Proposed Plan
Operable Unit 1 Site 1 Sanitary Landfill and Associated Wetlands
Naval Air Station Pensacola, Florida

THE CLEANUP PROPOSAL

This Proposed Plan (PP) has been prepared in accordance with the National Contingency Plan (NCP), the Naval Air Station (NAS) Pensacola Federal Facilities Agreement, and United States Environmental Protection Agency (U.S. EPA) guidance to present the approach proposed by the Department of the Navy (Navy) to address the following:

- Provide the basis for No Action determinations at Operable Unit (OU) 1 Wetland 1B (surface water and sediment), Wetland 4D (sediment), and Wetlands 15, 18A, and 18B (surface water).
- Address contaminated sediment at OU 1 Wetlands 15, 18A, and 18B at NAS Pensacola, Pensacola, Florida.
- Address elevated iron concentrations in surface water at OU 1 Wetlands 3 and 4D. A remedy to address iron in surface water was initially identified in the 1998 Record of Decision (ROD) (EnSafe 1998) and 1999 Explanation of Significant Differences (ESD) (EnSafe 1999) and involved a groundwater interceptor trench adjacent to Wetland 3. The trench was found to be ineffective, and this PP presents an amendment to that remedy.
- Finally, this PP explains a significant difference to the OU 1 Site 1 groundwater remedy identified in the 1998 ROD by updating the parameters included in the monitoring program based on a change to the maximum contaminant level (MCL) for arsenic and a re-evaluation of potential human health risks and updating cleanup levels (CLs) based on revisions to risk calculations and/or chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs).

This plan provides information on the remedial alternatives evaluated in the Feasibility Study (FS) for impacted sediment and/or surface water at OU 1 Site 1 and Associated Wetlands. It describes the Preferred Remedial Alternatives proposed by the Navy which, after careful study, are (1) removal and offsite disposal of contaminated sediment at Wetlands 15, 18A, and 18B followed by wetland restoration, and (2) modification of Wetland 3 to become a treatment wetland to enhance iron removal and restore surface water quality in Wetland 4D.

Finally, this plan provides information on the public comment period, the opportunity for a public meeting, and how the final remedy will be selected. The final remedy for OU 1 Site 1 and Associated Wetlands will be documented in a combined ROD/ROD Amendment.

LET US KNOW WHAT YOU THINK

Mark Your Calendar!

PUBLIC COMMENT PERIOD
1 MAY 2025 TO 31 MAY 2025

The Navy will accept written comments on the PP for OU 1 Site 1 Sanitary Landfill and Associated Wetlands during this comment period. Send written comments postmarked no later than 31 May 2025 to Mr. Bruce Cummins, Public Affairs Office, Naval Air Station Pensacola, 150 Hase Road, Suite A, Pensacola, Florida 32508-1051.

PUBLIC AVAILABILITY SESSION AND PUBLIC HEARING

If requested, the Navy will hold a public availability session and public hearing to discuss this PP. The public availability session will include posters describing the Proposed Plan and include an informal question-and-answer session. A formal public hearing will follow during which the Navy will provide a presentation and receive comments on this PP from the public. It is at this formal hearing that an official transcript of comments will be entered into the record. If requested, these activities will be held at NAS Pensacola in Pensacola, Florida

TO REQUEST AN AVAILABILITY SESSION AND PUBLIC HEARING OR TO OBTAIN MORE INFORMATION, CONTACT
BRUCE CUMMINS, NAS PENSACOLA,
850-452-4436

Date to Remember
Public Comment Period:

1 May 2025 — 31 May 2025

Federal and state environmental laws govern cleanup activities at federal facilities. A federal law called the Comprehensive Environmental Response, Compensation, and Liability Act, better known as Superfund, provides procedures for investigation and cleanup of environmental problems. Under this law, the Navy is pursuing cleanup of designated sites at Naval Air Station Pensacola to return the property to a condition that protects the community, workers, and the environment.

TECHNICAL TERMS USED THROUGHOUT THIS PROPOSED PLAN ARE EXPLAINED IN THE GLOSSARY OF TERMS ON PAGE 30

INTRODUCTION

As the lead agency, the Navy is issuing this PP as part of its public participation responsibilities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 117(a) and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This plan and its associated public community opportunities fulfill the Navy's public participation responsibilities under these laws.

This PP addresses the following components of OU 1 Site 1 Sanitary Landfill and Associated Wetlands at NAS Pensacola, Pensacola, Florida:

- Wetlands 1B, 15, 18A, and 18B (initial remedy selection for sediment and surface water)
- Wetland 4D sediment (initial remedy selection)
- Wetlands 3 and 4D Surface Water (amendment to 1998 ROD and 1999 ESD-selected remedy for Wetland 3 surface water and initial remedy for Wetland 4D surface water)
- Site 1 Groundwater (explanation of significant difference to 1998 ROD-selected remedy — modification of monitoring parameters and associated CLs for groundwater chemicals of concern)

A remedy for OU 1 Site 1 Sanitary Landfill soil was selected as documented in the 1998 *Final Record of Decision for Operable Unit 1* (EnSafe 1998). There are no proposed changes to the soil remedy; therefore, soil is not discussed further in this PP.

This PP summarizes information that is detailed in various Remedial Investigation (RI) Reports, RI Report Addendum, Feasibility Study (FS) Reports, FS Report Addendum, and other documents included in the NAS Pensacola Information Repository, which is available via the Administrative Record online at https://administrative-records.navfac.navy.mil/?MT64W7KUQ7G47WL. The Navy and U.S. EPA encourage the public to review these documents to gain a more comprehensive understanding of the site and associated environmental activities.

This document is issued by the Navy, as the lead agency for all investigations and cleanup programs ongoing at NAS Pensacola, and the U.S. EPA with the concurrence of the Florida Department of Environmental Protection (FDEP). The Navy and U.S. EPA, in consultation with FDEP, will select a final remedy for Wetlands 1B, 4D, 15, 18A, and 18B, and amend the remedy for surface water at Wetland 3 after reviewing and considering all information submitted during the public comment period. An announcement of the availability of this PP and Administrative Record file will be made at least two weeks before the beginning of the 30-day public comment period so that the public has sufficient time to obtain and read this PP.

The Navy and U.S. EPA, in consultation with FDEP, may modify the Preferred Remedial Alternative or select another response action differing from that proposed in this plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented in this PP. Additionally, new information, testimonies, or opinions that lead agency receives during the public comment period could result in the selection of a final remedial action that differs from the Preferred Remedial Alternative.

The purposes of this PP are to:

- Provide the public with basic background information about NAS Pensacola, with emphasis on OU 1 Site 1 Sanitary Landfill and Associated Wetlands.
- Identify the Navy's Preferred Remedial Alternative for remedial actions and explain the reasons for the preference.
- Describe the other cleanup options that were considered.
- Solicit and encourage public review of and comment on remedial alternatives presented in this PP.
- Provide the public with information on how they can be involved in the remedy selection process.

After the public has had the opportunity to review and comment on this PP, the Navy will summarize and respond to all comments received during the comment period and formal public hearing (if requested) in a document called the Responsiveness Summary. The Navy will carefully consider all comments received and may select remedies different from those proposed in this plan. Ultimately, the selected remedies for OU 1 Site 1 and Associated Wetlands and amended remedy for Wetland 3 surface water will be documented in a ROD/ROD Amendment. The Responsiveness Summary will be issued with the ROD/ROD Amendment.

SITE BACKGROUND

NAS Pensacola is in Escambia County in Florida's northwestern coastal area, approximately 5 miles west of the Pensacola city limits. Construction of the approximately 5,000-acre installation began in the 1800s. Currently, land use at NAS Pensacola consists of various military housing, training, and support facilities. The Site 1 Landfill and wetlands associated with OU 1 are described in the following sections.

Where is OU 1 Site 1 within the base?

The OU 1 Site 1 Sanitary Landfill is an approximately 85-acre area situated approximately one-half mile east of Forrest Sherman Field. Site 1 is bound to the north by Bayou Grande, to the east by the A.C. Read Golf Course, to the south by a cemetery extension for the Barrancas National Cemetery, and to the west by the base Brush Disposal Area (Figure 1).

How was OU 1 Site 1 used?

OU 1 Site 1 Sanitary Landfill was used as the predominant disposal site for a variety of solid (domestic and industrial) wastes generated on the base from the mid-1950s until the landfill was officially closed in 1976.

History of Site Investigations

1996: Remedial Investigation OU 1 Site 1 — The OU 1 Site 1 RI identified soil contamination within the landfill boundary and groundwater contamination that posed a threat to human health (via impact to potential drinking water supply) and nearby ecological receptors (via impact to surface water with migration).

1996-1997 Focused Feasibility Study and Addendum OU 1 Site 1 — A Focused FS was conducted for OU 1 Site 1 to develop remedial action objectives (RAOs) to address soil (landfill waste), groundwater, and surface water contamination.

1998 Time Critical Removal Action — Fifty-two cubic yards of waste tar were removed from Site 1 due to physical hazard. No quantitative remedial goals (i.e., Cleanup Levels) were established.

1998: ROD OU 1 Site 1 — The ROD established RAOs for OU 1 Site 1:

- *Waste*: Protect groundwater from leachable compounds.
- *Groundwater*: Restore site groundwater to Maximum Contaminant Levels (MCLs) and prevent further contamination of shallow/intermediate groundwater.
- *Surface Water:* Prevent further contamination of surface water in Wetland 3.

Remedies selected to achieve the RAOs:

- *Waste*: institutional controls to limit intrusive activities and capping of the landfill
- *Groundwater:* institutional controls to restrict groundwater use and monitored natural attenuation
- *Surface Water:* groundwater interception system to capture and treat contaminated groundwater upgradient of Wetland 3 (i.e., reduce iron levels before being reintroduced into Wetland 3).

1999: ROD Amendment — The ESD indicated that treated groundwater would not be discharged to Wetland 3 but instead discharged to the Navy's on-base wastewater treatment plant.

1991-2010: Groundwater Interceptor System — Implemented to capture and extract the iron contamination migrating from the landfill to Wetland 3. A 2008 Optimization Study concluded that performance of the system was insufficient, and the Navy decommissioned the interceptor trench in May 2010.

2007: Remedial Investigation Site 41 — The Site 41 RI evaluated the nature and extent of contamination in sediment and surface water and identified Wetlands 15, 18A, and 18B for no further action and Wetland 3 for further evaluation in an FS.

2010: Technical Memorandum — The Technical Memorandum refined the list of chemicals of potential concern at the Site 41 wetlands and recommended further evaluation of Wetlands 15, 18A, and 18B.

2021 RI Addendum Site 41 — The Site 41 RI Addendum concluded that no unacceptable risk was posed to human health or the environment from Wetlands 1B and 4D. Surface water at Wetland 4D had iron concentrations exceeding the marine surface water quality criteria and background concentrations at some locations. Wetlands 3, 15, 18A, and 18B were found to potentially pose unacceptable risk to human health or the environment.

2024 Feasibility Study Site 41 — The Site 41 FS evaluated remedial alternatives for chemicals of concern (COCs) identified in sediment at Wetlands 15, 18A, and 18B and ARAR-based COCs identified in surface water at Wetlands 3 and 4D.

2024 Human Health Risk Evaluation OU 1 Site 1 — A human health risk evaluation (HHRE) was conducted to re-evaluate potential risk to human receptors from groundwater COCs at OU 1 Site 1 Sanitary Landfill. Arsenic, benzene, cadmium, chlorobenzene, iron, and manganese were identified as groundwater COCs in the HHRE. These COCs were recommended for inclusion in the long-term monitoring program at OU Site 1/Site 1 Sanitary Landfill.

What is the current and future land use at the site?

OU 1 Site 1 Sanitary Landfill and Associated Wetlands include an inactive landfill and the 80 acres surrounding it which is densely vegetated with pines and natural scrub vegetation. The inactive landfill has limited recreational areas and designated nature trails. North of the landfill is a nature trail, picnic area, and recreational Buildings 3553 and 3487. Wetlands 3, 15, 18A, and 18B surround or are within the boundary of the OU 1 Site 1 Landfill. The land that includes OU 1 Site 1 Sanitary Landfill and Associated Wetlands is within an active military area that is expected to remain under the control of the Navy for the foreseeable future. Future use is not expected to change because LUCs prevent intrusive activities, such as those associated with new construction, on the landfill.

What previous efforts have been made by the lead agency to involve the public in matters related to site cleanup?

Following the 1997 OU 1 Site 1 Focused Feasibility Study (FFS) Addendum (EnSafe 1997), a Proposed Plan document was submitted for public review. The Navy published the availability of the Administrative Record and provided a public comment period.

Site Characteristics

Wetlands

Wetlands 1B, 3, 4D, 15, 18A, and 18B are associated with OU 1 Site 1. These wetlands were identified along with other wetlands within the base boundary during an initial field investigation performed by the U.S. EPA in 1991. Initially, all wetlands at NAS Pensacola were grouped into OU 16 Site 41 as an investigative unit. The wetlands were investigated under CERCLA as documented in the Site 41 RI Report (EnSafe 2007) and 2010 Technical Memorandum (Tetra Tech 2010). In 2014, the wetlands were re-assigned to their specific terrestrial OUs. OU 1 Wetlands were further investigated as documented in the RI Report Addendum for OU 1 Wetlands (Resolution Consultants 2021).

No remedial actions have been implemented for Wetlands 1B, 4D, 15, 18A, or 18B. The remedial action for OU 1 Site 1, discussed in the text box, included the installation of a groundwater interceptor trench upgradient of Wetland 3 to address the Surface Water RAO "prevent further contamination of surface water in Wetland 3".

Wetland 1B is an approximately 1-acre freshwater palustrine forested system southwest of the OU 1 Site 1 Sanitary Landfill. The 3-foot-wide maintained open storm water ditch that comprises Wetland 1B is part of the NAS Pensacola storm water drainage system that conveys runoff to Bayou Grande. The ditch is monitored under the auspices of the NAS Pensacola Storm Water Pollution Prevention Program.

Based on site investigations, no human health or ecological Chemical of Concern (COCs) were identified at Wetland 1B (see Summary of Site Risks). These findings support a No Action determination for Wetland 1B.

