | 0.024 U | 0.024 U | 0.014 U | 0.024 U | 0.0039 U | 0.024 U | 0.025 U | **430000** | 0.057 U | 0.024 U |
| Comp-9 DUP 012213 | 1/22/2013 | 0.018 U | 0.0044 U | 0.016 U | 0.038 U | 0.027 U | **3** | 0.40 U | 0.016 U | 0.029 U | 0.027 U | 0.027 U | 0.016 U | 0.027 U | 0.0044 U | 0.027 U | 0.029 U | **419000** | 0.064 U | 0.027 U |

# ATTACHMENT H

# Field Duplicate Outlier Report* (non-qualifying outliers)

**Lab Report Batch:** 130128.06 **Lab ID:** E84809

**Field Sample:** **Comp-4 012413**
**Field Sample Duplicate:** **Comp-4 DUP 012413**
**Matrix ID:** **SOILS**

| | | Total Or Dissolved | Result | Reporting Limit | MDL | Units | Lab Qualifier | RPD | RPD Criteria |
|---|---|---|---|---|---|---|---|---|---|
| **Analysis Method EPA 8270** | | | | | | | | | |
| **Phorate** | Sample result: | N/A | 9.6 | 200 | 4.1 | | I | | |
| | Duplicate result: | N/A | 4.7 | 230 | 4.7 | ug/kg | U | **200** | 50 |
| **Phorate** | Sample result: | N/A | 9.6 | 200 | 4.1 | | I | | |
| | Duplicate result: | N/A | 4.7 | 230 | 4.7 | ug/kg | U | **200** | 50 |

*Outlier report also includes analytes detected in the parent sample but not in the duplicate sample or vice versa. In this case, RPD value for the field duplicate defaults to 200. RPD values that exceed project requirements do not qualify samples.

**Project Number and Name:** **A-2 FEB - A-2 FEB**

# Surrogate Recovery Outlier Report

**Lab Report Batch:** 130128.06 **Lab ID:** E84809

| Client Sample ID | Lab Sample ID | Analysis Method | Dilution | Matrix | Surrogate | Percent Recovery | Criteria (percent) Lower Limit | Upper Limit | Reject Point | Associated Target Analytes |
|---|---|---|---|---|---|---|---|---|---|---|
| Comp-12 012513 | 159698 | EPA 8081 | 1.00 | SO | Tetrachloro-m-xylene | 43 | 50.0 | 130.0 | 10.0 | All Target |
| | | EPA 8270 | | | p-terphenyl-d14 | 36 | 40.0 | 140.0 | 10.0 | Base/Neutral |
| Comp-15 012213 | 159670 | EPA 8321 | | | 2,4-Dichlorophenylacetic acid | 40 | 50.0 | 150.0 | 10.0 | Base/Neutral |
| Comp-16 012313 | 159679 | EPA 8081 | | | Tetrachloro-m-xylene | 48 | 50.0 | 130.0 | 10.0 | All Target |
| | | EPA 8321 | | | 2,4-Dichlorophenylacetic acid | 48 | 50.0 | 150.0 | 10.0 | Base/Neutral |
| Comp-18 012513 | 159697 | EPA 8081 | | | Tetrachloro-m-xylene | 42 | 50.0 | 130.0 | 10.0 | All Target |
| | | EPA 8270 | | | p-terphenyl-d14 | 36 | 40.0 | 140.0 | 10.0 | Base/Neutral |
| Comp-19 012413 | 159695 | EPA 8081 | | | Tetrachloro-m-xylene | 46 | 50.0 | 130.0 | 10.0 | All Target |
| | | EPA 8270 | | | p-terphenyl-d14 | 37 | 40.0 | 140.0 | 10.0 | Base/Neutral |
| | | EPA 8321 | | | 2,4-Dichlorophenylacetic acid | 42 | 50.0 | 150.0 | 10.0 | Base/Neutral |
| Comp-2 012513 | 159701 | EPA 8081 | | | Tetrachloro-m-xylene | 48 | 50.0 | 130.0 | 10.0 | All Target |
| Comp-20 012413 | 159693 | | | | Tetrachloro-m-xylene | 43 | 50.0 | 130.0 | 10.0 | All Target |
| Comp-22 012313 | 159677 | EPA 8321 | | | 2,4-Dichlorophenylacetic acid | 38 | 50.0 | 150.0 | 10.0 | Base/Neutral |
| Comp-23 012413 | 159688 | | | | 2,4-Dichlorophenylacetic acid | 43 | 50.0 | 150.0 | 10.0 | Base/Neutral |
| Comp-24 012413 | 159690 | EPA 8270 | | | p-terphenyl-d14 | 39 | 40.0 | 140.0 | 10.0 | Base/Neutral |
| Comp-25 012513 | 159700 | | | | p-terphenyl-d14 | 38 | 40.0 | 140.0 | 10.0 | Base/Neutral |
| Comp-26 012413 | 159694 | EPA 8081 | | | Tetrachloro-m-xylene | 46 | 50.0 | 130.0 | 10.0 | All Target |
| Comp-27 012213 | 159672 | EPA 8321 | | | 2,4-Dichlorophenylacetic acid | 47 | 50.0 | 150.0 | 10.0 | Base/Neutral |
| Comp-28 012313 | 159678 | EPA 8081 | | | Tetrachloro-m-xylene | 49 | 50.0 | 130.0 | 10.0 | All Target |
| Comp-30 012513 | 159696 | EPA 8270 | | | p-terphenyl-d14 | 35 | 40.0 | 140.0 | 10.0 | Base/Neutral |
| Comp-4 012413 | 159691 | EPA 8081 | | | Tetrachloro-m-xylene | 43 | 50.0 | 130.0 | 10.0 | All Target |
| | | EPA 8321 | | | 2,4-Dichlorophenylacetic acid | 48 | 50.0 | 150.0 | 10.0 | Base/Neutral |
| Comp-4 DUP 012413 | 159692 | EPA 8081 | | | Tetrachloro-m-xylene | 44 | 50.0 | 130.0 | 10.0 | All Target |
| | | EPA 8270 | | | p-terphenyl-d14 | 38 | 40.0 | 140.0 | 10.0 | Base/Neutral |
| Comp-5 012513 | 159702 | | | | p-terphenyl-d14 | 35 | 40.0 | 140.0 | 10.0 | Base/Neutral |
| Comp-6 012513 | 159699 | | | | 2-Fluorobiphenyl | 39 | 40.0 | 140.0 | 10.0 | Base/Neutral |
| | | | | | p-terphenyl-d14 | 31 | 40.0 | 140.0 | 10.0 | Base/Neutral |
| Comp-7 DUP 012313 | 159685 | EPA 8321 | | | 2,4-Dichlorophenylacetic acid | 49 | 50.0 | 150.0 | 10.0 | Base/Neutral |

**Project Number and Name:** **A-2 FEB _ A-2 FEB**

# Matrix Spike / Matrix Spike Duplicate Outlier Report

**Method Batch :** E9377 **Analysis Method :** EPA 8321 **Analysis Date :** 01/31/2013

**Matrix ID :** Soils **Preparation Type :** 3545 **Preparation Date :** 01/29/2013

**Lab Reporting Batch :** 130128.06 **Lab ID:** E84809

## MS and/or MSD Analyte Recovery/RPD Outside Project Limits

| Client Sample ID | Lab Sample ID | Analyte Name | Total or Dissolved | Reported * Percent Recovery | Reported * RPD | Project Limits (Percent) Rejection Point | Project Limits (Percent) Lower Limit | Project Limits (Percent) Upper Limit | Project Limits (Percent) RPD |
|---|---|---|---|---|---|---|---|---|---|
| Comp-21 012213MS | E9377.04 | 2,4,5-T | N/A | 20 | | 10.00 | **30.00** | 170.00 | 35.00 |
| | | Dichlorprop | N/A | 30 | | 10.00 | **45.00** | 96.00 | 35.00 |
| | | MCPA | N/A | 25 | | 10.00 | **31.00** | 96.00 | 35.00 |
| Comp-21 012213MSD | E9377.05 | 2,4,5-T | N/A | 25 | | 10.00 | **30.00** | 170.00 | 35.00 |
| | | Dichlorprop | N/A | 29 | | 10.00 | **45.00** | 96.00 | 35.00 |
| | | MCPA | N/A | 25 | | 10.00 | **31.00** | 96.00 | 35.00 |

## Associated Samples

**All samples in Method Batch**

| Client Sample ID | Lab Sample ID |
|---|---|
| Comp-1 012313 | 159683 |
| Comp-10 012313 | 159681 |
| Comp-13 012213 | 159674 |
| Comp-14 012213 | 159673 |
| Comp-15 012213 | 159670 |
| Comp-16 012313 | 159679 |
| Comp-17 012313 | 159680 |
| Comp-21 012213 | 159671 |
| Comp-22 012313 | 159677 |
| Comp-27 012213 | 159672 |
| Comp-28 012313 | 159678 |
| Comp-3 012313 | 159682 |
| Comp-7 012313 | 159684 |
| Comp-7 DUP 012313 | 159685 |
| Comp-9 012213 | 159675 |
| Comp-9 DUP 012213 | 159676 |

* Only those Percent Recovery and/or RPD values outside project limits are listed in this report.

If the multiplier rule was selected for MS/MSD data review then spike recovery or RPD outliers will not show up on this report if that analyte did not get qualified in any associated samples during automated data review.

**Project Number and Name:** **A-2 FEB - A-2 FEB**

# Matrix Spike / Matrix Spike Duplicate Outlier Report

**Method Batch :** E9383 **Analysis Method :** EPA 8321 **Analysis Date :** 02/04/2013

**Matrix ID :** Soils **Preparation Type :** 3545 **Preparation Date :** 01/30/2013

**Lab Reporting Batch :** 130128.06 **Lab ID:** E84809

## MS and/or MSD Analyte Recovery/RPD Outside Project Limits

| Client Sample ID | Lab Sample ID | Analyte Name | Total or Dissolved | Reported * Percent Recovery | Reported * RPD | Project Limits (Percent) Rejection Point | Project Limits (Percent) Lower Limit | Project Limits (Percent) Upper Limit | Project Limits (Percent) RPD |
|---|---|---|---|---|---|---|---|---|---|
| Comp-11 012413MSD | E9383.05 | 2,4,5-T | N/A | 27 | | 10.00 | **30.00** | 170.00 | 35.00 |
| | | Dichlorprop | N/A | 44 | | 10.00 | **45.00** | 96.00 | 35.00 |

## Associated Samples

**All samples in Method Batch**

| Client Sample ID | Lab Sample ID |
|---|---|
| Comp-11 012413 | 159687 |
| Comp-12 012513 | 159698 |
| Comp-18 012513 | 159697 |
| Comp-19 012413 | 159695 |
| Comp-2 012513 | 159701 |
| Comp-20 012413 | 159693 |
| Comp-23 012413 | 159688 |
| Comp-24 012413 | 159690 |
| Comp-25 012513 | 159700 |
| Comp-26 012413 | 159694 |
| Comp-29 012413 | 159689 |
| Comp-30 012513 | 159696 |
| Comp-4 012413 | 159691 |
| Comp-4 DUP 012413 | 159692 |
| Comp-5 012513 | 159702 |
| Comp-6 012513 | 159699 |
| Comp-8 012313 | 159686 |

* Only those Percent Recovery and/or RPD values outside project limits are listed in this report.

If the multiplier rule was selected for MS/MSD data review then spike recovery or RPD outliers will not show up on this report if that analyte did not get qualified in any associated samples during automated data review.

**Project Number and Name:** **A-2 FEB - A-2 FEB**

# Matrix Spike / Matrix Spike Duplicate Outlier Report

**Method Batch :** E9388 **Analysis Method :** EPA 6010 **Analysis Date :** 02/04/2013

**Matrix ID :** Soils **Preparation Type :** 3050B **Preparation Date :** 01/31/2013

**Lab Reporting Batch :** 130128.06 **Lab ID:** E84809

## MS and/or MSD Analyte Recovery/RPD Outside Project Limits

| Client Sample ID | Lab Sample ID | Analyte Name | Total or Dissolved | Reported * Percent Recovery | Reported * RPD | Project Limits (Percent) Rejection Point | Project Limits (Percent) Lower Limit | Project Limits (Percent) Upper Limit | Project Limits (Percent) RPD |
|---|---|---|---|---|---|---|---|---|---|
| Comp-21 012213MS | E9388.04 | Barium | N/A | 64 | | 10.00 | 75.00 | 125.00 | 25.00 |
| | | Copper | N/A | 58 | | 10.00 | 75.00 | 125.00 | 25.00 |
| | | Lead | N/A | 74 | | 10.00 | 75.00 | 125.00 | 25.00 |
| Comp-21 012213MSD | E9388.05 | Barium | N/A | 72 | | 10.00 | 75.00 | 125.00 | 25.00 |
| | | Copper | N/A | 71 | | 10.00 | 75.00 | 125.00 | 25.00 |

## Associated Samples

| All samples in Method Batch | |
|---|---|
| **Client Sample ID** | **Lab Sample ID** |
| Comp-21 012213 | 159671 |

* Only those Percent Recovery and/or RPD values outside project limits are listed in this report.

If the multiplier rule was selected for MS/MSD data review then spike recovery or RPD outliers will not show up on this report if that analyte did not get qualified in any associated samples during automated data review.

**Project Number and Name:** **A-2 FEB - A-2 FEB**

# Matrix Spike / Matrix Spike Duplicate Outlier Report

**Method Batch :** E9408 **Analysis Method :** EPA 8270 **Analysis Date :** 02/01/2013

**Matrix ID :** Soils **Preparation Type :** 3545 **Preparation Date :** 01/31/2013

**Lab Reporting Batch :** 130128.06 **Lab ID:** E84809

## MS and/or MSD Analyte Recovery/RPD Outside Project Limits

| Client Sample ID | Lab Sample ID | Analyte Name | Total or Dissolved | Reported * Percent Recovery | Reported * RPD | Project Limits (Percent) Rejection Point | Project Limits (Percent) Lower Limit | Project Limits (Percent) Upper Limit | Project Limits (Percent) RPD |
|---|---|---|---|---|---|---|---|---|---|
| Comp-23 012413MSD | E9408.05 | Bolstar | N/A | 31 | | 10.00 | **35.00** | 115.00 | 64.00 |
| | | Demeton-O+S | N/A | | 52 | 10.00 | 0.00 | 134.00 | **40.00** |
| | | Disulfoton | N/A | | 49 | 10.00 | 8.00 | 102.00 | **26.00** |
| | | Fenthion | N/A | | 47 | 10.00 | 40.00 | 126.00 | **24.00** |
| | | Phorate | N/A | | 50 | 10.00 | 6.00 | 141.00 | **20.00** |

## Associated Samples

**All samples in Method Batch**

| Client Sample ID | Lab Sample ID |
|---|---|
| Comp-12 012513 | 159698 |
| Comp-18 012513 | 159697 |
| Comp-19 012413 | 159695 |
| Comp-2 012513 | 159701 |
| Comp-20 012413 | 159693 |
| Comp-23 012413 | 159688 |
| Comp-24 012413 | 159690 |
| Comp-25 012513 | 159700 |
| Comp-26 012413 | 159694 |
| Comp-29 012413 | 159689 |
| Comp-30 012513 | 159696 |
| Comp-4 012413 | 159691 |
| Comp-4 DUP 012413 | 159692 |
| Comp-5 012513 | 159702 |
| Comp-6 012513 | 159699 |

* Only those Percent Recovery and/or RPD values outside project limits are listed in this report.

If the multiplier rule was selected for MS/MSD data review then spike recovery or RPD outliers will not show up on this report if that analyte did not get qualified in any associated samples during automated data review.

**Project Number and Name:** **A-2 FEB - A-2 FEB**

# Laboratory Control Sample / Laboratory Control Sample Duplicate Outlier Report

**Preparation Batch :** E9374 **Analysis Method :** EPA 8270 **Analysis Date :** 01/31/2013

**MatrixID:** Soils **Preparation Type :** 3545 **Preparation Date :** 01/29/2013

**Lab Reporting Batch :** 130128.06 **Lab ID:** E84809

| LCS and/or LCSD Spike Recovery/RPD Outside Project Limits | | | Reported * | | Project Limits (Percent) | | | |
|---|---|---|---|---|---|---|---|---|
| **LCS Lab Sample ID** | **Analyte Name** | **Total or Dissolved** | **Percent Recovery** | **RPD** | **Rejection Point** | **Lower Limit** | **Upper Limit** | **RPD** |
| E9374.02 | Bolstar | N/A | 33 | | 10.00 | **40.00** | 111.00 | 40.00 |
| | Tokuthion | N/A | 51 | | 10.00 | **55.00** | 104.00 | 40.00 |
| E9374.03 | Bolstar | N/A | 34 | 3 | 10.00 | **40.00** | 111.00 | 40.00 |
| | Tokuthion | N/A | 52 | 2 | 10.00 | **55.00** | 104.00 | 40.00 |

## Associated Samples

| Client Sample ID | Lab Sample ID |
|---|---|
| Comp-1 012313 | 159683 |
| Comp-10 012313 | 159681 |
| Comp-11 012413 | 159687 |
| Comp-13 012213 | 159674 |
| Comp-14 012213 | 159673 |
| Comp-15 012213 | 159670 |
| Comp-16 012313 | 159679 |
| Comp-17 012313 | 159680 |
| Comp-21 012213 | 159671 |
| Comp-22 012313 | 159677 |
| Comp-27 012213 | 159672 |
| Comp-28 012313 | 159678 |
| Comp-3 012313 | 159682 |
| Comp-7 012313 | 159684 |
| Comp-7 DUP 012313 | 159685 |
| Comp-8 012313 | 159686 |
| Comp-9 012213 | 159675 |
| Comp-9 DUP 012213 | 159676 |

*Only those Percent Recovery and/or RPD values outside project limits are listed in this report

Scope of Data Qualification: The outlier in the LCS qualifies that analyte in all samples with the same Preparation Batch ID as the LCS

**Project Number and Name:** **A-2 FEB - A-2 FEB**

# Laboratory Control Sample / Laboratory Control Sample Duplicate Outlier Report

**Preparation Batch :** E9375 **Analysis Method :** EPA 8081 **Analysis Date :** 02/05/2013

**MatrixID:** Aqueous-Other **Preparation Type :** 3510 **Preparation Date :** 01/29/2013

**Lab Reporting Batch :** 130128.06 **Lab ID:** E84809

| LCS and/or LCSD Spike Recovery/RPD Outside Project Limits | | | Reported * | | Project Limits (Percent) | | | |
|---|---|---|---|---|---|---|---|---|
| **LCS Lab Sample ID** | **Analyte Name** | **Total or Dissolved** | **Percent Recovery** | **RPD** | **Rejection Point** | **Lower Limit** | **Upper Limit** | **RPD** |
| E9375.03 | Methoxychlor | Tot | 136 | 8 | 10.00 | 50.00 | **130.00** | 40.00 |

## Associated Samples

| Client Sample ID | Lab Sample ID |
|---|---|
| Equip Blank-1 | 159703 |
| FCEB-2 | 159704 |
| FCEB-3 | 159705 |

*Only those Percent Recovery and/or RPD values outside project limits are listed in this report

Scope of Data Qualification: The outlier in the LCS qualifies that analyte in all samples with the same Preparation Batch ID as the LCS

**Project Number and Name: A-2 FEB - A-2 FEB**

# Laboratory Control Sample / Laboratory Control Sample Duplicate Outlier Report

**Preparation Batch :** E9376 **Analysis Method :** EPA 8270 **Analysis Date :** 01/31/2013

**MatrixID:** Aqueous-Other **Preparation Type :** 3510 **Preparation Date :** 01/29/2013

**Lab Reporting Batch :** 130128.06 **Lab ID:** E84809

| LCS and/or LCSD Spike Recovery/RPD Outside Project Limits | | | Reported * | | Project Limits (Percent) | | | |
|---|---|---|---|---|---|---|---|---|
| LCS Lab Sample ID | Analyte Name | Total or Dissolved | Percent Recovery | RPD | Rejection Point | Lower Limit | Upper Limit | RPD |
| E9376.02 | Dimethoate | Tot | 57 | | 10.00 | **60.00** | 140.00 | 40.00 |
| | Monocrotophos | Tot | 8 | | 10.00 | **60.00** | 140.00 | 40.00 |
| | Naled | Tot | 12 | | 10.00 | **60.00** | 140.00 | 40.00 |
| E9376.03 | Monocrotophos | Tot | 8 | 0 | 10.00 | **60.00** | 140.00 | 40.00 |
| | Naled | Tot | 13 | 8 | 10.00 | **60.00** | 140.00 | 40.00 |

## Associated Samples

| Client Sample ID | Lab Sample ID |
|---|---|
| Equip Blank-1 | 159703 |
| FCEB-2 | 159704 |
| FCEB-3 | 159705 |

*Only those Percent Recovery and/or RPD values outside project limits are listed in this report

Scope of Data Qualification: The outlier in the LCS qualifies that analyte in all samples with the same Preparation Batch ID as the LCS

**Project Number and Name:** **A-2 FEB - A-2 FEB**

# Laboratory Control Sample / Laboratory Control Sample Duplicate Outlier Report

**Preparation Batch :** E9408 **Analysis Method :** EPA 8270 **Analysis Date :** 02/01/2013

**MatrixID:** Soils **Preparation Type :** 3545 **Preparation Date :** 01/31/2013

**Lab Reporting Batch :** 130128.06 **Lab ID:** E84809

| LCS and/or LCSD Spike Recovery/RPD Outside Project Limits | | | Reported * | | Project Limits (Percent) | | | |
|---|---|---|---|---|---|---|---|---|
| **LCS Lab Sample ID** | **Analyte Name** | **Total or Dissolved** | **Percent Recovery** | **RPD** | **Rejection Point** | **Lower Limit** | **Upper Limit** | **RPD** |
| E9408.03 | Phorate | N/A | 33 | 41 | 10.00 | 0.00 | 119.00 | **40.00** |

## Associated Samples

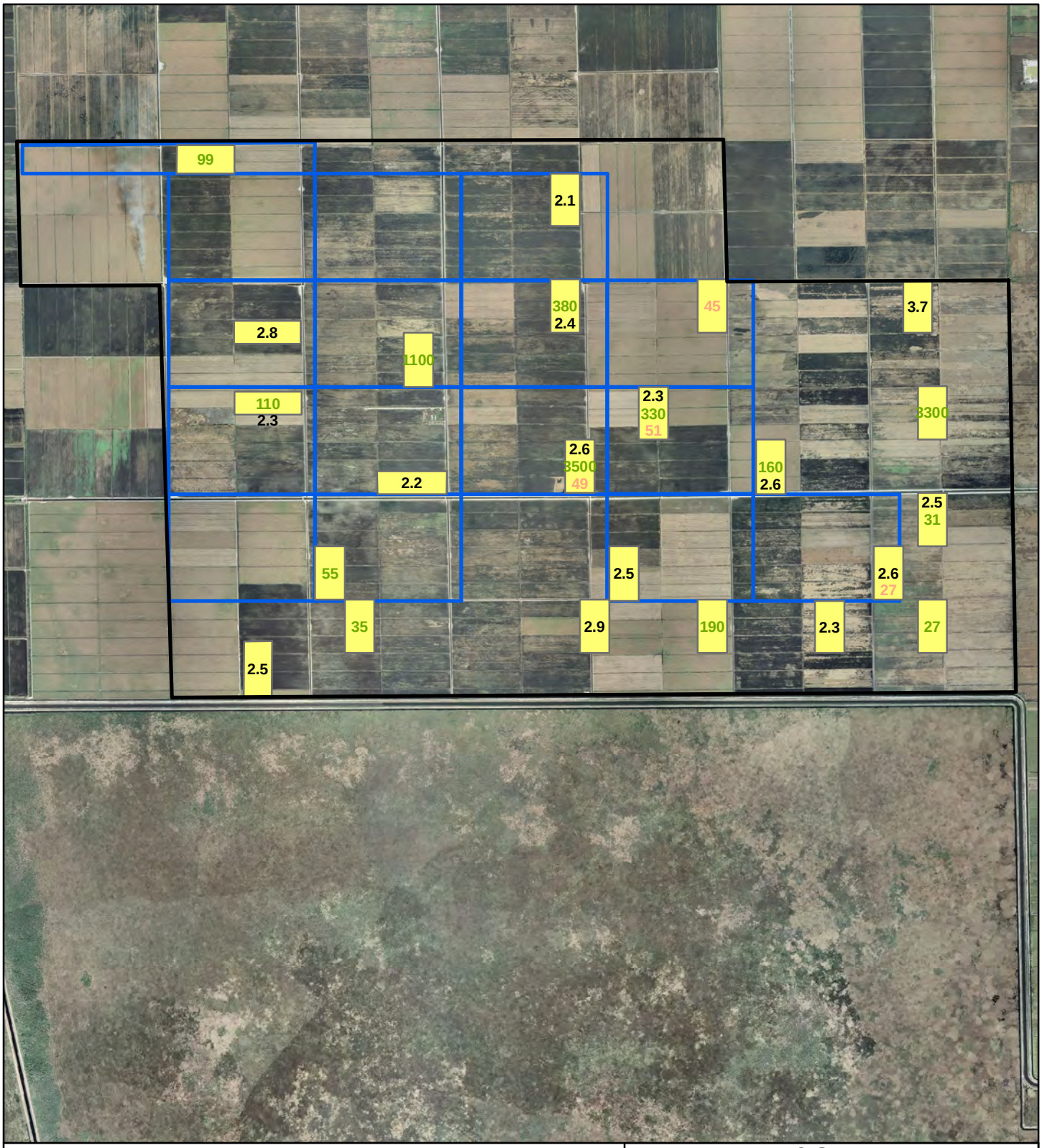
| Client Sample ID | Lab Sample ID |
|---|---|
| Comp-12 012513 | 159698 |
| Comp-18 012513 | 159697 |
| Comp-19 012413 | 159695 |
| Comp-2 012513 | 159701 |
| Comp-20 012413 | 159693 |
| Comp-23 012413 | 159688 |
| Comp-24 012413 | 159690 |
| Comp-25 012513 | 159700 |
| Comp-26 012413 | 159694 |
| Comp-29 012413 | 159689 |
| Comp-30 012513 | 159696 |
| Comp-4 012413 | 159691 |
| Comp-4 DUP 012413 | 159692 |
| Comp-5 012513 | 159702 |
| Comp-6 012513 | 159699 |

*Only those Percent Recovery and/or RPD values outside project limits are listed in this report

Scope of Data Qualification: The outlier in the LCS qualifies that analyte in all samples with the same Preparation Batch ID as the LCS

**Project Number and Name:** **A-2 FEB - A-2 FEB**

**ATTACHMENT I**




## Legend

Super-Grids

A-2 Perimeter

Samples w/SQAG Exceed. **Se** Dieldrin Atrazine

N

0 2,000 4,000

Feet

Copper concentrations exceeded the TEC SQAG in all samples.
Barium concentrations exceeded the PEC SQAG in all samples.

