Field Summary and Analytical Evaluation Report

Private Dredging Application

Submitted by:

ADVARIO Texas Independent Deepwater Expansion, LLC

Texas City, Texas

Permit Application No. SWG-2016-01025

Submitted to:

United States Army Corps of Engineers, Galveston District

Prepared by:
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BESI Benchmark Ecological Services, Inc.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADVARIO TIDE	ADVARIO Texas Independent Deepwater Expansion, LLC
ALS	ALS Laboratory Group
Benchmark	Benchmark Ecological Services, Inc.
BCF	Bioconcentration Factor
bgs	Below Ground Surface
bss	Below Sediment Surface
CAS	Chemical Abstracts Service (Registry Number)
CDF	Confined Disposal Facility
CFR	Code of Federal Regulations
COC/s	Chemical of Concern
CWA	Clean Water Act
EPA	United States Environmental Protection Agency
ERL	Effects Range Low
ERM	Effects Range Median
Ft	Feet
GLO	General Land Office
GPS	Global Positioning System
ID	Identification
LLC	Limited Liability Company
LPC	Limiting Permissible Concentration
MCY	Million Cubic Yards
MLLW	Mean Lower Low Water
NELAP	National Environmental Laboratory Accreditation Program
NOAA	National Oceanic and Atmospheric Administration
NWDLS	North Water District Laboratory Services, Inc.
OPDA	Off-Plant Disposal Area
PCB	Polychlorinated Biphenyl
PCL	Protective Concentration Level
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RIA	Regional Implementation Agreement
SAP	Sampling and Analysis Plan
SVOC	Semi-Volatile Organic Compound
SDL	Sample Detection Limit
Ship Channel	Texas City Ship Channel
TCEQ	Texas Commission on Environmental Quality
TDL	Target Detection Limit
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TRRP	Texas Risk Reduction Program
TSS	Total Suspended Solids
TSWQS	Texas Surface Water Quality Standards
UCC	Union Carbide Corporation
UCDF	Upland Confined Disposal Facility
USEPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers

UTM	Upland Testing Manual
VOC	Volatile Organic Compound
WQC	Water Quality Certification
WQS	Water Quality Standard

1.0 Executive Summary

ADVARIO Texas Independent Deepwater Expansion, LLC (ADVARIO TIDE) is proposing to remove approximately 2.95 million cubic yards (MCY) of material to deepen a portion of the Texas City Ship Channel (Ship Channel) and construct two (2) berths bisected by a finger pier to serve tankers and other vessels needed to operate the marine terminal. The proposed material excavation and dredge area is 77.4 acres. The location of the site is shown in **Figure 1** (Attachment 1) and the extent of the project is depicted in **Figure 2** (Attachment 1). Of the 2.95 MCY of material, approximately 1.61 MCY will be mechanically excavated "in the dry" prior to breaching the levee separating the property from the Ship Channel. The 1.61 MCY of material will be used on-site to provide fill for industrial development and associated infrastructure. The excavation methods and proposed handling of upland soils from the current soil surface down to -30 ft mean lower low water (MLLW) are described in greater detail in the Project Execution Plan included in Attachment 11. The balance of 1.34 MCY of material will be hydraulically dredged and pumped to an approved Upland Confined Disposal Facility (UCDF).

The sampling locations for the proposed project site include both an in-channel "submerged" area and "East Lagoon" (upland) area that is inland of the levee located adjacent to the channel. Thirty-two (32) submerged sediment samples were collected and processed, twenty (20) samples were analyzed, and twelve (12) samples were archived) from six (6) sample stations. Five hundred and sixty-one (561) East Lagoon soil samples were collected and processed, two hundred and ninety-one (291) samples were analyzed, and two hundred and seventy (270) samples were archived from twenty-seven (27) sample stations. Thirty-three (33) elutriate samples were prepared and analyzed using water collected from six (6) submerged sample stations. Four (4) groundwater samples were collected from four (4) groundwater wells constructed on the upland portion of the property.

Soil and sediment samples were analyzed for seventy-seven (77) chemicals of concern (COCs), surface water and elutriate samples were analyzed for seventy-four (74) COCs, and groundwater samples were analyzed for thirty-seven (37) COCs. Visual and olfactory indicators of COCs, such as staining or odor, were not encountered in any of the 561 East Lagoon samples except for two soil samples (SE-04 at 6-8 ft below ground surface (bgs) and 8-10 ft. bgs) that had a hydrocarbon odor. Soil from 20 to 25 ft bgs in the groundwater boring TMW-04 was also observed with a hydrocarbon odor, staining, and sheen.

A comprehensive assessment of risk to human health and ecological receptors is provided in Attachment 8. The conclusions of that assessment are:

- No unacceptable risks were found for construction workers, dredge workers or future terminal workers.
- No unacceptable risks were found for ecological receptors during the construction phase or after completion of the project.
- No unacceptable human and ecological risks were found for the upland materials to be placed into the UCDF.