Wetland 3 is 7.7 acres in the north-central portion of NAS Pensacola, west of the A.C. Read Golf Course and east of the Site 1 landfill. Wetland 3 is a palustrine system with predominantly scrub-shrub emergent vegetation. The area bordering the wetland consists of pine trees and some oaks and other species. Wetland 3 receives shallow groundwater and surface water runoff from Site 1 and is primarily fed by a visible seep at the north end of the wetland. Wetland 3 slopes downhill from west to east and is from 0 to 3 feet deep and 3 to 500 feet wide, consisting of saturated sediment drained by a narrow and shallow stream channel approximately 4 inches deep and 1 to 2 feet wide. Shallow sheet flow drains from the southwest to the northeast into a drainage culvert that runs east under John Tower Road and a golf course fairway before discharging into Wetland 4D.

The soils underlying Wetland 3 are classified as Hurricane series. Hurricane series soils are characterized as poorly drained soils that are strongly to very strongly acidic and contain masses of iron accumulation. The sediment was observed to be saturated orange-brown silt with high organic content. At Wetland 3, iron staining in sediment is visible to 7 inches below the surface.

Based on site investigations, iron was identified as a surface water COC at Wetland 3 due to exceedances of the Florida freshwater Surface Water Quality Criteria (SWQC) of 1,000 micrograms per liter (µg/L). Surface water quality criteria for iron specified in Chapter 62-302.530, Florida Administrative Code (F.A.C.) are considered relevant and appropriate chemical-specific requirements. Detections also exceeded the NAS Pensacola freshwater background concentration (260 µg/L, Resolution Consultants 2019). At the direction of U.S. EPA, no site-specific evaluations of potential risk to ecological receptors from iron in surface water were conducted. U.S. EPA determined that the exceedance of surface water standards and background concentrations triggered the need for a remedy to address landfill leachate discharging into Wetland 3. The most recent surface water data from Wetland 3 (collected in 2014) indicated iron concentrations from 3,700 µg/L to 21,000 µg/L.

Wetland 4D is a 1.4-acre saltwater-dominated estuarine system with emergent vegetation. Wetland 4D receives freshwater from surface water discharges from Wetland 3 and Wetland 4C and is tidally influenced by Bayou Grande. Groundwater from Site 1 also flows toward this wetland. The primary release mechanisms are likely from OU 1 Site 1 landfill constituents via surface flow from Wetland 3, groundwater-to-surface-water pathway, and potential golf course runoff.

Based on site investigations, no human health or ecological COCs were identified at Wetland 4D (see Summary of Site Risks). Iron was detected in multiple surface water locations at concentrations exceeding the marine SWQC of 300 µg/L and/or background concentration of 3,000 µg/L (Resolution Consultants 2019). Surface water quality criteria for iron specified in Chapter 62-302.530, F.A.C. are considered relevant and appropriate chemical-specific requirements. The most recent surface water data from Wetland 4D (collected in 2014) consisted of three samples with iron concentrations of 2,900 µg/L, 3,000 µg/L, and 4,100 µg/L. Based on these exceedances and the location of Wetland 4D immediately downgradient of Wetland 3 where iron is a COC, iron was identified as a COC in surface water at Wetland 4D.

Wetland 15 is a 1.2-acre saltwater estuarine wetland on the shore of Bayou Grande, northeast of Site 1, between Wetland 4D and the NAS Pensacola Picnic Ground. The wetland is bordered to the south, east, and west by the A.C. Read Golf Course and to the north by Bayou Grande. This wetland has recreational or functional uses because it could be accessed by Navy personnel or trespassers walking and/or wading through the wetland. Wetland 15 is fed from the south by surface water runoff from the area of the golf course and the north by tidal influences from Bayou Grande. Site 1 groundwater flows toward this wetland. Lithology at Wetland 15 comprises 11 to 18 inches of peat and silt overlying medium grained sand.

Based on site investigations, manganese was identified as a sediment ecological COC that may pose unacceptable risk to benthic invertebrates. Detections of manganese in surficial sediment (0 to 4 inches below surface) collected in 2014 ranged from 5.6 milligrams per kilogram (mg/kg) to 2,100 mg/kg.

The following pesticides were identified as sediment ecological COCs with potential risk to benthic invertebrates:

- 4,4'-dichlorodiphenyldichloroethane (4,4'-DDD),
- 4,4'-dichlorodiphenyldichloroethene (4,4'-DDE),
- 4,4'-dichlorodiphenyltrichloroethane (4,4'-DDT), and
- DDx (the sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT)

Detections in surface sediment in 2014 ranged from 4 micrograms per kilogram (µg/kg) to 230 µg/kg of 4,4'-DDD, from 20 µg/kg to 270 µg/kg of 4,4'-DDE, from 50 µg/kg to 59 µg/kg of 4,4'-DDT, and from 14.55 µg/kg to 500 µg/kg of DDx.

Arsenic was identified as a sediment human health COC that may pose unacceptable risk to maintenance workers. Arsenic detections in surface sediment in 2014 ranged from 1.2 mg/kg to 130 mg/kg.

Wetland 18A is a 1.3-acre long, narrow freshwater ditch fed by groundwater seeps from Site 1 to the east leading toward 18B, which connects with Redoubt Bayou. Redoubt Bayou is along the northern shoreline of Bayou Grande, situated at the midpoint of NAS Pensacola. Wetland 18A, classified as a palustrine emergent system, is no deeper than 1 foot and has a maximum width of 2 feet; it transitions to Wetland 18B via a stream approximately 2 feet wide. Minor tidal mixing with saltwater occurs between Wetland 18A and Wetland 18B.

Based on site investigations, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and DDx were identified as sediment ecological COCs with potential unacceptable risk to benthic invertebrates and fish-eating birds at Wetland 18A. Detections in surface sediment in 2014 ranged from 2 µg/kg to 10,000 µg/kg of 4,4'-DDD, from 2.7 µg/kg to 4,600 µg/kg of 4,4'-DDE, from 14 µg/kg to 3,800 µg/kg of 4,4'-DDT, and from 6.25 µg/kg to 18,400 µg/kg of DDx.

Wetland 18B is a 0.6-acre saltwater wetland adjacent to the eastern shore of Redoubt Bayou, which is along the northern shoreline of Bayou Grande, situated at the midpoint of NAS Pensacola. Classified as an estuarine emergent system, Wetland 18B connects to and is tidally interactive with Redoubt Bayou. Wetland 18B is fed by freshwater influx from Wetland 18A and freshwater drainages. It is up to 8 feet deep and 50 feet wide, depending on bayou influx. Wetland 18B has tidally influenced surface flow. Sediment at Wetland 18B comprises silt and sand in the channel areas and 3 to 4 inches of topsoil and silt overlying silt and sand to approximately 25 inches below ground surface.

Based on site investigations, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and DDx were identified as sediment ecological COCs with potential unacceptable risk to benthic invertebrates at Wetland 18B. Detections in surface sediment in 2014 ranged from 21 µg/kg to 36,000 µg/kg of 4,4'-DDD, from 3.4 µg/kg to 3,700 µg/kg of 4,4'-DDE, from 40 µg/kg to 430 µg/kg of 4,4'-DDT, and from 6.65 µg/kg to 39,620 µg/kg of DDx.

Arsenic was identified as a human health COC that may pose unacceptable risk to maintenance workers at Wetland 18B. Arsenic detections in surface sediment in 2014 ranged from 11 mg/kg to 190 mg/kg.

Scope and Role of the Response Action

The response action at OU 1 involves the first remedy for sediment at Wetlands 15, 18A, and 18B, an amended remedy for Wetland 3 surface water that incorporates a remedy for Wetland 4D surface water, and an explanation of significant difference to the remedy for OU 1 Site 1 groundwater. The remedial action objective for Wetland 3 surface water has been revised from the 1998 ROD.

There have not been any response actions at OU 1 Wetlands 1B, 4D, 15, 18A, or 18B, and this PP details their final remedy. The final remedy for OU 1 wetlands is not expected to have an impact on the strategy or progress of cleanup for the other OUs at NAS Pensacola. As other OUs progress through the cleanup process, OU- or site-specific PPs will be issued.

Summary of Site Risks

The following summarizes human health and ecological risks and recommendations for further action at OU 1 Site 1 Sanitary Landfill and Associated Wetlands. More detailed historical summaries of human health and ecological risk evaluations from the studies conducted from 2007 through 2024 are available in the Administrative Record. COCs are identified in Table 1.

Site 1 Groundwater

Human Health Risk: Arsenic, benzene, cadmium, chlorobenzene, iron, and manganese were identified as human health COCs in groundwater in the 2024 Human Health Risk Evaluation (HHRE). These COCs contributed to potential unacceptable risk for a hypothetical future resident using groundwater for household purposes (e.g., cooking, washing, etc.) and as drinking water.

Ecological Risk: Ecological receptors are not directly exposed to groundwater; however, groundwater discharges to Wetland 3 via a seep. Iron was identified as a COC in the groundwater discharging to Wetland 3 based on the exceedance of the freshwater surface water criteria.

Wetland 1B

Human Health Risk: Current and future land use for Wetland 1B is limited to trespassers and maintenance workers. No human health COCs were identified in surface water or sediment in the 2007 Site 41 RI.

Table 1
Chemicals of Concern and Cleanup Levels
Operable Unit 1/Site 1 Sanitary Landfill and Associated Wetlands 3, 15, 18A, and 18B
Naval Air Station Pensacola, Florida

Wetland/Site	Media	COC	Cleanup Level	Basis
1	Groundwater	Arsenic	10 µg/L	Federal MCL and Florida Groundwater Cleanup Target Level (Chapter 62-777, F.A.C.)
		Benzene	1 µg/L	Florida Groundwater Cleanup Target Level (Chapter 62-777, F.A.C.)
		Cadmium	5 µg/L	Federal MCL and Florida Groundwater Cleanup Target Level (Chapter 62-777, F.A.C.)
		Chlorobenzene	100 µg/L	Federal MCL and Florida Groundwater Cleanup Target Level (Chapter 62-777, F.A.C.)
		Iron	4,200 µg/L	Florida Health-based Groundwater Cleanup Target Level (Chapter 62-780, F.A.C.)
		Manganese	330 µg/L	Florida Health-based Groundwater Cleanup Target Level (Chapter 62-780, F.A.C.)
3 and 4D[1]	Surface water	Iron	3,000 µg/L	Wetland 4D: Marine surface water background concentration[2] Wetland 3: No cleanup level applies to surface water at Wetland 3*
15	Sediment (saltwater)	Arsenic	37.5 mg/kg	Calculated using NAS Pensacola-specific exposure durations for maintenance workers (20 days/year) and Florida-specified human health target cancer risk of 1E-06 and target hazard index of 1.0
		Manganese	630 mg/kg	Site-specific NOAEL for benthic invertebrates based on toxicity testing at Wetland 15
		4,4'-DDD	92 µg/kg	Site-specific NOAEL for benthic invertebrates based on toxicity testing at Wetland 15
		4,4'-DDE	374 µg/kg	Ecological Probable Effect Level (FL SQAG)
		4,4'-DDT	20 µg/kg	Basewide Reference Concentration and Site-specific NOAEL for benthic invertebrates based on toxicity testing at Wetland 15
		DDx	222 µg/kg	Site-specific NOAEL for benthic invertebrates based on toxicity testing at Wetland 15
18A	Sediment (freshwater)	4,4'-DDD	50 µg/kg	Basewide Reference Concentration
		4,4'-DDE	40 µg/kg	Basewide Reference Concentration
		4,4'-DDT	63 µg/kg	Ecological Probable Effect Concentration (FL SQAG)
		DDx	570 µg/kg	Ecological Probable Effect Concentration (FL SQAG)
18B	Sediment (saltwater)	Arsenic	37.5 mg/kg	Calculated using NAS Pensacola-specific exposure durations for maintenance workers (20 days/year) and Florida-specified human health target cancer risk of 1E-06 and target hazard index of 1.0
		4,4'-DDD	92 µg/kg	NOAEL for benthic invertebrates based on toxicity testing at Wetland 15
		4,4'-DDE	374 µg/kg	Ecological Probable Effects Level (FL SQAG)
		4,4'-DDT	20 µg/kg	Basewide Reference Concentration and Site-specific NOAEL for benthic invertebrates based on toxicity testing at Wetland 15
		DDx	222 µg/kg	NOAEL for benthic invertebrates based on toxicity testing at Wetland 15

Notes:

COC = chemical of concern
F.A.C. = Florida Administrative Code
MCL = Maximum Contaminant Level
µg/L = microgram per liter or part per billion
µg/kg = micrograms per kilogram or parts per billion
mg/kg = milligrams per kilogram or parts per million
NAS = Naval Air Station
NOAEL = No Observed Adverse Effects Level
4,4'-DDD = 4,4'-dichlorodiphenyldichloroethane
4,4'-DDE = 4,4'-dichlorodiphenyldichloroethene
4,4'-DDT = 4,4'-dichlorodiphenyltrichloroethane
DDx = Sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT
FL SQAG = Florida Sediment Quality Assessment Guidelines

* Portions of Wetland 3 are proposed for conversion into a treatment system and an effluent limit based on a surface water concentration of 3,000 ug/L will be complied with at the point of discharge into Wetland 4.

Under CERCLA (Role of Background in the CERCLA Cleanup Program OSWER 9285.6-07P, [U.S. EPA 2002]) and consistent with Navy policy (Department of the Navy 2004) and Florida code (Chapter 62-780.650(1)(d), F.A.C.), Cleanup Levels are generally not set at concentrations that are less than natural or anthropogenic background.

What Risks Were Assessed?

Human Health Risk Assessment: When evaluating the potential risk to humans, the risk estimates for carcinogens (chemicals that may cause cancer) and non-carcinogens (chemicals that may cause adverse health effects other than cancer) are expressed differently.

Carcinogens: For carcinogens, risk estimates are expressed in terms of probability. For example, exposure to a carcinogenic chemical may present a 1 in 10,000 increased chance of causing cancer over an estimated lifetime of 70 years. This can also be expressed as $1x10^{-4}$. The U.S. EPA acceptable risk range for carcinogens is $1x10^{-6}$ (a 1 in 1 million chance) to $1x10^{-4}$.

The State of Florida has derived its cleanup concentrations based on a carcinogenic risk of $1x10^{-6}$. In general, calculated risks higher than this range would require consideration of the development and implementation of cleanup alternatives.

Non-carcinogens: For non-carcinogens, exposures are first estimated and then compared to a reference dose. The reference dose is developed by U. S. EPA scientists to estimate the amount of a chemical a person (including the most sensitive person) could be exposed to over a lifetime without developing adverse (non-cancer) health effects. When summed for each noncarcinogen, this is known as a hazard index. A hazard index greater than 1 suggests that adverse health effects are possible.