# A-2 SLERA

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

FIGURE 2

## SQAG Exceedances

DATE: MAR 18, 2013

BY: FSR

FOR: JMA

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\SFWMD\012-069\Fig2_A-2.mxd

# ATTACHMENT J

# SunLabs Summary Sample Report

**Table 1**
**Summary of COIs Detected in Composite Soil Samples**
**A-2 Flow Equalization Basin**

| Sample ID | Date Collected | Arsenic | Atrazine | Barium | Cadmium | Chromium | Copper | D, 2,4- | Dieldrin | Lead | Mercury | Metribuzin | Phorate | Selenium | Total Organic Carbon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SQAG -TEC** | | **9.8** | **0.0003** | **20** | **1** | **43** | **32** | **N/A** | **0.0019** | **36** | **0.18** | **N/A** | **N/A** | **N/A** | **N/A** |
| **SQAG - PEC** | | **33** | **N/A** | **60** | **5** | **110** | **150** | **N/A** | **0.062** | **130** | **1.1** | **N/A** | **N/A** | **N/A** | **N/A** |
| Comp-1 012313 | 1/23/2013 | 6.8 | 0.099 I | 110 | 0.11 U | 19 | 110 | 0.058 U | 0.0017 U | 7.8 | 0.1 | 0.041 I | 0.0036 U | 1.7 I | 320000 |
| Comp-10 012313 | 1/23/2013 | 4.9 | 0.025 U | 95 | 0.11 U | 12 | 68 | 0.057 U | 0.0045 I | 5.9 | 0.13 | 0.018 U | 0.0036 U | 1.6 I | 384000 |
| Comp-11 012413 | 1/24/2013 | 3.6 | 0.027 U | 98 | 0.11 U | 15 | 79 | 0.063 U | 0.0018 U | 5.6 | 0.14 | 0.020 U | 0.0039 U | 0.58 U | 450000 |
| Comp-12 012513 | 1/25/2013 | 3.8 | 0.027 U | 100 | 0.11 U | 13 | 87 | 0.063 U | 0.0018 U | 6.8 | 0.14 | 0.020 U | 0.0039 U | 3.7 | 470000 |
| Comp-13 012213 | 1/22/2013 | 6.2 | 0.110 I | 100 | 0.15 I | 29 | 90 | 0.059 U | 0.0017 U | 6.7 | 0.13 | 0.019 U | 0.0037 U | 2.3 | 400000 |
| Comp-14 012213 | 1/22/2013 | 5.5 | 0.026 U | 80 | 0.18 I | 16 | 68 | 0.060 U | 0.0017 U | 6.6 | 0.11 | 0.019 U | 0.0038 U | 2.2 I | 374000 |
| Comp-15 012213 | 1/22/2013 | 3.4 | 3.5 | 87 | 0.12 I | 7.8 | 75 | 0.29 | 0.0049 I | 7 | 0.11 | 0.73 | 0.0043 U | 2.6 | 477000 |
| Comp-16 012313 | 1/23/2013 | 4 | 0.33 | 91 | 0.096 U | 23 | 96 | 0.052 U | 0.0051 I | 6.1 | 0.13 | 0.058 I | 0.120 I | 2.3 | 388000 |
| Comp-17 012313 | 1/23/2013 | 3.8 | 0.160 I | 99 | 0.12 U | 17 | 85 | 0.060 U | 0.0017 U | 6.4 | 0.13 | 0.6 | 0.0038 U | 2.6 | 409000 |
| Comp-18 012513 | 1/25/2013 | 3.4 | 3.3 | 97 | 0.11 U | 11 | 88 | 0.94 | 0.0018 U | 4.7 | 0.15 | 1.1 | 0.0039 U | 1.5 I | 450000 |
| Comp-19 012413 | 1/24/2013 | 5.5 | 0.024 U | 88 | 0.11 U | 17 | 59 | 0.055 U | 0.0016 U | 6.5 | 0.12 | 0.017 U | 0.0034 U | 0.57 U | 198000 |
| Comp-2 012513 | 1/25/2013 | 5.2 | 0.029 U | 93 | 0.11 U | 15 | 59 | 0.065 U | 0.0019 U | 6.7 | 0.098 | 0.020 U | 0.0041 U | 2.0 I | 383000 |
| Comp-20 012413 | 1/24/2013 | 5 | 0.025 U | 90 | 0.10 U | 14 | 70 | 0.057 U | 0.0016 U | 6.3 | 0.11 | 0.14 | 0.0036 U | 0.55 U | 361000 |
| Comp-21 012213 | 1/22/2013 | 3.5 | 0.055 I | 69 | 0.17 I | 9.4 | 79 | 0.052 U | 0.0015 U | 8.4 | 0.099 | 0.2 | 0.093 I | 0.47 U | 308000 |
| Comp-22 012313 | 1/23/2013 | 4.3 | 0.027 U | 100 | 0.16 I | 12 | 83 | 0.063 U | 0.0018 U | 6.2 | 0.14 | 0.020 U | 0.0039 U | 2.5 | 448000 |
| Comp-23 012413 | 1/24/2013 | 4.2 | 0.026 U | 82 | 0.11 U | 13 | 59 | 0.059 U | 0.0027 I | 5.4 | 0.12 | 0.019 U | 0.0037 U | 2.6 | 384000 |
| Comp-24 012413 | 1/24/2013 | 4.1 | 0.028 U | 99 | 0.14 I | 28 | 82 | 0.064 U | 0.0018 U | 6.6 | 0.14 | 0.020 U | 0.0040 U | 2.5 | 464000 |
| Comp-25 012513 | 1/25/2013 | 6.4 | 0.031 I | 100 | 0.11 U | 19 | 67 | 0.058 U | 0.0017 U | 5.6 | 0.11 | 0.12 | 0.0036 U | 2.5 | 392000 |
| Comp-26 012413 | 1/24/2013 | 5.5 | 0.025 U | 98 | 0.11 U | 17 | 78 | 0.057 U | 0.0016 U | 6.4 | 0.13 | 0.018 U | 0.0036 U | 0.58 U | 355000 |
| Comp-27 012213 | 1/22/2013 | 3.5 | 0.035 I | 89 | 0.12 U | 9.1 | 74 | 0.070 U | 0.00099 U | 5.9 | 0.14 | 0.022 U | 0.0043 U | 2.9 | 503000 |
| Comp-28 012313 | 1/23/2013 | 3.1 | 0.19 | 83 | 0.14 I | 26 | 69 | 0.058 U | 0.0017 U | 5.8 | 0.13 | 1.7 | 0.0036 U | 1.8 I | 415000 |
| Comp-29 012413 | 1/24/2013 | 4.3 | 0.033 U | 86 | 0.14 U | 7.2 | 60 | 0.074 U | 0.0011 U | 5.2 | 0.13 | 0.023 U | 0.0047 U | 2.3 I | 485000 |
| Comp-3 012313 | 1/23/2013 | 4.3 | 0.029 U | 91 | 0.11 U | 16 | 82 | 0.065 U | 0.0019 U | 5.4 | 0.11 | 0.020 U | 0.0041 U | 2.5 | 440000 |
| Comp-30 012513 | 1/25/2013 | 3.2 | 0.027 I | 96 | 0.12 U | 21 | 100 | 0.063 U | 0.0018 U | 6.9 | 0.15 | 0.020 U | 0.0039 U | 0.65 U | 424000 |
| Comp-4 012413 | 1/24/2013 | 4.7 | 0.029 U | 95 | 0.12 U | 5.6 | 91 | 0.065 U | 0.0019 U | 5.9 | 0.14 | 0.020 U | 0.0096 I | 2.3 I | 354000 |
| Comp-4 DUP 012413 | 1/24/2013 | 4.1 | 0.033 U | 93 | 0.14 U | 6.8 | 80 | 0.074 U | 0.0011 U | 5.7 | 0.13 | 0.023 U | 0.0047 U | 1.8 I | 259000 |
| Comp-5 012513 | 1/25/2013 | 4.6 | 0.027 U | 94 | 0.11 U | 15 | 53 | 0.063 U | 0.0018 U | 5.5 | 0.12 | 0.020 U | 0.0039 U | 2.1 I | 423000 |
| Comp-6 012513 | 1/25/2013 | 4.5 | 0.030 U | 110 | 0.12 U | 18 | 75 | 0.070 U | 0.00099 U | 6.1 | 0.12 | 0.022 U | 0.0043 U | 0.66 U | 440000 |
| Comp-7 012313 | 1/23/2013 | 6.4 | 0.025 U | 97 | 0.10 U | 20 | 75 | 0.057 U | 0.0016 U | 6.3 | 0.11 | 0.018 U | 0.0036 U | 0.55 U | 389000 |
| Comp-7 DUP 012313 | 1/23/2013 | 5.7 | 0.025 U | 97 | 0.11 U | 19 | 74 | 0.058 U | 0.0017 U | 7.1 | 0.11 | 0.018 U | 0.0036 U | 2.8 | 329000 |
| Comp-8 012313 | 1/23/2013 | 3.8 | 1.1 | 96 | 0.12 U | 14 | 87 | 0.062 U | 0.0018 U | 6.3 | 0.13 | 0.24 | 0.0038 U | 0.62 U | 358000 |
| Comp-9 012213 | 1/22/2013 | 3.9 | 0.38 | 92 | 0.12 U | 13 | 67 | 0.200 I | 0.0018 U | 5.3 | 0.12 | 0.28 | 0.0039 U | 2.4 I | 430000 |
| Comp-9 DUP 012213 | 1/22/2013 | 3.5 | 0.44 | 110 | 0.14 U | 17 | 65 | 0.170 I | 0.0010 U | 5.8 | 0.12 | 0.28 | 0.0044 U | 3 | 419000 |

All units mg/kg DW
Detected Conc. > TEC
Detected Conc. > PEC

ANNEX H

PART 2

2012-2013 A2FEB LANDS CORRESPONDENCE

| | |
|---|---|
| **From:** | Shafer, Mark D SAJ |
| **To:** | Kukleski, Robert; Taylor, Robert |
| **Cc:** | Gued, Lisa R SAJ; Morrison, Matthew; Taplin, Kimberley A SAJ |
| **Subject:** | Shafer review of Phase II Environmental Assessment; Screening Level Ecological Risk Assessment; A-2 Flow Equalization Basin Project; Former Talisman Sugar Corporation Property (Tract No. D7 100-104) (UNCLASSIFIED) |
| **Date:** | Tuesday, April 02, 2013 12:36:00 PM |

Classification: UNCLASSIFIED
Caveats: NONE

Bob(s)

Here are my comments on the A2 Sampling report. Lisa Gued indicated that she would send you comments under separate cover hopefully by end of the week.

In addition to the comments below the following are requested.

a. Documentation of FWS review of A2 sampling results.
b. Documentation of FDEP review of A2 Sampling results.
c. Letter from SFWMD to USACE requesting application of Sep 2011 AG-Chem policy to this project.

Shafer Comments:
Overall comment: In addition to USFWS review, this report must be reviewed by FDEP to satisfy USACE Ag-Chem policy.

1. Page 1. In reviewing the A2 Phase II report of March 25th, 2012, it references on page 1 the draft Summary Env. Report for the A-2 FEB, dated September 17, 2012. I have a copy of that report and it does not include much of the information that was originally included in the August 21st, 2012 version. I believe that the WMD solution to USACE concerns about the Sep 17 version was to revert back to the August 21st, 2012 version. I will be referencing the August 21st 2012 version in the CEPP PIR. To do this, page 1 of the March 25 report should be changed to reference the August 21st Summary report and the August 21st report should be provided with a signature from Steve Long.

2. Page 6. Section 3.1. Should provide statement that USFWS and USACE reviewed the sampling scope of work and approved the sampling plan. Provide copy of USFWS review letter in appendix.

3. Page 4.1.1 Soil, 4th bullet. Second sentence says SCTL-LSW is appropriate. Third sentence essentially says SCTL-LSW not relevant. Please confirm with FDEP that FEB would not be a class III water though since the FEB eventually discharges to Class III water body don't know of relevance. Also, a discussion that FEB will discharge to STA34 or STA2B before being discharged to a Class III water.

4. Page 12. Metals Results. Chromium exceeded the SCTL-LSW in all samples. Add discussion of why was this analyte not tested using SPLP protocol.

5. Page 21. Arsenic: Concentrations do exceed the residential exposure criteria. The FEB may be open to the public for recreation. Some discussion of risks associated with public access should be provided in text. Perhaps a reference to other sites where FDEP has developed a "recreational" exposure criteria (Lake Okeechobee Scenic Trail for instance.)

5. Page 21. Chromium. Not sure that it is relevant that the planned FEB will or will not be classified as a Class III water body. The FEB will discharge to the STAs and eventually a class III water body. By the way, this paragraph on the SCTL-LSW exceedances is in direct contrast to the discussion that begins in the next paragraph that follows which begins "Class III surface water criteria".

6. Page 21. Bullet on Chromium, mercury, and selenium were.... Actual testing of these analytes using the SPLP test procedure would have been useful so you could say for sure if these "leach to a significant degree". This lack of testing should be further justified or corrected by additional testing.

7. Page 22. Arsenic: The recommendation should indicate whether the results for Arsenic should warrant measures taken in the soil management plan to reduce possible human exposure due to potential for arsenic on levee soils. (Blending or capping with low-arsenic soils, for instance.)

Thanks

Mark Shafer

-----Original Message-----
From: Kukleski, Robert [mailto:rkuklesk@sfwmd.gov]
Sent: Tuesday, March 26, 2013 2:30 PM
To: Barnett, Ernie; Teets, Thomas M; Morgan, Temperince; Morrison, Matthew; Thourot, Scott; Burns, Kirk; Cooper, Abner; Warner, Paul; Kivett, Jeff; Mitnik, John; Shirkey, Alan; Leeds, Jennifer; Sciotto, Sara; Jeyakumar, Nirmala; Bertolotti, Lesley; Shaffer, John; Ramirez, Armando; Virgil, Richard; Loehrlein, Vincent; Collins, Kathleen; Story, Ester; Bassell, Richard; Palmer, Ray; Schaeffer, Robert; Arias, Dolores; Taylor, Robert; Smith, Jeffrey; Coughlin, Steve; Trammell, Herbert; Pfeuffer, Richard
Cc: robert_frakes@fws.gov; Emily Bauer; 'Anthony Sowers'; Shafer, Mark D SAJ; Gued, Lisa R SAJ; 'Dougherty, Brian'; 'Stuckey, Mark'; 'Lurix, Joe'; 'william.rueckert@dep.state.fl.us'; William C. Kennedy; 'Steve Long'; Michael Rothenburg; 'andrew.cadle@psiusa.com'; 'Joe Allen'; 'Mark Lewis'
Subject: Phase II Environmental Assessment; Screening Level Ecological Risk Assessment; A-2 Flow Equalization Basin Project; Former Talisman Sugar Corporation Property (Tract No. D7 100-104)

The attached memorandum is intended to accompany the Phase II Environmental Assessment and Screening Level Ecological Risk Assessment (SLERA) of the A-2 Flow Equalization Basin (FEB) Project, comprised of the former Talisman Sugar Corporation property (Tract No. D7 100-104). All known “point-sources” within the Project footprint have been previously assessed/remediated, with Florida Department of Environmental Protection (FDEP) concurrence with the completeness of corrective actions. The current Phase II Sampling Investigation (and accompanying SLERA) were focused upon the cultivated portions of the subject property that were not previously sampled in order to quantify the residual agrochemical concentrations associated with routine application, and to determine the environmental suitability of the subject property for the proposed Project.

The report was completed by Professional Service Industries, Inc. (PSI). A condensed electronic version (Text, Tables, and Figures) of the PSI report is also attached. A complete version of the report (including all Appendices) has been uploaded into Documentum. Complete printed versions of the report are being transmitted separately by PSI to selected recipients (as detailed in the memorandum).

We value your opinion. Please take a few minutes to share your comments on the service you received from the District by clicking on this link <http://my.sfwmd.gov/portal/page/portal/pg_grp_surveysystem/survey%20ext?pid=1653> .

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Comments for Phase II Environmental Site Assessment for the A-2 Flow Equalization Basin

Commenter: Lisa R. Gued, Ph.D., USACE

Date: April 11, 2013

Page 2: 1st bullet: How were ND values incorporated in the statistical analyses?

Page 2: 1st bullet: A table listing the mean and the standard deviation of detected compounds would be useful.

Page 7: 2nd paragraph: Which chemicals were recently applied?

Page 8: 2nd bullet: Split samples were not accomplished with OP pesticides and herbicides because the primary split laboratory subcontracted these analyses to Sunlabs. Sunlabs was the primary laboratory.

Page 10: 3rd paragraph: FWS protocols recommend consideration of ESV established by EPA Region IV when Florida SQAGs are not available. Where these values considered in this assessment?

Pages 11-13: In the discussion of the results, the mean and the standard deviation should be reported.

Pages 11-13: For compounds where the detection limit was higher than the criteria, this should be reported.

Page 11: Last paragraph. The MDL that the laboratory reported is approximately 100 times the SQAG-TEC for atrazine.

Page 12: 2nd paragraph: The text fails to state that the holding times for SPLP analyses per method EPA 1312 were exceeded. This makes the data questionable.

Page 13: 4.3 Data validation: ADaPT data validation forms were not provided with the laboratory reports in Appendix A.

Page 13: 4th paragraph: Does USFWS concur with the value used of 4.2 mg/kg selenium?

Page 14: 4th bullet: A spot check of the data indicate that this statement is inaccurate. The method blank run 1/30/13 by CAS has barium, cadmium, copper, mercury in it.

Page 14|: It should be noted that the laboratory did not achieve the SQAGs TEC concentrations for any of the organophosphate pesticides (OPP), the triazine herbicides (including atrazine) or toxaphene. The SOW that this assessment was supposed to follow named EPA 8140 as the

method for OPP. The chain of custody from the field requested EPA 8141 + atrazine for the split samples; the chain of custody between ALS and their subcontractor, Sunlabs was changed to EPA 8270. The chain of custody from the field produced to Sunlabs (the primary laboratory) requested EPA 8141. The data was reported out from EPA 8270 which did not conform to the scope. Typically, EPA 8140 provides lower detection limits than EPA 8270 due to use of a more selective detector.

Page 14: Bullets 6&7: There are a wide variety of MDLs being reported by commercial laboratories. Were the labs told which criteria the data was going to be compared to? Were different labs contacted?

Page 17: 1st bullet: Please confirm that the 95% UCL of dieldrin exceeds the SQAG-TEC.

Page 17: 2nd bullet: Does the FWS concur with no risk for barium?

Page 17: 2nd bullet: The range of barium concentration defined by FDEP (Carvalho and Schropp, 2002) in the Florida DEPs Interpretive Tool for Assessment of Metal Enrichment in Florida Freshwater Sediment warns of the limitation that "the majority of the freshwater sediment systems used to build the sediment metals database from which this tool was developed came from central peninsular and north Florida. Therefore, this tool should be used to evaluate sediments from the same region". It goes on to say in the Recommendations: "… the interpretive tool should be used with a cautionary note outside of central peninsular and north Florida."

Table 1: SPLP should have a footnote.

Tables: A complete table listing the criteria and the found value and or detection limit would be useful to see at a glance the detection limit vs the criteria.

Appendix B Screening Level Ecological Risk Assessment

Page 3: 4th paragraph I have been unable to locate the full dataset.

Page 3: 5th paragraph: Which samples are discrete?

Page 4: 3.1.1 Does USFWS concur with this?

Page 4: 3.1.1 The range of barium concentration defined by FDEP (Carvalho and Schropp, 2002) in the Florida DEPs Interpretive Tool for Assessment of Metal Enrichment in Florida Freshwater Sediment warns of the limitation that "the majority of the freshwater sediment systems used to build the sediment metals database from which this tool was developed came from central peninsular and north Florida. Therefore, this tool should be used to evaluate sediments from the

same region". It goes on to say in the Recommendations: "… the interpretive tool should be used with a cautionary note outside of central peninsular and north Florida."

Page 5: 1st paragraph: Does the USFWS concur with the barium concentrations are not likely to cause effects?

Page 5: 4th paragraph: Does the USFWS concur with the lack of PEC exceedance in any sample and the unique properties of muck soils with the A-2 cultivated area suggest that the potential for toxic effects would be lower than predicted by SQAGs?

Page 5: 4th paragraph: Define unique properties.

Page 6: 3.1.3: The information is in conflict with the ESA assertion on page 13. The recommended value for selenium should be inserted in to the detected table 1 and footnoted.

Page 6: 3.1.4 I am unable to identify a Figure 2 in the hard copy report.

Page 6: Does USFWS concur with the recalculation of the 0.0003 ug/kg TEC value for atrazine to 587 ug/kg TEC for atrazine?

Page 6: 3.1.5 What is the half-life for 2,4-D?

Page 6: 3.1.5: Does USFWS concur with the calculation of the site-specific SQAGs for 2,4-D?

Table 1: comp-10 should be shaded for dieldrin concentration

Page 8: 2nd paragraph Does USFWS concur?

Page 8:5th paragraph: Was metribuzin applied recently or not?

Page 8:6th paragraph: Was phorate applied recently or not?

Page 9: 3.2 The cumulative risk did not include the data for barium. Barium data were not used because it was considered background. It those data were left in the average PEC-HQ would be greater than 0.5. Does USFWS concur with deletion of barium data?

