Technical Memorandum

Naval Air Station - Pensacola, Florida

To: NAS Pensacola Partnering Team

From: Ecological Subgroup, EnSafe Inc.

Date: January 2004

Subject: Recommendation for Sediment Sampling, Site 41 - Wetland 5

During the Site 41 Wetland investigations, a data gap in the previous sampling strategy became evident. The purpose of this memorandum is to outline a sampling scheme to collect additional data thereby reducing or eliminating uncertainty from Wetland 5. The aim is to provide the risk manager with sufficient technical data so informed management decisions can be made about the need for remedial activities in the ditches draining Operable Unit (OU) 2.

This document summarizes the sampling rationale, locations, and techniques that are proposed by the Ecological Subgroup for collecting additional data.

Site History

Several COPCs were detected during the Phase II sampling effort at sample location 5B02, including: cadmium (HQ = 323.5), chromium (HQ = 8), lead (HQ = 16), nickel (6), silver (HQ = 7), and dieldrin (HQ = 9.9). However, no Phase IIB/III sampling was conducted in Wetland 5B. Because the highest concentration of cadmium in any sediment sample was the most downgradient sample collected (041M5B0201) in Wetlands 5A/B and no toxicity testing was done in that location, the results of the toxicity testing conducted at Wetland 5A cannot be applied to the concentrations detected in sample 041M5B0201. It is also not clear from the Phase IIA sampling if the extent of the downgradient cadmium has been delineated. The sampling proposed in this memorandum will address both the issue of extent and potential for toxicity throughout the length of Wetland 5B. In addition, this sampling event will determine if cadmium is still present at location 041M5B0201 and downstream in Wetland 5B sediments at concentrations similar to those found during the 1995 sampling event. The screening HQ at 041M5B0201 was 323.5 and exceeded the NOAA effects range – median (ERM) (9.6 mg/kg) and FDEP PEL (4.21 mg/kg) at the location as well.

It should also be noted that the Phase II sediment sample at 5B02 that yielded the HQ of 323.5 for cadmium was collected in November 1995. Sediments by their very nature, move through deposition and erosion and have been known to disperse during heavy weather disturbances. Since 1995, the Pensacola area has seen several named storms and many un-named winter storms. The results of the analytical testing will be added to the RI Nature and Extent discussions to more adequately address the historical cadmium concentrations.

