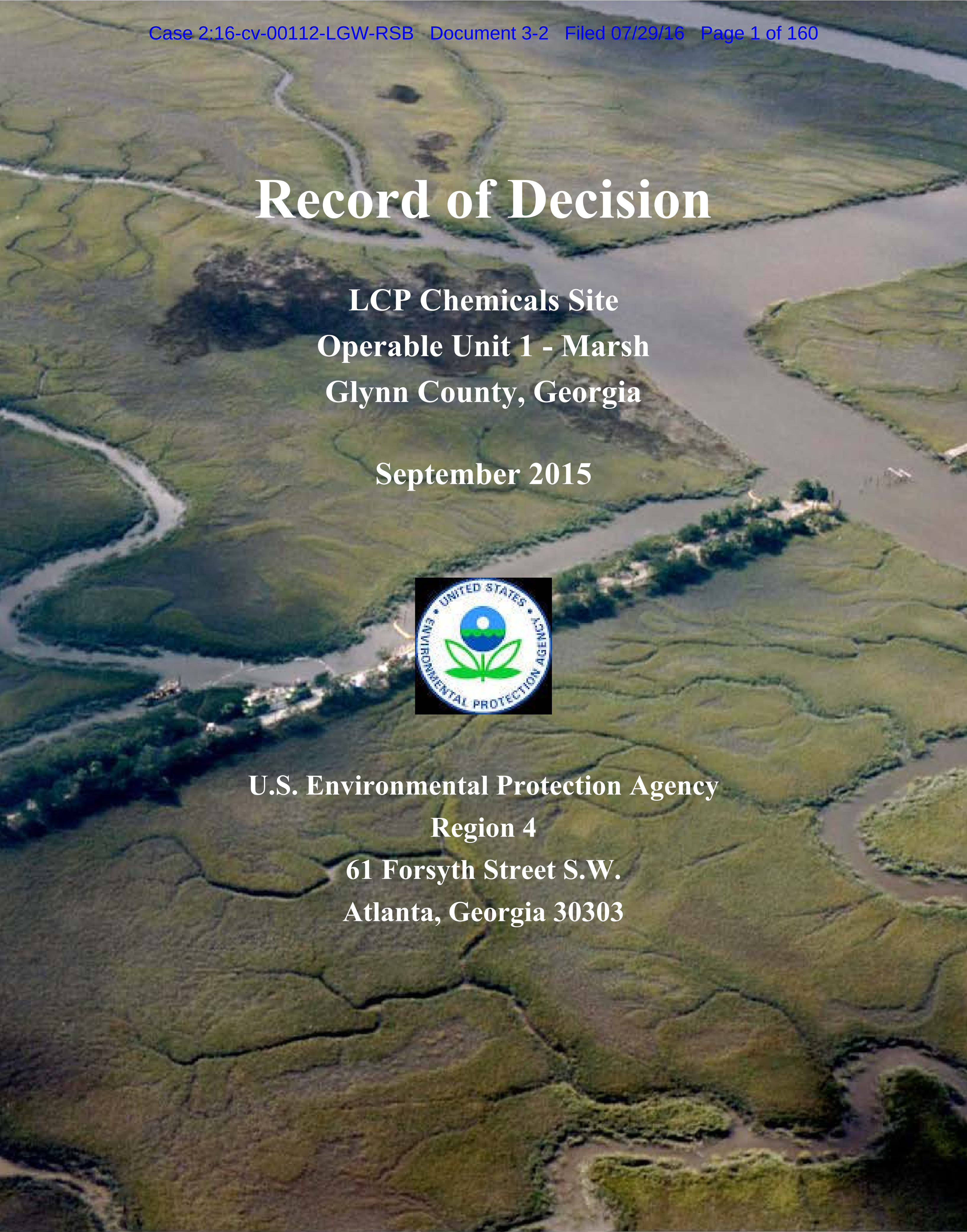


Record of Decision

LCP Chemicals Site
Operable Unit 1 - Marsh
Glynn County, Georgia

September 2015

U.S. Environmental Protection Agency
Region 4
61 Forsyth Street S.W.
Atlanta, Georgia 30303

RECORD OF DECISION

SUMMARY OF REMEDIAL ALTERNATIVES SELECTION

LCP CHEMICALS SITE
BRUNSWICK, GLYNN COUNTY, GEORGIA
OPERABLE UNIT (OU) 1 - MARSH

CERCLIS ID: GAD099303182

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA, GEORGIA

SEPTEMBER 2015

PART 1: DECLARATION

1.0 Site Name and Location

The LCP Chemicals Superfund Site (the Site), Operable Unit (OU) 1 is located at 4125 Ross Road, Brunswick, Glynn County, Georgia. The Site was entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database June 24, 1988 and the identification number of the Site in CERCLIS is: GAD099303182. The Site was listed on the National Priorities List (NPL) on June 17, 1996. Because the conditions at the LCP Chemicals Site are complex, the Site was organized into three OUs: OU1, the LCP Chemicals marsh; OU2, the Site's groundwater, including the surface and subsurface soil of the former mercury Cell Building Area; and OU3, the remaining Site's Uplands, excluding the mercury Cell Building Area. The LCP Chemicals marsh (OU1) occupies approximately 760 acres immediately northwest of Brunswick, Glynn County, Georgia. The property is bordered by a former Glynn County land disposal facility and a pistol firing range on the north, Ross Road on the east, the Turtle River and associated marshes to the west, and the Brunswick Cellulose plant to the south. The LCP Chemicals marsh consists of approximately 662 acres of flat, vegetated tidal marsh and 98 acres of tidal creeks. Former operations at the LCP Chemicals Site were located on 121 acres of upland area, east of the marsh.

2.0 Statement of Basis and Purpose

This decision document, presents the Selected Remedy for OU1 of the LCP Chemicals Site, Brunswick, Glynn County, Georgia, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) 42 U.S.C. Section 9601 *et seq*., and to the extent practicable, the National Contingency Plan (NCP) 40 Code of Federal Regulations (CFR) Part 300. This decision is based on the Administrative Record (AR) for the LCP Chemicals Site (OU1), the Marsh.

The Georgia Environmental Protection Division (GAEPD) concurs with the Selected Remedy.

3.0 Assessment of the Site

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

4.0 Description of Selected Remedy

Based on the information currently available, the U.S. Environmental Protection Agency (EPA) believes the selected remedy of dredging, *in situ* capping and thin-layer placement over the lower concentrations of contaminated sediment meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. In compliance with CERCLA Section 121(b), this alternative will be protective of human health and the environment, comply with applicable, relevant and appropriate requirements (ARARs), be cost effective, will use permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable. Sediment removal, capping and covering of mercury, Aroclor 1268, lead and polycyclic aromatic hydrocarbon (PAH) contaminated sediment have been demonstrated to be reliable and provide an element of treatment to reduce mobility and toxicity (bioavailability) through physical isolation, stabilization, and chemical sequestration/immobilization of the contaminants under the caps.

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site whenever possible (NCP §300.430(a)(1)(iii)(A)). The LCP Chemicals marsh's mercury, Aroclor 1268 and otherwise contaminated sediment is not readily classifiable as principal threat wastes despite the inherent toxicity of mercury and Aroclor 1268 and demonstrated mobility which, in the case of the former, has contaminated surface water. Capping alternatives have been demonstrated to be reliable containment remedies for this type of contamination in submerged sediments.
The major components of the remedy include:

- Dredging approximately seven acres (~22,000 cubic yards [CY]) in the LCP Ditch and Eastern Creek to a target depth of 18 inches;
- Backfilling the dredged areas with ~14,000 CY of clean material;
- Replanting the disturbed vegetated marsh areas with native plants;
- Capping approximately six acres in Domain 3 Creek and Purvis Creek;
- Thin-layer placement on approximately 11 acres of marsh;
- Confirmation of co-location of dioxins/furans with Aroclor 1268;
- Dewatering dredged sediments on-site and disposing of them at licensed off-site facilities;
- Constructing staging areas and temporary access roads. This will likely require an additional disturbance of approximately seven acres;
- Restoring of disturbed areas;
- Monitoring in the short-term during the construction phase, including soundings and surveys to verify removal depths, depth verification measurements to document material placed, and/or material coverage assessments;
- Monitoring in the long-term the remedy's long-term effectiveness in enhancing ecosystem recovery and reducing risks to human health and the environment; and
- Institutional controls (ICs).

5.0 Statutory Determinations

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.
The remedy in this OU does not satisfy the statutory preference for treatment as a principal element of the remedy. The toxicity and mobility of mercury and Aroclor 1268

in sediments will be significantly reduced by physically and, depending on further evaluation during remedial design, possibly chemically isolating the contaminated sediments from the aquatic environment. *In-situ* caps, and in the case of lower concentrations, thin-layer placement is generally accepted as reliable containment for contaminated sediment.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a CERCLA statutory review will be conducted every five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

6.0 Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the AR file for this Site.

- ✓ Chemicals of concern (COCs) and their respective concentrations.
- ✓ Baseline risk represented by the COCs.
- ✓ Cleanup levels established for COCs and the basis for these levels.
- ✓ How source materials constituting principal threats are addressed.
- ✓ Current and reasonably anticipated future land use assumptions used in the baseline risk assessment (BRA) and Record of Decision (ROD).
- ✓ Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.
- ✓ Key factor(s) that led to selecting the remedy that demonstrate how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision.

7.0 Authorizing Signature

This ROD documents the selected remedy for sediments at the LCP Chemicals (OU1) Superfund Site. This remedy was selected by EPA with concurrence from GAEPD.

for [signature] 9/22/15

Franklin E. Hill, Director
Superfund Division
U.S. Environmental Protection Agency, Region 4

Date

RECORD OF DECISION

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

AET	Apparent effect threshold
Allied	Allied Chemical Corporation
amsl	above mean sea level
AOC	Administrative Order on Consent
API	American Petroleum Institute
AR	Administrative Record
ARAR	Applicable or Relevant and Appropriate Requirement
ARCO	Atlantic Refining Company
ATSDR	Agency for Toxic Substance and Disease Registry
AWQC	Ambient Water Quality Criteria
BERA	Baseline Ecological Risk Assessment
bls	below land surface
BMI	brine mud impoundments
BMP	best management practices
Bohicket	Bohicket-Capers Association
BRA	Baseline Risk Assessment
CalEPA	California Environmental Protection Agency
CBP	caustic brine pool
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CFS	cancer slope factor
cm^2	square centimeter
cm/s	centimeters per second
COCs	chemicals of concern
COPC	chemicals of potential concern
CP	conservation preservation
CSM	conceptual site model
CT	central tendency
CTE	central tendency exposure
CUL	cleanup levels
CY	cubic yards
Dixie	Dixie O'Brien Company
dw	dry weight
ECR	excess cancer risk
EJSEAT	Environmental Justice Strategic Enforcement Assessment Tool
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ERA	Ecological Risk Assessment
ER-L	effects range low
ER-M	effects range median

ACRONYMS AND ABBREVIATIONS - Continued

ERT	Emergency Response Team
FFDA	former facility disposal area
FS	Feasibility Study
ft	feet/foot
ft/sec	feet per second
GADNR	Georgia Department of Natural Resources
GAEPD	Georgia Environmental Protection Division
Geosyntec	Geosyntec Consultants
HI	hazard index
HQ	hazard quotient
HHRA	Human Health Risk Assessment
IC	institutional control
IRIS	Integrated Risk Information System
LCP	Linden Chemical and Plastic
LOAEL	lowest-observed-adverse-effect-level
LOE	line of evidence
LTM	long-term monitoring
LTMP	long-term monitoring plan
MeHg	methylmercury
mg/kg	milligrams per kilogram
ng/kg	nanograms per kilogram
ng/L	nanograms per liter
NCP	National Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effect level
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NTR	National Toxics Rule
O&M	Operation and Maintenance
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzodioxins
PCDF	polychlorinated dibenzofurans
PELs	probable effect levels
pH	hydrogen ion concentration
ppm	parts per million
PRG	Preliminary Remedial Goals
PRPs	potentially responsible parties
PTI	PTI Environmental Services
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act

ACRONYMS AND ABBREVIATIONS - Continued

RD	Remedial Design
RfD	reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SEC	sediment effect concentration
SIC	Standard Industrial Classification
Site	LCP Chemical Site
su	standard units
SWAC	surface-weighted average concentration
TCDD	tetrachlorodibenzodioxin
TCDF	tetrachlorodibenzofuran
TCLP	Toxicity Characteristic Leaching Procedure
TEC	toxic equivalence concentrations
TELs	threshold effect levels
TOC	total organic carbon
TRBE	Turtle River/Brunswick Estuary
TRV	toxicity reference factor
TSCA	Toxics Substances Control Act
UAO	Unilateral Administrative Order
UCL	upper confidence limit
WCC	Western Creek Complex

PART 2: THE DECISION SUMMARY

1.0 Site Name, Location, and Description

The LCP Chemical Site (the Site) is located at 4125 Ross Road, Brunswick, Glynn County, Georgia and is surrounded primarily by commercial and industrial property. For an area location map and general Site map see Figure 1. The Site occupies approximately 850 acres immediately northwest of Brunswick, Glynn County, Georgia (Figure 2). The property is bordered by a former County land disposal facility and a pistol firing range on the north, Ross Road on the east, the Turtle River and associated marshes to the west, and Brunswick Cellulose plant to the south. The LCP Chemicals marsh comprises about 760 acres of the property, consisting of approximately 662 acres of flat vegetated tidal marsh and 98 acres of tidal creeks. Former manufacturing operations at the Site were located on 121 acres of upland area, located east of the marsh. Figure 3 shows the key features of the uplands portion of the Site, while in operation. Various industries occupied the Site's uplands since the 1920s, including most recently mercury cell chlor-alkali plants.

The U.S. Environmental Protection Agency (EPA) and the Georgia Environmental Protection Division (GAEPD) have organized the work for the Site into three operable units (OUs): OU1 addresses the marsh; OU2 addresses the Site's groundwater, as well as the surface and subsurface soil associated with the former mercury Cell Building Area; and OU3 pertains to the remainder of the Site's Uplands. This is the first remedial action selected for any of the OUs. The EPA is the lead agency for the Site. GAEPD is the support agency. The remedial investigation (RI)/feasibility study (FS) has been funded by the potentially responsible parties (PRPs), as a result of a settlement.

2.0 Site History and Enforcement Activities

2.1 Site History and Sources of Contamination

The Atlantic Refining Company (ARCO) operated the Site as a petroleum refinery from 1919 until the mid-1930s, when a labor dispute forced its closure. Georgia Power Company purchased portions of the Site between 1937 and 1950, and operated electric power generating facilities. In 1941, the Dixie O'Brien Company (Dixie) purchased 10.5 acres of the Site, south of the Georgia Power parcels, where it formulated paints and varnishes. Dixie sold its land to the Allied Chemical Corporation (Allied) in 1955 and moved its operations across town.

In 1956, the Allied Chemical and Dye Corporation (now Honeywell) built and operated a chlor-alkali facility at the Site, principally for the production of chlorine gas, hydrogen gas, and caustic solution. The plant operated using the mercury cell process, which involved passing a concentrated brine solution between stationary graphite anodes and a flowing mercury cathode to produce chlorine gas, sodium hydroxide (caustic) solution, and hydrogen gas. Sodium hypochlorite (bleach) and hydrochloric acid were also produced in secondary reactions. For a time, the graphite anodes were impregnated with the polychlorinated biphenyl (PCB) Aroclor 1268 to extend their life.

In December 1979, LCP Chemicals (Georgia) acquired the Site. It continued using the same chlor-alkali process. Figure 4 shows the layout of the process piping as it conveyed initially untreated process liquids from the mercury cell building to the receiving basins in the marsh.

In July 1991, LCP Chemical's parent, Hanlin, initiated bankruptcy proceedings under Chapter 11. After a severe decline in plant maintenance and operations, the State of Georgia began administrative proceedings to revoke the company's air and water permits. When the State brought suit against the company in 1993, Allied intervened and attempted to negotiate a Consent Decree with the State for the purchase of the facility and transfer of all of its permits. In February 1994, following failed negotiations between Allied, Hanlin, and GAEPD, LCP Chemicals ceased all manufacturing activities at the Site. In 1998, the bankruptcy court approved Hanlin's conveyance of title to the Brunswick plant and the property to Allied. Allied acquired and merged with Honeywell, Inc., becoming Honeywell International, Inc. in 1999.

At the time LCP Chemicals ceased operations, mercury and Aroclor 1268 contamination was widespread throughout Domain 1 (see Figure 2 and Section 5.1 for a description of the marsh Domains) of the LCP Chemicals marsh and to a lesser extent in the other domains. In addition to the mercury and Aroclor 1268, lead, other metals, and polycyclic aromatic hydrocarbon (PAHs) also contaminated the domains closest to the Uplands. Mercury and Aroclor 1268 were detected in aquatic life at levels elevated enough to require a ban on commercial fishing in the area and a seafood consumption advisory for part of Turtle River and its creeks.

In June 17, 1996, the LCP Chemicals Site was place on the National Priority List (NPL) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or "Superfund." Groundwater contamination at the Site had been established based on the results of various investigations. In listing the Site on the NPL, the EPA found the following hazardous substances associated with the Site: mercury, Aroclor 1268, and other hazardous substances. Mercury and Aroclor 1268 contamination was caused by the operation of the mercury chlor-alkali plant during the period of 1956 to 1994.

In February 1994, after numerous investigations by the GAEPD and the EPA, GAEPD requested that the EPA initiate removal enforcement actions at the Site. According to the Action Memorandum signed in May 1994, the Site was a high priority for removal action. Section 2.3.2 and 2.3.3 provide detail on the 1990s removal actions.

A Unilateral Administrative Order (UAO) was issued to Allied, Hanlin and the former LCP Chemicals plant manager in March 1994 and then amended in March 1995 to add ARCO, Georgia Power, and the O'Brien Corporation (successor to Dixie) as respondents. The O'Brien Corporation failed to comply with the UAO and is defunct. Besides development of plans and schedules for the removal and proper disposal of waste and debris, the work to be performed under the 1995 UAO included the following: a) control the migration and/or releases of all hazardous substances, b) install and operate an oil/water separation system, c) install a carbon adsorption unit for wastewater, d) drain, treat and dispose of the remaining caustic and sulfuric acid used to absorb the moisture in the chlorine, e) complete the abandonment of the water supply wells, f) develop a plan a schedule for the demolition and removal of the mercury cell buildings, g) develop a plan and schedule for sampling the subsurface soil beneath the mercury cell buildings and h) develop plans and schedules for the removal, treatment and proper disposal of all contaminated soil, debris, and sediment beneath the mercury cell buildings and other portions of the plants, which were removed.

The three remaining PRPs; Allied, Georgia Power, and ARCO, subsequently entered into a mixed funding Administrative Order on Consent (AOC) to conduct additional removal activities in November 1997. The removal, which involved excavation of 13 acres of contaminated marsh and select portions of the Eastern Creek and LCP Ditch (Main Canal) down to an average depth of one foot, backfilling of the marsh with clean soil to design grade and planting with cordgrass (*Spartina alterniflora*), was completed in July 1999. Figure 5 shows the extent of the work performed under the 1997 AOC.

The RI/FS for the LCP Chemicals marsh is being performed pursuant to an AOC, dated July 6, 1995, between ARCO, Allied, Georgia Power and the EPA. The PRPs agreed to perform the RI/FS concurrently with the removal work.

In May 2007, Honeywell, identified earlier as the successor to Allied, signed an AOC, agreeing to perform a time critical removal of a caustic brine pool (CBP) located in the vicinity of the former mercury cell buildings. Figure 6 shows the extent of the CBP, as it is currently delineated.

2.2 Previous Investigations

Multiple parties performed investigations in the LCP Chemicals marsh to determine the scope of a removal action that was identified in the November 1997 AOC and performed in 1998-1999. The EPA conducted a three-phase sample investigation during 1995 in the marsh flats and the tidal channels, at the direction of the On-Scene Coordinator (OSC), for use in assessing the need for and scope of removal action in the marsh. Geosyntec Consultants (Geosyntec) performed limited sampling in the marsh over the period of 1995-1997, and PTI Environmental Services (PTI) performed additional sampling in 1996. The National Oceanic and Atmospheric Administration (NOAA) also performed a monitoring study in the marsh and tidal channels in 1997. A summary of these events is provided below.

2.2.1 EPA (1995)

The EPA conducted three sampling events in 1995. A major part of the EPA's sampling program was conducted along a grid, established immediately west of the Former Facility Disposal Area (FFDA, a former disposal area) and south of the B-Street causeway. Additional sampling in the outer reaches of the LCP Chemicals marsh (west of Purvis Creek) was also performed. In all, over 200 separate locations were sampled by EPA in 1995. These sampling events included other media samples such as biota and toxicological test samples in addition to sediment chemistry.

2.2.2 PTI Environmental Services (1996)

In 1996, PTI completed a sediment sampling event consistent with the event completed by the EPA in 1995, involving sampling at well over 100 separate locations across the LCP Chemicals marsh and adjacent area. This sampling event was completed, in part, to confirm the 1995 EPA results which lacked accurate position coordinates due to global position limitations during that period.

Sediment sampling was focused in the in the area between the marsh-upland border and Eastern Creek below the B-Street causeway. Additional sampling in the outer reaches of the LCP Chemicals marsh (west of Purvis Creek) was also performed but at a lower sampling density. This sampling event included other media samples such as biota and toxicological test samples, in addition to sediment chemistry.

2.2.3 Geosyntec Consultants (1995-1997)

Geosyntec performed more limited scopes of sampling in support of the other studies by EPA and PTI, prior to the removal action. Geosyntec conducted two sampling events in 1995. The first event, conducted in June 1995, involved sediment sampling at 17 locations in the marsh along the perimeter of the FFDA and two additional locations in the same vicinity. Later in September 1995, in support of the uplands removal action, described in detail in Section 2.3.3, Geosyntec sampled near-shore sediment at three locations immediately west of each of two former American Petroleum Institute (API) separators (one north of B-Street and one south of B-Street). In 1996, three locations were sampled in the Dillon Duck area at the north end of the Site and two locations were sampled west of the FFDA in support of a removal action treatability test. A more comprehensive sampling was performed in 1997 involving sediment collection from 22 locations across the entire LCP Chemicals marsh.

2.2.4 NOAA 1997

In 1997, NOAA performed a sampling event involving eight locations across the LCP Chemicals marsh. The study focused on sediment sampling in the LCP Chemicals marsh south of the B-Street causeway and east of Purvis Creek. Biota and sediment samples were also collected for laboratory toxicity testing.

2.2.5 Sampling in Support of the 1998-1999 Marsh Removal Response Action

Between 1998 and 1999, approximately 13 acres of marsh flats (nearest the sources of historical facility discharges) were excavated, backfilled to restore grade, and re-vegetated with native marsh grasses. Dredging was also performed along a portion of the Eastern Creek and in select portions of the LCP Ditch (2,650 linear feet [ft]). Figure 5 shows the Marsh Removal Area and extent of dredging in the LCP Ditch and Eastern Creek. Sampling support for the marsh removal action included several separate events spanning the timeframe from 1997 (pre-removal planning) through 1999 (post removal).

2.3 Cleanup Activities Planned and Completed to Date

2.3.1 Background

During the period of active manufacturing at the Site, process and storm sewer discharges from the on-site operations entered the near-shore marsh at several locations along the Site shore. Most of the process/storm sewer lines were located in the southern portion of the Site, especially those serving the mercury cell plants (Figure 4).

One of the sewer lines is believed to have served areas in the former ARCO community (the community built by ARCO to support the refinery operation at the Site); it passed into the South API Separator and then into the marsh. This South API Separator tank once contained several feet of sludge characterized by elevated concentrations of mercury, Aroclor 1268, and other Site related constituents. The sludge was removed from the tank during the upland removal action completed in 1997 and the API Separator was closed in place.

Another pipeline is believed to have been present in the northern part of the Site uplands, connected to a second API Separator (the “North” tank) located along the marsh edge. Sludge was also removed from this API Separator and the tank was closed in place during the removal response action completed in 1997.

Two 36-inch diameter process sewer lines were associated with the mercury cells plants, directing process wastewater to the Outfall Canal and to the Outfall Pond. Overflow from the settling pond went into the LCP Ditch. This process wastewater was discharged to the sewer lines without treatment during early industrial operations (up until the early 1970s) in accordance with standard industrial practices of that era. The chemical characteristics of this untreated wastewater can be inferred from the chemical characteristics of the first Brine Mud Impoundments (BMIs) constructed in the early 1970s (these impoundments received sludge from wastewater of the mercury cell plants operation). Sludge in BMI No. 1 contained mercury and Aroclor-1268 at concentrations over 1,000 milligrams per kilogram (mg/kg). Some of the mercury and Aroclor-1268 chemical contributions to the marsh area can be attributed to the composition of this wastewater discharge. A storm sewer line also drained into the Outfall Pond.

During the operation of the chlor-alkali plant, two mercury cell buildings housed approximately 100 mercury cells that were used in the production of chlorine gas, caustic solution and hydrogen gas. Beginning around 1970, wastewater was diverted via concrete sloping floors to a sump and then to the on-site wastewater treatment plant for treatment prior to off-shore permitted release. The two mercury cell buildings were demolished during the removal and the concrete slab was covered with soil to prevent future mercury emissions. The cover was planted with a Bermuda grass surface that is routinely maintained.

2.3.2 Source Control

Source control measures at the LCP Chemicals Site began with the construction of the mercury brine impoundments in 1970 and continues to the present time with the sparging (injection) of carbon dioxide into the caustic brine pool. Pursuant to a Preauthorization of CERCLA Section 111(a) Claim, the PRPs removed 13 acres of highly contaminated marsh flats which were nearest to facility discharges points. In this removal about 21,500 cubic yards (CY) of contaminated sediment and debris were removed and properly disposed of. In addition, 3,500 CY of contaminated sediment were excavated from 2,650 linear ft of the LCP Ditch and Eastern Creek. In total, 38,925 tons of material required off-site disposal. Of this amount, 13,400 tons were shipped as hazardous waste and 25,525 tons were shipped as non-hazardous material. Figure 5 shows the extent of the marsh removal work completed in the 1990s.

Eleven discrete disposal units were located on the western portion of the Site, where the Uplands meet the LCP Chemicals marsh. The eight closest to the marsh disposal areas are: 1) outfall pond and canal, 2) the FFDA, 3) the south gravity separator, 4) the north disposal area, 5) the south disposal area, 6) the BMIs, 7) the north gravity separator and 8) scrapyard and cell parts area. About 45,797 CY of Subtitle D Resource Conservation and Recovery Act (RCRA) non-hazardous waste and 45,118 CY of Subtitle C RCRA / Subtitle C Toxic Substances Control Act (TSCA) hazardous waste, and associated contaminated soil were removed from these eight areas and properly disposed of. The following is a brief description of the eight areas:

1) The "outfall pond" served as the central discharge point for almost all the outfalls at the Site and predated Allied's arrival in 1955. Along with the Outfall Canal, the

Outfall Pond was dredged, de-watered, and excavated in 1995. It was roughly 70 ft in diameter and 8-to-12 ft deep. Portions of the filtercake resulting from the cleanup activities failed the toxicity characteristic leaching procedure (TCLP) test for mercury and had PCB concentrations greater than 500 mg/kg.

2) The FFDA, also known in early EPA documents as the "Allied Disposal Area," was a landfill about four acres in size in the marsh, extending from the upland area. It included both hazardous and non-hazardous debris and contained spent mercury cell anodes, waste sludge and various other materials. Contaminants included mercury, PCBs, lead and various organic constituents. With each high tide, the FFDA became inundated with salt water from the marsh.
3) The "south gravity separator" was a concrete separator about 200 ft long and 40 ft wide. It was built in the southern portion of the Site within the footprint of the Altamaha Canal by ARCO's corporate predecessor at the Site. It received both sanitary sewage from the town of Arco and various petroleum waste streams from the refinery operations. The south gravity separator was connected to the marsh by pipe and the water contained therein rose and fell with the tides. What amounted to petroleum sludge in the separator also contained high levels of mercury, lead and PCBs.
4) The "north disposal area," also known as the "acid pits", was located immediately south of the north gravity separator. It was comprised of roughly a quarter acre of marsh and was filled with acid sludge from gasoline clarification. The sludge contained significant levels of lead which were highly acidic, and on warm days, would ooze up through the ground surface. It did not contain mercury or PCB contamination.
5) The "south disposal area," also known as the "tar pits," was about an acre in size and was located on the very southwest corner of the upland area of the Site. It was adjacent to the marsh and extended underneath the BMIs. It contained petroleum (perhaps tank bottoms) to a depth of 12-to-15 ft below land surface (bls). Contaminants included only PAHs and lead.
6) There existed four BMIs located at the Site that occupied a total of about three acres between the south disposal area and the FFDA. The first three BMIs were built by Allied in the mid-1970s as part of the plant's National Pollutant Discharge Elimination System (NPDES) wastewater treatment system; the fourth BMI was built by LCP Chemicals (GA) during the mid-1980s. The BMIs were located adjacent to the south gravity separator and partly over the Altamaha Canal, and were constructed in a petroleum-contaminated area. Material used to construct the BMIs included demolition debris and spent graphite anodes from the Solvay process. The brine mud (K071RCRA waste) contained mercury and PCBs above 500 parts per million (ppm); the material comprising the berms of the BMIs were contaminated with a combination of mercury, lead, PCBs and organic wastes.
7) The "north gravity separator" was essentially identical to its companion to the south in purpose, construction, and history; it too was located within the footprint of the Altamaha Canal. However, it is not thought to have contained mercury or PCB contamination.

8) During plant operations, the Scrap Yard was utilized for storage of used process equipment, used tanks, small storage sheds and miscellaneous trash and debris. The Cell Parts Area is an approximately 0.1 acre area on the south side of the Cell Parts Storage Warehouse, adjacent to the northeast side of the Scrap Yard. The warehouse was utilized to store chlor-alkali cell parts.

2.3.3 Uplands Removals

In total, about 130,120 CY of Upland (non-marsh) wastes and associated contaminated soils were removed and properly disposed of under EPA's Emergency Removal authority. About 45 percent of the yardage excavated was disposed of as Subtitle C (TSCA) waste. The remainder was disposed of in a Subtitle D landfill. Including the Upland areas discussed above, approximately 25 Upland areas were addressed during the 1990s removal. The Upland removal response activities included the following components: (i) characterization of the upland area of the Site; (ii) delineation of removal areas; (iii) removal and off-site disposal of impacted materials; (iv) post-excavation confirmation sampling to verify compliance with the removal action goals; (v) containment and treatment of contaminated water; (vi) permanent abandonment of water-supply wells; (vii) backfilling and grading of removal areas; and (viii) closure of the site sewer system. Cell Building Area removal action decommissioning activities began immediately following the chlor-alkali plant closure in February 1994. Other Upland removal activities commenced in July 1994 and were completed in June 1997. The depth of excavation at the upland portion of the site ranges from less than 1 ft (0.3 meters [m]) to approximately 13 ft (4 m). Figure 7 shows the extent of the Uplands removal, including the eight areas proximal to the LCP Chemicals marsh.

2.4 Enforcement Activities

In February 1994, after numerous investigations by the GAEPD and the EPA, GAEPD requested that the EPA initiate removal enforcement actions at the Site. According to the Action Memorandum signed in May 1994, the Site was a high priority for removal action. A UAO was issued in 1994 and then amended in 1995, to add PRPs. Three PRPs; Allied, Georgia Power, and ARCO, subsequently entered into an AOC, which included a Preauthorization of CERCLA Section 111(a) Claim, to conduct additional removal activities in August 1997. The removal was completed in July 1999. The RI/FS has been performed pursuant to an AOC, between ARCO, Allied, Georgia Power and the EPA. The PRPs agreed to perform the RI/FS concurrently with the removal work. In May 2007, Honeywell, identified earlier as the successor to Allied, signed an AOC, agreeing to perform a time-critical removal of a caustic brine pool located in the vicinity of the former mercury cell buildings.

3.0 Community Participation

Based on the Site's current Environmental Justice Strategic Enforcement Assessment Tool (EJSEAT) ranking, which is calculated by evaluating indicators related to health, the environment, environmental compliance and social demographics, the residents in the census tract where the Site is located were identified as among the top 30 percent of the State's most vulnerable citizens. Some of these residents may be fisherman considered high quantity consumers who eat approximately 73 meals of fish per year.

The EPA is continuing its efforts to promote community awareness and involvement with the Site. It has developed an electronic reading room for the Site that contains the documents which will support remedy selection and related information. The Site's remedial project managers have met with and made presentations before the members of the Glynn Environmental Coalition and participated in radio interviews about the Site. The Region also publishes the Brunswick Environmental Cleanup Newsletter to update the public on the cleanup progress at the LCP Chemicals Site and the three other Superfund sites in the Brunswick area.

On December 4, 2014, the EPA hosted a Proposed Plan meeting, during which the EPA presented a description of the proposed remedy and schedule for remedy implementation. Additionally, on February 26, 2015, EPA, in collaboration with GAEPD, the Agency for Toxic Substance and Disease Registry (ATSDR) and the Georgia Department of Health hosted an Availability Session to answer questions regarding the remedy and questions regarding the health effects of PCBs.

Site documents are available to the public in the Administrative Record (AR) repositories located at the EPA Region 4 Superfund Records Center (61 Forsyth Street, Atlanta, GA 30303) and these documents are also posted on the EPA Region 4 webpage (http://epa.gov/region4/foiapgs/readingroom/lcp_chemicals_site/). The EPA Region 4's local repository is located at the Brunswick-Glynn County Library, 208 Gloucester Street, Brunswick, GA 31520.

4.0 Scope and Role of the Operable Unit

As indicated above, the EPA and GAEPD have organized the work for the LCP Chemicals Site into three OUs: OU1 addresses the marsh; OU2 addresses the Site's groundwater, as well as the surface and subsurface soil associated with the mercury Cell Building Area; and OU3 pertains to the remainder of the LCP Chemical Site's Uplands. This is the first remedial action selected for any of the OUs.

The status of the two remaining operable units is as follows:

- The feasibility study for OU3 (the Uplands) is underway. The ROD for OU3 (the Uplands) is expected to be finalized during 2016; and
- Groundwork has begun for OU2, the Site's groundwater including the mercury Cell Building Area.

5.0 Site Characteristics

5.1 Physical Characteristics

The approximately 760 acre LCP Chemicals marsh is bordered to the west by Turtle River, to the north by Gibson Creek (a tributary to Turtle River) and the Brunswick Cellulose plant to the south. The principal feature of the LCP Chemicals marsh is Purvis Creek, which divides the marshlands roughly in half - north to south. Purvis Creek traverses most of the LCP Chemicals marsh, entering at the southwest corner of the marsh near the Salt Dock and ending at the northeast upland-marsh border. At high tide, Purvis Creek has a maximum depth of approximately 11 ft and a maximum width of 500 ft. Purvis Creek and its associated smaller channels are tidally influenced and are considered salt water. Tidal variation in the LCP Chemicals marsh occurs twice daily and can range in excess of 9 ft during a tidal cycle. Numerous smaller tidal channels exist in the LCP Chemicals marsh. Many of these channels were named during the development of the baseline ecological risk assessment (BERA), including the manmade LCP Ditch, the Eastern Creek, the Western Creek Complex (WCC), the Landfill Creek and the Dillon Duck (Figure 2). The LCP Ditch runs adjacent to the manmade causeway extending from the LCP Chemicals Uplands (OU3) to Purvis Creek. The Eastern Creek feeds into the LCP Ditch at approximately its midpoint and drains the eastern half of the LCP Chemicals marsh south of the causeway road.

Approximately 750 ft downstream from where the LCP Ditch enters Purvis Creek is the mouth of the WCC. The WCC is comprised of three principal channels and drains the western half of the LCP Chemicals marsh below the causeway. The Landfill Creek borders the old Glynn County landfill at the northern portion of the LCP Chemicals marsh, and is proximate to Dillon Duck. The physical breakup of the LCP Chemicals marsh by these physical features led to the development of “domains”, or areas of similar physical setting and contaminant characteristics in the BERA, as shown on Figure 2.

Domain 1 is 21 acres in size and bounded by the Uplands to the east, the LCP Ditch to the north and Eastern Creek to the west. Because this domain is located closest to LCP Chemical’s discharge/disposal areas, a removal of contaminated sediments took place in the eastern portion of Domain 1 in 1998-1999. Domain 2 is 115 acres in size and is bounded on the east by Domain 1, the south by Uplands and the west and north by Purvis Creek and the LCP Ditch. It contains the WCC. Domain 3 is 108 acres in size and is bounded to the south by the LCP Ditch, the east by the Uplands, and the west and north by Purvis Creek. Domain 4 is 417 acres in size and is the area west of Purvis Creek up to the Turtle River. Domain 4 is divided into an eastern and western portion by the surface water flow divide between creek and the river.

The Upland area east of the marshland is characterized by gently sloping terrain from approximately 5 ft above mean sea level (amsl) along the marsh/upland border to an elevation of approximately 15 ft amsl along Ross Road. This area of the Site is roughly divided in half by the east-west entrance road (B Street). Operations related to the chlor-alkali process were primarily located in the areas south of the entrance road and the area of the boiler house north of B Street, along with smaller isolated waste disposal areas dispersed over the northern half of the Site. The location of the former chlor-alkali mercury cell buildings is currently covered with soil and fenced. Refinery operations were present over the western portion of the upland areas. The Dixie Paint operations were located on the south side of B Street. The southern border of the Site is defined by another rail spur that goes almost to the Turtle River before heading south onto the Brunswick Cellulose property. Figure 3 shows the features discussed above.

5.1.1 Surface Water Hydrology

The Turtle River and its associated tidal creeks and tributaries are not rivers and creeks in the traditional sense; rather, they are tidally influenced systems. The hydrodynamics within the Turtle River and its tributaries is governed by semi-diurnal tidal forces. Three tidal zones (termed "prisms") occur in these types of estuarine river systems, as well as within smaller tidal channels:

1. Headwater Zone (upper reaches) – water rises from the channel onto the marsh flats on the flood tide, and spills back into the channel on the ebb.
2. Middle Zone – water oscillates (with little mixing) back and forth with tides.
3. Lower Zone (mouth) – water leaves the river channel on each ebb tide and is replaced with "new" water on the subsequent flood tide (this phenomenon is termed "excursion").

During the flood tide, water feeds in from St. Simons Sound and into the Turtle River and into smaller tidal channel reaches. As the water level rises, it spills over the channel banks and across the broad vegetated marsh flats. This water spreads to the point of the "tidal node" where it meets flood tide waters from an adjacent channel. Waters then recede from the tidal node back into the channels during the ebb tide cycle. Ebb tides have slightly higher water velocity than the flood tide whereas the flood tide duration is slightly longer compared to ebb.

5.1.2 Marsh Sediment Classification

The marsh areas are underlain by soils of the Bohicket-Capers Association (Bohicket). The Bohicket soils consist of very poorly drained soils in a regular and repeating pattern. The landscape consists of level tidal marshes that border the Atlantic Ocean and extend a few miles inland along creeks and rivers. These soils formed in silty and clayey marine sediment. Bohicket soils make up 80 percent of the unit. Typically, the surface layer is dark gray silty clay loam about eight inches thick. The substratum is dark greenish-gray silty clay and clay to a depth of 65 inches or more. There are many fibrous grass roots throughout Bohicket soils have very low permeability. The sulfur content is two-to-three percent and a strong hydrogen sulfide odor is noticeable when the soil is disturbed. Bohicket soils are flooded by seawater twice each day.

The Bohicket soils in the LCP Chemicals marsh may not be as generally characterized. The sulfide content ranged from 2.8-to-3,300 mg/kg, with a mean of 297 mg/kg.

5.1.3 Physical Properties of Marsh and Channel Sediments

The sediment hydrogen ion concentration (pH) is neutral to slightly alkaline and ranges from 7.2 to 8.0 standard units (su). Total organic carbon (TOC) levels were high and ranged from 1,900 to 130,000 mg/kg on a dry weight basis (0.19- to-13 percent), with most samples in the 3 percent to 6 percent range. This reflects a typical wetlands environment with relatively slow decomposition of organic matter under submerged and partially anaerobic conditions, which leads to an accumulation of organic carbon in surface sediment. Iron oxide levels range from non-detect to 8,400 mg/kg (0.84 percent), with most samples being in the 0.3-to-0.4 percent range.

The channel sediments consisted mostly of clayey silt with very high moisture contents. The texture classification of these samples ranged from sandy clay loam to sandy clay-to-clay according to the United States Department of Agriculture soil texture triangle.

Mineralogical analysis was performed to identify major reactive soil components that may be controlling mercury and lead solubility. The mineralogical analysis identified quartz, pyrite, halite, clay (i.e., unspecified clay minerals), non-crystalline inorganics, and organics. The predominant minerals, by weight, were non-crystalline inorganics, which includes amorphous iron oxides and other precipitates, and quartz. A significant percentage by weight (generally 10-20 percent) of the sediment makeup was identified as organic matter.

5.1.4 Generalized Marsh Site Model

A cross-sectional view of the LCP Chemicals marsh, including the transition from the Uplands is provided in Figure 8. The dominant features of the cross section, from the surface down include a dense root mat, a low permeability marsh clay ($1.3x10^{-7}$ to $1.8x10^{-8}$ centimeters per second [cm/s]), the Satilla Sand aquifer, and at the base the partially cemented sandstone layer. The dense root mat zone exhibits high organic carbon content (5,300 to 80,000 mg/kg) and supports an active layer of *Spartina* grass. Below the root mat zone, the marsh clay extends several feet in depth (on average about 7-8 ft). Below the marsh clay is the Satilla Sand aquifer, which is composed primarily of fine-to-medium grained sand. Beneath the Satilla Sand is the semi-confining, variably cemented sandstone, estimated to be between 4 and 24 ft thick at the Site.

5.1.5 Marsh Stratigraphy

Figure 9 shows the clay thickness measured at these numerous locations throughout the marsh. At all but one near-shore location, the marsh clay thickness generally ranged from 5 to 10.5 ft; there was one location where the marsh clay was reported to be 20 ft thick. The one location that had less than 5 ft of clay was located at the marsh shore and had a thickness of 2.5 ft.

Figure 10 shows a number of stratigraphic cross-sections across the LCP Chemicals marsh, along the near-shore area. The stratigraphy is characterized by a downward sequence of mixed rootmat with sediment, a “muck” or very soft clay layer, a layer of firm clay transitioning to sandy clay/clayey sand and then to the Satilla Sand aquifer (the surficial aquifer of the Site).

In undisturbed areas, the average TOC levels were generally above 2.5 percent, except at a few isolated locations; lower levels of 1- to- 2.5 percent and < 1 percent TOC occurred where the removal in Domain 1was conducted during the late 1990s. This is attributed to the borrow material used to backfill the marsh after remediation. A consistent distribution of average percent fine particulates also was observed; most locations in undisturbed areas had >75 percent fines, and all had >50 percent fines, consistent with mud flat channels. Less than 25-50 percent fines occurred in the removal areas of Domain 1, which also was attributed to the borrow material used to backfill the marsh.

5.2 Contaminant Transfer Conceptual Site Models

The Human Health Risk Assessment (HHRA) focused on potential human exposure to chemicals of potential concern (COPCs) detected in sediment and biota collected at, and adjacent to, the LCP Chemicals marsh (Environmental Planning Specialists, 2011). Exposure points are places or "points" where exposure could potentially occur. Exposure routes include the basic pathways through which COPCs may potentially be taken up by the receptor. The HHRA evaluated exposure to COPCs through consumption of fish, shellfish and clapper rail (an infrequently consumed game bird). Direct contact with contaminated sediment and surface water was also evaluated though the trespasser scenario. Figure 11 shows a diagram of the simplified conceptual site model (CSM) for the marsh trespasser and fish and clapper rail consumers.

An early ecological assessment conducted at the Site by the EPA Emergency Response Team (ERT, 1997) concluded that there were risks to ecological receptors inhabiting the LCP Chemicals marsh. An ecological CSM (Figure 12) provided a basis for evaluating contaminant migration pathways to ecological receptors. Elevated concentrations of mercury and Aroclor 1268 were detected in fish tissue samples from Turtle River, Gibson Creek, and Purvis Creek by the Georgia Department of Natural Resources (GADNR). During the mid-1990s, an ERT field study found mercury and Aroclor 1268 contamination in most abiotic and biotic samples. Mercury and Aroclor 1268 were found in fiddler crabs, blue crabs, killifish, marsh periwinkles, marsh grass, diamondback terrapins, clapper rail, brown shrimp, grasshoppers, spot, and rats. The highest concentration of mercury (330 mg/kg) was found in a terrapin liver sample. The highest concentration of Aroclor 1268 (3,500 mg/kg) was also found in a terrapin liver sample. Elevated levels of persistent organic pollutants, including Aroclor 1268, have been detected in bottlenose dolphins in the Turtle River/Brunswick Estuary (TRBE) (Pulster and Maruya, 2008).

Early indications from sediment toxicity testing by ERT (Winger *et al.* 1993) were that the contaminants at the Site were not acutely toxic to benthic invertebrates in 10-day tests conducted with brown shrimp, amphipods, and Japanese medaka embryos. However, hydrophobic organic compounds like Aroclor 1268 require time to accumulate in test organisms before they reach toxic levels. Subsequently, numerous chronic toxicity tests were conducted to evaluate longer exposure periods (e.g., 28 days for amphipods and 2 months for grass shrimp).

The initial ecological assessment focused on the prevalent and bioavailable chemicals among other COCs identified at the Site. The most prevalent and bioavailable chemicals (mercury, Aroclor 1268, lead, and PAHs) were extensively monitored in abiotic media and biota. A Baseline Ecological Risk Assessment (BERA), conducted over a seven year period, utilized food-web models for various receptors to assess exposures (Black and Veatch, 2011). Multiple rounds of sediment toxicity testing on amphipods and grass shrimp have identified other chemical factors (e.g., organic carbon and sulfides) that affect bioavailability of these chemicals in sediment.

Two additional important contaminant pathways were also evaluated in detail. The first is that both mercury and Aroclor 1268 readily bioaccumulate and biomagnify via trophic transfer through the food web. This results in greater concentrations of these chemicals in the higher trophic levels (e.g., otters, herons and humans) than in invertebrates or marsh grasses. Second, methylation of mercury occurs in the marsh sediment and biota that results in the formation of methylmercury which is more toxic than inorganic mercury.

5.3 Nature and Extent of Contamination

The BERA evaluated data records (sediment biota and toxicity) generated in the course of the post-removal action Site characterization and monitoring events. The HHRA evaluated the post-removal sediment data collected between the years 2000 and 2007, excluding the creek sediment records, since the creeks were judged to be too soft to support the weight of an individual. Only fish tissue samples collected between the years 2002 to 2006, from the Purvis and Gibson Creeks and the middle portion of the Turtle River, were evaluated in the HHRA (Figure 23). Both the HHRA and the BERA screened all of the analytical records and evaluated their contribution to the computed risks. These assessments lead to the identification of COCs which include the following:

- Mercury
- Aroclor-1268
- Lead
- Total PAHs

5.3.1 Mercury in Sediment

The highest mercury concentrations, typically in the range of 10-to-100 mg/kg, are found in Eastern Creek, most notably in the southern half of the channel where the previous dredging was limited (due to the more restricted channel width and depth, as well as the meandering nature of the channel) and further south beyond the limits of where the dredging occurred in the removal action. In contrast, the average sediment mercury concentration in the reference stations was 0.07 mg/kg.

Two reference locations were used during the various ecological studies. One (Troup Creek) was located about 4.3 miles from the LCP Chemicals marsh, on the eastern side of the Brunswick Peninsula, and the other west of Sapelo Island, over 25 miles from the Brunswick area. The purpose of these reference locations was to collect data from areas presumed to have been uncontaminated with the LCP Chemicals Site, for the sake of comparison. Figure 13 shows the locations of the reference locations.

As shown in Figure 14, elevated mercury concentrations also occur in the LCP Ditch, most notably in the region where Eastern Creek joins this feature, with concentrations typically in the range of 5-to-25 mg/kg. A third area with elevated mercury concentrations is in the western segment of the WCC, where mercury concentrations are generally highest in the headwater portion of this channel, ranging from 5-to-16 mg/kg. With the exception of the areas proximal to the Uplands in Domain 1 as delineated above, in the marsh flats and tidal channels beyond these regions, including Purvis Creek, sediment mercury levels are typically at concentrations of less than 2-5 mg/kg, and lower yet in the marsh west of the tidal node which divides Domain 4 into “a” and “b” portions (Figure 1).

Methylmercury (MeHg) was measured at over 150 sediment sampling locations throughout OU1. The methylmercury in sediment ranged from below detection limits to 0.05 mg/kg, with a mean concentration of 0.005 mg/kg. Only a small fraction of the mercury in sediment was present as methylmercury. Because methylmercury readily bioaccumulates, it is more prevalent and toxic in biota tissue and toxic than elemental mercury. Figure 15 shows the locations of the sediment samples analyzed for methylmercury and the results.

5.3.2 Aroclor 1268 in Sediment

Sediment concentrations of Aroclor 1268 (the predominant PCB mixture in the LCP marsh) exhibit a spatial pattern generally consistent with that of mercury, with the highest sediment concentrations observed in the LCP Ditch and Eastern Creek (Figure 16). The western limb of the Western Creek Complex contains isolated detections of Aroclor 1268, with three sampling locations in the range of between 10-to-25 mg/kg. The Aroclor 1268 concentrations are noticeably higher compared to mercury at these locations, with many more sample locations in the range of 25-to-100 mg/kg or higher. Aroclor 1268 concentrations also tend to be a bit higher compared with mercury in Purvis Creek, in particular in the central portion of Purvis Creek where Aroclor 1268 is in the range of 5-to-10 mg/kg. Similar to mercury, the Aroclor 1268 concentrations are lowest in the marsh west of Purvis Creek. Aroclor 1268 was not detected above 0.13 mg/kg in the reference stations.

5.3.3 Lead in Sediment

Sample locations with the more elevated concentrations of lead occur in the Dillon Duck feature, the upper headwaters of Domain 3 Creek (located in the northern portion of the Site), and the former Glynn County landfill (Figure 17). Concentrations are typically in excess of 100 mg/kg in these locations, whereas elsewhere the concentrations are consistently in the range of 10 mg/kg to 50 mg/kg. Lead was not detected above 22 mg/kg in the reference stations.

5.3.4 Total PAHs in Sediment

The contaminant distribution for total PAHs is consistent with other COCs previously described (Figure 18), with the more elevated conditions present in the tidal channel areas. The majority of the marsh flats (i.e., vegetated top of marsh) in the LCP Chemicals marsh are low to non-detect for PAHs. The average sediment total PAH concentration in the reference stations was 0.145 mg/kg.

5.3.5 Observed Sediment Aroclor 1268 and Mercury Vertical Distributions

Figures 19a through 19i show the Aroclor 1268 and mercury results from vertical profile sampling in both the channels in the LCP Chemicals marsh and the marsh "flats." Note that vertical sampling in an environment such as the marsh is difficult and the data from the deeper samples collected is likely to represent worse case conditions, since some degree of cross-contamination is a certainty.

Of the 26 cores collected to a depth of one foot below the marsh surface or less, non-detect levels were approached within the upper one foot sample interval in 18 cores. The remaining shorter profiles could not be used to identify the bottom of contamination at these locations because the data did not extend beyond one foot, where declines in mercury and Aroclor 1268 concentrations were observed in the deeper cores.

Among the three cores collected at deeper depths, concentrations were low or approaching non-detect at 1.6 ft or deeper. The LCP Ditch core showed decreasing concentrations that were less than 20 mg/kg mercury and less than 2 mg/kg Aroclor 1268 at 1.6 ft depth. The two Domain 3 locations were characterized by low chemical concentrations at all depths (less than 6 mg/kg mercury and less than 2 mg/kg Aroclor 1268).

Note that, in contrast to the vertical profiles completed in the marsh channels (Figures 19a through 19e), those completed in the marsh "flats" (Figures 19f through19i) almost uniformly show a decline to low mercury and Aroclor 1268 concentrations in the upper six inches of the profile. This implies that in the marsh "flats' the COCs are present in a relatively thin layer at the surface.

5.3.6 Observed Sediment PAH and Lead Vertical Distributions

Figures 20a through 20f show the lead and PAH results from vertical profile sampling of the channels and marsh flats. Total PAHs were not collected at all locations, but Domains 1 through 3 were represented. All of the Domain 1 cores were collected from the removal area (pre-removal) and had lead concentrations above 40 mg/kg. In the other locations, eight of the ten cores analyzed for lead were characterized by sediment concentrations below 40 mg/kg at all depths, and eight of the ten cores analyzed for PAHs were characterized by sediment concentrations below 4 mg/kg, except for one core in taken in Purvis Creek, where the concentration was 17.4 mg/kg at eight inches below that creek bottom.

The distribution of COCs clearly points to the Eastern Creek, LCP Ditch and portions of Domain 3 Creek near the Site Uplands as major contaminant sources. In addition the Eastern Creek and LCP Ditch are more directly influenced by tidal action that can mobilize contaminants into Purvis Creek and beyond, much more so than contaminants in vegetated wetland marsh areas with very low tidal energy.

5.3.7 Observed Sediment Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs)

PCDDs and PCDFs are persistent chemicals in the environment. They tend to be very insoluble in water, adsorb strongly onto soils, sediments, and airborne particulates, are persistent in the environment, and bioaccumulate in biological tissues. These substances have been associated with a wide variety of toxic effects in animals. The association of PCDDs/PCDFs with the LCP Chemicals Site is due to the use of graphite anodes in the former chlor-alkali plant.

There exist about 48 sediment PCDD/PCDF results from LCP Chemicals marsh and surrounding areas sediment/soil samples. The general conclusion is that there exists a strong correlation between Aroclor 1268 and PCDD/PCDF concentrations.

In the marsh, sediment dioxin toxic equivalence concentrations (TECs) declined from an average of about 6,768 nanograms per kilogram (ng/kg) [range 2,640 to 12,761 ng/kg] in the vicinity of the removed FFDA to 138 ng/kg at dioxin station 111, located over half way down the LCP Ditch, at the confluence of the Eastern Creek with the LCP Ditch, to a TEC of 6.9 ng/kg at dioxin sampling station 117, where the LCP Ditch enters Purvis Creek, (Table 1 and Figure 21). This represents a 1,000 fold reduction of TECs from the removed source area (the former facility disposal area) to Purvis Creek. The EPA (2014) dioxins/furans memorandum provides details on the available data for dioxins and furans in the LCP Chemicals Marsh.

With exception of dioxin station 100, the Purvis Creek sediment dioxin TECs remain at single digit parts per trillion downstream of where the LCP Ditch enters Purvis Creek, until the confluence of Purvis Creek with the Turtle River. All the 1996 Turtle River sediment TECs remained in the single digit part per trillion range (Table 1) and many of the dioxin concentrations in Purvis Creek were similar to the Troup Creek and Crescent River reference stations.

The PCDD/PCDF and Aroclor 1268 sediment data presented in Table 1 show a strong relationship between Aroclor 1268 concentration and PCDD/PCDF concentration (correlation coefficient = 0.91). Similar relationships were found at the Onondaga Lake and Ninemile Creek Superfund sites in upstate New York.

5.4 Surface Water

The highest concentration of total mercury in the surface water of the major creeks in the LCP Chemicals marsh was 188 nanograms per liter (ng/L) in Eastern Creek (Table 2), which was less than the EPA's chronic ambient water quality criteria of 940 ng/L (saltwater) and 770 ng/L (freshwater). However, several surface water samples exceeded the Georgia in-stream water quality criteria for Coastal and Marine Estuary Waters of 25 ng/L for total mercury. Methylmercury concentrations in surface water in OU1 ranged from 0.15 to10 ng/L, which exceeded levels at reference locations (0.008 – 0.22 ng/L).

Aroclor 1268 was infrequently detected in creeks or at background reference locations and occasionally exceeded the Georgia in-stream water quality criteria for Coastal and Marine Estuary Waters of 0.03 and 0.000064 µg/L for total PCBs (including Aroclor 1268). Dissolved lead concentrations at the Site never exceeded water quality criteria. Figure 22 shows the locations of the surface water sampling stations.

Surface water concentrations of PCDD/PCDF collected in 2000 (approximately one year after the FFDA sediment removal) from the LCP Chemicals marsh were not very different from those found at the two reference stations (Troup Creek and Crescent River, Table 3).

5.5 Fish, Shellfish, Benthic Invertebrate and Other Biota Tissue

5.5.1 Mercury and Aroclor 1268

Body burdens of COCs in biota key to the functioning of the marsh system at the LCP Chemicals Site (i.e., cordgrass, Eastern oysters, grass shrimp, fiddler crabs, blue crabs, mummichogs, and various large finfish) were typically higher in the LCP Chemicals marsh, when compared to biota at reference locations. Table 4 shows the concentrations of mercury (assumed to be all methylmercury) and Aroclor 1268 in wholebody tissues collected from the LCP Chemicals marsh and from the Troup Creek reference area, as reported in the BERA. The significance of these concentrations in biota is described in the risk assessments and in the "Summary of Site Risks" section below.

The levels of methylmercury and PCBs (primarily Aroclor 1268) detected in fish fillets resulted in a fish consumption advisory for the TRBE issued by the GADNR from 1995 to the present.

5.5.2 PCDD/PCDF

A 1997 Turtle River ATSDR Health Consultation presented dioxin fish data from 1989 through 1994. The fish data presented in the report were acquired by Georgia-Pacific from two Turtle River stations, one immediately above the confluence of Purvis Creek with the Turtle River and the second near the confluence of the East River with the Turtle River. Fish tissue dioxin data for the Chattahoochee and Oconee Rivers, and the Sapelo Sound are also presented in the report for the sake of comparison. The Health Consultation concluded that fish PCDD/PCDF concentrations were higher in the Turtle

River than in reference areas; however, the dioxin levels found in fillet tissue were well below the Food and Drug Administration tolerance levels for dioxin in fish of 3 ng/kg. Table 5 presents the fillet and whole body PCDD/PCDF concentrations in fish collected at two stations upstream and downstream of the Brunswick Cellulose Mill, as well as at the Sapelo Sound reference station.

During the late 1990s a University of Michigan investigator analyzed organ and muscle tissue from clapper rail, mottled duck, boat-tailed grackle, red-winged blackbird, stripped mullet, yellow tail, sea trout, Atlantic croaker and blue crab caught in the marsh for PCDD/PCDF. All tissues were found to be uniformly below the detection limits of 10 ng/kg.

In 1998, the U.S. Fish and Wildlife Service collected killifish (Fundus heteroclitus) tissue from mid-way along the LCP Ditch. Along with other parameters, the whole body tissue was analyzed for dioxins/furans. Almost all PCDD/PCDF congeners were found to be below detection limits. Consequently, because the calculated TECs assume each congener is present at one-half the detection limit, the results are an overestimation of actual tissue levels. In addition, the concentrations of dioxin/furan in the whole fish tissue samples were taken from killifish collected from the LCP Ditch during the marsh removal which also represents worst case conditions.

6.0 Current and Potential Future Land and Water Uses

6.1 Land Uses

The LCP Chemicals Site is surrounded primarily by commercial and industrial property. As shown on Figure 3, it is bordered by a former Glynn County land disposal facility and a pistol firing range to the north, a tidal marsh and the Turtle River to the west, the Brunswick Cellulose plant to the south, and Ross Road on the east. The Glynn County Planning Commission Land Use Maps designates the area as industrial for both present and future use. The "useable" areas of the Site, the marshland from the east bank of Purvis Creek, and the Brunswick Cellulose property to the south are all zoned "Basic Industrial." The former Standard Industrial Classification (SIC) code for the property is 2812 (Chemicals and Allied Products, Alkalies and Chlorine), which falls within the GAEPD's regulatory definition of non-residential property (391-3-19-.02(2)(i)). Current and future off-site land use for commercial and industrial purposes is expected to remain unchanged.

6.2 Marsh and Creek Use

The LCP Chemicals marsh is zoned by Glynn County as a conservation preservation (CP) district. The intent of the CP designation is to preserve and/or control development areas of the County which: 1) serve as wildlife refuges, 2) possess natural beauty or are of historical significance, 3) are utilized for outdoor recreational purposes, 4) provide needed open spaces for the health and general welfare of the county inhabitants, or 5) are subject to period flooding.

Purvis Creek and associated streams within OU1 are considered Coastal and Marine Estuarine Waters and under the Georgia Water Use Classifications, Chapter 391-3-6-.03(14), and include the following use Classifications: Recreation, Fishing, Propagation of Fish, Shellfish, Game and Other Aquatic Life and Coastal Fishing.

7.0 Summary of Site Risks

A baseline HHRA was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site assuming no remedial action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The public health risk assessment followed a four step process: 1) hazard identification, which identified those hazardous substances which, given the specifics of the site were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances, and 4) risk characterization and uncertainty analysis, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the site, including carcinogenic and non-carcinogenic risks and a discussion of the uncertainty in the risk estimates. A summary of those aspects of the human health risk assessment which support the need for remedial action is discussed below followed by a summary of the environmental risk assessment.

7.1 Human Health Risks

7.1.1 Identification of Contaminants of Concern

The contaminants of potential concern (COPCs) were selected to represent potential site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment.

The baseline HHRA identified a subset of the COPCs as presenting a significant current or future risk and are referred to as the COCs in this ROD. Table 6 presents the COCs and exposure point concentrations for each of the COCs detected in sediment, fish, shellfish and the clapper rail. The tables include the range of concentrations detected for each COC, as well as frequency of detection (i.e., the number of times the chemical was detected in the samples collected from the LCP Chemicals marsh), the exposure point concentration (EPC), and how the EPC was derived. The table indicated that mercury and Aroclor 1268 were most frequently detected COCs in the sediment and biota at the LCP Chemicals marsh. The 95 percent upper confidence limit (UCL) on the arithmetic mean was used as the EPC for mercury and Aroclor 1268. The HHRA quantitatively evaluated both cancer and non-cancer health hazards associated with potential current and/or future exposures to COCs present in sediment, fish, shellfish and clapper rail from the LCP Chemicals marsh, in the absence of any action to control or mitigate the chemicals. The HHRA was prepared to evaluate potential risks associated with exposure to elevated concentrations of mercury and Aroclor1268 in sediment; Aroclor-1268 and mercury in fish; Aroclor 1268 and mercury in shellfish; and Aroclor-1268 and mercury in the clapper rail.

7.1.2 Exposure Assessment

The receptors evaluated in the LCP Chemicals marsh baseline HHRA include the marsh trespasser, recreational fish consumer, high quantity fish consumer, shellfish consumer and the clapper rail consumer. Figure 11 is an illustration of the CSM used to determine reasonable exposure scenarios and pathways of concern. Note that the figure identifies the dermal contact with surface water as having been considered qualitatively. The marsh trespasser scenario assumed that a hypothetical individual visits the marsh on a regular basis and comes into contact with contaminated sediment and surface water over time beginning in adolescence and continuing into adulthood. The recreational fish consumer scenario evaluated exposure to recreational anglers who consistently consume fish and shellfish from the LCP Chemicals marsh over a long period of time (30 years for adults). This scenario uses data on the amount of recreationally-caught fish consumed by children, adolescents, and adults in the southeastern United States and assumes that all of that consumption would be from fish caught within Zones D, H, and I of the St. Simons Estuary (Figure 23).

The high quantity fish consumer scenario evaluated exposures to individuals who, based on the area-specific creel survey, consume more locally-caught fish than the typical recreational angler. The shellfish consumer scenario was used to evaluate potential exposure to COC in shellfish (e.g., white shrimp and blue crab) caught in areas of the marsh proximate to the LCP Chemicals Site. The clapper rail consumer scenario is used to evaluate potential exposure to COC in clapper rail caught in areas of the marsh proximate to the LCP Chemicals Site. According to United States Fish and Wildlife representatives, although the clapper rail is hunted, people do not commonly consume clapper rail. There are no data specific to clapper rail ingestion rates; therefore data for total wild game ingestion for children, adolescents, and adults was used, along with the conservative assumption that clapper rail obtained from the LCP Chemicals marsh comprised 10 percent of the total wild game ingestion. A summary of the results of the risk estimates is provided below in the "Risk Characterization" section.
Fish consumption rates used in the baseline HHRA were based on the following:

- The adult high quantity consumer scenario was assumed to consume, on average, 27 grams of finfish per day. Assuming a fish meal size of 0.3 pounds (135 grams), this translates to 73 meals/year, or approximately six meals per month (from Zones D, H and I), based on self-identified high-quantity consumers in an area-specific creel survey. Assuming a larger fish meal (0.5 pounds) fish meal size, this translates to about 43 meals per year, or a little less than four meals per month;
- The recreational adult consumer was assumed to consume, on average, about 16 grams of finfish per day. Assuming a fish meal size of 0.3 pounds, this translates to about 38 fish meals per year, or about three and a half meals of finfish per month. Assuming a larger fish meal size (0.5 pounds), this translates to about 26 meals per year, or about two meals per month. For shellfish consumption, the adult recreational fisher was assumed to catch and eat about 12 grams per day, on average. This translates to about one and a half meals per month for a 0.5 pound

meal or about two and a half meals of shellfish per month for a 0.3 pound meal size. These finfish and shellfish consumption quantities are based on upper-end of EPA defaults for recreational fishing in Southeast United States. The HHRA assumes that these consumption amounts are for fish caught in the same area; and

- The area-specific creel survey was the basis for the high quantity fish consumption rates used in the baseline HHRA, conducted by the federal ATSDR (U.S. Department of Human Health Services) and the Glynn County Health Department, which surveyed 211 Turtle River anglers. The creel survey covered racial/ethnic groups representative of area population. The NOAA fisheries information was used to assign site-specific weighting factors to the various species of fish caught and eaten. Based on the survey, Table 7 shows the average percentage of the various species of fish caught by coastal Georgia anglers between 2001 and 2005.

Fish filet tissue data used in the HHRA from the GADNR Zones D, H and I. Zone D is considered to be the middle of the Turtle River. Zones H and I are Purvis Creek and Gibson Creek, respectively. Figure 23 shows the GADNR Fish Consumption Guidelines Zones. The most recent fish fillet data (2011) shows that fish caught in Zone H (Purvis Creek) had the highest mercury and Aroclor 1268 concentrations in 56 percent of the species sampled. Hence, the HHRA estimated the risks posed by consuming fish from the most contaminated zones in the St. Simon estuary.

Because risk assessments are designed to be conservative so that risk management strategies can be protective of human health, as well as consistent with EPA policy and guidance, two types of exposure scenarios were analyzed in the HHRA to assess the range of potential risk: the reasonable maximum exposure (RME), which estimates the highest level of human exposure that could be reasonably expected to occur, and the central tendency (CT, or "typical") scenario. Cancer and non-cancer health hazards were assessed under both these scenarios.

Major assumptions about exposure frequency, duration, and other exposure factors that were included in the exposure assessment (e.g., exposure frequency (days per year), exposure duration (years), and body surface area (cm^2) for dermal exposure) were included in the HHRA.

7.1.3 Toxicity Assessment

Risk estimates for all COCs were based on the toxicity values, using cancer slope factors (CSFs) to assess potential carcinogenic effects and reference doses (RfDs) to assess potential non-cancer effects. The measures were primarily derived and published by EPA. The two contaminants responsible for the majority of the estimated site risks are mercury and Aroclor 1268.

Whenever possible, route-specific toxicity values were used. However, toxicity values for sediment dermal exposures have not yet been developed by the EPA; therefore, the oral toxicity values were used to derive adjusted toxicity values for use in assessing dermal exposure. The hierarchy of sources to toxicity values recommended by the EPA was used to obtain toxic criterion, with the exception of Aroclor 1268.

For all exposure scenarios considered in the HHRA (sediment exposure, fish/shellfish consumption or clapper rail consumption), all mercury was assumed to be present as methylmercury. Methylmercury is a toxic metal compound with which a number of adverse human health effects have been associated in both humans and animals. Large amounts of data exist on neurotoxicity, particularly in developing organisms.

The Integrated Risk Information System (IRIS) contains values for the CFS for PCB mixtures and RfDs for Aroclor 1016 and Aroclor 1254 only. The RfD for Aroclor 1016 on the IRIS database was used as surrogate toxicity for Aroclor 1268, as detailed in the HHRA, because it is more similar on a toxicological basis to Aroclor 1016 than to Aroclor 1254.

PCBs are classified as probable human carcinogens, as a result of dose-response bioassays of Aroclor mixture performed in rodents. Studies on rhesus monkeys exposed to PCBs indicate a reduced ability to fight infections and resulted in reduced birth weight in offspring exposed in utero. Two slope factors were derived, one for high risk and persistent mixtures and the other for low risk and low persistence mixtures. To be conservative, the slope factor for high risk and persistence was used for dermal contact with Aroclor 1268, as well as that consumed in fish.

A summary of the toxicity criteria used and their sources for both cancer and non-cancer health effects are presented in Tables 8 and 9, respectively.

7.1.4 Risk Characterization

For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

Risk = CDI x SF

where: risk = a unitless probability (e.g., 2E-05) of an individual's developing cancer.
CDI (cancer) = chronic daily intake averaged over 70 years (mg/kg-day).
SF = slope factor, expressed as (mg/kg-day)-1.

These risks are probabilities that usually are expressed in scientific notation (e.g., 1E-06). An excess lifetime cancer risk of 1E-06 indicates that an individual experiencing the RME estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. The EPA's generally acceptable risk range for site-related exposures is 1E-06 to 1E-04.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., life-time) with a RfD derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ<1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all COCs that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI<1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An HI > 1 indicates that site-related exposures may present a risk to human health. The HQ is calculated as follows:

Non-cancer HQ = CDI/RfD

where: CDI = Chronic daily intake.
RfD = reference dose.

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

Hazards and Risks from Exposure to Sediment
For the current and future trespasser wandering in the LCP Chemicals marsh, the RME maximum non-cancer HI presented in the HHRA was 0.08, indicating no hazard (Table 10). The cancer risk from exposure to sediment was 1.0E-05, which is within EPA's acceptable risk range (Table 11).

Non-Cancer Hazards from Consumption of Fish and Shellfish
Non-cancer hazards from consumption of fish collected from zones D, H and I are summarized in Table 12 for the RME scenarios. For recreationally-caught finfish, the estimated HIs for the adult, adolescent and child are 3, 3, and 4, respectively. These HIs are greater than one and indicate that for the recreational fish consumer, the potential for adverse non-cancer effects could occur from exposure to contaminated recreationally-caught finfish containing mercury and Aroclor 1268.

For the high quantity fish consumer RME scenarios, the HIs were estimated to be 5, 4, and 8 for the adult, adolescent and child, respectively. These HIs also indicate that adverse non-cancer effects are expected to occur.

The estimated RME hazards from consumption of shellfish (blue crab and white shrimp) are summarized in Table 13. The HIs range from 0.7 for the adolescent to 4 for the child, suggesting the potential for adverse health hazards to adults and children from exposure to mercury and Aroclor 1268 in shellfish. In general, hazards from mercury in blue crab are higher than from white shrimp; and conversely, hazards from Aroclor 1268 slightly higher from consumption of white shrimp than from blue crab.

Non-Cancer Hazards from Consumption of Clapper Rail
The estimated hazards from RME consumption of clapper rail are shown in Table 14. The HIs are greater than one and suggest that potential adverse effects could occur. Most of the hazards are related to Aroclor 1268 in clapper rail breast tissue.

Cancer Risks from Consumption of Fish and Shellfish
Table 15 provides lifetime cancer risk estimates for consumers of recreationally-caught and high-quantity consumption of finfish. These risk estimates are based on RME exposures and were developed by taking into account various conservative assumptions about the frequency and duration of exposure, as well as the toxicity of Aroclor 1268. The current lifetime cancer risk to the adult recreational finfish consumer at this Site is estimated to be 1.1E-04. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 1 in 10,000 of developing cancer as a result of site-related exposure to the COCs. For the high-quantity fish consumer RME scenario the lifetime cancer risk is higher at 2E-04.

For consumption of shellfish (blue crab and white shrimp) the RME lifetime cancer risk was estimated to be 5.8E-05 (Table 16). This risk level indicates that an individual would have an increased probability of about 6 in 100,000 of developing cancer as a result of site-related exposure to the COCs in shellfish.

Cancer Risks from Consumption of Clapper Rail
As summarized in Table 17, RME lifetime cancer risk from eating clapper rail harvested from Domain 1 is estimated to be 1.1E-04 or a probability of about 1 in 10,000.

Risk Summary
A summary of the hazards and risks is presented in Table 18. The HHRA describes the cancer risks and non-cancer health hazards associated with ingestion of fish contaminated with mercury and Aroclor 1268 from the LCP Chemicals marsh. Fish and shellfish ingestion is the primary pathway for exposure to COCs and for potential adverse health effects. Cancer risks and non-cancer health hazards calculated for consumption of LCP Chemicals marsh fish, shellfish and clapper rail exceeded the target risk level range, as follows:

- ***Non-cancer health hazards*:** The calculated RME non-cancer HIs ranged from 0.7 for consumption of shellfish to 8 for the child high quantity fish consumer. Adult recreational anglers would have a HI of 3 and the adult high-quantity fish consumer would have a HI of 5, both of which exceed EPA's acceptable level. Calculated central tendency exposure (CTE) hazards exceeding the acceptable level are for child consumption of fish and shellfish and the high quantity fish consumer. The calculated RME non-cancer HIs ranged from 1 for the adolescent to 5 for the child. All of the CTE cancer risks were within acceptable levels for the clapper rail.

- ***Cancer risks***: Cancer risks are only associated with Aroclor-1268. The HHBRA calculated a RME excess cancer risks (ECR) of 2E-04 for the high quantity fish consumer and 1E-04 for the clapper rail consumer. An ECR of 6E-05 for consumption of shellfish is within EPA's acceptable range. All of the CTE cancer risks were within acceptable levels.

There were no unacceptable health hazards or risks associated with lead or PAHs. The only two contaminants that contribute to unacceptable human health risks are mercury and Aroclor 1268.

The Baseline HHRA also estimated fish and shellfish tissue concentrations that would be protective to humans at EPA's acceptable HI of 1.0 and cancer risk range of 1E-06 to 1E-04. For example, Table 19 compares the current average edible tissue concentrations from the Baseline HHRA with the calculated protective tissue goals for the adult RME high quantity fish/shellfish/clapper rail consumer at a HI of 1 and cancer risks at 1E-04. These numbers from the Baseline HHRA and those calculated as part of the State of Georgia fish consumption advisory for the TRBE can be used for future monitoring of fish tissue levels to determine if protective levels are achieved.

7.1.5 Uncertainties Related to the Baseline HHRA

Uncertainties are inherent in the quantitative risk assessment process due to environmental sampling design, assumptions regarding exposure, and the quantitative representation of chemical toxicity. To satisfy the EPA goal of ensuring that health risks are not underestimated, conservative assumptions were built into the HHRA so that resultant risk estimates are more likely to overestimate risks than to underestimate them. Examples of uncertainty in the OU1 Baseline HHRA where conservative assumptions were made relate to the exposure assumptions used to characterize the RME receptor scenarios, the COC concentrations in biota tissue used to estimate receptor intake, and the toxicity values used to characterize the potential cancer risks associated with Aroclor 1268. These assumptions are as follows:

- An individual trespasser would walk through the Site marsh once a week for 30 years (a total of 1,560 separate events), each time incidentally ingesting contaminated sediment;
- 100 percent of the fish and shellfish eaten by any individual would come from the areas in the immediate vicinity of the Site.
- A hunter would eat clapper rail obtained from the Site such that this source of clapper rail comprises 10 percent of the total wild game eaten.
- The potential carcinogenicity of Aroclor 1268 was evaluated using the upper-bound cancer slope factor for high risk/persistence PCBs. At least one review of

the available carcinogenicity data suggests the tumorigenic potency of Aroclor 1268 may be somewhat lower.

7.1.6 Qualitative Estimation of Risks Posed by PCDD/PCDF to Human Health

The HHRA for the marsh assumed six days per year reasonable maximum exposure intake frequency for direct human contact to the sediment. Using this site-specific exposure frequency, the dioxin-TEC protective for the human child is calculated as follows:

$$50 \text{ ng/kg} \times \frac{350 \text{ d/y}}{6 \text{ d/y}} = 2{,}900 \text{ ng/kg (for dioxin TEC in sediment)}$$

Based on the dioxin TECs presented in Table 1, all areas above this concentration of 2,900 ng/kg will be removed, thereby suggesting no risk to children from direct contact to sediment.

For fish consumption, using the EPA Fish Advisory Guidance (with an ingestion rate higher than OU1 HHRA ingestion rate for all receptors), the calculated screening level is 3 ng/kg (for dioxin TEC in fish fillets). The fish filet data associated with the 1997 Turtle River Health Consultation Report led ATSDR to the conclusion that the TEC levels were not of significant concern.

These sediment and fish fillet values are both based on a non-carcinogenic hazard quotient of one (HQ = 1) for the sensitive young child receptor, using the EPA IRIS RfD. They are also within the carcinogenic risk range of 1E-06 to 1E-04. Finally, University of Michigan investigators analyzed organ and muscle tissue from clapper rail, mottled duck, boat-tailed grackle, red-winged blackbird, stripped mullet, yellow tail, sea trout, Atlantic croaker and blue crab for tetrachlorodibenzodioxin (TCDD) / tetrachloro-dibenzofuran (TCDF). All were found to be uniformly below the detection limits of 10 ng/kg.

7.2 Ecological Risks

7.2.1 Ecological Communities in the LCP Chemicals Marsh

The tidal estuary of the Site is comprised of approximately 13 percent tidal creeks and 87 percent marsh composed of indigenous marsh grasses, predominantly smooth cordgrass (*Spartina alterniflora*).

OU1 generally consists of a community of *S. alterniflora* and occasional patches of black needle rush (*Juncus roemerianus*). Cordgrass is prevalent in the low marsh with plant diversity increasing towards the upland area such as in the Dillon Duck area.

The benthic salt marsh invertebrate community at the Site includes those organisms that live in the sediment of the marsh (benthic infauna) and on top of the sediment (epibenthic fauna). It also includes those organisms that live on the plants of the marsh (epiphytic fauna). Tidal influences and inundation are key factors that govern community structure and function in the marsh system. Site-specific surveys and studies have described the important components of the invertebrate community as follows:

- Fiddler crabs (*Uca* spp.) are ubiquitous in salt marshes and appear to have a mutually beneficial interaction with marsh vegetation. Crab burrows increase plant production by moderating soil conditions and, in turn, marsh plants facilitate crab burrows by stabilizing the substrate.
- Grass shrimp (*Palaemonetes pugio*) are a major source of food for crabs and fish and facilitate nutrient cycling.
- Other invertebrates including infaunal, epifaunal, and epiphytic organisms are present at the Site. The benthic community is composed of barnacles, mysids, penaeid shrimp, ribbed mussels, marsh periwinkle, mud snails, eastern oysters, blue crabs, oligochaetes, polychaetes, and amphipods.

Fish inhabit the LCP Chemicals creek and marsh system, generally entering into the marsh area with incoming tides. Fish indigenous to the marsh include the mummichog, red drum, black drum, silver perch, spotted seatrout, striped mullet, Atlantic croaker, southern kingfish, spot, and sheepshead. Smaller fish, like mummichog, do not migrate and are a key component of the food web. Many other fish species migrate from the Site to nearby areas.

Finfish and shellfish predominantly reside in the creeks and make use of the marsh areas only during high tide conditions when the marsh is inundated. The use of different areas of the marsh by other aquatic organisms (e.g., mummichogs, shellfish, grass shrimp) depends on the proportion of time that each area is inundated. The location and duration of inundation depends on bank elevation. During low tide, vegetated marsh areas and creeks are predominantly exposed and water is present only in small portions of the creeks. Exposed marsh areas are used by organisms such as fiddler crabs, which emerge from their burrows to forage on organic carbon and algae.

Based on current understanding of tidal fluctuations, flooding in the marsh may only be fully inundated 5-to-20 percent of the time, which equates to approximately one-to-four hours a day, depending on the elevation at any particular point. Thus, tidal fluctuations are a critical factor in understanding the types of ecological exposures that occur for wildlife in the marsh as fish and other aquatic organisms move in and out of the marsh with tides.

There are many birds indigenous to the marsh and include grebes, herons, bitterns, ibises, geese, marsh ducks, vultures, hawks, ospreys, rails (including the clapper rail), stilts, plovers, sandpipers, gulls, pelicans, and songbirds. The wood stork (*Mycteria americana*), an endangered species, has been observed foraging in tidal creeks of the salt marsh and breeding at several colonies in the vicinity of Brunswick.

Mammals use the marsh and surrounding habitats for food and shelter even though there are major variable conditions in salt marshes that are related to tidal inundation and salinity. Resident mammal species likely include shrews, bats, raccoon, river otter, and marsh rabbit. The West Indian manatee (*Trichechus manatus*) and the Atlantic bottlenosed dolphin (*Tursiops truncatus*), both of which are protected under the Marine Mammal Protection Act, have been observed in Purvis Creek.

The most common reptile in Atlantic coast salt marshes is the diamondback terrapin (*Malaclemys terrapin*). In addition, several species of threatened or endangered Atlantic sea turtles, the green turtle (*Chelonia mydas*), Kemp's ridley turtle (*Lepidochelys kempi*), hawksbill turtle (*Eretmochelys imbricata*), loggerhead turtle (*Caretta caretta*), and leatherback turtle (*Dermochelys coriacea*), may visit the Site.

7.2.2 Problem Formulation

Problem formulation identifies the major factor to be considered in a BERA, including COPC characteristics, ecosystems and/or species potentially at risk, and ecological effects to be evaluated. It establishes the goals, breadth, and focus of the assessment, develops a conceptual model, and selects assessment endpoints, which are explicit expressions of the environmental value that is to be protected. In a HHRA, only one species (humans) is evaluated and the cancer and non-cancer effects are the usual endpoints. In contrast, a BERA involves multiple species that are likely to be exposed to differing degrees and respond differently to the same contaminant. Assessment endpoints focus the risk assessment on particular components of the ecosystem that could be adversely affected by contaminants from the Site.

Assessment endpoints are the ecological resources whose protection from adverse effects is the goal of risk management actions. Measurement endpoints are environmental parameters that can be measured through field and laboratory analysis, and provide a good indication of the condition of an assessment endpoint.

The assessment and measurement endpoints evaluated in the BERA include:

- Viability of the benthic estuarine community as evaluated by three measurement endpoints: 1) comparisons of concentrations of COPCs in surface sediment to site-specific effects levels; 2) results of toxicity tests conducted with sensitive life stages of benthic biota exposed to surface sediment; and 3) evaluation of the indigenous benthic community;
- Viability of omnivorous reptiles utilizing the marsh, as evaluated by HQs derived from food-web exposure models for diamondback terrapins (*Malaclemys terrapin*);
- Viability of omnivorous avian species utilizing the LCP Chemicals marsh, as evaluated by two basic measurement endpoints: 1) HQs derived from food-web exposure models for red-winged blackbirds (*Agelaius phoeniceus*); and 2) HQs derived from food-web exposure models for clapper rails (*Rallus longirostris*);
- Viability of piscivorous avian species utilizing the marsh, as evaluated by HQs derived from food-web exposure models for green herons (*Butorides striatus*);

- Viability of herbivorous mammalian species utilizing the marsh, as estimated by HQs derived from food-web exposure models for marsh rabbits (*Sylvilagus palustris*);
- Viability of omnivorous mammalian species utilizing the marsh, as estimated by HQs derived from food-web exposure models for raccoons (*Procyon lotor*);
- Viability of piscivorous mammalian species utilizing the marsh, as estimated by HQs derived from food-web exposure models for river otters (*Lutra canadensis*); and
- Viability of finfish utilizing the estuarine system, as evaluated by five measurement endpoints: 1) comparisons of concentrations of COPCs in surface water to general literature-based effects levels; 2) results of toxicity tests conducted with early (and sensitive) life stages of aquatic biota exposed to COPCs in surface water; 3) tissue residue HQs derived from finfish bioaccumulation models; 4) tissue residue HQs derived from field-collected finfish; and 5) evaluation of the benthic community as a food source for juvenile and adult fish.

Detailed quantitative assessment of select populations of fish and wildlife were conducted by selecting individual species representative of various feeding preferences, predatory levels, and habitats. Receptors selected to represent the LCP Chemicals marsh ecological community for the BERA included two species of benthic invertebrates, one species of reptile, three species of birds, three species of mammals and five species of finfish. Concentrations of COCs in prey items for these species were also measured (e.g., in fiddler crabs, blue crabs, and mummichogs). The remaining receptors (i.e., aquatic plants and oysters) were evaluated qualitatively.

7.2.3 Identification of Contaminants of Concern for Ecological Receptors

The BERA evaluated the likelihood that adverse ecological effects are occurring or may occur as a result of exposure to one or more chemical stressors. The COCs quantitatively evaluated in the BERA included mercury, Aroclor-1268, lead and PAHs. Both inorganic mercury and methylmercury were evaluated as COCs in sediment, surface water, and biota. Receptors exposed to these COPCs included benthic invertebrates, omnivorous reptiles, omnivorous birds, piscivorous birds, piscivorous mammals, herbivorous mammals and finfish. The framework used for assessing site-related ecological risks is similar to that used for the HHRA and consists of problem formulation, ecological exposure assessment, ecological effects assessment, and risk characterization.

Tables 20a and 20b summarize the ecological COCs and their associated concentrations in sediment and surface water, respectively.

7.2.4 Ecological Exposure Assessment

Exposure assumptions and dietary models were used to predict the potential exposure of biota to COCs associated with the LCP Chemicals marsh. Exposure parameters (e.g., body weight, prey ingestion rate, home range) of the representative fish and wildlife species were used to calculate the exposure concentrations or dietary doses. Site-specific measured COCs in the dietary components of each modeled receptor were included to provide better predictive power and reduce uncertainty.

The primary means of assessing exposure to benthic organisms was the use of 245 sediment toxicity tests to amphipods and 110 toxicity tests with grass shrimp that included a variety of endpoints such as embryo development, reproductive response and survival. The tests were conducted during the multi-year study period as part of the annual monitoring for the 2001 removal action. Details of the toxicity tests may be found in Appendix C of the BERA.

Table 21 presents a summary of ecological exposure pathways evaluated in the BERA.

7.2.5 Ecological Effects Assessment

The BERA evaluated the likelihood that adverse ecological effects are occurring or may occur as a result of exposure to the contaminants associated with the LCP Chemicals marsh. The COCs quantitatively evaluated in the BERA included mercury, Aroclor 1268, lead, and PAHs. Receptors exposed to these COCs included benthic invertebrates, omnivorous reptiles (represented by the diamondback terrapin), omnivorous birds (represented by the clapper rain and redwing blackbirds), piscivorous birds (represented by the green heron), piscivorous mammals (represented by the river otter), herbivorous mammals (represented by the marsh rabbit), omnivorous mammals (represented by the raccoon) and finfish. The framework used for assessing site-related ecological risks is similar to that used for the Baseline HHRA.

The BERA evaluated multiple lines of evidence (LOE), based on various measured effects, to determine if contamination from the LCP Chemicals marsh had adversely affected the biota in and around the marsh. The LOE for each receptor and associated results are summarized below.

Benthic Invertebrates. The three LOE used to assess the benthic community were: 1) comparisons of concentrations of COCs in surface sediment with site-specific effects levels; 2) results of toxicity tests conducted with sensitive life stages of benthic biota exposed to surface sediment; and 3) evaluation of the indigenous benthic community. The collective results from these LOE indicate that the viability of the structure and function of the benthic community in the LCP Chemicals marsh is at risk from the COCs, especially in the LCP Ditch and Eastern Creek.

Two sensitive species were selected for the toxicity tests: 1) amphipods (*Leptocheirus plumulosus*) that burrow into the sediment and grass shrimp (*Palaemonetes pugio*) that generally float above the sediment. Results of over 300 sediment toxicity tests conducted between 2000 and 2006 provided the data for assessing risks to the benthic community. For the amphipods, survival was the most sensitive endpoint, followed by reproductive response; and for grass shrimp the most sensitive endpoint was embryo development. The results from tests on amphipods that burrow into the sediment indicated toxic effects in up to 85 percent of sediment samples from the LCP Chemicals marsh. However, toxicity was also observed in several reference samples from Troup Creek. Toxicity tests with grass shrimp showed toxic effects in up to 69 percent of the samples, including a few from reference stations. Although limited toxicity occurred in some reference sediment samples, this did not add intractable uncertainty. A detailed analysis of potential causes of the toxicity was presented in the BERA, along with the conclusion that, in addition to the COCs in sediment, various other non-measured factors likely influenced the tests, such as sulfides and organic carbon content, redox conditions, sediment pH, and grain size.

Notwithstanding the toxicity test results, sediment effect concentrations (SECs) which are guidelines used to predict sediment toxicity were calculated for both species based on several measurement endpoints that included tests for survival, reproduction, and growth rates. The results of each measurement endpoint were then evaluated using five different statistical analyses to determine SECs, such as threshold effect levels (TELs) and probable effects levels (PELs). Each of the five SECs conveys a sense of variability and are not considered a "bright line" for defining toxicity. In addition, accuracies in predicting SECs were calculated based on numbers of false positives and false negatives.

The TEL and effects range-low (ER-L) form the most conservative or lower end of the SECs while a probable effects level (PEL) concentration suggests that the sediment will likely be toxic. The effects range median (ER-M) and the apparent effects threshold (AET) were used to define the less conservative upper end effects. Table 22 summarizes the SEC concentrations based on the five statistical measures for the most sensitive toxicity tests (amphipod survival and grass shrimp embryo development). The data indicates a wide range of effect concentrations with low average accuracies among the five measures.

Using all valid toxicity test data, the SECs selected to represent the low-end of effects are highlighted in yellow color on Table 22. These concentrations represent conservative values that takes into account the widespread toxicity observed at the site as well as toxicity observed at the reference locations. The upper-end of the SECs (blue highlights on Table 22) represents values that address the toxicity to sensitive test organisms with a small margin for error. The selected SECs were also more reliable and accurate (generally between 55 and 60 percent accuracy). Other less sensitive test endpoints such as reproductive response and embryo hatching resulted in higher SECs and less accuracy. The SECs presented in Table 22 provide the basis for development of preliminary remedial goals (see Section 8.1).

Finfish. There were five basic measurement endpoints available for evaluating the viability of finfish utilizing the LCP Chemicals marsh: 1) comparisons of concentrations of COCs in surface water to general state and federal water quality criteria; 2) results of toxicity tests conducted with early (and sensitive) life stages of mysids and sheepshead minnows exposed to COCs in surface water; 3) HQs derived from food-web exposure models for finfish (silver perch, red drum, black drum, spotted seatrout, and striped mullet); 4) HQs derived from actual measured residues in field-collected finfish; and 5) evaluation of the benthic macroinvertebrate community (as a food source for juvenile and adult fishes). The overall conclusion derived from these five measurement endpoints is that there is no risk to finfish in the marsh from direct exposure to COCs in the water column. However, the dietary modeling and tissue data for field-collected finfish suggest that chronic risk to the viability of finfish indigenous to the LCP Chemicals marsh is of concern. The lowest-observed-adverse-effect-level (LOAEL) methylmercury HQs for field-collected finfish ranged from 0.1 to 2.2 and from 0.4 to 4 for exposure to Aroclor-1268. Finfish with LOAEL HQs < 1 are not likely to be at significant adverse risk. The LOAEL HQs suggest persistent low-level chronic effects.

Wildlife. To assess exposure to various wildlife receptors that occurs in the LCP Chemicals marsh, food-web models were used. These models included conservative assumptions and input values to ensure protectiveness, such as assuming that each receptor spends its entire life in the LCP Chemicals marsh and that the COCs are 100 percent bioavailable. Calculated intake doses were compared to toxicity reference values based on the NOAEL and the LOAEL. Table 23 summarizes the modeled results and lists the COCs generating the potential risks.

The results indicate that lead and PAHs do not present unacceptable risk to the wildlife receptors. Methylmercury is of concern to birds, while Aroclor 1268 is of concern to mammals. None of the LOAEL HQs were exceeded for the redwing blackbird, marsh rabbit, raccoon and river otter, indicating minimal risks. The green heron (piscivorous birds) are at most risk.

7.2.6 Ecological Risk Characterization

The BERA was primarily designed to address potential risk pertaining to the following eight fundamental assessment endpoints according to a “strength-of-evidence” approach.

Multiple lines of evidence (LOE), based on various measured effects, were used to evaluate major components of the LCP Chemicals marsh ecosystem to determine if contamination has adversely affected the biota in and around the marsh. Based on the availability of data, some of the assessment endpoints had only one or two LOE such as those receptors evaluated in the food chain model, while other receptors such as finfish had several LOE.

The three LOE to assess the benthic estuarine community indicate that the viability of the structure and function of the benthic estuarine community in the LCP Chemicals marsh is at risk from the COCs, especially in the southeastern part of the marsh (in particular, the LCP Ditch and Eastern Creek).

The two LOE generated to evaluate the viability of omnivorous birds utilizing the LCP Chemicals marsh suggested minimal risk to the red-winged blackbird and the clapper rail.

The single LOE available to evaluate the viability of the green heron utilizing the LCP Chemicals marsh suggested that potential risk to the viability of the green heron in the LCP Chemicals marsh, due to exposure to methylmercury is moderate.

The single LOE available for evaluating the viability of herbivorous mammalian species utilizing the LCP Chemicals marsh consisted of HQs derived from food-web exposure models for marsh rabbits. A modeling study for marsh rabbits concluded that the potential for risk to the viability of herbivorous mammals utilizing the LCP Chemicals marsh is minimal.

The only LOE generated for assessing the viability of omnivorous mammals utilizing the LCP Chemicals marsh consisted of HQs derived from food-web exposure models for raccoons. In the modeling study, all HQs for inorganic mercury, methylmercury, and lead derived for raccoons indigenous to the LCP Chemicals marsh were less than unity (1). Consequently, the potential for risk to omnivorous mammals was judged to be minimal.

The sole LOE for evaluating the viability of piscivorous mammals utilizing the LCP Chemicals marsh consisted of HQs derived from a food-web exposure model for river otters. The model results indicated that potential adverse risk to piscivorous mammals using the LCP Chemicals marsh is minimal.

Based on the five above-discussed measurement endpoints for finfish, it was concluded that there is no acute life threat to finfish in the LCP Chemicals marsh from direct exposure to COCs in the water column. However, the dietary modeling and tissue data for field-collected finfish suggest that chronic risk to viability of finfish indigenous to the LCP Chemicals marsh is of concern.

Table 24 summarizes the range of COC concentrations in sediment that are expected to be protective of fish and wildlife receptors. The protective concentrations are generally defined to be between the NOAEL and LOAEL.

7.2.7 Uncertainties Analysis for BERA

The OU1 BERA examined a variety of uncertainties associated with the components of the BERA process and considered whether these uncertainties tend to over or underestimate risks. It also presents findings from several independent studies conducted at the Site and evaluates whether those studies lend additional support to, or conflict with, the conclusions of the BERA. The most significant sources of uncertainty in the OU1 BERA are briefly described below.

- The evaluation of potential adverse effects to the benthic invertebrate community relied on hundreds of site-specific acute and chronic toxicity test measurements using both indigenous and laboratory-cultured organisms. The OU1 BERA notes that the development of the lower end of the preliminary remedial goals (PRGs) range for the protection of benthic invertebrates is “highly uncertain with poor accuracies" and that "only conservative assumptions were used" for this purpose. The upper-end of the benthic PRG range was less conservative and less uncertain;

- The evaluation of potential adverse effects to mammalian receptors from Aroclor 1268 is based on a toxicity reference factor (TRV) for Aroclor 1254. Aroclor 1254 is generally accepted to be more toxic to mammals; and
- The evaluation of potential adverse effects to upper-trophic level fish from Aroclor 1268 is based on a tissue residue TRV derived by the EPA for that PCB mixture. This TRV is based on significant weight changes observed in mummichogs that were conservatively determined to represent a lowest-observed-adverse-effect-level (LOAEL) rather than a no-observed-adverse-effect level (NOAEL), which likely overestimates risk to finfish.

7.2.8 Qualitative Estimation of Risks Posed by PCDD/PCDF to Ecological Receptors

The EPA developed a dioxins/furans memorandum (EPA 2014) that included a method used to estimate the sediment dioxin TEC protective levels based on assumptions and calculations associated primarily with the 2,3,7,8-TCDD congener. This method resulted in an estimated sediment concentration of 260 ng/kg TEC as a protective level for the omnivorous mammal, such as the river otter. Similarly, the calculated sediment concentration considered protective of 95 percent of fish species is 32 ng/kg TEC or a level of 0.909 ng/g lipid in fish tissue. These concentrations are considered very conservative because they are based largely on 2,3,7,8-TCDD data from literature, whereas bioaccumulation and toxicity data are generally not available for the other congeners. In addition, it is likely that the heavier chlorinated furans, that are more prevalent in the LCP Chemicals marsh than dioxins, partition from sediment to a lesser degree than 2,3,7,8-TCDD and thus would be less bioavailable as well as less toxic. Furthermore, application of these sediment concentrations must take into account the numerous congeners that are not detected but conservatively assumed to be present at one half their detection limit.

7.2.9 Summary of Human Health and Ecological Risks

Human Health. The HHRA found that contamination in the LCP Chemicals marsh poses unacceptable risks to human health. The primary sources of these cancer risks and non-cancer health hazards are due to mercury and Aroclor 1268 as a result of consumption of fish and shellfish harvested from the LCP Chemicals marsh (Table 18). The concentrations of dioxins/furans in fish tissue samples (collected from the LCP Ditch during the late 1990s marsh removal period) were low and do not appear to present unacceptable risk (see Section 7.1.6).

Ecological. The BERA indicates that ecological risks from hazardous substances released to the LCP Chemicals marsh create a need to evaluate measures that would reduce the incidence of adverse growth and reproductive effects to benthic organisms, fish, and wildlife. The receptors at risk include: 1) omnivorous and piscivorous birds from methylmercury; 2) herbivorous, omnivorous, and piscivorous mammals from Aroclor 1268; 3) fish from methylmercury and Aroclor 1268; and 4) benthic invertebrates from mercury, Aroclor 1268, lead, and PAHs. Risk to finfish from dioxin and furans appears low.

The risk assessments concluded that the COCs in the LCP Chemicals marsh are mercury, Aroclor 1268, lead, and PAHs in sediment, surface water, and biota.

Mercury and Aroclor 1268 are persistent and therefore, the risks associated with these contaminants (including any co-located dioxins/furans) are unlikely to decrease significantly in the absence of taking action. Therefore, based on the BERA, the receptors listed above are at risk.

7.3 Basis for Action

Based upon the results of the RI and the risk assessments, the EPA and GAEPD have determined that action under CERCLA is necessary to protect public health and the environment. The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

8.0 Remedial Action Objectives

Remedial action objectives (RAOs) are established to support the development and evaluation of remedial alternatives for areas with the potential for unacceptable risk as identified in the human health and ecological risk assessments. The RAOs are established by the risks posed by the contamination in media of concern, through potential exposure pathways to receptors and remediation objectives.
The following RAOs were identified for OU1:

1. Prevent or minimize releases of COCs in contaminated in-stream sediment from entering Purvis Creek.
2. Reduce to acceptable levels, piscivorous bird and mammal population exposure to COCs from ingestion of prey exposed to contaminated sediment in the LCP Chemicals marsh, considering spatial forage areas of the wildlife and movement of forage prey.
3. Prevent human exposure, through the ingestion of finfish and shellfish, to COCs above levels that pose unacceptable health risk to recreational and high quantity fish consumers.
4. Reduce risks to benthic organisms exposed to COC-contaminated sediment to levels that will result in self-sustaining benthic communities with diversity and structure comparable to that in appropriate reference areas.
5. Reduce, to acceptable levels, finfish exposures to COCs from ingestion of prey and contaminated sediment in the LCP Chemicals marsh.
6. Restore surface water COC concentration to levels which are protective for recreational users, high quantity finfish consumers and ecological receptors.

This section further describes the selected cleanup levels (see Section 8.1), ARARs (see Section 8.2), and fish and shellfish tissue concentrations (see Section 8.3) for the LCP Chemicals marsh cleanup and key factors that formed the basis for each. The selected cleanup levels are contaminant concentrations that will be used to measure the success of the cleanup alternatives in meeting the RAOs. Cleanup levels are based on ARARs, which provide minimum legal standards, and in the absence of ARARs, risk-based concentrations.

8.1 Derivation of Sediment Preliminary Remedial Goals

The Feasibility Study developed remedial alternatives designed to meet the RAOs. In addition to the RAOs, a range of sediment PRGs was derived from the human health and ecological risk assessments and the November 30, 2011 letter from EPA to Honeywell. Given that fish, shorebirds and mammals move throughout the LCP Chemicals marsh, PRGs for these mobile receptors were separated from benthic community PRGs because the benthic organisms are highly sedentary with very limited mobility.

8.1.1 PRGs for Fish, Wildlife and Humans

Development of PRGs for the LCP Chemicals marsh was based on the premise that the source of contamination is the contaminated sediment, regardless of how the fish, shellfish, birds, or mammals acquired the contaminants through the local food web. This means that the tissue concentrations measured in the consumed food items are ultimately related to the levels of contamination in the sediment. This relationship is expressed as bioaccumulation factors (BAFs).

For finfish and shellfish, the average area-weighted creek sediment concentrations were used to represent the exposure source. These sediments represent permanently inundated habitat areas for fish and shellfish. Marsh sediments were not included in the creek analysis because they are tidally influenced and subject to periodic wet-dry cycles.

For the clapper rail exposed to tidal marsh sediment instead of creek sediment, the average marsh sediment concentrations were used to represent the exposure source.

For human health, the sediment concentrations were compared to the fish tissue concentrations at the levels that resulted in a non-cancer HI ≥1 or in cancer risk of ≥1E-06. This BAF relationship was then used to predict sediment and/or tissue concentrations that would result a HI=1.0 or cancer risk =1E-04, both considered to be protective of human health. This approach was used to develop a range of sediment PRGs for each consumption scenario for the adult and child as described in Section 7.1.2. For example, the sediment goals for Aroclor 1268 for the adult consumer ranged between 2.4 mg/kg if consuming clapper rail and 8.5 mg/kg if consuming shellfish.

BAFs were also used to predict exposure in piscivorous birds, mammals, and several species of finfish to back-calculate a range of sediment concentrations considered protective between the NOAEL and the LOAEL. For example, the sediment goals for mercury ranged from 1 mg/kg (NOAEL) to 3 mg/kg (LOAEL) in both wading bird and finfish receptors.

The numerous calculated sediment concentrations considered protective of a variety of receptors and consumption scenarios were then synthesized to provide a conservative range of PRGs that would assist in the development of remedial alternatives.

The range of PRGs for the highly mobile fish, wildlife and humans that are exposed over wide areas of the marsh and its various creeks are provided below:

- Mercury – between 1 and 2 mg/kg
- Aroclor 1268 – between 2 and 4 mg/kg

These PRGs are applicable to RAOs 2, 3 and 5 and are applied to each individual exposure domain due to their large areas and applied to the total creeks area (not for each small creek or ditch).

Because fish, shorebirds and mammals move throughout the LCP Chemicals marsh, sediment surface weighted average concentrations (SWACs) were calculated for Aroclor 1268 and mercury for each of the domains and major creeks identified in the risk assessments (PAHs and lead were not of concern to these receptors). Table 25 lists sediment SWACs in the various domains and creeks within the LCP Chemicals marsh along with their size in acres. These SWACs represent current sediment exposure concentrations to these receptors that are exposed over large spatial scales that encompass multiple sample locations.

8.1.2 Benthic Community PRGs

Benthic PRGs were based on site-specific toxicity tests results and their associated uncertainties (refer to the highlighted values in Table 22 and the discussion in Section 7.2.5). The following benthic community PRG ranges were used to guide alternative development:

- Mercury – 4 to 11 mg/kg
- Aroclor 1268 – 6 to 16 mg/kg
- Lead – 90 to 177 mg/kg
- PAHs – 4 mg/kg

Given the lack of wide-spread mobility of benthic organisms, these PRGs were applied to contaminated areas as measured by 50 by 50 meter grids. The range of benthic PRGs was provided for the FS because extending the alternative footprints in certain areas was prudent to address uncertainty in the existing data. The concentrations of COCs just slightly higher than the upper-end of the benthic PRG range are toxic to sensitive benthic organisms with a high degree of certainty. The lower-end of the PRG range adds a degree of conservatism to the alternative footprints to ensure that all of the concentrations above the upper-end of the PRG range will be captured. However, isolated samples with contamination above the lower-end of the PRG range do not contribute unacceptable risk to the benthic invertebrate community. The benthic PRGs are quantifiable measures to evaluate attainment of RAO #4.

8.2 Cleanup Levels

After the alternatives were developed (Section 9 of this ROD) and compared and evaluated against the National Contingency Plan (NCP) criteria (Section 10), the PRGs described above were then refined into sediment cleanup levels (CULs).

The most conservative sediment PRG at 1E-06 cancer, for protection of human health from consumption of fish, is Aroclor 1268 at 0.037 mg/kg. However, this would result in destruction of over 700 acres of functioning marsh and was therefore rejected as a potential cleanup level. Similarly, a 1E-05 cancer risk would result in an Aroclor 1268 concentration of 0.37 mg/kg which would impact approximately 586 acres or 77 percent of the entire marsh. Therefore, that level was also rejected as a potential cleanup level. Additionally, given the conservative assumptions used in the HHBRA and BERA along with their associated uncertainties as described in Sections 7.1.5 and 7.2.7, such extensive remediation would be unnecessary.

For fish, wildlife and humans the following SWAC CULs will be applied to each exposure domain and the total creeks area so as to achieve the predicted post-remediation SWACs for the Selected Remedy:

- Mercury – 2 mg/kg
- Aroclor 1268 – 3 mg/kg

Each of the alternatives described in Section 9 required an analysis of achieving the RAOs and result in sediment concentrations within the protective PRG range. Table 26 shows the predicted post-remediation SWACs in each exposure domain and creeks for the alternatives, along with the SWAC CULs. The purpose of the CULs is to attain the necessary predicted risk-based SWACs for each domain and total creeks. For example, the SWAC CUL of 2 mg/kg for mercury is expected to result in a SWAC concentration in Domain 1 of 1.1 mg/kg which is the ultimate goal (Alternative 6 in Table 26). Similarly, the SWAC CUL for Aroclor 1268 of 3 mg/kg is predicted to attain a total creeks concentration of 2.7 mg/kg. The differences in the predicted SWACs depend on the features of each alternative and the influence of the benthic PRGs as described in Section 9.

Using the same approach to define PRGs as outlined in the November 30, 2011 letter from EPA to Honeywell, for the adult high quantity fish consumer, the risk-based area weighted mercury sediment concentration of 2.74 mg/kg resulted in a HI of 2.0. The resulting mercury SWAC of 1.4 for total creeks (Table 26) results in a HI of 1 (2.74/2 = 1.4/X). Similarly for Aroclor 1268, the risk-based total creeks sediment concentration resulted in an HI of 3 for the adult high quantity fish consumer. A total creeks SWAC of 2.7 mg/kg would result in an HI of 1 (7.44/3 = 2.7/X). Therefore, these sediment SWAC CULs are expected to be protective of the high quantity fish consumer, provided they consume roughly the same fish mixture as in ROD Table 7.

Note that the risk-based, area-weighted sediment concentrations derived from the risk assessments are not identical to the current SWACs due to the additional sediment data collected during the FS and refinements to the polygons used to calculate the current SWACs (e.g., greater accuracy of domain and creek areas, and polygon-specific morphological adjustments based on field data).

Based on the analysis in Section 10, the benthic community PRGs were refined into the following CULs:

- Mercury – 11 mg/kg
- Aroclor 1268 – 16 mg/kg
- Lead – 177 mg/kg
- PAHs – 4 mg/kg

Surface water CULs are based on the State of Georgia water quality standards as discussed in Section 8.3.2.

8.3 ARARs

ARARs are legally applicable or relevant and appropriate substantive (as opposed to administrative) standards, requirements, criteria, or limitations under any federal environmental law, or promulgated under any state environmental or facility siting law that is more stringent than under federal law. Section 121(d) of CERCLA, as amended, specifies that remedial actions for cleanup of hazardous substances must comply with the ARARs that are applicable or relevant and appropriate to the hazardous substances or particular circumstances at a site unless such ARARs are waived under CERCLA Section 121(d) (4). See also 40 Code of Federal Regulations (CFR) § 300.430(f)(1)(ii)(B).

This section discusses State of Georgia surface water quality requirements. ARARs are also discussed in Sections 10.1.2 and 14.2, and a complete list of ARARs is in Table 27.

8.3.1 Sediment Quality ARARs

No federal or State of Georgia sediment standards exist.

8.3.2 Surface Water Quality ARARs

Surface water quality ARARs consist of applicable promulgated state water quality standards and, in accordance with Section 121(d)(2)(A)(ii) and (B)(i) of CERCLA, federal recommended Clean Water Act Section 304(a) Ambient Water Quality Criteria (AWQC) guidance values where they are relevant and appropriate. The AWQC for human health include values to protect for consumption of organisms only, and those to protect for consumption of organisms and water. For the LCP Chemicals marsh, the relevant and appropriate AWQC for the protection of human health are those established for the consumption of organisms only because surface water within the marsh is not a source of consumable water due to high salinity. The AWQC also include acute and chronic criteria values for the protection of aquatic life, including benthic organisms. State standards in Georgia include those standards promulgated in GA Rule §391-3-6-.03(5)(e)(ii), GA Rule §391-3-6-.03(5)(e)(vii) and, for protection of human health, EPA's 1992 promulgated National Toxics Rule (NTR) standards. Consistent with Section 121(d) of CERCLA, the NCP, and the preceding State of Georgia rules, ARARs are the most stringent of the values.

Surface water will not be directly remediated but will be improved by implementation of the selected remedy and by source control to be implemented as discussed in Section 13. Surface water is a key exposure pathway for consumption of aquatic organisms by humans or wildlife. Surface water quality monitoring data will be compared to these ARAR values to measure progress towards achieving RAO 6, and evaluated as discussed in Appendix A.

8.4 Fish and Shellfish Target Tissue Concentrations

EPA has established fish and shellfish tissue concentrations to measure progress toward achieving RAO 3. Remediating contaminated sediments will reduce COC concentrations in surface water and in fish and shellfish tissue in addition to reducing COC concentrations in sediment. Table 19 lists resident fish, shellfish (blue crab and white shrimp) and clapper rail target tissue concentrations for RAO 3. They are based on 1E-04 ECR or HQ of 1 for the adult high quantity fish consumer RME scenario. The non-cancer risk tissue goals are more conservative than the cancer risk tissue goals and provide more protection. These tissue concentrations were developed in the Baseline HHRA by setting the HQ to 1 or risk to 1E-04 and back calculating the protective tissue concentrations. The relationship between the tissue and sediment concentrations that used the BAF approach was discussed in Sections 8.1.1 and 8.2.

It is important to note that these tissue concentrations are not cleanup levels; they will be used to assess potential interim risks to people who consume resident fish and shellfish post-remediation and measure progress to achieving RAO 3. Tissue monitoring data will also inform the content or degree of any potential future fish advisories, other ICs intended to minimize risk to the fishing community, or other response actions that may be identified in a potential future ROD Amendment.

Due to the wide range of prey species in the diet of piscivorous birds and finfish, site-specific tissue concentrations have not been developed for these receptors. However, tissue monitoring for mercury and Aroclor 1268 in common prey (mummichog, fiddler crab and blue crab) will be included in the monitoring program (See Appendix A). The resulting monitoring data will be used to assess potential residual risks based on the same dietary models conducted in the BERA. If the resulting calculated hazard quotients for the receptors are less than one, then the goal of reducing exposures to these receptors (i.e., RAOs 2 and 5) would be achieved.

9.0 Description of Alternatives

9.1 Framework for Developing Alternatives

Under its legal authorities, the EPA responds to releases or threat of releases and/or takes action at an imminent and substantial endangerment from an actual or threatened release of a hazardous substance at Superfund sites. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: a requirement that the EPA's remedial action, when complete, must comply with all federal and more stringent state environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked; a requirement that the EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Remedial alternatives were developed to be consistent with these statutory requirements.

