U.S. ENVIRONMENTAL PROTECTION AGENCY



SUPERFUND PROPOSED PLAN FACT SHEET TERRY CREEK SUPERFUND SITE **OUTFALL DITCH/OPERABLE UNIT 1 (OU1)**

Brunswick, Glynn County, Georgia

June 2015

Introduction

The U.S. Environmental Protection Agency (EPA) invites comments on the proposed cleanup plan for the Outfall Ditch/Operable Unit 1 (OU1) of the Terry Creek Superfund Site located in Brunswick, Georgia. OU1 is one of three operable units that comprise the Terry Creek Superfund Site. Operable Unit 2 (OU2) addresses dredge spoils and upland soils, and Operable Unit 3 (OU3) addresses Terry and Dupree Creeks.

The Hercules Brunswick pesticide plant discharged untreated wastewater through the Outfall Ditch into Dupree Creek from 1948 until 1980. EPA proposed placing the site on the National Priorities List (NPL)¹ in 1997 because of pesticide-contaminated groundwater, soil, sediment, and fish tissue.

In 1999, EPA entered into an agreement with Hercules to conduct a Remedial Investigation/ Feasibility Study (RI/FS) for the Site. Hercules submitted a RI/FS work plan to EPA in 2001. However, work on the project was suspended shortly thereafter due to concerns regarding the analytical method for toxaphene, and interpretation of the toxicity of toxaphene breakdown products.

Progress has been made on these issues since 2001, however consensus has yet to be reached. Due to the relatively small size of OU1 and the existing elevated toxaphene concentrations present in the OU1 sediments, EPA and Hercules agreed to perform a Focused RI/FS that may allow for the selection of a final remedy at OU1 that is not reliant on the new toxaphene analytical methodology or toxicity reference value development.

An outgrowth of this agreement was EPA's approval of the Outfall Ditch/OU1 work plan in January 2012. The field investigations described in the work plan

Community Involvement Coordination

Public Comment Period

Dates: June 29, 2015 – August 14, 2015 Purpose: To solicit comments on the Proposed Cleanup Plan

Public Meeting

July 30, 2015

Time: 6:00 p.m. – 7:30 p.m.

Place: Brunswick Glynn County Library

208 Gloucester Street Brunswick, GA 31520

Purpose: To discuss the Proposed Cleanup

Plan for Outfall Ditch/Operable Unit 1 (OU1) of the Terry Creek Superfund

Site.

EPA Contacts

Direct questions or written comments to: Scott Martin, Remedial Project Manager

Angela Miller, Community Involvement Coordinator Superfund Remedial Branch U.S. EPA

> Atlanta Federal Center 61 Forsyth Street SW Atlanta, Georgia 30303 404-562-8561

were performed between 27 February and 21 August 2012 under EPA and Georgia Department of Environmental Protection (EPD) oversight.

The conclusions drawn from the 2012 field investigations form the basis for the remedy proposed

¹ All terms in bold typeface are defined in the Glossary attached to this Proposed Plan.

for the Outfall Ditch presented in this **Proposed Plan**. This **Proposed Plan** presents the summary of the information from the focused RI/FS and presents the remedial alternatives that were evaluated to address the risk posed by the Outfall Ditch/OU1 contamination, and provides the rationale for EPA's preferred alternative. EPA, the lead agency, in consultation with Georgia EPD, the support agency, will select a remedy to address the Outfall Ditch contamination after reviewing and considering the comments submitted during public comment period. Subsequent Proposed Plans will be prepared for OU2 and OU3 in the future.

This Proposed Plan was developed in compliance with the requirements of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Section 300.430(f)(2) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 117(a). This Proposed Plan presents a summary of the RI/FS data and other documents included in the Site Administrative Record. These documents may be found at the Information Repository for the Site, which is available at the Brunswick/Glynn County Regional Library, 208 Gloucester St., Brunswick, Georgia.

EPA in consultation with the State, may modify the Preferred Alternative or select another response action presented in this Plan based on new information or public comments received during the public comment period. Therefore, the public is encouraged to review and comment on all the alternatives presented in this Proposed Plan.

SITE LOCATION AND DESCRIPTION

The Terry Creek Site consists of a salt water tidal creek and marsh system contaminated with toxaphene caused by discharges from the former Hercules pesticide plant. The Site is located on the Atlantic coast directly east of the city of Brunswick, near the confluence of Terry Creek, Dupree Creek, and the Back River, north of the Torras Causeway and east of U.S. Highway 17 (Figure 1).

SCOPE AND ROLE OF PROPOSED REMEDY

The proposed remedy is intended to be the final cleanup decision for the OU1: Outfall Ditch. Cleanup decisions for OU2: Dredge Spoils and Uplands soils, and OU3: Terry and Dupree Creeks will be made at a later date. The Preferred Alternative identified in this Proposed Plan, or one of the other measures considered in this plan, is necessary to protect public health, welfare, and the environment from actual or threatened releases of hazardous substances into the

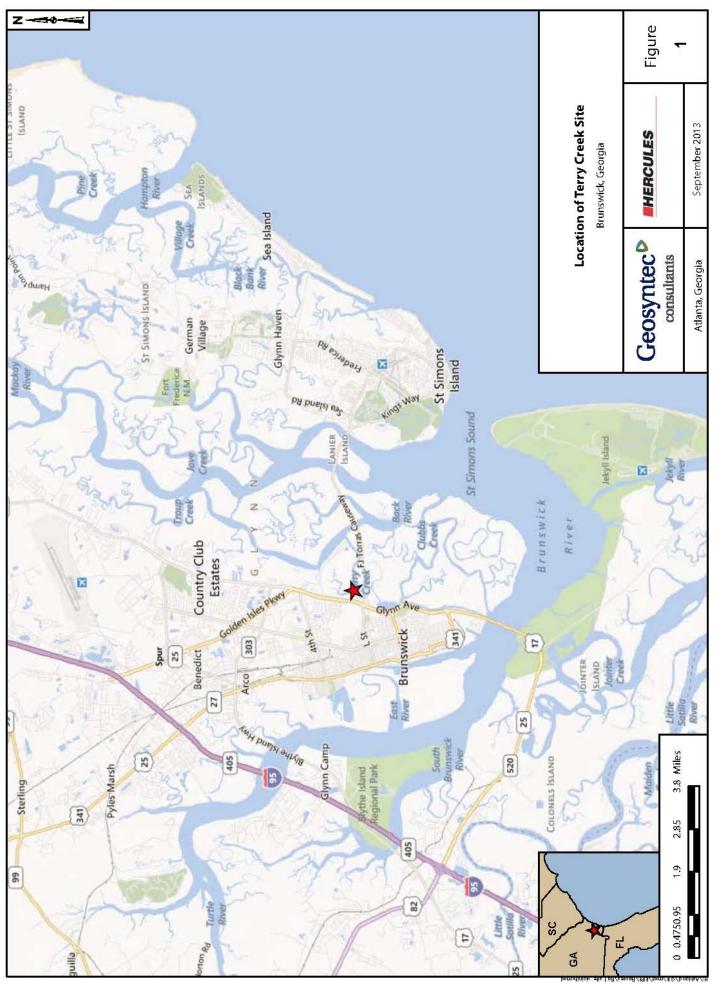
environment. Figure 2 provides a site layout and description of the operable units.