Sampling Rationale

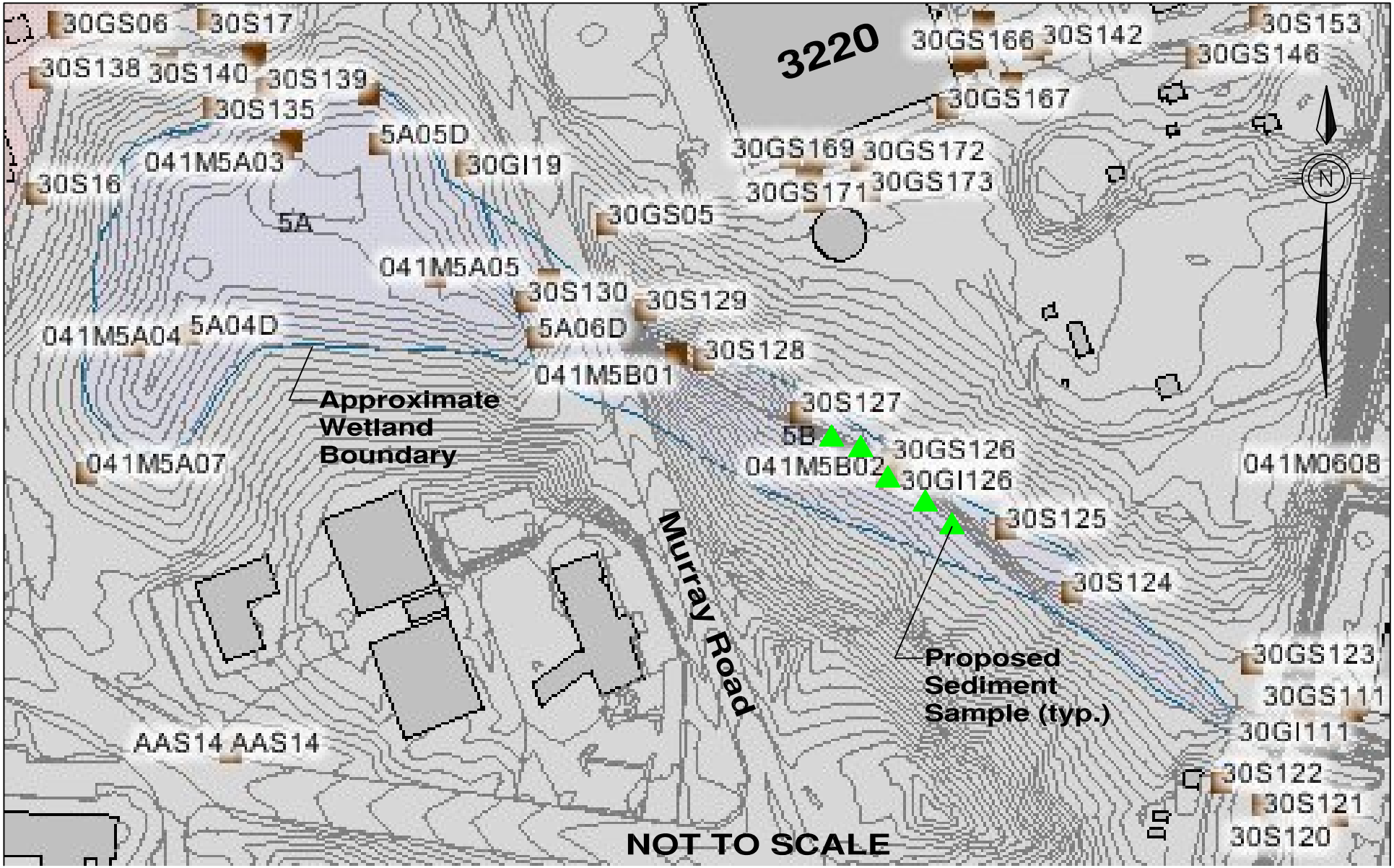
The sampling proposed in this memorandum will assess the current sediment chemistry in and around sample location 5B02. In addition, toxicity tests will be conducted concurrent with the chemistry analyses. Sample location 5B02 is approximately 350-feet downstream from the culvert under Murray Road. Six sediment samples are proposed. In Wetland 5B, two sediment samples will be collected upstream and two samples downstream at 50' and 100' intervals, respectively, from sample location 5B02 (Figure 1). Location 5B02 will also be resampled. In addition, a reference sediment sample will be collected from Wetland 19A, which has similar physical characteristics to Wetland 5B. Wetland 19A had low Phase II sediment HQs with no cadmium detected in this wetland (Figure 2).

All samples will be submitted for volatile organic compound, semivolatile organic compound, pesticide/PCB and metals (except cyanide) analysis at Level 2 data quality. In addition, the sediment samples will be analyzed for total organic carbon (TOC), grain size and toxicity testing.

Sampling Methods

All samples will be collected, handled, and documented in accordance with Sections 11.0 and 3.0 respectively, of the USEPA, Region IV, SESD, EISOPQAM (1996). All samples will be preserved in accordance with Appendix A of the EISOPQAM (1996).

Sampling will be conducted using stainless steel equipment including; hand augers, collection bowls, and mixing spoons. Stainless steel sampling equipment will be decontaminated using methods described in Chapter 11 of the *Final Comprehensive Sampling and Analysis Plan (CSAP)* (E/A&H, July 8, 1994).