Detailed descriptions of the remedial alternatives for addressing the contamination and the risks posed by the Site can be found in the RI report, the FS report and the Proposed Plan. This decision document is supported by the Administrative Record. The FS report presents six alternatives that involve the following remedial technologies:

- Sediment dredging (removal)
- Capping
- Enhanced monitored natural recovery (thin-layer placement)
- Monitoring

Each of the alternatives, except no action, also includes habitat restoration / reestablishment of areas disturbed by remedial activities. Reestablishment can be either restoring the same type of habitat that existed prior to remediation, or establishing a slightly different type of habitat that has been deemed appropriate for the ecological conditions of the area. The design and construction of habitat improvement and restoration elements must be consistent with the substantive requirements of permits associated with disturbance of state and federal regulated wetlands. A comprehensive mitigation Work Plan will be developed during the Remedial Design (RD) phase. This plan will be specific to the final remedy, selected in this document, to address restoration needs of disturbed areas (e.g., access roads, staging areas), and will likely include re-grading and planting of marsh vegetation to restore natural hydrological and habitat conditions.

Key ARARs for the alternatives include the Clean Water Act restrictions on the discharge of dredged material into the waters of the U.S., State of Georgia's regulations on construction in coastal marshlands, and the federal laws and regulations that protect marine mammals, migratory birds, and endangered species. See the ARARs table (Table 27) for reference to the specific regulations and more detail. Because all alternatives use similar technologies, the key ARARs are the same for all alternatives. All alternatives, including the Selected Remedy (except Alternative 1, No Action), include off-site disposal of dredged material. Data for the RI/FS indicate that sediment removed from the LCP Chemicals marsh can be disposed of in a solid waste landfill that is in compliance with RCRA Subtitle D. If wastes that require disposal in a landfill permitted to receive RCRA hazardous wastes or Toxic Substances Control Act (TSCA) regulated wastes are encountered during remedial design or remedial action, they will disposed in a landfill compliant with RCRA Subtitle C or TSCA.

The remedial action alternatives for the LCP Chemicals marsh are:

1. No Action
2. Sediment Removal – 48 acres
3. Sediment Removal, Capping and Thin-Layer Placement – 48 acres
4. Sediment Removal – 18 acres
5. Sediment Removal, Capping and Thin-Layer Placement – 18 acres
6. Sediment Removal, Capping and Thin-Layer Placement – 24 acres

9.2 Summary of Remedial Alternatives

9.2.1 Alternative 1: No Action

Estimated Capital Cost: $ 0
Estimated Operation and Maintenance (O&M) Cost: $ 0
Estimated Present Worth Costs: $ 0
Estimated Construction Time Frame: N/A

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative does not include any physical remedial measures that address the problem of sediment contamination and resulting risks to human health and the environment at the Site. Because this alternative, or any of the other alternatives, results in contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure to site media, CERCLA requires that the Site be reviewed at least once every five years to ensure that the remedy is protective.

9.2.2 Alternative 2: Sediment Removal - 48 acres

Estimated Capital Costs: $ 64.5 million
Estimated Operation and Maintenance (O&M) Costs: $385,000
Estimated Present Worth Costs: $64.8 million
Estimated Construction Time Frame: 3-to-4 years

Alternative 2 achieves the RAOs in the 48-acre remediation area by combining sediment removal, ICs (such as administrative and legal controls to minimize the potential for exposure and to ensure the long-term integrity of the remedy), and long-term monitoring (LTM). This alternative uses a SWAC range for human health, mammals, and birds of 2 mg/kg for mercury and 2 mg/kg for Aroclor-1268. In addition, the lower-end PRGs for benthic organisms are targeted (i.e., 4 mg/kg for mercury, 6 mg/kg for Aroclor 1268; 90 mg/kg lead, and 4 mg/kg for total PAHs).

This alternative involves sediment removal and backfilling within Eastern Creek, Western Creek, LCP Ditch, Purvis Creek, the Domain 3 Creek, Dillon Duck, and the vegetated marshes of Domains 1a, 2 and 3, as shown on Figure 24. This is expected to improve the surface water body quality. This alternative includes:

- Dredging approximately 48 acres (~153,000 CY) in the areas shown on Figure 24 to a target depth of 18 inches, where the contaminants concentrations are expected to meet the goals;
- Backfilling dredged area with 12 inches (approximately 96,000 CY) of clean material;
- Dewatering sediments on-site and disposing off-site at a licensed facility;
- Treating dewatering fluids, prior to discharge to the marsh;
- Constructing various staging areas and temporary access roads to facilitate material management and sediment dredging/excavation (approximately 11 additional acres of disturbance); and
- Restoration of disturbed areas.

Short-term monitoring activities will span the construction phase and will be defined during the remedial design phase. Some of these activities could include monitoring for elevated COC levels during dredging activities, soundings and surveys to verify removal and backfilling depths, and/or backfill material coverage assessments.

Current institutional controls will be maintained as necessary – specifically fish advisories already in place for Purvis Creek and the Turtle River system, and an existing commercial fishing ban for Purvis Creek. With time, when fish chemical concentrations fall below the criteria to maintain the fish advisories and/or commercial fishing ban, the State of Georgia may elect to remove the advisories and/or commercial fishing ban. Current U.S. Army Corps of Engineers permit requirements for dredging, capping, or other construction activities under Section 401 and 404 of the Clean Water Act will also serve as institutional controls for future construction in and adjacent to the LCP Chemicals marsh. Finally, the Coastal Marshlands Protection Act (OCGA§ 12-5-280 et seq.) protects marshland areas against construction alterations in the State of Georgia without first obtaining a permit from the Coastal Marshlands Protection Committee.

Long-term monitoring measures the remedy's long-term effectiveness in enhancing ecosystem recovery and reducing risks to human health and the environment and ensuring the integrity of the remedy. A framework outline of the long-term monitoring plan is provided in Appendix A and includes, but is not limited to, the following:

- Physical measurements to monitor the integrity of backfilled areas (e.g., bathymetric surveys, push cores, or visual observation via camera or video

profiling);
- Visual observations and surveys of marsh recovery, including plant growth and plant density;
- Contaminant measurements in tissues of fish and shellfish;
- Measurements of COCs in sediment; and
- Surface water sampling as necessary to demonstrate compliance with ARARs.

Final specific details of the LTM plan will be developed by EPA and GAEPD during the RD phase.

9.2.3 Alternative 3: Sediment Removal, Capping and Enhanced Monitored Natural Recovery (EMNR) – 48 acres

Estimated Capital Costs: $ 37.6 million
Estimated O&M Costs: $1.4 million
Estimated Present Worth Costs: $38.7 million
Estimated Construction Time Frame: 3-to-4 years

Alternative 3 achieves the RAOs in a 48-acre remediation area by combining sediment removal, sediment capping, and EMNR (thin-layer placement) , ICs (as described for Alternative 2), and LTM. This alternative targets the same SWAC cleanup levels and benthic community goals as Alternative 2, with the same area footprint.

This alternative includes sediment removal and backfilling in Eastern Creek, Western Creek, and LCP Ditch and capping in Purvis Creek and Domain 3 Creek. Thin-layers would be placed within Dillon Duck and the vegetated marshes of Domains 1a, 2 and 3 as shown on Figure 25.

This alternative includes:

- Dredging approximately 9 acres (~27,000 CY) to a target depth of 18 inches;
- Backfilling with 12 inches approximately 17,000 CY of clean material (e.g., sand);
- Capping approximately 16 acres with an isolation layer of clean material of (for costing purposes) at least 6 inches and at least 6 inches of an armored layer of coarse sand and/or gravel;
- Thin-layer placement of clean sediment or sand on approximately 23 acres;
- Dewatering sediments on-site and disposing of them at a licensed off-site facility;
- Treating dewatered liquids, prior to discharge to the marsh;
- Constructing various staging areas and temporary access roads to facilitate material management and sediment excavation (approximately 8 additional acres of disturbance); and
- Restoration of disturbed areas.

Short and long term monitoring will be implemented as described above under Alternative 2. In addition, although caps are designed to withstand high-energy flows, they may require repairs if damaged by erosion or unexpected conditions, such as storm events. The extent of these potential repairs will be evaluated during post-remediation site inspections.

Sediment caps isolate underlying sediment contaminants; control contaminant migration, physical erosion and biological contact with underlying sediment contaminants; and provide a clean sediment surface for habitat restoration. Modeling was used to design the thickness and material size for the cap armor layer to ensure that the cap retains its integrity under worst case shear stress conditions. Contaminant isolation modeling concluded that a 6-inch base isolation layer with up to six inches of coarse sand-to-gravel armoring will adequately protect against contaminant migration through the cap, as well as erosive forces resulting from storm events. Cap placement could be performed as a barge-based operation in north and south Purvis Creek and as a land-based operation in Domain 3 Creek.

Given shallow water depths, narrow creeks and tidal effects, the cap may need to be placed by small mechanical equipment (e.g., backhoe or similar excavator with a fixed arm or a telescoping conveyor belt) operating from the shoreline and/or a shallow-draft barge.

The horizontal extent of the thin-layer placement for Alternative 3 is shown on Figure 25. The proposed thin-layer placement area is approximately 23 acres. Thin layers consisting of six inches of clean sediment or sand are targeted for the lower contaminant concentration, low-energy environments within the LCP Chemicals marsh to accelerate ongoing natural recovery processes (e.g., contaminant burial), reduce risks to human health and the environment, and provide a clean sediment surface for habitat restoration. Thin-layer placement is best suited for wetlands or marsh environments where tidal energy and potential erosion is at a minimum. Thin-layer placement minimizes the negative ecological impacts of sediment capping (e.g., loss of aquatic habitat, potential changes in marsh inundation patterns) and sediment removal (e.g., destruction of marsh habitat, areas of limited accessibility). It is recognized that some bioturbation will occur through the thin layer by deep-burrowing macroinvertebrates, but that the resulting sediment COC concentrations in those disturbed areas would be still be below the CULs.

9.2.4 Alternative 4: Sediment Removal – 18 acres

Estimated Capital Costs: $ 33.8 million
Estimated O&M Costs: $ 257,000
Estimated Present Worth Costs: $ 34.1 million
Estimated Construction Time Frame: 2 years

Alternative 4 addresses exceedances of the cleanup levels and achieves RAOs in the 18-acre remediation area by combining sediment removal, ICs (such as administrative and legal controls to minimize the potential for exposure and to ensure the long-term integrity of the remedy), and LTM. This alternative targets the SWAC for human health, mammals, and birds at 2 mg/kg for mercury and 4 mg/kg for Aroclor 1268. In addition, achieves the benthic community CULs.

This remedial alternative includes sediment removal and backfilling which would be performed in parts of Eastern Creek, the LCP Ditch, the Domain 3 Creek, Dillon Duck and the vegetated marsh areas of Domains 1a and 2 (Figure 26):

- Dredging approximately 18 acres (~ 57,000 CY) to a target depth of 18 inches;
- Backfilling with 12 inches (~ 36,000 CY) of clean material such as sand;
- Dewatering sediments on-site and disposing off-site at a licensed facility;
- Treating dewatering liquids, prior to discharge to the marsh;
- Constructing staging areas and temporary access roads to facilitate material management and sediment excavation (approximately 11 additional acres of disturbance); and
- Restoration of disturbed areas.

Short-term monitoring activities will span the construction phase and will be defined during the remedy design phase. Some of these activities could include soundings and surveys to verify removal depths, depth verification measurements to document backfill material placed, and/or backfill material coverage assessments.

Long-term remedy monitoring measures the remedy's long-term effectiveness in enhancing ecosystem recovery and reducing risks to human health and the environment. Appendix A provides an outline of the LTM plan with specific monitoring details to be worked out in the RD phase.

9.2.5 Alternative 5: Sediment Removal, Capping and EMNR – 18 acres

Estimated Capital Costs: $ 25.6 million
Estimated O&M Costs: $ 475,000
Estimated Present Worth Costs: $ 26.0 million
Estimated Construction Time Frame: 2 years
This alternative targets the same SWAC and benthic community CULs as Alternative 4 with the same area footprint. It combines sediment removal, sediment capping and EMNR (thin-layer placement) to accelerate natural recovery, ICs (such as administrative and legal controls to minimize the potential for exposure and to ensure the long-term integrity of the remedy), and LTM.

This alternative (Figure 27) incorporates the following components:

- Dredging approximately 7 acres (~22,000 CY) in the LCP Ditch and Eastern Creek to a depth of 18 inches;
- Backfilling the dredged area with 12 inches (~14,000 CY) of clean material;
- Capping approximately 3 acres of Domain 3 Creek;

- Thin-layer placement on approximately 8 acres with clean sediment or sand;
- Dewatering sediment on-site and disposing of it at licensed off-site facilities;
- Treating the dewatered liquids, prior to discharge to the marsh;
- Constructing staging areas and temporary access roads which will require approximately 8 acres of additional disturbance beyond the 18-acre footprint; and
- Restoration of disturbed areas.

Short and long term monitoring will be implemented as described above under Alternative 2. In addition, although caps are designed to withstand high-energy flows, they may require repairs if damaged by erosion or unexpected conditions, such as storm events. The extent of these potential repairs will be evaluated during monitoring Site inspections. Sediment caps isolate underlying sediment contaminants; control contaminant migration, physical erosion and biological contact with underlying sediment contaminants; and provide a clean sediment surface for habitat restoration. Modeling was used to design the thickness and material size for the cap armor layer to ensure that the cap retains its integrity under worst case shear stress conditions. Contaminant isolation modeling concluded that a 6-inch base isolation layer with up to 6 inches of coarse sand-to-gravel armoring will adequately protect against contaminant migration through the cap, as well as erosive forces resulting from storm events. Cap placement could be performed as a land-based operation (Domain 3 Creek). Given the shallow water depths, narrow creeks and tidal effects, the cap may need to be placed by small mechanical equipment (e.g., backhoe or similar excavator with a fixed arm or a telescoping conveyor belt) operating from the shoreline and/or a shallow-draft barge.

Land-based access to the Domain 3 Creek requires construction of a small number of temporary access roads across the soft sediments of Domain 3 marshes and Uplands areas. Construction of various material staging areas (8 acres) is also required to facilitate material management and sediment cap placement. While the anticipated amount of submerged debris is relatively high, since the proposed sediment removal areas have not been periodically maintained, debris will remain in place unless it interferes with capping operations. Any removed debris will be disposed of off-site at licensed facilities.

The boundaries of thin-layer placement for Alternative 5 are shown on Figure 27. The proposed thin-layer placement area is approximately eight acres. Thin layers consisting of 6 inches of clean sediment or sand are targeted for the lower contaminant concentration, low-energy environments within OU1 to accelerate ongoing natural recovery processes (e.g., contaminant burial), reduce risks to human health and the environment, and provide a clean sediment surface for habitat restoration. Thin-layer placement is best suited for wetlands or marsh environments where tidal energy and potential erosion is at a minimum. Thin-layer placement minimizes the negative ecological impacts of sediment capping (e.g., loss of aquatic habitat, potential changes in marsh inundation patterns) and sediment removal (e.g., destruction of marsh habitat, areas of limited accessibility).

9.2.6 Alternative 6: Sediment Removal, Capping and EMNR – 24 acres

Estimated Capital Costs: $ 27.9 million
Estimated O&M Costs: $ 673,000
Estimated Present Worth Costs: $ 28.6 million
Estimated Construction Time Frame: 2 years

Alternative 6 addresses a total of 24 acres (Figure 28). This includes achieving exceedances of cleanup levels and RAOs in the 18-acre remediation area similar to Alternative 5, plus an additional six acres located in Purvis Creek and Domain 1. This alternative combines sediment removal, sediment capping and thin-layer placement to accelerate natural recovery, ICs (such as administrative and legal controls to minimize the potential for exposure and to ensure the long-term integrity of the remedy) and LTM. This alternative targets the SWAC for human health, mammals and birds at 2 mg/kg for mercury, and 4 mg/kg for Aroclor 1268; and the benthic community CULs.
The six additional acres in Purvis Creek and Domain 1 were included in the footprint for this alternative for the following reasons:

- Addressing areas in Purvis Creek and Domain 1 helps achieve the SWAC-based goals for mercury and Aroclor 1268;
- Because most of Purvis Creek is permanently submerged, even at low tide, exposure times for fish and piscivorous wildlife are longest in Purvis Creek;
- Purvis Creek is relatively accessible from water so remedial actions in the creek will not adversely or significantly impact vegetated marsh areas beyond impacts already contemplated for Alternatives 4 or 5; and
- The additional remedial area in Domain 1 is located immediately adjacent to areas where other work (i.e., work in LCP Ditch and Eastern Creek) is already planned, making expansion into Domain 1 easily implementable with minimal additional marsh impacts.

Remedial components of this alternative include:

- Dredging approximately 7 acres (~22,000 CY) in the LCP Ditch and Eastern Creek to a target depth of 18 inches;
- Backfilling dredged areas with 12 inches (~14,000 CY) of clean material;
- Capping approximately 6 acres in Domain 3 Creek and Purvis Creek;
- Thin-layer capping approximately 11 acres of marsh with clean sediment or sand;
- Dewatering sediments on-site and disposing of them at licensed off-site facilities;
- Treating the dewatered liquids, prior to discharge to the marsh;
- Constructing various staging areas and temporary access roads, which will require an additional disturbance of approximately 7 acres, beyond the 24 acres of active remediation;
- Sampling and analysis for PCDD/PCDF during remedial design to confirm co-location with Aroclor 1268; and
- Restoration of disturbed areas.

As indicated in the Alternative 3 discussion, thin-layer covers are targeted for the lower contaminant concentration, low-energy environments within OU1 to accelerate natural recovery processes (i.e., contaminant burial), reduce risks to human health and the environment, and provide a clean sediment surface for habitat restoration. Although caps are designed to withstand high-energy flows, they may require repairs if damaged by erosion or unexpected conditions, such as storm events. The extent of these potential repairs will be evaluated during monitoring Site inspections. The LTM plan in Appendix A outlines monitoring requirements.

Alternative 6 differs from Alternatives 2 and 3 in that a response action for the western limb of the WCC is not proposed for the following reasons. The WCC is accessible only from Upland areas because the creek is narrow and completely drains at low tide. Land-based access to the WCC would require construction of temporary roads to access remedial areas and facilitate material (e.g. excavated material, backfill material, cover or capping material) transport to and from each remediation area. These roads would need surface elevations of at least one foot above the mean high water elevation so operations could be performed above water. Construction and use of these elevated roads would have significant negative impact on the marsh. Further, upon completion of construction activities, the roads would have to be removed or integrated into the remedial action, perhaps as backfill for excavated areas. This would create additional negative impacts on the marsh.

Because the areas with higher contaminant concentrations within the WCC are discontinuous and isolated from other areas in the creek complex, capping discrete areas would likely result in the creation of troughs and valleys within the narrow and shallow WCC. These troughs would likely restrict flow conveyance, especially at low tide, and thus could negatively impact the vegetated marshes surrounding the creek. Therefore, sediment capping was not retained for evaluation for the WCC, and sediment removal is considered the only viable remedial alternative in this area. Productivity and accessibility of equipment, material, and personnel from work areas may be limited by tidal effects.

10.0 Summary of Comparative Analysis of Alternatives

The EPA uses nine NCP criteria to evaluate remedial alternatives for the cleanup of a release. These nine criteria are categorized into three groups: threshold, balancing, and modifying. The threshold criteria must be met in order for an alternative to be eligible for selection. The threshold criteria are overall protection of human health and the environment and compliance with Applicable or Relevant and Appropriate Requirements (ARARs). The balancing criteria are used to weight major tradeoffs among alternatives. The five balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; and cost. The modifying criteria are state acceptance and community acceptance.

10.1 Threshold Criteria

10.1.1 Overall Protection of Human Health and the Environment

Alternatives 2 through 6 are protective of human health and environment because they are designed to comply with ARARs, achieve RAOs and reduce contaminant concentrations to acceptable levels, which are within the protective PRG ranges. Although not all individual sediment stations, domains, and creeks meet the CULs, such as mercury in the Domain 3 Creek (Table 26), they are protective of the local ecosystem when the creeks and/or domains are considered collectively.

Each alternative results in reduction of mercury sediment concentrations. All the creeks and domains meet the 2 mg/kg mercury SWAC CUL, except Domain 3 Creek (3.7 mg/kg) and the WCC (2.1 mg/kg). Only very small discontinuous segments in these two creeks that comprise approximately three percent of the total creeks habitat exceed the CUL. However, when all creeks are combined, the mercury SWAC CUL is met (Table 26).

Under each alternative (except the no-action alternative) all creeks and domains will be reduced to below the SWAC PRG of 4 mg/kg for Aroclor 1268, which is within the acceptable risk range. Compared to Alternatives 2, 3 and 6, Alternatives 4 and 5 are less protective because they do not result in a change in the Aroclor 1268 exposure concentration of 3.6 mg/kg in Purvis Creek (Table 26) which is above the CUL of 3 mg/kg. Mercury is further reduced in the Purvis Creek and in Domain 1 marsh under Alternative 6.

Each alternative (except no-action) is predicted to result in reductions of mercury and Aroclor 1268 levels in finfish and shellfish concentrations sufficient to meet fish tissue goals for human health (Table 19) and justify an eventual end to the consumption advisories within the TRBE. These reductions are likely to be observed only after several years post remediation.

The larger remedy footprint associated with Alternatives 2 and 3 were based on cleanup to the lower end of the benthic community PRG range and achieve lower residual COC concentrations than the smaller remedy footprints associated with Alternatives 4, 5 and 6.

Cleanup to the lower end of the benthic PRGs may be unnecessary to be protective since the entire range is protective and would result in more physical impacts to existing benthic community habitat.

Surface water quality is expected to improve with each alternative except the No Action Alternative. Therefore, the ambient water quality criteria for protection of aquatic life are expected to be achieved, as will the requirements of RAO 6. It remains to be seen whether any of the alternatives will be able to achieve the surface water quality PCB ARAR for protection of human health (i.e., 0.000064 μg/L), which is very low. The lower surface sediment COC concentrations achieved by each of the alternatives, except the No Action Alternative, will substantially decrease the potential for the suspension and transport of contaminated sediment particles. Alternatives 2 through 6 are expected to achieve federal and state water quality criteria for dissolved-phase and total mercury and Aroclor 1268.

10.1.2 Compliance with ARARs

Section 121(d)(2) of CERCLA requires that remedial actions must comply with federal and more stringent state environmental laws or regulations that are legally "applicable" or "relevant and appropriate" (commonly referred to as "ARARs") under the circumstances of the release or threatened release of such hazardous substance or pollutant or contaminant. Further, the NCP at 40 CFR § 300.435(b)(2) requires remedies to attain, or waive under CERCLA Section 121(d)(4), ARARs during the course of a remedial action.

For ease of identification, EPA has classified ARARs into three categories, chemical-, action-, and location-specific. *Chemical-specific* ARARs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numeric values. These values establish an acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. *Location-specific* ARARs are restrictions on hazardous substances or the conduct of response activities solely based on their location in a special geographic area (e.g. wetlands, watersheds, floodplains, sensitive habitats, coastal zones, historic places). *Action-specific* ARARs are technology- or activity-based requirements or limits on actions taken with respect to particular hazardous substance or waste type (*e.g.*, RCRA hazardous waste or TSCA PCB waste). These requirements are triggered by a particular remedial activity (*e.g.*, excavate soil, stage waste in pile or containers, treat, dispose, emit, discharge to surface water, cap with waste in place, etc.).

The State of Georgia surface water quality standard for mercury and total PCBs (i.e., the standard for protection of human health [via fish consumption] of 0.025 μg/L dissolved mercury and 0.000064 μg/L for total PCBs).

Due to these exceptionally low concentrations, it may not be feasible for the remedial action to attain Georgia's water quality criteria in the surface water bodies impacted by this Site. Once the remedial action has been implemented and remedy effectiveness monitored for a number of years (including surface water quality), the EPA will evaluate whether a waiver under CERCLA Section 121(d)(4)(C) of these chemical-specific standards is warranted at this Site. As required in CERCLA and the NCP, any waiver of an ARAR must be documented in a ROD (or an Amended ROD) and must include a justification for invoking the waiver.

Federal and State of Georgia ARARs (Chemical-, Location- and Action-specific) for the OU1 selected remedy are provided in Table 27.

10.2 Balancing Criteria

10.2.1 Long-Term Effectiveness and Permanence

Other than the No Action Alternative, all alternatives include measures for long-term human health and ecological risk reduction by targeting site-specific exceedances of CULs for removal, capping, or thin-layer placement, thus reducing risk of exposure to contaminated material. Sediment removal, sediment capping, and to a lesser degree thin-layer placement have been found reliable and effective at sites similar to the LCP Chemicals marsh.

Sediment removal would permanently remove COCs from the LCP Chemicals marsh and backfilling would address residuals. Capping and thin-layer covers are engineered to account for hydrodynamic conditions to ensure their permanence. Overall the LCP Chemicals marsh is characterized as stable and relatively resistant to scour and sediment re-suspension. The results from hydrodynamic model simulations demonstrated relatively low velocities (generally less than 2 feet per second [ft/sec]) throughout the LCP Chemicals marsh during spring-neap tidal cycles, 100-year flood conditions, and hurricane storm surge conditions. Velocities that could result in cap material instability are addressed through armoring to minimize or prevent erosion. The thin-layer covers are only placed in low-energy areas in marsh habitat and not in the creeks. This substantially reduces erosion of the cover that may occur from major storm events. Figure 29 shows the maximum predicted current velocity for existing conditions under hurricane storm surge. The figure shows that, under hurricane conditions, maximum scour would be expected in Purvis Creek and certain portions of the LCP Ditch and the Eastern Creek. Under hurricane conditions, the marsh flats are predicted to have maximum current velocities of less than 0.25 feet per second.

Materials for sediment capping and thin-layer placement will be sized to ensure protection against erosion and scour. However, the thin-layer cover is not an armored contaminant barrier. Based on several case studies, some burrowing and other types of biological activities will occur in the thin-layer cover, but are not expected to significantly impact its effectiveness in reducing exposures to the benthic community. These covers are also only being used in areas where erosion potential is low. Monitoring and maintenance will be performed as necessary to ensure long-term remedy effectiveness.

ICs (e.g., land use or deed restrictions, maintenance agreements, permits limiting land use for future activities and fish consumptions advisories) will be used, as necessary, to control residual risks following remedy implementation. In addition, LTM ensures confirmation of long-term structural integrity and effectiveness.

10.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 1 provides no reduction in risk to humans or the environment beyond current on-going natural processes. In Purvis Creek, there is evidence that mercury concentrations in fish and shellfish tissue have decreased over time. However, there is no clear evidence that Aroclor 1268 fish tissue concentrations have decreased in Purvis Creek. Therefore, Alternative 1 may not satisfy the RAO goals over the long-term. It is not clear how long it would take to reduce fish tissue levels, and without monitoring, risk reduction cannot be confirmed. Therefore, the No Action Alternative does not provide adequate risk reduction or adequately address residual risk for human health and some ecological receptors.

All of the other alternatives include varying degrees of sediment removal, which reduces the volume of COC-impacted sediment in the marsh following remedy implementation. Where alternatives include sediment capping and thin-layer placement, long-term COC toxicity and mobility are reduced by creating a clean sediment surface through burial with clean materials. The thin-layer cover is not intended to function as an absolute contaminant barrier, but as a layer which will stimulate ongoing natural recovery processes, which is limited in its capacity for rapid natural recovery because of low background sedimentation rates. Therefore, some possible bioturbation beyond the cover depth is not expected to diminish the effectiveness of this remedy and would not preclude its beneficial use as a component of a protective remedy.

Alternatives 2 through 6 target cleanup of sediments that exceed benthic cleanup levels. Although these alternatives achieve an acceptable risk level for the benthic community and are expected to meet RAO 4, residual risks may occur with varying degrees of uncertainty. Alternatives 2 and 3 are expected to have less residual risks to the benthic community than Alternatives 4, 5 and 6, because they remove more contaminant mass.

Sediment removal reduces long-term risks of exposure since contaminated material is removed. Backfilling addresses dredge residuals that otherwise pose risks. Capping and thin-layer cover placements, which leave contaminant material in place, isolate COCs and reduce bioavailability and mobility through burial with clean material.

Residual risks posed by COCs left un-remediated are addressed through ICs (including permit requirements, which are already in place to limit use or future activities in the LCP Chemicals marsh and fish consumption advisories) and LTM. The ICs and LTM will help ensure the remedy's long-term structural integrity and effectiveness in reducing COC concentrations in fish/shellfish as well as the achievement of RAO 4 for the affected benthic community.

10.2.3 Short-Term Effectiveness

Implementation of any alternative, other than the No Action Alternative, presents short-term impacts associated with on-site construction and remediation operations. As indicated below, the extent of these impacts is proportional to the remedial footprint, the sediment removal volume, the selected remedy components, the time required to complete the remedy, and on-site material handling requirements. Alternative 2 includes the removal of 153,000 CY of contaminated sediment material from 48 acres of OU1 and construction is estimated to span 3-to-4 years. Thus, Alternative 2 poses greater short-term risks and potential impacts to human health and the environment than the rest of the alternatives.

Alternatives 3 and 4 require the removal, transportation, and disposal of 27,000 and 57,000 CY of contaminated material from nine and 18 acres, respectively. These volumes represent approximately 18 percent and 37 percent, respectively, of the 153,000 CY volume considered for removal in Alternative 2. Based strictly on the volume of contaminated materials to be removed, Alternative 2 poses greater short-term impacts than Alternative 3 and 4. These negative impacts primarily relate to extensive use of heavy equipment for dredging and the transport of contaminated sediments through the community to an uplands disposal facility and clean material transport to the Site. Since the negative short-term human health and ecological impacts of sediment capping and thin-layer cover placement are generally associated with transportation of the clean material and heavy equipment usage, short-term effectiveness strongly correlates to the duration of construction activities. The longer the construction time, the more risk of such negative impacts. These impacts can be managed by best management practices (BMPs) and site-specific safety plans. The estimated construction duration for the alternatives range from two years (Alternative 4, 5 and 6) to three-to-four years for Alternatives 2 and 3. Thus, 4, 5 and 6 provide greater short term effectiveness than Alternatives 2 and 3 by one-to two years.

Since the risk of sediment re-suspension increases during excavation, the greater the volume of sediment excavated, the greater the impacts to adjacent areas by the re-suspended sediment.

10.2.4 Implementability

There are no implementability constraints for the No Action Alternative because no remedial action is taken.

Portions of each other alternative pose different challenges and technical difficulties associated with remedy implementation. Since tides in the LCP Chemicals marsh will severely affect accessibility to equipment, material and personnel, productivity will be severely impacted, regardless of whether a land- or water-based operation is employed. An example of this is presented by the WCC, as discussed in detail in Section 9.2.6. To summarize:

- The WWC is accessible only from Upland areas because the contaminated limb is narrow and completely drains at low tide;
- Land-based access to the WCC requires construction of temporary roads for access. Construction and use of these elevated roads would have negative impacts on the marsh;
- Because the areas with higher contaminant concentrations within the WCC are discontinuous and isolated from other areas in the creek complex, capping discrete areas would result in the creation of troughs and valleys within the narrow and shallow WCC. These troughs would restrict flow, especially at low tide, and would negatively impact the marsh surrounding the creek;
- Finally, pre-remediation SWAC of mercury in the WCC is already 2.1 mg/kg and the Aroclor 1268 is 3.0 mg/kg. Active remediation would reduce it 1.2 mg/kg and 1.7 mg/kg, respectively. The small reduction in risk does not appear to justify the negative impacts to the marsh.

Implementation of any remedial technology (whether sediment removal, sediment capping or thin-layer placement) will encounter the following constraints:

- As with other sediment remediation projects, the removal, transportation, off-loading, dewatering/solidification, and disposal of contaminated sediment and debris present significant implementation challenges, such as traffic management, noise control, and suitable disposal facility capacity identification.
- Scattered debris has been observed throughout the LCP Chemicals marsh, including large stone lining the banks of the LCP Ditch. Debris within removal areas will be removed and disposed of off-site during remedy implementation.

There are technologies and techniques available to meet the challenges associated with working in soft sediments in tidally influenced marsh areas. These include employing low-ground-pressure earth-moving equipment, telescoping conveyor belts for cap placement, shallow draft barges for water-based sediment removal and sediment capping, and hydraulic equipment to place thin-layer material. Most of these issues will be resolved during design and the construction bidding process.

10.2.5 Cost

A summary of the remedial alternative costs are presented in Table 28. Thirty-year net-present value costs for each alternative, calculated with a 7 percent discount rate, were presented for each alternative. The basis of cost estimates and assumptions made in developing these estimates are detailed in Appendix H of the FS.

10.3 Modifying Criteria

10.3.1 State/Support Agency Acceptance

The State of Georgia concurs with the selected remedy (see concurrence letter in Appendix B).

10.3.2 Community Acceptance

The public comments to the EPA's Proposed Plan were generally supportive of a more robust cleanup of the LCP Chemicals marsh that should proceed without undue delay. However, this support was not without significant concerns and additional desires. The comments received during the public comment period are summarized and addressed in the Responsiveness Summary, Part 3 of this ROD.

A large number of comments expressed the desire to clean up 48 acres of the Site, as reflected in Alternatives 2 or 3 of the Proposed Plan. Several commenters opposed the preferred remedy because it was not extensive enough and that leaving contamination in the marsh was simply postponing the final resolution of the problem to future generations.

Most of the comments were highly technical and questioned the methodologies used in the human health and ecological risk assessments. The primary human health concerns were that the seafood consumption scenarios were not conservative (protective) enough and the lack of including potential risks from dioxins and furans. These issues would subsequently impact the cleanup levels that would likely result in more remediation sediments in the LCP Chemicals marsh. The primary concerns with the ecological risk assessment were that more receptors should have been included such as dolphins, mink, and manatees. The assertion of including these sensitive receptors would likely change the cleanup levels.

There were a number of concerns pertaining to statements regarding the long-term monitoring (LTM) plan without any details provides in the Proposed Plan. Several technically knowledgeable groups submitted comments and questions on specific technical aspects of the risk assessments, RI, FS, and Proposed Plan. These topics included, among others, extent of contamination outside the current Superfund Site boundaries, cleanup levels, mercury cycling, exposure assumptions, statistical treatment of data, impact of dioxins/furans, and effectiveness of thin-cover placement.

11.0 Principal Threat Wastes

The NCP establishes the expectation that treatment will be used to address the principal threats posed by a site whenever practicable (40 CFR 300.430[a] [1] [iii] [A]). In general, principal threat wastes (PTW) are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner, or will present a significant risk to human health or the environment should exposure occur.

The PTW in LCP Chemicals marsh included mercury at concentrations over 1,000 mg/kg and PCBs in concentrations above 1,000 mg/kg. They were successfully excavated during the removal action at the Site in 1998-1999, when more than 13 acres of saltwater tidal marsh, including vegetated tidal flats and small drainage channels located immediately adjacent to the Uplands, were removed. In addition, more than 2,650 linear feet of tidal channels contaminated with PTW were also partly excavated. The residual lower-level threat mercury and Aroclor 1268 waste will be addressed by this action. However, the selected remedy (Alternative 6) does not use treatment to address the residual contamination. Therefore, remedy does not meet the preference for treatment.

12.0 Documentation of Significant Changes to the Selected Remedy

There have been to significant changes to the Selected Remedy from the Proposed Plan.

13.0 Selected Remedy

Based on CERCLA requirements, the detailed analysis of remedial alternatives, and consideration of public comments, EPA selects Alternative 6 as the Selected Remedy for the LCP Chemicals OU1- marsh. This section provides EPA's rationale for the Selected Remedy, and a description of its anticipated scope, how the remedy will be implemented, and its expected outcomes.

13.1 Summary of the Rationale for the Selected Remedy

The Selected Remedy is protective of human health and the environment. Risks are reduced through the removal of the highest concentrations of mercury and Aroclor 1268-contaminated sediment currently located in the LCP Ditch and the Eastern Creek. Tidal channels least impacted by tidal scouring will be dredged and stabilized with clean backfill. Armored caps will be placed over contaminated sediments in scour-prone tidal areas, to protect the sediments from tide induces scour. In addition, lead and PAHs present in the Domain 3 creek will be isolated under an armored cap. The low mercury and Aroclor 1268 concentrations present on the marsh surface flanking the tidal channels will be addressed through a thin-layer sand placement. The Selected Remedy (Alternative 6) will comply with ARARs and is protective of human health and the environment.

Although the Selected Remedy will leave elevated concentrations of mercury and Aroclor 1268 in isolated portions of Domain 3 Creek and in the WCC that exceed benthic CULs, the SWAC CULs are met. Long-term monitoring in these two creeks should confirm that residual contamination does not pose an adverse risk to fish, wildlife, and humans.

While Alternatives 4 and 5 addresses most contaminants above the CULs except in the WCC, Upper Domain 3 Creek, and in Purvis Creek, the Selected Remedy additionally addresses the majority of areas in Purvis Creek above the CUL. Each of the alternatives provide for long-term human health and ecological risk reduction by decreasing surface sediment COC concentrations, which leads to reduced chemical mobility and chemical uptake by human and ecological receptors, which in turn leads to reduced risks to human health, mammals, birds, fish, and the benthic community. LTM will measure the long-term remedy integrity and effectiveness.

The Selected Remedy prevents or minimizes COC contaminated in-stream sediment from entering Purvis Creek. The remedy removes the highest COC concentrations in OU1; i.e.; the LCP Ditch, Eastern Creek, Domain 3 Creek and Purvis Creek, without undue harm to the existing habitat. The larger remedy footprints of Alternatives 2 and 3 are based on conservative assumptions related solely to the predicted increase in protection of benthic communities, even though the benthic CULs are still protective. The additional impacts to the marsh, with the goal of protecting benthic organisms, does not significantly increase the remedy's effectiveness for protecting of fish, wildlife, and humans, where bioaccumulation of mercury and Aroclor 1268 is of paramount concern.

The Selected Remedy meets the site-specific RAOs insofar as it achieves the sediment CULs for the COCs. Furthermore, post-remediation HQs for all species, including the most sensitive species (green heron), are at or below 1 for all alternatives. Thus, the five alternatives reduce sediment concentrations to acceptable levels, especially when considering spatial forage areas of wildlife and movement of forage prey. Each alternative is predicted to achieve total creek and total marsh SWACs that meet the SWAC CULs, leading to reductions of mercury and Aroclor 1268 in fish and shellfish. After several years post-remediation, reductions are expected to result in reducing fish and shellfish consumption advisories within the Turtle River Brunswick Estuary.

The Selected Remedy reduces risks to benthic organisms exposed to contaminated sediment to levels that are consistent with the benthic community CULs. The Selected Remedy is also expected to reduce finfish exposures to COCs to acceptable levels. Long-term monitoring will be conducted to monitor the reduction of levels in sediment, surface water and fish tissue.

The Selected Remedy is expected to meet the applicable EPA and Georgia Water Quality Standards for protection of aquatic life in the marsh, using total and dissolved-phase mercury and PCB measures. However, it may not be feasible to meet the State of Georgia surface water quality standard for mercury and total PCBs (i.e., the standard for protection of human health [via fish consumption] of 0.025 µg/L total mercury and 0.000064 µg/L for total PCBs). Once the remedial action has been implemented and remedy effectiveness monitored for a number of years (including surface water quality), the EPA will evaluate whether a waiver under CERCLA Section 121(d)(4)(C) of these chemical-specific standards is warranted at this Site. As required in CERCLA and the NCP, any waiver of an ARAR must be documented in a ROD (or an Amended ROD) and must include a justification for invoking the waiver.

The Selected Remedy balances human and ecological risk reduction with sustaining and protecting existing habitat and wildlife to varying degrees. Alternatives 2 and 3 addressed larger areas and thus have the potential for greater risk reduction, but more substantially impact the existing vegetated marsh habitat than the Selected Remedy. The Selected Remedy reduces the uncertainty in meeting the fish tissue goals by adding six acres of capping in Purvis Creek, thereby reducing the SWAC in Purvis Creek. The remedy also reduces the mercury and Aroclor 1268 SWACs in Domain 1 by extending the thin cover to a portion of Domain 1A to provide greater protection to the green heron.

For the marginal improvement in risk reduction for mammals, birds, fish, and benthic organisms, the dredge-only alternatives (Alternatives 2 and 3) are less cost efficient when compared to alternatives that combine and optimize the use of removal, capping, and thin-layer placement.

13.2 Description of Remedial Components

The selected remedy is consistent with EPA's preferred alternative outlined in the November 2014 Proposed Plan, and is consistent with Alternative 6, as described in the

October 2014 Public Comment Draft FS. The following is a brief description of each of the components of the Selected Remedy.

13.2.1 Active Cleanup of 24 Acres

Apply active cleanup technologies in a total of 24 acres of sediment, as described in Section 9.2.6 and shown in Figure 28. The major components of the remedy are as follows:

- Dredge of seven acres (22,000 CY) of the LCP Ditch and Eastern Creek to a target depth of 18 inches and backfill with 12 inches of clean material. Dredged sediments will be taken to a licensed disposal facility;
- Place of 14,000 CY of engineered sediment cap on six acres of the Domain 3 Creek and Purvis Creek South;
- Place 13,000 CY of thin-layer sand on eleven acres of the Dillon Duck, Domain 1A and Domain 2 to reduce exposures and enhance natural recovery. A detailed evaluation regarding material types and specifications for the thin-cover layer will take place during remedy design;
- Sample and analyze PCDD/PCDF during remedial design to confirm co-location with Aroclor 1268 (see Section 13.2.2);
- LTM, including biological monitoring;
- ICs throughout the LCP Chemicals marsh – i.e., community outreach as well as posting and maintenance of signs advising against the consumption of fish where they are unsafe for regular consumption; and
- Five-Year Reviews.

13.2.2 Confirm Co-Location of PCDDs/PCDFs with Aroclor 1268

Existing PCDD/PCDF and Aroclor 1268 sediment data support the conclusion that the PCDDs and PCDFs are co-located with Aroclor 1268. Sufficient sampling in Domains 1, 2 and 3 will be undertaken during the Remedial Design phase to confirm that the PCDDs and PCDFs are co-located located with the Aroclor 1268. In the event that they are not co-located, a ROD Amendment may be required.

13.2.3 Long-Term Monitoring Program

Monitoring plans are recommended during and after remedial action. Monitoring is conducted for a variety of reasons, including: 1) to assess compliance with design and performance standards; 2) to assess short-term remedy performance and effectiveness in meeting sediment cleanup levels; and/or 3) to evaluate long-term remedy effectiveness in achieving RAOs and in reducing human health and/or environmental risk. In addition, monitoring data are usually needed to complete the five-year review process where a review is conducted.

A sediment remedy typically is one where the sediment contaminant CULs and/or target tissue levels have been met and maintained over time, and where all relevant risks have been reduced to acceptable levels. Due to the potential for post-remedial residual contamination or the inability to control all significant sources of contamination to the water body, reaching sediment or biota levels resulting in unlimited exposure and unrestricted use may take many years if not a few decades. However, it is expected that contamination in biota within the LCP Chemicals marsh will be substantially reduced after several years post-remediation.

The focus of the long-term monitoring plan (LTMP) is to verify:

- risk reduction to acceptable levels;
- meet RAOs and clean-up levels; and
- the physical integrity of remedy construction elements, specifically the caps; and the assumptions used in remedy selection, such as the sediment concentrations in thin-layer areas affected by burrowing organisms.

The primary purpose of the LTMP framework is to provide an overview of the data needed to assist in determining remedy effectiveness and is organized to cover each of the following major data acquisition programs:

- Sediment monitoring;
- Water column monitoring;
- Fish and shellfish monitoring;
- Cap and thin-layer cover monitoring; and
- Benthic community assessment and re-vegetation of disturbed areas.

Appendix A contains the framework outline for the LTMP, which will be further developed during the Remedial Design phase. Target fish and shellfish tissue concentrations are listed in Table 19.

13.2.4 Institutional Controls

The selected remedy requires a fishing advisory, installation of signs, public outreach and implementation of a plan to gauge the effectiveness of these measures.

To ensure that information is received by the target fishing population, the EPA will undertake public outreach and education. The EPA understands that many of the more intensive users of the St. Simons estuary (i.e., those potentially eating the most fish caught from the area) are likely from minority and lower-income groups. The EPA will take steps to ensure that outreach activities are developed and implemented to also identify and target these specific groups. This will likely include continued posting of signs using pictograms and in multiple languages, such as English and Spanish. The EPA may also prepare outreach materials, such as public service announcements and internet postings targeted to these specific groups.

13.2.5 Five-Year Reviews

The selected remedy leaves waste in place above levels that allow for unlimited use and unrestricted exposure, therefore CERCLA requires periodic reviews of the remedy. A statutory review will be conducted at least every five years to evaluate the protectiveness of the remedy. The purpose of these five-year reviews is to evaluate the implementation and performance of the remedy in order to determine if the remedy is or will be protective of human health and the environment. The five-year review will document recommendations and follow-up actions as necessary to ensure long-term protectiveness of the remedy.

13.3 Summary of Estimated Remedy Costs

The total estimated cost of the selected remedy is approximately $28.6 million. A summary table of the major capital and annual operation, maintenance; and monitoring cost elements for each component of the selected remedy is shown in Table 29. The discount rate used for calculating total present worth costs was 7 percent.

The information in these cost estimate summary tables are based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost elements are likely to occur as a result of new information and data which may be obtained during the pre-design phase. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

13.4 Expected Outcomes of Selected Remedy

Expected residual risks associated with the preferred remedy include:

- RAO 1 – Minimal residual risks would be expected since the primary contaminated source areas in the LCP Ditch and Eastern Creek would be dredged. Residual contamination in the WCC and Domain 3 Creek is not expected to contribute any substantial releases of COCs to Purvis Creek.
- RAO 2 – LOAEL risks to piscivorous birds and mammals will be reduced to an HI of 1 or less. Fish tissue concentrations are expected to be reduced within several years after post construction. Monitoring of fish and shellfish will occur to assess remedy effectiveness.
- RAO 3 – The predicted high quantity finfish consumer excess cancer risk for Aroclor 1268 will be reduced to acceptable levels. Similar to RAO 2, the fish tissue concentrations are anticipated to decrease several years after construction is complete and a corresponding decrease in the limitations of the fish advisories.
- RAO 4 – Residual risks to the benthic community may occur in those areas where COC concentrations exceed the CULs, such as in isolated areas in the WCC and in Domain 3. However, it is not expected that these relatively isolated exceedances would adversely impact the overall benthic community in the various creeks and domains.

- For RAO 5 – LOAEL finfish exposures would be reduced to HQs less than 1, with the possible exception of stripped mullet (a bottom feeder) exposure to Aroclor 1268.
- RAO 6 – It is anticipated that the applicable EPA and State of Georgia water quality standards for protection of aquatic life will be met after construction is complete and that any residual risks from COCs in surface water would not be significant.

14.0 Statutory Determinations

The remedial action selected for OU1 at the LCP Chemicals marsh is consistent with CERCLA and, to the extent practicable, the NCP. The Selected Remedy for the LCP Chemicals marsh is protective of human health and the environment, will comply with ARARs and is cost effective. In addition, the Selected Remedy utilizes permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable, and although it does not satisfy the statutory preference for treatment, the Selected Remedy does significantly reduce the mobility of contaminants that could be considered a principal threat. Removal, capping and thin-layer sand placement of mercury and PCB contaminated sediments have been demonstrated to be reliable for this type of contamination and reduces mobility and accessibility through physical isolation and immobilization of the contaminants through capping.

14.1 The Selected Remedy is Protective of Human Health and the Environment

The remedy for the LCP Chemicals marsh will adequately protect human health and the environment by eliminating or controlling exposures to human and environment receptors through engineering controls and ICs as described in Section 13.2.

The Selected Remedy will reduce potential human health non-cancer risk levels such that they do not exceed EPA's acceptable hazard index of 1. Similarly, risks to ecological receptors will be reduced to acceptable levels below the LOAEL. The remedy will comply with ARARs and To Be Considered criteria, as specified in Table 27.

Implementation of the Selected Remedy will not pose any unacceptable short term risks or cause any cross-media impacts.

14.2 The Selected Remedy Complies with ARARs

Section 121(d) of CERCLA, as amended, specifies, in part, that remedial actions for cleanup of hazardous substances must comply with ARARs or obtain a waiver under CERCLA Section 121(d)(4). *See also* 40 CFR § 300.430(f)(1)(ii)(B). ARARs include only federal and state environmental or facility siting laws/regulations and do not include occupational safety or worker protection requirements. Compliance with Occupational Safety and Health Administration (OSHA) standards is required by 40 CFR § 300.150 and therefore the CERCLA requirement for compliance with or wavier of ARARs does not apply to OSHA standards.

Key ARARs for the LCP Marsh include the Clean Water Act restrictions on the discharge of dredged material into the waters of the U.S., the State of Georgia's regulations on construction in coastal marshlands, and the federal laws and regulation that protect marine mammals, migratory birds, and endangered species.

Under CERCLA Section 121(e)(1), federal, state, or local permits are not required for the portion of any removal or remedial action conducted entirely on-site as defined in 40 CFR § 300.5. *See also* 40 CFR §§ 300.400(e)(1) & (2). Also, on-site CERCLA response actions must only comply with the "substantive requirements," not the administrative requirements of a regulation. Administrative requirements include permit applications, reporting, record keeping, and consultation with administrative bodies. Although consultation with state and federal agencies responsible for issuing permits is not required, it is recommended for determining compliance with certain requirements such as those typically identified as Location-specific ARARs.

In accordance with 40 CFR § 300.400(g)(5), the EPA and State of Georgia have identified the ARARs and TBCs for the selected remedy. Table 27 lists respectively, the Chemical-specific, Location-specific and Action-specific ARARs for the selected remedy. The Selected Remedy is expected to attain all identified ARARs, so a statutory waiver is not necessary at this time. *See* 40 CFR § 300.430(f)(5)(ii)(B).

14.3 The Selected Remedy is Cost Effective

The Selected Remedy is cost-effective because the remedy's costs are proportional to its overall effectiveness (see 40 CFR 300.430(f)(1)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., that are protective of human health and the environment and comply with all federal and any more stringent ARARs, or as appropriate, waive ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness, in combination. The overall effectiveness of each alternative then was compared to the alternative's costs. The Selected Remedy was determined have the best tradeoffs for the cost.

14.4 The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The NCP establishes an expectation that the EPA will use treatment to address the principal threat posed at a site wherever practicable (Section 300.430(a)(1)(iii)[A]). In practice, the "principal threat" concept is applied by the EPA to the characterization of "source materials" at a Superfund site. A source material includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The LCP Chemicals marsh mercury and Aroclor 1268 contaminated sediments being addressed by this action are considered low-level threat waste. Sediments considered to be a principal threat were addressed by previous removal actions. However, capping has been demonstrated to be reliable containment remedies for this type of contamination.

14.5 The Selected Remedy Does Not Satisfy the Preference for Treatment Which Permanently and Significantly Reduces the Toxicity, Mobility or Volume of the Hazardous Substances as a Principal Element

The selected remedy for the LCP Chemicals marsh does not satisfy the statutory preference for treatment as a principal element of the remedy. The sediment that is addressed in this ROD has been classified as low-level threat. Because of the relatively high volume of sediments involved, and the concentrations of mercury and Aroclor 1268 involved, treatment of sediments was not considered practical. The toxicity, mobility and volume of mercury and Aroclor 1268 in sediments will be significantly reduced through dredging and physically isolating the contaminated sediments from the aquatic environment. *In situ* caps are generally accepted as reliable containment for contaminated sediment.

14.6 Five Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-Site above levels that allow for unlimited use and unrestricted exposure, a CERCLA statutory review is required and will be conducted every five years after initiation of remediation to ensure that the remedy is, or will be, protective of human health and the environment.

15.0 Key Terms

Administrative Record (AR): Documents, including correspondence, public comments, Records of Decision and other decision documents, and technical reports upon which the agencies base their remedial action selection.

Amphipod: A small, shrimp-like crustacean.

Apparent effects threshold (AET): A sediment effects concentration representing the sediment concentration above which a particular effect always occurs. The AET is the concentration above which all of the sediment samples were observed to be toxic.

Applicable or Relevant and Appropriate Requirements (ARARs): ARARs are any promulgated standards, requirements, criteria, or limitations under federal environmental laws, or any promulgated standards, requirements, criteria, or limitations under state environmental or siting laws that are more stringent than federal requirements, that are either legally 'applicable or relevant and appropriate' under the circumstances. Under CERCLA Section 121(d), a remedial action must comply (or justify a waiver) with ARARs.

Aroclor: A discontinued registered trademark for a series of PCB compounds. Aroclors were first sold in 1930. It was available as viscous oils and thermoplastic solids with high refractive indices. Aroclors are no longer used because of its high toxicity. Aroclor production was discontinued in the United States in 1977.

Aroclor 1268: A polychlorinated biphenyl mixture where the second two numbers indicate the percentage of chlorine by mass in the mixture. Hence, Aroclor 1268 means that the PCB mixture contains approximately 68 percent chlorine by weight.

Assessment Endpoint: An explicit expression of a valuable aspect of the ecology to be evaluated in the ecological risk assessment. This is generally some characteristic(s) of a species of plant or animal, such as reproduction, that can be described numerically.

Baseline Risk Assessment (BRA): A qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and the environment by the presence or potential presence of specific contaminants.

Benthic invertebrates: Small but visible animals (e.g., insects, worms, clams, and snails) that live in or on the sediment at the bottom of a marsh, lake, or stream.

Bioaccumulation: The uptake and storage of chemicals by living animals and plants. This can occur through direct contact with contaminated water or sediment or through the ingestion of another organism that is contaminated. For example, a small fish might eat contaminated algae, a bigger fish might eat several contaminated fish and a human might eat a bigger, now-contaminated fish. Contaminants typically increase in concentration as they move up the food chain.

Bioavailability: Degree of ability to be absorbed and metabolized in an organism.

Biomagnification: A process causing an increase in concentration of a substance in the tissues of predator relative to the concentration in the tissues of its prey. Biomagnification causes chemical concentrations to increase with passage through the food web from lower trophic levels to higher trophic levels.

Bioturbation: The process whereby bottom dwelling and burrowing organisms mix-up sediment and destroy primary layering.

Cancer slope factor (CFS): Used to estimate the risk of cancer associated with exposure to a carcinogenic or potentially carcinogenic substance. A slope factor is an upper bound, approximating a 95 percent confidence limit, on the increased cancer risk from a lifetime exposure to an agent by ingestion or inhalation.

Central tendency exposure (CTE): An estimate of the average experienced by the affected population, based on the amount of chemical present in the environment and the frequency and duration of exposure.

Chemical of Concern (COC): A hazardous substance or group of substances that pose unacceptable risk to human health or the environment at a site.

Chlor-alkali: There are three production methods for producing chlorine and sodium hydroxide in use. The mercury cell method produces chlorine-free sodium hydroxide. In a normal production cycle a few hundred pounds of mercury per year are emitted, which accumulate in the environment. Additionally, the chlorine and sodium hydroxide produced via the mercury-cell chlor-alkali process are themselves contaminated with trace amounts of mercury. The membrane and diaphragm method use no mercury, but the sodium hydroxide contains chlorine, which must be removed.

Clapper Rail: The Clapper Rail is a chicken-sized game bird that rarely flies. It is grayish brown with a pale chestnut breast and a noticeable white patch under the tail.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA): A federal law (also known as Superfund) passed in 1980 and modified in 1986 by the Superfund Amendment and Reauthorization Act (SARA); the act authorizes EPA to investigate and cleanup abandoned or uncontrolled hazardous waste sites. The law authorizes the federal government to respond directly to releases of hazardous substances that may endanger public health or the environment. EPA is responsible for managing the Superfund.

Dewatering: Removal of water from solid material or soil by wet classification, centrifugation, filtration, or similar solid-liquid separation processes, such as removal of residual liquid from a filter cake by a filter press as part of various industrial processes.

Dioxin/furans: Dioxins and furans are the abbreviated or short names for a family of toxic substances that all share a similar chemical structure. Dioxins, in their purest form, look like crystals or a colorless solid. Most dioxins and furans are not man-made or produced intentionally, but are created when other chemicals or products are made. Of all of the dioxins and furans, one, 2,3,7,8-tetrachloro-p-dibenzo-dioxin (2,3,7,8 TCDD,) is considered the most toxic.

Discharge: Flow of surface water in a stream or the outflow of groundwater from a flowing well, ditch, or spring. It can also apply to release of liquid effluent from a facility or to chemical emissions into the air.

Ecological Risk Assessment (ERA): The application of a formal framework, analytical process, or model to estimate the effects of human actions on a natural resource and to interpret the significance of those effects in light of the uncertainties identified in each component of the assessment process. Such analysis includes initial hazard identification, exposure and dose/response assessments, and risk characterization.

Effects range-low (ER-L): A sediment effects concentration representing the lower 10^{th} percentile of sediment concentrations associated with a particular effect. The ER-L is where the effects of the toxicant begin to manifest at a rate of about 10 percent.

Effects range-median (ER-M): A sediment effects concentration representing the median concentration of sediment associated with a particular effect. The ER-M is the sediment effects concentration above which about 50 percent of the sediment samples are expected to be toxic. Like a PEL, an ER-M is a sediment concentration above which a particular effect is likely to occur.

Feasibility Study (FS): A study of the applicability or practicability of a proposed action or plan conducted after the Remedial Investigation to determine what alternatives or technologies could be applicable to clean up the site-specific COCs.

Grass shrimp: A very small shrimp that lives among the marsh grasses in fresh and brackish waterways in many parts of the eastern United States. They are pinkish in color but so pale as to be almost transparent, with yellowish eye stalks protruding from their heads. These shrimp are also sometimes called popcorn shrimp.

Hazard Index (HI): The sum of more than one hazard quotient for multiple substances and/or multiple exposure pathways.

Hazard Quotient (HQ): The ratio of an exposure level to a substance to a toxicity value selected for the risk assessment for that substance.

Heavy metals: Metallic elements with high atomic weight, e.g., mercury, chromium, cadmium, arsenic, and lead. They can damage living things at low concentrations and tend to accumulate in the food chain.

Herbivorous: Animals that feed on plants.

Human Health Risk Assessment (HHRA): A qualitative and quantitative evaluation performed in an effort to define the risk posed to human health by the presence or potential presence of specific contaminants.

Information Repository: A library or other location where documents and data related to a Superfund project are placed to allow public access to the material.

In situ: Situated in the original, natural, or existing; not having been moved to another location.

Institutional Control (IC): Restriction that prevents an owner inappropriately using a property. The restriction is designed to reduce exposure to hazardous substances for workers or the general public and maintain the integrity of the remedy.

Lowest-observed-adverse-effects-level (LOAEL): The lowest level of a chemical stressor evaluated in a toxicity test that shows harmful effects on a plant or animal.

Macroinvertebrate: An invertebrate that is large enough to be seen without the use of a microscope.

Mercury Cell Process: In the mercury cell process, sodium forms an amalgam (a "mixture" of two metals) with the mercury at the cathode. The amalgam reacts with the water in a separate reactor called a decomposer where hydrogen gas and caustic soda solution at 50 percent are produced. The products are extremely pure. The chlorine gas, produced at the anode, contain a small amount of oxygen and can generally be used without further purification.

Methylation: The addition of a methyl group, CH3, to a molecule.

Mummichog: A small killifish found in the eastern United States. Also known as mummies, gudgeons, and mud minnows, these fish are found in brackish and coastal waters including estuaries and salt marshes along the eastern seaboard of the United States as well as the Atlantic coast of Canada. The mummichog is a popular research subject in toxicological studies.

Mysids: Mysida is an order of small, shrimp-like crustaceans in the malacostracan superorder Peracarida. Their common name opossum shrimps stems from the presence of a brood pouch or "marsupium" in females.

Nanogram (ng): One billionth of a gram.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The federal regulations governing CERCLA cleanups and the determination of the sites to be addressed under both the Superfund program and Oil Pollution Act to prevent or control spills into waters of the U.S. and elsewhere. 40 CFR Part 300 et seq.

National Priorities List (NPL): List of high priority sites with hazardous waste releases which may be addressed by EPA's Superfund program.

Net Present-Value Analysis/Present-Value Cost: A method of evaluation of expenditures that occur over different time periods. By discounting all costs to a common base year, the costs for different remedial action alternatives can be compared. When calculating present worth costs for Superfund sites, capital and O&M costs are included.

No observed adverse effect level (NOAEL): The highest level of a chemical stressor in a toxicity test that did not cause harmful effect in a plant or animal.

Omnivorous: An animal that eats food from both plants and animals, which may include eggs, insects, fungi and algae. Many rely on both vegetation and animal protein to remain healthy.

Operable Units (OUs): Separate activities undertaken as part of a Superfund site cleanup. Often a Superfund Site is divided in phases to better address different pathways and areas of contamination.

Persistence: Refers, in general, to the length of time a compound remains in the environment, once introduced. A compound may persist for less than a second or indefinitely.

Piscivorous: Describes a carnivorous diet that consists largely of fish, though a piscivorous diet may also include similar aquatic foods such as aquatic insects, mollusks and crustaceans.

Polycyclic Aromatic Hydrocarbons (PAHs): Also known as poly-aromatic hydrocarbons or polynuclear aromatic hydrocarbons, they are fused aromatic rings and do not contain heteroatoms or carry substituents. Naphthalene is the simplest example of a PAH. PAHs occur in oil, coal, and tar deposits and are produced as byproducts of fuel burning (whether fossil fuel or biomass).

Polychlorinated Biphenyl (PCB): A high molecular-weight halogenated organic compound formerly used in dielectric fluids in transformers and other electrical equipment.

Probable effects level (PEL): A sediment effects concentration above which a particular effect is likely to occur or below which no effect is expected to occur. It is calculated as the geometric mean of the ER-M and the 85th percentile of the sediment concentrations where no effects were observed.

Proposed Plan: A Superfund public participation fact sheet that summarizes the preferred cleanup strategy for a Superfund Site.

Reasonable Maximum Exposure (RME): The maximum exposure reasonably expected to occur in a population.

Receptor: Entity exposed to a stressor.

Record of Decision (ROD): A legal, technical, and public document that identifies the selected remedy at a site, outlines the process used to reach a decision on the remedy, and confirms that the decision complies with CERCLA.

Reference Dose (RfD): An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark dose, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's non-cancer health assessments.

Reference Station: A sampling station believed to be un-impacted by the site being investigated and used for comparison purposes.

Remedial Action Objectives (RAOs): They provide overall cleanup goals which guide the comparison and selection of remedial options.

Remedial Design (RD): A phase of remedial action that follows the remedial investigation / feasibility study and Record of Decision and includes development of engineering drawings and specifications for a site cleanup.

Remedial Investigation/Feasibility Study (RI/FS): A two-part investigation conducted to fully assess the nature and extent of a release, or threat of release, of hazardous substances, pollutants, or contaminants, and to identify alternatives for cleanup. The Remedial Investigation gathers the necessary data to support the corresponding Feasibility Study.

Remediation: Cleanup or other methods used to remove or contain a toxic spill or hazardous substances from a Superfund site.

Residuals: Contaminants that are left in place following remediation.

Responsiveness Summary: A summary of oral and written comments received by EPA during a comment period on key EPA documents, and EPA’s responses to those comments. The responsiveness summary is a key part of the ROD, highlighting community concerns for EPA decision-makers.

Sediment effect concentrations (SEC): Sediment quality guidelines used to predict sediment toxicity. Site-specific SECs were derived for the LCP Chemicals marsh based on the results of the chronic toxicity tests.

Semi-volatile Organic Compounds (SVOCs): Organic chemicals that evaporate slowly at standard temperature (70 degrees Fahrenheit).

Superfund: The common name for the program operated under the legislative authority of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the federal law that governs cleanup of abandoned hazardous waste sites. The Superfund Amendments and Reauthorization Act (SARA) amended CERCLA on October 17, 1986.

Surface Weighted Average Concentrations (SWAC): The average contaminant concentration in the biologically active portion of sediment, that takes into account the surface area associated with each sample along with the concentration. SWACs are generally used when evaluating sediment exposures that occur over spatial scales that encompass multiple sample locations.

Thin-layer placement: The placement of a thin (typically six inches or less) layer of sediment, sand or amendments to reduce exposure to underlying sediments. Also referred to as thin-layer placement and enhanced natural recovery.

Threshold effects level (TEL): A sediment effects concentration above which a particular effect is expected to occur or below which effects are unlikely to occur. It is calculated as the geometric mean of the median of the sediment concentrations where no effects were observed and the 15^{th} percentile of the sediment concentrations where effects were observed.

Toxicity Equivalence Factor (TEF): Estimate of the potency, relative to 2,3,7,8-TCDD, of an individual polychlorinated dibenzo-p-dioxin, dibenzofuran or biphenyl congener, using careful scientific judgment after considering all available relative potency data.

Toxicity Equivalence Concentration (TEC): The TEC is the product of the TEF multiplied by the concentration for an individual congener. The total TEC for a mixture is calculated as the sum of 2,3,7,8-TCDD equivalence concentrations of all congeners present in the mixture.

Toxicity reference value: Represents a daily dose associated with an effect level or threshold and is expressed in units of milligrams of chemical per kilogram of body weight of the wildlife receptor per day. TRVs are developed in the effects assessment and used in the risk characterization phases of a BERA.

Trophic level: A feeding level within an ecosystem at which energy is transferred (e.g., insectivores, herbivores, carnivores).

Trophic transfer: The movement of chemical concentrations from tissue body burdens in organisms in a lower trophic level to chemical concentrations in tissue body burdens in organisms at a higher trophic level, i.e., predators receiving body burdens from chemicals in their prey.

Volatile organic compound (VOC): Chemicals that, as liquids, evaporate into the air.

16.0 Documentation of Significant Changes

No significant changes have occurred.

17.0 References Cited

Black and Veatch Special Projects Corp. (Black & Veatch). 2011. Baseline Ecological Risk Assessment for the Estuary at the LCP Chemical Site in Brunswick, Georgia. Prepared for the U.S. Environmental Protection Agency, Region 4. April, 2011.

Environmental Planning Specialists, Inc. (EPS). 2011. Human Health Risk Assessment for the Estuary, Operable Unit 1 Marsh Trespasser, Fish and Shellfish Consumer, Clapper Rail Consumer, Final. Prepared for LCP Chemical Site, Brunswick, Georgia. August 2011.

Environmental Response Team (ERT). 1997. Ecological Assessment Ecological Risk Evaluation of the Salt Marsh and Adjacent Areas at the LCP Superfund Site, Brunswick, GA. Prepared by ERT, Office of Emergency and Remedial Response. April, 1997.

Pulster, E.L., and K.A. Maruya. 2008. Geographic specificity of Aroclor 1268 in bottlenose dolphins (*Tursiops truncates*) frequenting the Turtle/Brunswick River Estuary, Georgia (USA). *Sci. Tot. Environ.* 393:367-375.

U.S. Environmental Protection Agency (EPA). 2014. Dioxins/Furans: LCP Chemicals Superfund Site, Brunswick, Glynn County, GA. Memorandum from Galo Jackson, Remedial Project Manager to Pam Scully, Acting Section Chief, EPA Region 4 Superfund Remedial Branch. September 2, 2014. 106pp.

Winger, P.V., Lasier, P.J., and H. Geitner. 1993. Toxicity of sediments and pore water from Brunswick Estuary, Georgia. *Arch. Environ. Contam. Toxicol.* 25: 371-376.

TABLES

List of Tables

Table 1: Dioxin Toxicity Equivalency Concentration (TEC) and Aroclor-1268 Sediment and Soil Data

Location	Year	TEC Dioxin Total ng/kg	Aroclor-1268 µg/kg	Description
17/18	1995	213.7	56,000	LCP ditch - Already Removed
36	1995	393.2	55,000	LCP ditch - Already Removed
61	1995	2,768.3	1,300,000	Eastern Creek - Will be Removed
68	1995	762.4	330,000	Eastern Creek - Will be Removed
E3	1995	4,905.4	3,800,000	FFDA - Already Removed
F2 (surf.)	1996	2,639.8	1,100,000	FFDA - Already Removed
F2 (subsurf.)	1996	1,326.1	88,000	FFDA - Already Removed
H1	1995	12,760.7	4,000,000	FFDA - Already Removed
Grid Marsh	1995	119.4	6,100	FFDA - Already Removed
Cell Bldg.	1995	244.6	53,000	Uplands soil - Already Removed
Process S.	1995	764.1	450,000	Uplands soil - Already Removed
100	1996	22.5	1,100	Purvis Creek
101	1996	6.6	85	Purvis Creek
102	1996	7.4	130	Purvis Creek
105	1996	8.7	990	Turtle River
106	1996	5.1	160	Turtle River
107	1996	4.3	580	Turtle River
108	1996	3.1	600	Turtle River
110	1996	2.7	250	Purvis Creek
111	1996	137.6	6,100	LCP Ditch
117	1996	6.9	11,000	Purvis Creek
118	1996	9.4	10,000	Western Creek Complex - Will not be Removed
BR000	1995	11.4	-	Turtle River
BR003	1995	15.1	5	Turtle River
BR008	1995	13.4	590	Turtle River
BR010	1995	15.1	45	Turtle River
BR022	1995	15.2	47	Near Troup Creek
BR028	1995	15.1	250	Turtle River
BR030	1995	15.4	110	Black River
BR032	1995	19.7	610	East River (side channel)
BR041	1995	11.2	120	Turtle River
BR048	1995	20.4	1,400	Gibson Creek
BR052	1995	14.7	100	Saint Simons Sound
BR055	1995	15.1	250	South Brunswick River
BR074	1995	15.6	43	Turtle River
BR080	1995	14.9	48	Turtle River
ES	1996	1,271.3	567	Excavation soil - Already Removed
MS	1996	614.2	481	Marsh sediment - Already Removed

Table 1: Dioxin Toxicity Equivalency Concentration (TEC) and Aroclor-1268 Sediment and Soil Data - Continued

Location	Year	TEC Dioxin Total ng/kg	Aroclor-1268 µg/kg	Description
MS	1996	614.2	481	Marsh sediment - Already Removed
CS	1996	56	9.6	Creek sediment
C-6	2000	1,877.8	7,580	Eastern Creek - Will be Removed
C-8	2000	123.3	2,200	Eastern Creek - Will be Removed
C-15	2000	53.6	99	Mouth of WCC - Will not be Removed
TC-C	2000	6.9	0.045	Troup Creek reference station
CR-C	2000	13.1	0.022	Crescent River- reference station
AL-J1-83	2011	125.5	41	Altamaha canal south of Site - Not a part of OU1
AL-D1-12	2011	61.9	22	Altamaha canal south of Site - Not a part of OU1
AL-M1-1	2011	68.0	43	Altamaha canal south of Site - Not a part of OU1
AL-S1-32	2011	20.3	34	Altamaha canal south of Site - Not a part of OU1

Notes:
FFDA - Former Facility Disposal Area
BR Stations are from the Brunswick Initiative sampling.
ng/kg - nanograms per kilogram
OU – operable unit
µg/kg - micrograms per kilogram

Table 2: Chemicals of Concern (COC) in Surface Water of Major Creeks in the LCP Chemicals Marsh (2000-2007) Yearly Averages

Year	Mercury (ng/L)		Methylmercury		Aroclor 1268	Lead (µg/L)	
	Total[c]	Dissolved	(ng/L)	% of total mercury	Total (µg/L)[d,e]	Total	Dissolved[f]
Mouth of Main Canal (C-5)							
2000	59	0.1	-------	-------	0.50	2.5	2.5
2002	-------	-------	-------	-------	-------	-------	-------
2003	-------	-------	-------	-------	-------	-------	-------
2004	-------	-------	-------	-------	-------	-------	-------
2005	71	-------	0.59	0.83	0.83	-------	-------
2006	37	4.4	-------	-------	0.082	0.393	0.046
2007	120	4.2	-------	-------	0.79	1.0	0.026
Mouth of Eastern Creek (C-9)							
2000	188	-------	0.94	0.49	0.19	2.5	-------
2002	-------	-------	-------	-------	-------	-------	-------
2003	-------	-------	-------	-------	-------	-------	-------
2004	-------	-------	-------	-------	-------	-------	-------
2005	13	-------	0.22	1.7	-------	-------	-------
2006	160	5.0	-------	-------	0.18	0.449	0.027
2007	43	3.4	-------	-------	0.44		0.079
Mouth of Western Creek Complex (C-15)							
2000	12	-------	0.22	1.8	0.50	2.5	-------
2002	-------	-------	-------	-------	-------	-------	-------
2003	-------	-------	-------	-------	-------	-------	-------
2004	-------	-------	-------	-------	-------	-------	-------
2005	36	-------	0.89	2.5	-------	-------	-------
2006	15	3.8	-------	-------	0.026	0.441	0.025
2007	49	2.9	-------	-------	0.22	1.1	0.021
Upper Purvis Creek (Station C-36)							
2000	99	0.1	10	10	0.50	2.5	0.50
2002	11	-------	0.28	2.6	0.50	25	-------
2003	48	-------	1.2	2.5	0.25	2.5	-------
2004	49	-------	2.2	4.5	0.60	0.60	-------
2005	8.4	-------	0.35	4.2	0.010	0.58	-------
2006	12	4.6	-------	-------	0.021	0.363	0.014
2007	23	3.2	-------	-------	0.024	0.41	0.018

Table 2. Chemicals of concern (COC) in surface water of major creeks in the LCP Chemicals Marsh (2000-2007) Yearly Averages – Continued

Year	Mercury (ng/L)		Methylmercury		Aroclor 1268	Lead (µg/L)	
	Total[c]	Dissolved	(ng/L)	% of total mercury	Total (µg/L)[d,e]	Total	Dissolved[f]
Mid-stretch of Purvis Creek (Station C-29)							
2000	24	-------	0.38	1.6	0.50	2.5	-------
2002	8.1	-------	0.15	1.9	0.50	25	-------
2003	44	-------	1.0	2.3	0.25	2.5	-------
2004	46	-------	1.6	3.5	0.60	0.60	-------
2005	9.8	-------	0.36	3.7	0.010	0.22	-------
2006	17	3.7	-------	-------	0.044	0.575	0.019
2007	29	4.7	-------	-------	0.031	0.50	0.029
Mouth of Purvis Creek (Station C-16)							
2000	16	0.1	0.20	1.2	0.50	1.8	1.9
2002	11	-------	0.18	1.6	0.50	25	-------
2003	33	-------	0.61	1.8	1.0	2.5	-------
2004	21	-------	1.6	7.6	0.60	0.60	-------
2005	9.6	-------	0.25	2.6	0.010	0.56	-------
2006	25	3.4	-------	-------	0.029	0.561	0.022
2007	50	3.6	-------	-------	0.037	1.2	0.15
Troup Creek (Reference)							
2000	3.3	0.1	0.036	1.1	0.50	2.5	2.5
2002	1.1	-------	0.050	4.5	0.50	25	-------
2003	2.1	-------	0.012	-------	0.25	2.5	-------
2004	4.6	-------	0.22	4.8	0.60	0.60	-------
2005	4.7	-------	0.088	1.9	0.50	-------	-------
2006	1.8	1.0	-------	-------	0.0012	0.213	0.010
2007	78	1.3	-------	-------	0.0024	0.43	0.025
Crescent River (Reference)							
2000	1.7	0.1	0.012	-------	0.33	2.5	2.5
2002	1.2	-------	0.043	3.6	0.50	25	-------
2003	1.2	-------	0.012	-------	0.25	2.5	-------
2004	1.6	-------	0.047	2.9	0.60	0.60	-------
2005	1.2	-------	0.008	-------	1.4	-------	-------
2006	0.70	0.60	-------	-------	0.0005	0.371	0.010

Notes:
a - Creek surface water was typically collected during ebb tide.
b - Concentrations of COPC identified by underlining were non-detected values that were assigned a value of 1/2 of detection limit.
c - The U.S. EPA chronic ambient water quality criterion for mercury (total mercury) is 940 ng/L (this value does not account for food-web uptake by biota.) The State of Georgia chronic ecological screening value (ESV) is 25 ng/L (based on marketability of fishes).
d - The State of Georgia water quality standard for total PCBs in coastal and marine estuarine waters is 0.03 µg/L.
e - There are no U. S. EPA or Region 4 toxicological benchmarks for Aroclor 1268.
f - The State of Georgia water quality standard for lead (dissolved lead) is 8.1 µg/L.

Table 3. Surface Water Dioxin Toxicity Equivalence Concentration (TEC) and Aroclor-1268 Concentrations

Location	Year	Dioxin Total TEC, pg/L	Aroclor-1268, µg/L	Description
C-6	2000	1.69	1 U	Eastern Creek
C-8	2000	3.72	1 U	Eastern Creek
C-15	2000	2.74	1 U	mouth of Western Creek
C-15 (duplicate)	2000	4.64	NA	mouth of Western Creek
TC-C	2000	1.91	1 U	Troup Creek reference
CR-C	2000	2.85	0.33 J	Crescent River reference

Notes:
TEC conversion used WHO TEF (2005) factor
NA - not analyzed
pg/L - picogram per liter
µg/L - microgram per liter
U - Below detection limit
J - Estimated value

Table 4. Wholebody Biota Tissue Concentration Used in the BERA

Receptor	Average Wholebody Tissue Concentrations (mg/kg dry weight)	
	Site	Reference
Black Drum n = 50 n = 16		
Mercury	0.84	0.10
Aroclor 1268	5.51	0.10
Red Drum n = 39 / n = 13		
Mercury	1.14	0.30
Aroclor 1268	1.43	0.10
Silver Perch n = 55 / n = 32		
Mercury	1.6	0.29
Aroclor 1268	5.67	0.19
Spotted Seatrout n = 49 / n = 21		
Mercury	2.27	0.34
Aroclor 1268	4.92	0.16
Striped Mullet n = 27 / n = 13		
Mercury	0.23	0.05
Aroclor 1268	13.2	0.18
Blue Crab n = 91 / n = 49		
Mercury	1.59	0.15
Aroclor 1268	1.61	0.13
Fiddler Crab n = 43 / n = 48		
Mercury	0.57	0.04
Aroclor 1268	2.86	0.22
Mummichog n = 16 / n = 22		
Mercury	0.58	0.09
Aroclor 1268	4.28	0.15

Notes:
Site tissue data are from Purvis Creek except fiddler crabs and mummichogs from the LCP Ditch.

Table 5. Summary of Total Toxic Equivalent Concentration (TEC)[1] in Gamefish and Bottom Feeder Fillets and Whole Fish Samples Collected from the Turtle River near the Brunswick Cellulose Mill - 1989 through 2005[2]

	Station 1- Upstream from mill TECs in ng/kg		Station 2 – Downstream from mill TECs in ng/kg		Reference Station Sapelo Sound TECs in ng/kg	
Sample Year [3,4]	Gamefish Fillets	Bottom Feeder Fillets	Gamefish Fillets	Bottom Feeder Fillets	Gamefish Fillets	Bottom Feeder Fillets
1989	4.84	1.04	1.93	1.14	0.02	0.04
1990	0.24	0.10	ND[3]	5.21	0.06	3.56
1991	1.88	2.69	2.61	0.2	0.18	ND
1992	0.07	0.06	0.19	0.96	0.01	0.21
1993	0.95	0.36	0.47	2.05	<0.15[7]	0.31
1994	0.25	3.38	0.12	1.78	ND	0.29
1996	0.31	0.85	0.56	1.47	0.33	3.86
1999	0.0	0.0	0.0	0.23	0.0	0.0
2002	0.07	0.54	0.21	0.08	0.06	2.62
2005	0.08	0.12	1.88	0.92	0.0	0.67
Average	**0.87**	**0.91**	**0.86**	**1.40**	**0.08**	**1.28**

Sample Year	Gamefish Whole Fish	Bottom Feeder Whole Fish	Gamefish Whole Fish	Bottom Feeder Whole Fish	Gamefish Whole Fish	Bottom Feeder Whole Fish
1989	7.29	3.65	6.61	2.81	0.05	0.05
1990	NA[4]	0.1	ND	5.21	0.06	3.56
1991	3.58	7.96	9.15	1.39	ND	0.06
1992	3.96	0.07	1.5	2.75	0.03	0.2
1993	<2.65	0.96	1.25	4.06	0.18	0.85
1994	0.08	3.53	0.12	1.59	ND	0.26
1996	NA	NA	NA	NA	NA	NA
1999	NA	NA	NA	NA	NA	NA
2002	NA	NA	NA	NA	NA	NA
2005	NA	NA	NA	NA	NA	NA
Average	**3.73**	**2.71**	**3.73**	**2.97**	**0.08**	**0.83**

Notes:

1 - TEC calculation procedure followed USEPA. 1989. Interim procedures for estimating risks associated with exposures to mixtures of polychlorinated dibenzo-p-dioxins and dibenzo-p-furans (PCDDs and PCDFs) and 1989 update. Risk Assessment Forum. EPA/625/3-89/016.

2 - Summarized from available fish tissue bio-monitoring reports produced for the Georgia-Pacific Brunswick Mill during the period since the fish tissue dioxin monitoring requirement was activated in the mill's NPDES Permit.

3 - Original protocol required laboratory analysis using NCASI Method 551 for detection only of 2,3,7,8-TCDD and 2,3,7,8-TCDF during 1989-1993. Subsequent tri-annual surveys used revised protocol and Method 1613 for detection of all 17 congeners of 2,3,7,8-TDDD and 2,3,7,8-TCDF.

4 - Sample species varied within the list of approved target or fallback species over the course of the survey period based on availability in the catches.

ND - Not detected

NA – Not available

Assume half value for calculation.

Table 6. Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations Used in the Human Health Risk Assessment

Scenario Timeframe: Current/Future Medium: Sediment (mg/kg) Exposure Sediment							
Exposure Point	**Chemical of Concern**	**Concentration Detected**		**Units**	**Frequency of Detection**	**Exposure Point Concentration**	**Statistical Measure**
		Min	**Max**				
Sediment Onsite ingestion and direct contact	Aroclor 1268	0.043	300	mg/kg	269/296	2.571	95% H-UCL
	Mercury	0.029	62.9	mg/kg	307/311	3.62	95% Chebyshev
Scenario Timeframe: Current/Future Ingestion of Fish Medium: Exposure Medium: Fish Tissue							
Atlantic Croaker	Aroclor 1268	0.36	2.244	mg/kg	11/11	1.427	95% Approx. Gamma UCL
	Mercury	0.00004	0.02	mg/kg	11/11	0.302	95% Approx. Gamma UCL
Black Drum	Aroclor 1268	0.052	0.83	mg/kg	22/28	0.343	95% Approx. Gamma UCL
	Mercury	0.00037	0.02	mg/kg	28/28	0.177	95% Student's T - test
Red Drum	Aroclor 1268	0.097	0.1936	mg/kg	4/12	0.148	95% Student's T - test
	Mercury	0.02	0.05	mg/kg	12/12	0.348	95% Student's T - test
Sheepshead	Aroclor 1268	0.16	0.858	mg/kg	8/8	0.724	95% Approx. Gamma UCL
	Mercury	0.263	0.448	mg/kg	8/8	0.372	95% Student's T - test
Southern Flounder	Aroclor 1268	0.026	0.408	mg/kg	5/11	0.249	95% H-UCL
	Mercury	0.198	0.315	mg/kg	11	11	95% Student's T - test
Southern Kingfish	Aroclor 1268	0.1	1.344	mg/kg	11/12	0.716	95% Student's T - test
	Mercury	0.189	1.13	mg/kg	12/12	0.663	95% Approx.
Spot	Aroclor 1268	0.69	3.072	mg/kg	8/9	1.785	95% Student's T - test
	Mercury	0.0495	0.166	mg/kg	9/9	0.124	95% Student's T - test
Spotted Seatrout	Aroclor 1268	0,089	1.2	mg/kg	31/31	0.556	95% Approx. Gamma UCL
	Mercury	0.12	0.941	mg/kg	31/31	0.495	95% Student's T - test
Striped Mullet	Aroclor 1268	0.027	10.5	mg/kg	26/26	2.704	95% Approx. Gamma UCL
	Mercury	0.0111	0.0775	mg/kg	26/26	0.042	95% Student's T - test

Table 6. Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations Used in the Human Health Risk Assessment – Continued

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Statistical Measure
Scenario Timeframe: Current/Future Ingestion of Shellfish Medium: Exposure Medium: Shellfish							
		Min	Max				
Blue Crab	Aroclor 1268	0.0073	0.4	mg/kg	15/18	0.195	95% Approx. Gamma UCL
	Mercury	0.255	1.12	mg/kg	18/18	0.708	95% Student's T - test
White Shrimp	Aroclor 1268	7.48	22	mg/kg	9/9	0.533	95% Chebychev
	Mercury	0.0374	0.125	mg/kg	9/9	0.112	95% Student's T - test
Scenario Timeframe: Current/Future Ingestion of Clapper Rail Medium: Exposure Medium: Bird Tissue							
Clapper Rail	Aroclor 1268	0.19	19.42	mg/kg	14/14	19.94	95% Chebychev
	Mercury	0.68	7.3	mg/kg	14/14	4.671	95% Approx. Gamma UCL

Notes:
mg/kg: milligrams per kilogram
100% of total mercury analyzed assumed to be methylmercury

Table 7. Percent of Total Catch of Various Fish Species Based on Angling Success

Wave	Sheepshead	Spotted Seatrout	Southern Kingfish	Black Drum	Red Drum	Southern Flounder	Spot	Atlantic Croaker	Striped Mullet
Jan-Feb	9.1%	52.5%	9.4%	0.5%	25.9%	2.6%	0.00%	0.0%	0.0%
Mar	12.9%	23.9%	40.8%	2.6%	16.4%	2.8%	0.04%	0.6%	0.0%
Apr	20.5%	28.9%	27.2%	5.9%	5.4%	5.8%	0.02%	1.8%	4.6%
May	3.3%	38.7%	22.5%	8.7%	12.8%	10.2%	0.07%	3.4%	0.2%
Jun/Jul	5.1%	35.3%	13.9%	4.4%	37.3%	3.5%	0.07%	0.5%	0.0%
Aug	8.7%	57.2%	4.5%	1.4%	26.2%	1.9%	0.04%	0.1%	0.01%
Yearly	**9.9%**	**39.4%**	**19.7%**	**3.9%**	**20.7%**	**4.4%**	**0.04%**	**1.1%**	**0.8%**

Notes:
Species-specific fish harvest data from 2001-2005 in Georgia were obtained from the Marine Recreational Fisheries Statistics Survey (MRFSS) (NMFSS, 2007).

Table 8. Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal							
Chemical of Concern	**Oral Cancer Slope Factor**	**Oral Absorption Efficiency for Dermal** (1)	**Adjusted Dermal Cancer Slope Factor** (2)	**Slope Factor Units**	**Weight of Evidence / Cancer Guideline Description**	**Source**	**Date**
Aroclor 1268	2.0	1.0	2.0	$mg/kg\text{-}d^{-1}$	B2 (PCBs)	IRIS	06/01/1997

Notes:
IRIS – Integrated Risk Information System
1. GI ABS value based on EPA RAGs Part E.
2. Derived by dividing the oral slope factor by the oral absorption efficiency.

Table 9. Non-Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal										
Chemical of Concern	**Chronic/ Subchronic**	**Oral RfD Value**	**Oral RfD Units**	**Oral Absorption Efficiency for Dermal[1]**	**Adjusted Dermal RfD[1]**	**Dermal RfD Units**	**Primary Target Organ Effects**	**Combined Uncertainty/ Modifying Factors**	**Sources of RfD: Target Organ**	**Dates of RfD: Target Organ**
Aroclor 1268	Chronic	7.0E-05	mg/kg-day	1.0	7.0E-05	mg/kg-day	CNS (developmental)	100 [2]	IRIS	04/01/1991
Methylmercury	Chronic	1.0E-04	mg/kg-day	1.0	1.0E-04	mg/kg-day	CNS (developmental)	10	IRIS	07/27/2001

Notes:
IRIS – Integrated Risk Information System
Source: RAGs Part E (2004).
RfD – reference dose
1 Adjusted dermal RfD = (oral RfD) X (oral absorption efficiency).
2 Oral RfD based on Aroclor 1016.

Table 10. Non-Cancer Hazard Index from Exposure to Marsh Sediment

Non-Cancer Hazard	Dermal HQ	Oral HQ	Total HQ
Adult			
Aroclor 1268	0.024	0.0075	0.031
Aluminum	0	0.0071	0.0071
Chromium	0	0.0084	0.0084
Manganese	0	0.00074	0.00074
Mercury	0	0.0074	0.0074
Methylmercury	0	0.000021	0.000021
Thallium	0	0.0068	0.0068
		Adult	**HI = 0.06**
Adolescent			
Aroclor 1268	0.024	0.012	0.036
Aluminum	0	0.011	0.011
Chromium	0	0.013	0.013
Manganese	0	0.0012	0.0012
Mercury	0	0.011	0.011
Methylmercury	0	0.000033	0.000033
Thallium	0	0.011	0.011
		Adolescent	**HI = 0.08**

Table 11. Lifetime Cancer Risks from Exposure to Marsh Sediment

Cancer Risk	Dermal Risk	Oral Risk	Total Risk
Adult			
Aroclor 1268	1.4E-06	4.5E-07	1.9E-06
B(a)P toxic equivalence	1.1E-06	3.8E-07	1.5E-06
Chromium	0	5.4E-06	5.4E-06
		Adult	**8.8E-06**
Adolescent			
Aroclor 1268	4.9E-07	2.3E-07	7.2E-07
B(a)P toxic equivalence	3.9E-07	2.0E-07	5.9E-07
Chromium	0	2.8E-06	2.8E-06
		Adolescent	**4.1E-06**
Lifetime Receptor	**2.6E-06**	**7.4E-06**	**1.0E-05**

Table 12. Non-Cancer Hazard Index (HI) from Consumption of Finfish [1]

Fish Consumption RME Scenarios	COC	Primary Target Organ	Cumulative Hazard
Adult Recreational	Mercury	CNS/developmental	1.0
	Aroclor 1268	CNS/developmental	1.7
			HI = 2.7
Adolescent Recreational	Mercury	CNS/developmental	1.1
	Aroclor 1268	CNS/developmental	1.7
			HI = 2.8
Child Recreational	Mercury	CNS/developmental	1.7
	Aroclor 1268	CNS/developmental	2.6
			HI = 4.3
Adult High Quantity	Mercury	CNS/developmental	2.1
	Aroclor 1268	CNS/developmental	2.9
			HI = 5.0
Adolescent High Quantity	Mercury	CNS/developmental	1.3
	Aroclor 1268	CNS/developmental	3.0
			HI = 4.3
Child High Quantity	Mercury	CNS/developmental	2.9
	Aroclor 1268	CNS/developmental	5.1
			HI = 8.0

Notes:
[1] – Fish caught from Zones D, H and I of the St. Simons Estuary.
Based on average percentage of fish caught and consumed by anglers (see Table 7).
RME – reasonable maximum exposure
COC – chemical of concern.
CNS – central nervous system.

Table 13. Non-Cancer Hazard Index (HI) from Consumption of Shellfish [1]

Shellfish Consumption RME Scenarios	Shellfish Tissue	COC	Primary Target Organ	Cumulative Hazard
Adult	Blue Crab	Mercury	CNS/developmental	0.6
		Aroclor 1268	CNS/developmental	0.2
	White Shrimp	Mercury	CNS/developmental	0.09
		Aroclor 1268	CNS/developmental	0.64
				HI = 1.6
Adolescent	Blue Crab	Mercury	CNS/developmental	0.3
		Aroclor 1268	CNS/developmental	0.1
	White Shrimp	Mercury	CNS/developmental	0.04
		Aroclor 1268	CNS/developmental	0.3
				HI = 0.7
Child	Blue Crab	Mercury	CNS/developmental	1.4
		Aroclor 1268	CNS/developmental	0.6
	White Shrimp	Mercury	CNS/developmental	0.2
		Aroclor 1268	CNS/developmental	1.6
				HI = 3.8

Notes:
[1] – Combination of blue crab and white shrimp caught from Zones D, H and I of the St. Simons Estuary.
RME – reasonable maximum exposure
COC – chemical of concern.
CNS – central nervous system.

Table 14. Non-Cancer Hazard Index (HI) from Consumption of Clapper Rail [1]

Clapper Rail Consumption RME Scenarios	COC	Primary Target Organ	Cumulative Hazard
Adult	Mercury	CNS/developmental	0.2
	Aroclor 1268	CNS/developmental	1.4
			HI = 1.6
Adolescent	Mercury	CNS/developmental	0.2
	Aroclor 1268	CNS/developmental	1.0
			HI = 1.2
Child	Mercury	CNS/developmental	0.6
	Aroclor 1268	CNS/developmental	4.0
			HI = 4.6

Notes:
[1] – Clapper Rail breast tissue harvested from Domain 1.
RME – reasonable maximum exposure
COC – chemical of concern.
CNS – central nervous system.

Table15. Lifetime Cancer Risks from Consumption of Finfish [1]

Fish Consumption RME Scenarios	COC	Pathway	Cancer Risk
Adult – Recreation	Aroclor 1268	Ingestion	1.0 E-04
Adolescent – Recreation	Aroclor 1268	Ingestion	3.2 E-05
Child – Recreation	Aroclor 1268	Ingestion	3.2 E-05
		Lifetime Cancer Risk	**1.1 E-04**
Adult – High Quantity	Aroclor 1268	Ingestion	1.7 E-04
Adolescent – High Quantity	Aroclor 1268	Ingestion	5.4 E-05
Child – High Quantity	Aroclor 1268	Ingestion	6.0 E-05
		Lifetime Cancer Risk	**2.0 E-04**

Notes:
[1] – Fish caught from Zones D, H and I of the St. Simons Estuary.
Based on average percentage of fish caught and consumed by anglers (see Table 7).
Lifetime receptor cancer risk was calculated using 0.5 times the adult risk plus the adolescent and child risk to equal a 30 year exposure period.
RME – reasonable maximum exposure
COC – chemical of concern.

Table 16. Lifetime Cancer Risks from Consumption of Shellfish [1]

Shellfish Consumption RME Scenarios	COC	Pathway	Cancer Risk
Adult	Aroclor 1268	Ingestion	5.3 E-05
Adolescent	Aroclor 1268	Ingestion	7.1 E-06
Child	Aroclor 1268	Ingestion	2.5 E-05
		Lifetime Cancer Risk	**5.8 E-05**

Notes:
[1] – Blue crab and white shrimp caught from Zones D, H and I of the St. Simons Estuary.
Lifetime receptor cancer risk was calculated using 0.5 times the adult risk plus the adolescent and child risk to equal a 30 year exposure period.
RME – reasonable maximum exposure
COC – chemical of concern.

Table 17. Lifetime Cancer Risks from Consumption of Clapper Rail [1]

Clapper Rail Consumption RME Scenarios	COC	Pathway	Cancer Risk
Adult	Aroclor 1268	Ingestion	4.1 E-05
Adolescent	Aroclor 1268	Ingestion	9.4 E-06
Child	Aroclor 1268	Ingestion	2.4 E-05
		Lifetime Cancer Risk	**1.1 E-04**

Notes:
[1] – Clapper Rail breast tissue harvested from Domain 1.
Lifetime receptor cancer risk was calculated using 0.5 times the adult risk plus the adolescent and child risk to equal a 30 year exposure period.
RME – reasonable maximum exposure
COC – chemical of concern.

Table 18. Summary of Risk Estimates

Exposure Scenario	Receptor	Cancer Risk [1]		Non-Cancer HI	
		RME	CTE	RME	CTE
Marsh Trespasser					
	Lifetime	1E-05	2E-07		
	Adult			0.06	0.005
	Adolescent			0.08	0.006
Recreational Finfish Consumer	Lifetime	1E-04	2E-05		
	Adult			3	0.8
	Adolescent			3	0.9
	Child			4	1
High Quantity Finfish Consumer	Lifetime	2E-04	4E-05		
	Adult			5	2
	Adolescent			5	3
	Child			8	2
Shellfish Consumer					
	Lifetime	6E-05	9E-06		
	Adult			2	0.6
	Adolescent			0.7	0.2
	Child			4	2
Clapper Rail Consumer					
	Lifetime	1E-04	8E-06		
	Adult			2	0.4
	Adolescent			1	0.1
	Child			5	0.4

Notes:
RME – reasonable maximum exposure
CTE – central tendency exposure
1 – Cancer risk based on exposure to Aroclor 1268.

Table 19. Tissue Concentrations Protective of Human Health Based on RME Adult High Quantity Fish Consumer

Receptor	Edible Tissue Concentrations (mg/kg dry weight)		
	Current Average	HI = 1 Non-Cancer Tissue Goals	1E-04 Cancer Risk Tissue Goals
Atlantic Croaker			
Mercury	0.24	0.060	-
Aroclor 1268	0.99	0.285	0.71
Black Drum			
Mercury	0.16	0.035	-
Aroclor 1268	0.27	0.069	0.17
Red Drum			
Mercury	0.29	0.070	-
Aroclor 1268	0.13	0.030	0.07
Sheepshead			
Mercury	0.33	0.074	-
Aroclor 1268	0.43	0.14	0.36
Southern Flounder			
Mercury	0.24	0.051	-
Aroclor 1268	0.14	0.050	0.12
Southern Kingfish			
Mercury	0.49	0.133	-
Aroclor 1268	0.51	0.143	0.36
Spot			
Mercury	0.10	0.025	-
Aroclor 1268	1.2	0.357	0.89
Spotted Seatrout			
Mercury	0.439	0.099	-
Aroclor 1268	0.445	0.11	0.28
Striped Mullet			
Mercury	0.04	0.008	-
Aroclor 1268	1.91	0.54	1.35
Shellfish			
Blue Crab			
Mercury	0.60	0.43	-
Aroclor 1268	0.12	0.12	0.33
White Shrimp			
Mercury	0.09	0.07	-
Aroclor 1268	0.22	0.32	0.91
Wildlife			
Clapper Rail			
Mercury	3.1	2.9	-
Aroclor 1268	5.0	12.2	18.0

Notes:
All fish and shellfish collected from Purvis Creek, Gibson Creek and in the Turtle River adjacent to the LCP Chemicals Site.
Clapper rail collected from Domain 1.

Table 20a. Occurrence, Distribution and Selection of Chemicals of Concern in Sediment

Exposure Medium: Sediment								
Chemical of Concern	**Minimum Conc.**	**Maximum Conc.**	**Mean Conc.**	**95% UCL of the Mean**	**Mean Background Conc.**	**Screening Toxicity Value [1]**	**Maximum HQ**	**COC Flag (Y or N)**
Domain 1								
Aroclor 1268	0.053	300	11.45	23.43	0.05	0.00003	10,000,000	Y
Mercury	0.01	62	4.85	11.51	0.08	0.13	477	Y
Lead	2.1	210	31	40.7	17.6	30.2	7	Y
Total PAHs	0.08	1.6	0.56	0.89	0.15	1.7	0.94	N
Domain 2								
Aroclor 1268	0.0465	65	3.75	5.05	0.05	0.00003	2,166,666	Y
Mercury	0.18	62.9	3.85	5.84	0.08	0.13	484	Y
Lead	11	765	40.9	63.0	17.6	30.2	25.3	Y
Total PAHs	0.40	40.88	2.06	7.9	0.15	1.7	24.0	Y
Domain 3								
Aroclor 1268	0.013	9	1.67	2.04	0.05	0.00003	300,000	Y
Mercury	0.044	8.37	1.88	2.23	0.08	0.13	64.8	Y
Lead	8.9	1590	90.7	133	17.6	30.2	52.6	Y
Total PAHs	0.15	27.93	1.87	4.58	0.15	1.7	16.4	Y
Domain 4								
Aroclor 1268	0.0445	8.8	1.14	1.36	0.05	0.00003	293,333	Y
Mercury	0.03	4.62	0.63	1.07	0.08	0.13	35.5	Y
Lead	8.8	52.7	21.7	22.9	17.6	30.2	1.7	Y
Total PAHs	0.08	7.98	0.87	1.37	0.15	1.7	4.7	Y
LCP Ditch (Main Canal)								
Aroclor 1268	0.25	570	27.64	41.71	0.05	0.00003	19,000,000	Y
Mercury	0.196	55	7.40	8.72	0.08	0.13	35.5	Y
Lead	3.9	69.9	26.1	28.1	17.6	30.2	2.3	Y
Total PAHs	0.16	16.68	1.00	2.21	0.15	1.7	9.8	Y
Eastern Creek								
Aroclor 1268	0.0074	460	49.57	65.28	0.05	0.00003	15,333,333	Y
Mercury	0.0437	145	20.28	25.04	0.08	0.13	125	Y
Lead	5.74	238	35.7	41.5	17.6	30.2	7.9	Y
Total PAHs	0.006	38.45	1.46	3.75	0.15	1.7	22.6	Y
Western Creek Complex								
Aroclor 1268	0.0079	25	3.18	3.84	0.05	0.00003	83,333	Y
Mercury	0.043	16.3	2.75	3.31	0.08	0.13	2.1	Y
Lead	13	51.8	29.0	30.1	17.6	30.2	0.96	N
Total PAHs	0.083	11.37	0.87	1.62	0.15	1.7	6.7	Y
Purvis Creek								
Aroclor 1268	0.007	28	3.78	5.07	0.05	0.00003	933,333	Y
Mercury	0.0071	6.83	1.22	1.53	0.08	0.13	52.5	Y
Lead	2.03	34.6	17.4	23.1	17.6	30.2	1.1	Y
Total PAHs	0.006	7.21	0.83	1.05	0.15	1.7	4.2	Y

Notes:
All concentrations in mg/kg dw
1 – Source of screening values are from EPA Region 4 Sediment Ecological Screening values.

Table 20b. Occurrence, Distribution, and Selection of Chemicals of Concern in Surface Water

Exposure Medium: Surface Water									
Chemical of Potential Concern	**Minimum Conc.**	**Maximum Conc.**	**Mean Conc.**	**95% UCL of the Mean**	**Mean Background Conc.**	**Screening Toxicity Value**	**Screening Toxicity Value Source [1]**	**Maximum HQ**	**COC Flag (Y or N)**
Mercury (total) (ng/L)	8.08	188	43.68	57.24	7.9	25	GADEP	7.5	Y
Mercury (dissolved) (ng/L)	0.1	5	3.15	3.8	1.01	25	GADEP	7.5	Y
Methylmercury (ng/L)	0.15	2.23	0.70	0.96	0.05	-	-	-	Y
Aroclor 1268 (µg/L)	0.01	1.0	0.26	0.38	0.0018	0.03	GADEP	33	Y

Notes:
1 – GADEP (Georgia Department of Environmental Protection) water quality standards

Table 21. Ecological Exposure Pathways of Concern

Exposure Medium	Sensitive Environment Flag	Receptor	Endangered/ Threatened	Exposure Routes	Assessment Endpoints	Measurement Endpoints
Sediment	No	Benthic organisms	No	Direct contact with COPCs in sediment.	Viability of the benthic estuarine community.	1) Comparison of sediment COPC concentrations to site-specific effect levels. 2) Results of toxicity tests conducted with sensitive life stages to amphipods and grass shrimp. 3) Evaluation of indigenous benthic community.
Surface Water	No	Mysid shrimp (epibenthic organisms)	No	Direct contact and uptake of COPCs in surface water.	Viability of the benthic estuarine community.	1) Comparison of surface water COPC concentrations to general literature-based effect levels. 2) Results of toxicity tests (survival and growth) conducted with mysid shrimp.
		Finfish			Viability of finfish utilizing the LCP Estuary.	1) Comparison of surface water COPC concentrations to general literature-based effect levels. 2) Results of toxicity tests (survival and growth) conducted with sheepshead minnows.
Biota	No	Finfish	No	Ingestion of contaminated food items (fiddler crabs, blue crabs, and mummichogs).	Viability of finfish utilizing the LCP Estuary.	1) Hazard quotients (HQs) derived from residue-based toxicity reference values (TRVs) and finfish bioaccumulation models. 2) HQs derived from residue-based TRVs and finfish collected in Purvis Creek. 3) Evaluation of benthic organisms as a food source for juvenile and adult fish.
Biota	No	Omnivorous avians	No	Ingestion of contaminated food items (insects, fiddler crabs, and mummichogs).	Viability of omnivorous avians utilizing the LCP Estuary.	1) HQs derived from food-web exposure model for red-winged blackbirds. 2) HQs derived from food-web exposure model for clapper rails.

Table 21. Ecological Exposure Pathways of Concern – Continued

Exposure Medium	Sensitive Environment Flag	Receptor	Endangered/ Threatened	Exposure Routes	Assessment Endpoints	Measurement Endpoints
Biota	No	Piscivorous avians	Yes Wood stork	Ingestion of contaminated food items (fiddler crabs, blue crabs, and mummichogs).	Viability of piscivorous avians utilizing the LCP Estuary.	HQs derived from food-web exposure model for green herons.
Biota	No	Herbivorous mammals	Yes Manatee	Ingestion of contaminated cordgrass.	Viability of herbivorous mammals using the LCP Estuary.	HQs derived from food-web exposure model for marsh rabbits. Manatee not modeled.
Biota	No	Omnivorous mammals	No	Ingestion of contaminated food items (fiddler crabs, blue crabs, and mummichogs).	Viability of omnivorous mammals using the LCP Estuary.	HQs derived from food-web exposure model for raccoons.
Biota	No	Piscivorous mammals	Yes Bottlenose dolphin	Ingestion of contaminated food items (fiddler crabs, blue crabs, silver perch, & mummichogs).	Viability of piscivorous mammals using the LCP Estuary.	HQs derived from food-web exposure model for river otters. Dolphin not modeled due to general lack of site-specific data.

Table 22. Summary of Sediment Effect Concentrations to Most Sensitive Benthic Organism Toxicity Test Endpoints

Chemical of Concern	Sediment Effect Concentrations (SECs)					Average % accuracy in predicting effects
	TEL	ER-L	PEL	ER-M	AET	
Amphipod Survival – 240 tests						
Mercury	4.2	11.3	15.4	21.7	62	34
Aroclor 1268	6.2	16	20.3	32	64	42
Total PAHs	0.8	1.5	2.1	4.4	6	24
Lead	40.8	59.8	88.4	196	177	29
Grass Shrimp Embryo Development – 77 tests						
Mercury	1.4	3.2	4.8	10.5	11	54
Aroclor 1268	3.2	12	10.7	20	41	49
Total PAHs	1.6	4.0	4.5	6.1	11.5	31
Lead	139	1,190	198	1,190	419	35

Notes:
Yellow shading indicates the sediment effect concentration was used for the lower end of the benthic community preliminary remediation
goal (PRG) range. Blue shading indicates the sediment effects concentration was used for the upper end of the benthic community PRG range. Some sediment effects concentrations in this table were rounded before they were used as PRGs.
TEL – Threshold Effect Level; **ER-L** – Effects Range-Low; **PEL** – Probable Effects Level; **ER-M** – Effects Range-Medium;
AET – Apparent Effects Threshold

Table 23. Summary of Risks to Wildlife Receptors

Receptor	COC	Maximum NOAEL HQ	Maximum LOAEL HQ	Areas of Concern
Diamondback terrapin	None	< 1	< 1	None
Clapper rail	MeHg	1.0	3.0	Domain 1
Redwing blackbird	MeHg	1.0	0.3	Eastern Creek, LCP Ditch, Domain 1
Green heron	MeHg	10.6	3.5	Eastern Creek, LCP Ditch, Domains 1, 3
Marsh rabbit	Aroclor 1268	4.8	0.5	Eastern Creek, LCP Ditch
Raccoon	Aroclor 1268	4.9	0.5	Eastern Creek, LCP Ditch
River otter	Aroclor 1268	3.9	0.4	Domains 2, 3, 4, Blythe Island

Notes:
COC – Contaminant of Concern
LOAEL HQ - Lowest Observed Adverse Effect Level Hazard Quotient
NOAEL HQ – No-Observed-Adverse-Effect Level Hazard Quotient
MeHg - Methylmercury

Table 24. COC Sediment Concentrations Expected to Provide Adequate Protection of Ecological Receptors

Exposure Medium	COC	Protective Range	Units	Basis	Assessment Endpoint
Sediment	Mercury	1 to 3	mg/kg	Based on levels between the NOAEL and LOAEL RGs for blue heron derived using sediment to fish BSAF uptake model.	Protection of piscivorous birds (green heron)
		2 to 4		Selected between the NOAEL and LOAEL.	Protection of piscivorous mammals (river otter)
		1 to 3		Finfish range based on sediment concentration resulting from back-calculation of fish bioaccumulation models to 5 different finfish species and selected between the NOAEL and LOAEL from the more sensitive fish species.	Protection of finfish
	Aroclor 1268	2 to 5	mg/kg	Range begins between the geometric mean between the NOAEL and LOAEL, and to the LOAEL for piscivorous mammals.	Protection of piscivorous mammals (river otter)
		3 to 6		Finfish range based on sediment concentration resulting from back-calculation of fish bioaccumulation models to 5 different finfish species and generally selected between their NOAELs and LOAELs.	Protection of finfish

Notes:
COC – chemical of concern
NOAEL – no observed adverse effect level
LOAEL – lowest observed adverse effect level

Table 25. Current SWAC Concentrations

Domain	Domain Area (acres)	Current SWAC (mg/kg)
Mercury		
Dillon Duck	1.8	1.4
Domain 1	21.0	4.8
Domain 2	114.6	2.5
Domain 3	107.7	1.7
Domain 4 East	191.9	2.0
Domain 4 West	224.5	0.7
Total Domains	**661.5**	**1.7**
Domain 3 Creek	12.4	5.9
Eastern Creek	4.2	14.6
LCP Ditch	2.5	7.7
Purvis Creek	70.5	1.2
Western Creek Complex	9.0	2.1
Total Creek	**98.5**	**2.6**
Mercury Total Marsh	**760.0**	**1.8**
Aroclor 1268		
Dillon Duck	1.8	2.1
Domain 1	21.0	3.1
Domain 2	114.6	1.9
Domain 3	107.7	1.7
Domain 4 East	191.9	2.1
Domain 4 West	224.5	0.8
Total Domains	**661.5**	**1.6**
Domain 3 Creek	12.4	5.7
Eastern Creek	4.2	43.5
LCP Ditch	2.5	25.4
Purvis Creek	70.5	3.6
Western Creek Complex	9.0	3.0
Total Creeks	**98.5**	**6.0**
Aroclor 1268 Total Marsh	**760.0**	**2.2**

Notes:
SWAC – Surface Weighted Average Concentration

Table 26. Predicted Sediment SWAC Concentrations between Alternatives

Domain	Domain Area (acres)	Current SWAC (mg/kg)	SWAC Cleanup Level (CUL)	Post-Remediation Predicted SWAC Concentrations (mg/kg)		
				48-Acres Alternatives 2, 3	18-Acres Alternatives 4, 5	24-Acres Alternative 6
Mercury						
Dillon Duck	1.8	1.4	2	0.3	0.3	0.3
Domain 1	21.0	4.8	2	0.6	1.6	1.1
Domain 2	114.6	2.5	2	0.9	1.3	1.3
Domain 3	107.7	1.7	2	1.5	1.7	1.7
Domain 4 East	191.9	2.0	2	2.0	2.0	2.0
Domain 4 West	224.5	0.7	2	0.7	0.7	0.7
Total Domains	**661.5**	**1.7**	**--**	**1.2**	**1.4**	**1.3**
Domain 3 Creek	12.4	5.9	--	1.0	3.7	3.7
Eastern Creek	4.2	14.6	--	0.3	0.3	0.3
LCP Ditch	2.5	7.7	--	0.3	0.4	0.4
Purvis Creek	70.5	1.2	--	0.9	1.2	1.1
Western Creek Complex	9.0	2.1	--	1.2	2.1	2.1
Total Creeks	**98.5**	**2.6**	**2**	**0.9**	**1.5**	**1.4**
Mercury Total Marsh	**760.0**	**1.8**		**1.2**	**1.4**	**1.4**
Aroclor 1268						
Dillon Duck	1.8	2.1	3	0.2	0.2	0.2
Domain 1	21.0	3.1	3	0.6	1.2	0.9
Domain 2	114.6	1.9	3	1.4	1.5	1.5
Domain 3	107.7	1.7	3	1.5	1.7	1.7
Domain 4 East	191.9	2.1	3	2.1	2.1	2.1
Domain 4 West	224.5	0.8	3	0.8	0.8	0.8
Total Domains	**661.5**	**1.6**	**--**	**1.4**	**1.5**	**1.4**
Domain 3 Creek	12.4	5.7	--	1.1	3.4	3.4
Eastern Creek	4.2	43.5	--	0.2	0.2	0.2
LCP Ditch	2.5	25.4	--	0.2	0.3	0.3
Purvis Creek	70.5	3.6	--	1.7	3.6	2.7
Western Creek Complex	9.0	3.0	--	1.7	3.0	3.0
Total Creeks	**98.5**	**6.0**	**3**	**1.6**	**3.3**	**2.7**
Aroclor 1268 Total Marsh	**760.0**	**2.2**		**1.4**	**1.7**	**1.6**

Notes:
SWAC – Surface Weighted Average Concentration

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site

Chemical-Specific ARARs/TBC			
Action/Media	**Requirements**	**Prerequisite**	**Citation**
Restoration of coastal and marine estuarine waters	The following criteria are deemed to be necessary and applicable to all waters of the State: (a) All waters shall be free from materials associated with municipal or domestic sewage, industrial waste or any other waste which will settle to form sludge deposits that become putrescent, unsightly or otherwise objectionable. (b) All waters shall be free from oil, scum and floating debris associated with municipal or domestic sewage, industrial waste or other discharges in amounts sufficient to be unsightly or to interfere with legitimate water uses. (c) All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses. (d) All waters shall be free from turbidity which results in a substantial visual contrast in a water body due to a man-made activity. The upstream appearance of a body of water shall be as observed at a point immediately upstream of a turbidity-causing man-made activity. That upstream appearance shall be compared to a point which is located sufficiently downstream from the activity so as to provide an appropriate mixing zone. For land disturbing activities, proper design, installation, and maintenance of best management practices and compliance with issued permits shall constitute compliance with Paragraph 391-3-6-.03(5)(d). All waters shall be free from toxic, corrosive, acidic and caustic substances discharged from municipalities, industries or other sources, such as nonpoint sources, in amounts, concentrations or combinations which are harmful to humans, animals or aquatic life.	Waters of the State of Georgia with designated uses of *Recreation, Fishing, Propagation of Fish, Shellfish, Game and Other Aquatic Life and Coastal Fishing* under the Georgia Water Use Classifications at GA Rule §391-3-6-.03(4) – **relevant and appropriate**	GA Rule §391-3-6-.03 (5) *General Criteria for All Waters*

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site – Continued

Chemical-Specific ARARs/TBC			
Action/Media	**Requirements**	**Prerequisite**	**Citation**
Restoration of coastal and marine estuarine waters	In-stream concentrations of the following chemical constituents listed by the U.S.EPA as toxic priority pollutants pursuant to Section 307(a)(1) of the Federal Clean Water Act (as amended) shall not exceed the chronic criteria indicated below under 7-day, 10-year minimum flow (7Q10) or higher stream flow conditions except within established mixing zones or in accordance with site specific effluent limitations developed in accordance with procedures presented in §391-3-6-.06. Lead - *Coastal and Marine Estuarine Waters* - 8.1 µg/L[1] Mercury - *Coastal and Marine Estuarine Waters* - 0.025 µg/L[2] *NOTE:* Current methods available in commercial laboratory can detect at or below the specified concentration. Total mercury is recoverable form (not dissolved) as specified at GA Rule §391-3-6-.03 (5)(e)(ii). Thus aqueous samples are not filtered as indicated in the reference to approved methods in 40 CFR 136 at GA Rule §391-3-6-.03(13). See table entry below.	Waters of the State of Georgia with designated uses of *Recreation, Fishing, Propagation of Fish, Shellfish, Game and Other Aquatic Life and Coastal Fishing* under the Georgia Water Use Classifications at GA Rule §391-3-6-.03(4) – **relevant and appropriate**	GA Rule §391-3-6-.03(5)(e)(ii) *Criteria for Protection of Aquatic Life*
Restoration of coastal and marine estuarine waters	In-stream concentrations of the following chemical constituents listed by the U.S.EPA as toxic priority pollutants pursuant to Section 307(a)(1) of the Federal Clean Water Act (as amended) shall not exceed criteria indicated below under 7-day, 10-year minimum flow (7Q10) or higher stream flow conditions except within established mixing zones or in accordance with site specific effluent limitations developed in accordance with procedures presented in 391-3-6-.06. Total PCBs-*Coastal and Marine Estuarine Waters*-0.03 µg/L* * The in-stream criterion is lower than the EPD laboratory detection limits.	Waters of the State of Georgia with designated uses of *Recreation, Fishing, Propagation of Fish, Shellfish, Game and Other Aquatic Life and Coastal Fishing* under the Georgia Water Use Classifications at GA Rule §391-3-6-.03(4) – **relevant and appropriate**	GA Rule §391-3-6-.03(5)(e)(iii) *Criterion for Protection of Aquatic Life*

1 The in-stream criterion is expressed in terms of the dissolved fraction in the water column. Conversion factors used to calculate dissolved criteria are found in the EPA document – National Recommended Water Quality Criteria – EPA 2006.