FOCUSED REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

The rationale for prioritizing actions at OU1 was presented in the Site Management Plan. In summary, Georgia EPD has issued a fish consumption advisory due to toxaphene and toxaphene residues in fish tissue for Terry and Dupree Creeks. These upper-trophic level receptors (game fish) are potentially exposed to bioaccumulated toxaphene concentrations from lower-trophic level food/prey biota. These lowertrophic level (benthic and aquatic) receptors are exposed to toxaphene-impacted sediments in the Outfall Ditch and Terry and Dupree Creeks. There are four potential sources of toxaphene and toxaphene residues to the Terry and Dupree Creek system. These areas include the Outfall Ditch and the three dredge spoil areas (Main, Riverside, and Carter's Island); the Outfall Ditch exhibited the highest relative concentrations of toxaphene at the Terry Creek Site. Therefore, prioritizing and implementing remedial actions at the Outfall Ditch will address a significant source of toxaphene to the creek system and its ecological receptors.

Since the science regarding toxaphene and its breakdown products continues to evolve and because of the size and complexities of OU2 and OU3, the implementation of the RI/FS at these operable units is contingent upon gaining consensus on the toxicity of toxaphene breakdown products for both human and ecological receptors. However, due to the relatively small size of OU1 and the existing elevated toxaphene concentrations present in the OU1 sediments following the removal action, a Focused RI/FS that may allow for the selection of a final remedy at OU1 that is not reliant on the new toxaphene analytical methodology or toxicity reference value development was implemented at OU1. The approach is appropriate for developing remedial action objectives and cleanup goals defined for OU1 as a narrative performance-based goal (i.e., protectiveness achieved via pathway elimination) rather than numerical riskbased concentrations.

This approach is consistent with EPA guidance documents, particularly with the Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (EPA, 2005) and the Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites (EPA, 2002). Collectively, these guidance documents highlight the consideration of separating the management of source areas with the





most elevated concentrations of chemicals of potential concern (COPCs) from other, less concentrated areas. The use of an iterative adaptive management approach provides more certainty for future risk management decisions.

There is no universal remedy applicable to all sediment sites and many risk management decisions for sediment sites include a combination of remedial options. For the Terry Creek Site, one interim management option that has already been implemented was hot-spot dredging in the Outfall Ditch and Terry and Dupree Creeks. A substantial decrease in fish tissue concentrations was observed following these removal actions. The selected remedy for the Outfall Ditch should complement the dredging previously performed in Terry and Dupree Creeks, with the overall goal of achieving further reductions in fish tissue concentrations. As noted in the National Research Council report on the management of PCBcontaminated sediments (NRC, 2001), fish tissue concentrations are the most relevant means of measuring exposure of receptors to contaminated sediments.

SITE HISTORY

The Brunswick plant has been in continuous operation from 1911 to the present, producing a variety of rosin-based resins from wood resins. Between 1948 and 1980, Hercules produced toxaphene, a chlorinated pesticide, and the primary contaminant of concern at the Terry Creek Site. Untreated wastewater from the production of toxaphene was discharged through the Outfall Ditch into Dupree Creek until 1972. In 1972, a wastewater treatment plant was installed, and the amount of toxaphene in the discharge was reduced significantly. In 1976, an under/overflow weir was built in the Outfall Ditch to prevent floating discharge. In 1980, toxaphene production was discontinued.

Portions of Terry Creek and Dupree Creek have been dredged by the United States Army Corps of Engineers beginning in 1938, prior to the production of toxaphene, and periodically thereafter until 1989. Dredge spoils were disposed in an area located adjacent to the Torras Causeway beside Terry Creek (Trailer Park Dredge Spoil Area); on the north side of Terry Creek at the confluence of Terry and Dupree Creeks (Main Dredge Spoil Area); at the Riverside Dredge Spoil Area; and on Carter's Island.

From August 1999 to April 2000, Hercules conducted a removal action to remove sediment containing the highest concentrations of toxaphene. Contaminated sediments in the pre- and post-weir Outfall Ditch, the mouth of the Outfall Ditch, the confluence area of Terry and Dupree Creeks, and north Dupree Creek were targeted. Approximately 16,800 cubic yards of sediment was excavated from the Outfall Ditch. (Figure 3)

On January 28, 2010 Hercules sold the Brunswick Plant Resins business and a portion of the property to Pinova, Inc. Hercules continues to own the property east of Highway 17 that contains the Outfall Ditch and the Marsh Wood Storage Yard. Currently, only surface water runoff from the Pinova plant and surrounding neighborhoods and non-contact cooling water from the Pinova plant are discharged through the Outfall Ditch. These discharges are regulated under a state-enforced National Pollutant Discharge Elimination System (NPDES) permit.

SITE INVESTIGATIONS

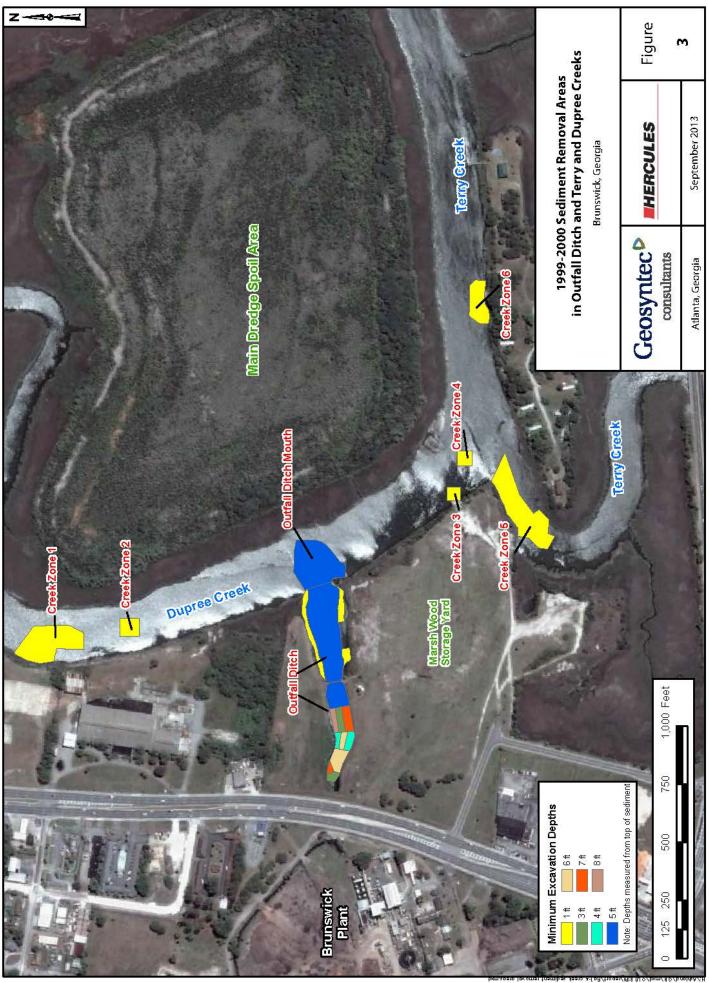
Site investigations preceding the 2012 RI/FS spanned the period between 1994 and 2006. In 1994, the National Oceanographic and Atmospheric Administration (NOAA) obtained sediment samples from Terry Creek and Back River areas and analyzed them for acute toxicity to a marine amphipod. The study concluded that sediment obtained from Terry Creek exhibited sediment toxicity that was not observed in sediments obtained from a reference location.