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SITE 41 – WETLANDS
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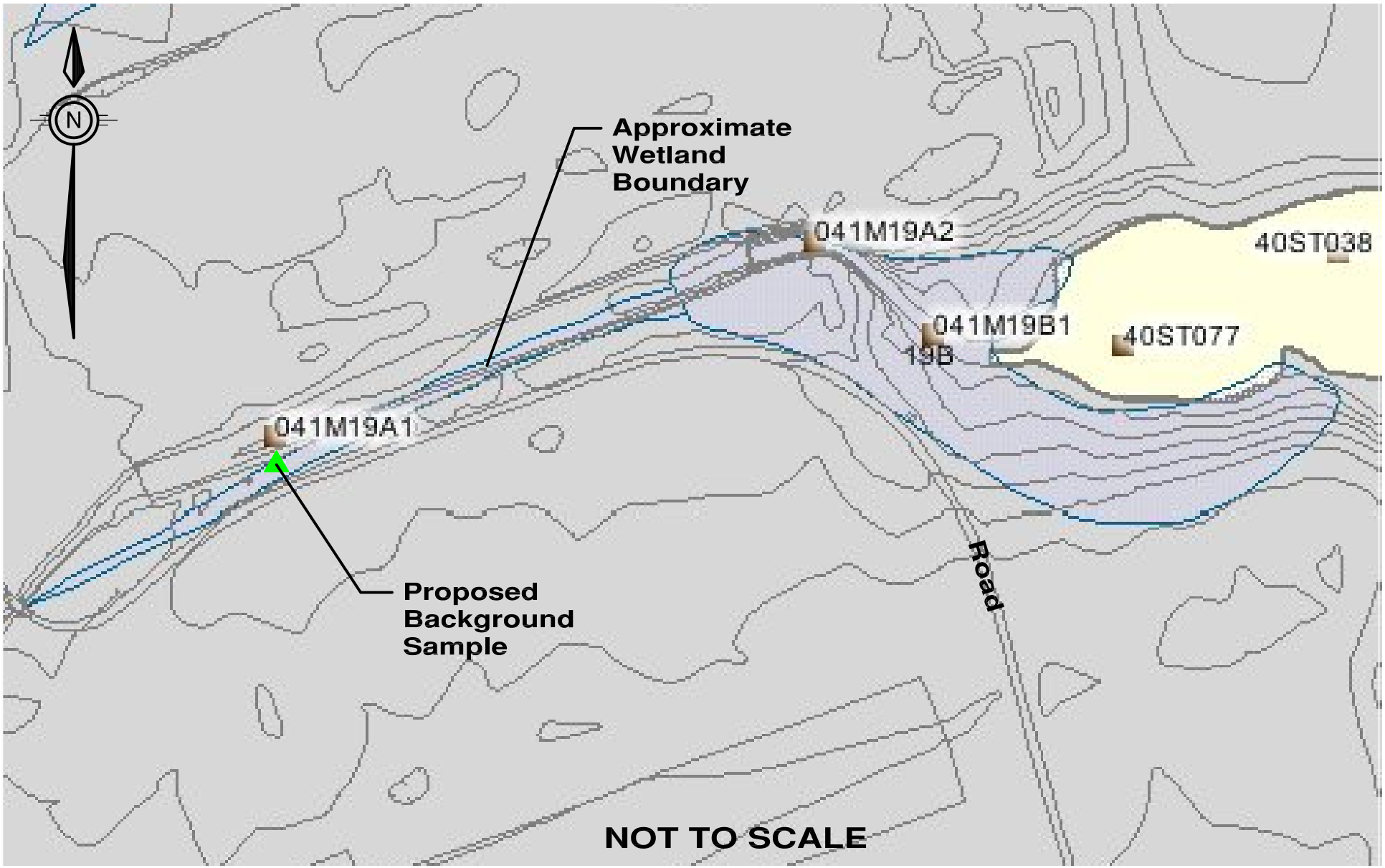
FIGURE 1
WETLAND 5
PROPOSED SEDIMENT SAMPLES

Date: 01/22/04

DWG Name: 0036001C001



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SITE 41 – WETLANDS
REMEDIAL INVESTIGATION
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FIGURE 2
WETLAND 19A
PROPOSED BACKGROUND SAMPLE

Date: 01/23/04 | DWG Name: 0036001C002

Table 1 describes the sediment sample aliquots proposed for sampling (these requirements may change, depending on the needs of the contracted laboratory).