2 The in-stream criterion is lower than the EPD laboratory detection limits (A "*" indicates that the criterion may be higher than or lower than EPD laboratory detection limits depending upon the hardness of the water).

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site – Continued

Chemical-Specific ARARs/TBC			
Action/Media	**Requirements**	**Prerequisite**	**Citation**
	NOTE: Current methods available in commercial laboratory can detect at or below the specified concentration.		
	In-stream concentrations of the following chemical constituents listed by the U.S.EPA as toxic priority pollutants pursuant to Section 307(a)(1) of the Federal Clean Water Act (as amended) shall not exceed criteria indicated below under annual average or higher stream flow conditions: Total PCBs - 0.000064 µg/L *NOTE:* Current method detection limit is close to specified concentration. Background levels of Total PCBs in surface water has been established by EPA as part of the CERCLA remedy selection process and may be used in determining cleanup level instead of the specified criterion.		GA Rule §391-3-6-.03(5)(e)(iv) *Criterion for Protection of Human Health*
Restoration of coastal and marine estuarine waters	For the protection of human health, total mercury concentrations bioaccumulating in a waterbody, in a representative population of fish, shellfish and/or other seafood representing different trophic levels, shall not exceed a total mercury concentration in edible tissues of 0.3 mg/kg wet weight. This standard is in accord with the USEPA *Water Quality Criterion for the Protection of Human Health: Methylmercury*, (January 2001, EPA-823-R-01-001), and because nearly 100% of the mercury in fish tissue is methylmercury, adoption of the standard as total mercury is an additional conservative measure. The representative fish tissue total mercury concentration for a waterbody is determined by calculating a Trophic-Weighted Residue Value, as described by the Georgia EPD Protocol (October 19, 2001).	Waters of the State of Georgia with designated uses of *Recreation, Fishing, Propagation of Fish, Shellfish, Game and Other Aquatic Life and Coastal Fishing* under the Georgia Water Use Classifications at GA Rule §391-3-6-.03(4) – **relevant and appropriate**	GA Rule §391-3-6-.03(5)(e)(vii) *Mercury Fish Tissue Concentration for Protection of Human Health*
Sampling of surface water to assess compliance with criteria specified in GA Rule §391-3-6-.03(5)	Analytical standards for these samples must comply with the requirements of *Title 40, Code of Federal Regulations*, Part 136.	Sampling methods for water quality samples collected and reported by any person(s), (including volunteer groups), to the Division – **relevant and appropriate**	GA Rule §391-3-6-.03(13) *Acceptance of Data*

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Location-Specific ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
	Wetlands		
Presence of wetlands	Requires Federal agencies to evaluate action to minimize the destruction, loss or degradation of wetlands and to preserve and enhance beneficial values of wetlands.	Actions that involve potential impacts to, or take place within, wetlands – **TBC**	Executive Order 11990 – *Protection of Wetlands* Section 1.(a)
Presence of wetlands	If project will have unavoidable adverse impacts after all appropriate and practicable steps have been taken to avoid or minimize impacts, responsible party must implement compensatory mitigation – i.e., the restoration, creation, enhancement, or (in some circumstances) preservation of aquatic resources. This requires a mitigation work plan, including detailed specifications and descriptions for compensatory mitigation. The regulations also require objective performance standards, monitoring for at least 5 years and active long-term management and maintenance where necessary to ensure long-term sustainability. *NOTE:* Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a CWA 404(b) permit including appropriate and practicable mitigation after consultation with USCOE.	Actions that involve unavoidable adverse impacts to waters of the United States (including jurisdictional wetlands) – **applicable**	33 CFR PART 332 *et. seq.* Compensatory Mitigation For Losses of Aquatic Resources
	Floodplains		
Presence of floodplain designated as such on a map	Shall consider alternatives to avoid, to the extent possible adverse effects and incompatible development in the floodplain. Design or modify its action in order to minimize potential harm to or within the floodplain. Shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains	Federal actions that involve potential impacts to, or take place within, floodplains – **TBC**	Executive Order 11988 – *Floodplain Management, as amended by Executive Order 13690, Section 2(i).*

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Location-Specific ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
Aquatic Resources and Coastal Zone Areas			
Location encompassing *aquatic ecosystem* as defined in 40 CFR 230.3(c)	Except as provided under [CWA] section 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.	Action that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – **applicable**	Clean Water Act Section 404(b)(1) Guidelines regulations 40 CFR Part 230.10(a) Restrictions on Discharge
	No discharge of dredged or fill material shall be permitted if it: (1) Causes or contributes, after consideration of disposal site dilution and dispersion, to violations of any applicable State water quality standard; (2) Violates any applicable toxic effluent standard or prohibition under section 307 of the CWA; (3) Jeopardizes the continued existence of species listed as endangered or threatened under the Endangered Species Act of 1973, as amended, or results in likelihood of the destruction or adverse modification of a habitat which is determined by the Secretary of Interior or Commerce, as appropriate, to be a critical habitat under the Endangered Species Act of 1973, as amended. If an exemption has been granted by the Endangered Species Committee, the terms of such exemption shall apply in lieu of this subparagraph; (4) Violates any requirement imposed by the Secretary of Commerce to protect any marine sanctuary designated under title III of the Marine Protection, Research, and Sanctuaries Act of 1972.	Action that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – **applicable**	40 CFR Part 230.10(b) Restrictions on Discharge
Location encompassing *aquatic ecosystem* as defined in 40 CFR 230.3(c) *Cont'd*	Except as provided under [CWA] section 404(b)(2), no discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States.	Action that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – **applicable**	40 CFR Part 230.10(c) Restrictions on Discharge

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Location-Specific ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
Aquatic Resources and Coastal Zone Areas			
	Except as provided under [CWA] section 404(b)(2), No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps in accordance with 40 CFR 230.70 *et seq. Actions To Minimize Adverse Effects* have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.		40 CFR Part 230.10(d) Restrictions on Discharge
Location encompassing aquatic ecosystem as defined in 40 CFR 230.3(c)	Must comply with the substantive requirements of the NWP 38 General Conditions, as appropriate, any regional or case-specific conditions recommended by the Corps District Engineer, after consultation. NOTE: Despite that consultation may be considered an administrative requirement; it should be performed to ensure activities are in compliance with substantive provisions of the permit.	On-site CERCLA action conducted by Federal agency that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – applicable	Nation Wide Permit (38) Cleanup of Hazardous and Toxic Waste 33 CFR Part 323.3(b)
Presence of coastal marshlands	No person shall remove, fill, dredge, drain, or otherwise alter any marshlands or construct or locate any structure on or over marshlands in this state within the estuarine area thereof without first obtaining a permit. NOTE: Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit.	Alteration to, or construction on or over, the marshlands or water bottoms within the estuarine area of the State – applicable	Georgia Coastal Marshlands Protection Act O.C.G.A. §12-5-286(a)
Presence of marshlands and estuarine area	There is a 50-foot marshlands buffer applicable to the upland component of the project as measured horizontally inland from the coastal marshland-upland interface, which is the Coastal Marshland Protection Act jurisdiction line, so as to ensure the project does not result in the filling or other alteration of the coastal marshlands.	Upland component of the project as defined in GA Rule 391-2-3-.02(2)(i) in coastal marshlands as defined in GA Rule §391-2-3-.02(2)(b) – applicable	GA Rule §391-2-3-.02(4)(a)

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Location-Specific ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
Aquatic Resources and Coastal Zone Areas			
Presence of marshlands and estuarine area	Except as provided in subparagraph 2. of this paragraph and paragraphs (d) and (g) below, no land-disturbing activities within the project boundaries shall be conducted within the 50-foot marshlands buffer, and such marshlands buffer shall remain in its natural, undisturbed state of vegetation, so as to naturally treat stormwater during both construction and post construction phases of the upland component of the project.	Upland component of the project as defined in GA Rule 391-2-3-.02(2)(i) in coastal marshlands as defined in GA Rule §391-2-3-.02(2)(b) – applicable	GA Rule §391-2-3-.02(4)(b)(1)
	Land disturbance and construction of structures within the 50-foot marshlands buffer in the upland component of the project shall be limited to the following: (i) Construction and maintenance of temporary structures necessary for construction of the marshlands component of the project; (ii) Construction and maintenance of permanent structures that are required for the functionality of and/or provide permanent access to the marshlands component of the project; and (iii) Planting and grading with vegetated materials within the marshlands buffer to enhance stormwater management, such as erosion and sediment control measures, and to allow pedestrian access for passive recreation.		GA Rule §391-2-3-.02(4)(b)(2)
Presence of marshlands and estuarine area	After such land disturbing activities associated with (b)2.(i) above are completed, and except as allowed for in (b)2.(ii) and (iii) above, the marshlands buffer must be restored to and maintained in a natural vegetated state or in a vegetated state at least as protective or better than pre-construction conditions, subject to hand trimming and thinning as authorized in the permit. *NOTE:* Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit.	Upland component of the project as defined in GA Rule 391-2-3-.02(2)(i) in *coastal marshlands* as defined in GA Rule §391-2-3-.02(2)(b) – **applicable**	GA Rule §391-2-3-.02(4)(c)

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Location-Specific ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
Aquatic Resources and Coastal Zone Areas			
	Already existing impervious surfaces and structures within the marshlands buffer area may remain and be maintained, provided the replacement, modification or upgrade does not increase any encroachment upon the required marshlands buffer in effect at the time of the replacement, modification or upgrade.		GA Rule §391-2-3-.02(4)(d)
	Marshlands buffers shall be designed, installed and/or maintained sufficiently such that stormwater discharge to coastal marshlands from the marshlands buffer is managed according to the policy, criteria, and information including technical specifications and standards in the Coastal Stormwater Supplement to the Georgia Stormwater Management Manual, 1st Edition, April 2009.		GA Rule§ 391-2-3-.02(4)(e)
Georgia Shore Protection	No person shall construct or erect any structure or construct, erect, conduct, or engage in any shoreline engineering activity or engage in any land alteration which alters the natural topography or vegetation of any area within the jurisdiction of this part except in accordance with the terms and conditions of a permit. *NOTE:* Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit.	Activities that affect beaches and dynamic dune fields located on Georgia's barrier islands and the submerged shoreline lands adjacent to such beaches and dynamic dune fields seaward – **relevant and appropriate**	Georgia Shore Protection Act O.C.G.A. §12-5-237(a)
Submerged Cultural Resources	All findings of submerged cultural resources shall be reported to the Georgia Department of Natural Resources within two days of discovery, Saturday, Sundays, and legal holidays excluded.	Discovery of prehistoric or historic sites, ruins, artifacts, treasure, treasure-trove, and shipwrecks or vessels and their cargo or tackle, which have remained on the bottom for more than 50 years, and similar sites and objects found in the Atlantic Ocean within the three-mile territorial limit of the State of Georgia or within its navigable waters – **relevant and appropriate**	O.C.G.A. §12-3-81

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Location-Specific ARARs/TBC			
Location Characteristics	**Requirements**	**Prerequisite**	**Citation**
Threatened and Endangered Species			
Presence of Threatened and Endangered Wildlife listed in 50 CFR 17.11(h) – or critical habitat of such species	Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary of Interior, after consultation as appropriate with affected States, to be critical, unless such agency has been granted an exemption for such action by the Committee pursuant to subsection (h) of this section. *NOTE:* Despite that consultation may be considered an administrative requirement; it should be performed to ensure activities are in compliance with substantive provisions of the Endangered Species Act and regulations.	Agency action that may jeopardize listed wildlife species, or destroy or adversely modify critical habitat – **applicable**	16 U.S.C. §1536 (a)(2) –or Section 7(a)(2) of *the Endangered Species Act of 1973*
Presence of Threatened and Endangered Wildlife listed in 50 CFR 17.11(h)	It is unlawful to take threatened or endangered wildlife in the United States. *NOTE:* Under 50 CFR 10.12 *Definitions* the term *Take* means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect.	Action that may jeopardize listed wildlife species – **applicable**	50 CFR Part 17.21(c) 50 CFR Part 17.31(a) 50 CFR Part 17.42(a)(2)
Presence of protected Marine Mammals	It is unlawful to take any marine mammal in waters or on lands under the jurisdiction of the United States.	Action that may jeopardize protected marine mammals – **applicable**	Marine Mammal Protection Act, 16 U.S.C. §1372 Section 102 (a)(2)(A)
Presence of Migratory Birds listed in 50 CFR 10.13	No person may take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such bird except as may be permitted under the terms of a valid permit issued pursuant to the provisions of this part and part 13 of this chapter, or as permitted by regulations in this part, or part 20 of this subchapter (the hunting regulations).	Action that have potential impacts on, or is likely to result in a 'take' (as defined in 50 CFR 10.12) of migratory birds – **applicable**	Migratory Bird Treaty Act, 16 U.S.C. §703(a) 50 CFR 21.11

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
General Construction Standards – All Land-disturbing Activities (i.e., excavation, clearing, grading, etc.)			
Managing stormwater runoff from land-disturbing activities	Shall implement best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, as provided in O.G.C.A. § 12-7-6(b), during excavation activity.	Land-disturbing activity (as defined in O.C.G.A. §12-7-3(9)) of more than one acre of land **– applicable**	GA Erosion and Sedimentation Act O.G.C.A. §12-7-6(b)
	Shall control turbidity of stormwater runoff discharges to the extent the limits in O.C.G.A. § 12-7-6 shall not be exceeded.	Land-disturbing activity (as defined in O.C.G.A. §12-7-3(9)) of more than one acre of land **– applicable**	GA Rule §391-3-7-.06
Managing stormwater runoff from upland area	There shall be no discharge of untreated stormwater from developed or disturbed areas, whether surface or piped, to coastal marshlands from the upland component of the project. The Committee is authorized to waive this requirement if the Committee finds that the site or project characteristics prohibit treatment, there is no practicable alternative, and it has minimal adverse impact.	Upland component of the project as defined in GA Rule §391-2-3-.02(2)(i) in coastal marshlands as defined in GA Rule 391-2-3-.02(2)(b) – **applicable**	GA Rule §391-2-3-.02(5)(a)
	In addition to the requirements of Section (5)(a) above, discharged stormwater from the upland component of the project shall be managed according to the policy, criteria, and information including technical specifications and standards in the Coastal Stormwater Supplement to the Georgia Stormwater Management Manual, 1st Edition, April 2009.		GA Rule §391-2-3-.02(5)(b)
Managing discharge of wastewater	No person shall discharge, allow, or cause to be discharged into the CS4 or watercourses any materials, other than stormwater, including but not limited to pollutants or waters containing any pollutants that cause or contribute to a violation of applicable water quality standards. Shall take all reasonable precautions to prevent fugitive dust from becoming airborne, including the following precautions: (i) use of water or chemicals for dust control; (ii) application of asphalt, water, or chemicals on surfaces that can give rise to airborne dusts; (iii) installation of hoods, fans, and filters to enclose and vent the handling of dusty materials;	Discharge of wastewater other than stormwater – **relevant and appropriate**	Glynn County Ordinance 2-27-11

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
General Construction Standards – All Land-disturbing Activities (i.e., excavation, clearing, grading, etc.)			
Managing fugitive dust emissions	(iv) covering, at all times when in motion, open bodied trucks transporting materials likely to give rise to airborne dusts; and (v) prompt removal of earth or other material from paved streets onto which it has been deposited.	Operations, processes, handling, transportation or storage which may result in fugitive dust – **relevant and appropriate**	Georgia Air Quality Control Regulations Rule §391-3-1-.02(2)(n)(1)
	Shall not allow the percent opacity from any fugitive dust source to equal or exceed 20 percent		Georgia Air Quality Control Regulations Rule §391-3-1-.02(2)(n)(2)
Waste Characterization – Primary Wastes (e.g., excavated soil/sediment) and Secondary Wastes(e.g., wastewaters and spent treatment media)			
Characterization of solid waste (all primary and secondary waste)	Must determine if solid waste is hazardous waste or if waste is excluded under 40 CFR 261.4(b); and must determine if waste is listed under 40 CFR Part 261.	Generation of solid waste as defined in 40 CFR 261.2 and which is not excluded under 40 CFR 261.4(a) – **applicable**	40 CFR 262.11(a) and (b) GA Rule §391-3-11-.08
	Must determine whether the waste is (characteristic waste) identified in subpart C of 40 CFR part 261by either: (1) Testing the waste according to the methods set forth in subpart C of 40 CFR part 261, <u>or</u> (2) Applying knowledge of the hazard characteristic of the waste in light of the materials or the processes used.		40 CFR 262.11(c) GA Rule§391-3-11-.08
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous – **applicable**	40 CFR 262.11(d) GA Rule §391-3-11-.08
Characterization of *hazardous* waste (all primary and secondary waste)	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 CFR 264 and 268.	Generation of RCRA hazardous waste for storage, treatment or disposal – **applicable**	40 CFR 264.13(a)(1) GA Rule §391-3-11-.10
Characterization of *hazardous* waste (all primary and secondary waste) *Cont'd*	Must determine the underlying hazardous constituents [as defined in 40 CFR 268.2(i)] in the waste.	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment or disposal – **applicable**	40 CFR 268.9(a) GA Rule §391-3-11-.16

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Waste Characterization – Primary Wastes (e.g., excavated soil/sediment) and Secondary Wastes(e.g., wastewaters and spent treatment media)			
	Must determine if the waste is restricted from land disposal under 40 CFR 268 *et seq.* by testing in accordance with prescribed methods or use of generator knowledge of waste. This determination can be made concurrently with the hazardous waste determination required in 40 CFR 262.11.		40 CFR 268.7 GA Rule §391-3-11-.16
	Must comply with the special requirements of 40 CFR § 268.9 in addition to any applicable requirements in 40 CFR § 268.7.	Generation of waste or soil that displays a hazardous characteristic of ignitability, corrosivity, reactivity, or toxicity for storage, treatment or disposal **– applicable**	40 CFR 268.7(a)(1) GA Rule §391-3-11-.16
	Must determine each EPA Hazardous Waste Number (Waste Code) to determine the applicable treatment standards under 40 CFR 268.40 *et. seq*. This determination may be made concurrently with the hazardous waste determination required in Sec. 262.11 of this chapter.		40 CFR 268.9(a) GA Rule §391-3-11-.16
Management of PCB waste (e.g., contaminated soil, PPE, equipment, wastewater)	Any person storing or disposing of PCB waste must do so in accordance with 40 CFR 761, Subpart D.	Generation of waste containing PCBs at concentrations ≥ 50 ppm **– applicable**	40 CFR 761.50(a)
	Any person cleaning up and disposing of PCBs shall do so based on the concentration at which the PCBs are found.	Generation of PCB remediation waste as defined in 40 CFR 761.3 **– applicable**	40 CFR 761.61
Temporary Storage of Wastes – Primary Wastes (e.g., excavated soil/sediment) and Secondary Wastes(e.g., wastewaters and spent treatment media)			
Temporary storage of hazardous waste in containers	A generator may accumulate hazardous waste at the facility provided that: • waste is placed in containers that comply with 40 CFR 265.171-173 • the date upon which accumulation begins is clearly marked and visible for inspection on each container • container is marked with the words "hazardous waste"	Accumulation of RCRA hazardous waste on site as defined in 40 CFR 260.10 – **applicable**	40 CFR 262.34(a)(1)-(3) GA Rule §391-3-11-.08
	• container may be marked with other words that identify the contents	Accumulation of 55 gal. or less of RCRA hazardous waste at or near any point of generation – **applicable**	40 CFR 262.34(c)(1) GA Rule §391-3-11-.08

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Temporary Storage of Wastes – Primary Wastes (e.g., excavated soil/sediment) and Secondary Wastes(e.g., wastewaters and spent treatment media)			
Use and management of hazardous waste in containers	If container is not in good condition (e.g. severe rusting, structural defects) or if it begins to leak, must transfer waste into container in good condition.	Storage of RCRA hazardous waste in containers – **applicable**	40 CFR 265.171 GA Rule §391-3-11-.10
	Use container made or lined with materials compatible with waste to be stored so that the ability of the container is not impaired.		40 CFR 265.172 GA Rule §391-3-11-.10
	Keep containers closed during storage, except to add/remove waste.		40 CFR 265.173(a) GA Rule §391-3-11-.10
	Open, handle and store containers in a manner that will not cause containers to rupture or leak.		40 CFR 265.173(b) GA Rule §391-3-11-.10
Storage of hazardous waste in container area	Area must have a containment system designed and operated in accordance with 40 CFR 264.175(b).	Storage of RCRA hazardous waste in containers with *free liquids* **– applicable**	40 CFR 264.175(a) GA Rule §391-3-11-.10
	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or Containers must be elevated or otherwise protected from contact with accumulated liquid.	Storage of RCRA hazardous waste in containers that *do not contain free liquids* (other than F020, F021, F022, F023,F026 and F027) **– applicable**	40 CFR 264.175(c)(1) and (2) GA Rule §391-3-11-.10
Closure performance standard for RCRA container storage unit	Must close the facility (e.g., container storage unit) in a manner that: • Minimizes the need for further maintenance; • Controls minimizes or eliminates to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run –off, or hazardous waste decomposition products to the ground or surface waters or the atmosphere; and • Complies with the closure requirements of subpart, but not limited to, the requirements of 40 CFR 264.178 for containers.	Storage of RCRA hazardous waste in containers **– applicable**	40 CFR 264.111 GA Rule §391-3-11-.10

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Temporary Storage of Wastes – Primary Wastes (e.g., excavated soil/sediment) and Secondary Wastes(e.g., wastewaters and spent treatment media)			
Closure of RCRA container storage unit	At closure, all hazardous waste and hazardous waste residues must be removed from the containment system. Remaining containers, liners, bases, and soils containing or contaminated with hazardous waste and hazardous waste residues must be decontaminated or removed. [Comment: At closure, as throughout the operating period, unless the owner or operator can demonstrate in accordance with 40 CFR 261.3(d) of this chapter that the solid waste removed from the containment system is not a hazardous waste, the owner or operator becomes a generator of hazardous waste and must manage it in accordance with all applicable requirements of parts 262 through 266 of this chapter].	Storage of RCRA hazardous waste in containers in a unit with a containment system – **applicable**	40 CFR 264.178 GA Rule §391-3-11-.10
Performance criteria for staging pile	Staging pile must: • facilitate a reliable, effective and protective remedy; • must be designed to prevent or minimize releases of hazardous wastes and constituents into the environment, and minimize or adequately control cross–media transfer as necessary to protect human health and the environment (e.g. use of liners, covers, run–off/run–on controls).	Storage of remediation waste in a staging pile – **applicable**	40 CFR 264.554(d)(1)(i) and (ii) GA Rule §391-3-11-.10
Operation of a staging pile	Must not operate for more than two years, except when an operating term extension under 40 CFR 264.554(i) is granted. *Note:* Must measure the two-year limit (or other operating term specified) from first time remediation waste placed in staging pile	Storage of remediation waste in a staging pile – **applicable**	40 CFR 264.554(d)(1)(iii) GA Rule §391-3-11-.10
	Must not use staging pile longer than the length of time designated by EPA in appropriate decision document.		40 CFR 264.554(h) GA Rule §391-3-11-.10
Design criteria for staging pile	In setting standards and design criteria must consider the following factors: • Length of time pile will be in operation; • Volumes of waste you intend to store in the pile; • Physical and chemical characteristics of the wastes to be stored in the unit; • Potential for releases from the unit;	Storage of remediation waste in a staging pile – **applicable**	40 CFR 264.554(d)(2)(i) – (vi) GA Rule §391-3-11-.10

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Temporary Storage of Wastes – Primary Wastes (e.g., excavated soil/sediment) and Secondary Wastes(e.g., wastewaters and spent treatment media)			
	• Hydrogeological and other relevant environmental conditions at the facility that may influence the migration of any potential releases; and • Potential for human and environmental exposure to potential releases from the unit.		
Operation of a staging pile	Must not place in the same staging pile unless you have complied with 40 CFR 264.17(b).	Storage of "incompatible" remediation waste (as defined in 40 CFR 260.10) in staging pile – **applicable**	40 CFR 264.554(f)(1) GA Rule §391-3-11-.10
	Must separate the incompatible waste or materials, or protect them from one another by using a dike, berm, wall or other device.	Staging pile of remediation waste stored nearby to incompatible wastes or materials in containers, other piles, open tanks or land disposal units – **applicable**	40 CFR 264.554(f)(2) GA Rule §391-3-11-.10
	Must not pile remediation waste on same base where incompatible wastes or materials were previously piled unless you have sufficiently decontaminated the base to comply with 40 CFR 264.17(b).		40 CFR 264.554(f)(3) GA Rule §391-3-11-.10
Closure of staging pile of remediation waste	Must be closed within 180 days after the operating term by removing or decontaminating all remediation waste, contaminated containment system components, and structures and equipment contaminated with waste and leachate. Must decontaminate contaminated subsoils in a manner that EPA determines will protect human and the environment.	Storage of remediation waste in staging pile in previously contaminated area – **applicable**	40 CFR 264.554(j)(1) and (2) GA Rule §391-3-11-.10
	Must be closed within 180 days after the operating term according to 40 CFR 264.258(a) and 264.111 or 265.258(a) and 265.111.	Storage of remediation waste in staging pile in uncontaminated area – **applicable**	40 CFR 264.554(k) GA Rule §391-3-11-.10
Storage of PCBs			
Storage of PCB Waste in a RCRA-regulated container storgae area	Does not have to meet storage unit requirements in 40 CFR 761.65(b)(1) provided unit: • is permitted by EPA under RCRA §3004, or • qualifies for interim status under RCRA §3005; or • is permitted by an authorized state under RCRA §3006 and, PCB spills cleaned up in accordance with Subpart G of 40 CFR 761.	Storage of PCBs and PCB Items designated for disposal – **applicable**	40 CFR Part 761.65(b)(2)(i)-(iv)

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
	Storage of PCBs		
	NOTE: Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit.		
Temporary storage of bulk PCB remediation waste in a waste pile	Waste must be placed in a pile that: • Is designed and operated to control dispersal by wind, where necessary, by means other than wetting; and Does not generate leachate through decomposition or other reactions.	Storage PCB remediation waste (as defined in 40 CFR 761.3) at cleanup site or site of generation up to 180 days – **applicable**	40 CFR Part 761.65(c)(9)(i) and (ii)
Waste pile liner performance	The storage site must have a liner designed, constructed, and installed to prevent any migration of wastes off or through liner into adjacent subsurface soil, groundwater, or surface water at any time during active life (including closure period) of the storage site.		40 CFR 761.65(c)(9)(iii)(A)
Construction of storage pile liner	Liner must be: • Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure because of pressure gradients, physical contact with waste or leachate to which they are exposed, climactic conditions, the stress of installation, and the stress of daily operation; • Placed on foundation or base capable of providing support to liner and resisitance to pressure from gradients above and below the liner to present failure because of settlement compression or uplift; Installed to cover all surrounding earth likely to be in contact with waste.		40 CFR 761.65(c)(9)(iii)(A)(*l*)-(3)
Construction of storage pile cover	The storage site must have a cover that: • Meets the requirements of 40 CFR 761.65(c)(9)(iii)(A); • Is installed to cover all of the stored waste likely to be contacted by the precipitation; and • Is secured so as to not be functionally disabled by winds expected under normal weather conditions.	Storage PCB remediation waste or PCB bulk product waste at cleanup site or site of generation up to 180 days – **appicable**	40 CFR 761.65(c)(9)(iii)(B)

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Storage of PCBs			
Construction of storage pile run-on control system	The storage site must have a run-on control system designed, constructed, operated, and maintained such that it: • Prevents flow on the stored waste during peak discharge from at least a 25-year storm; • Collects and controls at least the water volume resulting from a 24-hour, 25-year storm. Collection and holding facilities (e.g., tanks or basins) must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system.		40 CFR 761.65(c)(9)(iii)(c)(*l*) and (2)
Treatment and Disposal of PCBs			
Disposal of decontamination wastes and residues	Such waste shall be disposed of at their existing PCB concentration unless otherwise specified in 40 CFR 761.79(g)(1-6).	Decontamination waste and residues – **applicable**	40 CFR 761.79(g)
	Are regulated for disposal as PCB remediation waste.	Distillation bottoms or residues and filter media – **applicable**	40 CFR 761.79(g)(1)
	Are regulated for disposal at their original concentration.	PCBs physically separated from regulated waste during decontamination, other than distillation bottoms and filter media – **applicable**	40 CFR 761.79(g)(2)
Disposal liquid PCB remediation waste (self-implementing option)	Shall either: • Decontaminate the waste to the levels specified in 40 CFR 761.79(b)(1) or (2); or Dispose of the waste in accordance with 40 CFR 761.61(b) or a risk-based approval under 40 CFR 761.61(c).	Liquid PCB remediation waste (as defined in 40 CFR 761.3) – **relevant and appropriate**	40 CFR 761.61(A)(5)(iv) 40 CFR 761.61(a)(5)(iv)(A) and (B)
Disposal of bulk PCB remediation waste off-site (self-implementing option)	May be sent off-site for decontamination or disposal provided the waste is either dewatered on-site or transported off-site in containers meeting the requirements of DOT HMR at 49 CFR parts 171-180.	Generation of bulk PCB remediation waste (as defined in 40 CFR 761.3) for disposal – **relevant and appropriate**	40 CFR 761.61(A)(5)(i)(B)

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Treatment and Disposal of PCBs			
	Must provide written notice including the quanitity to be shipped and highest concentration of PCBs [using extraction EPA Method 3500B/3540C or Method 8082 in SW-846 or methods validated under 40 CFR 761.320-26 (Subpart Q)] at least 15 days before the first shipment of waste to each off-site facility	Generation of bulk PCB remediation waste (as defined in 40 CFR 761.3) for disposal at an off-site facility where the waste is destined for an area not subject to a TSCA PCB Disposal Approval – **relevant and appropriate**	40 CFR 761.61(A)(5)(i)(B)(2)(iv)
	Shall be disposed of in accordance with the provisions for Cleanup wastes at 40 CFR 761.61(a)(5)(v)(A).	Bulk PCB remediation waste which has been dewatered and with a PCB concentration < 50 ppm – **relevant and appropriate**	40 CFR 761.61(A)(5)(i)(B)(2)(ii)
	Shall be disposed of: • In a hazardous waste landfill permitted by EPA under §3004 of RCRA; • In a hazardous waste landfill permitted by a State authorized under §3006 of RCRA; or In a PCB disposal facility approved under 40 CFR 761.60.	Bulk PCB remediation waste which has been dewatered and with a PCB concentration ≥ 50 ppm – **relevant and appropriate**	40 CFR 761.61(A)(5)(i)(B)(2)(iii)
Performance-based disposal of PCB remediation waste	Shall dispose by one of the following methods: • In a high-temperature incinerator approved under 40 CFR 761.70(b); • By an alternate disposal method approved under 40 CFR 761.60(e); • In a chemical waste landfill approved under 40 CFR 761.75; • In a facility with a coordinated approval issed under 40 CFR 761.77; or • Through decontamination in accordance with 40 CFR 761.79.	Disposal of non-liquid PCB remediation waste (as defined in 40 CFR 761.3) – **relevant and appropriate**	40 CFR 761.61(b)(2) 40 CFR 761.61(b)(2)(i) 40 CFR 761.61(b)(2)(ii)
	Shall be disposed according to 40 CFR 761.60(a) or (e), or decontaminate in accordance with 40 CFR 761.79.	Disposal of liquid PCB remediation waste – **applicable**	40 CFR 761.61(b)(1)
Disposal of PCB cleanup wastes (e.g., PPE, rags, non-liquid cleaning materials) (self-implementing option)	Shall be disposed of either: • In a facility permitted, licensed, or registered by a State to manage municipal solid waste under 40 CFR 258 or non-municipal, non-hazardous waste subject to 40 CFR 257.5 thru 257.30; or	Generation of non-liquid PCBs at any concentration during and from the cleanup of PCB remediation waste –**relevant and appropriate**	40 CFR 761.61(a)(5)(v)(A)(1)-(4)

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Treatment and Disposal of PCBs			
	• In a RCRA Subtitle C landfill permitted by a State to accept PCB waste; or • In an approved PCB disposal facility; or • Through decontamination under 40 CFR 761.79(b) or (c).		
Decontamination of PCB contaminated water	For discharge to a treatment works as defined in 40 CFR 503.9(aa), or discharge to navigable waters, meet standard of < 3 ppb PCBs; or For unrestricted use, meet standard of ≤ 0.5 ppb PCBs	Water containing PCBs regulated for disposal – **applicable**	40 CFR 761.61(b)(1)(ii) 40 CFR 761.61(b)(1)(iii)
Waste Treatment and Disposal – Primary Wastes (e.g., excavated soil/sediment) and Secondary Wastes (e.g., wastewaters, spent treatment media)			
Disposal of RCRA-hazardous waste in a land-based unit	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 CFR 268.40 before land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste – **applicable**	40 CFR 268.40(a) GA Rule §391-3-11-.16
	Must be treated according to the alternative treatment standards of 40 CFR 268.49(c) <u>or</u> Must be treated according to the UTSs [specified in 40 CFR 268.48 Table UTS] applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted hazardous soils – **applicable**	40 CFR 268.49(b) GA Rule §391-3-11-.16
Disposal of RCRA characteristic wastewaters in an NPDES permitted WWTU	Are not prohibited, if the wastes are managed in a treatment system which subsequently discharges to waters of the U.S. pursuant to a permit issued under 402 of CWA (i.e., NPDES permitted), unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40, or D003 reactive cyanide. *NOTE*: For purposes of this exclusion, a CERCLA on-site wastewater treatment unit that meets all of the identified CWA NPDES ARARs for point source discharges from such system is considered wastewater treatment system that is NPDES permitted.	Land disposal of RCRA restricted hazardous wastewaters that are hazardous only because they exhibit a characteristic and not otherwise prohibited under 40 CFR 268 – **applicable**	40 CFR 268.1(c)(4)(i) GA Rule §391-3-11-.16
Disposal of RCRA characteristic wastewaters in a POTW	Are not prohibited, if wastes are treated for purposes of the pretreatment requirements of Section 307 of the CWA, unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40, or are D003 reactive cyanide.	Land disposal of hazardous wastewaters that are hazardous only because they exhibit a characteristic and are not otherwise prohibited under 40 CFR 268 – **applicable**	40 CFR 268.49(b) GA Rule §391-3-11-.16

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Discharge of Wastewaters			
Discharge of wastewater from treatment unit or de-watering	All pollutants shall receive such treatment or corrective action so as to ensure compliance with the terms and conditions of the issued permit and with the following, whenever applicable: • Effluent limitations established by EPA pursuant to Sections 301, 302, 303 and 316 of the Federal CWA; • Effluent limitations and prohibitions and pretreatment standards established by the EPA pursuant to Section 307 of the Federal CWA; • Notwithstanding the above, more stringent effluent limitations may be required as deemed necessary by the EPD (a) to meet any other existing Federal laws or regulations, or (b) to ensure compliance with any applicable State water quality standards, effluent limitations, treatment standards, or schedules of compliance. *NOTE:* Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit.	Discharge of any pollutant into the waters of the State – **applicable**	GA Rule §391-3-6-.06(4)(a) (1),(3) and (10) Degree of Waste Treatment Required
Discharge of wastewater from treatment unit or de-watering *Cont'd*	Until such time as such criteria, standards, limitations, and prohibitions are promulgated pursuant to Sections 301, 302, 303, 304(e), 306, 307 and 405 of the Federal CWA, the EPD shall apply such standards, limitations and prohibitions necessary to achieve the purposes of said sections of the Federal Act. With respect to individual point sources, such limitations, standards, or prohibitions shall be based upon an assessment of technology and processes, to-wit: 1. To existing point sources, other than publicly owned treatment works, effluent limitations based on application of the best practicable control technology currently available; 2. To publicly owned treatment works, effluent limitations based upon the application of secondary treatment or treatment equivalent to secondary treatment in accordance with Federal Regulations, 40 C.F.R. 133.102 and .105;		GA Rule §391-3-6-.06(4)(d) Degree of Waste Treatment Required

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Discharge of Wastewaters			
	3. To any point source, other than publicly owned treatment works, whose construction commences after the initial effective date of this Paragraph, and for which there are not new source performance standards, effluent limitations which reflect the greatest degree of effluent reduction which the EPD determines to be achievable through application of the best available demonstrated control technology, processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants, consistent with 40 C.F.R. 125.3(c)(2); 4. To any point source, as appropriate, effluent limitations or prohibitions designed to prohibit the discharge of toxic pollutants in toxic amounts or to require pretreatment of pollutants which interfere with, pass through, or otherwise are incompatible with the operation of publicly owned treatment works; and 5. To any point source, as appropriate, more stringent effluent limitations as are required to ensure compliance with applicable State water quality standards, including those to prohibit the discharge of toxic pollutants in toxic amounts. Where necessary, NPDES Permits issued or reissued after the adoption of this paragraph shall include numeric criteria based upon the following procedures to ensure that toxic substances and other priority pollutants are not discharged to surface waters in harmful amounts. *NOTE:* Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit.		
Monitoring of discharges into surface water	The monitoring requirements of any discharge authorized by any such permit shall be consistent with Federal Regulations, 40 C.F.R. 122.41, 122.42, and 122.44 and applicable State laws.	Discharge of any pollutant into the waters of the State – **applicable**	GA Rule §391-3-6-.06(11)(a)

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Discharge of Wastewaters			
	NOTE: Per CERCLA §121(e)(1) permits are not required for on-site response action; however project must comply with any substantive requirements that otherwise would be included in a permit. Monitoring parameters including frequency will be included in a CERCLA document such as a Remedial Action Work Plan that is reviewed by EPD.		
Decontamintation of PCB contaminated water	For discharge to a treatment works as defined in 40 CFR 503.9(aa), or discharge to navigable waters, meet standard of < 3 ppb PCBs; or For unrestricted use, meet standard of ≤ 0.5 ppb PCBs.	Water containing PCBs regulated for disposal – **applicable**	40 CFR 761.61(b)(1)(ii) 40 CFR 761.61(b)(1)(iii)
Transportation of Wastes			
Transportation of hazardous waste on-site	The generator manifesting requirements of 40 CFR 262.20–262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 CFR 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way – **applicable**	40 CFR 262.20(f) GA Rule §391-3-11-.08
Transportation of hazardous waste off-site	Must comply with the generator requirements of 40 CFR 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding, Sect. 262.40, 262.41(a) for record keeping requirements, and Sect. 262.12 to obtain EPA ID number.	Preparation and initiation of shipment of hazardous waste off-site – **applicable**	40 CFR 262.10(h); GA Rule §391-3-11-.08
	Must comply with the requirements of 40 CFR 263.11-263.31. A transporter who meets all applicable requirements of 49 CFR 171-179 and the requirements of 40 CFR 263.11 and 263.31 will be deemed in compliance with 40 CFR 263.	Transportation of hazardous waste within the United States requiring a manifest – **applicable**	40 CFR 263.10(a) GA Rule §391-3-11-.09
Transportation of samples (i.e. contaminated soils and wastewaters)	Are not subject to any requirements of 40 CFR Parts 261 through 268 or 270 when: • the sample is being transported to a laboratory for the purpose of testing; or • the sample is being stored by sample collector before transport to a lab for testing	Samples of solid waste or a sample of water, soil for purpose of conducting testing to determine its characteristics or composition **– applicable**	40 CFR 261.4(d)(1)(i)–(iii) GA Rule §391-3-11-.07

Table 27. Applicable or Relevant and Appropriate Requirements (ARARs) for OU1 at the LCP Chemicals Site - Continued

Action-Specific ARARs/TBC			
Action	**Requirements**	**Prerequisite**	**Citation**
Transportation of Wastes			
	• the sample is being stored by sample collector before transport to a lab for testing		
	In order to qualify for the exemption in paragraphs (d)(1)(i) and (ii), a sample collector shipping samples to a laboratory must: • Comply with U.S. DOT, U.S. Postal Service, or any other applicable shipping requirements • Assure that the information provided in (1) thru (5) of this section accompanies the sample. • Package the sample so that it does not leak, spill, or vaporize from its packaging.	Samples of solid waste or a sample of water, soil for purpose of conducting testing to determine its characteristics or composition– **applicable**	40 CFR 261.4(d)(2)(i)(A) and (B) GA Rule §391-3-11-.07
Transportation and handling of solid waste	No person shall engage in solid waste or special solid waste handling in Georgia or construct or operate a solid waste handling facility in Georgia, except those individuals exempted from this part under Code Section 12-8-30.10, without first obtaining a permit from the director authorizing such activity.	Management of solid waste in Georgia – **applicable**	Georgia Solid Waste Management Act of 1990 O.C.G.A. §12-8-24

Notes:
ARAR = applicable or relevant and appropriate requirement
CFR = *Code of Federal Regulations*
CWA = Clean Water Act of 1972
DEACT = deactivation
DOT = U.S. Department of Transportation
EPA = U.S. Environmental Protection Agency
EPD = Georgia Environmental Protection Division of the Georgia Department of Natural Resources
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act
GAC = granulated activated carbon
GA Rule = *Rules and Regulations*, Section as noted
LDR = Land Disposal Restrictions
NPDES = National Pollutant Discharge Elimination System
O.C.G.A. = *Official Code of Georgia Annotated*, Chapter as noted
POTW = Publicly Owned Treatment Works
RCRA = Resource Conservation and Recovery Act of 1976
TBC = to be considered
TCLP = Toxicity Characteristic Leaching Procedure
U.S. = United States
USCOE = U.S. Corps of Engineers
UTS = Universal Treatment Standard
WWTU = Waste Water Treatment Unit

Table 28. Summary of Remedial Alternative Costs

Alternatives and Remedial Actions		Area (Acres)	Total Estimated Indirect Costs (Present Day $MM)	Total Estimated Direct Costs (Present Day $MM)	Total Estimated Recurring Costs (Present Day $MM)	Contingency Cost (Present Day $MM)
Alt 1	**No Action**	-	$0.0	$0.0	$0.0	$0.0
Alt 2	**Dredge:** All Areas	48	$8.6	$48.6	$0.4	$7.3
Alt 3	**Dredge:** LCP Ditch, Eastern & Western Creek Complex	8				
	Cap: Domain 3 Creek, Purvis Creek North & South	16	$5.3	$27.9	$1.4	$4.2
	Thin Cover: Domain 1A, 2, 3 and Dillon Duck	23				
Alt 4	**Dredge:** All Areas	18	$4.9	$25.2	$0.3	$3.8
Alt 5	**Dredge:** LCP Ditch & Eastern Creek	7				
	Cap: Domain 3 Creek	3	$3.9	$18.9	$0.5	$2.8
	Thin Cover: Dillon Duck, Domain 1A & 2	8				
Alt 6	**Dredge:** LCP Ditch & Eastern Creek	7				
	Cap: Domain 3 Creek & Purvis Creek South	6	$4.2	$20.7	$0.7	$3.1
	Thin Cover: Dillon Duck, Domain 1A & 2	11				

Note: Recurring Costs include Operations and Maintenance (O&M) and long-term monitoring

Table 29. Cost Estimate Summary for the Selected Remedy

Task	Quantity	Unit	Unit Cost	Total Cost
Indirect Costs				
1.01 Institutional Controls	1	LS	$250,000	$250,000
1.02 Predesign Investigations and Reporting	1	LS	$600,000	$600,000
1.03 Remedial Design		8%	$0	$1,653,280
1.04 Construction Management		8%	$0	$1,653,280
Direct Construction Costs				
2.0 Mobilization and Site Preparation	1	LS	$6,888,000	$6,888,000
3.0 Dredging	21,600	CY	$400	$8,604,000
4.0 Capping				
4.1 Sand	7,260	CY	$82	$598,500
4.2 Armor Stone	7,260	CY	$134	$971,500
5.0 Thin-Layer Cover	13,190	CY	$114	$1,505,000
6.0 Marsh Restoration	1	LS	$1,408,000	$1,408,000
7.0 Demobilization and Site Restoration	1	LS	$691,000	$691,000
Recurring Costs				
8.0 Long-term Monitoring of Capping Areas	1	LS	$236,000	$236,000
9.0 Long-term Monitoring of Thin-Layer Cover Areas	1	LS	$226,000	$226,000
10.0 Long-term Monitoring of Marsh Restoration Areas	1	LS	$211,000	$211,000
		Contingency (15% of TDCC)		$3,099,900
		Total Alternative Cost		**$28,595,460**

General Notes

- All costs are provided in present day dollars and all cost expenditures are assumed to occur at the start of construction.
- Work is to be conducted 5 days per week, 12 hours per day. Work is to be conducted year round with no planned interruptions in operations.
- Costs do not include property costs (where applicable), access costs, legal fees, Agency oversight, or public relations efforts.
- These costs have been developed using currently available information regarding site characteristics, such as site bathymetry, potential debris, and physical properties of the existing sediment at the site. As information regarding these site characteristics changes or new information becomes available, these costs will be subject to change.
- These estimates are developed using current and generally accepted engineering cost estimation methods. Note that these estimates are based on assumptions concerning future events and actual costs may be affected by known and unknown risks including, but not limited to, changes in general economic and business conditions, site conditions that were unknown to Anchor QEA, LLC at the time the estimates were performed, future changes in site conditions, regulatory or enforcement policy changes, and delays in performance. Actual costs may vary from these estimates and such variations may be material. Anchor QEA, LLC is not licensed as accountants, or securities attorneys, and, therefore, make no representations that these costs form an appropriate basis for complying with financial reporting requirements for such costs.

Table 29. Cost Estimate Summary for the Selected Remedy – Continued

Assumptions:

1.01 Institutional controls include deed restrictions, navigational controls and signage installation as deemed necessary.

1.02 Pre-design investigation includes all sampling, analysis and design work to be conducted prior to construction.

1.03 Remedial design work includes all plans, specifications and reporting necessary for construction to be implemented at the site. This has been preliminarily estimated as 8% of the direct construction costs based on best engineering judgment and previous experience at similar sites.

1.04 Construction management costs include necessary monitoring and oversight throughout construction. This includes only elevation verification after excavation, surface WQ measurement during dredging, and post backfill verification that the surface layer is clean. This cost has been preliminarily estimated as 8% of the direct construction costs based on best engineering judgment and previous experience at similar sites.

2.0 Mobilization and site preparation includes all pre-construction submittals and bonds. Also includes construction of temporary facilities, access roads, staging areas, mooring facilities and installation of soil erosion and sediment controls. Includes all costs necessary to mobilize construction equipment and general construction support materials necessary to complete the work.

3.0 Dredging costs include all equipment, labor, and materials necessary to perform the sediment removal operations at the site. Variations in dredging costs have been developed to account for adjustments in sediment disposal characterization, removal methodology due to site conditions and limited working times due to tidal cycles. Costs for sediment dewatering and disposal are also included in this task and vary depending on material characterization. This task also includes costs associated with turbidity controls, turbidity monitoring, health and safety oversight, and site surveying.

4.0 Capping costs include all equipment, labor, and materials necessary to perform the capping operations. Costs for delivery and placement of the cap components are included and placement cost variations have been developed to account for variable site conditions which impact production of this task. Also includes costs associated with turbidity monitoring and health and safety oversight.

5.0 Thin-layer cover costs include all equipment, labor and materials necessary to perform the thin layer placement operations. Costs for delivery and placement of the cover material is included. It is assumed that thin-layer placement will be conducted utilizing a pipeline transport system to deliver the slurried cover materials. Also includes costs associated with turbidity monitoring and health and safety oversight.

6.0 Marsh restoration costs include all equipment, labor and materials necessary to perform the restoration activities over the area impacted by the construction of access roads. Assumes that general plantings will be spaced on 2-foot centers over the restoration area.

7.0 Demobilization and site restoration involves removing equipment, materials, and labor from the site and restoring all disturbed areas to conditions similar to those existing prior to the start of construction. Disturbed areas include, at a minimum the two constructed staging areas, access roads, temporary site facilities, and temporary mooring facilities. It is assumed that only the top 2 inches of gravel on the access roads will be transported off site for disposal and that all remaining road fill material will be utilized in the remedy to the extent possible.

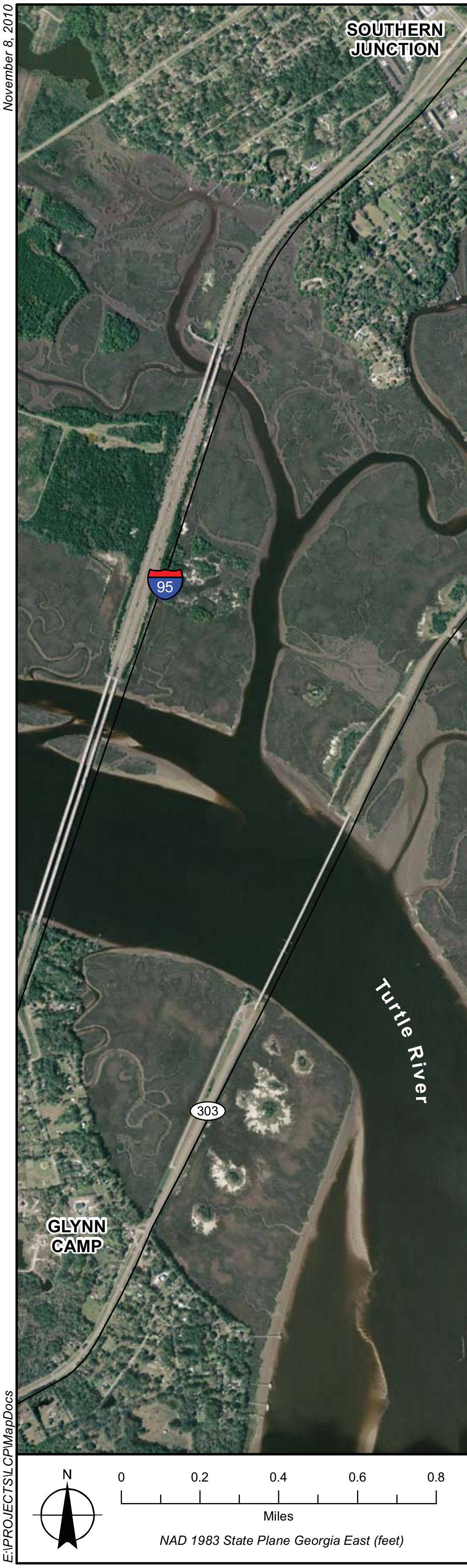
8.0 The cost for cap monitoring has been estimated in this analysis as 15% of the total direct capping cost of the alternative.

9.0 The cost for thin-layer cover monitoring has been estimated in this analysis as 15% of the total direct thin-layer cover cost of the alternative.

10.0 The cost for marsh restoration monitoring has been estimated in this analysis as 15% of the total direct marsh restoration cost of the alternative.

FIGURES

November 8, 2010

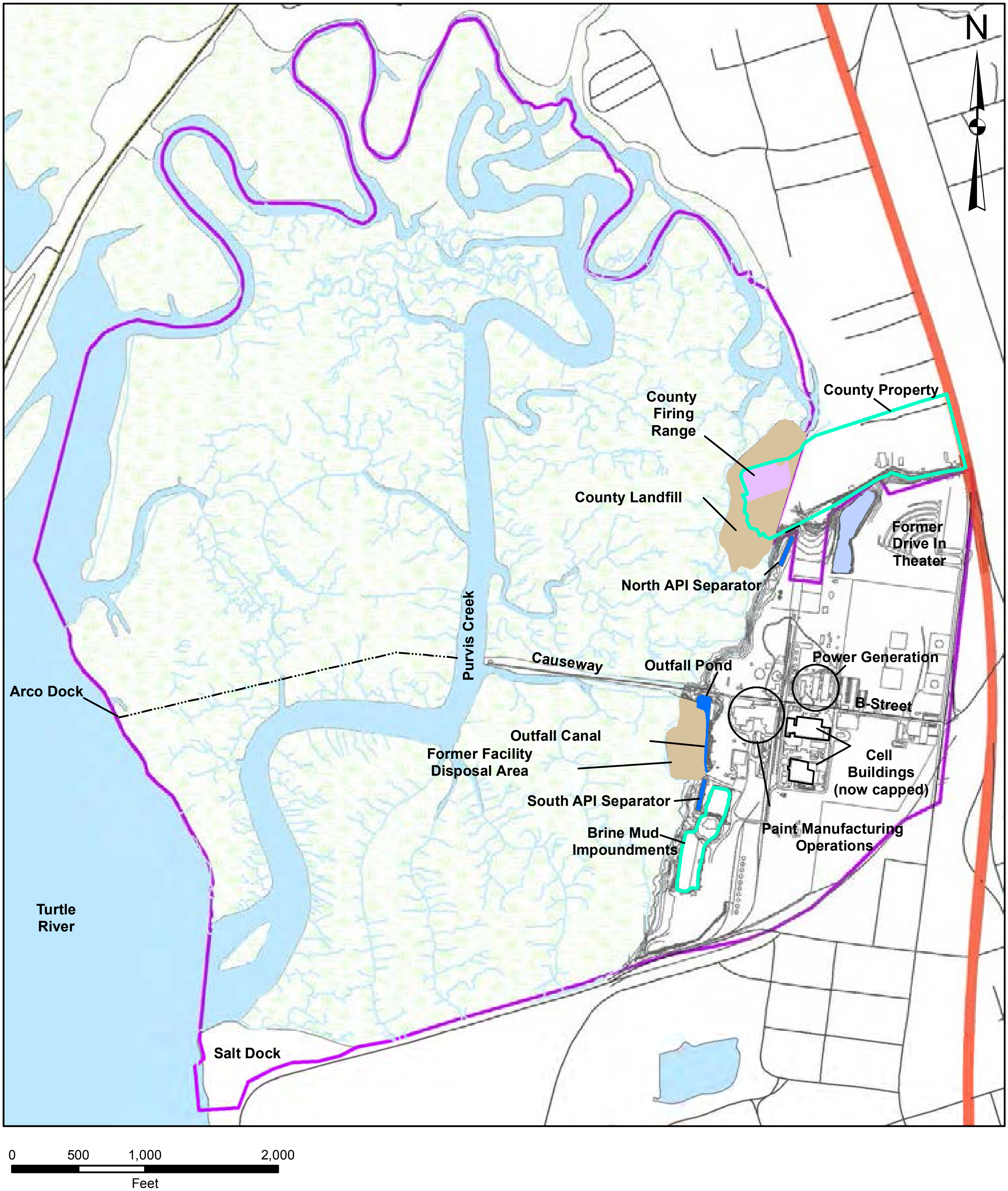


LCP Site Map
Glynn County, Georgia

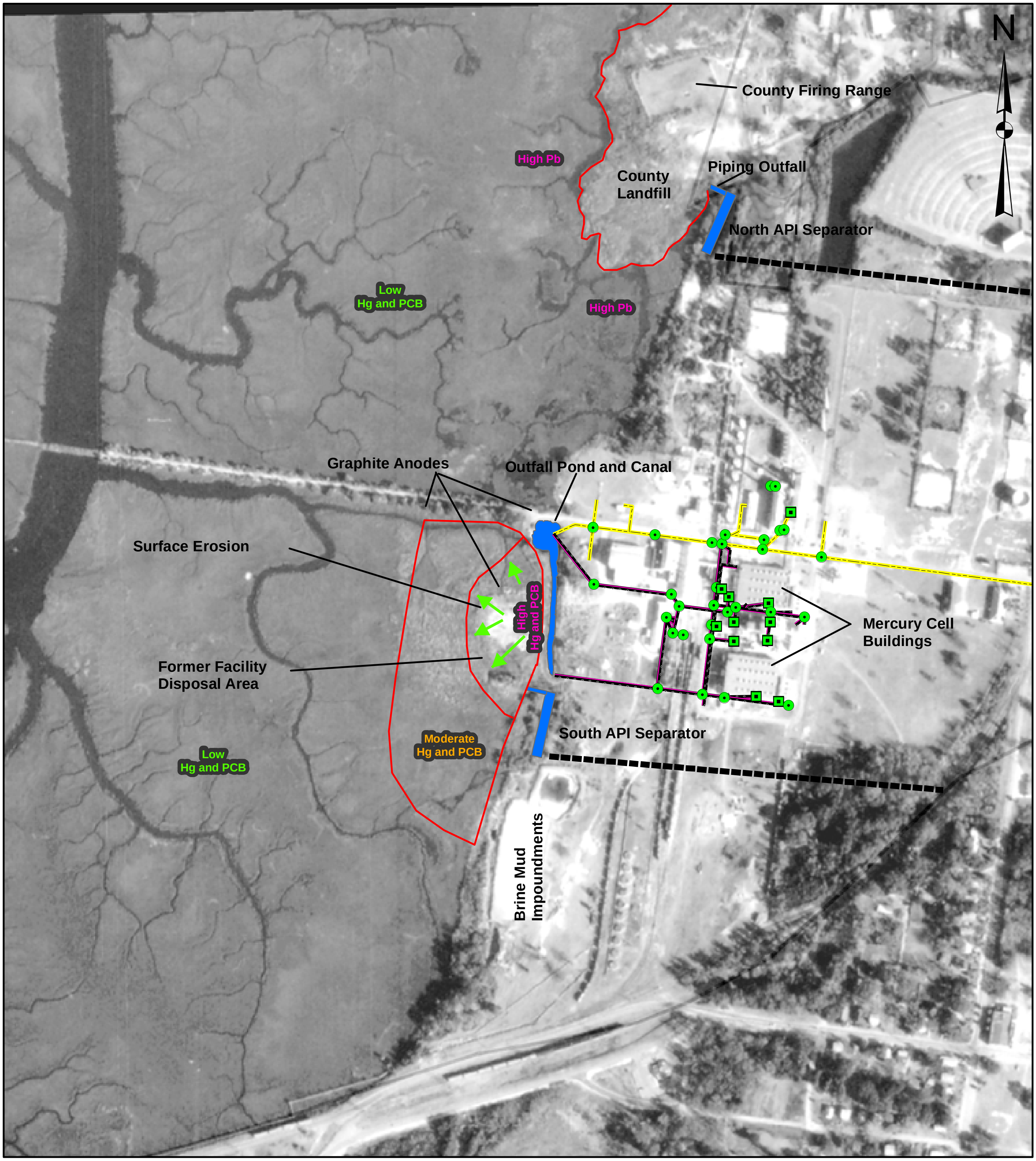
Figure 1

E:\PROJECTS\LCP\MapDocs

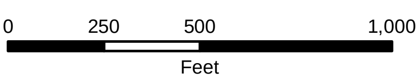
Features of the LCP Estuary **Figure 2**



Features of the Upland Portion of the LCP Site **Figure 3**



Source: 1990 Aerial Photo

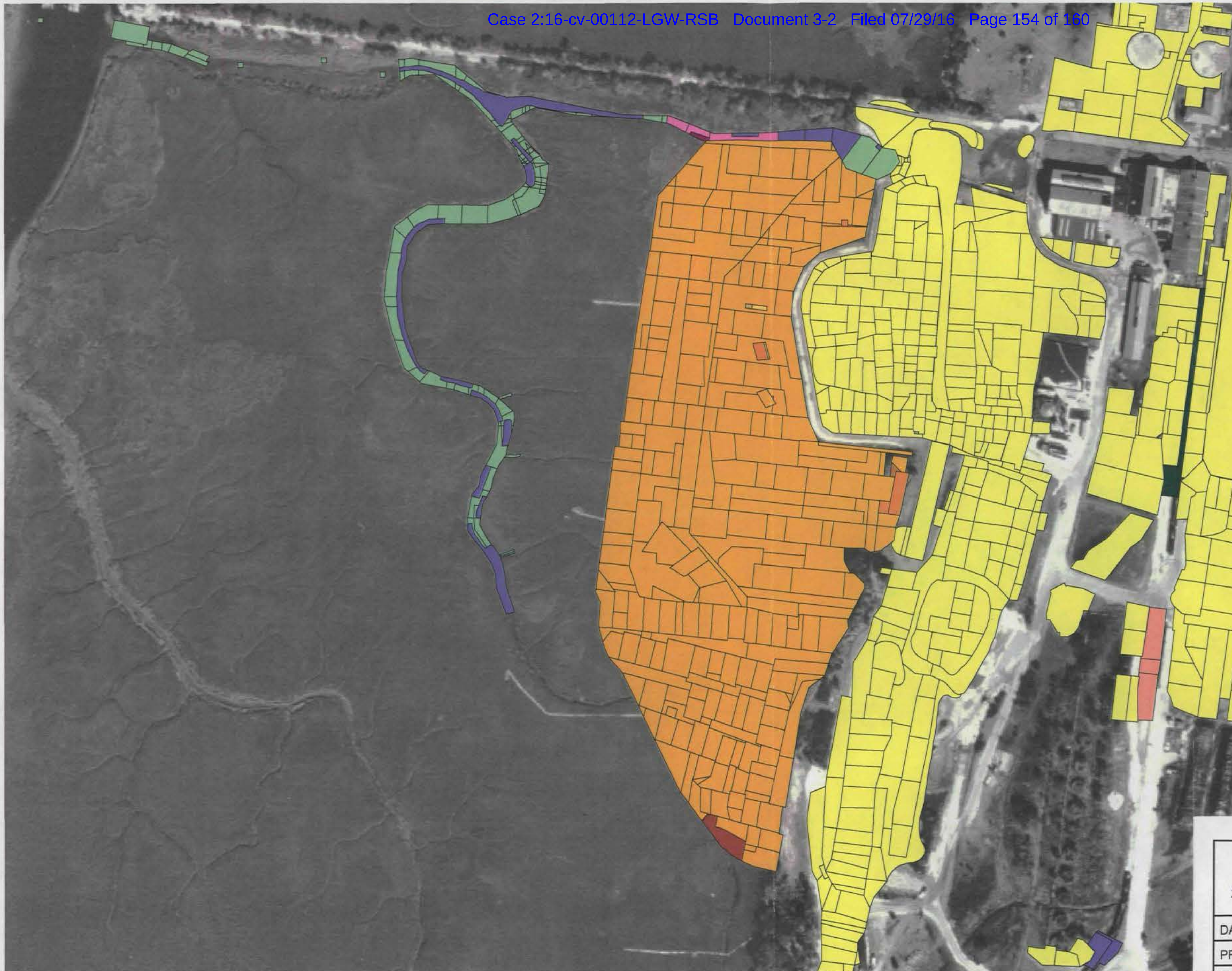


Legend

- Process Piping
- Stormwater Piping
- Manhole
- Sump
- Estimated Location of ARCO Community Sewer Lines Connects to API Separator

Source Areas for COC Transport to the Marsh **Figure 4**

AS CONSTRUCTED MARSH AND RAILROAD REMOVAL AREAS



LEGEND

As Constructed Marsh Removal Area
- 0.3 ft
- 1 ft
- 2 ft
- 2.5 ft
- 3 ft
- 5 ft

As Constructed Tidal Channel Removal Areas
- 1 ft
- 2 ft
- 3 ft
- 4 ft

As Constructed Railroad Removal Area
- 1 ft
- 1.5 ft
- 3 ft

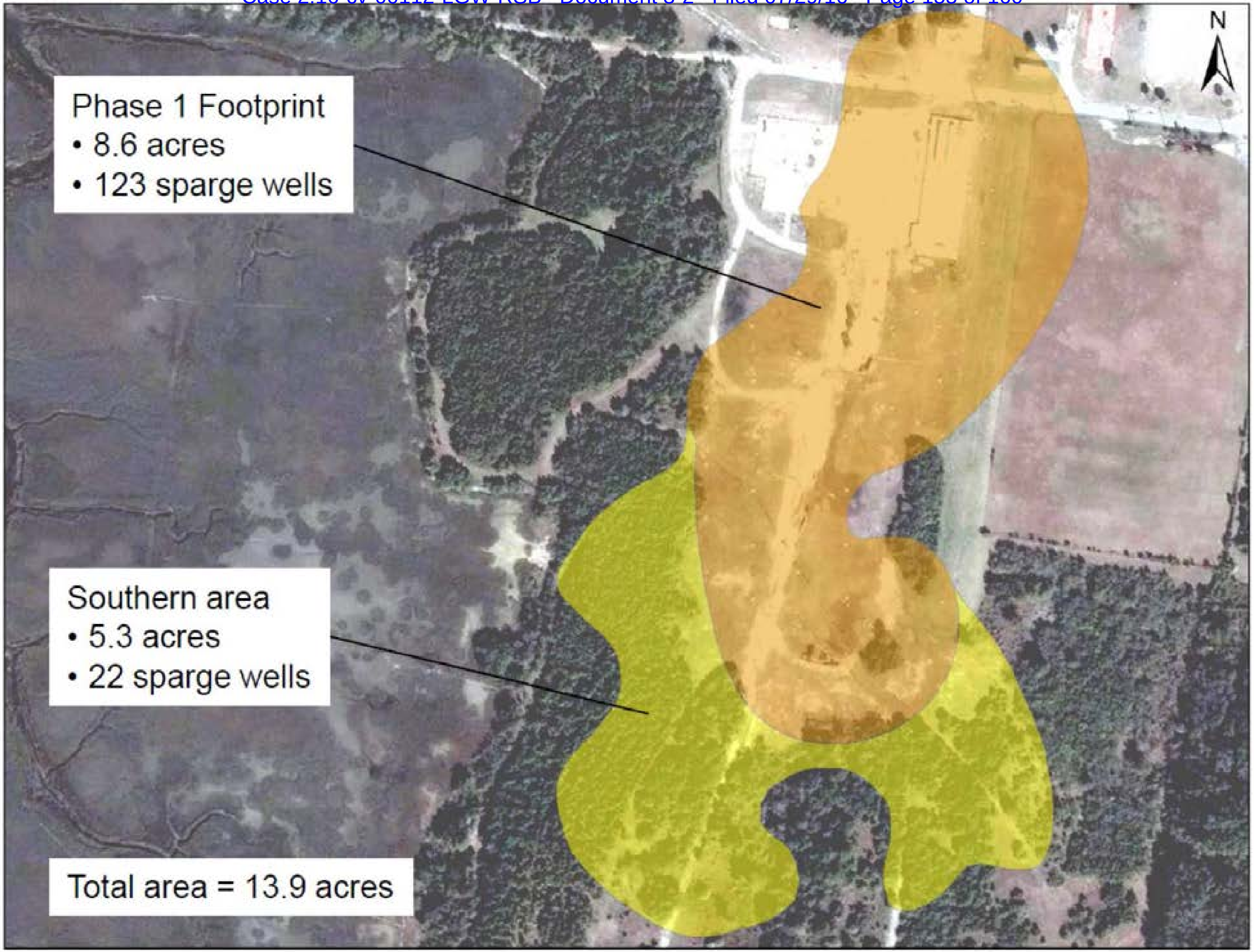
Previous Upland Removal Areas

100 0 100 200 Feet

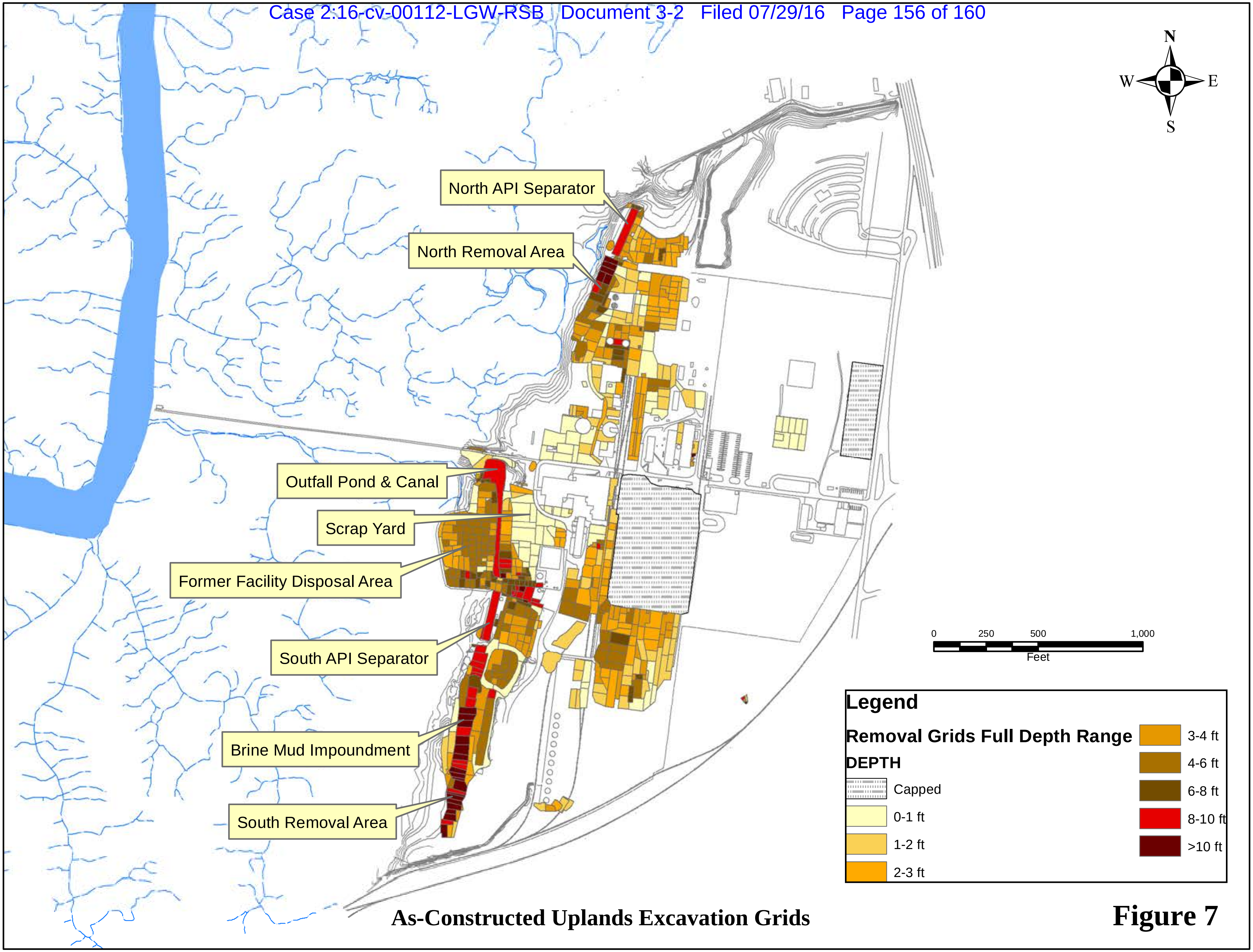
GEOSYNTEC CONSULTANTS
ATLANTA, GEORGIA

FIGURE 5

DATE: 27 SEPTEMBER 1999	SCALE: 1"= 200 FEET
PROJECT NO. GL0440	FIGURE NO. 3
DOCUMENT NO. GA990830	FILE NO. CLOSEOUT.APR

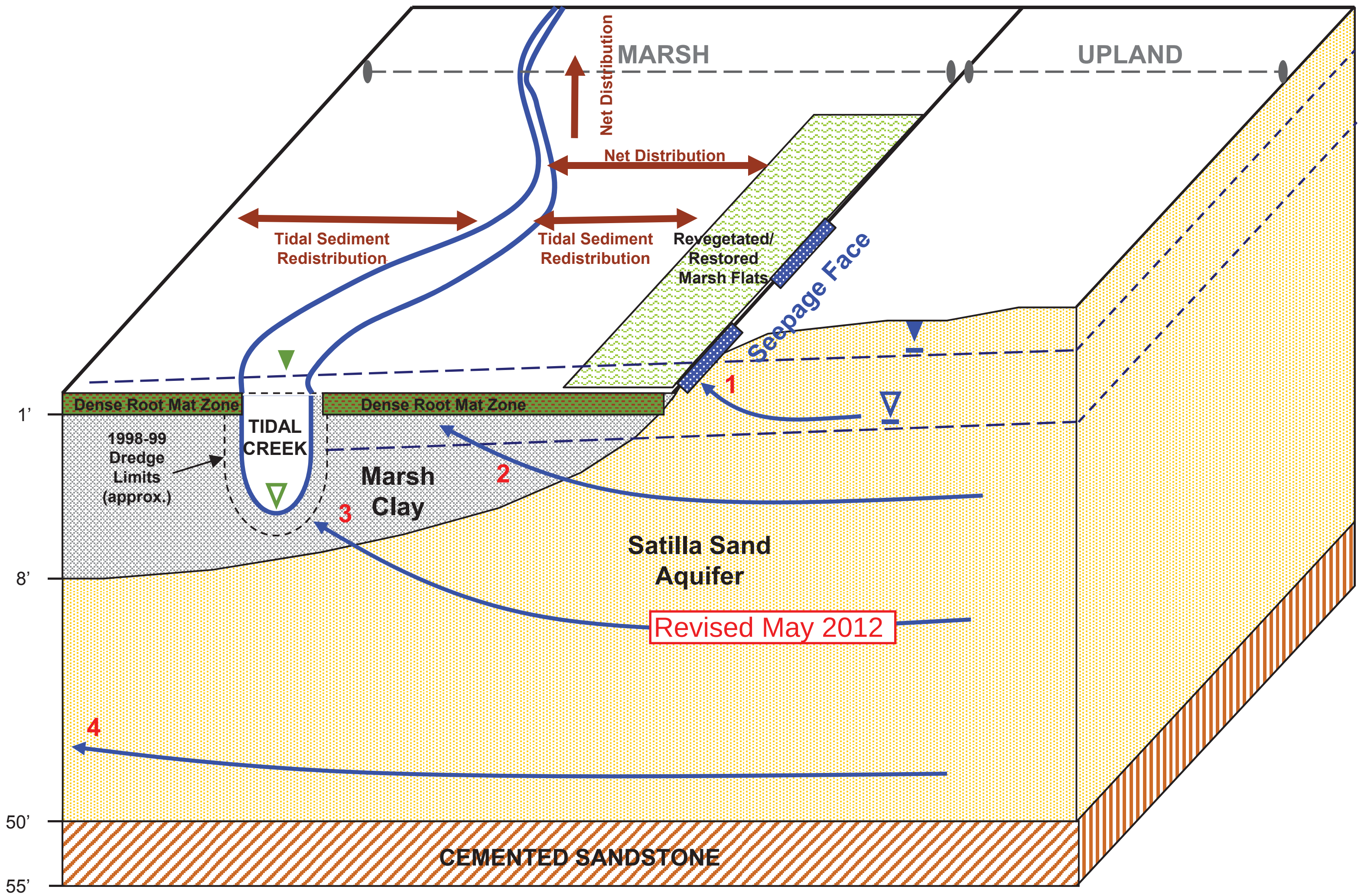


Extent of the Caustic Brine Pool **Figure 6**



As-Constructed Uplands Excavation Grids

Figure 7



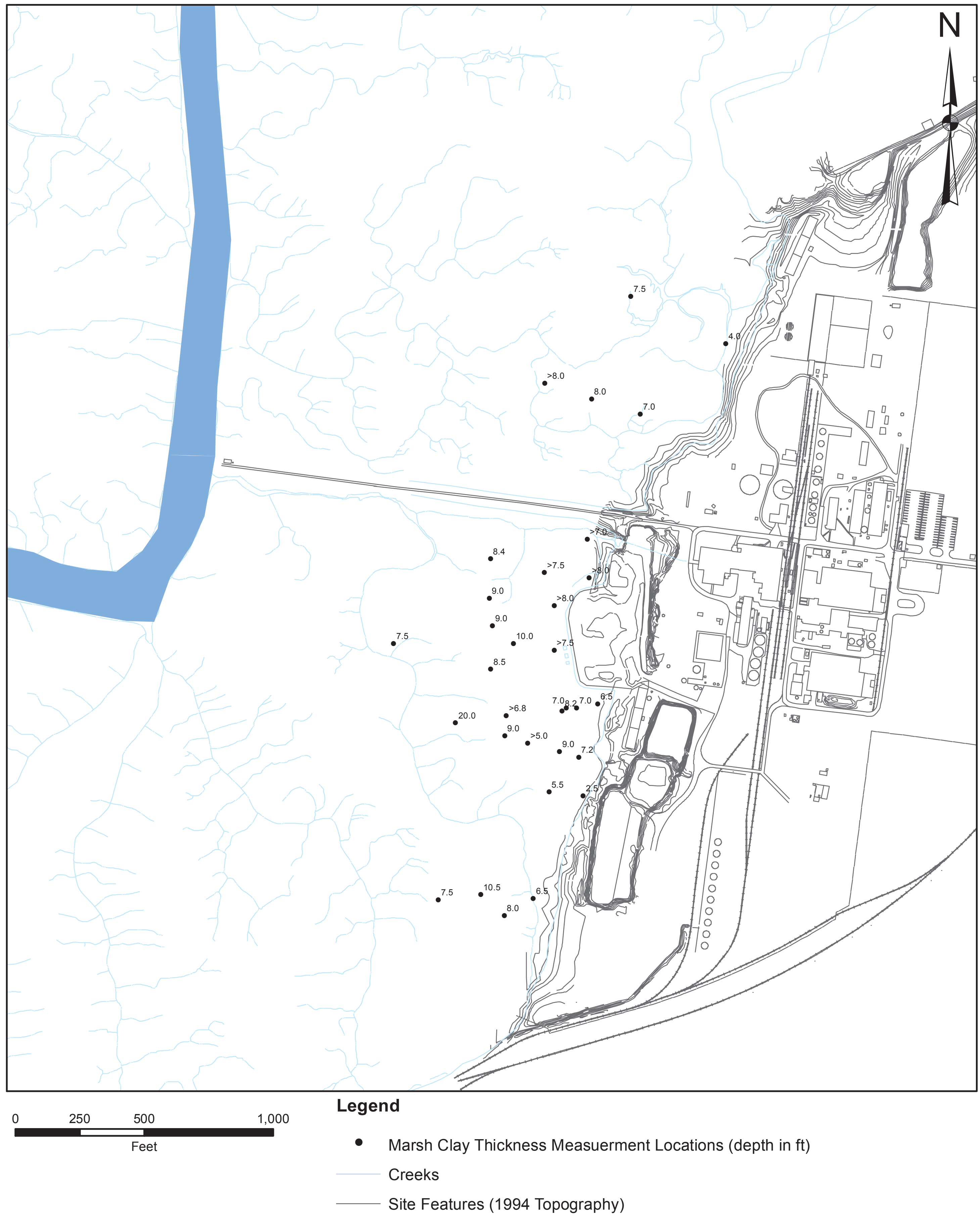
1 Seep along marsh edge (only at high water table condition).
2 Diffuse groundwater seepage through marsh clay discharging to marsh surface.
3 Diffuse groundwater seepage through marsh clay discharging to tidal tributary.
4 Deeper groundwater migrates to distant discharge boundary (e.g. Turtle River).

▼ High water table condition
▽ Low water table condition
▼ High tide level in tidal tributary
▽ Low tide level in tidal tributary (dry)

Note: The "Dredge Limits" shown in the tidal creek is conceptual, but conveys that the 1998-99 removal action dredging removed approximately 1ft of sediment from the channel profile while at no time did the dredging cut through the marsh clay to the underlying sand aquifer.

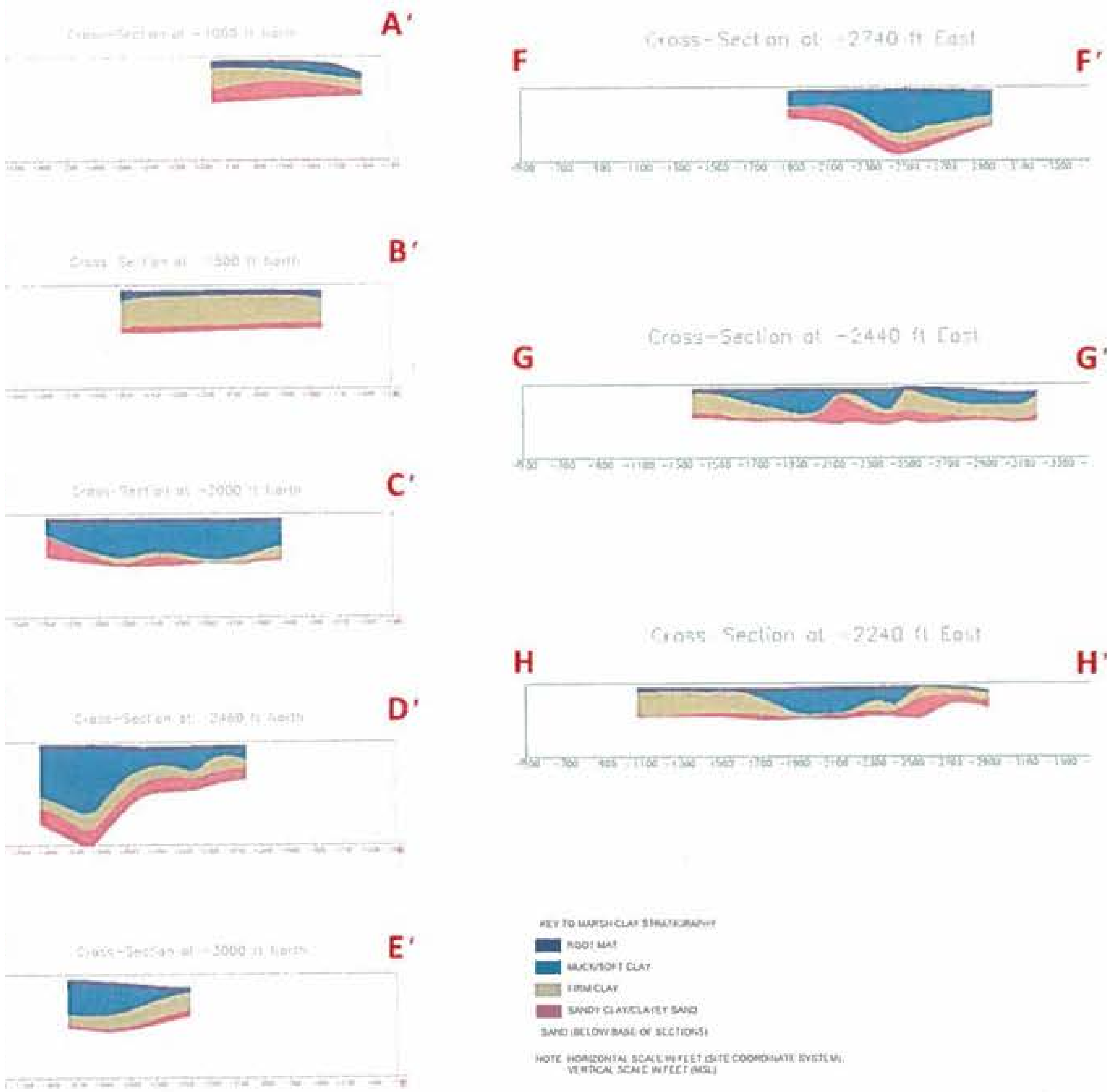
Note: Marsh clay texture is variable and the thermal IR photography indicates some discharge into the marsh.

Conceptual Site Model of LCP Marsh **Figure 8**

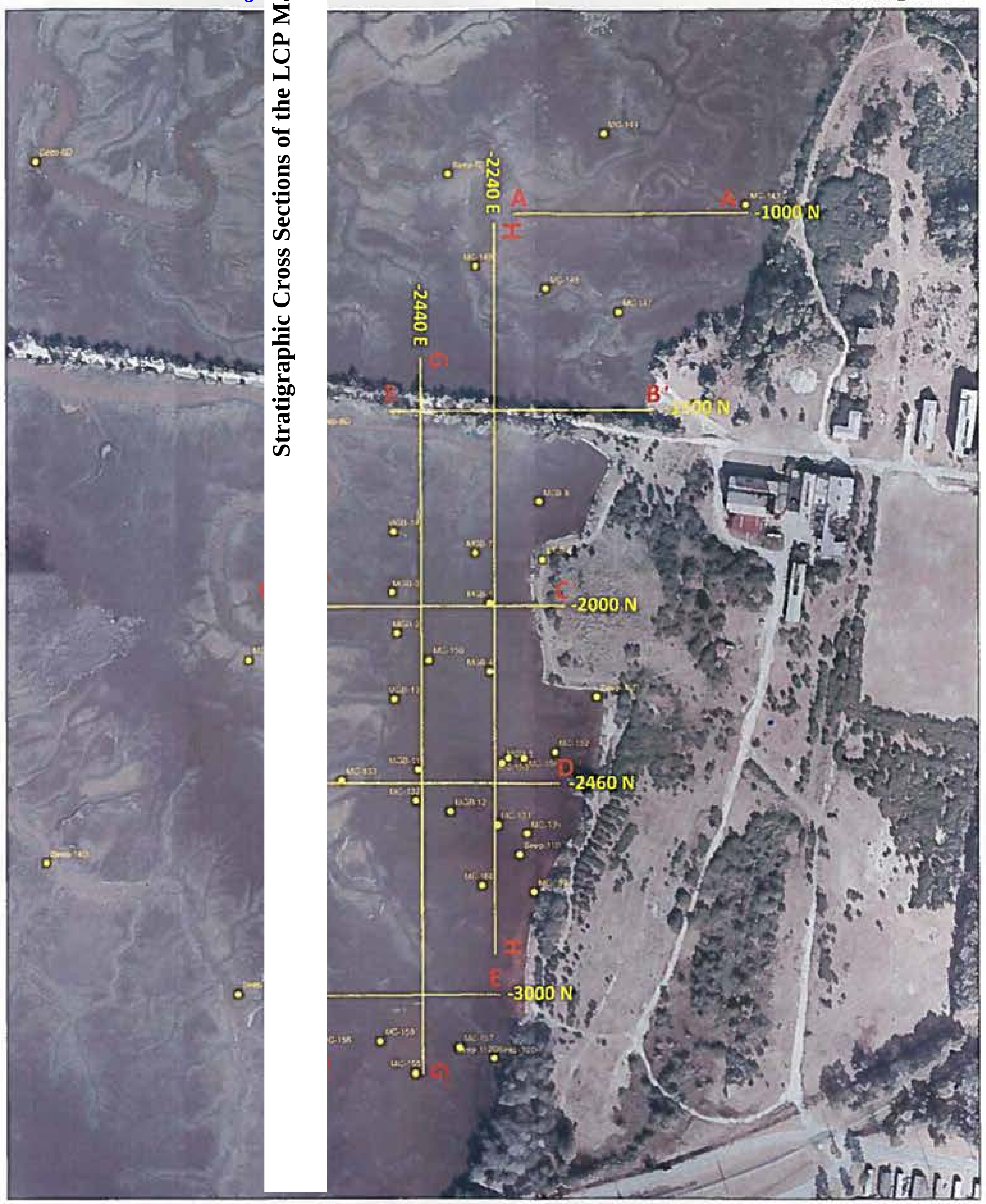


Marsh Clay Thickness (Overlying Surficial Sand Aquifer) **Figure 9**

~~Drawing No. 1~~

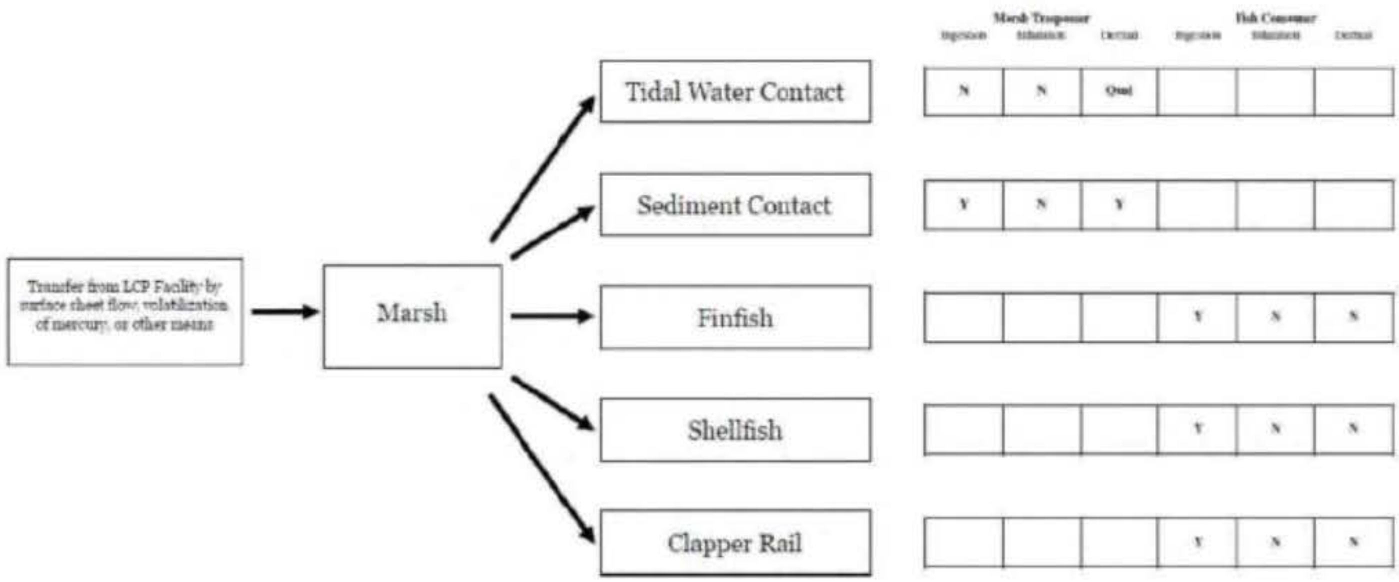


te: Cross sections in the original Site coordinate system



Stratigraphic Cross Sections of the LCP March

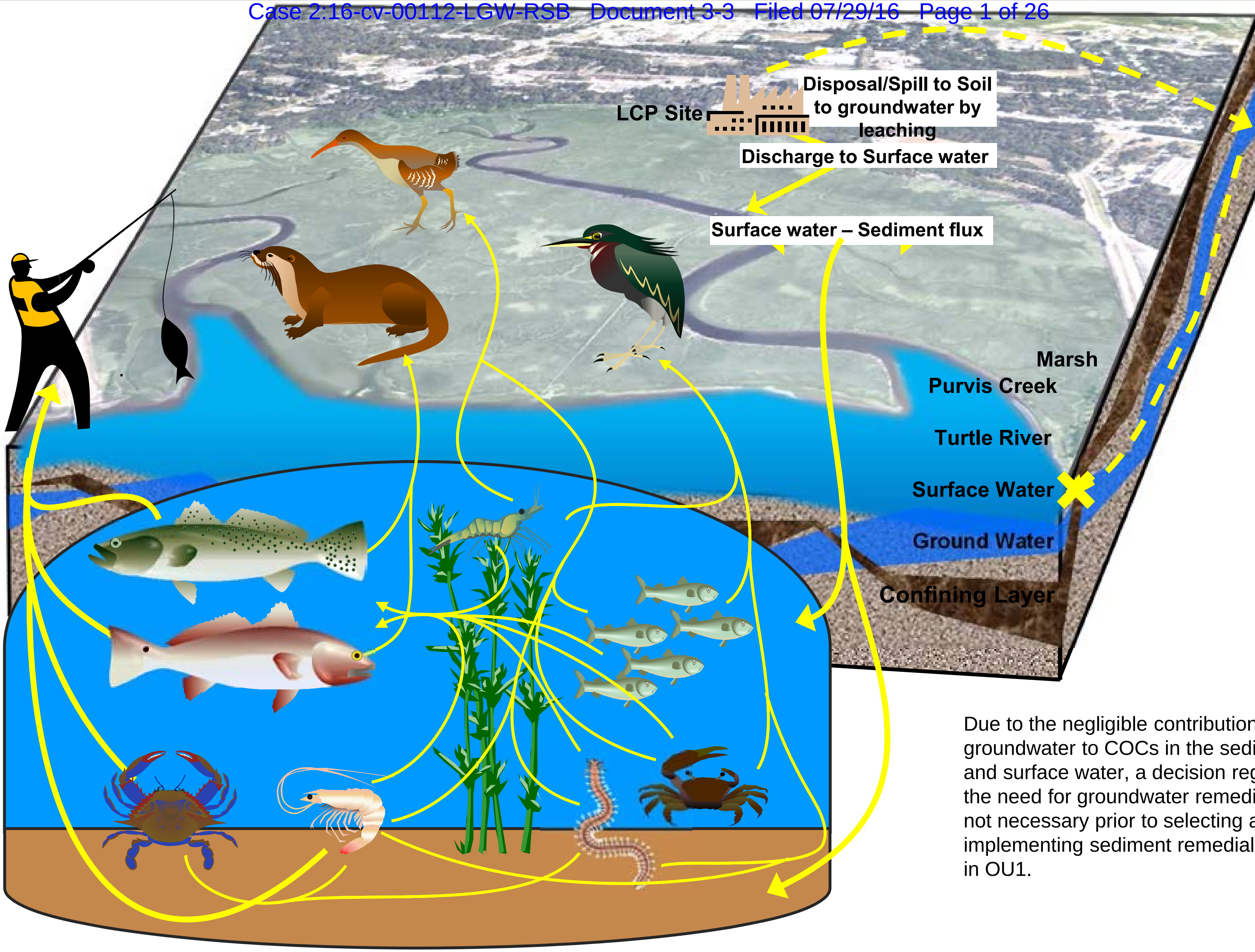
Stratigraphic Cross Sections of the LCP Marsh



Marsh Trespasser, Fish, Shellfish and Game Consumption
LCP Chemical Site
Brunswick, GA

Figure 11
Conceptual Site Model

Baseline Risk Assessment

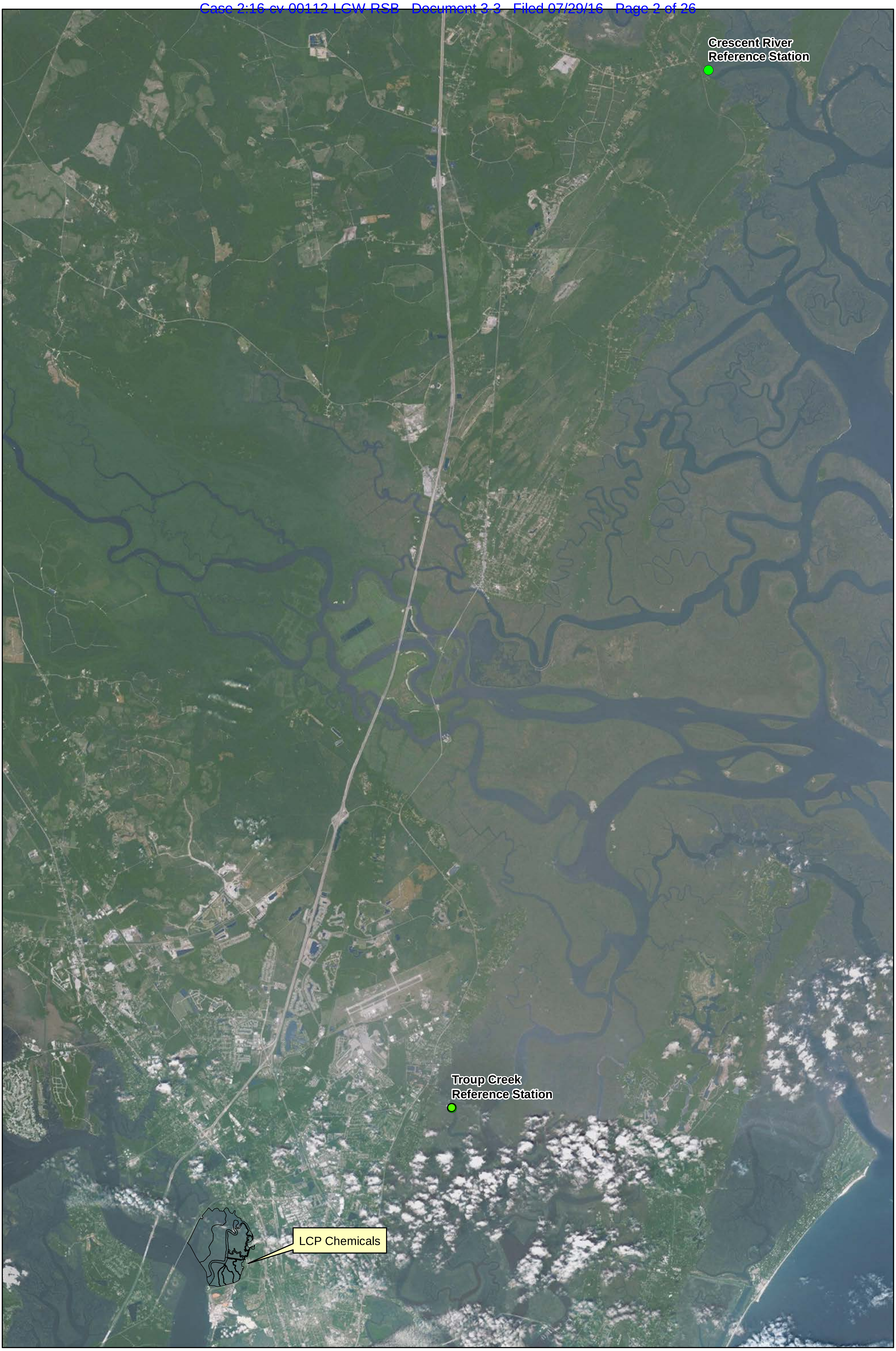


Due to the negligible contributions of groundwater to COCs in the sediments and surface water, a decision regarding the need for groundwater remediation is not necessary prior to selecting and implementing sediment remedial actions in OU1.