In 1995, EPA collected groundwater, surface water, soil, and sediment samples from Terry Creek, Dupree Creek, the Back River, and dredge spoil areas for toxaphene analysis. Soil and sediment samples obtained from the dredge spoil areas, Dupree Creek and Terry Creek contained concentrations of toxaphene up to 430 mg/kg (parts per million, ppm).

In 1996, EPA collected samples of killifish at the confluence of Terry and Dupree Creeks. Toxaphene was detected at concentrations of 19 and 27 ppm in whole fish analyses.

In 1997, EPA collected sediment and surface water samples, and various species of forage fish, consumer fish, and shellfish from the vicinity of Terry and Dupree Creeks. The presence of toxaphene was not confirmed in any fish or shellfish samples; however, toxaphene was detected at concentrations up to 230 mg/kg in sediment samples.

Also in 1997, fish body burden studies identified toxaphene residues in fish collected from Terry and Dupree Creeks. This prompted the Georgia Department of Natural Resources (GaDNR) to issue fish consumption guidelines that recommended



limiting consumption of certain fish species in the area.

In 1997 and 1998, Geosyntec Consultants conducted a Site Status Investigation on behalf of Hercules. Sediments in the Outfall Ditch had toxaphene concentrations generally in excess of 100 mg/kg to a depth of 5 feet. Deeper samples (5-8.5 feet) exhibited similar concentrations in the center, but low and nondetect concentrations along the margins of the ditch. Surficial sediments in Dupree Creek were generally less than 10 mg/kg toxaphene with some exceptions. In Terry Creek, toxaphene concentrations were in the range of 20-50 mg/kg near the confluence with Dupree Creek, but generally less than 10 mg/kg elsewhere. Toxaphene concentrations in soils in the dredged spoil areas varied, but frequently had concentrations between 10 and 50 mg/kg with a few sample locations greater than 100 mg/kg. Toxaphene was not detected in groundwater.

In 2006, shallow soil samples were collected from the Marsh Wood Storage as part of a **Resource**Conservation and Recovery Act (RCRA) Facility
Investigation. The highest reported concentrations of toxaphene in soil were found at locations just north and south of the Outfall Ditch. Concentrations of toxaphene in soil generally decreased with depth and distance from the Outfall Ditch.

SITE PHYSICAL CHARACTERISTICS Site Geology

Pleistocene to recent (Holocene) age soils in the area are composed of sandy beach and dune deposits in the upland areas and organic-rich silty clays in the tidal marshes. The soils are referred to in the literature as the Satilla Formations and Cypresshead Formations and range in thickness from about 50 to 180 feet.

Miocene sediments lie beneath the Satilla and Cypresshead Formations and consist of a thick sequence of silt, clay, phosphatic sand, and limestone of the Hawthorne Group which extends to a depth of approximately 500 feet. The Hawthorne Group in the Brunswick area is comprised of the Ebenezer, Coosawhatchie, Marks Head, Parachucla, and Tigers Leap Formations.

The Hawthorne Group is underlain by the Suwanee Limestone and the Ocala Group. The Ocala Group limestone is extremely porous and is from 500 to 700 feet thick in the Brunswick area and exists under artesian heads (flowing wells). This unit is underlain by at least another 1,000 feet of carbonates ranging from Middle Eocene to Cretaceous in age. This basal carbonate sequence is highly cavernous and contains

salt water under sufficient artesian head to flow at the land surface.

Site Hydrogeology

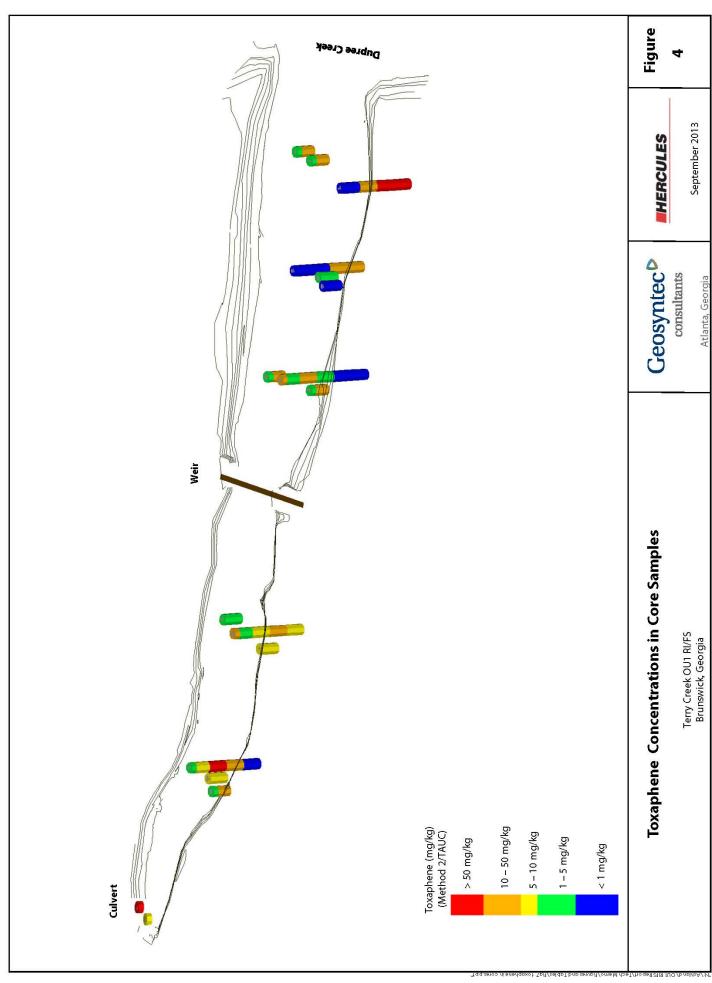
Multiple aquifers have been identified in the Brunswick area. In descending order, they are the surficial aquifer, the Brunswick aquifer, and the upper Floridan aquifer. The surficial aquifer consists of water-bearing sands under water-table or unconfined conditions in the Satilla and Cypresshead Formations and two confined water bearing zones in the Ebenezer formation. For the water-table zone, reported well yields range from 2 gallons per minute (gpm) to 140 gpm in Glynn County. At the Site, surficial aquifer groundwater is encountered approximately 2 to 5 feet below ground surface (bgs) and flows from west to east toward the Outfall Ditch and Dupree Creek. Groundwater likely discharges into the Outfall Ditch and Dupree Creek with hydraulic gradients that are tidally influenced.