Table 1 Proposed Sample Aliquots		
Analysis	**Sample Container/Aliquot**	**Remarks**
Metals	9 oz. Jar	
Pesticides/PCBs	9 oz. Jar	
SVOCs	9 oz Jar	
VOCs	4 oz. Jar	Packed with no Headspace.
Toxicity	Two 1-Liter Plastic Containers	

All samples will be collected from 0 to 6 inches. Except for VOC samples which will be a grab samples, sediments will be homogenized, aliquots of which will be collected from the homogenate and transferred to laboratory ready glass containers with Teflon lids and thermally preserved to 4°°C for chemical and toxicity analysis.

Laboratory Analyses

Detection limits or quantitation limits for metals and extractable organics must be below the lower of the USEPA Region IV's ecological screening values or FDEP threshold effects levels. Attachment 1 details the screening values.

Toxicological Tests

Bioassay organisms will be selected based on their sensitivity to the contaminants suspected. As a group, benthic macroinvertebrates are often the optimal assessment tool in determination of sediment toxicity. Their intimate contact with bottom sediments and interstitial and overlying waters for extended periods of their life cycle increases the likelihood for adverse effects occurring in the presence of contaminated sediments. Benthic macroinvertebrates fill a multitude of ecological niches: functioning as prey, predators, herbivores, omnivores, collectors, gatherers, shredders, and filter feeders, thus interacting with multiple trophic levels which control energy/nutrient/organic matter cycling dynamics in many ecosystems. Therefore, the health of the benthic community will be used as an assessment endpoint for evaluating the sediments collected from Wetland 5B.

Unacceptable ecological impacts will be identified by any sediment location that yields a statistically significant reduction in lethal and sublethal effects linked to an exposure gradient when compared to a reference ditch/wetland area at NAS Pensacola.

The benthic amphipod, *Hyallela azteca*, is widely distributed and common in unpolluted lotic and lentic systems. *H. azteca* are the primary food source for many juvenile fish and are voracious feeders of animal, plant, and detrital material. The life cycle of *H. azteca* can be divided into three stages: (1) immature (includes instars 1 to 5), (2) juvenile (includes instars 6 and 7), and (3) adult. An epibenthic species, *H. azteca* has been used frequently in sediment testing due to its many desirable characteristics. These include a short generation time, its ease at being cultured in the laboratory, and survival, growth, and development; all of which can be obtained from toxicity tests. Table 2 summarizes the test conditions recommended for conducting a 10-day sediment exposure using *H. azteca.*

Table 2
Recommended Test Conditions for Conducting 10-day Sediment Exposures using the Amphipod *Hyallela azteca*.

Test Condition	Hyallela azteca
Temperature (°C.)	23 ± 1
Light Intensity	50-100 fc
Photo Period	16:8 (L:D)
Vessel Size	300 ml
Sediment Volume	100 ml
Water Volume	175 ml
Organisms/vessel	10
Replicates/concentration	8
Organisms/concentration	80
Aeration	only if DO < 2.5 mg/L
Dilution Water	Reconstituted Freshwater
Hardness	Moderately Hard
Test Duration	10 Days
Size/age at Test Initiation	7-14 Days
Renewal	2 volume additions daily
Feeding	YCT
Endpoints	Survival, growth (by weight)

Reporting

Upon receipt of the sample results from the analytical laboratory, the data will be compared to the Site 41 screening and refinement values. Toxicity data received from the laboratory will be reviewed, and effects will be determined and correlated to the health of sediments in Wetland 5B. The data will be summarized for the Tier 1 Partnering Team and added to the Site 41 RI Report.

Attachment 1

Sediment Screening Values

Attachment 1		
Site 41 Screening Values for Sediment		
Parameter	**Screening Values (SVs) (see footnotes for sources)**	
	Value	**Source**
Inorganics		
Aluminum	N/S	N/A
Antimony	12	1
Arsenic	7.24	1, 2
Barium	N/S	N/A
Beryllium	N/S	N/A
Cadmium	0.68	2
Calcium	N/S	N/A
Chromium	52.3	1, 2
Cobalt	N/S	N/A
Copper	18.7	1, 2
Cyanide (CN)	N/S	N/A
Iron	N/S	N/A
Lead	30.2	1, 2
Magnesium	N/S	N/A
Manganese	N/S	N/A
Mercury	0.13	1, 2
Nickel	15.9	1, 2
Potassium	N/S	N/A
Selenium	N/S	N/A
Silver	0.73	2
Sodium	N/S	N/A
Thallium	N/S	N/A
Vanadium	N/S	N/A
Zinc	124	1, 2
Pesticides and PCBs		
Aldrin	N/S	N/A
Dieldrin	0.715	2
Endosulfan I	N/S	N/A
Endosulfan II	N/S	N/A
Endosulfan sulfate	N/S	N/A
Heptachlor	N/S	N/A
Heptachlor epoxide	N/S	N/A
Methoxychlor	N/S	N/A
Toxaphene	N/S	N/A
alpha-BHC	0.32	4
beta-BHC	0.32	4
delta-BHC	0.32	4
gamma-BHC (Lindane)	0.32	4
Total BHCs	0.32	4
alpha-Chlordane	1.7	5