Conceptual Site Model for OU1

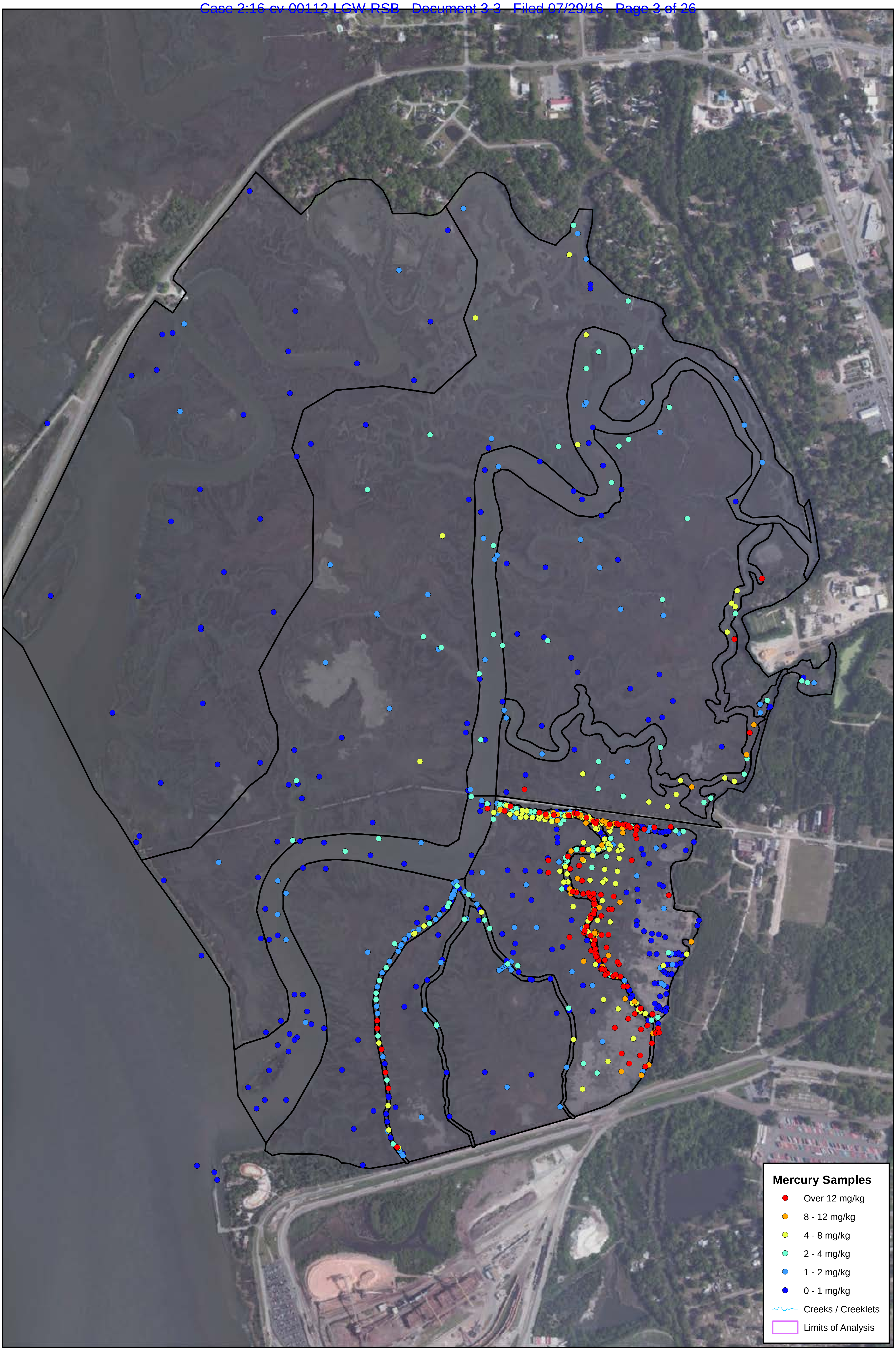
LCP CHEMICAL SITE, BRUNSWICK, GEORGIA

Figure 12



Troup Creek and Crescent River Reference Stations
Brunswick, GA

Figure 13

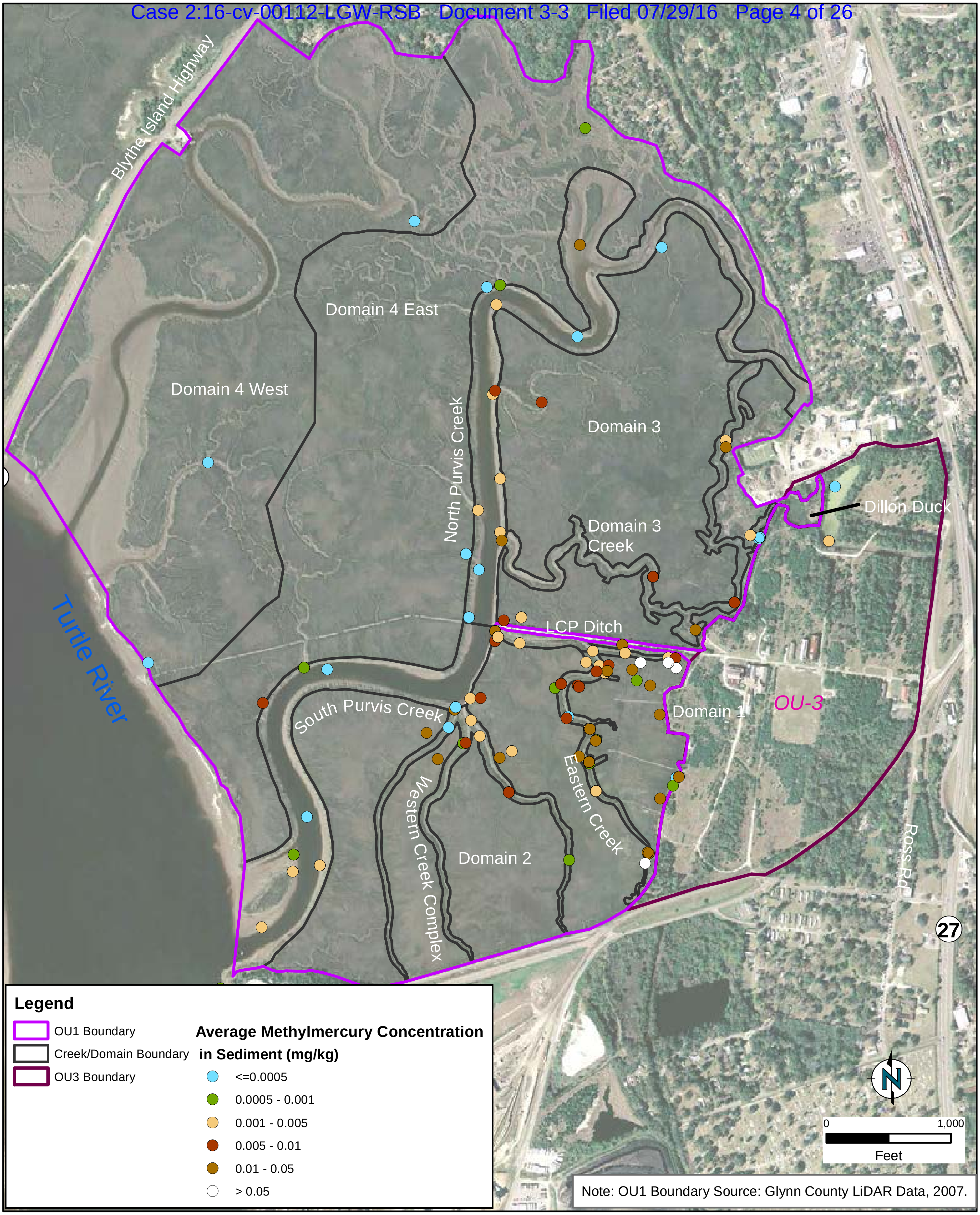


N

0 250 500 750 1,000
Feet

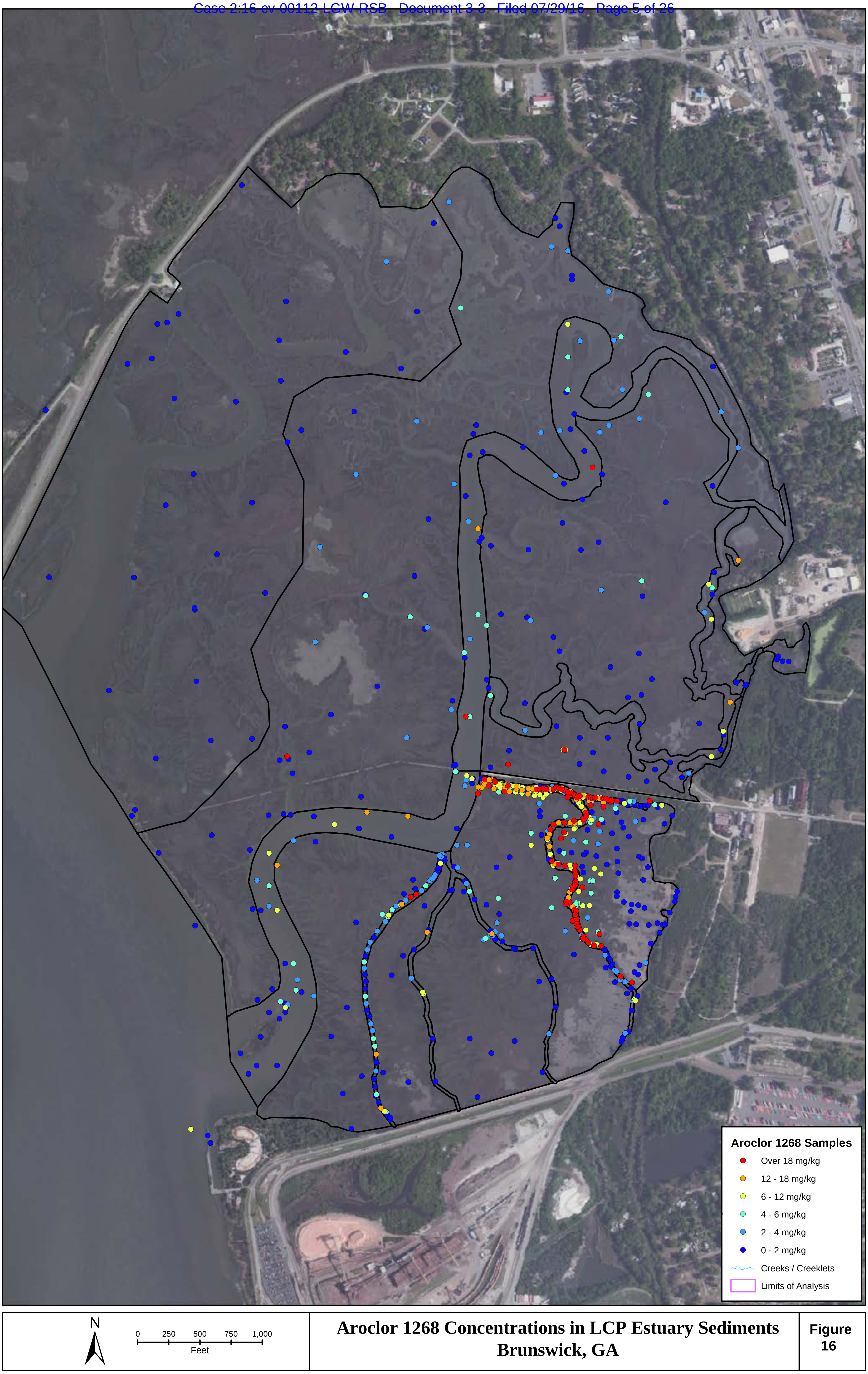
Mercury Concentrations in LCP Estuary Sediments
Brunswick, GA

Figure 14



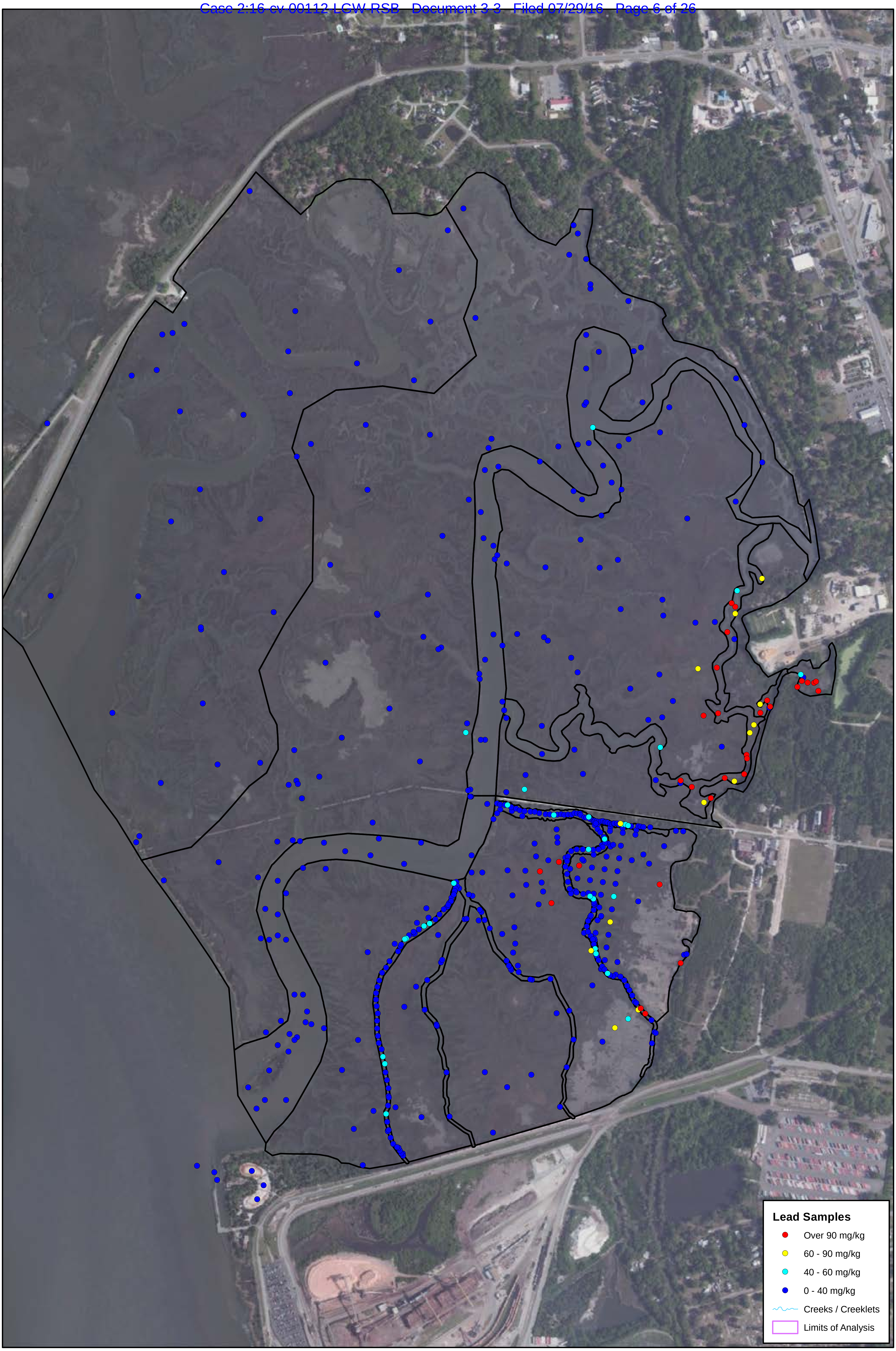
	Average Methylmercury Concentration in Surface Sediments	**Figure 15**
	LCP CHEMICAL SITE, BRUNSWICK, GEORGIA	

lid48934 Date Saved: 11/14/2013 11:35:44 AM N:\FSD\EPA\LCP\Aroclor-1268_Dot_20131112.mxd



Aroclor 1268 Concentrations in LCP Estuary Sediments
Brunswick, GA

Figure 16

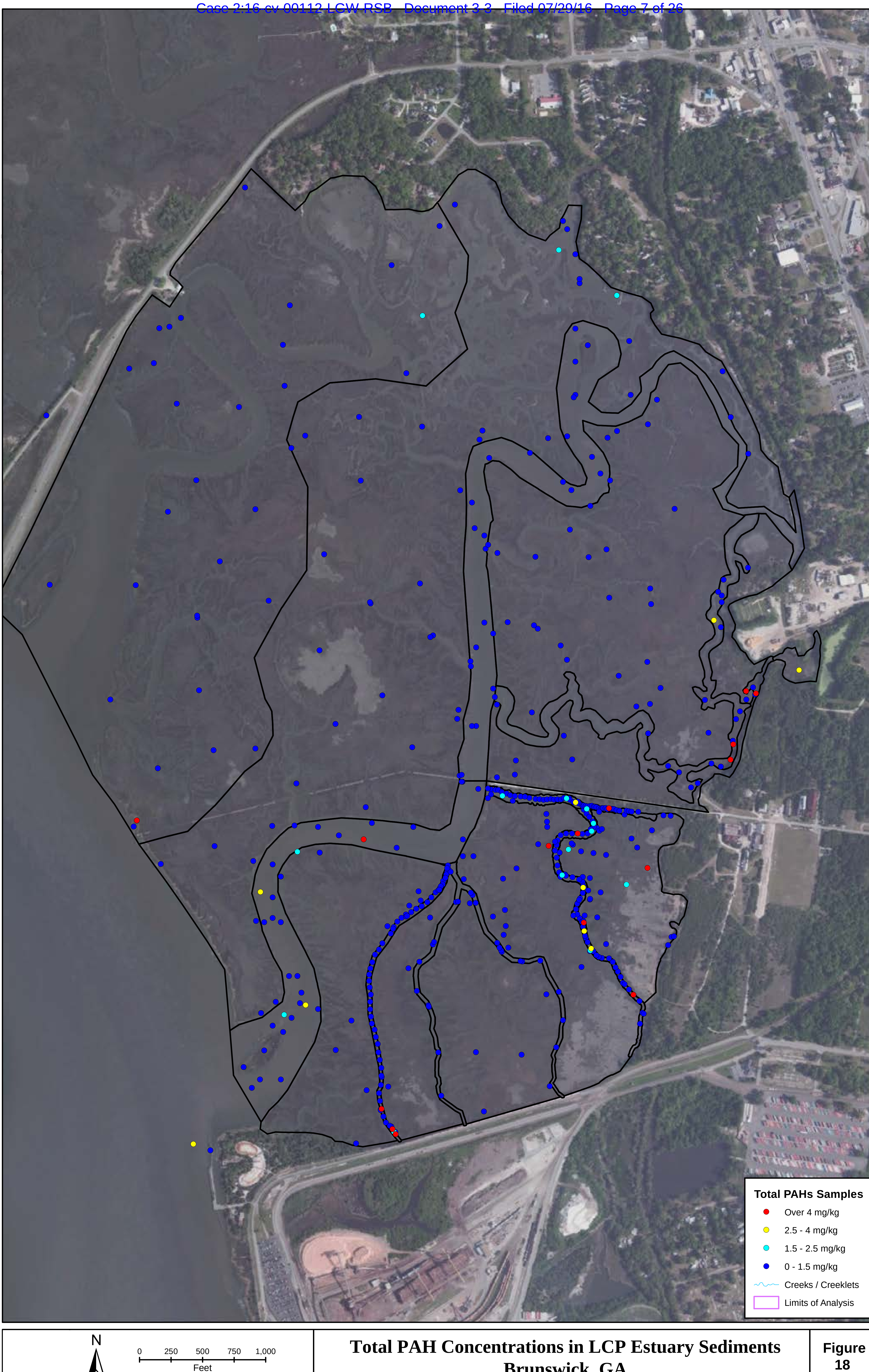


N

0 250 500 750 1,000
Feet

Lead Concentrations in LCP Estuary Sediments
Brunswick, GA

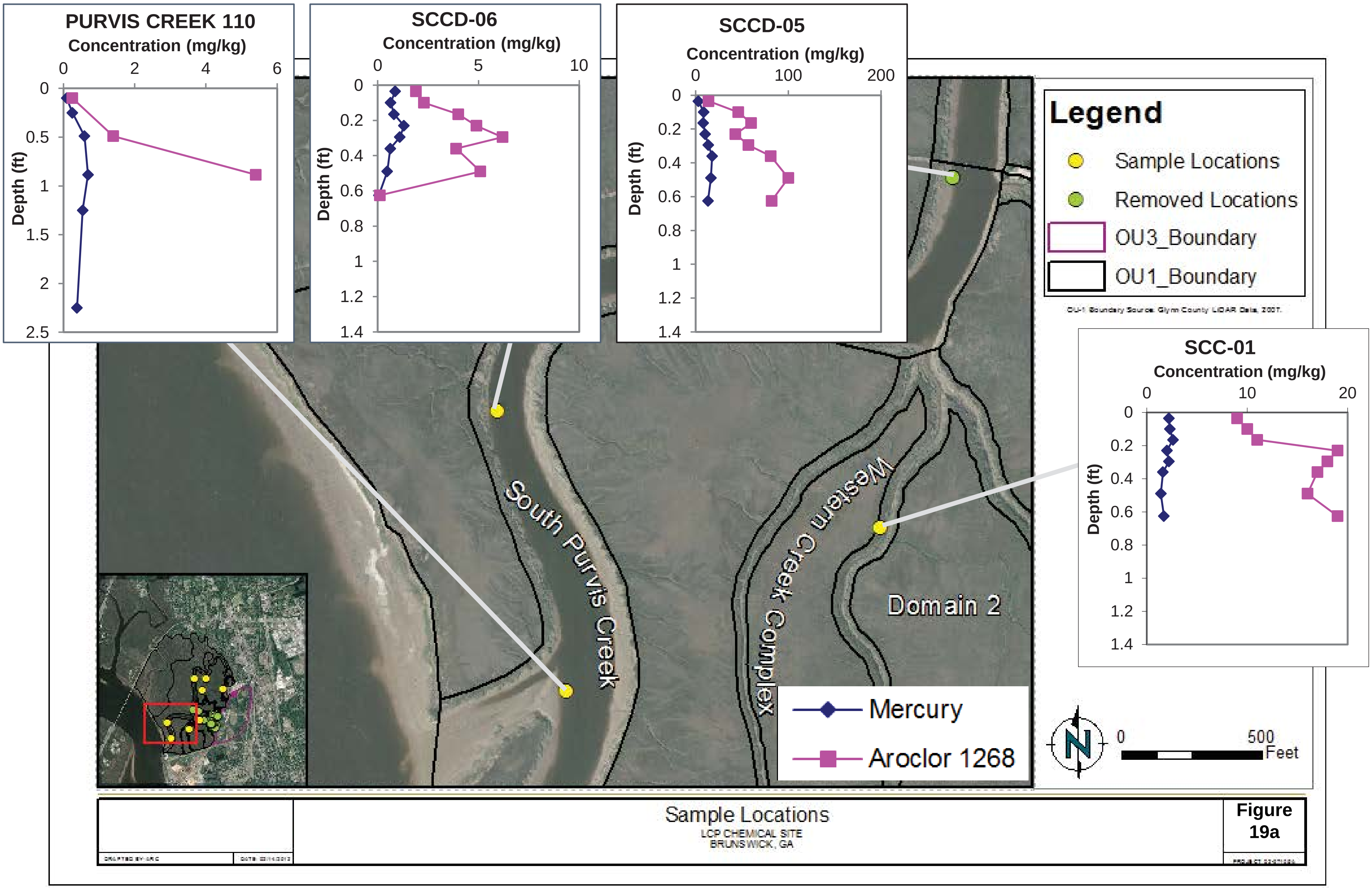
Figure 17



Total PAH Concentrations in LCP Estuary Sediments
Brunswick, GA

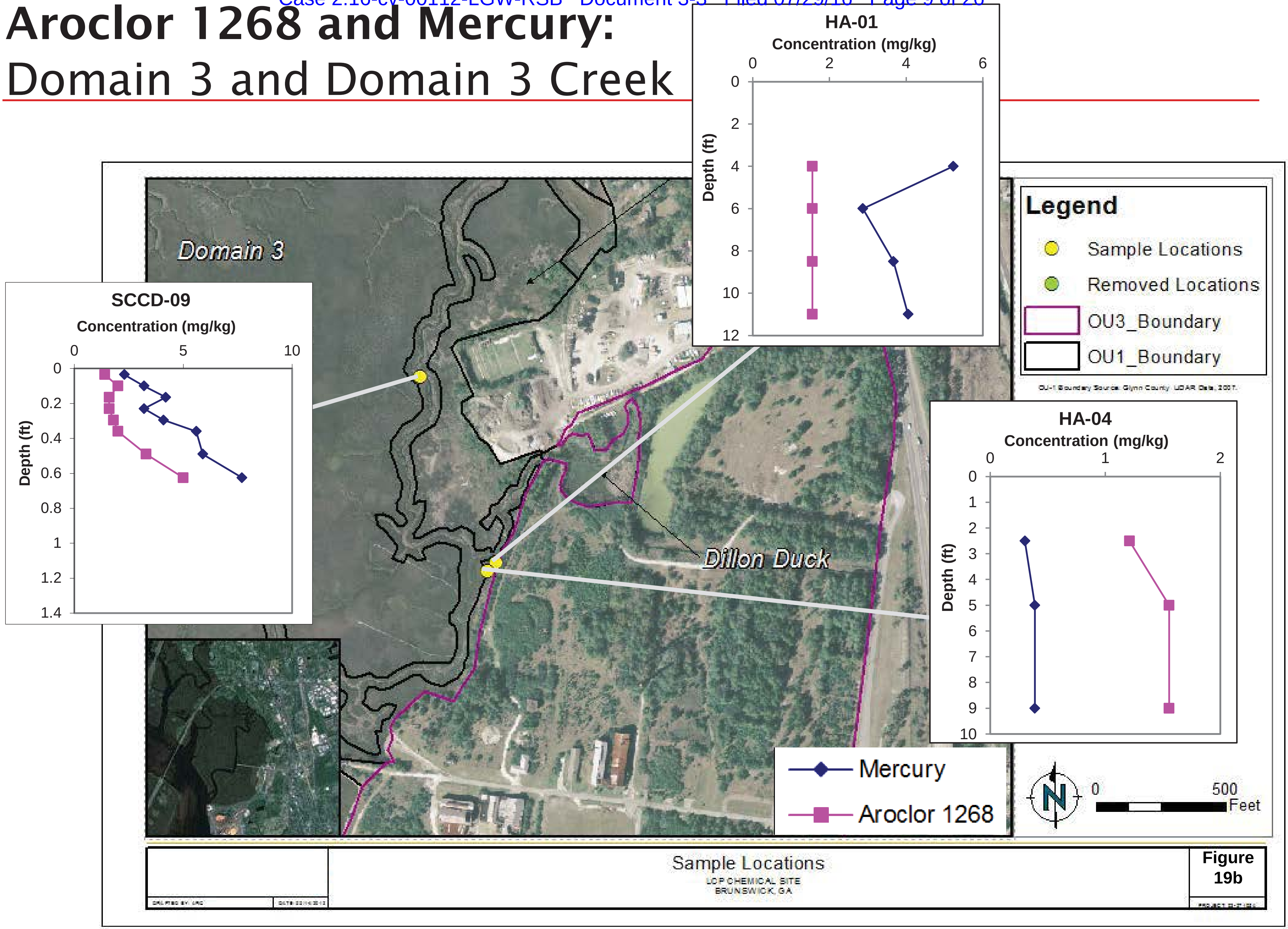
Figure 18

Aroclor 1268 and Mercury:
Western Creek and South Purvis Creek



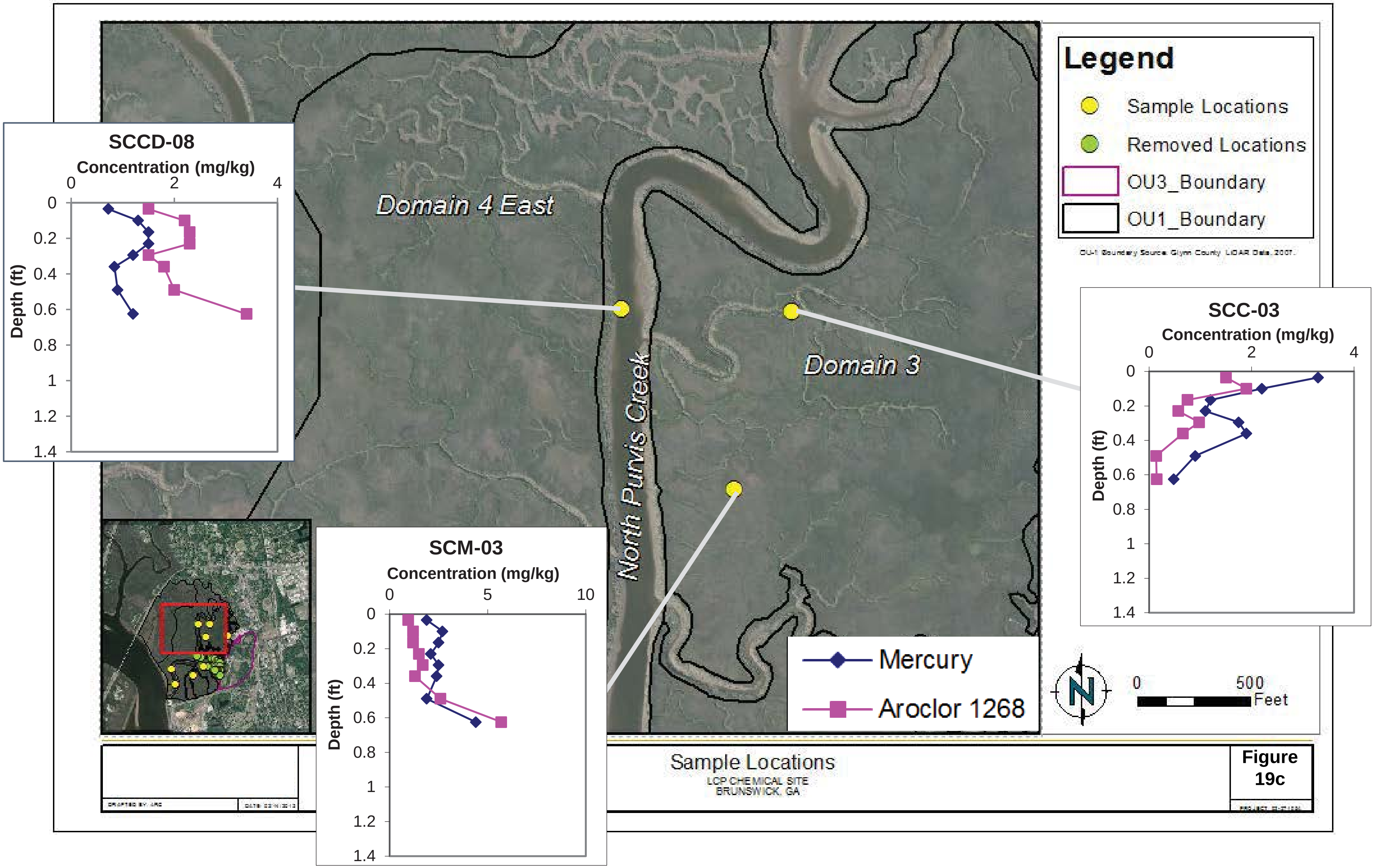
Revised May 2012

Aroclor 1268 and Mercury:
Domain 3 and Domain 3 Creek



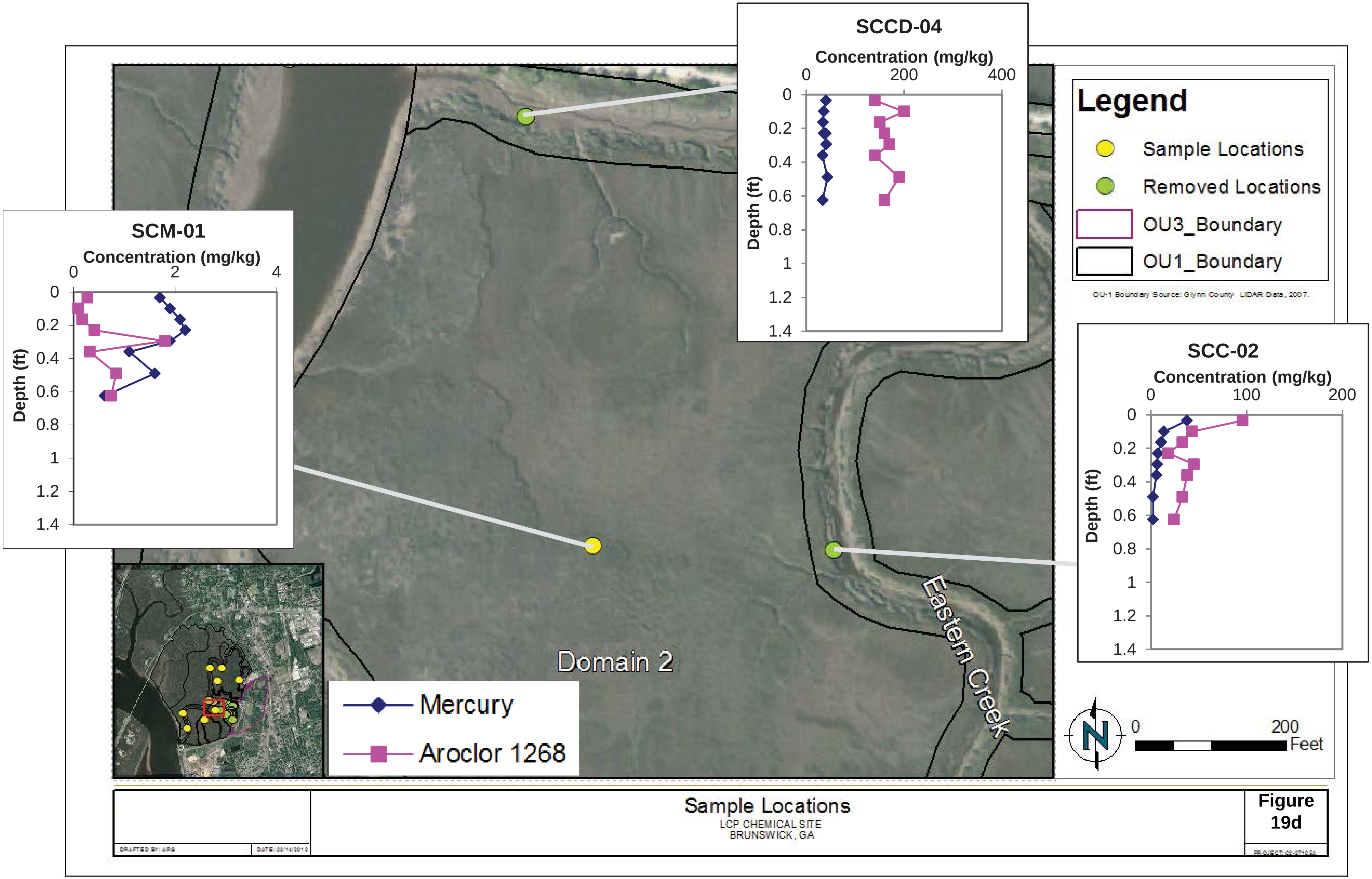
Revised May 2012

Aroclor 1268 and Mercury:
Domain 3 and North Purvis Creek



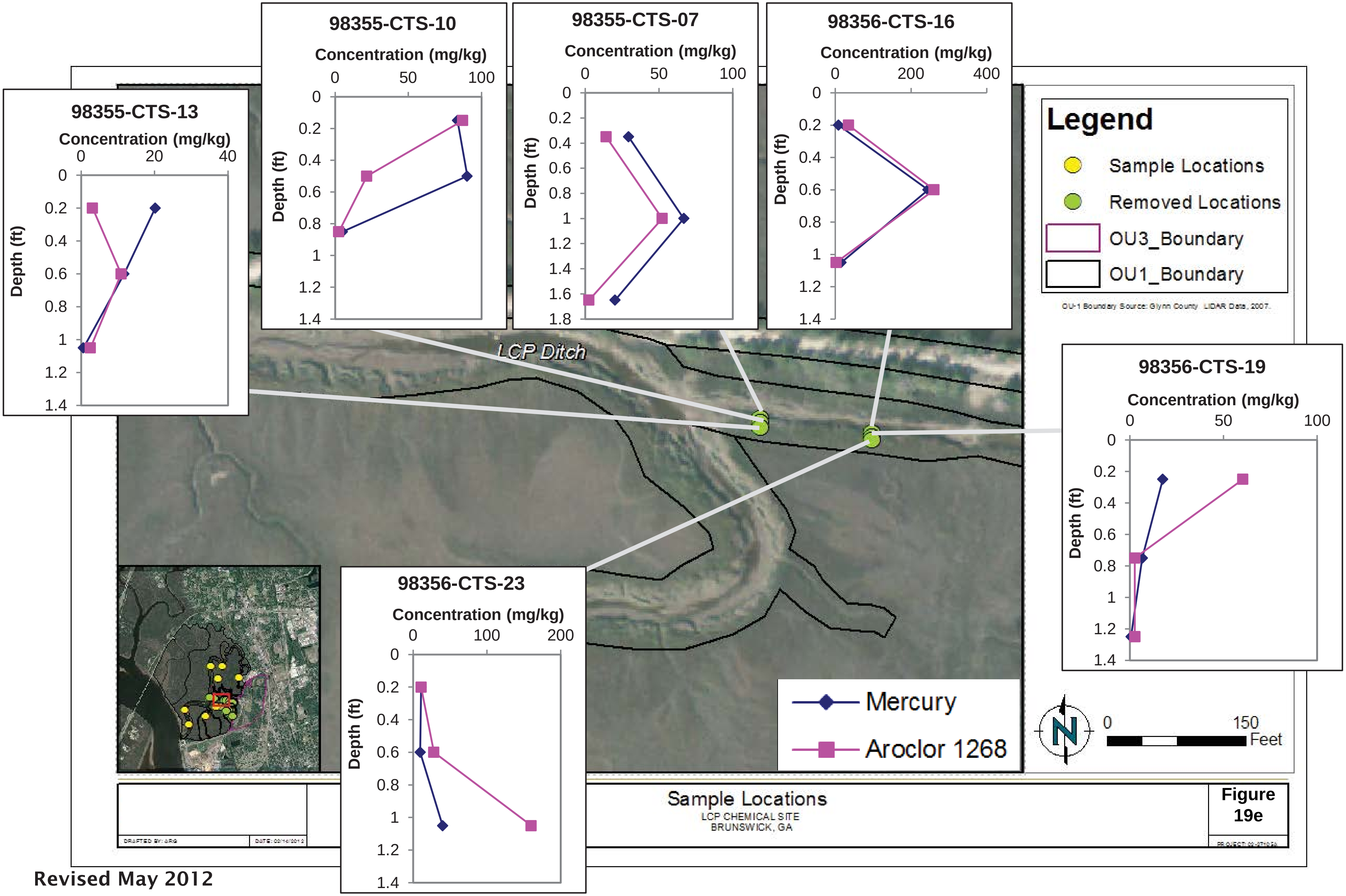
Revised May 2012

Aroclor 1268 and Mercury:
LCP Ditch, Domain 2 and Eastern Creek



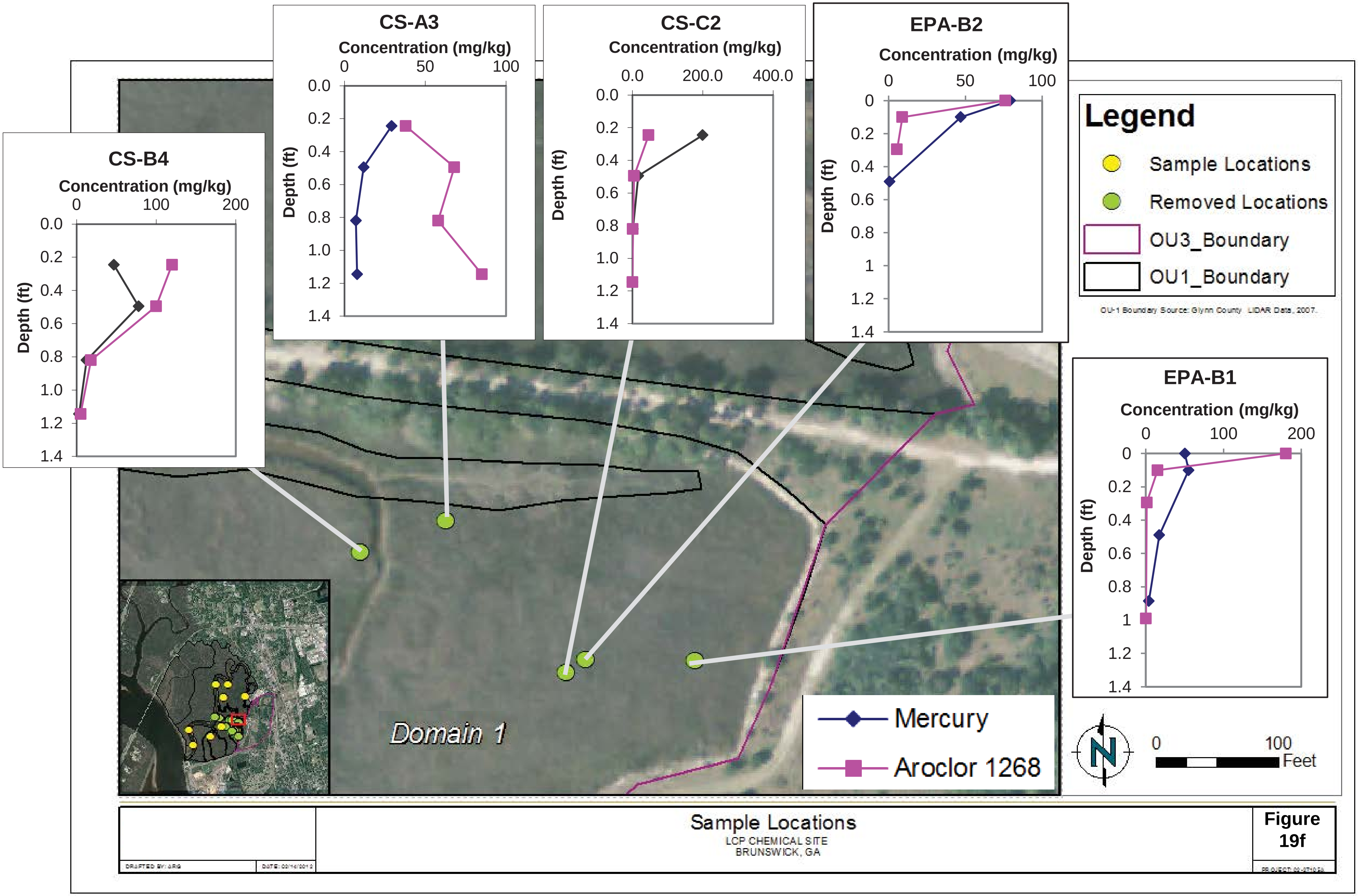
Revised May 2012

Aroclor 1268 and Mercury:
LCP Ditch



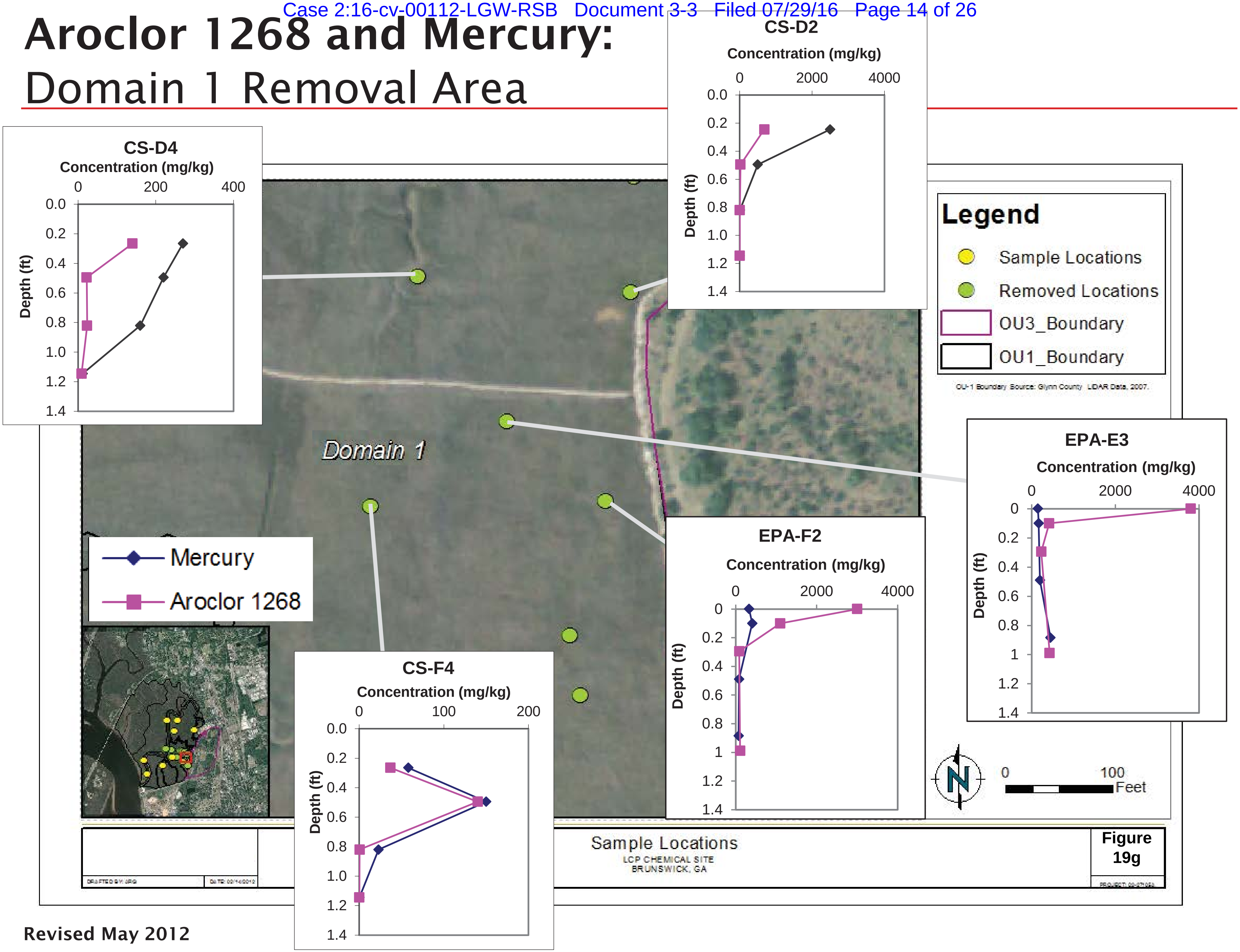
Revised May 2012

Aroclor 1268 and Mercury:
Domain 1 Removal Area



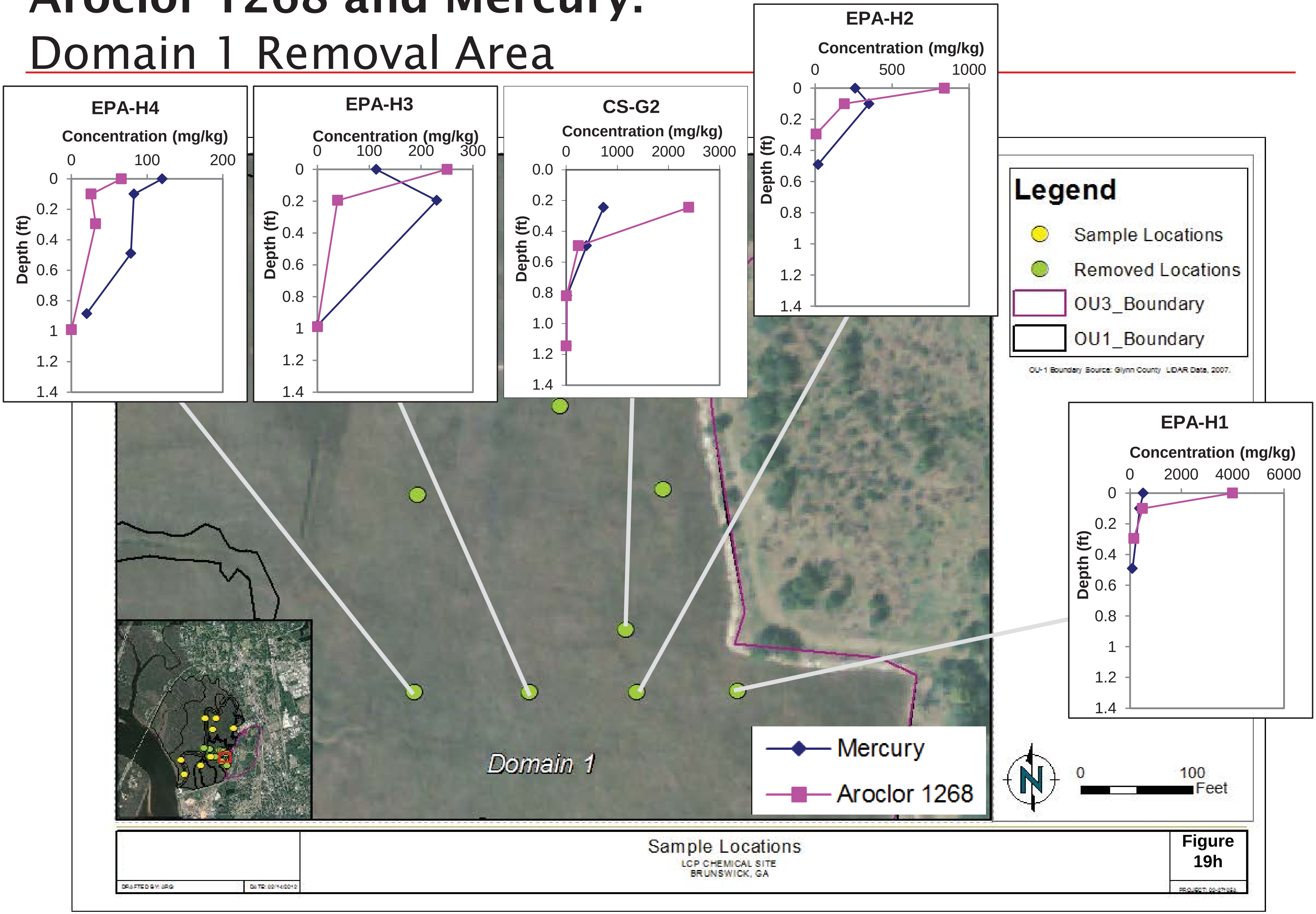
Revised May 2012

Aroclor 1268 and Mercury:
Domain 1 Removal Area



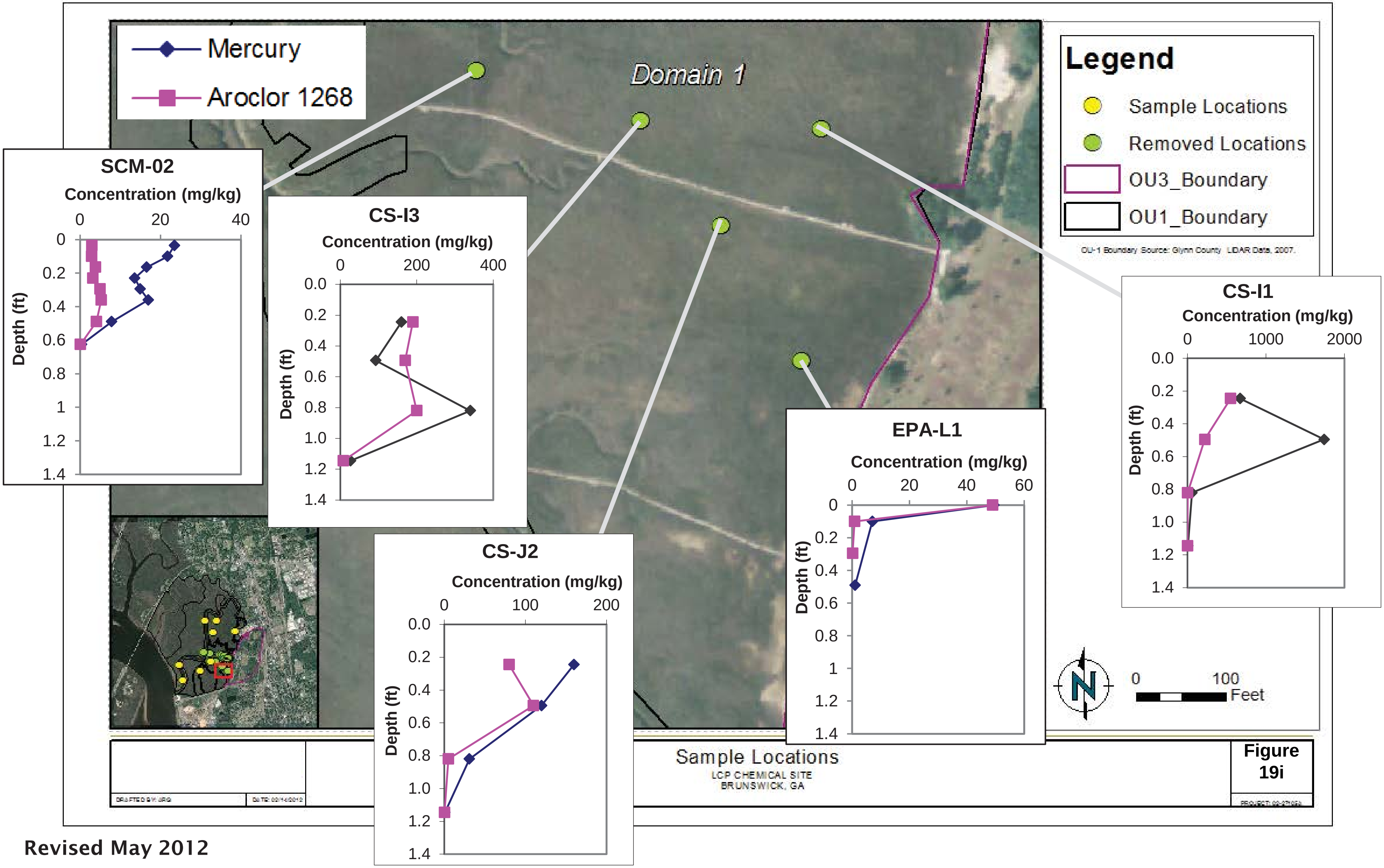
Revised May 2012

Aroclor 1268 and Mercury:
Domain 1 Removal Area



Revised May 2012

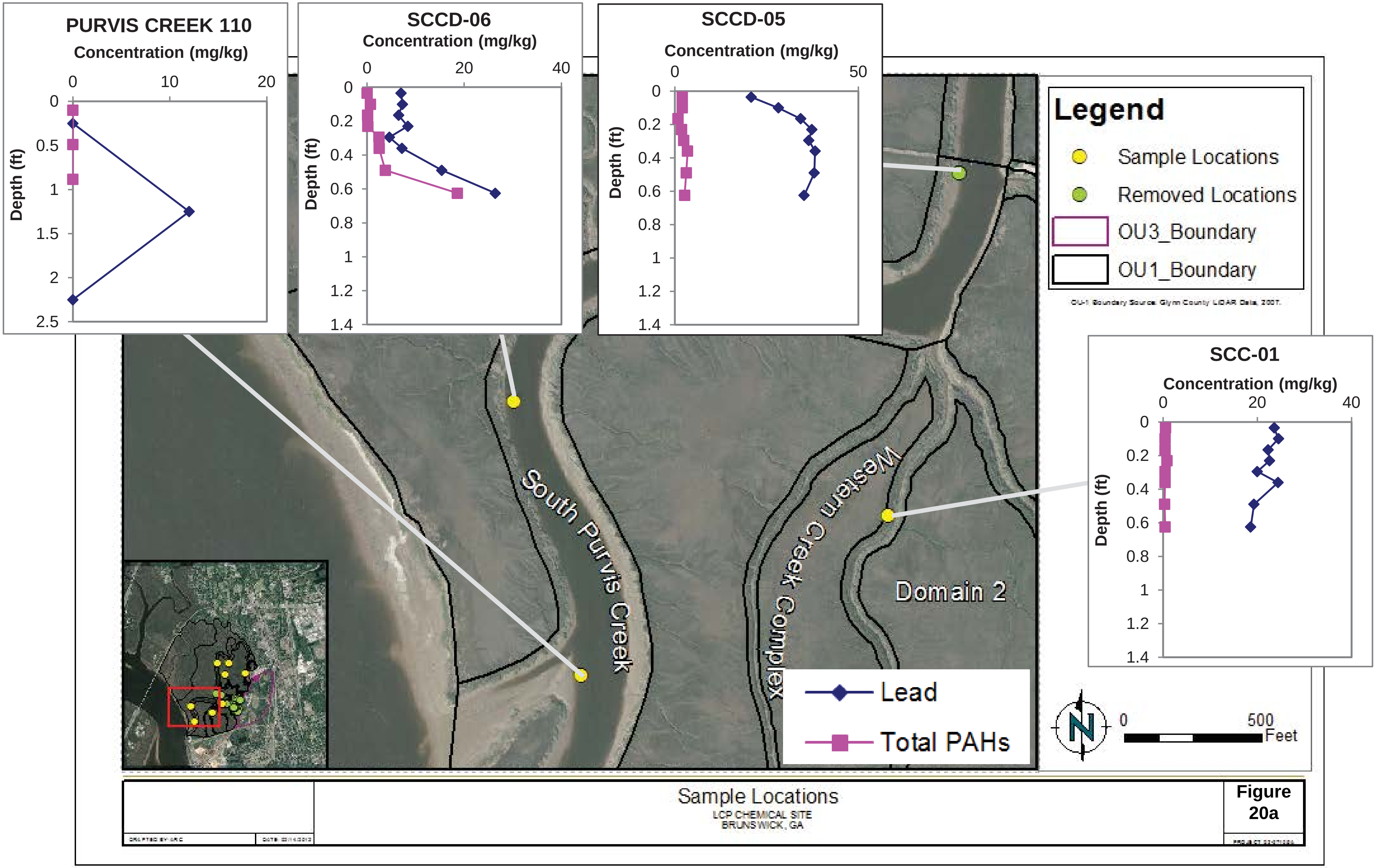
Aroclor 1268 and Mercury:
Domain 1 Removal Area



Revised May 2012

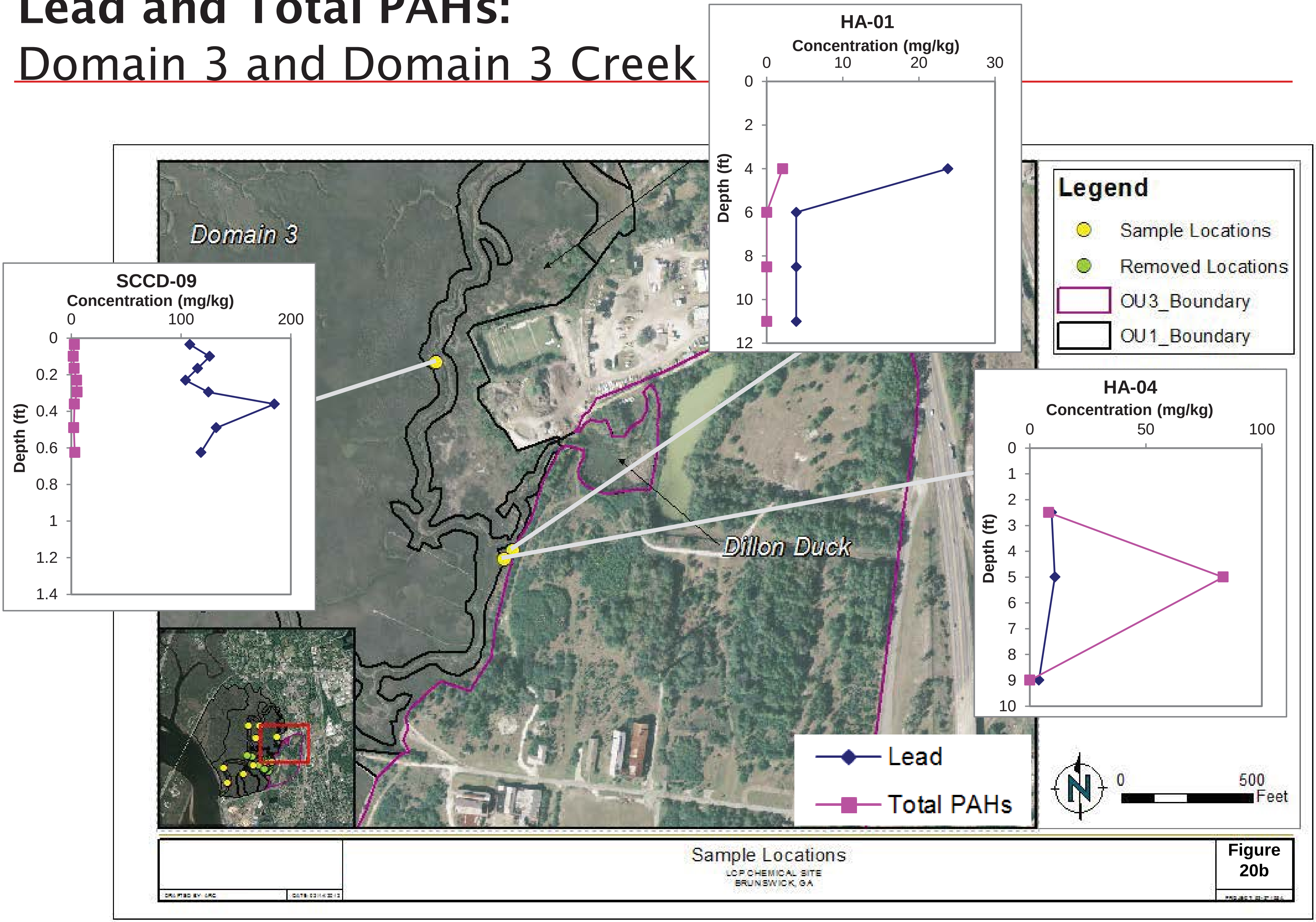
Lead and Total PAHs:

Western Creek and South Purvis Creek



Revised May 2012

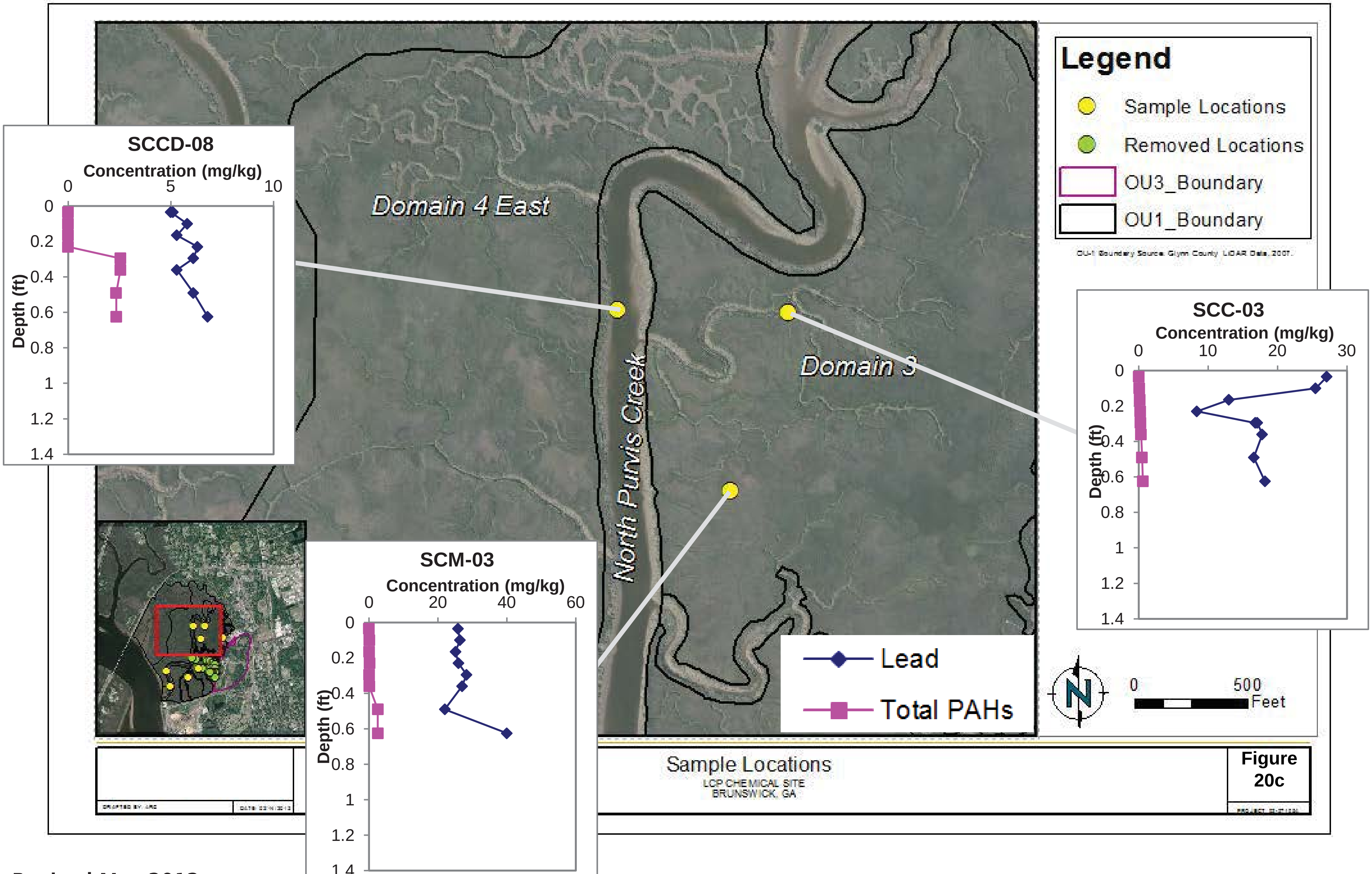
Lead and Total PAHs:
Domain 3 and Domain 3 Creek



Revised May 2012

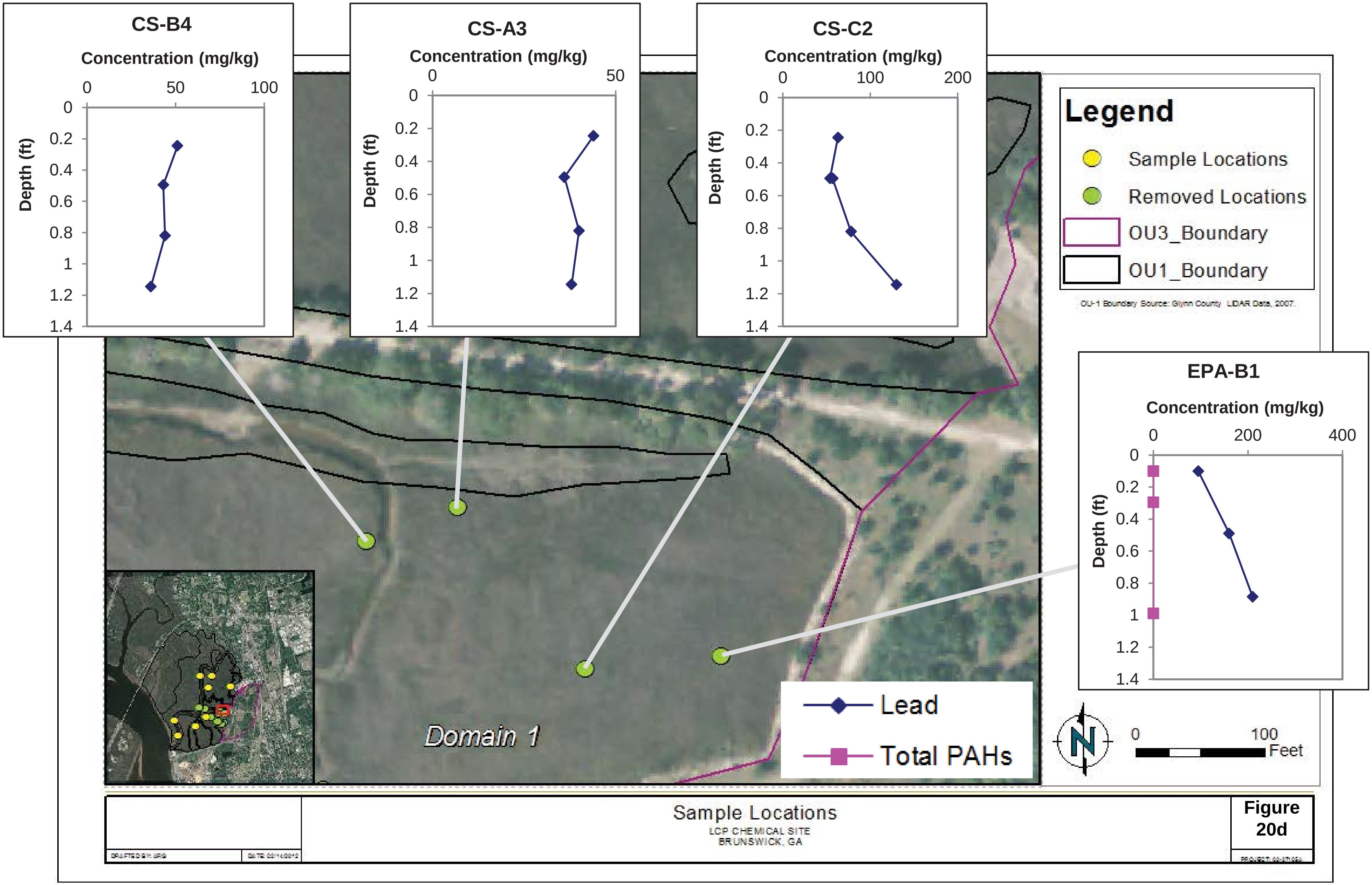
Lead and Total PAHs:

Domain 3 and North Purvis Creek



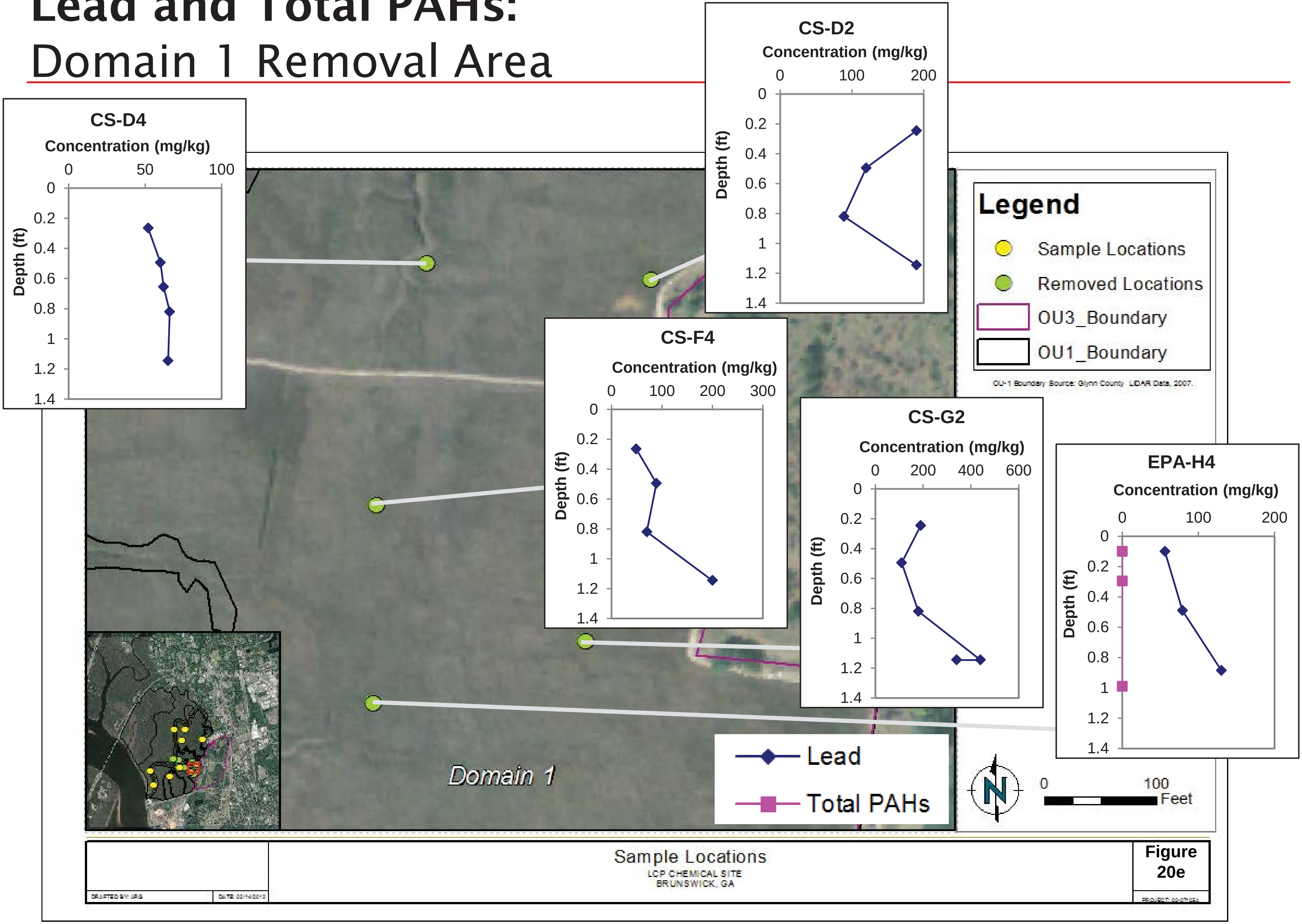
Revised May 2012

Lead and Total PAHs:
Domain 1 Removal Area



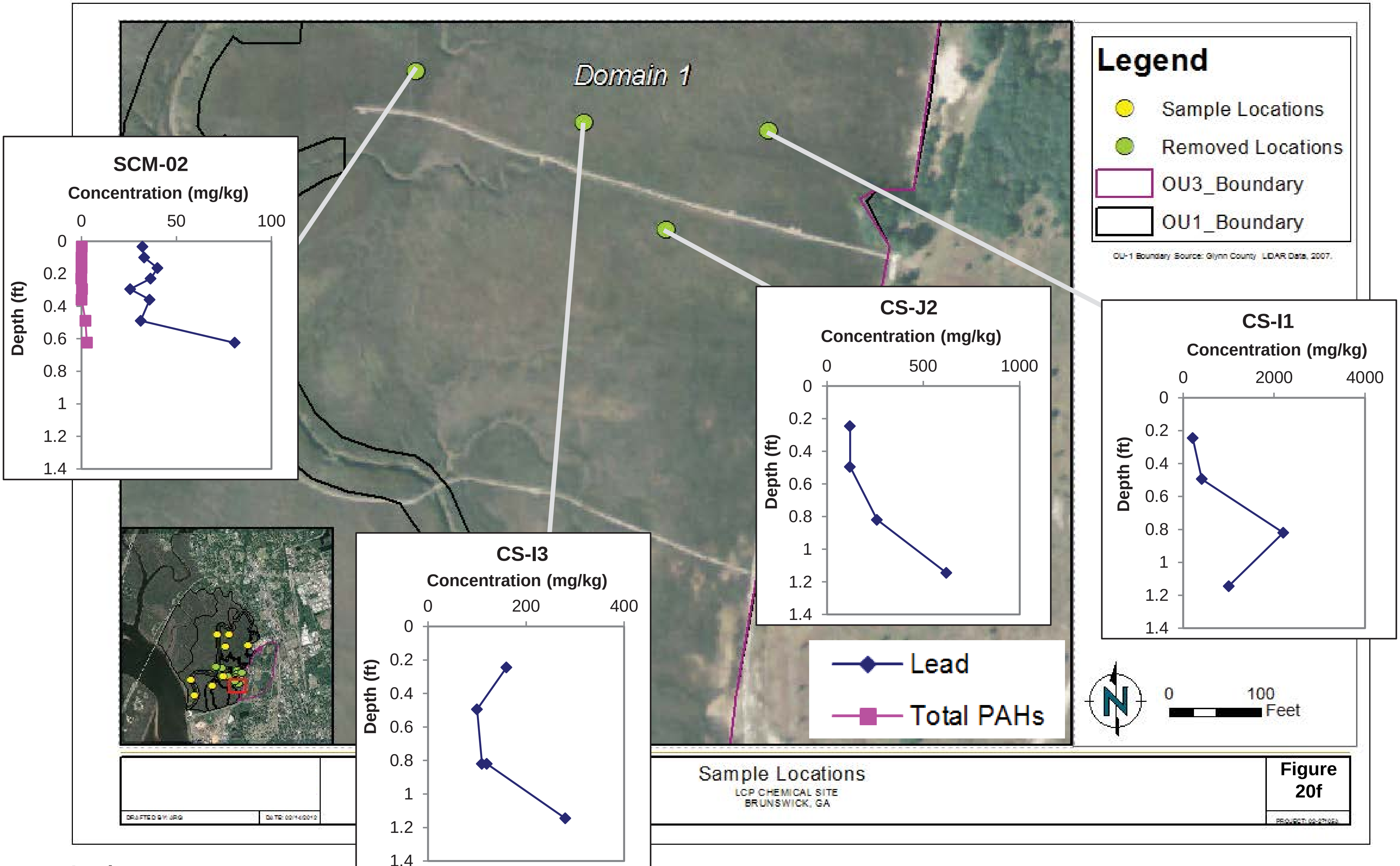
Revised May 2012

Lead and Total PAHs:
Domain 1 Removal Area



Revised May 2012

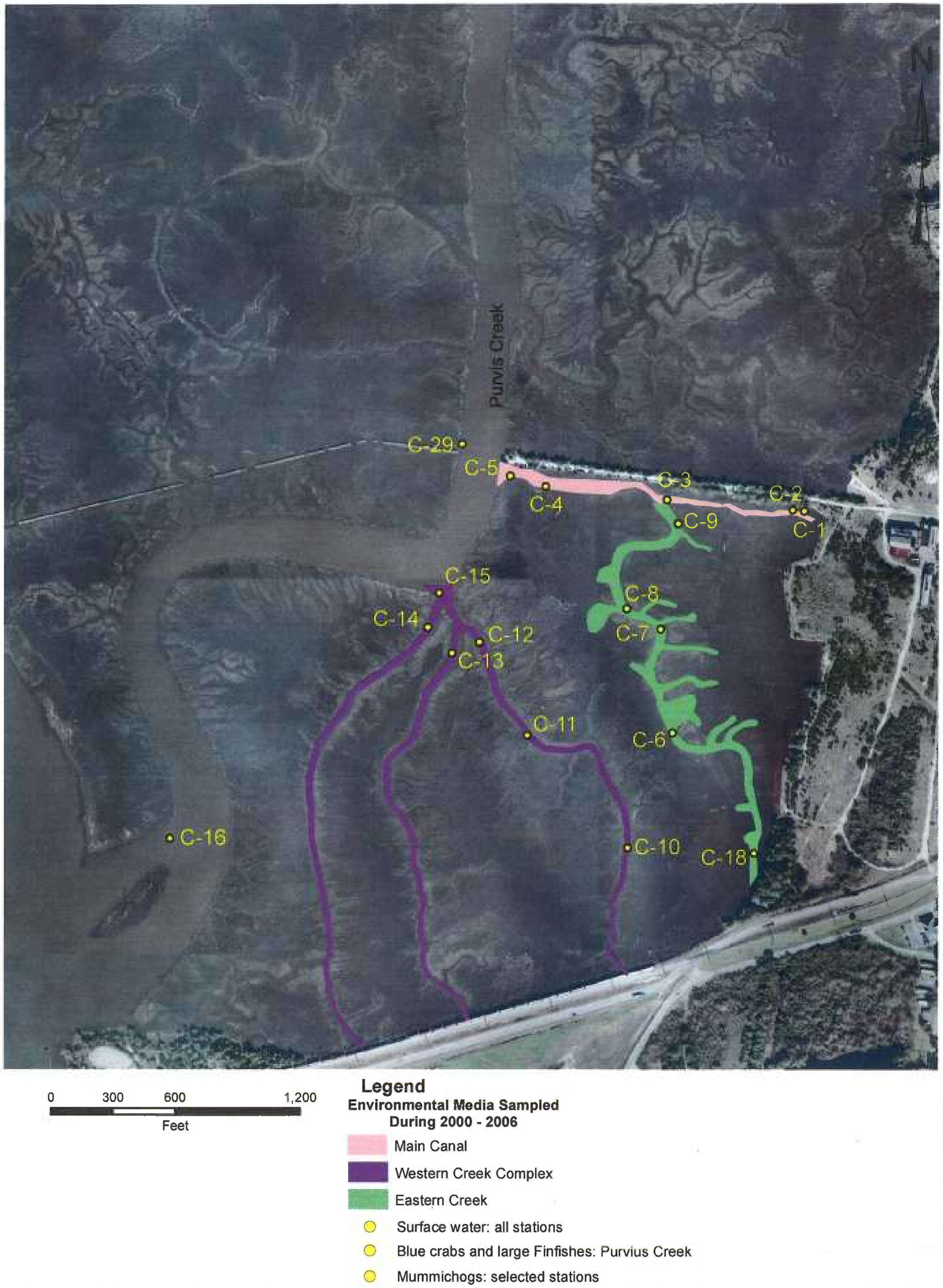
Lead and Total PAHs:
Domain 1 Removal Area

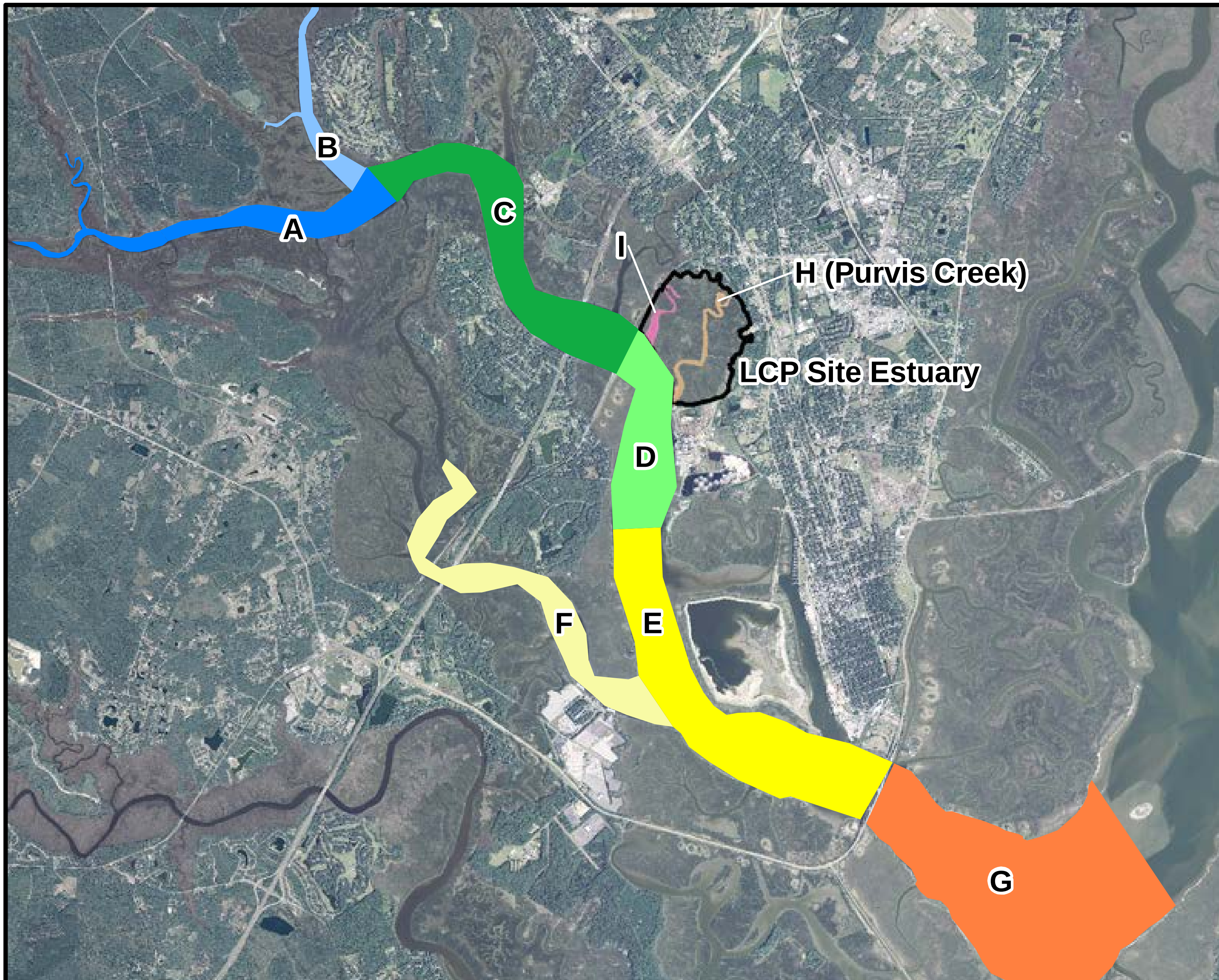


Revised May 2012

Figure 21. Locations of 1995 and 1996 Sediment Samples Analyzed for Dioxins/Furans and Aroclor 1268

Figure 22 - Locations of sampling stations for surface water of major creeks and associated biota in estuary at LCP Site. Refer to Table 2 for details of sampling of environmental media.





Legend

- Zone A
- Zone B
- Zone C
- Zone D
- Zone E
- Zone F
- Zone G
- Zone H
- Zone I
- LCP Site Estuary

Fish Consumption Guideline Zones

Lower Turtle and South Brunswick Rivers (Zones E, F, G)

Middle Turtle River (Zone D)

Purvis and Gibson Creek (Zones H and I)

Upper Turtle and Buffalo Rivers (Zones A, B, C)

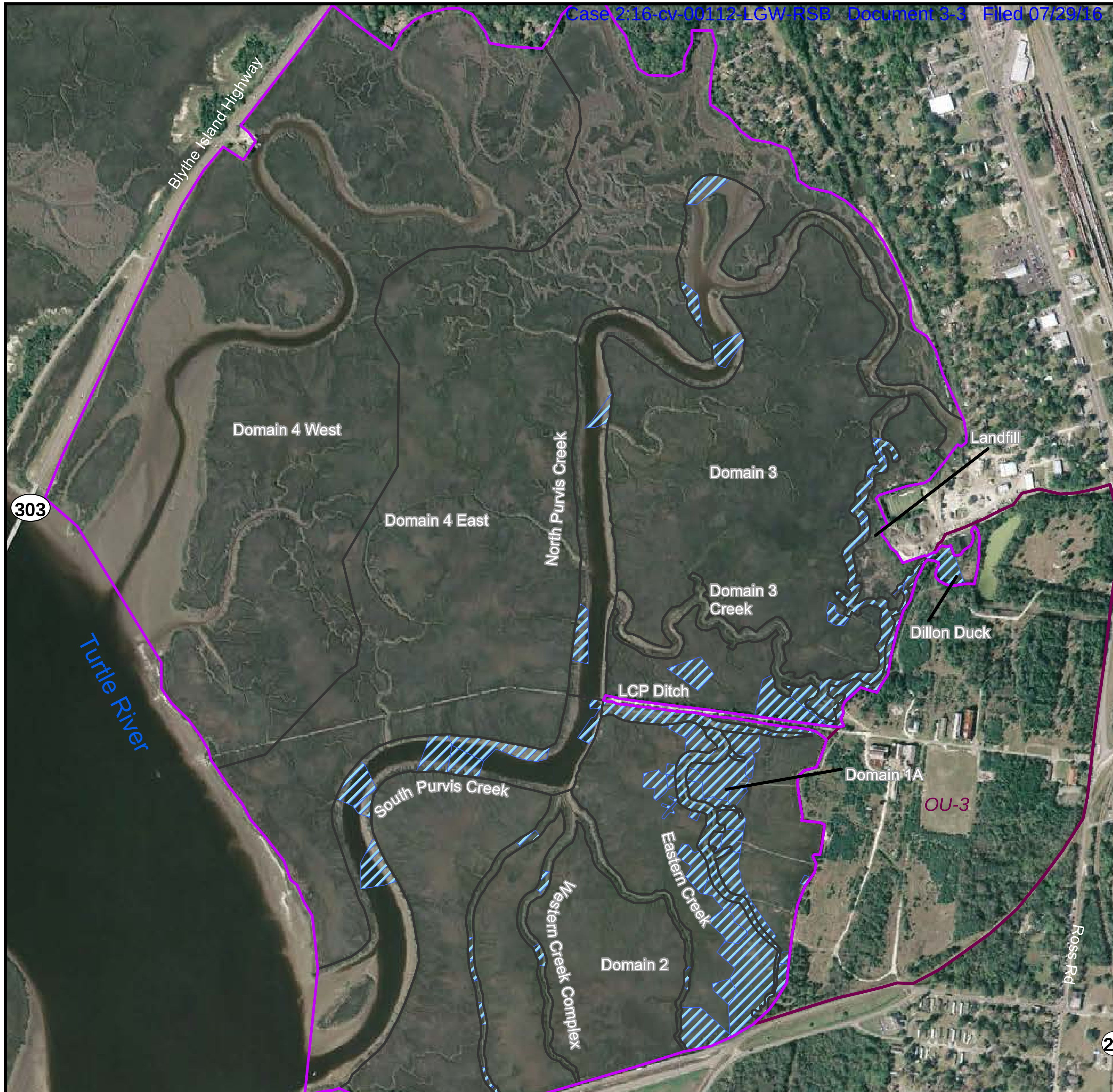
OU1 Boundary Source: Glynn County LiDAR Data, 2007.

0 0.5 1 2 Miles

Collection Locations for Fish and Shellfish within the Turtle River / Brunswick Estuary

LCP CHEMICAL SITE, BRUNSWICK, GEORGIA

Figure 23



Legend

Alternative 2: 48 Acres

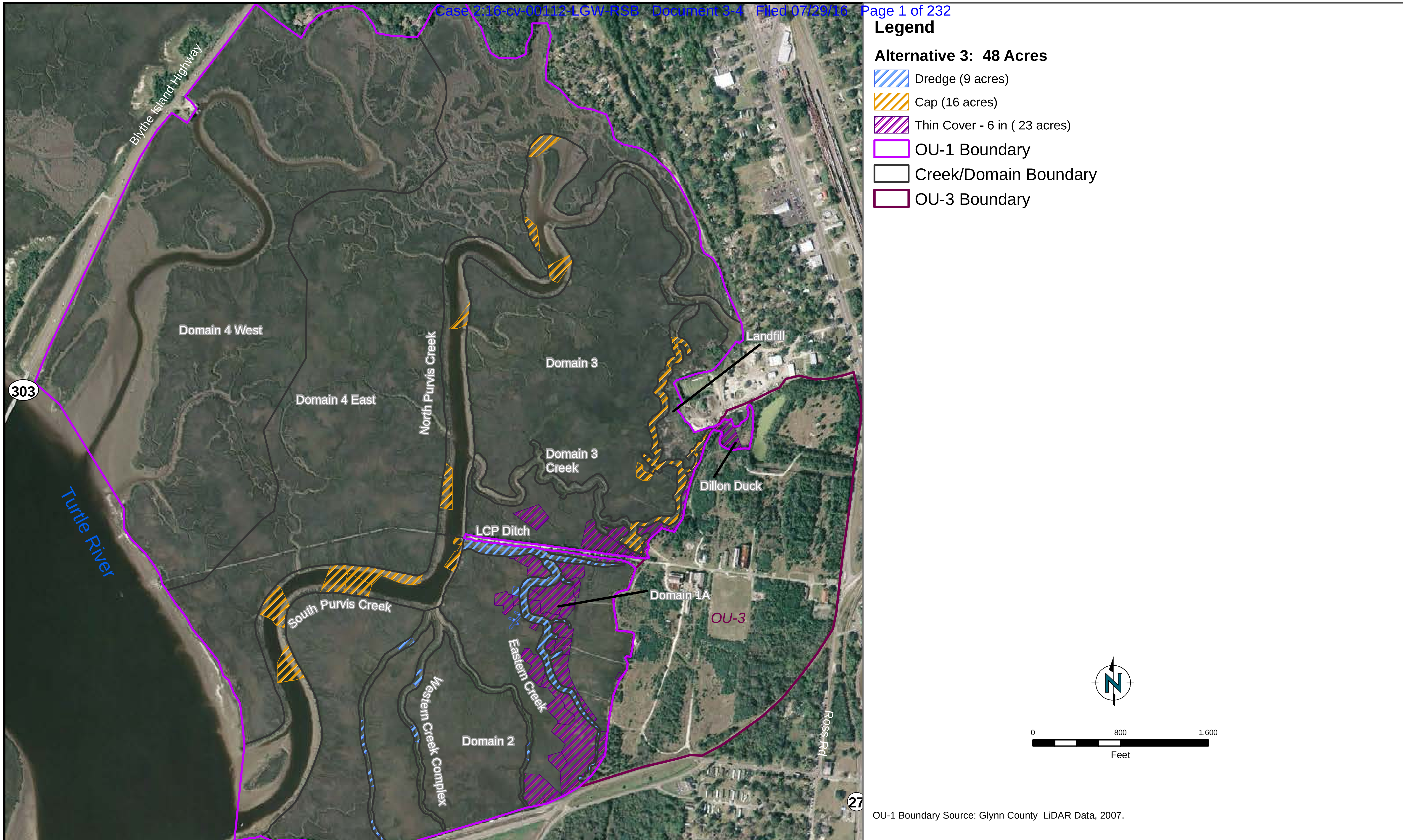
- Dredge All (48 acres)
- OU-1 Boundary
- Creek/Domain Boundary
- OU-3 Boundary

N

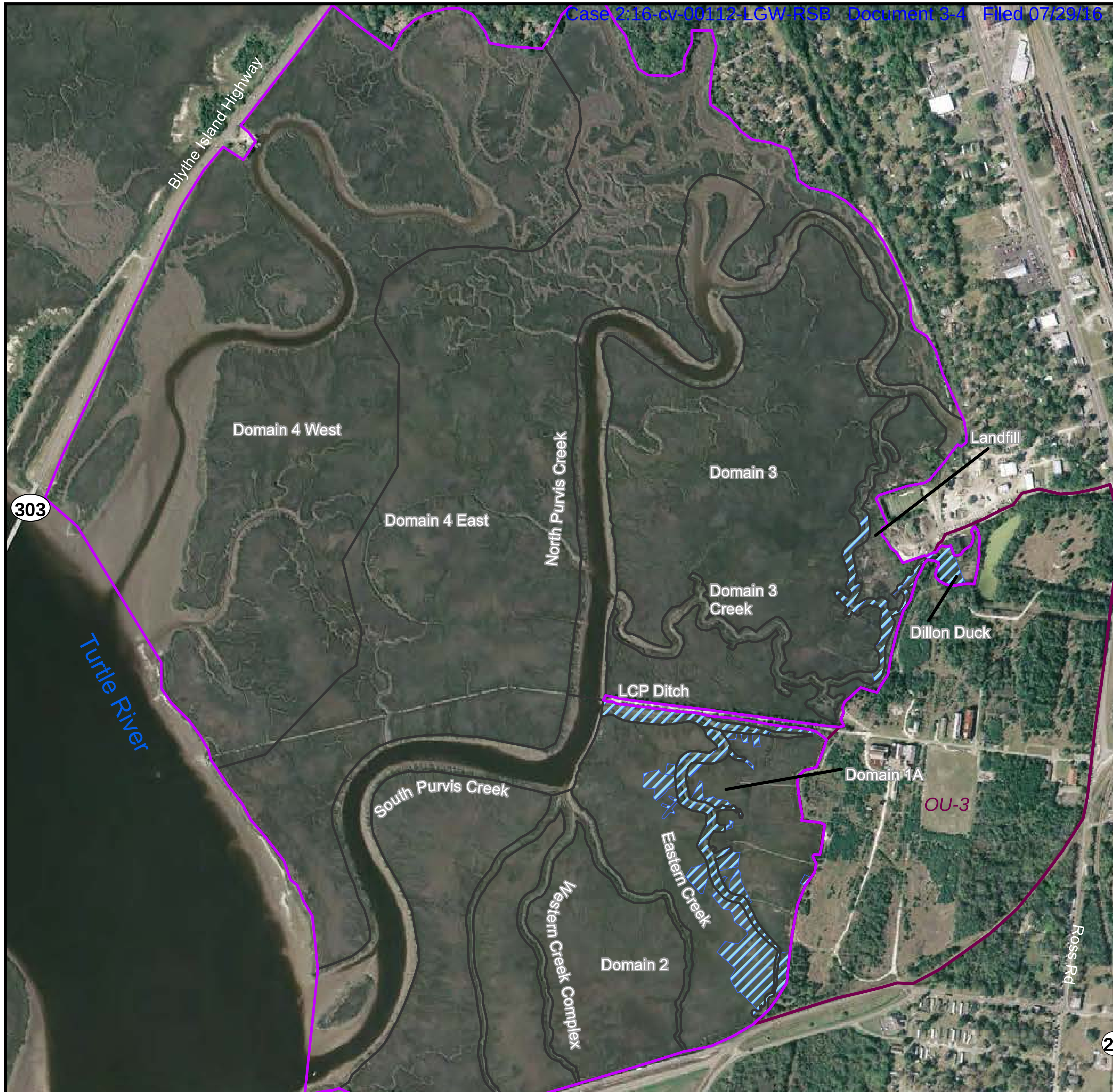
0 800 1,600
Feet

OU-1 Boundary Source: Glynn County LiDAR Data, 2007.

DRAFTED BY: MRJ	DATE: 03/28/2013	Sediment Remedy Alternative 2: Sediment Removal - 48 Acres LCP CHEMICAL SITE BRUNSWICK, GA	DRAFT	Figure 24 PROJECT: 02-27105C



DRAFTED BY: MRJ	DATE: 03/28/2013	Sediment Remedy Alternative 3: Sediment Removal, Capping and Thin Cover - 48 Acres LCP CHEMICAL SITE BRUNSWICK, GA	DRAFT	Figure 25 PROJECT: 02-27105C



Legend

Alternative 4: 18 Acres

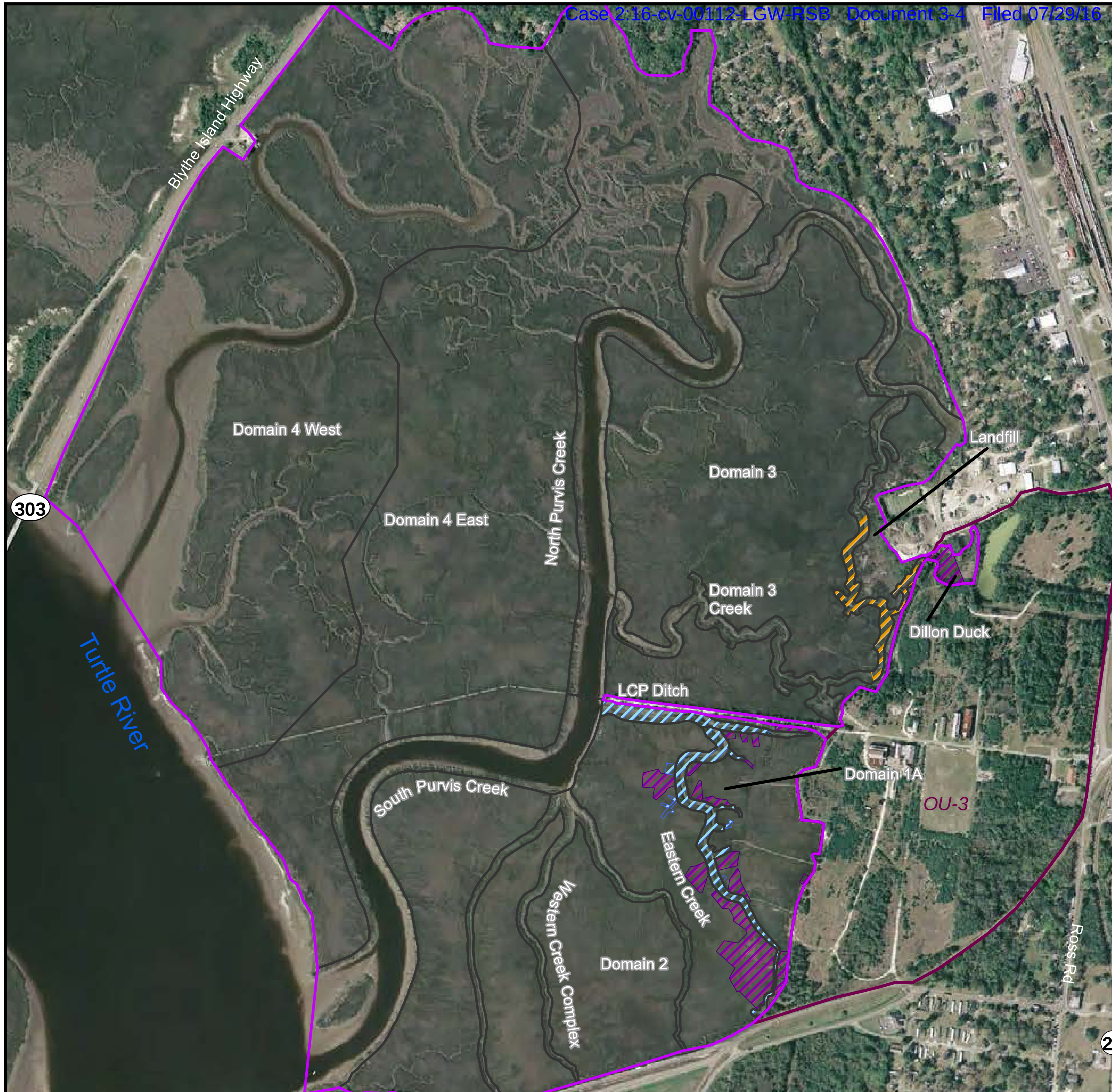
- Dredge All (18 acres)
- OU-1 Boundary
- Creek/Domain Boundary
- OU-3 Boundary

N

0 800 1,600
Feet

OU-1 Boundary Source: Glynn County LiDAR Data, 2007.

DRAFTED BY: MRJ	DATE: 03/28/2013	Sediment Remedy Alternative 4: Sediment Removal - 18 Acres LCP CHEMICAL SITE BRUNSWICK, GA	DRAFT	Figure 26 PROJECT: 02-27105C



Legend

Alternative 5: 18 Acres

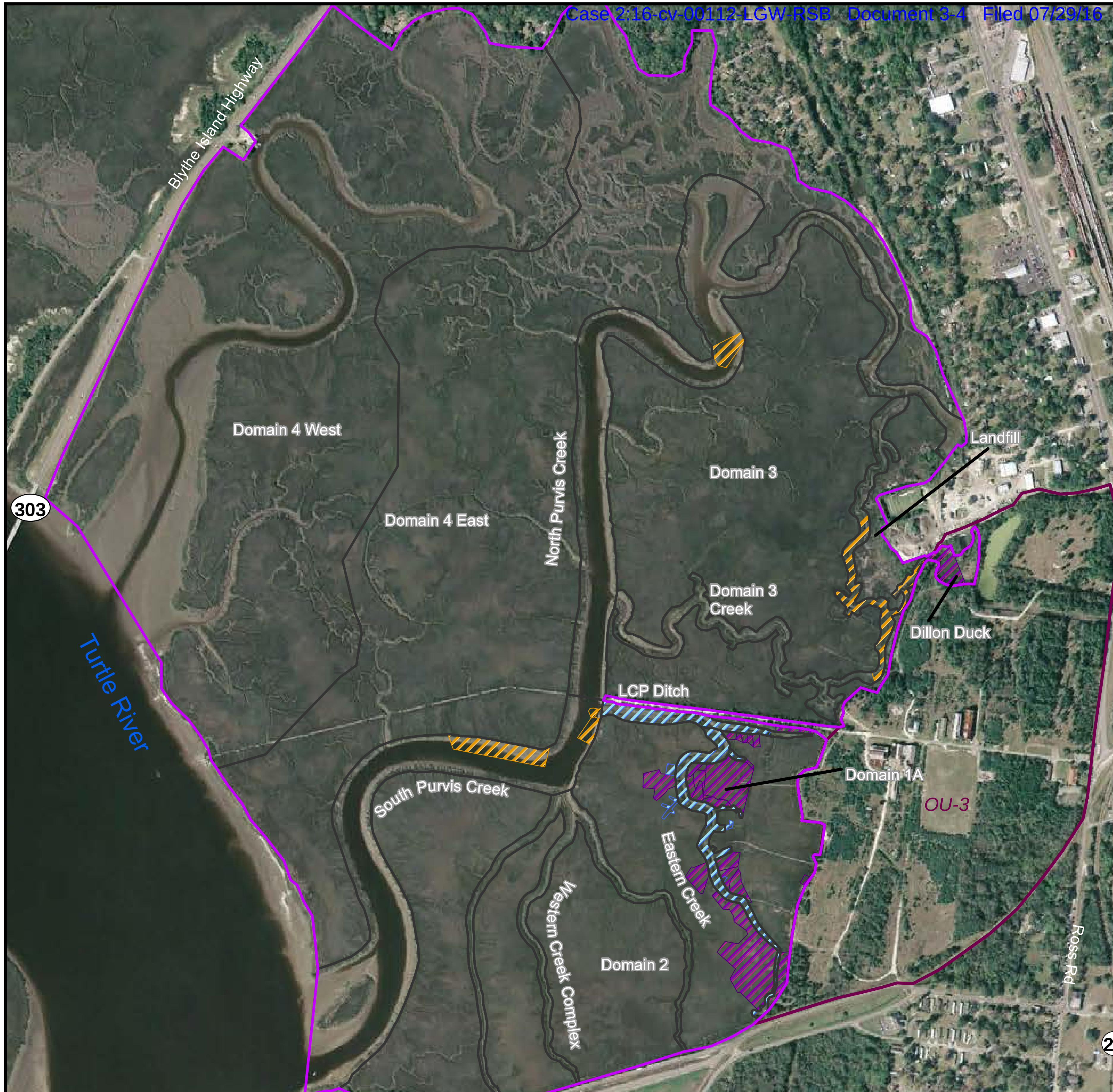
- Dredge (7 acres)
- Cap (3 acres)
- Thin Cover - 6 in (8 acres)
- OU-1 Boundary
- Creek/Domain Boundary
- OU-3 Boundary

0 800 1,600

Feet

OU-1 Boundary Source: Glynn County LiDAR Data, 2007.

DRAFTED BY: MRJ	DATE: 03/28/2013	Sediment Remedy Alternative 5: Sediment Removal, Capping and Thin Cover - 18 Acres DRAFT LCP CHEMICAL SITE BRUNSWICK, GA	Figure 27 PROJECT: 02-27105C



Legend

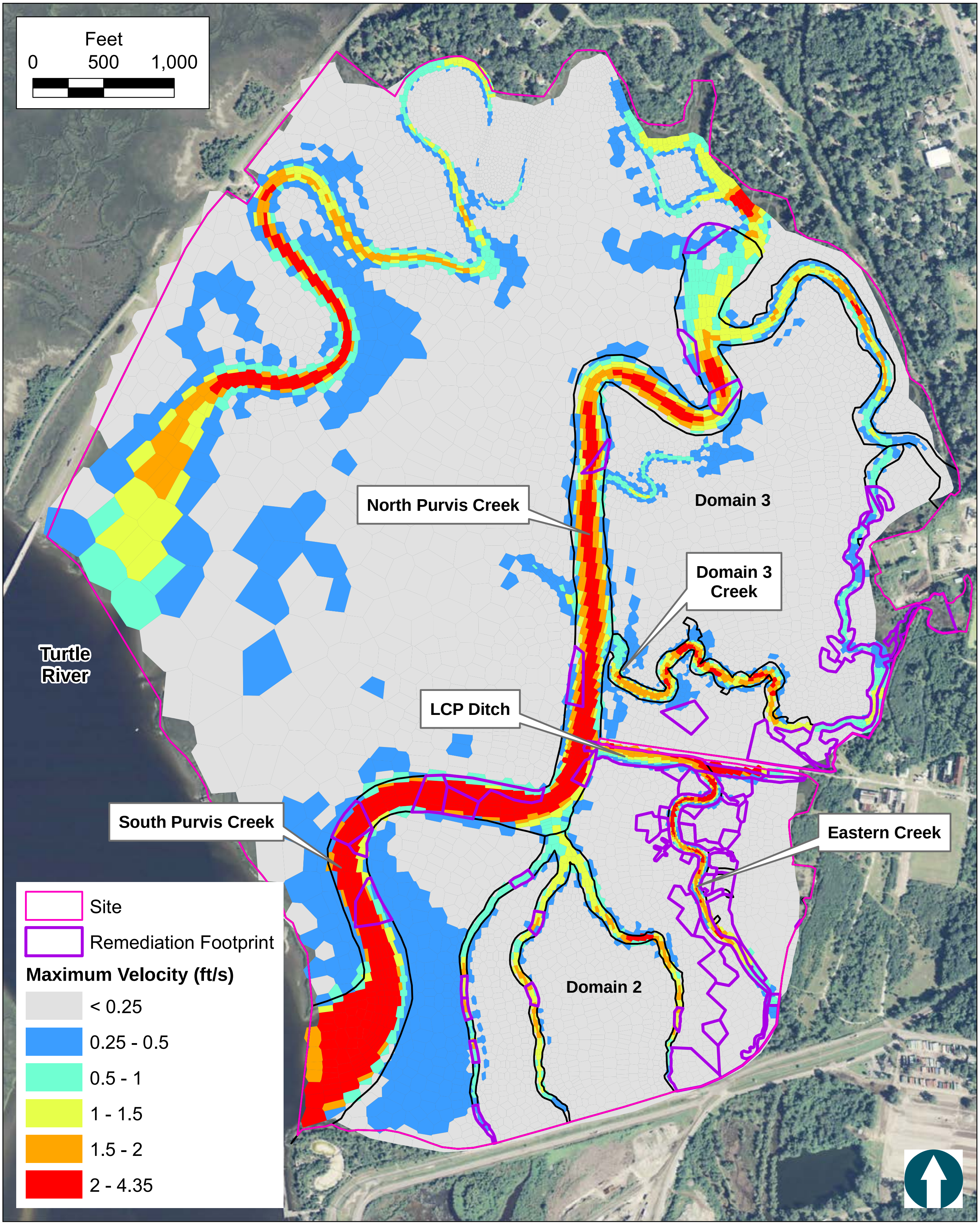
Alternative 6: 24 Acres

- Dredge (7 acres)
- Cap (6 acres)
- Thin Cover - 6 in (11 acres)
- OU-1 Boundary
- Creek/Domain Boundary
- OU-3 Boundary

0 800 1,600
Feet

OU-1 Boundary Source: Glynn County LiDAR Data, 2007.

DRAFTED BY: MRJ	DATE: 03/28/2013	Sediment Remedy Alternative 6: Sediment Removal, Capping and Thin Cover - 24 Acres LCP CHEMICAL SITE BRUNSWICK, GA DRAFT	Figure 28 PROJECT: 02-27105C



\\woodcliffbu\jobs26a\Brunswick\REPORT\HYDRO\140514\Brunswick_ModelConditions_Template_140514.mxd vlist 5/14/2014 4:48:14 PM

Maximum Predicted Current Velocity for Existing Conditions: Hurricane Storm Surge

LCP CHEMICAL SITE, BRUNSWICK, GEORGIA

Figure 29

APPENDIX A
Long-Term Monitoring Plan Framework

Long-Term Monitoring Plan Framework

1.0 Introduction

A rigorous monitoring plan is required as part of the remediation plan for Operable Unit (OU) 1, the marsh area. Monitoring plans are recommended during and after all remedial actions. When contaminants are left in place and/or when attainment of remediation goals is anticipated to occur over time, a monitoring plan is also required. Monitoring may be conducted with a variety of objectives, including: 1) to assess compliance with design and construction performance standards; 2) to assess short-term remedy performance and effectiveness in meeting sediment cleanup levels; and/or 3) to evaluate long-term remedy effectiveness in achieving remedial action objectives (RAOs) and in reducing human health and/or environmental risk. The monitoring data are utilized in the five-year review process (five year review cycle) where the data and any decisions made are documented.

As part of the remedy for OU1, a Long Term Monitoring Plan (LTMP) is being developed. The development of this plan reflects the Agencies commitment to the full remediation of the LCP Site and the marsh. The Agency has acknowledged that there are uncertainties associated with the marsh remedy and that there are contaminants being left in place which are of concern. In addition, the agency acknowledges that, post remedy implementation, declines in fish tissue contaminant levels are expected, but that these declines may not be immediate in all areas of the marsh and that the declines must be maintained over time. In addition, monitoring may highlight contamination sources or exposure pathways which may or may not be associated with the Site, thereby influencing what can be obtained through the current remedial action.

The objectives of the LCP OU1 LTMP will include verification that the remedy is performing as designed and is or will meet the Record of Decision (ROD) RAOs. There are a number of aspects of remediation in OU1 that will require monitoring and include:

- Thin-layer cover area for material loss, material incorporation, changes in contaminant flux;
- Capped areas, cap integrity/erosion;
- Marsh-wide to location-specific bioaccumulation;
- Monitoring of key species for exposure to humans and ecological receptors;
- Sediment monitoring to assess recontamination;
- Water monitoring to assess compliance with State Applicable or Relevant and Appropriate Requirement (ARARs);
- Overall flux of Site contaminants from OU1; and
- Marsh reconstruction/stabilization.

This list of aspects of monitoring components should not be viewed as complete, but a starting point from which the development of the LTMP can be initiated. It is anticipated that the design of the LTMP will consider how data collected can serve multiple purposes. Efforts to use data for several objectives can result in an effective design with multiple lines of evidence and more rigorous conclusions.

Based upon the ROD RAOs, the LTMP will develop specific goals and data quality objectives (DQOs) which will define the data needed and upon which the plan for collection of data (*e.g.* the sampling design) will be based. In addition, performance measures or triggers related to each RAO will be developed in the LTMP. For example, if an aspect of the remedy is successful, then monitoring of it can be discontinued; or if a portion of the remedy failed, such as loss of capping material, then an action must be taken to repair the cap or implement an appropriate alternate remedy.

The monitoring plan will not revisit the risk assessments. If new information becomes available which would substantially change the existing risk assessments; revisions to the risk assessments should be done independent of the monitoring program.

Biomonitoring trend analysis (e.g., bioaccumulation of mercury and Aroclor 1268 in tissues) may indicate substantive declines in contaminant levels, which in turn, could trigger reduction in monitoring intensity. The reverse applies to determine if further action may be required.

2.0 Specific Monitoring Aspects of Remediation Components

Thin-layer Cover (TLC) Monitoring

Thin-layer covers are an integral component of the remedy. The objectives of TLC monitoring will include: confirmation of successful application of the TLC material, stability and/or loss of the cap material, rate of incorporation of the cap material, changes in the physical and or biological condition of the TLC marsh area, and flux of contamination. Specifics of the monitoring will depend on the actual cap final designs and placement parameters but may include bathymetric surveys, physical measures of cap material depth, sediment sampling for physical parameters (e.g. total organic carbon [TOC] and grain size) with depth, changes in the marsh plant community, sediment sampling for contaminant levels and other visual tools to assess any changes.

Frequency of cap monitoring would be expected during predesign (baseline), upon capping completion (time zero), years 1, 3, and 5; further monitoring frequency will be dependent upon the performance of the TLC. The TLC areas will require selected monitoring components after severe storm/catastrophic events such as hurricane-type events independent of planned monitoring events.

Performance standards and triggers for the TLC area will be defined during the design phase and in the LTMP. As there are many ways to generate data which can answer individual monitoring goals, and input from all stakeholders is important to the success of the monitoring program, only illustrative examples of performance standards and triggers are included here. Potential examples include:

- If the loss of TLC material exceeds 30 percent of the applied material, then a reapplication of capping material will occur.
- If greater than a 20 percent loss of marsh plant density occurs, then it will be concluded that the TLC that cap stability is being compromised.
- If TLC biomonitoring does not demonstrate a significant and substantial decline in contaminant flux into the food web, then it will be concluded that the TLC was unsuccessful.

Capped Areas
The goal of in-place capping is to isolate contaminated sediments. The objective of cap monitoring is to confirm cap integrity, stability, and containment of the contaminants within the caps. Erosion of the caps or excessive settling could compromise their long-term effectiveness. Monitoring will depend on the actual cap final designs and placement parameters but may include bathymetric surveys and other visual tools to assess any changes as well as other options.

Frequency of cap monitoring would be expected during predesign (baseline), upon capping completion (time zero), years 1, 3, and 5; further monitoring frequency will be dependent upon the performance of the cap. The capped areas will require selected monitoring components after severe storm/catastrophic events such as hurricane-type events independent of planned monitoring events.

Potential "if then" performance statements may include:

- If greater than 20 percent loss of cap thickness occurs within a monitoring period and/or cap thickness monitoring indicates continual loss of cap thickness then it may be concluded that the cap is ineffective.
- If surface water, pore water or another measure of contaminant flux suggests the capping is not isolating the contamination from the marsh system, then it may be concluded that the capping of the specific area has failed.

Specifics of these or other statements must be evaluated and agreed to by stakeholders during the development of the LTMP.

Sediment Monitoring
Within the LTMP sediment sampling and analysis is anticipated to be a component of multiple evaluations of the overall remedy performance. Sediment monitoring is anticipated to be used in assessing attainment of cleanup levels, contaminant redistribution in the marsh, contaminant flux, incorporation of TLC material into the marsh surface, as well as other data needs. The specific sediment monitoring parameters will be established during design and in the LTMP and linked to ROD RAOs as will all monitoring efforts. For example: sediment monitoring is needed to meet RAO #1 in the ROD which is to "*Prevent or minimize chemicals of concern (COCs) in contaminated in-stream sediment from entering Purvis Creek.*"

Water Quality Monitoring
A primary objective of long-term surface water quality monitoring is to determine compliance with ARARs. The State of Georgia water quality standards (for saltwater) apply in the LCP Chemicals marsh for mercury (0.025 microgram per liter [µg/L]), lead (8.1 µg/L), and polychlorinated biphenyls (PCBs) at 0.03 µg/L. RAO #6 in the ROD states "*Restore surface water COC concentration to levels which are protective for recreational users, high quantity finfish consumers and ecological receptors.*"

Sampling protocols will need to be very prescriptive and account for variables such as specific times during the tide cycle, weather conditions, and specific dates and frequencies. These would be developed in the LTMP. However, it is expected that both filtered and un-filtered samples will be collected during post-remediation years 1, 3 and 5.

Fish and Shellfish Monitoring

Fish and/or shellfish sampling will be prominent feature of the LTMP. Sampling biota can provide data related to risk reduction and contaminant flux in the marsh. Dependent upon the species selected, the data can provide information on spatial scales from localized points (e.g. on the thin-layer cover) to larger portions of the marsh complex (e.g., mobile finfish species). Monitoring fish and shellfish tissue can provide a basis for tracking reductions in concentrations of COCs in biota and determining attainment of target tissue levels (TTLs), which may be triggers for concluding remedy success. The TTLs can be based on RAO #3 in the ROD which is to prevent human exposure, through the ingestion of finfish and shellfish that pose unacceptable health risk to recreational and high quantity fish consumers.

The LTMP will need to develop specific performance triggers will need to be species-specific (e.g., at least two finfish species for human health and other ecological "trigger" species such as mummichogs and blue crab), and specific to the size and time of year of capture, as well as other factors which must be specified in the LTMP. The trigger values will include those listed in ROD Table #19 and may also be based upon State fish advisories.

With respect to RAO #2 to protect piscivorous birds and mammals, and RAO #5 that protects finfish, typical prey items include mummichog, fiddler crab and blue crab. Tissue data from these prey items were used in the Baseline Ecological Risk Assessment (BERA) to evaluate exposures to the birds and mammals. For LTM purposes, tissue concentrations of mercury and Aroclor 1268 in these three organisms could be used to monitor potential exposures to wildlife. The specific sampling methodologies, frequencies, numbers of organisms to be collected and from where will be developed in LTMP during the remedial design (RD) phase. This may require baseline sampling prior to implementing the remedy.

Because of the wide array of potential use of biomonitoring within the LTMP, it will be important to craft the collection efforts, species and sizes to be collected along with other factors in order to obtain an effective and implementable design upon which all the stakeholders concur. This effort will be done during the design phase development of the LTMP.

Benthic Community Assessment

The objective of a benthic community assessment is to determine achievement of RAO #4, which states "*Reduce risks to benthic organisms exposed to COC-contaminated sediment to levels that will result in self-sustaining benthic communities with diversity and structure comparable to that in appropriate reference areas*."

Establishing baseline benthic community conditions both before and after remediation is important. Benthic community assessments may be targeted at locations in TLC areas to assess impacts of the cover on reestablishment of the benthic community. In addition, benthic assessments may be targeted in selected un-remediated portions of the marsh and compared to an appropriate reference envelope so that monitoring results (various biological integrity metrics appropriate to the habitat) are evaluated within a range of background marsh conditions. This is because community assessments have many confounding factors such as particle size distribution, detrital and organic carbon contents, sediment stratification, and variable tidal positions within the marsh.

Benthic monitoring will require a baseline surveys in the affected areas and in the reference envelope prior to remedial action. Then, an anticipated frequency could be at years 5 and 10 post-remediation. Again, specifics of the surveys will need to be established and agreed to by the stakeholders during LTMP development.

Revegetation of Disturbed Areas

To implement the remedy, various areas of the marsh may be disturbed due to construction of temporary access roads, staging areas, and general disturbances from dredging and sediment removal actions. These disturbed areas will be revegetated according to a work plan to be developed in the RD phase. The LTMP will include monitoring the success of vegetative recovery and would likely include percent cover and diversity.

APPENDIX B
State Concurrence Letter

Georgia Department of Natural Resources
Environmental Protection Division
2 Martin Luther King Jr. Drive, Suite 1456, Atlanta, Georgia 30334
Judson H. Turner, Director
(404) 656-4713

SEP 1 8 2015

CERTIFIED MAIL
Return Receipt Requested

Mr. Franklin E. Hill
Director, Superfund Division
USEPA Region IV
Atlanta Federal Center
61 Forsyth Street
Mail Code: 9T25
Atlanta, Georgia 30303-8960

Re: LCP Chemicals NPL Site, Operable Unit 1 (OU1) Record of Decision (ROD)

Dear Mr. Hill:

The Environmental Protection Division (EPD) has reviewed the above referenced document, received August 24, 2015. EPD appreciates the opportunity to have participated fully with EPA Region IV in the development of the remedial alternatives for OU1 of the site; the marsh and estuary. We concur that the remedial alternative proposed provides the greatest level of environmental restoration consistent with an acceptable compromise between aggressive cleanup and concomitant damage to the coastal salt marsh. In concurring with the ROD, we reiterate our requirement for a robust monitoring program. A quality monitoring program is essential so that EPD, EPA and other affected parties can evaluate the effectiveness and permanence of the remedy in a reasonable timeframe.

EPD appreciates the effort by all parties that was necessary to develop this decision document on the largest portion of the LCP NPL site. Please continue to contact Jim Brown, of my staff, at 404-656-7802 regarding the LCP NPL site.