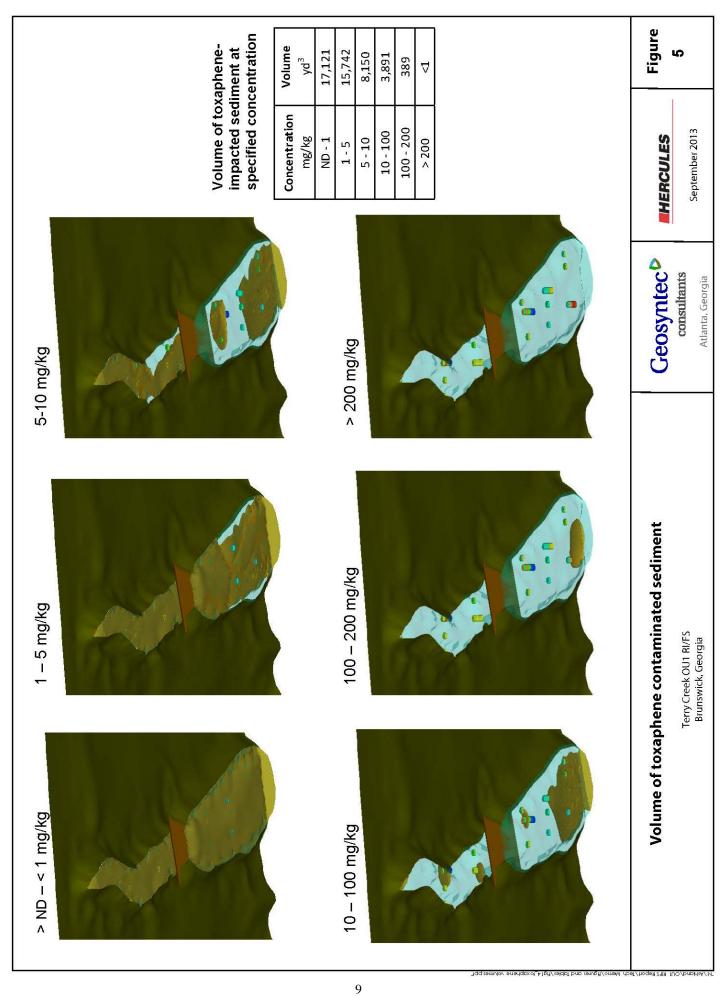
The Brunswick aquifer is comprised of two confined water-bearing zones. The upper zone is comprised of the Coosawhatchie and Marks Head Formations and the lower zone is comprised of the Tigers Leap Formation. Well yields in the Brunswick aquifer range from 350 gpm to 750 gpm. These artesian aquifers are used in the Brunswick area for light industrial use.

The most prolific aquifer in the Brunswick area is the upper Floridan aquifer. The aquifer is found at a depth of approximately 500 feet bgs and extends to a depth of over 1,500 feet. Groundwater circulation is rapid through zones of high porosity. Reported well yields of 5,000 gpm to 10,000 gpm are common in Glynn County.

NATURE AND EXTENT OF CONTAMINATION Sediment

Figure 4 depicts a sketch detail of the Outfall Ditch along with the location and concentration ranges of toxaphene in the sediment cores. Each color band at the location of each core sample represents the concentration ranges at that location and depth. Lowest concentrations (<1 mg/kg) are shown in blue and the highest concentrations are shown in red (>50 mg/kg). Figure 4 indicates that much of the toxaphene contamination is found at depth with the exception of the culvert locations. Figure 5 shows a three-dimensional image of the volume of toxaphene-impacted sediment at various concentrations.





Surface Water

Toxaphene was not detected in any of the surface water samples. Detected compounds included various metals, semi-volatile organic compounds (SVOCs), and volatile organic compounds (VOCs). These compounds were detected at low concentrations. Pinova's NPDES-permitted discharge is currently monitored for toxaphene, carbon tetrachloride, total organic carbon, pH, solids, and chronic toxicity. Carbon tetrachloride was measured at 9 μ g/L in the surface water sample collected on the ebb tide (i.e., discharging), which is attributed to Plant-permitted surface water discharges.

Pore Water

Toxaphene was detected in pore water samples collected from the pre-weir location at a concentration of 17 μ g/L in the unfiltered sample and 8.8 μ g/L in the filtered sample. Toxaphene was not detected in the post-weir samples. Metals and a few SVOCs and VOCs were detected at low levels.

Contaminant Fate and Transport

The contaminant fate and transport discussion is limited to toxaphene since it is the principal Site contaminant. Toxaphene is only slightly soluble in water with reported solubility ranging from 0.4 mg/L to 3.3 mg/L. Toxaphene is relatively immobile in soils. Toxaphene in surface waters is rapidly attached to deposited sediments or suspended particulates and is tightly attached to organic particles.

Toxaphene attached to sediment particles can be conveyed from the Outfall Ditch via surface water flow, and can be buried or deposited in the creek bottoms or the marshes. Subsequently, sediments can be re-suspended by natural erosive forces or propeller wash from boat traffic.

Biota living in the marsh and creek complex can uptake toxaphene through ingestion or adsorption by direct contact. As a result, toxaphene can be transferred through the marsh and creek complex food web. Chemicals accumulate in various tissues and are transferred throughout the food web or released to the environment upon death and decomposition of organisms. The successive accumulation of chemicals to higher concentrations in organisms at higher levels in the food web is termed **biomagnification**.

SUMMARY OF SITE RISKS Human Health Risks

The risk assessment included data evaluation and selection of constituents of concern (COCs); exposure

assessment; toxicity assessment; and risk characterization.

Data evaluation and selection of COCs - Surficial sediment (0–0.5 feet bgs) and surface water data from OU1 were compared to human health screening levels (HHSLs). For sediment, HHSLs are the EPA Regional Screening Levels (RSLs) for residential soil. Surface water HHSLs are the Federal Maximum Contaminant Levels (MCLs) for drinking water or, if an MCL is not available, the RSL for tap water. Maximum concentrations of arsenic, total chromium (assuming 100% hexavalent chromium), and toxaphene exceeded these criteria and were identified as COCs. No constituents in surface water were retained as COCs.

Exposure assessment - Based on current and reasonably foreseeable conditions, receptors potentially present in the immediate vicinity of the Outfall Ditch are limited to trespassers and recreationalists. Trespassers may be exposed to COCs in sediment via incidental ingestion and dermal contact. Recreationalists have no access to OU1; however, they have the potential to be exposed to OU1-related constituents that have been transported downstream to Terry and Dupree Creeks (OU3). The primary exposure route for OU3 recreationalists is indirect exposure to constituents (e.g., toxaphene) in fish tissue; however, direct exposure to sediment and surface water via incidental ingestion and dermal contact may also occur.

Toxicity assessment - Based on currently available toxicological information for OU1 COCs (arsenic, chromium, and toxaphene), cancer is the primary health endpoint of concern. Toxicity data for quantifying non-cancer health effects from arsenic and chromium are also available. It should be noted that there are considerable uncertainties associated with evaluating toxaphene risks as technical toxaphene is comprised of over 670 related chemicals. These chemicals are transformed in the environment such that they are not the same as a laboratory standard.

Risk characterization – For trespassers, the direct contact risks from exposure to OU1 sediment and surface water are considered to be negligible due to low exposure frequency.

For recreationalists, the GaDNR fish consumption guidelines illustrate that there are potential risks associated with consumption of fish and other seafood from Terry and Dupree Creeks. The elevated concentrations of toxaphene residues in OU1

sediments likely contribute to the body burdens of toxaphene in these species.