Ecological Risk Assessment: When evaluating the potential risk to ecological receptors, a hazard quotient method is used to identify chemicals that may have the potential to contribute to unacceptable risk. A hazard quotient greater than 1 suggests the potential for ecological risk and require further evaluation.

Ecological Risk: Current ecological use of Wetland 1B is wetland habitat. No ecological COCs were identified in surface water or sediment in the 2021 Site 41 RI Addendum.

Wetland 3

Human Health Risk: Current and future land use for Wetland 3 is limited to trespassers and maintenance workers. No human health COCs were identified in surface water or sediment in the 2007 Site 41 RI.

Ecological Risk: Current ecological use of Wetland 3 is wetland habitat. No ecological COCs were identified in surface water or sediment in the 2021 Site 41 RI Addendum.

ARAR-based COC: Iron was identified as a COC in surface water at Wetland 3 based on exceedances of the Florida freshwater surface water quality criteria (SWQC) (1,000 µg/L) (Chapter 62-302.530, F.A.C., Table: Surface Water Quality Criteria) and the NAS Pensacola freshwater background concentration (260 µg/L; Resolution Consultants 2019). Following a series of technical discussions in 2012, the NAS Pensacola Partnering Team concluded that the SWQC exceedance was the primary concern at Wetland 3, specifically to the potential migration of iron from Wetland 3 to downgradient habitats.

Wetland 4D

Human Health Risk: Current and future land use for Wetland 4D is limited to trespassers and maintenance workers. No human health COCs were identified in surface water or sediment in the 2007 Site 41 RI.

Ecological Risk: Current ecological use of Wetland 4D is wetland habitat. No ecological COCs were identified in surface water or sediment in the 2021 RI Addendum.

ARAR-based COC: Iron was identified as a COC in surface water based on exceedances of the Florida marine SWQC (300 µg/L) and the marine background concentration (3,000 µg/L).

Wetland 15

Human Health Risk: Current and future land use of Wetland 15 is limited to trespassers and maintenance workers. No human health COCs were identified in surface water. Arsenic was identified as a human health COC in sediment for maintenance workers; exposures include inhalation, skin exposure, and incidental ingestion. Unacceptable risk was identified based on comparisons of the site-wide exposures in sediment (upper confidence limit [UCL] of the mean concentration) to a NAS Pensacola-specific carcinogenic remedial goal based on an exposure frequency of 20 days per year and a Florida- specified risk level of 1E-06 (one in one million chance of increased carcinogenic risk). No COCs were identified for trespassers.

Ecological Risk: Current and future ecological use of Wetland 15 is wetland habitat. No ecological COCs were identified in surface water. Arsenic, manganese, 4,4'-DDD, 4,4,'-DDE, 4,4'-DDT, and DDx were identified as ecological COCs in sediment with potential unacceptable risk to benthic invertebrates; exposure is via direct contact. The potential for unacceptable risk was identified based on comparisons of site-wide exposures in sediment (including consideration of potential hot spots) to no observed adverse effects concentrations identified through site-specific toxicity testing. No other ecological receptors were indicated to be at unacceptable risk from exposure to Wetland 15 sediment.

Wetland 18A

Human Health Risk: Current and future use for Wetland 18A is limited to trespassers and maintenance workers. No human health COCs were identified in surface water or sediment.

Ecological Risk: Current and future ecological use of Wetland 18A is wetland habitat. No ecological COCs were identified in surface water. 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and DDx were identified as ecological COCs in sediment. These COCs pose potential risk to benthic invertebrates via

direct contact and to fish-eating birds via incidental ingestion and ingestion of contaminated food items. The potential for unacceptable risk to benthic invertebrates was identified based on comparisons of site sediment concentrations to literature-based sediment toxicity values (i.e., Florida Sediment Quality Assessment Guidelines). The potential for unacceptable risk to fish-eating birds was identified via comparison of modeled daily intakes to literature-based toxicity reference values. The most sensitive of these two ecological receptors was benthic invertebrates. Sediment with the potential to pose unacceptable ecological risk was limited to a hot spot of contamination; therefore, site- specific studies to refine ecological risks were not conducted for Wetland 18A.

Wetland 18B

Human Health Risk: Current and future land use for Wetland 18B is limited to trespassers and maintenance workers. No human health COCs were identified in surface water. Arsenic was identified as a human health COC in sediment for maintenance workers; exposures include inhalation, skin exposure, and incidental ingestion. Unacceptable risk was identified based on comparisons of the site-wide exposures in sediment (UCL of the mean concentration) to a NAS Pensacola-specific carcinogenic remedial goal based on an exposure frequency of 20 days per year and a risk level of 1E-06 (one in one million chance of increased carcinogenic risk). No COCs were identified for trespassers.

Ecological Risk: Current ecological use of Wetland 18B is wetland habitat. No ecological COCs were identified in surface water. 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and DDx were identified as ecological COCs in sediment with potential unacceptable risk to benthic invertebrates via direct contact. No other ecological receptors were indicated to be at unacceptable risk from exposure to Wetland 18B sediment. The potential for unacceptable risk to benthic invertebrates was identified based on comparisons of site-wide exposures in sediment (considering potential hot spots) to no observed adverse effects concentrations identified through toxicity testing results from Wetland 15. Toxicity testing was conducted at Wetland 18B but could not be used to identify the effects concentrations due to poor test performance.

Why is action needed at the site?

It is the current judgment of the Navy and U.S. EPA, after consultation with FDEP, that the Preferred Remedial Alternatives, or other active measures identified in this PP, are necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment at OU 1 Site 1, Wetland 3, Wetland 4D, Wetland 15, Wetland 18A, and Wetland 18B. No Action is necessary to protect public health or welfare or the environment at Wetland 1B.

Remedial Action Objectives

Remedial Action Objectives (RAOs) are the goals that the Preferred Remedial Alternatives should achieve. They are established to protect current and future human health and the environment and comply with all pertinent federal and state regulations. Site-specific RAOs were developed to permit consideration of land use controls (LUCs), monitoring, and containment alternatives based on current and potential future land use. The following RAOs were developed for OU 1 Site 1 and OU 1 Wetlands:

- RAO 1: Reduce unacceptable risk to ecological and human receptors associated with exposure to COCs in sediment at Wetlands 15, 18A, and 18B.
- RAO 2: Restore surface water in Wetland 4D to attain the CL of 3,000 µg/L for iron (marine surface water background concentration).
- RAO 3: Restore the functions and values of the wetlands following the remedial actions (applicable to sediment remedial alternatives that involve excavation and/or alteration of the wetland).

RAO 2 amends the surface water RAO presented in the 1998 ROD for Wetland 3 (see History of Site Investigations text box) and is established in response to the identification of iron as a surface water COC in Wetlands 3 and 4D.

Cleanup Levels

CLs are the concentrations of each chemical that can be present without posing unacceptable risk to human health or ecological receptors above background concentrations. The National Contingency Plan at 40 CFR 300.430(e)(2)(i) specifies that preliminary remediation goals (that become CLs once remedy is selected) initially be based on chemical- specific ARARs when available. Under CERCLA (Role of Background in the CERCLA Cleanup Program OSWER 9285.6-07P, [U.S. EPA 2002]) and consistent with Navy policy (Department of the Navy 2004) and Florida code (Chapter 62-780.650(1)(d), F.A.C.), CLs are generally not set at concentrations that are less than natural or anthropogenic background.

CLs for sediment were developed for chemicals identified as COCs for potentially exposed ecological and human (maintenance workers) receptors following the risk evaluations for Wetlands 15, 18A, and 18B. Values considered were risk-based concentrations protective of human health and the environment, NAS Pensacola background concentrations (Resolution Consultants 2019), and NAS Pensacola Basewide DDx concentrations (EnSafe 2007).

The human health risk-based CL for arsenic is protective of maintenance workers, which were the only human receptors indicated to be at potential unacceptable risk from exposure to sediment. As noted in Summary of Site Risks, maintenance workers may be exposed to sediment in Wetlands at the site up to 20 days per year. The CL is protective based on a target cancer risk of 1E-06 (one in one million chance of increased carcinogenic risk), which is a Florida-specified risk level.

Ecological risk-based CLs are protective of the most sensitive ecological receptor indicated to be at risk for each individual wetland (specified in Summary of Site Risks). The basis of ecological CLs for individual wetlands are provided on Table 1.

Values considered for CLs for surface water at Wetland 3 took into consideration the RAO of restoring surface water in Wetland 4D from iron from the Site 1 landfill. Wetland 4D is a saltwater wetland; therefore, values considered for CLs were the Florida marine surface water quality criteria of 300 μg/L (Chapter 62-302.530, F.A.C.) and the NAS Pensacola marine background concentration of 3,000 μg/L (Resolution Consultants 2019). The U.S. EPA has not established a National Ambient Water Quality Criteria for iron.

CLs for groundwater were established in the 2024 HHRE based on potential chemical-specific ARARs as the lower of Federal MCLs identified in the Safe Drinking Water Act Primary Drinking Water regulations, Florida Groundwater Cleanup Target Levels (GCTLs) specified in Table 1 of Chapter 62-777 F.A.C., and Florida health-based Groundwater Cleanup Target Levels specified in Table F of Chapter 62-780 F.A.C.

CLs for sediment, surface water, and groundwater are summarized in Table 1 on page 7.

Volume of Contaminated Media Exceeding Cleanup Levels

In sediment, acceptable risk is achieved when the 95% UCL of the mean site concentration is equal to or less than the CL. Table 2 lists estimated areas of sediment requiring remediation to achieve UCL concentrations below or equal to CLs; those areas, calculated in the FS, are also shown on Figures 2, 3, and 4 for Wetlands 15, 18A, and 18B, respectively. Not all individual locations with COC concentrations above CLs must be remediated to achieve RAOs. Cleanup Level exceedances were measured in the bioactive zone (top 4 to 6 inches) of sediment at Wetlands 15, 18A, and 18B.

Table 2
Estimated Volume of Contaminated Sediment Exceeding Cleanup Levels
OU 1 Wetlands 15, 18A, and 18B
Naval Air Station Pensacola, Florida

Wetland	Area (square feet)	Volume (cubic yards)[1]
15	12,300	300
18A[2]	4,800	89
18B	19,800	735

Notes:
[1] Assumes 6-inch remedial depth for ecological chemicals of concern and 12-inch remedial depth for human health chemicals of concern.
[2] Only one sediment sample at Wetland 18A requires remediation to achieve 95% UCL concentrations less than or equal to CLs.
Source: Feasibility Study Report (Resolution Consultants, 2022)

Summary of Remedial Alternatives

General Response Actions (GRAs) are broadly defined remedial approaches that may be used by themselves or in combination to attain RAOs. GRAs and associated technologies/process options were considered based on preliminary screening criteria (i.e., implementability, effectiveness, and cost) in the FS for OU 1 Site 1 Wetlands 3, 4D, 15, 18A, and 18B. Sediment and surface water GRAs were evaluated within the context of impact to the overall wetland habitat and recreational uses, reductions in functional habitat, and potential harm to adjacent habitat.

SEDIMENT

The following alternatives were developed for sediment at Wetlands 15, 18A, and 18B:

- SED-1: No Action
- SED-2: Monitored Natural Recovery (MNR) and Land Use Controls
- SED-3: Sediment Removal, Offsite Disposal, Wetland Restoration, and Restoration Monitoring
- SED-4: Enhanced Monitored Natural Recovery (EMNR) and Land Use Controls

The recommended preferred alternative for sediment is Alternative SED-3: Sediment Removal, Offsite Disposal, Wetland Restoration, and Restoration Monitoring.

Assembly and Detailed Analysis of Sediment Remedial Alternatives

The following provides additional site-specific information and assumptions to further explain the alternative development process for sediment remediation at Wetlands 15, 18A, and 18B. Any differences in the detailed and comparative analyses of the evaluation criteria for Wetland 15, 18A, or 18B are noted in the following text. Each sediment alternative is evaluated individually for each wetland and not collectively for these three wetlands.

Alternative SED-1 — No Action

No Action alternatives, where no cleanup remedies would be applied, were evaluated for sediment in the FS. This is required under CERCLA and the NCP, and it serves as a baseline for comparison with other alternatives. The alternative does not address the sediment contamination and there would be no reduction in toxicity, mobility, or volume of contaminants other than what would result from the natural dispersion, dilution, and other attenuating factors. The wetland would be available for unrestricted use because no LUCs would be in place. Alternative SED-1 does not impact current or anticipated future land use of Wetlands 15, 18A, or 18B.

Alternative SED-2 — Monitored Natural Recovery

Alternative SED-2 consists of three major components: LUCs, natural recovery, and sediment monitoring.

Component 1: Land Use Controls

LUCs would be implemented to prevent removal of the natural cover that protects ecological receptors from exposure to COCs in underlying sediment. LUCs may also prohibit destruction of the wetland vegetation or require signs to prevent recreational use near affected wetlands. The process for implementing and maintaining the LUCs would be detailed in a Remedial Design document that would be prepared by the Navy and submitted to U.S. EPA and FDEP for review and concurrence after finalization of the ROD.

Component 2: Natural Recovery

Natural recovery allows naturally occurring processes to reduce risks posed by COCs over time. Natural recovery could involve physical, biological, and/or chemical processes. The primary processes that would be monitored to evaluate the success or failure of MNR in mitigating site-specific risks include contaminant isolation/burial (e.g., natural deposition of clean sediment), contaminant dispersion (e.g., mixing clean and contaminated sediments to reduce surface concentrations thereby reducing exposure), contaminant sequestration (to reduce contaminant mobility and bioavailability), and contaminant transformation (converting contaminants to different, less toxic chemicals or bioavailable products).

Component 3: Sediment Monitoring

Sediment monitoring would be implemented by using existing or Pre-Design Investigation (PDI) sediment concentrations (as determined during Remedial Design) as a baseline for future comparison. Sediment monitoring may consist of collecting and analyzing sediment samples from Wetlands 15, 18A, and 18B to assess natural recovery and verify that migration of the COCs is not occurring into clean areas at concentrations that exceed CLs.

The Remedial Design would include a Sampling and Analysis Plan (SAP) that identifies the location and number of sediment samples to be collected, the types of data to be collected, the data quality objectives (DQOs), and the decision rules for how the data will be evaluated. The sediment monitoring would be performed at the frequency described in the SAP until CLs have been met.

Five-Year Review

Because this remedy would result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review would be conducted within five years after the initiation of remedial action, and every five years thereafter, until COCs meet CLs. The five-year reviews would be conducted to ensure that the remedy was, or would be, protective of human health and the environment. If results of the five-year reviews revealed that remedy integrity was compromised and protection of the environment was insufficient, then additional remedial actions would be evaluated by the Navy, U.S. EPA, and FDEP. The statutory five-year reviews would be conducted per CERCLA 121(c) and the NCP requirement 40 Code of Federal Regulations (CFR) 300.430(f)(4)(ii).

Alternative SED-2 will not impact anticipated future land use, which will not change from the current land use (i.e., use by trespassers and maintenance workers and as ecological habitat).

Alternative SED-3 — Sediment Removal, Offsite Disposal, Wetland Restoration, and Restoration Monitoring

Alternative SED-3 consists of four major components described below: removal (excavation) of contaminated sediment, offsite sediment disposal, wetland restoration, and wetland restoration monitoring.

Component 1: Sediment Removal

Under Alternative SED-3, sediment would be removed from approximately 0-6 inches in depth from areas with ecological COCs only and from approximately 0- 12 inches in depth from areas with human health COCs. Mechanical or pneumatic (air knifing) methods could be used to remove sediment, depending on the sediment geotechnical characteristics and the number of trees in the excavation area. Bulk excavation could be conducted using heavy equipment. Load-bearing mats may be used to provide access to excavation areas and to move around the excavation areas. Sediment would be removed in a manner that minimizes adverse effects to the surrounding wetland. Results of a dewatering assessment would determine the need for construction of a temporary containment area, which may be needed to reduce the moisture content in the sediments to a level that is acceptable for disposal at an offsite landfill. Sediment in the water obtained from the excavated sediments would be allowed to settle out before returning the water to the wetland. If necessary, the water would be treated (e.g., by filtration or with activated carbon) before discharge. A stabilization agent may also be added to the removed sediment to assist in material handling and transportation.

To assist with preparing the Remedial Design, a PDI would be conducted to evaluate the implementability of Alternative SED-3. The PDI would include collection of functions and values information, broad-scale topographical survey, additional sampling to refine the horizontal extent of excavation, and sediment dewatering assessment to be considered for offsite disposal requirements (see Component 2). Data collected during the PDI would be used to determine the final areas designated for remediation (i.e., extent of excavation) to achieve acceptable risk levels for ecological and human receptors. The horizontal extent of excavation would be determined via PDI sampling such that confirmatory sampling would not be required. For wetlands that pose a risk to human health, potential exposures, and therefore remedial depths, are 0-1 foot below ground surface. For ecological receptors, remedial depths are 0-0.5 feet below ground surface. PDI samples in both cases would be collected to a depth of 1 foot following the procedures in an approved SAP to determine the vertical extent of contamination.

Component 2: Offsite Disposal

Samples of excavated materials will be collected to ensure waste materials are non-hazardous and can be disposed of in a permitted Resource Conservation and Recovery Act Subtitle D landfill. Before disposal, sediment would be dewatered in a temporary holding area until it passes testing required by the landfill. The estimated tonnage of excavated sediment to be disposed of offsite is approximately 475 tons from Wetland 15, 141 tons from Wetland 18A, and 1158 tons from Wetland 18B.

Component 3: Wetland Restoration

Sediment removal from Wetlands 15, 18A, and 18B would be preceded by stripping some portion of vegetative cover; therefore, wetland restoration would be necessary as required by Clean Water Act 404(b)(1) regulations related to compensatory mitigation for alteration of wetlands which are identified as location- specific ARARs. Clean materials with the proper organic content would be placed to reestablish topography and hydrology to allow for vegetation restoration. Native species of plants would be used to restore the previous functions and values of the wetlands to the extent possible.

Component 4: Wetland Restoration Monitoring

Monitoring would be conducted annually for the first 2 years and in year 5 to ensure the establishment of new vegetation and restoration of wetland function following the removal action.

Five-Year Review

This remedy would not result in hazardous substances, pollutants, or contaminants remaining onsite. A statutory Five-Year Review would be required to ensure attainment of RAO 3: Restore the functions and values of the wetlands following the remedial actions.

Alternative SED-3 will not impact anticipated future human land use of Wetlands 15, 18A, or 18B (i.e., use by trespassers and maintenance workers). This alternative will disturb ecological habitat in the short-term via the removal of vegetation, biota, and habitat in impacted areas. This short-term impact will be addressed via Wetland Restoration (RAO 3).

Alternative SED-4 — Enhanced Monitored Natural Recovery

Alternative SED-4 consists of three major components: LUCs, EMNR, and sediment monitoring.

Component 1: Land Use Controls

LUCs would be implemented to prevent the removal of the enhanced cover that protects ecological receptors from exposure to COCs in the underlying sediment and reduces bioavailability of chemicals in the sediment. LUCs may also prohibit destruction of wetland vegetation within the site or posting signs to prevent trespass onto affected wetlands. The process for implementing and maintaining the LUCs would be detailed in the Remedial Design to be prepared by the Navy and submitted to the U.S. EPA and FDEP for review and concurrence after finalization of the ROD.

Component 2: Enhanced Monitored Natural Recovery

EMNR involves in situ sequestering or destruction of contaminants to reduce risks primarily to ecological receptors. EMNR technologies include thin layer caps, amended caps, and direct sediment amendments. Amendments are generally placed into or onto the sediment surface layer, into a sand cap, or within a geotextile mat. The most common amendments are specialized materials that decrease contaminant bioavailability by sorption or promote the degradation of contaminants. Other amendments promote the degradation of contaminants. The appropriate use of these amendments limits exposure to contaminants and reduces risk.

Amendments can be introduced in sediments as part of a cap or directly into or onto the existing sediment. Amendments can be spread on the sediment in bulk using conventional equipment or with fine-grain soil or sands to provide better dispersion, uniformity, placement controls, and contact time when the required quantity of the amendment is small.

Two types of EMNR technologies were considered and evaluated under Alternative SED-4: SED-4A and SED-4B.

- ***Thin layer amended caps (SED-4A)*** — Thin layer (less than 6 inches thick) sand caps may be effective for preventing ecological exposure to underlying COCs in sediment. Unlike thicker conventional caps, thin layer caps are meant to cover and be blended into the top 4 to 6 inches of sediment where organisms that live in the sediment are most likely to be found while allowing wetland vegetation to grow uninhibited. Thin layer caps work primarily by retarding contaminant transport through the cap and acting as an isolation barrier between the contaminated sediment and the new layer. However, when sediments contain relatively high concentrations of COCs, or if porewater contains COCs, amendments can be added to the thin layer cap to increase treatment efficiency and reduce bioavailability. Activated carbon and other carbonaceous amendments are attractive amendments because of their strong sorbent properties and can increase a cap's effectiveness (U.S. EPA 2014).

  Pilot or bench studies would be needed to design an effective blend of inert cap material and an amendment that reduces the bioavailability of COCs and can sustain continued vegetative growth in the wetland. The blend would need to be able to reduce the concentrations and bioavailability of organic COCs at Wetland 18A, and both inorganic and organic COCs at Wetlands 15 and 18B.

- ***Direct sediment amendments (SED-4B)*** — Direct application of a sediment amendment with sorbents to surficial sediment can reduce pollutant bioavailability to the food chain and flow of pollutants into the water column. Amendments can be spread on the surface of the contaminated sediment as a thin

layer, intended to be mixed with the sediments through natural processes, or mixed into the surface using equipment similar to a rototiller. The direct application intends to change the native sediment geochemistry to reduce contaminant bioavailability without creating a new surface layer or cap.

Pilot studies for direct sediment amendment applications have distributed a slurry of activated carbon and water close to the sediment surface, injected activated carbon into sediment through hollow tines, or delivered the amendment in a pelletized form that breaks up over time.

Depending on the hydrodynamics of the wetland, the amendment may need to be protected from erosion by placing a sand or gravel armoring layer on top of the amendment. The type of material selected for the uppermost layer may also depend on habitat of the wetland (U.S. EPA 2005).

Additional components of EMNR include a PDI to ensure the thin cap/direct amendment application covers and treats the required amount of sediment, a Functions and Values assessment to evaluate the risk of applying the thin cap/direct amendment to the ecosystem and for restoration planning, and a topographical survey to assist with thin cap/amendment placement and to better understand erosional pathways. Methods to apply amendments would be evaluated during Remedial Design.

Component 3: Sediment Monitoring

Sediment monitoring would be implemented by using the existing sediment COC concentrations as a baseline for future comparison. Sediment samples would be collected from areas of concern at Wetlands 15, 18A, and 18B to assess natural recovery and verify that migration of the COCs is not occurring into clean areas at concentrations that exceed CLs.

The Remedial Design would include a SAP that identifies the location and number of sediment samples to be collected, the types of data to be collected, the DQOs, and the decision rules for how the data will be evaluated. The sediment monitoring would be performed at the frequency described in the SAP until CLs have been met.

Five-Year Review

Because this remedy would result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review would be conducted within five years after the initiation of remedial action, and every five years thereafter, until COCs meet CLs. The five-year reviews would be conducted to ensure that the remedy was, or would be, protective of human health and the environment. If results of the five-year reviews revealed that remedy integrity was compromised and protection of the environment was insufficient, then additional remedial actions would be evaluated by the Navy, U.S. EPA, and FDEP. The statutory five-year reviews would be conducted per CERCLA 121(c) and the NCP requirement 40 Code of Federal Regulations (CFR) 300.430(f)(4)(ii).

Alternative SED-4 will not impact anticipated future human land use of Wetlands 15, 18A, or 18B (i.e., use by trespassers and maintenance workers). This alternative will disturb ecological habitat in the short-term via the addition of thin layer caps or direct sediment amendments, which may bury vegetation and biota, and alter habitat in impacted areas. This impact would be relatively short-term.

SURFACE WATER

The following alternatives were developed to address surface water at Wetlands 3 and 4D. Surface water alternatives are evaluated collectively for Wetlands 3 and 4D and not separately for these two wetlands.

- SW-1 — No Action
- SW-2 — Aerobic Surface Flow Constructed Wetland, Monitoring, and Land Use Controls
- SW-3 — Mechanical Aeration, Monitoring, and Land Use Controls

The recommended preferred alternative for surface water is Alternative SW-2: Aerobic Surface Flow Constructed Wetland, Monitoring, and Land Use Controls.

ASSEMBLY AND DETAILED ANALYSIS OF SURFACE WATER REMEDIAL ALTERNATIVES

The following provides additional site-specific information and assumptions to further explain the alternative development process for surface water at Wetlands 3 and 4D.

Alternative SW-1 — No Action

The No Action alternative maintains the wetland as is. This alternative does not address surface water contamination and is retained to provide a baseline for comparison to other alternatives. There would be no reduction in toxicity, mobility, or volume of the contaminants other than what would result from natural dispersion, dilution, and other attenuating factors. The wetland would be available for unrestricted use because no LUCs would be implemented. Alternative SED-1 does not impact current or anticipated future land use of Wetlands 3 or 4D.

Alternative SW-2 — Aerobic Surface Flow Constructed Wetland, Monitoring, and Land Use Controls

SW-2 consists of three major components: an aerobic surface flow constructed wetland, monitoring, and LUCs.

Component 1: Aerobic Surface Flow Constructed Wetland

Under Alternative SW-2, groundwater exiting the seep at Wetland 3 would be treated passively throughout an aerobic surface flow constructed wetland. The wetland would be created by modifying the topography and flow of surface

water in Wetland 3 to enhance iron removal. Based on groundwater and surface water sample data collected and discussed in the OU 1 RI Addendum, groundwater flowing from the seep is low in dissolved oxygen, exhibits reducing conditions, is dominated by soluble ferrous iron, and is slightly net-alkaline, all of which are suitable for iron removal in an aerobic surface flow wetland via abiotic processes. The alteration and restoration of Wetland 3 would be subject to Location-specific ARARs including identified Clean Water Act Section 404(b) regulations at 40 CFR part 230 et. seq. related to discharge and fill material in aquatic ecosystems such as wetlands, as well as U.S. EPA and FDEP regulations related to compensatory mitigation.

Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act (CWA) are not considered "waters of the U.S." even where they otherwise meet the definition in 40 C.F.R. § 120.3. Wetland 3 qualifies as a "water of the U.S." but is proposed to be converted/modified into a treatment system that addresses elevated iron leachate from Sanitary Landfill 1. Under Alternative SW-2, the modified portion of Wetland 3 would function as a waste treatment system designed to meet the requirements of the CWA. Pursuant to 40 CFR part 120.2, the modified portion of Wetland 3 would not be considered waters of the U.S. The water discharged from Wetland 3 into Wetland 4D will have to meet a water quality-based effluent limit which is based on the background concentration for marine surface water of 3000 µg/L at the discharge point. Compliance with the limit will be measured at the end of the culvert where surface water from Wetland 3 discharges to Wetland 4D.

Aerobic wetland cells are the simplest type of surface flow system and are used to treat mildly acidic or net-alkaline waters containing elevated iron concentrations. These systems' primary functions are to allow aeration to the surface waters flowing among vegetation and dissolved iron to oxidize, and to provide residence time where the water is slowed for iron oxide products to precipitate.

The primary physical and chemical abiotic processes that are responsible for contaminant removal in a surface flow wetland include settling and sedimentation, sorption, chemical oxidation/reduction and precipitation, photodegradation/ oxidation, and volatilization.

The primary mechanisms for iron removal from groundwater discharging to the aerobic surface flow wetland that would be constructed at Wetland 3 would be precipitation through oxidation and hydrolysis, settling, and sedimentation.

Aerobic surface flow wetlands consist of shallow basins in soil or other media that will support plant roots. These wetlands typically mimic natural marshes. A surface flow wetland generally has a soil bottom, emergent vegetation, and a water surface exposed to the atmosphere. The water moves through the wetland above the substrate at low velocities in a dormant manner.

Wetland plants perform many important functions such as stabilizing wetland soil and sediment and enhancing the creation of new sediments through the filtering action of their leaves and stems, causing settleable solids to fall out of the water column. Plants serve as physical obstacles that help prevent channelized flow, which happens when flowing waters are concentrated within the shortest distance between the entrance and exit. Dispersed flow causes the waters to move more slowly, allowing more time for oxidation and aiding in physical filtration and sedimentation of small particles.