Sincerely:

Mary S. Walker
Assistant Director

Part 3

RESPONSIVENESS SUMMARY

LCP CHEMICALS SUPERFUND SITE OPERABLE UNIT 1
PROPOSED PLAN RESPONSIVENESS SUMMARY

Table of Contents

Please note that a list of acronyms/abbreviations and the references for this Responsiveness Summary are contained in the Record of Decision (Part 1).

List of Tables

Attachments

1.0 PUBLIC REVIEW PROCESS

1.1 Introduction

This Responsiveness Summary (RS) provides a summary of comments and concerns received during the public comment period related to the LCP Chemicals Superfund Site, Operable Unit 1 (OU1) remedial investigation and feasibility study (RI/FS) and the Proposed Plan, and provides the responses of the US Environment Protection Agency (EPA) to those comments and concerns.

A responsiveness summary serves two functions: first, it provides the decision maker with information about the views of the public, government agencies, and potentially responsible parties (PRPs) regarding the proposed remedial action and other alternatives; and second, it documents the way in which public comments have been considered during the decision-making process and provide answers to significant comments.

The Human Health Risk Assessment RI report (EPS, 2011) and the Baseline Ecological Risk Assessment (Black & Veatch, 2011) evaluates risks to human health and the environment from exposure to hazardous substances. The RI report (EPS and Environ, 2012) describes the nature and extent of the contamination in the LCP Chemicals marsh. The FS report (Environ and Anchor QEA, 2014) evaluates remedial alternatives to address this contamination. The Proposed Plan (EPA, 2014) identifies the EPA's preferred remedy and the basis for that preference.

Public involvement in the review of Proposed Plans is stipulated in Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Sections 300.430(f)(3)(i)(F) and 300.430(f)(5)(iii)(B) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). These regulations provide for active solicitation of public comment.

All public comments received are addressed in this RS, which was prepared following guidance provided by the EPA in EPA 540-R-92-009 and the Office of Solid Waste and Emergency Response (OSWER) in OSWER 9836.0-1A. The comments presented in this document have been considered in EPA's final decision in the selection of a remedy to address the contamination at OU1 of the LCP Chemicals Site.

Under the EPA policy, responsiveness summaries are divided into two parts. The first part is a summary of general stakeholder issues and concerns, and it will expressly acknowledge and respond to those issues and concerns raised by major stakeholders (e.g., community groups, support agencies, businesses, municipalities, PRPs). The second part is a comprehensive response to all specific comments. It is comprised mostly of specific legal and technical questions, and, if necessary, will elaborate with technical detail on answers covered in the first part of the responsiveness summary.

The text of this RS explains the public review process and how comments were responded to. In addition to this text, there are three attachments:

Attachment 1 The Comment and Response Index, which contains summaries of every comment received and EPA's response.
Attachment 2 Comments provided during the public comment period, including letters, e-mails, and oral statements. This attachment contains copies of every comment received.
Attachment 3 Transcript of the December 4, 2014 public meeting.

1.2 Public Review Process

The EPA relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, the Proposed Plan for the LCP Chemicals OU1 Superfund Site, Brunswick, Georgia was made available to the community on November 20, 2014. A ten-page summary was released with the Proposed Plan and both were made available on the EPA's web site (http://www2.epa.gov/foia/region-4-virtual-reading-room-lcp-chemicals-site-brunswick-ga)

The complete Administrative Record file, which contains the information including the RI/FS reports and risk assessments, upon which the Selected Remedy is based, is available at the locations listed below.

Information Repositories for the LCP Chemicals Superfund Site Administrative Record

Brunswick-Glynn Co. Library
208 Gloucester Street
Brunswick, GA 31520
(912) 267-1212

U.S. EPA - Region 4
Superfund Records Center
61 Forsyth St., SW
Atlanta, GA 30303

1.3 Public Comment Period, Public Meeting and Availability Sessions

The public comment period is intended to gather information about the views of the public regarding both the remedial alternatives and general concerns about the site. A notice of the start of the public comment period, the public meeting date, the preferred remedy, contact information, and the availability of above-referenced documents was provided in a fact sheet distributed to the public on November 20, 2014 and published in the Brunswick News on December 1, 2014.

The public comment period for the LCP Chemicals OU1 Proposed Plan commenced on December 4, 2014 and continued until March 16, 2015. During that period, a public meeting was held on December 4, 2014, followed by a public availability session on February 26, 2015. Approximately 120 people, including residents, local business people, university students, media, and state and local government officials, attended the public meeting and approximately 70 people attended the availability session. A question-and-answer session followed the formal presentation at the public meetings. A complete transcript of the public meeting can be found in Attachment 3 of this RS.

1.4 Receipt and Identification of Comments

Public comments on the Proposed Plan and EPA Region 4 responses were received in several forms, including:

- Written comments submitted to the EPA Region 4 via e-mail;
- Written comments submitted at the public meeting;
- Written comments mailed to the EPA;
- Oral comments made at the public meeting.

Each submission received, whether written or contained in the transcript of the public meeting, was assigned one of the following letter codes:

GEC – Glynn Environmental Coalition
ESC – Environmental Stewardship Concepts
SELC – Southern Environmental Law Center
SR – Satilla Riverkeeper
T – Natural Resource Trustees
R – Regional or local agencies and officials.
C – Corporations
P – Public (individuals).
O – Oral (comments presented at the public meeting).

These codes were assigned for the convenience of readers and to assist in the organization of this RS; there was no priority or special treatment given to one commenter over another in the responses to comments. Within each of the coded categories, the comments were put in order based on the original page number and comment number if given, and assigned a number, such as GEC 3.1, GEC 3.2, and so on.

RS Table 1 lists all of the submissions received during the comment period. The written comments are summarized and responses are provided in the Comment and Response Index (Attachment 1). Note that comments reproduced in Attachment 1 are presented as submitted, including spelling and grammatical errors. Copies of all written submissions have been included in Attachment 2.

RS Table 2 provides a summary of oral comments given during the question/answer period during the December 4, 2014 public meeting. These oral comments are part of the transcript. A full copy of the public meeting transcript is provided in Attachment 3.

1.5 Locating Responses to Comments within the Comment and Response Index

The Comment and Response Index (Attachment 1) contains a complete listing of all comments and responses from the EPA. The index allows readers to find answers to specific questions they have raised and is organized as follows:

- The first column lists the location (i.e., commenter), according to their assigned letter code (e.g., GEC, SELC, T) and page or comment number (e.g., SELC 3.1) which refers to original page 3, comment 1 from the Southern Environmental Law Center's letter to the EPA.
- The second column provides a summary of the comment.
- The third column provides the response to the comment or a reference to see responses to frequent, technical, or other comments (see section below).

In a few instances, a commenter may appear in the Comment and Response Index more than once, because he/she sent different letters, sent letters that were different from their oral statements, or made different oral statements. If an individual spoke for a group and then wrote a letter in his/her own name (or vice-versa), the submissions were coded separately and each appears in the Comment and Response Index.

It was not always clear if a commenter intended to represent an organization/group or simply himself /herself. The reader is advised to examine both the listing for the name of the group, firm, or association used on the letterhead of a written submission and the public (P) list for his/her own name.

1.6 Kinds of Responses

Due to the complexity of the LCP Chemicals OU1 Site and the large number of comments received, comments are addressed according to three categories: frequent comments, technically detailed comments, and individual comments. These categories are defined as follows:

- **Frequent comments** are comments that were made by many commenters. A frequent comment may be a combination of several comments on a similar topic. Frequent comments and the associated responses are in the text of the RS below, in the section called "Summary of Major Public Comments and EPA Responses."
- **Technically detailed comments** are those that required a lengthy scientific or engineering explanation. Technical comments and the associated responses are in the text of the RS below, in the section called "Summary of Major Public Comments and EPS Responses."
- **Individual comments** are answered directly in the Comment and Response Index (Attachment 1).

The EPA carefully considered each comment received and made every effort to be fully responsive. All comments received are addressed in this RS, and a copy of every comment is provided in Attachment 2.

2.0 SUMMARY OF COMMENTOR'S MAJOR ISSUES AND CONCERNS AND EPA RESPONSES

2.1 Frequent Comments and Responses

Frequent comments are comments that were made by many commenters. A frequent comment is typically a combination of several comments on a similar topic. One answer has been provided for each frequent comment.

Frequent Comment #1: A relatively large number of comments expressed the desire to clean up 48 acres of the Site as reflected in Alternatives 2 or 3 of the Proposed Plan.

Response to Frequent Comment #1: The Selected Remedy balances the need to remove from the marsh system the contaminants posing risk to human health and the environment, while limiting the impacts to the areas with lower concentrations of contaminants. The two areas with the highest mercury and Aroclor 1268 concentrations in the LCP Chemicals marsh are the Eastern Creek and LCP Ditch. Both of these tidal channels, which are scoured twice daily by the tides, have contaminants present at elevated concentrations to depths of about 18 inches below the channel surface. Under the Selected Remedy, both of these tidal channels will be excavated and backfilled with clean sand, thereby removing the highest concentrations of mercury and Aroclor 1268 from the marsh system. Available vertical profiles suggest that the marsh surface, immediately flanking the tidal channels (presumably contaminated over the decades of incoming and outgoing tides overtopping the channels) are contaminated to depths of six inches or less. The concentrations in these areas that flank the tidal channels are appreciably lower than in the channels themselves. For these reasons, thin-layer covering is specified under the Selected Remedy for the estimated 11 acre areas with lower concentrations, rather than removal. Excavation of the lower concentrations would not only disturb the 11 acres but additional acreage necessary to construct the roads to permit the access for the heavy equipment. Finally, Alternative 2, which entails excavation of 48 acres of marsh, plus an additional 11 acres in access roads beyond the remedy footprint, for a total of 59 acres was judged to be too disruptive to the marsh for the benefit gained. Other, less disruptive methods at achieving the same risk reduction were preferred and ultimately selected.

Frequent Comment #2: Most of the comments were highly technical and questioned the methodologies used in the human health and ecological risk assessments. The primary human health concerns were that the seafood consumption scenarios were not conservative (protective). This issue would subsequently impact the cleanup levels that would likely result in more remediation sediments in the LCP Chemicals marsh.

Response to Frequent Comment #2: The Proposed Plan was in error in only citing the 40 and 26 meals per year fish consumption rate for the high quantity and recreational fish consumer, respectively. The following is a more detailed description of the assumptions used in the Human Health Baseline Risk Assessment (HHBRA):

- The adult high quantity consumer scenario was assumed to consume, on average, 27 grams of finfish per day. Assuming a fish meal size of 0.3 pounds (135 grams), this translates to 73 meals/year, or approximately six meals per month (from Zones D, H and I, see ROD Figure

23), based on self-identified high-quantity consumers in an area-specific creel survey. Assuming a larger fish meal size (0.5 pounds), this translates to about 43 meals per year, or a little less than four meals per month;

- The recreational adult consumer was assumed to consume, on average, about 16 grams of finfish per day. Assuming a fish meal size of 0.3 pounds, this translates to about 38 fish meals per year, or about three and a half meals of finfish per month. Assuming a larger fish meal size (0.5 pounds), this translates to about 26 meals per year, or about two meals per month. For shellfish consumption, the adult recreational fisher was assumed to catch and eat about 12 grams per day, on average. This translates to about one and a half meals per month for a 0.5 pound meal or about two and a half meals of shellfish per month for a 0.3 pound meal size. These finfish (recreational scenario) and shellfish consumption quantities are based on upper-end of EPA defaults for recreational fishing in Southeast United States. The HHBRA conservatively assumes that these consumption amounts are for fish caught in the same area; and
- The area-specific creel survey was the basis for the high quantity fish consumption rates used in the HHBRA conducted by the Agency for Toxic Substances and Disease Registry (ATSDR; Division of Health Studies) and the Glynn County Health Department, which surveyed 211 Turtle River anglers. The creel survey covered racial/ethnic groups representative of area population. The NOAA fisheries information was used to assign site-specific weighting factors to the various species of fish caught and eaten. Table 7 in the ROD shows the average percentage of the various species of fish caught by coastal Georgia anglers between 2001 and 2005.

Fish filet tissue data used in the HHBRA is from the Georgia Department of Natural Resources (GADNR) Zones D, H and I. Zone D is considered to be the middle of the Turtle River. Zones H and I are Purvis Creek and Gibson Creek, respectively. Figure 23 in the ROD shows the GADNR Fish Consumption Guidelines Zones. The most recent fish fillet data (2011) shows that fish caught in Zone H (Purvis Creek) had the highest mercury and Aroclor 1268 concentrations in 56% of the species sampled. Hence, the HHBRA estimated the risks posed by consuming fish from the most contaminated zones in the St. Simon estuary.

Frequent Comment #3: An equally important human health concern is the risks from dioxins and furans. Similarly, this issue would subsequently impact the cleanup levels that would likely result in more remediation sediments in the LCP Chemicals marsh.

Response to Frequent Comment #3: The September 2, 2014 Dioxin/Furans Memorandum consolidated into one document all the known dioxin/furans data available for the Site. It also evaluated the risk posed by the dioxin/furans still in place, following the removals. The memo concluded that the dioxin/furans are very likely co-located. To confirm this, the ROD's Selected Remedy requires additional sampling during the remedial design (RD) to confirm this belief. Should co-location not be confirmed by the RD sampling, the ROD will have to be amended to address any locations that may pose unacceptable risk.

Frequent Comment #4: The primary concerns with the ecological risk assessment were that more receptors should have been included such as dolphins, mink, and manatees. The assertion of including these sensitive receptors would likely change the cleanup levels.

Response to Frequent Comment #4: The EPA appreciates concerns regarding sensitive species such as mink and dolphins. The EPA fully recognizes the latest data collected over the past several years on the bottlenose dolphin in the region. The baseline ecological risk assessment (BERA) was based on data collected between 2000 and 2007. Much of the dolphin data were unavailable at that time for meaningful quantification of dolphin exposure in the LCP Chemicals marsh. However, both the BERA and the HHBRA used very conservative exposure and effect assumptions to account for uncertainties where exposure to other potential indicator receptors may be unknown. The data and conclusions in the BERA and the HHBRA were used to develop cleanup goals in sediment that are expected to reduce COC fish concentrations to levels protective of humans, river otters, dolphins, and herons. Given their large home ranges, dolphins, river otters, and mink are exposed to contamination in fish in OU1 and in the broader TRBE. The proposed remedy will reduce the concentrations in fish tissue.

Manatees may occur in the Turtle River area and even more infrequently in Purvis Creek and may graze occasionally on *Spartina* containing elevated concentrations of mercury. Manatees feed on a wide variety of submerged, emergent, floating, and shoreline vegetation. The BERA focused on top carnivorous indicator species because they tend to accumulate more mercury in the more toxic form of methylmercury from their prey (mummichogs, crabs, finfish). In addition, these food items contain much higher methylmercury (MeHg) concentrations (up to 100%) than *Spartina*, which only contains about 10% MeHg relative to mercury. It was determined in the planning process that if the top level carnivorous species could be protected, this would also be protective of species that would likely have lower doses of MeHg. For these reasons, the manatee was not selected for quantitative exposure analysis in the BERA. Risk to the manatee was evaluated in EPA (1997) and PTI (1998). In addition, the BERA did not conclude unacceptable risk to the river otter. The manatee consumes vegetation and would be covered by the risk assessment for the marsh rabbit, which did not present unacceptable risk in the BERA. The reproduction of mink can be adversely affected by PCBs to a greater degree than anticipated for river otter. The BERA assumed a lowest observable effects level (LOAEL) toxicity reference value of 0.3 mg/kg-day for the river otter. The LOAEL used in the assessment of the river otter was appropriately conservative to be protective of mink. The concentrations of total PCBs in certain fish species captured in Purvis Creek (black drum, silver perch, spotted seatrout, striped mullet) in the BERA are currently above the estimated protective concentration of total PCBs in the diet of the mink (4.7 mg/kg dry weight). The PCB concentrations in fish of Purvis Creek will be reduced by the remedy.

With regards to the dolphin, it was not assessed in the BERA. Currently, there is a lack of information on the toxicity of PCBs related to survival, growth, or reproduction of dolphins that may be used in a BERA. The only available information for dolphins is on the effect of Aroclor-1268 on the thyroid hormone and immune system response. The 70 µg/g-lipid threshold for effects on thyroid hormone and immune response (Schwacke *et al.* 2012) is equivalent to about 28 mg/kg blubber tissue (wet weight) based on 40% lipid content in blubber. A fish-to-dolphin biomagnification factor of 15.2 was estimated by Maruya *et al.* (2004). Based on this rough estimate, the concentrations of total PCBs in the diet of the dolphin would need to be on average 1.84 mg/kg wet weight in fish (7.36 mg/kg dry weight). This rough estimate of a protective concentration in fish tissue to protect dolphins from thyroid hormone and immune response effect is the same order of magnitude as the concentrations in fish necessary to protect other wildlife species.

The proposed remedy will reduce the fish tissue concentrations. Post-remedy monitoring of fish tissues will be conducted. Concentrations of PCBs in striped mullet consumed by dolphins will reduce as a consequence of the remedy.

Frequent Comment #5: There were a number of concerns pertaining to statements regarding a robust long-term monitoring plan (LTMP) without any details provided in the Proposed Plan.

Response to Frequent Comment #5: LTMPs are an important element of site remedies which leave some contamination in place, such as with the use of thin layer capping. Appendix A of the ROD provides a framework of the LTM plan and basic assumptions that will be developed in the remedial design phase. As noted, it is important that decision criteria be developed in conjunction with the LTM plan to insure that the appropriate data are generated such that conclusions on remedy effectiveness can be made, either success or failure.

Frequent Comment #6: Several comments touched on environmental sampling in the LCP Chemicals marsh.

Response to Frequent Comment #6: Marsh sampling has been ongoing since 1994, with a combination of grid node sampling and subsequent sampling directed by the results of the grid node sampling or other directed marsh sampling which suggested a source area or concentration gradient. The marsh sampling included surface water sampling, but focused upon sediment sampling and organism tissue sampling (biomonitoring). The historically generated data led to the identification of source material along the marsh border, which was removed as part of the 13-acre removal action. The data generated to date, both sediment data and biomonitoring/tissue data, support the conclusion that the nature and extent of contamination is known within the marsh. It is believed that additional sampling would identify the presence of site COCs particularly Hg and PCBs, as suggested by the comment, however, the EPA believes that the concentrations found would be similar and/or consistent with the concentrations of those contaminants in the area of the sampling.

Frequent Comment #7: Several commenters opposed the preferred remedy because it was not extensive enough and that by leaving contamination in the marsh was simply postponing the final resolution of the problem to future generations.

Response to Frequent Comment #7:

See response to Frequent Comment #1.

2.2 Technically Detailed Comments and Responses

This section provides a summary of frequent technically detailed comments that were typically asked by more than one commenter. More specific responses to individual technical comments are provided in the Comment and Response Index (Attachment 1 of this RS).

Technical Comment #1: Several technically knowledgeable groups (e.g., GEC, ESC, SELC) submitted comments and questions on specific technical aspects of the risk assessments, remedial investigation, feasibility study, and Proposed Plan. These topics included, among others, extent of contamination outside the current Superfund Site boundaries.

Response to Technical Comment #1: The EPA understands these comments to be based on the extent to which Aroclor 1268 can be found along the coast in the Brunswick area. Aroclor 1268, which was used at the LCP Chemicals Site, has been identified as being present in far-reaching areas based upon the presence of PCB 209, in particular. PCB 209 (decachlorobiphenyl) is one of the 209 individual PCB compounds (congeners) which comprise the Aroclor products that were used. PCB 209 is a component of Aroclor 1268 but is not commonly found in some of the most commonly used Aroclors. For this reason, the presence of PCB 209 has been used as a signal that Aroclor 1268 is present and that the PCB quantification should be made assuming that the PCBs found are from Aroclor 1268. However, PCBs are currently ubiquitous in our environment from multiple sources; and while the presence of PCB 209 and a few other congeners may indicate that a portion of the PCB content in a fish or dolphin originated from the LCP Chemicals Site, the amount of PCBs contributed by the Site cannot be easily determined and it may be impossible to determine. In addition, there exists evidence that PCB 209 is found throughout the east coast of the US, suggesting that sources of this and other congeners, commonly found in Aroclor 1268, exist other than from the LCP Chemicals Site in Brunswick, GA. In addition, none of the available information shows site-related PCBs at levels which we can effectively remediate (active remediation) outside of the LCP Chemicals marsh area.

Technical Comment #2: Several groups submitted comments and questions on specific technical aspects of the risk assessments, RI, FS, and Proposed Plan. These topics included, among others, cleanup levels.

Response to Technical Comment #2: The BERA described significant uncertainties associated with the derivation of RGOs. In addition, the BERA provided results of five different sediment effect concentrations (SECs) on eight test endpoints (e.g., survival, reproductive response) for the two test organisms (amphipods and grass shrimp) and for each of the four COCs, including attempts to normalize for organic carbon, for a total of 240 statistically derived potential SECs. For mercury, there were 40 SECs (25 for grass shrimp and 15 for amphipods). In accordance with risk assessment guidance, the initial RGOs were based on the most conservative numbers from the most sensitive sediment toxicity receptors and test endpoints. The actual range of sediment mercury SECs was between 1.4 and 145 mg/kg. For Aroclor 1268, the SEC range was between 4 and 420 mg/kg. Similarly for total PAHs and lead, the SEC concentrations range over an order of magnitude. Thus, the BERA RGOs were very conservative and did not take into account the locations or magnitude of sediment contaminant distribution in the LCP Chemicals marsh.

When the BERA RGOs were overlain with the Site sediment spatial concentration distributions during development of the feasibility study (FS), it was determined that large areas of the LCP Chemicals marsh would be disturbed without commensurate risk reduction. In order to get to a realistic range to assess the feasibility of cleanup alternatives, the benthic PRGs were developed from the SECs by providing essential conservatism within the range of uncertainty. The lower of the two PRG values had higher uncertainty and therefore more conservative. Whereas the concentrations of COCs just slightly higher than the upper-end PRGs are toxic to sensitive benthic organisms with a high degree of certainty. The FS evaluated these uncertainties during alternative development which resulted in the variable spatial areas for potential cleanup.

After the evaluation of each alternative that was presented in the FS, it was determined that the proposed cleanup levels (CULs) would still provide substantial protection to the benthic community without undue harm to the existing marsh, especially in combination with a robust monitoring program that will include benthic community assessments.

Technical Comment #3: Several submitted comments and questions on specific technical aspects of the risk assessments, RI, FS, and Proposed Plan. These topics included, among others, exposure assumptions.

Response to Technical Comment #3: The 2014 ATSDR Public Health Assessment cited a study performed in 1997 between the Augusta Lock and Dam and the Route 301 Bridge of the Savannah River. This part of the Savannah River is about 140 miles “as the crow flies” from Brunswick, GA. Consumption rates are lower in the Savannah River study (64 meals/year for the African American population) than assumed in the LCP Chemicals marsh HHBRA (73 meals/year for high quantity). However, meal sizes in the Savannah River study were almost three times larger than modelled in the HHBRA. The Savannah River study’s mean consumption rate is about 70 grams per day for adult African Americans, as opposed to the 27 grams per day used in the HHBRA for the adult high quantity fish consumer. Table 10-5 in EPA’s 2011 Exposure Factor Handbook places the Savannah River study in context of other national studies. The mean 70 grams per day consumption rate is an outlier. The summary (mean ranges) on Table 10-5 are: Statewide Surveys: 5-to-51 grams/day, Rivers: 20-to-70 grams/day and Lakes: 5-to-10 grams/day.

A goal of the HHBRA is to develop reasonable maximum exposure scenarios to contaminants from a specific hazardous waste site. The purpose of the HHBRA is not to assume exposure on a regional scale but on a site-specific basis. The consumption rates used in the HHBRA (27 grams/day for the high quantity fish consumer) are very specific to assessing exposure to contaminated fish caught in the near vicinity of the LCP Chemicals marsh (Zones D, H, and I from the TRBE). The EPA recognizes that the same anglers who fish in these three zones also fish elsewhere in the TRBE, including upstream in the Turtle River or in the Sapelo Island area.

Any additional grams/day that the angler would obtain from those areas are not included in the site-specific risk assessment.

The HHBRA does not account for every fish meal that a person eats over the course of a 30 year period, but rather provides a reasonable maximum exposure (RME) related to the Site. Even though the dominant PCB signature of Aroclor 1268 in fish may extend to a much wider geographic area, the HHBRA does not use fish tissue data from afar. Similarly, even though local subsistence people may consume more seafood, not all of it is assumed to come from an area of approximately two square miles. To apply much higher consumption rates based on this small area would be unrealistically over-conservative. Conversely, to expand the geographic area to be more reflective of local fishing patterns would be less conservative because the concentrations of mercury and PCBs in fish are generally lower than those caught in Zones D, H, and I.

The anglers in the Sapelo Island area fish at various locations around the island. It is assumed that this behavior applies to most anglers in coastal Georgia. In addition, the EPA recognizes that there are differences in seafood consumption rates throughout the southeast coastal region and the value that these studies provide to our understanding of fishing behavior and consumption of seafood. However, consumption rates need to be applied at a RME scale specific to a contaminated site. Therefore, the higher fish consumption rates based on the Savannah River study (Berger et al., 1999) or the ATSDR 2014 study of nine individuals do not change the conservative RME consumption rates used in the HHBRA. Remaining grams/day obtained elsewhere may provide a more complete assessment of regional exposure but would not be very informative to develop site-specific cleanup levels of sediment in the LCP Chemicals marsh.

Technical Comment #4: Several groups submitted comments and questions on specific technical aspects of the risk assessments, RI, FS, and Proposed Plan. These topics included, among others, statistical treatment of data.

Response to Technical Comment #4: These comments questioned the difference between the use of the 95% upper confidence limit on the mean of fish fillet tissue levels for the human health risk assessment, and the use of surface weighted averages of corresponding sediment levels in the FS and in the BERA. Within the human health risk assessment, it is EPA policy for the exposure point concentration to evaluate exposure using the 95% UCL of the mean. Consumption of fish tissue is the human exposure scenario resulting in unacceptable health risk. It is the sediment, however, which must be remediated to reduce fish tissue contaminant levels. While the surface weighted average concentration (SWAC) is the sediment concentration, the long-term monitoring will verify the decline of contaminant levels in the fish tissue. Within an ecological risk assessment (ERA), there is more latitude on how the exposure may be estimated. This is because the types of data used can be more variable in the ERA. For example, site-specific toxicity testing is used, and exposure response relationships are evaluated, and co-located bioaccumulation tests are conducted using sediments collected at the biota sampling location. Some exposures do use the 95% UCL of the mean. Others do not, based upon the professional judgment of the risk assessors, with input from Stakeholders such as the State, Fish and Wildlife Service, and/or NOAA. The resulting exposure assessment is typically a mix of more and less conservative assumptions and input parameters, and every attempt is made to make that process and the decisions open and transparent.

The use of surface weighted averages is an accepted approach to estimating surface soil/sediment exposure estimates. The EPA is mindful of not aggregating areas inappropriately--areas that are not the same habitat or by their size dilute the exposure estimate. Concerns on how to deal with outliers/hotspots and non-normally distributed contamination is a long standing issue within the EPA, and, to date, one standard approach has not been satisfactory between sites. Within the FS, various methods of defining areas and exposures were considered. The PRPs preferred approach is presented within the FS. The EPA did not find the approach to be technically wrong or to be misleading. Therefore, the EPA did not require that the PRPs conduct the evaluations using other means of defining areas or estimating exposure levels.

Technical Comment #5: Several groups submitted comments and questions on specific technical aspects of the risk assessments, RI, FS, and Proposed Plan. These topics included, among others, impact of dioxins/furans.

Response to Technical Comment #5: The BERA did not consider all the available PCDD/PCDF data and left it as an uncertainty. All the available PCDD/PCDF data was consolidated and evaluated in the September 2, 2014 Dioxin/Furans Memorandum for the Site. The Memo concluded that dioxin/furans concentrations of concern were likely either removed during the late 1990s removal or will be removed during the dredging under the Selected Remedy. This concept will be tested during the remedial design phase though sediment sampling of Domains 1, 2 and 3.

Technical Comment #6: Several groups submitted comments and questions on specific technical aspects of the risk assessments, RI, FS, and Proposed Plan. These topics included, among others, effectiveness of thin-cover placement.

Response to Technical Comment #6: The EPA agrees that actual removal of contaminated sediment from the marsh is more permanent for the marsh. However, the removed sediment would still require disposal elsewhere in a contained system. It is also acknowledged that thin-layer covers may be subject to bioturbation which is why there will be a monitoring program to ensure that this aspect of the remedy is effective. Thin caps will only be applied to low energy environments (i.e., in areas of minimal tidal/storm surge areas). This portion of the remedy is not to eliminate contamination, but to substantially reduce toxic exposures and contaminant mobility. Armored caps are only proposed in the tidal creeks, and they have been successfully used in major tidal rivers that are also subject to substantial flooding.

Technical Comment #7: A few comments suggested different and/or innovative technologies that could be considered for remediation.

Response to Technical Comment #7:

In Situ Treatment

In-situ treatments require contact between the contaminant and the treatment. For soil or sediments, this typically requires some means of dispersing the treatment into the sediment or mixing the soil to achieve contact. This requirement for establishing contact can result in an equal level of disturbance to the system as dredging or capping. Most in-situ technologies remain difficult to implement on a large scale and are typically suited to a specific concentration range. At both high and low concentrations, the technology may be ineffective. In time, several emerging technologies may become viable.

Bioremediation

The challenges in bioremediation are maintaining the favorable conditions to a specific microbe or a consortium of microbes and creating the contact between the microbes and the contaminant. Contact and contact time (maintaining conditions) are no different between a biodegradation process and a purely chemical process. Disturbance and materials handling (dredging, digging, transport, mixing, storage, etc.) create impediments to biodegradation as a treatment technology.

Phytoremediation

Burning PCB-contaminated plant matter for biofuel would lead to the long-recognized incineration issues. There are a couple points to be aware of regarding the use of phytoremediation as a technology. First, most, if not all, of the studies mentioned do not perform a mass balances or trace the degradation; they are either subject to the same limitations of PCB quantification that as the issues on Sapelo Island, or they only look only at one or a few of the more easily degraded congeners. Highly chlorinated congeners are more difficult to degrade, even in a laboratory. Second, soil/root zone degradation has to be aerobic, but dechlorination is strictly anaerobic, so what is the actual mechanism? There are outstanding scientific and technical questions regarding translating these studies into a treatment technology.

In-Situ Sediment Ozonator

Once again, the problem is translating to a field treatment technology. This technology is similar to chemical oxidation. When there is a lot of material that can react, such as organic matter, the organic matter will react with the reactant in competition with the Aroclor 1268. In order to effectively react/degrade the Aroclor 1268, one may have to destroy all the associated organic matter in that marsh.

Ex-Situ Technologies

All ex-situ technologies require the removal of the contaminated material from the system (dredging/excavation). Then the “cleaned” soil needs to be placed somewhere. If returned to where it was removed from, it needs to be lower than the clean-up goal. The process cannot modify or enrich concentration or the availability of elements in the sediment, and it is likely that the sediment will need to be amended to restore its function. Lastly, there are costs associated with the soil handling (i.e. placing the soil back or replacing the removed material and stabilizing (e.g. re-vegetate). Collectively, these "costs" often exceed the disposal cost once the material has been dredged or excavated.

Monitored Natural Recovery (MNR)

MNR is a viable treatment technology in situations where there exists information that indicate the following: 1) where natural attenuation is or will occur, once the source areas are removed, 2) where the risk presented from the contamination will attenuate at an acceptable rate, 3) where impacts to the environment from active remediation are anticipated to be great and/or not recoverable and 4) where the disparity between the overall risk reduction between the use of MNR and other remediation alternatives is not great. We would add that MNR is not a containment technology.

Summary

In summary, while these technologies are emerging, there has been limited field application of these as field treatment technologies. On small scales, within laboratory settings, under specific conditions, or with a focused or limited contamination mix (specific congeners); these technologies show promise, and the EPA will continue to support the investigation and evaluation of these technologies. However, there are still currently limited proven remediation technologies for PCB-contaminated sediment and mercury-contaminated sediment and/or a mix of these two contaminants.

The EPA preferred remedy removes the contamination believed to be critical to achieve a protective remedy, but leaves contamination that which can be left in place (thin-layer cover) or that will naturally decline in concentration at an acceptable rate to achieve a protective remedy. The following are observations regarding the two principal contaminants at the Site:

- Both mercury and PCBs are difficult to remove from the environment;
- Mercury is an element and therefore cannot be destroyed;
- While PCBs can be destroyed, they are normally very stable in the environment; and
- Existing treatment technologies for mercury and PCBs are frequently mutually exclusive (what works for one does not work for the other or makes the other worse);

While the EPA is always looking for new and demonstrated treatment technologies, we have not found a demonstrated treatment technology which can be used as an interim measure to reduce all risks from the LCP Chemicals marsh. EPA's preferred remedy uses the technologies which can effectively remediate the contaminated marsh and achieve protectiveness over time. Finally, the references included in the comment suggest the overwhelming majority of the listed technologies are still at the university laboratory stage, nowhere near a full-scale application.

3.0 REFERENCES

Black & Veatch. 2011. Baseline Ecological Risk Assessment for the Estuary at the LCP Chemical Site in Brunswick, Georgia. Prepared for the U.S. Environmental Protection Agency, Region 4. April 2011.

Environmental Planning Specialists, Inc. (EPS). 2011. Human Health Risk Assessment for the Estuary, Operable Unit 1 Marsh Trespasser, Fish and Shellfish Consumer, Clapper Rail Consumer, Final, LCP Chemical Site, Brunswick, Georgia. Prepared for LCP Chemicals Site, Brunswick, Georgia. August 2011.

EPS and Environ International Corporation (Environ). 2012. Remedial Investigation Report Operable Unit 1 – Estuary, Revision 2, LCP Chemicals Site, Brunswick, Georgia. Prepared for LCP Site Steering Committee. August 2012.

Environ and Anchor QEA, LLC. 2014. Feasibility Study. LCP Chemical Superfund Site, Operable Unit 1 (Estuary), Brunswick, Georgia. June 2014.

U.S. Environmental Protection Agency (EPA). 2014. Proposed Plan, LCP Chemicals Superfund Site, Operable Unit 1. November 2014.

RESPONSIVENESS SUMMARY

Tables

RS Table 1 – Comment Directory

Letter Code	Last Name	First Name	Affiliation	Date Submitted	Form Submitted	Individual Comments
Groups and Associations						
GEC	Parshley	Daniel	Glynn Environmental Coalition	03-16-2015	Letter	GEC 3.1 – 54.1
GEC (2)	Parshley	Daniel	Glynn Environmental Coalition	02-13-2015	Letter	GEC (2) 1.1 – 2.13
SELC	Sapp	William	Southern Environmental Law Center	03-16-2015	Letter	SELC 3.1 – 17.1
ESC	deFur	Peter	Environmental Stewardship Concepts, LLC	03-16-2015	Letter	ESC 1.1 – 16.2
SR	Nix	Ashby	Satilla Riverkeeper	03-09-2015	Letter	SR 1.1 – 5.6
Regional or Local Officials						
R-1	Atwood	Alex	Georgia State House Representative – District 179	01-21-2015	Letter	R-1.1
R-2	Woodside	M. H.	Brunswick-Golden Isles Chamber of Commerce	03-10-2015	Letter	R-2.1
Trustees						
T	Meade	Norman	National Oceanic and Atmospheric Administration	01-29-2015	Letter	T.1 – T.3
Corporations						
C-1	Taylor	Paul	Atlantic Richfield Company	03-16-2015	E - Letter	C-1.1 – 3.4
C-2	Iannicelli	Joseph	Aquafine Corporation	No Date	Letter	C-2.1
Public Comments						
P-1	Abner	Jimmie Ann		03-07-2015	E – Mail	P-1.1 - .3
P-2	Ahl	Jessica		No Date	Joint Letter	P-2.1
P-3	Balbona	Virginia		03-16-2015	E – Mail	P-3.1
P-4	Barker	Beth		No Date	Joint Letter	P-4.1
P-5	Bartkovich	Becca		No Date	Joint Letter	P-5.1
P-6	Brand	Rachel		No Date	Joint Letter	P-6.1
P-7	Browning	Janice		03-07-2015 03-08-2015	E – Mails	P-7.1 - .8
P-8	Bryant	Kolin		03-16-2015	Post Card	P-8.1
P-9	Clauson	Patricia		03-16-2015	E – Mail	P-9.1
P-10	Cook	Gary B. Jr.		03-16-2015	Post Card	P-10.1
P-11	Cook	Jeremy		03-16-2015	Post Card	P-11.1
P-12	Cook	Valentina		03-16-2015	Post Card	P-12.1
P-13	Cook	Veda		03-16-2015	Post Card	P-13.1
P-14	Corson	Sam		03-03-2015	E – Mail	P-14.1
P-15	Deverger	Wesley		03-16-2015	Post Card	P-15.1
P-16	Fraser	Jane		03-16-2015	Letter	P-16.1 - .4
P-17	Gowen	Michael		01-21-2015	Letter	P-17.1
P-18	Hannah	Cora Lee		03-16-2015	Post Card	P-18.1
P-19	Henderson	Marla		03-13-2015	E – Mail	P-19.1
P-20	Jennings-McElheney	Jill		03-16-2015	E – Mail	P-20.1 - .2
P-21	Jeb	Antle M.		03-16-2015	Post Card	P-21.1
P-22	Kline	Amanda		No Date	Joint Letter	P-22.1

RS Table 1 – Comment Directory

Letter Code	Last Name	First Name	Affiliation	Date Submitted	Form Submitted	Individual Comments
Public Comments (continued)						
P-23	Knight	Cheryl		03-16-2015	Post Card	P-23.1
P-24	Ladson	Helen		03-16-2015	Post Card	P-24.1
P-25	Latham	Chuck		03-16-2015	Post Card	P-25.1
P-26	Lea	Frank & Luanne		03-08-2015	E – Mail	P-26.1 - .4
P-27	Mahas	John		No Date	Joint Letter	P-27.1
P-28	McInnis	Sarah		No Date	Joint Letter	P-28.1
P-29	McQuown	John R.		03-16-2015	E – Mail	P-29.1 - .10
P-30	Miller	Barbara		03-16-2015	Post Card	P-30.1
P-31	Montague	Clay		03-15-2015	E – Mail	P-31.1 - .8
P-32	O'Keefe	Kyle		02-09-2015	E – Mail	P-32.1
P-33	Patrick	James Wilson		03-15-2015	E – Mail	P-33.1
P-34	Patterson	Debra		03-16-2015	Post Card	P-34.1
P-35	Rader	Carolyn		12-04-2014	E – Mail	P-35.1
P-36	Sage	Jovan		03-16-2015	Post Card	P-36.1
P-37	Shellito	Joan & Charles		No Date	Note	P-37.1
P-38	Smith	Madeline		No Date	Joint Letter	P-38.1
P-39	Smith	Monica		No Date	EPA Form	P-39.1
P-40	Smith	Pat		03-16-2015	Post Card	P-40.1
P-41	Strong	Debra Ann		02-02-2015	Letter	P-41.1
P-42	Thomas	Shirleen		03-16-2015	Post Card	P-42.1
P-43	Vick	Alice		03-16-2015	Post Card	P-43.1
P-44	Weldon	Drew		No Date	Joint Letter	P-44.1
P-45	Wheat	Margaret		No Date	Joint Letter	P-45.1
P-46	Wooten	Mishaunda		03-16-2015	Post Card	P-46.1
Oral Comments at Public Meeting: December 4, 2014						
O-1	Brown	Carl				
O-2	Brown	Tommy				
O-3	Brown	Wendy				
O-4	Cidar	Kate				
O-5	Click	Damon				
O-6	Crooms	Lisa				
O-7	deFur	Peter				
O-8	Dressel	Floyd				
O-9	Freund	Mary				
O-10	Hubbard	Peach				
O-11	Hughes	Van				
O-12	Keyes	Alice				
O-13	Killian	Bob				
O-14	Kyler	David				
O-15	Lawrence	Larry				
O-16	Lloyd	Roger, Dr.				
O-17	McQuown	John				
O-18	Murray	Roger				

RS Table 1 – Comment Directory

Letter Code	Last Name	First Name	Affiliation	Date Submitted	Form Submitted	Individual Comments
Oral Comments at Public Meeting: December 4, 2014 (continued)						
O-19	Parshley	Daniel				
O-20	Paulin	James				
O-21	Purvis	Kim				
O-22	Renner	Jim				
O-23	Strong	Linda				
O-24	Wooten	Joel				

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
Comments regarding the Proposed Remedy			
Dr. Roger Lloyd / Galo Jackson	22, 6	Do you have any reproducible data on the thin-cover cap in a nine to ten-foot diurnal tide situation like we have here?	Well, the thin-cover cap, we put that through hydrodynamic modeling, and in the feasibility study there's an appendix that has the results of the modeling that was performed to establish the thin-cover cap should work. Now keep in mind that once the thin-cover cap is applied there will be long-term monitoring going on -- periodic monitoring to see that it, indeed, is intact.
	22, 20	But previous to now it's just modeling?	Modeling and experience with other sites. There's a sediment site -- EPA website that has a number of sites where thin-cover placement has applied. However, what I notice from that website is the feedback has not been received yet as to its effectiveness.
Floyd Dressel / Galo Jackson / Mr. Rhon	23, 12	Why is that cap off there by itself?	The design in the feasibility area is where they detected elevated Aroclor-1268. I think Purvis Creek is primarily conditions of elevated -- the PCB Aroclor-1268.
	23, 18	What is that going to do to the flow above the cap in Purvis Creek?	The flow will not change significantly.
	24, 2	Is it going to kill any of the marsh grass?	The cap might, but to a fairly limited extent.
	24, 6	I see where others are, but there's just one cap, right? That would block or dam Purvis Creek, and I live up here.	These caps are not going to be interfering with flow at all. What we did was we modeled the system with a hydrodynamic model, and we look at the scenario before we do any action -- you know, how would the system react today and how would it react -- you know, after we place a cap, and there's no significant change with respect to flow or the health and the behavior of the marsh following.
Van Hughes / Galo Jackson	24, 24	How thin is this thin cap, or to put it another way, how thick is it?	The thin-layer cover is about six inches.
	25, 3	So, it's only a six-inch cap, and it will stay there?	It's to restrict the -- it's on the flats, not in the creeks. In the creeks they're going to be armoring to make it stay. That's where your velocities are. That's where the modeling

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
			indicated the velocities are that might erode. That's where the cap will be armored.
	25, 12	You'll change the elevation of the marsh by only six inches?	Correct, in the flats. In the flats, not the creeks.
Peach Hubbard / Galo Jackson	26, 10	Capping the marsh will not eliminate toxic contaminates in the shrimp, shellfish, and fish, and dolphins, and if a hurricane comes and moves all those rocks and those armaments you've wasted your money.	That's a comment we'll take.
Wendy Brown / Galo Jackson	26, 21	My question is you said institutional controls every time with the different alternatives. What does it mean? Give us an example of institutional controls.	Well, one example is fish consumption advisories that are already in place. Another one is the restrictions on the use of the marsh in perpetuity. Those are the two examples that come more readily to mind.
	27, 6	Well, I assume that that has never been done yet? You said it is, but I don't see something like this visible in marshes.	You're right. That's something that has to be worked on, and a record of decision will develop that.
Lisa Crooms / Galo Jackson	27, 14	I want to know where these advisories are posted.	They're state advisories. It's the State's responsibility -- they're under the state of Georgia, and they're on their web sites I believe. I've seen them myself.
	27, 20	What web site specifically, please?	I don't know off the top of my head, but I have looked at them
Jim Renner / Galo Jackson	37, 23	Why is the preferred alternative Alternative 6?	It's explained in the proposed plan summary, and there's a link to the full proposed plan which is on the web. It was a matter of balancing -- balancing the marsh disturbance and removal of contaminants. We have to balance those things.
	38, 10	Minimally invasive?	Well, not minimally invasive, but not taking out 48 acres which may or may not come back.
Floyd Dressel / Galo Jackson	40, 7	My question on the dredging, where will the dredge spoils go?	They'll be taken - depending on the concentration of the contaminants they'll be taken to hazardous or nonhazardous land-fills.
	40, 19	What's going to happen to all the water running all	The liquids will be treated, and that's in the proposed plan. I encourage everybody to use the link on the proposed plan summary. There's a link that takes you to the 50-page proposed plan with all the details.
	41, 1	None of the water will run back into there?	No. It will be treated and it will be monitored.

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
Unknown speaker / Galo Jackson	41, 5	The whole ocean?	Yes, ma'am.
Alice Keyes / Galo Jackson	42, 22	The long-term monitoring that you described in every single one of the alternatives does not include marine mammals or include terrestrial animals. Additional studies should be conducted to determine the extent of the contamination. The Sapelo study, I understand it's beyond your purview but for public record I would like to get it in that we need additional studies to determine the extent of the contamination. What you have proposed in Alternative 6 is not enough. Capping these contaminates will not clean up the LCP Super fund site. We oppose the development of another alternative that removes more sediment, cleans it up, and looks at additional treatments such a bioremediation. It doesn't have to return to its existing site. We just want the stuff cleaned out of there. We would like for EPA and our potential responsible parties to work with us as citizens of this community to come up with a better solution. We know there's a better solution out there that can clean this up. It's dependent on our health, our children's health, and our health as a community in coming up with a better alternative. So, we look forward to continuing this conversation with you. Again, we appreciate the extension to the public comment period, but before I sit down I want to submit for the public record a report that was released earlier this year. It's called the Dirty Dozen. It was developed by the Georgia Water Coalition, a group of over 250 organizations and businesses who identify the most outrageous situations throughout our state, the most egregious	
Kate Cidar / Galo Jackson	57, 21	Why is there not a management plan in place right now? If this was a site on land there'd be a fence around it. It's in the marsh, and I understand that's more tricky, but there are Superfund sites that are water bodies that are settling under	Well, the removal did remove 39,000 tons of contaminated sediment, and as we saw in a couple of slides it has dropped. It has brought the concentrations down dramatically, but as far as isolating this, yeah, you're right. There is no

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
		active water bodies under tens if not dozens of feet of water. In an intertidal zone… I mean, we live in an area with tons of historic impoundments. We see water being managed for waterfowl, for agriculture, and this site needs to be maintained similarly to keep in those contaminates from getting into the next generation of people who live here. So, where has that been? In what alternative does that management-step occur?	alternative for something like that. That would be a good comment.
Peter deFur / Galo Jackson	63, 7	Did I hear you say at the beginning you would have a time for official public comment, or is just now?	You're talking about tonight? Yes. This is questions and comments, but the comment period does not -- I wanted to make that clear -- doesn't stop tonight. It's through February 2nd. Everything that comes in will be noted.
Comments Regarding the HHRA			
David Kyler / Galo Jackson / Mr. Koporec	28, 12	But it's obvious from the report that the plan -- that the assessment of human health risk had a fish consumption rate that is a fraction of the rate that people have revealed through this sample commonly exhibited. So, whereas you estimated 40 meals a year, they're eating twice or three times a week which would be 100 to 150 meals a year. So, that being the case won't you have to completely re-evaluate the human health assessment because of the much higher rate of consumption? Actual consumption being two and a half to three times the rates you assumed in your health assessment.	The human health risk assessment was based on -- the consumption rate was based on a study done some years ago that was site specific, and that's -- Kevin, you might be able to --- The human health risk assessment assumed fish consumption rates based on a survey of people in this area, how much fish in the area they said they would eat if there was not a consumption advisory in place, and those were the assumptions used in the health risk assessment. It amounted to -- for the recreational fish consumption that we saw it was 26 meals per year for the adult and a corresponding number of meals -- based on each meal being about half a pound of fish per meal. And then for the high-quantity fish consumer that assumed about 43 meals per year. What we would say to that is there are fish consumption advisories in place because we know contaminate levels are above where we would like them to be. We all acknowledge that. So, we would recommend you follow the fish consumption advisories.

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
	30, 10	That doesn't answer my question. What my point was --my question was given the consumption is at least two and a half to three times the rate you assumed, and there are already fish consumption advisories in place of certain types -- I'm not sure exactly how much they correspond with those in your study, but advisories are in place and plenty of them thanks to DNR, but will you now have to reassess human health risks because we know for a fact that consumption is two and a half to three times what you assume?	We've already triggered the need for remedial action. That was the function of the human health risk assessment. It's already been triggered.
Unknown speaker / Galo Jackson / Mr. Koporec	31, 1	What does trigger mean?	We have already got --we have -- EPA has legal license now to require a cleanup. It won't change anything. That means the levels of the fish are high enough that we know there's an unacceptable risk for people that eat the fish. We already know that. The goal is to get those levels in the fish down, and the target is to hope to do that by reducing the -- you can't clean up the fish directly, of course, but if we clean up the sediment the assumption is that that will reduce the levels in the fish over time.
David Kyler / Mr. Koporec	31, 15	The higher risk revealed by the higher consumption does not alter the remedy or the amount of money being spent to implement a more comprehensive remedy?	Well, we'll be following -¬I mean, the State has fish consumption guidelines based on number of meals per week or per month, or they have a graduated approach of looking at fish consumption guidelines. So, those numbers are going to stay in place, and the State, based on what data they have from what they collect and from what others give them, they will adjust those guidelines to say if the levels go up or down in the fish. The levels go up and down in the fish over time whether that's shellfish or finfish or whatever, but as Galo mentioned it's already triggered the need for action, and monitoring is a very important part of the remedy --of any remedy that ends up being selected here.

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
David Kyler / Mr. Koporec	32, 18	I' m looking for a succinct answer. In other words, the level of risk revealed by actual testing of human consumption is far higher than the assumed level of consumption in your human health assessment does not alter the proposed remedy which means the amount you're willing to invest and the comprehensiveness and intensity of the remedy; So, we will continue to monitor both the sediment levels as well as the fish levels and talking to people, that's part of -- the State's job is to talk to people about how much fish they eat or how much fish they would eat if there weren't consumption guidelines or whatever -- or how much fish they eat even with consumption guidelines	Well, I'm not selecting the remedy, but if you have that comment that comment is on the record now, and that will be considered in the remedy selection as well.
	33, 6	So, it could?	Yeah, it could, it could.
Bob Killian / Galo Jackson	33, 10	It sounds like you're saying that the fish advisory will continue in perpetuity because DNR on behalf of assisting the State will not require Allied Chemicals and Honeywell to clean up the levels for the fish advisories; is that correct? Why do we not clean up? Sure, but why don't we start removing it all so we no longer have a fish advisory as quick as possible? I don't want fish advisories to still be here when my great grandchildren are alive. I want the fish advisories to be three years, five years, ten years, but it looks like that's not even a goal. My question was why not? Why not clean it up? Why not clean it up so we have no more fish advisories?	It probably will last many years realistically. Even if it were removed today -- all of it were removed today. Keep in mind the PCBs are being removed from the majority of in the creeks are being removed. They're being dredged out of there.
	34, 18	You know that's not true. You know how widespread they are. You know that they spread out into the ocean. Why tell us something that's not true, or do you not know the truth? I understand that, but we can clean up as much of the source as possible.	We can't clean up the ocean.
Unknown speaker / Galo Jackson	35, 9	And it's a lot deeper than 18 inches too. We know that. It was in 1990.	We've got -- the remedial investigation -- the Appendix A has some vertical profiles, and the contamination drops off significantly after the first couple of inches, and it's

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
			Appendix A of the remedial investigation which is in the Reading Room.
Kim Purvis / Galo Jackson	35, 17	I grew up here in Brunswick, Georgia and spent my teenage years in Ellis Point which is located, if you Google Map, about midway between where the creeks feed out from LCP and the Brunswick Wood Preserving Plant. In that area of Ellis Point -- and this was without research, just the people that I know. Two ladies before the age of 30 diagnosed with breast cancer, myself and another young lady diagnosed at the age of 40 with breast cancer, and another woman 50 years old with breast cancer on the same road in Ellis Point. These are just people that I know personally, not doing research in the area. I don't recall seeing any type of public survey or invitation to come be part of the testing that took place with the residents of Sapelo Island. Is there a way for people to volunteer to be tested for these levels of PCBs and such other carcinogenic agents?	As I mentioned in the early slides we -- EPA is restricted to determining nature and extent of contamination and cleanups. That's the -- what you're asking about is something that is the responsibility of the Agency for Toxic Substances and Disease Registry, and I believe they've done studies here and, in fact, a couple years ago when I first became involved with this site with LCP they were consulted through the County and ultimately the State to look for cancer clusters, and my recollection is they didn't find anything. I can pass that on. Now that we've got your name I can pass it on to the Agency for Toxic Substances and Disease Registry.
Other			
Larry Lawrence / Galo Jackson	39, 5	That water flowing from the LCP plant and all surrounding areas goes from there to Sapelo Island. That means it passes through St. Simons, Sea Island, every island you can think of between here and there. What are these people or their property going to do with a situation like this? Are they going to correct it or not? In Step 3, you've got -- what is your environmental people up in Atlanta that have to do with taking care of the.. I'm sorry -- the people -- CDC or whatever it is -- disease control, are these people working on it? Are they being made aware of -- are they following step-by-step what you're doing down here to see if it's correct and at a correct enough speed. You know, we've seen very little -- other than a PowerPoint we've	That's a question for CDC.

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
		seen very little of the CDC, and I don't think it's been scrutinized yet. It's just been made available.	
Alice Keyes / Galo Jackson	42, 11	I know that you've located the material here at the Brunswick Library 24 hours ago. That's not enough time for us to absorb and inspect and get back to you guys.	You've got two months actually. The public comment runs to the beginning of February. Sixty days.
Tommy Brown / Galo Jackson	45, 11	Can I make a fair assumption that because this is in the Sapelo area -- or Island that these things are found in Sapelo Sound as well as the other sounds, right? Would that be fair? MR. BROWN: Sediment. Well, what I've seen over the last 20 years is a decline in the crabs, a decline in the fish. We built fisheries -- DNR built fisheries out there, and you can't buy fish. Crabs are no longer down there because your crab will eat around the septic tank, but he won't eat in it. What I propose to -- just now propose -- I got a letter back from the commissioner -- was that we open the sounds to a limited amount of trawling. He didn't like that idea. I've talked to shrimpers that said we'll take our nets off. We'll just drag drag-lines through there and get the crap out of our sounds, move it out. Like the gentleman said earlier, the 43 acres ain't going to fix this. We got a major problem, I think, in all of our estuaries, and the shrimpers if y'all would call on them, they would be willing to help y'all. Sure they'd like to drag the sounds for shrimp but they'll take -- they're willing --a lot of them are willing to take the nets off and just drag the stuff out of here, and it needs to go. It really needs to go I think.	The Sapelo was you know -- are you talking about sediment or fish? I don't know enough about the sediment quality in Sapelo.
Tommy Brown / Galo Jackson	47, 17	That money is gone now. BP pays for the study of the dolphins in the Gulf of Mexico. That's it. So, if you don't propose some money for this cleanup we won't know in a year or two whether it's working or not.	
James Paulin / Galo Jackson	48, 15	Have y'all looked at Andrews Island down in the depths of that of what's there? I know what leachates out of there.	Well, that's what -- we're proposing that, and we explain the reasoning in the long version of the proposed plan fact sheet.

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
		There's metals coming out of Andrews Island through the leachate, and 48 acres -- you better look at this whole darn thing. I've crabbed this river. I've fished this river for 30 years or more, and I don't think y'all can do what you're trying to even say you're going to do. How did we come up with these alternatives? You're talking about Alternative 6 is best. Who decided that?	
	49, 6	Quite frankly -- you know, I don't personally have zillions of dollars, but I wish that we would extend this program out and look a little bit further because how did people up on Sapelo Island get sick from what we did down here in Brunswick? That's a long ways --you know. I agree that fish travel but we've got fish crabs in our traps. They generally just kind of maintain themselves in this sound and these beaches. They don't like to go up to Sapelo. How do they get up there?	
Wendy Brown / Galo Jackson	62, 2	Are you familiar where Coffin Park is? The fence came down. What was there? Was that residual from the marsh? Well it's on public record that kids were playing in that contaminated environment and my son was one. I want us to be able to be tested, and that's what I request as a citizen.	I really don't know. Okay.
Comments Directed at Honeywell			
Steve Day / Galo Jackson	50, 12	Who is here from Honeywell? Sir, you asked the question about money. This really shouldn't be taxpayer money. Sir, how much did Honeywell earn last year, fiscal year 2013? You should. It's $3.9 billion net revenue. $3.9 billion in gross sales. I can tell you this. $3.9 billion and you're talking about $28 million, I would say that their attorneys in Washington are better than your attorneys because they're getting up in front of -- and their lobbyists, and where does	I have no idea. This went to the National Remedy Review Board because it went over the $25 million threshold which meant Washington and others in the country.

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
		the plan come from? Does it come from Washington, or does it come from Region 4? Did it really come from you guys, or did it come from higher up?	
	51, 14	So, they sought input from the stakeholders, in this case Honeywell.	And the Glynn Environmental Coalition.
	52, 9	Can you answer that question? Why are they not here?	UNKNOWN SPEAKER: They are here. They just don't want to be recognized.
	52, 18	Can you tell us why you're only willing to spend $28 million and work with the EPA for $28 million versus doing a complete cleanup?	We have worked with EPA as have the other responsible parties. Honeywell's not the only responsible party.
Steve Day / John Morris	52, 25	Who are the majority?	And we've been working with the Agency in a cooperative manner without attorneys to follow a Superfund process in a way that Galo has described, and we're standing here ready based on 20 year's-worth of scientific studies.
	53, 7	Is Honeywell willing to stand up to the plate and really commit to really doing a complete cleanup rather than just piecemeal?	We're not slinking in the background. This is the process that is followed. I am not here to answer questions. This is not my public meeting. This is the EPA's public meeting. If you would please honor that and direct your questions to the people who are here to answer them.
Unknown speaker / John Morris	54, 14	Where do you live, Mr. Morris? Are you a resident of this community or in town for this meeting?	No. I am in town. I come from the corporate office, and I am here because this site is important to Honeywell. We want to get this site cleaned up. We are cooperating with the Agency. We are not fighting with the Agency. We are here to say that this plan is based upon sound science, and it has evaluated the risks, and we are here ready to implement the plan.
Unknown speaker / John Morris	55, 2	Would you object to taking it to a higher level assuming that the community doesn't feel like capping is a complete answer? Would you be willing to go back to your board and say we need more revenue to get this done properly and be good corporate citizens?	We are ready to encourage the public to put your comments on the record, and the process requires EPA to evaluate those comments and respond, and that's what's going to occur here, and we support that process.

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
Mercury/Contaminants			
Unknown Speaker / Galo Jackson	59, 10	I'm curious about mercury. Can you quantify how much mercury was discharged, where and when, how much has been recovered? I ran across an article in the Atlanta Constitution a couple days ago. Back in 1993 they reported 35 pounds of mercury that was released over a five-day period. We know mercury is a real heavy metal. It likes to sink down low. So, it's probably not going to be sitting on the top 18 inches of marsh. It's probably sunk down deep. What types of mercury were discharged? Was it solid metal – Is that soluble form or what?	It was methyl mercury. The discharge was elemental mercury, but in the marsh it methylates, but only -- I may have mentioned too quickly that only a tiny fraction has methylated. As far as volume and mass of mercury there are estimates that I have in the record. I know I can come up with those.
Unknown Speaker / Galo Jackson	60, 8	Can you estimate how much mercury is left in the 28 acres that you want to dredge given the concentrations that you said, 12 milli-grams per kilogram? Can we get a figure on how much was emitted, how much was left, how much was recovered, and where else the rest of the mercury might have gone? I'm just curious because it didn't go anywhere. It didn't disappear. It's out there.	Yeah, you probably could. I agree with you.
Carl Brown / Galo Jackson	87, 19	Dealing with the PCBs, the type that we're dealing with where's the toxicity level? Is this something that is more toxic than some of the other types, or is it less?	The Arclor-1268 is the PCB compound that -- or mixture that1s prevalent here that we're worried about. The testing that's been done showed it to be less - somewhat less toxic than the most toxic one that we have well-established toxicity information on - and that's Aroclor-1254 -- and so, we used the toxicity information from 1254 to evaluate 1268. Even though we think it's probably less toxic we don't have enough information for its own toxicity value, but basically it's an EPA database. It's a probable human carcinogen. We have some information about causing cancer, not enough human information about it causing cancer to be a known carcinogen like other compounds are, and from a non-carcinogenic toxicity standpoint at higher exposure levels it's been shown to cause immune system problems and other

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
			effects on the blood system, effects on the central nervous system sometimes. So, things like that could happen at higher exposure levels. That's where we're at with that.
Hydrodynamic Model			
John McQuown / Galo Jackson	60, 22	You in your 54-page report -- of which 20 percent is forms and pictures -- you do make extreme use of a hydrodynamic model. It's not footnoted. Its design, its authorship, or anything else is nowhere referenced in that report. Googling produces no result. That report needs to be there. That model needs to be challenged. As I understand it the feasibility study wasn't delivered until 36 hours ago.	Again I would remind you that you we have set up an electronic EPA has set up an electronic Reading Room. All you have to do is Google LCP Chemicals Electronic Reading Room, and the report you're looking for is there -- a couple of drafts and, in fact, those drafts have all -- the risk assessments have been there for multiple years now. Starting shortly after I got involved with the site. There are drafts of it there with substantially the same thing. Remember you've got two months left.
Peter deFur / Galo Jackson	63, 7	Now as to the substance. The higher actual fish consumption rate does, in fact, affect the cleanup because if lower cleanup numbers are needed in order to accommodate a higher fish consumption rate then the remedy must accommodate lower concentrations of the contaminants in the site cleanup. That's just simple math, and it's a calculation that is done throughout the nation. The boundaries of the site are not clearly established as evidenced by two pieces of data. Number 1 is the dolphin data indicating that PCB-1268 -- which we know originates from the LCP site --is found in dolphins that are both residents of the river and residents of the nearby area.	

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
Peter deFur / Galo Jackson		Second of all, the other set of data are the Sapelo Island data that we've seen indicating that again PCB-1268 is not restricted to the narrow marsh area, so I think it's incumbent upon evaluation to do a broader consideration of samples farther afield. Hence the boundaries have not been clearly established. The other limitation or problem that I see with the evaluation of the site is the evaluation of the salt marsh grass itself. Salt marsh grass has multiple components, and in order to accurately understand how the contaminates are separated between the plants and the sediment they have to measure all the different parts of the plants including not just the leaves but the stems and the roots as well as the rhizomes of those roots. So, those data have not been collected. In addition, even though the report indicates that dioxin is a known co-contaminate and a known product of the process that occurred at the LCP site I don't find dioxin data in any of the reports. So, those data are needed. It's not obvious or necessary that the dioxide is all and exclusively collocated with PCBs or mercury or PAHs or lead. The dioxins may occur in other places, and we don't know about that. As to the remedies there are a couple of comments that I think need to be made and I will elaborate on these at great detail and length. The thin-layer cap is a problem because of a couple of things, one of which was already noted here, and that is that we don't have a long experience with thin-layer caps. That is we don't have 30, 40, or 50 years. We do have a longer experience with some other remedies.	
Mr. Parshley	69, 11	My question is the gradient being observed across the Brunswick peninsula a result of air transport of the PCBs? We see a PCB gradient. This same gradient that we observe across the Brunswick peninsula extends toward Sapelo Island, and that is why we are seeing PCBs in seafood and	*Note: The comments read by Mr. Parshley at the public meeting were similar to those submitted in writing. They are responded to in the responses to written comments of this Responsiveness Summary.*

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
		people and sediments towards Sapelo Island. We also see the same distribution across tidal modes going in other directions down to the Sapelo River, and so it makes -- it appears from the sediment data that has been issued with the Sapelo Island Report that there's a strong indication of air deposition. If you go into the library, Volume Number 38 goes into	
Roger Murray / Mr. Parshley	70, 8	how many pounds of each chemical were released, and that would be again to the soils, to the marsh, and to the air. Please identify how many pounds to the marsh will be removed of those that you've identified. This is called a mass calculation. Please provide the mass calculations for the site. I could not find them in any document.	
	71, 7	Who determined the physical damage for the proposed toxins in the feasibility study? What projects have the authors of the proposed options in the feasibility study completed in spartina marsh ecosystems? How many companies who have been working in estuaries and marshes were consulted for the estimates presented for remedial options in the feasibility study and proposed plans? Please provide a list of the projects they have done and the success of those projects. What institutional controls has the EPA implemented over the past 20 years? Who conducted these institutional controls? What is the budget for these institutional controls, and what institutional controls does the EPA anticipate implementing as far as the proposed plan? As part of that please describe the institutional controls in detail. Who will be implementing the institutional controls, and please provide an evaluation of your last 20 years of institutional controls since you've been aware of the problem for the past 20 years. I'm sure since you're going to depend on that to protect human health and welfare and to meet your	

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
		regulatory-required protection of human health and the environment that's going to be very important. The proposed plan lacks any monitoring plan. In particular mink are not found within the area. Mink is an apex species, and it's indigenous. So, the only conclusion can be that the dead zone for mink around the LCF site extends to where the mink population has been established. Please explain in the response to the study the work that the EPA has done to identify the mink habitat and the area of reproductive failure. Please describe the frequency of testing the EPA is proposing for the marine mammal population and for the mink population, and also for the individual fish species. The EPA does mention goals, but the goals do not have any timeline for evaluation. It mentions evaluation, but it doesn't state what the evaluation criteria are. Please clearly state in your response to the summary what are the evaluation goals, at what date and time would those evaluations take place? What are the action items the evaluation will use to determine if additional action is needed, and what will the additional actions be to meet those goals? Please make those specific dates, specific goal criteria, specific evaluation criteria so we'll know how it's going to be evaluated. I will submit the rest of my comments and the peer review journal studies in support of my comments here this evening at a later date.	
Linda Strong / Galo Jackson	74, 18	Can you tell me how this plan protects the aquifer?	Right now there's -- they were doing work on the caustic brine pool which is out there, and they're bringing that mix from a pH of about 11 or 12 to neutral, and it's working quite well.

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
			That will immobilize the mercury because at high pHs mercury becomes much more volatile as well as other heavy metals.
Mr. Killian / Galo Jackson	75, 4	Does it give concern to DNR that Honeywell is so happy with your plan?	I don't know how to answer that.
	75, 9	Does anybody from DNR have any concern about how happy Honeywell is?	Not that I'm aware of.
Damon Click / Galo Jackson	75,14	I guess the question I heard from a couple people is if Honeywell is putting up any of their own money to help the community, or is just government funds?	Honeywell funded the removal that occurred in the 1990s. There were two on-scene coordinators here overseeing it. In fact, all the uplands removal was overseen by the funding was done by not just Honeywell but the other responsible parties as well.
	75, 24	And for the additional remediation?	It's exactly the same.
	76, 6	Also, does anyone know if there's any of our local representatives here tonight? What's his name?	One city commissioner, and he's right back there. Johnny Cason.
Joel Wooten / Galo Jackson	76, 16	What do you mean by long-term monitoring; 50 years, 100 years, 200 years?	Long term, decades, until it's determined to have met the goals.
	76, 21	What are the goals?	There are goals for sediment concentration as well as fish tissue concentrations also, and those are prescribed by the State of Georgia regulations.
	77, 1	Do you know how much mercury was discharged at the Allied Chemical plant, Honeywell plant? What records are those? Plant manager? Didn't he testify that over one million pounds of mercury was unaccounted for and potentially discharged? The one that was taken up in Jessup?	I have run recent estimates, but they're -- I know the records are incomplete, but there are some records that we've been looking at. Generally depositions from some of the former people. I have not read the deposition recently so Correct.
	77, 23	You've done testing on fish. You've done testing on herons. You've done testing on mammals, but there's been no testing whatsoever on humans or substantive fishermen in the Turtle River area, the Blythe Island area, St. Simons,	There was an ATSDR health study done more than ten years ago. It's kind of vague in my memory.

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
	78, 15	Are you the person that's most informed about what's been going on?	This has decades of history. I don't recall every nuance immediately.
	78, 19	Do you recall any testing of PCB levels and mercury levels in residents of Glynn County to see what the PCB levels or the mercury levels were that were-- in the Turtle River area?	No, I don't recall.
	79, 2	Wouldn't that be the gold standard; to find out whether or not there's mercury in residents in that area?	I would imagine so.
Mary Freund / Galo Jackson / Mark Springer	79, 21	So, my question is why is there no bioremediation being explored? So, that's your answer?	PCBs -- I think to bioremediate would create difficulty. Actually Mark is the sediment expert. PCB degradation and bioremediation, people have been working on it for 20-plus years starting with the Hudson River. The primary researcher from Rensselaer is at the point where she can degrade in the laboratory some of the higher chlorinated compounds. The problem, especially with 1268, is it's primarily higher chlorinated content. It's a slow process, and quite frankly we're not at the point where we can do it as a treatability. We can do it in the laboratory. If you want to follow it actually Tierra Solution which is a conglomerate or coalition of responsible parties on the Passaic River site in New Jersey which is PCBs and dioxins from the Diamond Shamrock site, they proposed to do an in situ project to evaluate whether or not they could do it. That's in the works. It's being addressed. I do bioremediation of contaminates. Doing PCBs as a treatment technology, as far as I know were not there yet.
Unknown speaker / Galo Jackson	84, 14	How much contamination would have to be present for the EPA then to decide to get another agency involved on their own instead of having the people in the community be the one that drives that? It's not that we shouldn't drive it, but when does the EPA decide to drive it?	I've not been confronted with that.

RS TABLE 2
Summary of Public Meeting Comments and Responses

Name/Agency	Location Page#, Line	Comment Summary	Response
	86, 10	Will you have to go back out for a public comment period with a new component of the remedy that includes, for example, Steve's method or the one that Joe has talked about, or one that I'm going to explain to you? Do you have to start over? Can you include that even though it's not been part of the feasibility study. All over or do you simply have to take it out to public hearing?	I have not thought that through. I'm not sure. I'd have to get back to you on it. It's starting another feasibility study.
	87, 8	I would just like to comment that I think there should more health risk assessment and testing of the residents in the area -- all of the area, and I think that the fish consumption advisories should be more prevalent. I bought a fishing license this year. No one said a word to me about what I should and shouldn't eat or how much and how often I should and should not eat fish.	

RESPONSIVENESS SUMMARY

ATTACHMENT 1

Comment and Response Index

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
Glynn Environmental Coalition (GEC) letter March 16, 2015		
Baseline Ecological Risk Assessment (BERA) Comments and Questions		
Comments regarding Cordgrass (*Spartina Alterniflora*)		
GEC 3.1	Why does the BERA fail to describe the marsh ecosystem in a manner that shows an understanding and knowledge about the movement of nutrients and Chemicals of Concern (COCs) within the ecosystem?	The BERA acknowledges the highly productive ecosystem of the salt marsh and associated tidal creeks with general discussion of the relationship of various animals dependent on detritus (mostly from Spartina). The BERA discusses movement of the bioaccumulative chemicals (mercury and PCBs) through the tidal system and the food web. The exposure models for various receptors used in the BERA reflected this by using data related to organisms such as crabs and mummichogs that depend on the detrital matter. Even the "sediment" samples were largely comprised of detrital material and less of the mineralized portion, therefore reflecting the importance of detritus in the marsh.
GEC 3.2	Why, in the entire 1002 page BERA, is *Spartina alterniflora* detritus potential to transport COCs not mention even once?	
GEC 3.3	Has *Spartina* been identified and an initial vector for mobilization of sediment bound chlorinated hydrocarbons, such as PCBs, into the estuarine food chain (Mrozek, 1982)?	Yes.
GEC 3.4	Have studies shown *Spartina* to be a key factor in bioaccumulation of PCB in detritus and an important means of entry for this pollutant into estuarine food webs (Marinucci, 1982)?	Yes. See response to GEC 3.1.
GEC 3.5	Does the statement from the LCP Marsh Remedial Investigation indicate the authors understood the importance of *Spartina* to the bioaccumulation and transport throughout the ecosystem and movement through the food web?	Yes. *Spartina* was evaluated as a food source to herbivorous mammals such as the marsh rabbit in the BERA and the manatee in the 1997 EPA and 1998 PTI Environmental Services (PTI) ecological risk assessments.
GEC 3.6	If so, why were steps to sample all parts of the *Spartina* plant not taken during the remedial investigation?	Please see responses to GEC 4.10 below.
GEC 3.7	Has scientific literature noted a differentiation between the root rhizome stem and leaves and their ability to bioaccumulate PCBs?	Yes.
GEC 4.1	Did Sustainable Development in the Southeastern Coastal Zone note .33 ppm in *Spartina* shoots, 2.80 ppm in roots (Army Corps of Engineers)?	Yes.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
Comments regarding Cordgrass (*Spartina*) and Mercury		
GEC 4.2	Why did the BERA limit testing for mercury to a section of the leaf 15 cm above the sediment?	See response to GEC 4.10.
GEC 4.3	Does *Spartina* testing most frequently and routinely sample the root, rhizome, stem, leaf, and detritus due to the selective bioaccumulation noted with Spartina (Mrozek, 1982; Windham, 2001)?	No. Depends on the objectives of the investigation.
GEC 4.4	What was the decision-making process used to limit sampling to just a small section of the leaf, which is know from literature to be the part of the plant with the least bioaccumulation potential?	See responses below for GEC 4.10 and GEC 5.4
GEC 4.5	Were the BERA authors aware that in the fall, the root-rhizome material makes up 78% of the total live biomass and by spring this decreases to 53% (Schubauer and Hopkinson 1984)?	Yes.
GEC 4.6	Did the authors of the BERA consider the Manatee has been seen grazes on the *Spartina* in the LCP Site area?	Yes.
GEC 4.7	What was the decision-making structure used to limit the *Spartina* sampling to the leaf 15 cm above the sediment?	See responses below for GEC 4.10 and GEC 5.4.
GEC 4.8	Were stakeholder agencies consulted such as the National Oceanographic and Atmospheric Association (NOAA) or U.S. Fish and Wildlife consulted before this *Spartina* sampling plan was limited to just the leaf 15 cm above the sediment?	Yes. For purposes of the BERA.
GEC 4.9	What peer reviewed journal articles were used to support the decision to limit *Spartina* sampling to 15 cm above the sediment?	It may not be possible to determine this at this juncture.
GEC 4.10	Did the BERA consider the potential for *Spartina* to bioaccumulate metals like mercury from sediment and excrete them from the leaf (Weis, 2003; Windham, 2001)?	The Remedial Investigation and BERA tried to convey the importance of detrital material and various forms of organic carbon (OC) on their ability to sorb PCBs and to show that it reduces the availability of PCBs to bio-accumulate when bound tightly to OC. Although this occurs, the food web models assumed 100% bioavailability. It is well known that plants differentially uptake and compartmentalize various contaminants in different parts of the plant and that various researchers attempt to identify contaminant movements within the plant itself. However, for risk assessment purposes, sampling *Spartina* shoots

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		(up to 15 cm above the sediment) was considered to provide a central tendency or average concentration in the plant for exposure evaluation (e.g., to the marsh rabbit that is assumed to feed solely on *Spartina*). It was not a goal of the BERA to understand the mechanisms of *Spartina* accumulation and excretion of mercury or PCBs.
GEC 5.1	What would the implications of *Spartina* growing on top of mercury contaminated sediments?	Uptake of contaminants into *Spartina*.
GEC 5.2	Would removing the *Spartina* from mercury contaminated sediments result in less transport from sediments into the ecosystem?	See responses to GEC 4.10 and GEC 5.4.
GEC 5.3	Did the BERA examine mercury transport via *Spartina* (Weise, 2003; Windham, 2001)?	No. See response to GEC 5.4.
GEC 5.4	What was the reasoning of the BERA to exclude this critical fact about the excretion and bioaccumulation properties of *Spartina*?	It is recognized that *Spartina* and other plants and animals uptake, sequester, and excrete chemical contaminants such as mercury and PCBs. In a sense, some mercury is removed from the sediment, stored and excreted from plant tissues. As the plants decay, some mercury returns to the substrate. The critical aspect of this is to avoid chemical uptake that would not only be detrimental to the plant but to consumers of the plant. The BERA focused on the consequences of elevated concentrations of contaminants in *Spartina* that may cause toxic effects rather than on the ultimate fate of contaminants within plants.
GEC 5.5	Did the authors of the BERA do their due diligence and research to identify the potential of the biota to bioaccumulate and transport identified COCs? If not, why not?	Yes.
GEC 5.6	Did any stakeholder agencies comment about the apparent selective use of data or data appeared to be censored?	No.
GEC 5.7	Could the oversight of including mercury excretion along with salt from *Spartina* leaves be interpreted by a reasonable individual as the selective use of data or the censorship of data?	No. The data objective for the BERA was to collect *Spartina* tissue to assess exposure to consumers of *Spartina*.
GEC 5.8	What is the EPA's explanation for such a critical piece of information, such as mercury excretion, being excluded from the BERA?	See responses to GEC 4.10 and GEC 5.4.
GEC 5.9	How would the exclusion of mercury excretion impact the risk calculations used to develop the Feasibility Study?	Detailed research into the uptake, compartmentalization, and excretion of each contaminant in *Spartina* or many other organisms is not a critical

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		objective of the ecological risk assessment. The BERA focuses on the concentrations of contaminants in sediment, water, and biota that are expected to result in adverse effects. The nature and extent of mercury excretion from *Spartina* is not considered a data gap or a censorship of facts. It may be useful information, but it provides minimal enlightenment to our knowledge of how to reduce adverse effects and exposures.
GEC 5.10	Would mercury levels in *Spartina* leaves be a critical piece of information for evaluating the potential impact to marine mammals like Manatees that use this plant as a primary food source?	See response to GEC 5.11 below.
GEC 5.11	Being that the St. Simons Sound and Turtle River are documented Manatee calving grounds, what significance is mercury in the Manatee's primary food source while lactating?	Manatees may be found in the Turtle River area and even more infrequently in Purvis Creek and may graze occasionally on *Spartina* containing elevated concentrations of mercury. Manatees feed on a wide variety of submerged, emergent, floating, and shoreline vegetation. The BERA focused on top carnivorous indicator species because they tend to accumulate more mercury in the more toxic form of methylmercury from their prey (mummichogs, crabs, finfish). In addition, these food items contain much higher methylmercury (MeHg) concentrations (up to 100%) than *Spartina,* which only contains about 10% MeHg relative to mercury. It was determined in the planning process that if the top level carnivorous species could be protected, this would also be protective of species that would likely have lower doses of MeHg. For these reasons, the manatee was not selected for quantitative exposure analysis in the BERA. Risks to the manatee were evaluated by EPA (1997) and PTI (1998).
Comments regarding Cordgrass (Spartina) and Aroclor 1268		
GEC 5.12	The BERA appears focused on Aroclor 1268. Were the following Aroclors found at the LCP Site – Aroclor 1016, Aroclor 1221, Aroclor 1248. Aroclor 1254, and Aroclor 1260 (ATSDR, 2014a)?	See response below for GEC 6.9.
GEC 6.1	What PCB congeners are present in Aroclor 1016, Aroclor 1221, Aroclor 1248. Aroclor 1254, Aroclor 1260, and Aroclor 1268?	There are 209 PCB congeners and many of them are found in various Aroclor mixtures.
GEC 6.2	Do the PCB congeners found in Aroclor 1016, Aroclor 1221, Aroclor 1248, Aroclor 1254, Aroclor 1260, and Aroclor 1268 include those with dioxin and furan properties?	PCB congeners are found in all Aroclor mixtures. The Administrative Record's key documents (in this specific case Appendix J of the BERA and Section 8.3 of the HHBRA) contain much of the information sought.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		The only PCB congeners present in Aroclor 1268 with dioxin/furans-like properties are IUPAC No. 77, 105 and 126. They are present at concentrations of 0.38%, 0.38% and 0.07%, respectively. Table 27 of the HHBRA contains the percent composition of the dioxin-like PCBs in Aroclors 1016, 1254 and 1268. Note Aroclor 1221 was analyzed in sediment 1,058 times and detected only 10 times at a maximum concentration of 0.2 mg/kg.
GEC 6.3	Were the non-dioxin-like and dioxin-like effects of the specific PCB congeners analyzed in the BERA, or was only a general Aroclor 1268 analysis conducted?	The BERA evaluated risk from Aroclor 1268. For the most part only Aroclors were analyzed and evaluated in the BERA. A limited number of congener analyses were run on invertebrate, sediment and cordgrass samples during the mid-1990s. Congener analyses results are included in the Administrative Record. Due to the limited number of samples, those results were discussed only qualitatively in the BERA.
GEC 6.4	Were the EPA BERA protocols for analysis of PCB dioxin and non-dioxin-like effects conducted as part of the 2003 BERA for the LCP Site marsh (EPA, 2003)?	The EPA 2003 guidance was taken into consideration during the planning process. The 2003 draft of the BERA was not approved by the EPA, hence it is not included in the Administrative Record. The EPA's remedy decision is not based on the 2003 draft document.
GEC 6.5	Were all congeners of PCBs detected at the LCP Site measured in the *Spartina* samples collected 15 cm above the sediment?	No.
GEC 6.7	Was the PCB congener analysis limited to those found in Aroclor 1268?	
GEC 6.8	What is the significance of the BERA focusing on Aroclor 1268?	When sediment and biota samples were collected in the late 1990s and early 2000s, the other Aroclors were virtually non-detected or at very low concentrations; therefore subsequent investigations focused on Aroclor 1268. PCB congeners were also analyzed in the late 1990s. The results indicated that the total hepta-, octa- and nona-PCB congeners made up approximately 97% of the total PCBs in sediment. These heavy chlorinated congeners correlated well with Aroclor 1268. In addition, samples were collected and analyzed for dioxins and furans. The results were similar in that the heavy chlorinated congeners dominated in sediment and biota samples. The results confirmed that analysis of Aroclor 1268 would be highly representative for evaluating exposures. Therefore, analysis of Aroclor 1268 was adopted as best representing PCBs in the marsh. It also provided a cost-effective way to obtain lots of samples, relative to the high cost of congener analysis.
GEC 6.9	Was the BERA limited to an analysis of Aroclor 1268? If not, where can the chemicals with similar modes of physiological action, like the other Aroclors, dioxin, and furans be found?	

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 6.10	Was a Toxicological Equivalency Factor (TEF) developed for all the PCB Aroclors, dioxins, and furans found in *Spartina*? If not, why not?	Species-specific TEFs are not conducted for risk assessments as they would require enormous amounts of data. The COCs in sediment were selected based on a screening process (Appendix B of the BERA) where chemical concentrations could pose unacceptable adverse risk to ecological receptors via direct contact or through bioaccumulation. Specific toxicological effects were then evaluated for the COCs. Of the 31congeners evaluated in a cordgrass sample, only the following four congeners were detected: 202, 206, 207 and 209. They were detected at concentrations of 0.78, 6.3, 0.71 and 0.73 µg/kg, respectively. None of these congeners have dioxin-like properties.
GEC 6.11	What was the reasoning used to limit the COCs examined in *Spartina*?	See previous responses to GEC 6.8 through 6.10.
GEC 6.12	Were toxicological effect found in organisms at levels lower than expected when the toxicological factors were limited to just the three factors: mercury, Aroclor 1268, and lead?	Effects were based on the three COCs, not on all detected chemicals that may be present in the LCP Chemicals marsh.
GEC 7.1	Why is the crucial nutrient recycling system the *Spartina alterniflora* serves for the estuary noticeably missing from the BERA?	Based on previous responses, the BERA evaluates potential toxic risk to various indicator receptors and does not examine nutrient recycling mechanisms.
GEC 7.2	The BERA is devoid of any discussion about the PCB bioaccumulation properties of *Spartina* in marsh environments.	As mentioned in the above responses, the risk assessment focused on the potential toxicity of the COCs to a variety of organisms in the local marsh ecosystem. This included the collection and analysis of COCs in *Spartina* where the data were used in relevant food web exposure models. The sediment samples contained plenty of detrital matter, composed largely of processed and decayed *Spartina*. The sediment data were also used in food-web models to assess the effects of bioaccumulation from the base of the food web. Substantially more PCB and methylmercury accumulates in animal lipid tissue (e.g., in crabs that feed among the *Spartina*) which then moves rapidly through the food web, more so than just from plant tissue.
Comments regarding Fiddler Crabs (*Uca minax* or red-jointed, *Uca pugnax* or mud fiddler, *Uca pugilator* or sand fiddler)		
GEC 7.3	Why does the BERA limit reporting of PCBs in fiddler crabs to Aroclor 1268 (BERA, pg. S-5)?	See response to GEC 6.8 and 6.9.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 7.4	Why does the BERA report found that they were fiddler crabs present in numbers (200 young and adult crabs per square meter) that might be expected to occur in a relative pristine marsh, but not quantify the amount of sediment brought to the surface on an annual basis?	See response below for GCE 8.3.
GEC 7.5	Is the amount of sediment excavated from the sediments by Fiddler Crabs important information for remedies using capping of marsh sediments?	See response below for GCE 8.3.
GEC 7.6	Why were Fiddler Crabs sampled at a location previously remediated (BERA, Pg. 55)?	See response below for GCE 8.3.
GEC 7.7	Was the BERA data concerning fiddler crab abundance biased by sampling in a previously remediated area?	See response below for GCE 8.3.
GEC 7.8	Can the encountering of the membrane at 40 cm be used to infer the minimum depth of the fiddler crab burrows are 15.75 inches (BERA, pg. 55)?	See response below for GCE 8.3.
GEC 8.1	Does the BERA state "these burrows, which often extend to 2 ft in depth …. (BERA, pg. E-2)? What are the implications of sediment excavation activity by fiddler crabs to remedies involving placement of capping material over the marsh?	Yes. Some bioturbation of soft capping materials will occur.
GEC 8.2	What is the quantity of sediment brought to the surface annually by over 200 fiddler crabs per square meter?	This was beyond the scope of the BERA.
GEC 8.3	What is the quantity of sediment brought to the surface annually by the remaining biota (other than Fiddler Crabs)?	As mentioned previously, Aroclor 1268 is the most representative form of PCBs for assessing exposures in the marsh. The fiddler crab abundance study occurred at an active seep area that has relatively high concentrations of COCs that would be expected in crab tissue. Uncertainties of this study were presented in the BERA. Quantifying the volume of sediment excavated by benthic organisms such as crabs was beyond the objectives of the risk assessment. However, for determining if a cap would be protective, the alternatives and the proposed remedy (excavation, capping, and thin-layer cap) took into account the potential effects of bioturbation, especially by fiddler crabs. The conclusion was that bioturbation would have a negligible effect on the excavation or permanent armored cap portions of the proposed remedy. With respect to the thin-layer cap, it was concluded that some mixing of the thin cap and bioturbed sediments may occur over a long period of time, but that the

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		overall mixed sediment concentrations would not exceed the cleanup levels.
Comments regarding Mink (*Mustela vison*)		
GEC 8.4	Does the EPA intend to make identification of the mink range within the Turtle River's system and the St. Simons sound estuary a priority?	No, the EPA does not intend to identify the mink's range in the region.
GEC 8.5	If the EPA is can make mink range a priority what is the timeline for collection of this data?	
GEC 8.6	After identifying the Mink as an indigenous species missing from the ecosystem surrounding the LCP Chemicals Superfund site, why did the EPA eliminate the species from the baseline ecological risk assessment when it was obviously one of the most impacted species?	Please see response at end of this mink subsection (GEC 10.1).
GEC 8.7	Is the EPA aware that mink are a species susceptible to adverse impacts from PCB exposure and a good indicator species for measuring ecological impacts?	Yes.
GEC 8.8	What is the EPA's rationale for elimination of the mink from the BERA?	See response at GEC 10.1 below.
GEC 8.9	What is the EPAs explanation for the absence of mink from the LCP Site?	
GEC 9.1	Does the EPA intend to identify the "dead zone' around the LCP Site where mink are absent?	There is no reason to suspect that mink are not present in LCP Chemicals marsh area. The commenter does not provide evidence of a "dead zone".
GEC 9.2	Does the EPA intend to define the area where mink are absent, and delineate where viable and sustainable mink populations can be found?	No. See also response to GEC 8.4.
GEC 9.3	If the EPA does determine the extent of the area where the contamination has eliminated the mink population, and will mink be used as a monitoring criterion to assess the Remedial Action?	See response to GEC 9.1 above.
GEC 9.4	If the EPA does intend to use the mink and a monitoring indicator, will this be placed in the Record of Decision and Consent Decree for the LCP Site?	The EPA does not plan to monitor mink in the LCP Chemicals marsh.
GEC 9.5	Will the EPA recommend mink be used as monitoring criteria for assessment of the remedial action? If not, why not?	No. Please see response at end of this mink subsection.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 9.6	Why should the EPA use otters when mink are an indigenous species and the indicated as the proper species to use?	See response to GEC 10.1.
GEC 9.7	Does the EPA agree that if an exposure model can be applied from the mink to the dolphin, the model can be applied from the dolphin to the mink?	Each receptor has its own exposure model and specific assumptions, thus applying the same model to different species would be inappropriate.
GEC 9.8	Is the EPA aware that PCBs have been associated with low mink kit survival and mink are a sensitive population to the toxic effects of PCBs (Bursian 2006; Bursian, 2013)?	Yes.
GEC 10.1	Will the EPA consult literature and establish a remedial action level that will result in the recovery of the mink population at the LCP Site?	It is not the objective of the ecological risk assessment to evaluate risk to dozens of individual species. The objective is to select likely indicator species as surrogate representatives of potentially affected feeding guilds. The river otter was observed in the LCP marsh system and selected as the piscivorous mammal at most risk. This does not mean that mink are not present in the marsh or that there is a dead zone for mink. The food-web model assumed the otter would consume not only mummichogs and finfish, but crabs as well. Due to the limited use of the LCP marsh by mink and their presumed dietary needs relative to the otter, it was conservatively assumed that risks to the otter would be similar to the mink. In addition, extra conservatism was used, in that any potential toxicological effects to the otter would be based on reproductive effects in mink exposed to Aroclor 1254 which is considered more toxic than Aroclor 1268. Monitoring contamination in mink from the LCP marsh would not be cost-effective and would likely result in undue harm to them. Monitoring the anticipated contaminant reductions in river otter and mink dietary components is more measurable and effective. The proposed cleanup levels for mercury and Aroclor 1268 are considered to be protective of consumers of fish and shellfish (carnivorous and piscivorous mammals, including humans).
Comments regarding Dolphins		
GEC 10.2	What is the EPA's explanation for not including the dolphin data in the BERA?	The EPA appreciates concerns regarding sensitive species such as mink and dolphins. The EPA fully recognizes the latest data collected over the past several years on the bottlenose dolphin in the region. The BERA was based on data between 2000 and 2007. Much of the dolphin data were unavailable at that time for meaningful quantification of dolphin exposure in the LCP marsh. However, to be conservative, both the

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		BERA and the human health baseline risk assessment (HHBRA) used very conservative exposure and effect assumptions to account for uncertainties where exposure to other potential indicator receptors may be unknown. The data and conclusions in the BERA and the BHHRA were used to develop cleanup goals in sediment that are expected to reduce COC fish concentrations to levels protective of humans, river otters, dolphins, and herons.
GEC 10.3	Did the EPA failed to communicate with the stakeholder agencies, including the Georgia Department of Natural Resources, the National Oceanic and Atmospheric Administration, and the US Fish and Wildlife Service concerning the dolphin sampling and analysis?	The EPA has been aware of the on-going dolphin studies.
GEC 10.4	Was the EPA oblivious to the fact that the same people that were producing data on the LCP Chemicals Superfund site were also doing sampling and analysis on the resident dolphin population for PCBs associated with the LCP site?	No.
GEC 11.1	Will the EPA include the large volume of data on the coastal Georgia resident and transient dolphin population into the BERA? If not, why not?	See response below at GEC 12.4.
GEC 11.2	Does the EPA understand the implications to human health from the dolphin data? Does the EPA understand that dolphins and humans eat the same fish species?	Yes.
GEC 11.3	Will the EPA incorporate the dolphin data into the HHBRA? If not, why not?	No. Please see responses below in this dolphin subsection.
GEC 12.1	Does the EPA intend to incorporate the large volume of dolphin data into their decision- making process for the propose plan for the marsh at the LCP Chemicals Superfund site?	Please see response below to GEC 12.4 and GCE 13.6.
GEC 12.2	Will the EPA established a maximum allowable level of 5.1 parts per billion (PPB) in fish as the goal for the LCP marsh cleanup?	No.
GEC 12.3	What is the rational for inclusion of the dolphin studies in the HHBRA to argue for only Aroclor 1268 sampling and not including them in the BERA?	There were no dolphin studies used to assess human risks in the HHBRA. The HHBRA and BERA was not limited to only Aroclor 1268 data.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 12.4	Will the EPA utilize all the dolphins studies identified in these comments and the corresponding references to formulate Remedial Action levels protective of the resident dolphin population?	The BERA and HHBRA were completed in 2011 and formed the basis of the Feasibility Study and Proposed Plan. The dolphin data (e.g., tissue concentrations of Aroclor 1268 in dolphins) are not inconsistent with the data presented in the risk assessments. Potential adverse risks from exposure to Aroclor 1268 primarily through dietary intake was documented for humans, river otters, herons and several other indicator receptors. Even though a site-specific food web model was not performed for the dolphin, EPA has assumed that the dolphins are also at risk, similar to humans. The primary local source of Aroclor 1268 contamination is in the LCP marsh sediment, so the proposed remedy seeks to remove much of the contamination to reduce exposure from the base of the food chain up to consumers of fish. This includes dolphins. It would be counter-productive at this time to spend additional time and resources to come to a similar conclusion with other researchers that dolphins are at risk. The proposed remedy and sediment cleanup goals are expected to protect all upper trophic-level consumers of fish.
GEC 12.5	Were Aroclor 1254 found in 81 samples (9%), and Aroclor 1260 found in 37 (4.1%) in upland samples (ATSDR, 2014a)?	Yes.
GEC 12.6	If Aroclor 1254 and Aroclor 1260 were found in upland samples, what was the EPA's rational for eliminating these PCB Aroclors from the COC to be sampled for in the LCP marsh?	See responses to GEC 6.2 and GEC 6.8.
GEC 12.7	Were other PCB Aroclors found in upland samples at the LCP Site, and if so, what was the EPA's rational for eliminating these from the COC to be sampled for in the LCP marsh?	As mentioned previously, Aroclor 1268 is the most predominant form of PCBs in the marsh sediment and biota, with negligible amounts of the other Aroclors. The analysis of Aroclor 1268 does not eliminate any PCB congeners in the sample, so if there are any dioxin-like PCB congeners in the sample, they are included in the total concentration reported for Aroclor 1268.
GEC 12.8	Was PCB congener 206 established as the one defining Aroclor 1268 contamination from the LCP Site in coastal Georgia (ATSDR, 2014b)?	Yes, PCB congener 206 is prevalent in Aroclor 1268.
GEC 12.9	Is PCB congener 206 the most prevalent, or dominant, in Aroclor 1268?	Yes.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 12.10	Has a gradient of PCB congener 206 been found emanating from the LCP through sediment samples taken in coastal Georgia (ATSDR, 2014b)?	Apparently, according to ATSDR 2014b.
GEC 13.1	Using PCB congener 206 as an indicator of the boundaries of the LCP Site contamination, what are the geographical boundaries of the contamination from the LCP Site (ATSDR, 2014b)?	See response below for GCE (2) 2.2.
GEC 13.2	Did ATSDR compare and contrast total PCBs in fish between the Brunswick Georgia and Sapelo Island area (ATSDR, 2014b)? If so, what were the findings (differences quantified)?	The ATSDR 2014b study provides its own conclusions.
GEC 13.3	Was the purpose of the ATSDR study to "Compare results in people with what is known about dolphins" (ATSDR, 2014b)?	Yes.
GEC 13.4	Does the ATSDR study imply what is known about dolphins could be utilized to predict impacts to people eating the same fish species (ATSDR, 2014b)?	The ATSDR study is preliminary and unpublished. Conclusions, including its implications, are not currently available.
GEC 13.5	Did ATSDR report, "We did find that human and dolphin specimens contain qualitatively similar environmental contaminants" (ATSDR, 2014b)? Does this statement imply the dolphin data is very important to understanding chemical exposure to people from the LCP Site?	It is not surprising that the PCBs 206 and 209 are found in both dolphins and humans. Dolphin data cannot be used to assess human health risks.
GEC 13.6	What are the implications to the HHBRA from the BERA not having included the dolphin data and studies identified in these comments to the EPA on the BERA?	The ATSDR 2014b citation was a summary presentation of data. It is known that a major local source of Aroclor 1268 and its dominant PCB congener (206) is from the LCP marsh area. Congener 206 is not listed as part of the dioxin-like PCB congeners, nor does it appear to contribute to non-cancer toxic effects (last slide of the ATSDR 2014b presentation). The EPA risk assessments largely assumed that Aroclor 1268 had similar toxicity to Aroclor 1254, which contains many of the dioxin-like PCBs. This conservatism was carried through in the development of the sediment cleanup levels. It is expected that the proposed cleanup in the LCP marsh will substantially reduce adverse exposures to Aroclor 1268 and mercury to fish, wading birds, mammals, dolphins, and humans.
Comments regarding The BERA and Dioxin/Furan		
GEC 13.7	Are the TECs (a.k.a TEQ) reported 2 to 4 orders of magnitude higher than the EPA screening level of dioxin of 2.5 ng/kg?	The 2.5 ng/kg is only for 2,3,7,8-TCDD, and not for all TEQ dioxin/furan congeners. In addition, none of the TECs calculated for the sediment

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		samples were four orders of magnitude above the EPA screening value of 2.5 ng/kg. This includes the samples from the Former Facility Disposal Area (FFDA), which were removed and properly disposed of in the late 1990s. Ten sediment samples had calculated TECs greater than two orders of magnitude above the EPA screening value, however, all were removed during the late 1990s removal, or will be removed during the execution of the Selected Remedy, as they were located in either the LCP Ditch or Eastern Creek.
GEC 14.1	Was any effort whatsoever made by the EPA to obtain existing dioxin/furan data from the St. Simons Sound in which the LCP Site is located?	Yes, the September 2, 2014 Dioxin Memo: LCP Chemicals National Priorities List Site presents the data from the river sediment sampling stations covered areas of the Turtle River, St. Simons Sound and tidal tributaries along the eastern boarder of the Brunswick Peninsula. The memo notes that the TEC totals ranged from 11.4 to 20.4 ng/kg. The memo further notes that the detection limits in that dataset were elevated, relative to those reported earlier by EPA. The detection limits in the St. Simons Sound dataset were generally ten times higher than those achieved earlier. As a consequence, even with the re-calculation of all the 1995 dioxin TECs using the WHO TEF of 2005, the total TECs calculated from the BCS reflect artifact of using one half the detection limit for the dioxin congeners which were not detected. See also response below for GEC 14.10.
GEC 14.2	Did the EPA ask Stakeholder Agencies if they had collected Dioxin/Furan data for the St. Simons sound estuarine system?	The EPA was aware of the most recent dioxin/furans data available and included it in the September 2, 2014 Dioxin Memorandum.
GEC 14.3	Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder and Black Drum (both whole and filet) in Turtle River in 1989 (GADRN, 1989)?	See response at GEC 14.10.
GEC 14.4	Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder, Black Drum. Sheephead, and Hardhead Catfish (filet) in Turtle River in 1990 (GADRN, 1990)?	
GEC 14.5	Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder, Black Drum. Sheephead, (whole and filet) in Turtle River in 1991 (GADRN, 1991)?	See response below at GEC 14.10. In its review of the 2011data from the former Altamaha Canal, the EPA did not that one sediment sample exceeded the PRG for TCDD TEQ of 72 ng/kg (now reduced to 50

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 14.6	Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder, Atlantic Croaker, and Gafftopsail Catfish (whole and filet) in Turtle River in 1992 (GADRN, 1992)?	ng/kg). Note that three of the congeners analyzed had associated method blank contamination.
GEC 14.7	Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder, Black Drum, and Hardhead Catfish (whole and filet) in Turtle River in 1993 (GADRN, 1993)?	
GEC 14.8	Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder, and Stripped Mullet, (whole and filet) in Turtle River in 1993 (GADRN, 1993)?	
GEC 14.9	Did the EPA consider the four samples for Dioxin/Furan taken in the Altamaha Canal south of the LCP Site in 2011 with results above the 2.5 NG/KG TEC (a.k.a TEQ) of 62, 130, 68, and 20 ng/kg (EPA, 2011)?	
GEC 14.10	Did the EPA consider the December 1995 EPA Community Based Environmental Project's 14 sediment samples from the Turtle River/St. Simons Sound area?	Yes, in selecting the remedy for the LCP Chemicals marsh, the EPA did consider the Turtle River and the 1995 Community Based Study. All these data are contained in the Administrative Record. Specifically, the Turtle River data are presented in Attachment 4 to the September 4, 2014 Dioxin Memorandum. An October 1997 Turtle River ATSDR Health Consultation presented dioxin/furans Turtle River fish data from 1989 through 1994. The fish data presented in the report were acquired by Georgia-Pacific from two Turtle River stations, one immediately above the confluence of Purvis Creek with the Turtle River and the second near the confluence of the East River with the Turtle River. Fish tissue dioxin data for the Chattahoochee and Oconee Rivers, and the Sapelo Sound are also presented in the report for the sake of comparison. The Health Consultation concluded that fish dioxin/furans concentrations were higher in the Turtle River than in comparison areas; however, the dioxin levels found were well below the Food and Drug Administration tolerance levels for dioxin/furans in fish. As mentioned above, the 1995 Community Based Study's 14 dioxin/furans results are presented in the same September 2, 2014 memo, with a discussion of the effects of elevated detection limits.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 14.11	In light of all the above Dioxin/Furan sampling conducted by the EPA or one of the LCP Chemicals Superfund Site Stakeholder agency, why should anyone, or the court who considers the Consent Decree, believe the EPA when it states, "Therefore, potential risk cannot be adequately evaluated in this assessment based on the three sediment samples collected in 2000, but will be discussed further in the uncertainty section"?	The quote taken from the 2011 BERA did not recognize the remaining PCDD/PCDF data available. The September 4, 2014 memorandum consolidated all available sediment, soil surface water and biota data PCDD/PCFD data available for the LCP Chemicals Site and reached conclusions about the human health and environmental risks posed by the concentrations found at the Site. The memorandum acknowledges that the PCDD/PCDF data is limited, and proposed acquisition of additional data during the remedial design, thereby reducing the uncertainty related to PCDDs/PCDFs. Furthermore, the stakeholders agreed that the data considered in the 2011 BERA would be from samples collected between years 2000 and 2007. The older dioxin/furan data between the late 1980s and mid-1990s were not considered for risk assessment purposes in the BERA. Dioxins in sediment samples collected in 1995 and 1996 were evaluated in the 1997 EPA ecological assessment.
GEC 15.1	The EPA has interjected data from the lake Onondaga LCP site located near Syracuse, New York, into the Proposed Plan for the LCP site in Brunswick Georgia. Unlike the LCP site located in Brunswick Georgia, there was a significant amount of dioxin data collected at the LCP site located in New York (USEPA, 2002). Was whole fish sampling for dioxin and furan in juvenal and adult fish conducted at the LCP site in Brunswick Georgia, or only at the Lake Onondaga Site?	It was not the EPA's intent to introduce the PCDD/PCDF data from the two Upstate New York Superfund sites. No data has been cited. The intent was to communicate that, due to the costs associated with PCDD/PCDF analyzes (currently in the range of $400 and $500 per sample), in all sites researched, not all samples are routinely analyzed for these analytes, rather an informal survey shows that between 20 and 80 percent of the samples are analyzed for PCDDs/PCDFs. In the case of the Onondaga Lake Superfund Site, about 27% of the sediment samples were analyzed for PCDDs/PCDFs. Further, at the Onondaga Lake Superfund Site, while dioxins/furans were determined to be both human health and ecological risk drivers, as a result of fish consumption in Onondaga Lake, they were not found to be widespread in lake sediments. The areas where dioxins/furans are elevated are generally co-located with areas that exceeded the lake cleanup criteria for other contaminants, which are being addressed under the lake remedy. A similar situation existed with the Ninemile Creek Superfund Site, with a similar approach was used. PCDDs/ PCDFs also contributed to Site risks. These locations were to be remediated based on concentrations of other detected contaminants (e.g., mercury). Therefore, Site preliminary remediation goals for PCDDs/PCDFs in sediments were not developed.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		The following is excerpted from the September 2, 2014 LCP Chemicals Dioxin Memorandum: In addition, Kannan et al. (1999) analyzed organ and muscle tissue from clapper rail, mottled duck, boat-tailed grackle, red-winged blackbird, stripped mullet, yellow tail, sea trout, Atlantic croaker and blue crab for TCDD/TCDF. All were found to be uniformly below the detection limits of 10 ng/kg. In May and June1998, the U.S. Fish and Wildlife Service collected killifish (*Fundus heteroclitus*) tissue from mid-way along the LCP Ditch. Along with other parameters, the whole body tissue was analyzed for dioxins/furans. Attachment 5 contains documentation of the 1998 U.S. fish and Wildlife killifish sampling, as well as the TEF calculation spreadsheets for the two whole fish tissue killifish samples collected in 1998. Note that almost all dioxin/furan congeners were found to be below detection limits. Consequently, because the calculated TECs assume each congener is present at one-half the detection limit, the results are an overestimation of actual tissue levels. In addition, the concentrations of dioxin/furan in the whole fish tissue samples were taken from killifish collected from the LCP Ditch during the marsh removal, which also represented worst case conditions. The TEC mammal concentration in samples KF0513MD and KF071MD are 6.5 and 7.1 ng/kg, respectively, also assuming one-half the detection limit for the non-detected dioxin/furan congeners. The TEC fish concentration in samples KF0513MD and KF071MD are is 8.1 and 8.2 ng/kg, respectively. The one-half detection limit concentration predicts no NOAEL-level or LOAEL-level risk to the river otter. Overall, the concentrations of dioxin/furans measured in the fish collected from the Site are low and do not appear to present unacceptable risk to the environment. Hence, seven fish specimens from the LCP Chemicals Site have been analyzed for PCDDs/PCDFs. In contrast, the Lake Onondaga Site's BERA (Table 18-4) shows that 18 whole fish samples were analyzed for PCDDs/PCDFs.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 15.2	Do the dioxin and furan sampling at the Lake Onondaga site in New York find risks to wildlife from dioxin and furans (USEPA, 2002)?	The commenter is referred to the Lake Onondaga Lake Bottom Record of Decision available at: http://www.dec.ny.gov/chemical/34481.html
GEC 15.3	If the risk from wildlife from dioxin and furans was found at the Lake Onondaga site, with those risks be applied to the wildlife at the LCP site in Brunswick Georgia? If not, why not?	Each site has its own levels of concentrations in sediment and biota, so risk assessment pathway models at the New York site should not be applied to risk estimates at the LCP Chemicals marsh. Furthermore, Section 1 of the Feasibility Study for the Lake Onondaga Lake Bottom Site observed that principal component analysis in their RI report also identified a source pattern for PCDD/PCDFs consistent with atmospheric deposition of byproducts from incineration. This source is very different from the PCDD/PCDFs at the LCP Chemicals Site, where they are believed to have been generated at the graphite anodes in sludge.
GEC 15.4	If the EPA is using data from the Lake Onondaga Site for decision-making concerning sampling of dioxin and furan at the LCP site in Brunswick Georgia and to delay such sampling until after the Record of Decision and Consent Decree, why not use the same reasoning to utilize the data for estimating risk in Brunswick from the observations at the New York site?	The EPA is not using data from the Lake Onondaga Lake Bottom Site. PCDD/PCDF data from the LCP Chemicals Site is used. The Lake Onondaga and Ninemile Creek Sites were cited in the November 2014 LCP Chemicals Proposed Plan as examples of other chlor-alkali sites where PCDD/PCDFs were found to be co-located with other site contaminants and, as described in the Ninemile Creek final Remedial Design Report, "a preliminary remediation goal for PCDD/PCFDs in sediment was not established, and the areas where PCDD/PCDFs are elevated are generally co-located with other chemical parameters of interest (CPOIs) that would be address under the selected remedy."
GEC 15.5	Will the EPA order whole fish sampling for dioxin/furan in juvenal and adult fish from Turtle River to obtain the same quality data as used at Lake Onondaga, New York?	As discussed above in response to GEC 15.1, seven fish specimens from the LCP Chemicals Site's OU1 have been analyzed for PCDDs/PCDFs. None have contained concentrations of PCDD/PCDFs at or above levels of concern. The 1997 ATSDR Turtle River Dioxin Health Consultation, which evaluated data from 1989 through 1994 concluded that the dioxin levels found in 48 fish composite samples collected in the Turtle River were well below Food and Drug Administration tolerance levels for dioxin in fish. Finally, the September 2, 2014 Dioxin/Furans Memorandum makes the point that the PCDD/PCDF concentrations in sediment collected in the Turtle River and Purvis Creek were extremely low, most undetected. The preceding does not support additional PCDD/PCFD analyses on fish samples from the Turtle River.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 15.6	Did the BERA include the dioxin and furans within the Turtle River area in their calculations for PCBs, dioxins, and furans TEQ or the hazard quotient or the hazard index?	See response to Technical Comment #5.
Comments regarding Manatees		
GEC 15.7	Did the USFWS find a need to examining the roots and note cleaning of the *Spartina* could result in an underestimation of the exposure scenario of herbivores like the Manatees, and the others in residents year round (USFWS, 1996)?	The 1997 EPA and 1998 PTI ecological risk assessments included incidental ingestion of sediments as a component of dietary intake.See responses to GEC 16.1 and GEC 37.5.
GEC 15.8	What was the EPA's rationale for not including the Manatee in the Baseline Ecological Risk Assessment?	See response below for GEC 16.2 at end of this subsection.
GEC 15.9	Is EPA aware that the Manatee is an endangered and protected species?	Yes.
GEC 16.1	What action is the EPA taking at the LCP Chemicals Superfund site to assure the Manatee is not consuming excessive amounts of PCBs, mercury, and dioxin via the cordgrass (*Spartina*)?	Cordgrass (*Spartina*) from OU1 has been analyzed for the following analytes: Aroclor 1268, PCB congeners, mercury, methyl mercury, lead and PAHs. The Aroclor 1268, mercury and methyl mercury data is the most abundant. Dioxin/furans analyses were not run on cordgrass samples. As indicated in the response to Comment GEC 16.2, uptake in the cordgrass is not very efficient. No PAHs were detected in cordgrass. The manatee is reported to feed on the upper third of the plant and has a wide feeding range. Given these facts, it is unlikely that the manatee is at risk from consuming cordgrass in the LCP Chemicals marsh. Furthermore, it is expected that cleanup of sediments will also reduce uptake of the contaminants by *Spartina* and thus reduce manatee exposure.
GEC 16.2	Did the EPA make an estimation about how much sediment the Manatee would consume while foraging on the cordgrass (*Spartina*)? If not why not?	The endangered Manatee may infrequently enter Purvis Creek and may graze occasionally on Spartina containing elevated concentrations of mercury and Aroclor 1268. Manatees were evaluated in the 1997 EPA ecological risk assessment and the 1998 PTI ecological risk assessment for the marsh, and predicted hazard quotients were less than 0.01. As mentioned previously, the BERA focused on top carnivorous indicator species because they tend to accumulate more methylmercury from their prey. In addition, these food items contain much higher MeHg concentrations (up to 100%) than *Spartina,* which only contains about 10% MeHg relative to mercury. It was determined in the planning process that, given the PTI conclusion, if the top level carnivorous