Ecological Risks

Ecological risk assessments (ERAs) are conducted as an eight-step process, punctuated by Scientific Management Decision Points (SMDPs). SMDPs represent points in the ERA process where the risk assessor, risk manager, and interested parties reach concurrence on conclusions, actions, or methodologies that are needed such that the ERA process can continue (or terminate) in a technically defensible manner.

For OU1, a Screening Level Ecological Risk Assessment (SLERA) (Steps 1 and 2 of the eight-step process) was conducted. The objectives of the SLERA were to:

- evaluate whether there is a potential for ecological receptors to be exposed to constituents in OU1 (e.g., identify potentially complete exposure pathways in the Outfall Ditch); and
- 2. evaluate whether site-related constituents are present in OU1 media (sediment, surface water, and pore water) at concentrations that have the potential to result in adverse ecological effects.

Based on the magnitude of the screening-level risk estimates for toxaphene developed in the SLERA, and the recognition that a more comprehensive baseline ERA (Steps 3 through 7) would also likely identify potential risks to ecological receptors, the SLERA concluded with a SDMP recommending no further ecological investigation for the Outfall Ditch. Instead, a recommendation was made that the ERA proceed directly to Step 8, Risk Management. The Risk Management step considers the potential ecological risk reduction provided by performancebased remedial actions that focus on eliminating direct exposure to all contaminants in the Outfall Ditch and eliminating the potential transport of contaminants to Dupree Creek and other downstream locations.

It is the lead agency's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES AND CLEANUP LEVELS

Remedial Action Objectives (RAOs) are the overall goals that an alternative is to achieve, and are used to guide the development of the remedial alternatives. EPA identified the following RAOs for toxaphene-impacted surface water, pore water, and sediment:

- Eliminate or minimize direct exposure pathways to potential receptors to elevated concentrations of toxaphene and other COCs present in OU1 sediments;
- 2. Eliminate or minimize transport of sediments contaminated with toxaphene and other COCs to downstream locations;
- Eliminate or minimize exposure pathways to potential receptors to elevated concentrations of toxaphene and other COCs present in OU1 pore water; and
- 4. Eliminate or minimize exposure pathways to potential receptors to elevated concentrations of COCs present in OU1 surface water.

DESCRIPTION OF ALTERNATIVES

Several remedial alternatives were evaluated in the **Feasibility Study** (**FS**). After an initial screening process, some of the evaluated alternatives were retained for further examination to develop comprehensive remedies. The alternatives were developed using combinations of general response actions and evaluated with respect to their effectiveness in protecting human health and the environment, compliance with **Applicable or Relevant and Appropriate Requirements** (**ARARs**), implementability, cost, and the time required to achieve the RAOs and cleanup levels. For additional details regarding the remedial alternatives, refer to the final FS report.

The following sections summarize the remedial alternatives evaluated to address the impacted Outfall Ditch sediment.

ALTERNATIVE 1: No Further Action

Estimated Capital Cost: \$0

Estimated Operation & Maintenance (O&M) Cost:\$0

Estimated Present Worth Cost: \$0 Estimated Construction Time: N/A

No Further Action (NFA) includes site monitoring and general maintenance (i.e., erosion control, maintenance of fencing, etc.), but no further active remediation within OU1 or additional "limited" action alternatives such as deed restrictions. This alternative is carried through consistent with the requirements of the NCP.

ALTERNATIVE 2: SEDIMENT REMOVAL WITHIN EXISTING CHANNEL

Estimated Capital Cost: \$6,902,000
Estimated Annual O&M Cost: \$118,740
Estimated Present Worth Cost: \$9,299,000
Estimated Construction Time: 34 Weeks
Alternative 2 includes removal of approximated

Alternative 2 includes removal of approximately 36,000 cubic yards of sediment by dredging the existing Outfall Ditch. Several possible means of sediment removal are available; however, it was assumed that a hydraulic dredging process would be utilized, although mechanical dredging can yield equivalent results. Hydraulic dredging would consist of a floating barge equipped with a cutter head, suction hose, and pump mobilized into position to systematically dredge the sediment, beginning at the downstream end of the Outfall Ditch and progressing upstream. The sediment would be pumped through a floating discharge hose to a central upland location for dewatering and drying. The existing weir would be removed.

The depth of channel dredging under this alternative ranges from approximately 8 to 11 feet below mean sea level. Given the characteristics of the soft soil along the banks, bank height following sediment removal, and flow conditions (due to storms and from tidal influences), it is anticipated that the Outfall Ditch banks would be graded to a 2:1 horizontal to vertical slope and armored with riprap to minimize the potential for excessive bank sloughing and erosion. The final graded and restored site would be seeded and stabilized. A monitoring and maintenance plan would be established to observe conditions and possible displacement of the riprap armoring and corrective measures taken should the riprap be disturbed or modified from its designed placement and function.

ALTERNATIVE 3: SHEET PILE CHANNEL RE-ROUTED WITH LIMITED SEDIMENT REMOVAL

Estimated Capital Cost: \$4,817,000 Estimated Annual O&M Cost: \$118,740 Estimated Present Worth Cost: \$7,214,000 Estimated Construction Time: 23 Weeks

Alternative 3 includes re-routing the Outfall Ditch discharge into a newly constructed channel along an alignment parallel to the Outfall Ditch; excavation and offsite disposal to a Subtitle D landfill of approximately 1,200 cubic yards of contaminated sediment within the Highway 17 Triple Box Culvert and the area in the existing Outfall Ditch used as the transition zone between the new channel and the Triple Box Culvert; removal of the weir; placement of a layer of geotextile fabric over the existing sediment

within the Outfall Ditch; backfilling the Outfall Ditch with compacted soil over the geotextile fabric; and armoring the backfill slope into Dupree Creek with riprap.

The re-routed channel would consist of steel sheet pile driven to form the channel sides; soil between the sheet pile walls would be excavated to form the channel and the excavated material would be temporarily stockpiled for future use in backfilling the Outfall Ditch. The re-routed channel would be sized to maintain the required channel profile and convey plant discharges and storm water flows generated from the drainage basin upstream of the Triple Box Culvert. The re-routed channel bottom would be concrete-lined to facilitate future maintenance and periodic sediment removal.

Following placement of fill and grading, the stream bank along Dupree Creek would be armored with riprap to protect the bank from erosion and to contain the newly-placed fill. The final graded and restored site, including all areas disturbed during construction, would be seeded and stabilized. A monitoring and maintenance plan would be established.

Finally, an environmental covenant would be placed on the property in accordance with state law. The environmental covenant would limit future use of the property to non-residential uses and prohibit extraction of groundwater for drinking water purposes.

ALTERNATIVE 3A: SHEET PILE CHANNEL WITHIN EXISTING CHANNEL WITH LIMITED SEDIMENT REMOVAL

Estimated Capital Cost: \$5,382,000 Estimated Annual O&M Cost: \$118,740 Estimated Present Worth Cost: \$7,779,000 Estimated Construction Time: 30 Weeks

With Alternative 3A, steel sheet pile would be driven to create a channel similar to the channel presented under Alternative 3, but the channel would be constructed within the existing Outfall Ditch.

Alternative 3A also includes excavation and offsite disposal of sediments within the Triple Box Culvert and in the bottom of the Outfall Ditch within the sheet pile walls to obtain the profile needed to convey the discharge water; removal of the weir; and backfilling the portions of the Outfall Ditch outside the sheet pile walls. Restoration of disturbed areas, a monitoring and maintenance plan, and an environmental covenant are included.