The most effective type of aerobic surface flow wetland design for Wetland 3 is a marsh system. The surface flow marsh system developed for Alternative SW-2 assumes that two depressions and a flow path will be constructed between the inlet and outlet micro-pools. Substrates in the depressions may vary from natural soils to composted organic matter. Existing deposits of iron may need to be excavated or otherwise removed to allow for a proper substrate that can foster vegetative growth. Shallow water levels (2 to 3 feet or less) are recommended in the vegetated areas to promote aerobic conditions and to enable growth of aquatic plants that aid wetland performance.

A marsh system generally has a large surface area to volume ratio and uses areas of shallow water to support wetland plants. The existing Wetland 3 topography to some extent will guide the design of the marsh system. Some marsh system designs have a forebay (micro-pool) that reduces incoming water velocity to promote settling. Most of the sediment loading occurs in the micro-pool so maintenance removal of sediments should only be needed in this localized area. For Wetland 3, a micro-pool could be constructed using the existing topography, creating a berm/dam downstream of the seep, and controlling the flow with a weir or similar structure. The outlet micro- pool for Wetland 3 will be located before the wetland discharge point at the road culvert. The pool affords hydraulic depth and flow control and can provide storage during extreme flows. Table 3 lists preliminary dimension estimates for the surface flow wetland features, which are also shown on Figure 5.

Table 3
Preliminary Dimensions of Marsh System
Constructed Wetland
Operable Unit 1, Wetland 3 —
Naval Air Station Pensacola, Florida

Aerobic Surface Flow Marsh System Feature	Area (square feet)	Depth (feet)	Volume (gallons)	Hydraulic Retention Time (hours)
Forebay (Inlet Pond)	9,300	3	208,706	15.5
Depression 1	10,400	2	155,595	11.5
Depression 2	13,800	2	206,462	15.3
Outlet pond	4,500	3	100,987	7.5
Total	38,000	—	671,750	49.8

A PDI would be conducted to collect the following information for Alternative SW-2:

- Wetland 3 functions and values information;
- Additional surface water data along Wetland 3 and 4D flow paths to assess iron attenuation;
- Groundwater seepage rate and mass loading of iron throughout Wetlands 3 and 4D;
- Geochemistry of iron to determine the long-term stability of precipitation/immobilization reactions throughout the wetland; and
- Topography and features to determine what types of additional vegetation would be conducive for existing hydrology.

A haul road would be constructed to bring equipment, soil or substrate, and wetland plant/seed to the site. The haul road would also be used to remove waste materials if needed. A decontamination station would also be constructed to clean trucks before entering any public roads.

Component 2: Monitoring

Groundwater seep and surface water samples would be collected to monitor for iron and dissolved oxygen concentrations, alkalinity, acidity, redox potential, and pH to ensure that surface water conditions remain conducive to iron removal (i.e., promote precipitation and flocculation). The depth of forebay, treatment depressions, and outlet pond would be monitored to maintain appropriate depths for the treatment wetland. Wetland plant diversity would also be observed to maintain a healthy wetland plant population. A period of up to 5 years postconstruction completion would be identified during which time the Navy would review the remedy to ensure it is functioning as designed. Metrics to evaluate remedy performance will include, for example, percent reduction in iron discharge at the culvert discharging to Wetland 4D, increased flocculation within Wetland 3, time trends of iron concentrations within surface water in Wetland 4D, and health and growth of wetland vegetation within the treatment wetland. Monitoring parameters and collection frequency would be described as part of Remedial Design.

Component 3: Land Use Controls

LUCs would be implemented to prevent alterations to surface flow or land use in the constructed wetlands. Administrative controls would prevent diversion of surface water, construction activities, or destruction of vegetation within the wetlands. The process for implementing and maintaining the LUCs would be detailed in the Remedial Design prepared by the Navy and submitted to U.S. EPA and FDEP concurrence after finalization of the ROD.

Five-Year Review

Because SW-2 would result in hazardous substances, pollutants, or contaminants remaining in Wetland 4D above levels that allow for unlimited use and unrestricted exposure, a statutory review would be conducted within five years after the initiation of remedial action, and every five years thereafter, until COCs meet CLs. The five-year reviews would be conducted to ensure that the remedy was, or would be, protective of human health and the environment. If results of the five-year reviews revealed that remedy integrity was compromised and protection of the environment was insufficient, then additional remedial actions would be evaluated by the Navy, U.S. EPA, and FDEP. The statutory five-year reviews would be conducted per CERCLA 121(c) and the NCP requirement 40 Code of Federal Regulations (CFR) 300.430(f)(4)(ii).

Alternative SW-2 does not impact current or anticipated future land use of Wetland 4D. Alternative SW-2 removes ecological habitat from Wetland 3 and transforms it into a managed treatment wetland that would have water quality effluent limits that are expected to be met prior to discharge into Wetland 4.

Alternative SW-3 — Mechanical Aeration, Monitoring, and Land Use Controls

Alternative SW-3 consists of three components: groundwater treatment and monitoring.

Component 1: Mechanical Aeration

Alternative SW-3 assumes that groundwater exiting the seep at Wetland 3 would be treated at and near the seep through active groundwater treatment technologies and be discharged to follow its current course through Wetlands 3 and 4D. Similar to Alternative SW-2, the treatment processes that would be used to remove iron from groundwater would be oxidation, pH, adjustment, and settling/sedimentation. Technologies would be used to mechanically aerate groundwater and add chemicals to meet the groundwater chemistry needed to precipitate dissolved ferrous iron and remove it from groundwater as an insoluble ferric iron precipitate. Aeration and precipitation would take place in bays/inlet ponds as described further below. These would encompass a portion of Wetland 3 but would not involve modification of the entire wetland flow path, in contrast to Alternative SW-2. Similar to SW-2, the alteration and restoration of Wetland 3 would be subject to Location- specific ARARs including certain CWA Section 404(b) regulations related to discharge and fill material in aquatic ecosystems such as wetlands as well as U.S. EPA and FDEP regulations related to compensatory mitigation.

Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the CWA are not considered “waters of the U.S.” even where they otherwise meet the definition in 40 C.F.R. § 120.3. Wetland 3 qualifies as a “water of the U.S.” but is proposed to be converted/modified into a treatment system that addresses elevated iron leachate from Sanitary Landfill 1.

What are the Nine Evaluation Criteria?

Threshold Criteria
(The selected remedy must satisfy these criteria)
Overall Protection of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment.

Compliance with Applicable and Relevant or Appropriate Requirements evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

Balancing Criteria
(These criteria are used to weigh the relative merits of the alternatives)

Long-Term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Short-Term Effectiveness considers the length of time needed to implement an alternative and the risk the alternative poses to workers, residents, and the environment during implementation.

Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

Cost includes estimated capital and annual operation and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

Modifying Criteria
(These criteria are also considered during remedy selection and incorporated into the ROD)

State/Support Agency Acceptance considers whether the state agrees with the Navy's analyses and recommendations, as detailed in the RI, RI Addendum, FS, and PP.

Community Acceptance considers whether the local community agrees with the Navy's analyses and Preferred Alternative. Comments received on the PP are an important indicator of community acceptance.

Additional Considerations
Natural Hazard Resiliency

Sustainability/Green Remediation Considerations

Under Alternative SW-3, the modified portion of Wetland 3 would function as a waste treatment system designed to meet the requirements of the CWA. Pursuant to 40 CFR part 120.2, the modified portion of Wetland 3 would not be considered waters of the U.S. The water discharged from Wetland 3 into Wetland 4D will have to meet a water quality-based effluent limit which is based on the background concentration for marine surface water of 3000 µg/L at the discharge point. Compliance with the limit will be measured at the end of the culvert where surface water from Wetland 3 discharges to Wetland 4D.

PDI would be conducted to collect the following information:

- Wetland 3 functions and values information;
- Groundwater seepage rate and mass loading of iron;
- Geochemistry of iron to determine form and long-term stability of precipitation/immobilization reactions throughout the wetland; and
- Bench-scale studies to evaluate iron concentrations at various pHs and dissolved oxygen concentrations for design purposes and required chemical doses (if needed).

Several different treatment layouts may be used to remove iron from the groundwater based on groundwater flow from the seep and space limitations. The FS assumed a forebay/inlet pond would be created (similar to SW-2) to retain water at and near the seep and allow large floc and suspended solids to settle. The forebay in SW-3 would have an estimated retention time of approximately 16 hours, although 4 to 8 hours would likely be adequate to settle the large floc observed at the Wetland 3 seep. Multiple cells would be created in the forebay to allow for isolation and maintenance/solids removal and to dry sediments removed from the forebay. The water exiting from the forebay would be aerated if required.

Under Alternative SW-3, the portion of Wetland 3 used to create the forebay in SW-3 would function as a waste treatment system designed to meet the requirements of the Clean Water Act. Pursuant to 40 CFR part 120.2, under Alternative SW-3, the forebay portion of Wetland 3 would not be considered waters of the United States. The water discharged from Wetland 3 into Wetland 4D will have to meet a water quality based effluent limit which is based on the background concentration for marine surface water of 3000 µg/L at the discharge point. Compliance with the limit will be measured at the end of the culvert in Wetland 3.

Active remediation will require electrical power and a haul road would be constructed to bring equipment, chemicals, and maintenance personnel to the site. Electrical power can be brought in from the local utility or a source of renewable energy may be constructed to provide electrical power; the Navy encourages use of renewable energy sources when possible and cost-effective. The haul road would also be used

to remove waste materials if needed. A decontamination station would also be constructed to clean trucks before entering any public roads, as needed.

Component 2: Monitoring

Groundwater and surface water samples would be collected to monitor for iron and dissolved oxygen concentrations, alkalinity, acidity, redox potential, and pH to ensure that groundwater is being treated. Monitoring parameters and collection frequency will be described in a SAP as part of Remedial Design.

Component 3: Land Use Controls

LUCs would be implemented to prevent alterations to surface flow or land use in the wetland. Administrative controls would prevent diversion of surface water, construction activities, or destruction of vegetation within the wetland. The process for implementing and maintaining the LUCs would be detailed in the Remedial Design prepared by the Navy and submitted to U.S. EPA and FDEP concurrence after finalization of the ROD.

Five-Year Review

Because SW-3 would result in hazardous substances, pollutants, or contaminants remaining in Wetland 4D above levels that allow for unlimited use and unrestricted exposure, a statutory review would be conducted within five years after the initiation of remedial action, and every five years thereafter, until CLs are met. The five-year reviews would be conducted to ensure that the remedy was, or would be, protective of human health and the environment. If results of the five-year reviews revealed that remedy integrity was compromised and protection of the environment was insufficient, then additional remedial actions would be evaluated by the Navy, U.S. EPA, and FDEP. The statutory five-year reviews would be conducted per CERCLA 121(c) and the NCP requirement 40 CFR 300.430(f)(4)(ii).

Alternative SW-3 does not impact current or anticipated future land use of Wetland 4D. Alternative SW-3 removes ecological habitat from Wetland 3 and transforms it into a managed treatment wetland that would have water quality effluent limits that are expected to be met.

Evaluation of Alternatives

The U.S. EPA has established in the NCP 40 CFR 300.430(e)(9) nine criteria for use in comparing the advantages/disadvantages of remedial alternatives. These criteria fall into three groups: threshold criteria, primary balancing criteria, and modifying criteria. These nine criteria are explained in the text box: “What are the Nine Evaluation Criteria?” A detailed analysis of the alternatives can be found in the FFS along with identified ARARs for the alternatives. ARARs include surface water quality criteria and CLs calculated in the risk assessment for the wetlands. EPA and FDEP criteria are identified as ARARs for groundwater. The two modifying criteria, State Agency and Community Acceptance, are evaluated following the public comment period. The evaluation criteria are described below and presented in Tables 4, 5, and 6 are on pages 16, 21, and 24; a detailed analysis of alternatives is in the OU 1 Wetlands FS.

Groundwater Cleanup Levels and Monitoring Program

Monitored Natural Attenuation (MNA) of groundwater at OU 1 Site 1 was implemented in 2000 and is ongoing. The most current monitoring plan was finalized in 2014 (Resolution Consultants 2014) and was modified in 2018 (EnSafe 2018) to update information on Navy contractors, update the conceptual site model, add arsenic to the sampling program based on the lowering of the federal MCL for arsenic (a chemical-specific ARAR), add natural attenuation parameters, and modify the wells included in the program. The groundwater monitoring program for OU 1 Site 1 Sanitary Landfill will be updated based on the results of the 2024 HHRE, and changes to the list of COCs and CLs will be documented in the ROD/ROD Amendment.

LUCs restrict current and future groundwater use of the surficial zone of the Sand-and-Gravel Aquifer within 300 feet of the site boundaries and restrict intrusive activities within the site boundaries. The 2024 HHRE identified arsenic, benzene, cadmium, chlorobenzene, iron, and manganese as groundwater COCs and recommended them for continued inclusion in the groundwater monitoring program. Seven constituents evaluated in the HHRE (1,1,2,2-tetrachloroethene, aluminum, total chromium, naphthalene, nickel, vinyl chloride, and total xylenes) were not identified as COCs and were recommended to be removed from the long-term monitoring program. Natural attenuation parameters including methane, ethane, ethene, nitrate, sulfate, chloride, total organic carbon, alkalinity, hydrogen, and carbon dioxide are monitored to verify that conditions in the aquifer are conducive to natural attenuation.

Groundwater CLs are the lower of Federal MCLs, FDEP GCTLs, and Florida health-based Groundwater Cleanup Target Levels, as presented in Table 1. These levels are protective of human health. Monitoring will continue until groundwater CLs have been achieved through natural attenuation processes. Determination that the remedy has achieved CLs and RAOs will be made the Navy, U.S. EPA and FDEP consistent with U.S. EPA guidance for evaluating completion of groundwater restoration remedial actions (OSWER Directive 9355.0-129 November 25, 2013).

Five-Year Review Requirements

Wetland 1B is recommended for No Action and therefore would not require statutory five-year reviews. For Wetlands 3, 4D, 15, 18A, 18B, and groundwater, because the remedies will result in hazardous substances and contaminants remaining onsite in excess of levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after the initiation of the remedial action, and every 5 years thereafter until the levels of COCs allow for unrestricted use with unlimited exposure to impacted media. The five-year reviews will be conducted to ensure that the remedy is, or will be, protective of human health and the environment and/or compliant with ARARs. If results of the five-year reviews reveal that remedy integrity is compromised and protection of human health or the environment is insufficient, then additional remedial actions will be evaluated by the Navy, U.S. EPA, and FDEP. The statutory five-year reviews will be conducted in accordance with CERCLA 121(c) and the NCP requirement 40 CFR 300.430(f)(4)(ii).

PREFERRED REMEDIAL ALTERNATIVES

Based on the evaluation of the remedial alternatives in the 2024 Feasibility Study Report for OU 1 Site 1 and Wetlands 3, 4D, 15, 18A, and 18B, the Navy has selected Alternative SED-3: Sediment Removal, Offsite Disposal, Wetland Restoration, and Restoration Monitoring as the preferred alternative for sediment at Wetlands 15, 18A, and 18B. Alternative SED-3 is recommended because it provides the greatest amount of long-term effectiveness and permanence and would be protective of human health and the environment because COCs would be removed from the wetlands resulting in COC levels that do not pose unacceptable risk. The time frame for implementation of this alternative is estimated to be approximately 18-24 months, at which time the remedy would achieve RAOs.

Based on the evaluation of remedial alternatives in the 2024 Feasibility Study Report for OU 1 Site 1 and Wetlands 3, 4D, 15, 18A, and 18B, the Navy has selected Alternative SW-2: Aerobic Surface Flow Constructed Wetland, Monitoring, and Land Use Controls for surface water at Wetland 3 and 4D. Alternative SW-2 would be protective of the environment in Wetland 4D per RAO 2 but requires conversion of Wetland 3 into a treatment system that is subject to water quality based effluent limits. Alternative SW-2 is recommended because it would provide long-term effectiveness and permanence at the lowest cost and is less technically difficult to implement than other alternatives.

Based on information currently available, the Navy and U.S. EPA, with the support of FDEP, believe the preferred alternatives meet the criteria and provide the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Navy and U.S. EPA, with the support of FDEP, expect the preferred alternatives to satisfy the following statutory requirements of CERCLA §121(b): (1) Be protective of human health and the environment; (2) Comply with applicable or relevant and appropriate requirements; (3) Be cost effective; (4) Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) Satisfy the preference for treatment as a principal element or explain why the preference for treatment would not be met.

The Preferred Alternatives may change in response to public comments or new information.

COMMUNITY PARTICIPATION

The public is encouraged to participate in the decision-making process by reviewing and commenting on this PP during the public comment period, which is 1 May 2025 to 31 May 2025.

Table 4
Detailed Analysis of Sediment Alternatives
Operable Unit 1 — Wetlands 15, 18A, and 18B, Naval Air Station Pensacola, Florida

Evaluation Criterion	Alternative SED-1: No Action	Alternative SED-2: Monitored Natural Recovery	Alternative SED-3: Sediment Removal, Offsite Disposal, Wetland Restoration, and Restoration Monitoring	Alternative SED-4: Enhanced Monitored Natural Recovery
Estimated Time Frame (years)				
Designing and Constructing the Alternative	Not Applicable	<0.5	<2	<1.5
Achieving the Cleanup Objective (years)	Not Applicable	PDIs are necessary to estimate timeframes required to meet RAOs.	Excavation activities would last for 2 to 3 months, depending on quantity of sediment requiring excavation and drying.	Will depend on the need for additional applications of amendments or thin layer cap; this will be determined by monitoring.
Overall Protection of Human Health and Environment *(Will it protect you and the animal life on and near the site?)*	Not protective of human health or the environment	Would not be protective of human health or the environment at the time of implementation but would protect human and ecological receptors over time.	Protective of human health and the environment. Excavation activities in larger footprints (e.g., Wetland 18B) would have the potential to permanently alter the functions and values of the wetland; however, restoration and monitoring would ensure they were restored. Smaller footprints (e.g., Wetlands 15 and 18A) would have less potential to impact the wetland.	Would be protective of human health and the environment when amendments have adsorbed and/or reacted with COCs to reduce concentrations below Cleanup Levels (CLs).
Compliance with Applicable or Relevant and Appropriate Requirements *(Does the alternative meet federal and state environmental statutes, regulations, and requirements?)*				
Chemical-Specific	Not Applicable	None	None	None
Location-Specific	Not Applicable	Will Comply	Will comply; requires significant regulatory coordination for wetlands excavation and restoration	Will Comply
Action-Specific	Not applicable	Will Comply	Will Comply	Will Comply
Long-Term Effectiveness and Permanence *(Will the effects of the cleanup last?)*	The magnitude of the residual risk will remain unchanged unless the COCs attenuate naturally and without disturbance.	Residual contamination exceeding ecological RGs may remain in sediment below the natural cover, which would limit exposure to COCs. DDx compounds appear to be degrading with time at Wetland 18B and possibly at 18A, and the magnitude of the residual risk will decrease with time. Land Use Controls will prevent future uses that may result in human and ecological receptor exposure.	Will provide long-term effectiveness and permanence as no controls will be needed after RAOs are met.	Residual contamination exceeding ecological RGs may remain in sediments below the thin layer cover; however, the COCs would be sequestered to limit their bioavailability. Exposure to COCs would also be limited by the overlying thin layer cap. Land Use Controls will prevent future uses that may result in human and ecological receptor exposure.
Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment *(Are the harmful effects of the contaminants, their ability to spread, and the amount of contaminated material present reduced?)*	No treatment would occur. Would not reduce toxicity, mobility, or volume of contaminants, except through unmonitored natural processes.	No treatment would occur. Would not reduce toxicity, mobility, or volume of contaminants, except through natural processes.	No treatment would occur. Would not reduce the toxicity of contaminants. Would reduce the volume and mobility of contaminants through permanent removal.	Would reduce the toxicity and mobility of DDx through treatment; however, the volume of contaminants will remain adsorbed and sequestered in the amendment. Phosphate additives would reduce toxicity, mobility, and volume of metal COCs through adsorption and/or precipitation.
Short-Term Effectiveness *(How soon will site risks be reduced and are there hazards to workers, residents, or the environment that could occur during cleanup?)*	Because no action would occur, implementation would not pose any risks to the local human community, onsite workers, or the environment.	Minor potential for short-term risks from worker exposure during sediment monitoring will be minimized by wearing appropriate PPE and compliance with OSHA regulations and site-specific health and safety procedures.	Potential for worker exposure to contaminated sediment and water will be minimized if suitable health and safety procedures are followed. Minor potential for impacts to the community due to increased truck traffic on base roads during excavation; appropriate engineering controls such as fencing would protect residents during excavations. Short-term impacts to the wetland will include removal or destruction of vegetation required for excavation activities. Dust and erosion control measures will minimize potential contaminant migration and exposures during implementation.	No short-term impacts to the community. Potential for worker exposure will be minimized by wearing appropriate PPE and compliance with OSHA regulations and site-specific health and safety procedures. Application methods for the thin layer cap or amendments will be designed to ensure no long-term impacts from implementation and the wetland can be restored to previous functions and value.

Table 4
Detailed Analysis of Sediment Alternatives
Operable Unit 1 — Wetlands 15, 18A, and 18B, Naval Air Station Pensacola, Florida

Evaluation Criterion	Alternative SED-1: No Action	Alternative SED-2: Monitored Natural Recovery	Alternative SED-3: Sediment Removal, Offsite Disposal, Wetland Restoration, and Restoration Monitoring	Alternative SED-4: Enhanced Monitored Natural Recovery	
Implementability *(Is it technically feasible and are the goods and services necessary to implement the alternative readily available?)*	Not applicable; additional actions could be readily implemented.	Readily implementable. PDIs would be required to establish current concentrations of COCs in sediment. Sampling and laboratory services are readily available. The areas that would be monitored can be accessed. Additional actions could be implemented if monitoring indicates that COC concentrations are not decreasing naturally.	Would require significant administrative planning to implement. Regulatory coordination would be required to ensure that wetland excavation and restoration requirements are met, and that the wetland is restored to its original functions and value. Excavation contractors are readily available.	Would require significant technical and administrative planning to implement. Significant site-specific PDI to maximize effectiveness of enhancements. Treatability tests would be required to select the appropriate thin layer cap (Alternative SED-4A) and amendment (Alternative SED-4B) materials. Uses well-understood methods and materials. Requires specialists to develop mix for thin layer cap/amendments.	
Costs:	**SED-1**	**SED-2**	**SED-3**	**SED-4A**	**SED-4B**
Capital *(Up-front costs to design and construct)*	$0	**Wetland 15** — $141,000 **Wetland 18A** — $135,000 **Wetland 18B** — $151,000	**Wetland 15** — $623,000 **Wetland 18A** — $420,000 **Wetland 18B** — $918,000	**Wetland 15** — $332,000 **Wetland 18A** — $242,000 **Wetland 18B** — $356,000	**Wetland 15** — $328,000 **Wetland 18A** — $246,000 **Wetland 18B** — $351,000
NPW of O&M	$0	**Wetland 15** — $309,000 **Wetland 18A** — $290,000 **Wetland 18B** — $309,000	**Wetland 15** — $23,000 **Wetland 18A** — $23,000 **Wetland 18B** — $23,000	**Wetland 15** — $309,000 **Wetland 18A** — $290,000 **Wetland 18B** — $309,000	**Wetland 15** — $309,000 **Wetland 18A** — $290,000 **Wetland 18B** — $309,000
Total NPW *(Costs in today's dollars)*	$0	**Wetland 15** — $450,000 **Wetland 18A** — $425,000 **Wetland 18B** — $460,000	**Wetland 15** — $646,000 **Wetland 18A** — $443,000 **Wetland 18B** — $941,000	**Wetland 15** — $641,000 **Wetland 18A** — $532,000 **Wetland 18B** — $665,000	**Wetland 15** — $637,000 **Wetland 18A** — $536,000 **Wetland 18B** — $660,000
Additional Considerations					
Natural Hazard Resiliency	Extreme weather events may lead to sediment disturbance in coastal and near-coastal environments including Wetlands 15, 18A, and 18B.				
	Extreme weather events could influence the distribution of COCs left in place through mixing and migration.	Extreme weather events could influence the distribution of COCs left in place through mixing and migration.	Because COCs exceeding CLs will not be left on site, extreme weather events will not impact the protectiveness of the remedy.	Extreme weather events could influence the distribution of COCs left in place through mixing and migration. Events could disturb the sediment cap (e.g., scour/erosion) or contribute to greater sedimentation	
Sustainability/Green Remediation	Not applicable	Because this is not an active remedy, disturbance to the wetland habitat is minimal (limited to monitoring events).	Green Remediation Best Management Practices for Excavation and Surface Restoration (U.S. EPA 2019) will be followed. Considerations include minimizing sediment removal by refining the area of concern through remedial design sampling, using excavation techniques that minimize wetland disturbance, and using disposal facilities located as near as possible to the site.	Remedial design sampling will refine the area of concern to minimize are of wetland disturbance. Thin layer capping and/or amendments will be implemented in a manner that minimizes sediment and vegetation disturbance. Additional Best Management Practices will be incorporated into remedial design when possible and practicable (U.S. EPA 2022).	

Notes:

SED	=	Sediment Alternative	O&M	=	Operations & Maintenance
COC	=	Chemical of Concern	RAO	=	Remedial Action Objective
EMNR	=	Enhanced Monitored Natural Recovery	PPE	=	Personal Protective Equipment
DDx	=	Sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT	OSHA	=	Occupational Safety and Health Administration
LUC	=	Land Use Control	NPW	=	Net Present Worth
PDI	=	Pre-Design Investigation			

Table 5
Detailed Analysis of Surface Water Alternatives
Operable Unit 1 — Wetlands 3 and 4D, Naval Air Station Pensacola, Florida

Evaluation Criterion	Alternative SW-1: No Action	Alternative SW-2: Aerobic Surface Flow Constructed Wetland, Monitoring, and Land Use Controls	Alternative SW-3: Mechanical Aeration, Monitoring, and Land Use Controls
Estimated Time Frame (years)			
Designing and Constructing the Alternative	Not Applicable	<3.5	<2
Achieving the Remedial Alternative Objective (years)	Not Applicable	<10	<10
Overall Protection of Human Health and Environment *(Will it protect you and the animal life on and near the site?)*	Protective of human health. Not protective of the environment because iron levels in surface water would continue to exceed surface water quality criteria, which is an ARAR.	Protective of human health. Would be protective of the environment over time.	Protective of human health. Would be protective of the environment over time.
Compliance with Applicable or Relevant and Appropriate Requirements *(Does the alternative meet federal and state environmental statutes, regulations, and requirements?)*			
Chemical-Specific	Will not comply	Will Comply	Will Comply
Location-Specific	None	Will Comply[1]	Will Comply[1]
Action-Specific	None	Will Comply	Will Comply
Long-Term Effectiveness and Permanence *(Will the effects of the cleanup last?)*	The magnitude of the residual risk will remain unchanged unless iron eventually attenuates by dilution in the groundwater discharged from the landfill seep. Changes to iron concentrations would not be determined through monitoring.	Dissolved ferrous iron in groundwater from the landfill seep would be oxidized to an insoluble ferric iron precipitate that would be periodically removed and remain in solid form, limiting the potential for iron in Wetland 3 to migrate to Wetland 4D.	Dissolved ferrous iron in groundwater from the landfill seep would be oxidized to an insoluble ferric iron precipitate that would be periodically removed and remain in solid form, limiting the potential for iron in Wetland 3 to migrate to Wetland 4D.
Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment *(Are the harmful effects of the contaminants, their ability to spread, and the amount of contaminated material present reduced?)*	Would not reduce toxicity, mobility, or volume of contaminants.	Treatment would reduce mobility and volume via precipitation and removal of iron floc. Would potentially reduce toxicity via change of chemical form of iron making it less bioavailable.	Treatment would reduce mobility and volume via precipitation and removal of iron floc. Would potentially reduce toxicity via change of chemical form of iron making it less bioavailable.
Short-Term Effectiveness *(How soon will site risks be reduced and are there hazards to workers, residents, or the environment that could occur during cleanup?)*	Because no action would occur, implementation would not pose any risks to the local human community, onsite workers, or the environment.	No short-term impacts would occur because the iron in surface water does not pose a human health risk. Short-term hazards for worker exposure during the use of earthmoving equipment will be minimized by wearing appropriate PPE and compliance with OSHA regulations and site- specific health and safety procedures.	No short-term impacts would occur because the iron in surface water does not pose a human health risk. Short-term hazards for worker exposure during the use of earthmoving equipment will be minimized by wearing appropriate PPE and compliance with OSHA regulations and site-specific health and safety procedures.
Implementability *(Is it technically feasible and are the goods and services necessary to implement the alternative readily available?)*	Not applicable; additional actions could be readily implemented.	Would require significant PDI and substantial coordination with regulatory agencies. The constructed wetland would be on the side of a landfill and the ground surface would require substantial modifications. Sampling, laboratory services, and equipment are readily available. Additional remedial actions can be taken easily.	Would require significant PDI, substantial maintenance requirements, and coordination with regulatory agencies. Sampling, laboratory services, and equipment are readily available. The technology (aeration and pH adjustment) is readily accepted, and additional remedial actions can be taken to add treatment capacity once power has been added at the treatment area.
Costs:	**SW-1**	**SW-2**	**SW-3**
Capital *(Up-front costs to design and construct)*	$0	$787,000	$650,000
NPW of O&M	$0	$987,000	$1,850,000
Total NPW *(Costs in today's dollars)*	$0	$1,774,000	$2,500,000
Additional Considerations			
Natural Hazard Resiliency	Extreme weather events may lead to sediment disturbance in coastal and near-coastal environments including Wetlands 3 and 4D. Extreme weather events could influence the distribution of COCs left in place through mixing and migration. Extreme weather events could influence the distribution of COCs left in place through mixing and migration. Concentrations of COCs left in place over time will decrease due to treatment.		
Sustainability/Green Remediation	Not applicable	The spatial footprint of the treatment wetland will be minimized to the extent possible without sacrificing function. The treatment wetland will have functions and values equivalent to comparable non-treatment wetlands. Additional Best Management Practices will be incorporated into remedial design when possible and practicable (U.S. EPA 2022).	The spatial footprint of the treatment wetland will be minimized to the extent possible without sacrificing function. The treatment wetland will have functions and values equivalent to comparable wetland systems. Mechanical aeration will be powered by renewable energy (solar). Additional Best Management Practices will be incorporated into remedial design when possible and practicable (U.S. EPA 2022).

Notes:
1 Modification of Wetland 3 is subject to U.S. EPA Clean Water Act and FDEP regulations related to compensatory mitigation for alteration of wetlands, which would require consultation with regulatory agencies.
SW = Surface Water Alternative
COC = Chemical of Concern
PDI = Pre-Design Investigation
PPE = Personal Protective Equipment
OSHA = Occupational Safety and Health Administration
NPW = Net Present Worth
O&M = Operations and Maintenance

Table 6
Comparative Description of Remedial Alternatives, Operable Unit 1, Wetlands 3, 4D, 15, 18A, and 18B

ALTERNATIVE	SED-1	SED-2	SED-3	SED-4A SED-4B	SW-1	SW-2	SW-3
Estimated Time Frame (years)							
Designing and Constructing the Alternative	NA	<.5	<2	<1.5	NA	<3.5	<2
Achieving the Cleanup Objectives (years)	NA	Unknown	<0.5	Unknown	NA	<10	<10
Criteria Analysis							
Threshold Criteria							
Protects Human Health and the Environment ➢ Will it protect you and the animal life on and near the site?	○	◘	●	●	○	●	●
Meets federal and state regulations ➢ Does the alternative meet federal and state environmental statutes, regulations, and requirements?	NA	●	●	●	NA	●	●
Primary Balancing Criteria							
Provides long-term effectiveness and is permanent ➢ Will the effects of the cleanup last?	○	○	●	◘	○	●	●
Reduces mobility, toxicity, and volume of contaminants through treatment ➢ Are the harmful effects of the contaminants, their ability to spread, and the amount of contaminated material present reduced?	NA	○	◘	●	NA	◘	◘
Provides short-term protection ➢ How soon will the site risks be reduced? ➢ Are there hazards to workers, residents, or the environment that could occur during cleanup?	○	◘	●	●	○	●	●
Can it be implemented ➢ Is the alternative technically feasible? ➢ Are the goods and services necessary to implement the alternative readily available?	NA	●	●	◘	NA	●	◘
Cost ($)							
➢ Upfront costs to design and construct the alternative (capital costs)	0	141K/135K/ 151K	623K/420K/ 918K	332K/242K/ 356K 328K/246K/ 351K	0	787K	650K
➢ Operations & Maintenance costs associated with the alternative (30-year Net Present Worth)	0	309K/290K/ 309K	23K/23K/ 23K	309K/290K/ 309K 309K/290K/ 309K	0	987K	1,850K

Table 6
Comparative Description of Remedial Alternatives, Operable Unit 1, Wetlands 3, 4D, 15, 18A, and 18B

ALTERNATIVE	SED-1	SED-2	SED-3	SED-4A SED-4B	SW-1	SW-2	SW-3
➢ Total cost in today's dollars (Net Present Worth cost)	0	450K/425K/ 460K	646K/4443/ 942K	641K/532K/ 665K 637K/536K/ 660K	0	1,774K	2,500K
Modifying Criteria							
State Agency Acceptance ➢ Does FDEP agree with the Navy's recommendation?	To be determined after the public comment period.						
Community Acceptance ➢ What objections, suggestions, or modifications does the public offer during the comment period?	To be determined after the public comment period.						

Relative comparison of the Nine Balancing Criteria and each alternative: ● — High, ◘ — Medium, ○ — Low, NA — not applicable;
Cost ($): K — thousand
The preferred remedies for sediment and surface water are highlighted.
Sediment Alternatives: SED-1 — No Action; SED-2 — Monitored Natural Recovery; SED-3 — Sediment Removal, Offsite Disposal, Wetland Restoration, and Restoration Monitoring; SED-4 — Enhanced Monitored Natural Recovery
Surface Water Alternatives: SW-1 — No Action; SW-2 — Aerobic Surface Flow Constructed Wetland; SW-3 — Groundwater Treatment

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U.S. Environmental Protection Agency. *Role of Background in the CERCLA Cleanup Program*. Office of Solid Waste and Emergency Response, OSWER 9285.6-07P. April 2002.

What Do You Think?

You do not have to be a technical expert to comment. If you have a comment, the Navy wants to hear it before beginning the cleanup.

WHAT IS A FORMAL COMMENT?

Federal regulations make a distinction between *formal* comments received during the 30-day comment period and *informal* comments received outside this comment period.

Although the Navy uses comments throughout the cleanup process to help make cleanup decisions, it is required to respond to formal comments. Your formal comments will become part of the official record for OU 1 Site 1 Sanitary Landfill and associated wetlands and are a crucial element in the decision-making process.

Formal comments can be made orally at the public meeting, if held, or in writing. To make a formal comment on this PP, you need only:

- Request a public meeting and offer written or oral comments during the public hearing portion of such meeting,
- Send written comments, by U.S. Mail, postmarked no later than 31 May 2025 or
- Send written comments, by e-mail, dated no later than 31 May 2025.

A tear-off mailer is provided for your convenience.

NEXT STEPS

Comments received during the comment period will be considered before making the final cleanup decision for the site. Written comments and Navy responses will be included in the Responsiveness Summary in the ROD, which will document the final CERCLA remedy selected by the Navy and U.S. EPA, in consultation with FDEP, for OU 1 Site 1 Sanitary Landfill and Associated Wetlands. After the ROD is signed, it will be made available to the public via the online Administrative Record at https://administrative-records.navfac.navy.mil/?MT64W7KUQ7G47WL.

For More Detailed Information You May Go to the Public Information Repository

This PP was prepared to help the public understand and comment on the Preferred Remedial Alternatives for OU 1 Site 1 Sanitary Landfill and Associated Wetlands and provides a summary of reports and studies.

The technical and public information documents used by the Navy to prepare this PP are available at the following Public Information Repository: Administrative Record online at https://administrative-records.navfac.navy.mil/?MT64W7KUQ7G47WL.

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GLOSSARY OF TERMS

This glossary defines the terms used in this PP. The definitions in this glossary apply specifically to this PP and may have other meanings when used in different circumstances.

Applicable or Relevant and Appropriate Requirements (ARARs): Refers to Federal and more stringent, promulgated State environmental requirements in a law or regulation that a selected remedy must attain, which vary from site to site.

Benthic: Related to or living in the bottom sediments of rivers, streams, and lakes.

Bioaccumulation: The gradual increase of chemicals in an organism through uptake in the food chain.

Chemical of Concern (COC): Chemicals that through evaluation in the ecological or human health risk evaluation, are determined to potentially present an adverse effect on human health or the environment.

Cleanup Level (CL): The concentration of a chemical in a medium (soil, surface water or groundwater) that can be present without posing unacceptable risk to human health or ecological receptors. Some CLs are based on chemical-specific ARARs such as Safe Drinking Water Act MCLs for groundwater.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law also known as "Superfund." This law was passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. This law created a tax on the chemical and petroleum industries and provided broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment.

Data Quality Objectives (DQOs): Performance and acceptance criteria that are the basis for determining if collected data are of sufficient quality and quantity to support the goals of a study.

4,4'-DDD: 4,4'-dichlorodiphenyldichloroethane; a chemical similar to 4,4'-DDT, historically used to control insects. Use in the United States was banned in 1972.

4,4'-DDE: 4,4'-dichlorodiphenyldichloroethylene; a chemical similar to 4,4'-DDT that historically contaminated commercial 4,4'-DDT preparations. This chemical has no commercial use.

4,4'-DDT: 4,4'-dichlorodiphenyltrichloroethane; a pesticide historically used to control insects. Use in the United States was banned in 1972.

DDx: The sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT.

Ecological Risk Evaluation: A multiple-step quantitative process used to determine if chemicals at a site may pose adverse effects to ecological receptors such as plants, invertebrates, birds, and mammals.

Enhanced Monitored Natural Recovery (EMNR): Addition of amendments to impacted sediments that will decrease contaminant bioavailability or that will encourage chemical breakdown of contaminants. Amendments are used in combination with natural recovery.

Estuarine: Of or found in the tidal mouths of large rivers. An estuary is a partially enclosed coastal body of brackish water with one or more rivers or streams flowing into it. Estuaries are subject to both marine influences (tides and waves) and riverine influences (flows of fresh water and sediment).

Feasibility Study (FS): A report that presents the description and analysis or evaluation of potential cleanup alternatives against criteria specified in the NCP.

General Response Action (GRA): Broadly defined remedial approaches that may be used, by themselves or in combination, to attain Remedial Action Objectives. GRAs were evaluated within the context of impact to overall wetland habitat, reductions in functional habitat, and potential harm to adjacent habitat.

Human Health Risk Evaluation (HHRE): A multi-step quantitative process performed as part of a Baseline Risk Assessment used to determine if chemicals at a site may pose adverse effects to human receptors such as maintenance workers or residents.

Installation Restoration Program: The Navy's program for investigating and cleaning up contamination from past practices at Department of Defense sites.

Invertebrate: An organism without a backbone, such as insects, clams, and worms.

In situ: a term meaning "in place" with no change in location.

Land Use Controls (LUCs): LUCs include both engineered and institutional controls, which are formulated and enforced to regulate current and future land use options. Institutional controls are administrative or legal mechanisms that regulate land use (such as through zoning and deed restrictions) or require permits (such as for digging). Engineering controls are method(s) to manage environmental and health risks by placing a barrier (such as fencing and caps) between the contamination and the receptors, thus limiting exposure pathways.

Lower Trophic Level Receptor: Organisms that are at the bottom of the food web such as invertebrates and plants.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): More commonly called the National Contingency Plan, it is the federal government's blueprint for responding to both oil spills and hazardous substance releases. Following the passage of CERCLA legislation in 1980, the NCP was broadened to cover releases at hazardous waste sites requiring emergency removal actions. A key provision involves authorizing the lead agency to initiate appropriate removal action in the event of a hazardous substance release.

Natural Recovery: Allowing naturally occurring processes to reduce the ecological risks posed by COCs over time. Natural recovery could involve physical processes (sedimentation, advection, dilution, dispersion, bioturbation, or volatilization), biological processes (biodegradation, biotransformation, or phytoremediation), and/or chemical processes (natural oxidation/reduction or sorption).

Naval Air Station (NAS) Pensacola Partnering Team: A team of representatives from governmental agencies and contractors working together to coordinate and clean up contaminated sites at NAS Pensacola. The team includes representatives of the Navy, U.S. EPA, and FDEP.

Net Present Worth (NPW): A costing technique that expresses the total of initial capital expenditure and long-term O&M costs in terms of present-day dollars.

No Observed Adverse Effects Level (NOAEL): In toxicity testing, the highest exposure of a chemical having no adverse effect.

Operable Unit (OU): The U.S. EPA's term to describe a distinct area depending on the complexity of the site and may include a geographic area of a site, specific site problems, or areas where a specific action is required.

Operation and Maintenance (O&M): Activities conducted after a Superfund site action has been completed to ensure that the action is effective.

Palustrine: Relating to a system of inland, nontidal wetlands characterized by trees, shrubs, and emergent vegetation (i.e., rooted below water but grows above the surface). Palustrine wetlands can be permanently saturated or flooded (such as marshes and swamps) or seasonally wet.

Personal Protective Equipment (PPE): Items that are worn to reduce an individual's exposure to contaminants or protect human health (e.g., boots, gloves, respirators).

Proposed Plan: A document that summarizes the preferred cleanup remedy for a site and encourages and facilitates public involvement in the cleanup selection.

Record of Decision (ROD): An official document that describes the selected cleanup action for a specific site/operable unit. The ROD documents the cleanup selection process and is issued by the Navy following the public comment period.

Remedial Action Objective (RAO): A goal that the preferred remedial alternative should achieve, established to protect human health and the environment and to comply with pertinent federal and state regulations. The Navy and U.S. EPA agree to the RAO, in consultation with FDEP. One or more RAOs are typically formulated for each site.

Remedial Investigation (RI): An in-depth study designed to gather data needed to determine the nature and extent of contamination at a Superfund site, evaluate potential risk to human health and the environment, establish site cleanup criteria, identify preliminary alternatives for remedial action, and support technical and cost analyses of alternatives.

Resource Conservation and Recovery Act (RCRA): The federal law that regulates the management of hazardous waste, non-hazardous waste, medical waste, and underground storage tanks.