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		species can be protected, then this would also be protective of the manatee, and therefore the manatee was not selected for detailed exposure analysis in the BERA.
Comments regarding Diamondback Terrapin		
GEC 16.3	In light of the wasting syndrome reproductive problems identified with the Terrapin, how did the BERA come to the conclusion that there is a hazard index or hazard quotient less than one?	It is unclear what report the commenter is referring to with respect to wasting syndrome and how it is linked to the LCP Chemicals marsh contaminants.
GEC 16.4	Is it possible to have reproductive failure and a hazard quotient or hazard index less than one?	It is possible; however, conservative exposure/toxicity assumptions built into the assessment try to limit this uncertainty.
GEC 16.5	Is it true that the levels of PCBs observed in the Terrapin eggs was in excess of 600 ppm (USEPA, 1997)?	Yes. The Aroclor 1268 concentrations in seven eggs from one female (DD-5) ranged from 390 to 610 mg/kg. The mean Aroclor 1268 concentrations in eggs from 2 other females were 29.7 and 28.6 mg/kg.
GEC 16.6	Were the eggs examined for reproductive viability?	Yes.
GEC 16.7	What were the results of the examination of the Terrapin eggs for reproductive viability?	Eggs from female DD-5 were not incubated. The five eggs from female DD-4 did not hatch with mean Aroclor 1268 levels at 28.6 mg/kg and mean mercury levels at 2.2 mg/kg, and all seven eggs from female BD-1 did hatch with mean Aroclor 1268 levels of 29.7 mg/kg and mercury concentrations of 0.87 mg/kg. No reasons were given as to why hatching did not occur in the one clutch. It may be a combination of in-utero egg collection and subsequent incubation problems, contaminations levels, or other physical issues. Caution should be used in drawing definitive conclusions from the small sample size of eggs from two female terrapins.
GEC 16.8	Will the Terrapin be included in the species used for monitoring and evaluating the remedial action efficacy?	Results of the conservative food chain models for the diamondback terrapin in the BERA, in the 1997 EPA ERA, and in the 1998 PTI ERA resulted in no significant adverse effects. These assessments used a toxicological reference value from a study on Caspian terrapin exposure to Aroclor 1254, generally a more toxic form than Aroclor 1268. The long-term monitoring plan is not expected to include terrapins. Fish and other dietary items of the terrapin (e.g., mummichogs and crabs) are more statistically easier to monitor for trends in contaminant tissue concentrations than collecting and analyzing many terrapins.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
Human Health Baseline Risk Assessment Comments and Questions		
GEC 17.1	What programs has the EPA implemented to raise awareness about fishing advisories among residents and healthcare providers?	See response below for GEC 18.5.
GEC 17.2	What were the dates of the EPA initiatives to raise awareness with health care providers about the seafood advisories?	
GEC 18.1	What improvements did the EPA make to the fishery advisory signs so they are more easily seen? How many fish advisory signs has the EPA had placed in the community?	
GEC 18.2	Where are the fish advisory signs the EPA has placed in the community located?	
GEC 18.3	What is the EPA's budget for fish advisory signs?	
GEC 18.4	What is the EPA's budget to maintain the fish advisory until the source of contamination is removed?	
GEC 18.5	What is the EPA's budget for continuing public education regarding the hazards of consuming mercury and PCB contaminated seafood?	The EPA and ATSDR provide assistance to the State of Georgia regarding implementation of fish advisories. EPA does not make signs or set the fish advisory levels. The EPA, ATSDR and Georgia Environmental Protection Division (GAEPD) have been active in providing community awareness of the current advisories and recent studies regarding potential fish consumption by Georgia coastal residents. Each agency also maintains web sites where information regarding fish advisories, other data, and resources regarding potential health effects of mercury and PCBs may be accessed by the public. It has been recognized that mercury and PCBs are global contaminants found in humans and dolphins. Not all mercury and PCBs in tissues of humans and dolphins in the Brunswick area originate from the LCP Chemicals marsh, although it is evident that elevated levels of these chemicals are found locally. The human health baseline risk assessment was conducted according to guidance and included data from local anglers on fish species caught and consumed.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 18.6	How does the EPA focusing on pregnant and nursing women, children, the elderly, and those with compromised immune systems?	This comment is too general for a response related to the human health baseline risk assessment.
GEC 18.7	Will the EPA require an appropriation or appropriate funding to implement the already identified activities to better protect human health and the environment?	See response below at GEC 18.8.
GEC 18.8	Will the EPA expedite the appropriation of funds to implement the recommendations intend to help protect human health?	The EPA, GAEPD and the responsible parties have committed resources and funds to clean up the LCP Site in the upland portion as well as in the marsh. There have been several cleanup actions at the Site to reduce risks and protect human health and the environment. This site is funded the same way as other sites with commensurate risk.
GEC 18.9	Are the fish samples collected from Turtle River being prepared according to the appropriate protocols and the skin and belly flap left on the filet?	The fish samples used in the HHBRA and those collected for monitoring the fish advisories use existing guidelines and protocols. Unlike ecological receptors, humans do not consume all parts of a fish. Whole fish sampling is not part of the protocols for assessing human health exposure.
GEC 19.1	Was whole fish sampling conducted in order to determine the range of exposures human consumers might encounter?	
GEC 20.1	Did the EPA review their own demographic data for the area around the LCP Chemicals Superfund site when reviewing the HHBRA (EPA, 2015)?	The HHBRA did not incorporate the EPA 2015 data.
GEC 20.2	Did the EPA advise the authors of the HHBRA that they could find more accurate demographic data and household income data on the EPA's website (EPA, 2015)?	See response below at GEC 20.3.
GEC 20.3	Will the EPA utilize the income data from their website to modify the HHBRA to indicate there's a high likelihood of a significant numbers of subsistence fishers within close proximity to the LCP site?	The HHBRA was finalized in August 2011 using available data at that time. The discussion of income levels was only a fraction of the uncertainty analysis regarding the sensitive population of likely subsistence fish consumers that would harvest all of their fish from Zones D (Turtle River from GA Highway 303 to Channel Marker 9), H (Purvis Creek), and I (Gibson Creek), every year for 30 years. Although the ATSDR (2014) and EPA (2015) data provide updated information on demographics and potential fish consumption, the assumptions used in the HHBRA regarding harvesting and consuming fish only from these specific zones remain conservative.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 21.1	Does the EPA agree that the definition of Aroclor 1268 presented in Pulster, 2005 and Pulster, 2008 was used in the HHBRA to define PCBs associated with the LCP site? Does EPA agree that the same PCB profile described in Pulster, 2005 and Pulster, 2008 was used to define an associate the PCBs found in humans sampled in the Sapelo Island area (ATSDR, 2014b)?	The HHBRA evaluated the potential risks from exposure to Aroclor 1268 and mercury to consumers of fish caught in Zones D, H and I of the Turtle River-Brunswick Estuary (TRBE). The PCB profile described by Pulster et al. (2005) and Pulster and Maruya (2008) are consistent with EPA's knowledge of Aroclor 1268. Dolphin tissue data are informative but are not appropriate for assessing non-cancer hazards and cancer risks to humans.
GEC 21.2	Will the more current data (ATSDR, 2014b) collected in coastal Georgia rather than the discredited data that's now 20 years old (DHHS, 1999)?	No. See response below at GEC 21.4.
GEC 21.3	Will the EPA set the annual number of seafood meals consumed by the high quantity consumer at 156 or higher?	
GEC 21.4	Will the EPA increase the size of the meal to reflect those consumed by African-Americans as reported in the Public Health Assessment (ATSDR, 2014a)?	The ATSDR data is based on a small sample size of only nine individuals in the Sapelo Island study whose fishing areas span various coastal and interior waterways around the island. The activities of the nine individuals in that study may not be reflective of those who catch and eat all their fish from Zones D, H, and I of the TRBE every year for 30 years with no assumed change in fish tissue concentrations over time. In addition, the HHBRA assumed 27 grams/day or 9,855 grams/year at an average meal size of 134.6 grams; which results in 73 meals/year from the affected zones. If the meal size were larger, then the number of meals would decrease. The important point is that the HHBRA did not include additional seafood meals originating elsewhere along the Georgia coast or inland waterways. This is consistent with one of the conclusions of the Brunswick fish study, which stated that most study participants did not fish in the restricted area.
GEC 22.1	The actual seafood consumption habits are far different than the assumptions used in calculating risk, which were based upon filets only, and did not consider fish egg (roe) consumption.	The four out of nine people surveyed who occasionally consume fish eggs during a seafood meal is informative but lacks statistical power to replace fish consumption advisory guidance and methodologies issued by the EPA and GAEPD.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 24.1	Will the EPA utilize existing dioxin and furan in fish data and incorporated into the HHBRA risk analysis (GA DNR, 1989; GADNR, 1990; GADNR 1991; GADNR, 1992; GADNR, 1993; GADNR, 1994)? If not, why not?	These reports are not available in the EPA's files. Inquiry with the GADNR has not turned them up either. It may be that these data are the same evaluated in the 1997 ATSDR Turtle River Health Consultation. The years mentioned in the comment cover the same years presented in Tables 1 through 6 of the 1997 Health Consultation. If so, then these data have been evaluated and are available in the Administrative Record.
Remedial Investigation Comments and Questions		
Fish Consumer Scenarios		
GEC 25.1	How many signs have been posted by the GADNR in the area and where are the signs located?	Posting of fish advisories is the responsibility of the Georgia Department of Natural Resources. This information should be available thought their offices.
GEC 25.2	Has the high quantity fish consumer meal assumption of 40 meals per year been discredited (ATSDR, 2014a)?	There exist errors in the October 2012 OU1 RI and the November 2014 Proposed Plan mentioning a 40 meal per year fish consumption rate. Overall consumption depends on the number of meals and meal size. The HHBRA used a consumption rate of 73 meals per year and an adult meal size of 135 grams (4.75) ounces. This is based on the derivation of the ingestion rates for the high quantity fish consumer shown on Table B-1 (Appendix B) of the HHBRA. The issue is the total number of grams per day that are consumed only from Zones D, H, and I, rather than the number of meals or size of meals.
GEC 25.3	Are a more appropriate number of meals for the high quantity fish consumer closer to 156 per year (ATSDR, 2014b)?	No. The source of the 156 meals per year originates in the September 2014 ATSDR slide presentation (slide #21), where it appears that ATSDR or CDC sought to find nine Sapelo Island residents who had lived in the community for at least five years and who had eaten at least two-to-three meals of locally-caught seafood each week. The ATSDR investigator then multiplied three times the 52 weeks in a year and arrived at 156 meals per year. This was not a study. This was one line on one slide of a PowerPoint presentation, which has yet to be published. A "study" based on nine individuals from Sapelo Island, located about 25 miles from Brunswick, with a vague question, is not defensible. In addition, the Sapelo individual fish all around the island – not like somebody only fishing in Zones D, H, and I of the TRBE, who theoretically consume fish every year for 30 years with no change in fish tissue concentrations.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
Shellfish Consumer Scenario		
GEC 25.4	Does the EPA actually believe the data presented in the RI for shellfish consumption in light of catching crabs and casting for shrimp being recreational activities in coastal Georgia?	Yes. The HHBRA, developed by the responsible parties and overseen by the EPA and GAEPD, evaluated the recreational adult consumer scenario assuming that two and a half meals of shellfish per month, from Zones D, H and I of the St. Simon's estuary, based on upper-end of EPA defaults for recreational fishing in Southeast United States.
GEC 25.5	Has either the EPA or the Responsible Parties noticed all the docks along Turtle River and the crab trap lines extending onto the water?	A review of a December 2014 Google Earth aerial photograph shows no docks in Purvis Creek, where the most recent (2011) blue crab tissue data show exceedances of the weekly consumption guidelines for mercury and Aroclor 1268. Four docks are visible in the neighborhood north of where the creek forms a channel. The monthly guidelines were not exceeded in Purvis Creek. With regards to the middle part of the Turtle River (Zone D), the 2011 data show mercury and Aroclor 1268 to be below both the weekly and monthly advisory concentrations. The December 2014 aerial photograph shows five docks along Zone D (the middle Turtle River).
GEC 25.6	Did the authors of the RI make any attempt to observe seafood harvest and consumption patterns along the Georgia Coast or are all the assumptions in the RI averages of the entire population of the United States?	Yes, Table B-1 (Appendix B) of the HHBRA, entitled "Derivation of Ingestion Rates for High Quantity Fish Consumption" contains four footnotes. The footnotes demonstrate the extent to which the HHBRA attempted to use as much site-specific data and values as possible.
GEC 25.7	Is the EPA aware of just how dangerous applying data from national consumption pattern is when determining risk to a local population from a locally contaminated food source?	Please see immediately preceding response (25.6).
GEC 25.8	What does the FDA recommend to do when a locally contaminated food source is encountered?	The EPA, ATSDR and Georgia State agencies have been active over the past decade in dealing with contaminated seafood, independent of FDA actions.
8.2.6 Characterization of Uncertainties		
GEC 26.1	What is the study cited in support of the conclusion "….posted signage generally serve to discourage the consumption of significant amounts of seafood from the area…"?	The GADNR issues fish advisories to discourage consumption of significant amounts of contaminated seafood.
GEC 26.2	Are the authors of the RI citing a study or opinion when they state "….posted signage generally serve to discourage the consumption of significant amounts of seafood from the area…"?	The general consensus of state fish advisories issued throughout the country is that they serve as a deterrent.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 26.3	What is the definition of the LCP estuary and what are the geographical boundaries?	The marshlands shown on Figures 2 and 3 of the ROD show the boundary of the OU1.
GEC 26.4	Is the "LCP estuary" defined by the extent of contamination from the LCP Site in coastal Georgia?	The November 2014 Proposed Plan and the Record of Decision have corrected the inherited nomenclature. The LCP Chemicals marsh is part of the St. Simons estuary. The contaminant concentrations posing risk have been found within marshlands delineated by the purple line shown on Figures 2 and 3.
GEC 26.5	Does the Georgia Department of Natural Resources seafood consumption advisories encompass the entire "LCP estuary"?	This information is available at: https://epd.georgia.gov/sites/epd.georgia.gov/files/related_files/site_page/FCG_2014_073114_EAB.pdf
GEC 26.6	Have any agencies questioned the need to extend the extent of seafood consumption advisories due to the spread of contamination from the LCP Site (ARSDR, 2014b)?	Seafood consumption advisories are the responsibility of GADNR. Apparently the ATSDR was not aware of the existence the 2011 fish data, which are presented in Appendix F of the final FS, during the September 2014 meeting referenced. GADNR has had the 2011 fish data for some time now.
GEC 26.7	Have any recommendations or suggestions been made concerning expanding the sampling and analysis in the ecosystem and humans to more fully identify the extent of LCP Site contaminants spread (ATSDR, 2014b)?	Testing of humans is the responsibility of ATSDR and the CDC.
Chemicals of Potential Concern (only mention of dioxin in the RI)		
GEC 26.8	Were the chemicals detected in a small number of samples or were they identified for analysis in a small number of samples?	Detected in a small number of total sediment samples. For example, dichlorodiphenyltrichloroethane (4,4'DDT), dioxin/furan congeners, bis(2-ethylhexyl)phthalate, 3,4-methylphenol, butylbenzylphthalate, and hexachlorobenzene have been analyzed approximately 237, 45, 284, 307, 284 and 290 times, respectively.
GEC 26.9	How many samples were taken in the LCP Site marsh, and how many were specified for dioxin and furan analysis?	Over 5,500 mercury, Aroclor 1268, lead and PAH analyses were run on approximately 1,650 sediment samples. Of those, 45 sediment samples were analyzed for dioxin/furans. A limited number of dioxin/furans analyzes were run on surface water and biota samples. Details of the dioxin/furans results are contained in the December 2, 2014 Dioxin/Furans Memorandum.
GEC 26.10	What is the difference between qualitative and quantitative when establishing risk in a document like the BERA?	In general, quantitative risk is based on acceptable protocols where site data is relatively statistically robust; whereas, qualitative risk is often based on generalizations, observations and non-statistical relationships.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 27.1	How was risk established through a qualitative discussion of dioxin and furan in the BERA?	The September 2, 2014 Dioxin/Furans Memorandum consolidated into one document all the known dioxin/furans data available for the Site. It also evaluated the risk posed by the dioxin/furans still in place, following the removals. The memo concluded that the dioxin/furans are very likely co-located. To confirm this, the ROD's Selected Remedy requires additional sampling during the remedial design (RD) to confirm this belief. Should co-location not be confirmed by the RD sampling, the ROD will have to be amended to address any locations that may pose unacceptable risks.
GEC 27.2	Did the quality and completeness of the sampling and analysis for dioxin and furan in the RI a hindrance to evaluating risk in the BERA and HHBRA?	Due to the cost of dioxin/furans analyses ($400-to-$500 per sample), these analyses are typically run on a subset of the samples analyzed. For example, at the LCP Chemicals (New Jersey) NPL Site, about 19% of the samples were analyzed for dioxins, at the Onondaga Lake Bottom NPL Site, about 27% of the samples were analyzed for dioxins, at the Geddes Brook/Ninemile Creek Site, about 81% of the samples were analyzed for dioxins. The percentage of dioxin analyses at the LCP Chemicals Site is about 3%, which is recognized to be low. For this reason, the Selected Remedy requires the collection of additional dioxin/furans data to confirm the belief that the dioxin/furans are co-located with the Aroclor 1268 and that remediating the latter will remediate the former. The dioxin/furans are reported to have been created in the graphite anodes, which were in use from the time the plants started-up in late 1956 until December 1976, when the graphite anodes were replaced with the DSA anodes, composed principally of titanium. Since the dioxin/furans were generated only in the graphite anodes, which were impregnated with Aroclor 1268 starting in January 1962, this further supports that the dioxins/furans are co-located. The available Aroclor 1268 and dioxin/furans sediment data substantiates this.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
8.3.5.8 Piscivorous Mammals (Assessment Endpoint 7)		
GEC 27.3	Would the conclusion "….BERA Report concluded that the potential risk to the viability of piscivorous mammalian species utilizing the LCP estuary is minimal" if the dophin data was added to the BERA (Balmer, 2011; Balmer, 2013a; Balmer 2013b; Hart, 2012; Hickie, 2013; NOAA, 2013; Pulster, 2005; Pulster, 2008; Schwacke, 2012)?	Likely not. See also responses to comments regarding the dolphin under the BERA Comments and Questions Section.
GEC 27.4	What impacts to dolphin health were found in the studies (Balmer, 2011; Balmer, 2013a; Balmer 2013b; Hart, 2012; Hickie, 2013; NOAA, 2013; Pulster, 2005; Pulster, 2008; Schwacke, 2012)?	The research papers speak for themselves regarding impacts to dolphins, and the EPA fully respects their work. It is noted that mercury and Aroclor 1268 were not the only contaminants found in dolphins but also chemicals such as toxaphene congeners, chlordanes, DDTs, mirex, etc.
GEC 27.5	Were the health effects found in dolphins "minimal" (Balmer, 2011; Balmer, 2013a; Balmer 2013b; Hart, 2012; Hickie, 2013; NOAA, 2013; Pulster, 2005; Pulster, 2008; Schwacke, 2012)?	The authors made their own conclusions irrespective of the BERA, which did not evaluate dolphins for the reasons mentioned earlier. In addition, the EPA is unaware of any attempt at minimizing the health effects found in dolphins by the Hollins Marine Institute, working on behalf of the NRDA claim. On the contrary, the BERA does acknowledge this work, which at the time the BERA was being concluded, was still ongoing.
GEC 27.6	Were the chemicals found in the dolphins linked to the LCP Site (ATSDR, 2014b)?	Although Aroclor 1268 was detected in the dolphin blubber, other toxicants listed above were also detected. The majority of these other contaminants are not related to the LCP Chemicals Site.
GEC 27.7	Would the EPA find the absence of an indigenous species like the mink from the LCP Site significant	The following are excerpts from a Georgia DNR Fact Sheet: "In Georgia, mink most commonly are found in the Piedmont, Ridge and Valley, Blue Ridge Mountains, and Atlantic Coast Regions while absent in much of the Upper and Lower Coastal Plain." "However, uncontrolled use of DDT, PCPs, DDE and other pesticides in the 1950s and 1960s caused widespread pollution throughout America's waterway systems that resulted in extremely low wild mink populations." Mink have been collected in Glynn County (See Osowski et al., 1995), and there is no evidence offered by the commenter that mink do not exist in the LCP Chemicals marsh.
GEC 27.8	Would the absence of a viable mink population indicate there is a dead zone where mink cannot survive around the LCP Site?	See the immediately preceding response on the mink population.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 27.9	Would a dead zone where mink cannot survive be described by the EPA as "minimal risk"?	See the preceding comment on the mink population. See also the responses to mink comments in the BERA Section.
GEC 27.10	Would the EPA agree that the observations in the dolphin population indicate the models referenced in the RI are significantly flawed and do not agree with the observed ecological impacts? If not, why not?	No, the EPA does not agree the models used in the BERA are significantly flawed. See responses related to mink and dolphins in the BERA comment section.
GEC 28.1	What is the definition of "minimal risk" used in the RI?	The following is taken from section 5.7 of the BERA: "The sole measurement endpoint for evaluating the viability of piscivorous mammals utilizing the LCP estuary consisted of HQs derived from food-web exposure models for river otters (*Lontra canadensis*). The modeling study for river otters generated site-related NOAEL HQs for Aroclor 1268 (based on a TRV for Aroclor 1254) that ranged from 0.01 to 3.94 (Table 4-30). No LOAEL-based HQ for Aroclor 1268 was greater than unity (1). In addition, no potential for risk was associated with mercury or lead. The potential for adverse risk to the viability of piscivorous mammalian species utilizing the LCP estuary is judged to be minimal." In this context, minimal risk is defined as no LOAEL-based HQ for Aroclor 1268 greater than unity (1) and NOAEL HQs for Aroclor 1268 ranging from 0.01 to 3.9. In addition, there was no risk associated with mercury or lead.
GEC 28.2	Does the empirical evidence documented prove the models in the BERA and RI do not hold up when compared what is known about ecosystem on the Georgia coast and the impacts from the chemicals associated with the LCP Site (Balmer, 2011; Balmer, 2013a; Balmer 2013b; Hart, 2012; Hickie, 2013; NOAA, 2013; Pulster, 2005; Pulster, 2008; Schwacke, 2012, ATSDR, 2014b)?	This comment is too unspecific to respond to.
Feasibility Study Comments and Questions		
GEC 31.1	In light of the EPA, Georgia Department of Natural Resources, and the Potentially Responsible Parties failure to implement recommendations by the ATSDR to protect human health since issues 21 years ago, why should anyone believe	These two questions are too vague to merit a cogent response.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
	any of these agencies or parties are capable or will now do so at this time?	
GEC 31.2	Is it arrogant to suggest the Potential Responsible Parties have the power to guide or modify human behavior?	
GEC 31.3	What evidence (studies or reports) are presented to suggest there has been any success in implementing Institutional Controls over the past 20 years?	One of the conclusions of the late 1990s Brunswick fish study was that, "The majority of study participants do not fish in the restricted area; the few that do, however, state that they are aware of the advisory."
GEC 31.4	What is the budget for implementing Institutional Controls until the cleanup goals are reached?	Institutional control costs are included In the October 2014 FS as a single lump-sum cost item for each alternative; costs are assumed to be consistent between alternatives and are not expected to vary significantly based on remedy footprint or construction methodology. The present day net worth of institutional controls is estimated to be $250,000. This net present worth estimate used a 7% discount rate.
GEC 31.5	What has been the budget for these Institutional Controls over the past 20 years?	Since the Georgia Department of Natural Resources implements the State's fish advisories, this question is better directed to this agency.
GEC 32.1	Does the EPA agree the authors of the FS are interjecting opinion with statement like, "because anglers do not consume the whole-body fish samples, only the edible tissues"?	The above-quoted February 9, 2004 memorandum from the late Dr. Randall O. Manning, with the Georgia Department of Natural Resources, is reproduced in Appendix F of the October 2014 FS. The memo addresses only edible fish tissue. The BERA analyzed the effects of whole fish. For this reason the EPA not consider the quote as an opinion, rather a matter of State of Georgia policy.
GEC 32.2	Does the EPA agree that people in coastal Georgia do eat the whole fish, and not just the filet?	Undoubtedly a small fraction of the population does consume whole fish. Ever a smaller fraction of the coastal Georgia population may consume the whole fish, including the organs with the highest concentrations of contaminants, such as the hepatopancreas. Unfortunately, it does not appear that the 1999 ATSDR Glynn County seafood consumption survey inquired as to what percentage of the population consumed whole fish. It is however likely, that the whole fish consumers are not consuming tissue with the concentrations shown in Section F.4 of the October 2014 FS Appendix F, since the graphed results show analytical results for muscle, organ and bone, appropriate for an ecological risk assessment but not a human risk assessment. The "whole fish" dataset, excluding organ and bone, may not exist.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 32.3	Does the EPA realize the fish eggs potentially have significantly higher levels of LCP Site COCs than the fish filet?	The four out of nine people surveyed who occasionally consume fish eggs during a seafood meal is informative but lacks statistical power to replace fish consumption advisory guidance and methodologies issued by the GAEPD and the EPA.
GEC 32.4	Did the FS or other LCP Site documents evaluate the consumption of fish eggs or other high lipid content seafood?	See immediately preceding response (32.3).
GEC 32.5	Was the EPA aware of the cultural seafood consumption practices in coastal Georgia such as fish eggs (roe), whole fish, and other methods of cleaning and preparation? If not, why not?	The 1999 ATSDR Glynn County seafood consumption survey did not consider the consumption of fish roe. It should be noted that the GEC was one of eight members of the Seafood Advisory Board, involved in the development of the 1999 Glynn County seafood consumption survey.
GEC 32.6	Would the findings about cultural seafood consumptions patters be significant and warrant inclusion in the HHBRA?	No. Since whole fish consumers are unlikely to consume organs and bones and the percentage of the population consuming fish roe is very likely low, the HHBRA correctly assessed the risks posed by consuming fish tissue.
Proposed Plan Comments and Questions		
Introduction		
GEC 33.1	Was there a compelling reason for the EPA to exclude data collected after 2012? Why not include data to date?	2012 is the year that the most recent sediment data was acquired.
Site History		
GEC 33.2	Honeywell contends in their Fact Sheet the paint contained Aroclor 1268. What documentation does the EPA have to support the contention that Aroclor 1268 was an ingredient in paints manufactured by Dixie Paint and Varnish Company?	The purpose of this Responsiveness Summary is to respond to comments on the November 2014 Proposed Plan. This question is beyond the scope of the Proposed Plan and supporting documents.
Public Participation		
GEC 33.3	Does the EPA maintain a mailing list for the LCP Chemicals Superfund site?	The EPA maintains mailing lists with returned mailings, sign-in-sheets from public meetings/availability sessions and upon requests from interested parties.
GEC 33.4	Does the EPA use the returned newsletters to update the LCP Site mailing list?	Yes.
GEC 33.5	If not, how does the EPA maintain the mailing list and keep it current, and maintain continuity in community participation at the LCP Site?	The EPA maintains mailing lists with returned mailings, sign-in-sheets from public meetings/availability sessions and upon requests from interested parties. A local community group was awarded the Technical Assistance Grant (TAG) and one of their requirements is to assist the EPA in notifying the community of participation opportunities, availability of site updates, reports and any other site related documents

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		including the Proposed Plan and also notify the community of any public meetings/availability sessions.
GEC 33.6	How many EPA quarterly newsletters have been sent out over the past three years at each mailing, and what were the dates of the mailings?	This was an error in the Proposed Plan. The newsletters were never intended to be mailed quarterly. The purpose of the newsletter was to update the community on the Superfund sites in Brunswick. The newsletters were mailed out a couple times a year. Approximately 385 were mailed, but many of those were returned at each mailing. The following gives the dates the Brunswick newsletters were mailed. This does not include the newsletter prepared during the removal period. The newsletters started as quarterly but, as is evident, soon became periodic. Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, USEPA (March 2008), Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, EPA Region 4 and the Georgia Environmental Protection Division (November 2008), Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, USEPA (December 2008), Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, USEPA (April 2009), Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, USEPA (October 2009), Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, USEPA (March 2010), Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, USEPA (August 2010), Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, USEPA (February 2011), Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, USEPA (August 2011), Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, USEPA (February 2012),

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, USEPA (October 2012), and Brunswick Environmental Cleanup Newsletter, Brunswick, Georgia, USEPA (June 2014)
GEC 34.1	When the LCP Proposed Plan was released, how many were mailed to the community?	Approximately 290 Proposed Plans were mailed to the community. In addition to mailing the proposed plans, many were emailed to those who had requested it. Copies of the Proposed Plan were handed out at the public meeting held in December 2014. The TAG recipient also received a copy of the Proposed Plan in hopes to help assist with distribution to their mailing list. In addition, the Proposed Plan (two versions) were posted in the World Wide Web.
GEC 34.2	In light of the report from Ms. Miller that the LCP mailing list has been deleted, how did the EPA formulate the mailing list to send out the Proposed Plan?	The LCP mailing list was not deleted; it was revised with current census data.
GEC 34.3	Was the Proposed Plan sent to all the people who have signed up for on the EPA's mailing list for the LCP Site? If not, how many (what number) of the people who have previously signed up to the LCP Site EPA mailing list did not receive the Proposed Plan mailing?	The Proposed Plan was mailed to approximately 290 local residents, many were also distributed via email and the TAG recipient received a copy in hopes to help assist with distribution to their mailing list.
GEC 34.4	What are the EPA's plans to assure future continuity in the mailing list for public participation at the LCP Chemicals Superfund site?	The EPA mailing lists will be updated using sign-in-sheets from public meetings/availability sessions and upon requests from interested parties.
GEC 34.5	Is it possible for the EPA to recover the deleted mailing list and updated with returned newsletters or other mailings concerning the LCP Chemicals Superfund site, or other Superfund sites, in Glynn County?	The mailing list was not deleted; it was revised with current census data. The EPA maintains mailing lists with returned mailings, sign-in-sheets from public meetings/availability sessions and upon requests from interested parties.
GEC 34.6	How many addresses were on the list that was deleted?	The original mailing list was not deleted; it was revised with current census data. The original mailing list had approximately 385 addresses and the revised version has approximately 290 and will be updated with the recent sign-in-sheets from the public meeting/availability sessions.
GEC 34	Does the EPA keep a record of the Glynn County Superfund Site the person has signed up to receive information about from the EPA?	Interested parties are added to the mailing list upon request.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 34.7	Can the EPA assure that there will be a mailing list for the community participation in the decision-making process for the citizens of Glynn County from now and into the future, and will be available for the other propose plans and records of decisions that will be coming up for the Superfund sites in Glynn County?	The EPA mailing lists will be updated using sign-in-sheets from public meetings/availability sessions, returned mailings and upon requests from interested parties. And as a requirement of the TAG recipient, they are to assist in informing the community of the participation opportunities, availability of Proposed Plans and any public meetings/availability sessions.
GEC 34.8	Does the EPA feel it is appropriate to allow 3.3 seconds per page for the public to read the documents the EPA provided?	Beginning in early 2010, drafts of key site documents were posted on the World Wide Web's LCP Chemicals Reading Room. For example, by the date the comment period for the Proposed Plan started, the final drafts of baseline human health and ecological risk assessments had been available to the public 42 and 40 months, respectively. Similarly, the final drafts of the remedial investigation and feasibility study had been available 24 and 6 months, respectively, before the comment period for the Proposed Plan started. Currently, about 80 LCP Chemicals documents are posted on the web site.
GEC 34.9	How much time does the EPA feel is appropriate for the community to review 8700 pages, prepare comments, and be ready for the EPA Public Comment Meeting to submit comments to be taken down by a court recorder?	See the immediately preceding comment (GEC 34.8).
GEC 34.10	Was the purpose of releasing 8700 pages 24 hours before the Official EPA Public Comment Meeting to thwart any meaningful community comments at the Official EPA Public Comment Meeting?	The EPA held a public meeting on the same day the comment period started (December 4, 2014), but extended the comment period for a total of 102 days (March 16, 2015). The purpose of the public meeting is to present the Proposed Plan to the community in a way that they will understand and be able to provide comments within the comment period. The purpose of the comment period is to provide the community an opportunity time to review the documents and submit comments via email or regular mail as long as the comments are postmarked on the last day of the comment period. The EPA encouraged the community to review all of the documents and provide comments, the reason for extending the comment period out 102 days. The EPA generally gives 30 days to comment, but because of the volume of documents it was extended well beyond 30 days.
GEC 35.1	How many requests for another EPA public comment meeting have been received by the EPA?	Immediately after the public meeting in December 2014, the EPA planned an availability session for February 26, 2015, to help the community understand the details of the preferred cleanup alternative, show graphics of what has already been cleaned up under a removal

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		action, and addressed questions and concerns that they had regarding the Site.
GEC 35.2	Have the Congressional representatives of Glynn County requested the EPA provide a public comment meeting for the LCP Chemicals Superfund site marsh proposed plan?	The EPA held a public meeting on December 4, 2014 to discuss the preferred alternative to clean up the LCP Chemical marsh. No requests are necessary because the EPA is required to hold a public meeting to discuss the Proposed Plan.
GEC 35.3	Does EPA feel it is appropriate to limit participation in decision-making process to those with access to the internet, email, or innate ability to write comments to participate in the decision-making process?	The EPA advertised the public meeting through local newspapers, public service announcements through a local radio station, email and phone calls to local groups throughout the community. And as a requirement of the TAG recipient, they are to assist the EPA in informing the community of participation opportunities, availability of site related documents including the Proposed Plans and opportunities to attend public meetings/availability sessions.
1.3 Setting and Hydrodynamics of the Marsh		
GEC 35.4	What data is presented in support of this statement? How much sediment has accumulated or eroded from the LCP Site?	The passage is taken from the final remedial investigation report. The RI report cites two references: Cundy et al. 1997 and Fox et al. 1999. The following is taken from the RI report: "Whereas the site is net depositional, deposition rates are low. Thus there has not been substantial historical burial of surface sediment deposits over time, making it difficult to discern historical time trends."
GEC 35.5	If the LCP marsh has a net deposition of particles, what is the annual deposition rate?	The following is taken from the FS: "A study of a coastal Georgia marsh located approximately 25 miles northeast of the Site found that net sedimentation rates varied from 2 to 6 millimeters per year (mm/yr) within the marsh." (Letzsch, W.S. and R.W. Frey, 1980)
GEC 35.6	Are these tides consistent with an area with "low current velocities"?"	The range of tides and current velocities are not related.
GEC 35.7	What are the tidal ranges for the St. Simons sound estuary under storm conditions such as a northeast wind?	Section 3.3 (Sediment Remedy Alternatives: Hurricane Storm Surge) of the FS Appendix B discussed the modeled effects of storm conditions on the marsh.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 35.8	How does the wind affect currents in the estuary and on the tidal flats?	The following is taken from Section 3.3 (Appendix B) of the FS: "Additional simulations for storm surges with rarer recurrence intervals (e.g., 500-year event) may be considered during the design phase of the study to evaluate model sensitivities. However, based on experience from other sites of similar characteristics, the incremental effects of higher frequency storm surges on marsh sites such as the Brunswick LCP Site is not expected to be considerable. The 2010 Georgia Hurricane Readiness Plan (GEMA 2010) establishes procedures for state employees to follow in the event of a hurricane. The document presents a range of wind speeds and storm surges for Category 1 to 5 hurricanes, as well as typical effects of each category. It also provides a brief, though unsubstantiated, anecdote from 1898 in which a Category 4 hurricane caused a 16-foot storm surge in the city of Brunswick and surrounding communities."
Figure 1, Figure 2		
GEC 35.9	Why is the Salt Dock area not shown as part of the LCP Site?	The Salt Dock was sold to Brunswick Cellulose in 2014, hence it is shown excluded from the property currently owned by Honeywell International, Inc. As far as the LCP Chemicals CERCLA Site is concerned, it remains part of the Site and will be evaluated as part of OU3 (the Uplands).
GEC 35.10	How were the LCP Site boundaries shown in Figure 2 determined?	The purple line in Figure 2 of the November 2014 Proposed Plan, describe as "LCP Property" in the figures legend shows the boundary of the property currently owned by Honeywell International, Inc.
GEC 35.11	With the boundaries of the LCP Chemicals Superfund site determined by land ownership or by the extent of the contamination?	Superfund site boundaries are determined by extent of contamination.
GEC 35.12	Are Superfund sites boundaries supposed to be determined by the extent of contamination or the surveyed ownership lines?	
Past Actions		
GEC 36.1	Why is marsh removal and re-vegetation with native marsh grasses not part of the Proposed Plan?	Marsh restoration has been added to the remedy.
GEC 36.2	Were coffer dams used during past actions?	The October 1999 Marsh and Railroad Removal Close-Out Report, documenting the marsh removal work, does not mention cofferdams.
GEC 36.3	If coffer dams were used in the past, why was this technology not considered in the Feasibility Study?	See preceding comment (GEC36.2).

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 36.4	What was the decision-making matrix that leads the exclusion of all technologies deployed from the uplands or utilizing dry excavation techniques?	Section 4 of the FS (Identification and Screening of Remedial Technologies) contains the discussion of the technology screening process.
GEC 36.5	Is there only "highly contaminated…" and "low level threat…" wastes at the site?	During the late 1990s removal, the higher concentrations of mercury and Aroclor 1268 were removed, leaving low level concentrations. To illustrate: the average pre-late 1990s removal mercury and Aroclor 1268 concentration were about 104 and 134 mg/kg, respectively. The current (post-removal) average mercury and Aroclor 1268 concentrations are 5.4 and 9.9 mg/kg, respectively.
GEC 36.6	Who made the determination that the remaining wastes are "…low-level threat waste"?	See the discussion regarding Principal Threat Waste in Part 2 of the Record of Decision.
GEC 36.7	What is the definition of low-level threat waste?	That which in not Principal Threat Waste.
GEC 36.8	What is the difference between waste and COCs?	See the text box on page 9 of the November 2014 Proposed Plan for a discussion of the LCP Chemicals marsh COCs. Section 7 of the baseline human health risk assessment also has a discussion of COCs.
GEC 36.9	How does the EPA quantify low-level threat waste and what is the threat level to humans and wildlife?	Principal and low-level threat wastes are wastes are discussed in the November 1991 Guide to Principal Threat and Low Level Threat Wastes (Superfund Publication 9380.3-06FS), available on the World Wide Web. The threat to humans and the environment is evaluate in the baseline human health and ecological risk assessments.
GEC 36.10	What are the numerical differences between low level, mid-level, and high level wastes for the Chemicals of Concern (COC) at the LCP Chemicals Superfund site?	See preceding responses in this subsection regarding principal and low-level threat wastes at the LCP Chemicals marsh.
GEC 36.11	Where can the low, mid, and high levels of waste threats definitions be found in EPA rules and regulations?	
GEC 36.12	How does the EPA define residual contamination and how is that numerically quantified?	"Residual contamination" is not a defined term and thus has no numerical quantification.
GEC 36.13	Would contamination that has resulted in documented sick Dolphins within this estuary qualify under the definition of residual contamination?	See above response (GEC 36.12).
2.0 SITE CHARACTERISTICS		
GEC 37.1	Were the COCs that have synergistic and similar modes of action considered, or were COCs like dioxin/furan excluded, even if they should be considered along with PCBs?	Dioxins and furans were not directly evaluated in the RI. However, the EPA 2014 Dioxin Memorandum provides data and analysis.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 37.2	Were all PCBs included or were the others excluded and only Aroclor 1268 included? If so, why? If not, why is the data missing?	In contrast to the uplands, almost all (98%) of the Aroclors found in the marsh was Aroclor 1268. The maximum sediment concentration of Aroclors 1016, 1221, 1232, 1242 and 1248 was 0.2 mg/kg. One exception to this was Aroclor 1260, which was detected 21 times. The following are the highest five detections of Aroclor 1260: 1,400, 180, 11, 3.6 and 0.99 mg/kg.
2.1 Distribution of COCs in Sediment		
GEC 37.3	Why was sampling limited to 6 or 12 inches?	This sampling interval represents the most biologically active zone for benthic invertebrates.
GEC 37.4	Was the EPA or the PRPs unaware of the biosphere depth in the estuary that inhabits the marsh sediments?	The EPA and PRPs were fully aware of sediment depths influenced by biota and contamination. In addition, most of the contamination in the marsh is highest in these intervals, thus providing conservative estimates of exposure to sediment.
GEC 37.5	Did the US Fish and Wildlife Service (USFWS) advise the EPA that sampling to only 12 inches was insufficient to delineate contamination in the LCP Marsh (USFWS, 1996)?	Indeed the USFWS through their November 21, 1996 comment letter did indicate that sampling sediment to a depth of 18 inches was not sufficient. Appendix A of the RI Report contains the vertical profile data collected in the marsh. Note that it is almost impossible to avoid cross-contamination when collecting sediment samples in an environment such as the LCP Chemicals marsh. The comments regarding a November 1996 USFWS comment letter have to be looked in the context of where the Site was close to 20 years ago. A lot has been done since and most of the comments in the letter are no longer relevant.
GEC 37.6	Did the USFWS advise the EPA to conduct whole body fish analysis?	It is assumed that the question refers to the November 1996 USFWS letter. The following is taken from that letter: "Use of edible tissue data is essential to evaluate human health concerns, however, to be conservative regarding environmental impacts it would be prudent to use individual samples (whole body) to assess potential bioaccumulation of the COC's."
GEC 37.7	Has the EPA assured whole body fish analysis has been conducted?	All the fish data used in the BERA were whole fish data.
GEC 37.8	Did the USFWS note the *Spartina* root bed extends to 18 inches and COCs at this depth might have a higher propensity to be bioavailable (USFWS, 1996)?	The following is taken from the 1996 USFWS letter to the EPA: "Sediment testing within the "marsh" to a depth of 18" is not sufficient. The report indicates that "PCB concentrations increased from 0.25 mg/kg at the surface to 5.4 mg/kg at depth." without specifying the depth. It is assumed the depth was to the 18" level. Interestingly enough this is the same approximate depth that the root bed and mat of the *Spartina*

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		extends. It would seem reasonable that degradation of the PCB's, PAH's and possible methylation of mercury could occur within this depth and that actions requiring the elimination of this layer may yield contaminants at higher levels. Furthermore, the products found within this layer may have a higher propensity to be bioavailable. Deeper sediment testing would be recommended to further identify and characterize the nature and extent of the COC's as well as sub surface water flow and potential transport of the COC's. The core sample from Purvis Creek indicated the mercury concentration increased with depth. This is an important finding when looking at the overall health and activities within the potential area of concern. That is, dredging activities are being planned and are occurring within the potential area of concern. This coupled with the releases occurring for many years would lead to a hypothesis that depositional zones could contain high levels of COC's and future activities may cause a bolus release of these through re-suspension and disturbance." The observations made in the above 19 year old paragraph are hypothetical with little scientific merit. There is limited evidence that contaminants would be more bioavailable at depths of 18 inches. See Appendix A.1 of the RI Report which suggests a relatively thin (<one foot) veneer of sediment contamination on the marsh flats. The paragraph assumed contamination extends to 18 inches or deeper. The Selected Remedy includes dredging of contaminated sediments to 18 inches and replacement with fill material.
GEC 37.9	How would the greater bioavailability of COCs at a depth of 18 inches affect a cap remedy?	There is no evidence that the COCs in marsh sediment are more bioavailable at 18 inches depth.
GEC 37.10	Did the USFWS recommend in 1996 the EPA total "dioxin" levels reported for the nature and extent of the contamination within the marsh?	The comment is too unclear to provide a response.
GEC 38.1	In light of the data collected since 2012, does the EPA agree the Reference Stations are likely, if not confirmed, to be within the radius of contamination deposition from the LCP Site (ATSDR, 2014b)?	The EPA does not agree that both reference stations have been impacted by the LCP Chemicals marsh. The following tables in the BERA demonstrate that these areas have not been impacted: Table 4-2a, 4-2b, 4-3a and 4-3b.
GEC 38.2	If the EPA disagrees, what data does the EPA have to support continued use of the Reference Stations?	See response to immediately preceding comment (GEC 38.1).

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 38.3	Does the EPA agree that there is only one sample of methylmercury for approximately every 4.5 acres of the LCP Site march? (640 acres/ 150 samples)	The correct answer is one methylmercury result sample every 4.3 acres. However, sampling was focused in more contaminated areas based on likely contaminant migration pathways and exposure routes.
GEC 38.4	Is the reason a small fraction of the mercury was methylmercury because it readily bioaccumulates? If not, why not?	Methylmercury does bioaccumulate in organisms; however, methylation of mercury occurs more readily in animal tissues such as in crabs and fish (mean methylmercury/mercury ratios up to 100%) than in sediment (< 1%) and Spartina tissue (~10%). See also Appendix F in the BERA.
Figure 4 – Aroclor 1268 Concentrations in LCP Marsh Sediments		
GEC 38.5	Why is there a high level of Aroclor 1268 reported at the Salt Dock in Figure 4?	This appears to be an isolated detection of Aroclor 1268 in the Turtle River, with a concentration of 25 mg/kg. Table 1 of the ROD shows that Aroclor 1268 concentrations were generally below 1 mg/kg.
GEC 38.6	Does this indicate dioxin/furan could have been transported to this area since the EPA and Honeywell argue the PCBs and dioxin/furan are co-located?	The December 2014 Dioxin Memo observes the following regarding the observed rapid decline in dioxin/furans concentration in sediment, away from the Former Facility Disposal Area: "As noted in the 1997 ERE, sediment dioxin TECs declined from an average of about 6,768 ng/kg [range 2,640 to 12,761 ng/kg] in the vicinity of the removed Former Facility Disposal Area to 138 ng/kg at dioxin station 111, located over half way down the LCP Ditch, at the confluence of the Eastern Creek with the LCP Ditch, to a TEC of 6.9 ng/kg at dioxin sampling station 117, where the LCP Ditch enters Purvis Creek, (Figure 1). This represents a 1,000 fold reduction of TECs from the removed source area (the former facility disposal area) to Purvis Creek. With exception of dioxin station 100, the Purvis Creek sediment dioxin TECs remain at single digit parts per trillion downstream of where the LCP Ditch enters Purvis Creek, until the confluence of Purvis Creek with the Turtle River. All the Turtle River sediment TECs remained in the single digit part per trillion range (Table 1)."
GEC 38.7	Why were fish not tested around the LCP Site and in Turtle River like they were at Lake Onondoga (whole, filet, juvenal and adult) and include dioxin and furans (USEPA, 2002)?	As mentioned in the response to comment GEC 15.1, the October 1997 ATSDR Turtle River Health Consultation evaluated dioxin/furans fish tissue concentration in the Turtle River from 1989 through 1992 and, though described to be higher in the Turtle River than in the comparison areas, the levels were well below the tolerance levels for dioxins in fish. Additionally, the U.S. Fish and Wildlife Service analyzed killifish tissue, collected during the removal action, mid-way along the most

Location Page#	Comment Summary	Response
		contaminated portion of the marsh, the LCP Ditch. Overall the dioxin/furans concentrations detected in the two fish samples were low and do not appear to present unacceptable risk to the environment. Table 5 of the ROD contains additional and more recent information on the dioxin concentrations in fish from the Turtle River.
What Is Risk and How Is it Calculated?		
GEC 38.8	If the BRA is an analysis of current and future conditions, why does it use data 20 years old (DHHS, 1999)?	The data used in the BERA and the HHBRA spanned the years 2000 to 2007.
GEC 38.9	Did the ATSDR Public Health Assessment discredit the study used to establish the annual number of seafood meals used to determine risk (ATSDR, 2014a)?	No. The 2014 ATSDR Public Health Assessment in no way discredited the modeled fish consumption rate. See response to GEC 40.1 below.
Exposure Assessment		
GEC 38.10	If the BRA is an analysis of current and future conditions, why is it using data 20 years old (DHHS, 1999)?	See response above at GEC 38.8.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 38.11	Did the ATSDR Public health Assessment discredit the use of DHHS, 1999 with the following statement? "And finally, it should be noted that African-Americans made up only 4% (9 out of 211) of the people who participated in the study. African-Americans make up 26% of the population of Glynn County and nearly 40% of the population within four miles of the LCP Chemicals Site. Therefore, African-Americans are underrepresented in the Brunswick fish study. A study of fishers along the Savannah River showed that African-Americans • Eat more fish meals per month than whites (average, 5.4 vs. 2.9), • Eat slightly larger portions than whites (average, 13.7 oz. vs. 13.1), and • Eat higher amounts of fish per month than whites (average, 75 ounces vs. 41 ounces). It is reasonable to assume that the fish-eating habits of African-Americans in Brunswick, Georgia, are similar to African-Americans along the Savannah River. Therefore, African Americans who fish along the Turtle River are likely to have higher exposure to mercury from eating fish than whites. The results of the Brunswick fish study should not be applied to African Americans in the Brunswick area for those reasons." (ATSDR, 2014a).	See response to Technical Comment #3. Also see response to GEC 40.1.
GEC 38.12	Did the Sapelo Study of Chemicals in seafood consumer find an annual consumption rate closer to 156 meals per year (ARSDR, 2014b)?	The reference to the September 2014 ATSDR presentation cannot, under any circumstances, be interpreted as a study. The 156 meals/year is one line on one slide from this ATSDR slide presentation (#21) where ATSDR appears to have asked nine individuals if they eat two-to-three meals/week and they all said "yes". This "study" based on nine individuals with a vague question is not scientifically defensible.
GEC 40.1	Does the EPA now realize the Baseline HHRA is seriously flawed?	A goal of the HHBRA is to develop reasonable maximum exposure scenarios to contaminants from a specific hazardous waste site. The purpose of the HHBRA is not to assume exposure on a regional scale but on a site-specific basis. The consumption rates used in the HHBRA (27 grams/day for the high quantity fish consumer) are very specific to assessing exposure to contaminated fish caught in the near vicinity of the

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		LCP Chemicals marsh (Zones D, H, and I from the TRBE). The EPA recognizes that the same anglers who fish in these three zones also fish elsewhere in the TRBE, including upstream in the Turtle River or in the Sapelo Island area. Any additional grams/day that the angler would obtain from those areas are not included in the site-specific risk assessment. The HHBRA does not account for every fish meal that a person eats over the course of a 30 year period, but rather provides a reasonable maximum exposure (RME) related to the Site. Even though the dominant PCB signature of Aroclor 1268 in fish may extend to a much wider geographic area, the HHBRA does not use fish tissue data from afar. Similarly, even though local subsistence people may consume more seafood, not all of it is assumed to come from an area of approximately two square miles. To apply much higher consumption rates based on this small area would be over-conservative. Conversely, to expand the geographic area to be more reflective of local fishing patterns would be less conservative because the concentrations of mercury and PCBs in fish are generally lower than those caught in Zones D, H, and I. The anglers in the Sapelo Island area fish at various locations around the island. It is assumed that this behavior applies to most anglers in coastal Georgia. In addition, the EPA recognizes that there are differences in seafood consumption rates throughout the southeast coastal region and the value that these studies provide to our understanding of fishing behavior and consumption of seafood. However, consumption rates need to be applied at a RME scale specific to a contaminated site. Therefore, the higher fish consumption rates based on the Savannah River study (Berger et al., 1999) or the ATSDR 2014 study of nine individuals do not change the conservative RME consumption rates used in the HHBRA. Remaining grams/day obtained elsewhere may provide a more complete assessment of regional exposure but would not be very informative to develop site-specific cleanup levels of sediment in the LCP Chemicals marsh. The 2011 HHBRA was conducted according to EPA's guidance and the available scientific data. The 2014 ATSDR Public Health Assessment (which mentions the higher fish consumption rates mentioned above) has

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		confirmed that fish/shellfish consumers (especially the high quantity fish consumers) are at adverse risk from exposure to mercury and PCBs (Aroclor 1268). The conclusions of the HHBRA and the ATSDR report findings are consistent with each other and support the fish advisory for the TRBE and the need for cleanup action in the LCP Chemicals marsh. This collective information does not necessitate further investigations or more reports, but for managers to use this information to make cleanup decisions along with a robust monitoring program to ensure that the contaminants in fish tissue decrease to acceptable levels.
Toxicity Assessment		
GEC 40.2	Why is the additive effect from dioxin and furan not included in the discussion of associated uncertainties (EPA, 2000)?	Dioxins/furans were not assessed in the HHBRA; consequently an evaluation of uncertainties related to dioxins was not presented. See the Dioxin Memorandum and response to GEC 40.4.
GEC 40.3	Does EPA guidance instruct to include dioxin and furan in the analysis of the carcinogenic and non-carcinogenic effects of PCBs like Aroclor 1268 and the other PCBs found at the LCP Site (EPA, 2000)?	Aroclor 1268 is overwhelmingly the only PCB found in the marsh. In contrast, other PCBs were detected in the LCP Chemical uplands.
GEC 40.4	Was the dioxin and furans known to be present in seafood and sediment evaluated in included in the Toxicity Assessment?	The finfish data are presented in the September 2, 2014 Dioxin Memorandum evaluated the available fish and other biota data. The memorandum concluded the following: "Tables 1 through 4 identify those PCDD/PCDF sampling stations which either have already been removed or will be removed. The range of sediment concentration to remaining in-place after the proposed remedy is between 2.7 and 53.6 ng/kg dioxin TEC. The maximum concentration is well below the dioxin-TEC concentration protective of the child, below the protective level for protection of the omnivorous mammal and below the protective level for protection of 90% of fish species. The maximum concentration is moderately above the highly conservative PRG protective of 95% of fish species. Due to the uncertainty related to limited sediment samples analyzed for dioxin/furans, it is recognized that additional PCDD/PCDF sampling will be required to confirm the dioxin/furans conceptual Site model, i.e. that Aroclor 1268 and dioxin/furans are co-located and that remediating the former will reduce dioxin/furans concentrations to acceptable levels. The additional sampling of the areas not proposed for either removal or covering should take place during the remedial design."

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 40.5	Does the EPA acknowledge the above statement is incorrect and there are cancer risks associated with dioxin and furans found in the LCP Site area and in Turtle River (EPA, 1996)?	Table 5 of the ROD presents the total toxic equivalent concentrations (TEC) in fish tissue for the Turtle River between the years 1989 and 2005. Station 1 was located immediately upstream of the former Arco Dock (see ROD Figure 3). Station 2 was located near the northern end of Andrew's Island, downstream of the Brunswick Cellulose Mill. The November 2014 EPA Region III Risk-Based Concentration Screening Table for fish tissue shows that the carcinogenic risk of 1E-4 corresponds to a 2,3,7,8- TCDD fish tissue concentration of 3.2 nanograms per kilogram (ng/kg). TCDD was rarely detected in the fish samples, suggesting minimal risk. If the 3.2 ng/kg was applied as a TEC for all dioxins/furans in fish tissue, then risks could occur. If the Region III fish tissue screening level for a hexachlorodibenzo-p-dioxin mixture of 67 ng/kg (for 1E-04 cancer risk) is used, then cancer risk would be well within the acceptable risk range. Based on Site data, this heavier chlorinated dioxin mixture appears to be more representative as a screening level than 2,3,7,8-TCDD alone.
GEC 40.6	Were these levels of risk based upon the discredited 40 meals per year (DHHS, 1999; ATSDR, 2014a)?	No, following a closer scrutiny of the HHBRA, the Proposed Plan was in error in only citing the 40 and 26 meals per year fish consumption rate for the high quantity and recreational fish consumer, respectively. The following is a more detailed description of the assumptions used in the HHBRA: • The adult high quantity consumer scenario was assumed to consume, on average, 27 grams of finfish per day. Assuming a fish meal size of 0.3 pounds (135 grams), this translates to 73 meals/year, or approximately six meals per month (from Zones D, H and I), based on self-identified high-quantity consumers in an area-specific creel survey. Assuming a larger fish meal (0.5 pounds) fish meal size, this translates to about 43 meals per year, or a little less than four meals per month; • The recreational adult consumer was assumed to consume, on average, about 16 grams of finfish per day. Assuming a fish meal size of 0.3 pounds, this translates to about 38 fish meals per year, or about three and a half meals of finfish per month. Assuming a larger fish meal size (0.5 pounds), this translates to about 26 meals per year, or about two meals per month. For shellfish consumption, the adult recreational fisher was assumed to catch and eat about 12 grams per

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		day, on average. This translates to about one and a half meals per month for a 0.5 pound meal or about two and a half meals of shellfish per month for a 0.3 pound meal size. These finfish and shellfish consumption quantities are based on upper-end of EPA defaults for recreational fishing in Southeast United States. The HHBRA assumes that these consumption amounts are for fish caught in the same area; and • The area-specific creel survey was the basis for the high quantity fish consumption rates used in the baseline HHRA, conducted by the federal ATSDR (Center for Disease Control) and the Glynn County Health Department, which surveyed 211 Turtle River anglers. The creel survey covered racial/ethnic groups representative of area population. The NOAA fisheries information was used to assign site-specific weighting factors to the various species of fish caught and eaten. From the survey, Table 7 in the ROD shows the average percentage of the various species of fish caught by coastal Georgia anglers between 2001 and 2005. Fish filet tissue data used in the HHBRA from the GADNR Zones D, H and I. Zone D is considered to be the middle of the Turtle River. Zones H and I are Purvis Creek and Gibson Creek, respectively. Figure 23 in the ROD shows the GADNR Fish Consumption Guidelines Zones. The most recent fish fillet data (2011) shows that fish caught in Zone H (Purvis Creek) had the highest mercury and Aroclor 1268 concentrations in 56% of the species sampled. Hence, the HHBRA estimated the risks posed by consuming fish from the most contaminated zones in the St. Simon estuary. See also previous response at GEC 40.1.
GEC 40.7	Was dioxin furan data available to the EPA utilized in the Toxicity Assessment and factored into this statement?	Yes, after a review of the available data as discussed in the 2014 Dioxin Memorandum.
GEC 41.1	Does the existing dioxin/furan data exceed the EPA allowable levels in seafood (GA DNR 1989; GADNR, 1990; GADNR 1991; GADNR, 1992; GADNR, 1993; GADNR, 1994)?	No. The October 1997 ATSDR Turtle River Health Consultation evaluated dioxin/ furans fish tissue concentration in the Turtle River from 1989 through 1992 and, though described to be higher in the Turtle River than in the comparison areas, the levels were well below the tolerance levels for dioxins in fish.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 41.2	Is Table 3 based upon the discredited data (DHHS, 1999; ATSDR, 2014a)?	The data presented on the "current average" column of Table 3 is the same average presented on Table 3 of the HHBRA. As such, it is now dated since year 2011 data are now available. The 2014 ATSDR assessment provided an update of potential fish consumption rates in the TRBE area based on more recent information from surveys conducted in the Savannah River area. The update of the new assumptions by ATSDR is welcome but does not disrepute prior local data used in the HHBRA.
4.2 Ecological Risks		
GEC 41.3	Was available dioxin and furans data included in the evaluation? If not, why not?	A limited amount of dioxin data was discussed in the BERA. It was agreed that the dataset for the BERA would include data between 2000 and 2007. At the time the BERA was concluded, the majority of the dioxin/furans data was only available in hardcopy format. Since most of the data handling for the BERA was electronically, this historical data was overlooked. In addition, there was a lack of sensitivity within the Region that chlor-alkali sites are associated with dioxin/furans. Once this was realized, the entire LCP Chemicals file was reviewed for dioxin data. These data were consolidated in the December 2, 2014 Dioxin Memorandum and interpreted.
GEC 41.4	In light of the toxicity sampling by the US National Park Service at Fort Puaski and Cumberland Island that did not find toxicity, does the sampling from the Reference Stations indicate they are toxic due to chemicals from the LCP Site, or failure of the lab to use appropriate protocols?	Recording of toxic expression in reference samples is not uncommon even when appropriate protocols are followed, and may be due to a variety of causes, such as pathogens in the sample, other organisms feeding on the test organisms, or other chemical factors such as redox conditions.
GEC 41.5	When questionable results are encountered, it is appropriate to repeat the test or do an analysis of the sediment to identify the toxic chemical or pathogen?	The specific toxicity tests on reference samples were not immediately repeated, but have been repeated over several years as part of an annual sediment toxicity program.
GEC 41.6	Did the EPA find any significance in the sediments being toxic to both burrowing and non- burrowing biota?	There were some statistical differences for some calculated COC sediment effect concentrations (SECs) between amphipods and grass shrimp. For example, the AET SEC for mercury was much lower for grass shrimp than for the amphipod (Table 22 in the ROD).
GEC 42.1	Is it scientifically acceptable to the EPA to use data with a less than 50% chance of being correct to establish preliminary remedial goals?	As stated in the ROD, some of the SECs were considered unreliable and were therefore not used to develop preliminary remedial goals. The far right column in Table 22 of the ROD is an average accuracy for the five SECs. Those highlighted in the table had higher accuracies. When there is much uncertainty, conservatism is used along with other lines of evidence such as results from the benthic community assessments.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 42.2	Is the likelihood of the Proposed Plan working less than 50%?	These two questions are too vague for a response.
GEC 42.3	If the data used has a likelihood of being less than 50% correct, how can a Proposed Plan based upon that data be any more correct or likelihood of success be any more than "less than 50%"?	
GEC 42.4	When questionable science is encountered, is the normal procedure to repeat the experiment to find the variables causing the low chance of being correct?	The sediment toxicity tests that were performed over several years were based on established protocols and not questionable science as purported. Results of such tests are facts that may or may not have definitive causes or explanations of their outcome. It is not the goal of toxicity testing to repeat tests ad infinitum until there is an ultimate cause(s) of the observation or until an exact SEC is defined.
GEC 42.5	Is it correct to conclude the EPA saying the data being used has much less than a 50% chance of being correct?	No. It was simply reported that only some of the data had poor accuracy and reliability.
GEC 42.6	What are the persistent low-level chronic effects expected to be present in the LCP Site marsh?	This comment is related to effects to finfish. Tissue residue hazard quotients were greater than 1 for several species of fish suggesting likely effects on finfish reproduction from both methylmercury and Aroclor 1268.
GEC 42.7	How many marsh rabbit, raccoon and river otter were sampled?	None. Estimating chemical exposure using dietary food chain models is a common accepted practice of ecological risk assessment and it avoids unnecessary killing of receptors to obtain statistically reliable tissue data.
GEC 42.8	How many studies documented the population dynamics of marsh rabbit, raccoon and river at the LCP Site? If none were conducted, why not?	None. An evaluation of population dynamics of various receptors is not a common practice in ecological risk assessment methodology.
GEC 42.9	Does the EPA have any empirical evidence or baseline monitoring to compare with the LOAEL HQs?	Yes. There are numerous baseline tissue data for finfish, crabs, mummichogs, and clapper rail to compare to.
GEC 42.10	How does the EPA propose to evaluate the Remedial Action?	This was provided in Section 7 of the Proposed Plan and is presented in Sections 10 and 13 of the ROD.
GEC 42.11	Has any data been collected to evaluate the upcoming Remedial Action or is all the data presented for the decision-making based upon models and assumptions?	Yes. See responses to previous two comments (GEC 42.9 and 42.10). The ROD is based on all of the baseline data in the RI/FS including risk assessments and all their associated uncertainties.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 42.12	If models and assumptions, when will baseline data (Baseline monitoring data) be collected for evaluating the remedy effectiveness?	Some data such as sediment dioxins/furans will be collected in the remedial design phase. A long-term monitoring plan will also be developed prior to implementation of the remedy to assess remedy effectiveness.
Table 5. Summary of Risks to Wildlife Receptors		
GEC 43.1	Please explain how the EPA can conclude a HI or HQ less than 1 when empirical data reported reproductive failure (EPA, 1997)?	The conservative dietary exposure models for the diamondback terrapin used in the BERA and in the 1997 and 1998 ecological risk assessments resulted in HQs < 1. See responses to GEC 16.4 and 16.7.
Uncertainties Related to the BERA		
GEC 43.2	Why is data that is "highly uncertain with poor accuracies" being used in the proposed Plan?	See responses to GEC 41.5 through 42.5.
GEC 43.3	When science is unreliable, is the appropriate action to repeat the data collection, analysis, or experiment?	The toxicity tests and other approaches used in the BERA followed established scientific methodologies and protocols. Many of these tests were repeated annually and the results are factual. See also responses to GEC 42.1 and 42.4.
Uncertainties Related to the Dioxin and Furans		
GEC 43.4	Why does this section ignore and not report the large volume of dioxin and furan data available for this area of Turtle River (GA DNR, 1989; GADNR, 1990; GADNR 1991; GADNR, 1992; GADNR, 1993; GADNR, 1994)?	See responses to GEC 41.3 and GEC 14.10 through 15.1.
GEC 43.5	Why does the EPA feel it is so important to avoid dioxin and furan sampling until after the Proposed Plan, Record of Decision, and the Consent Decree is entered into and approved by the court?	To date, the EPA has generated a limited amount of dioxin/furans data. The remedy includes sampling during the remedial design to confirm that the Aroclor 1268 and the dioxin/furans are co-located. Should that not be the case, the ROD will have to be amended. To date, all indications are the two contaminants are co-located, likely because they were generated in the graphite anodes.
GEC 43.6	How will the EPA know what the "Remedial Footprint" is without the dioxin and furan data?	The dioxin/furans analyses to be conducted during the remedial design will confirm that the footprints developed for Aroclor 1268, mercury, lead and PAHs include any footprint developed by the RD dioxin/furans analyses. Should that not be the case, the ROD will require an amendment.
GEC 43.7	Would the dioxin and furan data be additive to the PCB risk assessment data for humans and wildlife?	Yes. Although the September 2, 2014 Dioxin Memorandum has evaluated the existing dioxin/furans data, any additional data obtained

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		during the remedial design will be evaluated and the risk assessments amended, if necessary.
GEC 43.8	How could this dioxin and furan data significantly change the Proposed Plan?	Since sampling during the mid-1990s took place predominantly in the former facility disposal area, where the graphite anodes were disposed of (see ROD Figure 20), the highest dioxin/furans concentrations were evaluated in the 2014 Dioxin Memorandum. It is very unlikely that different congeners and/or higher concentrations will be found elsewhere in the OU1 marsh.
GEC 43.9	Could the unexpected toxicity observed be due to the very toxic dioxin and furan?	It is unclear what the unexpected toxicity observed is referring to. Based on the concentrations of the dioxin congeners measured, their toxicity is low relative to the more toxic TEC congeners.
GEC 44.1	Could dioxin and furan be the variable that is accounting for the "…generally much less than a 50% chance of being correct…" noted in Section 4.2 Ecological Risks? If not, what is the factor causing the large disparity?	No. Dioxins/furans are relatively non-toxic to aquatic invertebrates. Only certain dioxin congeners are variably toxic to fish, birds, and mammals. See also responses to GEC 42.1 through 42.5.
GEC 44.2	Since this Onondaga Lake site is being used as a comparison site and as an argument to NOT test for dioxin and furan until after the Record of Decision and Consent Decree, why did the EPA NOT use the human health and ecological risk drivers found at Onondaga Lake in the LCP Site in Brunswick Risk Assessments?	See response to GEC 15.1.
GEC 44.3	Why did the EPA NOT do the same sampling at the LCP Site in Brunswick as at the Onondaga Lake Site?	It is assumed that the comment is inquiring why the EPA did not require the PRPs to conduct much more dioxin/furans analyses, as was done at the Onondaga Lake Bottom NPL Site, where about 27% of the sediment samples were analyzed for dioxin/furans. The initial ecological risk assessment conducted by the EPA did acquire the majority of the existing dioxin/furans data. Following the initial effort, the focus of the data acquired through the sampling of about 1,650 sediment samples focused on Aroclor 1268 and mercury. Relatively minor subsequent dioxin/furans data were acquired subsequent to this. It is believed that while the additional sediment data was acquired, there was a lack of sensitivity of the fact that dioxin/furans may be present at chlor-alkali sites where graphite anodes were used and disposed of.
GEC 44.4	Unlike Lake Onondaga, was dioxin and furan found widely distributed in the Turtle River and the St. Simons Sound estuarine system sediments (USEPA, 1995b)?	No. The September 2, 2014 Dioxin Memorandum, specifically Attachments 2 and 4, clearly demonstrates that only very low concentrations of dioxin/ furans were detected in the Turtle River and St.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		Simons Estuary. In fact the memo observes the following with regards to the data acquired for the 1995 Brunswick Community Study: "Table 2 shows that the TEC totals ranged from 11.4 to 20.4 ng/kg. It is also apparent in Attachment 2 that the detection limits in the Brunswick Community Study were elevated, relative to those reported in the 1997 ERE. The detection limits in the BCS were generally ten times higher than those achieved in the 1997 ERE. As a consequence, even with the re-calculation of all the 1995 dioxin TECs using the WHO TEF of 2005, the total TECs calculated from the BCS reflect artifact of using one half the detection limit for the dioxin congeners not detected."
Relationship between Dioxin/Furans and Chlor-alkali Sites		
GEC 45.1	Why has the EPA failed to apply the risk found at the LCP site in New York to the ecological and human health baseline risk assessments for the LCP site in Brunswick, Georgia?	Each site has its own levels of contamination and site-specific exposure scenarios; consequently there is no direct application of risks from one site to another.
GEC 45.2	Are the two Sites really similar and if so in what ways? - What are the similarities or differences in salinity ranges at the Lake Onondaga site when compared to the Brunswick Georgia site? - What is the title range at the Lake Onondaga New York site compared to the Brunswick Georgia site? - What is the rainfall at the Lake Onondaga New York site when compared to the Brunswick Georgia site? - One of the water temperature ranges at the Lake Onondaga New York site when compared to the Brunswick Georgia site? - What is the annual temperature ranges for the Lake Onondaga New York site when compared to the Brunswick Georgia site? - Are the fish species found at Lake Onondaga New York site the same as those found at the Brunswick Georgia site? - Does Lake Onondaga in New York have a Spartina marsh like at the LCP site in Brunswick Georgia? - What is the water current speed in Ninemile Creek in New York and the current speed in Purvis Creek at the LCP site in Brunswick Georgia?	No, the two sites are very different.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
	- Do people fish from Lake Onondaga in New York and from Turtle River near the LCP site in Brunswick Georgia?	
GEC 45.3	Does the EPA agree the only similarity between Lake Onondaga and Turtle River is people catch and eat fish from both locations?	No. Some of the contaminants are similar and both the Lake Onondaga and LCP Chemicals sites were chlor-alkali operations. Also see response to GEC 44.3.
GEC 45.4	Does the EPA agree the dioxin and furan is more widely distributed in the Turtle River area than at Lake Onondaga, and the EPA's data documents this dispersion (USEPA, 1995b)?	No. See response to GEC 44.4.
GEC 45.5	Will the EPA add the risks found from dioxin and furan in fish to the BERA and HHBRA for the LCP Site in Brunswick, Georgia? If not, why not?	The EPA will evaluate the complete suite of dioxin/furans data, which will be supplements during the RD and, document its analysis in addenda to the risk assessments.
GEC 46.1	Does the noted uncertainty, "…the potential contribution of TEC dioxins to existing risk is unknown", still exist?	The uncertainty has been reduced since the time this excerpt from the BERA was written. The September 2014 Dioxin Memorandum consolidated all the existing dioxin data and evaluated it. A more comprehensive evaluation will take place after the acquisition of additional dioxin data during the RD.
GEC 46.2	Since the EPA has proposed a plan to remediate the LCP site in Brunswick Georgia without any dioxin furan data or any dioxin furan risk calculations for wildlife or people who consume the seafood, will the risk data from the Lake Onondaga site be used at the Brunswick Georgia site to better estimate the additive risk of dioxin and furan to the existing PCB contamination?	The comment is incorrect in stating there are no dioxin/furan data that exists. Lake Onondaga Lake Bottom NPL Site data will not be used to estimate risk posed by the LCP Chemicals Site.
5.0 REMEDIAL ACTION OBJECTIVES (RAOS) AND PRELIMINARY REMEDIAL GOALS (PRGS)		
GEC 46.3	What data does the EPA have to support the statement that the LCP Site is "…otherwise functioning marsh…"?	The point being made in the statement is that, as a result of the risk modelled in the HHBRA, it was estimated that almost 700 acres would have to be impacted to reduce risks to 1E-06.
GEC 46.4	How large is the entire marsh in the Turtle River (St. Simons Sound)?	This question is beyond the scope of the November 2014 Proposed Plan and supporting documentation.
GEC 46.5	Would remediating to 1E-05 result in removing the entire marsh, or just the contaminated areas adjoining the LCP Site?	The estimate of the acreage involved in remediating down to 1E-05 excess cancer risk was 586 acres or about 77% of the entire marsh.
GEC 47.1	How did the EPA and GAEPD come to the conclusion that achievement of a mercury SWAC PRG of 1 mg/kg for the	The genesis of 33 acres mentioned in the above quote is described below. Thiessen polygons were created, based on the sampling density. See Appendix K of the October 2014 FS for more detail on Thiessen polygon construction. Since, as is reasonable given the size of the marsh, sampling

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
	entire marsh would not be appropriate and what were the decision-making metrics?	density was greater in the domains closer to the discharge points (Domain 1) than those more removed from discharge points (Domains 3 and 4), the polygons were considerably larger in the polygons located in Domain 4. Hence, during development of the FS, a decision was made to exclude from consideration for remediation the 33 acres located west of Purvis Creek, consisting of larger polygons, represented by marginally elevated single data points. To illustrate, on Figure K-6 of the FS, a single data point with a total PAH concentration greater than 4 mg/kg, contributes substantially to the 33 acre total.
GEC 47.2	What timeframe did the EPA and GAEPD consider long-term ecological harm?	Likely decades, though the modelling has not been attempted. The value of such modelling is questionable.
GEC 47.3	How long will the mercury remain in the marsh and continue the methylation process?	The mercury available for methylation in the areas targeted for removal or capping will be eliminated within an estimated two years after the start of remediation. This will remove a substantial portion of the mercury available for methylation.
GEC 47.4	How long will it take to remove the mercury contaminated marsh and complete the restoration process?	
GEC 47.5	When comparing leaving the mercury in place and the continued methylation process or removing the mercury contaminated sediments and restoring the marsh, which alternative results in the shortest impact to the marsh and estuarine system when considered over the long-term?	The latter part on this question is confusing. The impacts of removing mercury contamination, which is present in thicknesses of less than six inches in the marsh flats, will be significant not only because, besides the obvious disturbance caused by dredging, roads must be built and equipment transported, further causing disturbance. This disturbance will require long periods to return to its current state.
6.0 DESCRIPTION OF ALTERNATIVES		
GEC 48.1	What was the rationale of the EPA in excluding technologies that utilized coffer dams sheet piling or similar technologies to confine the area, reduce sediment dispersion, and facilitate dewatering of the sediments needing removal?	Cofferdams are discussed in Section 4.2.6 of the October 2014 FS.
GEC 48.2	Did the EPA compare technologies utilizing dredging versus coffer dams or sheet piling?	
GEC 48.3	If the EPA did compare the technologies, why were technologies that left contamination in place or that have a high probability of recent spending sediments selected?	This comment is too unclear for a response.
GEC 48.4	Did the EPA consider accessing the marsh via an upland route instead of by barge?	The October 2014 FS discussed accessing the marsh by various means, depending on the area under consideration.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 48.5	Was a barge used previously for the EPA Emergency Response and Removal or was the marsh accessed via the uplands?	The following is taken from Section 5.3.2 of the October 1999 Marsh Close-Out Report: "Excavation of sediment within the impacted channels involved the use of three removal approaches: (i) long reach hydraulic excavators; (ii) custom built bucket ladder barge with concrete pump; and (iii) long reach hydraulic excavator mounted on pontoon tracks (marsh buggy). Articulated off-road dump trucks and High Density Polyethylene (HDPE) piping were utilized to transport the excavated material to the processing area."
7.1 Overall Protection of Human Health and the Environment		
GEC 48.6	How many years is "…after a few generations of fish lifespans"?	Most of the fish modelled in the HHBRA have lifespans of around four-to-eight years. The exceptions are the black drum, the red drum and the sheepshead. Those fish have lifespans of around 20-to-30 years.
GEC 48.7	Which fish species are being used to determine "fish lifespans"?	
7.3 Long Term Effectiveness and Permanence		
GEC 48.8	What example of a similar marsh or estuary with *Spartina alterniflora* is being referenced as the example? Do the "…sites similar to the LCP Chemicals marsh" have tides in excess of 9 feet, Fiddler crabs, and other burrowing birds and animals?	Appendix I of the FS (Review of Technical Issues: Thin-Cover Placement in Spartina Marsh and Potential Bioturbation Effects) contains the case studies sought. The following is the abstract for one of the references cited in FS Appendix I: "A study of the capability of high salt marsh to recover from disposal of dredged material indicates that smothering high marsh could be a feasible disposal alternative but should be used with caution and should only be employed when other alternatives are economically or physically infeasible. The study investigated the impact of smothering short form *Spartina alterniflora* in Glynn County, Ga., with three types of dredged material (coarse sand, sand and clay mixed, and clay), at six depths (8, 15, 23, 30, 61, and 91 cm), and at different stages of plant growth (February, July, and November) over two growing seasons. *Spartina alterniflora* was able to penetrate up to 23 cm of each type of dredged material and exhibited biological growth and production nearly equal to that in undisturbed marsh. These depths, being within the elevation range of the marsh, indicate that accurate tidal and elevation data should be collected before disposal on a marsh and that deposition should not exceed the elevation limit of the existing marsh. The study also assessed the impact of smothering on selected species of crabs and snails. Crabs

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		were able to recolonize areas covered with up to 23 cm of clay dredged material and 15 cm of sand. Snails rapidly recolonized material placed 8 and 15 cm deep. Faunal recovery may depend on the proximity of the disposal area to natural populations and the extent of the smothered areas."
GEC 49.1	How will the cap reducing exposures to the benthic community with the 200 Fiddler Crabs per square meter, documented in the BERA, burrowing to a depth of 36 inches?	This question is unclear. The EPA has acknowledged that some bioturbation may occur in thin cap areas but that the overall concentrations of COCs in the sediment are not expected to exceed the cleanup levels.
GEC 49.2	Will the cap be compromised by approximately 8% per year?	It is unclear where the 8% comes from.
GEC 49.3	If not by approximately 8% per year, how much sediment will be brought to the surface each year by the 200 Fiddler Crabs per square meter?	
GEC 49.4	What are the other burrowing animals that will further compromise the cap materials?	The commenter is directed to Appendix I of the FS for detail. Besides fiddler crabs, oligochaetes and polychaetes are expected to borrow.
GEC 49.5	How often is the monitoring schedule to take place at the site and what will this entail?	Appendix A of the ROD contains the framework of the Long-Term Monitoring Plan. Specifics of the monitoring plan will be further developed during the RD.
GEC 49.6	How often will maintenance be performed and how will the areas be accessed?	Operation and Maintenance will be performed by the responsible parties with oversight from the EPA and GAEPD, pursuant to the Consent Decree between the United States and the responsible parties.
GEC 49.7	Will funding be in place to conduct the monitoring and maintenance or will it be contingent upon approval and appropriations by the PRPs or in the case of the EPA, Congress?	As part of the Consent Decree process, the PRPs will have to demonstrate an ability to pay and post the appropriate bond.
GEC 49.8	How much money will be set aside for the monitoring and maintenance program?	
GEC 49.9	Does the EPA the description of the monitoring and maintenance program in detail is critical to the success of the remediation?	Long-Term Monitoring is an absolutely vital aspect of the remedy. An indication of the importance the EPA gives to this monitoring is the fact that a monitoring framework has been included in the ROD and not let entirely to the RD.
GEC 49.10	If so, please do describe in detail and include in Responsiveness Summary and the Record of Decision.	

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 49.11	How can the EPA claim "…long-term COC toxicity and mobility are reduced by creating a clean sediment surface through burial with clean materials", when the marsh is occupied by 200 Fiddler Crabs per square meter burrowing to a depth of 36 inches?	The following is excerpted from Attachment I-3 (Appendix I) of the October 2014 FS. It has been abbreviated to focus on fiddler crab burrowing depths, as determined by the various investigators. • McCraith et al. (2003) explored the effect of fiddler crab burrowing on sediment mixing in a South Carolina salt marsh by looking at the distribution of two isotopes (210Pb and 137Cs) in salt marsh sediments. Burrow densities ranged from between 40 and 300 burrows per m^2 with the highest densities reported to be by the creek bank. Results indicated that crab burrowing mixed the top 8 to 15 cm (3 to 6 inches) of salt marsh sediment thereby influencing sediment composition and salt marsh biogeochemistry. • Bertness (1985) demonstrates the importance of fiddler crabs to *Spartina* primary production at a salt marsh in Rhode Island. The authors found that burrows typically extended 5 to 25 cm (approximately 2 to 10 inches) below the surface in salt marsh sediments with densities between 224 and 480 burrows per m^2. • Katz (1980) studied *Spartina* marsh sediment turnover rate and the amount of surface area increase due to fiddler crab burrowing in a Massachusetts salt marsh. Quantitative measurements of burrow volume and surface area were measured in three 5-m^2 quadrats. Depth of fiddler crab burrows were predominantly 15 cm (6 inches) or less. With an average adult crab density of approximately 42 crabs per m^2, it was estimated that over 18% of the sediment in the upper 15 cm (6 inches) was turned over by crab burrowing. • Allen and Curran (1974) examined the sedimentary structures produced by fiddler crabs in protected lagoon and salt marsh environments near Beaufort, North Carolina. Results indicate that crab distribution was determined primarily by substrate characteristics, salinity, and vegetation cover in the intertidal zone. Fiddler crab and other crab burrows were reported to be up to 15 to 20 cm (6 to 8 inches) deep. Dimensions and shapes of burrows were variable depending on the species. This evaluation supports the conclusion that the majority of studies show that fiddler crabs burrow in the upper 15 cm (six inches) of the sediment column.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
7.4 Reduction of Toxicity, Mobility, or Volume (TMV) through Treatment		
GEC 50.1	Does the EPA have whole fish sampling in support of the statement, "In Purvis Creek, there is evidence that mercury fish and shellfish tissue concentrations have decreased over time," or is this an opinion or based upon data that is not comparable or obtained by different sampling and analysis methods?	Yes, it is found in Appendix H of the October 2014 FS. Mercury declines in Zone H (Purvis Creek) were noticed in the fillet data, not the Aroclor 1268 fish fillet data. With regards to whole body analyses, only six out the 11 species analyzed as fillet were also analyzed as whole body. Of these, three species (blue crab, spotted seatrout and striped mullet) showed a decreasing mercury trend. The blue crab and striped mullet showed a decreasing Aroclor 1268 trend. Whole body silver perch showed increasing trends for both mercury and Aroclor 1268. It should be noted that the limited number of data do not permit a statistically defensible comparison. This is only an observation of trends with the limited available data.
GEC 50.2	What is the source of the data of "evidence" the EPA is citing?	
GEC 50.3	What are the two data sets being compared to conclude there is evidence of COC reduction in fish and shellfish to make this conclusion and where can they be found in the LCP Site documents?	
GEC 50.4	Was the data collected used to conclude there is evidence of a reduction using EPA approved protocols?	The planning for all the fish data acquired until 2011 was conducted under the supervision of the late Dr. Randall Manning, with the GADNR.
GEC 50.5	Was both whole fish and filet sampling conducted?	Yes. See Appendix F of the October 2014 FS.
GEC 50.6	Where can the EPA's calculations for the bioturbation beyond the cover depth be found in the Feasibility Study?	See Appendix J of the October 2014 FS.
GEC 50.7	Is the thin cover based upon data or what is expected?	Appendix J describes the modelling work undertaken.
GEC 50.8	Who is defining "what is expected" and what are their credentials to do so?	Anchor QEA, LLC undertook the modelling work for the caps and thin layer cover. This work was reviewed by the U.S. Army Corps of Engineers at the request of the EPA.
GEC 50.9	How much sediment is brought to the surface each year by 200 Fiddler Crabs per square meter?	See response to GEC 49.1 and GEC 49.11.
GEC 50.10	What is the volume of sediment brought to the surface each year by the other burrowing animals in the marsh?	
GEC 50.11	How can the EPA claim "… isolate COCs and reduce bioavailability and mobility through burial with clean material.", when the marsh is occupied by 200 Fiddler Crabs per square meter burrowing to a depth of 36 inches?	

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 50.12	What is the cap annual failure rate calculated by the EPA, and the associated reintroduction of COC to the biota?	The long-term monitoring will determine this.
7.5 Short-term Effectiveness		
GEC 51.1	Was on-site treatment, the use of coffer dams of sheet pilling considered by the EPA or stakeholder agencies (USFWS, 1996)?	Temporary cofferdams have been used to control tidal waters during excavation. The FS does not exclude the use of temporary cofferdams as they may be needed in some situations depending on remedial design. Also see response to GEC 48.1 and 48.2
GEC 51.2	Were coffer dams used by the EPA during the removal action for the LCP Site dump during the Emergency Response and Removal Action?	
GEC 51.3	Are coffer dams a proven technology at the LCP Site?	
GEC 51.4	Did the EPA use coffer dams during the Emergency Response and Removal Action to keep sediments from entering the marsh and spreading further?	
GEC 51.5	Did the EPA use coffer dams during the Emergency Response and Removal Action to control and contain tidal waters?	
8.0 PROPOSED CLEANUP LEVELS		
GEC 51.6	Were ecological receptors such as dolphin, manatee, diamondback terrapin and mink considered in the derivation of the ecologically-based CULs? If not, why not?	Yes, indirectly through evaluation of surrogate representative receptors such as humans and river otters.
GEC 51.7	Does the EPA realize the dolphin, manatee, and mink are either species very susceptible to the COCs from the LCP Site protected species, or both susceptible and a protected species?	Yes.
GEC 51.8	Was the EPA aware of the large amount of peer reviewed journal data concerning COCs in dolphins and people prior to the release of the Proposed Plan (ATSDR, 2014b)?	Yes.
GEC 52.1	Where can the "Harm/Benefit" analysis be found?	Table 6-2 of the October 2014 FS contains information towards addressing this point.
GEC 52.2	What was the timeline utilized to evaluate harm verses benefit?	It is not clear what the commenter is attempting to convey.
GEC 52.3	Was short-term harm and restoration evaluated against the alternative of no action and long term risk to the ecosystem and human health?	Yes. The comparative analysis section of the ROD addresses this.
GEC 52.4	What were the specific decision-making metrics used for the harm/benefit analysis?	The October 2014 FS explains the logic used. To illustrate, the following is paraphrased from Section 5.1.2 of the October 2014 FS: Sediment

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		management areas are not solely defined by remedial goals. Remedies must weigh contaminant risk reduction against ecosystem impairments—in this case, including destruction of benthos, marsh vegetation, and wildlife habitat. Because remediating 33 of the 81 acres would cause significant damage to the marsh while providing minimal contaminant risk reduction (Table 5-1), the SMA-1 footprint is defined as 48 acres rather than 81 acres. The green shading on Figure 5-2 identifies areas that were excluded from the 81-acre remediation footprint.
GEC 52.5	What technologies were explored for these isolated high levels of COCs areas or areas that exceed remedial action goals?	The 33 acre "excluded areas", as the term was used in the FS, were not areas with high levels of COCs. To illustrate and referring to FS Figure 5-2 and proceeding in a north to south direction, the northern-most area excluded area had two data points with mercury concentrations of 6.8 and 6.5 mg/kg. The next excluded area had a single data point with a mercury concentration of 4.7 mg/kg the third excluded area had a data point with mercury concentrations of 4.6 mg/kg. Finally, the excluded area on the Turtle River has a total PAH concentration of 10.8 mg/kg, adjacent to another sampling point with a concentration of less than 1.5 mg/kg. The preceding attempts to illustrate that the excluded areas were not characterized by "high levels of COCs", rather moderately elevated levels, which brought into question the merit of constructing roads to access these areas the impact of removal or capping.
GEC 52.6	Did it occur to anyone in any of the stakeholder agencies that there is likely another COC causing the observed extreme range in toxicity?	It is unclear what the commenter is referring to as "observed extreme range in toxicity". The SECs are mathematical algorithms to help determine COC concentrations that could be used to predict specific effects. Also see responses to GEC 42.1 and 42.4.
GEC 52.7	What does a "robust monitoring program" entail? How often would the "robust monitoring program" be conducted? Where are the sampling locations for the "robust monitoring program"?	The framework of the monitoring program is presented in Appendix A of the ROD. The Long-Term Monitoring Program will be finalized during the Remedial Design.
GEC 52.8	When would the sampling and analysis start, and how long would the "robust monitoring program" be continued under the Record of Decision and Consent Decree?	
GEC 52.9	Will dolphins, mink, and manatees be part of the "robust monitoring program"?	They will not likely be monitored.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 52.10	Has the EPA or the PRPs done the needed baseline monitoring over the past 20 years needed for a "robust monitoring program"?	The 2000 through 2007 data contained for the most part in the BERA will form the baseline for the monitoring as well as the fish data collected by GADNR.
GEC 52.11	If not, why should anyone believe the EPA or PRPs will start to do so now?	
GEC 53.1	What does the EPA or PRPs have to show for work over the past 10 years to indicate they are competent to perform a "robust monitoring program"?	See the BERA including its appendices for this information.
GEC 53.2	Has the EPA or PRPs collected the baseline data for a monitoring program? If not, why not?	See response to GEC 52.10.
GEC 53.3	Does a monitoring baseline need several data points to track changes, which requires several sampling events over time to establish the baseline?	Yes. This is brought-out in the framework of the monitoring program contained in Appendix A of the ROD.
GEC 53.4	What is the time period for attainment of the RAOs?	The period of time to attain the RAOs may be lengthy. Implementation of the Long-Term Monitoring Program, which has built-in triggers for additional work, will determine whether remedy is performing as expected.
GEC 53.5	When will the effectiveness of the remedy be evaluated?	The remedy will be evaluated at least every five, during the remedy's formal Five Year Review.
GEC 53.6	What is the time period, specific goals, the decision-making metric by which the goals will be determined, and follow-up that will be implemented if goals are not reached?	The detail sought in this question is presented in Appendix A of the ROD, the frame work of the Long-Term Monitoring Program.
GEC 53.7	Why are the goals not specified in the Proposed Plan?	The proposed Clean-Up Levels for mercury, Aroclor 1268, lead and PAHs are presented on page 42 of the November 2014 Proposed Plan.
GEC 53.8	Why are the goal decision-making metric by which the goals will be determined and triggers for additional action implementation, or the actions to be taken, not specified in the Proposed Plan?	See Appendix A of the ROD.
GEC 53.9	Why is there no baseline monitoring to use in establishing goals to be reached? Why has there been no baseline monitoring over the past 20 years?	The accumulated baseline monitoring will indeed be used for developing the Long-Term Monitoring Program. Also see response to GEC 52.10.
GEC 53.10	Will the time period to reach the goals be specified in the Record of Decision?	See response to GEC 53.4.
GEC 53.11	What specific actions will be taken if the goals are not reached?	It depends on which goal(s) are not reached as evidenced by results of the long-term monitoring data.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
GEC 53.12	Has an analysis been conducted to compare the cost of conducting a remediation that will have a higher likelihood of success verses the cost of a "…robust monitoring program…" and the highly likely need to remobilize and conduct another remedial action due to minimal removal and significant unknown toxicity found during toxicity tests?	The analysis described in the comment has not been performed. A cost analysis of potential remedy failure can only be determined if long-term monitoring indicates further action may be needed for the remedy to be successful.
GEC 54.1	Will multiple remedial actions shave a greater impact on the marsh than one comprehensive removal action and restoration?	This all depend on the scale of each action.
Glynn Environmental Coalition letter of February 13, 2015		
GEC (2) 1.1	Did the EPA evaluate air transport and deposition of PCBs from the LCP Site as part of the LCP Marsh Remedial Investigation, Baseline Ecological Risk Assessment, or Human Health Baseline Risk Assessment?	No, the air transport of PCBs through air was not investigated in the remedial investigation for OU1 (the marsh), nor required by the EPA or the GAEPD. Since impregnation of the anodes with Aroclor 1268 ended in the early 1970s, the creation of Aroclor 1268 vapors would have ended at that time. The air monitoring work during the removal action is contained in the Administrative Record for the removal response action.
GEC (2) 1.2	Does the EPA agree that the gradient of PCBs documented across the Brunswick Peninsula is a result of air releases from the LCP Site? If not, what is the mechanism for the formation of a PCB gradient of congeners of PCBs associated with the LCP Site?	The current response action contemplates work in the LCP Chemical marsh. Research into PCB gradients across Brunswick is beyond the scope of this operable unit.
GEC (2) 1.3	Does the EPA agree that the gradient of PCBs found across the Brunswick Peninsula likely extends into the marsh?	Yes. The Aroclor 1268-impregnated anodes were placed in the Outfall Pond, among other locations. From these locations the tides dispersed some of the PCB into more distant parts of the marsh and beyond.
GEC (2) 2.1	Does the EPA agree that the gradient of PCBs found across the Brunswick Peninsula likely extends into the marsh and likely the deposition is according to wind direction?	See response to GEC (2) 1.1 above.
GEC (2) 2.2	Does the EPA agree that the gradient of PCBs found across the Brunswick Peninsula likely extends to Sapelo Island and is an explanation for how PCBs associated with the LCP Site crossed tidal nodes, rivers, and other natural hydrological boundaries? If not, what is the explanation for the PCBs crossing hydrological boundaries and barriers?	The extent to which Aroclor 1268 is found in the southeastern coast of the United States may be appreciated by mapping the two principal congeners found in Aroclor 1268, PCB 206 and 209. Both congeners have been found at considerably higher concentrations in Pamlico Sound. North Carolina, a distance of 450 miles from Brunswick, than at Sapelo Island. This is likely because Aroclor 1268 was used in multiple ways. Aroclor 1268 was used not only as a dielectric sealant (the use at this site) but also as: a) in marine varnish, b) for dipping gloves to impart chemical

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		resistance, c) as a flame retardant in silicon rubber, and d) in asphalt as a flame retardant coat on paper. In addition, U.S. Navy submarines and surface ships used a mixture of the Aroclors 1254, 1260 and 1268 in various ways. The highest concentrations have been found in double backed adhesive tape, ventilation bedding components, aluminized paint, ventilation gaskets and ventilation cooling coil insulation, etc. Note that, on the basis of testimony and available records provided by former Allied Chemical employees, Allied Chemical purchased about 40,000 pounds of Aroclor 1268 per year for use at the Site. Monsanto's, Inc. (the producer of Aroclor 1268) limited available records reflect the following pounds of Aroclor 1268 produced: Year — Pounds Produced 1953 — 254,985 1954 — 163,055 1955 — 63,202 1963 — 315,556 1970 — 384,000 In a study entitled "Temporal Trends of Aroclor 1268 in the Taunton River Estuary: Evidence of Early Production, Use and Release to the Environment" (Cantwell *et al*, 2006), dated sediment cores showed the presence of PCBs, including the Aroclor 1268 congeners, appearing in about the year 1929 and peaking in concentration around 1955. The Taunton River Estuary is over 1,000 miles from Brunswick.
GEC (2) 2.3	Have PCBs been found past the Reference Stations at Troup Creek and Crescent River?	Yes, Aroclor 1268 has been found in both reference stations. Tables 1and 2 of the ROD contains the concentrations of Aroclor 1268 in sediment and surface water in both reference stations. The BERA contains sediment data for both reference stations. Note that Table 2 shows, with time, as detection limits decrease, PCBs have become detectable at extremely low concentrations. PCBs are persistent and widespread in the environment.
GEC (2) 2.4	Were dioxins and furans found at the Reference Stations? If so, could the source be the LCP Site?	Table 1 of the ROD shows the dioxin toxicity equivalency concentrations (TECs) in sediment at the reference stations. No surface water samples from the reference stations were analyzed for dioxins. Dioxins are

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		ubiquitous in the environment and may or may not be related to the Site. Note that sediment samples in the St. Simons Estuary analyzed for dioxins/furans showed extremely low, almost non-detectable amounts of those contaminants. Please review Attachment 2 of the September 2, 2014 Dioxin/Furans: LCP Chemicals Superfund Memorandum for more information on dioxin/furans in the St. Simons estuary.
GEC (2) 2.5	Could the source of observed toxicity at the Reference Stations be from the air transport of toxic compounds from the LCP Site? If not, why not? What additional efforts were made to identify the cause of toxicity at the Reference Stations?	It is highly unlikely because invertebrates are known to be insensitive to dioxins due to the general lack of the AhR receptor, in contrast to fish, birds and mammals. Further, it is highly improbable that particulates as heavy as Aroclor 1268 could be transported by air from the Site to the reference stations. Correlations with various chemical concentrations were used to identify causes of toxicity, but no statistical correlations were found. Mortality in reference stations is not uncommon due to a combination of chemical and non-chemical stressors.
GEC (2) 2.6	Did the EPA look at nearby toxicity sampling stations used by the United States National Park Service at Cumberland Island and Fort Pulaski? If not, why not?	No. The toxicity work was limited to the Site and the two reference stations.
GEC (2) 2.7	Will the EPA consider using the sampling stations used by the United States National Park Service at Cumberland Island and Fort Pulaski as the Reference Stations for the LCP Site?	Yes, the EPA could consider using the Cumberland Island and Ft. Pulaski stations as reference stations. Note that a quick search on the World Wide Web reveals that neither of these U.S. National Park sampling stations have escaped anthropogenic impacts.
GEC (2) 2.8	Did the EPA ever consider the Reference Stations were within the area where chemicals and other compounds were released from the LCP Site? If not, why not?	There are very few reference stations, if any, where PCBs, mercury, and dioxins would not be detected. What is important is that the sediment and surface water data shown on Tables 1 and 2 of the ROD are non-detect to very low. With improvement in analytical techniques, detection limits have dropped to less than one part per trillion for Aroclor 1268 and mercury.
GEC (2) 2.9	If the EPA did evaluate air transport and deposition, what was the estimated volume of PCBs distributed via air transport?	See response to GEC (2) 1.1 above. The EPA does not believe that 45 years after the end of anode impregnation and creation of Aroclor 1268 fog, the evaluation of air releases in the RI/FS would significantly affect or improve the development of a remedy for the sediments in the LCP Chemicals marsh.
GEC (2) 2.10	Did the EPA evaluate the extensive record of air releases recorded by the Georgia Environmental Protection Division and documented in the LCP Site Removal Administrative Record?	
GEC (2) 2.11	Does the GAEPD a documented air releases in the LCP Site Removal Administrative Record discuss the high temperature	

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
	of the gasses released? What was the composition of the gasses released?	
GEC (2) 2.12	Can heavier than air chemicals like PCBs and Dioxin/Furan be air transported in a release of heated gasses?	The Site file does contain records describing an "Aroclor fog" created during anode impregnation, however, the same records indicate that the fog was carried only several hundred feet before the wind dispersed it.
GEC (2) 2.13	What is the EPAs explanation for the gradient of PCB congeners associated with the LCP site that extend out from the Site?	The most likely transport mechanism was the twice-a-day tides that dispersed the Aroclor 1268 in the disposed anodes during the period when Aroclor 1268 initially was used in the early 1960s and the present. Since the early 1960s, the tides have come in and out about 39,000 times.
Environmental Stewardship Concepts Comments/Responses		
ESC 1.1	What sampling will be undertaken to determine the full extent of contamination in the Turtle River estuary system as a result of the LCP facility activities? This question is based on the data showing Aroclor 1268 congener profiles on Sapelo Island sediments, human tissues and in dolphins from the Turtle River?	In the mid-1990s, as part of the Brunswick Community Based Study, the EPA sampled the sediment in rivers and the marshes of the St. Simons Estuary. The results are documented in the February 1997 report entitled Characterization and Spatial Distribution of Contaminants in Surface Water, Sediments and Fish Within the Tidal Reaches Surrounding Brunswick, GA. Ninety Five sediment samples collected from the Turtle River Brunswick Estuary (TRBE) were analyzed for purgeable organic compounds, extractable organic compounds, pesticides/PCBs and metals. A subset of the sediment samples were analyzed for dioxin and furans. Since the comment focuses on Aroclor 1268, this response will be tailored to address the Aroclor 1268 in river and marsh sediments. The mid-1990s, sediment sampling showed that, of the 95 Aroclor 1268 results, 32 were non-detects, with an average detection limit of 0.43 mg/kg. The average concentration of the 57 sediment samples with detected Aroclor 1268 was 0.25 mg/kg. More recently, work performed by Wirth, et al. 2014, reports that the geometric mean concentration of total PCBs, including Aroclor 1268, in the Brunswick area is 0.079 mg/kg. The geometric mean for Sapelo Island sediment samples is 0.00021 mg/kg. The historically low and more recent lower concentrations of Aroclor 1268 do not argue for expansion of the sampling program to Sapelo Island, where other investigators are monitoring the sediment quality. With the exception of long-term monitoring of fish and shellfish in the TBRE and sediment sampling of dioxins, there currently are no plans for

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		additional sampling. The focus is to remove the most contaminated sediments located in the LCP Chemicals marsh in order to reduce any further contaminant migration and to reduce human and wildlife exposure to acceptable levels.
ESC 1.2	How will EPA incorporate new methods for cleaning up contaminated sediments that have not been considered in the FS?	The FS documents the technologies screened and retained. Without more specificity as to which methods are being referred to, it is not possible to properly respond to this question.
ESC 1.3	What corrections will EPA make to the Human Health Risk Assessment to account for the errors and omissions in human exposures and toxicity of contaminants, considering that site use is greater than estimated, fish consumption is greater than the value used and that dioxin contribution has not been included in the toxicity of site contaminants?	The HHBRA was conducted according to guidance and utilized local data regarding fish consumption rates consistent with other studies in the region. The high quantity fish consumer was assumed to eat 73 meals per year, with 4.75 ounces per meal (Appendix B of the HHBRA). Although the number of meals per year is higher than the Savannah River study (see Table 4 in Berger et al. (1999), which suggests a yearly consumption rate of 64 meals/year, the quantity eaten per serving in the 1999 study is about 13oz (similar to eating two 6.5 oz cans of tuna fish per serving). The ATSDR 2014 interview of nine individuals from Sapelo Island suggests higher consumption rates but is lacking in statistical power relative to the Berger et al study. The HHBRA only evaluates risks from fish caught from Zones D, H, and I of the TBRE (about two square miles) and does not include consumption of fish caught in other zones of the TBRE or elsewhere in the local area. The EPA has reviewed available dioxin data and consolidated it in the September 2, 2014 Dioxin/Furans Memorandum. It also evaluated with the risk posed by the dioxin/furans still in place, following the removals. The memo concluded that the dioxin/furans are very likely co-located. To confirm this belief, the ROD's Selected Remedy requires additional sampling during the remedial design (RD) to confirm this belief. Should co-location not be confirmed by the RD sampling, the ROD will have to be amended.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
ESC 1.4	How does the Proposed Plan address the contamination of dolphins and other marine life that are not now included in the BERA or in another aspect of the RI/FS?	Detailed dolphin data were not available at the time of the HHBRA; however the results of the HHBRA and the BERA (effects on the river otter) provide a range of risks that are assumed to apply to dolphins. The EPA considers the bottlenose dolphin to also be at risk and believes that the proposed cleanup action in the LCP Chemicals marsh will reduce risks to acceptable levels. A long-term monitoring effort of fish and shellfish concentration trends will help ensure the tissue goals are met. If they are not met, then additional measures may be taken to further reduce risks. See also responses to Glynn Environmental Coalition regarding dolphins.
ESC 1.5	What additional sampling or analysis will EPA conduct in order to account for the omission of fate and transport of PCBs and other contaminants by Spartina grasses?	No additional data collection is planned for contaminants in Spartina. The EPA (1997) and PTI (1998) ecological risk assessments concluded that there were no adverse risk to manatees which were assumed to eat Spartina. The 2011 BERA included Spartina tissue data in the transport through the food chain to marsh rabbits and also concluded no adverse risks. See also responses to Glynn Environmental Coalition regarding Spartina.
ESC 1.6	Will EPA require ecological risk evaluation of dolphins, based on all mammalian data, such as mink and other marine mammals and evaluate the toxicity to mink and river otter on the effects (toxicity) of PCBs as congeners?	See response to ESC 1.4 regarding dolphins. The river otter was used in the BERA as a surrogate species for mink for exposure to Aroclor 1268. The limited PCB congener data in sediment and tissues were not used. An important factor is that none of the non-ortho or mono-ortho PCB congeners (those congeners on the World Health Organization toxicity equivalence factors list that likely generate most toxicity) were identified in samples from the site area. The BERA used toxicity of Aroclor 1254 (which does contain more toxic congeners) to assess effects to the river otter, which resulted in lowest-effect hazard quotients at 0.4 and no-effect hazard quotients at 4, suggesting some risk to the river otter. This information was used to develop remedial goals.
ESC 1.7	The toxicity evaluations of the sediment have not adequately captured the anticipated toxicity, thus, how will EPA re-evaluate the sediment toxicity to account for this information?	The comment is unclear what is meant by “anticipated toxicity” or what “this information” is. The BERA evaluated over 200 sediment toxicity tests to benthic organisms in relation to contaminant concentrations and other potential stressors in the sediment samples. Numerous sediment samples were also use to estimate bioaccumulation factors into various biota (i.e., fiddler crab, blue crab, mummichog, finfish and Spartina) to assess potential toxicity through the food web to various receptors.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		Potential toxic effects from incidental ingestion of sediment by humans were also evaluated.
ESC 1.8	Will EPA require measurement and assessment of dioxin in the site contaminants, EPA having included reference to the cleanup at Lake Onandoga that has both PCBs and dioxins, and obviously admits the occurrence of dioxins in this type of site.	The dioxin memorandum (EPA 2014) provides information on available dioxin data in the site area and suggests that dioxin congeners are co-located with Aroclor 1268. Thus, cleanup of Aroclor 1268 is also assumed to capture any associated dioxins. The EPA will require sediment sampling of dioxins in the LCP Chemicals marsh during the remedial design phase to confirm this co-location relationship.
ESC 2.1	Will EPA require alteration of the assessment of damage to the marsh to account for the factual errors present in the statements of damage to the marsh based on out-dated methods that are not used in working in salt marshes?	It is assumed that this comment refers to physical damage to the marsh from remedial actions. The Feasibility Study provided the number of acres that would be disturbed for each alternative to meet preliminary remedial goals, including disturbances to the marsh to access the removal areas. It is unclear which factual errors the reviewer is referring to or what out-dated methods that are not used. It is not simply the number of acres that could be remediated but the level of commensurate risk-reduction that would be achieved between the 48 and 18-acre alternatives. The proposed remedy achieves the threshold of environmental protection while providing less disturbance to the existing marsh. The EPA acknowledges that there are various techniques that can be used to minimize construction disturbance to salt marshes and will encourage the use of such techniques in the design phase.
ESC 2.2	What provisions in the Record of Decision will EPA make for the consequences of rising sea-level and climate change on the remedy and the site?	The hydrodynamic modeling that was conducted (Appendix B of the FS) to assist in the design of stream bed and sediment cap stability, took into account effects that could occur during maximum spring flood tide conditions, 100-year flood conditions, and during a hurricane storm surge. These data were used to assist in remedy selection. Climatic conditions stronger than the 100-year flood, rising sea levels or a stronger storm surge were not modelled. See also response to SELC 14.1 (IV, C).
ESC 3.1	**Sediment Removal vs. Capping**	The EPA agrees that actual removal of contaminated sediment from the marsh is more permanent. However, the available vertical profile data, presented as figures in the ROD, demonstrate that contaminant concentrations drops to very low concentrations within nearly six inches of the marsh surface on the marsh flats. In addition, contaminant concentrations on the marsh flats that flank the tidal creeks are far lower than the creeks themselves. Hence, the rationale for where thin-layer covers can be reasonably successfully used is where sediment

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		contaminant concentrations are a relatively thin veneer overlying the marsh surface and where concentrations are also relatively moderate. It is also acknowledged that thin-layer covers will be subject to bioturbation, which is why there will be a monitoring program to ensure that this aspect of the remedy is effective. Thin-layer covers will only be applied to very low energy environments (i.e., in areas of minimal tidal/storm surge areas). This portion of the remedy is not to eliminate contamination, but to substantially reduce toxic exposures and contaminant mobility. Armored caps are only proposed in the tidal creeks, and they have been successfully used in major tidal rivers that are also subject to substantial flooding.
ESC 3.2	**Salt Marsh Grasses**	The 2011 BERA and previous risk assessments (EPA 1997 and PTI 1998) collected Spartina tissue for use in contaminant transport food chain models into consumers of salt marsh grass. The pathway of contaminant movement via Spartina resulted in minimal risk to the receptors evaluated. See also responses to GEC's concerns with Spartina. The EPA has added a requirement for salt marsh restoration to disturbed areas. Spartina re-plantings are a likely outcome of the restoration plan that will be developed in the remedial design stage.
ESC 4.1	**Estuary Use by People**	Although the LCP Chemicals marsh is not readily accessible for recreational use, there are people that do visit, trespass and/or fish within the Site. It was never assumed that people do not use the area. In fact, the HHBRA utilized local information about fishing patterns in the TRBE and assumed that a person could eat about five meals/month from Zones D, H, and I of the TRBE alone. These three zones comprise about 15% of the TRBE.
ESC 4.2	**Dolphins**	EPA agrees that fish, humans and dolphins are likely at adverse risk from mercury, PCBs, and other contaminants. The remedy selected to remove and cap sediments in the LCP Chemicals marsh is expected to reduce exposure to mercury and Aroclor 1268 to acceptable levels. Long-term monitoring is included in the ROD to ensure that the remedy is effective.
ESC 4.3	**Human Health and Ecological Risk Assessments**	The limited available dioxin data was not used to quantify numerical risk estimates in the HHBRA. The EPA (2014) dioxin memorandum evaluated dioxin data and has determined that it is largely co-located in sediments with Aroclor 1268. Thus, removal of Aroclor 1268 is expected

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		to also remove any co-located dioxins. Additional sediment dioxin data will be collected during the remedial design phase to confirm this. In the HHBRA, the high quantity fisher was modelled to consume 73 meals/year from Zones D, H, and I of the TRBE (Appendix B of the HHBRA), not the frequency of 40 meals/year mentioned in the FS. Other meals that a person obtains from other zones of the TRBE or elsewhere were not included because the result would be less conservative (e.g., include fish caught is larger areas upstream in the TRBE) and not site-specific enough to assess exposures likely related to contaminants in the LCP Chemicals marsh. It is not accurate to assert that the Troup Creek reference station is equally as contaminated as the LCP Chemicals marsh without supporting information. Data presented in the RI/FS and BERA clearly indicate otherwise. It is acknowledged that mercury and PCBs have been detected at very low levels in Troup Creek. This is not surprising as mercury and PCBs are contaminants that can be detected throughout the world. The Crescent River reference station also has been an appropriate reference location. With respect to cleanup levels (CULs), the Proposed Plan and Record of Decision acknowledge that not all segments of the marsh and creeks will achieve CULs and that residual risks may occur. It is required to implement a long-term monitoring plan when residual contamination is left in place. The ROD includes a framework of the monitoring plan that will be developed with stakeholder input during the remedial design phase. It is expected that virtually all monitoring components will occur more frequently than once every five years. The five-year review process is a mandated review to document if the remedy is protective and whether other measures should be taken to achieve decision goals.
ESC 5.1	**Total Acreage of Cleanup**	The 81 acres represented the maximum area that could be affected if the CUL for mercury was 1 mg/kg in sediment (for PCBs the number of acres was much less). However, the concentration of 2 mg/kg mercury in sediment is also considered protective of all receptors. The comparative evaluation in the FS was to determine the spatial variability of where potential residual mercury concentrations less than 2 mg/kg could occur.