ALTERNATIVE 4: CONCRETE-LINED CHANNEL RE-ROUTED WITH LIMITED SEDIMENT REMOVAL

Estimated Capital Cost: \$3,015,000 Estimated Annual O&M Cost: \$118,740 Estimated Present Worth Cost: \$5,412,000 Estimated Construction Time: 25 Weeks

Alternative 4 includes re-routing the discharge into a newly constructed concrete-lined conveyance channel along an alignment parallel to the Outfall Ditch; excavation and offsite disposal of approximately 1,200 cubic yards of sediment within the Highway 17 Triple Box Culvert and the area in the existing Outfall Ditch used as the transition zone between the new conveyance channel and the Triple Box Culvert; removal of the weir; placement of a layer of geotextile fabric over the existing sediment within the Outfall Ditch; backfilling the Outfall Ditch with compacted soil over the geotextile fabric; and armoring the backfill slope into Dupree Creek with riprap.

Like Alternative 2, this alternative would remove the sediment exposure pathway entirely. Clean soils would be used as backfill to bring the Outfall Ditch elevation up to grade with the surrounding uplands in the Marsh Wood Storage Yard. With the sediment encapsulated approximately 5 to 10 feet beneath the ground surface and the ground surface armored with riprap, it will not be susceptible to storm surges or high tides. Restoration of disturbed areas, a monitoring and maintenance plan, and an environmental covenant are included.

ALTERNATIVE 4A: CONCRETE-LINED CHANNEL WITHIN EXISTING CHANNEL WITH LIMITED SEDIMENT REMOVAL

Estimated Capital Cost: \$4,277,000

Estimated Annual O&M Cost: \$118,740 Estimated Present Worth Cost: \$6,674,000 Estimated Construction Time: 32 Weeks Alternative 4A includes construction of a concretelined channel within the existing Outfall Ditch. The concrete-lined channel would be trapezoidal in shape, matching the cross-sectional dimensions of the rerouted concrete-lined channel described in Alternative 4. This alternative also includes excavation and offsite disposal of approximately 12,800 cubic yards of contaminated sediments within the Triple Box Culvert and in the bottom of the Outfall Ditch to obtain the profile needed to convey the discharge water, and removal of the weir. Restoration of disturbed areas, a monitoring and maintenance plan, and an environmental covenant are included.

ALTERNATIVE 5: BOX CULVERT RE-ROUTED WITH LIMITED SEDIMENT REMOVAL

Estimated Capital Cost: \$5,119,000 Estimated Annual O&M Cost: \$118,740 Estimated Present Worth Cost: \$7,516,000 Estimated Construction Time: 28 Weeks

Alternative 5 includes re-routing the discharge into a newly constructed quadruple 8-foot by 6-foot concrete box culvert conveyance system along an alignment parallel to the Outfall Ditch; excavation and offsite disposal of approximately 1,200 cubic vards of contaminated sediment within the Highway 17 Triple Box Culvert and the area in the existing Outfall Ditch used as the transition zone between the new conveyance structure and the Triple Box Culvert; removal of the weir; placement of a layer of geotextile fabric over the existing sediment within the Outfall Ditch; backfilling the Outfall Ditch with compacted soil over the geotextile fabric; and armoring the backfill slope into Dupree Creek with riprap. Restoration of disturbed areas, a monitoring and maintenance plan, and an environmental covenant are included.

ALTERNATIVE 5A: BOX CULVERT WITHIN EXISTING OUTFALL DITCH WITH LIMITED SEDIMENT REMOVAL

Estimated Capital Cost: \$5,802,000 Estimated Annual O&M Cost: \$118,740 Estimated Present Worth Cost: \$8,119,000 Estimated Construction Time: 35 Weeks

Alternative 5A includes installation of a quadruple 8-foot by 6-foot concrete box culvert within the existing Outfall Ditch. This alternative also includes excavation and offsite disposal of approximately 9,800 cubic yards of contaminated sediments within the Highway 17 Triple Box Culvert and in the bottom of the Outfall Ditch to obtain the profile needed to convey the discharge water, and removal of the weir. Restoration of disturbed areas, a monitoring and maintenance plan, and an environmental covenant are included.

ALTERNATIVE 6: AQUA BLOKTM-LINED CHANNEL WITH LIMITED SEDIMENT REMOVAL

Estimated Capital Cost: \$5,843,000 Estimated Annual O&M Cost: \$118,740 Estimated Present Worth Cost: \$8,240,000 Estimated Construction Time: 34 Weeks

Alternative 6 includes construction of an Aqua BlokTM (or similar) and riprap armored channel within the existing Outfall Ditch. This alternative also includes excavation and offsite disposal of approximately 12,800 cubic yards sediments within the Triple Box Culvert and in the bottom of the

Outfall Ditch to obtain the profile needed to convey the discharge water, and removal of the weir.

Aqua Blok™ is a product that creates a bentonite barrier between overlying materials and underlying sediment. Aqua Block™ would be placed at a thickness of approximately four inches on compacted clean fill and armored with a 24-inch thick layer of Georgia Department of Transportation (GDOT) type 1 riprap to form the final channel shape and provide protection from erosion. The channel would be trapezoidal in cross-section, similar to the cross sectional dimensions of the concrete-lined channel described in Alternatives 3 and 3A. Restoration of disturbed areas, a monitoring and maintenance plan, and an environmental covenant are included.

ALTERNATIVE 6A: CARBON-AMENDED SAND CAP CHANNEL WITH LIMITED SEDIMENT REMOVAL

Estimated Capital Cost: \$5,854,000 Estimated Annual O&M Cost: \$118,740 Estimated Present Worth Cost: \$8,251,000 Estimated Construction Time: 34 Weeks

Alternative 6A includes construction of a sand cap amended with granular activated carbon (GAC)with a riprap- armored channel within the existing Outfall Ditch. This alternative also includes excavation and offsite disposal of approximately 12,800 cubic yards of sediments within the Triple Box Culvert and in the bottom of the Outfall Ditch to obtain the profile needed to convey the discharge water, and removal of the weir.

The sand cap creates a barrier between overlying materials and underlying sediment. The addition of GAC is intended to promote the attachment and permanent binding of organic contaminants, such as toxaphene. The sand cap (composed of a manufactured sand) would be mixed with 5–10 percent GAC to a depth of approximately 1 foot and armored with a 24-inch thick layer of GDOT type 1 riprap. Restoration of disturbed areas, a monitoring and maintenance plan, and an environmental covenant are included.

ALTERNATIVE 7: RIPRAP-ARMORED CHANNEL WITH LIMITED SEDIMENT REMOVAL

Estimated Capital Cost: \$4,705,000 Estimated Annual O&M Cost: \$118,740 Estimated Present Worth Cost: \$7,102,000 Estimated Construction Time: 34 Weeks

Alternative 7 includes construction of a new channel with a traditional sand cap (or compacted clean fill) and riprap armoring within the existing Outfall Ditch. The channel would be trapezoidal in cross-section,

similar to the concrete-lined channel described in Alternatives 3 and 3A. This alternative also includes excavation and offsite disposal of approximately 12,800 cubic yards of impacted sediments within the Triple Box Culvert and in the bottom of the Outfall Ditch to obtain the profile needed to convey the discharge water, and removal of the weir. Restoration of disturbed areas, a monitoring and maintenance plan, and an environmental covenant are included.