- One COC, pyrene, potentially exhibits a risk to water column receptors from exposure to leaching from the future bank slope.

None of the groundwater sample detection limits exceeded appropriate benchmarks; however, because of the hydrocarbon odor, sheen and staining noted above, well TMW-04 was redeveloped and sampled for SVOCs, VOCs, and TPH. A comprehensive assessment of risk to human health and ecological receptors associated with the June 2023 resampling of groundwater at station TMW-04 is provided in Attachment 9. The conclusions of that assessment are:

- The 2023 TMW-04 groundwater data indicates that COC concentrations and SDLs are below the TCEQ Saltwater chronic benchmarks or the TCEQ saltwater chronic benchmarks adjusted for the Site-specific dilution factor.

- The June 2023 data confirmed the Human Health and Ecological Risk Assessment Report conclusion that groundwater concentrations do not present a risk to ecological receptors. WSP recommends no further action with regards to groundwater at the Project site.

This report presents the sampling and analysis results in accordance with the Sampling and Analysis Plan (SAP) accepted on 31 May 2022 by the U. S. Army Corps of Engineers (USACE) in collaboration with the United States Environmental Protection Agency (USEPA) and the Texas Commission on Environmental Quality (TCEQ) (Attachment 4). Site surface water, groundwater, elutriate, soil/consolidated material, and sediment samples were collected from the proposed dredge/excavation site for conducting laboratory testing to characterize material that may be removed or relocated onsite. Sampling locations were evenly distributed over the proposed excavation/dredge footprint to spatially represent the material to be removed. Sample stations are shown in **Figure 2** (Attachment 1).

Summary of Results in the Submerged Dredged Area

While a few COCs were detected in the sediment with values greater than their respective Effects Range Low (ERL) values, all samples had concentrations lower than TCEQ TRRP Residential PCLs for all COCs. In addition, no COCs were detected in submerged elutriate samples with values exceeding their respective USACE-Selected Screening Benchmarks.

Summary of Results in the Proposed Upland Excavation/Dredge Area

Two COCs (antimony in sample SE-08-(8-10 ft bgs) and TPH in sample SE-14 (0-2 ft bgs)) exceeded the TCEQ TRRP Residential PCLs, but less than the TCEQ TRRP Commercial PCLs. Based on a suggestion from TCEQ, ADVARIO TIDE will complete the appropriate paperwork to classify the site as an Industrial/Commercial restricted site.

Total PCBs exceeded the ERL value in one (1) sample, arsenic exceeded the ERL value in seven (7) samples, and nickel exceeded the ERL value in twenty-two (22) samples in the designated zone to be hydraulically dredged. No COCs exceeded their respective ERM values in the area designated for hydraulic dredging. The arsenic and nickel concentrations detected in the soil samples are similar to those that

currently exist in the Texas City Channel and Houston Ship Channel. In addition, no COCs were detected in upland elutriate samples with values exceeding their respective screening benchmarks.

Based on the analytical results summarized below and in the Human Health and Ecological Risk Assessment Report (Attachment 8) prepared under the guidance provided by the Regional Implementation Agreement (RIA, EPA/USACE, 2003), the Upland Testing Manual (UTM, USACE 2003), and the TCEQ TRRP regulations (30 TAC §350), the dredging activities proposed for the ADVARIO TIDE project are not expected to have any adverse impact on the benthic environment in the Ship Channel. In addition, the conclusion of this report is that the chemical results do not indicate a concern with the placement of these sediments in a UCDF.

Protective Measures and Monitoring Proposed by ADVARIO TIDE

Revetment matting will be installed along the proposed channel slopes within the upland area to act as a barrier (plans summarized in Attachment 10) to reduce exposure of receptors to soil after the terminal is constructed. This is consistent with the revetment matting used at the Dock 68 dredging project approved by the USACE.

A monitoring plan will be implemented during excavating and dredging activities. An environmental scientist will be onsite daily to monitor turbidity and total suspended solids (TSS) whenever excavation and dredging activities are conducted and at the UCDF decant structure whenever water is released. This monitoring would ensure compliance with the Section 401 Water Quality Certification issued by TCEQ on February 1, 2023, requiring that TSS not exceed 300 mg/l (Attachment 11). A quarterly monitoring update will be provided to the USACE.

The monitoring plan will include triggers that will stop work, and work will not resume until the issue is addressed. Advario will keep the USACE informed throughout the process and will only restart work after receiving concurrence from USACE.

The material to be excavated in the East Lagoon is expected to be highly saturated and will require augmentation and daily monitoring and management by the contractor. Rock filter dams, ditches, silt fences, and other devices will be constructed to control turbidity levels and any effluent leaving the site Attachment 11 - Project Execution Plan).