Table 2: The value for SQAG PEC for dieldrin is incorrect in this table. The correct value is 0.062 mg/kg.

Page 10: 2nd paragraph: The text says that "a screening-level approach was used to identify COPCs by using the maximum composite sample concentration from the discrete sediment samples…" This does not make sense. There were no discrete samples..

Page 10: 3rd paragraph: Treatment of barium is inconsistent through this report. It was not used in Table 2 to calculate PECs-HQ but it was used in Table 3 to calculate HQs for aquatic – feeding birds.

Page 10: 3rd paragraph: The text says that atrazine is a chemical with low toxicity. How do the authors reconcile the 0.0003 mg/kg SQAG-TEC values; it is the lowest concentration of TEC for the compounds detected.

Page 11: 3.3.1 Does USFWS concur with this position?

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960


April 17, 2013

Robert Kukleski
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

Dear Mr. Kukleski:

The U.S. Fish and Wildlife Service (Service) has reviewed the document entitled "Phase II Environmental Site Assessment for the A-2 Flow Equalization Basin, Palm Beach County, Florida," prepared by Professional Service Industries, Incorporated (PSI). This report summarizes sampling results for the approximately 14,408 acre Talisman property.

Previous due diligence assessments were performed on the A-2 Flow Equalization Basin (FEB) parcels prior to the creation of the current "Protocol for Assessment, Remediation, and Post-Remediation. Monitoring for Environmental Contaminants on Everglades Restoration Projects", therefore a reduced sampling density of 10 percent was agreed to prior to the current assessment of previously cultivated areas in the project footprint. All point source concerns within the A-2 FEB were previously assessed and remediated as necessary. A total of 30, fifty acre grids were sampled using composite samples. Analytical results were compared to the Florida Department of Environmental Protection Sediment Quality Assessment Guidelines (SQAG) and the Florida Administrative Code Soil Cleanup Target Levels (SCTL).

Results

Barium concentrations (69 to 118 mg/kg) exceeded the SQAG threshold effect concentration (20 mg/kg) and probable effect concentration (PEC) (60 mg/kg) in all of the samples. Copper (53 to 110 mg/kg) was detected at concentrations that exceeded the recommended interim screening level for protection of the Everglade snail kite (*Rostrhamus sociabilis plumbeus*) (85 mg/kg) in eight of the samples collected. The calculated 95 percent upper confidence level (UCL) of the mean copper concentrations (83.1 mg/kg) was below 85 mg/kg. The metals chromium, mercury, and selenium exceeded the SCTL for leaching to surface water in several of the sample locations. The herbicides 2,4-D, metribuzin, phorate, and atrazine were detected at some locations with concentrations above the SCTL for leaching to surface water or ground water. Atrazine (27 to 3,500 μg/kg) was relatively widespread, with detections at 16 of the sampling locations above the SQAG threshold effect concentration (TEC) (0.30 μg/kg). The pesticide dieldrin was detected above the SQAG TEC (1.9 μg/kg) in four samples, ranging from 2.7 to 5.1 μg/kg. Atrazine and dieldrin were also analyzed with the synthetic precipitation leaching procedure (SPLP). Atrazine was detected in SPLP extract at concentrations above the Florida Administrative Code (FAC) groundwater cleanup target level (GCTL) and the FAC

Surface water Cleanup Target Level (SwCTL). The detection limits for the dieldrin SPLP extracts were above the SwCTL.

Copper concentrations within the A-2 FEB did show some exceedances above the recommended interim screening level, but sitewide they are calculated to be below 85 mg/kg. In addition, the total organic carbon (TOC) content of the soils at the proposed A-2 FEB are high (20-50 percent) and will act to decrease the bioavailability of copper. The recommended interim screening level was generally established for sandy soils with roughly 1 percent TOC. To verify that copper does not present a risk to snail kites, PSI recommended a sampling program at the start-up of the A-2 FEB to monitor copper concentrations in surface water, periphyton, and any apple snails that may establish onsite. To address the exceedances of 2,4-D, atrazine, metribuzin, phorate, dieldrin, chromium, mercury, and selenium above the SCTL for leaching to surface water PSI recommended sampling surface water after start-up operations at the A-2 FEB.

Summary and Recommendations

After reviewing the analytical data, the Service concurs that the detected contaminant concentrations are unlikely to pose risk to Service trust resources at the proposed A-2 FEB. We agree that the proposed monitoring for copper is necessary to verify predictions of reduced copper bioavailability due to the high TOC. While the detected levels of barium could potentially impact the benthic community, it is unlikely that they would pose risk to federally listed species.

The Service agrees that an agrochemical best management practices (BMP) plan is appropriate to address the use of agrochemicals, if the property is used for agricultural purposes prior to project construction. We strongly recommend restricting any further use of copper and discontinuing use of atrazine a minimum of one year prior to project construction. If agrochemicals are applied during the interim use, then further sampling may be necessary to ensure that agrochemical concentrations are below thresholds for ecological risk.

Thank you for the opportunity to provide comments regarding the assessment in the A-2 FEB project area. If you have any questions, please contact Emily Bauer at 772-469-4335.

Sincerely yours,

for Larry Williams
Field Supervisor
South Florida Ecological Services Office

cc: electronic only

Corps, West Palm Beach, Florida (Tori White)
Service, Vero Beach, Florida (Sharon Kocis, Steve Mortellaro)
PSI, Tampa, Florida (Stephen Long)

DEPARTMENT OF ENVIRONMENTAL PROTECTION

# MEMORANDUM

**TO:** **Joe Lurix, Air/Waste/WF Program Administrator**

**FROM:** **William Rueckert, Environmental Manager, Waste Compliance Assistance & Enforcement Section** WAR

**DATE:** **April 4, 2013**

**SUBJECT:** **Phase II Environmental Site Assessment, A-2 Flow Equalization Basin, Palm Beach County; Site No. COM_157258 (Talisman); Tract Numbers: D7100-044; -047; -066; -067; -104; -139; -141; and D7200-005.**

As requested by the Department's Office of Ecosystem Projects in Tallahassee, I have reviewed the document prepared for the South Florida Water Management District (District) by Professional Service Industries, Inc. (PSI) dated March 25, 2013 (received April 1, 2013) *Phase II Environmental Site Assessment, A-2 Flow Equalization Basin (Report), Palm Beach County, Florida*. The Department's review was performed following the "Protocol for Assessment, Remediation and Post Remediation Monitoring for Environmental Contaminants on Everglades Restoration Projects" known as the White Paper. The Waste Compliance Assistance & Enforcement Section has the following comments:

1. Based on the information and representations as presented, this Report adequately addresses the concerns of the Department's Waste Compliance Assistance & Enforcement Section with further discussion below. Therefore, the property addressed in this Report should be capable of being utilized for the intended end use as a flow equalization basin.

2. Start Up Operations - the Department concurs that during the start up operation a one-time surface water and sediment sampling event should be performed. This sampling event should be performed at the 30- or 60-day period from inundation. **In addition,** after one year of operations, an additional surface water sampling event should be performed. Sample location, minimum of three, determinations should be based upon the highest concentrations of the listed parameters presented in this Report. The Department suggests three locations with the highest copper concentrations for the metals analyses. For example, sample collection should be in the vicinity of Comp-1, Comp-16, and Comp-30.

Sample locations, minimum of three, for the pesticide and herbicide analyses should be in the areas of Comp-9, Comp-18, and Comp-28. The following parameters should be laboratory analyzed: pesticides and herbicides (2,4-D; atrazine; metribuzin; phorate) and metals (barium, chromium, copper, mercury and selenium).

3. Arsenic is not suggested for additional analyses but these soils should not be transported off site for uncontrolled disposal. As presented in Section 6.2, Recommendations, a soil management plan should be developed for project construction to ensure proper handling and disposal of the soils.

4. Also as presented in Section 6.2 of the Report, an agrochemical best management practices plan should be instituted during the continued use of agrochemicals on the property.

If you have any questions, feel free to contact William Rueckert at (561) 681-6679 or at William.Rueckert@dep.state.fl.us.

cc: (RPPS_Comp@dep.state.fl.us)

130267

# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

June 14, 2013

Mr. David S. Hobbie
Deputy District Engineer
Programs and Project Management Division
U.S. Army Corps of Engineers
701 San Marco Boulevard
Jacksonville, FL 32207-8175

Dear Mr. Hobbie:

**Subject: Request for Inclusion of a Section Entitled "Residual Agricultural Chemicals" within the Central Everglades Planning Project Final Integrated Project Implementation Report and Environmental Impact Statement**

I am writing on behalf of the South Florida Water Management District (SFWMD) to request inclusion of a section entitled "Residual Agricultural Chemicals" to the Central Everglades Planning Project (CEPP) Final Integrated Project Implementation Report and Environmental Impact Statement. This request is in accordance with Paragraph 4 of the Comprehensive Everglades Restoration Plan (CERP) – Residual Agricultural Chemicals memorandum issued September 14, 2011 from the Assistant Secretary of the Army for Civil Works.

SFWMD has provided information to the Jacksonville District to fulfill the applicable requirements set forth in Paragraph 4 of the policy guidance for the CEPP and will work with the Jacksonville District to complete this section in the Final Integrated Project Implementation Report and Environmental Impact Statement.

Sincerely,

Temperince Morgan

Temperince Morgan
Director
Office Everglades Policy and Coordination

TM/pv

c: Eric Bush, USACE
Howard Gonzales, USACE
Kimberley Taplin, USACE
Tom Teets, SFWMD

| | |
|---|---|
| **From:** | Kukleski, Robert |
| **To:** | Gued, Lisa R SAJ |
| **Cc:** | robert_frakes@fws.gov; Emily Bauer; Shafer, Mark D SAJ; "william.rueckert@dep.state.fl.us"; "Steve Long"; "andrew.cadle@psiusa.com"; "Joe Allen"; Davis, Murika R SAJ; Irfan, Muhammad SAJ; Taplin, Kimberley A SAJ; Taylor, Robert; Morrison, Matthew; Warner, Paul; Cooper, Abner; Thourot, Scott; Teets, Thomas M; Palmer, Ray; Bassell, Richard; Bergstrom, Jayne; Virgil, Richard; Loehrlein, Vincent; Kivett, Jeff; Mitnik, John |
| **Subject:** | Response To Additional USACOE Comments; Phase II Environmental Assessment (Addendum #1); Screening Level Ecological Risk Assessment; A-2 Flow Equalization Basin Project; Former Talisman Sugar Corporation Property (Tract No. D7 100-104) |
| **Date:** | Friday, June 14, 2013 11:02:32 AM |

Lisa:

The South Florida Water Management District (SFWMD, or "the District") is submitting this response to address your requests for clarification on the Phase II Environmental Site Assessment (ESA) for the A-2 Flow Equalization Basin (FEB) that were received via e-mail on May 21, 2013; the comments were issued in response to the Phase II ESA - Addendum #1. We have provided each of your comments in italics below, followed by our response:

1. With respect to the FDEP letter, which standards will be used to evaluate the target compound water concentrations (if any) in the FEB after inundation?

Response: The FDEP concurrence letter, which was previously provided for the Phase II ESA did not specify which standards would be applied to evaluate target compound concentrations in the surface water in the A-2 Flow Equalization Basin (FEB) after inundation. However, the District is not permitting the FEB as a treatment works; and, therefore, the surface water standards for Class III surface water bodies, which are contained in Chapter 62-302, Florida Administrative Code (FAC) would apply.

2. With respect to the FDEP letter, what would be the repercussions if any of the targets exceeded the standards?

Response: The FDEP concurrence letter did not specify the repercussions for any target compounds that might exceed the surface water quality standards during the operation of the FEB. However, exceedences of the water quality standards for this FEB would be treated no differently than exceedences for any other constructed water body or reservoir that is operated by the District. When an exceedence is detected and confirmed through follow-up testing, a corrective action plan would be developed to reduce the chemical concentrations to below the applicable criteria. The District commonly employs adaptive management strategies to meet water quality standards, and the operation of the FEB might need to be altered to meet the water quality standards.

3. With respect to the USFWS letter, what concentrations of copper found in surface water, periphyton and apple snails after FEB inundation would be a cause for concern?

Response: As you are aware, SFWMD, USFWS, FDEP and USACOE are currently participating in a joint Copper Working Group to further our understanding of the fate and transport and potential ecological effects of copper in the Everglades environment. As part of this effort, we have jointly sponsored several studies which are currently underway to evaluate copper bioaccumulation, toxicity, desorption, and other important parameters that significantly impact the potential risks associated with exposure of the Everglades snail kite, and other species to copper in sediments. We believe that it is premature to set goals for allowable concentrations of copper in periphyton and apple snails at this time, but we will be in a better position to jointly set these goals after completion of these studies within the next 12-18 months, and prior to FEB construction. With regard to copper in surface water, the Class III surface water standard for copper would apply, and this value is hardness dependent.

4. With respect to the USFWS letter, what would be the consequences if copper concentrations exceeded the level of concern?

Response: Similar to the FDEP concurrence letter, the USFWS concurrence letter does not identify the consequences if the copper concentrations within the FEB exceeded the level of concern during operation. The District will utilize adaptive management techniques to address any exceedences of copper in surface water, periphyton, or snail tissue.

5. With respect to the USFWS letter, does the SFWMD agree with restricting further use of copper at the site and discontinuing use of atrazine a minimum of one year prior to project construction?

Response: The District does agree with the USFWS recommendation to restrict copper applications and to require the leasee to discontinue atrazine use a minimum of one year prior to project completion. It has been very common for the District to prepare and adopt agricultural chemical Best Management Practices (BMP) Plans which are implemented during interim use to prevent further degradation of a property prior to construction.

6. With respect to the USFWS letter, it says that "If agrochemicals are applied during the interim use, then further sampling may be necessary to ensure that agrochemical concentrations are below thresholds for ecological risk". Please confirm that SFWMD is still planning on leasing the land for the A-2 and agrochemicals will be applied. Please clarify what further sampling would be necessary to ensure that agrochemical concentrations are below threshold for ecological risk.

Response: The current lease on the property varies, with some components of the property leased until 2015 and others until 2019. The portions leased until 2019 can also be extended beyond that timeframe if the Project is not ready for construction. The District intends to allow continued farming on the property, subject to the proposed BMP restrictions, during the interim use period. Upon termination of the lease, the SFWMD Environmental Science Unit (ESU) will conduct an Exit Assessment on the property. The Exit Assessment typically involves a thorough reconnaissance of the property to identify any evidence of spills that may have occurred during the lease period (e.g., dead vegetation, staining, odors), or new chemical sources (e.g., mix/load areas, tanks, etc.) with a high potential for spills. A governmental database search is also typically performed to identify any reported spills or environmental violations that have been reported on the property during the lease period.

If any potential point sources are identified, soil and groundwater samples would typically be collected from these areas. The District would also typically perform re-sampling within the cultivated fields at a few grid locations to verify current conditions. During this re-sampling, we collect samples from previously sampled grids for comparison of current conditions with the Phase II ESA results. We typically perform re-sampling at 5-10% of the previously sampled grids. SFWMD will submit a workplan for any Exit Assessment sampling to FDEP and USFWS to obtain concurrence prior to conducting the additional work.

We trust that these responses will be satisfactory to address the USACOE's concerns regarding the report. If you have any additional questions, please do not hesitate to contact me at (561)686-8800, ext. 3337.

We value your opinion. Please take a few minutes to share your comments on the service you received from the District by clicking on this link <http://my.sfwmd.gov/portal/page/portal/pg_grp_surveysystem/survey%20ext?pid=1653> .

# ANNEX H

# PART 3

# CERP ENVIRONMENTAL RISK ASSESSMENT PROTOCOL DOCUMENTS

1) **Whitepaper to Address Florida DEP Remaining Concerns about the Ecological Risk Assessment (ERA) Protocol**
   **Prepared by**
   **Joseph Allen, Mark Lewis, Ph.D., and Shahrokh Rouhani, Ph.D., P.E.**
   **NewFields Companies, LLC**

2) **3/14/08 FINAL VERSION**
   **ATTACHMENT 1, PROTOCOL FOR ASSESSMENT, REMEDIATION AND POST-REMEDIATION MONITORING FOR ENVIRONMENTAL CONTAMINANTS ON EVERGLADES RESTORATION PROJECTS**

# Whitepaper to Address Florida DEP Remaining Concerns about the Ecological Risk Assessment (ERA) Protocol

**Prepared by**
**Joseph Allen, Mark Lewis, Ph.D., and Shahrokh Rouhani, Ph.D., P.E.**
**NewFields Companies, LLC**

**Prepared for**
**South Florida Water Management District**

**October 15, 2007**

NEWFIELDS

## 1.0 INTRODUCTION

The South Florida Water Management District (SFWMD) routinely acquires large agricultural tracts for incorporation into water storage and water quality improvement projects. Many of these tracts have residual chemicals present in the soil associated with routine agrochemical application during the period of agricultural use. In order to characterize the level of chemical impacts on these tracts, SFWMD and its land acquisition contractors have utilized a protocol for sampling and subsequent risk assessment ("the protocol") of these properties which was developed by the United States Fish and Wildlife Service (USFWS) in cooperation with SFWMD. This protocol has been in use for a number of years and has been revised occasionally to reflect lessons learned through the assessment process. The intent of the protocol is to ensure that the sampling density and methodology is consistent between project objectives and is sufficient to adequately characterize these properties with regard to chemical impacts and potential future use. As the protocol states (USFWS, 2004, page 1):

*"Many of these lands proposed for acquisition will support functioning water reservoirs (storm water treatment areas, Aquifer Storage and Recovery detention reservoirs, and storage reservoirs) designed to impound a wide range of water capacities and depths over long periods of time. Additionally, many of these reservoirs will cover large expanses of several thousand acres, establishing local and regional aquatic ecosystems as well as providing foraging habitat for waterfowl and other aquatic wildlife. Without appropriate risk management and attention to design alternatives, the subsequent release of these pesticides and trace metals into CERP* [the Comprehensive Everglades Restoration Plan] *wetlands, reservoirs, and conveyances will provide exposure pathways to the regional fish and wildlife communities in south Florida."*

Ultimately, the data collected using the USFWS protocol are utilized in performing ecological risk assessments (ERA) and in the decision making process as to whether the land is suitable for the proposed water quality projects, or whether remedial actions are required to protect the receptors that may utilize the habitat created by the proposed water quality improvement project.

This document has been prepared in response to concerns raised by the Florida Department of Environmental Protection (FDEP) regarding the ERA guidance. In recent months, FDEP has provided comments on environmental reports for tracts within the BBCW and C-111 projects, and other SFWMD projects. On October 20, 2006 FDEP provided SFWMD with a list of comments and concerns related to the ERA guidance. A meeting to discuss these comments was held on November 3, 2006 with technical experts representing FDEP, USFWS and SFWMD with the primary goal of addressing FDEPs concerns regarding the ERA guidance and associated sampling protocols. These comments, including the SFWMD responses to the comments were provided at the November 3, 2006

meeting. A round of comments based on the SFWMD responses was provided to SFWMD on February 26, 2007 by FDEP.

To address the above FDEP comments, a draft version of this document was submitted to FDEP on July 9, 2007, which was followed by a joint FDEP/SFWMD meeting on July 12, 2007. Discussions during this meeting indicated that the submitted draft document satisfactorily addressed most of the concerns raised by FDEP. A final round of comments, highlighting the remaining concerns, was provided to SFWMD on September 9, 2007 by FDEP. This document has been revised to address these comments.

## 2.0 OUTLINE OF THE ECOLOGICAL RISK ASSESSMENT GUIDANCE

The ERA guidance outlines a multi-phased approach toward determining the presence or absence of hazardous materials and the potential for ecological risk associated with their presence. The assessment steps provided in the ERA guidance are as follows:

- An initial Phase I Environmental Site Assessment ("ESA") is performed according to American Society of Testing and Materials ("ASTM") Standard Practice E1527-00 with the goal of identifying the presence or likely presence of any hazardous substance of petroleum products on the property.
    - The Phase I ESA includes a thorough site inspection, review of historical aerial photographs, land use records, and review of pertinent environmental databases, as well as onsite personnel interviews. Information acquired via the Phase I ESA is used to determine the necessity for a Phase II ESA.
    - If the Phase I ESA indicates the presence of contamination or that the potential for contamination exists, a Phase II ESA is initiated that includes coordination with the USFWS.
- A Phase II ESA is used to identify sources and locations of contamination, specifically contaminants of potential concern (both human health and ecological), and provide recommendations for additional sampling, testing or risk assessment; and corresponding corrective actions.
    - The Phase II ESA is focused on potential point sources at the property along with additional limited sampling within canals or agricultural fields.
    - Data are used to conduct a screening-level ERA (SLERA) using available benchmarks, such as the Florida Sediment Quality Assessment Guidelines (SQAGs) and/or surface water quality standards and assessment of risk to USFWS trust species.

- The ERA guidance recommends risk assessment protocols for further risk-based evaluation should the results of the SLERA indicate that risks may be elevated at the site.

## 3.0 OUTLINE OF THE PHASE II SAMPLING PROTOCOL

The sampling protocol for Phase II ESAs provides data for risk assessment purposes in both potential point source areas and within current or former agricultural areas. The media sampled may include soils, sediments, groundwater and/or surface water (if present).

- Phase II ESA sampling is generally focused on facilities (current and/or former) and potential point sources on the property.
  - Discrete samples are collected from all potential source areas identified during the site inspection or historical review conducted as part of the Phase I ESA and may include: pesticide mixing and loading areas, storage sheds, vehicle turn-arounds, airstrips, cattle dip tanks, pumping stations and burn areas.
  - Sediment and surface water data are collected from canals at the site.

- Phase II sampling also includes the collection of data from the current or former agricultural areas at the property following a standard protocol. The collected data in the former agricultural areas are intended to provide representative average concentrations over the specified grids for risk assessment purposes. The proposed sampling protocol does not recommend the use of grid-wide values, especially grid composite data, to delineate and/or evaluate extents or magnitudes of potential hot spots.

  - On small properties (< 500 acres), discrete samples are collected at regular intervals across the property with a density of at least one sample per 10 to 20 acres with a minimum of 10 samples.
  - On large properties (> 500 acres), a composite sampling protocol is instituted based on 50-acre grid cells.
    - On very large properties, a previously determined number of grids are randomly selected for sampling.
    - On smaller properties (e.g. < 1000 acres) an attempt is made to sample all grids.
      - 50-acre grids are stratified by agricultural use.
      - Grids are divided into ten 5-acre plots.
      - A discrete random sample is collected from each 5-acre plot.
      - Samples are composited from all discrete samples within the 50-acre grid.
      - A second aliquot from each 5-acre grid sample is typically archived for future analysis.
      - Copper is analyzed in all 5-acre discrete samples.

## 4.0 RISK MANAGEMENT GOALS AND GUIDING PRINCIPLES FOR THE CERP LAND ACQUISITION AND ASSESSMENT.

Risk Management Goals (RMGs) are an important part of assessing risk (EPA 1998). The RMGs for an ERA form the basis of the sampling design and process by which risks are assessed. The RMGs implicit in CERP guiding documents and ERA risk assessment and management process are as follows:

- The overall purpose of CERP is to manage ecosystem nutrient loading and hydrology.

- The CERP process recognizes that agricultural chemicals, and the risk of adverse effects from them cannot be completely removed (i.e., cannot manage to NO Risk).

- The benefits realized from reclamation of wetland and hydrologic function through CERP outweighs risk of adverse effects from residual agricultural chemicals.

- Risks to USFWS trust species are managed to avoid unacceptable adverse effects on "individual" basis rather than on a population basis.

- Ecological function from other aquatic receptors (benthos and fish) is protected on populations and community basis, some effect is tolerated if ecosystem function is protected.

- Risks and ecological function are assessed and managed on a landscape scale rather than on the smaller scale typically encountered on a regulated industrial or commercial cleanup site.

- The ability to assess ecotoxic risk is limited by available resources (time and money).

The ERA process design is based on the primary RMGs of protecting Trust wildlife species, and ecological function on a landscape scale. The process for assessing benthic effects is based on this underlying principle in that:

- The Assessment Endpoint for the benthic community is based on function of the community as a whole ecosystem occupying the landscape. Functions of benthos include nutrient cycling (including organic carbon) and to provide important prey base for the aquatic food web. These functions are generally scaled over large, landscape levels rather than at small scales and can tolerate small-scale disturbances provided that the majority of the community

remains viable. The overall impact on function should be related to the degree to which the system is affected.

- The system level effects from direct sediment toxicity to benthos (or anything else), if they occur, do not extend beyond the boundaries of the affected portion of the site (whereas bioaccumulation effects can affect area and resources beyond contaminated spot).
  - As a result, a relatively small portion of an area may be severely affected, without affecting function in the system.
  - Conversely, a large area with relatively small level of effects can have significant system effects because a proportionately larger fraction of the system is affected.

- The RMGs relate to restoring ecosystem function and protecting Trust wildlife species. For benthos and other ecological functions, this typically applies to landscape scales of the project areas. As a result, the ERA assessment goal for benthos is geared toward detecting large areas of even small effects, possibly sacrificing resolution of proportionately small areas of higher impact. This is consistent with the goals cited in the USFWS/SFWMD Guidance. This is driven, in part, by limited resources (time and money) to investigate such large tracts.

## 5.0 ADDRESSING FDEP KEY CONCERNS AND RECOMMENDATIONS

As noted, FDEP provided a series of comments about various aspects of the sampling protocol. Some of these comments were satisfactorily addressed by SFWMD. The remaining FDEP comments can be grouped into the following key concerns:

- Reliability of composite samples proposed in large property investigations;
- Random selection of grids for composite sampling and analysis in very large properties;
- Analysis of resulting composite data in ERA decisions;
- Sufficiency of collected data in agricultural areas of the investigated properties;
- The use of copper Threshold Effect Concentrations (TECs), Probable Effect Concentrations (PECs) and the interim benchmark for the protection of the Everglades snail kite.
- The overall protectiveness of the process for benthic receptors (i.e. the aquatic community).
- The use of bioaccumulation and toxicity testing studies.
- Additional analysis for heavy metals.
- Canal sediment sampling.
- Fish tissue sampling.

The following sections address the above concerns and provide recommendations where appropriate.

### *5.1 Discrete Sample Compositing*

In large properties, discrete sampling at short intervals would be at best cost prohibitive, if not impracticable. Reducing the sample density, however, can lead to under-representation of large portions of the property, as well as elevated likelihood of missing hotspots. Composite sampling is a compromise, under which large numbers of discrete samples are collected, but composited prior to laboratory analyses. As early as the 1980s, the United States Environmental Protection Agency (EPA) recognized the utility of composite sampling in large site investigations (e.g. EPA, 1989, Section 6.6).

The main advantage of composite sampling is its expanded spatial coverage, which is achieved without the ensuing increase in analytical costs. The proposed composite samples, which are unbiased and representative samples of their constituent aliquots, have the following characteristics:

- Composite samples yield unbiased and representative estimates of average concentrations over exposure areas that have ecologically relevant scales for large properties. For example, comparison of an individual composite sample to appropriate ecological benchmarks allows an appropriate remedial decision concerning the entire 50-acre grid.

- For the aquatic community endpoint, site-wide averages are an appropriate scale. Composite samples directly provide estimates of exposure and potential risk to the entire aquatic community that may colonize the site.

- For the USFWS trust species, risks to individuals are more important than risks to the population due to their threatened or endangered status. This sampling protocol allows for average concentrations to be measured directly over areas that may encompass the entire foraging range or only a portion of the foraging range depending on the species being evaluated.

The primary disadvantage of composite samples is the likelihood of masking hotspots by diluting the elevated discrete samples with cleaner aliquots. This masking can be viewed as a form of a "*false negative*," i.e., the probability of yielding clean composite results, while certain portions of the grid may exceed ecological benchmarks.

The protocol attempts to minimize the above disadvantage by including rules according to which all discrete aliquot samples associated with an exceeding composite sample should be analyzed individually. As noted, recent adjustments to the protocol have also called for the analysis of the archived discrete aliquot samples from adjacent grids.

The above protocol rule addresses the false negative problem associated with elevated composite samples. The question that remains is the problem of false negatives among non-exceeding composites. For this purpose, available data can be used to quantify such likelihoods. For example, consider the discrete and composite copper concentrations from 37 50-acre grids from various sites that have been sampled under the Phase II ESA protocol, as listed in Table 1. Figure 1 shows the range of variability of discrete aliquot samples associated with each composite. The issue is whether these exceeding discrete values are ecologically significant.

The probability of an aliquot exceeding a benchmark in a given grid can be computed as the ratio of the number of exceeding discrete aliquots in that grid over its total number of aliquots. Using the above copper data, Table 2 lists the aliquot exceedance rates in individual grids based on the three copper benchmark levels routinely used in the SLERAs of 85 ppm (USFWS Interim Benchmark for the Everglades Snail Kite), 31.6 ppm (TEC), and 150 ppm (PEC). On average, the aliquot exceedance in individual grids increases with decreasing ecological benchmarks and increasing composite values.

To address FDEP's concern about false negatives associated with non-exceeding composite samples, a supplementary step can be added to the protocol. For this purpose, a subset of non-exceeding grids is randomly selected, in which all discrete aliquots are laboratory analyzed. These discrete results are then added to discrete aliquot data produced for exceeding grids. When selecting the subset of non-exceeding grids, the following should be considered: (1) the non-exceeding grids targeted for discrete sampling shall not be clustered; and (2) the number of non-exceeding grids targeted for discrete sampling shall be at least 20% of the total number of non-exceeding grids but not greater than 10.

For each grid, the aliquot exceedance rate is computed based on the appropriate ecological benchmarks. The resulting rates are then listed according to the ascending order of their corresponding composite values, as listed in Table 2. Using these results, then the average aliquot exceedance rates are computed in the ascending grids (i.e., all grids having a composite value equal or less than the given grid). Such results allows the analyst to identify the composite concentration beyond which ascending average aliquot exceedance rates is greater than a pre-determined level, *e.g.* 5%. This composite threshold value is then considered as the area-specific trigger level. The trigger values for the example copper dataset based on the above three ecological benchmarks are listed in Table 2.

Consistent with the FDEP's recommendation, the final area-specific trigger levels must meet the following criteria: (1) trigger levels shall be determined on a chemical- and area-specific basis; and 2) if the empirically derived trigger level

exceeds the chemical-specific PEC (or PEC equivalent) benchmark then the benchmark shall be used as the trigger level.

Upon the above determination, all grids associated with composite concentrations in excess of the trigger level either will be remediated in their entirety, or their discrete samples will be laboratory analyzed for all contaminants of concern and investigated in a manner similar to other previously analyzed discrete samples. This supplementary step: (a) enhances the conservative basis of the protocol, (b) reduces the chances of false negatives consistent with area-specific results, and (c) avoids reliance of arbitrary trigger levels, such as 1/10 of a benchmark.

As the final comments of FDEP indicate, although the above approach reduces the likelihood of false negatives, it does not eliminate the chances of such occurrences. The question that immediately arises is whether the proposed approach leaves unreasonable data gaps regarding undetected hot spots. For this purpose, the following must be considered:

- The majority of hot spots are likely to occur within grids associated with composite concentrations in excess of trigger values. Therefore, although such hot spots may go undetected individually, they will be addressed collectively through proposed grid-wide remediations or further investigation.

- Under the proposed approach, the chances of missing isolated hot spots in non-exceeding grids, *i.e.* grids with composite concentrations less than trigger values, will be maintained below a pre-determined level, *e.g*. 5%. Given the fact that non-exceeding grids cover only parts of the area, the cumulative extent of undetected, isolated hot spots on an area-wide basis will always remain below the pre-determined level.

- The cumulative extent of undetected, isolated hotspots is further reduced by the fact that in the revised approach, based on the FDEP's recommendation, trigger values are ensured to remain at or below their corresponding benchmark criteria, i.e. the final chances of missing isolated hot spots in non-exceeding grids will always be at or below the pre-determined level.

- Regardless of sampling density, any field measurement entails the likelihood of a false negative. As EPA guidance (1989, page 2-1) states the question is: "*How can you balance the two sets of possibilities: the chance that the site is contaminated even when the sampling shows attainment of the cleanup standard, and the chance of contamination when the majority of samples taken show the site to be clean? The answer is to evaluate the potential magnitude of these two errors and balance them using the statistical strategies described in* [EPA (1989)]." This is exactly how SFWMD approached the problem and addressed it in accordance with EPA Guidance (EPA, 1989).

Considering the above, SFWMD concludes that the proposed sampling protocol provides a balanced approach, which maintains the chances of false negatives at a reasonable level. Language addressing FDEP's concerns regarding the accumulation of risk based on unidentified, small hot spots will be included as an uncertainty in all future risk assessments.

### *5.2 Random Selection of Grids*

As noted, the protocol prescribes random selection of a pre-determined number of 50-acre grids for composite sampling and analysis in very large properties (>1000 acres). FDEP raised concerns about the fact that such random selections may lead to data gaps and uneven sampling of the property resulting in under-representation of large portions of the property.

Theoretically, the homogeneity of the delineated properties mitigates concerns about potential gaps and under-representations. In fact, the ERA Phase I investigation is primarily focused on ensuring the homogeneity of the investigated properties by excluding potential hotspots and point sources. The chance, however, exists that random selection of grids may leave certain zones of a property under-represented.

To address the above concern SFWMD proposes to divide very large properties into super-grids, each consisting of about 25 50-acre grids, and then randomly select a pre-determined number of grids from each super-grid. This stratified random sampling, which is consistent with EPA Guidance (EPA, 1989, Section 6.5.2.2), addresses the coverage issue, while preserving the unbiased nature of the sampling process, without undue increases in the overall cost of the sampling or analysis effort.

### *5.3 Analysis of Composite Data*

FDEP has raised a number of comments concerning the use of composite data in remedial computations and decisions, specifically with regards to maximum and the upper confidence level of the mean (UCL) computations. Comments indicate that the main concerns stem from the apparent treatment of composite values, which are physical averages of a finite number of aliquots, as discrete values.

Any sample is representative of a given volume. The use of discrete and composite data is predicated on the following fundamental requirements that are already imbedded in the protocol, including:

- Samples representative of different volumes shall not be mixed in any statistical computations. For example, the UCL of the mean concentration

over an area cannot be calculated based on a mixture of composite and discrete samples.

- Estimates, such as mean or maximum concentration, computed based on composite or discrete samples, shall be considered as representative of the volumetric base of their constituent sample data.

- ERA decisions must be made based on sample data that have volumetric bases consistent with the given decision.

The computational procedures in the protocol are based on strict separation of composite and discrete samples. These procedures fully recognize the fact that composite data generally have lower standard deviations when compared to discrete datasets. However, many statistical procedures have self correcting mechanism to account for such differences. For example, discrete data are usually more numerous than composite data, *e.g.* Table 1. However, when calculating the UCL, the higher standard deviation of the discrete aliquot copper data is compensated by their larger sample size. As a result, UCLs of the mean based on both discrete and composite data would yield nearly similar results. As listed in Table 3, in the example dataset, although discrete aliquots have a higher standard deviation, due to their much larger number, yield a lower UCL when compared to the one calculated based on composite data.

Such self correcting mechanism does not exist for composite sample statistics. For example, on average, the maximum composite concentration in a given property is bound to be less than the maximum discrete concentrations. For example, see Table 3. Use of such sample statistics in an ERA decision is appropriate, if only the volumetric base of the composite data are considered as consistent with the underlying assumptions of the given decision.

### *5.4 Sufficiency of Composite Data*

FDEP has raised concerns about the potential insufficiency of composite datasets for characterizing large properties. In statistical terms, large sample sizes are required for characterization of highly variable contaminants (see EPA, 1989, Box 6.10, page 6-14). The protocol pursues procedures to ensure the homogeneity of the delineated properties. Implicit in this approach is the low level of variability among the contaminants of concern within the delineated area. However, definitive confirmation of the data adequacy occurs upon the completion of the sampling effort when UCL of the mean over the entire area is computed.

Given the unbiased and representative nature of composite samples, if the computed UCL is less than ecological benchmarks, then consistent with EPA guidance (EPA, 1989, Section 6.4.3), the property as a whole can be considered as clean and the sample size can be viewed as adequate. In contrast, if the

resulting composite data display high variability, then the computed UCL may exceed ecological benchmarks, even when the computed mean is low. Under such a condition, the sample size can be viewed as inadequate for determining the clean status of the property.

If data inadequacy is determined, specific alternative can be pursued, including: (a) additional grid sampling; or (b) segregating grids that cause elevated standard deviations and repeat the process for each part separately. The segregation of composite data into statistically homogeneous subsets can be accomplished using techniques, such as the probability plot analysis (DON, 2002).

The above post-sampling analyses not only provide appropriate data for ERA decisions, but also confirm the sufficiency of the data to reach the appropriate decision.

### *5.5 The Use of Copper Benchmarks*

Comments from FDEP have indicated concern over the application of the TEC and PEC copper benchmarks along with the interim benchmark for the protection of the Everglades snail kite. The comments have suggested that the snail kite benchmark appears to supersede all other values in risk assessment conclusions and risk management decisions.

Current SFWMD practice is to analyze all discrete 5-acre grid subcells from sampled 50-acre grid cells for copper. As a result, copper is evaluated in all current SLERAs conducted at citrus farms on a discrete sample basis only. This is an example of a protocol change made in response to agency (USFWS) comments.

In practice, all copper data are screened against the TEC. If the maximum concentration (grid composite or discrete sample) exceeds the TEC, the copper distribution is further evaluated by identifying the (discrete) grid cells in which the TEC or the PEC is exceeded. The results are presented in reports. Copper concentrations in all samples are also compared to the 85-ppm snail kite benchmark and the locations exceeding this value are identified.

Based on the results of the SLERA, risk managers at SFWMD make decisions on corrective actions and/or decisions to do more extensive ecological risk analysis, including toxicity testing, bioaccumulation testing, and elutriate testing as appropriate to the chemicals and receptors identified in the Phase II analysis.

Remediation for copper is usually based on exceedance of the snail kite screening value (85 ppm). Toxicity test results used for development of the SQAGs indicate that the 85-ppm value is protective of benthos. The snail kite value is approximately 57% of the copper PEC (150 mg/Kg). Although specific

data for copper are not available for review, FDEP (2003) indicates that an average PEC-quotient (PEC-Q) less than 0.5 (50%) for all chemicals combined corresponds to less than 20% toxicity in laboratory tests (See Attachment A, Table 4.10). This also applies to PEC-Q for combined metals (see Table 2 in USEPA 2000). This percentage is within the range corresponding to identification of TECs (See Attachment A, Table 4.8). Therefore, site management decisions made to protect snail kites based on this value appear to be protective of benthic invertebrates.

### *5.6 Overall Protectiveness of the ERA Process for the Aquatic Community*

Comments received from FDEP have indicated that the use of the PEC value for screening purposes is not acceptable and have suggested the use of the PEC divided by a safety factor (i.e., 1/10 of the PEC) for use in the SLERA. FDEP comments also suggest that risk from combinations of chemicals (i.e., cumulative risks) are not adequately represented, and that sediment toxicity testing should be used to assess this aspect of risk to benthos.

SFWMD disagrees that 1/10 PEC should be used as a screening value. In response to past comments from FDEP and USFWS, the ERA screening process that is implemented is more conservative than described in the guidance and essentially equivalent to what FDEP has suggested. The process described above for copper is also applied to all other chemicals detected at each site. All chemical results are first screened against the TEC. For properties smaller than 500 acres this means that each 5-acre parcel is screened. For larger properties, this includes 50-acre grid composite samples. All screening results are presented in the ERA reports.

FDEP (2003) recommends using a TEC as a screening level, below which adverse effects on benthics is considered unlikely. For most organic chemicals, the TEC is less than 20% of the PEC, and for many important insecticides, less than 10% (Table 4). For metals, the ratio is higher, but still protective based on the RMGs described in previous sections. Therefore, the level of conservatism implied by screening against the TEC is near that requested for composite samples in FDEP's comment.

To address the issue of a cumulative risk to benthos from multiple chemicals, SFWMD proposes adding the PEC-quotient (PEC-Q) method to the screening process (FDEP 2003). Based on data presented by FDEP (2003), the SFWMD proposes to use a mean PEC-Q of 0.5 as a screening level. Samples from the Southeastern US with mean PEC-Q values less than 0.5 exhibited detectable toxicity in less than 20% of samples (See Attachment A, Table 4.10). FDEP guidance relies upon TECs as screening levels, and TECs typically represent concentrations at which 15-30% of toxicity tests show positive results (See

Attachment A, Table 4.8). Therefore, a PEC-Q corresponding to equivalent toxicity would offer similar protection.

Results could be used to determine whether corrective actions can be used to reach acceptable conditions. If corrective action decisions cannot be made on the basis of the above, then an expanded ERA will be performed for the site. The scope for the expanded ERAs is dependent upon results of the SLERA, and on site-specific conditions and data needs. In the past, the expanded risk assessments have included toxicity testing to varying degrees. Use of toxicity testing as part of an expanded ERA may be considered. SFWMD proposes that standard testing procedures be used to maintain consistency.

### *5.7 Bioaccumulation and Toxicity Testing Studies*

In cases where expanded ERAs are necessary, additional data are required that allow the ERA to move beyond the typical SLERA stage. The USFWS/SFWMD guidance document provides some examples of the types of testing that could be done as part of an expanded ERA. Comments received from FDEP have provided additional suggestions.

In current practice, the use of expanded ERAs has been minimal. The Phase I/Phase II ESA process associated with the acquisition process requires relatively quick turn-around in the initial 'screening' stages. On a project-specific basis, long-term investigations (*e.g.*, long-term bioaccumulation testing) are not feasible in the initial stages. SFWMD practice has been to make conservative decisions on corrective actions to expedite process.

Expanded ERAs have been conducted under USFWS oversight in cases where decisions on corrective actions are not possible based on screening assessments. Such assessments have included bioaccumulation and toxicity testing. Study designs have been based on EPA and ASTM standard methods.

SFWMD is willing to combine data from past bioaccumulation and toxicity testing exercises to glean trends in bioaccumulation rates, and to support the development of South Florida benchmarks based on toxicity test results. Results can be used to help guide use of toxicity tests and bioaccumulation testing in the future.

SFWMD is also willing to consider research, or use of non-standard methods on a separate path. However, schedule and budget constraints in the Phase I/II process must be considered. The SFWMD agrees that additional types of data may be valuable as part of an expanded ERA and that consultation with FDEP can be beneficial to the successful completion of an expanded ERA.

## *5.8* Additional Analysis for Heavy Metals

The FDEP has requested that the SFWMD consider routinely analyzing soil, sediment, and groundwater samples for metals such as cadmium, chromium, boron, vanadium, nickel, and zinc because these heavy metals may be present in pesticides.

The SFWMD already routinely analyzes samples for cadmium and chromium, as part of the eight Resource Conservation and Recovery Act (RCRA) metals suite. However, these metals have not typically been detected at concentrations to raise any human health or ecological concerns.

A detailed evaluation of agrochemical application is typically conducted as part of the Phase I environmental site assessment (ESA) portion of the CERP ERA process. This evaluation includes interviews with the property manager regarding the type, quantity, timing, and method of application of agrochemicals. The evaluation also typically includes a review of material safety data sheets (MSDS) for chemicals which are handled by the property manager. Based on the SFWMD's experience, the chemicals cited by FDEP as potential components of pesticides have not been noted on any reviewed MSDS. In the event that any of these metals were noted in the MSDS, the analytical suite for the Phase II ESA would be expanded to include these chemicals. The SFWMD does not believe that routine analyses for these metals are warranted. Therefore, the SFWMD proposes to conduct these analyses on a case by case basis, as warranted by the Phase I ESA results.

## *5.9* Canal Sediment Sampling

The FDEP has suggested expanding the sampling of sediments in site canals as a potential screening tool for the CERP ERA protocol. While limited canal sediment sampling is typically performed as a component of the ERA protocol, the SFWMD's experience indicates that expanded canal sediment sampling is not likely to be an effective screening tool. Currently, canal sediment sampling is typically limited to potential point source areas where run-off of agrochemicals into the canals appears likely. A limited number of canal sediment samples are also typically collected in areas where canals converge or in other areas which the sampler believes would most likely be impacted.

One of the major concerns with using canal sediment sampling as a screening tool is the high potential for false negatives due to the fact that most agricultural canals are dredged on a routine basis. In many cases, the SFWMD has found a complete lack of sediments for sampling, or the chemicals of concern in the site soils have been banned for many years (e.g., DDT) and the canals have been dredged multiple times since the last application.

Additionally, since very few canals originate and terminate on the same property, it is very difficult to conclude whether the sediments in the canal originated on-site or off-site. The presence of absence of a chemical in the canal sediments appears to be a poor predictor of whether the chemical will be detected in the site soils.

Lastly, the presence of contaminants in canal sediments would probably be a minor contributor to ecological risk on agricultural properties after they are converted to water storage or treatment areas. The relatively low contribution to the overall ecological risk is also associated with several factors related to the typical construction characteristics of these projects.

(1) Most of the canals within the areas proposed for flooding are backfilled during construction to promote sheet flow across the storage areas. The backfilling of the canals would eliminate the exposure pathway to contaminated canal for ecological risk.
(2) The canals generally represent a very small percentage of the overall footprint of the eventual project areas, so they do not represent a significant portion of total habitat area when compared to the project scale.
(3) Existing conditions in many remaining canals would typically not be preferred habitat for wading birds and other sensitive receptors due to steep banks that prevent shallow water areas needed for emergent vegetation and that are preferred by wading birds.

If canal segments are to be included in project plans as part of the deepwater refugia, then samples will be collected from segments that are to remain. However, these segments cannot be identified during the Phase I/II process because detailed designs are not available.

## *5.10* Fish Tissue Sampling

The FDEP has suggested the collection of fish tissue samples from existing canals on agricultural properties as a screening mechanism for evaluating cumulative ecological risk. The SFWMD acknowledges that fish tissue analysis may be an appropriate tool in post-construction monitoring and adaptive management of the CERP projects. However, pre-construction sampling of fish within existing canals would not be an effective tool in making decisions about corrective actions or evaluating post construction conditions.

Foremost, it must be acknowledged that most of the canals on these agricultural properties cross many properties. Both the surface water and fish in these canals move freely between sites. While the home range of smaller fish may be solely within the subject property boundaries, the fish are exposed to water,

sediment, and possibly food sources that enter the subject property from upgradient areas. As a result, it would not be possible to infer that any accumulation of agrochemicals in fish tissue is associated with the subject property.

The construction of the CERP projects typically involves significant alteration of the surface water hydrology and habitat on these agricultural sites. Therefore, post-construction conditions are likely to be vastly different from pre-construction conditions. It is likely that most of the existing fauna on these properties would be excluded from the proposed water storage areas due to significant alteration of the habitat during and after the construction stage. For example, most existing fish in the site canals would move off-site during the draining and filling of on-site canals and other disruptive construction activities.

The SFWMD has limited experience that indicates that fish tissue may not be a reliable indicator of sources of contamination in sediments. On one particular site, no significant concentrations of toxaphene were detected in fish tissue samples collected from existing canals where high toxaphene concentrations were present in the soils of the adjacent property. Additionally, the interpretation of the data is likely to require iterative sampling and negotiating access to off-site properties in order to determine whether the source of any identified fish tissue burdens are related to on-site or off-site sources. Such a process is not likely to fit into schedule available during the property acquisition process.

Fish tissue samples collected on a project-wide basis may be good indicators of contaminants that may have the potential to cause risk following construction of the project. Such information could be used to focus on the contaminant types (and associated land uses) that are important to manage or control through design and management of the reservoirs and STAs. However, such samples do not appear to be a useful tool in the relatively narrowly focused decisions associated with the property acquisition Phase I/II process.

## 6.0 SUMMARY

The ecological risk assessment protocol designed and utilized by SFWMD and USFWS represents a defensible and adequate approach to making informed risk management decisions regarding the purchase of property to be utilized in various SFWMD projects.

This document was prepared in order to address several concerns regarding the protocol that have been raised by FDEP. These concerns have been grouped into ten (10) categories and the conclusions reached in each for each of these topics following discussions with FDEP are as follows:

- Reliability of composite samples proposed in large property investigations.