EVALUATION OF ALTERNATIVES

A summary of the evaluation of the alternatives to address the Site contamination is presented below. A detailed evaluation of the alternatives is included in the Final FS Report, which can be found in the Information Repository. The objective of this evaluation is to compare and contrast the alternatives, and to ultimately select and present a preferred alternative.

The remedial alternatives presented in this Proposed Plan were evaluated using the nine criteria specified the NCP. A summary of the evaluation is presented below.

Overall Protection of Human Health and the Environment

All alternatives evaluated in the FS except for Alternative 1 (No Further Action) would be protective of human health and the environment. Alternative 1 is not evaluated further.

Compliance with ARARs

All alternatives comply with chemical-specific, location-specific, and action-specific ARARs.

Long-Term Effectiveness and Permanence

Alternatives 3, 3A, 4, 4A, 5, and 5A provide a long-term effective remedy with a high degree of permanence. The Outfall Ditch sediments are permanently capped/contained, which will reduce long-term exposure to potential receptors and loading of toxaphene-impacted sediments to the Terry and Dupree Creek system.

Alternatives 6, 6A, and 7 provide a long-term effective solution with a moderate degree of permanence. Permanence of these remedies is enhanced with the implementation of Land Use Controls. **Operation and maintenance (O&M)** of these alternatives is anticipated to be minimal and would likely be limited to periodic inspection and replacement of riprap armoring.

CRITERIA FOR EVALUATING REMEDIAL ALTERNATIVES

In selecting a preferred cleanup alternative, EPA uses the following criteria to evaluate those screened in the FS. The first two criteria are threshold criteria and must be met for an option to be considered further. The next five are balancing criteria for weighing the merits of those that meet the threshold criteria. The final two criteria are used to modify EPA's proposed plan based on state and community input. All nine criteria are explained in more detail here.

- 1. Overall Protection of Human Health and the Environment Eliminates, reduces, or controls health and environmental threats through institutional or engineering controls or treatment.
- 2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) Compliance with Federal/State standards and requirements that pertain to the site or whether a waiver is justified.
- **3. Implementability** Technical feasibility and administrative ease of conducting a remedy, including factors such as availability of services.
- **4. Short-Term Effectiveness** Length of time to achieve protection and potential impact of implementation.
- **5. Long-Term Effectiveness and Permanence** Protection of people and environment after cleanup is complete.
- 6. Reduce Toxicity, Mobility, or Volume by Treatment Evaluates the alternative's use of treatment to reduce the harmful effects of principal contaminants and their ability to move in the environment.
- 7. Cost Compares cost of each alternative.
- **8. State Acceptance** Consideration of state's opinion of the preferred alternative(s).
- **9. Community Acceptance** Consideration of public comments on the Proposed Plan.

Alternative 2 provides a long-term effective remedy with some degree of permanence. Additional contaminated sediment volumes are removed from the Outfall Ditch, which will reduce long-term exposure to potential receptors and loading of toxaphene-impacted sediments to the Terry and Dupree Creek system.

Reducing Toxicity, Mobility or Volume through Treatment

Alternatives 3, 4, 4A, 5, 5A, 6, 6A, and 7 reduce or eliminate the mobility of contaminants by installing a cap over impacted sediments within the existing Outfall Ditch. These alternatives provide varying

reductions in volume of contaminated sediment through excavation and offsite disposal.

Alternative 2 reduces the mobility through sediment removal and offsite disposal of approximately 36,000 cubic yards of impacted materials.

None of the alternatives reduce the toxicity of the sediments; however, each eliminates the exposure pathways, thereby mitigating the potential effects of sediment toxicity to aquatic organisms.

Short-Term Effectiveness

Alternative 3, sheet pile installation, is relatively rapid and can provide for a shorter construction schedule than other evaluated alternatives, thereby reducing short-term construction risks. Additionally, the rerouted channel minimizes the short term risk associated with water management during construction.

The short-term effectiveness of Alternative 4, concrete-lined channel, and Alternative 5, box culvert installation, is similar to Alternative 3. Each is a rerouted channel design that minimizes the short term risk associated with water management during construction.

Alternatives 3A, 4A, 5A, 6, 6A, and 7 have issues associated with working within the existing channel, including additional water management requirements, poor foundation soils, and multiple handling of select parts of the soil management. For these reasons, these alternatives will require a longer construction schedule than "re-route" Alternatives 3, 4, and 5.

Alternative 2 will require a longer construction schedule than any of the other alternatives.

Implementability

Alternatives 3, 4, and 5 are readily implementable. The technologies and materials necessary for these alternatives are readily available and encompass traditional construction techniques. Construction of these alternatives in a re-routed alignment allows the existing Outfall Ditch to remain in place and functional until the new, re-routed channel is completed and brought into service.

Construction of Alternatives 3A, 4A, and 5A within the Outfall Ditch presents some significant challenges; however, the technologies and materials necessary for these alternatives are readily available and encompass traditional construction techniques.

Construction of Alternatives 6, 6A, and 7 presents some challenging issues; however, the technologies

and materials necessary for these alternatives are readily available and encompass traditional construction techniques with some specialty techniques for placement of the Aqua BlokTM material (Alternative 6), GAC (Alternative 6A), and sand cap (Alternative 7).

Construction of Alternative 2 within the Outfall Ditch presents significant challenges; however, the technologies and materials necessary for this alternative are readily available and encompass traditional construction techniques.

Cost

Cost estimates for all remedial alternatives were developed during the FS and are summarized below. It should be noted that present worth costs are based on an effective discount rate of 3 percent (%) and O&M was estimated to last for 30 years.

Remedial Alternative	Estimated Capital Costs	Estimated Annual O&M Costs	Estimated Present Worth	
1	\$0	\$0	\$0	
2	\$6,902,000	\$118,740	\$9,299,000	
3	\$4,817,000	\$118,740	\$7,214,000	
3A	\$5,382,000	\$118,740	\$7,779,000	
4	\$3,015,000	\$118,740	\$5,412,000	
4A	\$4,277,000	\$118,740	\$6,674,000	
5	\$5,119,000	\$118,740	\$7,516,000	
5A	\$5,802,000	\$118,740	\$8,119,000	
6	\$5,843,000	\$118,740	\$8,240,000	
6A	\$5,854,000	\$118,740	\$8,251,000	
7	\$4,705,000	\$118,740	\$7,102,000	

State Acceptance

GaEPD has been actively involved in the development and review of the RI, FS, and the cleanup plan for the Site. State support for the preferred alternative is anticipated.

Community Acceptance

Community acceptance of the preferred alternative will be evaluated subsequent to the Proposed Plan comment period. Comments received during this period will be addressed and responses will be presented in the **Responsiveness Summary**, which will be included in the **Record of Decision (ROD)**.