2.0 Introduction

ADVARIO TIDE contracted Benchmark Ecological Services, Inc. (Benchmark) to provide support, sample collection, laboratory analysis, and reporting associated with the excavation and dredging of the proposed ADVARIO TIDE terminal on the Ship Channel in Texas City, Texas. The approximate location of the proposed terminal is shown in **Figure 1** (Attachment 1). All figures and tables associated with this assessment are in Attachments 1 and 2, respectively.

This report was developed to provide the USACE with data to make a decision on the ADVARIO TIDE

Section 404/10 permit application. As part of this overall assessment and at the request of the USACE, risk to human and ecological receptors were evaluated. A human health risk assessment and a screening level ecological risk is provided in the Human Health and Ecological Risk Assessment Report included as Attachment 8.

3.0 Background

The history and regulatory nature of the East Lagoon is provided in the SAP.

To ensure that the SAP addressed any potential requirements from USEPA or TCEQ, ADVARIO TIDE, as directed by USACE, consulted with USEPA and TCEQ regarding the content of the SAP and obtained their concurrence before submitting it to USACE for approval. After review of the SAP, USACE granted permission to ADVARIO TIDE to proceed with implementation on 31 May 2022. Also, ADVARIO TIDE prepared a human health and ecological risk assessment that addresses the USACE request that the previous human health risk assessment be revised to be more comprehensive, and in addition to human health, include an ecological risk assessment. The Human Health and Ecological Risk Assessment Report is appended as Attachment 8.

4.0 Methods

Following the procedures specified in the SAP, ADVARIO TIDE collected soil from 27 soil sample locations within the upland area and sediment from six (6) sample locations within the submerged area shown in **Figure 2** (Attachment 1). Surface water was collected from six (6) locations. Groundwater wells were installed at four (4) locations, with the screened interval in each well set to coincide with the depths observed to facilitate interstitial flow.

Submerged sediment samples were collected on 12 July through 15 July 2022 using a barge-mounted drill rig. Water samples for chemical analysis and elutriate preparation were initially collected on 20 July 2022 using Benchmark's sampling vessel. Due to drought conditions in the summer of 2022, no standing water was present within the upland area in June 2022. ADVARIO TIDE used polymer mats to access sample locations and track-mounted drill rigs to collect the upland soil samples and install the groundwater wells. ADVARIO TIDE contractors began installing mats on 19 July 2022, and upland soil samples were collected between 25 July and 12 August 2022. Groundwater samples were collected between 25 July and 12 August 2022.

Installing matting to access upland sample stations increased the time that was required to collect the upland soil samples. The standard hold time limitation for soil used to prepare elutriate samples is 14 days (EPA,USACE, 2003). The extended collection of upland soil samples caused some of the upland elutriate samples to be prepared and analyzed outside of the EPA/USACE hold times. While a hold time for water used to prepare elutriate samples was not defined in the SAP, ADVARIO TIDE assumed a water hold time of 14 days. The upland elutriate samples prepared with water collected more than fourteen (14) days before preparing the elutriate samples were reanalyzed using additional surface water collected on 22

August 2022. Elutriate samples are discussed in greater detail in **Section 4.3**.

All submerged elutriate samples were processed within the 14-day hold time for sediment and water. Five of the 27 upland elutriate samples were processed with water that was within hold time, but with soil that was out of hold time (SE-05, SE-06, SE-17, SE-18, and SE-23). The time from soil sample collection to elutriate preparation for these five samples ranged from 16 to 22 days. The 22 upland elutriate samples that were analyzed within hold times are sufficient to spatially represent the upland area.

4.1 Submerged Sediment Samples

Submerged sediment samples from sample stations SEW-01 and SEW-02 were collected on 12 and 13 July 2022 using a drilling rig mounted on a spud barge. Sediment samples from stations SEW-03, SEW-04, and SEW-05 were collected using a Van Veen grab sampler on 15 July 2022. Surface grabs were used to collect sediment samples from SEW-03, SEW-04, and SEW-05 instead of a drill rig because the sediment surface elevations in July 2022 were -45 ft, -46 ft, and -46 ft MLLW, respectively. In addition, a single reference sample was collected with a Van Veen grab sampler and processed on 15 July 2022 from three (3) sample sub-stations immediately adjacent to the Texas City Channel as shown in **Figure 2** (Attachment 1).

Water depth to the top of the sediment layer was determined at each sample station using a lead line and measuring tape. All water depths were corrected to MLLW using a NOAA tide gauge station and are listed in **Table 1** (Attachment 2). Field data recorded at the time of sampling included date, time, water depth (adjusted to MLLW), sample appearance, odor, stratification, texture, plasticity, depth of sediment core/grab, GPS coordinates and photo IDs. Field data are summarized in **Table 1** (Attachment 2).

Sediment samples were delivered to three labs. All samples for dioxins and furans analysis were delivered to ALS Laboratory Group (ALS), composite and grab samples were delivered to North Water District Laboratory Service (NWDLS), and 2-foot interval samples from SEW-01 and SEW-02 were delivered to Eurofins Scientific Group.