Location Page#	Comment Summary	Response
		The concentration of 1 mg/kg mercury in sediment is not "high level" from the perspective of the risk assessments. In addition, it is important to understand the genesis of 81 acres mentioned in the comment. Thiessen polygons were created, based on the sampling density. See Appendix K of the October 2014 FS for more detail on Thiessen polygon construction. Since, as is reasonable given the size of the marsh, sampling density was greater in the domains closer to the former discharge points (Domain 1) than those more removed discharge points (Domains 3 and 4), the polygons were considerably larger in the polygons located in Domain 4. Hence, during development of the FS, a decision was made to exclude from consideration for remediation the 33 acres located west of Purvis Creek, consisting of larger polygons, represented by marginally elevated single data points. To illustrate, on Figure K-6 of the FS, a single data point with a total PAH concentration greater than 4 mg/kg, contributes substantially to the 33 acre total. Hence the largest remedial footprint considered in the FS was 48 acres (or 81 minus the 33 acres).
ESC 5.2	**Sapelo Island**	The selected remedy, removal/capping of contaminated sediments in the LCP Chemicals marsh, is expected to result in lower concentrations of PCBs and mercury in local seafood. Finally, in contrast to comment's assertion that the residents of Sapelo Island have "dangerously high levels of PCBs in their bodies", scientists with the Center of Disease Control have publicly stated the following: • The total levels of PCBs in the nine participants who participated in their study were similar to national averages, based on a person's age; • Some specific types of PCBs in the participants were higher than the national average, and some were lower than the national average; and • The total PCB levels **were lower than those known to cause health problems**.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
Institutional Controls at the Site		
ESC 8.1	**Issues with Institutional Controls**	The EPA agrees that ICs do nothing to reduce contamination. The one sentence referred to in the Proposed Plan should have only mentioned the long-term monitoring plan and should not have included ICs. The EPA works cooperatively with States on health issues related to federal hazardous waste sites, but does not issue fish advisories. The State of Georgia is responsible fish consumption advisories and recommendations to provide for a more meaningful advisory for the TRBE should be directed to the GADNR. The HHBRA and the ATSDR 2014 Public Health Assessment support the need for the advisory to deter (not prevent) unlimited consumption of seafood from the TRBE before, during and after implementation of the remedy, until such time when mercury and PCB concentrations in seafood fall within acceptable levels.
Fish Consumption Advisories at the Site		
ESC 13.1	**The Solution**	See previous response above (ESC 8.1).
Site Boundaries at the Site		
ESC 16.1	**Table 1: OU1 acreage estimates**	The existing OU1 boundary has been sufficiently characterized to select a remedy to clean up contaminated sediments in the LCP Chemicals marsh. It is recognized that contamination has migrated due to tidal action over the decades. However, the ROD is currently focused on OU1 so that cleanup can occur, rather than delay for more expanded studies over a larger geographical area. The long-term monitoring plan will assist in determining how successful the OU1 remedy will be in reducing exposures to acceptable levels. If unsuccessful, then other actions will need to be implemented to achieve the remedial action objectives. Most of the differences in the OU1 acres have been between earlier estimates in the late 1990s and 2000s of marsh and creeks based on topographic maps and GPS data, and the more recent LiDAR data collected during the FS. The more accurate acres calculated in the FS (~662 acres of vegetated tidal marsh and ~98 acres of tidal creeks) will be used in the ROD.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		Finally, the extent to which Aroclor 1268 is found in the southeastern coast of the United States may be appreciated by mapping the two principal congeners found in Aroclor 1268, PCB 206 and 209. Both congeners have been found at considerably higher concentrations in Pamlico Sound. North Carolina, a distance of 450 miles from Brunswick, than at Sapelo Island. This is likely because Aroclor 1268 was used in multiple ways. Aroclor 1268 was used not only as a dielectric sealant (the use at this Site) but also as: a) in marine varnish, b) for dipping gloves to impart chemical resistance, c) as a flame retardant in silicon rubber, and d) in asphalt as a flame retardant coat on paper. In addition, U.S. Navy submarines and surface ships used a mixture of the Aroclors 1254, 1260 and 1268 in various ways. The highest concentrations have been found in double backed adhesive tape, ventilation bedding components, aluminized paint, ventilation gaskets and ventilation cooling coil insulation, etc. Note that, on the basis of testimony provided by former Allied Chemical employees, Allied Chemical purchased about 40,000 pounds of Aroclor 1268 per year for use at the Site. Monsanto's, Inc. (the producer of Aroclor 1268) limited available records reflect the following pounds of Aroclor 1268 produced: <u>Year</u> <u>Pounds Produced</u> 1953 254,985 1954 163,055 1955 63,202 1963 315,556 1970 384,000 See also responses to GEC (2) 2.2.
Modern Construction Methods for Salt Marsh Remediation		
	Use of Alternative Technologies	See Response to Technical Comment #7.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
Southern Environmental Law Center Comments/Responses		
SELC 3.1 (I)	The potentially responsible parties have drawn the boundaries of the area that needs to be addressed by the LCP Chemical Site cleanup too narrowly.	See response to Technical Comment #1. In addition, it is EPAs policy that at large/complicated sites where some decisions can be made, the Site is broken into Operable Units (OUs) to facilitate site remediation. This has been done at the LCP Chemicals Site. In addition, EPA policy at sediment sites promotes the idea of "remove source first" (OSWER Directive 9285.6-08, Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites). The concept is that until the sources have been remediated, other remediation (including natural processes) cannot effectively result in contaminant reductions. Again, this approach has been followed at LCP, starting with the marsh removal action and continuing with the current proposed remedial action in the marsh, designated as OU1. The other relief suggested by SELC, such as establishing food banks for the subsistence fishers and cancer victims is not within the EPA's authority. With respect to the natural resources damage assessment (NRDA), this is part of the CERCLA process but it is not within the legal jurisdiction of the EPA as the Agency is not a natural resource trustee. The NRDA and any liability settlements are the responsibility of the State of Georgia, the NOAA, and DOI/FWS, as well as other natural resource trustees. The EPA's role in the NRDA process is only to "coordinate" our RI/FS studies with the Trustees such that when possible the EPA has generated data in such a way as to be useful to the Trustees in the NRDA process. The EPA has satisfied all requests from the federal and State trustees in a timely manner.
SELC 5.1 (II)	Sampling density is inadequate, especially in Purvis Creek.	The EPA contends that the determination of the extent of contamination (EOC) is sufficient for the RI/FS and therefore for remedy selection. The goal of the sampling within the marsh area is to understand the nature and extent of the marsh contamination and to evaluate risks through the risk assessments. The nature and extent along with the risk assessments are then used to evaluate remediation alternatives in the FS. The EPA believes that these goals have all been met.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		Marsh sampling has been ongoing since 1994, with a combination of grid node sampling and subsequent sampling directed by the results of the grid nod sampling or other directed marsh sampling which suggested a source area or concentration gradient. The marsh sampling included water surface sampling, but focused upon sediment sampling and organism tissue sampling (biomonitoring). The data historically generated led to the identification of source material along the marsh border, which was removed as part of the 13-acre removal action. The data generated to date, both sediment data and biomonitoring/tissue data, support the conclusion that the nature and extent of contamination of the four COCs is known within the marsh. It is believed that additional sampling would identify the presence of site COCs particularly Hg and PCBs, as suggested by the comment, however, the EPA believes that the concentrations found would be similar and/or consistent with the concentrations of those contaminants in the area of the sampling.
SELC 5.2 (III)	Exposure levels do not adequately protect human health and the environment.	The EPA has conducted the human health risk assessment in accordance with Agency policy and guidance. For the fish consumption scenario, EPA has evaluated two human receptors: 1) recreational fishing – used consumption rates from EPA guidance based on data for the southeastern U.S.; and 2) high-quantity fish consumer – used site-specific consumption rates based on the creel survey done for the Brunswick area. The consumption rates for both receptors conservatively assume that the fish consumption advisories (issued by GADNR) are not followed by area anglers.
SELC 6.1 (III, A.1)	The Human Health Baseline Risk Assessment (HHBRA) underestimates the consumption of contaminated food.	The HHBRA assumed that all of the fish consumed was caught from Zones D, H, and I of the Turtle River/ Brunswick Estuary (TRBE) every year for 30 years with no assumed change in fish tissue concentrations over time. In addition, the HHBRA assumed that the high quantity fish consumer eats 27 grams/day or 9,855 grams/year at an average meal size of 134.6 grams; which results in 73 meals/year from the affected zones (Appendix B of the HHRA). This did not include additional seafood meals originating elsewhere along the Georgia coast or inland waterways. This is also consistent with one of the conclusions of the Brunswick fish study, which stated that most study participants did not fish in the restricted area and the few that did were aware of the advisory. The

Location Page#	Comment Summary	Response
		ATSDR Sapelo Island work likely does not rise to the level of being called a study because of the small sample size of only nine individuals that fished in various coastal and interior waterways around the island. The activities of the nine individuals in the study may not be reflective of those that catch and eat all their fish from the affected TRBE zones. The EPA agrees that fishing advisories may not keep certain community members from eating contaminated food, which is why cleanup of the most contaminated sediment portions of LCP Chemicals marsh is proposed. The cleanup, along with a robust monitoring program, is to ensure that the contaminants in fish tissue decrease to acceptable levels.
SELC 7.1 (III, A.2)	The assumption that there has been a decrease in fish contamination is flawed.	Appendix F of the Feasibility Study (FS) was an attempt to decipher any trends in fish/shellfish concentrations. Since 1991, over 700 composite samples of more than 2,600 individual fish have been collected in the TRBE. Appendix F focused on Zones D, H, and I of the TRBE, and the EPA agrees that not all species show a decline in Aroclor 1268 and/or mercury, and that statistical power is limited for these particular zones (which is where data for the HHBRA were used). However, the general decline in mercury tissues since 2002 is encouraging. The long-term monitoring plan is expected to include sufficient tissue sampling for greater statistical analyses of trends so that achievement of tissue target levels will have good confidence.
SELC 7.2 (III, A.3)	Groundwater, surface water and Operable Unit 3 (OU3) have not been taken into account.	Appendix A of the FS provides details of the potential for hydraulic connection between contaminated groundwater from the uplands area (OU3) and the marsh. When there were filtered and unfiltered samples, the model used unfiltered data in the calculations. The model suggests that there may be some small level of potential re-contamination of the LCP Chemicals marsh, but that it is insignificant with respect to selecting a cleanup remedy. The proposed remedy of sediment removal (with clean layer placement) and capping took into account the potential for groundwater re-contamination through the removed areas and caps. The long-term monitoring plan will include monitoring of surface water and sediment quality so that the remedial action objectives and cleanup goals are met. Potential cumulative risks from multiple pathways of exposure (e.g., upland soil, groundwater, fish and shellfish) could occur; however,

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		individuals fishing in the TRBE are not likely to drink contaminated groundwater from the upland site. Similarly, most contamination in upland soil has been removed, and access restrictions remain in place. A person briefly trespassing through the upland Site areas today would receive negligible exposure to contaminants relative to fish consumption measured on a daily basis for 30 years. Fish and shellfish are addressed separately because it is assumed that only shellfish is consumed for 30 years or that only fish is consumed for the duration. If they were combined, then the HHBRA would have had to assume some dietary fraction to account for the percent of fish versus the percent of shellfish consumed during each seafood meal.
SELC 8.1 (III, B)	The ecological exposure levels are not protective enough.	The EPA does not dispute the findings that PCBs, which include congeners consistent with Aroclor 1268 (e.g. PCBs 206/209), which are present at the LCP Chemicals Site, have been found distant from the LCP Chemicals Site. What is not known is what fraction of the PCBs in dolphins is actually from the LCP Chemicals Site. While this information does not change the exposure of dolphins to PCBs or any risks posed by that exposure; the information is relevant to directing actions at the Site. Regarding the use of dolphin within the BERA, CERCLA ecological risk assessments do not and are not intended to "predict" actual risk. They are done to provide an objective evaluation of risk such that the EPA may conclude that the existence of risk is real or probable; which gives the EPA statutory authority to conduct the FS and direct appropriate remediation. Secondly, the BERA provides an objective means of evaluation the remedial alternatives. The conclusions of the BERA generally provide the basis for the remediation goals. The BERA meets these objectives. It would be unlikely that the use of the dolphin as a model for PCB exposure and Site risk would result in a conclusion of greater ecological risk than already exists, and it would not be expected to affect the remediation selection process. Undoubtedly, the final conclusion would be that there is some degree of risk posed to the dolphins which feed in Purvis Creek and nearby in the Turtle River. Back calculations on these exposure models, a common way of calculating a preliminary remediation goals (PRGs), would be anticipated to result in less stringent sediment contaminant levels because of the limited exposure periods directly to the Site. The EPA contends only that

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		the use of dolphins or other highly mobile species with large home ranges in risk assessment models, contributes to high uncertainties when making localized site-specific action decisions. The selected remedy will reduce concentrations in sediment and fish in the Site vicinity.
SELC 9.1 (III, C)	The exposure range selected is not acceptable.	Regarding fish consumption, see response to SELC 6.1 above. Regarding sediment exposure, the HHBRA conservatively assumed that people do occasionally go out into the marsh and incidentally ingest sediment, even though the softness of the marsh sediment prevents regular access by foot. The risk estimate of 2E-04 for the high quantity fish consumer does indeed exceed EPA's risk range of 1E-04, so this exceedance resulted in "triggering" a remedial action. The 2E-04 risk estimate was used to develop sediment remedial goal options as described in the EPA's letter to Honeywell dated November 30, 2011 regarding Human Health Risk Assessment for the Estuary, OU1 (See Appendix G of the Feasibility Study). The sediment remedial goal options were set at a cancer risk of 1E-04 and a non-cancer hazard index of 1.0.
SELC 10.1 (III, D)	The potentially responsible parties want to leave contaminant hot spots in the marsh.	Surface weighted averaging can be misused in exposure assessments by diluting specific exposure areas of high concentrations with low concentrations. However, achieving CULs in sizeable wetland or creek areas is better served by meeting risk-based SWACs rather than examining individual point-by-point exceedances. A few isolated individual sample "hot spots" may be tolerated, provided that overall risk reduction goals are achieved at the proper spatial scale without commensurate disturbance to the ecosystem, or to simply reduce costs, or to avoid actions in difficult locations.
SELC 10.2 (IV, A)	The site is a volatile marsh environment unsuitable for a thin layer cover.	As noted by these comments, the marsh at the LCP Site has areas of high water velocity and potential for erosion. In addition, there is the potential for storms, including hurricanes, which can significantly impact the area. However, with respect to the placement of the thin layer cap, the areas targeted for these caps are lower energy areas within the marsh where scouring is not anticipated (see ROD Figure 29 and FS Appendix B). The areas targeted for thin layer capping are also areas of intermediate

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		contamination levels where the contamination is generally limited to the upper 4-to-6 inches. The sediment concentrations, along with the limited depth of contamination, mean that, while the surface concentration may be of concern, the total mass of contamination present is not great. This is an important point relative to thin layer cap functioning. The comments suggest that the goal of the thin layer cap is to isolate the contamination, analogous to the use of a standard in-situ cap. Complete or permanent isolation of the contaminants is not anticipated to be the result of the use of the thin layer cap. Rather, it is anticipated that the organisms present in the marsh such as fiddler crabs, will burrow through the cap material and that the resulting "bioturbation" will mix the thin layer cap material into the existing marsh sediments. The result of the mixing will be a decrease in the surface sediment concentrations of the site contaminants, not an isolation of the contamination. It is anticipated that the long term stability of the marsh surface will not change with the addition of the thin layer cap material because it will be incorporated into the marsh. The incorporation will take time, and the progress and status of the thin layer cap will be monitored post construction to insure that it functions as anticipated. If the thin lay cap fails, because of storm erosion for example, the PRPs will be responsible for repairing the cap or potentially implementing a different remediation strategy for these areas. The alternative to thin-layer covering (or conventional capping) is the destruction of an additional 28 acres (see FS Table 6-2) of marsh.
SELC 13.1 (IV, B)	The integrity of the thin layer cap will be compromised by bioturbation.	The comment appears to confuse in-situ capping, which is an isolation remediation strategy, with thin-layer capping, which anticipates and may actually desire the mixing which occurs with bioturbation. As discussed above, the thin-layer cover proposed for areas within the marsh does anticipate the mixing, which as the comment notes, will occur by marsh organisms such as fiddler crabs. It is expected that the mixing of contaminants with the clean cap will not exceed the sediment cleanup levels.
SELC 14.1 (IV, C)	Sea-level rise has been ignored.	The impacts of sea level rise are difficult to predict on a local scale; and the comment is correct in that the effects of sea level increases were not explicitly made. However, since contaminants are being left in place by the proposed remediation CERCLA requires that the Site be reviewed every five years to assess the status of the remedy. Should sea level rise,

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		or other factors which alter the hydrodynamics of the marsh or alter the ecosystem or the physical status of the remedy, the five year review plan will be the means by which the EPA can address these issues.
SELC, 15.1, (IV, D) - Summary of Flaws with Thin Cap Technology		
	Destruction of capping/cover material by scouring due to tidal action.	The thin layer cap is to be used in low energy locations within the marsh (see ROD Figure 29 and FS Appendix B). In addition, the integrity and performance of the thin layer cap will be monitored and repaired if necessary, and if it does not perform as anticipated with respect to contaminant reductions in biota, this portion of the remediation will be reassessed.
	Destruction of capping/cover material by hurricane type storms.	Catastrophic events such as a hurricane could damage the thin layer cap. The Site monitoring program will assess the remediation at a minimum through the five year review program. In addition, it is common for the EPA to assess the status of sites and remedies when events, such as a hurricane, impact an area.
	Destruction of capping/cover material by changing hydraulic conditions due to sea-level rise.	Sea level changes and other factors could alter the hydrodynamics of the marsh and alter the ecosystem or the physical status of the remedy. The five year review plan will be the means by which the EPA can address these issues.
	Destruction of capping/cover material by changing environmental conditions typically associated with meandering creeks within delta systems.	The physical status of the marsh relative to the remediation will be part of the monitoring program. Factors could alter the hydrodynamics of the marsh and alter the ecosystem or the physical status of the remedy. The five year reviews will be the means by which the EPA can address these issues.
	Destruction of capping/cover material by sediment dwelling organisms.	Bioturbation will not destroy the thin layer cap. The functioning of the thin layer cap anticipates and actually relies upon the action of the sediment dwelling/burrowing organisms of the marsh.
	Lateral movement of contaminants within the subsurface sediment has not been addressed.	This comment appears to be directed at the potential for ground water discharging within the marsh to either be a source of sediment contamination (the ground water is contaminated) or a means of transporting existing sediment contamination (becoming contaminated). The areas targeted for thin layer capping are marsh surfaces (not channels or low points in the marsh). While there are areas where groundwater is discharging to the marsh, it is unlikely that the areas targeted for thin layer capping include areas of groundwater discharge because they are marsh surface just off channels. There is no information which suggests

Location Page#	Comment Summary	Response
		that these areas are active release areas of contaminants to the marsh system. The distribution of contaminants in the marsh suggests that the areas targeted for thin layer capping are depositional areas, and were contaminated by historical surface water transport mechanisms.
SELC 15.2 (VI)	The Draft Feasibility Study is incomplete because it does not include any alternatives that incorporate marsh restoration.	Marsh restoration has now been included in the ROD. In addition, this comment appears to focus on issues which may be described as net ecological benefit analysis (NEBA). A NEBA balances what is known about existing risk (current contaminant risks), what environmental impacts are likely to occur as a result of actions (remediation – dredging – thin layer capping etc.), what residual risks may exist (residual contaminant risks), and the anticipated environmental recovery from both actions and residual risk attenuation. As noted in the comment, statements were made by the PRPs regarding aspects of impact of remediation alternatives; however the comparisons of alternatives in the FS did not quantitatively incorporate these contentions made by the PRPs. The EPA evaluated the remedy alternative independently of the PRPs, while also considering the environmental impacts which may occur as a result of the different remediation alternatives. The following outlines the thought process which selects thin layer capping (over dredging and backfilling) in targeted areas. The EPA is required by the CERCLA to select a "protective remedy"; a remedy that reduces contaminant (chemical) risk such that the EPA can explain or justify its' conclusion that the remedy is protective of human health and the environment. Remediation alternatives that meet this criterion are then evaluated for "cost effectiveness" and evaluated for environmental impacts which may result from the remediation itself. Relative to dredging: dredging of soft bottom areas (e.g. open channels) is anticipated to have limited environmental impacts (unless the hydrodynamics of the location is changed) as silts and muds will deposit in the area. Hard bottom channels can be replaced with hard structure which will resist the water flow and will be recolonized by organisms using that structure. The marsh surface is different, marsh surface removal over significant areas (acres) requires the construction of "roads" to get the heavy equipment to the areas and to remove the excavated sediment and bring in clean material. These areas and the area to be

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		remediated would need to be isolated from tidal water for a number of reasons, with the net effect being that the areas contaminated and uncontaminated will need to be dewatered during operations. In addition, excavation equipment removes approximately 12 inches of material at a minimum; therefore a minimum of 12 inches of clean material will be required at all dredged/ excavated areas to return the surface to the original elevation. As noted above, soft bottom channel material is not necessarily unique and can return readily depending upon the system, and hard bottom channel material can be acquired and placed in locations; however, marsh surface sediments/soils are fairly unique and cannot be obtained from suppliers. Material of similar organic content, and particle sizes can be constructed, but these constructed soils are not the same as the material removed. As the comment notes, the reconstruction of the 13 acres is viewed as a success. Spartina grass is re-established; however, functional measures of this area indicate that it has not recovered all of the functions of the original marsh surface. A comparison of the potential or anticipated environmental impacts of dredging vs. thin layer capping in the targeted areas suggest the following: both will result in some alteration in the functioning of the marsh within the footprint of the thin layer capping area – one because the original marsh soil has been removed and replaced with an engineered soil, the other because additional material has been added to the marsh surface which will affect the marsh elevation in this area and may change some of the physical characteristics of the marsh soil. Dredging/marsh removal will also impact an undermined amount (acreage) of marsh which is not scheduled to be remediated for the construction of road access to the contaminated areas. (This was not the case for the remediation of the 13 acres as the access was constructed through areas which required remediation.) This additional impact to the marsh will be short term as the road access would be removed upon completion of the project, and marsh soil should not be removed. The EPA believes that the risk reduction (reduction in contaminant exposure and bioaccumulation) which can be achieved through dredging and thin layer capping to be similar to that of wholesale marsh

Location Page#	Comment Summary	Response
		restoration. The EPA also believes that the long term effectiveness of the thin layer capping will be comparable to that of the removal of the contaminated marsh surface. The EPA therefore contends that the two alternatives have comparable risk reduction, comparable long term effectiveness, and comparable marsh functioning post remediation; however, the thin layer capping is less costly and will result in less direct impacts to the marsh.
SELC 17.1 (VIII)	The Proposed Plan and the Draft Feasibility Study provide for inadequate information on monitoring.	As the comment suggests, long term monitoring (LTM) plans are an important element of site remedies which leave some contamination in place, such as with the use of thin layer capping. The Agency will commit to a LTM plan within the ROD. However, specific details on the plan will be provided during the Remedial Design phase. As noted, it is important that decision criteria be developed in conjunction with the LTM plan to insure that the appropriate data are generated such that conclusions on remedy effectiveness can be made, either success or failure.
SELC 17.2 (IX)	The cap-in-place alternatives should be discarded because they do not provide a permanent solution.	The EPA acknowledges the expressed concern for remedy permanence. However, the EPA believes that the use of a thin layer cap in the targeted areas will result in a permanent remediation, because the targeted areas are not high energy areas, bioturbation is part of the thin layer cap functioning, and the LTM plan and the remedy review process will be in place should there be a failure of the thin layer cap. The EPA has selected dredging as part of the overall remediation of the marsh area, both the past 13 acre removal action and the areas currently proposed for sediment removal as part of the remedy. These actions are the final portion of removal of contaminant "source" material. Once this portion of the remedy is completed, redistribution of the residual contamination (including the potential for failure of the thin layer capping areas during catastrophic events) is unlikely to result in increases in substantive recontamination of remediated areas or increases in sediment contaminant levels in other areas. The EPA believes that the rationale presented for the use of the thin layer capping technology in targeted areas, non-source areas, is appropriate, but as the comment suggests,

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		monitoring will be require to document the effectiveness and permanence of the remedy. As noted in the comments, the preference for permanence is one of the balancing criteria for remedy selection. There are two threshold criteria: (protectiveness of human health, welfare, and the environment; and compliance with ARARs). There are five balancing criteria, which include the concept of preference for permanent remedies and the selection of cost effect remedies. The EPA believes that the use of thin layer capping for targeted areas can be a permanent remedy as this technology does not rely upon isolation. Also, the EPA believes that the thin layer capping technology is cost effective in this instance, recognizing that the costs for this remedy do include the cost of monitoring the remedy. While the final costs are evaluated, the EPA has not selected any portion of the proposed plan for the marsh remediation based upon the dollar value of a technology application.
Attachment A. Review by Philip B Bedient, P.E., Ph.D. March 13, 2015.		
PB 4.1	The cap/thin sand coverings are subject to erosion/scour and/or failure given the volatile tidal regime in the area.	Thin layer covering technology has been selected as part of an overall marsh remediation effort which has included the removal of contaminated sediment and marsh surface of 13 acres historically and will be supplemented by the dredging and removal of additional highly contaminated sediments. Thin layer covering is to be utilized in targeted areas of lower/intermediate contamination where the current hydrodynamics of the marsh system indicate that the potential for erosion and/or scour are low. While the EPA believes that the potential for failure of the thin layer cover through material loss is low; monitoring of the thin layer cover for loss or other measures of failure will be part of the remediation plan.
PB 4.2	The cap/thin sand covering concepts are subject to disturbance by sediment dwelling organisms that inhabit the marsh area.	The thin layer cover, as proposed, actually desires the burrowing activity of marsh organisms. The activity of these organisms will result in the dilution of the contamination which exists at a location with the overall goal of reducing the contaminant exposure level. The objective of this thin layer cover is not to isolate the contaminated sediments.
PB 4.3	The cap/thin sand covering concepts are subject to increased inundation due to sea level rise.	The EPA acknowledges that environmental factors such as the potential for sea level rise can affect the performance of selected remedies. However, at a local level it is not possible to predict what changes could occur in the hydrodynamics of the marsh area. The EPA will monitor the

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		effectiveness of the thin layer cover and will evaluate the need for additional assessments triggered by environmental factors such as sea level rise or catastrophic events.
PB 5.1 (4)	The cap/thin sand covering concepts will require long-term monitoring to ensure effectiveness.	The EPA concurs with this comment. A LTM Plan will be an important component of the marsh remediation. Not only because of the use of thin layer covering in targeted areas, but also to evaluate the total performance of the marsh remediation. The EPA plans to include the framework of an LTM Plan as part of the ROD; however, there will be limited details within the ROD as there are many technical issues which must be resolved before a final LTM Plan can be completed. These technical details include how the collected data will be interpreted and what criteria will be used to make decisions from the data, such as concluding whether the remediation was successful or if it is failing.
PB 5.2 (5)	Movement of contaminants from under the thin sand layer is possible given the interaction of groundwater with the surface water in the marsh and the fluctuation of the tides in this area.	The EPA is not clear on the intent of this comment, whether the comments is arising from concerns for groundwater releases, which may be transporting contamination into the marsh; concern that "clean" ground water is being contaminated by the contamination in the marsh and being transported to uncontaminated sediments or to the water column; or concern that surface water moves in and out of the marsh sediments/soils being contaminated and transporting the contaminants out of the marsh sediment/soils to the surface waters. Regardless of the comment's intent, the use of the thin layer cover technology is not dependent upon isolation and does not attempt to stop all exposure to contaminants, or transport of contaminants within the marsh. Rather the goal of the thin layer cover is to reduce the exposure to a tolerable level.
PB 5.3 (6)	Previous experience at other sites not similar to this site given its volatile tidal regime in relation to the topography.	The EPA agrees that there are unique and relatively extreme tidal actions within the marsh at the LCP Chemicals Site. The EPA also agrees that the area where thin layer cover is proposed is physically different from those of areas of sites where thin layer covers have been successfully used. However, the EPA does believe that thin layer covering can be effectively utilized in the marsh area as part of the overall marsh remediation. The areas targeted for thin layer covering are areas which contain lower contaminant concentrations and limited contamination depth (see ROD Figures 19 and 20), and therefore limited contaminant total mass. In addition, these areas are not subject to the strong currents

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		and tidal actions within the marsh (see ROD Figure 29 and FS Appendix B). Catastrophic events such as hurricanes are always a concern. However, whether an event would cause failure of the thin layer cover technology cannot be predicted. Therefore, long term monitoring and reassessment will be necessary should a catastrophic event occur at the site.
PB 5.4 (7)	The proposed cap areas along Purvis Creek seem to be selected based on limited sampling.	Sampling of sediments and marsh soils throughout the marsh area of the LCP Chemicals Site began in the mid-1990s (more intensive sampling was initiated in 1995), and iterative sampling to refine our knowledge of the distribution of contaminants has occurred since that time. Sampling has been conducted by EPA as well as the PRPs directed by the EPA. As noted in the comment, sampling density is not uniform throughout the marsh system, and the overall or collective sampling locations is a result of a mixture of sampling designs including, systematic sampling efforts and directed sampling efforts. Collectively, the EPA is confident that there is sufficient understanding of the distribution of contaminants within the marsh system (creeks, and marsh surfaces) to make informed decisions on the placement of caps and to direct dredging. However, it is anticipated that additional data will be generated during the design phase of the marsh remediation. This additional data will be used to make any adjustments to the areas proposed for specific remediation actions (dredging, capping, etc.).
PB 6.1 (8)	Dredging is a more permanent solution than the cap/thin sand covering concepts.	The EPA agrees that capping and thin layer covering remediation technologies do not remove contamination and can be subject to failure. However, the EPA does not believe that these remediation technologies cannot be permanent when successfully implemented. Capping, isolation of contaminated sediments in depositional areas, can be effectively permanent. While it is plausible that catastrophic events could impact a cap or change conditions such that the area becomes non-depositional (subject to erosion), capping experience has not demonstrated this to be a common problem. Thin layer covers, such as those being designed for the LCP Chemicals marsh are not isolation caps. It is anticipated that the covering material will be incorporated into the existing sediment/marsh soil. The goal of this thin layer cover is to accelerate the natural processes accretion; as such this technology can be viewed as permanent.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
Attachment B. Review by Loren H Raun, Ph.D. March 13, 2015.		
LR 2.1 Development of Remedial Goals	There are multiple junctures where decisions were made which result in underestimation of risk and RGOs. The overarching concern is that RGOs be protective in spite of the uncertainties and that remediation attains these RGOs.	As indicated by this comment, the threshold criteria for remedy selection includes that the remedy must be protective of human health and the environment. The function of the risk assessments is to inform the remedy decision making process such that remedy options may be compared to the threshold standard and to each other relative to the potential for risk reduction. These actions take place with knowledge of the uncertainties within the risk assessments. The use of screening criteria and/or screening level risk model parameters is the starting point for risk assessments, the most conservative risk estimation. If based upon these conservative evaluations, an informed, reasonable and justifiable remediation decision can be made, the risk assessment may stop, as the goals of the risk assessment has been met. This scenario exists within the overall investigation, risk assessment and decision making in the LCP Chemicals marsh. However, reasonable and justifiable remediation decisions in other areas of the marsh could not be made using screening level risk assessments. For these areas, addition risk assessment was conducted using justifiable, less conservative assumptions and actual field data to refine the risk estimates. There are uncertainties within all risk assessments. These uncertainties can be conservative in nature, increasing the calculated risk, or be lack of information which could result in risk calculations either increasing or decreasing. The EPA believes that it has selected a remedy that meets the threshold criteria for remedy selection. The EPA has made this determination based upon an evaluation of the risk assessments conducted, which vary in refinement, and an understanding of the potential effect of the uncertainties on the risk calculations.
LR 3.1	Failing to add risk from OU3 when estimating the RGO for OU1.	Although the EPA has segregated exposures by operable units, the risk assessments have followed all EPA protocols and guidance on conducting the risk assessments. By assessing the OUs separately in the HHRA, the exposure/risk is higher than if it was assumed the human receptor(s) were exposed to OU1 and OU3 in the same timeframe.
LR 3.2	Failing to add the risk from exposure to surface water or sediment.	As stated in the HHBRA, the maximum detected surface water concentrations were well below cancer and non-cancer screening levels and were not evaluated further for incidental ingestion of marsh water. Sediment ingestion was evaluated in the HHRA and resulted in negligible

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		non-cancer hazards (0.08) if added to the fish consumer. The cancer risk from exposure to sediment was 1E-05. Assuming the trespasser exposed to the LCP Chemicals marsh sediment also consumed recreationally-caught fish, the risk would be 1.1E-04, which when rounded is still 1E-04 for the overall risk estimate. This added uncertainty did not change the overall development of the RGOs.
LR 3.3	Underestimating consumption of contaminated food by relying on default exposure factors especially given a large portion of the local community is below the poverty level (exposure frequency, ingestion rate), and likely a sensitive subpopulation.	The HHBRA assumed consumption of fish based on the area-specific survey. The consumption rate assumed for the high-quantity fish consumer was higher than the EPA default rates used for the recreational consumer.
LR 4.1	Misrepresenting concentration levels by not including statistical confidence.	Per EPA guidance, the risk assessments used either the maximum concentration or the 95th upper confidence level (95UCL) to estimate exposures. From the risk assessments, the health-based RGOs already incorporate the conservative 95UCL. It would be inappropriate to apply another 95UCL associated with sediments to the RGO. Surface weighted area averages (SWACs) were applied spatially to various exposure domains and creeks to determine where sediment concentrations may exceed RGOs. SWACs also are not true means because they use a geographic algorithm to relate concentrations between different points. SWACs are commonly used to assess variability in spatial contamination and are often more informative than non-spatial averages with confidence limits.
LR 4.2	Basing decisions on small sample sizes without enough statistical power.	As noted in the comment, a formal power analysis was not conducted as part of the RI/FS for the LCP Chemicals marsh area. However, the Agency does not see how the added statistical rigor would change any of the conclusions made from the data. The EPA has concluded that both human health and ecological risks exist within the marsh area and that remediation is both appropriate and necessary under CERCLA. The proposed remediation is believed to be appropriate and will result in reduction of risks and does ultimately result in a protective remedy. Since there are uncertainties, as noted in the comment, and since some contamination is being left in place, the EPA is including a monitoring plan within the ROD as part of the remedy, so that remedy can be evaluated for success or failure.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
LR 4.3	Misrepresenting decreases in concentration which are not statistically significant.	It is not clear which data is being referred to by this comment. However, the EPA agrees that trend analyses must be interpreted carefully so that data variability or sampling artifacts are not misinterpreted as data trends.
LR 4.4	Screening out COCs which did not exceed screening levels/standards or were present in the background.	The health-based screening values used for surface water, and for PAHs in sediment ensure that the contribution to health risk is not significant based on the EPA risk range. When the health risk is insignificant, then chemicals below the screening levels are also assumed not to significantly impact RGOs.
LR 5.1	Groundwater was not included in the risk assessment or evaluation of the remedy although it is heavily contaminated and in contact with the surface water.	The potential for recontamination is of critical concern to the EPA as this could result in remedy failure and thereby a failure to protect human health and the environment. The EPA will continue to assess the data to evaluate the threats from recontamination. The LTM Plan, which is being required within the ROD, will be a tool by which the EPA can determine if recontamination is occurring. If the assessments conducted by the PRPs are incorrect and recontamination occurs, the PRPs may be required to take additional remediation actions in the re-contaminated areas. Groundwater releases to the marsh are complicated and are a difficult issue. The EPA does not believe, and has no information which would suggest, that the proposed remedy would aggravate contaminant releases through seeps. It is anticipated that collectively, the actions taken by the EPA in both the upland areas and in the marsh will result in the remediation of seep contaminant discharges.
LR 7.1	In Appendix F there are not enough fish tissue samples to detect a difference between the 2007 and 2011 concentrations (i.e., not enough statistical power).	The EPA agrees that the interpretation of fish tissue trend data must be done with caution. It should be noted that, during the period of time noted in the comment, there was not active remediation in the marsh itself, so declines in the fish tissue levels would not be expected to be substantial.
LR 7.2	In Appendix F the comparison between concentrations in seafood between years does not consider statistical confidence.	The graphs in Appendix F do provide the mean and confidence intervals bars. It is agreed that one should not be visually subjugated by the colored bars themselves, but to interpret the confidence intervals appropriately.
LR 8.1	The comparison between concentrations in seafood to the advisory threshold does not consider statistical confidence.	
LR 8.2	The seafood advisories appear to consider only one contaminant at a time, when a fish could actually contain mercury, lead and PCBs. Therefore, additive risks from multiple contaminants are not considered.	The EPA does consider the potential for "additive risk" the risk which may exist as a result from exposure to multiple contaminants which do not individually cause the same or similar adverse effects. When our knowledge of the toxicology of contaminants permits us to combine the

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		risks from individual contaminants, the EPA does this, as with lifetime cancer risk estimates. However, for non-cancer risk, there are only a limited number of contaminants for which our understanding of the toxicology indicates that risk estimates should be combined into a single "cumulative risk estimate". With regards to State fishing advisories, in general, it is important to keep in mind that, if more than one contaminant is found in a species, the guideline is based on the chemical with the most restrictive consumption frequency. Also, the consumption recommendations are based on health risk calculations for someone eating fish with similar contamination over a period of 30 years or more.
LR 8.3	In development of the RGOs the only pathway that the EPA considers is consumption of fish. The risk from a local resident or trespasser exposure to OU3 or sediments from OUI should be added to the ingestion of contaminated food (finfish, clapper rail and shell fish). If the trespasser or resident also ate contaminated food, the carcinogenic risk would increase by as much as 3.3E-6, and 5.2E-5, respectively. These additions would result in a lowering of the sediment RGOs.	As mentioned previously, much of the contaminated upland soil in OU3 has been removed, meaning and that occasional inadvertent ingestion of soil or sediment is of lesser concern than consumption of seafood. If the marsh trespasser obtains a cancer risk of 1E-05 and obtains a risk of 2E-04 as a high quantity fish consumer, then the overall cancer risk would be 2.1E-04 or rounded to 2E-04. With all of the conservative assumptions built into the risk assessment, this addition did not substantially change the RGO ranges that were developed.
LR 9.1	Attachment A presents the method to calculate area weighted average. While spatial weighting between the areas is reasonable, use of the average to represent an area is not statistically appropriate. There is not enough information provided to determine if the underlying distribution of the sediment data are normal. The data are likely not normal and contain high concentration outliers therefore, more sophisticated statistical methods should be employed within each area.	See responses to Technical Comment #4.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
LR 9.2	In the case of calculating the RGO, the *lower confidence limit* should be used.	The Aroclor 1268 sediment concentration of 3.408 mg/kg results in a clapper tissue concentration of 19.42 mg/kg. If the sediment concentration was lower we would expect a lower tissue concentration. For example, if the sediment concentration was 2.2 mg/kg (from Table 5-1 of the FS), then this would result in a corresponding clapper rail tissue concentration of 12.54 mg/kg (19.42/3.408 = x/2.2), assuming a linear relationship. This lower tissue concentration would result in less risk, not more as suggested in the comment. Statistical confidence is already built into the maximum tissue concentration in the rail, which is conservative. The minimum and mean concentrations of Aroclor 1268 in the 14 clapper rail samples were 0.19 and 5.02 mg/kg, respectively. In addition, the RGO approach assumes that 100% of the contaminant tissue concentration in each receptor is due to site-related sediment concentrations, even though the receptor may visit other off-site marsh areas or creeks.
LR 10.1	The cost savings from avoiding adverse health should be considered. Choosing a remedy which will provide the fastest route to safe levels with limited uncertainty should be the main objective. The most reliable remedy is removal. Considering the uncertainty in this assessment, the more protective RGOs should be applied.	The EPA is aware and has made Site management decisions in light of the environmental justice issues at the LCP Chemicals Site. The Agency believes that the time required for contaminant levels in fish time to decline to an unrestricted use (no fish advisories) for PCBs and mercury, will not significantly change with reasonable but more aggressive contaminant removal within the marsh remediation. However, as this is an uncertainty, a monitoring plan is being required, and the need for the plan will be documented in the ROD. A goal of this plan is to evaluate the decline in fish tissue body burdens relative to the marsh actions taken, and to evaluate the longer term reductions in contaminant bioaccumulation. If the proposed remedy does not achieve the anticipated goals, then additional actions in the marsh may be taken.
LR 10.2	The report indicates that the dredging would be more damaging to the habitat than other remedial measures, however, the previously remediated area recovered much sooner than anticipated (two years). In addition, the contamination is on the surface of the sediment, not at depth. Therefore, the contaminants should be removed and the marsh replanted in the same manner as the previously remediated area.	There are multiple issues with additional marsh surface (vs. channels and banks). First, the EPA's Proposed Plan did considered the impacts of removal of marsh surface areas, but the primary consideration was the ability of the proposed plan to meet the threshold criteria of "protection of human health welfare and the environment". Only remedial alternatives that passed the criteria were considered for selection. The comment suggests that the remediation of additional marsh surface can be done in the same way that the removal in the 13-acre area was

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
		done, with similar results. There is no question that the marsh removal can be physically done. However, it cannot be done in the same way. The 13-acre removal area did not require crossing of marsh creeks and drainages. The technological approach was to build access through the area to be remediated and work backwards towards the shoreline. This cannot be done in the additional marsh areas. Access to the additional areas for heavy equipment is not practical via water access and therefore would need to be constructed through areas which are not targeted for active remediation. Further, while the 13-acre remediation is a success, the area is not completely the same as the surrounding marsh because the replacement material is not the same as the material removed. While it may be a point of debate as to whether or not the differences are important, the larger the area of the marsh that is affected by being a different marsh sediment/soil, the greater that overall impact is.
Trustees Comments/Responses		
T 1a	The subject PP concludes that Alternative 6 is the preferred alternative for remedial action in the LCP Marsh. The three major components of this alternative are: 1) dredging 7 acres of the LCP Ditch and Eastern Creek, 2) installation of armored caps in 6 acres of tidal creeks, 3) application of a thin-layer sand cap (6-9 inches) over 11 acres of marsh largely along either side of the Eastern Creek. For reasons given below, the Trustees believe this remedial action may not restore the injured natural resources as quickly as the other alternatives that were considered. Moreover, Alternative 6 may not represent a permanent solution to environmental contamination at the LCP Marsh and the larger Turtle-Brunswick River Estuary. The LCP Ditch and Eastern Creek were dredged in 1998-1999 along with approximately 13 acres of saltmarsh in Domain 1. Now, 15 years later, the LCP Ditch and Eastern Creek must be	The late 1990s work performed under the EPA's Emergency Response authority was never intended to achieve the sediment cleanup goals proposed under this action. While the 13 acres of marsh addressed in the late 1990s, located in the Former Facility Disposal Area (FFDA), have remained generally uncontaminated (see Figures 3 through 6 of the November 2014 Proposed Plan), the Eastern Creek and the LCP Ditch were different. As documented in the October 1999 Marsh and Railroad Area Close-Out Report, the approach for the removal in the Eastern Creek and LCP Ditch was source control, with excavation depths between one-to-two feet below channel surface (See ROD Figure 5). At times, the on-scene coordinators (OSCs) could see the prills (droplets) of elemental mercury in the marsh sediment. Using the available data, the OSCs performed a mass distribution and cost analysis and estimated that they could target the depths and portions of the channels, thereby removing somewhere between 85-95% of the Aroclor 1268 and mercury, yet disturb only about 16 acres of marsh. The OSCs calculated that if they targeted the next "tier", they would remove another 2-6% of the

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
	dredged again. Without a more comprehensive remedial action (i.e., Alternative 2 in the PP), the Trustees are concerned that re-dredging these tidal creeks now may not restore the marsh to its baseline condition.	Aroclor 1268 and mercury, spend an additional $15-25 million, and destroy substantially more of the marsh. The OSCs thought it prudent to wait and see how the system responded before doing any further work, especially given the destructive nature of the sediment removals. This seemed to be especially reasonable given that the remedial program was very likely to do a much more extensive investigation of the marsh ecosystem and would more thoroughly vet cleanup technologies thru the RI/FS process. The Selected Remedy includes backfilling dredged areas in the creeks to isolate any residual contamination that may occur. Long-term monitoring of the dredged/backfilled areas and the caps will be conducted to ensure that any residual contamination remains isolated.
T 1b	PP describes armoring material for the capped tidal creek areas as "coarse sand and/or gravel". This appears to be inconsistent with the descriptions in Appendix H of the 2013 Feasibility Study which specify an "armor stone layer for erosion protection" (§3.3.1) or an "armor stone cap" (Table H-4). Furthermore, the placement of an armored stone layer (or any hard substrate) on top of 6 acres of capped tidal creek areas, will likely result in the development of oyster reef communities similar to those currently found on large pieces of concrete that line the LCP Ditch. While oyster reef communities can provide important ecological services, in this particular case, a 6-acre attractive nuisance will likely be created if Alternative 6 is implemented. This is because oysters efficiently bioaccumulate site contaminants such as mercury, lead and Aroclor 1268 thus making these contaminants available to higher trophic level organisms; e.g., blue crabs, black drum. As a result, capping 6 acres of tidal creeks under Alternative 6 may actually enhance entry of site contaminants into the marsh food web. This possibility must be studied as part of the post-remedial monitoring plan.	During the remedial design phase the details of the caps will be determined. Regarding bioaccumulation potential post remediation, the EPA believes that the exposures/contaminant flux after the remedy has been completed will not result in an attractive nuisance. However, concerns for the degree of exposure reduction which will be achieved, along with the requirement for the EPA to monitor the Site because contaminants are being left in place, result in the EPA including the framework of a Long-Term Monitoring Plan within the ROD. The EPA hopes that the trustees will be able to play an active role in the design of this monitoring plan, which will include biomonitoring.
T 1c	The arguments presented in support of installing a thin layer (6-9 inches) sand cap over 11 acres of LCP salt marsh as a	The EPA acknowledges the concerns expressed in this comment. The EPA plans to include monitoring to evaluate the effectiveness of the thin-

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
	method of reducing the risk to the benthic community are unconvincing. At the very least, placing sand over silty vegetated marsh surface may alter the benthic community and hydrology in ways not foreseen by the modeling that was performed.	layer cover (TLC) to reduce exposure to benthic organisms living on or within the TLC, and to evaluate impacts to the marsh surface, as changes in the vegetation or other aspects to the marsh surface could result in destabilization. Monitoring of the benthic community composition could compare capped areas to uncapped areas. Again, input from the trustees on the design and monitoring of the TLC will be solicited.
T 1d	The PP (page 29) provides a justification for the thin layer cap saying, "Thin-cover placement is best suited for wetlands or marsh environments where tidal energy and potential erosion is at a minimum." This minimal tidal energy requirement seems inconsistent with the LCP marsh's 7-10 foot semi-diurnal tidal range and periodic high energy storm events. EPA's National Remedy Review Board expressed a similar view in their March 28, 2014 Memo saying, "The Board is concerned about the long-term permanence aspects of the proposed thin cover placement" (page 5, March 28, 2014 Memo). "Long-term effectiveness and permanence" is the first Primary Balancing Criteria that EPA is required to use when evaluating remedial alternatives. Dredging certainly meets this criterion especially when compared to the more questionable thin layer (≈6-9 inches) capping in a system experiencing large daily tidal fluctuations and periodic high energy storm events. EPA's National Remedy Review Board echoed this same concerns when they recommended to EPA Region 4 that they "consider a contingent remedy approach due to the uncertainty regarding the long-term permanence aspect of the proposed thin cover and capping components of alternative 6" (page 5, March 28, 2014 Memo). The permanence and effectiveness of the thin layer capping will need to be studied as part of the post-remedial monitoring.	The EPA acknowledges these concerns. The areas proposed for TLC are low energy areas with low-to-intermediate surficial contamination and contamination generally limited to the upper six inches. As such, these areas a believed to contain a limited mass of contaminant. This limited contaminant mass combined with a low energy area and the potential for significant bioturbation leads the EPA to believe that the use of a TLC will be successful in reducing exposures over time. As noted in the comment, monitoring of the performance of the TLC will be critical.
T 1e	It is not exactly clear in the PP how Preliminary Remedial Goals (PRGs) and Cleanup Levels (CULs) were derived and whether they are protective of human health and the environment. For example, the ranges of PRGs for the protection of the Benthic Community (page 22 of the PP) are greater than the ecologically protective Remedial Goal	See response to Technical Comment #2.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
	Objectives (RGOs) initially developed in the Baseline Ecological Risk Assessment (BERA) (see page 92 of the BERA and the values below). The recommended CULs in the PP are higher still (page 42 of the PP and below). These CULs represent the highest value in the range of PRGs in the PP. The PP does not clearly explain how these PRGs and CULs can drift ever higher, yet still be protective of the benthic community. Further, the PP does not explain whether a similar progressive relaxation of PRGs and CULs was allowed for fish and wildlife receptors. [*all values below reported in ppm (mg/kg)*] **COC BERA RGOs → PP PRGs → PP CULs** Mercury 1.4 - 3.2 4 - 11 11 Aroclor 1268 3.2 - 12.8 6 - 16 16 tPAH 0.8 - 1.5 4 4 Lead 41-60 90-177 177	
T 2	As noted above, approximately 13 acres of saltmarsh were excavated and backfilled with clean material in 1998-1999. Visual observations afterwards suggested very rapid recovery of the saltmarsh vegetation (see 2-year post-removal photo in Figure 2-10 of the 2013 OU1 Feasibility Study). Despite this site-specific experience of rapid recovery, the subject PP opts for other less permanent methods of remediation. The PP also repeatedly states that additional dredging and excavation would create unnecessary "destruction", "unwarranted harm" and "significant damage", which is not supported by the evidence. EPA's National Remedy Review Board reached a similar conclusion stating, "The PRPs do not provide any site-specific information to indicate that marsh restoration at this site is particularly difficult and, in fact, earlier removal actions have excavated and restored wetlands at the site already." (pages 6-7, March 28, 2014 Memo). In their Memo, the Remedy Review Board recommended dredging the 6 acres of tidal creek currently slated for capping under Alternative 6.	Although excavation/removal of contaminated sediments may be more permanent, capping in low-energy environments minimally affected by tidal action effectively isolates contaminated sediment from contact with human and ecological receptors. In addition, capping prevents mobility of contaminants to spread further in the marsh or into the creeks. Capping and thin-cover placement also create a clean sediment surface for natural or enhanced recovery by vegetation and biota. The past removal action referred to was excavation of near shore sediment in a low energy environment with reasonable recovery of saltmarsh on the backfill. However, recovery of marsh grass to a significant density with sufficient root mass to firmly hold sediment took longer than two years. Excavation and backfilling the marsh sediment surrounding Eastern Creek, the LCP Ditch and closer to Purvis Creek involves more complex hydraulic energy dynamics, elevation differences and tidal flows. Dredging versus capping in the isolated low-energy areas of Purvis Creek is an engineering consideration as it relates to permanence in a tidal creek which does not completely drain. Hydraulic velocities are lower than in the LCP Ditch and Eastern Creek, which are completely drained at low tide except for a few standing pools.

Attachment 1 – Comments and Response Index

Location Page#	Comment Summary	Response
T 3	The above comments are offered from the perspective of the LCP NRDA Trustees, which differs slightly from that of EPA. At Superfund sites, the Trustees are charged with: 1) restoring ecological services back to baseline (if possible) and 2) compensating the public for interim losses through restoration projects. As a general rule, more thorough cleanups at a Superfund site translate into smaller interim losses and a more rapid return to baseline. Consequently, the LCP NRDA Trustees would rather see implementation of a more aggressive remedial action. However, the NRDA Trustees also recognize that important uncertainties are always present in ecological risk assessments and evaluations of remedial alternatives. Therefore, if Alternative 6 is implemented, the Trustees strongly urge that a comprehensive, science-based monitoring plan be designed and implemented. The plan should be capable of quantifying the rate of recovery (return to baseline) soon after the remedial action. Additionally, the plan should incorporate specific numerical "triggers" for further clean up action as described in §8.0 of the PP. The importance of post-remedial monitoring was also cited in EPA's National Remedy Review Board's March 28, 2014 memo. The Trustees concur with the Board's recommendation to develop a fish tissue monitoring plan using extant EPA guidance; i.e., Sediment Assessment and Monitoring Sheet (SAMS) #1 " Using Fish Tissue Data to Monitor Remedy Effectiveness" (2008) which can be found at http://www.epa.gov/superfund/health/conmedia/sediment/documents.htm	The monitoring plan will contain specific numerical target goals for acceptable tissue levels in finfish and shellfish that are considered protective of human health, such as those presented in Table 3 of the Proposed Plan and the State of Georgia fish consumption advisory levels for the Turtle River/Brunswick Estuary. Achievement of protective tissue levels will take time through annual monitoring and through the 5-year review process. Other triggers would include measureable goals for recovery of disturbed salt marsh vegetation, benthic community indices relative to reference conditions, and specific physical measurements related to maintaining cap integrity (including thin-layer). It is expected that the monitoring plan will include statistically significant sample populations for various abiotic and biotic parameters such as tissue data from key 1st level food chain organisms that are needed to accurately reflect the impact of remediation on food-chain uptake to fish, birds and wildlife.

Attachment 1 – Comments and Response Index

Comments/Responses from Community Members		
P - Jessica Ahl P – Virginia Balboana P – Beth Barker P – Becca Bartkovich P – Rachel Brand P – Kolin L Bryant P – Patti Clauson P – Gary B Cook P – Jeremy Cook P – Valentina Cook P – Veda Cook P – Sam Corson P – Wesley Deverger P – Cora Lee Hannah P – Marla Henderson P – Antle M. Jeb P – Amanda Kline P – Cheryl Knight P – Helen Ladson P – Chuck Latham P – John Mahas P – Sarah McInnis P – Barbara Miller P – Kyle O'Keefe P – James Patrick Wilson P – Debra Patterson P – Carolyn Rader P – Jovan Sage P – Joan and Charles Shellito P – Madeline Smith P – Monica Smith P – Pat Smith P – Shirleen Thomas P – Alice Vick P – Drew Weldon P – Margaret Wheat P – Mishaunda Wooten	A large number of community members submitted requests that the EPA thoroughly cleanup toxic chemicals from all media, particularly the wetlands (marsh). The general concern appears to be that the proposed remedy is not extensive enough or does not cover a large enough area. A number of people noted that the cleanup needed to be sufficient to protect the food chain to ensure children and families are protected.	The Selected Remedy balances the need to remove from the marsh system the contaminants posing risk to human health and the environment, while limiting the impacts to the areas with lower concentrations of contaminants. The two areas with the highest mercury and Aroclor 1268 concentrations in the LCP Chemicals marsh are the Eastern Creek and LCP Ditch. Both of these tidal channels, which are scoured twice daily by the tides, have contaminants present at elevated concentrations to depths of about 18 inches below the channel surface. Under the Selected Remedy, both of these tidal channels will be excavated and backfilled with clean sand, thereby removing the highest concentrations of mercury and Aroclor 1268 from the marsh system. Available vertical profiles suggest that the marsh surface immediately flanking the tidal channels (presumably contaminated over the decades of incoming and outgoing tides overtopping the channels) is contaminated to depths of six inches or less. The concentrations in these areas that flank the tidal channels are appreciably lower than in the channels themselves. For these reasons, thin-layer covering, rather than removal, is specified under the Selected Remedy for this estimated 11-acre area. Excavation of the lower concentration area would disturb not only the 11 acres, but also the additional acreage necessary to construct the roads to permit the access for the heavy equipment. The EPA believes that the Selected Remedy is sufficient to protect the food chain to ensure children and families are protected.

Attachment 1 – Comments and Response Index

P – Joseph Iannicelli	An officer for a company selling an alternative technology recommended that an alternative be added to evaluate the technology he represented for use at the site.	The material has been received and forwarded to the EPA Emergency Response Team in Edison, New Jersey for evaluation.
P – Michael Gowen S – Rep. Alex Atwood P – Penn Clarke L – Satilla Riverkeeper	One community member and one member of the Georgia State House of Representatives requested that the comment period be extended for 60 day and end on March 31, 2015. Several others community members questioned why a longer comment period was not provided. One community group criticized the EPA for releasing the Administrative Record only 26 hours before the public comment meeting took place, and suggested that a proper public meeting and advertising be provided	The comment period, which started on December 4, 2014, was extended to March 16, 2016. Regarding the length of time the Administrative Record was available, it was available during the entire public comment period, which was extended to more than three times the length required by law. Further, beginning in early 2010, drafts of key Site documents were posted on the World Wide Web's LCP Chemicals Reading Room, which is available to the public and which was expressly promoted to the community group funded by a site-specific Technical Assistance Grant. For example, by the date the comment period for the Proposed Plan started, the final drafts of baseline human health and ecological risk assessments had been available to the public 42 and 40 months, respectively. Similarly, the final drafts of the remedial investigation and feasibility study for OU1 had been available 24 and six months, respectively. Review drafts of these documents were posted on the Reading Room years earlier. Currently, over 80 LCP Chemicals documents are posted on the web site.
GEC (Daniel Parshley)	The community group requested that the EPA include four documents into the administrative record for consideration in selecting a remedy. Those documents include: • Health Consultation, Organic Chemical Residue in School Yard Soils, Goodyear and Burroughs-Mollette Elementary Schools and Risley Middle and Edo-Miller Park/Lanier Field City of Brunswick, Glynn County, Georgia, March 22, 2005 (ATSDR 2005). • Wind Rose for Glynn County (GLYNCO Wind Rose). • Polychlorinated Biphenyls (PCBs) in Georgia Coastal Environments and Populations, September 3, 2014, by Lorraine C. Backer, PhD; David Mellard, PhD; Health Studies Branch, National Center for Environmental	The Administrative Record should contain documents which supports the reasoning the EPA used in arriving at a Selected Remedy. None of the documents listed above pass that test and are therefore not included in the Responsiveness Summary. The third document is cited in a numbers of specific comments is included in the Responsiveness Summary.

Attachment 1 – Comments and Response Index

	Health, Eastern Branch, Agency for Toxic Substances and Disease Registry (Backer, 2014). • "Determination of Toxaphene in Brunswick (GA) Public Access Area Soils by Immunoassay and Gas Chromatography," by Marco Frohlick and Dr. Keith A. Maruya, 23 October 2002.	
L – Brunswick-Golden Isles Chamber of Commerce C – Atlantic Richfield	The community group and the company support the proposed remedy.	The EPA acknowledges this support from Brunswick-Golden Isles Chamber of Commerce and the Atlantic Richfield Company.
P – Jill Jennings-McElheney P – John McQuown	Supported the remedy proposed by the Glynn Environmental Coalition.	It is not clear from the comments submitted on March 16, 2015 that the GEC supports any of the alternatives evaluated in the feasibility study. In comments on the Proposed Plan, the GEC suggests that additional sampling be undertaken and, if need be, available data be used to articulate the need for a Time-Critical Removal Action. The EPA has determined that the existing sampling data is sufficient to support the selection of a remedy. The EPA has also determined that the size and scope of the cleanup to be done at OU1 warrants a Remedial Action rather than a Time-Critical Removal Action, which would not provide sufficient tools for the long-term monitoring that will be necessary at the Site.
P – Debra Ann Strong	Supported Alternative 2 in the Proposed Plan.	Alternative 2, which entails excavation of 48 acres, plus an additional 11 acres in access roads beyond the remedy footprint, for a total of 59 acres was judged to be too disruptive to the marsh for the benefit gained. Other, less disruptive methods at achieving the same risk reduction were preferred and ultimately selected.
P – John McQuown	The community member noted that a hydrodynamic model was used by the EPA to test the proposed and recommended remediation design. He noted that the two models available on the EPA website are for rivers. • Does the EPA think these models are applicable to the LCP Site and why? • What is the authorship, ownership, and revision level for the hydrodynamic model used to evaluate the proposed remedy in the	Appendix B (Hydrodynamic Modeling) and Appendix J (Effectiveness Evaluation for Thin Cover and Chemical Isolation Cap) detail the modeling work to support use of thin covers and chemical isolation capping. Briefly, the RMA-2 [1] hydrodynamic model was used to simulate changes in water depth, current velocity, and bed shear stress over space and time. The hydrodynamic model was developed and calibrated using Site-specific data to the extent feasible. A boundary-fitted numerical grid with relatively high resolution in the Site was used to represent spatial variations in geometry and bathymetry throughout

	proposed plan? • What are the parameters that were used and what data set(s) was used in the hydrodynamic model when testing the recommendations in the proposed plan. • Were the sample sites predicted by the hydrodynamic model's estimate of where pollutants spread since the initial remediation? Is this why the sampling was performed at the LCP site? If so, how well did the hydrodynamic model predict the spreading? If not, why not? • What does the hydrodynamic model predict into the long future? What time horizons have been tested on the hydrodynamic model? Will the results be reported in the Final Plan document? • Based on the HDM modeling, how complex and how frequent will future sampling be required?	the estuary. The model reproduced four key characteristics of hydrodynamics within the Site: • Amplitude and phase of water surface elevation; • Qualitative differences in the symmetry (asymmetry) of tidal currents during ebb and flood tide between Turtle River and Purvis Creek; • Changes in the magnitude of a long-channel velocity during the neap-spring tidal cycle; and • Flooding and drying of secondary channels and intertidal marsh areas. Existing conditions and two remedial scenarios were simulated for the following three hydrodynamic conditions: • typical tidal conditions over a spring-neap tidal cycle; • 100-year flood; and • hurricane storm surge The latter two events were modeled to simulate the expected behavior of the Site under extreme events. Note that the 100-year flood and the 100-year storm surge were used, as it is a consistent standard practice at Superfund sites to evaluate extreme event influence. Additional simulations for storm surges with rarer recurrence intervals (e.g., 500-year event) may be considered during the design phase of the project to test sensitivities. Based on experience from other sites of similar characteristics, the incremental effects of higher-frequency storm surges on marsh sites such as the Brunswick LCP Site is not expected to be considerable. In general, the change in the areal extent of intertidal inundation due to either remedial scenario was less than 4%, which indicated that the remedial scenarios would not have a significant effect on the circulation and marsh inundation within the Site. Overall, only relatively minor increases in maximum current velocities (relative to existing conditions) were predicted to occur for the two remedial scenarios, indicating that implementation of the remedies will not influence the general hydrodynamic characteristics of the marsh and tidal creeks.

Attachment 1 – Comments and Response Index

		The modeling work was overseen by the U.S Army Corps of Engineers. [1] RMA2 is a two dimensional, depth averaged, finite element, hydrodynamic, numerical model. It computes water surface elevations and horizontal velocity components for subcritical, free-surface flow in two dimensional flow fields. RMA2 computes a finite element solution of the Reynolds form of the Navier-Stokes equations for turbulent flows. Friction is calculated with the Manning's or Chezy equation, and eddy viscosity coefficients are used to define turbulence characteristics. Both steady and unsteady state (dynamic) problems can be analyzed.
P – Jane Fraser L - Satilla Riverkeeper	A community member recommended that the EPA include an evaluation of how PCB contamination affects women's health, particularly in regard to endometriosis. (Will the EPA include information about how the chemicals at the LCP Chemicals Superfund Site can hurt a woman's health? Will the EPA plan a cleanup that will reduce these chemicals to levels that will not cause endometriosis in women? Will the EPA call in experts to assist the EPA in finding the level to cleanup that will end the risk of endometriosis from the LCP Chemical Superfund Site use experts to determine what level is protective of endometriosis? Will the EPA include the following studies in the LCP Superfund Site documents and use these documents to plan a cleanup that not only protects men, but women, too? • Potera C. "Women's Health: Endometriosis and PCB Exposure." Environmental Health Perspectives, July 2006; 114(7): A404. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1513298/ • Bruner-Tran, K.L. and Kevin G. Osteen, "Dioxin-Like PCBs and Endometriosis." Systems Biology in Reproductive Medicine, April 2010; 56(2): 132-146. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2867352/).	An oral reference dose, such as that used to guide the development of remedial goal options for the LCP Chemicals Superfund Site in Brunswick, GA, is an estimate of an exposure (including in susceptible populations) that is likely to be without an appreciable risk of adverse health effects over a lifetime (U.S. EPA, 2002). The oral reference dose is intended to represent a lifelong exposure level at which a person is unlikely to experience any health effect as a result of the exposure – even if the person is a member of a susceptible population or life stage (e.g., women, children, the elderly). In order to determine a level of exposure to a chemical unlikely to increase health risk, EPA analyzes data from studies in which health effects have been observed in humans or animals exposed to the chemical at known doses. For PCBs, data are available from many different studies investigating a wide array of health outcomes in humans and various laboratory animals (e.g., monkeys, rats, mice, rabbits, guinea pigs, mink). The oral reference dose for Aroclor 1016, a PCB mixture, was used to develop remedial goal options for the LCP Chemicals Superfund Site. The oral reference dose for Aroclor 1016 is 0.07 µg/kg-day and is based on the finding of decreased birth weight in infant rhesus monkeys that were born to mothers exposed to Aroclor 1016 for 7 months prior to breeding until offspring were weaned at age 4 months (Schantz et al. 1989). There have been no animal studies evaluating the occurrence of endometriosis following exposure to Aroclor 1016. Human studies have provided limited evidence that dietary or environmental PCB exposure affects female reproductive endpoints, including endometriosis. Some studies have reported a positive association between blood PCB levels and the incidence of endometriosis (Heilier et al. 2005; Porpora et al. 2006; Quaranta et al. 2006; Reddy et al. 2006; Tsuchiya et al. 2007; Porpora et al. 2009; Roya

	Another community group asked if the EPA considered that three congeners, PCBs 138, 153, and 180, were particularly high in women with endometriosis. If not, why not?	et al. 2009), while other studies found no such association (Lebel et al. 1998; Pauwels et al. 2001; Fierens et al. 2003; De Felip et al. 2004). As noted by Bruner-Tran and Osteen (2010), the reasons behind these inconsistencies may include differences in control populations, different analytical methods used to assess PCB exposure, and differences in statistical analyses. Whether or not PCBs can cause endometriosis has also been evaluated in a study conducted by Health Canada using rhesus monkeys exposed to another PCB mixture, Aroclor 1254 (Tryphonas et al. 1989; Tryphonas et al. 1991; Tryphonas et al. 1991; Arnold et al. 1993; Arnold et al. 1993). This study utilized a range of PCB doses (5-80 µg/kg-day) that was among the lowest that have ever been tested for any PCB mixture, allowing for the identification of sensitive effects of PCB exposure. Effects that occurred at the lowest dose included inflammation of the eye, nail lesions, and decreased immune function. Endometriosis was not observed even at the highest exposure level tested (80 µg/kg-day). U.S. EPA has derived an oral reference dose of 0.02 µg/kg-day for this PCB mixture by dividing the lowest dose (5 µg/kg-day) by an uncertainty factor of 300, accounting for (1) the possibility that some people may be more sensitive to the effects of PCBs than other people, i.e., susceptible populations, (2) the possibility that humans may be more sensitive than monkeys, (3) the fact that the study did not identify a dose at which there was no effect, and (4) the study duration, which was less than a lifetime of exposure (6.5 years). If one divides the highest dose (80 µg/kg-day) by the same uncertainty factor of 300, then doses up to approximately 0.3 µg/kg-day may be considered unlikely to result in endometriosis in humans based on this analysis. Since the reference dose for Aroclor 1016 (i.e., 0.07 µg/kg-day) that was used to develop the remedial goal options is lower than the highest exposure level for Aroclor 1254, adjusted for uncertainty, where endometriosis was not observed (i.e., 0.3 µg/kg-day), then use of the oral reference dose for Aroclor 1016 may be expected to protect against the development of endometriosis related to PCB exposure given the available data.

P – Jimmie Ann Abner	Asked what the medical risks to women is for the contamination not being cleaned up (residual contamination).	Contaminant levels remaining after the completion of the cleanup will all be within or below the EPA target health risk range for all receptors. The target range (as stated in EPA Superfund regulations) for excess cancer risk is 1 in a million to 1 in 10 thousand. For non-cancer toxicity, the cleanup levels are set at levels resulting in chronic, daily exposure for humans (including sensitive subpopulations) determined by the EPA to be without appreciable risk of deleterious effects during a lifetime. If monitoring shows that target risk based levels are not achieved for contaminants in edible fish, additional remediation may be needed.
C – Atlantic Richfield Company	Disagree with the EPA's assertion regarding potential benthic invertebrate risks in that various studies clearly demonstrate that there is no difference between the OU1 results and those from a reference/ background study site.	Between 2000 and 2006, the potentially responsible parties (PRPs) conducted over 300 sediment toxicity tests with amphipods and grass shrimp to assess risks to the benthic community. In contrast, only two benthic community surveys were conducted. One in 1999 and one in 2000. Appendix G of the Feasibility Study provides information related to the selection of benthic community remedial goal options based on the uncertainties associated with the toxicity tests and the two benthic community assessments. Appendix L of the FS provides a summary of major uncertainties associated with the benthic data. Several of the sediment toxicity tests conducted in both the Crescent River and Troup Creek reference areas resulted in significant toxic responses that were unexpected. No explanation was given by the PRPs in their toxicity test reports (Appendix C of the BERA). These toxic results at very low contaminant concentrations were considered highly uncertain. However, an analysis of toxicity at high COC concentrations was far more certain. Comparable toxicity in some reference area samples is not a justification to say there is no difference between OU1 data and reference data (e.g., see Table 4-23 in the BERA). With respect to the two benthic community assessments, a similar trend was noted in that one or two of the OU1 sampling stations had similar benthic indices as the reference station, but other OU1 stations did not. As another example of uncertainty, annual toxicity tests with indigenous grass shrimp also displayed toxicity in some samples collected from the main canal (LCP Ditch) and Eastern Creek while others did not. Sediment concentrations that displayed toxicity (for DNA strand damage, which is not a very sensitive endpoint) ranged from 1.2 – 86.6 mg/kg Hg and between 1.7 and 88 mg/kg Aroclor 1268. Sediment concentrations that were non-toxic ranged from 0.8 – 11

		mg/kg Hg and between 1.1 and 31 mg/kg for Aroclor 1268. There is significant overlap between toxic and non-toxic concentrations. Likely causes for these results were not presented in the PRPs test reports. As stated in the BERA, a number of potential non-measured factors could have contributed to the observed responses including substrate type, organic carbon and sulfide content. Given the above lines of evidence, along with the calculation of five different sediment effect concentrations for each test endpoint, the EPA concluded that there is a protective range of sediment concentrations to the benthic community that should be evaluated in the FS, and that an exceedance of the low end of the range did not mean definitively that the benthic community would be impaired. However, based on all the lines of evidence and uncertainties, the EPA believes that the majority of the benthic data clearly indicate that the most contaminated portions of the LCP Chemicals marsh do affect the benthic community and are not considered equivalent to the reference areas.
C – Atlantic Richfield Company	Disagree with the inclusion of polycyclic aromatic hydrocarbons (PAHs) and lead (Pb) as Risk Management Issues for OU1 in the Proposed Plan because PAHs and Pb do not pose a bioaccumulative (food web) unacceptable risk to humans, fish or wildlife of any kind or by any means of exposure. PAHs and Pb are identified as contaminants that create possible risk to benthic invertebrates. The commenter claimed that Site-specific testing shows toxicity levels and community metrics are comparable with the reference/ background area, meaning that no further response for PAHs and Pb is warranted.	The EPA acknowledges that the contamination of sediments by PAHs and lead are not widespread and exceed benthic cleanup levels in only a few areas. The EPA disagrees that these smaller areas of contamination should be ignored and disagree that the OU1 sediments are comparable with reference areas (see immediately previous response). The Selected Remedy addresses the highest PAH and lead contaminated areas.
L - Satilla Riverkeeper	This community group asked if the EPA considered containment of the contaminated areas with a coffer dam and complete removal as one of the alternatives in the Feasibility Study. If not why, not? Would a coffer dam or other containment structure facilitate removal without reintroducing the contaminated sediments to the estuary?	Removal of the entire marsh was not formally evaluated within the FS. Since a significant area of the marsh contains lower contamination levels than the cleanup goals, there is not a risk-based reason to remove the entire marsh surface. The goal of a remedy under CERCLA is to achieve protection of human health and the environment, and do so in a cost effective manner.

Attachment 1 – Comments and Response Index

L - Satilla Riverkeeper	The group asked if the EPA modelled reintroduction of contaminants into the marsh via benthic organisms and the Spartina lifecycle. If not, why not?	No specific modeling of mercury re-contamination via benthic organisms or *Spartina* was conducted. The Remedial Investigation and BERA tried to convey the importance of detrital material and various forms of organic carbon (OC) on their ability to sorb PCBs and that it reduces the availability of PCBs to bioaccumulate when bound tightly to OC. Although this occurs, the food web models used to assess exposure assumed 100% bioavailability. It is well known that plants differentially uptake and compartmentalize various contaminants in different parts of the plant and that various researchers attempt to identify contaminant movements within the plant itself. However, for risk assessment purposes, *Spartina* shoots were sampled to provide an average concentration in the plant for exposure evaluations. Understanding *all* aspects of contaminant movement or compartmentalization within an estuary was not an objective of the RI.
P – Penn Clarke	The community member notes that a thin layer cap failed in Seattle Bay, Washington.	This appears to be a reference to the Wyckoff Eagle Harbor Site. There is a section within the near shore (within the tidal area) where the thin layer cap did not achieve the remediation goal. However, the reason for the thin layer cap not being effective in these particular locations was because there were active releases in this spots. It is a creosote site with large amounts of subsurface non-aqueous phase liquid "stringers" that exist through the soils which result in localized seeps within the intertidal zone. The situation between this Region 10 site and the LCP Site are quite different. However, Region 10 is doing additional containment work, and may continue to use thin layer capping in the intertidal zone.
P – Janice Browning	Asked if just a small portion of the contaminated area was being cleaned up. She further commented that he did not see the point of cleaning up a small portion. She said that the EPA's goal should be to see healthy fish, dolphins, turtles, and animals freely roam this marsh and water.	The Selected Remedy will remove and properly dispose of the most contaminated portion of the LCP Chemicals marsh. The lower contaminant concentrations will be thin-layer covered or capped. These measures will be followed by an aggressive monitoring program, which will track the performance of this work. Should the response of the marsh and biota not perform as anticipated the EPA will have the legal tools at its disposal to require additional work to correct the situation. The EPA's specific remedial action objectives for the Site do include: 1. Reducing to acceptable levels piscivorous bird and mammal population exposure to contaminants of concern (COCs) from ingestion of prey exposed to contaminated sediment in the LCP Chemicals marsh, considering spatial forage areas of the wildlife

Attachment 1 – Comments and Response Index

		and movement of forage prey; 2. Reducing risks to benthic organisms exposed to COC-contaminated sediment to levels that will result in self-sustaining benthic communities with diversity and structure comparable to that in appropriate reference areas; 3. Reducing finfish exposures to COCs, through their ingestion of prey and contaminated sediment in the LCP Chemicals marsh, to support conditions within OU1 that do not cause unacceptable adverse effects in fish; and 4. Restoring surface water COC concentration to levels which are protective for recreational users, high quantity finfish consumers and ecological receptors.
P – Frank and Luanne Lea P – Jimmie Ann Abner	Several community members asked what the measurable goals and timelines of the cleanup are. One wanted to know whether it is possible to have healthy wildlife, fish, and dolphins when the cleanup is done. Another wanted goals that include seafood safe to eat, mink once again living at the LCP site and dolphins health improving.	The sediment cleanup levels for the LCP Chemicals marsh are specified in the ROD and it is expected that the remedial action objectives listed in the immediately preceding response will be met. Appendix A of the ROD provides a framework of goals for the long-term monitoring plan (LTMP). Specific measurable goals for the LTMP will be developed during the remedial design phase. With regards to whether it is possible for the wildlife at the Site to become healthy, among other things, the LTMP tissue data will be imported into the BERA risk models to determine the levels of protectiveness to fish and wildlife. Similarly, edible tissue data collected during the LTMP will be compared to the target tissue levels stated in the ROD. The timelines are difficult to predict; however, it will likely be a minimum of several years post-remediation.
P – Janice Browning	Asked what fiddler crabs will do to the thin layer cap?	Appendix I of the feasibility study includes a survey of bioturbation caused by fiddler crabs, among other organisms. The burrowing activity of fiddler crabs is a type of bioturbation, and burrowing can occur up to depths exceeding 12 inches. However, the majority of fiddler crab burrows have been reported to be within six inches. The deeper burrows are breeding burrows that are maintained and defended, so once established, there is little additional movement of sediment. In addition, the crabs forage and feed at the sediment surface, not at depth, so they do not cycle sediment from depth to the surface as part of feeding activities. In addition, vertical profiles suggest that, on the marsh flats, contaminant concentrations decline to near non-detectable levels at depths of greater than six inches.

Attachment 1 – Comments and Response Index

P – Jimmie Ann Abner	Noted that it is understood that the marsh around the site is contaminated with mercury and PCBs, and thinks the whole marsh should be removed.	It is not practicable to remove the entire marsh, nor would that remove all of the mercury. The basis for this is that since the construction of the chlor-alkali plants in the late 1950s, the tides in the LCP Chemicals marsh have advanced and retreated over 42,000 times, thereby dispersing the mercury, and to a lesser extent, the Arcolor 1268, over a very large area, making complete removal not practicable.
P – Clay Montague L – Satilla Riverkeeper	The community member and group asked what lasting risks to human health will remain after remediation? Who will be responsible for these and what remedies or recourse will they have? How safe will the environment be? Will children be safely able to swim and boat in Purvis Creek or in the nearby open waters of Gibson Creek and Turtle River? Will people be able to safely eat shellfish caught in the vicinity? Will warning signs be needed, and if so, who will be responsible for the warnings?	One of the objectives of the remedial action is to restore surface water concentrations of COCs to levels which are protective for recreational users of the marsh and high quantity consumers of finfish. However, such restoration will take time. Removing the remaining long-term sources of contamination, such as those present in the Eastern Creek and LCP Ditch, will address the remaining areas with high concentrations. A framework for the Long-Term Monitoring Plan (LTMP) is included in the ROD to measure the efficacy of the remedy. During the Remedial Design details of the LTMP will be developed. As a consequence, performance of the remedy will be monitored by the EPA and GAEPD through implementation of the LTMP, as well as the statutorily-required Five Year Reviews, which obviously will occur every five years, until the Site no longer poses a risk to human health and the environment. Should a problem be found with meeting the cleanup levels, the remedy may need to be amended or supplemented to allow for additional work. Warning signs related to fishing have been constructed on Purvis Creek. The State of Georgia is responsible for the warning signs.
P – Clay Montague L – Satilla Riverkeeper	The community member and group asked how it was determined that only 81 acres of the 670+ acres of marshland at the LCP site needed remediation. They asked if it is true that 33 of these target 81 acres were not chosen for remediation because of concern over temporary damage to restorable wetlands. If these 33 acres were included despite the damage to the marsh that might result, how would the amount and timeframe of damage to the marsh compare to the risk to people that remains from leaving LCP-contaminated sediments in those 33 acres? Has this comparison of risk been the subject of a scientific risk assessment?	During development of the FS, a decision was made to exclude from consideration for remediation the 33 acres located west of Purvis Creek. The genesis of 33 acres mentioned in the comment is described below. Thiessen polygons were created, based on the sampling density. See Appendix K of the October 2014 FS for more detail on Thiessen polygon construction. Since, as is reasonable given the size of the marsh (+670 acres), sampling density was greater in the domains closer to the discharge points (Domain 1) than those more removed discharge points (Domains 3 and 4), the polygons were considerably larger in the polygons located in Domain 4. Hence, the 33 acres consisted of larger polygons represented by marginally elevated single data points. To illustrate, on Figure K-6 of the FS, a single data point with a total PAH concentration greater than 4 mg/kg, contributes substantially to the 33 acre total.

Attachment 1 – Comments and Response Index

P – Clay Montague L – Satilla Riverkeeper	The community member and community group asked what assurances can be given that capping contaminated sediments in place (rather than removing them) can withstand storm intensities at least comparable to that required for coastal construction. Does storm preparedness for coastal construction require structures to withstand FEMA-determined flood levels, and 120 mph wind speed? What similar storm preparedness standards will be required for the capping project? Even with capping, might a storm with upland flooding and 120 mph winds suspend contaminated sediments in the LCP-contaminated sediments and spread them over the upland landscape into residential neighborhoods and businesses? During a flooding storm, would contaminated sediments settle onto roadways, where they could be further spread on the tires of roadway traffic, and suspended as dust into the air? Will construction criteria for a contaminant cap include even stricter minimum storm standards (based on higher flood levels and more powerful winds) in order to address the public risk of contaminant exposure during and after a storm? If a storm pene-trates the cap, would contaminants spread far and wide once a bolus of contaminated sediments is suspended in coastal waters? Could any and all of the contaminants be spread by a storm, including mercury, lead, Aroclor 1268, PCBs, PAHs, dangerous dioxins, and others? If not, which would not be spread by a storm?	Appendix B of the FS (Hydrodynamic Modeling) details the numerical modeling work performed to simulate three conditions: 1) typical tidal conditions over a spring-neap tidal cycle, 2)100-year flood and 3) hurricane storm surge. This work was overseen by the U.S. Army Corps of Engineers. The following is excerpted from Appendix B. The latter two events (100-year flood and hurricane storm surge) were modeled to simulate the expected behavior of the Site under extreme events. Note that the 100-year flood and the 100-year storm surge were used for the modeling, as it is a consistent standard practice at Superfund sites to evaluate extreme event influence. Additional simulations for storm surges with rarer recurrence intervals (e.g., 500-year event) may be considered during the design phase of the project to test sensitivities. Based on experience from other sites of similar characteristics, the incremental effects of higher-frequency storm surges on marsh sites such as the LCP Chemicals Site is not expected to be considerable. In general, the change in the areal extent of intertidal inundation due to either remedial scenario was less than 4 percent (%), which indicated that the remedial scenarios would not have a significant effect on the circulation and marsh inundation within the Site. Overall, only relatively minor increases in maximum current velocities (relative to existing conditions) were predicted to occur for the two remedial scenarios, indicating that implementation of the remedies will not influence the general hydrodynamic characteristics of the marsh and tidal creeks.
P – Clay Montague L – Satilla Riverkeeper	The community member and group asked if among the contaminants allowed to remain in sediments at the LCP site, are any mutagenic or teratogenic, as well as carcinogenic. If so, what will be the risk of mutations and birth defects from human exposure to LCP-contaminated	PCBs (e.g., Aroclor 1268) are classified by the EPA as probable carcinogens. Benzo(a)pyrene (a typical component of PAHs) is also classified as a probable human carcinogen. No mutagenic or teratogenic chemical were identified as chemicals of concern in LCP sediments; therefore, mutations and birth defects are not expected. The human health risk assessment provides cancer risk estimates (prior to

	sediments, water, or seafood collected from impacted waters?	remediation) from exposure to these chemicals, and are summarized in Tables 11, 15, 16, and 17 in the ROD. It is expected that the current fish advisory will remain in place during and after implementation of the Selected Remedy until such time that long-term monitoring demonstrates that the advisory is no longer needed. The toxicity assessments for both mercury and PCBs do consider developmental effects; thus the remedial levels will be protective for these effects. Edible finfish, shellfish, and clapper rail are the media of concern for human health risks from the marsh. Direct contact with sediment and surface water do not pose unacceptable health risks for humans. Sediment, however, is a transfer medium which is proposed for remediation in order to reduce the contaminant levels in edible fish and birds.
L – Satilla Riverkeeper	The community group stated that it is unlikely that the marsh will be fully restored in two years, as assumed in the proposed plan. Have marsh vegetation restoration efforts been conducted at the LCP Site? If so, were they successful and should be repeated?	The Proposed Plan mentioned that the duration of construction will take two-to-four years, depending on the alternative. The Plan does note on page 44 that fish tissue concentrations are expected to be reduced within several years after construction. Marsh restoration was successful after the late 1990s removal in 13 acres of marsh; however, it did take about two decades. Similar marsh restoration will be required and is included in the cost estimate.
P – John McQuown	Asked why the cheaper Alternative (#6) was selected when a cheaper per acre option (#2) would provide more remediation.	The cost per acre for Alternative 2 is estimated to be about $1.35 million per acre, as opposed to the similar cost for Alternative 6, which is $1.19 million per acre. This notwithstanding, the cost per acre is not the sole consideration. Effectiveness of the remedy and impacts to the marsh must also be weighed.
P – John McQuown	He noted that signs are required around the capped area and to warn fishermen about consumption. Who is going to check and maintain the signage? Who is going to remind DNR to keep warning fishermen	The ROD contains a description of the measures that will be required to monitor the effectiveness of Institutional Controls (IC) such as fish advisories. Specifically, part of the Selected Remedy will be the development of an IC Implementation Assurance Plan (ICIAP). An ICIAP is a document designed to systematically: (a) establish and document the activities necessary to implement and ensure the long-term stewardship of ICs; and (b) specify the organizations that will be responsible for conducting these activities. As such, ICIAPs can be useful tools for planning and, in turn, for assuring effective implementation, maintenance, and enforcement of ICs because they can serve as a single-source of concise site-specific IC information.

Attachment 1 – Comments and Response Index

P – John McQuown	He noted that the EPA should continue to take proactive steps to make the Brunswick City Council and Glynn County Commission aware of the hazardous and development restrictions at the site after each general election. Additionally, police and game wardens need to be periodically reminded of site dangers.	Five-Year Reviews of the remedy require outreach to local officials about the status of the remedy.
P – Janice Browning P – Jimmie Ann Abner P – Penn Clarke P – John McQuown	A number of community members and groups commented on the need to monitor biota long-term for mercury and PCBs, and to provide a schedule for monitoring as well as a schedule for monitoring goals to the community. In some cases, there was concern that only fish and shellfish would be monitor, instead of dolphins. One community member noted that sampling needs to be done to check that the remediation is working. This could be on a four or five year cycle. Superfund money should be allocated but it would be more sustaining if the State carried out the sampling. The results should be reported to the community. One community member asked if the EPA will require annual monitoring for mercury and PCBs in all fish (whole and filets) that people eat and also that dolphins, mink, raccoon, otters, estuarine turtles, snails, and fiddler crabs eat. If not, why, not?	The Performance Standards Verification Plan (PSVP) will be developed during Remedial Design along with the LTMP. The PSVP and LTMP will define the sampling needed to monitor the remedy. The data collected in accordance with the PSVP will be used in the Five-Year Reviews of the remedy which is made available to the public. See also responses to GEC March 16, 2015 regarding monitoring.
P – Janice Browning	Asked what monitoring has the EPA conducted on a regular basis for the past 20 years?	The BERA analyzed the biota data acquired between the years 2000 and 2007. The data is presented in the body of the report, as well as its appendices. There exists more recent fish tissue data, with the most recent tissue data having been acquired in 2011. The majority of this data has been made available to the EPA, the State of Georgia and interest groups, such as the Glynn Environmental Coalition.
P – Janice Browning	Asked what monitoring data the EPA is using to compare before and after the cleanup and cover up of the contamination?	The existing data described immediately above will form the basis for baseline conditions. Note that the framework of the LTMP included in the ROD specifies acquisition of baseline data, should the existing data not be adequate.
P – Janice Browning	Asked when the EPA will evaluate the cleanup (dates for evaluation, and how frequent will the	The framework of the LTMP, contained in Appendix A of the ROD, outlines the requirements of the monitoring program. The full LTMP

	EPA evaluate), what will be the specific evaluation factors (numerical goals) and specifically what will be done if the numerical goals are not reached.	will be finalized during the Remedial Design. The numerical goals (cleanup levels) for sediment and fish tissue are contained in the ROD. In addition to the LTMP, the EPA is required to evaluate the effectiveness of the remedy every five years in a Five-Year Review.
P – Clay Montague L – Satilla Riverkeeper	The community member and group asked what warning signs have been posted in the estuary and at boat ramps to keep people from consuming fish and shellfish in the vicinity of the LCP site, and to keep boaters and swimmers from coming into contact with contaminated sediments. Who is responsible for these signs? The community group further asked how many signs the EPA posted in the 20 years since the serious threat to human health was identified. Where are the EPA posted signs located? What is the EPA budget to maintain the signs over the past 20 years, and for sign placement and maintenance required until seafood is safe to eat?	Posting of fish advisories is the responsibility of the Georgia Department of Natural Resources. This information should be available thought their offices.
P – Clay Montague L – Satilla Riverkeeper	The community member and group asked if contaminated crabs are still entering the public food supply. Are the sets of floats that are sometimes visible in waters adjacent to the LCP site from commercial or residential crab traps?	The most recent Purvis Creek blue crab data (2011) indicated that mercury concentrations remain above the one meal per week advisory of 0.23 mg/kg but below the one mean per month advisory of 0.71 mg/kg. Similarly, the 2011 blue crab data show that Aroclor 1268 is above the 0.10 mg/kg weekly advisory but below the monthly advisory of 0.30 mg/kg. This information is found in Appendix F of the feasibility study. The ICIAP described above will improve on measure designed to minimize the possibility that these crabs are entering the food supply.
P – Clay Montague L – Satilla Riverkeeper	One community member and one community group asked if the people most likely to have been contaminated by LCP-tainted seafood been tested. Have sufficient numbers of people been tested for LCP contaminants? Has testing included those who eat large amounts of fish and shellfish from St Andrew Sound, Jekyll Sound, Jointer Creek, Christmas Creek, and the Satilla River estuary? How many people have consumed large quantities of fish and shellfish from those waters during the decades of contamination at	The Agency for Toxic Substances and Disease Registry (ATSDR) tested Brunswick residents in the late 1990s. The July 1999 ATSDR report may be found at: http://www.atsdr.cdc.gov/hac/PHA/ArcoQuarry/consumption_seafood_final_report.pdf. (Note that the link to the July 1999 report contains “ARCOQuarry” in the link. This report does not contain any information in the ARCO Quarry, which is a later ATSDR consultation and report). The following are the conclusions of the 1999 ATSDR report:

	the LCP site? Has an effort been made to warn those people and to suggest that they be tested?	• Participants in the target group reported a higher number of statistically significant symptoms compared with participants in the comparison group; • Respondents generally under-estimated their amount of seafood consumption as reported in the questionnaire when compared to the amount they reported actually consuming as measured by the two-week dietary diary; • Seafood comprised a smaller proportion of protein in study participants' diets than anticipated; • The current GDNR risk-based seafood consumption guidelines are protective for the general public because individuals are not consuming more seafood per meal than values used in calculating the consumption guidelines; • The majority of study participants do not fish in the restricted area; the few that do, however, state that they are aware of the advisory; • All study participants had urine mercury concentration levels below the reference level of 20 micrograms mercury per gram creatinine; and • There is evidence that the target group consumed seafood from the restricted area, without evidence of high mercury burden.
P – Clay Montague L – Satilla Riverkeeper	One community member and one community group asked if the spin of the Earth (Coriolis Effect) tend to turn local river discharges southward, which over the decades could have put contaminated sediments suspended at the LCP site into these areas, and along the beaches of Cumberland Island and into Christmas Creek?	Aquatic systems do tend to have circulation patterns which are driven by external forces, the earth's rotation being one such force, wind driven currents are another as are patterns driven by land masses that redirect water movement. We are not aware of any study which specifically looked at water circulation patterns within the Turtle River system, although one may exist. While the earth's rotation undoubtedly has some effect, it is likely that prevailing winds and the location of land masses determine the water circulation. In either case, it would be mud areas which are depositional rather than beaches which could retain any contamination which may be transported through the system.
L – Satilla Riverkeeper	The community group wants the site boundary to be extended to include Sapelo Island and the Satilla River due to detections of PCB 206.	Please see previous responses to comment # GEC (2) 2.2.

Attachment 1 – Response References

Allen, E.A., and H.A. Curran (1974). "Biogenic sedimentary structures produced by crabs in lagoon margin and salt marsh environments near Beaufort, North Carolina." *Journal of Sedimentary Petrology* **44**(2):538-548.

Arnold, et al. (1993). "Toxicological consequences of Aroclor 1254 ingestion by female rhesus (Macaca mulatta) monkeys. Part 1B. Prebreeding phase: Clinical and analytical laboratory findings." Food and Chemical Toxicology **31**: 811-824.

Arnold, et al. (1993). "Toxicological consequences of Aroclor 1254 ingestion by female rhesus (Macaca mulatta) monkeys. Part 1A. Prebreeding phase: clinical health findings." Food and Chemical Toxicology **31**: 799-810.

Agency for Toxic Substances and Disease Registry. Turtle River Dioxin Contamination, Brunswick, Glynn County, GA. Atlanta: U.S. Department of Health and Human Services, Division of Health Assessment and Consultation, October 1997.

Agency for Toxic Substances and Disease Registry. Final Report: Consumption of Seafood and Wildgame Contaminated with Mercury, Brunswick, Glynn County, GA. Atlanta: U.S. Department of Health and Human Services, Division of Health Assessment and Consultation, July 1999.

Berger et al. (1999). "Factor in exposure assessment: ethnic and socioeconomic differences in fishing and consumption of fish caught along the Savannah River." Risk Analysys, **19**, 427-438.

Bertness M.D. and T. Miller (1984). "The Distribution and dynamics of *Uca pugnax* burrows in a New England Salt Marsh." Journal of Experimental Marine Biology and Ecology, **83**: 211-237.

Bruner-Tran and Osteen (2010). "Dioxin-like PCBs and endometriosis." Syst Biol Reprod Med **56**: 132-46.

Cantwell et al. (2006). "Temporal trends of Aroclor 1268 in the Taunton River estuary: evidence of early production, use and release to the environment." Marine Pollution Bulletin **52**: 1090-1117.

Cundy et al. (1997). "Releiability of salt marshes as geochemical recorders of pollution input: a case study from estuaries in southern England." Environmental Science and Technology, **31**: 1093-1101.

De Felip, et al. (2004). "Dioxin-like compounds and endometriosis: A study on Italian and Belgian women of reproductive age." Toxicology Letters **150**: 203-209.

EPA (1997). "Ecological assessment - ecological risk evaluation of the salt marsh and adjacent areas at the LCP Superfund Site, Brunswick, GA." vols 1 and 2.

EPA (1997). "Characterization and spatial distribution of contaminants in surface water, sediment and fish within the tidal reaches surrounding Brunswick, GA."

EPA (2014). Dioxin/Furans: LCP Chemicals Superfund Site, Brunswick, Glynn County, GA, September 2014.

Fierens, et al. (2003). "Short communication: Dioxin/polychlorinated biphenyl body burden, diabetes and endometriosis: Findings in a population-based study in Belgium." Biomarkers **8**: 529-534.

Fox et al. (1999). "The use of sediment cores from stable and developing salt marshes to reconstruct historical contaminant profiles in Mersey Estuary, U.K." Marine Environmental Research, **47**: 311-329.

Heilier, et al. (2005). "Increased dioxin-like compounds in the serum of women with peritoneal endometriosis and deep endometriotic (adenomyotic) nodules." Fertility and Sterility **84**:

Attachment 1 – Response References

305-312.

Katz (1980). "Effects of burrowing by the fiddler crab *Uca pugnax*." Estuarine and Coastal Marine Science **11**:233- 237.

Kannan, et al. (1999). "Extractable Organohalogens (EOX) in Sediment and Biota Collected at an Estuarine Marsh near a Former Chloralkali Facility." J. Environ. Sci. and Technol. **33**, 1004-1008.

Lebel, et al. (1998). "Organochlorine exposure and the risk of endometriosis." Fertility and Sterility **69**: 221-228.

Letzsch, W.S and R. W. Frey (1980). "Deposition and erosion in a Holocene salt marsh, Sapelo Island, Georgia." Journal of Sedimentary Research, **50,** 529-542.

Maruya, et al. (2004). "Predicted bioaccumulation of PCBs and toxaphene in bottlenose dolphins (Tursiops truncates): The contribution of contaminated prey. Pops in Marine Mammals: Levels and Effects."Organohalogen Compounds **66**, 1542-1547.

McCraith et al. (2003). "The effect of fiddler crab burrowing on sediment mixing and radionuclide profiles along a topographic gradient in a southeastern salt marsh." Journal of Marine Research **61**:359-390.

Osowski et al. (1995). "The decline of mink in Georgia, North Carolina, and South Carolina: the role of contaminants." Arch. Environ. Contam. Toxicol. **29**, 418-423.

Pauwels, et al. (2001). "The risk of endometriosis and exposure to dioxins and polychlorinated biphenyls: A case-control study of infertile women." Human Reproduction **16**: 2050-2055.

Porpora, et al. (2006). "Increased levels of polychlorobiphenyls in Italian women with endometriosis." Chemosphere **63**: 1361-1367.

Porpora, et al. (2009). "Endometriosis and organochlorinated environmental pollutants: A case-control study on Italian women of reproductive age." Environmental Health Perspectives **117**: 1070-1075.

PTI and CDR Environmetal Specialists. (1998). Ecological risk assessment of the marsh area of the LCP Chemicals site in Brunswick, GA, Vols 1 and 2.

Pulster et al. (2005). "Polychlorinated biphenyls and toxaphene in preferred prey fish of coastal southeastern U.S. bottlenose dolphins (*Tursiops truncatus*)." *Environmental Toxicology and Chemistry* **24** (12): 3128-3136.

Pulster and Maruya (2008). "Geographic specificity of Aroclor 1268 in bottlenose dolphins (*Tursiops truncatus*) frequenting the Turtle/Brunswick River estuary, Georgia (USA)." Sci. Total Environ. **393**: 367-375.

Quaranta, et al. (2006). "Impaired NK-cell-mediated cytotoxic activity and cytokine production in patients with endometriosis: A possible role for PCBs and DDE." Life Sciences **79**: 491-498.

Reddy, et al. (2006). "High plasma concentrations of polychlorinated biphenyls and phthalate esters in women with endometriosis: A prospective case control study." Fertility and Sterility **85**: 775-779.

Roya, et al. (2009). "Possible aggravating impact of gene polymorphism in women with endometriosis." Indian Journal of Medical Research **129**: 395-400.

Schantz, et al. (1989). "Effects of perinatal PCB exposure on discrimination-reversal learning in monkeys." Neurotoxicology and Teratology **11**: 243-250.

Schwacke, et al. (2012). "Anemia, hypothyroidism and suppressed immune response associated with extreme polychlorinated biphenyl exposure in common bottlenose dolphins

Attachment 1 – Response References

(*Tursiops truncatus*) from the Georgia, USA, coast." Proc. R. Soc. B Biol. Sci. **279**: 48–57. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3223648/

Tryphonas, et al. (1989). "Immunotoxicity studies of PCB (Aroclor 1254) in the adult rhesus (Macaca mulatta) monkey--preliminary report." International Journal of Immunopharmacology **11**: 199-206.

Tryphonas, et al. (1991). "Effect of chronic exposure of PCB (Aroclor 1254) on specific and nonspecific immune parameters in the rhesus (Macaca mulatta) monkey." Fundamental and Applied Toxicology **16**: 773-786.

Tryphonas, et al. (1991). "Effects of PCB (Aroclor 1254) on non-specific immune parameters in rhesus (Macaca mulatta) monkeys." International Journal of Immunopharmacology **13**: 639-648.

Tsuchiya, et al. (2007). "Interaction between cytochrome P450 gene polymorphisms and serum organochlorine TEQ levels in the risk of endometriosis." Molecular Human Reproduction **13**: 399-404.

RESPONSIVENESS SUMMARY

ATTACHMENT 2

Letters and emails Submitted During the Public Comment Period

GEC
Glynn Environmental Coalition

P.O. Box 2443, Brunswick, GA 31521

March 16, 2015

Mr. Galo Jackson, Ms. Shelby Johnston
Remedial Project Manager
South Superfund Remedial Branch
U.S EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303-8960

Mr. Jackson and Ms. Johnston,

The purpose of this letter is to request information, and submit questions and comments to be included in the official record for the LCP Chemicals Superfund Site Marsh Proposed Plan, Operable Unit One (1).

The Feasibility Study is built off the information contained in the Baseline Ecological Risk Assessment (BERA), Human Health Baseline Risk Assessment (HHBRA), and the Remedial Investigation (RI). The following comments will strive to address the LCP Marsh Feasibility Study (FS) by covering comments, questions, and concerns about these documents, and finally the Feasibility Study and the Proposed Plan (PP).

The period of time, 20 years, over which the LCP Site data were collected presents challenges of its own just related to the long period over which the data and studies were produced. These include: 1. Changes in Potentially Responsibility Party's Consultants and staff; 2. Continuity of EPA On-Scene Coordinators and Remedial Project Managers; 3. Demographic and socio-economic changes within the surrounding community; 4. Advances in scientific knowledge; and, 5. New and relevant research, studies, and reports concerning the marsh, estuary, and sound system in which the LCP Chemicals Site is located. Similarly, the institutional knowledge within the stakeholder agencies has undergone changes as key people retired, new hires came on and attempted to read the documents and get a grasp of the site conditions. Meanwhile, the sampling and analysis efforts declined and the existing data became dated and increasingly of limited value. Within this landscape of challenges, new agency personnel, and a feeling of urgency to get a Feasibility Study completed, the Proposed Plan for the LCP Marsh Operable Unit One (1) was produced.

The LCP Site documents reflect the challenges identified above. The following comments, questions, and studies and reports are presented to increasing the robustness and accuracy of the Feasibility Study and Proposed Plan, fully knowing the challenges the authors were encountering.

In the final analysis, the prudent course of action might be to use this point in time to develop a sampling and analysis plan, and a firm timeline for completion. There is an urgent need to obtain the information needed to produce complete BERA, HHBRA, and RI data needed to produce a viable FS and Proposed Plan with a measurable monitoring criteria to track and measure obtainment of remedial goals on a set timeline. The Proposed Plan should also establish follow-up actions to be taken if the remedial goals are not met at set points in time. Since the Potentially Responsible Parties (PRPs) have failed to produce the data needed to complete a viable remedial plan over an extended period of time measured in decades, the EPA is strongly urged to obtain the services of a competent contractor, such as Black & Veatch, to complete data collection needed and proceed with the Remedial Action without further delay. If need be, the EPA should use the available data to articulate the need for an "EPA Emergency Response and Removal Action" and designate the LCP Site a "Time Critical Action". The data identified in the following comments will support and articulate the need for a time critical action by the EPA.

With a full understanding of the challenges encountered during the 20 years leading up to the release of the proposed plan, the following comments are respectfully submitted. We trust the comments will help formulate a plan to develop a Proposed Plan that will obtain a timely cleanup and end the risk to human health and the ecosystem upon which the economic future of Brunswick and Glynn County, Georgia, depend.

Sincerely,

Daniel Parshley, Project Manager

Enclosures

<u>INDEX</u>

Baseline Ecological Risk Assessment (BERA) Comments and Questions

Cordgrass (*Spartina Alterniflora*)

The Baseline Ecological Risk Assessment (BERA) recognized Spartina as key to the functioning of the estuarine system, and the burden of Chemicals of Potential Concern (COPCs) were higher than biota at reference stations. Literature identifies Spartina as the base of the nutrient sharing system, and as such a key component to all life cycles in the estuarine system. Also noted was the Site is primarily vegetated with Spartina, which is also known as cord grass and marsh grass.

The BERA fails to identify why the marsh ecosystem is important, and in particular the nutrient transport system with *Spartina alterniflora* as the key species.

Why does the BERA fail to describe the marsh ecosystem in a manner that shows an understanding and knowledge about the movement of nutrients and Chemicals of Concern (COCs) within the ecosystem?

Why, in the entire 1002 page BERA, is *Spartina alterniflora* detritus potential to transport COCs not mention even once?

Has Spartina been identified and an initial vector for mobilization of sediment bound chlorinated hydrocarbons, such as PCBs, into the estuarine food chain (Mrozek, 1982)?

Have studies shown Spartina to be a key factor in bioaccumulation of PCB in detritus and an important means of entry for this pollutant into estuarine food webs (Marinucci, 1982)?

Did the LCP Marsh Remedial Investigation reported:

> "Sorption to organic carbon is the primary mechanism controlling the mobility and bioavailability of PCBs and PAHs in sediment, and also one of several mechanisms affecting bioavailability of divalent metals, including lead and mercury. Organic carbon is abundant in marsh habitat (e.g., detritus within the Spartina mud flats and dissolved organic carbon (DOC) from plant exudates, specifically fulvic and humic acids within the root zone of sediments). Sorption to soot, pitch, coke, and other black carbon forms can greatly decrease bioavailability of many hydrophobic organic compounds compared to amorphous organic carbon (Cornelissen et al., 2005)."

Does the statement from the LCP Marsh Remedial Investigation indicate the authors understood the importance of Spartina to the bioaccumulation and transport throughout the echo system and movement through the food web?

If so, why were steps to sample all parts of the Spartina plant not taken during the remedial investigation?

Has scientific literature noted a differentiation between the root rhizome stem and leaves and their ability to bioaccumulate PCBs?

Did *Sustainable Development in the Southeastern Coastal Zone* note .33 ppm in Spartina shoots, 2.80 ppm in roots (Army Corps of Engineers)?

<u>Cordgrass *(Spartina)* and Mercury</u>

The BERA noted:

> "Cordgrass (Spartina alterniflora) was characterized by concentrations of total mercury that ranged from a mean of 0.02 mg/kg (dw) in the Purvis Creek area to a mean of 0.147 mg/kg (dw) in the Main Canal area vs. 0.005 mg/kg in the Troup Creek reference location (Table 4-6a). Methylmercury frequently could not be detected in cordgrass and, when detected, averaged just 9.93 percent of concentration of total mercury (Appendix F)."

Why did the BERA limit resting for mercury to a section of the leaf 15 cm above the sediment?

Does Spartina testing most frequently and routinely sample the root, rhizome, stem, leaf, and detritus due to the selective bioaccumulation noted with Spartina (Mrozek, 1982; Windham, 2001)?

What was the decision-making process used to limit sampling to just a small section of the leaf, which is know from literature to be the part of the plant with the least bioaccumulation potential?

Were the BERA authors aware that in the fall, the root-rhizome material makes up 78% of the total live biomass and by spring this decreases to 53% (Schubauer and Hopkinson 1984)?

Did the authors of the BERA consider the Manatee has been seen grazes on the Spartina in the LCP Site area?

What was the decision-making structure used to limit the Spartina sampling to the leaf 15 cm above the sediment?

Were stakeholder agencies consulted such as the National Oceanographic and Atmospheric Association (NOAA) or U.S. Fish and Wildlife consulted before this Spartina sampling plan was limited to just the leaf 15 cm above the sediment?

What peer reviewed journal articles were used to support the decision to limit Spartina sampling to 15 cm above the sediment?

Did the BERA consider the potential for Spartina to bioaccumulate metals like mercury from sediment and excrete them from the leaf (Weis, 2003; Windham, 2001)?

What would the implications of Spartina growing on top of mercury contaminated sediments?

Would removing the Spartina from mercury contaminated sediments result in less transport from sediments into the ecosystem?

Did the BERA examine mercury transport via Spartina (Weise, 2003; Windham, 2001)?

Notable is the BERA fails to mention the same glands that excrete salt do excrete mercury. What was the reasoning of the BERA to exclude this critical fact about the excretion and bioaccumulation properties of Spartina?

Did the authors of the BERA do their due diligence and research to identify the potential of the biota to bioaccumulate and transport identified COCs? If not, why not?

Did any stakeholder agencies comment about the apparent selective use of data or data appeared to be censored?

Could the oversight of including mercury excretion along with salt from Spartina leaves be interpreted by a reasonable individual as the selective use of data or the censorship of data?

What is the EPA's explanation for such a critical piece of information, such as mercury excretion, being excluded from the BERA?

How would the exclusion of mercury excretion impact the risk calculations used to develop the Feasibility Study?

Would mercury levels in Spartina leaves be a critical piece of information for evaluating the potential impact to marine mammals like Manatees that use this plant as a primary food source?

Being that the St. Simons Sound and Turtle River are documented Manatee calving grounds, what significance is mercury in the Manatee's primary food source while lactating?

Cordgrass *(Spartina)* and Aroclor 1268

The BERA noted:

> Aroclor 1268 concentrations in cordgrass from the Site ranged from a mean of 0.096 to 0.261 mg/kg, in comparison to 0.0134 mg/kg at the reference location. The maximum concentration of 0.614 mg/kg occurred in Domain 1 at the AB Seep Location.

The BERA appears focused on Aroclor 1268. Were the following Aroclors found at the LCP Site – Aroclor 1016, Aroclor 1221, Aroclor 1248. Aroclor 1254, and Aroclor 1260

(ATSDR, 2014a)?

What PCB congeners are present in Aroclor 1016, Aroclor 1221, Aroclor 1248. Aroclor 1254, Aroclor 1260, and Aroclor 1268?

Do the PCB congeners found in Aroclor 1016, Aroclor 1221, Aroclor 1248, Aroclor 1254, Aroclor 1260, and Aroclor 1268 include those with dioxin and furan properties?

Were the non-dioxin-like and dioxin-like effects of the specific PCB congeners analyzed in the BERA, or was only a general Aroclor 1268 analysis conducted?

Were the EPA BERA protocols for analysis of PCB dioxin and non-dioxin-like effects conducted as part of the 2003 BERA for the LCP Site marsh (EPA, 2003)?

Were all congeners of PCBs detected at the LCP Site measured in the Spartina samples collected 15 cm above the sediment?

Was the PCB congener analysis limited to those found in Aroclor 1268?

What is the significance of the BERA focusing on Aroclor 1268?

Was the BERA limited to an analysis of Aroclor 1268? If not, where can the chemicals with similar modes of physiological action, like the other Aroclors, dioxin, and furans be found?

Was a Toxicological Equivalency Factor (TEF) developed for all the PCB Aroclors, dioxins, and furans found in Spartina? If not, why not?

> "The BERA limited Chemical of Concern (COCs) in Spartina (sp.) were limited to three - Mercury, Aroclor 1268, and lead."

What was the reasoning used to limit the COCs examined in Spartina?

Were toxicological effect found in organisms at levels lower than expected when the toxicological factors were limited to just the three factors: mercury, Aroclor 1268, and lead?

BERA Appendix E states:

> Smooth cordgrass occurs in all of the above-identified marsh zones, in great part because of its special adaptations that allow it to live where few other plants could survive. These adaptations include a tough and well-anchored root system, as well as narrow, tough blades and special glands that secrete excess salt, permitting it to withstand high heat and daily exposure to salt water.

The Spartina alterniflora nutrient recycling system, critical to the estuarine marsh system,

is notably missing from the BERA.

Why is the crucial nutrient recycling system the Spartina alterniflora serves for the estuary noticeably missing from the BERA?

The BERA is devoid of any discussion about the PCB bioaccumulation properties of Spartina in marsh environments. The potential for Spartina to be a significant reservoir of PCBs in the environment has not been identified or quantified, which would be a major factor in FS to identify areas for removal and determining total PCB mass calculation. As a major, if not the most primary and basic mechanism for transporting PCB in to biota at the base of the food chain, the lack of any information in the BERA is a glaring shortcoming in the report. Failure to be cognoscente of the potential for Spartina to bioaccumulate PCBs and incorporate them into the base of the food chair raises doubts about the technical expertise of the authors of the BERA work plan, or points to development of a work plan design to produce predictable results with the intent to under reporting actual levels of COCs. Regardless of the reason or intent, the fact remains that a major flaw in the BERA needs to be rectified.

Fiddler Crabs (*Uca minax* or red-jointed, *Uca pugnax* or mud fiddler, *Uca pugilator* or sand fiddler)

> "The greatest mean number of crabs, 196 individuals / m2 of substrate, was reported in a habitat characterized by medium-sized *Spartina* (0.5 -1.49 m in height), while 176 and 94 individuals / m2 were observed, respectively, in short *Spartina* (<0.5 m tall) and on essentially barren substrate (absence of vegetation)."

Why does the BERA limit reporting of PCBs in fiddler crabs to Aroclor 1268 (BERA, pg. S-5)?

Why does the BERA report found that they were fiddler crabs present in numbers (200 young and adult crabs per square meter) that might be expected to occur in a relative pristine marsh, but not quantify the amount of sediment brought to the surface on an annual basis?

Is the amount of sediment excavated from the sediments by Fiddler Crabs important information for remedies using capping of marsh sediments?

Why were Fiddler Crabs sampled at a location previously remediated (BERA, Pg. 55)?

Was the BERA data concerning fiddler crab abundance biased by sampling in a previously remediated area?

Can the encountering of the membrane at 40 cm be used to infer the minimum depth of the fiddler crab burrows are 15.75 inches (BERA, pg. 55)?

Does the BERA state "these burrows, which often extend to 2 ft in depth …. (BERA, pg. E-2)? What are the implications of sediment excavation activity by fiddler crabs to remedies involving placement of capping material over the marsh?

What is the quantity of sediment brought to the surface annually by over 200 fiddler crabs per square meter?

What is the quantity of sediment brought to the surface annually by the remaining biota (other than Fiddler Crabs)?

Mink *(Mustela vison)*

Even though mink are indigenous and wide-spread in coastal Georgia, mink are noticeably missing from the Site marsh indicating reproductive failure. Furthermore, no mink analysis is presented in the BERA. The reasonable assumption is the Chemicals of Concern (COCs) levels are sufficiently high around the Site to prevent reproductive viability in mink. **The range of mink should be established as a baseline before the Estuary Remedial Action (RA) is implemented.** The RA should sufficiently reduce COCs to allow, at a minimum, a viable reproducing mink population in the Site area.

Does the EPA intend to make identification of the mink range within the turtle River's system and the St. Simons sound estuary a priority?

If the EPA is can make mink range a priority what is the timeline for collection of this data?

The BERA notes the presence of mink in the estuary and notes these are animals found in the estuary. But, in the case of the LCP Site, and the BERA, the absence of any mink in the area is glaringly noticeable. Mink are sensitive to the chemicals present at the LCP Site, such as PCBs. It is unknown why the authors of the BERA or the EPA did not understand the significance of the absence of mink or make note of this fact, even though the absence was noted by the EPA previously (USEPA, 1997).

After identifying the Mink as an indigenous species missing from the ecosystem surrounding the LCP Chemicals Superfund site, why did the EPA eliminate the species from the baseline ecological risk assessment when it was obviously one of the most impacted species?