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Parameter	**Screening Values (SVs) (see footnotes for sources)**	
	Value	**Source**
gamma-Chlordane	1.7	5
Total Chlordanes	1.7	5
4,4'-DDD	1.22	2
4,4'-DDE	2.07	2
4,4'-DDT	1.19	2
Total DDT	3.3	1
Endrin	3.3	6
Endrin aldehyde	3.3	6
Endrin ketone	3.3	6
Total Endrins	3.3	6
Aroclor-1016	21.6	7
Aroclor-1221	67	1
Aroclor-1232	21.6	7
Aroclor-1242	21.6	7
Aroclor-1248	21.6	7
Aroclor-1254	21.6	7
Aroclor-1260	21.6	7
Total PCBs	21.6	2
SVOCs		
1,2,4-Trichlorobenzene	N/S	N/A
1,2-Dichlorobenzene	N/S	N/A
1,3-Dichlorobenzene	N/S	N/A
1,4-Dichlorobenzene	N/S	N/A
2,2'-oxybis(1-Chloropropane)/bis(2-chlor	N/S	N/A
2,4,5-Trichlorophenol	N/S	N/A
2,4,6-Trichlorophenol	N/S	N/A
2,4-Dichlorophenol	N/S	N/A
2,4-Dimethylphenol	N/S	N/A
2,4-Dinitrophenol	N/S	N/A
2,4-Dinitrotoluene	N/S	N/A
2,6-Dinitrotoluene	N/S	N/A
2-Chloronaphthalene	N/S	N/A
2-Chlorophenol	N/S	N/A
2-Methyl-4,6-Dinitrophenol	N/S	N/A
2-Methylphenol (o-Cresol)	N/S	N/A
2-Nitroaniline	N/S	N/A
2-Nitrophenol	N/S	N/A
3,3'-Dichlorobenzidine	N/S	N/A
3-Nitroaniline	N/S	N/A
4-Bromophenyl-phenylether	N/S	N/A

Attachment 1		
Site 41 Screening Values for Sediment		
Parameter	**Screening Values (SVs) (see footnotes for sources)**	
	Value	**Source**
4-Chloro-3-methylphenol	N/S	N/A
4-Chloroaniline	N/S	N/A
4-Chlorophenylphenyl ether	N/S	N/A
4-Methylphenol (p-Cresol)	N/S	N/A
4-Nitroaniline	N/S	N/A
4-Nitrophenol	N/S	N/A
Benzo(b)fluoranthene	N/S	N/A
Benzo(g,h,i)perylene	N/S	N/A
Benzo(k)fluoranthene	N/S	N/A
bis(2-Chloroethoxy)methane	N/S	N/A
bis(2-Chloroethyl)ether	N/S	N/A
bis(2-Ethylhexyl)phthalate (BEHP)	182	1, 2
Butylbenzylphthalate	182	8
Carbazole	N/S	N/A
Dibenzofuran	N/S	N/A
Diethylphthalate	182	8
Dimethylphthalate	182	8
Di-n-butylphthalate	182	8
Di-n-octylphthalate	182	8
Hexachlorobenzene	N/S	N/A
Hexachlorobutadiene	55	3
Hexachlorocyclopentadiene	N/S	N/A
Hexachloroethane	N/S	N/A
Indeno(1,2,3-cd)pyrene	N/S	N/A
Isophorone	N/S	N/A
Nitrobenzene	N/S	N/A
N-Nitroso-di-n-propylamine	N/S	N/A
N-Nitrosodiphenylamine	N/S	N/A
Pentachlorophenol	N/S	N/A
Phenol	50	9
2-Methylnaphthalene	20.2	2
Acenaphthene	6.71	2
Acenaphthylene	5.87	2
Anthracene	46.9	2
Benzo(a)anthracene	74.8	2
Benzo(a)pyrene	88.8	2
Chrysene	108	2
Dibenz(a,h)anthracene	6.22	2
Fluoranthene	113	2
Fluorene	21.2	2
Naphthalene	34.6	2
Phenanthrene	86.7	2
Pyrene	153	2