4.2 Upland Soil Samples

Upland soil samples were collected between 25 July and 12 August 2022. Temporary polymer mats were installed to allow track-mounted drill rigs to access the upland sample locations. Sample stations, dates, times, sample IDs, sample station coordinates, water depths, and soil descriptions are provided in **Table 1** (Attachment 2). Since initial analytical results showed commonly detected COCs were present with values equal to or greater than their respective ERL benchmarks in some horizons, the adjacent horizons above and below those samples were subsequently analyzed to better delineate vertical extents of COCs. The archived samples that were analyzed are summarized in **Section 6.2**.

4.3 Surface Water and Elutriate Samples

Water sample stations are listed in **Table 1** (Attachment 2) and shown in **Figure 2** (Attachment 1). Surface water samples were collected from mid-depth using a Kemmerer sampler and clean HDPE tubing.

Three water sampling events were conducted on 20 July 2022, 22 August 2022, and 2 December 2022. Water collected on 20 July 2022 was used to prepare elutriates for all submerged and upland sample

stations. The hold time for sediment/soil and water to prepare elutriate samples is 2 weeks. By the time some of the upland soil samples were collected, delivered to the laboratory, and elutriates were prepared with water collected on 20 July 2022, the water was out of hold time for preparing elutriate samples SE-11, SE-12, SE-14, SE-15, SE-16, SE-20, SE-21, SE-22, SE-24, SE-25, SE-26, and SE-27. The hold time issue was not discovered until after the samples were analyzed. To address the deviation, water was recollected on 22 August 2022 and used to prepare and reanalyze elutriates for the upland sample stations listed above. Elutriate samples for stations SEW-01, SEW-02, SEW-03, SEW-04, SEW-05, REF, SE-01-E, SE-02-E, SE-03-E, SE-04-E, SE-05-E, SE-06-E, SE-07-E, SE-08-E, SE-09-E, SE-10-E, SE-13-E, SE-17-E, SE-18-E, SE-19-E, and SE-23-E are associated with water samples collected on 20 July 2022.

While steps were taken to mitigate the hold time issues listed above, five elutriate samples (SE-05, SE-06, SE-17, SE-18, and SE-23) were prepared and analyzed with soil that was out of hold time for elutriate preparation. Additional water was collected on 2 December 2022 to reanalyze for chlordane as listed in **Section 5.0**.

The SAP specified that the upland elutriate samples would be prepared using soil from -30 ft MLLW down to dredge depth. However, upland elutriate samples were prepared using soil from the surface down to the proposed dredge depth, which provides a better data set to evaluate the potential impacts when the slopes are exposed to the channel water. Elutriate samples from the submerged sample stations were prepared using sediment composited from the surface down to the proposed dredge depth as well.

4.4 Groundwater Samples

Four (4) groundwater monitoring wells were installed at the locations shown in **Figure 2** (Attachment 1). Groundwater samples were collected from the monitoring wells using low-flow sampling methodology and were analyzed for the volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) listed in **Table 8** (Attachment 2). Lithological descriptions and water parameters from the collection period are detailed in Attachment 3. Field methods are included in the groundwater report in Attachment 3**.**

None of the groundwater sample detection limits exceeded appropriate benchmarks; however, because of the hydrocarbon odor, sheen and staining noted above, well TMW-04 was redeveloped and sampled on June 6, 2023 for SVOCs, VOCs, and TPH. Field sampling methods are described in the letter included in Attachment 9.

4.5 Chemical Analysis

Sediment, soil, groundwater, and water samples were collected, processed, and delivered to three USACE-approved analytical laboratories for chemical analysis and elutriate preparation. QA/QC and sample handling procedures specified in the SAP for sediment, soil, surface water, groundwater, and elutriate analysis were followed except for the instances noted below, in the analytical result tables (Attachment 2), and in the analytical case narratives (Attachment 5).

Listed below is an example of sample handling deviations from the SAP. Soil samples associated with TPH and VOCs for the Eurofins lab were frozen prior to being delivered to the laboratory based on the request of the laboratory project manager to meet hold times. The check-in sample temperatures listed in Eurofins lab reports J31197 and J31118 ranged from – 0.6 ºC to 16.0 ºC and – 16.0 ºC to 5.6 ºC, respectively. Samples associated with TPH and VOCs had temperatures ranging from -16.0 to 0 ºC. All other samples

(except for grain size) had temperatures ranging from 0.1 to 6 ºC, and grain size samples had temperatures ranging from 0.1 to 16.0 ºC. The SAP specified that all samples were to be stored at temperatures 2-4 ºC ±2 ºC, but the temperature ranges associated with COCs listed above fall within the temperature limits listed in the analytical methods. The sample temperatures listed above should not negatively impact the analytical data.

5.0 Summary of Analytical Results

Sample stations, dates, times, sample IDs, sample station coordinates, water depths, sediment descriptions and water parameters are provided in **Table 1** (Attachment 2). Sediment sample results associated with the USACE common list of COCs (USACE 2015) are provided in **Table 4** (Attachment 2), and sediment results associated with special land use/historical COCs are provided in **Table 5** (Attachment 2). Water and elutriate sample results associated with the USACE common list of COCs (USACE 2015) are provided in **Table 2** (Attachment 2), and water results associated with special land use/historical COCs are provided in **Table 3** (Attachment 2). As designated in the SAP, half of the 2-foot intervals were analyzed, and the other half were archived. All samples initially designated to be analyzed were analyzed within their respective hold times defined in the SAP, with the exception of total petroleum hydrocarbons (TPH) in the 2-foot interval submerged sediment samples associated with SEW-01 and SEW-02 and the 2-foot interval upland soil samples associated with SE-01, SE-02, SE-03, and SE-04. All metals analyzed in the hold/archive samples were analyzed within their respective hold times. The following hold/archive samples and COCs were analyzed out of hold time.

SE-06-(2-4): Total PCB; SE-12-(2-4): acenaphthene, fluorene, phenanthrene; SE-17 (0-2): acenaphthene, fluorene; SE-17-(4-6): acenaphthene, fluorene; SE-20-(2-4): Total PCB; SE-20-(6-8): Total PCB; SE-24-(2-4): Total PCB; SE-26-(2-4): Total PCB; SE-26-(6-8): Total PCB. The hold time for the COCs listed above is 14 days. Due to the large volume of samples that were initially assigned to be analyzed, the labs were unable to analyze the first round of samples in time to (1) provide the data needed to determine which hold samples would need to be analyzed, and (2) analyze these COCs within 14 days. COCs analyzed outside of hold time are designated with an "H" flag in the results tables (Attachment 2) denoting the quality concern.

Sediment and Soil

Sediment and soil analytical results are listed in **Tables 4** and **5** (Attachment 2) along with Sample Detection Limit (SDL), Target Detection Limit (TDL), and Screening Benchmarks. Acenaphthylene in submerged composites (SEW-03, SEW-04, and SEW-05) was detected with values greater than the ERL value but less than other benchmarks. Four COCs were detected in four (4) upland composite sediment samples (nickel in SE-01 and SE-02, acenaphthylene in the SE-08, dieldrin in the SE-08, and Total PCBs in the SE-12) with values greater than their respective ERL values but less than other benchmarks.

Upland soil 2-foot and 5-foot interval sample results with values greater than their respective ERL values are listed in **Table 6.1** (Attachment 2). Upland soil hold (archive) samples associated with adjacent horizons above and below the aforementioned samples were subsequently analyzed by the laboratory to better delineate vertical extents of COCs. Hold samples and results are listed in **Table 6.2** (Attachment 2).

The upland soil 2-foot and 5-foot intervals initially analyzed and the subsequently analyzed hold samples with values greater than their respective ERL values and four samples with COCs detected with values greater than their respective ERM values are listed in **Table 6.3 (**Attachment 2). Antimony in sample SE-08-(8-10) exceeded the TCEQ TRRP Residential PCL but was less than the TCEQ TRRP Commercial PCL. TPH was detected in one (1) soil sample, SE-14 (0-2 ft), with a value greater than the TCEQ TRRP Residential PCL, but less than the TCEQ TRRP Commercial PCL.

In all submerged sediment and upland soil samples, the laboratory report limits for dieldrin and acenaphthene are greater than the ERL. The laboratory report limits are below the TDLs, ERMs, and the Residential PCLs.

In two of the upland 2-foot interval soil samples (SE-02-(0-2) and SE-02-(4-6)) 4,4' DDD, and 4,4' DDE laboratory report limits are greater than their respective ERLs. However, the laboratory report limits are below the TDL, ERM, and the Residential PCLs. 4,4' DDD and 4,4' DDE were not detected in any of the sediment or soil samples.

In 42 of the 257 upland soil 2-foot and 5-foot interval samples, 4,4' DDT laboratory report limits are greater than the ERL. However, the laboratory report limits are below the TDL, ERM, and the Residential PCL. 4,4' DDT was not detected in any of the sediment or soil samples. In 67 of the 257 upland soil 2-foot and 5-foot interval samples, fluorene laboratory report limits are greater than the ERL. However, the laboratory report limits are below the ERM and Residential PCL. The laboratory detection limit issues listed above are further discussed in **Section 6.2**. COCs with detection values greater than their respective USACE-Selected Screening Benchmarks are highlighted orange in **Tables 4** and **5** (Attachment 2).

Surface Water and Elutriate

Analytical results for surface water are listed in **Tables 2** and **3** (Attachment 2) with their respective elutriate results, along with the SDL, TDL, and Screening Benchmarks. No COCs were detected above their respective USACE-Selected Screening Benchmarks in the site surface water.

Twelve upland soil elutriate samples (SE-01, SE-04, SE-08, SE-09, SE-10, SE-13, SE-19, SE-22, SE-24, SE-25, SE-26, and SE-27) were detected with chlordane concentrations ranging from 0.802 µg/L to 1.3 µg/L. Five (5) samples (SE-22, SE-24, SE-25, SE-26, and SE-27) were prepared with water that was out of hold time for preparing the elutriate samples (see **Section 4.4**). Elutriate samples were reanalyzed with water collected on 22 August 2022 (second round of water sample collection). Chlordane was not detected in any of the reanalyzed elutriate samples. Seven (7) samples (SE-01, SE-04, SE-08, SE-09, SE-10, SE-13, and SE-19) were reanalyzed by NWDLS using water collected on 20 July 2022. Second round chlordane results for these samples exceeded the USACE-selected screening benchmark. Based on the second-round results in both groups of samples listed above, it appears the water collected on 20 July 2022 caused problems for the laboratory and biased the chlordane to a higher value. According to the laboratory manager, it is likely the elevated results were caused by interference that could not be distinguished when evaluating the results. To confirm these assumptions, the seven (7) samples elutriate samples (SE-01, SE-

04, SE-08, SE-09, SE-10, SE-13, and SE-19) were reanalyzed by two labs using water recollected on 2 December 2022. Chlordane was not detected by either laboratory in any of the elutriate samples.

Nickel was detected with values greater than the TCEQ Marine Chronic value in elutriate samples from sample stations SEW-03, SE-02, and SE-13 but less than the USACE-Selected Screening Benchmark (TWSQS Acute).

In all water and elutriate samples, the laboratory report limit for toxaphene was below the EPA Region 6 TDL but greater than the ERL value. No samples were detected with toxaphene values greater than the ERM value. COCs with laboratory detection values greater than their respective USACE-Selected Screening Benchmarks are highlighted orange in **Tables 2** and **3** (Attachment 2).

Groundwater

Analytical results for groundwater are listed in **Table 8** (Attachment 2) along with the SDL, TDL, and Screening Benchmarks. No COCs were detected above their respective USACE-Selected Screening Benchmarks in groundwater samples. Three COCs (benzo(a)anthracene, benzo(a)pyrene, and pyrene) in sample TMW-02 were detected with values greater than their respective TCEQ Marine Chronic values, but less than their respective USACE-Selected Screening Benchmark (NOAA Marine Acute). No COCs were detected above their respective TCEQ Marine Chronic values in groundwater samples TMW-01, TMW-03, and TMW-04.

Soil (from 20 to 25 ft below ground surface (bgs)) in the ground water boring TMW-04 was identified with a hydrocarbon odor, staining, and sheen. ADVARIO TIDE resampled TMW-04 on June 5, 2023, and the results are summarized in Attachment 9.

6.0 Discussion

Sample results presented in **Section 5** are further evaluated below.

6.1 Sediment

Submerged Sediment – Composite and Interval Samples – Acenaphthylene in 3 submerged composites (SEW-03, SEW-04, SEW-05) was detected with values greater than the ERL value but less than the ERM and the TCEQ TRRP Residential PCL. Nickel was detected with values greater than the ERL but less than the ERM and TCEQ TRRP Residential PCL values in submerged sediment 2-foot interval samples SEW-01(4-6) and SEW-02-(10-12) .

The composite sample nickel values from stations SEW-01 and SEW-02 are both less than the nickel ERL value. When evaluating sediment for placement into an UCDF, the composite sample is typically used to represent the sediment to be dredged because it best represents the material pumped into the UCDF that the hydraulic dredge mixes during operation. Removing this sediment from the channel will result in transporting sediment with nickel and acenaphthylene values greater than the ERL value out of the marine environment and into an UCDF. Once the sediment is in the UCDF, any concerns that might exist regarding nickel and

acenaphthylene concentrations are alleviated as the screening benchmarks change from a set of marine benchmarks to the much higher TCEQ TRRP Residential Soil PCL.

6.2 Upland Soil Samples

Upland Soil – Composite and Interval Samples – Four COCs (nickel in SE-01 and SE-02, acenaphthylene and dieldrin in SE-08, and total PCBs in SE-12) were detected in four upland composite soil samples with values greater than their respective ERL values but less than their respective ERM and TCEQ TRRP Residential PCLs.

The upland soil 2-foot and 5-foot intervals initially analyzed and the subsequently analyzed hold samples with values greater than their respective ERL values are listed in **Table 6.3 (**Attachment 2).

Upland soil 2-foot and 5-foot interval samples with analytical values greater than their respective ERL values were detected at all upland sample stations except SE-03 and SE-25. It appears that COCs detected with values greater than their respective ERL values are distributed somewhat uniformly horizontally throughout the upland sample area.

Table 7 (Attachment 2) is sorted vertically from the current soil surface down to the proposed dredge depth in order to determine how the results are concentrated vertically. Based on **Table 7** (Attachment 2), the number of different COCs detected with values greater than their respective ERL values is greatest within the top 10 feet bgs.

Twelve (12) COCs (acenaphthylene, fluorene, phenanthrene, total PCBs, arsenic, cadmium, chromium, copper, lead, nickel, silver, and zinc) exceeded their respective ERL values within the top 10ft of the current soil surface (From +5ft MLLW to -5ft MLLW). Four (4) COCs (total PCBs, arsenic, lead, and nickel) exceeded their respective ERL values in soil between 10ft bgs down to the proposed dredge depth (from -5ft MLLW to -47ft MLLW). Three COCs (total PCBs, arsenic, and nickel) exceeded their respective ERLs below -30ft MLLW in the designated material for hydraulic dredging within the proposed berthing area.

Arsenic and nickel, which were the COCs most often detected above ERL values, are commonly observed in background studies of the Galveston Bay complex. EPA's Regional Environmental Monitoring and Assessment of the adjacent waters found arsenic in concentrations ranging from 1.62 to 11.09 mg/kg (EPA 1993). Likewise, nickel was observed in concentrations from 1.4 to 33.8 mg/kg (EPA 1993). Both results indicate the pervasive nature of these contaminants throughout the local sediments. TCEQ indicates the average background levels of these contaminants in Texas soils to be 5.9 mg/kg for arsenic and 10.0 mg/kg for nickel (30 TAC 350.51 (m)). Arsenic and nickel are known to concentrate in sediments via runoff of agricultural and industrial sources, both of which contribute to the Galveston Bay Complex. Nickel is not known to bio magnify in the food web (Kennicutt M.C. 2017).

In two (2) upland samples (SE-08-(8-10) and SE-14-(0-2)), antimony and TPH, respectively, were detected with values greater than their respective TCEQ TRRP Residential PCLs, but less than their respective TCEQ TRRP Commercial PCLs. These areas will be excavated in the dry and placed in an upland area on-site or other suitable upland location. A binder will be added to the excavated soils at the extraction site

to stiffen the soil sufficiently to be hauled by truck to the on-site placement location. Once at the placement location, the soil will be deep mixed with additional binder to ensure its stability. The excavation methods and proposed handling of upland soils from the current soil surface down to -30 ft MLLW are described in greater detail in the Project Execution Plan included as Attachment 11 .

The proposed marine terminal will be an industrial site, and the commercial/industrial PCLs will apply. When mixed with a binder and other soils on-site, the concentrations of antimony and TPH will be diluted.

As listed in **Section 5.0**, five (5) COCs (dieldrin, acenaphthene, 4,4' DDD, 4,4' DDE, 4,4' DDT, and flourene) had laboratory report limits greater than the USACE-Selected Screening Benchmarks.

In all sediment and soil samples, the laboratory report limits were below the ERM values and TCEQ TRRP Residential PCLs. Once the terminal is dredged and the soil/sediment has been placed in an upland area on-site or an UCDF, the TCEQ TRRP Residential and Commercial PCLs are used to evaluate the sediment/soil. Even with the laboratory report limit issues listed above, there are sufficient data for these COCs to show that they will not be a concern once the soil/sediment is in an upland area on-site or an UCDF. In addition, the Human Health and Ecological Risk Assessment (Attachment 8) did not find any reasons for concern for the COCs listed above.

6.3 Elutriate

No submerged elutriate samples were found to contain analyte concentrations exceeding their respective USACE-Selected Screening Benchmarks.

Chlordane in the upland elutriate samples (SE-01, SE-04, SE-08, SE-09, SE-10, SE-, and SE-19) was detected with values greater than the USACE-Selected Screening Benchmark (TSWQS Marine Acute 0.09 µg/L). The samples were reanalyzed using surface water recollected at later dates as listed in **Section 5**. When the samples were reanalyzed (using two separate labs) using water samples collected from the same stations, but on different dates, chlordane was not detected in any of the elutriate samples. In addition, chlordane was not detected in any of the sediment or soil samples with values that exceeded the ERL value.

Submerged elutriate results indicate that some metals, phenol, hydrocarbon, and ammonia were transferred to the water. No COCs were detected in submerged elutriate samples at levels exceeding their respective USACE-Selected Screening Benchmarks.

Upland elutriates sample results indicate that ammonia, hydrocarbons, metals, phenol, pyrene, and total organic carbon (TOC) were transferred to the water. Except for the initial chlordane issues listed above, no COCs were detected at levels exceeding their respective USACE-Selected Screening Benchmarks in upland elutriate samples.

6.4 Surface Water

No surface water samples were found to contain COCs at concentrations greater than their respective

screening benchmarks. However, an unknown component in the surface water samples collected on July 20th appears to have affected the laboratory's (NWDLS) ability to precisely report chlordane results in elutriate samples.

6.5 Groundwater

Benzo(a)anthracene, benzo(a)pyrene, and pyrene were detected with values that exceed their TCEQ Chronic screening values but were lower than their USACE-Selected Screening Benchmarks (NOAA Marine Acute) in sample TMW-02.

The 2023 TMW-04 groundwater data indicates that COC concentrations and SDLs are below the TCEQ Saltwater chronic benchmarks or the TCEQ saltwater chronic benchmarks adjusted for the Site-specific dilution factor.

7.0 Conclusion

Submerged Dredged Area

Although a few COCs were detected in the sediment with values greater than their respective ERL values, all COCs were detected with values less than their respective TCEQ TRRP Residential PCLs. Once the sediment is hydraulically dredged and placed into the GLO UCDF, the sediment will no longer be exposed to the marine environment and will be treated as upland soil. In addition, no COCs were detected in submerged elutriate samples with values exceeding their respective USACE-Selected Screening Benchmarks. The decant water associated with the dredged material placed into the UCDF should not negatively impact the water in the channel or Galveston Bay.

A 401 water quality certification (WQC) was issued for the proposed TIDE project on February 1, 2023, and is included as Attachment 12. The WQC includes the following special condition with which ADVARIO TIDE would comply. All decant water from the dredge placement area associated with this project shall not exceed 300 mg/L total suspended solids. This condition is necessary to ensure that return water discharges will comply with water quality requirements in accordance with Texas Water Code §26.003 and antidegradation policy in 30 TAC §307.5, and not result in violations of general water quality criteria in 30 TAC 307.4(b)(2)-(5). ADVARIO TIDE will monitor any return water discharges during and immediately after the dredge event is completed.

Once the terminal has been excavated, dredged and constructed, ADVARIO will be required to conduct maintenance dredge events every two to three years. Prior to each maintenance dredge event, ADVARIO will arrange for an upland confined disposal facility (UCDF) to except the proposed maintenance dredge material. The proposed UCDF will require sediment, water, and elutriates be sampled and analyzed for the same COCs listed in this Report. Based on the future maintenance dredge sampling events, ADVARIO will be required to monitor the sediment at the proposed AVARIO TIDE facility as long as the terminal is in operation.

Upland Dredged/Excavated Area

Although twelve (12) COCs were detected in the soil with values greater than their respective ERL values, three (3) of the twelve (12) COCs were detected with values greater than their respective ERM values, and two (2) COCs (without respective ERL/ERM values) were detected with values greater than their respective TCEQ TRRP Residential PCLs. All COCs were detected with values less than their respective TCEQ TRRP Commercial PCLs. The soil from the current soil surface down to -30ft. MLLW will be excavated and placed in upland areas on-site or other suitable upland location, and the soil from -30ft MLLW to dredge depth will be hydraulically dredged and placed into the GLO UCDF, at which point the soil will not be exposed to the marine environment and will be treated as an upland commercial soil. In addition, based on data listed in **Section 6.0,** elutriate results associated with the dredge material placed into the UCDF should not negatively impact the water in the channel or Galveston Bay.

Except for arsenic and nickel, the majority of the COCs that were detected in upland soils with values greater than their respective ERL values were detected in soil at elevations less than 10ft bgs. The arsenic and nickel concentrations detected in the soil samples are similar to those that currently exist in the Texas City Ship Channel and Houston Ship Channel.

Revetment matting will be installed along the proposed channel slopes within the upland area to act as a barrier to reduce exposure of receptors to soil. This is consistent with the revetment matting used at the Dock 68 dredging project that was approved by the USACE. The revetment matting will consist of a semi-permeable geotextile under concrete matting laid over the slope from +5 MLLW down to -30 MLLW as shown in Attachment 10.

To address any concerns that may exist with the potential for impacts to receptors during construction, ADVARIO TIDE will develop a monitoring plan to be implemented whenever material removal activities (mechanical excavation or hydraulic dredging) are conducted.

Groundwater

Groundwater concentrations for three COCs (benzo(a)anthracene, benzo(a)pyrene, and pyrene) are less than the Tier 2 PCLs developed for the groundwater surface water pathway in the risk assessment report (Attachments 8 and 9). Thus, the excavation and dredging should not affect receptors in the ship channel and the placement of material into the UCDF should not be a concern.

Based on the analytical results summarized above and in the Human Health and Ecological Risk Assessment Report (Attachment 8) under the guidance provided by the RIA (EPA/USACE, 2003), the Upland Testing Manual (UTM, USACE 2003), and the TCEQ TRRP regulations (30 TAC §350), the dredging activities proposed for the ADVARIO TIDE project are not expected to have any adverse impact on the benthic environment in the Ship Channel. In addition, the conclusion of this report is that the chemical results do not indicate a concern with the placement of these sediments in an on-site upland area or an UCDF.

8.0 References

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