- An area and chemical-specific trigger value that is equal or less than the PEC benchmark (or PEC equivalent benchmark) will be calculated and used to indicate grids requiring discrete sample analysis.

- Random selection of grids for composite sampling and analysis in very large properties.
  - On very large properties, using a 'super-grid' system, blocks of 50-acre grid cells will be created and a random subset of those grids will be sampled in a stratified random sampling design to ensure more uniform sample coverage.

- Analysis of resulting composite data in ERA decisions.
  - Statistical calculations will not mix composite and discreet data and estimates of the mean will be noted as being calculated on a volumetric basis.

- Sufficiency of collected data in agricultural areas of the investigated properties.
  - Additional data may be collected if the non-point source dataset is deemed to be statistically inadequate.
  - Discrete samples will continue to be collected at all known point-source locations

- The use of copper Threshold Effect Concentrations (TECs), Probable Effect Concentrations (PECs) and the interim benchmark for the protection of the Everglades snail kite.
  - A review of the toxicological data used to calculate the TEC and PEC indicates that the interim benchmark for the Everglades snail kite is expected to approximate the benthic toxicity predicted by the TEC and is adequately protective of the aquatic community.

- The overall protectiveness of the process for benthic receptors (i.e. the aquatic community).
  - The PEC-Q approach recommended in the FDEP sediment benchmark guidance document will be utilized as another line-of-evidence in assessing risk to the aquatic community.

- The use of bioaccumulation and toxicity testing studies.
  - Where expanded ERAs are required, SFWMD will consider the use of bioaccumulation studies using both standard and non-standard protocols on a project-specific basis.

- Additional analysis for heavy metals.
  - SFWMD will consider the analysis of heavy metals not included in the standard Phase II investigation on a case-by-case basis if the Phase I investigation indicates their potential presence.

- Canal sediment sampling.
    - If canal segments are to be included in project plans as part of the deepwater refugia, then samples will be collected from segments that are to remain but not as part of the property acquisition Phase I/II process.

- Fish tissue sampling.
    - Fish tissue samples do not appear to be a useful tool in the relatively narrowly focused decisions associated with the property acquisition Phase I/II process; however, their collection will be considered on a project-wide basis.

## 7.0 REFERENCES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United States Environmental Protection Agency (EPA). *"Prediction of sediment toxicity using consensus-based freshwater sediment quality guidelines*." Prepared by USGS for USEPA. EPA 905/R-00/007. 2000.

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# Tables

## Table 1. Examples of Aliquot and Composite Copper Data

| Area | Grid ID | Grid Number | Aliquot ID | Copper (Aliquot) | Unit | Qualifier | Copper (Composite) | Unit |
|---|---|---|---|---|---|---|---|---|
| AG Property | A1 | 1 | A1-1 | 79 | mg/Kg dw | | 95 | mg/Kg dw |
| AG Property | A1 | 1 | A1-2 | 200 | mg/Kg dw | * | 95 | mg/Kg dw |
| AG Property | A1 | 1 | A1-3 | 50 | mg/Kg dw | | 95 | mg/Kg dw |
| AG Property | A1 | 1 | A1-4 | 120 | mg/Kg dw | * | 95 | mg/Kg dw |
| AG Property | A1 | 1 | A1-5 | 56 | mg/Kg dw | | 95 | mg/Kg dw |
| AG Property | A1 | 1 | A1-6 | 84 | mg/Kg dw | | 95 | mg/Kg dw |
| AG Property | A1 | 1 | A1-7 | 74 | mg/Kg dw | | 95 | mg/Kg dw |
| AG Property | A1 | 1 | A1-8 | 230 | mg/Kg dw | * | 95 | mg/Kg dw |
| AG Property | A1 | 1 | A1-9 | 43 | mg/Kg dw | | 95 | mg/Kg dw |
| AG Property | A1 | 1 | A1-10 | 52 | mg/Kg dw | | 95 | mg/Kg dw |
| AG Property | A2 | 2 | A2-1 | 37 | mg/Kg dw | | 86 | mg/Kg dw |
| AG Property | A2 | 2 | A2-2 | 55 | mg/Kg dw | | 86 | mg/Kg dw |
| AG Property | A2 | 2 | A2-3 | 71 | mg/Kg dw | | 86 | mg/Kg dw |
| AG Property | A2 | 2 | A2-4 | 85 | mg/Kg dw | | 86 | mg/Kg dw |
| AG Property | A2 | 2 | A2-5 | 37 | mg/Kg dw | | 86 | mg/Kg dw |
| AG Property | A2 | 2 | A2-6 | 17 | mg/Kg dw | | 86 | mg/Kg dw |
| AG Property | A2 | 2 | A2-7 | 2 | mg/Kg dw | | 86 | mg/Kg dw |
| AG Property | A2 | 2 | A2-8 | 81 | mg/Kg dw | | 86 | mg/Kg dw |
| AG Property | A2 | 2 | A2-9 | 22 | mg/Kg dw | | 86 | mg/Kg dw |
| AG Property | A2 | 2 | A2-10 | 36 | mg/Kg dw | | 86 | mg/Kg dw |
| AG Property | A3 | 3 | A3-1 | 100 | mg/Kg dw | | 90 | mg/Kg dw |
| AG Property | A3 | 3 | A3-2 | 9 | mg/Kg dw | | 90 | mg/Kg dw |
| AG Property | A3 | 3 | A3-3 | 73 | mg/Kg dw | | 90 | mg/Kg dw |
| AG Property | A3 | 3 | A3-4 | 13 | mg/Kg dw | | 90 | mg/Kg dw |
| AG Property | A3 | 3 | A3-5 | 180 | mg/Kg dw | * | 90 | mg/Kg dw |
| AG Property | A3 | 3 | A3-6 | 48 | mg/Kg dw | | 90 | mg/Kg dw |
| AG Property | A3 | 3 | A3-7 | 5.5 | mg/Kg dw | | 90 | mg/Kg dw |
| AG Property | A3 | 3 | A3-8 | 53 | mg/Kg dw | | 90 | mg/Kg dw |
| AG Property | A3 | 3 | A3-9 | 23 | mg/Kg dw | | 90 | mg/Kg dw |
| AG Property | A3 | 3 | A3-10 | 37 | mg/Kg dw | | 90 | mg/Kg dw |
| AG Property | A4 | 4 | A4-1 | 120 | mg/Kg dw | * | 97 | mg/Kg dw |
| AG Property | A4 | 4 | A4-2 | 190 | mg/Kg dw | * | 97 | mg/Kg dw |
| AG Property | A4 | 4 | A4-3 | 25 | mg/Kg dw | | 97 | mg/Kg dw |
| AG Property | A4 | 4 | A4-4 | 130 | mg/Kg dw | * | 97 | mg/Kg dw |
| AG Property | A4 | 4 | A4-5 | 77 | mg/Kg dw | | 97 | mg/Kg dw |
| AG Property | A4 | 4 | A4-6 | 28 | mg/Kg dw | | 97 | mg/Kg dw |
| AG Property | A4 | 4 | A4-7 | 50 | mg/Kg dw | | 97 | mg/Kg dw |
| AG Property | A4 | 4 | A4-8 | 91 | mg/Kg dw | | 97 | mg/Kg dw |
| AG Property | A4 | 4 | A4-9 | 32 | mg/Kg dw | | 97 | mg/Kg dw |
| AG Property | A4 | 4 | A4-10 | 45 | mg/Kg dw | | 97 | mg/Kg dw |
| AG Property | A5 | 5 | A5-1 | 99 | mg/Kg dw | | 120 | mg/Kg dw |
| AG Property | A5 | 5 | A5-2 | 30 | mg/Kg dw | | 120 | mg/Kg dw |
| AG Property | A5 | 5 | A5-3 | 150 | mg/Kg dw | * | 120 | mg/Kg dw |
| AG Property | A5 | 5 | A5-4 | 26 | mg/Kg dw | | 120 | mg/Kg dw |
| AG Property | A5 | 5 | A5-5 | 180 | mg/Kg dw | * | 120 | mg/Kg dw |
| AG Property | A5 | 5 | A5-6 | 63 | mg/Kg dw | | 120 | mg/Kg dw |
| AG Property | A5 | 5 | A5-7 | 370 | mg/Kg dw | * | 120 | mg/Kg dw |
| AG Property | A5 | 5 | A5-8 | 50 | mg/Kg dw | | 120 | mg/Kg dw |

## Table 1. Examples of Aliquot and Composite Copper Data

| Area | Grid ID | Grid Number | Aliquot ID | Copper (Aliquot) | Unit | Qualifier | Copper (Composite) | Unit |
|---|---|---|---|---|---|---|---|---|
| AG Property | A5 | 5 | A5-9 | 19 | mg/Kg dw | | 120 | mg/Kg dw |
| AG Property | A5 | 5 | A5-10 | 45 | mg/Kg dw | | 120 | mg/Kg dw |
| Biscayne Bay CW | S1 | 6 | S1-A | 45.1 | mg/kg | | 20.9 | mg/kg |
| Biscayne Bay CW | S1 | 6 | S1-B | 8.13 | mg/kg | | 20.9 | mg/kg |
| Biscayne Bay CW | S1 | 6 | S1-C | 12.3 | mg/kg | | 20.9 | mg/kg |
| Biscayne Bay CW | S1 | 6 | S1-D | 9.07 | mg/kg | | 20.9 | mg/kg |
| Biscayne Bay CW | S1 | 6 | S1-E | 5.97 | mg/kg | | 20.9 | mg/kg |
| Biscayne Bay CW | S1 | 6 | S1-F | 5.88 | mg/kg | | 20.9 | mg/kg |
| Biscayne Bay CW | S1 | 6 | S1-G | 20.8 | mg/kg | | 20.9 | mg/kg |
| Biscayne Bay CW | S1 | 6 | S1-H | 2.9 | mg/kg | | 20.9 | mg/kg |
| Biscayne Bay CW | S1 | 6 | S1-I | 13.7 | mg/kg | | 20.9 | mg/kg |
| Biscayne Bay CW | S1 | 6 | S1-J | 11.8 | mg/kg | | 20.9 | mg/kg |
| Biscayne Bay CW | S2 | 7 | S2-A | 6.66 | mg/kg | | 7.35 | mg/kg |
| Biscayne Bay CW | S2 | 7 | S2-B | 12 | mg/kg | | 7.35 | mg/kg |
| Biscayne Bay CW | S2 | 7 | S2-C | 7.42 | mg/kg | | 7.35 | mg/kg |
| Biscayne Bay CW | S2 | 7 | S2-D | 6.13 | mg/kg | | 7.35 | mg/kg |
| Biscayne Bay CW | S2 | 7 | S2-E | 4.36 | mg/kg | | 7.35 | mg/kg |
| Biscayne Bay CW | S2 | 7 | S2-F | 17 | mg/kg | | 7.35 | mg/kg |
| Biscayne Bay CW | S2 | 7 | S2-G | 11.3 | mg/kg | | 7.35 | mg/kg |
| Biscayne Bay CW | S3 | 8 | S3-A | 9.6 | mg/kg | | 6.68 | mg/kg |
| Biscayne Bay CW | S3 | 8 | S3-B | 7.33 | mg/kg | | 6.68 | mg/kg |
| Biscayne Bay CW | S3 | 8 | S3-C | 15.5 | mg/kg | | 6.68 | mg/kg |
| Biscayne Bay CW | S3 | 8 | S3-D | 12.9 | mg/kg | | 6.68 | mg/kg |
| Biscayne Bay CW | S3 | 8 | S3-E | 5.81 | mg/kg | | 6.68 | mg/kg |
| Biscayne Bay CW | S3 | 8 | S3-F | 3.45 | mg/kg | | 6.68 | mg/kg |
| Biscayne Bay CW | S3 | 8 | S3-G | 6.21 | mg/kg | | 6.68 | mg/kg |
| Biscayne Bay CW | S3 | 8 | S3-H | 19.3 | mg/kg | | 6.68 | mg/kg |
| Biscayne Bay CW | S3 | 8 | S3-I | 18.2 | mg/kg | | 6.68 | mg/kg |
| Biscayne Bay CW | S3 | 8 | S3-J | 16 | mg/kg | | 6.68 | mg/kg |
| Biscayne Bay CW | S4 | 9 | S4-A | 6.08 | mg/kg | | 4.18 | mg/kg |
| Biscayne Bay CW | S4 | 9 | S4-B | 5.64 | mg/kg | | 4.18 | mg/kg |
| Biscayne Bay CW | S4 | 9 | S4-C | 4.97 | mg/kg | | 4.18 | mg/kg |
| Biscayne Bay CW | S4 | 9 | S4-D | 3.15 | mg/kg | | 4.18 | mg/kg |
| Biscayne Bay CW | S4 | 9 | S4-E | 3.12 | mg/kg | | 4.18 | mg/kg |
| Biscayne Bay CW | S4 | 9 | S4-F | 2.99 | mg/kg | | 4.18 | mg/kg |
| Biscayne Bay CW | S4 | 9 | S4-G | 4.24 | mg/kg | | 4.18 | mg/kg |
| Biscayne Bay CW | S4 | 9 | S4-H | 13.1 | mg/kg | | 4.18 | mg/kg |
| Biscayne Bay CW | S4 | 9 | S4-I | 13.6 | mg/kg | | 4.18 | mg/kg |
| Biscayne Bay CW | S4 | 9 | S4-J | 13.5 | mg/kg | | 4.18 | mg/kg |
| Biscayne Bay CW | S5 | 10 | S5-A | 15.6 | mg/kg | | 4.1 | mg/kg |
| Biscayne Bay CW | S5 | 10 | S5-B | 21.8 | mg/kg | | 4.1 | mg/kg |
| Biscayne Bay CW | S5 | 10 | S5-C | 12.8 | mg/kg | | 4.1 | mg/kg |
| Biscayne Bay CW | S5 | 10 | S5-D | 6.63 | mg/kg | | 4.1 | mg/kg |
| Biscayne Bay CW | S5 | 10 | S5-E | 2.76 | mg/kg | | 4.1 | mg/kg |
| Biscayne Bay CW | S5 | 10 | S5-F | 6.12 | mg/kg | | 4.1 | mg/kg |
| Biscayne Bay CW | S5 | 10 | S5-G | 4.2 | mg/kg | | 4.1 | mg/kg |
| Biscayne Bay CW | S5 | 10 | S5-H | 2.49 | mg/kg | | 4.1 | mg/kg |
| Biscayne Bay CW | S5 | 10 | S5-I | 2.24 | mg/kg | | 4.1 | mg/kg |

## Table 1. Examples of Aliquot and Composite Copper Data

| Area | Grid ID | Grid Number | Aliquot ID | Copper (Aliquot) | Unit | Qualifier | Copper (Composite) | Unit |
|---|---|---|---|---|---|---|---|---|
| Biscayne Bay CW | S5 | 10 | S5-J | 2.66 | mg/kg | | 4.1 | mg/kg |
| Biscayne Bay CW | S6 | 11 | S6-A | 9.78 | mg/kg | | 5.29 | mg/kg |
| Biscayne Bay CW | S6 | 11 | S6-B | 9.81 | mg/kg | | 5.29 | mg/kg |
| Biscayne Bay CW | S6 | 11 | S6-C | 8.26 | mg/kg | | 5.29 | mg/kg |
| Biscayne Bay CW | S6 | 11 | S6-D | 16.2 | mg/kg | | 5.29 | mg/kg |
| Biscayne Bay CW | S6 | 11 | S6-E | 2.51 | mg/kg | | 5.29 | mg/kg |
| Biscayne Bay CW | S6 | 11 | S6-F | 22.3 | mg/kg | | 5.29 | mg/kg |
| Biscayne Bay CW | S6 | 11 | S6-G | 3.02 | mg/kg | | 5.29 | mg/kg |
| Biscayne Bay CW | S6 | 11 | S6-H | 6.01 | mg/kg | | 5.29 | mg/kg |
| Biscayne Bay CW | S6 | 11 | S6-I | 2.16 | mg/kg | | 5.29 | mg/kg |
| Biscayne Bay CW | S6 | 11 | S6-J | 2.45 | mg/kg | | 5.29 | mg/kg |
| Biscayne Bay CW | S7 | 12 | S7-A | 27 | mg/kg | | 21.8 | mg/kg |
| Biscayne Bay CW | S7 | 12 | S7-B | 29.4 | mg/kg | | 21.8 | mg/kg |
| Biscayne Bay CW | S7 | 12 | S7-C | 25.3 | mg/kg | | 21.8 | mg/kg |
| Biscayne Bay CW | S7 | 12 | S7-D | 18.8 | mg/kg | | 21.8 | mg/kg |
| Biscayne Bay CW | S7 | 12 | S7-E | 26.1 | mg/kg | | 21.8 | mg/kg |
| Biscayne Bay CW | S7 | 12 | S7-F | 24.3 | mg/kg | | 21.8 | mg/kg |
| Biscayne Bay CW | S7 | 12 | S7-G | 23 | mg/kg | | 21.8 | mg/kg |
| Biscayne Bay CW | S7 | 12 | S7-H | 23.2 | mg/kg | | 21.8 | mg/kg |
| Biscayne Bay CW | S7 | 12 | S7-I | 20.7 | mg/kg | | 21.8 | mg/kg |
| Biscayne Bay CW | S7 | 12 | S7-J | 29.2 | mg/kg | | 21.8 | mg/kg |
| Biscayne Bay CW | S8 | 13 | S8-A | 27.2 | mg/kg | | 17.6 | mg/kg |
| Biscayne Bay CW | S8 | 13 | S8-B | 35 | mg/kg | | 17.6 | mg/kg |
| Biscayne Bay CW | S8 | 13 | S8-C | 3.46 | mg/kg | | 17.6 | mg/kg |
| Biscayne Bay CW | S8 | 13 | S8-D | 17 | mg/kg | | 17.6 | mg/kg |
| Biscayne Bay CW | S8 | 13 | S8-E | 15.5 | mg/kg | | 17.6 | mg/kg |
| Biscayne Bay CW | S8 | 13 | S8-F | 14.6 | mg/kg | | 17.6 | mg/kg |
| Biscayne Bay CW | S8 | 13 | S8-G | 15 | mg/kg | | 17.6 | mg/kg |
| Biscayne Bay CW | S9 | 14 | S9-A | 53.6 | mg/kg | | 28.3 | mg/kg |
| Biscayne Bay CW | S9 | 14 | S9-B | 36.6 | mg/kg | | 28.3 | mg/kg |
| Biscayne Bay CW | S9 | 14 | S9-C | 30 | mg/kg | | 28.3 | mg/kg |
| Biscayne Bay CW | S9 | 14 | S9-D | 23.6 | mg/kg | | 28.3 | mg/kg |
| Biscayne Bay CW | S9 | 14 | S9-E | 29.3 | mg/kg | | 28.3 | mg/kg |
| Biscayne Bay CW | S9 | 14 | S9-F | 21.8 | mg/kg | | 28.3 | mg/kg |
| Biscayne Bay CW | S9 | 14 | S9-G | 42.1 | mg/kg | | 28.3 | mg/kg |
| Biscayne Bay CW | S9 | 14 | S9-H | 28.2 | mg/kg | | 28.3 | mg/kg |
| Biscayne Bay CW | S9 | 14 | S9-I | 57.4 | mg/kg | | 28.3 | mg/kg |
| Biscayne Bay CW | S9 | 14 | S9-J | 57.1 | mg/kg | | 28.3 | mg/kg |
| Biscayne Bay CW | S10 | 15 | S10-A | 82.7 | mg/kg | | 7.6 | mg/kg |
| Biscayne Bay CW | S10 | 15 | S10-B | 4.57 | mg/kg | | 7.6 | mg/kg |
| Biscayne Bay CW | S10 | 15 | S10-C | 10.4 | mg/kg | | 7.6 | mg/kg |
| Biscayne Bay CW | S10 | 15 | S10-D | 2.83 | mg/kg | | 7.6 | mg/kg |
| Biscayne Bay CW | S10 | 15 | S10-E | 3.81 | mg/kg | | 7.6 | mg/kg |
| Biscayne Bay CW | S10 | 15 | S10-F | 6.61 | mg/kg | | 7.6 | mg/kg |
| Biscayne Bay CW | S10 | 15 | S10-G | 15.4 | mg/kg | | 7.6 | mg/kg |
| Biscayne Bay CW | S10 | 15 | S10-H | 5.92 | mg/kg | | 7.6 | mg/kg |
| Biscayne Bay CW | S10 | 15 | S10-I | 5.34 | mg/kg | | 7.6 | mg/kg |
| Biscayne Bay CW | S10 | 15 | S10-J | 7.33 | mg/kg | | 7.6 | mg/kg |

## Table 1. Examples of Aliquot and Composite Copper Data

| Area | Grid ID | Grid Number | Aliquot ID | Copper (Aliquot) | Unit | Qualifier | Copper (Composite) | Unit |
|---|---|---|---|---|---|---|---|---|
| Biscayne Bay CW | S11 | 16 | S11-A | 14 | mg/kg | | 10.5 | mg/kg |
| Biscayne Bay CW | S11 | 16 | S11-B | 9.32 | mg/kg | | 10.5 | mg/kg |
| Biscayne Bay CW | S11 | 16 | S11-C | 8.71 | mg/kg | | 10.5 | mg/kg |
| Biscayne Bay CW | S11 | 16 | S11-D | 8.62 | mg/kg | | 10.5 | mg/kg |
| Biscayne Bay CW | S11 | 16 | S11-E | 7.69 | mg/kg | | 10.5 | mg/kg |
| Biscayne Bay CW | S11 | 16 | S11-F | 9.01 | mg/kg | | 10.5 | mg/kg |
| Biscayne Bay CW | S11 | 16 | S11-G | 12 | mg/kg | | 10.5 | mg/kg |
| Biscayne Bay CW | S11 | 16 | S11-H | 6.9 | mg/kg | | 10.5 | mg/kg |
| Biscayne Bay CW | S12 | 17 | S12-A | 4.75 | mg/kg | | 4.95 | mg/kg |
| Biscayne Bay CW | S12 | 17 | S12-B | 4.1 | mg/kg | | 4.95 | mg/kg |
| Biscayne Bay CW | S12 | 17 | S12-C | 19.5 | mg/kg | | 4.95 | mg/kg |
| Biscayne Bay CW | S12 | 17 | S12-D | 5.36 | mg/kg | | 4.95 | mg/kg |
| Biscayne Bay CW | S12 | 17 | S12-E | 5.02 | mg/kg | | 4.95 | mg/kg |
| Biscayne Bay CW | S12 | 17 | S12-F | 4.38 | mg/kg | | 4.95 | mg/kg |
| Biscayne Bay CW | S12 | 17 | S12-G | 6.35 | mg/kg | | 4.95 | mg/kg |
| Biscayne Bay CW | S12 | 17 | S12-H | 3.24 | mg/kg | | 4.95 | mg/kg |
| Biscayne Bay CW | S12 | 17 | S12-I | 11.3 | mg/kg | | 4.95 | mg/kg |
| Biscayne Bay CW | S12 | 17 | S12-J | 9.65 | mg/kg | | 4.95 | mg/kg |
| Biscayne Bay CW | S13 | 18 | S13-A | 4.1 | mg/kg | | 4.89 | mg/kg |
| Biscayne Bay CW | S13 | 18 | S13-B | 4.33 | mg/kg | | 4.89 | mg/kg |
| Biscayne Bay CW | S13 | 18 | S13-C | 6.2 | mg/kg | | 4.89 | mg/kg |
| Biscayne Bay CW | S13 | 18 | S13-D | 3.82 | mg/kg | | 4.89 | mg/kg |
| Biscayne Bay CW | S13 | 18 | S13-E | 6.42 | mg/kg | | 4.89 | mg/kg |
| Biscayne Bay CW | S13 | 18 | S13-F | 6.81 | mg/kg | | 4.89 | mg/kg |
| Biscayne Bay CW | S13 | 18 | S13-G | 4.72 | mg/kg | | 4.89 | mg/kg |
| Biscayne Bay CW | S13 | 18 | S13-H | 3.23 | mg/kg | | 4.89 | mg/kg |
| Biscayne Bay CW | S13 | 18 | S13-I | 5.4 | mg/kg | | 4.89 | mg/kg |
| Biscayne Bay CW | S13 | 18 | S13-J | 26 | mg/kg | | 4.89 | mg/kg |
| Biscayne Bay CW | S14 | 19 | S14-A | 3.46 | mg/kg | | 4.71 | mg/kg |
| Biscayne Bay CW | S14 | 19 | S14-B | 4.71 | mg/kg | | 4.71 | mg/kg |
| Biscayne Bay CW | S14 | 19 | S14-C | 4.65 | mg/kg | | 4.71 | mg/kg |
| Biscayne Bay CW | S14 | 19 | S14-D | 4.23 | mg/kg | | 4.71 | mg/kg |
| Biscayne Bay CW | S14 | 19 | S14-E | 4 | mg/kg | | 4.71 | mg/kg |
| Biscayne Bay CW | S14 | 19 | S14-F | 4.43 | mg/kg | | 4.71 | mg/kg |
| Biscayne Bay CW | S14 | 19 | S14-G | 3.96 | mg/kg | | 4.71 | mg/kg |
| Biscayne Bay CW | S14 | 19 | S14-H | 4.32 | mg/kg | | 4.71 | mg/kg |
| Biscayne Bay CW | S14 | 19 | S14-I | 3.69 | mg/kg | | 4.71 | mg/kg |
| Biscayne Bay CW | S14 | 19 | S14-J | 4.59 | mg/kg | | 4.71 | mg/kg |
| Biscayne Bay CW | S15 | 20 | S15-A | 4.06 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S15 | 20 | S15-B | 4.4 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S15 | 20 | S15-C | 4.69 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S15 | 20 | S15-D | 4.59 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S15 | 20 | S15-E | 4.6 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S15 | 20 | S15-F | 4.24 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S15 | 20 | S15-G | 4.12 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S15 | 20 | S15-H | 3.85 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S15 | 20 | S15-I | 4.39 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S15 | 20 | S15-J | 4.02 | mg/kg | | 4.36 | mg/kg |

## Table 1. Examples of Aliquot and Composite Copper Data

| Area | Grid ID | Grid Number | Aliquot ID | Copper (Aliquot) | Unit | Qualifier | Copper (Composite) | Unit |
|---|---|---|---|---|---|---|---|---|
| Biscayne Bay CW | S16 | 21 | S16-A | 3.41 | mg/kg | | 3.16 | mg/kg |
| Biscayne Bay CW | S16 | 21 | S16-B | 3.8 | mg/kg | | 3.16 | mg/kg |
| Biscayne Bay CW | S16 | 21 | S16-C | 3.64 | mg/kg | | 3.16 | mg/kg |
| Biscayne Bay CW | S16 | 21 | S16-D | 4.01 | mg/kg | | 3.16 | mg/kg |
| Biscayne Bay CW | S16 | 21 | S16-E | 3.08 | mg/kg | | 3.16 | mg/kg |
| Biscayne Bay CW | S16 | 21 | S16-F | 4.1 | mg/kg | | 3.16 | mg/kg |
| Biscayne Bay CW | S16 | 21 | S16-G | 2.58 | mg/kg | | 3.16 | mg/kg |
| Biscayne Bay CW | S16 | 21 | S16-H | 2.54 | mg/kg | U | 3.16 | mg/kg |
| Biscayne Bay CW | S16 | 21 | S16-I | 10.1 | mg/kg | | 3.16 | mg/kg |
| Biscayne Bay CW | S16 | 21 | S16-J | 2.82 | mg/kg | | 3.16 | mg/kg |
| Biscayne Bay CW | S17 | 22 | S17-A | 2.5 | mg/kg | U | 4.36 | mg/kg |
| Biscayne Bay CW | S17 | 22 | S17-B | 2.62 | mg/kg | U | 4.36 | mg/kg |
| Biscayne Bay CW | S17 | 22 | S17-C | 3.44 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S17 | 22 | S17-D | 2.23 | mg/kg | U | 4.36 | mg/kg |
| Biscayne Bay CW | S17 | 22 | S17-E | 3.53 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S17 | 22 | S17-F | 3.5 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S17 | 22 | S17-G | 5.12 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S17 | 22 | S17-H | 5.5 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S17 | 22 | S17-I | 5.11 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S17 | 22 | S17-J | 4.59 | mg/kg | | 4.36 | mg/kg |
| Biscayne Bay CW | S18 | 23 | S18-A | 3.72 | mg/kg | | 4.27 | mg/kg |
| Biscayne Bay CW | S18 | 23 | S18-B | 4.31 | mg/kg | | 4.27 | mg/kg |
| Biscayne Bay CW | S18 | 23 | S18-C | 5.2 | mg/kg | | 4.27 | mg/kg |
| Biscayne Bay CW | S18 | 23 | S18-D | 4.61 | mg/kg | | 4.27 | mg/kg |
| Biscayne Bay CW | S18 | 23 | S18-E | 4.75 | mg/kg | | 4.27 | mg/kg |
| Biscayne Bay CW | S18 | 23 | S18-F | 4.7 | mg/kg | | 4.27 | mg/kg |
| Biscayne Bay CW | S18 | 23 | S18-G | 4.46 | mg/kg | | 4.27 | mg/kg |
| Biscayne Bay CW | S18 | 23 | S18-H | 4.88 | mg/kg | | 4.27 | mg/kg |
| Biscayne Bay CW | S18 | 23 | S18-I | 4.48 | mg/kg | | 4.27 | mg/kg |
| Biscayne Bay CW | S18 | 23 | S18-J | 4.42 | mg/kg | | 4.27 | mg/kg |
| Biscayne Bay CW | S19 | 24 | S19-A | 4.61 | mg/kg | | 4.41 | mg/kg |
| Biscayne Bay CW | S19 | 24 | S19-B | 5.08 | mg/kg | | 4.41 | mg/kg |
| Biscayne Bay CW | S19 | 24 | S19-C | 5 | mg/kg | | 4.41 | mg/kg |
| Biscayne Bay CW | S19 | 24 | S19-D | 4.72 | mg/kg | | 4.41 | mg/kg |
| Biscayne Bay CW | S19 | 24 | S19-E | 5.21 | mg/kg | | 4.41 | mg/kg |
| Biscayne Bay CW | S19 | 24 | S19-F | 5.03 | mg/kg | | 4.41 | mg/kg |
| Biscayne Bay CW | S19 | 24 | S19-G | 5.36 | mg/kg | | 4.41 | mg/kg |
| Biscayne Bay CW | S19 | 24 | S19-H | 5.55 | mg/kg | | 4.41 | mg/kg |
| Biscayne Bay CW | S19 | 24 | S19-I | 5 | mg/kg | | 4.41 | mg/kg |
| Biscayne Bay CW | S19 | 24 | S19-J | 4.33 | mg/kg | | 4.41 | mg/kg |
| Conley | C2 | 25 | C2-1 | 120 | mg/Kg dw | V | 96 | mg/Kg dw |
| Conley | C2 | 25 | C2-2 | 11 | mg/Kg dw | V | 96 | mg/Kg dw |
| Conley | C2 | 25 | C2-3 | 78 | mg/Kg dw | V | 96 | mg/Kg dw |
| Conley | C2 | 25 | C2-4 | 220 | mg/Kg dw | V | 96 | mg/Kg dw |
| Conley | C2 | 25 | C2-5 | 110 | mg/Kg dw | V | 96 | mg/Kg dw |
| Conley | C2 | 25 | C2-6 | 180 | mg/Kg dw | V | 96 | mg/Kg dw |
| Conley | C2 | 25 | C2-7 | 64 | mg/Kg dw | V | 96 | mg/Kg dw |
| Conley | C2 | 25 | C2-8 | 180 | mg/Kg dw | V | 96 | mg/Kg dw |

## Table 1. Examples of Aliquot and Composite Copper Data

| Area | Grid ID | Grid Number | Aliquot ID | Copper (Aliquot) | Unit | Qualifier | Copper (Composite) | Unit |
|---|---|---|---|---|---|---|---|---|
| Conley | C2 | 25 | C2-9 | 57 | mg/Kg dw | V | 96 | mg/Kg dw |
| Conley | C2 | 25 | C2-10 | 52 | mg/Kg dw | V | 96 | mg/Kg dw |
| Conley | C4 | 26 | C4-1 | 93 | mg/Kg dw | V | 87 | mg/Kg dw |
| Conley | C4 | 26 | C4-2 | 81 | mg/Kg dw | V | 87 | mg/Kg dw |
| Conley | C4 | 26 | C4-3 | 90 | mg/Kg dw | V | 87 | mg/Kg dw |
| Conley | C4 | 26 | C4-4 | 75 | mg/Kg dw | V | 87 | mg/Kg dw |
| Conley | C4 | 26 | C4-5 | 69 | mg/Kg dw | V | 87 | mg/Kg dw |
| Conley | C4 | 26 | C4-6 | 48 | mg/Kg dw | V | 87 | mg/Kg dw |
| Conley | C4 | 26 | C4-7 | 40 | mg/Kg dw | V | 87 | mg/Kg dw |
| Conley | C4 | 26 | C4-8 | 31 | mg/Kg dw | V | 87 | mg/Kg dw |
| Conley | C4 | 26 | C4-9 | 75 | mg/Kg dw | V | 87 | mg/Kg dw |
| Conley | C4 | 26 | C4-10 | 51 | mg/Kg dw | V | 87 | mg/Kg dw |
| Graves | 25GC | 27 | 36G | 98 | mg/kg | | 110 | mg/kg |
| Graves | 25GC | 27 | 32G | 68 | mg/kg | | 110 | mg/kg |
| Graves | 25GC | 27 | 28G | 270 | mg/kg | | 110 | mg/kg |
| Graves | 25GC | 27 | 33G | 89 | mg/kg | | 110 | mg/kg |
| Graves | 25GC | 27 | 29G | 98 | mg/kg | | 110 | mg/kg |
| Graves | 25GC | 27 | 25G | 160 | mg/kg | | 110 | mg/kg |
| Graves | 25GC | 27 | 26G | 190 | mg/kg | | 110 | mg/kg |
| Graves | 25GC | 27 | 30G | 120 | mg/kg | | 110 | mg/kg |
| Graves | 25GC | 27 | 34G | 98 | mg/kg | | 110 | mg/kg |
| Graves | 25GC | 27 | 35G | 55 | mg/kg | | 110 | mg/kg |
| Graves | 25GC | 27 | 31G | 83 | mg/kg | | 110 | mg/kg |
| Graves | 25GC | 27 | 27G | 190 | mg/kg | | 110 | mg/kg |
| L31 N | 046 | 28 | 046-A | 100 | mg/kg | | 160 | mg/kg |
| L31 N | 046 | 28 | 046-B | 190 | mg/kg | | 160 | mg/kg |
| L31 N | 046 | 28 | 046-C | 500 | mg/kg | | 160 | mg/kg |
| L31 N | 046 | 28 | 046-D | 420 | mg/kg | | 160 | mg/kg |
| L31 N | 046 | 28 | 046-E | 180 | mg/kg | | 160 | mg/kg |
| L31 N | 046 | 28 | 046-F | 130 | mg/kg | | 160 | mg/kg |
| L31 N | 046 | 28 | 046-G | 210 | mg/kg | | 160 | mg/kg |
| L31 N | 046 | 28 | 046-H | 130 | mg/kg | | 160 | mg/kg |
| L31 N | 046 | 28 | 046-I | 130 | mg/kg | | 160 | mg/kg |
| L31 N | 046 | 28 | 046-J | 87 | mg/kg | | 160 | mg/kg |
| MacArthur | M22 | 29 | 13M | 39 | mg/kg | | 100 | mg/kg |
| MacArthur | M22 | 29 | 14M | 83 | mg/kg | | 100 | mg/kg |
| MacArthur | M22 | 29 | 15M | 39 | mg/kg | | 100 | mg/kg |
| MacArthur | M22 | 29 | 16M | 84 | mg/kg | | 100 | mg/kg |
| MacArthur | M22 | 29 | 17M | 99 | mg/kg | | 100 | mg/kg |
| MacArthur | M22 | 29 | 18M | 56 | mg/kg | | 100 | mg/kg |
| MacArthur | M22 | 29 | 19M | 48 | mg/kg | | 100 | mg/kg |
| MacArthur | M22 | 29 | 20M | 49 | mg/kg | | 100 | mg/kg |
| MacArthur | M22 | 29 | 21M | 52 | mg/kg | | 100 | mg/kg |
| MacArthur | M22 | 29 | 22M | 37 | mg/kg | | 100 | mg/kg |
| MacArthur | M23 | 30 | 23M | 120 | mg/kg | | 120 | mg/kg |
| MacArthur | M23 | 30 | 24M | 130 | mg/kg | | 120 | mg/kg |
| MacArthur | M23 | 30 | 25M | 130 | mg/kg | | 120 | mg/kg |
| MacArthur | M23 | 30 | 26M | 51 | mg/kg | | 120 | mg/kg |

## Table 1. Examples of Aliquot and Composite Copper Data

| Area | Grid ID | Grid Number | Aliquot ID | Copper (Aliquot) | Unit | Qualifier | Copper (Composite) | Unit |
|---|---|---|---|---|---|---|---|---|
| MacArthur | M23 | 30 | 27M | 130 | mg/kg | | 120 | mg/kg |
| MacArthur | M23 | 30 | 28M | 74 | mg/kg | | 120 | mg/kg |
| MacArthur | M23 | 30 | 29M | 83 | mg/kg | | 120 | mg/kg |
| MacArthur | M23 | 30 | 30M | 52 | mg/kg | | 120 | mg/kg |
| MacArthur | M23 | 30 | 31M | 73 | mg/kg | | 120 | mg/kg |
| MacArthur | M23 | 30 | 32M | 180 | mg/kg | | 120 | mg/kg |
| MacArthur | M55 | 31 | 53M | 42 | mg/kg | | 60 | mg/kg |
| MacArthur | M55 | 31 | 54M | 29 | mg/kg | | 60 | mg/kg |
| MacArthur | M55 | 31 | 55M | 55 | mg/kg | | 60 | mg/kg |
| MacArthur | M55 | 31 | 56M | 49 | mg/kg | | 60 | mg/kg |
| MacArthur | M55 | 31 | 57M | 58 | mg/kg | | 60 | mg/kg |
| MacArthur | M55 | 31 | 58M | 47 | mg/kg | | 60 | mg/kg |
| MacArthur | M55 | 31 | 59M | 36 | mg/kg | | 60 | mg/kg |
| MacArthur | M55 | 31 | 60M | 30 | mg/kg | | 60 | mg/kg |
| MacArthur | M55 | 31 | 61M | 13 | mg/kg | | 60 | mg/kg |
| MacArthur | M55 | 31 | 62M | 35 | mg/kg | | 60 | mg/kg |
| MacArthur | M117 | 32 | 113M | 31 | mg/kg | | 100 | mg/kg |
| MacArthur | M117 | 32 | 114M | 57 | mg/kg | | 100 | mg/kg |
| MacArthur | M117 | 32 | 115M | 320 | mg/kg | | 100 | mg/kg |
| MacArthur | M117 | 32 | 116M | 53 | mg/kg | | 100 | mg/kg |
| MacArthur | M117 | 32 | 117M | 18 | mg/kg | | 100 | mg/kg |
| MacArthur | M117 | 32 | 118M | 31 | mg/kg | | 100 | mg/kg |
| MacArthur | M117 | 32 | 119M | 75 | mg/kg | | 100 | mg/kg |
| MacArthur | M117 | 32 | 120M | 140 | mg/kg | | 100 | mg/kg |
| MacArthur | M117 | 32 | 121M | 100 | mg/kg | | 100 | mg/kg |
| MacArthur | M117 | 32 | 122M | 34 | mg/kg | | 100 | mg/kg |
| Marcott | M1 | 33 | M1-1 | 15 | mg/Kg dw | V | 120 | mg/Kg dw |
| Marcott | M1 | 33 | M1-2 | 100 | mg/Kg dw | V | 120 | mg/Kg dw |
| Marcott | M1 | 33 | M1-3 | 99 | mg/Kg dw | V | 120 | mg/Kg dw |
| Marcott | M1 | 33 | M1-4 | 130 | mg/Kg dw | V | 120 | mg/Kg dw |
| Marcott | M1 | 33 | M1-5 | 150 | mg/Kg dw | V | 120 | mg/Kg dw |
| Marcott | M1 | 33 | M1-6 | 25 | mg/Kg dw | V | 120 | mg/Kg dw |
| Marcott | M1 | 33 | M1-7 | 51 | mg/Kg dw | V | 120 | mg/Kg dw |
| Marcott | M1 | 33 | M1-8 | 46 | mg/Kg dw | V | 120 | mg/Kg dw |
| Marcott | M1 | 33 | M1-9 | 57 | mg/Kg dw | V | 120 | mg/Kg dw |
| Marcott | M1 | 33 | M1-10 | 65 | mg/Kg dw | | 120 | mg/Kg dw |
| Marcott | M2 | 34 | M2-1 | 45 | mg/Kg dw | | 89 | mg/Kg dw |
| Marcott | M2 | 34 | M2-2 | 33 | mg/Kg dw | | 89 | mg/Kg dw |
| Marcott | M2 | 34 | M2-3 | 66 | mg/Kg dw | | 89 | mg/Kg dw |
| Marcott | M2 | 34 | M2-4 | 56 | mg/Kg dw | | 89 | mg/Kg dw |
| Marcott | M2 | 34 | M2-5 | 45 | mg/Kg dw | | 89 | mg/Kg dw |
| Marcott | M2 | 34 | M2-6 | 15 | mg/Kg dw | | 89 | mg/Kg dw |
| Marcott | M2 | 34 | M2-7 | 14 | mg/Kg dw | | 89 | mg/Kg dw |
| Marcott | M2 | 34 | M2-8 | 48 | mg/Kg dw | | 89 | mg/Kg dw |
| Marcott | M2 | 34 | M2-9 | 16 | mg/Kg dw | | 89 | mg/Kg dw |
| Marcott | M2 | 34 | M2-10 | 29 | mg/Kg dw | | 89 | mg/Kg dw |
| Marcott | M3 | 35 | M3-1 | 57 | mg/Kg dw | | 86 | mg/Kg dw |
| Marcott | M3 | 35 | M3-2 | 88 | mg/Kg dw | | 86 | mg/Kg dw |

## Table 1. Examples of Aliquot and Composite Copper Data

| Area | Grid ID | Grid Number | Aliquot ID | Copper (Aliquot) | Unit | Qualifier | Copper (Composite) | Unit |
|---|---|---|---|---|---|---|---|---|
| Marcott | M3 | 35 | M3-3 | 33 | mg/Kg dw | | 86 | mg/Kg dw |
| Marcott | M3 | 35 | M3-4 | 60 | mg/Kg dw | | 86 | mg/Kg dw |
| Marcott | M3 | 35 | M3-5 | 21 | mg/Kg dw | | 86 | mg/Kg dw |
| Marcott | M3 | 35 | M3-6 | 51 | mg/Kg dw | | 86 | mg/Kg dw |
| Marcott | M3 | 35 | M3-7 | 43 | mg/Kg dw | V | 86 | mg/Kg dw |
| Marcott | M3 | 35 | M3-8 | 98 | mg/Kg dw | V | 86 | mg/Kg dw |
| Marcott | M3 | 35 | M3-9 | 45 | mg/Kg dw | V | 86 | mg/Kg dw |
| Marcott | M3 | 35 | M3-10 | 24 | mg/Kg dw | V | 86 | mg/Kg dw |
| Marcott | M4 | 36 | M4-1 | 59 | mg/Kg dw | V | 210 | mg/Kg dw |
| Marcott | M4 | 36 | M4-2 | 1.2 | mg/Kg dw | V | 210 | mg/Kg dw |
| Marcott | M4 | 36 | M4-3 | 96 | mg/Kg dw | V | 210 | mg/Kg dw |
| Marcott | M4 | 36 | M4-4 | 4 | mg/Kg dw | V | 210 | mg/Kg dw |
| Marcott | M4 | 36 | M4-5 | 22 | mg/Kg dw | V | 210 | mg/Kg dw |
| Marcott | M4 | 36 | M4-6 | 19 | mg/Kg dw | V | 210 | mg/Kg dw |
| Marcott | M4 | 36 | M4-7 | 18 | mg/Kg dw | V | 210 | mg/Kg dw |
| Marcott | M4 | 36 | M4-8 | 80 | mg/Kg dw | V | 210 | mg/Kg dw |
| Marcott | M4 | 36 | M4-9 | 23 | mg/Kg dw | V | 210 | mg/Kg dw |
| Marcott | M4 | 36 | M4-10 | 31 | mg/Kg dw | V | 210 | mg/Kg dw |
| Tetley | TC | 37 | 1T | 36 | mg/kg | | 40 | mg/kg |
| Tetley | TC | 37 | 3T | 54 | mg/kg | | 40 | mg/kg |
| Tetley | TC | 37 | 5T | 24 | mg/kg | | 40 | mg/kg |
| Tetley | TC | 37 | 7T | 21 | mg/kg | | 40 | mg/kg |
| Tetley | TC | 37 | 9T | 23 | mg/kg | | 40 | mg/kg |
| Tetley | TC | 37 | 10T | 85 | mg/kg | | 40 | mg/kg |
| Tetley | TC | 37 | 11T | 24 | mg/kg | | 40 | mg/kg |
| Tetley | TC | 37 | 12T | 42 | mg/kg | | 40 | mg/kg |

## Table 2. Determination of Copper Trigger Levels Using Different Ecological Benchmarks

| Benchmark | Rate of Aliquots Exceeding Benchmark | | | | | |
|---|---|---|---|---|---|---|
| | 85 ppm | | TEC (31.6 ppm) | | PEC (149 ppm) | |
| Copper (Composite in ppm) | Individual Grid Rate | Ascending Grid Average | Individual Grid Rate | Ascending Grid Average | Individual Grid Rate | Ascending Grid Average |
| 3.16 | 0% | 0% | 0% | 0% | 0% | 0% |
| 4.1 | 0% | 0% | 0% | 0% | 0% | 0% |
| 4.18 | 0% | 0% | 0% | 0% | 0% | 0% |
| 4.27 | 0% | 0% | 0% | 0% | 0% | 0% |
| 4.36 | 0% | 0% | 0% | 0% | 0% | 0% |
| 4.36 | 0% | 0% | 0% | 0% | 0% | 0% |
| 4.41 | 0% | 0% | 0% | 0% | 0% | 0% |
| 4.71 | 0% | 0% | 0% | 0% | 0% | 0% |
| 4.89 | 0% | 0% | 0% | 0% | 0% | 0% |
| 4.95 | 0% | 0% | 0% | 0% | 0% | 0% |
| 5.29 | 0% | 0% | 0% | 0% | 0% | 0% |
| 6.68 | 0% | 0% | 0% | 0% | 0% | 0% |
| 7.35 | 0% | 0% | 0% | 0% | 0% | 0% |
| 7.6 | 0% | 0% | 10% | 1% | 0% | 0% |
| 10.5 | 0% | 0% | 0% | 1% | 0% | 0% |
| 17.6 | 0% | 0% | 14% | 2% | 0% | 0% |
| 20.9 | 0% | 0% | 10% | 2% | 0% | 0% |
| 21.8 | 0% | 0% | 0% | 2% | 0% | 0% |
| 28.3 | 0% | 0% | 50% | 4% | 0% | 0% |
| 40 | 0% | 0% | 50% | 7% | 0% | 0% |
| 60 | 0% | 0% | 70% | 10% | 0% | 0% |
| 86 | 0% | 0% | 70% | 12% | 0% | 0% |
| 86 | 20% | 1% | 80% | 15% | 0% | 0% |
| 87 | 20% | 2% | 90% | 19% | 0% | 0% |
| 89 | 0% | 2% | 60% | 20% | 0% | 0% |
| 90 | 20% | 2% | 60% | 22% | 10% | 0% |
| 95 | 30% | 3% | 100% | 25% | 20% | 1% |
| 96 | 50% | 5% | 90% | 27% | 30% | 2% |
| 97 | 40% | 6% | 80% | 29% | 10% | 2% |
| 100 | 30% | 7% | 70% | 30% | 10% | 3% |
| 100 | 10% | 7% | 100% | 32% | 0% | 3% |
| 110 | 75% | 9% | 100% | 35% | 33% | 4% |
| 120 | 40% | 10% | 70% | 36% | 30% | 4% |
| 120 | 40% | 11% | 80% | 37% | 10% | 5% |
| 120 | 50% | 12% | 100% | 39% | 10% | 5% |
| 160 | 100% | 15% | 100% | 40% | 50% | 6% |
| 210 | 10% | 14% | 30% | 40% | 0% | 6% |
| **Lower Bound of Trigger Level** | **95** | | **28.3** | | **120** | |

**Note: Composite values corresponding to the highlighted cells define the bounds of the trigger value for the given benchmark based on a cutoff exceedance rate of 5%**

**Table 3. Descriptive Statistics of Aliquot and Composite Copper Data**

| Parameters | Aliquot | Composite |
|---|---|---|
| Count | 362 | 37 |
| Minimum | 1.2 | 3.2 |
| Maximum | 500.0 | 210.0 |
| Mean | 44.7 | 55.0 |
| Std. Deviation | 61.6 | 54.5 |
| Std. Error | 3.2 | 9.0 |
| 95%UCL of Mean | 50.0 | 70.1 |

## Table 4
## Florida SQAGs and TEC/PEC Ratio

*from: Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. FDEP 2003*

| Chemical | TEC | PEC | TEC/PEC |
|---|---|---|---|
| Arsenic | 9.8 | 33 | 0.3 |
| Barium | 20 | 60 | 0.33 |
| Beryllium | NG | NG | -- |
| Boron | NG | NG | -- |
| Cadmium | 1 | 5 | 0.2 |
| Chromium | 43 | 110 | 0.39 |
| Cobalt | 50 | NG | -- |
| Copper | 32 | 150 | 0.21 |
| Lead | 36 | 130 | 0.28 |
| Mercury | 0.18 | 1.1 | 0.16 |
| Nickel | 23 | 49 | 0.47 |
| Silver | 1 | 2.2 | 0.45 |
| Strontium | NG | NG | -- |
| Titanium | NG | NG | -- |
| Zinc | 120 | 460 | 0.26 |
| Zircon | NG | NG | -- |
| Acenaphthene | 6.7 | 89 | 0.08 |
| Acenaphthylene | 5.9 | 130 | 0.05 |
| Anthracene | 57 | 850 | 0.07 |
| Fluorene | 77 | 540 | 0.14 |
| Naphthalene | 180 | 560 | 0.32 |
| Phenanthrene | 200 | 1200 | 0.17 |
| Benz[a]anthracene | 110 | 1100 | 0.1 |
| Benzo(a)pyrene | 150 | 1500 | 0.1 |
| Chrysene | 170 | 1300 | 0.13 |
| Dibenz[a,h]anthracene | 33 | 140 | 0.24 |
| Fluoranthene | 420 | 2200 | 0.19 |
| Pyrene | 200 | 1500 | 0.13 |
| Total PAHs | 1600 | 23000 | 0.07 |
| Total PCBs | 60 | 680 | 0.09 |
| Hexachlorobenzene (HCB) | 20 | 240 | 0.08 |
| Hexachlorobutadiene (HCBD) | 55 | 550 | 0.1 |
| Bis(2-ethylhexyl)phthalate | 180 | 2600 | 0.07 |
| Dimethyl Phthalate | NG | NG | -- |
| Diethyl Phthalate | 630 | NG | -- |
| Di-n-butyl Phthalate | NG | 43 | -- |
| Chlordane | 3.2 | 18 | 0.18 |
| Dieldrin | 1.9 | 62 | 0.03 |
| Sum DDD | 4.9 | 28 | 0.18 |
| Sum DDE | 3.2 | 31 | 0.1 |
| Sum DDT | 4.2 | 63 | 0.07 |
| Total DDTs | 5.3 | 570 | 0.01 |
| Endrin | 2.2 | 210 | 0.01 |

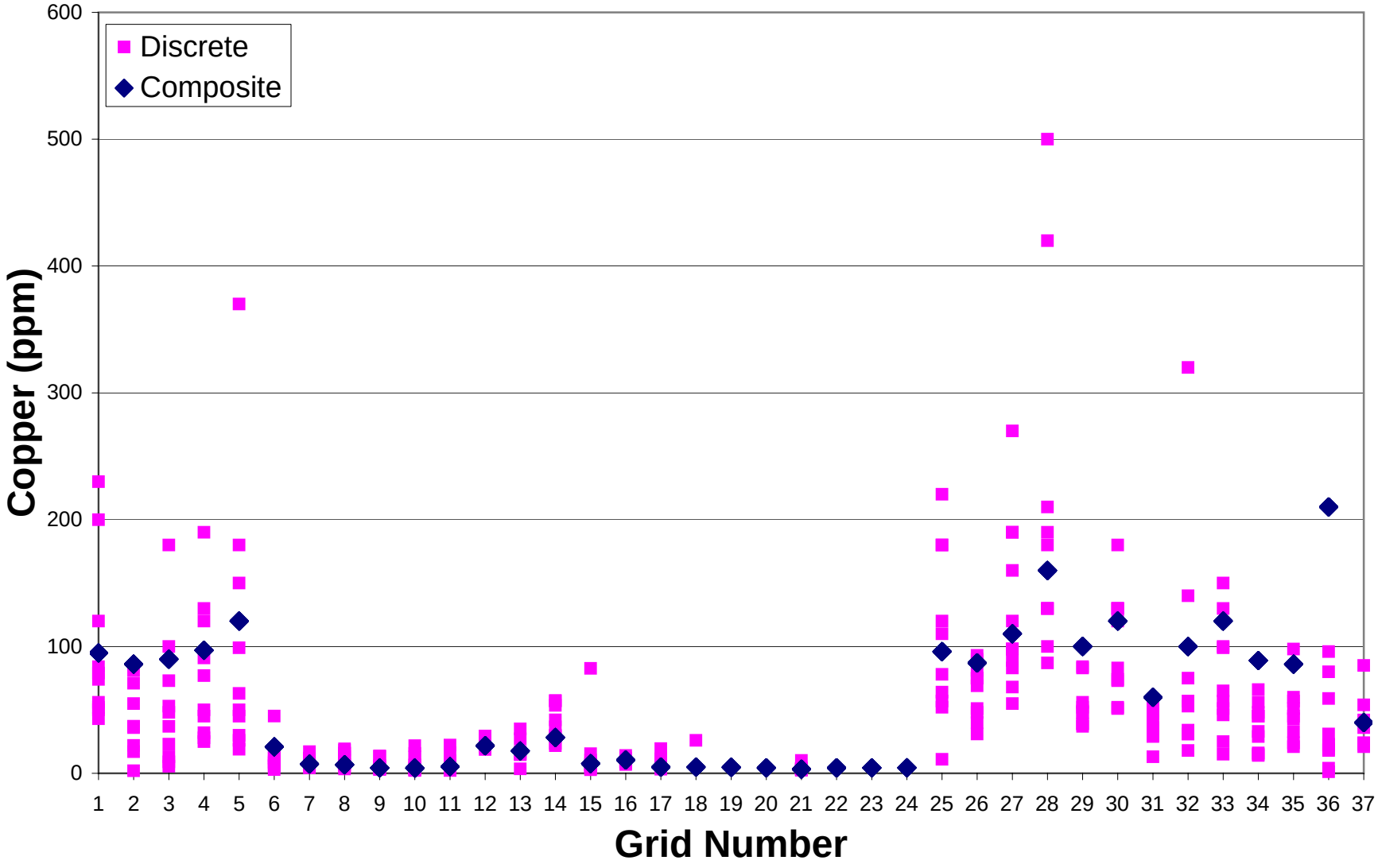
## Table 4
## Florida SQAGs and TEC/PEC Ratio

*from: Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. FDEP 2003*

| Chemical | TEC | PEC | TEC/PEC |
|---|---|---|---|
| Heptachlor Epoxide | 2.5 | 16 | 0.16 |
| Lindane | 2.4 | 5 | 0.48 |
| Azinphos-ethyl | 0.018 | NG | -- |
| Azinphos-methyl | 0.062 | NG | -- |
| Diazinon | 0.38 | NG | -- |
| Ethion | NG | NG | -- |
| Malathion | 0.67 | NG | -- |
| Methidathion | NG | NG | -- |
| Phosmet | NG | NG | -- |
| Phosphamidon | NG | NG | -- |
| Phoxim | 0.06 | NG | -- |
| Pyrazophos | 0.015 | NG | -- |

# Figures

**Figure 1. Examples of Composite and Discrete Aliquot Copper Data**



**Attachment A**
**Exerpted Tables from:**

*Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. (FDEP 2003)*

**Table 4.8. Incidence of toxicity within ranges of contaminant concentrations defined by the sediment quality guidelines (SQGs; from MacDonald *et al.* 2000a)**

| Substance | Number of Samples Evaluated | Incidence of Toxicity (number of samples in parenthesis) | | |
|---|---|---|---|---|
| | | ≤TEC | TEC-PEC | >PEC |
| ***Metals*** | | | | |
| Arsenic | 150 | 25.9% (15 of 58) | 57.6% (38 of 66) | 76.9% (20 of 26) |
| Cadmium | 347 | 19.6% (20 of 102) | 44.6% (29 of 65) | 93.7% (118 of 126) |
| Chromium | 347 | 28% (37 of 132) | 64.4% (38 of 59) | 91.7% (100 of 109) |
| Copper | 347 | 17.7% (28 of 158) | 64.0% (48 of 75) | 91.8% (101 of 110) |
| Lead | 347 | 18.4% (28 of 152) | 53.6% (37 of 69) | 89.6% (112 of 125) |
| Mercury | 79 | 65.7% (23 of 35) | 70.0% (28 of 40) | 100% (4 of 4) |
| Nickel | 347 | 27.7% (51 of 184) | 62.7% (32 of 51) | 90.6% (87 of 96) |
| Zinc | 347 | 18.4% (30 of 163) | 60.9% (39 of 64) | 90.0% (108 of 120) |
| ***Polycyclic Aromatic Hydrocarbons (PAHs)*** | | | | |
| Anthracene | 129 | 17.3% (13 of 75) | 92.9% (26 of 28) | 100% (13 of 13) |
| Fluorene | 129 | 29% (27 of 93) | 85.7% (12 of 14) | 100% (13 of 13) |
| Naphthalene | 139 | 24.7% (21 of 85) | 94.1% (16 of 17) | 92.3% (24 of 26) |
| Phenanthrene | 139 | 17.7% (14 of 79) | 88.2% (30 of 34) | 100% (25 of 25) |
| Benz[a]anthracene | 139 | 17.1% (13 of 76) | 70% (14 of 20) | 100% (20 of 20) |
| Benzo(a)pyrene | 139 | 18.5% (15 of 81) | 75.7% (28 of 37) | 100% (24 of 24) |
| Chrysene | 139 | 20% (16 of 80) | 68.1% (32 of 47) | 95.8% (23 of 24) |
| Fluoranthene | 139 | 25% (24 of 96) | 82.5% (33 of 40) | 100% (15 of 15) |
| Pyrene | 139 | 20.5% (16 of 78) | 63.0% (29 of 46) | 96.4% (27 of 28) |
| Total PAHs | 167 | 18.5% (15 of 81) | 65.1% (43 of 66) | 100% (20 of 20) |
| ***Polychlorinated Biphenyls (PCBs)*** | | | | |
| Total PCBs | 120 | 11.1% (3 of 27) | 31.0% (9 of 29) | 82.3% (42 of 51) |
| ***Organochlorine Pesticides*** | | | | |
| Chlordane | 193 | 14.9% (15 of 101) | 75.0% (15 of 20) | 73.0% (27 of 37) |
| Dieldrin | 180 | 16.5% (18 of 109) | 95.2% (20 of 21) | 100% (10 of 10) |
| Sum DDD | 168 | 19.8% (20 of 101) | 33.3% (1 of 3) | 83.3% (5 of 6) |
| Sum DDE | 180 | 18.1% (19 of 105) | 33.3% (1 of 3) | 96.7% (29 of 30) |
| Sum DDT | 96 | 23% (23 of 100) | 0.0% (0 of 1) | 91.7% (11 of 12) |
| Total DDT | 110 | 17.4% (16 of 92) | 100% (23 of 23) | 100% (10 of 10) |
| Endrin | 170 | 29.4% (37 of 126) | 40.0% (4 of 10) | NA% (0 of 0) |
| Heptachlor Epoxide | 138 | 17.8% (16 of 90) | 85.0% (17 of 20) | 37.5% (3 of 8) |
| Lindane | 180 | 28.1% (34 of 121) | 65.9% (29 of 44) | 82.4% (14 of 17) |

NA = not applicable; TEC = threshold effect concentration; PEC = probable effect concentration.

**Table 4.10. Incidence of sediment toxicity within ranges of mean PEC-Qs for sediments from Florida and elsewhere in the southeastern portion of the United States.**

| Toxicity Test - Endpoint | n | Avg mean Q | Incidence of Toxicity (number of samples in parentheses) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | <0.1 | 0.1 to <0.5 | 0.5 to <1.0 | 1.0 to <5.0 | ≥1.0 | ≥5.0 |
| 10-d *Hyalella azteca* survival | 522 | 0.379 | 13% (15 of 116) | 15% (51 of 339) | 30% (14 of 46) | 33% (6 of 18) | 38% (8 of 21) | 67% (2 of 3) |
| 10-d *Hyalella azteca* survival or growth | 522 | 0.379 | 13% (15 of 116) | 16% (54 of 339) | 37% (17 of 46) | 39% (7 of 18) | 48% (10 of 21) | 100% (3 of 3) |
| 28-42-d *Hyalella azteca* survival | 174 | 0.549 | 8% (4 of 53) | 13% (11 of 87) | 43% (10 of 23) | 38% (3 of 8) | 45% (5 of 11) | 67% (2 of 3) |
| 28-42-d *Hyalella azteca* survival or growth | 174 | 0.549 | 13% (7 of 53) | 24% (21 of 87) | 52% (12 of 23) | 38% (3 of 8) | 45% (5 of 11) | 67% (2 of 3) |
| 10-d *Chironomus tentans* survival | 133 | 0.391 | 19% (5 of 26) | 7% (7 of 94) | 0% (0 of 9) | 0% (0 of 3) | 0% (0 of 4) | 0% (0 of 1) |
| 10-d *Chironomus tentans* survival or growth | 133 | 0.391 | 23% (6 of 26) | 9% (8 of 94) | 33% (3 of 9) | 67% (2 of 3) | 75% (3 of 4) | 100% (1 of 1) |
| **Overall Toxicity** | 643 | 0.381 | 18% (27 of 150) | 18% (73 of 406) | 43% (26 of 61) | 36% (8 of 22) | 42% (11 of 26) | 75% (3 of 4) |

n = number of samples; PEC-Q = probable effects concentration quotient.

# ATTACHMENT 1

## PROTOCOL FOR ASSESSMENT, REMEDIATION AND POST-REMEDIATION MONITORING FOR ENVIRONMENTAL CONTAMINANTS ON EVERGLADES RESTORATION PROJECTS

### A. Contamination Assessment

1. *Phase I Environmental Site Assessment*

The Phase I Environmental Site Assessment (Phase I) is performed in accordance with the American Society of Testing and Materials (ASTM) Standard Practice E1527-00, "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process." The purpose of the Phase I is to identify the presence or likely presence of any hazardous substance or petroleum product on the property. Phase I should provide all available information on current and past land use, and consists of the following elements:

a. Site Inspection

The site inspection usually consists of walking, driving, and/or flying over the property to visually ascertain the presence of features or indicators of past land uses and possible environmental contaminants. A checklist of such indicators includes, but is not limited to, dumps, drums, construction debris, fills, unusual chemical odors, above ground and underground storage tanks, chemical storage buildings, asbestos evidence, "stressed" vegetation or bare ground, "sterile" water bodies, oiled roads, stained or discolored ground or stream banks, oil slicks, air strips, maintenance areas, pipelines, transformers or other electrical equipment, oil and gas drilling, and mining activities.

b. Historical Considerations

The historical review should include interviews with current owners, previous owners, and neighbors to obtain an accurate history of past land uses, farming practices, pesticide usage, etc. Aerial photographs should be reviewed for evidence of row crops and other agricultural, commercial or industrial activities. At a minimum, the historical review should include reliable information on (1) farming practices (e.g., row crops, sugarcane, citrus, sod farm, ornamentals, grazing), (2) exact location of these practices on the property, and (3) farming chronology. For example, row cropping on a portion of the property during the period from the 1940s to the mid-1980s is strong suggestive evidence for the presence of organochlorine (OC) pesticides at that location.

c. Review of Environmental Databases

An extensive review of environmental databases (Comprehensive Environmental Response, Compensation, and Liability Information System; Resource Conservation and Recovery Information System; National Priorities List; Emergency Response Notification System;

state Above Ground and Underground Storage Tank records; Solid Waste Facility and Landfill Report; Florida State Hazardous Waste Site list; Facility Index System/Identification Initiative Program Summary Report; Formerly Used Defense Sites; and local mosquito control districts) should be conducted.

Information gleaned from the Phase I assessment is used to determine the necessity of a Phase II assessment.

2. *Phase II Environmental Site Assessment*

Should information from the Phase I or other credible sources (i.e., previous investigations) indicate the presence of contamination or that the potential for contamination exists, a Phase II Environmental Site Assessment (Phase II) should be initiated. Coordination between FWS and the agency performing the assessment is important starting at this point and throughout the rest of the process. Coordination will be facilitated by providing FWS with a Phase II Scope of Work (SOW) or proposal for review. The proposal should describe in detail the sampling plan (number, media, and location of samples), sample collection methods, analytical parameters, quality control/quality assurance (QA/QC) plan, standards and/or ecological screening criteria to be used for comparison, contingency for expanded sampling, and screening level risk assessment procedures, if applicable. The environmental laboratory to perform chemical analyses should be EPA certified, maintain a rigorous QA/QC program, and achieve laboratory detection limits consistent with state and federally approved ecological screening values and water/soil quality standards. More detail on sampling procedures and analytical requirements is provided in the following section. The selection of a credible laboratory is one of the highest priorities in the site assessment process.

The purpose of the Phase II is to identify sources and locations of contamination, specify contaminants of potential concern (both human health and ecological), and provide recommendations for additional sampling, testing, or risk assessment; and corresponding corrective actions. The focus of the Phase II is generally on facilities and potential point sources on the property, which includes: mixing/loading areas, storage sheds, vehicle turn-around areas, airstrips, cattle dip tanks, pumping stations, and burn areas.

In addition, sampling may be conducted in other areas, such as canals and agricultural fields, in order to identify contaminants that have a more widespread distribution or to establish background levels of contaminants. Media sampled may include soils, sediments, groundwater and occasionally surface water. The most commonly encountered types of contaminants at agricultural sites include pesticides, petroleum hydrocarbons, and various metals.

Chemical concentrations in the various sampled media should be compared with the appropriate ecological screening values to determine if remediation and/or additional sampling or assessment is required. Ecological screening values to be used include the following: (1) Florida Department of Environmental Protection (FDEP) Sediment Quality Assessment Guidelines (SQAGs); (2) Florida Surface Water Quality Standards; or (3) USEPA Ambient Water Quality Criteria, among others. Ecological screening values are discussed in more detail in the next section.

Generally, any point sources identified can be remediated based on the results of the Phase II, with some additional delineation work. If remediation of the point source(s) removes all ecological concerns (i.e., all contaminant concentrations are reduced below screening values), no further assessment work is required on the site. However, if the results of the Phase I and/or Phase II indicate that widespread contamination at levels of ecological concern may be present, then more extensive sampling in the agricultural fields may be required (see next section).

3. *Agricultural Field Sampling and Screening Level Ecological Risk Assessment (SLERA)*

Generally, contaminant information obtained during a standard Phase I/Phase II Environmental Site Assessment (Phase I/II) is not detailed or comprehensive enough to be suitable for use in an ecological risk assessment (ERA). The methods described in this section are designed to provide detailed information on the distribution and concentrations of contaminants of concern (COCs) identified in the Phase I/II, for use in food chain models to predict risks to FWS's trust resources. A major purpose of this section is to determine whether concentrations of contaminants in the farmed areas are uniformly distributed in the fields, or are present as "hot spots[1]" that can be remediated. The method allows for sampling coverage of a large area while keeping assessment costs at manageable levels. If there is sufficient evidence to expect that pesticide contamination is likely at a site, it may be advantageous to conduct this sampling protocol concurrently with the Phase II assessment.

Sample site selection should be biased to maximize detection of agrochemicals in cultivated soils by sampling the entire cultivated area when possible. Random sampling on properties characterized by mixed land use is not likely to provide the greatest degree of representation regarding contamination commonly associated with agricultural production (i.e., insecticides, herbicides, fungicides, fertilizers, etc.). Prior to developing a sampling strategy, each property's land use should be reviewed in terms of spatial and temporal variables, placing the greatest sampling priority on those areas which were intensively managed for agricultural production (e.g., cultivated fields). Conversely, a lesser priority should be given to rangelands and abandoned or vacant lots which have limited or no historical agricultural land uses. Some exceptions to this rationale would include commercial and industrial land uses which are sparsely distributed within the geographic areas currently under consideration for incorporation into CERP projects. In most cases, the use of random sampling is limited to those properties demonstrating homogeneous land use across the majority of the property.

a. Sample Collection

Soil samples will be collected using a stainless steel spoon or hand auger from 0-6 inches below land surface. This interval represents the biologically relevant depth for interaction with surface water and biological receptors. It is important that care is taken not to include sample material from more than 6 inches deep, as this may result in dilution and underestimation of contaminant concentrations. Between samples, sampling equipment should be decontaminated using standard procedures to prevent cross-contamination between samples. (Decontamination between subsamples (see below) will not be necessary

[1] Hot spots are referred to isolated areas of elevated contaminant concentrations.

because subsamples will be mixed together to form a composite.) Immediately following collection, samples should be placed on ice and submitted as soon as possible to the laboratory for analysis.

At all properties except citrus groves, discrete soil samples and subsamples for compositing (see below) should be composed of five aliquots of equal volumes collected from the center point located at the nominal sampling location, and from four additional points located 5 feet from the center point in each of the cardinal directions. The sample should be thoroughly homogenized in a stainless steel mixing bowl. These "close proximity composite samples" are intended to reduce the effects of small scale soil heterogeneity.

At properties used for citrus farming, discrete soil samples should be composed of three equal-volume subsamples; one subsample each from (1) the drip line of the tree nearest to the nominal sampling point; (2) the nearest drainage swale to the tree; and (3) the nearest crown of the road between rows of the trees. The sample is, therefore, expected to be representative of the average concentration of the areas most likely to be affected by the application of agricultural chemicals used in citrus farming. The sample should be thoroughly homogenized in a stainless steel mixing bowl.

Before being placed in the sample jar, all soil samples (discrete and composites) should be thoroughly homogenized until they appear completely uniform in texture and color. Analytical laboratories should be instructed that samples received from the field should be thoroughly homogenized again in the jar before an aliquot is removed for extraction.

b. Analytical Parameters

If it has been determined during the Phase I/II that a property has a history of agricultural activity prior to 1985, then each soil analysis should include, at a minimum, organochlorine pesticides (EPA Method 8081), metals (including mercury and copper), and total organic carbon (TOC). If the history of the property or more recent use suggests that other contaminants may be present, then the list of analytes should be expanded as appropriate. The best available detection limits should be requested of the analytical laboratory, but at a minimum, detection limits (practical quantitation limits) for each chemical should be as low as the corresponding screening value (see below). That is not possible in all cases; however, since some screening benchmarks are lower than quantitation limits defined by the Florida Department of Environmental Protection. As a general rule, TOC analysis should be done for all soil and sediment samples. TOC is essential for food chain modeling and interpretation of individual sample results, bioassay results, etc.

c. Discrete Sampling for Small Properties (<500 acres)

Discrete sampling will be required for agricultural areas less than 500 acres in size. Discrete sample sites should be established at regular intervals across the property, at a density of at least one sample per 10-20 acres. The actual sampling density will depend on the size of the property, analytical cost per sample, likelihood of contamination, and other factors, and will

be specified in the proposed sampling plan and agreed to by consensus between the SFWMD and FWS. A minimum of 10 samples will be necessary for most properties. Some exceptions to this minimum sample size will occur where parcels are small (<100 acres) or demonstrate a combination of land uses (i.e., residential "ranchettes," small scale livestock/garden/nursery properties, rock mining pits, etc.) where only a small percentage of the overall area was cultivated. Careful consideration should be given prior to using a sample size smaller than 10. As sample size decreases, statistical variation tends to increase, thereby increasing the size of confidence intervals used to determine the 95 percent UCL of the mean for any given analyte. Higher UCL values may increase the probability that samples will exceed ecological screening values, thereby necessitating expanded sampling, risk assessment, and subsequent clean up. Also, higher UCL values will generate correspondingly higher Hazard Quotients (HQ) in food chain modeling exercises associated with Ecological Risk Assessments (ERA).

Within this framework, actual sample location is at the discretion of the project manager. This agricultural field sampling is in addition to, and separate from, Phase II sampling that may be focusing on facilities with a high likelihood of contamination, such as pump stations, storage sheds, mixing/loading areas, airstrips, vehicle turn-arounds, cattle dip tanks, etc. The exact location of each sample should be recorded using GPS.

d. Composite Sampling for Large Properties (>500 acres-1000 acres)

In large properties, discrete sampling at short intervals would be at best cost prohibitive, if not impracticable. Reducing the sample density, however, can lead to under-representation of large portions of the property, as well as elevated likelihood of missing hot spots. In order to address this problem, composite sampling is used. Composite sampling is a compromise, under which large numbers of discrete samples are collected, but composited prior to laboratory analyses. The following composite sampling strategy has been developed jointly by FWS and SFWMD.

Using aerial photographs, a 50-acre grid pattern will be established on each property or agricultural area greater than 500 acres in size. The grids should be located and confirmed in the field using GPS. For properties between 500 acres and 1,000 acres, all of the 50 acre grids will be sampled. For example, for a 1000-acre parcel, all 20 of the 50-acre grids would be sampled.

Each of the 50-acre grids will be subdivided into ten 5-acre subgrids. One close proximity composite soil sample will be collected from each of the 5-acre subgrids in the 50-acre grid. The location of each subsample should be exactly determined using GPS. The ten sub-samples are then composited into one sample and thoroughly mixed. This composite sample, representing the entire 50-acre grid, is then submitted to the laboratory for analysis and/or testing. (For copper, discrete samples will be maintained separate (i.e., not composited) and analyzed individually.)

e. Composite Sampling for Very Large Properties (>1000 acres)

For very large properties, where complete composite sample coverage is not possible due to budget constraints, a pre-arranged fraction of the 50-acre grids should be selected. For example, a 5000-acre parcel would be divided into 100, 50-acre grids. Perhaps half (50) of these grids would be selected for sampling. The number of grids to be selected will be pre-determined for each site by consensus between the SFWMD and FWS, based on site-specific factors. Grids will be selected for sampling using a stratified random approach.

For stratified random sampling, the agricultural area will be divided into a number of equally-sized supergrids, each consisting of group of adjacent 50-acre grids. From each supergrid, the pre-arranged fraction of grids will be selected randomly for sampling. For this purpose, a random number generator will be used to select 50-acre grids from each supergrid for sampling. The stratified random approach is recommended over a purely random approach. In random sampling there is always a chance of clustering, as well as over- and under-representation of segments of the agricultural area. The stratified random approach will assure that all segments of the agricultural area are equally represented.

f. Screening-Level Ecological Risk Assessment

Following the collection of Phase II data and sampling of the cultivated areas, each site will be evaluated using a SLERA. The SLERA is intended to identify contaminants of potential ecological concern (COPECs) and provide screening-level conclusions regarding the potential for risk to the ecological receptors at the site. The conclusions of the SLERA will primarily indicate which COPECs are likely to show a low potential for elevated risk and those that may require further evaluation either through the collection of additional data for use in an expanded ecological risk assessment or through remediation.

Screening is conducted for two general sets of ecological receptors and the screening values are used to identify areas that may require further attention for each receptor. For the aquatic community receptor, the FDEP's Sediment Quality Assessment Guidelines (SQAGs) for Florida Inland Waters (MacDonald et al. 2003) should be used as screening values whenever possible. The SQAGs were developed for assessing sediment quality in Florida waters, based on the probability of effects on sediment-dwelling organisms. For each contaminant there are two SQAGs: Threshold Effect Concentration (TEC) and Probable Effect Concentration (PEC). TECs were formulated to define concentrations of contaminants below which adverse effects on sediment-dwelling organisms are unlikely to occur. PECs were developed to define ranges of concentrations above which adverse effects are likely to occur.

In most cases the TEC will serve as the initial screening value, especially when using a composite sampling design. Use of PECs as screening values may be justified under some circumstances for certain contaminants. For some contaminants, SQAGs have not yet been developed. The U.S. Environmental Protection Agency's Ecotox Thresholds, the National Oceanic and Atmospheric Administration's Effects Range Low and Effects Range Median, or other ecologically-based guidelines should be used when SQAGs are not available. For

some chemicals such as metals, information on natural background levels may have to be considered. Human health-based guidelines for cleanup of contaminated sites, such as FDEP's Soil Cleanup Target Levels, should not be used for this purpose. Chemicals exceeding either the TEC or the PEC, or their equivalent benchmark where SQAGs are not available, will be identified as COPECs and will be further discussed in the SLERA.

When more than one chemical is present in the sediments, the risk associated with exposure of the aquatic community to the mixture may be greater than to a single chemical. Risks associated with exposure to multiple chemicals in any one chemical group (e.g., metals, organochlorine pesticides, etc.) are generally considered to be additive. In order to account for the potential effects of multiple chemicals, a PEC-quotient (PEC-q) approach will be utilized, when more than one chemical in a group is detected on a site. The PEC-q for each chemical is calculated by dividing the chemical concentration by the PEC for that chemical. The mean of the PEC-q's for all of the chemicals in the group will then be calculated. If the mean PEC-q is greater than 0.5, the combined effects of the multiple chemicals in the sediment may be toxic and should be further evaluated. Specific tests and methods to be used for further risk-based evaluation are discussed in the following sections.

Since TECs/PECs are specific to benthic macroinvertebrates, screening is also conducted for aquatic-feeding wildlife (birds and mammals) that are FWS trust wildlife species (i.e. MBTA and ESA species). Generally, the bald eagle (*Haliaeetus leucocephalus*), white pelican (*Pelecanus erythrorhynchos*), snail kite (Rostrhamus sociabilis), osprey (*Pandion haliaetus*), clapper rail (*Rallus longirostris*), great blue heron (*Ardea herodias*), and wood stork (*Mycteria americana*) are federal trust species that have been used as representative target species in exposure and risk calculations.

For wildlife, the screening-level risk is expressed by calculating a screening-level hazard quotient (HQ), which is simply the ratio of the modeled exposure (numerator) and TRV (denominator). Screening-level HQs for wildlife species are calculated using the site-specific reasonable maximum exposure (numerator) compared to a TRV based on the No Observed Adverse Effects Level (NOAEL)(denominator). Exposures are generally calculated using the fugacity-based foodweb exposure model that was developed jointly by FWS and SFWMD (Goodrich 2002 and NewFields 2006), but other exposure models can be used if needed and approved by FWS. A screening-level HQ greater than one indicates that the chemical should be retained as a COPEC for further risk analysis in the SLERA and potentially as a basis for risk management actions.

g. Sites Which Exceed the PEC and/or with Wildlife HQs Greater than 1.0

Sediments with concentrations of contaminants above the PEC potentially represent significant and immediate hazards to exposed aquatic life. If any of the 50-acre composite samples, described above, exceeds the PEC or other appropriate probable effect-level screening value, it will be necessary to return to that 50-acre grid and obtain individual samples from each of the ten aliquot locations. These samples should be taken as close as possible to the original sample locations. These discrete samples should then be submitted to the laboratory for analysis.

The purpose of this follow-up sampling is to determine the spatial distribution of contaminants within the 50-acre grid; i.e., do the data indicate the presence of one or more isolated hot spots, or widespread contamination above the PEC? If only one or a few of the individual (5-acre) samples are elevated, SFWMD may choose to attempt to remediate these areas in order to reduce the average contaminant levels of the 50-acre grid to below PEC. This will require additional sampling in order to confirm that the sub-grids in question were indeed responsible for the PEC exceedance, and to delineate the extent of the hotspot(s). Due to possible small scale variability in contaminant concentrations, one sample is not sufficient as a basis for remediation decisions. As discussed in Section C (Remediation), the SFWMD may chose to conduct a more detailed analysis, including geostatistical analyses, to attempt to identify areas in need of remediation.

Conversely, follow-up sampling may indicate that large portions of the site contain elevated levels of contaminants. Remediation of widespread contamination over such a large area may not be practical. In such a case, further testing and completion of an ecological risk assessment (ERA) will be necessary in order to refine our understanding of the hazards to federal trust resources associated with contaminants on the site. These tests and assessments should include: (1) desorption studies, (2) sediment bioassays, and (3) ERA with food chain modeling. In addition, if any of the contaminants have a tendency to accumulate in aquatic organisms or biomagnify in the food chain, such as organochlorine pesticides, PCBs, PCDDs/PCDFs, and some metals, bioaccumulation studies are recommended. Specific tests and methods to be used are discussed in the following sections.

As stated above, follow-up sampling of discrete locations within a 50-acre grid is intended to determine the spatial distribution of contaminants within the grid, and should not constitute an attempt to confirm or refute the original composite result. If widely disparate results are obtained upon follow-up (discrete) sampling compared with the original composite, this suggests either small-scale variability in the COPEC concentrations or that some error has occurred in sampling, homogenization, or laboratory analysis. In these cases, the original composite result will represent the 50-acre grid in question, barring some evidence to the contrary suggesting that the follow-up result is actually more representative of contaminant concentrations in the grid.

In order to avoid the above situation, consideration will be given on a project-by-project basis, that discrete samples collected in the field, following homogenization, be split into two jars. One sample jar will be used for producing the composite by mixing with the other samples representing a particular 50-acre grid; the other jar of each pair would be stored at 4 degrees centigrade for possible future analyses. If screening levels for any analytes of interest are exceeded in the composite sample analyses, then all 10 of the subsample aliquots used to make that sample will be reanalyzed for the observed compounds to identify more precisely the location of the observed contaminants. Use of this methodology may be problematic for very large properties due to limited storage space.

h. Sites Which Exceed Only the TEC

In general, a few scattered exceedances of a TEC by an individual contaminant at a site, when there are no PECs exceeded, is not considered to be a significant cause for concern. However, if enough samples exceed the TEC, such that the mean (estimated by the 95 percent upper confidence limit (UCL) of the mean) for the entire site (i.e., the mean of all discrete samples for a small site, or the mean of all 50-acre composites for a large site) is above the TEC, widespread ecological effects are possible. To evaluate this, the mean and the 95 percent UCL of the mean should be calculated for each COPEC. In most cases, if the 95 percent UCL for all contaminants is below the TEC, the SLERA will indicate that the potential for unacceptable risk is low and no further action will be necessary. However, if the 95 percent UCL for any contaminant exceeds the TEC, then the additional testing and an ERA (as described above for PEC exceedances) or remedial activities may be necessary. These tests and assessments should include: (1) desorption studies, (2) sediment bioassays, (3) ERA with food chain modeling, and (4) bioaccumulation studies for lipophilic contaminants. In addition, if TECs are exceeded by more than one contaminant in the same grid(s), further evaluation will be necessary to address possible synergistic or additive effects of these co-contaminants. Bioassays may be useful in this case to identify potential toxicity from multiple contaminants that would not be predicted by using individual screening values.

i. Evaluation of False Negatives where Composite Samples are Used

[Note: The following procedure for the evaluation of potential false negatives has been added to this MOA at the request of the Florida Department of Environmental Protection (FDEP) and is not required by FWS. This procedure is included in this MOA in order to provide a complete documentation of the sampling and assessment protocol followed by SFWMD.]

The primary disadvantage of composite samples is the possibility of masking hot spots by diluting the elevated discrete samples with cleaner aliquots. This masking can be viewed as a form of a "false negative," i.e., the probability of yielding clean composite results, while certain portions of the grid may exceed ecological benchmarks. In order to minimize the above disadvantage, the following procedure is included.

A representative percentage of "clean" grids (i.e., COPEC concentrations within the grid are all below the SQAG-TEC values) will be selected for further evaluation. The percentage of grids selected for further evaluation will depend upon the variability of the data and the total number of composite samples which were analyzed. When selecting the subset of non-exceeding grids, the following should be considered: (1) the non-exceeding grids targeted for discrete sampling shall not be clustered; and (2) the number of non-exceeding grids targeted for discrete sampling shall be at least 20% of the total number of "clean" grids but not greater than 10.

All of the individual discrete aliquots making up the ten-point composite samples within the selected grids will subsequently be analyzed for the COPECs only. The results for the

discrete samples for selected clean grids will be tabulated, along with the results for individual discrete samples that are analyzed for exceeding grids (per the procedure outlined in section h. below). Both the composite sample and discrete sample values for each grid should be tabulated.

For each grid, the percentage of discrete samples exceeding the ecological benchmark will be calculated. The grids will then be sorted based on ascending COPEC composite concentration. The average aliquot exceedence rate for each grid is then computed by obtaining the average percentage of aliquots exceeding the benchmark in that grid and in all grids with lower composite concentrations.

The average aliquot exceedance rates are then used to determine the composite sample concentration above which the individual sample results exceed the composite value by a pre-determined percentage (e.g., 5%). The largest composite value corresponding to the pre-determined exceedence rate will be defined as the trigger level. If the trigger level is less than the PEC for the given chemical, it shall be used in all subsequent analyses as the substitute for the PEC.

Using this approach, the probability of missing hot spots in clean grids can be maintained below a pre-determined level (e.g. 5%). Trigger levels for individual chemicals that have already been established in certain types of agricultural areas may be used in other similar agricultural areas. In such instances, supplementary area-specific false negative sampling and analyses are not required.

*4. Expanded Ecological Risk Assessment*

In cases where clear decisions regarding the potential for risk cannot be reached or where remediation to remove potential risks based on screening-level results is impractical, further testing and completion of an ERA will be necessary in order to refine our understanding of the hazards to federal trust resources associated with contaminants on the site. These tests and assessments should include: (1) desorption studies, (2) sediment toxicity tests, and (3) ERA with food chain modeling. In addition, if any of the contaminants have a tendency to accumulate in aquatic organisms or biomagnify in the food chain, such as organochlorine pesticides, PCBs, PCDDs/PCDFs, and some metals, bioaccumulation studies are recommended. The details of the ERA should be agreed upon by SFWMD and FWS prior to the initiation of work.

a. Desorption Studies

Contaminated soils inundated during the process of wetland restoration may release soil bound pollutants into the pore and surface waters. Soil or sediment characteristics governing pollutant desorption (e.g., total organic carbon, grain size, pH) will vary among locations. In addition, weathering or aging of some contaminants may alter their bioavailability from that predicted in the published literature. This necessitates site-specific desorption studies to accurately assess pollutant availability to aquatic organisms. Pollutant desorption is assessed on soils from the location using ASTM method E-1195-01, “Method for Determining a

Sorption Constant (Koc) for an Organic Chemical in Soil and Sediments." This method simulates flooding of site soils and measures release of contaminants from the soil over time. Filtered pore water samples are collected and analyzed for COCs after 3, 7, 14, and 2l days contact time. These results are used to determine a site-specific organic carbon partitioning coefficient (Koc), an estimate of pollutant partitioning between sediments and water. This value can be used in food chain models for predicting aquatic and terrestrial organism exposure to pollutants.

Soils used in the desorption study should represent, as near as possible, the maximum detected concentration of the contaminant on the site, in order to ensure that measurable levels of the particular COC are released into the water. Bulk soil samples collected for this purpose must be thoroughly mixed. To ensure uniform contaminant concentrations, samples should be collected and analyzed from several locations within the bulk soil sample (e.g., top, middle, and bottom of the container). In order to be useful, the water analysis results must show evidence that steady-state concentrations have been reached within the 21-day duration of the test. Contaminant concentrations in water obtained during the desorption study may be compared with Florida Surface Water Quality Standards.

b. Sediment Toxicity Testing

Toxicity testing with representative aquatic invertebrates and vertebrates allows prediction of soil bound pollutant toxicity to aquatic organisms if the location is converted to a wetland. For properties requiring an ecological risk assessment, the following sediment toxicity tests should be conducted: 10-day flow through sediment bioassay with two invertebrate species (e.g., *Hyalella azteca* and *Chironomus tentans*), and 7-day flow through sediment bioassay with one fish species such as the fathead minnow (*Pimephales promelas*) or other suitable species.

"Standard Test Methods for Measuring the Toxicity of Sediment-Associated Contaminants with Freshwater Invertebrates (ASTM E-1706-95)," "Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates (USEPA/600-R-99/064)," and "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms (USEPA/600/4-91/002)" provide standard methods to assess soil-associated pollutant effects upon aquatic organisms.

Endpoints measured in these tests are survival and growth. Any statistically significant impacts upon these endpoints in any test are considered direct evidence of potential impairment of the prospective benthic/aquatic community in the restored wetland.

As with the other sediment studies, bulk soil samples collected for this purpose must be thoroughly mixed, and uniformity of contaminant concentrations should be confirmed by sampling from several locations within the bulk soil simple. Soils used in the sediment toxicity tests should represent, as near as possible, the maximum detected concentration of the contaminant on the site.

c. Bioaccumulation Studies

Factors affecting pollutant accumulation by aquatic organisms can vary among locations. Accurate prediction of pollutant bioaccumulation at a location requires site-specific bioaccumulation studies, using species representative of those that may exist on the location once flooded. For properties requiring an ecological risk assessment, 28-day bioaccumulation studies should be performed with a representative benthic macro invertebrate (e.g., *Lumbriculus variegatus*) and fish (e.g., *Pimephales promelas*).

Methods described in "Great Lakes Dredged Material Testing and Evaluation Manual (USEPA and Army Corps of Engineers, 1998)" and "Standard Guide for Determination of the Bioaccumulation of Sediment-Associated Contaminants by Benthic Invertebrates (ASTM E-1688)" should be used to determine the bioaccumulation potential of soil-associated pollutants. These results are considered as site-specific measures of the degree to which sediment-associated chemicals may accumulate in biota. Results can be used to generate input variables for food-chain modeling.

Soils used in the bioaccumulation studies should represent, as near as possible, the maximum detected concentration of the contaminant on the site, in order to ensure that measurable levels of the particular COC are released into the water and taken up by the organisms. Bulk soil samples collected for this purpose must be thoroughly mixed. To ensure uniform contaminant concentrations, samples should be collected and analyzed from several locations within the bulk soil sample (e.g., top, middle, and bottom of the container). In order to be useful, the concentration of contaminant(s) in the test organisms must show evidence that steady-state conditions have been reached within the 28-day duration of the test.

d. Exposure and Risk Analysis Using Aquatic Food Chain Models

In the absence of direct measures of effects, it is necessary to estimate or predict the risk of adverse effects upon FWS's trust resources and other organisms that may utilize the created wetland, reservoir, or STA. Food chain models allow prediction of effects on higher level organisms by combining data from the site-specific desorption and bioaccumulation studies with information on dietary composition, consumption rates, body weights, etc. and literature toxicity data. The FWS and SFWMD have jointly developed a food web model for this purpose (Goodrich 2002 and NewFields 2006), and this model is the preferred tool for risk analysis. However, alternative approaches for modeling exposure may be used if they are more applicable to site conditions. FWS must approve the use alternative models, and reports should present details of the model components and input variables.

FWS's trust resources include migratory birds and federally listed threatened or endangered species. Typically, representative Trust species such as the bald eagle (*Haliaeetus leucocephalus*), white pelican (*Pelecanus erythrorhynchos*), snail kite (*Rostrhamus sociabilis*), osprey (*Pandion haliaetus*), clapper rail (*Rallus longirostris*), and wood stork (*Mycteria americana*) have been used in the analysis. Where bioaccumulating pollutants are present, a maximally exposed piscivorous bird must always be included. Generic fish

species (omnivorous and higher level predatory fish) may be used as aquatic focal species. At a minimum, the food chain model should assess risk to the following groups (trophic levels) of target organisms: benthic invertebrates (detritivores), omnivorous fish, first order carnivorous fish (trophic level 3), second order carnivorous fish (trophic level 4), omnivorous bird, first order carnivorous bird, second order carnivorous bird, and all threatened or endangered species that may utilize the site after flooding. The following potential routes of exposure should be included in the model: direct exposure to contaminated water/sediments, sediment ingestion, water ingestion, and food ingestion. The following transfer mechanisms and processes should be included; desorption from sediment to water, bioconcentration from water, bioaccumulation through ingestion of contaminated prey, and biomagnification.

Once the target species exposure to pollutants has been modeled, the potential risk to the species should be assessed by comparing the modeled exposure to a toxicity reference value (TRV). For purposes of this program, the most relevant endpoints for assessing risk are effects upon (1) survival and (2) reproduction. In the absence of toxicity tests performed with the specific target species, TRVs for the pollutant(s) of interest must be obtained from the literature. Where possible, the ideal TRV will have been generated using a similar exposure route for a taxonomically related species. Uncertainties arising from the use of TRVs based on different exposure routes or unrelated species should be discussed in the risk assessment. In general, the most sensitive TRV should be utilized to assess risk to the target species.

As discussed in previous sections, risk is expressed by calculating an HQ, which is simply the ratio of the modeled exposure (numerator) and TRV (denominator). HQs above one indicate a potential for adverse effects to occur in a species under a given exposure scenario. The higher the HQ above one, the greater the risk that adverse effects will occur. HQs below one generally indicate that adverse effects are unlikely. HQs that are greatly different from one provide the greatest level of certainty in their interpretation.

Where appropriate, a probabilistic risk analysis may also be used as a tool for assessing risk at sites where the food chain model is also used in an expanded risk analysis. The details of any probabilistic risk assessment should be discussed and agreed upon by SFWMD and FWS on a site-specific basis prior to initiating any such analysis.

## 5. *Final Reports*

### a. Phase I/II Environmental Site Assessment and SLERA Report

Upon completion of all sampling, chemical analyses, and screening-level food chain modeling, a Phase I/II and SLERA report should be prepared which identifies all potential hazards to ecological receptors and provides recommendations for additional risk-based data collection and assessment. The Phase I/II/SLERA will also provide all analytical data and corresponding global positioning system (GPS) coordinates for all collected samples in the report. These data and coordinates will also be provided to FWS in an electronic

spreadsheet form (Excel). Finally, the Phase I/II/SLERA may also provide general recommendations for corrective actions and/or management of the project that will reduce the hazards to acceptable levels.

Given the spatial resolution of the data collected for the Phase I/II and the sometimes limited timeframe available for completion of the Phase I/II, SFWMD recognizes that accurate delineation of areas that may require remediation may not possible without further investigation. The Phase I/II will be used to provide a general estimation of the amount of remediation necessary to reduce the potential for risk at a site. More detailed delineation of areas of elevated COPEC concentrations that may occur subsequent to the Phase I/II will be presented in separate reports.

FWS will review the report and provide concurrence or make recommendations for changes or additions. Any recommendations for changes or additions will be handled as addenda to the report.

b. Ecological Risk Assessment Report

If additional risk assessment activities are required, an Ecological Risk Assessment (ERA) report will be provided as a separate document. Following the completion of the expanded ERA, SFWMD will provide FWS with a draft of the ERA report for review. The draft ERA report will include the complete results of all desorption studies, sediment toxicity testing, bioaccumulation studies, and food chain modeling. In addition, it should include a complete and clear description of all methods, assumptions, and inputs used in the laboratory studies and food chain modeling. The report should provide detailed conclusions regarding risks to all trophic groups and species of concern for the entire site or any portion thereof. FWS will review the draft report and make recommendations for changes or additions. Following the resolution of any FWS concerns, a final ERA report will be provided to FWS.