PREFERRED REMEDIAL ALTERNATIVE

Alternative 4 (Concrete-Lined Channel Re-Routed with Limited Sediment Removal) is EPA's preferred remedial alternative. Alternative 4 consists of the following components:

- re-routing the discharge into a newly constructed concrete-lined conveyance channel
- excavation and offsite disposal of approximately 1,200 cubic yards of impacted sediment
- removal of the weir
- placement of geo-textile fabric over existing sediment in the Outfall Ditch
- backfilling the Outfall Ditch with compacted clean soil over fabric
- armoring the backfill slope
- seeding and stabilization of disturbed areas
- establishment of an environmental covenant to limit future development
- periodic inspections, maintenance, and sediment removal

EPA believes the preferred alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. EPA expects the preferred alternative to satisfy the following statutory requirements of CERCLA 121(b): (1) be protective of human health and the environment; (2) comply with ARARs (or justify a waiver); (3) be costeffective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the statutory preference for treatment as a principal element to the extent practicable.

The preferred alternative was selected over the other alternatives because of its overall potential effectiveness and efficiency in addressing the Site contamination. The proposed remedy will provide for permanent long term risk reduction.

Based on the information currently available, EPA believes the preferred remedial alternative will be protective of human health and the environment. Because the preferred alternative will not utilize active treatment technologies to address the sediment contamination, the remedy does not meet the statutory preference for the selection of a remedy that involves treatment as a principal element.

COMMUNITY PARTICIPATION

The EPA seeks public review and comments on this Proposed Plan and on EPA's Preferred Alternative. The Information Repository and Administrative Record for the Site are available at the Brunswick/Glynn County Regional Library, 208 Gloucester St., Brunswick, Georgia.

The EPA will accept public comments for at least 30 days. Comments may be submitted by mail, email, phone, or in person at a public meeting scheduled for:

July 30, 2015. 6:00 p.m. – 7:30 p.m. Brunswick Glynn County Library 208 Gloucester Street Brunswick, GA 31520

The EPA and the EPD will evaluate the submitted comments and will issue a ROD that incorporates public comments and explains the final cleanup decision. EPA in consultation with the State, may modify the Preferred Alternative or select another response action presented in this Plan based on new information or public comments received during the public comment period. Therefore, the public is encouraged to review and comment on all the alternatives presented in this Proposed Plan.

Please direct comments or questions to:

Scott Martin, Remedial Project Manager (404) 562-8916.

Email: martin.scott@epa.gov

or to:

Angela Miller, Community Involvement Coordinator (404) 562-8561.

Email: miller.angela@epa.gov

Toll Free: (877) 718-3752.

GLOSSARY

Administrative Record: Material documenting EPA's selection of cleanup remedies at Superfund Sites, a copy of which is placed in the **information repository** near the Site.

Applicable or Relevant and Appropriate Requirements (**ARARs**): Refers to Federal and State requirements a selected remedy must attain which vary from site to site.

Baseline Risk Assessment: 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.

Comprehensive Environmental Response,
Compensation and Liability Act (CERCLA): Also
known as Superfund, is a federal law passed in 1980 and
modified in 1986 by the Superfund Amendment and
Reauthorization Act (SARA); the act created a trust fund,
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.

Contaminants of Concern (COCs): Chemical constituents associated with a Superfund Site that have been released into the environment and pose a risk to human health.

Feasibility Study (FS): Study conducted after the Remedial Investigation to determine what alternatives or technologies could be applicable to clean up the sitespecific COCs.

Groundwater: The supply of fresh water found beneath the Earth's surface (usually in aquifers) which is often used for drinking water.

Hazardous waste: A waste may be considered hazardous if it exhibits certain hazardous properties/"characteristics" or if it is included on a specific list of wastes EPA has determined are hazardous ("listing" a waste as hazardous). The lists include the F-list (wastes from common manufacturing and industrial processes), K-list (wastes from specific industries), and P- and U-lists (wastes from commercial chemical products)

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.

Institutional Controls (ICs): Restriction that prevents an owner inappropriately developing a property. The restriction is designed to prevent harm to workers or the general public and maintain the integrity of the remedy.

Maximum Contaminant Levels (MCLs): Standards that are set by the United States Environmental Protection Agency (EPA) for drinking water quality in Title 40 of the Code of Federal Regulations. A Maximum Contaminant Level (MCL) is the legal threshold limit on the amount of a

hazardous substance that is allowed in drinking water under the Safe Drinking Water Act.

National Contingency Plan (NCP): The Federal Regulation that guides the Superfund program. The NCP was revised in February 1990.

National Pollutant Discharge Elimination System (NPDES): The primary permitting program under the Clean Water Act which regulates all discharges to surface water.

Operation and Maintenance (O&M): Activities conducted at sites after cleanup remedies have been constructed to ensure that they continue functioning properly.

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

Record of Decision (ROD): A public document describing EPA's rationale for selection of a Superfund remedy.

Regional Screening Levels (RSLs): Risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data. RSLs are considered by EPA to be protective for humans (including sensitive groups) over a lifetime.

Remedial Action Objectives (RAOs): The overall goals that the site cleanup is expected to achieve.

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.

Resource Conservation and Recovery Act (RCRA): A federal law enacted in 1976 and modified in the Hazardous and Solid Waste Amendments of 1984. RCRA's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner.

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.

Superfund: The common name used for the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the federal law that mandates cleanup of abandoned hazardous waste sites.

USE THIS SPACE TO WRITE YOUR COMMENTS

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Scott Martin, Remedial Project Manager U. S. EPA, Region 4 Superfund Remedial Branch Superfund Division 61 Forsyth St., SW Atlanta, GA 30303



Proposed Plan Public Meeting
Thursday, July 30, 2015
6:00 – 7:30 p.m.
Brunswick Glynn County Library
208 Gloucester Street
Brunswick, GA 31520

The U.S. Environmental Protection Agency (EPA) Region 4 Superfund Division and the Georgia Environmental Protection Division will host a **Proposed Plan Public Meeting for the General Public** on Thursday, July 30, 2015, at the Brunswick Glynn County Library located at 208 Gloucester Street, Brunswick, GA 31520. This meeting is scheduled to discuss the Proposed Plan for remediating the Outfall Ditch/Operable Unit 1 (OU1) of the Terry Creek Superfund Site, located on the Atlantic coast directly east of the city of Brunswick, near the confluence of Terry Creek, Dupree Creek, and the Back River, north of the Torras Causeway and east of U.S. Highway 17. EPA and EPD representatives who are directing cleanup activities will select a final remedy for the site after reviewing and considering all information submitted during the 30-day public comment period. EPA, along with the State, may modify the Proposed Preferred Alternative or select another response action presented in this Plan based on new information or public comments. Superfund representatives assigned to the Terry Creek Superfund Site, Outfall Ditch/Operable Unit 1 (OU1) will be available to answer questions and to hear any concerns you may have regarding cleanup activities at this site. To obtain additional information about the meeting, or if you have questions or concerns related to the site or cleanup activities, please contact:

Remedial Project Manager Scott Martin

(404) 562-8916 or via email at martin.scott@epa.gov

Of

Community Involvement Coordinator Angela Miller

Toll-free at (877) 718-3752 or via email at miller.angela@epa.gov

U. S. EPA, Region 4 Superfund Remedial Branch Superfund Division 61 Forsyth St., SW Atlanta, GA 30303