Attachment 1		
Site 41 Screening Values for Sediment		
Parameter	**Screening Values (SVs) (see footnotes for sources)**	
	Value	**Source**
Total PAHs	1684	2
TOC Normalized PAHs	290	10
VOCs		
1,1,1-Trichloroethane	N/S	N/A
1,1,2,2-Tetrachloroethane	N/S	N/A
1,1,2-Trichloroethane	N/S	N/A
1,1-Dichloroethane	N/S	N/A
1,1-Dichloroethene	N/S	N/A
1,2-Dichloroethane	N/S	N/A
1,2-Dichloroethene (total)	N/S	N/A
1,2-Dichloropropane	N/S	N/A
2-Butanone (MEK)	N/S	N/A
2-Hexanone	N/S	N/A
4-Methyl-2-Pentanone (MIBK)	N/S	N/A
Acetone	N/S	N/A
Benzene	N/S	N/A
Bromodichloromethane	N/S	N/A
Bromoform	N/S	N/A
Bromomethane	N/S	N/A
Carbon disulfide	N/S	N/A
Carbon tetrachloride	N/S	N/A
Chlorobenzene	N/S	N/A
Chloroethane	N/S	N/A
Chloroform	N/S	N/A
Chloromethane	N/S	N/A
cis-1,3-Dichloropropene	N/S	N/A
Dibromochloromethane	N/S	N/A
Ethylbenzene	N/S	N/A
Methylene chloride	N/S	N/A
Styrene	N/S	N/A
Tetrachloroethene	N/S	N/A
Toluene	N/S	N/A
trans-1,3-Dichloropropene	N/S	N/A
Trichloroethene	N/S	N/A
Vinyl chloride	N/S	N/A
Xylene (Total)	N/S	N/A

Notes:
1 = USEPA screening value from Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment (USEPA, 2001).

2 = FDEP threshold effects level (TEL) or probable effects level (PEL) from Approach to the Assessment of Sediment Quality in Florida Coastal Waters; Volume 1 — Development and Evaluation of Sediment Quality Assessment Guidelines (McDonald, D.D., 1994). Where applied, TEL used as SV.

3 = FDEP threshold effects concentration (TEC) pr probable effects concentration (PEC) from Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Technical Report (McDonald, D.D., et al. January 2003). Where applied, TEC used as SV.

4 = FDEP TEL for Lindane used as a surrogate SV for all BHCs, per decision from the July 15-16, 2002 Eco Subgroup meeting.

5 = USEPA screening value used for SV for all chlordanes, per decision from the July 15-16, 2002 Eco Subgroup meeting.

6 = USEPA screening value used for SV for all endrins per decision from the July 15-16, 2002 Eco Subgroup meeting.

7 = FDEP TEL for total PCBs used as a surrogate for all PCBs (except for Aroclor-1221; USEPA screening value used as SV).

8 = SV for BEHP used as a surrogate for all phthalates, per decision from the July 15-16, 2002 Eco Subgroup meeting.

9 = 50 ug/kg no effects surrogate screening value, per decision from the July 15-16, 2002 Eco Subgroup meeting.

10 = TEC or median effects concentration (MEC) from Sediment Quality Guidelines for Polycyclic Aromatic Hydrocarbon Mixtures (Swartz, R.C., 1999).
Where applied, TEC used as SV.

N/S = No screening value available.
N/A = Not applicable.
mg/kg = Milligrams per kilogram.
µg/kg = Micrograms per kilogram.
mg/kg-oc = Milligrams per kilogram normalized to organic carbon.