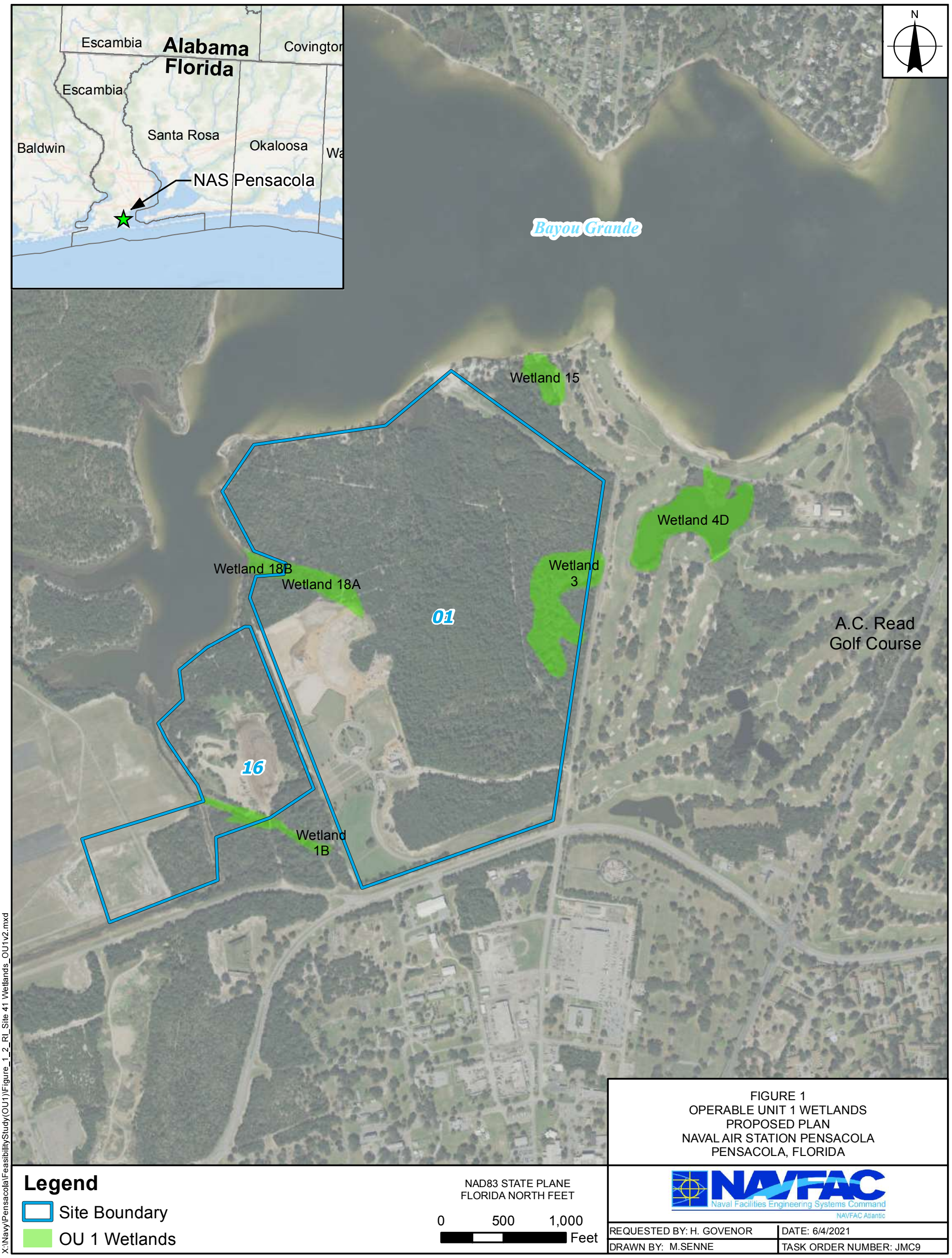
Restoration Advisory Board: A group of local stakeholders including community members; state, local, and tribal representatives; and regulatory agencies that meet to discuss investigation and cleanup activities at Installation Restoration Program sites.

Sampling and Analysis Plan (SAP): A document that describes procedural and analytical requirements for projects that involve collecting environmental media (e.g., water, soil, sediment) samplings to characterize areas of environmental contamination. A SAP identifies the location and number of samples to be collected, the types of data to be collected, the DQOs, and the decision rules for how the data will be evaluated.

Sediment: Sediment is a naturally occurring material that is broken down by processes of weathering and erosion, and is subsequently transported by wind, water, or ice.

95% Upper Confidence Level (UCL): The 95% UCL of the mean is a value that equals or exceeds the population mean 95% of the time.

Upper Trophic Level Receptor: Organisms that are at the upper portion of the food web, such as birds and mammals that eat plants and insects.



Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors, Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

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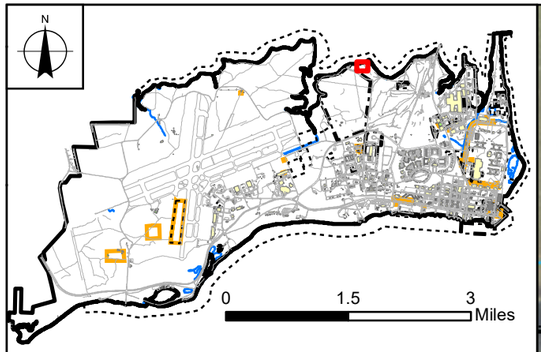

Legend

- Saltwater Sample Location
- Exceedance of Ecological Cleanup Level
- Exceedance of Human Health Cleanup Level
- Shoreline
- Road
- OU1 Wetlands
- Site
- Naval Air Station Pensacola Boundary
- Estimated Area Requiring Remediation

NAD83 STATE PLANE
FLORIDA NORTH FEET

0 50 100 Feet

FIGURE 2
EXCEEDANCES OF CLEANUP LEVELS
WETLAND 15 (OU 1) SEDIMENTS
PROPOSED PLAN
NAS PENSACOLA
PENSACOLA, FLORIDA

NAVFAC
Naval Facilities Engineering Systems Command

REQUESTED BY: H. GOVENOR	DATE: 6/4/2021
DRAWN BY: M. SENNE	TASK ORDER NUMBER: JMC9

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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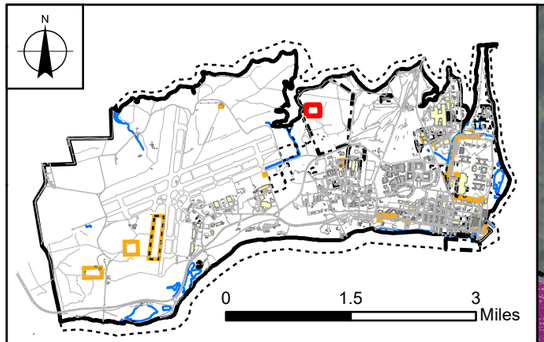

Legend

- Freshwater Sample Location
- Exceedance of Ecological Cleanup Level
- Estimated Area Requiring Remediation
- OU1 Wetland

Note: Although more than one sample location exceeds Cleanup Levels, location 041M18A12 is a hot spot of contamination. Remediation of this hot spot will result in acceptable risk to human health and the environment.

NAD83 STATE PLANE
FLORIDA NORTH FEET

0 60 120 Feet

FIGURE 3
EXCEEDANCES OF CLEANUP LEVELS
WETLAND 18A (OU 1) SEDIMENTS
PROPOSED PLAN
NAS PENSACOLA
PENSACOLA, FLORIDA

NAVFAC
Naval Facilities Engineering Systems Command

REQUESTED BY: H. GOVENOR	DATE: 6/4/2021
DRAWN BY: M. SENNE	TASK ORDER NUMBER: JMC9

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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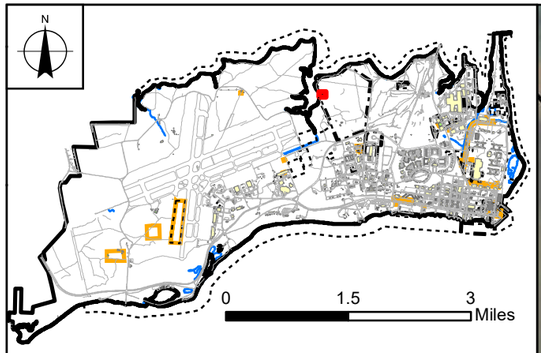

Legend

- Saltwater Sample Location
- Exceedance of Ecological Cleanup Level
- Exceedance of Human Health Cleanup Level
- Shoreline
- Operable Unit (OU) 1 Boundary
- OU1 Wetland
- Site
- NASP Boundary
- Estimated Area Requiring Remediation

NAD83 STATE PLANE
FLORIDA NORTH FEET

0 30 60 Feet

FIGURE 4
EXCEEDANCES OF CLEANUP LEVELS
WETLAND 18B (OU 1) SEDIMENTS
PROPOSED PLAN
NAS PENSACOLA
PENSACOLA, FLORIDA

NAVFAC Naval Facilities Engineering Systems Command

REQUESTED BY: H. GOVENOR	DATE: 6/4/2021
DRAWN BY: M. SENNE	TASK ORDER NUMBER: JM07

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OU 1

Site 1

Site 40

041M18B13
041M18B10
041M18B07
041M18B1
041M18B12
041M18B09
041M18B04
041M18B06
Wetland 18B
041M18B11
19,808 Sq Ft
041M18B05
041M18B08
041M18B03
041M18B02
Wetland 18A

N

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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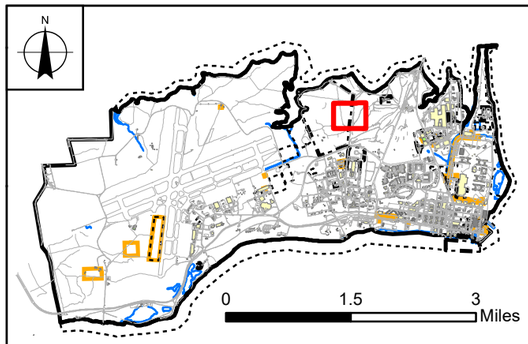

Legend

- Contour (1ft)
- Seep Location
- Constructed Flow Path
- Storm Water Culvert
- Constructed Forebay/Inlet Pool
- Constructed Outlet Pool
- Constructed Treatment Depression No. 1
- Constructed Treatment Depression No. 2
- Road
- OU1 Wetlands

NAD83 STATE PLANE
FLORIDA NORTH FEET

0 140 280 Feet

FIGURE 5
AEROBIC SURFACE FLOW CONSTRUCTED WETLAND LAYOUT
ALTERNATIVE SW-2
PROPOSED PLAN
WETLAND 3, SITE 41
NAS PENSACOLA, FLORIDA

NAVFAC
Naval Facilities Engineering Systems Command
NAVFAC Atlantic

REQUESTED BY: H. GOVENOR	DATE: 6/4/2021
DRAWN BY: M. SENNE	TASK ORDER NUMBER: JMC9

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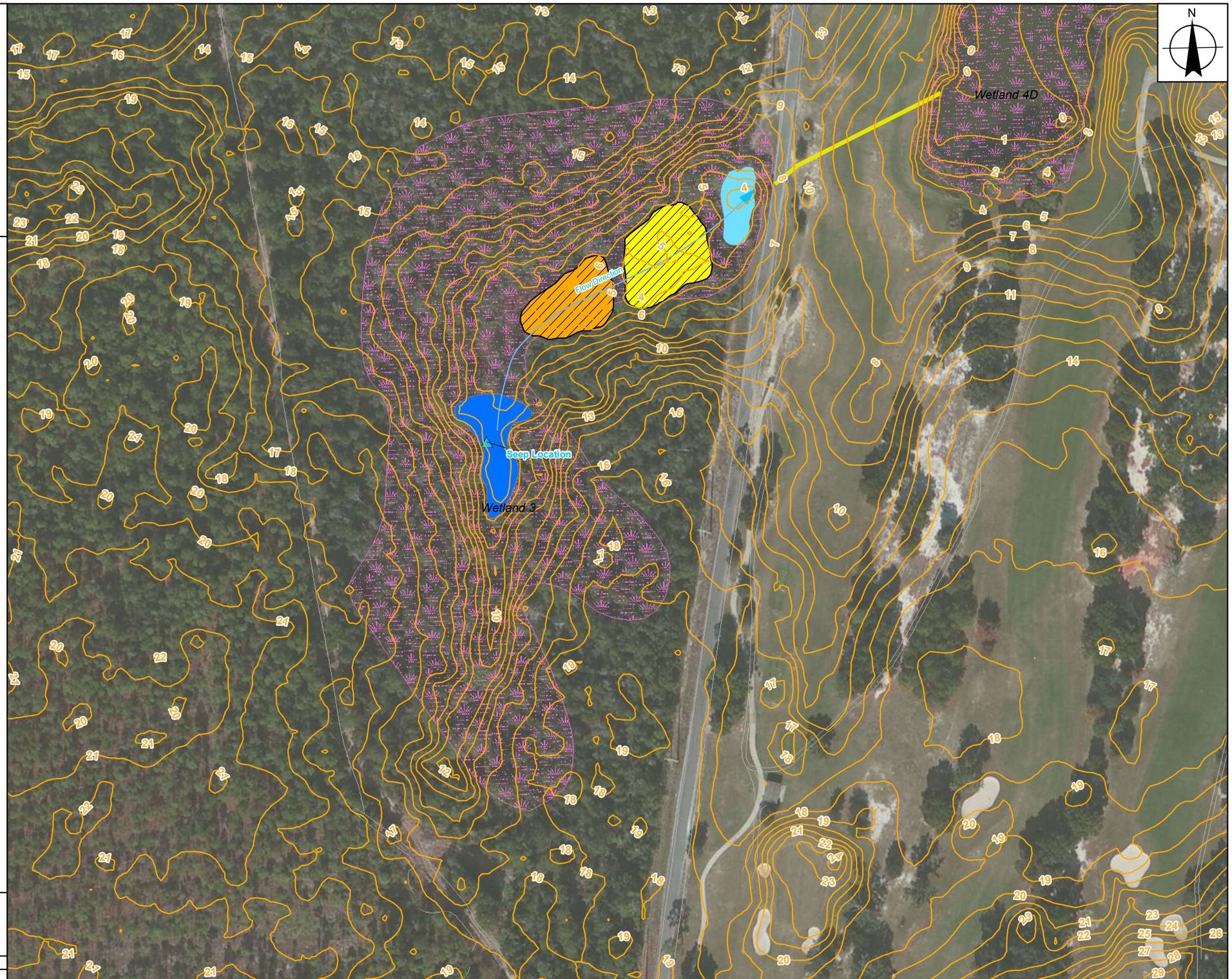

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http://mapping.ihrc.fiu.edu/

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Use This Space to Write Your Comments or to be Added to the Mailing List

Please use this form for your written comments and mail it to the address below.

Your comments must be postmarked no later than 31 May 2025.

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Comments submitted by:_____

Mailing List Additions, Deletions, or Changes

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☐ Note a change of address. Address: _____

☐ Unsubscribe from the mailing list. _____

☐ Obtain additional information _____

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PENSACOLA, FL 32508-1051