Is the EPA aware that mink are a species susceptible to adverse impacts from PCB exposure and a good indicator species for measuring ecological impacts?

What is the EPA's rationale for elimination of the mink from the BERA?

What is the EPAs explanation for the absence of mink from the LCP Site?

Does the EPA intend to identify the "dead zone' around the LCP Site where mink are absent?

Does the EPA intend to define the area where mink are absent, and delineate where viable and sustainable mink populations can be found?

If the EPA does determine the extent of the area where the contamination has eliminated the mink population, and will mink be used as a monitoring criteria to assess the Remedial Action?

If the EPA does intend to use the mink and a monitoring indicator, will this be placed in the Record of Decision and Consent Decree for the LCP Site?

Will the EPA recommend mink be used as monitoring criteria for assessment of the remedial action? If not, why not?

The BERA note (Section 6.2.2.5):

> An important source of uncertainty associated with this assessment endpoint is how well the river otter exposure model that represents a top-level piscivorous mammal could be extrapolated to dolphins and whether the TRV (based on Aroclor 1254 effects to mink) could reasonably be applied to dolphins.

Why should the EPA use otters when mink are an indigenous species and the indicated as the proper species to use?

Does the EPA agree that if an exposure model can be applied from the mink to the dolphin, the model can be applied from the dolphin to the mink?

The lack of a viable reproducing mink population does not indicate no problem, but rather quite the opposite. Alarms should be going off when an indigenous species shown to be sensitive to the chemicals released from the LCP Site is missing. The only conclusion can be a dead zone is surrounding the site. The baseline monitoring plan should use the mink as an indicator of marsh and estuary recovery. The area without a viable mink population should be delineated and help define the area of reproductive failure. The argument that a key species in the estuary is "just not present in this area" should not be accepted. The correct observation is "this is the only area where the mink is not present". The mink was suggested as an indicator of dolphin health by the Potentially Responsible Parties via dosing with Aroclor 1268. Notable is the lack of any mink sampling within the Turtle River estuary, which would have produced a real life's samples to use as an indicator of dolphin health. But these mink samples are not needed as an indicator of dolphin health because there is a wealth of data that has been collected from the resident dolphin population in coastal Georgia. It is now known dolphins are sick and lack of any reporting concerning this situation greatly questions to credibility or viability of the BERA as a decision-making document.

Is the EPA aware that PCBs have been associated with low mink kit survival and mink are a sensitive population to the toxic effects of PCBs (Bursian 2006; Bursian, 2013)?

Will the EPA consult literature and establish a remedial action level that will result in the recovery of the mink population at the LCP Site?

Dolphins

As previously noted, the lack of any information concerning the resident dolphin population in Turtle River and coastal Georgia is a glaring omission from the BERA. This omission is so glaring as to question the motives of the authors of the BERA. Since at least 2004, is been known that though dolphin population is grossly contaminated and this fact is been well documented. Furthermore stakeholder agencies have collected samples from the resident dolphin population, analyze the samples, and even conducted health assessments on the dolphin population. But the authors of the BERA have chosen to ignore this wealth of data.

What is the EPA's explanation for not including the dolphin data in the BERA?

Did the EPA failed to communicate with the stakeholder agencies, including the Georgia Department of Natural Resources, the National Oceanic and Atmospheric Administration, and the US Fish and Wildlife Service concerning the dolphin sampling and analysis?

Was the EPA oblivious to the fact that the same people that were producing data on the LCP Chemicals Superfund site were also doing sampling and analysis on the resident dolphin population for PCBs associated with the LCP site?

Notable are people who were sampling the dolphins and producing peer reviewed journal articles had also worked with EPA On-Scene Coordinators at the LCP Chemicals Superfund Site. It stretches the imagination to think that the EPA was not aware of the gross contamination in the resident dolphin population.

Inshore resident dolphin (T. truncates) populations exhibit long-term fidelity to specific estuaries and making them excellent sentinels for assessing the impact of stressors on coastal ecosystem health (Pulster, 2008). It is not surprising that the implications to human health were obvious to those studying the dolphins and they questioned the impact to the people who regularly and habitually consumed fish from the same waters (Schwacke, 2012).

The plight of the dolphins in Turtle River has been known since at least 2004. It was noted in the PCB levels were 10 times higher than those noted in the Savannah area dolphins (Pulstera, 2008). Literature reports 102 bottlenose dolphin blubber samples being analyzed from animals in Georgia (Balmer, 2011). The researchers noted that the levels of PCBs in the dolphins was associated with a point source near Brunswick Georgia or the LCP Chemicals Superfund site. The study was robust and photo identification was used to identify individual dolphins. Also noted were that the male dolphins in Turtle River had the highest concentrations of PCBs reported for any marine mammal, worldwide. The Aroclor 1268 levels were noted to be highest in the Brunswick Georgia area and decreasing with distance (Balmer, 2011).

The dolphins in the Turtle River estuary system were given a physical examination in addition to being sample for levels of PCBs. The result of the examination was the identification of anemia, hypothyroidism, and immune suppression associated with PCB exposure (Schwacke, 2012).

A high proportion of the sample dolphins suffer from anemia (26%), which is a finding previously reported being observed with Aroclor 1254. Furthermore the dolphins showed reduced thyroid hormone levels which were negatively correlated with PCB concentrations measured in the blubber. There was a correlation between immunity decrease and blubber PCB concentrations, which is suspected to increase susceptibility to infection and disease. Contrary to the assertions of the Potentially Responsible Parties that Aroclor 1268 is less toxic than other forms of PCBs, the re-searchers found the PCB mixture dolphins were exposed have substantial toxic potential and potential impacts on other top-level predators. Humans were identified as one of those other top-level predators consuming the same as fish species from the same estuary (Schwacke, 2012). **The significance of this empirical evidence and implications to human health appears to have been ignored by the EPA. At a minimum, the EPA has not conducted due diligence by conducting a basic literature search for the Superfund Site name for data and studies pertinent to the Site and the EPA decision-making process.**

The other notable impacts to the dolphins in Georgia coastal waters were skin disease, and specifically lesions. Again, the Brunswick Georgia site was found to have the highest incidence of skin lesions in bottlenose dolphins when compared to Sapelo Island Georgia and Sarasota Bay Florida (Hart, 2012).

The dolphins in the Turtle River estuary having the highest PCB concentrations required for any Marine mammal has raised considerable concern for both the dolphins and humans consuming seafood from this region of the Georgia coast. Dolphin densities were compared for the Brunswick Georgia area and the Sapelo Island area. The researchers noted that dolphin density in total abundance were sadistically higher in the Sapelo Island area than in Brunswick. Furthermore, anthropogenic stressors were identified as an important factor and potentially the cause of the differences in abundance density and habitat use observed (Balmer, 2013).

Research was done to establish the level of PCBs in fish that would result in tissue levels below the health effects threshold in dolphins. The model developed estimated that a dietary PCB concentration that did not exceed 5.1 ng/g (parts per billion or ppb) would be required to be protective of 95% of the dolphin population (Hickie, 2013). Very notable is how close the proposed maximum dietary PCB concentration is to the level that is protective of human health and the high quantity seafood consumer.

Will the EPA include the large volume of data on the coastal Georgia resident and transient dolphin population into the BERA? If not, why not?

Does the EPA understand the implications to human health from the dolphin data?

Does the EPA understand that dolphins and humans eat the same fish species?

Will the EPA incorporate the dolphin data into the HHBRA? If not, why not?

Does the EPA intend to incorporate the large volume of dolphin data into their decision-making process for the propose plan for the marsh at the LCP Chemicals Superfund site?

Will the EPA established a maximum allowable level of 5.1 parts per billion (PPB) in fish as the goal for the LCP marsh cleanup?

Notable is dolphin studies were not included in the BERA but were utilized in the Human Health Baseline Risk Assessment (HHBRA) to argue the Aroclor 1268 at the LCP Site is distinct and recognizable (Pulster, 2005; Pulster 2008).

As noted in the HHBRA:

> "Polychlorinated Biphenyl (PCB) homologue analysis of sediment and biota were presented in Kannan et al. (1997) and Kannan et al. (1998). The homologue proportions are substantially similar to the proportions in Aroclor 1268. More recent work indicates the same conclusions (Sajwan et al., 2008; Cumbee et al., 2008; Pulster and Maruya, 2008; Pulster et al., 2005)."

What is the rational for inclusion of the dolphin studies in the HHBRA to argue for only Aroclor 1268 sampling and not including them in the BERA?

Will the EPA utilize all the dolphins studies identified in these comments and the corresponding references to formulate Remedial Action levels protective of the resident dolphin population?

The HHBRA discusses using the dolphin data in the rationalizing for limiting sampling to Aroclor 1268 (Pulster, 2005; Pulster, 2008).

Were Aroclor 1254 found in 81 samples (9%), and Aroclor 1260 found in 37 (4.1%) in upland samples (ATSDR, 2014a)?

If Aroclor 1254 and Aroclor 1260 were found in upland samples, what was the EPA's rational for eliminating these PCB Aroclors from the COC to be sampled for in the LCP marsh?

Were other PCB Aroclors found in upland samples at the LCP Site, and if so, what was the EPA's rational for eliminating these from the COC to be sampled for in the LCP marsh?

Was PCB congener 206 established as the one defining Aroclor 1268 contamination from the LCP Site in coastal Georgia (ATSDR, 2014b)?

Is PCB congener 206 the most prevalent, or dominant, in Aroclor 1268?

Has a gradient of PCB congener 206 been found emanating from the LCP through sediment samples taken in coastal Georgia (ATSDR, 2014b)?

Using PCB congener 206 as an indicator of the boundaries of the LCP Site contamination, what are the geographical boundaries of the contamination from the LCP Site (ATSDR, 2014b)?

Did ATSDR compare and contrast total PCBs in fish between the Brunswick Georgia and Sapelo Island area (ATSDR, 2014b)? If so, what were the findings (differences quantified)?

Was the purpose of the ATSDR study to "Compare results in people with what is known about dolphins" (ATSDR, 2014b)?

Does the ATSDR study imply what is known about dolphins could be utilized to predict impacts to people eating the same fish species (ATSDR, 2014b)?

Did ATSDR report, "We did find that human and dolphin specimens contain qualitatively similar environmental contaminants" (ATSDR, 2014b)? Does this statement imply the dolphin data is very important to understanding chemical exposure to people from the LCP Site?

What are the implications to the HHBRA from the BERA not having included the dolphin data and studies identified in these comments to the EPA on the BERA?

The BERA and Dioxin/Furan

The BERA States:

> Dioxins/furans were collected from three sediment samples in October 2000 at C-6, C-8, and C-15 in the LCP estuary. Two additional samples were collected from the Troup Creek and Crescent River reference stations. Using the mammalian toxicity equivalency factors for each of the dioxin/furan congeners (U.S. EPA, 2008a), the toxicity equivalence concentrations (TECs) at the LCP estuary stations ranged from 54 ng/kg to 1,878 ng/kg. At the two reference stations the dioxin TEC concentrations were less than 10 ng/kg. The EPA Region 4 sediment screening-level for dioxins is 2.5 ng/kg which are based on the most toxic form of dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin [TCDD]). The maximum concentration of TCDD in the reference samples was 1.7 ng/kg while the highest concentration of TCDD from the three estuary samples was 53.7 ng/kg at C-6. Therefore, dioxins/furans are of concern. However, no further sediment or biota samples were analyzed for dioxins/furans during the monitoring program. **Therefore, potential risk cannot be adequately evaluated in this assessment based on the three sediment samples collected in 2000, but will be discussed further in the uncertainty section. (emphasis added)**

Are the TECs (a.k.a TEQ) reported 2 to 4 orders of magnitude higher than the EPA screening level of dioxin of 2.5 ng/kg?

Was any effort whatsoever made by the EPA to obtain existing dioxin/furan data from the St. Simons Sound in which the LCP Site is located?

Did the EPA ask Stakeholder Agencies if they had collected Dioxin/Furan data for the St. Simons sound estuarine system?

Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder and Black Drum (both whole and filet) in Turtle River in 1989 (GADRN, 1989)?

Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder, Black Drum. Sheephead, and Hardhead Catfish (filet) in Turtle River in 1990 (GADRN, 1990)?

Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder, Black Drum. Sheephead, (whole and filet) in Turtle River in 1991 (GADRN, 1991)?

Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder, Atlantic Croaker, and Gafftopsail Catfish (whole and filet) in Turtle River in 1992 (GADRN, 1992)?

Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder, Black Drum, and Hardhead Catfish (whole and filet) in Turtle River in 1993 (GADRN, 1993)?

Did the EPA take into consideration the Dioxin/Furan sampling of Southern Flounder, and Stripped Mullet, (whole and filet) in Turtle River in 1993 (GADRN, 1993)?

Did the EPA consider the four samples for Dioxin/Furan taken in the Altamaha Canal south of the LCP Site in 2011 with results above the 2.5 NG/KG TEC (a.k.a TEQ) of 62, 130, 68, and 20 ng/kg (EPA, 2011)?

Did the EPA consider the December 1995 EPA Community Based Environmental Project's 14 sediment samples from the Turtle River/St. Simons Sound area?

In light of all the above Dioxin/Furan sampling conducted by the EPA or one of the LCP Chemicals Superfund Site Stakeholder agency, why should anyone, or the court who considers the Consent Decree, believe the EPA when it states, "Therefore, potential risk cannot be adequately evaluated in this assessment based on the three sediment samples collected in 2000, but will be discussed further in the uncertainty section"?

The EPA has interjected data from the lake Onondaga LCP site located near Syracuse, New York, into the Proposed Plan for the LCP site in Brunswick Georgia. Unlike the LCP site located in Brunswick Georgia, there was a significant amount of dioxin data collected at the LCP site located in New York (USEPA, 2002).

Was whole fish sampling for dioxin and furan in juvenal and adult fish conducted at the LCP site in Brunswick Georgia, or only at the Lake Onondaga Site?

Do the dioxin and furan sampling at the Lake Onondaga site in New York find a risks to wildlife from dioxin and furans (USEPA, 2002)?

If the risk from wildlife from dioxin and furans was found at the Lake Onondaga site, with those risks be applied to the wildlife at the LCP site in Brunswick Georgia? If not, why not?

If the EPA is using data from the Lake Onondaga Site for decision-making concerning sampling of dioxin and furan at the LCP site in Brunswick Georgia and to delay such sampling until after the Record of Decision and Consent Decree, why not use the same reasoning to utilize the data for estimating risk in Brunswick from the observations at the New York site?

Will the EPA order whole fish sampling for dioxin/furan in juvenal and adult fish from Turtle River to obtain the same quality data as used at Lake Onondaga, New York?

> "In mammals, learning behavior and development of the reproductive system appear to be among the most sensitive effects following prenatal exposure. In general, the embryo or fetus is more sensitive than the adult to dioxin-induced mortality across all species (ATSDR, 1998c, U.S. EPA, 1994a).
> Environmental exposure to dioxins includes various mixtures of CDDs, CDFs, and some PCBs. These mixtures of dioxin-like chemicals cause multiple effects that vary according to species susceptibility, congeners present, and interactions." (USEPA, 1994a)

Did the BERA include the dioxin and furans within the Turtle River area in their calculations for PCBs, dioxins, and furans TEQ or the hazard quotient or the hazard index?

<u>Manatee</u>

The Manatee, and endangered and protected species, is mentioned in the BERA but none of the work recommended by the US Fish and Wildlife Service (USFWS) has been completed. Again, the recommended work was centered on the keystone plant species in the LCP marsh, Spartina.

Did the USFWS find a need to examining the roots and note cleaning of the Spartina could result in an underestimation of the exposure scenario of herbivores like the Manatees, and the others in residents year round (USFWS, 1996)?

What was the EPA's rationale for not including the Manatee in the Baseline Ecological Risk Assessment?

Is EPA aware that the Manatees is an endangered and protected species?

What action is the EPA taking at the LCP Chemicals Superfund site to assure the Manatee is not consuming excessive amounts of PCBs, mercury, and dioxin via the cordgrass (Spartina)?

Did the EPA make an estimation about how much sediment the Manatee would consume while foraging on the cordgrass (Spartina)? If not why not?

Diamondback Terrapin

Early in the examination of the LCP Chemicals Superfund Site for ecological damage the diamondback terrapins were examined. The terrapins were found to be suffering from wasting syndrome and reproductive problems. The BERA appears to have drifted away from the empirical evidence presented to modeling impacts.

In light of the wasting syndrome reproductive problems identified with the Terrapin, how did the BERA come to the conclusion that there is a hazard index or hazard quotient less than one?

Is it possible to have reproductive failure and a hazard quotient or hazard index less than one?

Is it true that the levels of PCBs observed in the Terrapin eggs was in excess of 600 ppm (USEPA, 1997)?

Were the eggs examined for reproductive viability?

What were the results of the examination of the Terrapin eggs for reproductive viability?

Will the Terrapin be included in the species used for monitoring and evaluating the remedial action efficacy?

Human Health Baseline Risk Assessment Comments and Questions

The only appropriate way to start the review of the Human Health Baseline Risk Assessment is with the following two quotes from studies that do, unlike the EPA or the Potentially Responsible Parties, fully realize the serious and dangerous situation facing people residing around the LCP Chemicals Superfund Site, the need to evaluate the dolphin data, studies and reports; and, in particular anyone consuming seafood from the St. Simons Sound estuarine system.

> "Moreover, PCB signatures in dolphin blubber closely resembled those in local preferred prey fish species, strengthening the hypothesis that inshore T. truncatus populations exhibit long-term fidelity to specific estuaries and making **them excellent sentinels for assessing the impact of stressors on coastal ecosystem health** (Pulster, 2008)".

> "The severity of the effects suggests that the PCB mixture to which the Georgia dolphins were exposed has **substantial toxic** potential and further studies are warranted to

elucidate mechanisms **and potential impacts on other top-level predators, including humans, who regularly consume fish from the same marine waters** (Schwacke, 2011)."

When reviewing the Human Health Baseline Risk Assessment (HHBRA) is important to keep in mind the saying "garbage in garbage out". In case of the HHBRA, there was plenty of garbage to go around. But in spite of the tendency to make light of how bad the document is, the ramifications to Glynn County and the surrounding Brunswick community are real, serious, and have significant ramifications to the future health and welfare of the citizens of Glynn County, and anyone from the surrounding coastal Georgia Counties catching and consuming seafood from the contaminated areas. Furthermore, the area of contamination delineated appears incomplete and limiting the remedial activities the site property boundaries could be grossly inadequate. The failure to produce a viable document is a real threat to human health. Like the Baseline Ecological Risk Assessment, what is missing from the report is more notable than what is in the report. In addition to the dismal quality of the report, the EPA has a long history of less than competent efforts to protect human health and the environment around the LCP Chemicals Superfund site for the past 20 years. This indicates the EPA has never had a firm grasp on the seriousness of the problem at the LCP Chemicals Superfund Site. Further aggravating the problem is the numerous changes in s EPA Remedial Project Managers, which is not meant to reflect on the character of the Remedial Project Managers but rather another indicator of the EPA management's inability to put a lucid and comprehensive plan together for the LCP Chemicals Superfund Site and move the cleanup ahead in a timely manner.

Numerous action items were identified for the EPA to implement in the Brunswick, Glynn County, community to protect people from the risks from the LCP Chemicals Superfund Site. These include, but not limited to, following recommendations from the Agency for Toxic Substances and Disease Registry (ATSDR, 1994, 1996, 1999, 2014):

- Raise awareness about the fishing advisories among residents and healthcare providers.
- Improve the fishing advisory signs so that they are more easily seen.
- Maintain the fishing advisory until the source of contamination is removed.
- Continue public education regarding the hazards of consuming Mercury contaminated seafood with a focus on pregnant and nursing women, children, the elderly, and those with compromised immune systems. Evaluate the feasibility of developing a fact sheet based on the Georgia DNR guidelines for eating fish from Georgia waters, specific for fishing areas in Glynn County to be made available were fishing licenses are sold.

What programs has the EPA implemented to raise awareness about fishing advisories among residents and healthcare providers?

What were the dates of the EPA initiatives to raise awareness with health care providers about the seafood advisories?

What improvements did the EPA make to the fishery advisory signs so they are more easily seen?

How many fish advisory signs has the EPA had placed in the community?

Where are the fish advisory signs the EPA has placed in the community located?

What is the EPA's budget for fish advisory signs?

What is the EPA's budget to maintain the fish advisory until the source of contamination is removed?

What is the EPA's budget for continuing public education regarding the hazards of consuming mercury and PCB contaminated seafood?

How does the EPA focusing on pregnant and nursing women, children, the elderly, and those with compromised immune systems?

The EPA answering the above questions is critical in evaluating the Feasibility Study since institutional controls are be considered for protection of human health. The EPA's performance over the past 20 years in implementing recommendations protective of human health will be a very good indicator of what can be expected moving forward. Indications are the EPA is inept and does not have the management continuity to implement or manage a competent program of institutional controls. Therefore, at a minimum, the EPA should appropriate sufficient funding to have the appropriate actions implemented on the local level for as long at the threat from contaminated seafood remains.

Will the EPA require an appropriation or appropriate funding to implement the already identified activities to better protect human health and the environment?

Will the EPA expedite the appropriation of funds to implement the recommendations intend to help protect human health?

The stated goal of the HHBRA is: The overall goal of this risk assessment is to develop essential scientific information that can be used in decision-making regarding the LCP Chemicals Site estuary in support of an evaluation of the need for remedial action.

The guidelines for seafood sampling utilized for the HHBRA state:

> "For scaled fish, fillets should be scaled but left with the skin on. For fish without scales, the skin should be removed from the fillet " (GA-DNR) (FTAC, 1992).

Are the fish samples collected from Turtle River being prepared according to the appropriate protocols and the skin and belly flap left on the filet?

Was whole fish sampling conducted in order to determine the range of exposures human consumers might encounter?

> "For the fish consumption risk assessment, both RME and CTE exposure assumptions (Table 10) were developed from USEPA (1997a) and other sources (DHHS, 1999; Appendix B)."

Agency for Toxic Substances and Disease Registry (ATSDR) Public Health Assessment (PHA) found the 1999 Department of Health and Human Services (DHHS) report on seafood consumption from the turtle River area to be inappropriate for estimating risk to the African-American population in Brunswick and Glynn County Georgia. Specifically, ATSDR noted:

> "And finally, it should be noted that African-Americans made up only 4% (9 out of 211) of the people who participated in the study. African-Americans make up 26% of the population of Glynn County and nearly 40% of the population within four miles of the LCP Chemicals Site. Therefore, African-Americans are underrepresented in the Brunswick fish study.
> A study of fishers along the Savannah River showed that African-Americans
> • Eat more fish meals per month than whites (average, 5.4 vs. 2.9),
> • Eat slightly larger portions than whites (average, 13.7 oz. vs. 13.1), and
> • Eat higher amounts of fish per month than whites (average, 75 ounces vs. 41 ounces).
> It is reasonable to assume that the fish-eating habits of African-Americans in Brunswick, Georgia, are similar to African-Americans along the Savannah River. Therefore, African Americans who fish along the Turtle River are likely to have higher exposure to mercury from eating fish than whites. The results of the Brunswick fish study should not be applied to African Americans in the Brunswick area for those reasons." (ATSDR, 2014a)

Notable is that the EPA's own database found 72% the population within 1 ½ miles of the LCP site reported their race as black, or African American. In addition based on reported 1999 household income 32% reported under $15,000, and 18% under $25,000 (EPA, 2015).

The authors of the HHBRA put great weight in the average yearly income of the coastal Georgia residents in evaluating seafood consumption patterns. The HHBRA reports the average yearly income of coastal Georgia ZIP Codes as being $38,193. Obviously the EPA's own data indicates the actual income level of over 50% of the people is less than half that was what is reported in the report. The HHBRA stated:

> "There were very few consumers of Striped Mullet and Spot. Census data can provide the average income per zip code. The average income of the zip codes of anglers harvesting Spot and Striped Mullet were obtained from databases maintained by the Missouri Census Data Center (MCDC, 2006). The average yearly income of the zip codes of the coastal Georgia residents harvesting Spot from 2001 to 2005 was $35,240. The average yearly income of the zip codes of the coastal Georgia residents harvesting Striped Mullet from 2001 to 2005 was $37,847. The average yearly income of all the coastal Georgia zip codes was $38,193. These income values seem quite similar."

Did the EPA review their own demographic data for the area around the LCP Chemicals Superfund site when reviewing the HHBRA (EPA, 2015)?

Did the EPA advise the authors of the HHBRA that they could find more accurate demographic data and household income data on the EPA's website (EPA, 2015)?

Is obvious the authors of the HHBRA were struggling to find data. Even data points of the single fishermen appeared to be important to them. It is obvious the authors were struggling to find demographic data. As noted in the HHBRA:

> "It is interesting to note that of the group of nine anglers who harvested Spot from 2001 through 2005, **only one came from Brunswick** (emphasis added) whereas four came from Savannah. The average zip code income of this single Brunswick angler was $23,898. The average zip code income of the Savannah anglers ranged from $18,830 to $60,182. In addition, there may be income variability within a single zip code but income data for smaller areas are not available."

And,

> "It is possible that some subsistence anglers lived in the Savannah zip code in which the average income was $18,830. However, none of these anglers were from the Brunswick area and there remains no evidence that there were subsistence anglers in the Brunswick area."

If the authors of the HHBRA were using income as an indicator of whether fishermen were or were not subsistence anglers, 32% of people living within 1 ½ miles of the LCP Site having an annual household income of under $15,000 would have been very significant and the only conclusion that could be made is that there are a very significant number of subsistence fishers in Brunswick, Georgia, based upon the metrics utilized in the HHBRA.

Will the EPA utilize the income data from their website to modify the HHBRA to indicate there's a high likelihood of a significant numbers of subsistence fishers within close proximity to the LCP site?

Over and over the authors of the HHBRA utilize data from a relative small number of people. They found two Glynn County residents identifying themselves as subsistence fishers as being significant. As noted in the HHBRA:

> "Appendix B of the HHBRA - Because the ATSDR/GCHD seafood survey (DHHS, 1999) included two Glynn County residents who identified themselves as "subsistence" fishers, this risk assessment included an evaluation of hypothetical high quantity consumers of fish."

It was obvious while reading the HHBRA that the authors were going to great extent to disprove through data on income and demographics that they were not subsistence fishers. Long and detailed discussions about what was or was not a subsistence fish filled the HHBRA. It was obvious the authors lost site of the purpose of the HHBRA and that is to establish the likely amount in seafood being consumed by the local population. Furthermore the HHBRA should utilize ecological data as an indicator of potential impacts to human health and the environment. The BERA appeared to selectively exclude data that would have provided the needed information through sentinel species such as dolphins. But the plight of the dolphins and its implication to human health and the environment is not lost on researchers in coastal Georgia (Schwacke, 2012). A great deal of research and study has been conducted on the resident dolphin population. The extremely high levels noted in the dolphins led to significant concerns about the human population consuming seafood in coastal Georgia. Sampling of nine humans did take place in the area of Sapelo Island and the results were reported to the personnel from stakeholder agencies and the EPA Remedial Project Managers working on the LCP Chemicals Superfund Site (ATSDR, 2014b). Without doubt the presentation was about the LCP Site since it specifically mentioned the LCP Site 25 times. Also notable is the authors of the HHBRA use the same dolphins studies that were used to link the PCBs found in humans to the LCP Site to define Aroclor 1268 (Pulster, 2005; Pulster 2008). Actually, the studies quoted by the HHBRA authors unequivocally identified the signature as being linked with the LCP site and noted his potential to harm human health and the environment.

> "Legacy organochlorine (OC) contaminants continue to pose a **potential risk to ecological and human health in coastal aquatic ecosystems of the southeastern United States." (**Pulster, 2005)

Does the EPA agree that the definition of Aroclor 1268 presented in Pulster, 2005 and Pulster, 2008 was used in the HHBRA to define PCBs associated with the LCP site?

Does EPA agree that the same PCB profile described in Pulster, 2005 and Pulster, 2008 was used to define an associate the PCBs found in humans sampled in the Sapelo Island area (ATSDR, 2014b)?

The September 3, 2014 presentation, *Polychlorinated Biphenyls (PCBs) in Georgia Coastal Environments and Populations,* to provide helpful information about the quantities of fish consumed in coastal Georgia. Based upon the surveyed fishermen, the appropriate annual number of seafood meals to be utilized for calculations in the HHBRA would be 156 (3 meals per week X 52 weeks = 156 meals per year) rather than the 40 utilized for risk-based calculations in the HHBRA. Notable is the 8 of the people sampled were from a community of 195 people and represent over 4% of the population. The high consumption consumer might exceed 156 meals per year the EPA should consider a greater number of meals per year than 156.

Will the more current data (ATSDR, 2014b) collected in coastal Georgia rather than the discredited data that's now 20 years old (DHHS, 1999)?

Will the EPA set the annual number of seafood meals consumed by the high quantity consumer at 156 or higher?

Will the EPA increase the size of the meal to reflect those consumed by African-Americans as reported in the Public Health Assessment (ATSDR, 2014a)?

As noted in real world survey of coastal Georgia fish consumers, the following consumption habits were documented (ATSDR, 2014b). The actual seafood consumption habits are far different the assumptions used in calculating risk, which were based upon filets only, and did not consider fish egg (roe) consumption.

- Filet with skin removed -11%
- Filet with skin on – 33%
- Whole fish (gutted) – 56%
- Whole fish (not gutted) – 11%
- Fish eggs – 44%

The cultural habits and preferences for seafood preparation and consumption are discussed further in the section - Feasibility Study Comments and Questions.

A considerable effort was made to obtain the sampling results and the reported high and low level of total PCBs observed in the nine sampled human subjects (ATSDR, 2014b). The numerical total PCB data in conjunction with the total PCB data from fish and shellfish could be utilized to better set maximum health-based remedial action goals. Good data is critical to accurate assessments through the calculations used to determine risk and set remedial action goals protective of human health and the environment. Even though quantitative results were presented at the September 3, 2014 meeting, the CDC and the agencies involved in producing the data have refused to provide the information critical to formulating a robust and protective cleanup plan and remedial action. Therefore, it became necessary to submit a Freedom of Information Act (FOIA) request to the Center for Disease Control (CDC). The FOIA was submitted in a timely manner that the CDC has been excessively recalcitrant and resistant to releasing any data. An Expedited Processing Request was submitted due to the limited time provided to submit comments to the EPA on the Proposed Plan for the marsh at the LCP site. At this time, it appears the EPA public comment period on the proposed plan will close without the requested data being received for inclusion two in the public participation and comment phase of the proposed plan decision-making process. At this time it is the intent of the Glynn Environmental Coalition to continue efforts to obtain the data critical to a robust and protective Proposed Plan, Remedial Design, and Remedial Action in the LCP marsh. Furthermore, the Glynn Environmental Coalition may exercise its right to challenge the Consent Decree when entered before the court and request the data be incorporated into the Proposed Plan, Record of Decision, and the Consent Decree.

The history of the effort of the Glynn Environmental Coalition to obtain the high and low levels of total PCBs observed in the human sampling study follows:

- September 3, 2014: ATSDR presentation "Polychlorinated Biphenyls (PCBs) in Georgia Coastal Environments and Populations" takes place.
- October 17, 2014: FOIA request to CDC/ATSDR for the underlying data, reports, or other information concerning Polychlorinated Biphenyls (PCBs) in Georgia Coastal Environments and Populations, presented on September 3, 2014, by the Health Studies Branch, by Lorraine Backer and David Mellard, National Center for Environmental Health Eastern Branch, Agency for Toxic Substances and Disease Registry.

• October 22, 2014: FOIA responds acknowledging receipt – informs that they will not be able to comply within the 30 days max provided by statute (20 business days plus ten day extension).
• November 7, 2014: Glynn Environmental Coalition contacts FOIA in effort to speed up process. "Due to the need for a prompt response to Request Number: 15-00080-FOIA, we request communications concerning any charges be made via email or arrangements for pre-payment be arrange to avoid any delays."
• November 14, 2014: Update from CDC on progress of request.
• November 25, 2014: Glynn Environmental Coalition emails CDC to narrow request in effort to expedite response; Concerning the Study presented. The scope of the request can be narrowed to:
- The study Methods
- Individual analytical results with identifying information redacted
- Study maps
- Abstract or Summary Report
- Full report w/o identifying information about the participants
- References and bibliography

CDC acknowledges receipt and revised request was sent to appropriate program office for a new search – refused to provide date by which request would be completed.
• December 19, 2014: Glynn Environmental Coalition calls CDC re: FOIA request.
• January 6, 2015: Letter from CDC stating amended request was still being processed, that CDC is under backlog, and CDC cannot give a timeframe for when request would be completed.
• January 26, 2015: Glynn Environmental Coalition officially requests expedited processing for the request.
• February 2, 2015: CDC denies expedited processing request and 30-day appeal process begins.
• February 20, 2015: Appeal of denial for Expedited Processing sent to CDC FOIA Office.
• February 24, 2015: CDC Acknowledgement of Receipt of Administrative Appeal
• March 16, 2015: EPA public comment period expires on the LCP Chemicals Superfund Site Proposed Plan.

Extensive contamination of the turtle River area with dioxin and furans has been documented over a number of decades but is noticeably missing from the HHBRA. Failure to collect dioxin and furan data over a 20 year at the LCP site strains the credibility of EPA management and those conducting the investigation of the site. The EPA has clear and specific guidance for assessing risk from sites with chemicals with dioxin like and non-dioxin like risks such as PCBs and assessing the carcinogenic and non-carcinogenic risk (EPA, 2000).

> "Therefore, separate risk assessments should be conducted for the dioxin-like and nondioxin-like PCB congeners if the congener analysis indicates elevated concentrations of dioxin-like congeners relative to the typical commercial mixtures (IRIS, 1999; U.S. EPA, 1996c).
>
> Therefore, failure to evaluate the dioxin-like PCB congeners could result in underestimating cancer risk.

Dioxins have been shown to cause adverse developmental effects in fish, birds, and mammals at low exposure levels. Several studies in humans have suggested that dioxin exposure may cause adverse effects in children and in the developing fetus.

In mammals, learning behavior and development of the reproductive system appear to be among the most sensitive effects following prenatal exposure. In general, the embryo or fetus is more sensitive than the adult to dioxin-induced mortality across all species (ATSDR, 1998c, U.S. EPA, 1994a).

Environmental exposure to dioxins includes various mixtures of CDDs, CDFs, and some PCBs. These mixtures of dioxin-like chemicals cause multiple effects that vary according to species susceptibility, congeners present, and interactions.

Risk assessment of these complex mixtures is based on the assumption that effects are additive and there is some experimental evidence to support this (U.S. EPA. 2000).

Organochlorine pesticides, PCBs, dioxins/furans tend to concentrate in fatty tissues (Armbruster et al. 1989; Branson et al., 1985; Bruggeman et al. 1984; Gutenmann et al. 1992; Kleeman et al., 1986a, 1986b; Ryan et al., 1983; Skea et al., 1979; Sanders and Hayes 1988; U.S. EPA, 1995a). Many of these compounds are neither readily metabolized nor excreted and thus tend to biomagnify through the food web (Gardner and White, 1990; Lake et al., 1995; Metcalf and Metcalf, 1997; Muir et al., 1986; Niimi and Oliver, 1989; Oliver and Niimi, 1988; U.S. EPA, 1995a)."

Will the EPA utilize existing dioxin and furan in fish data and incorporated into the HHBRA risk analysis (GA DNR, 1989; GADNR, 1990; GADNR 1991; GADNR, 1992; GADNR, 1993; GADNR, 1994)? If not, why not?

<u>Remedial Investigation Comments and Questions</u>

The Remedial Investigation (RI) appears to present opining and unsubstantiated statements of fact. The quantity and quality of the data used in the RI appears to have flawed the remaining site documents. Significant data gaps need filling before a viable RI/FS can be produced for the LCP Site. As previously noted in comments from the stakeholder agencies, quantity of data should not be confused with quality of data.

<u>8.2.3.2.2 Fish Consumer Scenarios</u>

"The fish consumer scenarios are used to evaluate potential exposure to COPC in fish caught in areas of the estuary proximate to the LCP Site. Fish Consumption Guidelines (FCGs) have been established by GADNR for these areas (GANDR 2011) and these FCGs are made available to the public via the GADNR website. GADNR **also posts signage in areas subject to the FCGs to advise anglers about the potential hazards**

> **associated with consuming fish and shellfish from these areas**.(emphasis added) …. The recreational fish consumer scenario is used to evaluate exposure to recreational anglers who consistently consume fish from the LCP estuary over a long period of time (e.g., 26 meals per year for 30 years for adults). ….. The high quantity fish consumer scenario is used to evaluate exposures to individuals who consume more locally-caught fish than the typical recreational angler (e.g., 40 meals per year for 30 years for adults)."

How many signs have been posted by the GADNR in the area and where are the signs located?

Has the high quantity fish consumer meal assumption of 40 meals per year been discredited (ATSDR, 2014a)?

Are a more appropriate number of meals for the high quantity fish consumer closer to 156 per year (ATSDR, 2014b)?

8.2.3.2.3 Shellfish Consumer Scenario

> "The shellfish consumer scenario is used to evaluate potential exposure to COPC in shellfish (e.g., white shrimp and blue crab) caught in areas of the estuary proximate to the LCP Site. As described above for fish, GADNR also develops FCGs for shellfish. The shellfish consumer scenario assumes consistent and long-term consumption of shellfish directly from the LCP estuary (e.g., 19 meals per year for 30 years for adults). This scenario uses data on the amount of shellfish fish consumed by children, adolescents, and adults in the United States (EPA, 1997a)."

Does the EPA actually believe the data presented in the RI for shellfish consumption in light of catching crabs and casting for shrimp being recreational activities in coastal Georgia?

Has either the EPA or the Responsible Parties noticed all the docks along Turtle River and the crab trap lines extending onto the water?

Did the authors of the RI make any attempt to observe seafood harvest and consumption patterns along the Georgia Coast or are all the assumptions in the RI averages of the entire population of the United States?

Is the EPA aware of just how dangerous applying data from national consumption pattern is when determining risk to a local population from a locally contaminated food source?

What does the FDA recommend to do when a locally contaminated food source is encountered?

8.2.6 Characterization of Uncertainties

"… posted signage generally serve to discourage the consumption of significant amounts of seafood from the area, particularly given the number of meals assumed to be eaten consisting of fish caught in the LCP estuary;"

What is the study cited in support of the conclusion "….posted signage generally serve to discourage the consumption of significant amounts of seafood from the area…"?

Are the authors of the RI citing a study or opinion when they state "….posted signage generally serve to discourage the consumption of significant amounts of seafood from the area…"?

What is the definition of the LCP estuary and what are the geographical boundaries?

Is the "LCP estuary" defined by the extent of contamination from the LCP Site in coastal Georgia?

Does the Georgia Department of Natural Resources seafood consumption advisories encompass the entire "LCP estuary"?

Have any agencies questioned the need to extend the extent of seafood consumption advisories due to the spread of contamination from the LCP Site (ARSDR, 2014b)?

Have any recommendations or suggestions been made concerning expanding the sampling and analysis in the ecosystem and humans to more fully identify the extent of LCP Site contaminants spread (ATSDR, 2014b)?

8.3.3.4 Chemicals of Potential Concern (only mention of dioxin in the RI)

"Several additional organic chemicals were detected in a small number of samples at concentrations above the conservative EEVs, including dichlorodiphenyltrichloroethane (4,4'DDT), dioxin/furan congeners, bis(2-ethylhexyl)phthalate, 3,4-methylphenol, butylbenzylphthalate, and hexachlorobenzene. These chemicals are not quantitatively evaluated for benthic or food chain risks, but are discussed qualitatively in the OU1 BERA."

Were the chemicals detected in a small number of samples or were they identified for analysis in a small number of samples?

How many samples were taken in the LCP Site marsh, and how many were specified for dioxin and furan analysis?

What is the difference between qualitative and quantitative when establishing risk in a document like the BERA?

How was risk established through a qualitative discussion of dioxin and furan in the BERA?

Did the quality and completeness of the sampling and analysis for dioxin and furan in the RI a hindrance to evaluating risk in the BERA and HHBRA?

8.3.5.8 Piscivorous Mammals (Assessment Endpoint 7)

> "One LOE was used to evaluate the viability of piscivorous mammals foraging within the LCP estuary: HQs derived from food-web exposure models for river otters. The following is a summary of the findings:
>
> • The modeling study for river otters generated Site NOAEL HQs for Aroclor-1268 (based on a TRV for Aroclor 1254) that ranged from 0.1 to 3.9. No LOAEL-based HQ for Aroclor-1268 exceeded 1. In addition, no risk of adverse effects was predicted for mercury or lead exposures. Based on these findings, the BERA Report concluded that the potential risk to the viability of piscivorous mammalian species utilizing the LCP estuary is minimal."

Would the conclusion "….BERA Report concluded that the potential risk to the viability of piscivorous mammalian species utilizing the LCP estuary is minimal" if the dophin data was added to the BERA (Balmer, 2011; Balmer, 2013a; Balmer 2013b; Hart, 2012; Hickie, 2013; NOAA, 2013; Pulster, 2005; Pulster, 2008; Schwacke, 2012)?

What impacts to dolphin health were found in the studies (Balmer, 2011; Balmer, 2013a; Balmer 2013b; Hart, 2012; Hickie, 2013; NOAA, 2013; Pulster, 2005; Pulster, 2008; Schwacke, 2012)?

Were the health effects found in dolphins "minimal" (Balmer, 2011; Balmer, 2013a; Balmer 2013b; Hart, 2012; Hickie, 2013; NOAA, 2013; Pulster, 2005; Pulster, 2008; Schwacke, 2012)?

Were the chemicals found in the dolphins linked to the LCP Site (ATSDR, 2014b)?

Would the EPA find the absence of an indigenous species like the mink from the LCP Site significant?

Would the absence of a viable mink population indicate there is a dead zone where mink cannot survive around the LCP Site?

Would a dead zone where mink cannot survive be described by the EPA as "minimal risk"?

Would the EPA agree that the observations in the dolphin population indicate the models referenced in the RI are significantly flawed and do not agree with the observed ecological impacts? If not, why not?

What is the definition of "minimal risk" used in the RI?

Does the empirical evidence documented prove the models in the BERA and RI do not hold up when compared what is known about ecosystem on the Georgia coast and the impacts from the chemicals associated with the LCP Site (Balmer, 2011; Balmer, 2013a; Balmer 2013b; Hart, 2012; Hickie, 2013; NOAA, 2013; Pulster, 2005; Pulster, 2008; Schwacke, 2012, ATSDR, 2014b)?

Feasibility Study Comments and Questions

The Feasibility Study (FS) could not be fully evaluated for a number of reasons. Most frequently, there was an insufficient amount of information or the technologies previously identified for consideration by the stakeholder agencies were not carried through the FS evaluation process. Much of the data utilized over the 20 years the FS was produced became outdated or otherwise discredited. More current data was produced about the state and condition of the ecosystem, cultural seafood consumption preferences, and demographics of the populations most impacted from the Site. To a large extent, the current data was not incorporated into the LCP site documents, and therefore not utilized in the FS. The FS became dated, lost continuity of process over the extended number of years, and otherwise became disconnected with the realities of Site conditions and the surrounding community.

Significant deficiencies identified in the FS were:

- The seafood consumption data underlying risk calculations was discredited by ATSDR and new data became available to evaluate human exposure to Site COCs (ATSDR, 2014a; ATSDR, 2014b). The appropriate meals per year number appear to be closer to 156 than the 40 previously used. The assumption that people consume only the fish filet appears to be wrong, also. The recalculation of risk and cleanup goals could significantly change the scope of work and the technologies considered for remediation.

- Dioxin and furan chemicals were not tested for, nor did the LCP Site documents include available data. Without inclusion of the dioxin and furan data, an accurate risk assessment and remedial action plan cannot be completed. It appears the FS is based upon assumptions and not data concerning dioxin and furan, and ignores these chemicals would be additive to the cancer and non-cancer risks associated with PCBs due to the similar structure of the molecules and similar modes of action. Without the dioxin and furan data, the risk calculations can only be assumed to grossly understate the actual risks. Furthermore, with the addition of the observation that toxicity tests found unexplained levels of toxicity in the sediments, the incompleteness of the COC list might extend beyond dioxin and furans. At a minimum, the cleanup should be driven by the observed toxicity (empirical data) and not the modeling data. Empirical data always trumps modeling data. Modeling data should always be compared with the empirical data to assure the model holds up to real world conditions at the Site. When sampling and analysis fail to identify the toxic compounds, the observed toxicity should drive the remedial decision-making.

- Technologies utilizing coffer dams, sheet piling, or other methods of confining sediments during remedial activities were not evaluated, even though the stakeholder agencies had identified these as preferred (NOAA, 2000). Furthermore, utilizing a containment structure and dry excavation method would have resulted in very significant changes in the approach to the remediation. 1.) Remedial Action mobilization and access to the marsh would have been from the uplands. 2.) "Marsh Disturbance Beyond Remedy (acres)" would have been minimized, as would the potential to re-suspend COCs and distribute throughout the marsh or remediated areas. 3.) The project could be accessed from a single access point and single decontamination of equipment point established. 4.) Technologies using other than dredging could have been evaluated and implemented. Notable is coffer dams were previously used at the LCP Site during the EPA Emergency Response and Removal. The proposed remedial activities adjacent to the existing coffer dam and can be accessed from these previously remediated areas, and new temporary coffer dam structure could be built off of the existing structures.

- Areas identified as Marsh Disturbance Beyond Remedy (acres)" were not described in the FS. While the authors of the FS argue minimal disturbance is needed to preserve the marsh ecosystem, the technologies selected and the methods of implementation are prone to marsh disturbance, and all proposed remedies "disturb" more acreage than is being remediated. Significant potential to disturbed COC contaminated sediments exists but could not be evaluated due to these areas not being identified.

- The source areas were not sufficiently described and significant data gaps were evident, including but not limited to the following:

- Spartina was not analyzed, investigated, or evaluated as a source of COCs in the marsh. Spartina is the base of the marsh food chain, known to bioaccumulate COCs present from the LCP Site, and appears to be intentionally avoided for remediation. Therefore, the FS appeared to be "fatally flawed" and detached from the realities of a Spartina-based marsh ecosystem.

- The depth of sediment samples was less than the expected depth of COCs in the marsh. It appeared the sampling was conducted with a maximum remedial depth already determined.

- The depth of bioturbidation was not accurately described or quantified. The authors of the FS did not appear to grasp the importance of knowing and identifying the biota causing bioturbidation, the depth of disturbance, and the quantity of sediment brought to the surface on an annual basis. Particularly with remedies considering capping, fully quantifying bioturbidation and the potential impact to the remedy is crucial. The lack of any such evaluation of bioturididation strains the credibility of the FS and questions the FS authors understanding if a Spartina-based marsh ecosystem inhabited by burrowing biota.

- Keystone ecological species are missing from the documents used to develop the FS. These include mink, dolphin, manatee, and diamondback terrapin. Notable is the large volume of data available on the resident and transient dolphin population, which is conspicuously missing from the FS decision-making process (Balmer, 2011; Balmer, 2013a; Balmer, 2013b; Hart, 2012;

Hickie, 2013; NOAA, 2013; Pulster, 2005; Pulster, 2008; Schwacke, 2012). The LCP Site documents utilize the dolphin data to argue for sampling and analysis of only Aroclor 1268 with the dolphin studies, but failed to also realize the ecological impact or include this data in the BERA. The selective nature of data usage throughout all the documents supporting the FS is very noticeable.

- Noticeable is the FS does not contain measurable goals for assessing the recovery of the eco-system or a timeline to take goal measurements and conduct evaluations. Even more noticeable is the exclusion of the keystone species by which a remedial action would be assessed and the recovery measured. These species include mink, diamondback terrapin, and dolphin, and would cover mammal marine mammal, and reptile. An avian and herbivore indicator species should also be included. A full suite for seafood species should be analyzed on an annual basis, and whole, filet samples of juvenile and adult specimens collected and analyzed for a full suite of COCs. Dioxin and furan should be analyzed routinely at every sampling event and included on the COCs list.

- The FS does not identify actions to implement if the remedy fails to meet remedial goals on a set timeline. There is a three-part problem:

1. No measurable goals for the remedial action.
2. No timeline or measurement metrics for evaluating the remedial action.
3. No identified actions to be implemented if the remedial goals are not met by a specific date.

There were other indications the authors of the FS were significantly disconnected from the realities of the LCP Site, the conditions present on and around the Site, and in the community. These "disconnects" have the potential to be a significant threat to public health, and should not be taking lightly by the EPA or the community. When those charged with a cleanup upon which the public health and welfare is dependent show a profound lack of understanding of the situation, the EPA should move quickly and decisively to remove remedial activities from the Potential Responsible Parties and into the hands of a competent contactor. Furthermore, the EPA should order the contractor to move ahead with all due diligence and speed. The following are two examples of failures to understand the public health crisis at the LCP Site.

<u>Example One:</u>

> "All alternatives include institutional controls such as fish consumption advisories."
>
> "Providing information that helps modify or guide human behavior and enhance protectiveness at a site, such as notices, signage, and fish consumption advisories that maybe required until RAOs are met."

The FS authors suggest they can modify or guide human behavior to enhance protectiveness. Again, the authors are either disingenuous or delusional (or both) in making this statement. If human health could be protected in such a manner, the only responsible action would have been to implement these measures (information, notices, signage, and fish consumption advisories) immediately upon learning about the risk to human health. As previously noted in comments on the HHBRA, the EPA, Georgia Department of Natural Resources, and the Potentially Responsible Parties have failed, to implement the recommended action made by ATSDR over the past 20 years.

In light of the EPA, Georgia Department of Natural Resources, and the Potentially Responsible Parties failure to implement recommendations by the ATSDR to protect human health since issues 21 years ago, why should anyone believe any of these agencies or parties are capable or will now do so at this time?

Is it arrogant to suggest the Potential Responsible Parties have the power to guide or modify human behavior?

What evidence (studies or reports) are presented to suggest there has been any success in implementing Institutional Controls over the past 20 years?

What is the budget for implementing Institutional Controls until the cleanup goals are reached?

What has been the budget for these Institutional Controls over the past 20 years?

<u>Example Two:</u>

> **"Section F-1 Contents: Excerpt from GADNR Fish Consumption Advisory Threshold Memorandum**
>
> "This section is an excerpt from the GADNR technical memorandum identifying the dietary thresholds used by GADNR to establish fish consumption advisories for the TRBE. The edible fish and shellfish tissue data provided in Section F-3 are compared to these thresholds. These thresholds are not appropriate for comparing to the whole-body fish tissue data provided in Section F-4 **because anglers do not consume the whole-body fish samples, only the edible tissues."(emphasis added)**

As noted in real world survey of coastal Georgia fish consumers, the following consumption habits were documented (ATSDR, 2014b).

- Filet with skin removed -11%
- Filet with skin on – 33%
- Whole fish (gutted) – 56%
- Whole fish (not gutted) – 11%
- Fish eggs – 44%

It is clear the authors are interjecting opinion and not scientific fact into the FS for the sole purpose of reducing the apparent level of risk. Obviously, the real world scientific data from Coastal Georgia shows at least 56% of people eat the whole fish, and only around 11% eat fish in the manner described in the FS. Also noticeably missing from the LCP Site records are data about fish eggs, which are high lipid seafood prone to accumulating site COCs. Interestingly, fish eggs were sampled and the results reported in the 2008 ATSDR Health Consultation for the Arco Quarry (ATSDR, 2008). In addition to Aroclor 1268 being found in the fish eggs, it was present at a level an order of magnitude (X10) than in fish tissue. Other notable coastal Georgia delicacies are smoked mullet and mullet roe, which also deserve sampling and analysis for the Site COCs, and are noticeable missing from Site documents. But the point of the above discussion and data is to clearly identify the need to accurately identify the human health risks at the LCP Site and produce a FS that stands up to the real world facts as they are. Currently, the situation is an imminent risk to human health and the environment, and the EPA and PRPs have failed to produce a viable remedial plan to rectify the situation.

Does the EPA agree the authors of the FS are interjecting opinion with statement like, "because anglers do not consume the whole-body fish samples, only the edible tissues"?

Does the EPA agree that people in coastal Georgia do eat the whole fish, and not just the filet?

Does the EPA realize the fish eggs potentially have significantly higher levels of LCP Site COCs than the fish filet?

Did the FS or other LCP Site documents evaluate the consumption of fish eggs or other high lipid content seafood?

Was the EPA aware of the cultural seafood consumption practices in coastal Georgia such as fish eggs (roe), whole fish, and other methods of cleaning and preparation? If not, why not?

Would the findings about cultural seafood consumptions patters be significant and warrant inclusion in the HHBRA?

Proposed Plan Comments and Questions

The following comments are on the full Proposed Plan. The quote from the proposed plan is followed by the comment or question for the EPA to respond to in the Responsiveness Summary for the LCP Chemicals Superfund Site for Operable Unity One, the Marsh. In addition, as a community member and one of the persons who has used Purvis Creek for recreation, and intends to continue to use Purvis Creek for recreation, the area needs to be cleaned up, made safe for all uses, and the seafood be safe to catch and consume.

Introduction

> "The Plan summarizes information that can be found in greater detail in the RI/FS reports and other documents, which present the results of sampling conducted from 1995 through 2012."

Was there a compelling reason for the EPA to exclude data collected after 2012? Why not include data to date?

<u>Site History</u>

> "The Dixie Paint and Varnish Company operated a paint and varnish manufacturing facility at the Site from 1946 to 1956."

Honeywell contends in their Fact Sheet the paint contained Aroclor 1268. What documentation does the EPA have to support the contention that Aroclor 1268 was an ingredient in paints manufactured by Dixie Paint and Varnish Company?

<u>Public Participation</u>

> "The Region also publishes the quarterly *Brunswick Environmental Cleanup Newsletter* to update the public on the cleanup progress at the LCP Chemicals Site and the three other Superfund sites in the Brunswick area."

The Glynn Environmental Coalition is very concerned about the public participation process at the LCP Chemicals Superfund site. At the December 4, 2014 EPA public meeting Ms. Angela Miller, EPA Community Involvement Coordinator, stated that the mailing list for the LCP site have been deleted. In light of this statement please list the dates of the quarterly *Brunswick Environmental Cleanup Newsletter*, and the number of people the newsletter was sent to. In addition, I asked Ms. Miller why I had not received a copy of Proposed Plan via postal mail. Evidently this was due to the EPA community participation mailing list being deleted. Ms. Miller indicated that there was a considerable number of newsletters sent by the EPA being returned as undeliverable. During the same period, the Glynn Environmental Coalition (GEC) has been sending out Technical Assistance Reports (TAR) produced under the EPA Technical Assistance Grant (TAG) program for the LCP Chemicals Superfund site. Like the EPA, the GEC does receive a few newsletters back after each mailing, which we used to update the mailing list and keep the current as is required by postal regulations for organizations using a bulk mailing permit. By doing so we enable to maintain the continuity of the TAG mailing list even though many of the people have moved over the 18 years we've administered the TAG.

Please describe the EPA procedures for maintaining their community participation program for the LCP Chemicals Superfund site, including:

Does the EPA maintain a mailing list for the LCP Chemicals Superfund site?

Does the EPA use the returned newsletters to update the LCP Site mailing list?

If not, how does the EPA maintain the mailing list and keep it current, and maintain continuity in community participation at the LCP Site?

How many EPA quarterly newsletters have been sent out over the past three years at each mailing, and what were the dates of the mailings?

When the LCP Proposed Plan was released, how many were mailed to the community?

In light of the report from Ms. Miller that the LCP mailing list have been deleted, how did the EPA formulate the mailing list to send out the Proposed Plan?

Was the Proposed Plan sent to all the people who have signed up for on the EPA's mailing list for the LCP Site? If not, how many (what number) of the people who have previously signed up to the LCP Site EPA mailing list did not receive the Proposed Plan mailing?

What are the EPA's plans to assure future continuity in the mailing list for public participation at the LCP Chemicals Superfund site?

Is it possible for the EPA to recover the deleted mailing list and updated with returned newsletters or other mailings concerning the LCP Chemicals Superfund site, or other Superfund sites, in Glynn County?

How many addresses were on the list that was deleted?

Does the EPA keep a record of the Glynn County Superfund Site the person has signed up to receive information about from the EPA?

Can the EPA assure that there will be a mailing list maintained for the community participation in the decision-making process for the citizens of Glynn County from now and into the future, and will be available for the other propose plans and records of decisions that will be coming up for the Superfund sites in Glynn County?

The EPA provided the documents and materials in support of the LCP Chemicals Superfund Site Proposed Plan to the repository at the Brunswick Library on December 3, 2014. The EPA held their public meeting the following day on December 4, 2014. This resulted in giving the community one day to review 8700 pages. Taking into account the average work days eight hours, this would've left 3.3 seconds per page for the public to read the document. This does not include the time it would take to prepare comments for submittal at the EPA public meeting.

Does the EPA feel it is appropriate to allow 3.3 seconds per page for the public to read the documents the EPA provided?

How much time does the EPA feel is appropriate for the community to review 8700 pages, prepare comments, and be ready for the EPA Public Comment Meeting to submit comments to be taken down by a court recorder?

Was the purpose of releasing 8700 pages 24 hours before the Official EPA Public Comment Meeting to thwart any meaningful community comments at the Official EPA Public Comment Meeting?

How many requests for another EPA public comment meeting have been received by the EPA?

Have the Congressional representatives of Glynn County requested the EPA provide a public comment meeting for the LCP Chemicals Superfund site marsh proposed plan?

Does EPA feel it is appropriate to limit participation in decision-making process to those with access to the internet, email, or innate ability to write comments to participate in the decision-making process?

<u>1.3 Setting and Hydrodynamics of the Marsh</u>

> "The intertidal vegetated marshes are a net depositional zone for suspended sediments due to the low current velocities and presence of vegetation within those areas. "Net depositional" means that particles are more likely to settle than to scour from the area."

What data is presented in support of this statement? How much sediment has accumulated or eroded from the LCP Site?

If the LCP marsh has a net deposition of particles, what is the annual deposition rate?

> "The Turtle River water surface elevation can vary in excess of nine ft during a tidal cycle."

Are these tides consistent with an area with "low current velocities"?"

What are the tidal ranges for the St. Simons sound estuary under storm conditions such as a northeast wind?

How does the wind effect currents in the estuary and on the tidal flats?

<u>Figure 1, Figure 2</u>

Why is the Salt Dock area not shown as part of the LCP Site?

How were the LCP Site boundaries shown in Figure 2 determined?

With the boundaries of the LCP Chemicals Superfund site determined by land ownership or by the extent of the contamination?

Are Superfund sites boundaries supposed to be determined by the extent of contamination or the surveyed ownership lines?

Past Actions

> "The approximately 13 acres of highly contaminated marsh sediments were excavated, backfilled with clean fill, and re-vegetated with native marsh grasses."

Why is marsh removal and re-vegetation with native marsh grasses not part of the Proposed Plan?

Were coffer dams used during past actions?

If coffer dams were used in the past, why was this technology not considered in the Feasibility Study?

What was the decision-making matrix that leads the exclusion of all technologies deployed from the uplands or utilizing dry excavation techniques?

> "As a result of these removal actions, the remaining contamination in OU1 is considered to be low-level threat waste to be addressed by this Superfund remedial action."

Is there only "highly contaminated…" and "low level threat…" wastes at the site?

Who made the determination that the remaining wastes are "…low-level threat waste"?

What is the definition of low-level threat waste?

What is the difference between waste and COCs?

How does the EPA quantify low-level threat waste and what is the threat level to humans and wildlife?

What are the numerical difference between low level, mid-level, and high level wastes for the Chemicals of Concern (COC) at the LCP Chemicals Superfund site?

Where can the low, mid, and high levels of waste threats definitions be found in EPA rules and regulations?

Mr. Franklin Hill of the Superfund branch at EPA Region 4 has publicly stated in an Atlantic Journal-Constitution Op-Ed that there is only residual contamination at the LCP Chemicals Superfund site.

How does the EPA defined residual contamination and how is that numerically quantified?

Would contamination that has resulted in documented sick Dolphins within this estuary qualify under the definition of residual contamination?

2.0 SITE CHARACTERISTICS

> "As a result of the RI studies and risk assessments, a limited number of contaminants were identified as **contaminants of concern** (COCs) (emphasis added) that warranted further evaluation and remedial action under CERCLA."

Were the COCs that have synergistic and similar modes of action considered, or were COSs like dioxin/furan excluded, even if they should be considered along with PCBs?

Were all PCBs included or were the others excluded and only Aroclor 1268 included?

If so, why?

If not, why is the data missing?

2.1 Distribution of COCs in Sediment

> "Figures 3 through 6 show the COC concentrations in surface sediment samples, defined as samples with a starting depth at the sediment surface and collected from the interval of 0-to-6 inches, or 0-to-1 ft below the sediment surface; the 0-to-1 ft interval was used when upper 6-inch intervals were unavailable."

Fiddler Crabs mix sediment up to 36 inches below ground.

Why was sampling limited to 6 or 12 inches?

Was the EPA or the PRPs unaware of the biosphere depth in the estuary that inhabits the marsh sediments?

Did the US Fish and Wildlife Service (USFWS) advise the EPA that sampling to only 12 inches was insufficient to delineate contamination in the LCP Marsh (USFWS, 1996)?

Did the USFWS advise the EPA to conduct whole body fish analysis?

Has the EPA assured whole body fish analysis has been conducted?

Did the USFWS note the Spartina root bed extends to 18 inches and COCs at this depth might have a higher propensity to be bioavailable (USFWS, 1996)?

How would the greater bioavailability of COCs at a depth of 18 inches affect a cap remedy?

Did the USFWS recommend in 1996 the EPA total "dioxin" levels reported for the nature and extent of the contamination within the marsh?

> "Two reference locations were used during the various ecological studies. One (Troup Creek) was located about 4.3 miles from the marsh, on the eastern side of the Brunswick

> Peninsula, and the other west of Sapelo Island, over 25 miles from the Brunswick area. The purpose of these reference locations is to collect data from areas presumed to have been uncontaminated with the LCP Chemicals Site, for the sake of comparison."

In light of the data collected since 2012, does the EPA agree the Reference Stations are likely, if not confirmed, to be within the radius of contamination deposition from the LCP Site (ATSDR, 2014b)?

If the EPA disagrees, what data does the EPA have to support continued use of the Reference Stations?

> "Methylmercury (MeHg) was measured at over 150 sediment sampling locations throughout OU1. The MeHg in sediment ranged from below detection limits to 0.05 mg/kg, with a mean concentration of 0.005 mg/kg. Only a small fraction of the mercury in sediment was present as MeHg. Because MeHg readily bioaccumulates, it is more prevalent and toxic in biota tissue and toxic than elemental mercury."

Does the EPA agree that there is only one sample of methylmercury for approximately every 4.5 acres of the LCP Site march? (640 acres/ 150 samples)

Is the reason a small fraction of the mercury was methylmercury because it readily bioaccumulates? If not, why not?

<u>Figure 4 – Aroclor 1268 Concentrations in LCP Marsh Sediments</u>

Why is there a high level of Aroclor 1268 reported at the Salt Dock in Figure 4?

Does this indicate dioxin/furan could have been transported to this area since the EPA and Honeywell argue the PCBs and dioxin/furan are co-located?

> "The distribution of COCs clearly points to the Eastern Creek, LCP Ditch and portions of Domain 3 Creek near the Site Uplands as major contaminant sources. In addition the Eastern Creek and LCP Ditch are more directly influenced by tidal action that can mobilize contaminants into Purvis Creek and beyond, much more so than contaminants in vegetated wetland marsh areas with very low tidal energy."

> "The high levels of MeHg and PCBs (primarily Aroclor 1268) detected in fish fillets resulted in a fish consumption advisory for the Turtle River/Brunswick Estuary (TRBE) issued by the Georgia Department of Natural Resources from 1995 to the present."

Why were fish not tested around the LCP Site and in Turtle River like they were at Lake Onondoga (whole, filet, juvenal and adult) and include dioxin and furans (USEPA, 2002)?

<u>What Is Risk and How Is it Calculated?</u>

> "A Superfund BRA is an analysis of the potential adverse effects caused by hazardous substances at a site under current and future conditions in the absence of any actions to control or mitigate these effects."

If the BRA is an analysis of current and future conditions, why does it use data 20 years old (DHHS, 1999)?

Did the ATSDR Public Health Assessment discredit the study used to establish the annual number of seafood meals used to determine risk (ATSDR, 2014a)?

<u>Exposure Assessment</u>

> "The high quantity fish consumer scenario evaluated exposures to individuals who consume more locally-caught fish, assumed to be 40 meals per year, than the typical recreational anglers."

If the BRA is an analysis of current and future conditions, why is it using data 20 years old (DHHS, 1999)?

Did the ATSDR Public health Assessment discredit the use of DHHS, 1999 with the following statement?

> "And finally, it should be noted that African-Americans made up only 4% (9 out of 211) of the people who participated in the study. African-Americans make up 26% of the population of Glynn County and nearly 40% of the population within four miles of the LCP Chemicals Site. Therefore, African-Americans are underrepresented in the Brunswick fish study.
> A study of fishers along the Savannah River showed that African-Americans
> • Eat more fish meals per month than whites (average, 5.4 vs. 2.9),
> • Eat slightly larger portions than whites (average, 13.7 oz. vs. 13.1), and
> • Eat higher amounts of fish per month than whites (average, 75 ounces vs. 41 ounces).
> It is reasonable to assume that the fish-eating habits of African-Americans in Brunswick, Georgia, are similar to African-Americans along the Savannah River. Therefore, African Americans who fish along the Turtle River are likely to have higher exposure to mercury from eating fish than whites. The results of the Brunswick fish study should not be applied to African Americans in the Brunswick area for those reasons." (ATSDR, 2014a)

Did the Sapelo Study of Chemicals in seafood consumer find an annual consumption rate closer to 156 meals per year (ARSDR, 2014b)?

> "Because risk assessments are designed to be conservative to ensure that risk management strategies will be protective of human health, as well as consistent with EPA requirements, two types of exposure scenarios were analyzed in the Baseline HHRA to assess the range of potential risk: the reasonable maximum exposure (RME), which

estimates the highest level of human exposure that could be reasonably expected to occur, and the central tendency exposure (CTE or "typical") scenario. Cancer and non-cancer health hazards were assessed under both these scenarios."

Does the EPA now realize the Baseline HHRA is seriously flawed?

Toxicity Assessment

"The Baseline HHRA provided detailed discussions on the toxicity of mercury and PCBs (Aroclor 1268) and their associated uncertainties."

Why is the additive effect from dioxin and furan not included in the discussion of associated uncertainties (EPA, 2000)?

Does EPA guidance instruct to include dioxin and furan in the analysis of the carcinogenic and non-carcinogenic effects of PCBs like Aroclor 1268 and the other PCBs found at the LCP Site (EPA, 2000)?

"Cancer risks: Cancer risks are only associated with Aroclor-1268."

Was the dioxin and furans known to be present in seafood and sediment evaluated in included in the Toxicity Assessment?

Does the EPA acknowledge the above statement is incorrect and there are cancer risks associated with dioxin and furans found in the LCP Site area and in Turtle River (EPA, 1996)?

"Non-cancer health hazards: The calculated RME non-cancer HIs ranged from 0.7 for consumption of shellfish to 8 for the child high quantity fish consumer. Adult recreational anglers would have a HI of 3 and the adult high-quantity fish consumer would have a HI of 5, both of which exceed EPA's acceptable level. Calculated CTE hazards exceeding the acceptable level are for child consumption of fish and shellfish and the high quantity fish consumer. The calculated RME non-cancer HIs ranged from 1 for the adolescent to 5 for the child."

Were this levels of risk based upon the discredited 40 meals per year (DHHS, 1999; ATSDR, 2014a)?

"There were no unacceptable health hazards or risks associated with lead or PAHs. The only two contaminants that contribute to unacceptable human health risks are mercury and Aroclor 1268."

Was dioxin furan data available to the EPA utilized in the Toxicity Assessment and factored into this statement?

Does the existing dioxin/furan data exceed the EPA allowable levels in seafood (GA DNR, 1989; GADNR, 1990; GADNR 1991; GADNR, 1992; GADNR, 1993; GADNR, 1994)?

> "For example, Table 3 compares the current average edible tissue concentrations from the Baseline HHRA with the calculated protective tissue goals for the adult recreational fish/shellfish/clapper rail consumer at a HI of 1 and cancer risks at 1E-04 and 1E-06. These numbers and others from the Baseline HHRA and those calculated as part of the State of Georgia fish consumption advisory for the TRBE can be used for future monitoring to achieve edible tissue levels that will be protective of human health."

Is Table 3 based upon the discredited data (DHHS, 1999; ATSDR, 2014a)?

4.2 Ecological Risks

> "The COCs quantitatively evaluated in the BERA included mercury, Aroclor 1268, lead, and PAHs."

Was available dioxin and furans data included in the evaluation? If not, why not?

> "The results from tests on amphipods that burrow into the sediment indicated toxic effects in up to 85 percent of sediment samples from the LCP Chemicals marsh. However, toxicity was also observed in several reference samples from Troup Creek. Toxicity tests with grass shrimp (that generally float above the sediment) showed toxic effects in up to 69 percent of the samples, including those from reference stations. A detailed analysis of potential causes of the toxicity was presented in the BERA, along with the conclusion that, in addition to the COCs in sediment, various other non-measured factors likely influenced the tests, such as sulfide and organic carbon content, redox conditions, sediment pH, grain size, and potential pathogens in the test chambers."

In light of the toxicity sampling by the US National Park Service at Fort Puaski and Cumberland Island that did not find toxicity, does the sampling from the Reference Stations indicate they are toxic due to chemicals from the LCP Site, or failure of the lab to use appropriate protocols?

When questionable results are encountered, it is appropriate to repeat the test or do an analysis of the sediment to identify the toxic chemical or pathogen?

Did the EPA find any significance in the sediments being toxic to both burrowing and non-burrowing biota?

> "Table 4 summarizes the SEC concentrations based on the five statistical measures for the most sensitive toxicity tests (amphipod survival and grass shrimp embryo development). Although the data indicates a wide range of effect concentrations with low accuracies (**generally much less than a 50% chance of being correct** (emphasis added)), the SECs chosen were among the more reliable and accurate for these sensitive endpoints. Other test endpoints such as reproductive response and embryo hatching

> resulted in higher SECs and even less accuracy. The SECs presented in Table 4 provide the basis for development of preliminary remedial goals."

Is it scientifically acceptable to the EPA to use data with a less than 50% chance of being correct to establish preliminary remedial goals?

Is the likelihood of the Proposed Plan working less than 50%?

If the data used has a likelihood of being less than 50% correct, how can a Proposed Plan based upon that data be any more correct or likelihood of success be anymore than "less than 50%"?

When questionable science is encountered, is the normal procedure to repeat the experiment to find the variables causing the low chance of being correct?

Is it correct to conclude the EPA saying the data being used has much less than a 50% chance of being correct?

> "The LOAEL HQs suggest persistent low-level chronic effects."

What are the persistent low-level chronic effects expected to be present in the LCP Site marsh?

> "None of the LOAEL HQs were exceeded for the redwing blackbird, marsh rabbit, raccoon and river otter, indicating minimal risks."

How many marsh rabbit, raccoon and river otter were sampled?

How many studies documented the population dynamics of marsh rabbit, raccoon and river at the LCP Site?

If none were conducted, why not?

Does the EPA have any empirical evidence or baseline monitoring to compare with the LOAEL HQs?

How does the EPA propose to evaluate the Remedial Action?

Has any data been collected to evaluate the upcoming Remedial Action or is all the data presented for the decision-making based upon models and assumptions?

If models and assumptions, when will baseline data (Baseline monitoring data) be collected for evaluating the remedy effectiveness?

Table 5. Summary of Risks to Wildlife Receptors

> "Diamondback terrapin None < 1 < 1 None"

Please explain how the EPA can conclude a HI or HQ less than 1 when empirical data reported reproductive failure (EPA, 1997)?

Uncertainties Related to the BERA

> " The evaluation of potential adverse effects to the benthic invertebrate community relied on hundreds of site-specific acute and chronic toxicity test measurements using both indigenous and laboratory-cultured organisms. The OU1 BERA notes that the development of PRGs for the protection of benthic invertebrates is "**highly uncertain with poor accuracies"** (emphasis added) and that "only conservative assumptions were used" for this purpose;"

Why is data that is "highly uncertain with poor accuracies" being used in the proposed Plan?

When science is unreliable, is the appropriate action to repeat the data collection, analysis, or experiment?

Uncertainties Related to the Dioxin and Furans

Why does this section ignore and not report the large volume of dioxin and furan data available for this area of Turtle River (GA DNR, 1989; GADNR, 1990; GADNR 1991; GADNR, 1992; GADNR, 1993; GADNR, 1994)?

> "During the remedial design, areas outside the remediation footprint chosen will be sampled for dioxins/furans to ensure that any unacceptable risk is addressed."

Why does the EPA feel it is so important to avoid dioxin and furan sampling until after the Proposed Plan, Record of Decision, and the Consent Decree is entered into and approved by the court?

How will the EPA know what the "Remedial Footprint" is without the dioxin and furan data?

Would the dioxin and furan data be additive to the PCB risk assessment data for humans and wildlife?

How could this dioxin and furan data significantly change the Proposed Plan?

Could the unexpected toxicity observed be due to the very toxic dioxin and furan?

Could dioxin and furan be the variable that is accounting for the "…generally much less than a 50% chance of being correct…" noted in Section 4.2 Ecological Risks?

If not, what is the factor causing the large disparity?

As noted in the section of the LCP Site Proposed Plan, "Relationship between Dioxin/Furans and Chlor-alkali Sites"**:**

> "At the Onondoga Lake Site, while dioxins/furans were determined to be both human health and ecological risk drivers as a result of fish consumption in Onondaga Lake,…"

Since this Onondaga Lake site is being used as a comparison site and as an argument to NOT test for dioxin and furan until after the Record of Decision and Consent Decree, why did the EPA NOT use the human health and ecological risk drivers found at Onondaga Lake in the LCP Site in Brunswick Risk Assessments?

Why did the EPA NOT do the same sampling at the LCP Site in Brunswick as at the Onondaga Lake Site?

Unlike Lake Onondaga, was dioxin and furan found widely distributed in the Turtle River and the St. Simons Sound estuarine system sediments (USEPA, 1995b)?

<u>Relationship between Dioxin/Furans and Chlor-alkali Sites</u>

The EPA's interjection of the Onondaga Lake LCP Site near Syracuse New York into the decision-making process for the LCP Site located in Brunswick Georgia presents an interesting situation. In order to compare and contrast the two sites the similarities and differences will need to be identified. In addition when similarities are found it will be interesting to note if the lessons learned have been applied to the LCP site in Brunswick Georgia.

> " The dioxins/furans and Aroclor 1268 sediment data collected to date show a strong relationship between dioxins/furans and Aroclor 1268 concentrations. A similar relationship was found at the Onondoga Lake and Ninemile Creek Superfund sites in upstate New York. **At the Onondoga Lake Site, while dioxins/furans were determined to be both human health and ecological risk drivers as a result of fish consumption in Onondaga Lake,** (emphasis added) they were not found to be widespread in lake sediments. The New York State Department of Environmental Conservation (NYSDEC) sediment screening criteria for protection of wildlife and humans from bioaccumulation were used as comparison values for the dioxins/furans. The areas where dioxins/furans are elevated are generally co-located with areas that exceeded the lake cleanup criteria for other contaminants, which are being addressed under the lake remedy.
>
> There was a similar situation with the Ninemile Creek Site and a similar approach was used. Dioxins/furans also contributed to Site risks but they exceeded the NYSDEC bioaccumulation screening criteria at only three of the 194 creek sample locations. These locations would be remediated based on concentrations of other detected contaminants (e.g., mercury).

Therefore, Site preliminary remediation goals for dioxins/furans in sediments were not developed."

At the Onondaga Lake site EPA found the dioxin and furans were a human health and ecological risk driver. But at the LCP site in Brunswick Georgia dioxin has not been considered as a risk driver in either the ecological or human health risk assessments.

Why has the EPA failed to apply the risk found at the LCP site in New York to the ecological and human health baseline risk assessments for the LCP site in Brunswick, Georgia?

Are the two Sites really similar and if so in what ways?

- **What are the similarities or differences in salinity ranges at the Lake Onondaga site when compared to the Brunswick Georgia site?**
- **What is the title range at the Lake Onondaga New York site compared to the Brunswick Georgia site?**
- **What is the rainfall at the Lake Onondaga New York site when compared to the Brunswick Georgia site?**
- **One of the water temperature ranges at the Lake Onondaga New York site when compared to the Brunswick Georgia site?**
- **What is the annual temperature ranges for the Lake Onondaga New York site when compared to the Brunswick Georgia site?**
- **Are the fish species found at Lake Onondaga New York site the same as those found at the Brunswick Georgia site?**
- **Does Lake Onondaga in New York have a Spartina marsh like at the LCP site in Brunswick Georgia?**
- **What is the water current speed in Ninemile Creek in New York and the current speed in Purvis Creek at the LCP site in Brunswick Georgia?**
- **Do people fish from Lake Onondaga in New York and from Turtle River near the LCP site in Brunswick Georgia?**

To my knowledge, the only similarity between the Lake Onondaga New York site in the Brunswick Georgia LCP site is that people consume fish from both the lake and Turtle River.

Does the EPA agree the only similarity between Lake Onondaga and Turtle River is people catch and eat fish from both locations?

Does the EPA agree the dioxin and furan is more widely distributed in the Turtle River area than at Lake Onondaga, and the EPA's data documents this dispersion (USEPA, 1995b)?

Will the EPA add the risks found from dioxin and furan in fish to the BERA and HHBRA for the LCP Site in Brunswick, Georgia? If not, why not?

As noted in the BERA:

> In addition, Aleiandro et al., (2006) states that some of the Clapper Rail effects observed may be attributable to "organochlorides other than PCBs (e.g. dioxins)." Kannan et al., (1998a,b) also associate dioxin-like compounds to the Site. These papers suggest dioxins/furans may be associated with the Aroclors at LCP. The magnitude of the TEC dioxin concentrations particularly in Eastern Creek suggests collocated contamination with Aroclor 1268. In the absence of TEC-dioxin data in sediment elsewhere in the estuary or in biota samples, the potential contribution of TEC dioxins to existing risk is unknown.

Does the noted uncertainty, "…the potential contribution of TEC dioxins to existing risk is unknown", still exist?

Since the EPA has proposed a plan to remediate the LCP site in Brunswick Georgia without any dioxin furan data or any dioxin furan risk calculations for wildlife or people who consume the seafood, will the risk data from the Lake Onondaga site be used at the Brunswick Georgia site to better estimate the additive risk of dioxin and furan to the existing PCB contamination?

5.0 REMEDIAL ACTION OBJECTIVES (RAOS) AND PRELIMINARY REMEDIAL GOALS (PRGS)

The most conservative potential sediment PRG would be one which protects humans at an upper bound excess cancer risk of 1E-06, based on consumption of fish with Aroclor 1268. However, this would require a sediment clean up goal of 0.037 mg/kg, which would result in destruction of almost 700 acres of **otherwise functioning marsh** (emphasis added) and was therefore rejected as a potential goal.

What data does the EPA have to support the statement that the LCP Site is "…otherwise functioning marsh…"?

> "Similarly, if a 1E-05 cancer risk were used as the basis for establishing a sediment goal, the Aroclor 1268 concentration would need to be 0.37 mg/kg, which would result in unwarranted harm to approximately 586 acres or 77% of the entire marsh."

How large is the entire marsh in the Turtle River (St. Simons Sound)?

Would remediating to 1E-05 result in removing the entire marsh, or just the contaminated areas adjoining the LCP Site?

> "Early in the feasibility study process, EPA and GAEPD concluded that achievement of a mercury SWAC PRG of 1 mg/kg for the entire marsh would not be appropriate."
> And,
> " EPA and GAEPD reached this conclusion after thoroughly evaluating whether the removal or treatment of sediment contaminants in 33 of the 81 acres would cause more long-term ecological harm than no active remedial action, since such a large remedial foot print would cause widespread physical damage to habitat and species."

How did the EPA and GAEPD come to the conclusion that achievement of a mercury SWAC PRG of 1 mg/kg for the entire marsh would not be appropriate and what were the decision-making metrics?

What timeframe did the EPA and GAEPD consider long-term ecological harm?

How long will the mercury remain in the marsh and continue the methylation process?

How long will it take to remove the mercury contaminated marsh and complete the restoration process?

When comparing leaving the mercury in place and the continued methylation process or removing the mercury contaminated sediments and restoring the marsh, which alternative results in the shortest impact to the marsh and estuarine system when considered over the long-term?

6.0 DESCRIPTION OF ALTERNATIVES

The proposed plan section concerning the description of alternatives is more notable for what's missing than what is discussed. In 2000, a preliminary restoration scoping analysis was conducted for the LCP Chemicals Superfund site marsh (NOAA, 2000). During this analysis many more remedial technologies were examined them were mentioned in the feasibility study or brought forward in the Proposed Plan. The technologies considered include, but are not limited to, the following:

- Controlled placement of multilayers with or without geosynthetic fabrics
- Solidification or stabilization biomechanically mixing the upper layers of the sediments with stabilizing or solidifying agents, which typically uses cement bentonite or polymer-based materials. The discussion of this technology include the use of containment structures such as coffer dams and caissons.
- Bioremediation by stimulating indigenous microbial activity with nutrients are introduction of design microorganisms. This technology was not found applicable for Mercury and PCBs. Also, consistent mixing and Spartina marsh would've been difficult.
- Mechanical including clamshell buckets, backhoes, bucket ladder, or similar technology. The drawbacks identified where the need for construction of berms, walls and silk curtains, and proper installation would require an effort similar to a dry excavation. But it was noted the typical drawbacks to dredging including site access and adequate space for sediment handling are not in issue for the LCP site.
- Dry excavation with a berm damn or dike marsh areas, followed by draining excavation is sediments and backfill, moving the berms and replanting was identified as a technology suitable for the site. Furthermore the technology was identified as being more efficient, reduced loss of sediments, and complete removal of the contamination when compared with dredging techniques.

The failure of the proposed plan to evaluate technologies utilizing coffer dams, sheet piling, berms, or dikes is an oversight that brings in the question the completeness of the Proposed Plan. Notable is the number of similar structures within the area of the LCP site. These include the aeration basin at the adjoining pulp and paper mill, the dikes at the Andrews island dredge spoil area, and even the existing road out to Purvis Creek at the LCP site. Furthermore, it is evident that the authors of the Feasibility Study failed to see the usefulness of the existing roadway (LCP Site causeway) as a significant containment structure within the area needing remediation. Placement of a coffer dam or sheet piling would be a very doable technology for the LCP site. The area can be accessed from the uplands, the spoils brought to the uplands, and a single point of entry and exit established for the purpose of decontamination.

What was the rationale of the EPA in excluding technologies that utilized coffer dams sheet piling or similar technologies to confine the area, reduce sediment dispersion, and facilitate dewatering of the sediments needing removal?

Did the EPA compare technologies utilizing dredging versus coffer dams or sheet piling?

If the EPA did compare the technologies, why were technologies that left contamination in place or that have a high probability of recent spending sediments selected?

Did the EPA consider accessing the marsh via an upland route instead of by barge?

Was a barge used previously for the EPA Emergency Response and Removal or was the marsh accessed via the uplands?

7.1 Overall Protection of Human Health and the Environment

> "These reductions are likely to be observed only after several years post remediation (i.e., after a few generations of fish lifespans)."

How many years is "…after a few generations of fish lifespans"?

Which fish species are being used to determine "fish lifespans"?

7.3 Long Term Effectiveness and Permanence

> "Sediment removal, sediment capping, and to a lesser degree thin-cover placement have been found reliable and effective at sites similar to the LCP Chemicals marsh."

What example of a similar marsh or estuary with *Spartina alterniflora* is being referenced as the example? Do the "…sites similar to the LCP Chemicals marsh" have tides in excess of 9 feet, Fiddler crabs, and other burrowing birds and animals?

> "Materials for sediment capping and thin-cover placement will be sized to ensure protection against erosion and scour. However, the thin cover is not an armored contaminant barrier. Based on several case studies, some burrowing and other types of

> biological activities will occur in the thin-cover layer, but are not expected to adversely impact its effectiveness in reducing exposures to the benthic community. Monitoring and maintenance will be performed as necessary to ensure long-term remedy effectiveness."

How will the cap reducing exposures to the benthic community with the 200 Fiddler Crabs per square meter, documented in the BERA, burrowing to a depth of 36 inches?

Will the cap be compromised by approximately 8% per year?

If not by approximately 8% per year, how much sediment will be brought to the surface each year by the 200 Fiddler Crabs per square meter?

What are the other burrowing animals that will further compromise the cap materials?

> "Monitoring and maintenance will be performed as necessary to ensure long-term remedy effectiveness."

How often is the monitoring schedule to take place at the site and what will this entail?

How often will maintenance be performed and how will the areas be accessed?

Will funding be in place to conduct the monitoring and maintenance or will it be contingent upon approval and appropriations by the PRPs or in the case of the EPA, Congress?

How much money will be set aside for the monitoring and maintenance program?

Does the EPA the description of the monitoring and maintenance program in detail is critical to the success of the remediation?

If so, please do describe in detail and include in Responsiveness Summary and the Record of Decision.

> "Where alternatives include sediment capping and thin-cover placement, long-term COC toxicity and mobility are reduced by creating a clean sediment surface through burial with clean materials."

How can the EPA claim "…long-term COC toxicity and mobility are reduced by creating a clean sediment surface through burial with clean materials", when the marsh is occupied by 200 Fiddler Crabs per square meter burrowing to a depth of 36 inches?

<u>7.4 Reduction of Toxicity, Mobility, or Volume (TMV) through Treatment</u>

> "In Purvis Creek, In Purvis Creek, there is evidence that mercury fish and shellfish tissue concentrations have decreased over time.."

Does the EPA have whole fish sampling in support of the statement, "In Purvis Creek, there is evidence that mercury fish and shellfish tissue concentrations have decreased over time," or is this an opinion or based upon data that is not comparable or obtained by different sampling and analysis methods?

What is the source of the data of "evidence" the EPA is citing?

What are the two data sets being compared to conclude there is evidence of COC reduction in fish and shellfish to make this conclusion and where can they be found in the LCP Site documents?

Was the data collected used to conclude there is evidence of a reduction using EPA approved protocols?

Was both whole fish and filet sampling conducted?

> "The thin cover is not intended to function as an absolute contaminant barrier, but as a layer which will stimulate ongoing natural recovery processes. Therefore, some possible bioturbation beyond the cover depth is not expected to diminish the effectiveness of this remedy and would not preclude its beneficial use as a component of a protective remedy."

Where can the EPA's calculations for the bioturbation beyond the cover depth be found in the Feasibility Study?

Is the thin cover based upon data or what is expected?

Who is defining "what is expected" and what are their credentials to do so?

How much sediment is brought to the surface each year by 200 Fiddler Crabs per square meter?

What is the volume of sediment brought to the surface each year by the other burrowing animals in the marsh?

> "Capping and thin-cover placements, which leave contaminant material in place, isolate COCs and reduce bioavailability and mobility through burial with clean material."

How can the EPA claim "… isolate COCs and reduce bioavailability and mobility through burial with clean material.", when the marsh is occupied by 200 Fiddler Crabs per square meter burrowing to a depth of 36 inches?

What is the cap annual failure rate calculated by the EPA, and the associated reintroduction of COC to the biota?

"Residual risks posed by COCs left un-remediated are addressed through ICs (including permit requirements, which are already in place to limit use or future activities in the LCP Chemicals marsh and fish consumption advisories) and LTM."

A discussion of the EPA's history of implementing Institutional Controls is in the comments submitted on the HHBRA and incorporated herein by reference.

7.5 Short-term Effectiveness

> "These negative impacts primarily relate to extensive heavy equipment used for dredging and the transport of contaminated sediments through the community to an uplands disposal facility and clean material transport to the Site."

Was on-site treatment, the use of coffer dams of sheet pilling considered by the EPA or stakeholder agencies (USFWS, 1996)?

Were coffer dams used by the EPA during the removal action for the LCP Site dump during the Emergency Response and Removal Action?

Are coffer dams a proven technology at the LCP Site?

Did the EPA use coffer dams during the Emergency Response and Removal Action to keep sediments from entering the marsh and spreading further?

Did the EPA use coffer dams during the Emergency Response and Removal Action to control and contain tidal waters?

7.6 Implementability

8.0 PROPOSED CLEANUP LEVELS

> "The derivation of the ecologically-based CULs was also a complex process that involved consideration of the ecological relationship of the affected areas of remedy implementation to the surrounding habitat, the recovery potential of the affected ecological receptors, and the magnitude of current and predicted future effects of the COCs on local populations within the marsh."

Were ecological receptors such as dolphin, manatee, diamondback terrapin and mink considered in the derivation of the ecologically-based CULs? If not, why not?

Does the EPA realize the dolphin, manatee, and mink are either species very susceptible to the COCs from the LCP Site, protected species, or both susceptible and a protected species?

Was the EPA aware of the large amount of peer reviewed journal data concerning COCs in dolphins and people prior to the release of the Proposed Plan (ATSDR, 2014b)?

> "Further, it was clear that not all discontinuous or isolated sediment locations that exceed PRGs could be removed without causing more harm than benefit."

Where can the "Harm/Benefit" analysis be found?

What was the timeline utilized to evaluate harm verses benefit?

Was short-term harm and restoration evaluated against the alternative of no action and long term risk to the ecosystem and human health?

What were the specific decision-making metrics used for the harm/benefit analysis?

What technologies were explored for these isolated high levels of COCs areas or areas that exceed remedial action goals?

> "In accordance with the EPA's risk assessment guidance, the initial PRGs were based on the most conservative estimates, using the most sensitive sediment toxicity receptors and test endpoints. The range of mercury SECs was between 1.4 and 145 mg/kg. For Aroclor 1268, the SEC range was between 4 and 420 mg/kg. Similarly for PAHs and lead, the SEC concentrations ranged over an order of magnitude."

Did it occur to anyone in any of the stakeholder agencies that there is likely another COC causing the observed extreme range in toxicity?

> "After evaluating each alternative that was presented in the FS, it was determined that the proposed CULs would still provide substantial protection to the benthic community without undue harm to the existing marsh, especially in combination with a robust monitoring program."

What does a "robust monitoring program" entail?

How often would the "robust monitoring program" be conducted?

Where are the sampling locations for the "robust monitoring program"?

When would the sampling and analysis start, and how long would the "robust monitoring program" be continued under the Record of Decision and Consent Decree?

Will dolphins, mink, and manatees be part of the "robust monitoring program"?

Has the EPA or the PRPs done the needed baseline monitoring over the past 20 years needed for a "robust monitoring program"?

If not, why should anyone believe the EPA or PRPs will start to do so now?

What does the EPA or PRPs have to show for work over the past 10 years to indicate they are competent to perform a "robust monitoring program"?

Has the EPA or PRPs collected the baseline data for a monitoring program? If not, why not?

Does a monitoring baseline need several data points to track changes, which requires several sampling events over time to establish the baseline?

> "Each of the SWAC and benthic community proposed CULs are expected to result in the attainment of the RAOs. In addition, surface water criteria that are identified as chemical-specific ARARs are expected, over time, to be attained as a result of dredging and capping of contaminated sediments."

What is the time period for attainment of the RAOs?

When will the effectiveness of the remedy be evaluated?

> "Where CULs may not be achieved and residual risks in some areas may occur, CERCLA and the NCP requires monitoring no less than every five years after implementation of the final remedy. Given that COCs will be left in place, a robust monitoring program, with triggers for additional actions, will be implemented as part of the selected remedy for OU1 to monitor and ensure success of the selected remedy."

What is the time period, specific goals, the decision-making metric by which the goals will be determined, and follow-up that will be implemented if goals are not reached?

Why are the goals not specified in the Proposed Plan?

Why are the goal decision-making metric by which the goals will be determined and triggers for additional action implementation, or the actions to be taken, not specified in the Proposed Plan?

Why is there no baseline monitoring to use in establishing goals to be reached?

Why has there been no baseline monitoring over the past 20 years?

Will the time period to reach the goals be specified in the Record of Decision?

What specific actions will be taken if the goals are not reached?

Has an analysis been conducted to compare the cost of conducting a remediation that will have a higher likelihood of success verses the cost of a "…robust monitoring program…" and the highly likely need to remobilize and conduct another remedial action due to minimal removal and significant unknown toxicity found during toxicity tests?

Will multiple remedial action shave a greater impact on the marsh than one comprehensive removal action and restoration?

9.0 SUMMARY OF THE PREFERRED ALTERNATIVE

A summary of preferred alternative cannot be conducted due the data deficiencies identified in the comments on the Baseline Ecological Risk Assessment and the Human Health Baseline Risk Assessment, and failure to evaluate all the technologies previously identified for inclusion in the Feasibility Study.

10.0 COMMUNITY PARTICIPATION

Please see comments concerning the Public Participation section of comments on the Proposed Plan for identified deficiencies and recommendations.

References

Armbruster, G., K.L. Gall, W.H. Gutenmann, and D.J. Lisk. 1989. Effects of trimming and cooking by several methods on polychlorinated biphenyls (PCBs) residues in bluefish. *J. Food Safety* 9:235-244.

ATSDR (Agency for Toxic Substances and Disease Registry). 1998c. *Toxicological Profile for Selected PCBs*. U.S. Department of Health and Human Services, Public Health Service, Atlanta, GA.

ATSDR (Agency for Toxic Substances and Disease Registry) 2008. Health Consultation, Arco Quarry Fish Tissue Sampling, Brunswick, Glynn County, Georgia

ATSDR (Agency for Toxic Substances and Disease Registry) 2014a. U.S. Department of Health and Human Services, Public Health Service, Division of Community Health Investigations.. "Public Health Assessment, LCP Chemicals Superfund site and Adjacent Areas." Brunswick, Georgia, EPA Facility ID: GAD099303182.

ATSDR (Agency for Toxic Substances and Disease Registry). 2014b. Polychlorinated Biphenyls (PCBs) in Georgia Coastal Environments and Populations. Lorraine C. Backer, L.C., Mellard, D.,

Balmer, B. C., L. H. Schwacke, R. S. Wells, R. C. George, et al. 2011. Relationship between persistent organic pollutants (POPs) and ranging patterns in common bottlenose dolphins (*Tursiops truncatus*) from coastal Georgia, USA. *Science of the Total Environment* 409: 2094-2101.

Balmer BC, Schwacke LH, Wells RS, Adams JD, et. al, (2013a). Comparison of abundance and habitat usage for common bottlenose dolphins between sites exposed to differential anthropogenic stressors within the estuaries of southern Georgia, U.S.A. Marine Mammal Science, 29(2): E114–E135 (April 2013) DOI: 10.1111/j.1748-7692.2012.00598.x

Balmer, B. C., Wells, R. S., Schwacke, L. H., Schwacke, J. H., Danielson, B., George, R. C., ... & Zolman, E. S. (2013b). Integrating multiple techniques to identify stock boundaries of common bottlenose dolphins (Tursiops truncatus).Aquatic Conservation: Marine and Freshwater Ecosystems.

Branson, D.R., T.I. Takahashi, W.M. Parker, and G.E. Blau. 1985. Bioconcentration kinetics of 2,3,7,8-tetrachlorodibenzo-p-dioxin in rainbow trout. *Environ. Toxicol. Chem.* 4:779-788.

Bruggeman, W.A., A. Opperhuizen, A. Wijbenga, and O. Hutzinger. 1984. Bioaccumulation of superlipophilic chemicals in fish. *Toxicol. Environ. Chem.* 7:173-189.

Bursian, S.J, et al. 2006. Dietary Exposure of Mink (*Mustela vision*) to Fish From the Housatonic River, Berkshire County, Massachusetts, USA: Effects on Organ Weights and Histology and hepatic concentrations of Polychlorinated Biphenyls and 2,3,7,8- Tettrachlorodibenzo-p-dioxin Toxic Equivalence. Environmental Toxicology and Chemistry, Vol. 25, No. 6, pp. 1541–1550, 2006

Bursian, S.J., et al. 2013. Dietary Exposure of Mink (*Mustela vison*) to Fish from the Upper Hudson River, New York, USA: Effects on Reproduction and offspring Growth and Mortality. Environmental Toxicology and Chemistry, Vol. 32, No. 4, pp. 780–793, 2013

Department of Health and Human Services (DHHS). (1999). Final Report: Consumption of Seafood and Wildgame Contaminated with Mercury, Brunswick, Glynn County, Georgia, July.

Gardner, A.M. and K.D. White. 1990. Polychlorinated dibenzofurans in the edible portion of selected fish. *Chemosphere* 21 (1-2): 215-222.

Georgia Department of Natural Resources. 1989. Results of Dioxin (TCCD) and Furan (TCDF) Analysis on Fish Tissue Composites From the Turtle River

Georgia Department of Natural Resources. 1990. Results of Dioxin (TCCD) and Furan (TCDF) Analysis on Fish Tissue Composites From the Turtle River

Georgia Department of Natural Resources. 1991. Results of Dioxin (TCCD) and Furan (TCDF) Analysis on Fish Tissue Composites From the Turtle River

Georgia Department of Natural Resources. 1992. Results of Dioxin (TCCD) and Furan (TCDF) Analysis on Fish Tissue Composites From the Turtle River

Georgia Department of Natural Resources. 1993. Results of Dioxin (TCCD) and Furan (TCDF) Analysis on Fish Tissue Composites From the Turtle River

Georgia Department of Natural Resources. 1994. Results of Dioxin (TCCD) and Furan (TCDF) Analysis on Fish Tissue Composites From the Turtle River

Gutenmann, W.H., J.G. Ebel Jr., H.T. Kuntz , K.S. Yourstone, and D.J. Lisk. l. 1992. Residues of p,p' DDE and mercury in lake trout as a function of age. *Arch. Environ. Contam. Toxicol.* 22:452-455.

Hart, L. B., Rotstein, D. S., Wells, R. S., Allen, J., Barleycorn, A., Balmer, B. C., & Schwacke, L. H. (2012). Skin Lesions on Common Bottlenose Dolphins (Tursiops truncatus) from Three Sites in the Northwest Atlantic, USA. PloS one, 7(3), e33081.

Honeywell. January 2015a. "Fact Sheet for the LCP Chemical Site."

Honeywell. February 2015b. "Fact Sheet for the LCP Chemical Site."

Hickie, B. E., Cadieux, M. A., Riehl, K. N., Bossart, G. D., Alava, J. J., & Fair, P. A. (2013). Modeling PCB-Bioaccumulation in the Bottlenose Dolphin (Tursiops truncatus): Estimating a Dietary Threshold Concentration. Environmental science & technology, 47(21), 12314-12324.

Kleeman, J., J.R. Olson, S.S. Chen, and R.E. Peterson. 1986a. Metabolism and disposition of 2,3,7,8-tetrachlorodibenzo-p-dioxin in rainbow trout. *Toxicol. Appl. Pharmacol.* 83:391-401.

Kleeman, J., J.R. Olson, S.S. Chen, and R.E. Peterson. 1986b. 2,3,7,8- tetrachlorodibenzo-p-dioxin metabolism and disposition in yellow perch. *Toxicol. Appl. Pharmacol.* 83:402-411.

Lake, J.L., R. McKinney, C.A. Lake, F.A. Osterman, and J. Heltshe. 1995. Comparison of patterns of polychlorinated biphenyl congeners in water, sediment, and indigenous organisms from New Bedford Harbor, Massachusetts. *Arch. Environ. Contamin. Toxicol.* 29 (2): 207-220.

Marinucci, A.C.; Bartha R.,1982. Biomagnification of Aroclor 1242 in Decomposing Spartina Litter. Appl Environ Microbiol. 1982 Sep; 44(3): 669–677

Metcalf, T.L. and C.D. Metcalf. 1997. The trophodynamics of PCBs, including mono- and non-ortho congeners, in the food web of North-Central Lake Ontario. *Sci. Total Environ.* 201: 245-272.

Mrozek, E.; Seneca, E.; Hobbs, L. 1982. Polychlorinated biphenyl uptake and translation by Spartina alterniflora loisel. Water, Air & Soil Pollution; Jan 1982, Vol. 17 Issue 1, p3

Muir, D.C.G., A.L. Yarechewski, A. Knoll, and G.R.B. Webster. 1986. Bioconcentration and disposition of 1,3,6,8-tetrachlorodibenzo-p-dioxin and octachlorodibenzo-p-dioxin by rainbow trout and fathead minnows. *Environ. Toxicol. Chem.* 5: 261-272.

Niimi, A.J., and B.G. Oliver. 1989. Distribution of polychlorinated biphenyl congeners and other halocarbons in whole fish and muscle among Lake Ontario salmonids. *Environ. Sci. Technol.* 23: 83-88.

NOAA Central Administrative Support Center, Preliminary Restoration Scoping Analysis, LCP Chemicals Superfund Site, Brunswick, Georgia. May 12, 2000

NOAA Fisheries. "Marine Mammal Protection Act (MMPA)" 2013. http://www.nmfs.noaa.gov/pr/laws/mmpa/.

NOAA Fisheries. "2013 Bottlenose Dolphin unusual Mortality Event in the Mid-Atlantic" http://www.nmfs.noaa.gov/pr/health/mmume/midatldolphins2013.html.

NOAA Fisheries. "Morbillivirus Infection in Dolphins, Porpoises, and Whales" 2013. http://www.nmfs.noaa.gov/pr/health/mmume/midatlantic2013/morbillivirus_factsheet2013.pdf.

NOAA Fisheries. "Coastal Bottlenose Dolphin Stocks" 2013. http://www.nmfs.noaa.gov/pr/health/mmume/midatlantic2013/bnd_stocks.jpg.

NOAA Fisheries Office of Protected Resources. "Bottlenose Dolphin (Tursiops truncatus)" 2013. http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/bottlenosedolphin.htm.

Oliver, B.G. and A.J. Niimi. 1988. Trophodynamic analysis of polychlorinated biphenyl congeners and other chlorinated hydrocarbons in the Lake Ontario Ecosystem. *Environ. Sci. Technol.* 22: 388-397.

Pulster, E. L., K. L. Smalling, and K. A. Maruya. 2005. Polychlorinated biphenyls and toxaphene in preferred prey fish of coastal southeastern U.S. bottlenose dolphins (*Tursiops truncatus*). *Environmental Toxicology and Chemistry* 24(12): 3128-3136.

Pulster, E. L. and K. A. Maruya. 2008. Geographic specificity of Aroclor 1268 in bottlenose dolphins (*Tursiops truncatus*) frequenting the Turtle/Brunswick River Estuary, Georgia (USA). *Science of the Total Environment* 393: 367-375.

Sanders, M. and B.L. Hayes. 1988. Distribution pattern and reduction of polychlorinated biphenyls (PCB) in bluefish *(Pomatomus saltatrix lineaus)* fillets through adipose tissue removal. *Bull. Environ. Contam. Toxicol.* 41: 670-677.

Skea, J.C., H.A. Simonin, E.J. Harris, S. Jackling, and J.J. Spagnoli. 1979. Reducing levels of mirex, arochlor 1254, and DDE by trimming and cooking Lake Ontario brown trout (*Salmo trutta L.*) and smallmouth bass (*Micropterus dolomieui lacepede*). *J Great Lakes Res.* 5(2):153-159.

Schwacke, Lori H., Eric S. Zolman, Brian C. Balmer, Sylvain De Guise, R. C. George, Jennifer Hoguet, Aleta A. Hohn, et al. 2012. Anaemia, hypothyroidism and immune suppression associated with polychlorinated biphenyl exposure in bottlenose dolphins (tursiops truncatus). Proceedings.Biological Sciences / the Royal Society 279 (1726): 48.

Schubauer, J. P., and C. S. Hopkinson. 1984. Above- and belowground emergent macrophyte production and turnover in a coastal marsh ecosystem, Georgia. Limnol. Oceanogr. 29:1052-1065.

U.S. EPA. 2000. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 2: Risk Assessment and Fish Consumption Limits. EPA-823-B-00-008. U.S. Environmental Protection Agency, Office of Water, Washington, DC. 383 pp.

U.S. EPA (Environmental Protection Agency). 1994a. *Estimating Exposure to Dioxin-Like Compounds* (External review draft). (3 volumes). EPA/600/6-88/005Ca, 005Cb, 005Cc. Office of Research and Development, Washington, DC. June.

U.S. EPA (Environmental Protection Agency). 1995a. *Guidance for Assessing Chemical Contamination Data for Use in Fish Advisories, Volume 1: Fish Sampling and Analysis.* Second Edition. EPA 823-R-95-007. Office of Science and Technology, Washington, DC. September.

U.S. EPA (Environmental Protection Agency). 1995b. Community Based Environmental Project, Brunswick Community Study 12/95. Dioxin/Furans Toxic Equivalency Values (TEQ) in River Sediments.

U.S. EPA (Environmental Protection Agency).1997. Ecological Assessment, Ecological Risk Evaluation of the Salt Marsh and Adjacent Areas at the LCP Superfund Site, Brunswick, Georgia

U.S. EPA (Environmental Protection Agency). 2006a. Identification of the manufacturing processes conducted at the site that could potentially form dioxins and furans.

U.S. EPA (Environmental Protection Agency). 1998a. ENFORCEMENT ACTION MEMORANDUM: Determination of an Imminent and Substantial Threat to Public Health and the Environment at the Riverside Boulevard Area. Emergency Response Branch . June 30, 2008. http://www.epa.gov/region05/cleanup/dowchemical/pdfs/dowchemical_aoc_20080715_attachment_c.pdf

U.S. EPA (Environmental Protection Agency). 2002, Lake Ononaga Remedial Investigation, Appendix G1 Tables G1-111 to G1-115

U.S EPA (Environmental Protection Agency). 2003 Non-Dioxin-Like PCBs: Effects and Consideration in Ecological Risk Assessment (NCEA-C-1340 ERASC-003) June 2003

U.S. EPA (Environmental Protection Agency). 2006a. Identification of the manufacturing processes conducted at the site that could potentially form dioxins and furans. http://yosemite.epa.gov/r10/cleanup.nsf/9f3c21896330b4898825687b007a0f33/25e3e8edb66bd9a688257142006a3860/$file/1225775.pdf

U.S. EPA (Environmental Protection Agency), Region 4. November 2014. Superfund Proposed Plan: LCP Chemicals Superfund Site Operable Unit 1.

U.S. EPA (Environmental Protection Agency). 2015. EJView. ACS Summary Report, LCP Chemicals . http://epamap14.epa.gov/ejmap/entry.html

USFWS (Fish and Wildlife Service), Review of the Draft Report on the Ecological Assessment: Ecological Risk Evaluation of the Salt Marsh and Adjacent Areas at the LCP Chemicals Superfund Site. November 21, 1996.

Weis J. S., P. Weis, 2003. Metal uptake, transport and release by wetland plants: implications for phytoremediation and restoration. Environment International 30 (2004) 685– 700.

Windham, L., J.S. Weis; P. Weis. 2001. Patterns and processes of mercury release from leaves of two dominant salt marsh macrophytes, Phragmites australis and Spartina alterniflora. Estuaries December 2001, Volume 24, Issue 6, pp 787-795.

.

GEC
Glynn Environmental Coalition

P.O. Box 2443
Brunswick, GA 31521
912-466-0934
gec@glynnenvironmental.org

February 13, 2015

Mr. Galo Jackson, Ms. Shelby Johnston
Remedial Project Manager
South Superfund remedial Branch
U.S EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303-8960

Mr. Jackson and Ms. Johnston,

The following comments and attachments are submitted as part of the Public Comment period for the LCP Chemicals Superfund Site (LCP Site)Proposed Plan for the marsh, Operable Unit One (1), located in Brunswick, Glynn County, Georgia.

Attached, please find:

- Health Consultation, ORGANIC CHEMICAL RESIDUE IN SCHOOLYARD SOILS, GOODYEAR AND BURROUGHS-MOLLETTE ELEMENTARY SCHOOLS AND RISLEY MIDDLE SCHOOL AND EDO-MILLER PARK/LANIER FIELDCITY OF BRUNSWICK, GLYNN COUNTY, GEORGIA, MARCH 22, 2005 (ATSDR, 2005)
- Wind Rose for Glynn County (GLYNCO, Wind Rose)
- Polychlorinated Biphenyls (PCBs) in Georgia Coastal Environments and Populations, September 3, 2014, by Lorraine C. Backer, PhD; David Mellard, PhD; Health Studies Branch, National Center for Environmental Health, Eastern Branch, Agency for Toxic Substances and Disease Registry (Backer, 2014)

The study cited in the ATSDR Health Consultation (March 22, 2005) is, "Determination of Toxaphene in Brunswick (GA) Public Access Area Soils by Immunoassay and Gas Chromatography, October 23, 2002" (Frohlick, Maruya, 2002), will be sent via postal mail for the LCP Site Administrative Record. The report cited by ATSDR also contains information about the specific species (congeners) of PCBs detected at the schools and playgrounds across the Brunswick Peninsula.

10989563

Comments and Questions

The quality of a Superfund Site cleanup or containment is contingent upon an understanding about how chemicals and other contaminates were released into the environment, and other environmental factors. The LCP Site air monitoring detected PCBs at the fence line. The sampling of soils at schools and playgrounds found a gradient of PCBs across the Brunswick Peninsula (ATSDR, 2005; (Frohlick, Maruya, 2002). PCB contaminated sediments with the congeners associated with the LCP Site were found in a wide radius in sediments and biota (Backer, 2014).

- **Did the EPA evaluate air transport and deposition of PCBs from the LCP Site as part of the LCP Marsh Remedial Investigation, Baseline Ecological Risk Assessment, or Human Health Baseline Risk Assessment?**
- **Does the EPA agree that the gradient of PCBs documented across the Brunswick Peninsula is a result of air releases from the LCP Site? If not, what is the mechanism for the formation of a PCB gradient of congeners associated with the LCP Site?**
- **Does the EPA agree that the gradient of PCBs found across the Brunswick Peninsula likely extends into the marsh?**
- **Does the EPA agree that the gradient of PCBs found across the Brunswick Peninsula likely extends into the marsh and likely the deposition is according to wind direction?**
- **Does the EPA agree that the gradient of PCBs found across the Brunswick Peninsula likely extends to Sapelo Island and is an explanation for how PCBs associated with the LCP Site crossed tidal nodes, rivers, and other natural hydrological boundaries? If not, what is the explanation for the PCBs crossing hydrological boundaries and barriers?**
- **Have PCBs been found past the Reference Stations at Troup Creek and Crescent River?**
- **Were dioxin and Furan Found at the Reference Stations? If so, could the source be the LCP Site?**
- **Could the source of observed toxicity at the Reference Stations be from the air transport of toxic compounds from the LCP Site? If not, why not? What additional efforts were made to identify the cause of toxicity at the Reference Stations?**
- **Did the EPA look at nearby toxicity sampling stations used by the United States National Park Service at Cumberland Island and Fort Pulaski? If not, why not?**

- **Will the EPA consider using the sampling stations used by the United States National Park Service at Cumberland Island and Fort Pulaski as the Reference Stations for the LCP Site?**
- **Did the EPA ever consider the Reference Stations were within the area where chemicals and other compounds were released from the LCP Site? If not, why not?**
- **If the EPA did evaluate air transport and deposition, what was the estimated volume of PCBs distributed via air transport?**
- **Did the EPA evaluate the extensive record of air releases recorded by the Georgia Environmental Protection Division and documented in the LCP Site Removal Administrative Record?**
- **Does the Georgia Environmental Protection Division a documented air releases in the LCP Site Removal Administrative Record discuss the high temperature of the gasses released? What was the composition of the gasses released?**
- **Can heavier than air chemicals like PCBs and Dioxin/Furan be air transported in a release of heated gasses?**
- **What is the EPAs explanation for the gradient of PCB congeners associated with the LCP site that extend out from the Site?**

Thank you for your attention to this comments and we will look forward to your response.

Sincerely,

Daniel Parshley, Project Manager

FACHHOCHSCHULE
MANNHEIM
Hochschule für Technik und Gestaltung

Determination of Toxaphene in Brunswick (GA) Public Access Area Soils by Immunoassay and Gas Chromatography

Final Report

by

Marco Fröhlich

Fachhochschule für Technik und Gestaltung
Mannheim, Germany

and

Dr. Keith A. Maruya

Skidaway Institute of Oceanography
10 Ocean Science Circle, Savannah, GA 31411 USA

23 October 2002

10989566

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES