# APPENDIX L

# ADDITIONAL EXPERT ANALYSIS BY ERM

# Ecological Risk Assessment and Expert Report of Karen P. Cejas, Ph.D.

Castex Development, LLC v. Anadarko Petroleum Corporation, et al., West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana

PREPARED FOR
Anadarko Petroleum Corporation
Anadarko US Offshore, LLC
BP America Production Company

DATE
June 9, 2025

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SIGNATURE PAGE

# Ecological Risk Assessment and Expert Report of Karen P. Cejas, Ph.D.

Castex Development, LLC v. Anadarko Petroleum Corporation, et al., West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana
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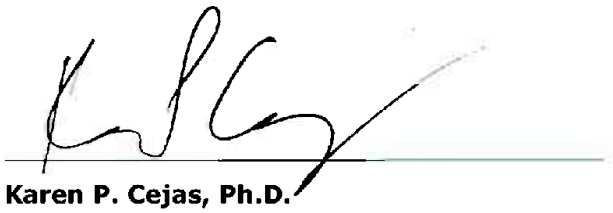

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## ACRONYMS AND ABBREVIATIONS

| Acronym | Description |
|---|---|
| AOI | Area of Investigation |
| AWQC | Ambient Water Quality Criteria |
| BAF | Bioaccumulation Factor |
| BERA | Baseline Ecological Risk Assessment |
| BW | Body Weight |

| Acronym | Description |
|---|---|
| COPEC | Constituents of Potential Ecological Concern |
| CSM | Conceptual Site Model |
| E&P | Exploration and Production |
| EDX | Energy Dispersive X-Ray |
| EEC | Estimated Environmental Concentration |
| EPA | Environmental Protection Agency |
| EPH | Extractable Petroleum Hydrocarbons |
| ERA | Ecological Risk Assessment |
| ERM | Environmental Resources Management Southwest, Inc. |
| ESV | Ecological Screening Values |
| FACW | Facultative Wetland |
| HET | Hydro-Environmental Technologies, Inc. |
| HMW | High Molecular Weight |
| HQ | Hazard Quotient |
| IBA | Important Bird Area |
| ICP | Inductively Coupled Plasma |
| LDEQ | Louisiana Department of Environmental Quality |
| LDENR | Louisiana Department Energy and Natural Resources |
| LDWF | Louisiana Department of Wildlife and Fisheries |
| LSU | Louisiana State University |
| NA | Not Available |
| NOAA | National Oceanic and Atmospheric Administration |
| NOAEL | No Observed Adverse Effect Level |
| NRCS | Natural Resources Conservation Service |
| NWI | National Wetlands Inventory |
| OBL | Obligate |
| PAH | Polycyclic Aromatic Hydrocarbon |
| RECAP | Risk Evaluation/Corrective Action Program |
| SEM | Scanning Electron Microscope |

| Acronym | Description |
|---|---|
| SIM | Selective Ion Monitoring |
| SLERA | Screening Level Ecological Risk Assessment |
| SPLP | Synthetic precipitation leaching procedure |
| TPH | Total Petroleum Hydrocarbons |
| TRV | Toxicity Reference Value |
| UF | Uncertainty Factor |
| US | United States |
| USACE | United States Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| USEPA | US Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| UTL | Upper Tolerance Limit |
| XRD | X-Ray Diffraction |

# 1. INTRODUCTION

Dr. Karen Cejas of Environmental Resources Management Southwest, Inc. (ERM)prepared this ecological risk assessment (ERA) and expert report pertaining to the claims asserted in the lawsuit: Castex Development, LLC v. Anadarko Petroleum Corporation, et al., 31st Judicial District Court for Parish of Jefferson Davis, State of Louisiana (Docket No. C-0502-20) (OC Legacy No. 031-027). This report is issued on behalf of the following named defendants: Anadarko Petroleum Corporation, Anadarko US Offshore, LLC,[1] and BP America Production Company.

The lawsuit pertains to a land tract owned by Castex Development, LLC of approximately 1130 acres in Sections 13 and 39 in Township 10 South, Range 03 West, and Sections 17 and 18 in Township 10 South, Range 02 West, Jefferson Davis Parish, Louisiana in the West Mermentau Oil and Gas Field ("Property") (Figure 1). The Property was historically used for oil and gas exploration and production (E&P) activities, and agriculture, among other uses. Additionally, a northern portion of the Property was utilized as a saltwater and non-hazardous oilfield waste commercial disposal facility operated by Castex Systems, Inc beginning in 1982. Recent uses of the Property include E&P operations, rice farming, crawfish aquaculture, hunting, and rural residential use. Former E&P activity and other features on the Property are shown on Figure 2.

The Property includes a mix of ecological communities, such as prairie and grassy areas, bottomland hardwood forest, riparian forest, edge forest, and cypress swamp, as well as built environment, which includes roads and rural residences. The Cajun Prairie and Sweetgum-Water Oak bottomland forest natural communities on the Property are providing habitats typical of the Western Gulf Coastal Plain Ecoregion of Louisiana. The habitats on the Property support a wide variety of wildlife, including pollinating insects, resident and migratory birds, including birds of prey, recreational game mammals such as white-tailed deer (*Odocoileus virginianus*), and reptiles and amphibians.

This ERA has been performed to evaluate whether historical oilfield E&P operations have adversely affected the ecology (flora and fauna) at the Property and whether remediation is required to protect the ecology. An ERA evaluates the ecological effects of chemical, physical, or biological actions on an ecosystem by quantifying adverse effects on individuals, populations, communities, or ecosystems. This ERA has been performed in accordance with United States Environmental Protection Agency (USEPA) and Louisiana Department of Environmental Quality (LDEQ) guidance (e.g., USEPA, 1997; USEPA, 1998; LDEQ, 2003).

ERA, per USEPA and LDEQ guidance, begins with a screening level assessment and progresses to a more site-specific ecological risk assessment, if needed, to assess if there is unacceptable risk to ecological receptors due to exposure to constituents of potential ecological concern (COPECs) in environmental media at the Property.

The conclusions in this ERA are supported by the following data:

[1] Plaintiff alleges that the Anadarko entities are the successors in interest to Delta Drilling Company. Although this report addresses areas allegedly operated by Delta Drilling Company, the opinions offered do not serve as a concession that the Anadarko entities are successors in interest to Delta Drilling Company.

- Field inspections and evaluations performed by Dr. Karen Cejas (2025), HET (2025), and ICON (2024);
- Data from 2021, 2022, 2024, and 2025 investigations of soils, wildlife, and vegetation (Cejas, 2025; HET, 2025; ICON, 2024); and
- The results of a Screening Level Ecological Risk Assessment (SLERA) and Baseline Ecological Risk Assessment (BERA) of the Property, which includes a comparison of soil constituent concentrations with ecological screening values (ESVs) and calculation of potential for ecological risk.

The purpose of this ERA is to determine if 1) additional investigation and studies are needed, 2) remediation is needed, or 3) no further action is required.

## 1.1 PURPOSE OF REPORT AND SOURCES OF INFORMATION

This report documents the ecological conditions of the Property and provides: 1) a review of Property information and data; 2) an ERA; 3) recommendations for a scientifically reliable course of action for the Property; and 4) a response to Plaintiff's expert report.

Fundamental principles of toxicology have been used to evaluate the Property and prepare this report. Basic principles of toxicology that govern the evaluation process include: 1) there must be an exposure to elicit a sufficient dose, response, and subsequent risk; and 2) an implemented remedy, if any, should not cause harm to a functioning ecosystem.

In preparing this report, I have reviewed the report prepared by Plaintiff expert, ICON (Gregory Miller and Jason Sills, 2024), which did not conduct an ERA, and the reports prepared by Defense experts, HydroEnvironmental Technology, Inc. (HET, 2025) and Dr. B.H. Kueper (Kueper, 2025).

## 1.2 QUALIFICATIONS, AREAS OF EXPERTISE, AND COMPENSATION

Dr. Karen Cejas is an environmental toxicologist and ecological risk assessor. She has a Bachelor of Science degree in zoology from Louisiana State University and a Ph.D. from Louisiana State University Department of Biological Sciences with a Ph.D. minor from the Department of Environmental Sciences. She has 15 years of experience in aquatic and terrestrial ecotoxicology, ecological risk assessment, natural resource damage assessments, and environmental site investigation involving a wide range of constituents including metals, hydrocarbons, polychlorinated biphenyls (PCBs), and dioxin/furans. ERM's hourly rate for Dr. Cejas is $280 for consulting work and $420 for time spent testifying.

A copy of Dr. Cejas' Curriculum Vitae is provided as Appendix A.

# 2. OPINIONS

1. The Property habitats are a mix of prairie and grassy areas, bottomland hardwood forest, edge forest, and riparian forest, cypress swamp, rice fields, and built areas. Habitats in the former BP operations areas include prairie and bottomland hardwood forest. Habitats in the former Anadarko operations areas include edge forest and grassy communities.
2. The prairie and bottomland hardwood forest habitats in the former BP operations areas at the Property are thriving, providing the expected ecosystem services, and not adversely affected by former E&P operations.
3. The edge forest and grassy habitats in the former Anadarko operations areas at the Property are thriving, providing the expected ecosystem services, and not adversely affected former E&P operations.
4. The Property supports commercial and recreational land uses such as rice farming, crawfish aquaculture, and hunting, as well as rural residential use.
5. The Property in the former BP operations areas and former Anadarko operations areas can be used for its intended purposes. Functionality and uses of the Property, including rice farming and crawfish aquaculture, as they relate to ecology are not impacted by former E&P operations, or soil concentrations, in the former BP operations areas and former Anadarko operations areas.
6. The site-specific ecological risk assessment, prepared per USEPA and LDEQ guidance, demonstrates that there are no unacceptable ecological risks from soil concentrations in the former BP operations areas and former Anadarko operations areas at the Property.
7. Soil concentrations in the former BP operations areas and former Anadarko operations areas at the Property do not pose an ecological risk to any surface water.
8. The conclusion of no unacceptable ecological risk to habitats or wildlife in the former BP operations areas and former Anadarko operations areas at the Property is based on site-specific data, analyses, and multiple lines of evidence. All lines of evidence support the conclusion of no unacceptable ecological risk from soil concentrations in the former BP operations areas and former Anadarko operations areas at the Property.
9. Remedial actions in the former BP operations areas and former Anadarko operations areas at the Property are not required for ecological reasons, or to mitigate any ecological risk. The remediation proposed by Plaintiff pertaining to the former BP operations areas and former Anadarko operations areas at the Property is excessive and destructive and is not required to protect ecological species.

# 3. INVESTIGATION METHODS

Site-specific data collected throughout the Property from 2021, 2022, 2024, and 2025 were used to complete this ERA. Data used include laboratory-measured chemical concentrations (soils), laboratory-measured mineral speciation data (soils), field observations of fauna (birds, other fauna), and field-identified percent coverage and species data (vegetation). Also used in the ERA were data from peer-reviewed scientific literature and other publicly available data.

Photographs taken of habitat, vegetation, and wildlife are included in Appendix B and fieldnotes are included in Appendix C. LDEQ's Risk Evaluation/Corrective Action Program (RECAP) Form 18 is included in Appendix D.

## 3.1 SITE INSPECTIONS

Dr. Karen Cejas performed site inspections of the Property and collected wildlife and vegetation data on April 15, 2025, and May 29, 2025. Wildlife and vegetation data collection were supported by the ecological "eco" field team, which included Mr. Connor Matherne (April 15, 16, and May 29, 2025), Ms. Anna Sivils (May 29, 2025), and Ms. Sam Schwippert (April 15, 2025) from ERM, and Mr. Jody Shugart (April 15 and 16, 2025). These data collected on April 15-16, 2025 included a focused assessment of the former BP operations areas, and on May 29, 2025 included a focused assessment of the former Anadarko operations areas. All these data collected were used to prepare the ERA.

## 3.2 ENVIRONMENTAL SAMPLING

Sampling of environmental matrices was performed by ERM, HET, and ICON on the Property and submitted to laboratories for chemical and mineralogical analyses. Sample locations are shown on Figures 3 through 8.

Soil, ground water, and vapor samples were collected in 2021, 2022, 2024, and 2025 by ERM, HET, and ICON at the Property. Analyses requested included:

Metals analyzed via USEPA 6020A, 6020B, 6010B, 6010D, 7470A, 7471A, and LDNR 29-B;

- TPH Mixtures via USEPA 8015B and SW8015C;
- TPH Fractions via MAEPH LA and MAVPH LA;
- PAH Selective Ion Monitoring (SIM) via 8270D SIM;
- Benzene, ethylbenzene, toluene, and xylene via USEPA 8260B;
- Synthetic Precipitation Leaching Procedure (SPLP) metals via USEPA 1312/9056A/6010D;
- Salts and other parameters by LDENR 29-B, USEPA 2320B, 9056;
- Radium by USEPA 903.0 and 904.0;
- Moisture via SW-DRYWT and LDNR 29-B;
- HEM Oil and Grease via 2540C-2011 and SW9071;
- Saturation Paste via LDENR 29-B;
- Exchangeable Sodium Percentage (ESP) via LDEQ 29-B, and lab calculations;

- Alkalinity parameters including carbonates, bicarbonate, and alkalinity (as $CaCO_3$) via 2540C-2011 and SM2320B;
- Total Dissolved Solids (TDS) via 2540C-201;
- pH via LDNR 29-B; and
- Gases sampled with an Isobag and analyzed for NG2D plus nC4.

Soil and ground water data were generated by analytical laboratories certified by LDEQ: ALS Environmental (Houston, TX), Eberline Analytical/Oak Ridge Laboratory (Oak Ridge, Tennessee), Element Materials Technology Lafayette (Lafayette, Louisiana), Pace Analytical Services, LLC (Greensburg, Pennsylvania), and Waypoint Analytical (Marrero, Louisiana). In addition, soil samples were submitted by ERM for barium mineralogy analysis by X-Ray diffraction (XRD) and X-Ray Dispersive Energy (EDX) to Core Minerology, Inc. (Broussard, Louisiana. Isotopic composition data was generated by Isotech Laboratories (Champaign, IL). Further details regarding the associated investigation methods are discussed in other experts' reports (HET, 2025; ICON, 2024) and not further discussed here.

Sample locations depicted on figures for this report are provisional. Refer to reports by site investigation parties (HET, 2025; ICON, 2024) for comprehensive and final determinations on sample locations.

## 3.3 ECOLOGICAL FIELD SURVEYS

### 3.3.1 20-FT ECOLOGICAL SURVEYS

Dr. Karen Cejas and the eco field team performed 20-foot (ft) radius ecological surveys on the Property on April 15, 2025. These surveys were conducted at 6 locations in the former BP operations areas (HA-1, HA-2, HA-3, HA-10, CD-6, and CD-18) and 5 on-site reference locations (Figure 9). Reference locations were selected based on the ecological communities, and distance (at least 500 feet) away from oil and gas E&P wells and former pits.

The ecological surveys included 20-ft radius vegetation surveys as well as observations of wildlife, including direct visual and auditory observation of birds, and direct and indirect observation of non-avian wildlife. The 20-ft radius vegetation surveys were performed per USEPA guidance in *Methods for Evaluating Wetland Condition: Using Vegetation to Assess Environmental Conditions in Wetlands* (USEPA, 2002), including using the standard Releve (Braun-Blanquet) vegetation sampling protocol, adapted from Mueller-Dombios and Ellenberg (USEPA, 2002; Mueller-Dombios and Ellenberg, 1974).

From a center point, recorded by GPS coordinates, a tape measure was used to establish a 20-ft radius plot (approximately 100 square meter plot). Species within the established plot were recorded. For each species, ERM recorded the stratification class (height/category) and the estimated percent cover. Per Mueller-Dombios and Ellenberg (1974), the strata were defined as:

- T1= Tree layer, any plant taller than 5 meters
- S1= Shrub layer, plants between 2 and 5 meters tall
- S2= Shrub layer, plants between 30 centimeters and 2 meters tall
- H1= Tall herb layer, plants greater than 30 centimeters in height

- H2= Medium-tall herb layer, plants 10 to 30 centimeters in height
- H3= Low herb layer, plants less than 10 centimeters

Plant cover is the relative area of the species when projected onto the surface and factors in the size of individual plants. Due to overlap of plants, it is possible for the total percent cover to be greater than 100% (Damagaard, 2019). For example, tree species such as American elm (*Ulmus americana*) and sweetgum (*Liquidambar styraciflua*) may be densely packed such that the leaves of the different plant species overlap within the same strata. Additionally, it is possible for a species to exist in more than one stratum. For example, there could be 50% cover of water oak (*Quercus nigra*) in the T1 layer and an additional 10% cover in the S1 layer, based on varying plant heights within the plot.

Dominant species were also determined for each 20-ft survey location using the 50/20 Rule dominance test (USACE, 2010). Per the 50/20 Rule, the most abundant species that individually or collectively account for more than 50 percent or any species that individually accounts for at least 20 percent of the total coverage of vegetation was considered dominant in that location.

Common names and scientific names of plants recorded during the 20-ft ecological surveys were confirmed with the United States Department of Agriculture (USDA) PLANTS Database (2024).

### 3.3.2 INCIDENTAL OBSERVATIONS

Incidental observations include all observations of flora and fauna (birds, insects, reptiles, etc.) made at times other than during the formal 20-ft ecological surveys on April 15, 2025 (Figure 10). Direct observations and signs of non-avian wildlife, such as tracks or scat, within the area were recorded. Avian wildlife observed through visual and auditory means were also recorded. Detailed observations of flora and fauna in the former Anadarko operations areas (CD-1, CD-2, CD-3, HA-4, HA-5, HA-9, and SN 28396) on May 29, 2025, are grouped as incidental observations. Incidental observations also occurred on April 15-16, and May 29, 2025, along on-site ditches, and during travel between ecological survey and observation locations.

Incidental observations on the Property on April 15-16, and May 29, 2025, as documented on eBird by Mr. Connor Matherne and Mr. Jody Shugart (eBird lists S226124806, S226279620, S226279810, S244222131, S244186926, S244252704, S244247047, S244242946, S244237674, S244195731) were also used to characterize bird populations across the Property. Photographs are provided in Appendix B and fieldnotes, including eBird lists, are provided in Appendix C.

# 4. ECOLOGICAL SETTING

## 4.1 LAND USE

Land use on the Property includes former E&P, agriculture (rice, crawfish), recreation (hunting), pipeline right-of-way, and rural residential. Portions of the Property are undeveloped. Land use surrounding the Property includes agriculture to the northwest, west, and southwest, undeveloped land to the east, and an industrial facility northeast.

Ditches and a pond-like feature are present on the Property, and portions of the Property abut the Mermentau River (Figures 11 and 12). The Property contains USFWS NWI-mapped wetlands and a pond-like feature which may hold water for part or all of the year (Figure 12). The Property lies within the LDEQ Drainage Basin Subsegment #050301 Bayou Nezpique – From headwaters to Mermentau River and LDEQ Drainage Basin Subsegment #050401 Mermentau River- From headwaters to Lake Arthur. The designated surface water uses for Subsegment #050301 and Subsegment #050401 include primary and secondary contact recreation, propagation of fish and wildlife, and agriculture.

## 4.2 LAND COVER

The Property includes a mix of upland and wetland ecological communities, such as prairie and grassy areas, bottomland hardwood forest, riparian forest, edge forest, and cypress swamp, as well as built environment, which includes roads and hunting camps.

U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) data, based on infrared imagery (1998), identifies Forested Broad-Leaved Deciduous (PFO1A, PFO1/2A) and Forested Needle-Leaved Deciduous (PFO2/1A) wetlands in the eastern portion of the Property along the Mermentau River and its tributaries (USFWS 2024, Figure 11). The waterbodies on the Property are characterized as Riverine Intermittent Streambed (R4SBC) and Riverine Lower Perennial (R2UBH) habitat (USFWS 2024, Figure 12).

To characterize ecological communities of the Property, the field team conducted field investigation of vegetation and wildlife on the Property (April 15$^{th}$ and 16$^{th}$, and May 29$^{th}$, 2025). Based on the ecological surveys conducted on the Property, it has been determined that the Property is mainly comprised of two natural communities, Cajun Prairie and Sweetgum-Water Oak Bottomland Forest. In addition, areas of the Property contain riparian forest, edge forest, and grassy areas. A lesser portion of the Property predominating on the eastern boundary can be defined as cypress swamp. The ecological communities documented on the Property are further described in the following sections.

## 4.3 ECOREGION

The Property is situated within the Western Gulf Coastal Plain Ecoregion of Louisiana (Figure 13), which is characterized by its relatively flat topography, fertile soils, and natural grassland vegetation. Due to its flat and fertile conditions, the Western Gulf Coastal Plain Ecoregion hosts a higher percentage of croplands, specifically rice and soybeans, compared to the neighboring regions. The Northern Humid Gulf Coastal Prairies area of the Western Gulf Coastal Plain, where

the Property is located, historically contained tallgrass grasslands but has since been converted to cropland, pasture, crawfish aquaculture and other urban land uses (Daigle et al., 2006).

The entire Property is within the Coastal Prairie Important Bird Area (Figure 14). Important Bird Areas (IBA) are distinct areas that provide essential habitat for breeding, wintering, or migrating bird species (Audubon, 2015). Louisiana has over 21.7 million acres of IBA, which is the fourth largest area of IBA for any one US state, behind only Alaska, Hawaii, and California (Audubon, 2024). The Coastal Prairie IBA encompasses nearly 2.5 million acres of relatively flat, moist landscape west of the Atchafalaya River and north of the coastal marshes. The rice and crawfish cultivation that occurs throughout the IBA provides ample food as well as water and cover for many birds, including shorebirds, wading birds, waterfowl, and passerines such as blackbirds. This IBA is located at the convergence of two major flyways, the Central and Mississippi, and supports a wide range of migrating species as well as Birds of Conservation Concern designed by the U.S. Fish and Wildlife Service (USFWS) (Audubon, 2024). The Property, in conjunction with the rest of the Coastal Prairie IBA, provides habitat for regionally and globally important bird conservation.

The Property is located within the Mississippi Flyway, which is a major bird migration route from central Canada to the Gulf. The flyway covers 13 U.S. states and provides shelter, food, and water for migrating birds. As of June 6, 2025, more than 27.7 million birds traveled through Jefferson Davis Parish along the Mississippi Flyway migration route during the Spring 2025 migration period, per BirdCast (2025). ERM observed 865 individual birds and 72 bird species on the Property during the site investigations on April 15 and 16, and May 29, 2025, which compares favorably to nearby observations from recreational birders during the same time period (April, May) (eBird, 2025). The abundance of bird habitat on the Property and its proximity to the Gulf of Mexico makes it a prime stopover for migrating birds. The Property, within the Mississippi flyway, is important regionally and globally for bird conservation.

The forested areas on the Property are part of a wider network of forested wetland habitats along the Mermentau River and its tributaries (USFS, 2021) (Figure 15). These areas provide connectivity across the region and serve as important travel corridors between habitats. The Property is therefore a location that regional terrestrial wildlife can use for foraging, resting, mating, and nesting (NRCS, 1999).

The Property is ecologically important within the Coastal Prairie IBA, the Central and Mississippi Flyways, and provides valuable wildlife habitat connected to a larger network of tree cover along the Mermentau River. The Property, as documented in the following sections, is serving a role in protecting local and regional wildlife diversity.

# 5. ECOLOGICAL COMMUNITIES

The Property includes a mix of ecological communities, such as prairie and grassy areas, bottomland hardwood forest, edge forest, riparian forest, and cypress swamp, as well as built environment, which includes roads, fencing, cropland, and hunting camps. The structure and health of the ecological communities on the Property were assessed during multiple field investigations of vegetation and wildlife performed by the eco field team (April 15-16, and May 29, 2025). Wildlife and vegetation observed on the Property during the investigations included 113 plant taxa, 72 bird species, and 71 non-avian taxa including mammals, reptiles, amphibians, and terrestrial invertebrates. Diverse and productive ecological communities were observed throughout the Property, including areas of former E&P operations.

Ecological survey locations and incidental observations are shown in Figures 9 and 10. Complete lists of all plants, birds, and other taxa observed on the Property are provided in Tables 1 through 3. Photographs of habitat, vegetation, and wildlife are included in Appendix B, and eBird lists and field notes are provided in Appendix C. The ecological communities observed within the Property, including the former BP operations areas (Section 5.1), former Anadarko operations areas (Section 5.2), and other areas of the Property (Section 5.3) are described in the following sections.

## 5.1 ECOLOGICAL COMMUNITIES IN THE FORMER BP OPERATIONS AREAS

The former BP operations areas on the Property are comprised predominately of prairie communities in the vicinity of BP well interest SN 76164 and nearby former pit, and bottomland hardwood forest communities in the vicinity of BP well interests SN 82706, SN 82022, and SN 139607. The ecological communities in the former BP operations areas were characterized using data collected from six 20-ft ecological survey locations on April 15, 2025: E-S20-1 (HA-1), E-S20-2 (HA-2), and E-S20-3 (HA-3) in prairie communities ("prairie survey locations"), and E-S20-4 (HA-10), E-S20-5 (CD-18), and E-S20-6 (CD-6) in bottomland hardwood forest communities ("forest survey locations") (Figure 9). During these 20-ft ecological surveys, ERM observed 67 plant taxa, 30 species of birds, and 15 non-avian taxa, including crawfish (Order Decapoda), coyote (*Canis latrans*), and white-tailed deer (*O. virginianus*).

To evaluate the health and function of the ecological communities in the former BP operations areas, ERM also surveyed 5 reference locations on the Property that are uninfluenced by oil and gas E&P activity: E-S20-7 and E-S20-9 in prairie communities, and E-S20-8 (CD-8), E-S20-10, E-S20-11 in bottomland hardwood communities (Figure 9). Surveys for the reference locations were performed using the same methodology and on the same day (April 15, 2025) as surveys for the former BP operations areas. A comparative analysis of the vegetation and bird communities observed in the former BP operations areas and reference locations is included in Sections 5.1.1 and 5.1.2, respectively.

Ecological survey locations in the former BP operations areas and reference are shown on Figure 9. Complete lists of plants and birds observed within ecological survey locations are provided in Tables 4A and 4B, respectively. Photographs of representative habitat at each ecological survey location in the former BP operations areas are shown in Figure 16. All photographs of habitat,

vegetation, and wildlife in the former BP operations areas and reference are included in Appendix B-1, and Appendix B-2, respectively.

### 5.1.1 NATURAL COMMUNITIES IN THE FORMER BP OPERATIONS AREAS

The Louisiana Department of Wildlife and Fisheries' (LDWF) Natural Heritage Program (NHP) documents 68 types of natural communities in Louisiana. Natural communities are defined as "groups of plant and animal species that typically occur in association with each other in certain landscapes or physical environments" (LDWF, 2009). The LDWF NHP natural communities inventory provides a helpful framework for understanding and characterizing ecological communities across Louisiana.

Diverse and productive natural communities were observed throughout the former BP operations areas. Based on the species richness (diversity, or number of unique species) and composition (abundance, measured by percent coverage) data collected during the 20-ft ecological surveys, the prairie and bottomland hardwood forest ecological communities observed in the former BP operations areas and the reference locations can be characterized more specifically as Cajun Prairie and Sweetgum-Water Oak Bottomland Forest natural communities. The vegetation observed in the former BP operations areas was dense and healthy, and there was no evidence of salt impacts observed (e.g., chlorosis, white crusts on soil, denuded areas) in either the forests or the prairie ecological survey location areas.

A total of 64 vegetative taxa were observed and recorded in the former BP operations areas, with 27 plant species in the Cajun Prairies and 42 plant species in the Sweetgum-Water Oak Bottomland Forest, during the 20-ft ecological surveys held on April 15, 2025. This is excellent diversity for habitats in the region and is a line of evidence of good ecosystem function. In addition, the abundance of representative wetland species indicates that wetland soils and conditions in the former BP operations areas and reference locations offer a productive and non-toxic setting for natural ecosystems to thrive.

The Plaintiff's proposed soil and groundwater remediation plans will destroy valuable Cajun Prairie and Sweetgum-Water Oak Bottomland Forest that are currently functioning and supporting the plants and wildlife expected in the region by removing and replacing soil to a maximum depth of 20 feet below ground surface (bgs). The groundwater plan would install 33 miles of piping and 349 recovery wells for a period of close to 30 years. The Plaintiff's proposed remediation plan would do more ecological harm than good as it would result in the temporal loss of valuable habitat that may indirectly cause species to vacate the area or perish. The plan would also result in destruction of intact ecosystems by large equipment and heavy machinery entering and leaving the Property, disruption of wildlife activities due to increased noise levels on the Property, crushed vegetation, soil compaction from heavy machinery, and direct harm to or death of plants and wildlife. Wildlife and habitat in the Plaintiff's proposed soil and groundwater remediation areas are discussed in Section 6.

#### 5.1.1.1 CAJUN PRAIRIE

Cajun Prairie is a type of wetland prairie community that once covered approximately 2.5 million acres across Louisiana, but today only remains in small, remnant parcels (LDWF, 2009). Cajun

Prairie natural communities are very diverse and host a variety of grasses and forbs (wildflowers) (LDWF, 2009). The prairies in the former BP operations areas are best characterized as Cajun Prairie based on the vegetation data collected during the 20-ft ecological surveys at locations E-S20-1 (HA-1), E-S20-2 (HA-2), and E-S20-3 (HA-3) ("former BP operations areas prairie survey locations").

This section discusses plant diversity, or species richness, the presence of representative Cajun Prairie plant species, the prairie community structure (in terms of height, or strata), and the presence of hydrophytic and non-hydrophytic vegetation (or, the likelihood to occur in wetlands) throughout the former BP operations areas and reference locations ("prairie survey locations").

**Species Richness**

There is a wide diversity of grass and forbs that may be present in Louisiana's prairies, and species assemblages vary across the state depending on hydrologic regimes and soil types. Generally, Cajun Prairies in Louisiana host a mix of wetland grasses and forbs (wildflowers), including sedge (*Carex sp.*), lovegrass (*Eragrostis sp.*), flatsedge (*Cyperus sp.*), and goldenrod (*Solidago sp.*), as per the LDWF NHP (LDWF, 2009).

The eco field team observed a total of 27 plant species in the former BP operations areas prairie survey locations during the 20-ft ecological surveys, including wetland grasses and forbs representative of Cajun Prairie natural communities in Louisiana (LDWF, 2009). Inset Table 5-1 lists the representative plant species observed in the prairie survey locations and their dominance based on percent coverage data collected during the 20-ft ecological surveys. The presence and dominance of representative Cajun Prairie grasses and forbs is evidence that the prairies in the former BP operations and reference locations are supporting vegetative diversity that is expected of this type of natural community in Louisiana (Inset Table 5-1). The eco field team's observation of healthy wetland grasses and forbs species indicates that the Cajun Prairie natural communities in the former BP operations areas have not been altered by E&P activities.

TABLE 5-1 REPRESENTATIVE CAJUN PRAIRIE SPECIES OBSERVED IN THE PRAIRIE SURVEY LOCATIONS

| Common name | Scientific name | Growth | Community association in the prairie survey locations |
|---|---|---|---|
| Sedge | *Carex sp.* | Grass | Dominant |
| Primrose-willow | *Ludwigia sp.* | Forb | Dominant |
| Bluestem | *Andropogon sp.* | Grass | Associate |
| Flatsedge | *Cyperus sp.* | Grass | Associate |
| Lovegrass | *Eragrostis sp.* | Grass | Associate |
| Dogfennel | *Eupatorium sp.* | Forb | Associate |
| Bluestem | *Schizachyrium sp.* | Grass | Associate |
| Goldenrod | *Solidago sp.* | Forb | Associate |

Notes:

Species with a "Dominant" community association are those that meet the 50/20 Rule dominance test threshold for dominance in at least one prairie survey location (USACE, 2010).

In addition to the representative grasses and forbs species observed in the former BP operations areas prairie survey locations, the eco field team documented an additional 15 wildflower species, including annual yellow sweetclover (*Melilotus indicus*), buttercup (*Ranunculus* sp.), Louisiana vetch (*Vicia ludoviciana*), and an additional 8 grasses, such as annual rabbitsfoot grass (*Polypogon monspeliensis*), little quakinggrass (*Briza minor*), and windmill grass (*Chloris* sp.), among others. The excellent diversity of herbaceous vegetation (27 different grasses and forbs) is an important line of evidence that the former BP operations areas are supporting the vegetation expected in the region in Cajun Prairie natural communities and emergent wetland prairies more generally.

The species richness of the Cajun Prairie was similar between the former BP operations areas and the reference locations. The prairie reference locations also support a mix of representative grasses and forbs, including love grasses (*Eragrostis* sp.) and goldenrod (*Solidago* sp.), among others. The similarity in the presence and abundance of representative species, and in the overall diversity of herbaceous species (27 species of grasses and forbs in both the former BP operations areas and reference locations), is a line of evidence that the Cajun Prairie natural communities have not been altered by E&P activities (Image 5-1).

IMAGE 5-1 CAJUN PRAIRIE NATURAL COMMUNITIES IN THE FORMER BP OPERATIONS AREA (LEFT) AND REFERENCE (RIGHT)

Pictured is Cajun Prairie at ecological survey location E-S20-2 (HA-2) in the former BP operations areas (left) and reference location E-S20-9 (right). Photos taken by K. Cejas on April 15, 2025. Both locations support functioning Cajun Prairie natural communities, with representative species such as sedge (*Carex* sp.), bushy bluestem (*Andropogon glomeratus*), and creeping primrose-willow (*Ludwigia repens*), as per ERM 20-ft ecological survey data collected April 15, 2025. The Cajun Prairie at ecological survey location E-S20-2 (HA-2) would be destroyed during the vegetation clearing and soil excavation proposed in the Plaintiff's soil remediation plan, which would do more ecological harm than good.

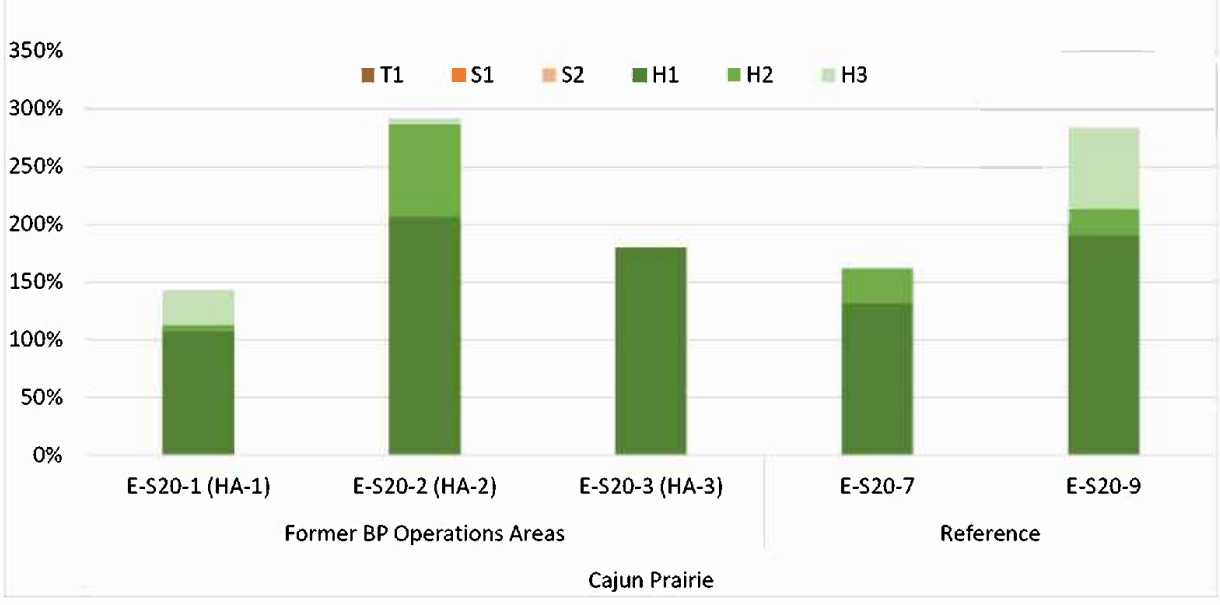
In addition to the overall similarity in species richness, ERM also observed similarities in species composition, or the average percent coverage of plant species in the prairie survey locations. The prairie survey locations in the former BP operations areas had an average total percent coverage

of 205% (143 – 292%), and the reference prairie survey locations had an average total percent coverage of 223% (162 – 284%). The similar coverage of prairie grasses and forbs in both the former BP operations areas and reference locations indicates the Property is providing a safe and healthy environment for natural communities in the region to thrive and has not been impacted by E&P activities.

**Vegetation Structure**

Vegetation structure refers to the vertical arrangement of canopy layers in an ecosystem or survey area. During the 20-ft ecological surveys, percent cover by species was recorded across six canopy layers: T1 (>5 m), S1 (2-5 m), S2 (30 cm-2m), H1 (>30cm), H2 (10-30 cm), and H3 (<30 cm). The prairies in the former BP operations areas and reference locations were similar in vegetative structure, per 20-ft ecological data by strata (Inset Figure 5-1). Grasses and forbs (H1-H3) are dense and abundant in the prairie survey locations, which is as expected for Cajun Prairie natural communities. Herbaceous species greater than 30 cm tall (H1) were abundant in all (100%) prairie survey locations, indicating that the vegetation is thriving in both the former BP operations areas and reference prairie survey locations. The similar vegetation structure (i.e., distribution of percent coverage across strata) between the former BP operations areas and reference prairie survey locations is a line of evidence that E&P operations have not adversely affected the Cajun Prairie in the former BP operations areas at the Property. The vegetation documented in the herbaceous layers of the prairie survey locations appeared dense and healthy with no signs of impact from salt or other constituents of concern.

FIGURE 5-1 VEGETATION STRUCTURE IN PRAIRIE SURVEY LOCATIONS



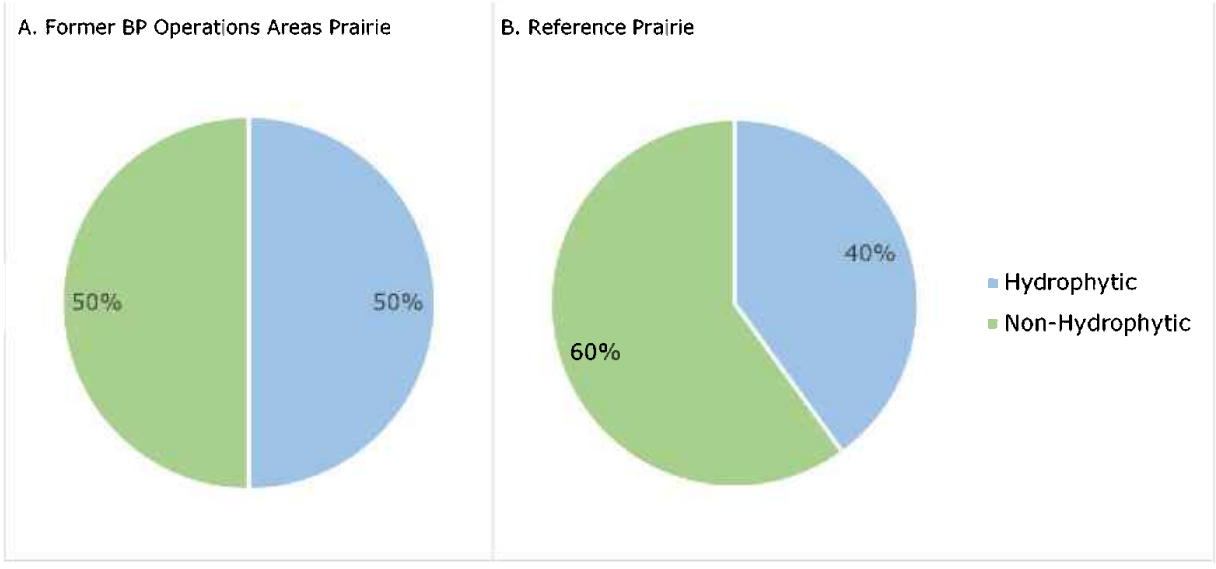

The vegetation structure in the former BP operations areas prairie survey locations (E-S20-1 (HA-1), E-S20-2 (HA-2), and E-S20-3 (HA-3)) and the prairie reference locations (E-S20-7 and E-S20-9) include a similar mix of herbaceous species typical for Cajun Prairie, and are therefore providing similar ecosystem services to people and wildlife.

### Wetland Classification

Cajun Prairie natural communities are emergent wetlands which may contain a mix of hydrophytic and non-hydrophytic species (LDWF, 2009). Hydrophytic species grow partly or totally submerged in water or in waterlogged soil (wetlands), and non-hydrophytic species prefer dry conditions (uplands). The eco field team observed a mix of both hydrophytic and non-hydrophytic plant species in the prairie survey locations, as is typical of Cajun Prairie natural communities in the region.

The eco team observed a similar distribution of hydrophytic and non-hydrophytic plant species in the prairie survey locations. The proportion of plant species primarily dedicated to wetlands (hydrophytic) in the former BP operations areas (50%) and reference (60%) prairies is similar, demonstrating that the vegetative habitat is as expected for Cajun Prairie natural communities (Inset Figure 5-2). The balance of hydrophytic and non-hydrophytic plant species observed in the prairie survey locations demonstrates that former E&P operations have not changed the expected plant community structure in prairies on the Property (Figure 12).

FIGURE 5-2 PROPORTION OF HYDROPHYTIC AND NON-HYDROPHYTIC PLANT SPECIES IN THE FORMER BP OPERATIONS AREAS (A) AND REFERENCE (B) PRAIRIE SURVEY LOCATIONS




The percentages shown represent the proportion of species assigned to hydrophytic and non-hydrophytic wetland classes in the former BP operations areas (A) and reference (B) prairies. Hydrophytic wetland species (Obligate - OBL, Facultative Wetland - FACW, and Facultative - FAC) are shown in blue, and non-hydrophytic upland species (Facultative Upland - FACU, Upland - UPL) are shown in green (USDA, 2020). Taxa identified to the genus level that could not be assigned a wetland classification, and species that do not have an assigned wetland classification from the USDA (2020) are not shown here or included in the proportion calculations.

The presence of representative Cajun Prairie plant species, abundance of healthy herbaceous vegetation, and expected proportion of wetland and upland species observed in the former BP operations areas prairie survey locations, as compared to reference prairie locations, demonstrates that the ecosystem function of the prairies in the former BP operations areas has not been adversely affected by former E&P activities.

**Ecosystem Function**

Cajun Prairies in Louisiana can include a diverse assemblage of grasses and forbs (wildflowers) which provide valuable habitat for pollinators such as native bees, butterflies, and other insects (LDWF, 2016). Examples of wildflowers observed in the former BP operations areas prairie survey locations include burclover (*Medicago polymorpha*), buttercup (*Ranunculus sp.*), and thistle (*Cirsium sp.*), among others. Native pollinators such as bees were observed pollinating wildflowers, such as Persian clover (*Trifolium resupinatum*), in the prairie survey locations, as pictured below in survey location E-S20-1 (HA-1) (Image 5-2). The presence of pollinating insects and nectar-producing wildflowers in the former BP operations areas prairie survey locations indicates that those areas are providing valuable habitat and have not been impacted by E&P activities.

In addition to providing important pollination ecosystem services, bees and other insects also serve as food resources for insectivorous birds. Swamp Sparrow (*Melospiza georgiana*), for example, has fidelity to emergent wetlands environments, is known to consume bees (Cornell Lab of Ornithology, 2025a), and was observed in former BP operations areas prairie survey location E-S20-3 (HA-3). Seven (7) unique terrestrial insects and 8 species of insectivorous birds, including Carolina Wren (*Thryothorus ludovicianus*), Barn Swallow (*Hirundo rustica*), and White-eyed Vireo (Vireo griseus), were observed in the prairie survey locations during the April 2025 field visits. The presence of pollinating insects along with insectivorous birds is a line of evidence that the Cajun Prairie vegetation in the prairie survey locations is sustaining a food web that has not been impacted by E&P activities. A comparative analysis of bird communities in the former BP operations areas and reference locations is provided in Section 5.1.2.

The diversity of plants and wildlife observed in the prairie survey locations is an indication that the former BP operations areas are supporting a healthy and productive Cajun Prairie natural community. The vegetation removal and soil excavation and fill proposed by the Plaintiff would not only remove an important remnant natural community but would also degrade a fully-functioning food web without an ERA, analysis of any habitat benefits, or consideration of environmental harm that would result from implementation.

IMAGE 5-2 WILDFLOWERS IN FORMER BP OPERATIONS AREAS CAJUN PRAIRIE SURVEY LOCATION E-S20-1 (HA-1) PROVIDING NECTAR RESOURCES FOR POLLINATORS

Pictured is a bee (Family Apidae) pollinating a Persian clover (*T. resupinatum*) wildflower, photographed at prairie survey location E-S20-1 (HA-1), in the former BP operations areas. Photo taken by K. Cejas on April 15, 2025.

#### 5.1.1.2 SWEETGUM-WATER OAK BOTTOMLAND FOREST

Sweetgum-Water Oak Bottomland Forest is a type of bottomland hardwood forest. All bottomland hardwood forest ecosystems in Louisiana have a hydrologic regime of alternating wet and dry periods due to naturally fluctuating water levels (LDWF, 2009). These natural forest communities are important for the maintenance of water quality, providing productive habitat for diverse assemblages of wildlife, and for the regulation of flooding and stream recharge (LDWF, 2009). The bottomland hardwood forests in the former BP operations areas are best characterized as Sweetgum-Water Oak Bottomland Forest based on the vegetation data collected during the 20-ft ecological surveys at locations E-S20-4 (HA-10), E-S20-5 (CD-18), and E-S20-6 (CD-6) ("former BP operations areas forest survey locations").

This section discusses species richness, representative Sweetgum-Water Oak Bottomland Forest plant species, forest community structure, and hydrophytic and non-hydrophytic vegetation, throughout the former BP operations areas and reference locations ("forest survey locations").

**Species Richness**

Sweetgum-Water Oak Bottomland Hardwood forests in Louisiana host a mix of wetland tree species, including sweetgum (*L. styraciflua*), water oak (*Q. nigra*), and American elm (*U. americana*), wetland shrubs, like dwarf palmetto (Sabal minor), and flowering vines, such as trumpet creeper (*Campsis radicans*) and eastern poison ivy (*Toxicodendron radicans*), as per the LDWF NHP (LDWF, 2009). The presence and abundance of these representative species can be used to determine the type of bottomland hardwood forest present in the ecological survey locations.

The eco field team observed a total of 42 plant species in the forested former BP operations areas during the 20-ft ecological surveys, including wetland trees, wetland shrubs, and vines that are

representative of Sweetgum-Water Oak Bottomland Forest natural communities in Louisiana (LDWF, 2009). Inset Table 5-2 lists the representative plant species observed in the forest survey locations and their dominance based on percent coverage data collected during the 20-ft ecological surveys. The presence and dominance of representative Sweetgum-Water Oak Bottomland Forest trees, shrubs, and vines is evidence that the forests in the former BP operations areas and reference locations are supporting vegetative diversity that is expected of this type of natural community in Louisiana (Inset Table 5-2). The eco field team's observation of healthy wetland tree species and diverse mid- and under-story vegetative communities comprising juvenile trees and native wetland shrubs indicates that the Sweetgum-Water Oak Bottomland Forest natural communities in the former BP operations areas have not been altered by E&P activities.

TABLE 5-2 REPRESENTATIVE SWEETGUM-WATER OAK BOTTOMLAND FOREST SPECIES OBSERVED IN THE FOREST SURVEY LOCATIONS

| Common name | Scientific name | Growth | Community association in the forest survey locations |
|---|---|---|---|
| Sweetgum | *Liquidambar styraciflua* | Tree | Dominant |
| Water oak | *Quercus nigra* | Tree | Dominant |
| American elm | *Ulmus americana* | Tree | Dominant |
| Trumpet creeper | *Campsis radicans* | Vine | Dominant |
| Sugarberry | *Celtis laevigata* | Tree | Associate |
| Possumhaw | *Ilex decidua* | Tree | Associate |
| Dwarf palmetto | *Sabal minor* | Shrub | Associate |
| Eastern poison ivy | *Toxicodendron radicans* | Vine | Associate |
| Greenbriar | *Smilax sp.* | Vine | Associate |

Notes:
Species with a "Dominant" community association are those that meet the 50/20 Rule dominance test threshold for dominance in at least one forest survey location (USACE, 2010).

In addition to the 5 representative tree species observed in the former BP operations areas forest survey locations (Inset Table 5-2), the eco field team documented an additional 9 tree species that are native to the region, such as yaupon (*Ilex vomitoria*), loblolly pine (*Pinus taeda*), winged elm (*Ulmus alata*), and live oak (*Quercus virginiana*), among others. The excellent tree species diversity (14 different species) is an important line of evidence that the former BP operations areas are supporting the trees expected in the region in Sweetgum-Water Oak Bottomland Forest natural communities and bottomland hardwood forests more generally.

The vegetative composition of the Sweetgum-Water Oak Bottomland Forests was similar between the former BP operations areas and the reference locations. The forest reference locations also support a mix of representative trees, shrubs, and vines, including water oak (*Q. nigra*),

sweetgum (*L. styraciflua*), American elm (*U. americana*), cherrybark oak (*Quercus pagoda*), sugarberry (*Celtis laevigata*), and eastern poison ivy (*T. radicans*), among others. The similarity in the presence and abundance of representative species, and in the overall diversity of tree species (14 tree species in the former BP operations areas and 14 tree species in the reference locations), is a line of evidence that the Sweetgum-Water Oak Bottomland Forest natural communities have not been altered by E&P activities (Image 5-3).

IMAGE 5-3 SWEETGUM-WATER OAK BOTTOMLAND FOREST NATURAL COMMUNITIES IN THE FORMER BP OPERATIONS AREAS (LEFT) AND REFERENCE (RIGHT)

Pictured is Sweetgum-Water Oak Bottomland Forest at ecological survey location E-S20-4 (HA-10) in the former BP operations areas (left) and reference location E-S20-11 (right). Photos taken by K. Cejas on April 15, 2025. Both locations support functioning Sweetgum-Water Oak Bottomland Forest natural communities, with representative species such as American elm (*U. americana*), trumpet creeper (*C. radicans*), and eastern poison ivy (*T. radicans*), as per ERM 20-ft ecological survey data collected April 15, 2025. The Sweetgum-Water Oak Bottomland Forest at ecological survey location E-S20-4 (HA-10) would be destroyed during the vegetation clearing and soil excavation proposed in the Plaintiff's soil remediation plan.

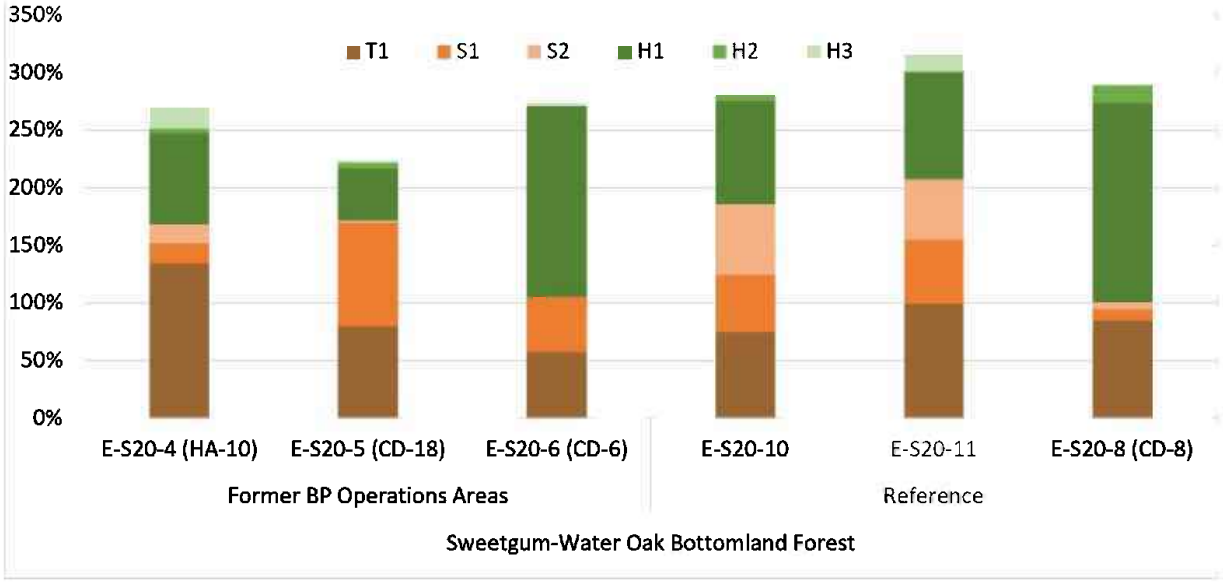
In addition to the overall similarity between the vegetative communities, ERM also observed similarities in the coverage of Sweetgum-Water Oak Bottomland Forest trees present in the former BP operations areas as compared to reference forests. Representative Sweetgum-Water Oak Bottomland Forest trees make up 158% of total coverage across all forest survey locations in the former BP operations areas, and 170% in the forest reference locations. The similar coverage of Sweetgum-Water Oak Bottomland Forest trees in both the former BP operations areas and reference locations indicates the Property is providing a safe and healthy environment for natural communities in the region and has not been impacted by E&P activities.

**Vegetation Structure**

The forests in the former BP operations areas and reference locations were similar in vegetative structure, per 20-ft ecological data by strata (Inset Figure 5-3). Trees and shrubs (T1-S2) are abundant in the forest communities observed in the former BP operations areas and the reference locations, which is as expected for Sweetgum-Water Oak Bottomland Forests. Species in the top-story tree canopy layer (T1), mid-story shrub canopy layers (S1 and S2), and understory

herbaceous canopy layers (H1-H3) were observed in all (100%) forest survey locations. The abundance and density of woody vegetation (forest) and the similarity of canopy layers as compared to the reference forest locations, is a line of evidence that E&P operations have not adversely affected the Sweetgum-Water Oak Bottomland Forests in the former BP operations areas at the Property. The vegetation documented across all strata of the forest survey locations appeared dense and healthy with no signs of salt impact.

FIGURE 5-3 VEGETATION STRUCTURE IN FOREST SURVEY LOCATIONS



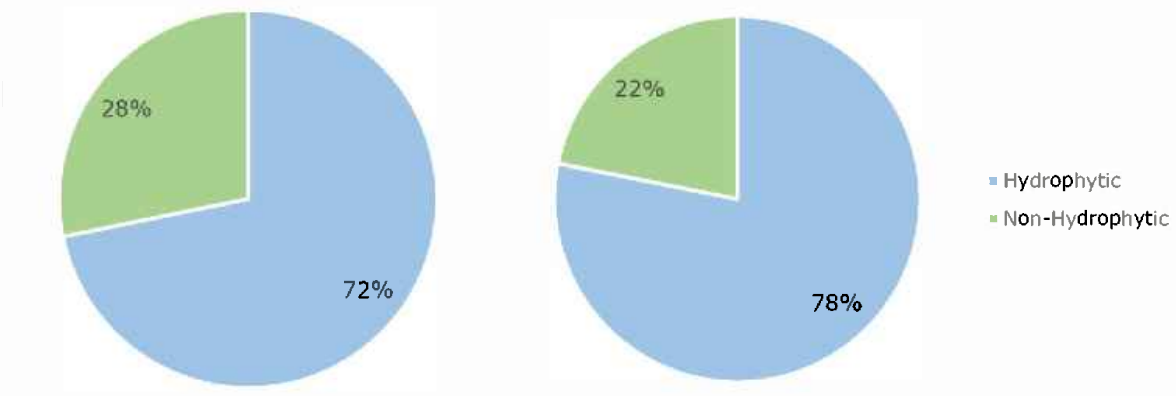

The vegetation structure in the former BP operations areas forest survey locations (E-S20-4 (HA-10), E-S20-5 (CD-18), and E-S20-6 (CD-6)) and the forest reference locations (E-S20-10, E-S20-11, and E-S20-8 (CD-8)) include a similar mix of woody and herbaceous species typical for Sweetgum-Water Oak Bottomland Forest, and are therefore providing similar ecosystem services to people and wildlife.

**Wetland Classification**

Sweetgum-Water Oak Bottomland Forest natural communities are wetland forests. As expected, the majority of plant species in the forest survey locations on the Property are hydrophytic species, which grow partly or totally submerged in water or in waterlogged soil. The abundance of hydrophytic plant species in the forest survey locations is therefore typical of Sweetgum-Water Oak Bottomland Forest natural communities in the region.

The proportion of plant species primarily dedicated to wetlands (hydrophytic) in the former BP operations areas (72%) and reference (78%) forests is similar, demonstrating that the vegetative habitat is as expected for Sweetgum-Water Oak Bottomland Forest natural communities (Inset Figure 5-4). The abundance of plants dedicated to wetlands demonstrates that former E&P operations have not changed the expected dominant wetland plant community structure in forested portions of the former BP operations areas from primarily a wetland habitat to any other type of setting (Figure 12).

## FIGURE 5-4 PROPORTION OF HYDROPHYTIC AND NON-HYDROPHYTIC PLANT SPECIES IN THE FORMER BP OPERATIONS AREAS (A) AND REFERENCE (B) FOREST SURVEY LOCATIONS




The percentages shown represent the proportion of species assigned to hydrophytic and non-hydrophytic wetland classes in the former BP operations areas (A) and reference (B) forests. Hydrophytic wetland species (Obligate - OBL, Facultative Wetland - FACW, and Facultative - FAC) are shown in blue, and non-hydrophytic upland species (Facultative Upland - FACU, Upland - UPL) are shown in green (USDA, 2020). Taxa identified to the genus level that could not be assigned a wetland classification, and species that do not have an assigned wetland classification from the USDA (2020) are not shown here or included in the proportion calculations.

The presence of representative Sweetgum-Water Oak Bottomland Forest plant species, abundance of healthy upper canopy, midstory, and understory vegetation, and expected proportion of wetland species observed in the former BP operations areas forest survey locations, as compared to reference forest locations, demonstrates that the ecosystem function of the forests in the former BP operations areas has not been adversely affected by former E&P activities.

**Ecosystem Function**

Sweetgum-Water Oak Bottomland Forests in Louisiana host a variety of fruiting trees and plants, such as those in the blackberry family (*Rubus sp.*), which provide valuable food resources to a variety of insects and birds (LDWF, 2009). Southern dewberry (*Rubus trivialis*) and sawtooth blackberry (*Rubus argutus*) are two Rubus species found in the forest survey locations. Fruiting Rubus species in the former BP operations areas provide food resources for insects, such as Eastern buckmoth (*Hemileuca maia*), as pictured below in forest survey location E-S20-6 (CD-6) (Image 5-4). The Eastern buckmoth is a native moth species that prefers oak trees (*Quercus sp.*) including live oak (*Q. virginiana*) which was observed in the former BP operations areas, as hosts for feeding, and while unlisted in Louisiana, is a species with a conservation status of critically imperiled in several other states (Foil et al. 1991). The presence of the Eastern buckmoth is

evidence that the Sweetgum-Water Oak Bottomland Forest habitat is providing functioning habitat for important species with fidelity to oak forests.

A total of 23 species of birds were observed in the forest survey locations during the April 2025 field visits, including all levels of the avian trophic food chain. Bird species that consume fruit produced by *Rubus sp.* include the Blue Jay (*Cyanocitta cristata*), Gray Catbird (*Dumetella carolinensis*), White-eyed Vireo (*V. griseus*), and Brown Thrasher (*Toxostoma rufum*), all of which were observed in the former BP operations areas forest survey locations. Birds observed in the former BP operations areas forest survey locations, included herbivores like Northern Cardinals (*Cardinalis cardinalis*) and Brown-headed Cowbirds (*Molothrus ater*), secondary consumers such as woodpeckers (Picidae family), and tertiary consumers such as herons and egrets (Ardeidae family). The functioning avian food chain is evidence of a healthy Sweetgum-Water Oak Bottomland Forest natural community that is providing the expected services of habitat and diet for birds that are important to recreation activities in the area. A comparative analysis of bird communities in the former BP operations areas and reference locations is provided in Section 5.1.2.

Additionally, the stems and foliage of Rubus sp. are consumed by white-tailed deer (*O. virginianus*) (USGS 2025), which were also observed in the former BP operations areas forest (E-S20-4 (HA-10) and E-S20-6 (CD-6)) and reference forest (E-S20-11). The observation of fruiting vines with insects, birds, and mammals that consume the foliage and fruit observed in the forest survey locations is evidence of a functioning forest food web that has not been impacted by E&P activities.

The diversity of plants and wildlife observed in the forest survey is an indication that the Sweetgum-Water Oak Bottomland Forests in the former BP operations areas are supporting a healthy and productive forested wetland habitat. The tree clearing and soil excavation and fill proposed by the Plaintiff would not only remove mature, native trees, but would also degrade a functioning food web.

IMAGE 5-4 CATERPILLAR ON A FRUITING VINE IN FORMER BP OPERATIONS AREAS FOREST SURVEY LOCATION E-S20-6 (CD-6)

Pictured is an Eastern buckmoth (*H. maia*) caterpillar on a fruiting sawtooth blackberry (*R. argutus*) photographed at forest survey location E-S20-6 (CD-6), in the former BP operations areas. Photo taken by K. Cejas on April 15, 2025.

### 5.1.2 BIRD COMMUNITY CHARARACTERIZATION AND ASSESSMENT IN THE FORMER BP OPERATIONS AREAS

Bird data collected during 20-ft ecological surveys were used to characterize and assess the bird communities in the former BP operations areas and reference locations. ERM observed 30 different bird species, including 1 Species of Greatest Conservation Need (SGCN) throughout the former BP operations areas, which represents good species diversity. The complete list of birds observed within the former BP operations areas is shown in Table 4B.

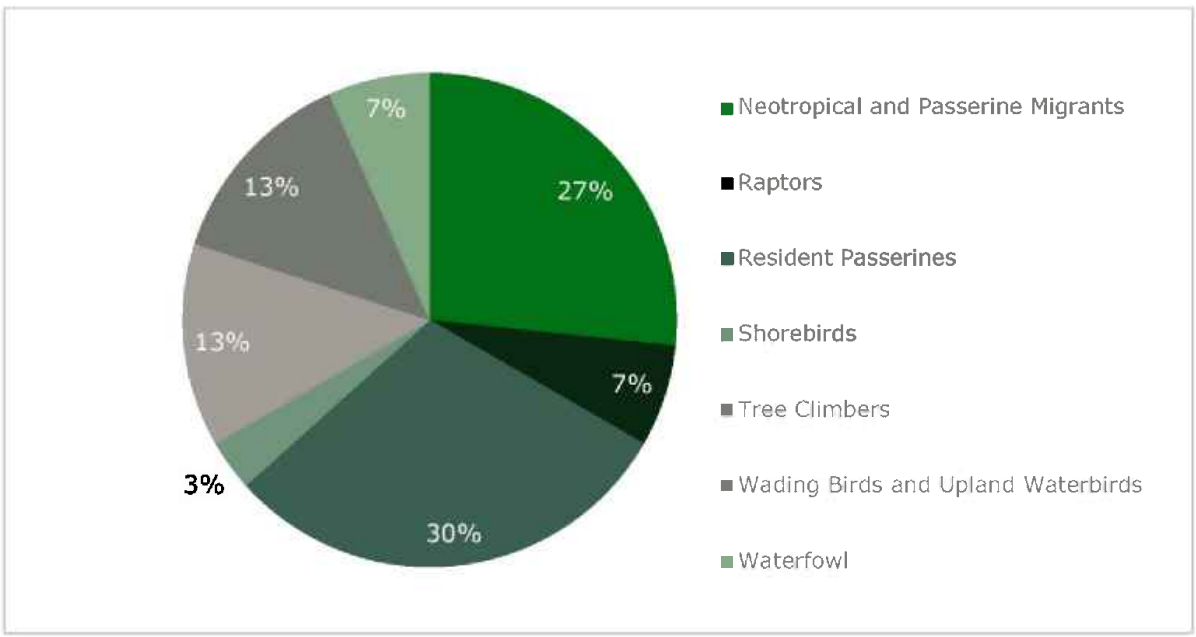
#### 5.1.2.1 CHARACTERIZATION OF THE BIRD COMMUNITY IN THE FORMER BP OPERATIONS AREAS

The former BP operations areas contain Cajun Prairie habitat, a once common habitat that has now dwindled to only exist in small, remnant parcels (LDWF, 2009). This habitat is important for supporting avian diversity within Louisiana as it provides essential breeding and foraging habitat for grassland-dependent bird species and species that prefer open areas such as the Red-tailed

Hawk (*B. jamaicensis*) and Turkey Vulture (*C. aura*), both of which were observed within the Cajun Prairie habitats of the former BP operations areas. Grassland bird species are among the fastest declining bird species and preserving prairie habitats is important to maintaining biodiversity. Seventeen (17) species of birds were observed within the Cajun Prairie habitats of the former BP operations areas. This is evidence that these areas have not been impacted by E&P activities.

The bottomland hardwood forests along the Gulf coast serve as critical habitats for resident passerine birds (or, perching birds that do not migrate) as well as important stopover habitat (i.e., habitat used during migration for resting and feeding) for those species that migrate across the Gulf. Resident passerines utilize Louisiana bottomland hardwood forests, including Sweetgum-Water Oak Bottomland Forest natural communities, year-round for foraging, nesting, and overwintering. Of the 23 species observed in the former BP operations area forests, 8 (35%) are resident passerine species and 6 (26%) are neotropical and passerine migrant species. These numbers indicate that the former BP operations areas provide year-round habitat for the local population of resident passerine birds as well as important stopover habitat for migrants (Figure 5-5, Image 5-5). The use of the former BP operations areas as habitats for both resident and migratory birds is evidence that these areas have not been impacted by E&P activities.

FIGURE 5-5 BIRD SPECIES OBSERVED IN THE FORMER BP OPERATIONS AREAS BY GUILD




Data reflects the percentage of unique species in each guild observed in the former BP operations areas during ERM 20-ft ecological surveys. Neotropical and passerine migrants include songbird species that migrate south during the non-breeding season (August through March). The complete list of species observed in the former BP operations areas is provided in Table 4B.

## IMAGE 5-5 MIGRANT PASSERINE SPECIES OBSERVED WITHIN AND NEAR THE FORMER BP OPERATIONS AREAS

Pictured is a migrant Orchard Oriole (*Icterus spurius)* photographed near E-S20-3 (HA-3) (right). Photo taken by C. Matherne on April 16, 2025.

The functioning Cajun Prairie and Sweetgum-Water Oak Bottomland Forest natural communities in the former BP operations areas support diverse avian communities with all trophic levels (the species' position in the food chain) represented (LDWF, 2009). The tropic level of each bird is defined by its diet, and in the former BP operations areas, all levels of the avian trophic food chain were observed.

Primary Consumers. Avian primary consumers include those species that eat plants and plant material, such as nuts, seeds, and nectar. Birds that consume seeds provide the service of seed dispersal, which is important (in the way that bees and pollinators are) for maintaining plant species biodiversity in the region (van Leeuwen et al., 2012; Kleyheeg et al., 2016; Kleyheeg et al., 2017). Seven species of primary consumer birds were observed within the former BP operations areas, including Brown-headed Cowbird (*M. ater*) and Northern Cardinal (*C. cardinalis*). Northern Cardinals (*C. cardinalis*) are known to ingest fruits from blackberries (*Rubus* sp.) and palmetto (*Sabal* sp.), and the seeds of various sedges (*Carex* sp.), vervain (*Verbena* sp.), bristle grass (*Setaria* sp.), and ragweed (*Ambrosia* sp.), all of which were observed in the former BP operations areas (Cornell Lab of Ornithology, 2021). Brown-headed Cowbirds (*M. ater*), which were also observed in the former BP operations areas, are also known to also ingest seeds of various sedges (*Carex* sp.), bristle grass (*Setaria* sp.), and ragweed (*Ambrosia* sp.), and are therefore contributing to seed dispersal (Cornell Lab of Ornithology, 2020a; Williams, 1981). Twenty-three percent (23%) of the observed bird species within the former BP operations areas are primary consumers, which is the expected percentage for bird populations in bottomland hardwood forests, per experience in Louisiana and by comparison to reference populations of birds. The presence of primary consumers demonstrates that the natural communities present in

the former BP operations areas are providing healthy habitat that is supporting the diet of avian primary consumers. This is a line of evidence that vegetation (the diet of primary consumers) found in the former BP operations areas has not been negatively affected by former E&P operations.

Secondary Consumers. Avian secondary consumers primarily consume insects and aquatic invertebrates. A total of 18 secondary consumer bird species were observed within the former BP operations areas. Secondary consumers make up 60% of the bird trophic structure within the former BP operations areas, which is the expected percentage for these consumers in Louisiana wetlands. Secondary consumers typically make up the largest portion of the avian food chain, and this is true within the former BP operations areas, demonstrating that the former BP operations areas' food chain is structured as expected. Examples of secondary consumers observed within the former BP operations areas include Yellow-billed Cuckoo (*Coccyzus americanus*), Brown Thrasher (*T. rufum*), Swamp Sparrow (*M. georgiana*), White-faced Ibis (*Plegadis chihi*) and White-eyed Vireo (*V. griseus*). Additionally, many species of insects were observed in the former BP operations areas (see Section 5.1.3), further demonstrating ample resources to support a diverse community of secondary consumers (Image 5-6).

IMAGE 5-6 EXAMPLE OF INTACT AVIAN FOOD CHAIN IN THE FORMER BP OPERATIONS AREAS

Pictured are forest tent caterpillars (*Malacosoma disstria*) observed at E-S20-5 (CD-18) (left). Hairy caterpillars such as forest tent caterpillars are a known prey-item of the Yellow-billed Cuckoo (*C. americanus*) (right) demonstrating a functioning food chain in the former BP operations areas (Cornell Lab of Ornithology, 2020b). The Yellow-billed Cuckoo was photographed at E-Inc-D2. Yellow-billed Cuckoos were also observed at E-S20-5 (CD-18) and E-S20-6 (CD-6). Both photos taken by C. Matherne on April 15 and 16, 2025.

Chimney Swift (*Chaetura pelagica*), which is listed as a Species of Greatest Conservation Need (SGCN) by the LDWF, is another example of a secondary consumer bird species observed in the former BP operations areas (LDWF, 2022). SGCN are selected based on global and state rarity ranks, threats to the population, extent of historical range, percent of habitat remaining, and amount of data available (Holcomb et al., 2015). The presence of SGCN is a line of evidence that the former BP operations areas are supporting state designated species of importance and contributing to local and regional biodiversity.

Tertiary Consumers and Apex Predators. Avian tertiary consumers and apex predators, or top predators, occupy the highest trophic level of the food chain and have primarily carnivorous diets of carrion (animal carcasses), mammals, fish, or other birds. Apex predators also have no natural predators themselves. Three tertiary consumer bird species and two apex predator bird species were observed within the former BP operations areas, which demonstrates that the former BP operations areas provide quality hunting ground for predators (sufficient insects, mammals, and other prey).

Avian tertiary consumers observed in the former BP operations areas include Great Egret (*Ardea alba*), Great Blue Heron (*Ardea Herodias*), and Snowy Egret (*Egretta thula*). The avian apex predators observed in the former BP operations areas include Red-tailed Hawk (*Buteo jamaicensis*), a bird of prey, and Turkey Vulture (*Cathartes aura*), a scavenger (see Image 5-7).

Seventeen percent (17%) of the bird species observed within the former BP operations areas were top predators. This percentage of predatory birds is the amount typically expected in Louisiana forested wetlands, per prior studies in the region. The presence of predatory birds is a line of evidence that the invertebrate and mammal diet available throughout the former BP operations areas supports the hunting needs of birds with high calorie diets at the top levels of the avian food chain. The thriving predatory bird population is evidence that the bird community in the former BP operations areas has not been impacted by former E&P operations.

## IMAGE 5-7 AVIAN TROPHIC LEVELS OBSERVED WITHIN AND IN THE VICINITY OF THE FORMER BP OPERATIONS AREAS

Pictured are a Snowy Egret (*E. thula*) (left), which is a tertiary consumer observed at E-S20-6 (CD-6) and an Indigo Bunting (*Passerina cyanea)* (right), a secondary consumer photographed near E-S20-3 (HA-3). Photos taken by C. Matherne on April 15, 2025 (left) and J. Shugart on April 16, 2025 (right).

The former BP operations areas support a balanced avian food chain, with 23% herbivores, 60% secondary consumers, and 17% top predators (Inset Figure 5-6). The large percentage of predators indicates a healthy population of prey for predatory birds. The former BP operations areas is providing habitat for 9 resident species, 8 migratory passerine species, and 1 SGCN, demonstrating that the former BP operations areas in their current condition are both providing habitat for birds of ecological importance to Louisiana, as well as providing important stop-over habitat for species as they migrate through the state. These findings are evidence that the prairie and bottomland hardwood forest ecosystems within the former BP operations areas provide needed conservation and habitat for a functioning avian community that does not have evidence of impact from former E&P operations.

### Value for Birdwatching

The diverse community of birds in the former BP operations areas (30 species) are recreationally important for the local birdwatching community. Birdwatching communities record observations in eBird, a global, online database and citizen science platform that allows birdwatchers to record, share, and access bird observations, contributing to global research and conservation by investigating bird populations and distributions. There are 5 eBird hotspots within 10 miles of the Property. These hotspots have recorded more than 131 species in total across these locations and a total of 261 lists (i.e., the number of birdwatching outings), which indicates that the Property and surrounding area are being utilized by a diverse community of bird species as well as providing recreational opportunities for the local community.

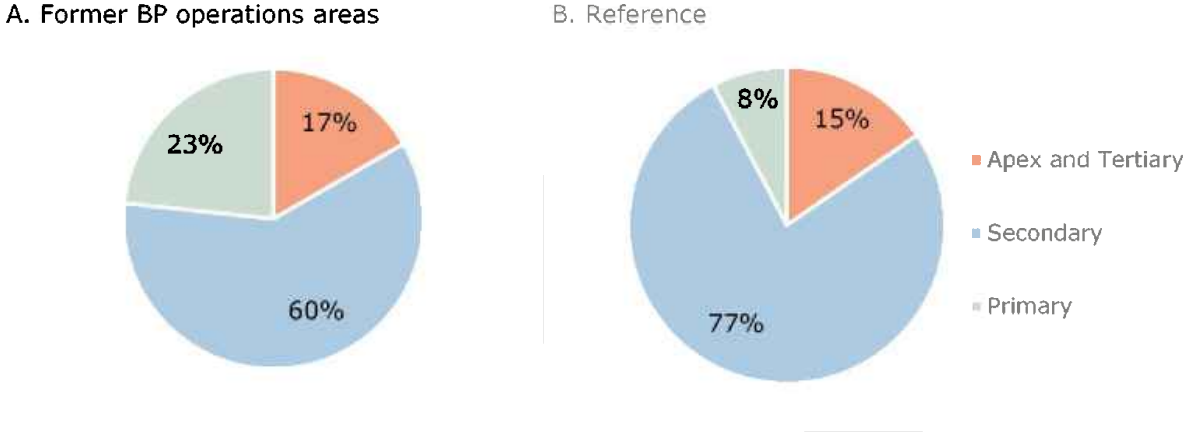
There is no evidence that the Plaintiff's proposed remediation plan will benefit the already fully-functioning bird population and all levels of the avian trophic food chain present in the former BP operations areas. Furthermore, the Plaintiff's proposed soil remediation plan disturbs existing bird habitats by reducing the amount of bottomland hardwood forest habitat and reducing vegetation used for resting, feeding, and breeding. The Plaintiff's proposed remediation plan would have negative impacts to the bird communities within the former BP operations areas and do more ecological harm than good.

#### 5.1.2.2 COMPARATIVE ASSESSMENT OF BIRD COMMUNITIES IN THE FORMER BP OPERATIONS AREAS AND REFERENCE LOCATIONS

The prairie and bottomland hardwood forest locations in the former BP operations areas and reference provide similar bird habitat (LDWF, 2022). During reference location investigations on April 15, 2025, the eco field team observed 13 total bird species (Table 4B). Ten (10) of the 13 species (77%) observed in reference were also observed in the former BP operations areas, indicating a high level of similarity in the bird communities observed (Table 4B). Of the 13 species observed in the reference locations, 8 are year-round resident passerine and 2 are Neotropic and passerine migrant species that perform long-distance migrations across the Gulf, demonstrating that, similar to the former BP operations areas, the reference locations are providing important habitat for resident and migrating bird species.

The trophic structure of the avian population at the former BP operations areas is similar to the trophic structure at the reference locations (Inset Figure 5-6). The primary consumer observed in the reference, Northern Cardinal (*C. cardinalis*), was also observed in the former BP operations areas. The percentage of primary consumers, or herbivorous species, is less than the secondary and tertiary trophic levels in both the former BP operations areas and the reference area populations, which is typical of bird populations in southern Louisiana wetlands, where the percentage of herbivores is the smallest trophic feeding group (5-15%).

FIGURE 5-6 TROPHIC STRUCTURE OF BIRD SPECIES OBSERVED IN THE FORMER BP OPERATIONS AREA (A) AND IN THE REFERENCE LOCATIONS (B)



Trophic level, or a species' position in the food chain, is informed by diet (Cornell Lab of Ornithology, 2025b). "Apex" refers to top-level carnivores with no natural predators, while tertiary consumers are carnivores that feed on secondary consumers. Secondary consumers eat primary consumers, which are herbivores that feed directly on primary producers (i.e., plants).

Secondary consumers make up the largest trophic group in both the former BP operations areas and the reference (Inset Figure 5-6). In addition, seventy percent (70%) of secondary consumer bird species observed within the reference locations were also observed within the former BP operations areas. The Red-bellied Woodpecker (*Melanerpes carolinus*) (Image 5-8) is an example of a secondary consumer observed in the reference whose primary diet is insects and preferred habitat is forests, including hardwood forests near rivers and wetlands (The Cornell Lab of Ornithology, 2025c). The similar trophic proportion and diversity of secondary consumers observed in the former BP operations areas and reference is evidence that the prairie and forest survey locations are providing similar avian habitat, with no observed impacts from former E&P operations.

A similar percentage of tertiary species was observed in the former BP operations areas (17%) and reference (15%) (Inset Figure 5-6). Examples of tertiary consumers observed in both the former BP operations areas and reference include Great Egret (*A. alba*) and Great Blue Heron (*A. Herodias*). The overlap of similar species observed in the former BP operations areas and the reference is an indication that these areas are providing sufficient diet for species at the top of the trophic pyramid, demonstrating good health of the entire ecosystem.

## IMAGE 5-8 AVIAN SECONDARY CONSUMER OBSERVED WITHIN THE REFERENCE FOREST SURVEY LOCATION

Pictured is a Red-bellied Woodpecker (*M. carolinus*), a secondary consumer photographed at E-S20-10. Photo taken by C. Matherne on April 15, 2025.

In summary, the similarity between the proportion of trophic levels in the former BP operations areas and reference is a line of evidence that the prairie and forest ecosystems in the former BP operations areas are functioning as expected for the region. The majority (77%) of species observed in reference locations were also observed in the former BP operations areas, indicating a high level of similarity between the bird communities. In addition, all trophic feeding groups from primary consumers to top predators were observed in the former BP operations areas, demonstrating an intact food chain without impact from former E&P operations.

There is no evidence that the Plaintiff's proposed remediation plan will benefit the already intact and thriving bird population in the former BP operations areas. Furthermore, the Plaintiff's proposed soil remediation plan disturbs existing bird habitats by reducing the amount of prairie and forest habitat these bird species require for nesting, foraging, and migrating. The Plaintiff's proposed remediation plan in the former BP operations areas would have negative impacts on the bird communities in the former BP operations areas, which are functioning as expected per comparison to the reference locations, and would do more ecological harm than good.

### 5.1.3 ADDITIONAL WILDLIFE OBSERVED IN THE FORMER BP OPERATIONS AREAS

A total of 15 additional taxa (i.e., other wildlife and insects, excluding birds) were documented in the former BP operations areas, and 17 non-avian taxa were documented in reference locations across the 20-ft ecological surveys.

A variety of herbivorous species were observed in the Cajun Prairie natural communities in both the former BP operations areas and the reference locations, including pollinators such as bumblebees (*Bombus sp.*), butterflies, and caterpillars (Order Lepidoptera) (Image 5-9). For example, the tropical checkered skipper (*Burnsius oileus*), a butterfly species native to southeastern North America, was observed at prairie survey location E-S20-1 (HA-1) in the former BP operations areas (Image 5-9). Pollinators such as the monarch butterfly (*D. Plexippus*), pipevine swallowtail (*Battus philenor*), eastern tiger swallowtail (Papilio glaucus), bumblebee (*Bombus sp.*), and mosquito (*Anopheles sp.*) were also observed in the forest survey locations. The diversity of pollinators throughout former BP operations areas and reference locations is indicative of healthy plant populations, as their presence and abundance directly impact plant reproduction and overall ecosystem health. The observation of pollinating insects in both the former BP operations areas and reference indicates that the habitats in the former BP operations areas provide similar support for pollinating ecosystem services and have not been impacted by former E&P operations.

IMAGE 5-9 POLLINATOR INSECTS OBSERVED IN THE CAJUN PRAIRIE HABITAT IN THE FORMER BP OPERATIONS AREAS (LEFT) AND IN THE REFERENCE (RIGHT)

Pictured are a tropical checked skipper (*B. oileus*) (left) photographed at E-S20-1 (HA-1) and a bumblebee (*Bombus sp.*) (right) photographed at E-S20-9. All photos taken by J. Shugart on April 15, 2025.

Grazing mammals, such as white-tailed deer (*O. virginianus*) and rabbit (Family Leporidae), were indirectly observed (tracks and scat) in the former BP operations areas. Rodent burrows (Order Rodentia) and mammal dens were also observed in Sweetgum-Water Oak Bottomland Forest of the former BP operations areas (Image 5-10). The diversity of herbivorous species present in both former BP operations areas and reference locations is evidence that the seeds, nuts, nectar, fruits, and berries available are providing sufficient calories for a variety of primary consumers. Primary producers (plants) are the base of the food chain, and the abundance of plant-eating animals, including large mammals such as white-tailed deer (*O. virginianus*), is a line of evidence that

plants are thriving in former BP operations areas and have not been impacted by former E&P operations.

IMAGE 5-10 MAMMAL DEN OBSERVED IN THE SWEETGUM-WATER OAK BOTTOMLAND FOREST HABITATS OF THE FORMER BP OPERATIONS AREAS

Pictured is a mammal den (Class Mammalia) photographed at E-S20-5 (CD-18), photo taken by J. Shugart on April 15, 2025.

Secondary consumers observed in the prairie survey locations include terrestrial invertebrates (fire ant [*Solenopsis* sp.], dragonfly (Order Odonata), and Asian lady beetle [*Harmonia axyridis*]), reptiles, such as the pond slider (*Trachemys elegans*), and terrestrial invertebrates, such as the crawfish (Order Decapoda). Additional secondary consumers were observed in the forest survey locations, including crawfish (Order Decapoda), invertebrates (cricket [Superfamily Grylloidea], six-spotted tiger beetle [*Cicindela sexguttata*], eastern pondhawk [*Erythemis simplicicollis*]), reptiles (skink [Family Scincidae] and green anole [*Anolis carolinensis*]), and the bullfrog (Lithobates sp.) (Image 5-11). The diversity of insectivorous secondary consumers in former BP operations areas and reference locations is a line of evidence that the insect populations are sufficient to support a variety of wildlife with similar diets in both habitat types.

## IMAGE 5-11 SECONDARY CONSUMERS OBSERVED IN FOREST SURVEY AREAS

Pictured are an eastern pond hawk (*E. simplicicollis*) (left) photographed at E-S20-11, photo taken by C. Matherne on April 15, 2025, and a green anole (*A. carolinensis*) (right) photographed at E-S20-8, photo taken J. Shugart on April 15, 2025.

Evidence of crawfish (Order Decaopoda), such as crawfish towers, was observed in both the former BP operations areas and reference locations (Image 5-12). As secondary consumers, crawfish play multiple roles in the food chain by both consuming dead plant material, algae, aquatic plants, and aquatic animals, but also serving as a food source for animals higher up in the food chain, such as feral hog (*Sus scrofa*) and coyote (*C. latrans*), both of which were observed in the former BP operations areas. Additionally, crawfish are considered an indicator species, as they are sensitive to water and soil pollution (Helfrich, 2020). The presence of crawfish in both the former BP operations areas and reference is evidence that the water and soil are of sufficient quality to support crawfish as well as other animals that depend on both aquatic and terrestrial habitats.

IMAGE 5-12 CRAWFISH TOWER OBSERVED AT FOREST SURVEY LOCATION E-S20-4 (HA-10)

Pictured is a crawfish tower (Order Decopoda) photographed at E-S20-4 (HA-10), photo taken by K. Cejas on April 15, 2025.

In addition to the carnivorous and piscivorous birds of prey (tertiary consumers) described in Section 5.1.2, tertiary consumers such as feral hog (*S. scrofa*) and coyote (*C. latrans*) were indirectly observed (hog tracks and coyote scat) in former BP operations areas. Feral hogs are omnivores with a wide diet including vegetation, invertebrates, reptiles, amphibians, and small mammals. Coyotes are also opportunistic omnivores, eating mostly small mammals but also plants. The presence of tertiary consumers indicates that the former BP operations areas provide diverse food resources for wildlife, and that food webs are well functioning and have not been impacted by former E&P operations.

## 5.2 ECOLOGICAL COMMUNITIES IN THE ANADARKO OPERATIONS AREAS AND VICINITY

Dr. Karen Cejas and the eco field team collected observations of dominant vegetation and wildlife in the former Anadarko operations areas and vicinity (Figures 9 and 10). The former Anadarko operations areas contain grassy areas and edge forest communities, and the surrounding areas (vicinity) include a ditch with riparian forest, agriculture (rice ponds), and built environments (roads) (Figures 9, 10, and 19). The structure and health of the ecological communities in the former Anadarko operations areas and vicinity were assessed during field investigations of vegetation and wildlife on May 29, 2025. Wildlife and vegetation observed in the former Anadarko operations areas and vicinity include 48 plant taxa, 34 bird species, and 32 non-avian taxa including insects, mammals, reptiles, amphibians, and terrestrial invertebrates. Diverse and

productive ecological communities were observed throughout the former Anadarko operations areas and vicinity.

### 5.2.1 VEGETATION IN THE FORMER ANADARKO OPERATIONS AREAS AND VICINITY

The vegetation in the former Anadarko operations areas and vicinity includes a diverse variety of hydrophytic (wetland) and non-hydrophytic (upland) species, including trees, shrubs, vines, grasses, and forbs. A total of 8 tree species were observed in the edge and riparian forest areas of the former Anadarko operations areas and vicinity, including black willow (*Salix nigra*), sugarberry (*Celtis laevigata*), elm (*Ulmus sp.*) and oak (*Quercus sp.*), among others. In addition, a variety of grasses were observed, such as flatsedge (*Cyperus sp.*), rush (*Juncus sp.*), spikerush (*Eleocharis sp.*), and wildflowers such as common boneset (*Eupatorium perfoliatum*), pinkladies (*Oenothera speciosa*), and purple passionflower (*Passiflora incarnata*). Two wildflower species observed in bloom in the vicinity of the former Anadarko areas include pickerelweed (*Pontederia cordata*) and seaside goldenrod (*Solidago sempervirens*) (Image 5-13). As shown below, flowering plants provide an important nectar resource for pollinators such as butterflies and moths.

The vegetation observed in the former Anadarko operations areas and vicinity was very dense and green, with no evidence of chlorosis. The health and diversity of wetland and upland plant species observed in the former Anadarko operations areas and vicinity indicates that the ecological communities are not negatively impacted by former E&P operations (Images 5-14, 5-15).

IMAGE 5-13 BLOOMING WILDFLOWERS OBSERVED IN THE VICINITY OF THE FORMER ANADARKO OPERATIONS AREAS

Pictured are pickerelweed (*P. cordata*) (left) and seaside goldenrod (*S. sempervirens*) (right) at observation location E-Inc-D2-A, in the vicinity of the Anadarko operations areas. Photos taken by A. Sivils on May 29, 2025.

## IMAGE 5-14 DENSE EDGE FOREST VEGETATION OBSERVED AT LOCATION HA-4 AND HA-5/CD-3 IN THE FORMER ANADARKO OPERATIONS AREAS

Pictured is dense edge forest vegetation at location HA-4 (left) and HA-5/CD-3 (right), in the former Anadarko operations areas. Photos taken by K. Cejas on May 29, 2025.

## IMAGE 5-15 HEALTHY HERBACEOUS VEGETATION AT LOCATION CD-1 IN THE FORMER ANADARKO OPERATIONS AREAS

Pictured is healthy herbaceous vegetation (left) at location CD-1 in the former Anadarko operations areas. Photos taken by K. Cejas on May 29, 2025.

Near the former Anadarko operations areas were rice fields, some of which show planted rice in the early stage of growth (Image 5-16). HET (2025) determined that the effective root zone for rice on the Property was 6 inches. The bermed edges of the rice fields are populated with healthy herbaceous vegetation, including Brazilian vervain (*Verbena brasiliensis*), spoonleaf purple everlasting (*Gamochaeta purpurea*), dogfennel (*Eupatorium capillifolium*), evening primrose (*Oenothera drummondii*), nightshade (*Solanum* sp.), giant ragweed (*Ambrosia trifida*), dogfennel (*Eupatorium capillifolium*), horse-nettle (*Solanum carolinense*), and curly dock (*Rumex crispus*).

IMAGE 5-16 RICE FIELDS IN THE VICINITY OF FORMER ANADARKO OPERATIONS AREAS

Pictured are rice fields in various stages of production near observation locations CD-1 (top left, top right, bottom left) and E-Inc-R8 (bottom right). Photos taken by K. Cejas on May 29, 2025.

### 5.2.2 BIRD COMMUNITIES IN FORMER ANADARKO OPERATIONS AREAS AND VICINITY

A total of 34 bird species were observed in the former Anadarko operations areas and vicinity. The grassy areas and riparian and edge forests in the former Anadarko operations areas and vicinity provide habitat for bird species of all trophic levels. During field investigations of the former Anadarko operations areas and vicinity on May 29, 2025, Dr. Karen Cejas and the eco field team observed herbivorous primary consumers, such as Northern Cardinal (*C. cardinalis*), Brown-headed Cowbird (*M. ater*), and Black-bellied Whistling Duck (*Dendrocygna autumnalis*), as well as secondary consumers that consume insects and aquatic invertebrates, such as Yellow-crowned Night Heron (*Nyctanassa violacea*), Indigo Bunting (*Passerina cyanea*), and Black-necked Stilt (*Himantopus mexicanus*). Higher trophic level species and apex birds of prey, such as Red-shouldered Hawk (*B. lineatus*), were also observed in the former Anadarko operations areas and vicinity. Image 5-17 shows the Indigo Bunting (*P. cyanea*) and Red-shouldered Hawk (*B.*

*lineatus*). The complete trophic structure of the avian population in the former Anadarko operations areas and vicinity demonstrates that there are sufficient resources present in the forest and grassy habitats to support higher and lower levels of the food chain.

IMAGE 5-17 INDIGO BUNTING AND RED-SHOULDERED HAWK OBSERVED IN THE FORMER ANADARKO OPERATIONS AREAS

Indigo Bunting (*Passerina cyanea*) and Red-shouldered Hawk (*B. lineatus*) at location HA-5/CD-3, in the former Anadarko operations areas. Photos taken by C. Matherne on May 29, 2025.

In addition to the species noted above, 4 SGCN were observed in the former Anadarko operations areas and vicinity during the field investigations on May 29, 2025: Chimney Swift (*C. pelagica*), Painted Bunting (*P. ciris*), Little Blue Heron (*E. caerulea*), and Wood Stork (*M. Americana*) (Image 5-18). The presence of these state-designated special status species in the former Anadarko operations areas and vicinity is evidence that these areas are providing valuable habitat for regionally important bird biodiversity.

IMAGE 5-18 BIRD SPECIES OF GREATEST CONSERVATION NEED (SGCN) OBSERVED IN THE VICINITY OF THE FORMER ANADARKO OPERATIONS AREAS

Pictured are two SGCN observed in the vicinity of the former Anadarko operations areas. Painted Bunting (*P. ciris*) (left), is a primary consumer observed at HA-9/CD-2, and a Little Blue Heron (*E. caerulea*) (right), is a tertiary consumer observed at E-Inc-R7. Photos taken by C. Matherne on May 29, 2025.

### 5.2.3 ADDITIONAL WILDLIFE OBSERVED IN THE FORMER ANADARKO OPERATIONS AREAS AND VICINITY

A total of 32 additional taxa, including non-avian wildlife and insects, were documented in the former Anadarko operations areas and vicinity. Species across all trophic levels were observed during the May 29, 2025, field investigation of the former Anadarko areas and vicinity.

A variety of primary consumers were observed in the former Anadarko operations areas and vicinity, including caterpillars and butterflies (Eastern tiger swallowtail [*Papilio glaucus*], Spicebush swallowtail [*Papilio troilus*], Viceroy butterfly [*Limenitis archippus*], and Giant swallowtail [*Papilio cresphontes*]), and other insects such as the Northern walkingstick (*Diapheromera femorata*), soldier beetle (Family Cantharidae), and katydid (Family Tettigoniidae) (Image 5-19). The diverse assemblage of insects observed in the former Anadarko areas and vicinity is indicative of healthy vegetation and provides a strong foundation for other animals in the food webs.

### IMAGE 5-19 BUTTERFLIES OBSERVED IN THE VICINITY OF FORMER ANADARKO OPERATIONS AREAS

Pictured are primary consumers, a Spicebush swallowtail (*P. troilus)* (left) photographed at location HA-9/CD-2, and a Giant swallowtail (*P. cresphontes)* (right) photographed near E-Inc-D2-A, in the vicinity of the former Anadarko operations areas. All photos were taken by C. Matherne on May 29, 2025.

In addition to terrestrial invertebrates, herbivorous animals observed directly and indirectly (tracks and scat) in the former Anadarko operations areas include rabbit (Family Leporidae), and white-tailed deer (*O. virginianus*). The presence of herbivorous mammals in the former Anadarko operations areas and vicinity indicates that the plant population is providing sufficient diet to support primary consumers and has not been impacted by former E&P operations.

Higher trophic level wildlife was also observed in the former Anadarko areas and vicinity, including a variety of secondary consumers insects (insects that consume other insects), reptiles, and amphibians. This includes terrestrial invertebrates such as spider wasp (*Entypus* sp.), great blue skimmer (*Libellula vibrans*), and black-footed yellow sac spider (*Cheiracanthium inclusum*), as well as green anole (*A. carolinensis*), squirrel tree frog (*Hyla squirrella*), bullfrog (*Lithobates* sp.), and green tree frog (*H. cinerea*) (Image 5-20). The secondary consumers observed in the former

Anadarko operations areas and vicinity are primarily insectivorous, demonstrating that the insect population is thriving and healthy enough to provide sufficient food resources for higher trophic level wildlife.

### IMAGE 5-20 SECONDARY CONSUMERS OBSERVED IN THE FORMER ANADARKO OPERATIONS AREAS

Pictured are great blue skimmer (L. vibrans) at HA-5/CD-3 (left) and a green tree frog (*H. comerea)* near SN 28396 (right) in the former Anadarko operations areas. Photos taken by C. Matherne (left) and A. Sivils (right) on May 29, 2025.

Tertiary consumers and apex predators were also observed in the former Anadarko operations areas and vicinity, including snakes (Suborder Serpentes) and feral hog (*S. scrofa*) (evidence of rooting behavior observed). The presence of these taxa from higher trophic levels in the former Anadarko operations areas and vicinity indicates that there is a high diversity of food sources available. The presence of higher-level trophic consumers is a line of evidence that food webs in the former Anadarko operations areas and vicinity are well functioning and provide a high calorie diet for species at the top of the food chain.

Species important to Louisiana's recreational hunting, such as rabbit (Family Leporidae), white-tailed deer (*O. virginianus*), and feral hog (*S. scrofa*), were indirectly observed (tracks, scat, and feral hog rooting behavior) at multiple locations throughout the former Anadarko operations areas and vicinity (HA-9/CD-2 and vicinity, E-Inc-P2, and while in transit between locations). Hunting stands were also documented at multiple locations within the vicinity of the former Anadarko operations areas (see Image 5-21image below). These species indicate that the former Anadarko operations areas and vicinity are providing habitat for recreationally important species, and contribute to the recreational value of the local community.

The diverse assemblage of primary, secondary, and tertiary consumers observed in the former Anadarko operations areas and vicinity illustrates healthy, well-functioning habitats that are not negatively impacted by former E&P operations.

IMAGE 5-21 HUNTING STAND IN THE VICINITY OF FORMER ANADARKO OPERATIONS AREAS

Pictured is a deer stand located at incidental observation location E-Inc-P2, in the vicinity of the former Anadarko operations areas. Photographed by K. Cejas on May 29, 2025.

## 5.3 ECOLOGICAL COMMUNITIES IN THE OTHER AREAS OF THE PROPERTY

In addition to the prairie and forest survey locations, ERM visited and collected incidental observations in the southern portion of the Property (i.e., "other areas") (Figure 10). These other areas of the Property include a mix of ecological communities, including ditches (Figures 18-20), rice ponds, built environments (hunting camps), and the Mermentau River. The structure and health of the ecological communities in the other areas of the Property were assessed during multiple field investigations of vegetation and wildlife performed by the eco field team (April 15-16, 2025). Wildlife and vegetation observed in the other areas of the Property include 7 plant taxa, 60 bird species, and 32 non-avian taxa including mammals, reptiles, amphibians, fish and terrestrial invertebrates. Diverse and productive ecological communities were observed throughout the other areas of the Property.

### 5.3.1 VEGETATION IN OTHER AREAS OF THE PROPERTY

The other areas of the Property include vegetative communities in ditches, rice ponds, built environments, and along the Mermentau River. Incidental observation locations within ditches

include E-Inc-D1, E-Inc-D2, and E-Inc-D3 (Figures 18 through 20), and the habitat within these ditches consisted of riparian forests with hydrophytic (wetland) trees, shrubs, vines, grasses, and forbs. The plant species observed in and nearby the ditches include pickerelweed (*Pontederia cordata*), waterspangles (*Salvinia minima*), yellowthistle (*Cirsium horridulum*), and Virginia creeper (*Parthenocissus quinquefolia*) and Eastern poison ivy (*T. radicans*) (Image 5-22).

IMAGE 5-22 PLANT SPECIES OBSERVED IN THE OTHER AREAS OF THE PROPERTY

Pictured are waterspangles (*S. minima*) (left) and Virginia creeper (*P. quinquefolia*) and Eastern poison ivy (*T. radicans*) (right) all at E-Inc-D3. Photos taken by C. Matherne on April 15, 2025.

The rice ponds on the Property were fallow at the time of the field investigation on April 15-16, 2025, resulting in the regeneration of native flora. Observation locations within or near the rice ponds include E-Inc-R1, E-Inc-R2, E-Inc-R3, E-Inc-R4 Area, E-Inc-R5 Area, and E-Inc-R6 Area. At these locations, the eco field team observed native grasses and vegetation with herbaceous growth (Image 5-23). These former rice ponds were found dry. HET (2025) determined that the effective root zone for rice on the Property was 6 inches.

## IMAGE 5-23 RICE PONDS OBSERVED IN THE OTHER AREAS OF THE PROPERTY

Pictured are the rice fields at incidental locations E-Inc-R2 (left) and E-Inc-R4 Area (right). Photos taken by K. Cejas (left) and C. Matherne (right) on April 15, 2025.

Incidental observations within or near the Mermentau River include E-Inc-M1 and E-Inc-M2. The areas of the Property that border the Mermentau River are characterized as transitional habitats between bottomland hardwood and cypress forest, as per the eco field team's incidental observations (Image 5-24). The transitional forests near the Mermentau River contain hydrophytic (wetland) trees, shrubs, grasses, and forbs.

## IMAGE 5-24 FORESTS ADJACENT TO THE MERMENTAU RIVER IN THE OTHER AREAS OF THE PROPERTY

Pictured are natural communities observed on the Property near the Mermentau River at E-Inc-M1. Photos taken by K. Cejas on April 15, 2025.

### 5.3.2 BIRD COMMUNITIES IN OTHER AREAS OF THE PROPERTY

A total of 60 bird species were observed in other areas of the Property, excluding the former BP and Anadarko operations areas and reference locations.

The other areas of the Property provide habitat for bird species of all trophic levels. This includes primary consumers (Northern Cardinal [*C. cardinalis*], Brown-headed Cowbird [*M. ater*], Black-bellied Whistling Duck [*Dendrocygna autumnalis*], Ruby-throated Hummingbird [*Archilochus colubris*]), secondary consumers (Summer Tanager [*Piranga subra*], Yellow-crowned Night Heron [*Nyctanassa violacea*], Prothonotary Warbler [*Protonotaria citrea*], Northern Parula [*Setophaga americana*]), as well as tertiary consumers and apex predators (Little Blue Heron [*Egretta caerulea*], Red-shouldered Hawk [*Buteo lineatus*], Barred Owl [*Strix varia*]) (Image 5-25). The trophic structure of the avian population in the other areas of the Property is similar to the trophic structure in the former BP operations areas and reference locations. Nine (15%) of the bird species in the other areas of the Property were primary consumers, 42 (70%) were secondary consumers, and 9 (15%) were tertiary consumers and apex predators.

Six (6) birds of SGCN were observed in the other areas of the Property. These species include Chimney Swift (*C. pelagica*), Eastern Meadowlark (*Sturnella magna*), Hooded Warbler (*Setophaga citrina*), Little Blue Heron (*E. caerulea*), Yellow-throated Vireo (*Vireo flavifrons*), and Prothonotary Warbler (*P. citrea*).

IMAGE 5-25 BIRDS OBSERVED IN THE OTHER AREAS OF THE PROPERTY

Pictured are a Red-shouldered Hawk (*B. lineatus*) (left), which is an apex predator observed at incidental location E-Inc-C1, and a Summer Tanager (*P. rubra*) (right), a secondary consumer photographed at incidental location E-Inc-BL. Photos taken by C. Matherne (left) and J. Shugart (right) on April 16, 2025.

### 5.3.3 ADDITIONAL WILDLIFE OBSERVED IN OTHER AREAS OF THE PROPERTY

A total of 32 additional taxa (wildlife and insects, excluding birds) were documented in other areas of the Property.

A variety of primary consumers were observed in the other areas of the Property, including caterpillars and butterflies (monarch butterfly [*D. plexippus*], spilosoma moth [*Spilosoma* sp.], question mark butterfly [*Polygonia interrogationis*], hawk moth [Family Sphingidae], and salt marsh moth [*Estigmene acrea*]), eastern leaf-footed bug (*Leptoglossus phyllopus*), spittle bug (Superfamily Cercopoidea), and bee species (eastern carpenter bee [*Xylocopa virginica*], furrow bee [*Halictus* sp.], and honeybee [*Apis* sp.]) (Image 5-26). This diverse set of insects is indicative of healthy vegetation on the Property and provides a strong foundation for other animals in the food webs.

#### IMAGE 5-26 CATERPILLARS AND BUTTERFLIES OBSERVED IN OTHER AREAS OF THE PROPERTY

Pictured are a spilosoma moth caterpillar (*Spilosoma sp.)* (left) photographed at incidental observation location E-Inc-H1 Vicinity, photo taken by C. Matherne on April 16, 2025, and a question mark butterfly (*P. interrogationis)* (right) photographed in the vicinity of E-S20-11, photo taken C. Matherne on April 15, 2025.

In addition to terrestrial invertebrates, herbivorous animals observed directly and indirectly (tracks and scat) in other areas of the Property include Eastern gray squirrel (*Sciurus carolinensis*), rabbit (Family Leporidae), and white-tailed deer (*O. virginianus*). The diverse number of herbivorous species present in the other areas of the Property indicates that the plant population is healthy and can support these primary consumers.

A variety of secondary consumers were observed throughout the other areas of the Property. This includes terrestrial invertebrates such as spiders (wolf spider [Family Lycosidae], spotted orbweaver (*Neoscona* sp.) and spinybacked orbweaver [*Gasteracantha cancriformis*]) and tiger beetle (Subfamily Cicindelinae), as well as reptiles (green anole [*A. carolinensis*] and pond slider [*T. elegans*]), amphibians (southern leopard frog [*L. sphenocephalus*], toad [Order Anura], and green tree frog [*H. cinerea*]), and fish (Subphylum Vertebrata) (Image 5-27 and 5-28). Many of these secondary consumers are insectivorous, demonstrating the insect population is thriving and healthy enough to provide a foundation for consumers higher up the food web.

## IMAGE 5-27 AMPHIBIANS OBSERVED IN OTHER AREAS OF THE PROPERTY

Pictured are a leopard frog (*Lithobates sp.)* (left) photographed at incidental location E-Inc-D3, photo taken by J. Shugart on April 15, 2025, and a green tree frog (*H. comerea)* (right) photographed at near SN 78514, photo taken J Shugart on April 16, 2025.

## IMAGE 5-28 POND SLIDER OBSERVED IN OTHER AREAS OF THE PROPERTY

Pictured is a pond slider (*T. elegans)* photographed at incidental location E-Inc-G, photo taken by J. Shugart on April 15, 2025.

Tertiary consumers and apex predators were also observed in other areas of the Property, including reptiles such as western ribbonsnake (*Thamnophis Proximus*), common watersnake

(*Nerodia sipedon*), garter snake (*Thamnophis* sp.), eastern mud turtle (*Kinosternon subrubrum*), and American alligator (*A. mississippiensis*) (Image 5-29). Additionally, mammals higher on the food web were observed, including Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), and feral hog (*S. scrofa*). All three mammals are omnivores, and their presence at the Property indicates that there is a high diversity of food sources available. The presence of such a wide variety of higher consumers is a line of evidence that food webs are well functioning and provide a high calorie diet for species at the top of the food chain.

IMAGE 5-29 WESTERN RIBBONSNAKE SWIMMING

Pictured is a western ribbonsnake (*T. Proximus)* photographed at incidental observation location E-Inc-R6, photo taken by C. Matherne on April 16, 2025.

Species important to Louisiana's recreational hunting, such as white-tailed deer (*O. virginianus*) and feral hog (*S. scrofa*), were both indirectly observed (tracks, scat, and feral hog rooting behavior) on the Property at multiple locations. Hunting stands were also documented at multiple locations throughout the Property (see Image 5-30 below). These species' prevalence indicates that the Property is providing habitat for these recreationally important species, and subsequently, the Property contributes to the recreational value of the local community. A discussion of current and future hunting land use at the Property is provided in Section 10.7.

The presence of a diverse set of primary, secondary, and tertiary consumers illustrates healthy, well-functioning habitats at the Property.

## IMAGE 5-30 HUNTING STANDS IN OTHER AREAS OF THE PROPERTY

Pictured left, a hunting blind located at incidental observation location E-Inc-H1, photographed by K. Cejas on April 15, 2025. Pictured right, a tree-stand located near SN 78514, photographed by C. Matherne on April 16, 2025.

# 6. WILDLIFE & HABITAT IN PLAINTIFF'S PROPOSED REMEDIATION AREAS

ICON (2024) has proposed remediation throughout the Property. This section presents observations of wildlife, vegetation, and habitat in these areas proposed for alteration. Observations are presented for areas on the Property ICON designated for soil and groundwater remediation. Ecosystem observations support that the proposed areas for remediation are currently functioning and providing expected ecosystem services.

The ecosystems proposed for soil removal and replacement and groundwater remediation by ICON (2024) are discussed in Sections 6.1 and 6.2, respectively. Section 6.3 discusses the ecology observed in the Defense's proposed groundwater monitoring area.

Gregory W. Miller and Jason Sills (ICON) authored a report dated October 18, 2024, *Expert Report and Restoration Plan for the Landowners Castex Development, LLC vs Anadarko Petroleum Corporation, et al; 31st JDC; Docket C-502-20; Mermentau West Oil Field, Jefferson Davis Parish, LA*, which presents a background-oriented proposed remediation plan to remove and replace approximately 3.38 acres of Cajun Prairie and Sweetgum-Water Oak Bottomland Forest to a maximum depth of 20 feet below ground surface (bgs) (Figure 21). This proposed remediation plan includes excavation of soil, transportation by trucks to an off-Property facility for disposal, followed by backfilling of excavated areas with materials from off-Property. The groundwater remediation plan proposes installing 33 miles of piping and 349 recovery wells for pumping and treating groundwater using a treatment train and reverse osmosis for close to 30 years.

## 6.1 ECOLOGICAL COMMUNITIES IN PLAINTIFF'S PROPOSED SOIL REMEDIATION PLAN

ICON (2024) has proposed a background-oriented remediation plan to remove and replace approximately 2.84 acres of soil across the former BP operations areas and former Anadarko operations areas, altering intact and functioning forested and grassy habitat. Throughout the proposed 1.03 acres in former BP operations areas and 1.81 acres in former Anadarko operations areas proposed for soil remediation, testing for E&P-related constituents in soil showed that the measured concentrations are below levels associated with ecological risk (no ecological risk is predicted). Additionally, ecological field investigations of the habitat and vegetation in these locations document that the ecology has not been negatively impacted by former E&P operations, as compared to reference.

The Plaintiff's experts did not conduct an ERA. Plaintiff's expert did not assess the impact of their proposed soil remediation plan on the local ecology and there is no evidence to suggest that the plan will benefit the local ecological communities. To the contrary, ecological communities will be negatively impacted by ICON's (2024) proposed soil remediation plan, which will cause more ecological harm than good.

Negative impacts of the ICON (2024) proposed soil remediation plan (soil removal and replacement) include permanent and temporary destruction of existing vegetation, which eliminates Sweetgum-Water Oak Bottomland Forest, Cajun Prairie, and other forested and grassy habitats, food for local wildlife, and significantly disturbs and/or eliminates forested and grassy

habitats that are currently supporting birds, terrestrial fauna (mammals, reptiles, amphibians), and insects (Figures 21 and 22).

Throughout the approximately 1.03 acres of soil across the former BP operations areas that is proposed for soil remediation, there is a diverse range of healthy bottomland hardwood forest and Cajun Prairie vegetation. Locations throughout the Plaintiff's proposed soil remediation plan were inspected by Dr. Karen Cejas and observed to be populated by healthy and abundant vegetation. Iconic Sweetgum-Water Oak Bottomland Forest vegetation was observed throughout the areas of the Property proposed to be excavated and replaced, including water oak (*Q. nigra*), American elm (*U. americana*), cherrybark oak (*Q. pagoda*), dwarf palmetto (*S. minor*), sugarberry (*C. laevigata*), and possumhaw (*Ilex decidua*) (Image 6-1). Other common bottomland hardwood forest plants are also abundant, including trumpet creeper (*C. radicans*), Eastern poison ivy (*T. radicans*), Virginia creeper (*P. quinquefolia*) and sawtooth blackberry (*Rubus argutus*). Other areas proposed for soil remediation in the former BP operations areas support Cajun Prairie habitat and a diverse composition of grasses and forbs were observed.

There is a diverse range of healthy edge forest and riparian forest throughout the approximately 1.81 acres of soil across former Anadarko operations areas that is proposed for soil remediation. Vegetation that was observed throughout the former Anadarko operations area that is proposed to be excavated includes trees and shrubs such as black willow, sugarberry, wax myrtle, and yaupon, and herbaceous species such as evening primrose (*Oenothera drummondii*), purple passionflower (*Passiflora incarnata*), white avens (Geum canadense), and yellow puff (*Neptunia pubescens*). The Plaintiff's proposed soil remediation plan will destroy the already existing healthy and diverse bottomland hardwood forest, edge forest, riparian forest, and Cajun Prairie that provides habitat and food for a functioning ecosystem.

IMAGE 6-1 HEALTHY SWEETGUM-WATER OAK BOTTOMLAND FOREST OBSERVED IN PLAINTIFF'S PROPOSED SOIL REMEDIATION AREA

Pictured is healthy Sweetgum-Water Oak Bottomland Forest vegetation in the former BP operations areas at ecological survey location E-S20-4 (HA-10). Photograph by K. Cejas taken on April 15, 2025.

The forested and grassy habitat proposed for excavation supports a diverse ecological community including migratory and resident bird species, both of which were observed in areas within the Plaintiff's proposed soil remediation plan throughout the former BP operations areas and former Anadarko operations areas. Examples of Neotropic migrant bird species (those that over-winter in Mexico, and Central and South America) observed in areas within the Plaintiff's soil remediation plan in the former BP operations areas included the Yellow-billed Cuckoo (*C. americanus*), Chimney Swift (*C. pelagica*), Great Crested Flycatcher (*M. crinitus*), and Swamp Sparrow (*M. georgiana*), Common Yellowthroat (*Geothlypis trichas*), Indigo Bunting (*P. cyanea*), Painted Bunting (*P. ciris)*, Wood Stork (*M. Americana)*, and Turkey Vulture (*C. aura*). Examples of resident and short-distance migrant bird species (those that overwinter in the United States) observed in areas within the Plaintiff's soil remediation included the White-eyed Vireo (*V. griseus*), Brown-headed Cowbird (*M. ater*), Tufted Titmouse (*Baeolophus bicolor*), Carolina Wren (*T. ludovicianus*), Downy Woodpecker (*Dryobates pubescens*), Red-bellied Woodpecker (*M. carolinus*), Blue Jay (*C. cristata*), American Crow (*Corvus brachyrhynchos*), Mourning Dove (*Z. macroura*), Northern Cardinal (*C. cardinalis*), Black-bellied Whistling Duck (*D. autumnalis*), Great Egret (*A. alba*), Great Blue Heron (*A. herodias*), Laughing Gull (*Leucophaeus atricilla*), Snowy Egret (*E. thula*), White-faced Ibis (*P. chihi*), Northern Flicker (*Colaptes auratus*), and Red-tailed Hawk (*B. jamaicensis*).

Primary, secondary, tertiary consumer birds and apex predators with a wide variety of diets (herbivores, insectivores, omnivores, and carnivores) were observed in the Plaintiff's proposed soil remediation plan areas. The presence of these species indicates an intact food chain that would be harmed by the Plaintiff's remediation plans.

The ICON (2024) proposed background-oriented plan (soil removal and replacement), which requires clear-cutting of existing bottomland hardwood forest, edge forest, and riparian forest on the Property, will disturb functioning forests and negatively affect the bird community that relies on this habitat for survival. The impacts associated with ICON's remediation plans include but are not limited to: the destruction of intact native ecosystems by large equipment and heavy machinery entering and leaving the Property, increased noise levels on the Property that disrupt wildlife activities, crushed vegetation, soil compaction from heavy machinery, direct harm to or death of plants and wildlife, and removal of habitat that may indirectly cause species to vacate the area or perish.

Higher trophic levels of all taxa, including birds, are dependent on the lower trophic levels for food. Invertebrates often make up large portions of many consumer species' diets and are integral parts of the food web. Many invertebrate species were observed on the Property, including a diverse community observed on areas proposed for soil removal and replacement by the Plaintiff. Examples of terrestrial invertebrates observed within these areas include: forest tent caterpillar moth (*Malacosoma disstria*), great blue skimmer (L. *vibrans*), red-headed bush cricket (*Phyllopalpus pulchellus*), tropical checkered skipper (*Burnsius oileus*), bumblebee (*Bombus* sp.), fire ant (*Solenopis* sp.), caterpillar (Order Lepidoptera), and mosquito (*Anopheles* sp.) (Image 6-2). These species, among others, provide not only pollination for forest and grassland plants, but are the consumers that form the base of the food chain.

## IMAGE 6-2 INVERTEBRATE SPECIES OBSERVED IN PLAINTIFF'S PROPOSED SOIL REMEDIATION AREA

Pictured are forest tent caterpillars (*M. disstria*), a terrestrial invertebrate observed at E-S20-5 (CD-18). Photograph by K. Cejas taken on April 15, 2025.

Other terrestrial species were also observed within the Plaintiff's proposed soil remediation areas. The mammals observed were the coyote (C. *latrans*), feral hog (*S. Scrofa*), white-tailed deer (*O. virginianus*), and rabbit (Family Leporidae), representing a range of trophic levels from primary consumer to apex predator. A mammal den was also observed in the area proposed for alteration. These species would be harmed by having their homes and habitats excavated.

Soils throughout the former BP operations areas and former Anadarko operations areas on the Property are not adversely affecting or causing toxicity to the wildlife and habitats. The Plaintiff's proposed soil remediation plan is not needed for protection of the currently functioning ecosystems. The vegetation and habitats do not show evidence of adverse impact from former E&P operations and are currently supporting populations of birds, invertebrates, mammals, and other wildlife, measured to be as expected for the regions, as compared to references.

## 6.2 ECOLOGICAL COMMUNITIES IN PLAINTIFF'S PROPOSED GROUNDATER REMEDIATION PLAN

ICON (2024) has proposed a plan to pump and treat groundwater using reverse osmosis for approximately 30 years. ICON characterizes four plumes, two of which are in the former BP operations areas (Plumes 2 and 4), and two in the former Anadarko operations areas (Plumes 1 and 3). The installation of equipment, including 33 miles of piping and 349 recovery wells, for the Plaintiff's proposed groundwater remediation plan would result in noise, vibration, and soil disturbance and habitat alteration of several acres of functioning forested and grassy habitat.

The risks associated with installation of recovery wells and additional equipment for the pump and treat system include destruction of wildlife and habitat by large equipment and construction vehicles entering and leaving the Property, increased noise and vibration levels that disrupt wildlife, vegetation crushed by construction activities, creation of new roadways within functional habitats, and destruction of biological species. Recovery well areas will be disrupted, and therefore diminished in ecological functioning, for the duration of pump and treat activities.

Ninety species of plants were observed in the Plaintiff's proposed groundwater treatment areas in former BP operations areas, 45 species within Cajun Prairies and 56 species in the Sweetgum-Water Oak Bottomland Forest. These numbers indicate high diversity for both habitat types, which is evidence of good ecosystem function. Dominant Cajun Prairie species observed within groundwater treatment areas include Carolina geranium (*Geranium carolinianum*), Carolina ponysfoot (*Dichondra carolinensis*), marsh bristlegrass (*Setaria parviflora*), and Timothy canarygrass (*Phalaris angusta*). Dominant species within Sweetgum-Water Oak Bottomland Forest areas proposed for groundwater treatment activities include American elm (*U. americana*), cherrybark oak (*Q. pagoda*), live oak (*Q. virginiana*), loblolly pine (*Pinus taeda*), Slender woodoats (*Chasmanthium laxum*), Trumpet creeper (*C. radicans*), and water oak (*Q. nigra*). Forty-four species of plants were observed in the Plaintiff's proposed groundwater treatment areas in former Anadarko areas including sugarberry (*C. laevigata*), pickerelweed (*P. cordata*), seaside goldenrod (*Solidago sempervirens*), black willow (*S. nigra*), American beautyberry (*C. americana*), and herbwilliam (*Ptilimnium capillaceum*). The vegetation in these areas was dense and healthy, with no evidence of salt impacts observed (e.g., chlorosis, white crusts on soil, denuded areas). Plant species in the Plaintiff's proposed areas for groundwater treatment would be harmed by installation and use of 33 miles of piping and 349 recovery wells, therefore disrupting healthy habitat function.

Disrupting plant species that provide both food and habitat would negatively impact avian and non-avian species in these areas. Fifty-eight species of birds were observed in the Plaintiff's proposed groundwater treatment areas, including observations of Chimney Swift (*C. pelagica*) Little Blue Heron (*E. caerulea*), Painted Bunting (*P. ciris*), and Wood Stork (*M. Americana)*, all SGCN birds (Image 6-3). All trophic levels of birds, primary, secondary, and tertiary consumers, as well as apex predators, were observed within the Plaintiff's proposed groundwater treatment areas. As discussed in Section 6.1, the presence of species with a wide variety of diets indicates an intact food chain that would be harmed by the Plaintiff's proposed plans.

### IMAGE 6-3 CHIMNEY SWIFT AND LITTLE BLUE HERON OBSERVED FLYING WITHIN PLAINTIFF'S PROPOSED GROUNDWATER TREATMENT AREA

Pictured left, a Chimney Swift (*C. pelagica*) observed at SN 971675 Area within the area of ICON groundwater plumes 2 and 4. Photograph by J. Shugart taken on April 15, 2025. Picture right, a Little Blue Heron (*E. caerulea*) observed at E-Inc-D2 within the area of Plumes 2 and 4. Photograph by C. Matherne taken on April 15, 2025.

Sixty-nine non-avian taxa were observed within the Plaintiff's proposed groundwater treatment areas. These include aquatic invertebrates (crawfish [Order Decopoda]), mammals (such as white-tailed deer [*O. virginianus*], rabbit [Family Leporidae], feral hog [*S. scrofa*], Virginia opossum [*D. virginiana]*, raccoon [*P. lotor*], coyote [*C. latrans*], and Eastern gray squirrel [*S. carolinensis]*), and terrestrial invertebrates (such as bumblebee [*Bombus sp.*], butterflies and caterpillars [Order Lepidoptera], and eastern buckmoth [*H. maia*]). The activities associated with installation and operation of recovery wells would negatively impact these species by destroying, disrupting, and altering their habitat.

ICON's (2024) proposed plan is not in the best interest of the Property's wildlife nor habitats. It would both destroy and disturb the Property's healthy, functioning ecological communities.

## 6.3 ECOLOGICAL COMMUNITIES IN DEFENSE'S PROPOSED GROUNDWATER MONITORING AREAS

HET (2025) has proposed no active remediation of soil or groundwater in former BP operations areas and former Anadarko operations areas. Remediation has not been recommended for these areas for ecological reasons, as the ecosystems in these locations were observed and documented to be without evidence of impact from former E&P operations or any brine disposal operations. Instead, as a conservative measure, HET (2025) has proposed a groundwater monitoring plan to evaluate constituent concentrations over one to three years. This conservative groundwater monitoring includes 5 nested monitoring wells in the former BP operations areas, and 5 nested monitoring wells in the former Anadarko operations areas.

Within the proposed HET (2025) groundwater monitoring network in former BP operations areas, birds such as Carolina Wren (*T. ludovicianus*), White-eyed Vireo (*V. griseus*), Great Blue Heron (*A.*

*herodias*), Red-tailed Hawk (*B. jamaicensis*), and Northern Cardinal (*C. cardinalis*) were observed. Vegetation in these areas was dominated by expected plants, such as Italian ryegrass (*Lolium perenne*), Persian clover (*T. resupinatum*), and Timothy canarygrass (*P. angusta*).

Within the proposed HET (2025) groundwater monitoring areas in former Anadarko operations areas, birds such as Indigo Bunting (*P. cyanea*), Black-necked Stilt (*Himantopus mexicanus*), Little Blue Heron (*E. caerulea*), Tufted Titmouse (*B. bicolor*), and Yellow-billed Cuckoo (*C. americanus*) were observed. Vegetation in these areas were dominated by expected plants such as dogfennel (*Eupatorium capillifolium*), yaupon (*I. vomitoria*), wax myrtle (*Morella cerifera*), peppervine (*Nekemias arborea*), and southern dewberry (*Rubus trivialis*).

The ecology habitats in the HET (2025) proposed groundwater monitoring areas were observed to be similar to the ecological communities throughout the rest of the Property and the reference areas. As explained, the proposed HET (2025) groundwater monitoring areas do not require remediation for ecological health or risk reasons, and are only proposed as a conservative measure considering that all concentrations meet applicable standards.

# 7. SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT

## 7.1 ERA STEP 1

This ERA includes a screening level ecological risk assessment (SLERA) and a BERA, performed in accordance with LDEQ RECAP and USEPA guidance. The SLERA includes the first two steps of the eight-step ecological risk assessment (USEPA, 1997) (Figure 23): 1) screening-level problem formulation and ecological effects evaluation, and 2) preliminary exposure estimates and risk calculations. The SLERA process is described in the following sections and shown on Figure 23. LDEQ's RECAP Form 18 is included in Appendix D.

### 7.1.1 SCREENING LEVEL FORMULATION

The screening-level portions of an ERA (Step 1 and Step 2) are problem formulation and ecological effects evaluation. At the end of Step 2, the decision is made whether: 1) risks are negligible, permitting the ERA to be completed at the SLERA stage, or 2) to proceed to the site-specific BERA.

This SLERA focuses on potential chemical stressors in soils on the former BP operations areas and the former Anadarko operations areas on the Property. Soil data are presented in Table 5 and sample locations are presented on Figures 3 through 5.

It is appropriate to focus on soils as the primary pathway of concern for Property wildlife (USEPA, 1997), as groundwater is not a complete exposure pathway for wildlife or other animals on the Property (HET, 2025; Kueper, 2025). Surface water ingestion is a minor pathway in mammals and birds, as compared to soils, and is not included in the quantitative risk assessment for mammals and birds.

Considered in the problem formulation portion of the screening assessment are information on the environmental setting, known constituents, fate and transport mechanisms on the Property, ecotoxicity of potential constituents, likely categories of receptors, potentially complete exposure pathways, and identification of endpoints. Information gathered for Step 1 of the SLERA is discussed in the following sections.

#### 7.1.1.1 ENVIRONMENTAL SETTING

The Property is situated within the Western Gulf Coastal Plain Ecoregion of Louisiana and includes a mix of prairie and grassy areas, bottomland hardwood forest, edge forest, riparian forest, and cypress swamp, as well as built environment, which includes roads, fencing, croplands, and hunting camps. Former oil and gas E&P operations are present on the Property. Additional land uses at the Property include rice and crawfish farming and recreation (hunting). Portions of the Property abut the Mermentau River (Figure 11).

#### 7.1.1.2 CONSTITUENT FATE AND TRANSPORT

The primary transport mechanisms possible within the Property are surface runoff, erosion of soils, and biological and chemical degradation and metabolic processes. The effects of these mechanical, chemical, and biological actions are assessed in this ERA through chemical analyses

of soils and leachate waters, and surveys of vegetation and wildlife populations. Constituent fate and transport due to chemical, physical, and biological actions are discussed in Section 8.

#### 7.1.1.3 ECOTOXICITY OF COPECS

Ecotoxicity of COPECs in the former BP operations areas and former Anadarko operations areas has been investigated beginning with collecting soil samples (Table 5). The COPECs screened in this level of assessment are arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, strontium, zinc, polycyclic aromatic hydrocarbons (PAHs), and total petroleum hydrocarbons (TPH). The potential for these COPECs to cause adverse effects to survival, growth, or reproduction in ecological receptors only exists if the COPECs are: 1) present and bioavailable in toxic concentrations, 2) a complete exposure pathway exists, and 3) exposure occurs.

For the screening portion of this ERA, soils were compared to conservative (protective) USEPA Eco-SSL soil values (USEPA, 2005a, 2005b, 2005c, 2005d, 2005e, 2005f, 2006, 2007a, 2007b, 2007c, 2008), a calculated barium soil screening value (Appendix E), and a calculated mercury sediment screening value (Appendix K). These screening values are protective of mammals, birds, invertebrates, and plants.

It should be noted that screening values are used to ensure that risk is not overlooked and that all potential constituents that may contribute to risk are evaluated. Screening values are not clean-up standards or remediation action levels, and exceedance of screening values does not equate to unacceptable risk to flora or fauna.

#### 7.1.1.4 POTENTIAL RECEPTORS AND ROUTES OF EXPOSURE

The receptors selected to represent ecological populations on the Property are species that are present or could potentially be present in the habitats of interest, based on the findings of the ERM 2025 vegetation and wildlife survey field investigation.

The representative receptors and routes of exposure used to estimate risk are ones for which there is sufficient ecotoxicity information available. Exposure is assessed via ingestion of COPECs through exposure to soil and diet. This exposure pathway (soil, diet) and exposure route (ingestion) is appropriate for ERA per USEPA guidance (1997). The receptors used in this risk assessment are described in the following sections.

#### 7.1.1.5 WILDLIFE (VERTEBRATES)

Wildlife includes four classes of vertebrates in their natural habitats: amphibians, reptiles, birds, and mammals. Because these vertebrates are not domesticated, they are included in the general category of wildlife.

Vertebrate wildlife are consumers that can be assessed through estimates of COPEC doses in their diets. This estimate assumes that dietary exposure could occur on the Property. Wildlife are exposed to COPECs via ingestion of other organisms, soil, or water. Other pathways of wildlife COPEC exposure include dermal contact and inhalation. Generally, wildlife are protected by their fur or feathers from excessive dermal exposure to COPECs; therefore, the dermal pathway is not included in the risk assessment. The inhalation pathway is not typically relevant to weathered oil and gas E&P-related constituents assessed for ecological risk in wetland settings. The inhalation

pathway is not a complete or significant pathway for metals and PAHs, which are not highly volatile, and for which potential risk is driven by the ingestion pathway. The inhalation pathway is not applicable to soils. Based on the conditions on the Property, the inhalation pathway is not a complete and significant pathway. Therefore, this risk assessment is focused on the ingestion pathway, per USEPA guidance (1997).

Specific wildlife species, based on their feeding behaviors, have been selected to be evaluated as representatives of larger wildlife communities. Mammals and birds are used as the representative wildlife species, because more toxicity data are available for these vertebrates, as compared to reptiles and amphibians.

Toxicity to birds and mammals associated with terrestrial (soil-based) food webs are quantitatively assessed in the ERA.

#### 7.1.1.6 INVERTEBRATES

The invertebrate population exists in and on soils. Invertebrate populations include organisms such as worms, crustaceans, gastropods, arthropods, and mollusks. These organisms function in the ecosystem to digest and degrade other biologic matter and to provide a diet for larger invertebrates and vertebrates. Because they are in direct contact with soils due to their lifestyles, they are a dietary source of COPECs to higher vertebrates.

#### 7.1.1.7 NEKTONIC AQUATIC SPECIES

Nektonic aquatic species are larger swimming vertebrates such as fish, alligators, and snakes. Direct observations of nektonic species in the Property include observations of the American alligator.

#### 7.1.1.8 PLANTS

Plant communities, including grasses, forbs, herbs, vines, and shrubs are present on the Property. Plants are primary producers and form the base of the food chain by converting the sun's energy to the carbohydrate energy that other invertebrates and vertebrates use. In this risk assessment, the plant population has been assessed through vegetation surveys performed throughout the Property and throughout the reference area. On the former BP operations areas and former Anadarko operations areas, vegetation surveys and observations were specifically performed in locations of maximum constituent concentrations in soil to identify any potential impacts to plants due to former oil and gas E&P activity.

#### 7.1.1.9 EXPOSURE PATHWAYS AND CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) has been developed to evaluate potential ecological exposure pathways on the former BP operations areas and former Anadarko operations areas (Figure 24). A CSM (USEPA, 1997) addresses: (1) the environmental setting and COPECs on the former BP operations areas and former Anadarko operations areas; (2) COPEC fate and transport mechanisms; (3) mechanisms of ecotoxicity and likely categories of ecological receptors; (4) potentially complete exposure pathways; and (5) selection of endpoints to assess ecological risk.

The potentially complete exposure pathways at the former BP operations areas and former Anadarko operations areas are through soil. However, as a conservative measure for screening purposes, all locations were treated as both soil and sediment. Per RECAP (LDEQ, 2003), samples collected in the 0-3′ depth interval were included in the evaluation of soil, as terrestrial habitat. To be inclusive of 0-3′ data, soil samples collected in the 0-2′ and 2-4′ depth intervals were included in the evaluation. The depth of 0-3′ includes the effective root zone of vegetative species on the Property of up to 14 inches (HET, 2025) and the recommended sampling depth for the biologically active zone for terrestrial species of 25-30 cm (up to 12 inches, USEPA, 2015). The biologically active zone of soils at the Property is assumed to be from ground surface to three feet deep.

### 7.1.2 EFFECTS EVALUATION

Following the screening level problem formulation is a preliminary evaluation of ecological effects. Ecological effects are estimated using thresholds values for soil and sediment that are referred to as ecological screening values (ESVs). ESVs are COPEC concentrations that are estimated to pose no risk of adverse effects to exposed wildlife. The screening level values are not used as predictors of the occurrence of ecotoxicity, but rather to protectively include all potential COPECs in the risk assessment.

The ESVs used in the SLERA are based on peer reviewed publications of field studies or laboratory studies in which no adverse effects were observed. The ESV is based on the highest observed exposure concentration that does not produce adverse effects. This "no observed adverse effect level" is referred to as the NOAEL. ESVs can also be based on a LOAEL, which is the lowest observed concentration that produces adverse effects (e.g., reduced growth, impaired reproduction, increased mortality) in a receptor species. The ESV is a dose or a concentration at or below which risk is not expected to occur.

The fact that an ESV is exceeded does not indicate the need for remediation or that there is ecological risk. ESVs are not site-specific and are intended to be overly protective. When ESVs are exceeded, a more specific ecological risk analysis can be performed. A concentration that exceeds a soil or sediment screening level does not identify that there is risk or that there are soil concentrations that require remediation. The screening process identifies and defines areas, constituents, and conditions that do not require further attention.

When COPEC concentrations fall below screening values, no further action is needed. When COPEC concentrations exceed ESVs, further evaluation can be performed, but the need for remediation is not assumed (USEPA, 1997). Instead, if a complete screening level ecological risk assessment has been performed, and a screening value is exceeded, the decision can be made to stop at the screening level or to do further evaluation (USEPA, 1997, pg. 2-6), but remediation is not initiated after only comparing to screening values or background concentrations.

For the initial metals screening assessment in this ERA, conservative (protective) screening thresholds for soils such as USEPA Eco-SSLs (USEPA, 2005a, 2005b, 2005c, 2005d, 2005e, 2006, 2007a, 2007b, 2007c, 2008; USEPA Eco-SSLs) for COPECs present in soil are used. The USEPA Eco-SSL for barium represents the toxicity of extremely bioavailable forms of barium, rather than the toxicity of very poorly bioavailable barium sulfate. Barium sulfate is the form of barium present at legacy oil and gas E&P sites and is the form of barium confirmed to be present at the

former BP operations areas and former Anadarko operations areas on this Property (Table 6). A more appropriate barium soil screening value was calculated for the former BP operations areas and former Anadarko operations areas using barium sulfate data (Appendix E). Calculations for screening values are provided in Appendix E (barium).

The limitations of the use of screening values have been discussed by the National Research Council (2003). The screening values used for this ERA are based on ecotoxicity studies of plants, birds, invertebrates, and mammals (Inset Table 7-1). Screening of organic constituents in soils is presented in Section 9.

TABLE 7-1 ECOLOGICAL SCREENING VALUES

| Constituent | Eco-SSL Plant | Eco-SSL Invertebrate | Eco-SSL Avian | Eco-SSL Mammal | Calculated Soil Screening Value |
|---|---|---|---|---|---|
| | USEPA | USEPA | USEPA | USEPA | |
| Aluminum | N/S | N/S | N/S | N/S | N/S |
| Arsenic | 18 | N/S | 43 | 46 | N/S |
| Barium | N/S | 300[a] | N/S | 2000[a] | 2424 |
| Cadmium | 32 | 140 | 0.77 | 0.36 | N/S |
| Chromium | N/S | N/S | 26 | 34 | N/S |
| Lead | 120 | 1700 | 11 | 56 | N/S |
| Mercury | N/S | N/S | N/S | N/S | N/S |
| Selenium | 0.52 | 4.1 | 1.2 | 0.63 | N/S |
| Silver | 560 | N/S | 4.2 | 14 | N/S |
| Strontium | N/S | N/S | N/S | N/S | N/S |
| Zinc | 160 | 120 | 46 | 79 | N/S |

Notes
Concentrations are in mg/kg-dry weight.
The Soil ESV is the lowest of the Eco-SSLs, USEPA. For barium, the Soil ESV is the calculated soil screening value.
[a] Shown for completeness and not appropriate to barium at Site.

## 7.2 ERA STEP 2

### 7.2.1 SCREENING LEVEL EXPOSURE ESTIMATES

The exposure assumptions used in the SLERA are intentionally overprotective. All COPECs are assumed to be 100% bioavailable to receptors. By making these overly protective assumptions, the exposure estimates are skewed towards over-predicting risk in the SLERA. The SLERA evaluation identifies COPECs that require no further investigation and identifies COPECs that should be carried forward into the BERA.

Soil constituent concentrations are summarized in Table 5 and select COPECs (mg/kg dry weight) are shown on Figures 25 through 29.

Maximum COPEC concentrations (soil 0-3') have been used in this screening portion of the ERA. Maximum soil concentrations are shown in Inset Table 7-2 below.

In Inset Table 7-3, maximum soil concentrations (0-3') are compared to soil ESVs (the lowest of the USEPA Eco-SSLs) and soil background. The following constituents (maximum concentration) exceed soil ESVs and background: barium, chromium, lead, selenium, and zinc. Strontium (maximum concentration) exceeds background strontium (USGS, Smith 2013), andthere are no strontium ecotoxicity ESVs, and strontium is not further assessed in the ERA.

Barium is of very limited toxicity to wildlife or plants. A discussion of barium concentrations in soil exposures is provided in Appendix E and Section 8.

## TABLE 7-2 MAXIMUM REPORTED SOIL CONCENTRATIONS

| Constituent | Maximum Reported Soil Concentration | Location | Sample Date |
|---|---|---|---|
| Former BP Operations Areas | | | |
| Arsenic | 13.1 | HA-2 (2-4) | 6/29/2021 |
| Barium | 4640 | HA-2 (0-2) | 6/29/2021 |
| Cadmium | <0.500 | CD-6 (0-4) | 4/12/2022 |
| Chromium | 192 | HA-2 (2-4) | 6/29/2021 |
| Lead | 262 | HA-2 (2-4) | 6/29/2021 |
| Mercury | 0.0814 | HA-2 (0-2) | 6/29/2021 |
| Selenium | 1.49 | HA-10 (0-2) | 8/2/2024 |
| Silver | <0.656 | HA-2 (2-4) | 6/29/2021 |
| Strontium | 218 | HA-2 (0-2) | 6/29/2021 |
| Zinc | 162 | CD-18 (0-4) | 7/23/2024 |
| Former Anadarko Operations Areas | | | |
| Arsenic | 10.13 | HA-5 (0-2) | 6/29/2021 |
| Barium | 5590 | CD-1 (0-2) | 2/23/2022 |
| Cadmium | 1.35 | HA-5 (2-4) | 6/29/2021 |
| Chromium | 172 | HA-5 (0-2) | 6/29/2021 |
| Lead | 87.3 | HA-5 (2-4) | 6/29/2021 |
| Mercury | 0.328 | HA-5 (2-4) | 6/29/2021 |
| Selenium | 1.86 | HA-4 (0-2) | 6/29/2021 |
| Silver | 1.155 | HA-4 (0-2) | 6/29/2021 |
| Strontium | 511 | HA-5 (0-2) | 6/29/2021 |
| Zinc | 513 | HA-4 (0-2) | 6/29/2021 |

Notes:
Maximum concentrations (0-3') are shown.
Concentrations are in mg/kg dry weight.
Depths are in feet bgs.
Former BP operations areas with soil (0-3') data include HA-1, HA-2, HA-2R, HA-3, HA-10, CD-6, CD-18, SB-1, SB-2, SB-3, and SB-4.
Former Anadarko operations areas with soil (0-3') data include HA-4, HA-5, HA-9, CD-1, and CD-1R.

## TABLE 7-3 SOIL SCREENING VALUES FOR ESTIMATION OF POTENTIAL ECOLOGICAL RISKS

| Constituent | Ecological Screening Value | Background USGS | Screening Comparison | |
|---|---|---|---|---|
| | | | Soil Concentration [Maximum Value] | Screening Exceedance [Y/N] |
| Former BP Operations Areas | | | | |
| Arsenic | 18 | 12[a] | 13.1 | N |
| Barium | 2424[b] | 775 | 4640 | Y |
| Cadmium | 0.36 | 0.8 | <0.500 | N |
| Chromium | 26 | 84 | 192 | Y |
| Lead | 11 | 44 | 262 | Y |
| Mercury | 0.18 | 0.11 | 0.0814 | N |
| Selenium | 0.52 | 1 | 1.49 | Y |
| Silver | 4.2 | ND | <0.656 | N |
| Strontium | N/S | 203 | 218 | Y[c] |
| Zinc | 46 | 140 | 162 | Y |
| Former Anadarko Operations Areas | | | | |
| Arsenic | 18 | 12[a] | 10.1 | N |
| Barium | 2424[b] | 775 | 5590 | Y |
| Cadmium | 0.36 | 0.8 | 1.35 | Y |
| Chromium | 26 | 84 | 172 | Y |
| Lead | 11 | 44 | 87.3 | Y |
| Mercury | 0.18 | 0.11 | 0.328 | Y |
| Selenium | 0.52 | 1 | 1.86 | Y |
| Silver | 4.2 | ND | 1.16 | N |
| Strontium | N/S | 203 | 511 | Y[c] |
| Zinc | 46 | 140 | 513 | Y |

Notes:
Concentrations are in mg/kg dry weight.
Ecological Screening Value is the lowest of the USEPA Eco-SSLs, and for barium, the calculated soil screening value.
Detected concentrations exceeding both the soil ESV and Louisiana soil background concentration (USGS, Smith et al. 2013) are indicated with "Y".
Former BP operations areas with soil (0-3') data include HA-1, HA-2, HA-2R, HA-3, HA-10, CD-6, CD-18, SB-1, SB-2, SB-3, and SB-4.
Former Anadarko operations areas with soil (0-3') data include HA-4, HA-5, HA-9, CD-1, and CD-1R.
[a] LDEQ approved background for arsenic.
[b] See Appendix E for development of barium soil screening value.
[c] Strontium has no soil ESV and is not further assessed in the ERA.

### 7.2.2 SCREENING LEVEL RISK CALCULATIONS

The hazard quotient (HQ) is used to estimate risk in the SLERA (USEPA, 1997). The screening level HQ is estimated by comparing ESVs to exposure concentrations. The screening level HQ is defined as the estimated environmental concentration (EEC) divided by the ESV:

$$HQ = EEC / ESV$$

The EEC is the maximum dry weight concentration detected in soil in mg COPEC/kg soil. The ESV represents the concentration below which no risk is predicted. For HQ values that exceed 1.0, the potential for adverse effects to a receptor cannot immediately be ruled out. For HQs equal to or less than 1.0, risks due to that COPEC are not predicted and are dropped from further consideration. The HQ is not a cleanup standard. An HQ >1.0 does not mean that unacceptable ecological risks exist or that any remediation is needed, only that further analysis, such as a site-specific BERA, is needed.

Screening level HQs, calculated by comparison of maximum concentrations to screening values are presented in Inset Table 7-4 (soil 0-3') below. HQs for these metals exceed the screening HQ benchmark of 1.0. It should be noted that the screening level ESVs, used for HQ calculations, are primarily based on bioavailable forms of metals, which is a conservative assumption.

TABLE 7-4 COPEC SCREENING HAZARD QUOTIENTS USING MAXIMUM SOIL CONCENTRATIONS

| Constituent | Soil Concentration [Maximum Value] | Location | Lowest Ecological Screening Value | Screening Hazard Quotient (HQ) [Based on ESV] |
|---|---|---|---|---|
| Former BP Operations Areas | | | | |
| Barium | 4640 | HA-2 (0-2) | 2424 | 1.9 |
| Chromium | 192 | HA-2 (2-4) | 26 | 7.4 |
| Lead | 262 | HA-2 (2-4) | 11 | 24 |
| Selenium | 1.49 | HA-10 (0-2) | 0.52 | 2.9 |
| Zinc | 162 | CD-18 (0-4) | 46 | 3.5 |
| Former Anadarko Operations Areas | | | | |
| Barium | 5590 | CD-1 (0-2) | 2424 | 2.3 |
| Cadmium | 1.35 | HA-5 (2-4) | 0.36 | 3.8 |
| Chromium | 172 | HA-5 (0-2) | 26 | 6.6 |
| Lead | 87.3 | HA-5 (2-4) | 11 | 7.9 |
| Mercury | 0.328 | HA-5 (2-4) | a | a |
| Selenium | 1.86 | HA-4 (0-2) | 0.52 | 3.6 |
| Zinc | 513 | HA-4 (0-2) | 46 | 11 |

Notes:
Concentrations are in mg/kg dry weight.
Depths are in feet bgs.
HQs are unitless.
Ecological Screening Value is the lowest of the USEPA Eco-SSLs, and for barium, the calculated soil screening value.
a - Mercury is included for further assessment due to lack of soil screening values and exceedance of Louisiana background (USGS).

### 7.2.3 RISK CHARACTERIZATION

Risk characterization combines data for exposures and effects into a statement about risk. If screening values are not exceeded, no risk exists due to COPEC exposures at the site. If screening

values are exceeded, a more detailed and focused site-specific ecological risk analysis can be initiated.

The term site-specific refers to data that is collected from the former BP operations areas and former Anadarko operations areas on the Property to characterize the environmental conditions present. Examples of site-specific data collected for this ERA include soil constituent concentration data, other soil chemistry data (such as SPLP), barium XRD/EDX speciation data, vegetation species data, bird data, and other wildlife data. These site-specific data support the conclusions made in the ERA.

An important part of characterizing potential ecological risk is the assessment of COPEC exposure. A discussion of the screening level refinements for evaluating exposure to metal COPECs in the former BP operations areas and former Anadarko operations areas is discussed in Section 8. The screening level assessment of organic compounds is discussed in Section 9.

# 8. SCREENING RISK CHARACTERIZATION FOR METALS

The following metals exceeding screening values are further assessed in this section: barium, cadmium, chromium, lead, mercury, selenium, and zinc. Exceedances of the screening values by location are shown on Inset Table 8-1 below. The following sections discuss screening risk characterization refinements via barium bioavailability assessment and average exposure concentrations.

TABLE 8-1 SCREENING EXCEEDANCES BY SAMPLE LOCATION

| Sample Location | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Zinc |
|---|---|---|---|---|---|---|---|
| Former BP Operations Areas | | | | | | | |
| HA-2/HA-2R | X | | X | X | | | |
| HA-10 | | | | | | X | |
| CD-18 | | | | | | | X |
| Former Anadarko Operations Areas | | | | | | | |
| HA-4 | X | | X | X | X | X | X |
| HA-5 | X | X | X | X | X | | X |
| HA-9 | X | | | | | | |
| CD-1/CD-1R | X | | | | | | |

## 8.1 BIOAVAILABILITY MEASURES

Low metals bioavailability is quantified in this section through site-specific measurements. This assessment demonstrates that soils in this setting, and throughout South Louisiana, are uniquely suited to sequestering metals and creating a setting of low metal solubility/low toxicity. This section explains the methods and rationale for quantifying metals bioavailability.

A metal is bioavailable to an animal if it can be absorbed through the skin, gills, or gut. Metal species and forms that are bioavailable are generally water soluble, and very insoluble metals are generally of limited bioavailability.

If a bioavailable metal is absorbed into an animal's body, it may be primarily metabolized and excreted, or it may cause some toxicity. Metals species that do not enter an animal's body are not bioavailable, and are not toxic, because the route of exposure is incomplete. The metals bioavailability assessment performed for this ERA establishes whether or not the barium concentrations are bioavailable, so that risk can be accurately calculated.

The metals bioavailability assessment identifies whether the specific barium compound present in the former BP operations area and former Anadarko operations area conditions are ones that can

be taken up and absorbed by animals (exposure occurs), or if they are mostly insoluble compounds that are not available for animal uptake and absorption in significant quantities.

The bioavailability of barium is discussed in this section. Bioavailability was assessed via the following methods: measured solubility in SPLP, and barium speciation.

### 8.1.1 WATER SOLUBILITY

Water solubility is the largest factor in bioavailability. Very water-soluble compounds are bioavailable and compounds of low water solubility are generally of low bioavailability. Water solubility was assessed through SPLP analysis, which measures the concentration of a metal (in a soil sample) that can solubilize in water. Per SPLP measurements, barium concentrations (0-3') are of very low solubility/bioavailability and not predicted to be associated with toxicity (Table 5).

As shown on Inset Table 8-2 below, maximum barium concentrations in SPLP leachate waters are low and are well below Ambient Water Quality Criteria (AWQC) for aquatic life. The comparison of SPLP values to water quality criteria is for illustration only, as these are not regulatory standards for SPLP leachate water. However, the comparison is useful for illustrating a lack of toxicity via water to aquatic life.

TABLE 8-2 SOLUBILITY OF MAXIMUM METALS CONCENTRATIONS

| Constituent | Maximum Total Metal Concentration[a] | Corresponding SPLP Metal Concentration[b] | Ambient Water Quality Criteria – Aquatic Life | Exceedance [Y/N] |
|---|---|---|---|---|
| | (mg/kg dry weight) | (mg/L) | (mg/L) | |
| Former BP Operations Areas | | | | |
| Barium | 4,640 | 5.58 | 9.75[c] | N |
| Barium | 1,210 | 4.48 | 9.75[c] | N |
| Former Anadarko Operations Areas | | | | |
| Barium | 5,590 | 0.502 | 9.75[c] | N |

Notes:
[a] Includes split samples and resamples.
[b] SPLP (total) including for split samples and resamples.
[c] See Appendix E for development of ERM calculated barium value.

In summary, SPLP results demonstrate that barium is of low solubility, below water criteria for protection of aquatic life, and not a source of ecological risk.

### 8.1.2 BARIUM SPECIATION

Barium soil concentrations (0-3') are above ecological screening values, as shown in Inset Table 8-1. Barium is associated with E&P operations, but barium is not an ecotoxin and is of very low bioavailability. Ecological risk is not predicted for barium in sediments, soils, or waters.

Barium has been investigated by ERM in locations of legacy E&P operations throughout South Louisiana using barium speciation analyses for the last six years. The form of barium identified

through barium speciation analyses at other Louisiana legacy E&P sites has been barium sulfate, which is also the finding at the Property. Barium sulfate (barite) is of low solubility, limited bioavailability, and very low toxicity.

Barium speciation using XRD/EDX (Core Mineralogy, 2025) was analyzed in soil samples from locations with an ESV exceedance for barium (HA-2R, CD-01R) and from additional locations (SB-3, HA-10R. The results of these analyses are that the form of barium detected in the former BP operations areas and former Anadarko operations areas is barium sulfate. No other forms of barium were detected. See Table 6 for barium speciation data. See Appendix E for barium speciation methods and barium ecological screening values.

Core performed XRD and EDX analyses of barium data in 2025. In XRD (X-Ray Diffraction) analysis, an X-ray source targets X-rays towards the sample. The diffracted energy waves enter the detector and are interpreted to determine the crystalline mineral structure of the sample. EDX (Energy Dispersive X-ray Spectrometry) analysis is also referred to as SEM-EDX because it uses a Scanning Electron Microscope (SEM) to produce the electron beam that bombards the sample and produces the X-rays which are then analyzed by an EDX detector. The X-rays are interpreted to identify elemental composition of a sample at the microscopic level.

### 8.1.3 BARIUM BIOAVAILABILITY SUMMARY

The EDX and XRD results from these analyses indicate that barium present at the former BP operations areas and former Anadarko operations areas is in the form of barite (Table 6). Additionally, as presented in Section 8.1.1, the SPLP results are below the water solubility of barite and are expected concentrations of low solubility barite.

Based on the finding of low solubility in the SPLP results (presented in Section 8.1.1), and the finding that all barium is in the form of barite, barium is demonstrated to be of low bioavailability and low toxicity at the former BP operations areas and former Anadarko operations areas.

## 8.2 METALS RISK CHARACTERIZATION AND BERA COPEC DETERMINATION

Per USEPA (2018), locations with exceedances of screening values are further screened using average exposure concentration and bioavailability data. Metal risk characterization is described below for the former BP operations areas and the former Anadarko operations areas.

### 8.2.1 FORMER BP OPERATIONS AREAS

The following metals were eliminated from the BERA based on bioavailability and other considerations as detailed below: selenium and zinc (see Inset Table 8-3). Barium, chromium, and lead were retained for further assessment in the BERA for soil exposure. The result of the full BERA assessment is that barium, chromium, and lead are not a source of ecological risk, as explained in Section 10.

TABLE 8-3 SPLIT SAMPLE AVERAGE CONCENTRATIONS AS COMPARED TO SCREENING VALUES IN THE FORMER BP OPERATIONS AREAS

| Constituent[a] | Sample (Depth)[a] | Sample Maximum Concentration | Sample Average Concentration[b] | Screening Value[c] | Retain for BERA?[d] |
|---|---|---|---|---|---|
| Selenium | HA-10 (0-2) | 1.49 | - | 1.0 | N |
| Zinc | CD-18 (0-4) | 162 | 101 | 140 | N |

Notes:
Depths are in feet bgs.
[a] Sample-specific constituents eliminated from further assessment are shown.
[b] Average of split sample results, including resample.
[c] Screening value shown is the higher of the lowest soil screening values (USEPA Eco-SSLs) and Louisiana background (USGS).
[d] Constituent not retained for this sample due to sample average concentration being less than screening value, or other. See discussion below.

- **Barium:** Barium concentrations at HA-2 (0-2', 2-4') exceeded barium screening values. Not all forms of barium in soil are associated with ecological risk to wildlife (USGS, 2017; USEPA, 1994). Barium speciation analyses, XRD/EDX, at HA-2R (0-2'), HA-10R (0-2'), and CD-1R (0-2') demonstrate that barium sulfate is the only form of barium and no other forms of barium were detected. Barium concentrations in SPLP leachate water are below the water solubility of barite and are expected concentrations of low solubility barite. Barium in the former BP operations areas is of very low bioavailability and very low toxicity to ecological species and is not a source of ecological risk in soils at the former BP operations areas. Barium is not predicted to pose a risk to wildlife, but is retained as a COPEC for the BERA for demonstration purposes. Barium, along with chromium and lead, at HA-2 is further assessed in the BERA.
- **Selenium:** Selenium was detected in 1 of 15 samples (0-3') in the former BP operations areas, at a concentration of 1.49 mg/kg dry at HA-10 (0-2'), which is similar to selenium concentrations in unimpacted Louisiana soils ranging up to 1.2 mg/kg dry (USGS, Smith et al., 2013). Selenium is an essential micronutrient in animals, and based on the limited frequency of detection and concentration similar to unimpacted soils, selenium can be screened out (USEPA 2018). Selenium is not anticipated to pose a risk to wildlife. Field observations indicate selenium is not impacting plant health. Selenium is not retained as a COPEC for the BERA.
- **Zinc:** Zinc exceeded Louisiana soil background (USGS, Smith et al., 2013) in 1 of 19 samples (0-3') in the former BP operations areas. The zinc concentration of 162 mg/kg dry at CD-18 (0-4') exceeded the Louisiana soil background concentration of 140 mg/kg dry. However, the split sample result at CD-18 (0-4') of 39.9 mg/kg dry and the average split concentration at CD-18 (0-4') of 101 mg/kg dry were less than the Louisiana soil background of 140 mg/kg dry. Zinc is not predicted to be a risk to wildlife, and is not retained as a COPEC for the BERA.

### 8.2.2 FORMER ANADARKO OPERATIONS AREAS

Metal concentrations using the average of split samples do not exceed screening values for sample locations shown on Inset Table 8-4. Barium, cadmium, chromium, lead, mercury, and zinc were retained for further assessment in the BERA for soil exposure. The result of the full BERA assessment is that barium, cadmium, chromium, lead, mercury, and zinc are not a source of ecological risk, as explained in Section 10.

TABLE 8-4 SPLIT SAMPLE AVERAGE CONCENTRATIONS AS COMPARED TO SCREENING VALUES IN THE FORMER ANADARKO OPERATIONS AREAS

| Constituent[a] | Sample (Depth)[a] | Sample Maximum Concentration | Sample Average Concentration[b] | Screening Value[c] | Retain for BERA?[d] |
|---|---|---|---|---|---|
| Barium | HA-9 (0-2) | 2630 | 1361 | 2424 | N |
| Barium | HA-9 (2-4) | 2420 | 1291 | 2424 | N |
| Chromium | HA-4 (0-2) | 120.9 | 75 | 84 | N |
| Lead | HA-4 (0-2) | 45.3 | 34 | 44 | N |
| Mercury | HA-4 (0-2) | 0.166 | 0.11 | 0.11 | N |
| Selenium | HA-4 (0-2) | 1.86 | 1.86 / ND | 1.0 | N |

Notes:
Depths are in feet bgs.
[a] Sample-specific constituents eliminated from further assessment are shown.
[b] Average of split sample results, including resample.
[c] Screening value shown is the higher of the lowest soil screening values (USEPA Eco-SSLs, calculated screening value (barium)) and Louisiana background (USGS).
[d] Constituent not retained for this sample due to sample average concentration being less than screening value, or other. See discussion below.

An assessment of the split sample results in the former Anadarko operations areas confirmed exceedances of barium, cadmium, chromium, lead, mercury, selenium, and zinc in samples HA-4, HA-5, HA-9, CD-1/CD-1R, except as follows:

- **Barium:** Barium was detected in HA-9 (0-2') at 2,630 mg/kg dry, above the ESV of 2424 mg/kg. The HA-9 (0-2') split sample (92.2 mg/kg dry) and average of split samples (1,361 mg/kg dry) were less than the ESV of 2424 mg/kg dry. Barium was detected in HA-9 (2-4') at 2,420 mg/kg dry and 162 mg/kg dry. These results for HA-9 (2-4) are less than the ESV of 2424 mg/kg. Barium is not retained at HA-9 for further assessment in the BERA.
- **Chromium:** Chromium in HA-4 (0-2') exceeded the ESV. The average of split sample results (0-2') was less than the ESV: 75 mg/kg dry average versus 84 mg/kg ESV. Chromium in HA-4 was not retained for further assessment in the BERA.
- **Lead:** Lead in HA-4 (0-2') exceeded the ESV. The average of split sample results (0-2') was less than the ESV: 34 mg/kg dry average versus 44 mg/kg ESV. Lead in HA-4 was not retained for further assessment in the BERA.

- **Mercury:** Mercury in HA-4 (0-2′) exceeded the ESVs. The average of split sample results (0-2′) was less than the ESV: 0.11 mg/kg dry average versus 0.11 mg/kg ESV. Mercury in HA-4 was not retained for further assessment in the BERA.
- **Selenium:** Selenium was detected in one sample (HA-4) at a concentration similar to Louisiana background (USGS), but was non-detect in the split sample, as well as all other soil (0-2′) samples in the former Anadarko operations areas. Selenium is an essential micronutrient in animals, and based on the limited frequency of detection and concentration similar to unimpacted soils, selenium is not anticipated to pose a risk to wildlife. Field observations indicate selenium is not impacting plant health. Selenium is not retained as a COPEC for the BERA.

# 9. SCREENING RISK CHARACTERIZATION FOR ORGANIC COMPOUNDS

Organic compounds, including TPH and PAHs, were analyzed in soils at the former BP operations areas and former Anadarko operations areas. A screening level assessment of TPH and PAH is presented in the following section.

## 9.1 TOTAL PETROLEUM HYDROCARBONS (TPH)

Weathered TPH, such as those present in soils at the former BP operations areas, are not one compound with a specific chemical formula, but are made up of many different-sized chains of hydrocarbons from both anthropogenic and natural sources. Ecotoxicity studies of TPH that have weathered for years or decades are limited in the scientific literature, and standards and benchmarks for weathered and degraded TPH are not available from USEPA, LDENR, or LDEQ.

Weathering processes cause hydrocarbons to become less bioavailable and therefore less toxic, as the volatile and soluble compounds are lost from the TPH compounds and stronger sorption and binding occurs between the long chain hydrocarbons to soils and sediments (Di Toro, 2007). Weathered TPH are poorly water soluble, which limits their bioavailability to ecological species. In general, the longer the weathering, the less bioavailable the TPH.

It should also be noted that the TPH soil results reported in this ERA (Inset Table 9-1) were produced by three methods that can generate very different results. The SW-846 8015 analytical method, used to analyze TPH mixtures, reports hydrocarbon compounds by molecular weight and may include, in the reported amount, naturally occurring degraded organic matter in addition to petroleum hydrocarbons. The MAEPH LA and MAVPH LA methods, used to analyze hydrocarbon fractions, is designed to extract and detect aromatic and aliphatic compounds, which are compounds that in this former BP operations area setting, have had a chance to degrade into compounds that may no longer have aliphatic or aromatic structures. The aliphatic and aromatic hydrocarbons, over time and natural weathering, incorporate oxygen and other elements into their structures, changing the nature of their reaction chemistry. The different analytical methods used (SW-846 8015 versus MAEPH/VPH), and the nature of the weathered hydrocarbons being analyzed, can generate results that are several orders of magnitude different for the same sample.

ICON measures hydrocarbons in soil using the TPH mixture method of analysis, whereas HET analyzes soil using the TPH fraction method. RECAP, Appendix D, requires the use of hydrocarbon fraction analysis and expressly notes that hydrocarbon fraction analysis supersedes the results of TPH analyses. At one soil sample in the former BP operations areas (HA-2), total TPH mixture concentrations up to 1,623 mg/kg-dw were reported and the total TPH fraction concentrations up to 1,357 mg/kg-dw were reported. However, in the resample at HA-2 (HA-2R 0-3'), total TPH fractions were not detected. A sample in the former Anadarko operations areas (HA-5 2-4') had detected TPH mixture concentrations up to 1,801 mg/kg-dw, but had low TPH fraction concentrations (263 mg/kg-dw). Per literature review, weathered TPH in soils are of low toxicity and have been shown to be non-toxic to birds, mammals, and invertebrates in soil concentrations ranging from 3,000 – 16,000 mg/kg (Pattee and Franson, 1982; Zhou et al., 2019; and Berger et

al., 2016). Measured hydrocarbons in surface soils of the former BP operations areas and the former Anadarko operations areas are weathered and degraded and are well below ecological levels of concern for weathered TPH in soil. The measured concentrations of TPH in site soils are below levels of ecological concern and are not presenting ecological risk to the site ecosystem.

In addition to the measured TPH soil concentrations being below levels of concern, the field evidence of thriving vegetation in the locations where TPH was measured supports the absence of adverse effects due to TPH. At HA-2, HA-10, and HA-5, grasses, forbs, vines, shrubs, and herbaceous species of vegetation were observed, with no denuded areas or vegetation that was not thriving. The line of evidence of healthy vegetation in the area where TPH was measured, supports the conclusion of no effects to the ecosystem due to TPH in soil.

Based on low TPH soil concentrations that are below literature values of concern for weathered TPH, as well as thriving vegetation growing throughout the former BP operations areas and the former Anadarko operations areas, TPH are not affecting the ecology and are not further assessed beyond the screening level of assessment.

TABLE 9-1 HYDROCARBON SCREENING

| Location | Depth | Sample Date | TPH Mixture | TPH Fraction | HMW PAH | LMW PAH |
|---|---|---|---|---|---|---|
| USEPA Soil Eco-SSL: | | | | | 29 | 1.1 |
| Former BP Operations Areas | | | | | | |
| HA-2 | 0-2 | 6/29/2021 | 63.7 | 86 | NA | NA |
| HA-2R | 0-2 | 4/23/2025 | NA | ND | 0.00761 | 0.00097 |
| HA-2 | 2-4 | 6/29/2021 | 1,623 | 1,357 | NA | NA |
| HA-2R | 2-4 | 4/23/2025 | NA | ND | 0.010936 | 0.00636 |
| HA-10 | 0-2 | 8/2/2024 | ND | 10.83 | NA | NA |
| HA-10 | 2-4 | 8/2/2024 | ND | 3.87 | NA | NA |
| Former Anadarko Operations Areas | | | | | | |
| HA-5 | 2-4 | 6/29/2021 | 1,801 | 263 | NA | NA |

Notes:
Concentrations shown are sums (TPH Mixture, TPH Fraction, HMW PAH, and LMW PAH).
Concentration is in mg/kg dry weight.
Depths are in feet bgs.
PAH: Polycyclic Aromatic Hydrocarbons
HMW PAH: Sum of High Molecular Weight PAH (benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, fluoranthene, pyrene).
LMW PAH: Sum of Low Molecular Weight PAH (2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene).
Non-detect results were treated as zero concentration (0 mg/kg) for summation.

## 9.2 POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)

While there are effect concentrations for weathered TPH in the literature, benchmarks for weathered/degraded TPH are not available from USEPA, LDENR, or LDEQ. However, there are PAH ecotoxicity screening values from USEPA for soil. Because PAH are the most toxic portion of TPH, PAH are the most appropriate group of hydrocarbons for the assessment of potential ecological effects of petroleum hydrocarbons in soil.

To evaluate potential ecological effects to terrestrial biota, the assessment focuses on PAH concentrations within the 0-3′ depth interval compared to soil ESVs. This is based on the assumption that this interval represents the biologically active zone to which biota (plants, invertebrates, and wildlife) are most highly exposed in these media (LDEQ, 2003). To be inclusive of 0-3′ data, soil samples collected in the 0-2′ and 2-4′ depth intervals were included in the evaluation.

Potential effects to terrestrial biota from PAH are assessed in 2 soil samples (HA-2R 0-2′, HA-2R 2-4′) by comparing the sum of high molecular weight (HMW) PAH and the sum of low molecular weight (LMW) PAH to Eco-SSLs (USEPA, 2007d). The 16 PAH specified in RECAP (LDEQ, 2003) as indicator analytes for TPH were used in summation (see Notes for Inset Table 9-1 for specific PAH in each group). Inset Table 9-1 presents the sum values compared to Eco-SSLs.

PAH concentrations in the resample at HA-2 (0-2′, 2-4′) do not exceed screening values for LMH PAHs or HMW PAHs, as shown on Inset Table 9-1. PAHs are not an ecological risk and are not carried forward into the BERA.

# 10. BASELINE ECOLOGICAL RISK ASSESSMENT (BERA)

## 10.1 ERA STEP 3

Based on the results from Step 2 of the USEPA (1997) ERA process, the following COPECs at the former BP operations areas exceed conservative screening values (Inset Table 10-1) and are further investigated in the BERA: barium, chromium, and lead. The following COPECs at the former Anadarko operations areas exceed conservative screening values (Inset Table 10-1) and are further investigated in the BERA: barium, cadmium, chromium, lead, mercury, and zinc.

TABLE 10-1 COPECS FOR THE BERA

| Location | Barium | Cadmium | Chromium | Lead | Mercury | Zinc |
|---|---|---|---|---|---|---|
| Former BP Operations Areas | | | | | | |
| HA-2 / HA-2R | X | | X | X | | |
| Former Anadarko Operations Areas | | | | | | |
| HA-4 | X | | | | | X |
| HA-5 | X | X | X | X | X | X |
| CD-1 / CD-1R | X | | | | | |

At the conclusion of Screening level Step 2, a Scientific Management Decision is made to either proceed to a site-specific BERA or to end the risk assessment at the screening level (USEPA, 1997). Based on the screening results, the Scientific Management Decision at the conclusion of Step 2 is to proceed to a site-specific BERA.

The BERA is a site-specific ecological evaluation based on the chemical forms of constituents present, the concentrations of COPECs, and the ecotoxicity of chemical species within exposure pathways that are complete. The BERA assesses potential toxicological impacts to ecological populations using indicator or surrogate species.

In the BERA, site-specific data are evaluated. The bioavailability of COPECs is evaluated along with fate and transport, potential for bioconcentration, bioaccumulation, and biomagnification in the food chain. Indicator species are selected to assess ecotoxicity of COPECs. To select appropriate indicator species, trophic level relationships and the physical structure of the habitat are considered. The toxicity endpoints used in this stage of the risk assessment are values based on mortality, reproduction, or growth.

In order to assess toxicity via ingestion exposure in a variety of animal populations, several indicator species were assessed. The following factors are considered in the species selection process: 1) ecological relevance to the Property, 2) vulnerability to exposures, 3) sensitivity to

toxic effects of COPECs, 4) social and economic importance, 5) protected species status, and 6) availability of species-specific toxicological information.

The following avian and mammalian indicator species were selected for the site-specific BERA: 1) Mourning Dove (*Zenaida macroura*), 2) Northern Cardinal (*C. cardinalis*), 3) White-eyed Vireo (*V. griseus*), 4) Red-tailed Hawk (*B. jamaicensis*), 5) Swamp Rabbit (*Sylvilagus aquaticus*), 6) White-tailed Deer (*O. virginianus*), 7) Raccoon (*P. lotor*), and 8) Coyote (*C. latrans*). The following sections discuss the lifestyle of these species.

These species were selected here to represent birds and mammals of various trophic levels and diet that can be present in a prairie and bottomland hardwood forested setting. The following sections discuss the lifestyle of these species. Note that aquatic food web exposure (e.g., consumption of rice or crawfish) is evaluated as a future use scenario in Section 10.7.

### 10.1.1 MOURNING DOVE (ZENAIDA MACROURA)

The Mourning Dove (*Z. macroura)* was selected to represent herbivorous birds in land habitats. The Mourning Dove is a widespread partially migratory bird species that is endemic from the Southern Provinces of Canada in North America all the way to southern Central America. However, it is primarily a residential bird species in the lower latitudes of North America and can be found in rural, suburban, and urban landscapes. The Mourning Dove prefers open habitats such as open woodlands and edges between forest and prairie and not deep forested areas.

The Mourning Dove has a typically grayish-blue to grayish-brown body with black-bordered white tips on its wing and tail feathers. Black spots are present on the wing and back feathers with one black spot or streak behind and below the eye. Additionally, the bill of a Mourning Dove is black and their legs and feet are a dull red color. Males (26.5-34 centimeters and 96-170 grams) are larger and slightly more colorful than females (22.5-31 centimeters and 86-156 grams), having a more bluish crown and nape as well as a paler rosier breast. The Mourning Dove diet consists of 99% seeds from cultivated plants such as sunflowers, corn, wheat, grain sorghum, various millets, buckwheat, barley, and peanuts and wild plants such as grasses, spurges, crotons, goosefoots, saltbushes, ragweeds, pokeweeds, poppies, amaranths, smartweeds, hemp, purslanes, and pines. The Mourning Dove forages almost exclusively on the ground, using its beak to expose seeds found under litter. During the breeding and nesting season, the Mourning Dove will feed in pairs while late summer through autumn they will feed in larger flocks. The Mourning Dove's home range is extensive between their feeding sites and their nesting sites which can be as much as 1 to 8 kilometers apart. Due to their adaptability, Mourning Dove nests on the ground, shrubs, trees, and ledges. The average clutch size for a Mourning Dove is two eggs with the fledging season occurring primarily in summer from May through August, although in the southern latitudes can occur year-round. The Mourning Dove's expected lifespan is about 1 year for adult birds (The Cornell Lab of Ornithology, 2020c).

The Mourning Dove is a game species in Louisiana, classified as a webless migratory game bird. The Property is located in the South Zone for Dove season, which in 2024-2025, occurs from September 7-21, October 19-Novemeber 30, and December 14-January 14. LDWF's Louisiana Big and Small Game Harvest Survey for 2021-2020 reported that 22,800 hunters harvested 429,600

mourning doves during 76,400 days of dove hunting (LDWF, 2022). The Mourning Dove was observed at HA-2 and elsewhere on the Property.

### 10.1.2 NORTHERN CARDINAL (CARDINALIS CARDINALIS)

IMAGE 10-1 NORTHERN CARDINAL

Pictured is an adult male Northern Cardinal (*C. cardinalis*) on the Property. Photographed by C. Matherne on April 16, 2025.

The Northern Cardinal (*C. cardinalis*) was selected to represent birds that eat terrestrial invertebrates and plants. The Northern Cardinal was selected because it has been observed at the Property and is found year-round in semi-open woodlands across the eastern United States.

Northern Cardinals are a common and easily recognized medium-sized songbird throughout Louisiana. Both females and males have a distinctive crest, red-orange bill, and mask on face (The Cornell Lab of Ornithology, 2021). Males have more distinctive plumage than females with solid bright red feathers with a black mask. Females have a less defined mask and are grayish tan with red tinges in wing, tail, and crest feathers. Northern Cardinal can be found opportunistically foraging on or near the ground and occasionally from higher branches of a tree or shrub (The Cornell Lab of Ornithology, 2021). Primarily herbivorous, the Northern Cardinal will feed on vegetable matter such as seeds and fruits and on animal matter such as insects. Generally, adult Northern Cardinals retain their breeding territories all year-round unless they must move due to food or shelter deficiencies (The Cornell Lab of Ornithology, 2021). Northern Cardinals are

monogamous and nest in denser vegetation with woody plants having a typical clutch size of two to three eggs. Male and female Northern Cardinals are territorial throughout the breeding season and defend their territory through song matching and over-singing, diving, and physical attacks.

Northern Cardinals were observed at HA-2 and throughout the Property.

### 10.1.3 WHITE-EYED VIREO (VIREO GRISEUS)

IMAGE 10-2 WHITE-EYED VIREO

Pictured is an adult White-eyed Vireo (*V. griseus*) on the Property. Photographed by J. Shugart on April 15, 2025.

The White-eyed Vireo (*V. griseus*) was selected to represent birds that eat terrestrial invertebrates. The White-eyed Vireo was observed on the Property and is found year-round in the southeastern United States. The primary habitats of the White-eyed Vireo include mid- to late-successional forests, preferring places where there is dense undergrowth. These habitats often occur along forest edges, in wetland and swamp thickets, overgrown fields, or in reforested areas (The Cornell Lab of Ornithology, 2022).

Both males and females share similar plumage, with greyish-olive green heads and backs, white underparts, washed-out yellow flanks, and greyish-brown tails. Their wings are marked with 2 white wingbars, and a yellow stripe extends from the top of their beaks around their eyes (The Cornell Lab of Ornithology, 2022). Males and females are also similar in size. The White-eyed

Vireo consumes primarily terrestrial insects, consuming high amounts of caterpillars and spiders. They also consume small amounts of fruits and berries, more-so during the winter/nonbreeding season. White-eyed Vireo forage mostly in deciduous undergrowth, taking prey from foliage rather than capturing from the air or from trunks and branches (The Cornell Lab of Ornithology, 2022). Male White-eyed Vireos will defend their territory during the breeding season through physical attacks and other agonistic encounters, whereas females will not. White-eyed Vireos nest in dense growth. They are monogamous and a breeding pair can produce two to three nests during one breeding season, often with three-five eggs each time (The Cornell Lab of Ornithology, 2022).

White-eyed Vireos were observed at HA-2 and throughout the Property.

### 10.1.4 RED-TAILED HAWK (BUTEO JAMAICENSIS)

IMAGE 10-3 RED-TAILED HAWK

Pictured is an adult Red-tailed Hawk (*B. jamaicensis*) flying around the Property. Photographed by C. Matherne on April 15, 2025.

The Red-tailed Hawk (*B. jamaicensis*) is a widespread soaring-hawk species that is endemic in the Southern Provinces of Canada and the United States, and year-round residents in southern latitudes of the United States. The primary habitats of the Red-tailed Hawk include woodlands, wetlands, pastures, prairies, and some deserts. The Red-tailed Hawk is able to adapt to rural, suburban, and urban landscapes.

The physical appearance of a Red-tailed Hawk can vary across North America but typically has the brick red color on its tail feathers with variations of brown on its wings, neck, and head, pale underbelly, and yellow legs and feet. Males (46 cm and 1 kilograms) are approximately 20% larger than females. The Red-tailed Hawk is carnivorous and will hunt for small- to medium-sized prey in open fields, forest edges, and most open areas. The preferred hunting method of a Red-tailed Hawk is to start from an elevated perch location usually near woodland edges to pursue prey such as mice, shrews, voles, rabbits, squirrels as well as birds, lizards, snakes, and large insects. Breeding hawks select wooded or semi-wooded areas where they can build their nests close to tree tops or, if trees are scarce, then high up on rock pinnacles, ledges or even man-made structures. The Red-tailed Hawk is territorial year-round where its home range can be few hundred to 1,500 hectares. Red-tailed Hawks breed once per year during mid-February to mid-May with a clutch size of one to three eggs. The Red-tailed Hawk reaches sexual maturity at two years of age and has a life span up to 18 years (USEPA, 1993).

Red-tailed Hawks were observed at HA-2 and elsewhere on Property.

### 10.1.5 SWAMP RABBIT (SYLVILAGUS AQUATICUS)

IMAGE 10-4 RABBIT

Pictured is a rabbit camouflaged under vegetation cover on the Property. Photographed by J. Shugart on April 16, 2025.

The swamp rabbit (*S. aquaticus*) was selected to represent plant-eating mammals at the Property. Swamp rabbits, also known as cane-cutters, are found in marshy lowlands along the Gulf coast from South Carolina to Texas.

Swamp rabbits often feed at dusk, eating emergent aquatic vegetation and succulent herbaceous vegetation, such as grasses, sedges, and cane. Swamp rabbits breed year-round on the Gulf coast and nests are often constructed underneath brush or fences (Wilson and Ruff, 1999).

Swamp rabbits are hunted in Louisiana, with 2024-2025 trapping season across the state from October 5-February 28. LDWF's Louisiana Big and Small Game Harvest Survey for 2021-2020 reported that 16,400 rabbit hunters harvested 100,000 rabbits (LDWF, 2022). Rabbit was observed on the Property.

### 10.1.6 WHITE-TAILED DEER (ODOCOILEUS VIRGINIANUS)

The white-tailed deer (*O. virginianus*) was observed on the Property and was selected to represent herbivorous mammals in land habitats. White-tailed deer commonly occur throughout North America and Central America, from the big woods of northern Maine to the swamps of Florida. White-tailed deer thrive in an array of habitats including swamps and forests, particularly areas that can provide cover and provide food sources. Completely herbivorous, the white-tailed deer feeds on buds and twigs of trees and shrubs. White-tailed deer are grayer in winter and redder in summer with white fur that occurs beneath the tail as well as inside the legs and ears, around the eyes, and over the chin, throat, and nose. White-tailed deer are good swimmers and extremely skittish. The basic social unit is the female and her fawns. During mating season, October to December, they communicate with gland secretions and vocalizations. The average number of offspring is 2 fawns that stay with the mother for up to two years. Females are very protective and will hide their offspring in vegetation while feeding. The average life span of a white-tailed deer is 2-3 years (University of Michigan, 2003).

White-tailed deer are hunted in Louisiana. The Property is located in Deer Area 10, which allows hunters to use archery and firearms to hunt deer. Archery season lasts in 2024-2025 from September 21-January 15, while firearm season occurs October 12-18, and January 6-12 (primitive firearms), and October 19-January 5 (firearms, still-hunt only). LDWF's Louisiana Big and Small Game Harvest Survey for 2021-2020 reported that 208,200 deer hunters spent about 5.1 million days afield, and harvested 233,400 deer (LDWF, 2022). The white-tailed deer was observed on the Property.

### 10.1.7 RACCOON (PROCYON LOTOR)

Raccoons (*P. lotor*) are nocturnal omnivores found throughout North America. They have a black mask appearance across their eyes, a pointed snout, and a bushy ringed tail. Raccoons can be grey, reddish brown, or beige. Their front paws look like human hands and they are dexterous in using their paws to collect and manipulate food. Raccoons can eat insects, eggs, small mammals, fruit, berries, seeds, frogs, crayfish, fish, and mollusks. However, they adapt to the available diet. Raccoons often rinse their food in water prior to eating. Raccoons weigh about six to seven kilograms (about 6-15 pounds) depending on food availability, with males being generally larger than females. Raccoon body length ranges from ~600 to 950 mm (two to three feet, including tail). Their front legs are shorter than their hind legs, producing a hunched appearance when walking or running. Raccoons can swim and climb. They prefer forested habitat near water, but

adapt to many habitats. The lifespan of raccoons in the wild is approximately two to five years (Chow et al., 2005; Goldman, 1950; Hamilton, 1936; Schuttler et al., 2015).

The raccoon is classified by LDWF as a furbearer in Louisiana, with trapping season in 2024-2025 from November 20 through March 31. Licensed hunters are allowed to take outside of trapping season as well. Raccoon was observed on the Property.

### 10.1.8 COYOTE (CANIS LATRANS)

The coyote (*C. latrans*) is a widespread and extremely adaptable species that is found as far north as Canada, the entire United States, and as far south as Panama in Central America. The primary habitats of the coyote include forests, grasslands, deserts, and swamps as well as able to adapt to agricultural, suburban, and urban landscapes.

The coyote has a grayish brown to a yellowish gray upper coat and a whitish under-belly and throat with reddish brown forelegs, muzzle, and feet. Coyotes usually have black-tipped guard hairs on its back, a black nose, and a bottle-shaped tail with a black tip. Males are larger than females with an average mass of 7-21 kilograms and 75-100 centimeters long.

The coyote diet mainly consists of small mammals such as rabbits, squirrels, and mice. Additionally, their versatility enables them to feed on birds, snakes, large insects, and carrion as well. During the fall and winter months, the coyote is known to get a significant portion of its diet from fruits and vegetables such as leaves of balsam fir and white cedar, sarsaparilla, strawberry, and apple. Coyotes are nocturnal predators that can hunt individually or form hunting partnerships to hunt prey such as deer and can travel as much as 4 kilometers during a night's hunt.

Coyotes breed typically once a year from January to March with gestation lasting 60 to 63 days. Litter size ranges from 1 to 19 pups (average is 6 pups). Pups are born and remain in a den until approximately 28 days after birth for protection from predators and competitors. Coyotes will often enlarge burrows from other animals to make their den. The adults will hunt and defend their territory up to 19 kilometers in diameter along fixed routes and trails. Coyotes become adults and sexually mature at 12 months of age with an average lifespan in the wild of 14.5 years (University of Michigan, 2001).

The coyote is considered resident small game by LDWF. LDWF's Louisiana Big and Small Game Harvest Survey for 2021-2020 reported that an estimated 16,200 hunters harvested 43,500 coyotes (LDWF, 2022). Licensed hunters in Louisiana are allowed to harvest coyote year-round. Coyote was observed on the Property.

## 10.2 ERA STEP 4

### 10.2.1 WORK PLAN AND SAMPLING PLAN

For assessing wildlife receptor exposures, available soil concentration data and vegetation and wildlife observation and survey data (ERM, 2021, 2024, 2025; ICON, 2021, 2022, 2024; HET, 2025) for the former BP operations areas and the former Anadarko operations areas were used. Chemical exposure point concentrations were estimated; chemical environmental fate and

transport mechanisms were determined; potentially exposed populations were identified; and ingestion exposure routes were identified (Appendices G and H).

Under RECAP, an area of investigation (AOI) can be used to evaluate exposure to ecological species in the exposure assessment. Preliminary AOIs for ERA purposes were developed to accurately estimate and evaluate ecological exposures (e.g., through concentration averaging) across a distinct relevant exposure area having similar habitat. Within each sampling area, the nature and spatial distribution of ecological screening exceedances were assessed and preliminary AOI groupings were developed accordingly. The COPEC list is specific to the preliminary AOI and can vary between preliminary AOIs. One soil preliminary AOI was developed for the former BP operation areas and three soil preliminary AOIs were developed for the former Anadarko operations areas. The soil preliminary AOIs and the COPECs are shown on Figures 30 and 31 for the former BP operations areas and the former Anadarko operations, respectively.

For a site-specific BERA, exposure estimates can be based on the 95% UCL of the arithmetic mean of concentrations or average concentrations (USEPA, 1997; LDEQ, 2003). For this BERA, a 95% UCL (where sufficient data were available), and the average concentrations were used to calculate risk (Appendix I). Exposure estimates used in the site-specific BERA are presented below on Inset Table 10-2.

TABLE 10-2 EXPOSURE POINT CONCENTRATIONS FOR SOIL PRELIMINARY AOIS

| Sample Location | Preliminary AOI | COPEC[1] | Average Concentration (0-3')[2,3] |
|---|---|---|---|
| Former BP Operations Areas | | | |
| HA-2, HA-2R | Preliminary AOI HA-2 | Barium | 2,613 |
| | | Chromium | 61 |
| | | Lead | 96 |
| Former Anadarko Operations Areas | | | |
| HA-4 | Preliminary AOI HA-4 | Barium | 2,097 |
| | | Zinc | 166 |
| HA-5 | Preliminary AOI HA-5 | Barium | 2,915 |
| | | Cadmium | 0.69 |
| | | Chromium | 112 |
| | | Lead | 57 |
| | | Mercury | 0.25 |
| | | Zinc | 243 |
| CD-1, CD-1R | Preliminary AOI CD-1 | Barium | 3,340 |

Notes:
[1] COPEC retained for the BERA following the SLERA risk characterization.
[2] Concentrations are in mg/kg dry weight.
[3] Value includes data from split samples and resample.

## 10.2.2 MEASUREMENT ENDPOINTS

Measurement endpoints for the BERA are Toxicity Reference Values (TRVs). TRVs are estimated to be safe doses for the wildlife being assessed (Table 7).

TRVs used in the BERA calculations for barium, cadmium, chromium, lead, mercury, and zinc are based on studies that use the most toxic and bioavailable form of the element being assessed and are based on reproduction, growth, or mortality.

### 10.2.3 STUDY DESIGN

The BERA uses more realistic input values and assumptions than are used in the SLERA. The following sections describe some of the assumptions used in the BERA, as compared to the SLERA.

**Bioavailability and Bioaccumulation:** Bioavailability of soil contaminants is assumed to be 100 percent in the SLERA. In the BERA, more accurate bioavailability has been estimated from a review of the scientific literature (Tables 8 and 9).

**Dietary composition:** In the BERA, the diet composition of the receptor is based on scientific research and specifically, the diet composition of animals native to Louisiana is used when that information is available (Table 10).

**Area-use factor:** The area use factor in the BERA more accurately represents the actual percentage of an animal's home range that may be affected and the percentage of time that the receptor would spend in the contaminated area, by incorporating home range and time estimates in the calculations (Table 11).

**Life stage:** In the BERA, data from an average receptor age is used to estimate risk. It is an overestimation of risk to assume that the entire population at the Property is at the most sensitive life stage.

**Body weight and food ingestion rates:** The BERA uses the body weights and food ingestion rates from the primary scientific literature to accurately estimate risk at the Property. Body weights from studies of Louisiana animals are used when available (Table 10).

**Toxicity Values:** For the SLERA, toxicity is estimated for entire classifications of receptors (example: invertebrates) by comparing soil concentrations to screening values that are calculated to be overly inclusive. The screening values are designed to "not miss" the possibility of risk being present. For the BERA, TRVs are used for calculating risk. TRVs are species-specific and are used to calculate a more accurate risk estimate for a representative receptor population (Table 7).

### 10.2.4 DATA QUALITY OBJECTIVES

Data Quality Objectives are important to the acquisition of reliable data for quantitative risk assessment. Risk-based decisions must be based on data of known quality which meet LDEQ RECAP and USEPA requirements. The data for this risk assessment were determined to be usable for risk assessment and comply with LDEQ RECAP and USEPA requirements.

The soil data collected and discussed in this report were collected by ERM (2021, 2022, 2024, 2025), ICON (2021, 2022, 2024, 2025), and HET (2025). The chemical analyses of salinity, metals, TPH fractions, and PAHs in soil were performed by ALS Environmental (Houston, TX), Eberline Analytical/Oak Ridge Laboratory (Oak Ridge, Tennessee), Element Materials Technology Lafayette (Lafayette, Louisiana), Pace Analytical Services, LLC (Greensburg, Pennsylvania), and Waypoint Analytical (Marrero, Louisiana). ALS, Eberline, Element, Pace, and Waypoint are LDEQ LELAP certified laboratories.

All laboratory qualified data have been included in the risk assessment. Data were generated using LDENR 29-B, USEPA SW-846, TPH MADEP VPH and EPH methods. Additional X-Ray Diffraction (XRD) barium speciation analysis was performed by CORE Mineralogy in Broussard, LA. Data meet the definition of definitive data per RECAP guidelines. Samples were appropriately collected and identified in the field by sample identification number, and date and time of collection. Sample quantitation limits were reviewed and found to be acceptable for ERA.

## 10.3 ERA STEP 5

### 10.3.1 FIELD SAMPLING PLAN VERIFICATION

In Step 5, efforts are made to determine that the field sampling plan is appropriate for former BP operations conditions. That is, the sampling methods and equipment planned should be effective for the media and populations on the former BP operations areas and former Anadarko operations areas on the Property. ERM experience from over the past ten years in other Louisiana settings were relied on to determine the sampling efforts needed.

## 10.4 ERA STEP 6

### 10.4.1 ANALYSIS OF ECOLOGICAL EXPOSURES AND EFFECTS

A review of the available sampling data (ERM, 2021, 2022, 2024, 2025; HET, 2025; ICON, 2021, 2022, 2023, 2024, 2025) identified that sufficient data are available to estimate ecological risk on the former BP operations areas and former Anadarko operations areas on the Property. Site-specific data from this step replace assumptions made during the screening-level analysis in Steps 1 and 2.

## 10.5 ERA STEP 7

### 10.5.1 RISK ESTIMATION AND CHARACTERIZATION

Risk characterization includes two major steps: risk estimation and risk description. In the risk estimation step of the BERA, risk is estimated and the uncertainties associated with risk assessment methods are evaluated. All input assumptions to the risk estimate are documented.

Potential exposures and ecological effects were evaluated for COPECs and wildlife receptors at the Property. The equation used for calculating potential risk (HQs) for COPECs in the site-specific BERA for the Property is as follows (USEPA, 2005a):

$$\frac{([\mathbf{Soil\ x\ Ps\ x\ FIR\ x\ AFas}] + [\sum_i^N \mathbf{Bi\ x\ Pi\ x\ FIR\ x\ AFai}])\ \mathbf{x\ AUF}}{\mathbf{TRV}} = \mathbf{HQ}$$

HQ = Hazard Quotient for analyte/COPEC (unitless)

Soil = Concentration of analyte/COPEC in soil (mg/kg dry weight)

N = Number of different biota types in diet (food types)

$B_i$ = Analyte/COPEC in biota type (i) (mg/kg dry weight)

$P_i$ = Proportion of biota type (i) in diet

FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight

$AF_{ai}$ = Absorbed fraction of analyte/COPEC from biota type (i)

$AF_{as}$ = Absorbed fraction of analyte/COPEC from soil (s)

TRV = Toxicity Reference Value, based on estimated no adverse effect dose (mg/kg BW/day) for the surrogate species

$P_s$ = Soil ingestion as a proportion of diet

AUF = Area use factor (spatial factor, SF, x temporal factor, TF)

Appendices G through I include the HQ calculations, analyses, and input values used to calculate risk estimates.

A summary of the results of the risk assessment and a discussion of uncertainties is included in the following sections.

## 10.6 ERA STEP 8

### 10.6.1 RISK MANAGEMENT DECISION

ERA risk characterization results and risk management decisions are provided below for wildlife and aquatic biota.

### 10.6.2 WILDLIFE HAZARD QUOTIENTS

Results of the BERA are provided in summary form for the ecological preliminary AOIs by COPEC and wildlife receptor (Inset Table 10-3). The results of this BERA can be used to support decisions regarding any remediation needed for the ecological preliminary AOIs. The harm caused by any remedy must be considered and weighed against the need for that remedy (USEPA, 1997).

The calculated HQs, based on average exposure concentrations in soil (0-3'), are low and less than 1.0 for the ecological preliminary AOIs (in the former BP operations areas and former

Anadarko operations areas) and wildlife. Additionally, all HQs are below 5, which, by USEPA practice, is below levels of concern for ecological risk assessment, and not predicted to be a source of ecological risk (USEPA, 2002).

In conclusion, no adverse effects to wildlife receptors due to metals and PAHs in soils are predicted for the former BP operations areas and former Anadarko operations areas on the Property. Based on the multiple lines of field evidence demonstrating expected biological diversity for the region, and low HQ values, there is currently no risk identified and no potential for risk to the wildlife receptors.

There is no need for remediation or for further investigation of ecological exposure to metals, TPH, and PAHs in the former BP operations areas and former Anadarko operations areas soils. See Appendix I for HQ calculations using average (arithmetic mean) exposure concentrations.

Additionally, HQs were also calculated using maximum exposure concentrations (0-3') for the preliminary AOIs using data, including split samples, collected during ICON, HET, and ERM investigations. Results of the calculations indicate that wildlife are not adversely impacted by maximum concentrations of metals in soils at the former BP operations areas and former Anadarko operations areas Property (Appendix J). Ecological risk is not associated with any of the calculated HQs based on calculations using maximum exposure concentrations.

Also, since HA-4 and HA-5 had standing water during the observations on May 29, 2025, HQs were also calculated for these samples assuming soil exposure to the aquatic food web (Appendix J). Note that the area received heavy precipitation the prior day. HQs are less than 1.0 for this standing water scenario, showing no adverse impacts to wildlife via the aquatic food web.

TABLE 10-3 HAZARD QUOTIENTS FOR ECOLOGICAL PRELIMINARY AOIS USING AVERAGE SOIL CONCENTRATIONS (0-3')

| Preliminary AOI | COPEC | Mourning Dove | Northern Cardinal | White-eyed Vireo | Red-tailed Hawk | Swamp Rabbit | White-tailed Deer | Raccoon | Coyote |
|---|---|---|---|---|---|---|---|---|---|
| Former BP Operations Areas | | | | | | | | | |
| HA-2 | Barium | 0.0000000014 | 0.000011 | 0.00074 | 0.00000012 | 0.00000055 | 0.0000000041 | 0.000000015 | 0.00000000014 |
| | Chromium | 0.000000028 | 0.00020 | 0.013 | 0.0000019 | 0.00011 | 0.00000077 | 0.0000027 | 0.000000011 |
| | Lead | 0.00000016 | 0.00053 | 0.030 | 0.0000035 | 0.00020 | 0.0000015 | 0.0000023 | 0.000000011 |
| Former Anadarko Operations Areas | | | | | | | | | |
| HA-4 | Barium | 0.0000000075 | 0.000051 | 0.0036 | 0.00000058 | 0.0000025 | 0.00000002 | 0.00000007 | 0.00000000072 |
| | Zinc | 0.00000044 | 0.0015 | 0.092 | 0.000005 | 0.0012 | 0.000009 | 0.000014 | 0.000000059 |
| HA-5 | Barium | 0.000000017 | 0.00012 | 0.0083 | 0.0000014 | 0.0000061 | 0.000000046 | 0.00000016 | 0.0000000016 |
| | Cadmium | 0.00000021 | 0.0011 | 0.068 | 0.00000072 | 0.0013 | 0.0000098 | 0.000019 | 0.000000019 |
| | Chromium | 0.00000055 | 0.0037 | 0.24 | 0.000035 | 0.002 | 0.000014 | 0.00005 | 0.00000021 |
| | Lead | 0.0000011 | 0.0032 | 0.18 | 0.000021 | 0.0012 | 0.0000088 | 0.000014 | 0.00000007 |
| | Mercury | 0.000000016 | 0.000045 | 0.0025 | 0.000000025 | 0.00017 | 0.0000012 | 0.0000015 | 0.0000000011 |
| | Zinc | 0.000001 | 0.0038 | 0.22 | 0.000013 | 0.003 | 0.000022 | 0.000035 | 0.00000014 |
| CD-1 | Barium | 0.0000000018 | 0.000014 | 0.00095 | 0.00000016 | 0.0000007 | 0.0000000053 | 0.000000019 | 0.00000000018 |

Notes:
HQs based on average concentrations (0-3') for the preliminary AOI.
These preliminary AOIs are a single point locations, and include 0-3' split samples and resample.

## 10.7 CURRENT AND FUTURE LAND USE

The Property is comprised of prairie and grassy areas, edge forest, and forested/shrub wetlands, with primary land uses consisting of industrial (former oil and gas E&P operations), agriculture (rice, crawfish), and recreation (hunting). Portions of the Property are undeveloped. This discussion of current and future land use is focused on soil concentrations within the 0-3' depth, which is inclusive of the effective root zone for trees and biologically active zone for plants and invertebrates (USEPA, 2015; HET, 2025). Soil/sediment concentrations (0-3') related to former oil and gas E&P activities do not compromise current and future land use of the Property related to agriculture (rice, crawfish) and recreation (hunting, birdwatching, fishing). A discussion of these uses is provided in the following sections.

### 10.7.1 RICE FARMING

Rice farming is a current land use of the Property, with some fields in active production while others are set aside (Figure 2) (HET, 2025). The rice fields are irrigated using surface water pumped from the Mermentau River, and piped to the northern portion of the Property, where it is released via an outfall and distributed to fields throughout the Property via gravity drainage (HET, 2025). The outfall is shown on Image 10-5 below. Groundwater in the A-Zone, B-Zone and Transition Zone are not used, and not a viable source for irrigation (HET, 2025).

IMAGE 10-5 IRRIGATION WATER OUTFALL

Pictured is an irrigation water outfall in the northern portion of the Property. Photo taken by Dr. Karen Cejas (ERM) on May 25, 2025.

Areas of former BP operations are not currently used for rice farming. Future use of these areas for rice farming is not limited by former E&P activity. Soil (0-3' average) concentrations in the former BP operations areas are fully supportive of potential future use for rice farming, as detailed in the following sections. As a conservative measure, should the area in the vicinity of BP operations at the former pit location be reincorporated into agricultural use, HET proposed to work with the farmer to recontour the land and add surface amendments at the HA-2 boring area to enhance rice production (HET, 2025). Image 10-6 below shows the condition of a rice field near sample location HA-2 during the April 15, 2025 field visit.

In the former Anadarko operations areas, sample location CD-1/CD-1R has surrounding rice field development, but sample locations HA-4, HA-5, and HA-9 do not. Image 10-7 below shows the rice field adjacent to CD-1/CD-1R. These areas fully support future use for rice farming, based on average soil (0-3') concentrations in the former Anadarko operations areas (detailed in the following sections).

Rice fields provide habitat and foraging areas for wildlife, including migratory birds. The Property, being located in the Mississippi Flyway, a major bird migration route, attracts migratory birds seeking food, water, and shelter. In this portion of Louisiana, rice fields are essential habitat and important overwintering areas for migratory species, such as ducks and geese. Migratory waterfowl utilize rice fields to forage for vegetative matter during flooded conditions and after rice harvest (LSU AgCenter, 2009). Migratory waterfowl, in turn, are game species for recreational hunters from November to March (LDWF, 2025).

## IMAGE 10-6 RICE FIELD NEAR HA 2

Pictured is a rice field nearest the HA-2 (former pit) sample location in the former BP operations areas. Photo taken by Dr. Karen Cejas (ERM) on April 15, 2025.

IMAGE 10-7 RICE FIELD ADJACENT TO CD-1

Pictured is a rice field bordering the CD-1 sample location in the former Anadarko operations areas. Photo taken by Dr. Karen Cejas (ERM) on May 29, 2025.

#### 10.7.1.1 SALINITY

The shallow soils (0-3') in the former BP operations areas and former Anadarko operations areas are of appropriate salinity for growing vegetation and crops, such as rice (effective root zone of 6 inches [HET, 2025]) (LSU AgCenter, 2014; Kafkafi et al., 2001; Zhu and Yu, 1991; Xu et al., 2000). Salinity indicators in soil such as average chlorides (< 400 mg/kg) and average EC (< 3 mmhos/cm) are low in concentration and suitable for rice production (LSU AgCenter, 2014; Kafkafi et al., 2001; Zhu and Yu, 1991; Xu et al., 2000).

Chloride is an essential nutrient in wildlife, and toxicity in herbivorous mammals is unlikely due to the generally low concentrations of chloride in forage plants (USGS, 1979). Chloride concentrations in plants of 3,000-6,000 mg chloride/kg plant dry matter, are not associated with ecological health effects for ruminants, such as deer (National Research Council, 2021). A maximum tolerable concentration corresponding to 18,198 mg chloride/kg diet was established for cattle, another mammal (National Research Council, 2005). High dietary concentrations are not a concern where freshwater is consistently available, such as on the Property (Thompson, 2024). With average soil chloride concentrations (0-3') being less than 400 mg/kg (much less than these

dietary values) and freshwater nearby, hypothetical salt consumption via crops in the former BP operations areas and former Anadarko operations areas is not a risk to deer, or other wildlife with lesser plant intake.

#### 10.7.1.2 METALS

Metals in soils (0-3') in the former BP operations areas and former Anadarko operations areas are protective of plants and crops, such as rice. Average concentrations of metals (0-3') are less than USEPA soil screening values protective of plants (USEPA, 2005b, 2005c, 2005d, 2005e, 2006, 2007b, 2007c) (Inset Table 10-4).

For demonstration purposes, HQ calculations were performed for a bird receptor (Black-bellied Whistling Duck) and a mammal receptor (raccoon) assuming exposure to metals via rice (plant) consumption (Appendix J). All HQs were less than 1.0, providing evidence of no risk to wildlife consuming rice (plants).

Average concentrations of metals in soils (0-3') are also within the range of typical metals concentrations in unimpacted soils throughout Louisiana (USGS, 2013) for arsenic, cadmium, chromium, lead, mercury, selenium, silver, strontium, and zinc (Inset Table 10-4). Barium is in the form of barite, and is of low bioavailability and low toxicity, as demonstrated by barium speciation and SPLP results (Tables 5 and 6).

TABLE 10-4 METALS SOILS CONCENTRATIONS (0-3') AND PLANT HEALTH

| Metal | Average Concentration (0-3')[a] | USEPA Plant Eco-SSL[b] | Louisiana Background (USGS)[c] |
|---|---|---|---|
| Former BP Operations Areas | | | |
| Arsenic | 5.6 | 18 | 12[d] |
| Barium | 823 | 2424[e] | 775 |
| Cadmium | ND | 32 | 0.8 |
| Chromium | 27 | NA | 84 |
| Lead | 31 | 120 | 44 |
| Mercury | 0.046 | NA | 0.11 |
| Selenium | ND[f] | 0.52 | 1 |
| Silver | ND | 560 | ND |
| Strontium | 75 | NA | 203 |
| Zinc | 40 | 160 | 140 |
| Former Anadarko Operations Areas | | | |

| Metal | Average Concentration (0-3')[a] | USEPA Plant Eco-SSL[b] | Louisiana Background (USGS)[c] |
|---|---|---|---|
| Arsenic | 5.5 | 18 | 12[d] |
| Barium | 2358 | 2424[e] | 775 |
| Cadmium | 0.36 | 32 | 0.8 |
| Chromium | 51 | NA | 84 |
| Lead | 30 | 120 | 44 |
| Mercury | 0.11 | NA | 0.11 |
| Selenium | ND[f] | 0.52 | 1 |
| Silver | 0.62 | 560 | ND |
| Strontium | 202 | NA | 203 |
| Zinc | 129 | 160 | 140 |

Notes:
Concentrations are in mg/kg dry.
Former BP operations areas samples (0-3'): HA-1, HA-2, HA-2R, HA-3, HA-10, CD-6, CD-18, SB-1, SB-2, SB-3, and SB-4.
Former Anadarko operations areas samples (0-3'): HA-4, HA-5, HA-9, CD-1, CD-1R.
[a] Soil concentrations (0-3'). See Appendix G for average concentration calculations.
[b] USEPA Eco-SSL for plants (USEPA, 2005b, 2005c, 2005d, 2005e, 2006, 2007b, 2007c).
[c] Louisiana soil background (USGS, 2013).
[d] LDEQ approved soil background.
[e] Calculated barium sediment screening value. See Appendix E for calculations.
[f] Selenium was not detected in all samples, except one.

#### 10.7.1.3 PAH

PAH concentrations in Property soil (0-3') are well below levels associated with effects to plants. Inset Table 10-5 compares measured Property concentrations (0-3') to growth and mortality effect levels in rice, other crops, and plants. PAH concentrations in Property soil (0-3') are considered safe for rice farming.

TABLE 10-5 PAH SOIL CONCENTRATIONS AND PLANT HEALTH

| PAH | Property Concentration (0-3') | Comparison Concentration | Effect | Reference |
|---|---|---|---|---|
| Phenanthrene + Pyrene | 0.00225[a]<br>0.00564[b] | 400 | Rice Growth (decreased biomass) | Li et al., 2008 |
| Total PAH | 0.00858[a]<br>0.0173[b] | 100 | Perennial ryegrass growth | USEPA, 2007d; Leyval and Binet, 1998 |
| Anthracene | <0.000219[a]<br>0.00201[b] | 30 to >1000 | Oats, cucumber, soybean, heath banksia, she-oak, and yellow bloodwood growth and mortality | USEPA, 2007d; Mitchell et al., 1988 |

Notes:
Concentrations are in mg/kg dry.
[a] PAH results from HA-2R 0-2'.
[b] PAH results from HA-2R 2-4'.

PAH concentrations in soils (0-3') are safe for wildlife consumption of crops. USEPA soil screening values are 1.1 mg/kg dry HMW PAH and 100 mg/kg dry LMW PAH (USEPA, 2007d). The PAH concentrations in soil at HA-2 (0-2') of 0.00761 mg/kg dry HMW PAH and 0.00097 mg/kg dry LWM PAH are less than the screening values, as are the concentrations at HA-2 (2-4') of 0.0109 mg/kg dry HMW PAH and 0.00636 mg/kg dry LMW PAH. No risk is predicted for wildlife consuming plants or crops.

#### 10.7.1.4 FIELD SURVEY

Vegetation in the former BP operations areas are dense and thriving, as expected for the region, and similar to reference. Examples of plant species observed in the former BP operations areas include American elm (*U. americana*), water oak (*Q. nigra*), cherrybark oak (*Q. pagoda*), Eastern poison ivy (*T. radicans*), dwarf palmetto (*S. minor*), green flatsedge (*Cyperus virens*), little quakinggrass (*B. minor*) tufted lovegrass (*Eragrostis pectinacea* var. *pectinacea*), and windmill grass (*Chloris* sp.).

Vegetation observed in the former Anadarko operations areas are also dense and thriving, with no evidence of chlorosis. The vegetation observed includes a diverse variety of hydrophytic (wetland)

and non-hydrophytic (upland) species, including trees, shrubs, vines, grasses, and forbs. The species observed include black willow (*S. nigra*), sugarberry (*C. laevigata*), elm (*Ulmus* sp.) and oak (*Quercus* sp.), flatsedge (*Cyperus* sp.), rush (*Juncus* sp.), spikerush (*Eleocharis* sp.), (*E. perfoliatum*), pinkladies (*O. speciosa*), and purple passionflower (*P. incarnata*), (*P. cordata*), seaside goldenrod (*S. sempervirens*).

Chlorosis, salt crusts, denuded areas, and stunted growth were not observed in the former BP operations areas or former Anadarko operations areas. There is no evidence that salts, metals, or hydrocarbons are limiting vegetation growth or health in the former BP operations areas or former Anadarko operations areas.

#### 10.7.1.5 RICE FARMING SUMMARY

Soils (0-3') in the former BP operations areas and former Anadarko operations areas fully support rice farming. The laboratory analytical data and ecological field data collected in the former BP operations areas and former Anadarko operations areas demonstrate that soils (0-3') in the former BP operations areas are suitable for crop production, including rice farming, and are protective of wildlife consumption of crops.

### 10.7.2 CRAWFISH AQUACULTURE

Crawfish aquaculture is currently practiced at the Property, in rotation with rice farming. While crawfish aquaculture is not a current use in the areas of former BP operations and former Anadarko operations, it is a potential future use for these areas.

Crawfish ponds provide habitat not only for crawfish, but also small invertebrates (worms, insects, crustaceans, and mollusks) and small vertebrates (fish). Crawfish ponds support a detrital food web with decomposing plant matter and microorganisms (detritus) that are consumed by small invertebrates and vertebrates, which in turn are consumed by crawfish. These invertebrates and vertebrates are sources of high quality protein for crawfish, and are important for crawfish growth. Crawfish ponds also serve as foraging areas for birds (such as egrets [Family Ardeidae], herons [Family Ardeidae], ibises [Family Threskiornithidae], cormorants [*Nannopterum* sp.]) and mammals (such as raccoons [*P. lotor*]), though they may be considered nuisances by farmers for their predation of crawfish (LSU AgCenter, 2007).

Soils (0-3') in the former BP operations areas and former Anadarko operations areas are acceptable for future use of crawfish aquaculture. Measured concentrations (0-3') are protective of crawfish, benthic invertebrates, aquatic life, birds, and mammals, as detailed in the following sections. Former E&P activity by BP and Anadarko have not diminished the use of the Property for crawfish aquaculture.

#### 10.7.2.1 METALS

Metals concentrations in soils (0-3') in former BP operations areas and former Anadarko operations areas fully support crawfish production and are not associated with adverse health effects to crawfish (Finerty et al., 1990), or wildlife consumers of crawfish. Metals concentrations (average) are less than sediment screening values (freshwater PEC) for benthic invertebrates, and are therefore protective of crawfish, and wildlife consuming crawfish (Inset Table 10-6).

For demonstration purposes, HQ calculations were performed for three bird receptors (Black-bellied Whistling Duck [*D. autumnalis*], Yellow-crowned Night Heron [*N. violacea*], and Snowy Egret [*E. thula*]) and a mammal receptor (raccoon [*P. lotor*]) assuming exposure to metals via crawfish consumption (Appendix J). All HQs were less than 1.0, providing additional evidence of no risk to wildlife consuming crawfish.

As with rice farming, average concentrations of metals in soils (0-3') are also within the range of concentrations in Louisiana unimpacted soils (arsenic, cadmium, chromium, lead, mercury, selenium, silver, strontium, zinc) (Inset Table 10-6), or are of low bioavailability and low toxicity (barium) (Tables 5 and 6).

TABLE 10-6 SOIL CONCENTRATIONS (0-3') AND CRAWFISH HEALTH

| Metal | Average Concentration (0-3')[a] | NOAA Freshwater PEC[c] | Louisiana Background (USGS)[b] |
|---|---|---|---|
| Former BP Operations Areas | | | |
| Arsenic | 5.6 | 33 | 12[d] |
| Barium | 823 | 2197[e] | 775 |
| Cadmium | ND | 4.98 | 0.8 |
| Chromium | 27 | 111 | 84 |
| Lead | 31 | 128 | 44 |
| Mercury | 0.046 | 1.06 | 0.11 |
| Selenium | ND[f] | NA | 1 |
| Silver | ND | NA | ND |
| Strontium | 75 | NA | 203 |
| Zinc | 40 | 459 | 140 |
| Former Anadarko Operations Areas | | | |
| Arsenic | 5.5 | 33 | 12[d] |
| Barium | 2358 | 2197[e] | 775 |
| Cadmium | 0.36 | 4.98 | 0.8 |
| Chromium | 51 | 111 | 84 |
| Lead | 30 | 128 | 44 |
| Mercury | 0.11 | 1.06 | 0.11 |

| Metal | Average Concentration (0-3')[a] | NOAA Freshwater PEC[c] | Louisiana Background (USGS)[b] |
|---|---|---|---|
| Selenium | ND[f] | NA | 1 |
| Silver | 0.62 | NA | ND |
| Strontium | 202 | NA | 203 |
| Zinc | 129 | 459 | 140 |

Notes:
Concentrations are in mg/kg dry.
Former BP operations areas samples (0-3'): HA-1, HA-2, HA-2R, HA-3, HA-10, CD-6, CD-18, SB-1, SB-2, SB-3, and SB-4.
Former Anadarko operations areas samples (0-3'): HA-4, HA-5, HA-9, CD-1, CD-1R.
[a] Soil concentrations (0-3'). See Appendix G for average concentration calculations.
[b] Louisiana soil background (USGS, Smith et al., 2013).
[c] NOAA freshwater PEC (NOAA, Buchman, 2008).
[d] LDEQ approved soil background.
[e] Calculated barium sediment screening value. See Appendix E for calculations.
[f] Selenium was not detected in all samples, except one.

#### 10.7.2.2 PAH

PAH concentrations in soils (0-3') at the Property are acceptable for crawfish aquaculture. Total PAH concentrations in soils (0-3') of 0.00858 to 0.0173 mg/kg dry are low and less than 22.8 mg/kg, the sediment screening value protective of benthic invertebrates, such as crawfish (NOAA freshwater PEC, Buchman, 2008). PAH concentrations are also below remediation levels in USEPA records of decision (USEPA, 2012, 2013, 2017, 2017, 2017).

#### 10.7.2.3 CRAWFISH AQUACULTURE SUMMARY

Metal and hydrocarbon concentrations measured in soil (0-3') in the former BP operations areas and former Anadarko operations areas fully support producing crawfish, the health of crawfish, and wildlife consumption of crawfish.

### 10.7.3 HUNTING

The Property supports game species and hunting for current and future use. Image 10-8 below shows hunting structures and equipment on the Property, including in areas of former BP and Anadarko operations. Game species such as deer, rabbit, raccoon, waterfowl, and dove were observed on the Property. Signs of feral hog activity were also noted on the Property.

## IMAGE 10-8 RECREATIONAL HUNTING ACTIVITIES

Pictured are hunting accessories such as hunting stands in the hunting clearing in the western portion of the Property (top left) and at E-Inc-P2 in the northern portion of the Property (top right), wild game feeder at HA-10 (E-S20-4) (bottom left), and a ladder tree stand at HA-10 (E-S20-4) (bottom right), in the eastern portion of the Property. Photographed by K. Cejas and C. Matherne on April 15 and May 29, 2025.

The former BP operations areas provide foraging, cover, and reproduction habitat for game species, in both grassy and forested areas. Important food sources observed include sugarberry (*C. laevigata*), possumhaw (*I. decidua*), American beautyberry (*C. americana*), and blackberry (*Rubus* spp.), among other plants that produce seeds, nuts, nectar, fruits, and berries of interest

to deer and wildlife. Also present is a diverse assemblage of pollinating insects and invertebrates to sustain the dietary needs of avian and mammalian game species through an abundance of plant and invertebrate populations.

The results of the SLERA and food chain modeling (HQs less than 1.0) indicate that soil metals and hydrocarbon concentrations (0-3') are protective of game species, including the deer, dove, rabbit, and raccoon, as well as other wildlife. Additionally, average concentrations of metals are similar to the range of concentrations typical of unimpacted soils in the state of Louisiana (USGS, Smith et al., 2013), or of low bioavailability and low toxicity (barium). Barium in soil is not associated with ecological health effects (USGS, 2017).

Shallow soils (0-3') throughout the former BP operations areas and former Anadarko operations areas are of appropriate salinity for supporting plants that game animals eat for their diet and use for shelter. Salinity indicators in soil such as average chlorides (<400 mg/kg) and average EC (<3 mmhos/cm) do not indicate elevated salt based on vegetation observed on the Property, and as compared to reference. Chlorosis, an indicator of salt impact, was not observed in vegetative species at ecological survey and observation locations across the Property. Trees and other vegetation that do not tolerate salt are thriving, such as American elm (*U. americana*) and sugarberry (*C. laevigata*), which is supporting evidence for the lack of salt toxicity. There is no evidence that salt is limiting any habitat for game animals.

### 10.7.4 BIRDWATCHING

The prairies and forests in the areas of former BP and Anadarko operations are suitable for birdwatching. During site visits on April 15 and 16, 2025, 30 species of birds were observed in the former BP operations areas and during the May 29, 2025 surveys, 34 species of birds were observed in the former Anadarko operations areas, including migratory and resident bird species. Birds of all trophic levels, primary consumer through apex predator, and with a wide variety of diets (herbivores, insectivores, omnivores, and carnivores) were observed throughout both the former BP operations areas and the former Anadarko operations areas, demonstrating the habitat's good species diversity. Bird species observed in the former BP operations areas include Neotropical migrant songbirds such as the Ruby-throated Hummingbird (*A. colubris*) and Yellow-billed Cuckoo (*C. americanus*); raptors such as the Red-tailed Hawk (*B. jamaicensis*) and Turkey Vulture (*C. aura*); and wading bird such as the White-faced Ibis (*P. chihi*) and Snowy Egret (*E. thula*). Bird species observed in the former Anadarko operations areas include Black-bellied Whistling Duck (*D. autumnalis*), Yellow-crowned Night Heron (*N. violacea*), Indigo Bunting (*P. cyanea*), Anhinga (*A. anhinga*), and Red-shouldered Hawk (*B. lineatus*). Bird community structure and function are intact with all trophic levels well represented in both the former BP operations areas and the former Anadarko operations areas. Therefore, both the former BP operations areas and the former Anadarko operations areas support the recreational use of birdwatching.

### 10.7.5 FISHING

On-site ditches within the Property are intermittent (Figure 11; USGS, 2023) and do not support sustainable, perennial communities of recreational fish species. The pond-like feature in the northern portion of the Property (Figure 11) is vegetated, and holds water for at least part of the

year, based on aerial and drone photographs (HET, 2025). E&P constituents in areas associated with former BP and Anadarko operations are not migrating to these on-site surface water features. E&P constituents in soil potentially associated with former BP and Anadarko operations are not migrating off-site to the adjacent Mermentau River. The dense vegetative surface cover in the former operations areas and throughout the Property makes overland flow to surface water an incomplete migration pathway (Figures 2, 18 through 20). Potential future transformation of these former operations areas into rice and crawfish fields will also not contribute to migration of soil constituents, as fields are typically bermed. Additionally, average metals (0-3') concentrations are similar to background. Groundwater to surface water is also an incomplete pathway as there is no direct hydraulic communication (HET, 2025). Fishing at the Property along the Mermentau River is not affected by former BP and Anadarko operations.

## 10.8 RISK OF REMEDY

Part of the ecological risk assessment process is evaluating the potential for adverse effects caused to the environment by the proposed remediation itself. I have evaluated the ecological risk associated with the proposed remediation plans for the Property presented by the Plaintiff and Defendants (ICON/Miller and Sills, 2024; HET, 2025).

Inset Table 10-7 below shows the estimated acreages proposed for remediation.

TABLE 10-7 REMEDIATION PROPOSALS

| **Report:** | **HET (2025)** | **ICON Miller & Sills (2024)** |
|---|---|---|
| **Rationale:** | **No remediation** | **Proposed background** |
| **Action:** | **No remediation** | **Soil Removal and Replacement (*acres*)** |
| Former BP Operations Areas | No remediation | 1.03 |
| Former Anadarko Operations Areas | No remediation | 1.81 |

The ICON/Miller & Sills (2024) plan, which is driven by an ICON-calculated purported background concentration, presents a proposal to remove and replace approximately 2.84 acres of grassy and forested areas in the former BP operations areas and former Anadarko operations areas to a maximum depth of 20 feet below ground surface (bgs), which includes excavation of soil, transportation by trucks to an off-Property facility for disposal, followed by backfilling of excavated areas with materials from off-Property.

The ICON proposed soil remediation will disrupt a total of 2.84 acres of soil (ICON/Miller and Sills, 2024) in areas that do not present ecological risk. The ICON groundwater remediation plan will also result in additional soil disturbance due to the installation of recovery wells and additional equipment for the pump and treat system.

HET (2025) has proposed no active remediation of soil or groundwater in former BP operations areas and former Anadarko operations areas. Instead, as a conservative measure, HET (2025) has proposed a groundwater monitoring plan to evaluate constituent concentrations over one to three years. This conservative groundwater monitoring includes 5 nested monitoring wells in former BP operations areas, and 5 nested monitoring wells in former Anadarko operations areas.

The ICON remediation areas will be disrupted and diminished in ecological function for the duration of the remediation, and disturbances associated with ICON's proposed groundwater remediation will continue to disturb wildlife past the installation phase. Ecological function will also be diminished in the years post-remediation, as the ecosystem services currently provided by the existing mature forest will not be achieved again until a new habitat establishes and reaches a similar state of maturity. This is particularly difficult to justify in this area within the Coastal Prairie Important Bird Area and within the Mississippi Flyway bird migration route, that is supporting a wide variety of bird species.

I have considered the balance of actions and results, as required by USEPA for ecological risk assessment (USEPA, 1997). Because remediation is not needed for ecological reasons and not measurably beneficial to the already functioning ecology, any remedial action should be performed with the least disturbance of grasses, the most minimal impact to forests, and the most respect for wildlife, as possible. On the balance, HET's proposal to install up to 10 nested monitoring wells for quarterly or semi-annual sampling from one to three years would be less harmful to the environment than Plaintiff's proposal to excavate with heavy machinery to remove 2.84 acres of soil that do not present ecological risk and install 33 miles of piping and 349 recovery wells and operate a reverse osmosis system for nearly 30 years to treat groundwater that does not present ecological risk.

## 10.9 UNCERTAINTY EVALUATION

The uncertainty evaluation is an assessment of the qualitative and quantitative methods used in ERA and the measure of confidence in the risk estimates produced from the ERA. The uncertainty analysis is a required portion of USEPA ecological risk assessment. There are three basic categories of uncertainty: 1) conceptual model uncertainty; 2) natural variation and parameter error; and 3) model error.

Parameter error in general is unavoidable, because all members of a population, all sediment/soil present, all habitat features cannot be sampled. If all members of a population could be sampled, the true parameter distribution could be known. However, only a few members of the population can be sampled, leaving uncertainty concerning the true parameter value distribution. This uncertainty for soil/sediment concentrations has been reduced by sampling the areas of E&P operations, biasing the results towards overestimation of risk.

The uncertainty associated with the conceptual model is related to potentially underestimating the number of routes of exposure. This is counterbalanced by using very conservative screening values

to estimate the toxicity of the routes of exposure that are assessed, so this is judged to be a small source of uncertainty.

The initial constituent list is a source of uncertainty. All chemicals present cannot be measured and analyzed. This uncertainty has been addressed by measuring and analyzing the chemicals that have historically been associated with oil and gas production sites and that are required by the LDENR and LDEQ for E&P sites. Uncertainty can arise from making estimates of toxicity based on limited data. This uncertainty has been limited by using conservative estimates of toxicity from the primary scientific literature. There is uncertainty in chemical monitoring data and in dose models. This uncertainty has been addressed by analyzing data at qualified labs certified to do the analyses. The uncertainty in the dose model is based on limiting the model to ingestion. There are other forms of exposure, but they are minor compared to ingestion, so this portion of uncertainty is judged to be low.

The uncertainty due to environmental variability, which arises from true heterogeneity in the environment and receptors, will be inherent in any calculation. There is uncertainty that could potentially be reduced by additional study, but in the instance of this assessment, there is no indication, based on the collected data and multiple lines of evidence, that further assessment is required. For this reason, that portion of uncertainty is judged to be low.

The effect of the uncertainties in this ERA results in overestimation of risk.

# 11. RESPONSE TO PLAINTIFF'S CLAIMS OF ECOLOGICAL RISK AND ASSESSMENT OF NEED FOR REMEDATION

## 11.1 MR. GREGORY W. MILLER AND MR. JASON S. SILLS (ICON)

**Miller, Gregory W. and J. Sills. 2024. Expert Report and Restoration Plan for the Landowners, Castex Development, LLC v Anadarko Petroleum Corporation, et al; 31st JDC; Docket C-502-20; Mermentau West Oil Field, Jefferson Davis Parish, LA (October 18, 2024).**

The ICON report (ICON/Miller and Sills, 2024) contains a proposal by Mr. Miller and Mr. Sills to restore soil to ICON-calculated "background standards". Mr. Miller and Mr. Sills did not perform an ecological risk assessment.

Mr. Miller and Mr. Sills's proposal to remediate soil based on a potential exceedance of an ICON-calculated background value using data from six soil borings is not supported by any data that remediation would benefit ecological species that are currently using the habitat. The calculated background values presented by Mr. Miller and Mr. Sills are not related to ecological risk and have not been demonstrated to be more protective of ecological populations than the existing soils that are currently on site and supporting wildlife and vegetation. A decision to remediate, following exceedance of a background value, is not part of the USEPA (1997) ecological risk assessment process. If screening levels are exceeded in steps 1 and 2 of an ERA, the decision can be made to further investigate, but the EPA process does not prescribe remediation without risk assessment.

Mr. Miller and Mr. Sills propose restoration of soil to a maximum depth of approximately 20 feet below ground surface in the former BP operations areas and former Anadarko operations areas. Removing soils in depths up to 20 feet is not beneficial in a setting that is currently supporting 43 vegetative taxa, 11 non-avian taxa, and 23 species of birds, including 1 bird listed by LDWF as Species of Greatest Conservation Need in the former BP operations areas. Nor is removing these soils beneficial in a setting that is currently supporting 48 vegetative taxa, 32 non-avian taxa, and 34 species of birds, including 4 birds listed by LDWF as Species of Greatest Conservation Need in the former Anadarko operations areas. The Miller/Sills planned removal would destroy approximately 2.84 acres of grassy and forested areas in the former BP operations areas and former Anadarko operations areas that currently serve as habitat for birds, mammals, reptiles, invertebrates, and plants. The Miller/Sills plan would not protect habitats and biodiversity. The habitats on site are functioning and the removal of 2.84 acres, for no improvement to the setting, is wasteful and imprudent from an ecological perspective.

Mr. Miller and Mr. Sills propose groundwater restoration in an area with functioning ecosystems. The installation of equipment for the Plaintiff's proposed groundwater remediation plan would result in soil disturbance and habitat alteration of several acres of functioning grassy and forest habitat. This habitat currently supports 118 vegetative taxa, 58 species of birds, and 69 non-avian taxa. The Miller/Sills plan for groundwater restoration is not necessary for ecological health and will disturb functioning habitat.

Mr. Miller and Mr. Sills suggest soil contamination from historical pits and surface discharges are demonstrated by scarring and vegetative stress on historical aerial images (ICON/Miller and Sills, 2024, pg. 13). Based on the site inspection performed in April 2025 and May 2025 by myself and analysis of soil and vegetation data collected by ERM and others, vegetation in the vicinity of BP former operations areas and former Anadarko operations areas are not adversely impacted by constituents in soil. Salt-scarring and denuded areas were not observed in former BP operations areas or in former Anadarko operations areas during my site inspection. To the contrary, vegetation was dense and thriving (Image 11-1, Image 11-2).

Based on my site inspection and ERA, the opinions provided by the Plaintiff's experts regarding exposures from legacy operations as well as impacts to the flora and fauna in former BP operations areas and former Anadarko operations areas on the Property are not supported by site-specific data. There is no evidence that habitat for populations of any species has been limited on the site by BP legacy oil and gas operations or Anadarko legacy oil and gas operations.

## IMAGE 11-1 VEGETATION AT ECOLOGICAL SURVEY LOCATIONS WITHIN FORMER BP OPERATIONS AREAS OF THE PROPERTY

Ecological Survey Location E-S20-5 (CD-18), taken on April 15, 2025 (K. Cejas)

Ecological Survey Location E-S20-3 (HA-3), taken on April 15, 2025 (K. Cejas)

Ecological Survey Location E-S20-4 (HA-10), taken on April 15, 2025 (K. Cejas)

Ecological Survey Location E-S20-1 (HA-1), taken on April 15, 2025 (K. Cejas)

## IMAGE 11-2 VEGETATION AT ECOLOGICAL OBSERVATION LOCATIONS WITHIN FORMER ANADARKO OPERATIONS AREAS OF THE PROPERTY

Location CD-2, taken on May 29, 2025 (K. Cejas)

Location CD-1, taken on May 29, 2025 (K. Cejas)

Location CD-3, taken on May 29, 2025 (K. Cejas)

Location HA-4, taken on May 29, 2025 (A. Sivils)

# 12. CONCLUSIONS

**Baseline Ecological Risk Assessment**

A complete ecological risk assessment of the former BP operations area in the Property, including a quantitative baseline ecological risk assessment, per USEPA (1997) and LDEQ (2003) guidance, was completed using all available soil and field data collected by ERM, HET, and ICON.

A quantitative risk assessment was performed for 4 bird and 4 mammalian wildlife receptors, to represent populations using the Property for habitat: 1) Mourning Dove (*Z. macroura*), 2) Northern Cardinal (*C. cardinalis*), 3) White-eyed Vireo (*V. griseus*), 4) Red-tailed Hawk (*B. jamaicensis*), 5) Swamp Rabbit (*S. aquaticus*), 6) White-tailed Deer (*O. virginianus*), 7) Raccoon (*P. lotor*), and 8) Coyote (*C. latrans*).

Risk was estimated for the 8 receptors for potential exposure to soils (0-3'). Metals and hydrocarbons known to be associated with E&P were analyzed and risk was calculated assuming possible exposure via ingestion.

The quantitative results of the risk assessment are that site soil concentrations of metals and hydrocarbons do not present a risk for any flora and fauna that utilize or inhabit the former BP operations areas or former Anadarko operations areas, including invertebrates, plants, mammals, birds, reptiles, amphibians, and terrestrial invertebrates. All calculated hazard quotients are below the benchmark of 1.0, and ecological risk is not estimated to be occurring or predicted. A supplemental analysis of risk was conducted for potential exposure to soil (as sediment) and the aquatic food web (e.g., crawfish). The results show that future use scenarios of rice and crawfish farming in the former BP and former Anadarko operations areas do not present ecological risk.

Remediation is not needed to protect ecological species or their habitats, per the quantitative risk assessment.

**Field Assessment**

An important portion of the risk assessment is the collection and analysis of field data for assessment of vegetation, habitats, and wildlife. Included in this field effort was documentation of plant and wildlife species throughout the Property.

**Habitat**

The habitats of the former BP operations areas include Cajun Prairie habitats with representative grass and herbaceous species such as sedge (*Carex* sp.), primrose-willow (*Ludwigia* sp.), bluestem (*Andropogon* sp.), flatsedge (*Cyperus* sp.), lovegrass (*Eragrostis* sp.), dogfennel (*Eupatorium* sp.), bluestem (*Schizachyrium* sp.), and goldenrod (*Solidago* sp.). These prairie habitats in the former BP operations areas also host flowering plants such as Carolina geranium (*G. carolinianum*) and Lousiana vetch (*V. ludoviciana*).

Sweetgum-Water Oak Bottomland Forest habitats are also present in the former BP operations areas with representative tree species such as American elm (*U. americana*), water oak (*Q. nigra*), cherrybark oak (*Q. pagoda*), sugarberry (*C. laevigata*), possumhaw (*I. decidua*), sweetgum (*L. styraciflua*) and various species of oak (*Quercus* sp.). These forested habitats in the former BP operations areas also host diverse mid- and under-story forest communities comprising

of juvenile trees, native wetland shrubs, such as dwarf palmetto (*S. minor*), and flowering plants, such as Lyreleaf sage (*Salvia lyrata*).

The habitats in the former Anadarko operations areas include grassy areas and edge forest communities, and the surrounding areas (vicinity) include a ditch with riparian forest, agriculture (rice ponds), and built environments (roads). Wildlife and vegetation observed in the former Anadarko operations areas and vicinity include 48 plant taxa, 34 bird species, and 32 non-avian taxa including insects, mammals, reptiles, amphibians, and terrestrial invertebrates. Diverse and productive ecological communities were observed throughout the former Anadarko operations areas and vicinity.

**Vegetation**

Vegetation is diverse throughout the Sweetgum-Water Oak Bottomland Forest and Cajun Prairie in the former BP operations areas. Forty-three (43) vegetative taxa were observed and recorded in the BP former operations areas during the 20ft ecological surveys. This is excellent diversity for habitats in the region and is a line of evidence of good ecosystem function. The abundance of representative forested wetland species indicates that soils and conditions are offering a productive and non-toxic setting for ecological habitats. The excellent tree species diversity (14 different species) is an important line of evidence that the former BP operations areas are supporting the trees expected in the region in bottomland hardwood forests.

Vegetation within the former BP operations areas does not show evidence of impact from E&P operations.

The vegetation in the former Anadarko operations areas and vicinity includes a diverse variety of hydrophytic (wetland) and non-hydrophytic (upland) species, including trees, shrubs, vines, grasses, and forbs. A total of 8 tree species were observed in the edge and riparian forest areas of the former Anadarko operations areas and vicinity, including black willow (*Salix nigra*), sugarberry (*Celtis laevigata*), elm (*Ulmus sp.*) and oak (*Quercus sp.*), among others. In addition, a variety of grasses were observed, such as flatsedge (*Cyperus sp.*), rush (*Juncus sp.*), spikerush (*Eleocharis sp.*), and wildflowers such as common boneset (*Eupatorium perfoliatum*), pinkladies (*Oenothera speciosa*), and purple passionflower (*Passiflora incarnata*).

The vegetation observed in the former Anadarko operations areas and vicinity was very dense and green, with no evidence of chlorosis. Vegetation within the former Anadarko operations areas and vicinity does not show evidence of impact from E&P operations.

**Wildlife**

A total of 30 species of birds were observed in the former BP operations areas during the April 2025 field visits. This total includes 1 SGCN species, 9 resident passerine species, and 8 neotropical and passerine migrant species, indicating that the former BP operations areas are providing important habitat for at-risk bird species, resident birds, as well as bird species that migrate. Furthermore, we observed all levels of the avian trophic food chain in the former BP operations areas, including herbivores like Northern Cardinals (*C. cardinalis*) and Brown-headed Cowbirds (*M. ater*), secondary consumers such as woodpeckers (Picidae family), and tertiary consumers such as herons and egrets (Ardeidae family). The functioning avian food chain is

evidence of a healthy Sweetgum-Water Oak Bottomland Forest natural community that is providing the expected services of habitat and diet for birds that are important to recreation activities in the area.

A total of 16 non-avian taxa were documented in the former BP operations areas across all field visits and survey types, including pollinating insects and grazing mammals. The diversity of herbivorous species present in the former BP operations areas is evidence that the seeds, nuts, nectar, fruits, and berries available in the former BP operations areas as diet are providing sufficient calories for a variety of primary consumers. Primary producers (plants) are the base of the food chain, and the abundance of plant-eating animals in the former BP operations areas, including large mammals such as white-tailed deer (*O. virginianus*), is a line of evidence that plants are thriving in the former BP operations areas.

Wildlife in the former BP operations areas do not show impact from E&P operations. Remediation is not needed to protect ecological species or their habitats, per the field investigation of vegetation and wildlife.

A total of 34 bird species were observed in the former Anadarko operations areas and vicinity. The grassy areas and riparian and edge forests in the former Anadarko operations areas and vicinity provide habitat for bird species of all trophic levels, including herbivorous primary consumers, secondary consumers that consume insects and aquatic invertebrates, and higher trophic level species and apex birds of prey, such as Red-shouldered Hawk (*B. lineatus*). The complete trophic structure of the avian population in the former Anadarko operations areas and vicinity demonstrates that there are sufficient resources present in the forest and grassy habitats to support higher and lower levels of the food chain.

In addition to the birds observed, the eco field team observed 32 additional taxa in the former Anadarko operations areas and vicinity, including a wide variety of pollinating insects and recreationally important species such as white-tailed deer (*O. virginianus*), feral hog (*S. scrofa*), and rabbit (Family Leporidae).

Wildlife in the former Anadarko operations areas and vicinity do not show impact from E&P operations. Remediation is not needed to protect ecological species or their habitats, per the field investigation of vegetation and wildlife.

**Summary**

Per the quantitative risk assessment and the field assessment, remediation is not needed to be protective of ecological species.

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# TABLES

*Table 1*
*List of Plants Observed on the Property*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Common Name | Scientific Name | Wetland Classification[a] |
|---|---|---|
| Alligatorweed | *Alternanthera philoxeroides* | OBL |
| American beautyberry | *Callicarpa americana* | FACU |
| American elm | *Ulmus americana* | FAC |
| Annual blue-eyed grass | *Sisyrinchium rosulatum* | FAC |
| Annual canarygrass | *Phalaris canariensis* | FACU |
| Annual rabbitsfoot grass | *Polypogon monspeliensis* | FACW |
| Annual yellow sweetclover | *Melilotus indicus* | FACU |
| Bald cypress | *Taxodium distichum* | OBL |
| Bermudagrass | *Cynodon dactylon* | FACU |
| Black willow | *Salix nigra* | OBL |
| Branched centaury | *Centaurium pulchellum* | FACU |
| Brazilian vervain | *Verbena brasiliensis* | FACU |
| Britton's wild petunia | *Ruellia brittoniana* | FAC |
| Burclover | *Medicago polymorpha* | FACU |
| Bushy bluestem | *Andropogon glomeratus* | FACW |
| Buttercup | *Ranunculus sp.* | NA |
| Butterweed | *Packera glabella* | OBL |
| Callery pear | *Pyrus calleryana* | ND |
| Canada goldenrod | *Solidago altissima* | FACU |
| Canadian black snakeroot | *Sanicula canadensis* | FACU |
| Carolina coralbead | *Cocculus carolinus* | FAC |
| Carolina desert-chicory | *Pyrrhopappus carolinianus* | ND |
| Carolina geranium | *Geranium carolinianum* | ND |
| Carolina ponysfoot | *Dichondra carolinensis* | FAC |
| Cherokee sedge | *Carex cherokeensis* | FACW |
| Cherrybark oak | *Quercus pagoda* | FAC |
| Chicory | *Cichorium intybus* | FACU |
| Chinese privet | *Ligustrum sinense* | FAC |
| Chinese tallow | *Triadica sebifera* | FAC |
| Clasping Venus' looking-glass | *Triodanis perfoliata var. perfoliata* | FACU |
| Common boneset | *Eupatorium perfoliatum* | FACW |
| Common persimmon | *Diospyros virginiana* | FAC |
| Common sheep sorrel | *Rumex acetosella* | FACU |
| Creeping primrose-willow | *Ludwigia repens* | OBL |
| Cuman ragweed | *Ambrosia psilostachya* | FAC |
| Curly dock | *Rumex crispus* | FAC |
| Cutleaf evening-primrose | *Oenothera laciniata* | ND |
| Dogfennel | *Eupatorium capillifolium* | FACU |
| Dwarf palmetto | *Sabal minor* | FACW |
| Eastern baccharis | *Baccharis halimifolia* | FAC |
| Eastern poison ivy | *Toxicodendron radicans* | FAC |
| Evening primrose | *Oenothera drummondii* | ND |
| False nettle | *Boehmeria sp.* | NA |
| Florida hedgenettle | *Stachys floridana* | ND |
| Fogfruit | *Phyla sp.* | NA |
| Giant ragweed | *Ambrosia trifida* | FAC |
| Green flatsedge | *Cyperus virens* | FACW |
| Hardy orange | *Poncirus trifoliata* | ND |
| Herbwilliam | *Ptilimnium capillaceum* | OBL |
| Horse-nettle | *Solanum carolinense* | FACU |
| Italian ryegrass | *Lolium perenne* | FACU |
| Japanese climbing fern | *Lygodium japonicum* | FAC |
| Japanese honeysuckle | *Lonicera japonica* | FACU |

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*Jefferson Davis Parish, Louisiana*

| Common Name | *Scientific Name* | Wetland Classification[a] |
|---|---|---|
| Johnsongrass | *Sorghum halepense* | FACU |
| Lateflowering thoroughwort | *Eupatorium serotinum* | FAC |
| Lettuce | *Lactuca sp.* | NA |
| Little bluestem | *Schizachyrium scoparium* | FACU |
| Little quakinggrass | *Briza minor* | FAC |
| Live oak | *Quercus virginiana* | FACU |
| Loblolly pine | *Pinus taeda* | FAC |
| Louisiana vetch | *Vicia ludoviciana* | ND |
| Lyreleaf sage | *Salvia lyrata* | FACU |
| Marsh bristlegrass | *Setaria parviflora* | FACW |
| Muscadine | *Vitis rotundifolia* | FAC |
| Narrowleaf mountainmint | *Pycnanthemum tenuifolium* | FACW |
| Peppervine | *Nekemias arborea* | FAC |
| Persian clover | *Trifolium resupinatum* | FACU |
| Philadelphia fleabane | *Erigeron philadelphicus* | FAC |
| Pickerelweed | *Pontederia cordata* | OBL |
| Pinkladies | *Oenothera speciosa* | ND |
| Possumhaw | *Ilex decidua* | FACW |
| Purple passionflower | *Passiflora incarnata* | ND |
| Roundleaf greenbrier | *Smilax rotundifolia* | FAC |
| Rush | *Juncus sp.* | NA |
| Savannah-panicgrass | *Phanopyrum gymnocarpon* | OBL |
| Saw greenbrier | *Smilax bona-nox* | FAC |
| Sawtooth blackberry | *Rubus argutus* | FAC |
| Scarlet pimpernel | *Anagallis arvensis* | FACU |
| Seaside goldenrod | *Solidago sempervirens* | FACW |
| Sensitive plant | *Mimosa sp.* | NA |
| Slender woodoats | *Chasmanthium laxum* | FACW |
| Smartweed | *Persicaria sp.* | NA |
| Southern arrowwood | *Viburnum dentatum* | FAC |
| Southern dewberry | *Rubus trivialis* | FACU |
| Spider lily | *Hymenocallis occidentalis* | FACW |
| Spikerush | *Eleocharis sp.* | NA |
| Spoonleaf purple everlasting | *Gamochaeta purpurea* | UPL |
| St. Johnswort | *Hypercium sp.* | NA |
| Stickywilly | *Galium aparine* | FACU |
| Submerged aquatic vegetation | *Kingdom Plantae* | OBL |
| Sugarberry | *Celtis laevigata* | FACW |
| Sumpweed | *Iva annua* | FAC |
| Swamp leather flower | *Clematis crispa* | FACW |
| Sweetgum | *Liquidambar styraciflua* | FAC |
| Texas star | *Sabatia campestris* | FACU |
| Texas vervain | *Verbena halei* | ND |
| Tievine | *Ipomoea cordatotriloba* | FACU |
| Timothy canarygrass | *Phalaris angusta* | FACW |
| Trumpet creeper | *Campsis radicans* | FAC |
| Tufted lovegrass | *Eragrostis pectinacea* | FAC |
| Variable panicgrass | *Dichanthelium commutatum* | FAC |
| Virginia creeper | *Parthenocissus quinquefolia* | FACU |
| Water oak | *Quercus nigra* | FAC |
| Water spangles | *Salvinia minima* | OBL |
| Wax myrtle | *Morella cerifera* | FAC |
| White avens | *Geum canadense* | FAC |
| White crownbeard | *Verbesina virginica* | FACU |

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*List of Plants Observed on the Property*
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*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Common Name | *Scientific Name* | Wetland Classification[a] |
|---|---|---|
| Windmill grass | *Chloris sp.* | NA |
| Winged elm | *Ulmus alata* | FACU |
| Woodsorrel | *Oxalis sp.* | NA |
| Yaupon | *Ilex vomitoria* | FAC |
| Yellow puff | *Neptunia pubescens* | FACU |
| Yellow thistle | *Cirsium horridulum* | FAC |
| **Total Observed:** | **113** | |

Notes:

[a]Wetland classification provided by the USDA (2025) PLANTS database.
OBL = Obligate species almost always occur in wetlands under natural conditions.
FACW = Facultative wetland species usually occur in wetlands.
FAC = Facultative species are equally likely to occur in wetlands and non-wetlands.
FACU = Facultative upland species usually occur in non-wetlands but are occasionally found in wetlands.
UPL = Upland species almost always occur in non-wetlands under natural conditions.
NA = Wetland classification, growth habit, and state status data are not applicable to taxa identified to genus.
ND = The USDA (2025) PLANTS Database does not provide wetland classification information for this species.
The plant taxa documented in the table include those observed and identified by ERM staff on the Property during all

Source:
U.S. Department of Agriculture (USDA) Natural Resources Conservation Service. 2025. PLANTS Database. Available: https://plants.sc.egov.usda.gov/home

*Table 2*
*List of Birds Observed on the Property*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Common Name | Scientific Name | SGCN[a] |
|---|---|---|
| American Crow | *Corvus brachyrhynchos* | |
| Anhinga | *Anhinga anhinga* | |
| Bank Swallow | *Riparia riparia* | |
| Barn Swallow | *Hirundo rustica* | |
| Barred Owl | *Strix varia* | |
| Black Vulture | *Coragyps atratus* | |
| Black-bellied Whistling Duck | *Dendrocygna autumnalis* | |
| Black-crowned Night Heron | *Nycticorax nycticorax* | |
| Black-necked Stilt | *Himantopus mexicanus* | |
| Blue Grosbeak | *Passerina caerulea* | |
| Blue Jay | *Cyanocitta cristata* | |
| Boat-tailed Grackle | *Quiscalus major* | |
| Brown Thrasher | *Toxostoma rufum* | |
| Brown-headed Cowbird | *Molothrus ater* | |
| Canada Goose | *Branta canadensis* | |
| Carolina Chickadee | *Poecile carolinensis* | |
| Carolina Wren | *Thryothorus ludovicianus* | |
| Cedar Waxwing | *Bombycilla cedrorum* | |
| Chimney Swift | *Chaetura pelagica* | ✓ |
| Common Grackle | *Quiscalus quiscula* | |
| Common Yellowthroat | *Geothlypis trichas* | |
| Double-crested Cormorant | *Nannopterum auritum* | |
| Downy Woodpecker | *Dryobates pubescens* | |
| Eastern Kingbird | *Tyrannus tyrannus* | |
| Eastern Meadowlark | *Sturnella magna* | ✓ |
| Fish Crow | *Corvus ossifragus* | |
| Gray Catbird | *Dumetella carolinensis* | |
| Great Blue Heron | *Ardea herodias* | |
| Great Crested Flycatcher | *Myiarchus crinitus* | |
| Great Egret | *Ardea alba* | |
| Great-tailed Grackle | *Quiscalus mexicanus* | |
| Green Heron | *Butorides virescens* | |
| Hairy Woodpecker | *Dryobates villosus* | |
| Hooded Warbler | *Setophaga citrina* | ✓ |
| Inca Dove | *Columbina inca* | |
| Indigo Bunting | *Passerina cyanea* | |
| Killdeer | *Charadrius vociferus* | |
| Laughing Gull | *Leucophaeus atricilla* | |
| Lesser Yellowlegs | *Tringa flavipes* | |
| Little Blue Heron | *Egretta caerulea* | ✓ |
| Mourning Dove | *Zenaida macroura* | |
| Northern Cardinal | *Cardinalis cardinalis* | |
| Northern Flicker | *Colaptes auratus* | |
| Northern Parula | *Setophaga americana* | |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | |
| Orchard Oriole | *Icterus spurius* | |
| Painted Bunting | *Passerina ciris* | ✓ |
| Pileated Woodpecker | *Dryocopus pileatus* | |
| Prothonotary Warbler | *Protonotaria citrea* | ✓ |
| Red-bellied Woodpecker | *Melanerpes carolinus* | |
| Red-eyed Vireo | *Vireo olivaceus* | |
| Red-shouldered Hawk | *Buteo lineatus* | |
| Red-tailed Hawk | *Buteo jamaicensis* | |
| Red-winged Blackbird | *Agelaius phoeniceus* | |
| Ring-billed Gull | *Larus delawarensis* | |
| Ruby-throated Hummingbird | *Archilochus colubris* | |
| Snowy Egret | *Egretta thula* | |
| Summer Tanager | *Piranga rubra* | |
| Swamp Sparrow | *Melospiza georgiana* | |
| Tree Swallow | *Tachycineta bicolor* | |
| Tufted Titmouse | *Baeolophus bicolor* | |
| Turkey Vulture | *Cathartes aura* | |
| Western Cattle-Egret | *Ardea ibis* | |
| White Ibis | *Eudocimus albus* | |
| White-eyed Vireo | *Vireo griseus* | |
| White-faced Ibis | *Plegadis chihi* | |
| White-throated Sparrow | *Zonotrichia albicollis* | |
| Wood Stork | *Mycteria Americana* | ✓ |
| Yellow-billed Cuckoo | *Coccyzus americanus* | |
| Yellow-crowned Night Heron | *Nyctanassa violacea* | |
| Yellow-rumped Warbler | *Setophaga coronata* | |
| Yellow-throated Vireo | *Vireo flavifrons* | ✓ |
| **Total Observed:** | **72** | **8** |

Notes:
SGCN = Species of Greatest Conservation Need
✓ = The species is a Species of Greatest Conservation Need in Louisiana, as per LDWF (2022).
The bird species documented in the table include all those observed and identified by ERM staff on the Property across all site visits (20-ft Ecological Surveys and Incidental Sampling).

Source:
Louisiana Department of Wildlife and Fisheries (LDWF). 2022. Louisiana's Animal Species of Greatest

*Table 3*
*List of Additional Taxa Observed on the Property*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Common Name | Scientific Name | Trophic Level |
|---|---|---|
| ***Mammals*** | | |
| Coyote | *Canis latrans* | Apex |
| Feral hog | *Sus scrofa* | Tertiary Consumer |
| Raccoon | *Procyon lotor* | Tertiary Consumer |
| Virginia opossum | *Didelphis virginiana* | Tertiary Consumer |
| Eastern gray squirrel | *Sciurus carolinensis* | Primary Consumer |
| Rabbit | Family Leporidae | Primary Consumer |
| White-tailed deer | *Odocoileus virginianus* | Primary Consumer |
| ***Reptiles*** | | |
| American alligator | *Alligator mississippiensis* | Apex |
| Common watersnake | *Nerodia sipedon* | Tertiary Consumer |
| Eastern mud turtle | *Kinosternon subrubrum* | Tertiary Consumer |
| Western ribbonsnake | *Thamnophis proximus* | Tertiary Consumer |
| Green anole | *Anolis carolinensis* | Secondary Consumer |
| Pond slider | *Trachemys elegans* | Secondary Consumer |
| Skink | *Family Scincidae* | Secondary Consumer |
| ***Amphibians*** | | |
| Bullfrog | *Lithobates sp.* | Secondary Consumer |
| Green tree frog | *Hyla cinerea* | Secondary Consumer |
| Southern leopard frog | *Lithobates sphenocephalus* | Secondary Consumer |
| Squirrel tree frog | *Hyla squirrella* | Secondary Consumer |
| Toad | Order Anura | Secondary Consumer |
| **Fish** | | |
| Fish | Subphylum Vertebrata | Secondary Consumer |
| **Aquatic Invertebrates** | | |
| Crawfish | Order Decapoda | Secondary Consumer |
| Isopod crustacean | *Probopyrus sp.* | Secondary Consumer |
| **Terrestrial Invertebrates** | | |
| Asian lady beetle | *Harmonia axyridis* | Secondary Consumer |
| Black-footed yellow sac spider | *Cheiracanthium inclusum* | Secondary Consumer |
| Cricket | Superfamily Grylloidea | Secondary Consumer |
| Eastern pondhawk | *Erythemis simplicicollis* | Secondary Consumer |
| Fire ant | *Solenopsis sp.* | Secondary Consumer |
| Great blue skimmer | *Libellula vibrans* | Secondary Consumer |
| Red-headed bush cricket | *Phyllopalpus pulchellus* | Secondary Consumer |
| Six-spotted tiger beetle | *Cicindela sexguttata* | Secondary Consumer |
| Spider wasp | *Entypus sp.* | Secondary Consumer |
| Spinybacked orbweaver | *Gasteracantha cancriformis* | Secondary Consumer |
| Spotted orbweaver | *Neoscona sp.* | Secondary Consumer |
| Tiger beetle | Subfamily Cicindelinae | Secondary Consumer |
| Wolf spider | Family Lycosidae | Secondary Consumer |
| Beetle | Order Coleoptera | Primary Consumer |
| Bumblebee | *Bombus sp.* | Primary Consumer |
| Carpenter bee | *Xylocopa sp.* | Primary Consumer |
| Cicada | Superfamily Cicadoidea | Primary Consumer |
| Eastern buckmoth | *Hemileuca maia* | Primary Consumer |
| Eastern carpenter bee | *Xylocopa virginica* | Primary Consumer |
| Eastern leaf-footed bug | *Leptoglossus phyllopus* | Primary Consumer |
| Eastern tiger swallowtail | *Papilio glaucus* | Primary Consumer |
| Forest tent caterpillar moth | *Malacosoma disstria* | Primary Consumer |
| Furrow bee | *Halictus sp.* | Primary Consumer |
| Giant leopard moth | *Hypercompe scribonia* | Primary Consumer |
| Giant swallowtail | *Papilio cresphontes* | Primary Consumer |
| Grasshopper | Infraorder Acrididea | Primary Consumer |
| Hawk moth | Family Sphingidae | Primary Consumer |
| Honey bee | *Apis sp.* | Primary Consumer |
| Horsefly | Family Tabanidae | Primary Consumer |
| Katydid | Family Tettigoniidae | Primary Consumer |
| Mayfly | Order Ephemeroptera | Primary Consumer |
| Monarch butterfly | *Danaus plexippus* | Primary Consumer |
| Mosquito | *Anopheles sp.* | Primary Consumer |
| Northern walkingstick | *Diapheromera femorata* | Primary Consumer |
| Pipevine swallowtail | *Battus philenor* | Primary Consumer |
| Question mark butterfly | *Polygonia interrogationis* | Primary Consumer |
| Salt marsh moth | *Estigmene acrea* | Primary Consumer |

*Table 3*
*List of Additional Taxa Observed on the Property*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Common Name | *Scientific Name* | Trophic Level |
|---|---|---|
| Skipper butterfly | Family Hesperiidae | Primary Consumer |
| Soldier beetle | Family Cantharidae | Primary Consumer |
| Spicebush swallowtail | *Papilio troilus* | Primary Consumer |
| Spilosoma Moth | *Spilosoma sp.* | Primary Consumer |
| Spittlebug | Family Cercopidae | Primary Consumer |
| Stink bug | Family Pentatomidae | Primary Consumer |
| Swallowtail | Family Papilionidae | Primary Consumer |
| Terrestrial isopod | Order Isopoda | Primary Consumer |
| Tropical checkered skipper | *Burnsius oileus* | Primary Consumer |
| Viceroy butterfly | *Limenitis archippus* | Primary Consumer |
| ***Fungi*** | | |
| Shelf fungus | Group Polypores | Decomposer |
| ***Lichens*** | | |
| Lichen | Lichen | Primary Producer |
| **Total Additional Taxa Observed:** | **71** | |

Notes:
Apex Predator = Carnivores at the top of the food chain without natural predators.
Tertiary Consumers = Carnivores and omnivores which consume primary and secondary consumers.
Secondary Consumers = Omnivores and carnivores which consume primary consumers (herbivores).
Primary Consumer = Herbivores that consume plants and plant material (nectar, seeds, nuts, etc.).
Decomposer = Organisms that decompose organic material such as fungi.
The taxa documented in the table include all those observed and identified by ERM staff on the Property across all ecological surveys (20-ft Ecological Surveys and Incidental Sampling).

*Table 4A*
*List of Plants Observed during the Former BP Operations Areas and Reference Areas Surveys*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Common Name | *Scientific Name* | Former BP Operations Areas | Reference Areas |
|---|---|---|---|
| American beautyberry | *Callicarpa americana* | ✓ | ✓ |
| American elm | *Ulmus americana* | ✓ | ✓ |
| Annual blue-eyed grass | *Sisyrinchium rosulatum* | | ✓ |
| Annual canarygrass | *Phalaris canariensis* | | ✓ |
| Annual rabbitsfoot grass | *Polypogon monspeliensis* | ✓ | |
| Annual yellow sweetclover | *Melilotus indicus* | ✓ | |
| Bermudagrass | *Cynodon dactylon* | ✓ | |
| Branched centaury | *Centaurium pulchellum* | ✓ | |
| Brazilian vervain | *Verbena brasiliensis* | ✓ | ✓ |
| Burclover | *Medicago polymorpha* | ✓ | |
| Bushy bluestem | *Andropogon glomeratus* | ✓ | ✓ |
| Buttercup | *Ranunculus sp.* | ✓ | |
| Butterweed | *Packera glabella* | ✓ | ✓ |
| Callery pear | *Pyrus calleryana* | | ✓ |
| Canada goldenrod | *Solidago altissima* | ✓ | ✓ |
| Canadian black snakeroot | *Sanicula canadensis* | ✓ | ✓ |
| Carolina coralbead | *Cocculus carolinus* | ✓ | ✓ |
| Carolina geranium | *Geranium carolinianum* | ✓ | ✓ |
| Carolina ponysfoot | *Dichondra carolinensis* | ✓ | |
| Cherokee sedge | *Carex cherokeensis* | ✓ | ✓ |
| Cherrybark oak | *Quercus pagoda* | ✓ | ✓ |
| Chicory | *Cichorium intybus* | | ✓ |
| Chinese privet | *Ligustrum sinense* | ✓ | ✓ |
| Chinese tallow | *Triadica sebifera* | ✓ | |
| Clasping Venus' looking-glass | *Triodanis perfoliata* | | ✓ |
| Common boneset | *Eupatorium perfoliatum* | ✓ | |
| Common persimmon | *Diospyros virginiana* | | ✓ |
| Common sheep sorrel | *Rumex acetosella* | | ✓ |
| Creeping primrose-willow | *Ludwigia repens* | | ✓ |
| Cuman ragweed | *Ambrosia psilostachya* | ✓ | ✓ |
| Cutleaf evening-primrose | *Oenothera laciniata* | | ✓ |
| Dogfennel | *Eupatorium capillifolium* | | ✓ |
| Dwarf palmetto | *Sabal minor* | ✓ | |
| Eastern baccharis | *Baccharis halimifolia* | ✓ | |
| Eastern poison ivy | *Toxicodendron radicans* | ✓ | ✓ |
| Everlasting | *Gamochaeta sp.* | ✓ | ✓ |
| Florida hedgenettle | *Stachys floridana* | | ✓ |
| Giant ragweed | *Ambrosia trifida* | ✓ | ✓ |
| Green flatsedge | *Cyperus virens* | ✓ | |
| Hardy orange | *Poncirus trifoliata* | | ✓ |
| Italian ryegrass | *Lolium perenne* | ✓ | ✓ |
| Japanese climbing fern | *Lygodium japonicum* | ✓ | ✓ |
| Japanese honeysuckle | *Lonicera japonica* | ✓ | ✓ |
| Johnsongrass | *Sorghum halepense* | ✓ | ✓ |
| Lettuce | *Lactuca sp.* | ✓ | |
| Little bluestem | *Schizachyrium scoparium* | | ✓ |
| Little quakinggrass | *Briza minor* | ✓ | ✓ |
| Live oak | *Quercus virginiana* | ✓ | ✓ |
| Loblolly pine | *Pinus taeda* | ✓ | ✓ |
| Louisiana vetch | *Vicia ludoviciana* | ✓ | ✓ |
| Lyreleaf sage | *Salvia lyrata* | ✓ | |
| Marsh bristlegrass | *Setaria parviflora* | ✓ | |
| Muscadine | *Vitis rotundifolia* | | ✓ |
| Peppervine | *Nekemias arborea* | ✓ | ✓ |
| Persian clover | *Trifolium resupinatum* | ✓ | |
| Philadelphia fleabane | *Erigeron philadelphicus* | ✓ | |
| Possumhaw | *Ilex decidua* | ✓ | ✓ |
| Roundleaf greenbrier | *Smilax rotundifolia* | | ✓ |
| Savannah-panicgrass | *Phanopyrum gymnocarpon* | ✓ | |
| Saw greenbrier | *Smilax bona-nox* | | ✓ |
| Sawtooth blackberry | *Rubus argutus* | ✓ | ✓ |
| Scarlet pimpernel | *Anagallis arvensis* | ✓ | ✓ |
| Seaside goldenrod | *Solidago sempervirens* | ✓ | |
| Slender woodoats | *Chasmanthium laxum* | ✓ | ✓ |
| Southern arrowwood | *Viburnum dentatum* | | ✓ |
| Southern dewberry | *Rubus trivialis* | ✓ | ✓ |

*Table 4A*
*List of Plants Observed during the Former BP Operations Areas and Reference Areas Surveys*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Common Name | *Scientific Name* | Former BP Operations Areas | Reference Areas |
|---|---|---|---|
| St. Johnswort | *Hypercium sp.* | ✓ | |
| Stickywilly | *Galium aparine* | | ✓ |
| Sugarberry | *Celtis laevigata* | ✓ | ✓ |
| Sumpweed | *Iva annua* | | ✓ |
| Swamp leather flower | *Clematis crispa* | | ✓ |
| Sweetgum | *Liquidambar styraciflua* | ✓ | ✓ |
| Texas vervain | *Verbena halei* | ✓ | |
| Timothy canarygrass | *Phalaris angusta* | ✓ | |
| Trumpet creeper | *Campsis radicans* | ✓ | ✓ |
| Tufted lovegrass | *Eragrostis pectinacea* | ✓ | ✓ |
| Variable panicgrass | *Dichanthelium commutatum* | ✓ | |
| Virginia creeper | *Parthenocissus quinquefolia* | ✓ | ✓ |
| Water oak | *Quercus nigra* | ✓ | ✓ |
| White crownbeard | *Verbesina virginica* | ✓ | |
| Windmill grass | *Chloris sp.* | ✓ | |
| Winged elm | *Ulmus alata* | ✓ | |
| Woodsorrel | *Oxalis sp.* | ✓ | ✓ |
| Yaupon | *Ilex vomitoria* | ✓ | ✓ |
| Yellow thistle | *Cirsium horridulum* | | ✓ |
| **Total Observed:** | | **64** | **59** |

Notes:
The plant taxa documented in the table include all those observed and identified by ERM staff in the Former BP Operations Areas and Reference Areas during 20-ft Ecological Surveys on April 15th, 2025.

*Table 4B*
*List of Birds Observed during the Former BP Operations Areas and Reference Areas Surveys*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Common Name | *Scientific Name* | Former BP Operations Areas | Reference Areas |
|---|---|---|---|
| American Crow | *Corvus brachyrhynchos* | ✓ | ✓ |
| Barn Swallow | *Hirundo rustica* | | ✓ |
| Black-bellied Whistling Duck | *Dendrocygna autumnalis* | ✓ | |
| Blue Jay | *Cyanocitta cristata* | ✓ | ✓ |
| Brown Thrasher | *Toxostoma rufum* | ✓ | |
| Brown-headed Cowbird | *Molothrus ater* | ✓ | |
| Canada Goose | *Branta canadensis* | ✓ | |
| Carolina Wren | *Thryothorus ludovicianus* | ✓ | ✓ |
| Chimney Swift | *Chaetura pelagica* | ✓ | ✓ |
| Downy Woodpecker | *Dryobates pubescens* | ✓ | |
| Fish Crow | *Corvus ossifragus* | | ✓ |
| Gray Catbird | *Dumetella carolinensis* | ✓ | |
| Great Blue Heron | *Ardea herodias* | ✓ | ✓ |
| Great Crested Flycatcher | *Myiarchus crinitus* | ✓ | |
| Great Egret | *Ardea alba* | ✓ | ✓ |
| Hairy Woodpecker | *Dryobates villosus* | ✓ | |
| Laughing Gull | *Leucophaeus atricilla* | ✓ | |
| Mourning Dove | *Zenaida macroura* | ✓ | |
| Northern Cardinal | *Cardinalis cardinalis* | ✓ | ✓ |
| Northern Flicker | *Colaptes auratus* | ✓ | |
| Red-bellied Woodpecker | *Melanerpes carolinus* | ✓ | ✓ |
| Red-tailed Hawk | *Buteo jamaicensis* | ✓ | |
| Red-winged Blackbird | *Agelaius phoeniceus* | | ✓ |
| Ruby-throated Hummingbird | *Archilochus colubris* | ✓ | |
| Snowy Egret | *Egretta thula* | ✓ | |
| Swamp Sparrow | *Melospiza georgiana* | ✓ | |
| Tree Swallow | *Tachycineta bicolor* | ✓ | |
| Tufted Titmouse | *Baeolophus bicolor* | ✓ | ✓ |
| Turkey Vulture | *Cathartes aura* | ✓ | |
| White-eyed Vireo | *Vireo griseus* | ✓ | ✓ |
| White-faced Ibis | *Plegadis chihi* | ✓ | |
| White-throated Sparrow | *Zonotrichia albicollis* | ✓ | |
| Yellow-billed Cuckoo | *Coccyzus americanus* | ✓ | |
| **Total Observed:** | | **30** | **13** |

Notes:
The bird species documented in the table include all those observed and identified by ERM staff in the Former BP Operations Areas and Reference Areas during 20-ft Ecological Surveys on April 15th, 2025.

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 8-10' | 8-10' | 22-24' | 22-24' | 32-34' | 32-34' | 46-48' | 46-48' | 56-58' | 56-58' |
| | | | Sample Date | 3/9/2022 | 3/9/2022 | 3/9/2022 | 3/9/2022 | 3/9/2022 | 3/9/2022 | 3/10/2022 | 3/10/2022 | 3/10/2022 | 3/10/2022 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | 6.19 | NA | NA | 9.20 | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | 108.0 | NA | NA | 390 | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NS | NS | <500 | NA | NA | 593 | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | <0.251 | NA | NA | <0.481 | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | 9.28 | NA | NA | 17.0 | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 11 | 44 | 5.87 | NA | NA | 13.4 | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | NS | 0.11 | <0.0181 | NA | NA | <0.103 | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | <1.26 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | <0.628 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | NA | NA | 182 | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | 20.2 | NA | NA | 54.4 | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | 238 | NA | NA | 291 | NA | NA | NA | NA | 70.0 | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 | CD-4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 8-10' | 8-10' | 22-24' | 22-24' | 32-34' | 32-34' | 46-48' | 46-48' | 56-58' | 56-58' |
| | | | Sample Date | 3/9/2022 | 3/9/2022 | 3/9/2022 | 3/9/2022 | 3/9/2022 | 3/9/2022 | 3/10/2022 | 3/10/2022 | 3/10/2022 | 3/10/2022 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 20.4 | 17.9 | 22.7 | 22.7 | 25.1 | 21.9 | 28.1 | 24.0 | 32.2 | 30.7 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | 43.8 | NA | 213 | NA | 38.1 | NA | 60.0 | NA | 102 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | 14.4 | NA | NA | 44.1 | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 27.4 | 23.9 | 3.32 | 1.54 | 1.84 | 1.60 | 6.23 | 3.79 | 7.80 | 6.35 |
| Exchangeable Sodium Percentage | % | NS | NS | 23.0 | NA | NA | 40.9 | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | 26.5 | NA | NA | 18.3 | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | 73.9 | NA | NA | 0.78 | NA | NA | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | NS | NS | 35.4 | NA | NA | 0.34 | NA | NA | NA | NA | NA | NA |
| Soluble Sodium | meq/L | NS | NS | 196 | NA | NA | 13.7 | NA | NA | NA | NA | NA | NA |
| pH | S.U. | NS | NS | 7.12 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | NS | NS | 5030 | 4320 | 954 | 704 | 54.8 | 76.6 | 834 | 812 | 1430 | 1880 |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-4 | CD-4 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 66-68' | 66-68' | 26-28' | 26-28' | 38-40' | 38-40' | 52-54' | 52-54' | 56-58' | 56-58' |
| | | | Sample Date | 3/10/2022 | 3/10/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 11 | 44 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-4 | CD-4 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 66-68' | 66-68' | 26-28' | 26-28' | 38-40' | 38-40' | 52-54' | 52-54' | 56-58' | 56-58' |
| | | | Sample Date | 3/10/2022 | 3/10/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 25.2 | 27.7 | 22.1 | 28.7 | 23.6 | 20.9 | 21.0 | 19.9 | 21.5 | 17.3 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | 48.7 | NA | 111.8 | NA | 52.2 | NA | 37.5 | NA | 57.1 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.811 | 0.81 | 0.878 | 0.82 | 0.882 | 1.08 | 0.878 | 0.83 | 14.0 | 9.34 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Sodium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| pH | S.U. | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | NS | NS | 26.4 | 77.1 | 70.1 | 155 | 27.3 | 186 | 56.8 | 145 | 1620 | 2500 |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 60-62' | 60-62' | 68-70' | 68-70' | 70-72' | 70-72' | 72-74' | 72-74' | 88-90' | 88-90' |
| | | | Sample Date | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 4/26/2022 | 4/26/2022 | 4/26/2022 | 4/26/2022 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 11 | 44 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | 194 | NA | NA | NA | 87.0 | NA | NA | NA | 0.865 | 5.10 |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 | CD-5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 60-62' | 60-62' | 68-70' | 68-70' | 70-72' | 70-72' | 72-74' | 72-74' | 88-90' | 88-90' |
| | | | Sample Date | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 3/14/2022 | 4/26/2022 | 4/26/2022 | 4/26/2022 | 4/26/2022 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 33.1 | 24.5 | 27.3 | 25.6 | 30.2 | 28.9 | 26.3 | 25.2 | 29.1 | 25.8 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | 91.3 | NA | 64.4 | NA | 98.4 | NA | 99.8 | NA | 63.4 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 19.2 | 18.3 | 17.0 | 17.9 | 9.13 | 8.26 | 4.2 | 3.16 | 0.757 | 0.68 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Sodium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| pH | S.U. | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | NS | NS | 3840 | 5340 | 3290 | 5290 | 1970 | 2190 | 844 | 782 | 17 | 20.7 |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-5 | CD-5 | CD-6 | CD-6 | CD-6 | CD-6 | CD-6 | CD-6 | CD-6 | CD-6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 94-96' | 94-96' | 0-4' | 6-8' | 6-8' | 10-12' | 10-12' | 28-30' | 28-30' | 52-54' |
| | | | Sample Date | 4/26/2022 | 4/26/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 |
| | | | Data Provider | ERM | ICON | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | 4.86 | 3.24 | 4.41 | 12.96 | 9.02 | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | NA | NA | 263 | 226 | 262 | 252 | 229 | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NS | NS | NA | NA | 418 | <500 | 417 | <500 | 389 | NA | NA | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | <0.500 | <0.239 | <0.483 | <0.274 | <0.497 | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | NA | NA | 12.8 | 14 | 16.6 | 27.3 | 19.2 | NA | NA | NA |
| Lead | mg/Kg | 11 | 44 | NA | NA | 11.7 | 8.38 | 12.0 | 21.4 | 14.3 | NA | NA | NA |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | <0.107 | <0.16 | <0.109 | <0.202 | <0.0928 | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | <1.19 | NA | <1.37 | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | <0.597 | NA | <0.686 | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | NA | 24.3 | NA | 50.4 | NA | 55.8 | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | NA | NA | 19.6 | 39.4 | 46.6 | 76.4 | 58.6 | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | 3.86 | 26.2 | 0.863 |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-5 | CD-5 | CD-6 | CD-6 | CD-6 | CD-6 | CD-6 | CD-6 | CD-6 | CD-6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 94-96' | 94-96' | 0-4' | 6-8' | 6-8' | 10-12' | 10-12' | 28-30' | 28-30' | 52-54' |
| | | | Sample Date | 4/26/2022 | 4/26/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/12/2022 |
| | | | Data Provider | ERM | ICON | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 27.0 | 25.5 | 19.0 | 16.3 | 17.4 | 27.1 | 21.7 | 24.3 | 23.1 | 22.4 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | 77 | NA | NA | 113 | NA | 160 | NA | 48.2 | NA | 77.0 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | 37.1 | 37.7 | 40.7 | 30.4 | 55.7 | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.648 | 0.61 | 0.30 | 0.569 | 0.37 | 0.526 | 0.32 | 0.806 | 0.73 | 0.704 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | 5.20 | 4.41 | 5.95 | 6.34 | 5.63 | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | 4.29 | 8.43 | 4.94 | 9.10 | 3.93 | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | NA | 0.37 | 0.420 | 0.47 | 0.312 | 0.47 | NA | NA | NA |
| Soluble Magnesium | meq/L | NS | NS | NA | NA | 0.28 | 0.292 | 0.33 | 0.235 | 0.51 | NA | NA | NA |
| Soluble Sodium | meq/L | NS | NS | NA | NA | 2.45 | 5.03 | 3.12 | 4.76 | 2.74 | NA | NA | NA |
| pH | S.U. | NS | NS | NA | NA | NA | 8.54 | NA | 8.52 | NA | NA | NA | NA |
| Chloride | mg/Kg | NS | NS | 12.5 | 15.5 | 7.75 | 10.7 | 18.9 | 12.7 | 31.1 | NA | NA | NA |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-6 | CD-6 | CD-6 | CD-12R | CD-12R | CD-12R | CD-12R | CD-12R | CD-12R | CD-12R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 52-54' | 76-78' | 76-78' | 8-10' | 8-10' | 16-18' | 16-18' | 26-28' | 26-28' | 46-48' |
| | | | Sample Date | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 |
| | | | Data Provider | ICON | ERM | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 11 | 44 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | 10.1 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-6 | CD-6 | CD-6 | CD-12R | CD-12R | CD-12R | CD-12R | CD-12R | CD-12R | CD-12R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 52-54' | 76-78' | 76-78' | 8-10' | 8-10' | 16-18' | 16-18' | 26-28' | 26-28' | 46-48' |
| | | | Sample Date | 4/12/2022 | 4/12/2022 | 4/12/2022 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 |
| | | | Data Provider | ICON | ERM | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 20.6 | 20.1 | 17.4 | 18.7 | 18.1 | 29.7 | 24.6 | 23.6 | 21 | 22.1 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 63.4 | NA | 101 | NA | 182 | NA | 100 | NA | 106 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.62 | 0.619 | 0.51 | 0.531 | 0.67 | 0.287 | 0.18 | 0.338 | 0.19 | 0.427 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | NA | NA | 0.614 | NA | 0.83 | NA | 0.901 | NA | 1.83 |
| Soluble Magnesium | meq/L | NS | NS | NA | NA | NA | 0.153 | NA | 0.295 | NA | 0.373 | NA | 0.626 |
| Soluble Sodium | meq/L | NS | NS | NA | NA | NA | 4.46 | NA | 1.96 | NA | 2.33 | NA | 1.79 |
| pH | S.U. | NS | NS | NA | NA | NA | 7.58 | NA | 8 | NA | 8.1 | NA | 8.22 |
| Chloride | mg/Kg | NS | NS | NA | NA | NA | 37.4 | NA | <20.0 | NA | <20.0 | NA | <20.0 |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | 88.3 | NA | 11.2 | NA | 7.09 | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | 2.82 | NA | 0.302 | NA | 0.393 | NA | 0.411 |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | 0.8 | NA | 2.6 | NA | 2.6 | NA | 3.3 |
| Sulfate | meq/L | NS | NS | NA | NA | NA | 0.438 | NA | 0.12 | NA | 0.319 | NA | 0.65 |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-12R | CD-12R | CD-12R | CD-12R | CD-12R | CD-18 | CD-18 | CD-18 | CD-18 | CD-18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 46-48' | 60-62' | 60-62' | 78-80' | 78-80' | 0-4' | 0-4' | 6-8' | 6-8' | 10-12' |
| | | | Sample Date | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | NA | NA | NA | 4.83 | 5.09 | 14 | 3.91 | 21.1 |
| Barium | mg/Kg | 2424 | 775 | NA | NA | NA | NA | NA | 401 | 479 | 385 | 845 | 427 |
| True Total Barium | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | 665 | 868 | 922 | 1,580 | 483 |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | NA | NA | NA | <0.257 | <0.494 | 0.44 | <0.488 | <0.27 |
| Chromium | mg/Kg | 26 | 84 | NA | NA | NA | NA | NA | 20.7 | 14.1 | 33.4 | 13.1 | 39.7 |
| Lead | mg/Kg | 11 | 44 | NA | NA | NA | NA | NA | 13 | 11.2 | 21.4 | 10.7 | 22.2 |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | NA | NA | NA | 0.0311 | <0.103 | <0.022 | <0.107 | <0.0236 |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | <1.28 | NA | <1.27 | NA | <1.35 |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | <0.642 | NA | <0.635 | NA | <0.676 |
| Strontium | mg/Kg | NS | 203 | NA | NA | NA | NA | NA | 58.2 | 43.4 | 59.4 | 74.7 | 62.7 |
| Zinc | mg/Kg | 46 | 140 | NA | NA | NA | NA | NA | 162 | 39.9 | 87.4 | 29.2 | 97.84 |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-12R | CD-12R | CD-12R | CD-12R | CD-12R | CD-18 | CD-18 | CD-18 | CD-18 | CD-18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 46-48' | 60-62' | 60-62' | 78-80' | 78-80' | 0-4' | 0-4' | 6-8' | 6-8' | 10-12' |
| | | | Sample Date | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 4/22/2025 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 21 | 21.6 | 24.2 | 18.6 | 17.5 | 22.1 | 16.1 | 21.2 | 18 | 26 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 36.8 | NA | 30.6 | NA | 77.4 | NA | 139 | NA | 167 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | 28.6 | 33.3 | 43.9 | 28.6 | 50.9 |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.38 | 0.544 | 0.48 | 0.486 | 0.48 | 0.464 | 0.53 | 0.734 | 0.44 | 1.13 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | 1.5 | 16.5 | 8.52 | 3.37 | 7.43 |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | 1.96 | 6.45 | 11.60 | 1.87 | 11.7 |
| Soluble Calcium | meq/L | NS | NS | NA | 2.01 | NA | 1.76 | NA | 1.91 | 0.51 | 0.458 | 2.05 | 0.717 |
| Soluble Magnesium | meq/L | NS | NS | NA | 0.745 | NA | 0.734 | NA | 0.657 | 0.42 | 0.205 | 0.74 | 0.571 |
| Soluble Sodium | meq/L | NS | NS | NA | 2.59 | NA | 2.06 | NA | 2.22 | 4.4 | 6.70 | 2.21 | 9.38 |
| pH | S.U. | NS | NS | NA | 8.01 | NA | 8 | NA | 7.95 | NA | 8.5 | NA | 8.39 |
| Chloride | mg/Kg | NS | NS | NA | <20.0 | NA | <20.0 | NA | 5.64 | 75.3 | 81.1 | 16.5 | 322 |
| Chloride | mg/Kg-dry | NS | NS | 20.9 | NA | 11.3 | NA | 17.8 | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | 1.43 | NA | 1.47 | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | 2.4 | NA | 2.3 | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | 1.1 | NA | 0.602 | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-18 | CD-18 | CD-18 | CD-18 | CD-18 | CD-18 | CD-18 | DB-1 | DB-1 | DB-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 10-12' | 14-16' | 14-16' | 26-28' | 26-28' | 56-58' | 56-58' | 8-10' | 8-10' | 23-25' |
| | | | Sample Date | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 4/16/2025 | 4/16/2025 | 4/16/2025 |
| | | | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | 9.85 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | 475 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NS | NS | 809 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | <0.495 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | 17.8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 11 | 44 | 15.6 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | NS | 0.11 | <0.0989 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | 57.1 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | 55.4 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | 6.45 | NA | NA | NA | 7.88 | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-18 | CD-18 | CD-18 | CD-18 | CD-18 | CD-18 | CD-18 | DB-1 | DB-1 | DB-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 10-12' | 14-16' | 14-16' | 26-28' | 26-28' | 56-58' | 56-58' | 8-10' | 8-10' | 23-25' |
| | | | Sample Date | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 7/23/2024 | 4/16/2025 | 4/16/2025 | 4/16/2025 |
| | | | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 18.7 | 25.1 | 22.7 | 25.1 | 21.1 | 23.6 | 21.7 | 22.1 | NA | 9.02 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 137 | NA | 105 | NA | 51.3 | NA | 91.9 | NA | 135 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | 39.5 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 1.21 | 0.629 | 0.5 | 0.472 | 0.66 | 0.958 | 0.52 | 5.13 | 5.55 | 0.589 |
| Exchangeable Sodium Percentage | % | NS | NS | 13.4 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | 7.34 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | 1.67 | NA | NA | NA | NA | NA | NA | 11.5 | NA | 2.04 |
| Soluble Magnesium | meq/L | NS | NS | 1.29 | NA | NA | NA | NA | NA | NA | 6.54 | NA | 0.916 |
| Soluble Sodium | meq/L | NS | NS | 8.93 | NA | NA | NA | NA | NA | NA | 29.1 | NA | 2.17 |
| pH | S.U. | NS | NS | NA | 8.14 | NA | 8.36 | NA | 8.17 | NA | 7.13 | NA | 8.14 |
| Chloride | mg/Kg | NS | NS | 233 | 65.7 | 79.3 | 18.5 | 49 | 39.9 | 27.7 | 1440 | NA | 87.6 |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | 1350 | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | 32.9 | NA | NA | NA | 16.1 | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | 46.8 | NA | 3.76 |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | <0.3 | NA | 1.5 |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | 0.066 | NA | 0.088 |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
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West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 23-25' | 43-45' | 43-45' | 58-60' | 58-60' | 60-62' | 60-62' | 70-72' | 70-72' | 78-80' |
| | | | Sample Date | 4/16/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 11 | 44 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 | DB-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 23-25' | 43-45' | 43-45' | 58-60' | 58-60' | 60-62' | 60-62' | 70-72' | 70-72' | 78-80' |
| | | | Sample Date | 4/16/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 | 4/17/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | NA | 23 | NA | 28.5 | NA | 31.3 | NA | 29.1 | NA | 22.4 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 88.5 | NA | 79.3 | NA | 112 | NA | 68.5 | NA | 110 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.53 | 1.87 | 1.5 | 2.04 | 1.6 | 1.31 | 1.05 | 0.653 | 0.32 | 0.525 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | 5.1 | NA | 8.28 | NA | 5.22 | NA | 2.59 | NA | 1.92 |
| Soluble Magnesium | meq/L | NS | NS | NA | 2.07 | NA | 3.67 | NA | 2.29 | NA | 1.14 | NA | 0.827 |
| Soluble Sodium | meq/L | NS | NS | NA | 8.95 | NA | 5.19 | NA | 3.43 | NA | 2.64 | NA | 2.18 |
| pH | S.U. | NS | NS | NA | 8.23 | NA | 8.07 | NA | 8.08 | NA | 8.51 | NA | 8.38 |
| Chloride | mg/Kg | NS | NS | NA | 304 | NA | 270 | NA | 168 | NA | 24.8 | NA | <20.0 |
| Chloride | mg/Kg-dry | NS | NS | 90.2 | NA | 339 | NA | 278 | NA | 198 | NA | 19.5 | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | 14.9 | NA | 16.2 | NA | 9.42 | NA | 0.955 | NA | 1.15 |
| Alkalinity | meq/L | NS | NS | NA | 2.3 | NA | 2.8 | NA | 2.2 | NA | 4.2 | NA | 3.6 |
| Sulfate | meq/L | NS | NS | NA | 0.276 | NA | 0.289 | NA | 0.345 | NA | 1.36 | NA | 0.637 |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | DB-1 | HA-1 | HA-1 | HA-1 | HA-1 | HA-1 | HA-1 | HA-2 | HA-2 | HA-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 78-80' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 0-2' | 0-2' | 2-4' |
| | | | Sample Date | 4/17/2025 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| | | | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | 3.57 | 5.95 | 4.65 | 4.97 | 4.67 | 5.92 | 8.31 | 6.90 | 13.1 |
| Barium | mg/Kg | 2424 | 775 | NA | 200 | 402 | 251 | 517 | 301 | 356 | 3174 | 4640 | 1365 |
| True Total Barium | mg/Kg-dry | NS | NS | NA | <500 | 559 | <500 | 759 | <500 | 506 | 3,520 | 39,100 | 14,200 |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | <0.238 | <0.460 | <0.256 | <0.494 | <0.266 | <0.458 | <0.251 | <0.472 | <0.262 |
| Chromium | mg/Kg | 26 | 84 | NA | 12.9 | 13.2 | 13.6 | 12.4 | 13.4 | 14.3 | 44 | 45.5 | 192 |
| Lead | mg/Kg | 11 | 44 | NA | 9.57 | 18.0 | 22.1 | 13.7 | 11.62 | 13.5 | 149 | 69.7 | 262 |
| Mercury | mg/Kg | NS | 0.11 | NA | 0.028 | <0.107 | 0.0266 | <0.105 | 0.0262 | <0.0995 | 0.0814 | <0.105 | 0.0593 |
| Selenium | mg/Kg | 0.52 | 1 | NA | <1.19 | <3.68 | <1.28 | <3.95 | <1.33 | <3.66 | <1.25 | <3.78 | <1.31 |
| Silver | mg/Kg | 4.2 | ND | NA | <0.594 | NA | <0.639 | NA | <0.665 | NA | <0.627 | NA | <0.656 |
| Strontium | mg/Kg | NS | 203 | NA | NA | 31.5 | NA | 21.7 | NA | 20.9 | NA | 218 | NA |
| Zinc | mg/Kg | 46 | 140 | NA | 16.7 | 11.5 | 16.1 | 17.3 | 26.5 | 28.5 | 53.2 | 33.2 | 122.8 |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | 28 | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | 35.7 | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <35.2 | NA | <38.2 |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <35.2 | NA | <38.2 |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <7.36 | NA | 43.6 |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | 45.9 | NA | 674 |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | 40.1 | NA | 483 |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <35.2 | NA | 44.9 |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <7.36 | NA | 7.83 |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <7.36 | NA | 53.5 |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <7.36 | NA | 28.6 |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <7.36 | NA | 21.2 |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | DB-1 | HA-1 | HA-1 | HA-1 | HA-1 | HA-1 | HA-1 | HA-2 | HA-2 | HA-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 78-80' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 0-2' | 0-2' | 2-4' |
| | | | Sample Date | 4/17/2025 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| | | | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | 63.7 | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | 86 | NA | 1356.63 |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | NA | 15.8 | 15.7 | 21.8 | 18.5 | 24.8 | 20.5 | 20.3 | 18.8 | 23.8 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | 18.5 | NA | 21.8 |
| % Saturation | % | NS | NS | NA | 70.9 | NA | 110 | NA | 120 | NA | 101 | NA | 183 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | 20.5 | 22.8 | 24.5 | 34.7 | 35.1 | 41.1 | 20.1 | 33.5 | 22.5 |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.61 | 0.360 | 0.30 | 0.294 | 0.34 | 0.321 | 0.32 | 3.71 | 2.46 | 5.80 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | 1.80 | 2.03 | 5.45 | 6.04 | 6.33 | 7.90 | 21.1 | 25.5 | 21.6 |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | 3.26 | 2.05 | 8.60 | 3.08 | 9.29 | 2.91 | 35.3 | 19.5 | 64.9 |
| Soluble Calcium | meq/L | NS | NS | NA | 0.989 | 1.02 | 0.180 | 0.50 | 0.174 | 0.60 | 1.56 | 1.31 | 1.21 |
| Soluble Magnesium | meq/L | NS | NS | NA | <0.410 | 0.31 | <0.410 | 0.57 | <0.410 | 0.32 | <0.820 | 0.52 | <1.64 |
| Soluble Sodium | meq/L | NS | NS | NA | 2.29 | 1.66 | 2.58 | 2.25 | 2.74 | 1.97 | 31.2 | 18.7 | 50.5 |
| pH | S.U. | NS | NS | NA | 7.71 | NA | 7.62 | NA | 7.72 | NA | 8.22 | NA | 8.17 |
| Chloride | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg-dry | NS | NS | 24.5 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-2 | HA-2 | HA-2 | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 2-4' | 4-6' | 4-6' | 0-2' | 2-4' | 6-8' | 8-10' | 8-10' | 10-12' | 10-12' |
| | | | Sample Date | 6/29/2021 | 6/29/2021 | 6/29/2021 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 |
| | | | Data Provider | ICON | ERM | ICON | HET | HET | ICON | HET | ICON | HET | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | 5.64 | 3.6 | 4.67 | NA | NA | 6.24 | NA | 5.77 | NA | 7.11 |
| Barium | mg/Kg | 2424 | 775 | 4180 | 1438 | 1510 | 1878 | 443 | 1330 | 1509 | 2300 | 436 | 367 |
| True Total Barium | mg/Kg-dry | NS | NS | 30,800 | 2,620 | 2,920 | 3250 | 456 | 1730 | 2410 | 3260 | 605 | 490 |
| Cadmium | mg/Kg | 0.36 | 0.8 | <0.479 | <0.254 | <0.492 | NA | NA | <0.500 | NA | <0.500 | NA | <0.497 |
| Chromium | mg/Kg | 26 | 84 | 37.6 | 15 | 13.4 | 24.2 | 22.3 | 19.7 | 35.4 | 29.1 | 26 | 15.5 |
| Lead | mg/Kg | 11 | 44 | 52.4 | 12.57 | 15.5 | 20.5 | 19.9 | 24.3 | 34 | 35 | 17.5 | 13.9 |
| Mercury | mg/Kg | NS | 0.11 | <0.108 | 0.033 | <0.101 | NA | NA | <0.0981 | NA | <0.0953 | NA | <0.0936 |
| Selenium | mg/Kg | 0.52 | 1 | <3.83 | <1.27 | <3.94 | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | <0.636 | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | 162 | NA | 105 | NA | NA | 192 | NA | 321 | NA | 199 |
| Zinc | mg/Kg | 46 | 140 | 30.1 | 19 | 19.3 | NA | NA | 23 | NA | 22.1 | NA | 30.6 |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | 5.58 | NA | NA | NA | NA | 7.85 | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | 0.339 | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | 0.0936 | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | 101 | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | 148 | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | <0.10 H | 0.26 H | NA | 0.26 H | NA | <0.10 H | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | 1623 | NA | 150 | NA | NA | NA | NA | 5230 | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | <125 | NA | <18.3 | NA | NA | NA | NA | 2800 | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | <34 | NA | <0.496 | NA | NA | 45.4 | NA | <0.692 | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | <34 | NA | <1.29 | NA | NA | 72.8 | NA | 6.87 | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | 12.43 | NA | <2.39 | <2.5 | NA | <54.9 | NA | <2.8 | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | 195 | NA | <2.39 | <2.5 | NA | 359 | NA | <2.8 | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | 166 | NA | <4.78 | <4.99 | NA | 1354 | NA | 6.46 | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | <56.7 | NA | <0.496 | NA | NA | 13.28 | NA | 0.754 | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | <7.6 | NA | <2.39 | <2.5 | NA | 40.7 | NA | <2.8 | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | 17 | NA | <2.39 | <2.5 | NA | 88.6 | NA | <2.8 | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | 8.19 | NA | <2.39 | <2.5 | NA | 68.7 | NA | <2.8 | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | <7.6 | NA | <2.39 | <2.5 | NA | 16.2 | NA | <2.8 | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | <0.000268 | <0.00028 | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | <0.000219 | 0.00152 | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | <0.00016 | <0.000167 | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | <0.000255 | 0.00201 | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | 0.000859 | 0.001002 | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | 0.001 | <0.000174 | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | 0.001135 | 0.000964 | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
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West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-2 | HA-2 | HA-2 | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 2-4' | 4-6' | 4-6' | 0-2' | 2-4' | 6-8' | 8-10' | 8-10' | 10-12' | 10-12' |
| | | | Sample Date | 6/29/2021 | 6/29/2021 | 6/29/2021 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 |
| | | | Data Provider | ICON | ERM | ICON | HET | HET | ICON | HET | ICON | HET | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | <0.000184 | <0.000192 | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | 0.001007 | 0.00288 | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | <0.000115 | <0.00012 | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | 0.00141 | 0.00199 | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | <0.000164 | <0.000171 | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | 0.000919 | <0.000398 | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | <0.000116 | 0.00129 | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | 0.00097 | 0.00154 | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | 0.00128 | 0.0041 | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | 1623 | NA | 150 | NA | NA | NA | NA | 8030 | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | 398.62 | NA | ND | ND | NA | 2058.68 | NA | 14.084 | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | 0.00858 | 0.017296 | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | 0.00097 | 0.00636 | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | 0.00761 | 0.010936 | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 19.9 | 21.4 | 18.1 | 16.4 | 19.9 | 22.8 | 27.1 | 26.9 | 28.5 | 20.9 |
| % Moisture Secondary[2] | % | NS | NS | NA | 21.1 | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 223 | NA | 128 | 121 | NA | 113 | NA | 366 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | 35.2 | 25.9 | 40.2 | 28.3 | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 3.64 | 5.09 | 4.42 | 1.33 | 3.13 | 5.82 | 9.37 | 13.6 | 3.44 | 3.67 |
| Exchangeable Sodium Percentage | % | NS | NS | 39.7 | 28.4 | 33.2 | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | 31.2 | 36.3 | 36.5 | 18.9 | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | 1.19 | 2.90 | 1.31 | 0.516 | 0.774 | NA | 2.49 | NA | 0.38 | NA |
| Soluble Magnesium | meq/L | NS | NS | 0.52 | <1.64 | 0.64 | 0.289 | 0.333 | NA | 1.09 | NA | 0.137 | NA |
| Soluble Sodium | meq/L | NS | NS | 28.9 | 43.7 | 36.0 | 12 | 29 | NA | 87.4 | NA | 32.3 | NA |
| pH | S.U. | NS | NS | NA | 8.35 | NA | 8.04 | 7.88 | NA | 7.91 | NA | 8.33 | NA |
| Chloride | mg/Kg | NS | NS | NA | NA | NA | 159 | 751 | NA | 2410 | NA | 2230 | NA |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | 1690 | NA | 3990 | NA | 2150 |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | 6.71 | 22.8 | NA | 85.6 | NA | 28.5 | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | 3.2 | 2.3 | NA | 2.2 | NA | 3.4 | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | 2.33 | 4.23 | NA | 1.01 | NA | 0.264 | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R | HA-3 | HA-3 | HA-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 14-16' | 14-16' | 18-20' | 22-24' | 22-24' | 28-30' | 28-30' | 0-2' | 0-2' | 2-4' |
| | | | Sample Date | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| | | | Data Provider | HET | ICON | ICON | HET | ICON | HET | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | NA | NA | NA | NA | NA | 5.43 | 5.48 | 3.59 |
| Barium | mg/Kg | 2424 | 775 | 180 | NA | NA | 120.4 | NA | 67 | NA | 248 | 313 | 133 |
| True Total Barium | mg/Kg-dry | NS | NS | 207 | NA | NA | 164 | NA | 135 | NA | 624 | 478 | <500 |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | NA | NA | NA | NA | NA | <0.255 | <0.461 | <0.257 |
| Chromium | mg/Kg | 26 | 84 | 21.1 | NA | NA | 24 | NA | 9.83 | NA | 10.46 | 11.1 | 14.5 |
| Lead | mg/Kg | 11 | 44 | 10.58 | NA | NA | 10.9 | NA | 4.68 | NA | 8.63 | 10.2 | 10.89 |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | NA | NA | NA | NA | NA | 0.0211 | <0.104 | 0.023 |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | <1.28 | <3.69 | <1.29 |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | <0.639 | NA | <0.644 |
| Strontium | mg/Kg | NS | 203 | NA | NA | NA | NA | NA | NA | NA | NA | 140 | NA |
| Zinc | mg/Kg | 46 | 140 | NA | NA | NA | NA | NA | NA | NA | 18.5 | 28.8 | 19 |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | 103 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | 128 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | <19.9 | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | 36.4 | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | <0.576 | NA | NA | <0.617 | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | <1.5 | NA | NA | <1.6 | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | <2.62 | NA | NA | <2.67 | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | <2.62 | NA | NA | 3.71 | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | <5.25 | NA | NA | 14.1 | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | <0.576 | NA | NA | <0.617 | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | <2.62 | NA | NA | <2.67 | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | <2.62 | NA | NA | <2.67 | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | <2.62 | NA | NA | <2.67 | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | <2.62 | NA | NA | <2.67 | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R | HA-2R | HA-3 | HA-3 | HA-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 14-16' | 14-16' | 18-20' | 22-24' | 22-24' | 28-30' | 28-30' | 0-2' | 0-2' | 2-4' |
| | | | Sample Date | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 4/23/2025 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| | | | Data Provider | HET | ICON | ICON | HET | ICON | HET | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | 36.4 | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | ND | NA | NA | 17.81 | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 23.8 | 19.4 | 21.6 | 25 | 21.6 | 19.3 | 22.3 | 21.7 | 20.4 | 22.3 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | 178 | NA | NA | 146 | NA | 38.9 | NA | 202 | NA | 236 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | 23.9 | 39.8 | 24.9 |
| Electrical Conductivity | mmhos/cm | NS | NS | 6.77 | 4.52 | 1.4 | 2.31 | 1.16 | 2.38 | 2.03 | 2.06 | 0.91 | 2.99 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | 36.7 | 22.5 | 42.3 |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | 27.5 | 8.94 | 38.4 |
| Soluble Calcium | meq/L | NS | NS | 1.48 | NA | NA | 0.377 | NA | 4.43 | NA | 0.906 | 0.74 | 0.896 |
| Soluble Magnesium | meq/L | NS | NS | 0.758 | NA | NA | 0.15 | NA | 2.57 | NA | <0.820 | 0.45 | <0.820 |
| Soluble Sodium | meq/L | NS | NS | 62.8 | NA | NA | 21.6 | NA | 15 | NA | 18.5 | 6.89 | 25.7 |
| pH | S.U. | NS | NS | 7.89 | NA | NA | 8.17 | NA | 7.42 | NA | 8.61 | NA | 8.63 |
| Chloride | mg/Kg | NS | NS | 2340 | NA | NA | 414 | NA | 204 | NA | NA | NA | NA |
| Chloride | mg/Kg-dry | NS | NS | NA | 1410 | 656 | NA | 353 | NA | 275 | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | 62.3 | NA | NA | 18.1 | NA | 20.1 | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | 1.8 | NA | NA | 2.9 | NA | 1 | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | 0.293 | NA | NA | 0.113 | NA | 0.258 | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-3 | HA-3 | HA-3 | HA-10 | HA-10 | HA-10 | HA-10 | HA-10 | HA-10 | HA-10R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 2-4' | 4-6' | 4-6' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 0-2' |
| | | | Sample Date | 6/29/2021 | 6/29/2021 | 6/29/2021 | 8/2/2024 | 8/2/2024 | 8/2/2024 | 8/2/2024 | 8/2/2024 | 8/2/2024 | 4/25/2025 |
| | | | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | 7.31 | 3.64 | 5.36 | 5.26 | 3.67 | 4.71 | 3.52 | 5.04 | 2.94 | NA |
| Barium | mg/Kg | 2424 | 775 | 365 | 133 | 495 | 985 | 1050 | 168 | 248 | 307 | 268 | 209 |
| True Total Barium | mg/Kg-dry | NS | NS | 621 | 500 | 860 | 2,910 | 1760 | 386 | 421 | 392 | 351 | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | <0.474 | <0.255 | <0.456 | <0.258 | <0.492 | <0.245 | <0.488 | <0.24 | <0.488 | NA |
| Chromium | mg/Kg | 26 | 84 | 12.3 | 11.94 | 11.6 | 25.5 | 13.9 | 21.8 | 12.7 | 22.5 | 12.5 | NA |
| Lead | mg/Kg | 11 | 44 | 12.6 | 8.1 | 12.2 | 13.9 | 11.2 | 13.1 | 10.5 | 14.7 | 10.7 | NA |
| Mercury | mg/Kg | NS | 0.11 | <0.0983 | 0.0386 | <0.0977 | <0.022 | <0.0979 | <0.0209 | <0.107 | <0.0211 | <0.0952 | NA |
| Selenium | mg/Kg | 0.52 | 1 | <3.79 | <1.28 | <3.65 | 1.49 | NA | <1.22 | NA | <1.2 | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | <0.638 | NA | <0.644 | NA | <0.612 | NA | <0.599 | NA | NA |
| Strontium | mg/Kg | NS | 203 | 163 | NA | 147 | 39.7 | 31.4 | 25 | 21.8 | 27.4 | 21.9 | NA |
| Zinc | mg/Kg | 46 | 140 | 41.5 | 26 | 27.0 | 44.8 | 19.6 | 44.6 | 20.9 | 39.28 | 20.5 | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | 4.48 |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | <24.2 | NA | <23.7 | NA | <23.2 | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | <24.2 | NA | <23.7 | NA | <23.2 | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | <0.421 | NA | <0.371 | NA | <0.358 | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | 5.61 | NA | <0.966 | NA | <0.931 | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | <2.58 | NA | <2.45 | NA | 4.6 | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | <2.58 | NA | 3.87 | NA | 11 | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | <5.15 | NA | <4.9 | NA | <4.79 | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | <0.421 | NA | <0.371 | NA | <0.358 | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | <2.58 | NA | <2.45 | NA | <2.4 | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | <2.58 | NA | <2.45 | NA | <2.4 | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | <2.58 | NA | <2.45 | NA | <2.4 | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | 5.22 | NA | <2.45 | NA | <2.4 | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-3 | HA-3 | HA-3 | HA-10 | HA-10 | HA-10 | HA-10 | HA-10 | HA-10 | HA-10R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 2-4' | 4-6' | 4-6' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 0-2' |
| | | | Sample Date | 6/29/2021 | 6/29/2021 | 6/29/2021 | 8/2/2024 | 8/2/2024 | 8/2/2024 | 8/2/2024 | 8/2/2024 | 8/2/2024 | 4/25/2025 |
| | | | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | ND | NA | ND | NA | ND | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | 10.83 | NA | 3.87 | NA | 15.6 | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 20.3 | 21.6 | 18.6 | 22.4 | 17.4 | 18.3 | 15.7 | 16.5 | 14.1 | 19.6 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 245 | NA | 100 | NA | 145 | NA | 144 | NA | NA |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | 36.5 | 23.9 | 41.5 | 30.8 | 37.4 | 33.1 | 25.8 | 33.2 | 30.1 | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 5.24 | 2.64 | 2.07 | 0.483 | 0.51 | 1.42 | 1.36 | 1.68 | 1.08 | NA |
| Exchangeable Sodium Percentage | % | NS | NS | 29.8 | 48.1 | 46.3 | 6.4 | 7.26 | 13.6 | 23.9 | 16.1 | 23.4 | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | 67.4 | 37.8 | 19.7 | 9.78 | 7.47 | 17.40 | 15.20 | 21.4 | 12 | NA |
| Soluble Calcium | meq/L | NS | NS | 0.62 | 0.761 | 0.93 | 0.172 | 0.51 | 0.519 | 0.75 | 0.48 | 0.69 | NA |
| Soluble Magnesium | meq/L | NS | NS | <0.05 | <0.820 | 0.44 | 0.13 | 0.39 | 0.366 | 0.89 | 0.362 | 0.64 | NA |
| Soluble Sodium | meq/L | NS | NS | 38.4 | 23.3 | 16.3 | 3.8 | 5.01 | 11.60 | 13.70 | 13.9 | 9.77 | NA |
| pH | S.U. | NS | NS | NA | 8.43 | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | NS | NS | NA | NA | NA | 74 | 75.4 | 268 | 256 | 385 | 251 | NA |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-10R | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 0-2' | 0-2' | 0-2' | 2-4' | 2-4' | 6-8' | 6-8' | 8-10' | 8-10' | 13-15' |
| | | | Sample Date | 4/25/2025 | 4/24/2025 | 4/24/2025 | 4/25/2025 | 4/25/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | 3.99 | NA | 4.58 | NA | 4.82 | NA | 5.97 | NA | 3.97 | NA |
| Barium | mg/Kg | 2424 | 775 | 1210 | 243 | 206 | 363 | 298 | 342 | 289 | 197 | 179 | 243 |
| True Total Barium | mg/Kg-dry | NS | NS | 2400 | 284 | 207 | 429 | 318 | 339 | 394 | 247 | 202 | 367 |
| Cadmium | mg/Kg | 0.36 | 0.8 | <0.499 | NA | <0.498 | NA | <0.498 | NA | <0.497 | NA | <0.500 | NA |
| Chromium | mg/Kg | 26 | 84 | 13 | 19.9 | 11.9 | 28.7 | 12.7 | 30 | 13.2 | 20.9 | 9.99 | 31.5 |
| Lead | mg/Kg | 11 | 44 | 11.9 | 17.3 | 13.2 | 12.37 | 11.3 | 13.15 | 10.6 | 9.83 | 7.72 | 16.4 |
| Mercury | mg/Kg | NS | 0.11 | <0.0963 | NA | <0.104 | NA | <0.109 | NA | <0.0945 | NA | <0.0965 | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | 33.7 | NA | 11.9 | NA | 16.8 | NA | 25.1 | NA | 17.4 | NA |
| Zinc | mg/Kg | 46 | 140 | 17.2 | NA | 13 | NA | 19.3 | NA | 38.8 | NA | 27.7 | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | <0.561 | NA | NA | NA | NA | NA | <0.583 | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | <1.45 | NA | NA | NA | NA | NA | <1.52 | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | <2.51 | NA | <2.53 | NA | NA | NA | <2.59 | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | <2.51 | NA | <2.53 | NA | NA | NA | <2.59 | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | <5.01 | NA | <5.06 | NA | NA | NA | <5.18 | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | <0.561 | NA | NA | NA | NA | NA | <0.583 | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | <2.51 | NA | <2.53 | NA | NA | NA | <2.59 | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | <2.51 | NA | <2.53 | NA | NA | NA | <2.59 | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | <2.51 | NA | <2.53 | NA | NA | NA | <2.59 | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | <2.51 | NA | <2.53 | NA | NA | NA | <2.59 | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-10R | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 0-2' | 0-2' | 0-2' | 2-4' | 2-4' | 6-8' | 6-8' | 8-10' | 8-10' | 13-15' |
| | | | Sample Date | 4/25/2025 | 4/24/2025 | 4/24/2025 | 4/25/2025 | 4/25/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | ND | NA | ND | NA | NA | NA | ND | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 16.9 | 20.2 | 13.8 | 21 | 17.5 | 25.7 | 20.2 | 22.8 | 18.5 | 26 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 66.5 | NA | 88.5 | NA | 110 | NA | 65.8 | NA | 188 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.26 | 0.201 | 0.18 | 0.246 | 0.25 | 0.28 | 0.25 | 0.382 | 0.27 | 0.249 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | 0.945 | NA | 1.47 | NA | 1.09 | NA | 1.85 | NA | 1.08 |
| Soluble Magnesium | meq/L | NS | NS | NA | 0.293 | NA | 0.496 | NA | 0.289 | NA | 0.446 | NA | 0.414 |
| Soluble Sodium | meq/L | NS | NS | NA | 0.649 | NA | 0.603 | NA | 1.6 | NA | 1.57 | NA | 1.06 |
| pH | S.U. | NS | NS | NA | 7.01 | NA | 7.89 | NA | 8.11 | NA | 7.99 | NA | 7.91 |
| Chloride | mg/Kg | NS | NS | NA | <20.0 | NA | <20.0 | NA | <20.0 | NA | <20.0 | NA | <20.0 |
| Chloride | mg/Kg-dry | NS | NS | 29.5 | NA | 8.05 | NA | 15.5 | NA | 8.3 | NA | 10.3 | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | 0.585 | NA | 0.203 | NA | 0.21 | NA | 0.941 | NA | 0.245 |
| Alkalinity | meq/L | NS | NS | NA | 0.7 | NA | 2 | NA | 2.3 | NA | 2.3 | NA | 2.2 |
| Sulfate | meq/L | NS | NS | NA | 0.437 | NA | 0.242 | NA | 0.335 | NA | 0.209 | NA | 0.132 |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-2 | SB-2 | SB-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 13-15' | 15-16' | 15-16' | 20-22' | 20-22' | 22-24' | 22-24' | 0-2' | 0-2' | 2-4' |
| | | | Sample Date | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | 7.65 | NA | NA | NA | NA | NA | NA | NA | 4.13 | NA |
| Barium | mg/Kg | 2424 | 775 | 173 | 228 | NA | 194 | NA | 117.1 | NA | 187 | 179 | 292 |
| True Total Barium | mg/Kg-dry | NS | NS | 254 | 339 | NA | 300 | NA | 199 | NA | 192 | 142 | 293 |
| Cadmium | mg/Kg | 0.36 | 0.8 | <0.495 | NA | NA | NA | NA | NA | NA | NA | <0.499 | NA |
| Chromium | mg/Kg | 26 | 84 | 14.6 | 35.8 | NA | 26.6 | NA | 15.2 | NA | 22.1 | 10.8 | 27.1 |
| Lead | mg/Kg | 11 | 44 | 12.5 | 16.8 | NA | 13.2 | NA | 7.17 | NA | 18.7 | 12.7 | 16.3 |
| Mercury | mg/Kg | NS | 0.11 | <0.0938 | NA | NA | NA | NA | NA | NA | NA | <0.101 | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | 52 | NA | NA | NA | NA | NA | NA | NA | 20.3 | NA |
| Zinc | mg/Kg | 46 | 140 | 57 | NA | NA | NA | NA | NA | NA | NA | 12.3 | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <0.542 | NA | <0.628 |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <1.41 | NA | <1.63 |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <2.4 | NA | <2.65 |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <2.4 | NA | <2.65 |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <4.8 | NA | <5.29 |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <0.542 | NA | <0.628 |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <2.4 | NA | <2.65 |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <2.4 | NA | <2.65 |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <2.4 | NA | <2.65 |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | <2.4 | NA | <2.65 |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-1 | SB-2 | SB-2 | SB-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 13-15' | 15-16' | 15-16' | 20-22' | 20-22' | 22-24' | 22-24' | 0-2' | 0-2' | 2-4' |
| | | | Sample Date | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | ND | NA | ND |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 23.8 | 29.3 | 25.1 | 21.5 | 20.9 | 21.5 | 20.4 | 16.6 | 26.8 | 24.4 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 178 | NA | 118 | NA | 51.1 | NA | 62.5 | NA | 117 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.19 | 0.267 | 0.27 | 0.287 | 0.18 | 0.243 | 0.25 | 0.77 | 0.61 | 0.953 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | 1.18 | NA | 0.959 | NA | 0.706 | NA | 2.82 | NA | 0.824 |
| Soluble Magnesium | meq/L | NS | NS | NA | 0.464 | NA | 0.446 | NA | 0.351 | NA | 1.48 | NA | 0.594 |
| Soluble Sodium | meq/L | NS | NS | NA | 1.12 | NA | 1.58 | NA | 1.37 | NA | 4.36 | NA | 8.16 |
| pH | S.U. | NS | NS | NA | 8.06 | NA | 8.08 | NA | 7.59 | NA | 8.15 | NA | 8.27 |
| Chloride | mg/Kg | NS | NS | NA | <20.0 | NA | <20.0 | NA | <20.0 | NA | <20.0 | NA | 96.8 |
| Chloride | mg/Kg-dry | NS | NS | 9.91 | NA | 18.5 | NA | 6.78 | NA | 8.72 | NA | 16.4 | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | 0.266 | NA | 0.317 | NA | 0.506 | NA | 1.28 | NA | 4.69 |
| Alkalinity | meq/L | NS | NS | NA | 2.2 | NA | 2.6 | NA | 1.6 | NA | 6.6 | NA | 4.2 |
| Sulfate | meq/L | NS | NS | NA | 0.158 | NA | 0.171 | NA | 0.217 | NA | 0.42 | NA | 0.33 |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 2-4' | 6-8' | 6-8' | 8-10' | 8-10' | 12-14' | 12-14' | 16-18' | 16-18' | 22-24' |
| | | | Sample Date | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | 4.04 | NA | 2.52 | NA | 5.48 | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | 243 | 143 | 134 | 450 | 284 | 145 | NA | 186 | NA | 92 |
| True Total Barium | mg/Kg-dry | NS | NS | 254 | 148 | 85.6 | 403 | 254 | 220 | NA | 236 | NA | 134 |
| Cadmium | mg/Kg | 0.36 | 0.8 | <0.498 | NA | <0.496 | NA | <0.498 | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | 11.1 | 18.7 | 8.65 | 22 | 11.9 | 21 | NA | 29 | NA | 14.2 |
| Lead | mg/Kg | 11 | 44 | 11.7 | 7.88 | 7.18 | 11.34 | 9.04 | 9.02 | NA | 13.3 | NA | 5.85 |
| Mercury | mg/Kg | NS | 0.11 | <0.103 | NA | <0.0987 | NA | <0.103 | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | 25.1 | NA | 18.7 | NA | 29.4 | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | 16.2 | NA | 20.3 | NA | 39.2 | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | <0.574 | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | <1.49 | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | <2.61 | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | <2.61 | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | <5.22 | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | <0.574 | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | <2.61 | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | <2.61 | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | <2.61 | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | <2.61 | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 | SB-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 2-4' | 6-8' | 6-8' | 8-10' | 8-10' | 12-14' | 12-14' | 16-18' | 16-18' | 22-24' |
| | | | Sample Date | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | ND | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 22.6 | 18.7 | 16.8 | 23.4 | 21.7 | 24.3 | 19.2 | 22.7 | 21.4 | 20.7 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 101 | NA | 70 | NA | 73.8 | NA | 125 | NA | 44.2 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 1.07 | 1.58 | 1.13 | 6.42 | 6.11 | 1.07 | 0.85 | 0.342 | 0.21 | 0.469 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | 0.86 | NA | 23.5 | NA | 3.49 | NA | 0.824 | NA | 1.63 |
| Soluble Magnesium | meq/L | NS | NS | NA | 0.646 | NA | 13 | NA | 1.7 | NA | 0.461 | NA | 0.696 |
| Soluble Sodium | meq/L | NS | NS | NA | 13.3 | NA | 24.8 | NA | 4.28 | NA | 1.94 | NA | 1.86 |
| pH | S.U. | NS | NS | NA | 7.84 | NA | 7.36 | NA | 7.66 | NA | 7.95 | NA | 7.59 |
| Chloride | mg/Kg | NS | NS | NA | 264 | NA | 1300 | NA | 166 | NA | 41 | NA | 37.1 |
| Chloride | mg/Kg-dry | NS | NS | 166 | NA | 166 | NA | 1170 | NA | 154 | NA | 25.9 | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | 12.3 | NA | 62.3 | NA | 8.59 | NA | 1.5 | NA | 2.9 |
| Alkalinity | meq/L | NS | NS | NA | 1.5 | NA | 0.7 | NA | 1 | NA | 1.7 | NA | 1.1 |
| Sulfate | meq/L | NS | NS | NA | 0.198 | NA | 0.153 | NA | 0.038 | NA | 0.036 | NA | 0.07 |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | SB-2 | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 22-24' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 8-10' | 8-10' | 12-14' |
| | | | Sample Date | 4/24/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | 5.59 | NA | 3.55 | NA | 6.89 | NA | 8.8 | NA |
| Barium | mg/Kg | 2424 | 775 | NA | 353 | 208 | 190 | 189 | NA | 330 | 518 | 309 | 120.5 |
| True Total Barium | mg/Kg-dry | NS | NS | NA | 376 | 155 | 245 | 197 | NA | 334 | 538 | 294 | 184 |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | <0.499 | NA | <0.499 | NA | <0.496 | NA | <0.498 | NA |
| Chromium | mg/Kg | 26 | 84 | NA | 22.4 | 12.5 | 28.3 | 10.9 | NA | 12.2 | 28.9 | 12 | 20.2 |
| Lead | mg/Kg | 11 | 44 | NA | 19 | 15.3 | 11.9 | 12.8 | NA | 12.7 | 12.66 | 9.37 | 9.5 |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | <0.0942 | NA | <0.0926 | NA | <0.0950 | NA | <0.0927 | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | NA | 19.9 | NA | 23 | NA | 33.1 | NA | 36.5 | NA |
| Zinc | mg/Kg | 46 | 140 | NA | NA | 13.8 | NA | 15.6 | NA | 32.1 | NA | 39.5 | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | <0.506 | NA | NA | NA | NA | NA | <0.612 | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | <1.32 | NA | NA | NA | NA | NA | <1.59 | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | <2.38 | NA | <2.5 | NA | <2.5 | NA | <2.7 | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | <2.38 | NA | <2.5 | NA | <2.5 | NA | <2.7 | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | <4.75 | NA | <5.01 | NA | <5.01 | NA | <5.41 | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | <0.506 | NA | NA | NA | NA | NA | <0.612 | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | <2.38 | NA | <2.5 | NA | <2.5 | NA | <2.7 | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | <2.38 | NA | <2.5 | NA | <2.5 | NA | <2.7 | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | <2.38 | NA | <2.5 | NA | <2.5 | NA | <2.7 | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | <2.38 | NA | <2.5 | NA | <2.5 | NA | <2.7 | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | SB-2 | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 22-24' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 8-10' | 8-10' | 12-14' |
| | | | Sample Date | 4/24/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | HET |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | ND | NA | ND | NA | ND | NA | ND | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 19.9 | 15.8 | 15.4 | 20.1 | 17.8 | NA | 20.3 | 26 | 21.7 | 21.8 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 67.1 | NA | 84.1 | NA | NA | NA | 113 | NA | 60.6 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.54 | 0.773 | 0.37 | 0.42 | 0.33 | NA | 0.21 | 0.358 | 0.22 | 0.391 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | 2.56 | NA | 0.38 | NA | NA | NA | 0.375 | NA | 0.541 |
| Soluble Magnesium | meq/L | NS | NS | NA | 1.81 | NA | 0.167 | NA | NA | NA | 0.181 | NA | 0.258 |
| Soluble Sodium | meq/L | NS | NS | NA | 4.27 | NA | 3.51 | NA | NA | NA | 3.25 | NA | 3.23 |
| pH | S.U. | NS | NS | NA | 8.28 | NA | 7.51 | NA | NA | NA | 7.93 | NA | 7.9 |
| Chloride | mg/Kg | NS | NS | NA | 26.2 | NA | 24 | NA | NA | NA | <20.0 | NA | <20.0 |
| Chloride | mg/Kg-dry | NS | NS | 30.8 | NA | 24.2 | NA | 25.9 | NA | 12.6 | NA | 11.3 | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | 1.64 | NA | 2.05 | NA | NA | NA | 0.552 | NA | 0.97 |
| Alkalinity | meq/L | NS | NS | NA | 5.2 | NA | 0.8 | NA | NA | NA | 2.6 | NA | 2.4 |
| Sulfate | meq/L | NS | NS | NA | 0.911 | NA | 0.464 | NA | NA | NA | 0.376 | NA | 0.401 |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 | SB-4 | SB-4 | SB-4 | SB-4 | SB-4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 12-14' | 16-18' | 16-18' | 22-24' | 22-24' | 0-2' | 0-2' | 2-4' | 2-4' | 7-9' |
| | | | Sample Date | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | NA | NA | NA | NA | 7.05 | NA | 6.31 | 4.08 |
| Barium | mg/Kg | 2424 | 775 | NA | 191 | NA | 137 | NA | 304 | 275 | 246 | 345 | 204 |
| True Total Barium | mg/Kg-dry | NS | NS | NA | 280 | NA | 193 | NA | 244 | 222 | 263 | 332 | 198 |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | NA | NA | NA | NA | <0.499 | NA | <0.500 | <0.499 |
| Chromium | mg/Kg | 26 | 84 | NA | 30.2 | NA | 21 | NA | 20.4 | 12.4 | 23.7 | 13.8 | 10.1 |
| Lead | mg/Kg | 11 | 44 | NA | 12.91 | NA | 8.97 | NA | 28.6 | 21.9 | 13.9 | 21 | 6.82 |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | NA | NA | NA | NA | <0.0991 | NA | <0.101 | <0.105 |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | NA | NA | NA | NA | NA | 11.4 | NA | 17.7 | 15.5 |
| Zinc | mg/Kg | 46 | 140 | NA | NA | NA | NA | NA | NA | 12 | NA | 17.6 | 19.1 |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | <0.506 | NA | <0.566 | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | <1.31 | NA | <1.46 | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | <2.34 | NA | <2.55 | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | <2.34 | NA | <2.55 | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | <4.68 | NA | <5.1 | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | <0.506 | NA | <0.566 | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | <2.34 | NA | <2.55 | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | <2.34 | NA | <2.55 | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | <2.34 | NA | <2.55 | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | <2.34 | NA | <2.55 | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | SB-3 | SB-3 | SB-3 | SB-3 | SB-3 | SB-4 | SB-4 | SB-4 | SB-4 | SB-4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 12-14' | 16-18' | 16-18' | 22-24' | 22-24' | 0-2' | 0-2' | 2-4' | 2-4' | 7-9' |
| | | | Sample Date | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/25/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 |
| | | | Data Provider | ICON | HET | ICON | HET | ICON | HET | ICON | HET | ICON | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | ND | NA | ND | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 19.3 | 25.2 | 22.7 | 20.3 | 19.7 | 14.6 | 14.2 | 21.5 | 16.8 | 13.9 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 134 | NA | 60.4 | NA | 61.1 | NA | 67.9 | NA | NA |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.15 | 0.262 | 0.26 | 0.42 | 0.3 | 0.304 | 0.34 | 0.132 | 0.15 | 0.18 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | 0.54 | NA | 1.06 | NA | 2.11 | NA | 0.635 | NA | NA |
| Soluble Magnesium | meq/L | NS | NS | NA | 0.279 | NA | 0.526 | NA | 0.647 | NA | 0.263 | NA | NA |
| Soluble Sodium | meq/L | NS | NS | NA | 1.89 | NA | 2.41 | NA | 0.407 | NA | 0.434 | NA | NA |
| pH | S.U. | NS | NS | NA | 7.9 | NA | 7.93 | NA | 7.9 | NA | 7.53 | NA | NA |
| Chloride | mg/Kg | NS | NS | NA | <20.0 | NA | 24.7 | NA | <20.0 | NA | <20.0 | NA | NA |
| Chloride | mg/Kg-dry | NS | NS | 7.19 | NA | 18.3 | NA | 19.3 | NA | 270 | NA | 3.69 | 6.43 |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | 0.388 | NA | 1.67 | NA | 0.157 | NA | 0.152 | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | 2 | NA | 1.9 | NA | 2.6 | NA | 0.8 | NA | NA |
| Sulfate | meq/L | NS | NS | NA | 0.27 | NA | 0.344 | NA | 0.434 | NA | 0.211 | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | SB-4 | SB-4 | SB-4 | SB-4 | SB-4 | SB-4 | SB-4 | SB-4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 8-10' | 8-10' | 12-14' | 12-14' | 18-20' | 18-20' | 22-24' | 22-24' |
| | | | Sample Date | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 |
| | | | Data Provider | HET | ICON | HET | ICON | HET | ICON | HET | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | 4.91 | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | 107.5 | 120 | 212 | NA | 269 | NA | 147 | NA |
| True Total Barium | mg/Kg-dry | NS | NS | 155 | 130 | 318 | NA | 342 | NA | 190 | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | <0.496 | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | 12.9 | 7.87 | 35.3 | NA | 25.3 | NA | 25 | NA |
| Lead | mg/Kg | 11 | 44 | 7.77 | 5.22 | 17.2 | NA | 13.44 | NA | 11.72 | NA |
| Mercury | mg/Kg | NS | 0.11 | NA | <0.101 | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | 11.8 | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | NA | 17.2 | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | <0.523 | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | <1.36 | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | <2.39 | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | <2.39 | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | <4.77 | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | <0.523 | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | <2.39 | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | <2.39 | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | <2.39 | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | <2.39 | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | SB-4 | SB-4 | SB-4 | SB-4 | SB-4 | SB-4 | SB-4 | SB-4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 8-10' | 8-10' | 12-14' | 12-14' | 18-20' | 18-20' | 22-24' | 22-24' |
| | | | Sample Date | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 | 4/24/2025 |
| | | | Data Provider | HET | ICON | HET | ICON | HET | ICON | HET | ICON |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | ND | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 16.2 | 17.2 | 29.8 | 39.1 | 30.5 | 23.3 | 23.3 | 19.7 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | 38.1 | NA | 188 | NA | 142 | NA | 92.5 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.182 | 0.24 | 0.308 | 0.15 | 0.268 | 0.15 | 0.301 | 0.25 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | 0.294 | NA | 0.875 | NA | 0.668 | NA | 0.762 | NA |
| Soluble Magnesium | meq/L | NS | NS | 0.14 | NA | 0.36 | NA | 0.29 | NA | 0.342 | NA |
| Soluble Sodium | meq/L | NS | NS | 1.3 | NA | 2.07 | NA | 1.86 | NA | 1.95 | NA |
| pH | S.U. | NS | NS | 7.56 | NA | 8.07 | NA | 8.11 | NA | 7.97 | NA |
| Chloride | mg/Kg | NS | NS | <20.0 | NA | <20.0 | NA | <20.0 | NA | <20.0 | NA |
| Chloride | mg/Kg-dry | NS | NS | NA | 3.96 | NA | 10.8 | NA | 10.9 | NA | 12.9 |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | 0.438 | NA | 0.286 | NA | 0.416 | NA | 0.67 | NA |
| Alkalinity | meq/L | NS | NS | 0.6 | NA | 2.7 | NA | 2.2 | NA | 2 | NA |
| Sulfate | meq/L | NS | NS | 0.461 | NA | 0.204 | NA | 0.179 | NA | 0.256 | NA |

Table 5A
Soil Analytical Data and Screening: Former BP Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

**Notes:**
meq/100g = milliequivalents per 100 grams of soil
mmhos/cm = millimhos per centimeter
mg/kg = milligram per kilogram
meq/L = milliequivalents per liter
s.u. = standard units
NA - Not analyzed; N/S - No standard; ND - non-detect; PAH - polycylic aromatic hydrocarbons
H - Laboratory qualifier: beyond holding time
< - Not detected at or above the reporting limit shown
Metals and hydrocarbons were reported in, or converted to, dry weight.
Sum TPH Mixture is the calculated sum of TPH-DRO and TPH-ORO.
Sum TPH Fraction is the calculated sum of aliphatic (C6-C8, >C8-C10, >C10-C-12, >C12-C16, >C16-C35) and aromatic (>C8-C10, >C10-C-12, >C12-C16, >C16-21, >C21-C35) fractions.
Sum Total PAH is the calculated sum of 16 RECAP PAH (2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene.
Sum HMW PAH is the calculated sum of High Molecular Weight PAH (benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, fluoranthene, and pyrene).
Sum LMW PAH is the calculated sum of Low Molecular Weight PAH (2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene).
Non-detect results were treated as zero concentration (0 mg/kg) for summation.
Samples (0-3') were assessed using soil screening values and Louisiana soil background.
Brown font indicates exceedance of soil screening value (USEPA Eco-SSL, calculated soil screening value [barium]).
Yellow shading indicates exceedance of Louisiana soil background (USGS).
Light grey shading indicates that soil/sediment sample is deeper than 3 ft and not assessed.



Castex-ERM-RPT-000190
BP/Castex-Ltd Adm-Apx L-000191

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 0-2' | 0-2' | 4-6' | 4-6' | 10-12' | 10-12' | 22-24' | 22-24' | 36-38' | 36-38' |
| | | | Sample Date | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| | | | | Eco 0-3 | Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | 3 | 4.54 | 4.38 | 3.77 | <6.46 | 7.74 | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | 3134 | 5590 | 136 | 172 | 213 | 325 | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NS | NS | 16,200 | 13,000 | <500 | 1,050 | 507 | 1,460 | NA | NA | NA | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | <0.225 | <0.463 | <0.237 | <0.492 | <1.29 | <0.472 | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | 8.2 | 9.53 | 15 | 10.6 | 17.1 | 15.5 | NA | NA | NA | NA |
| Lead | mg/Kg | 11 | 44 | 15 | 15.6 | 11.3 | 9.27 | 6.36 | 13.1 | NA | NA | NA | NA |
| Mercury | mg/Kg | NS | 0.11 | 0.021 H | <0.0926 | 0.037 H | <0.107 | <0.02 H | <0.102 | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | <1.13 | NA | <1.18 | NA | <6.46 | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | <0.564 | NA | <0.592 | NA | <3.23 | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | 38.1 | NA | 14.5 | NA | 28.2 | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | 12.5 | 12.8 | 19.9 | 12.7 | 34.9 | 43.7 | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | <0.0277 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | <0.400 | 2.81 | <0.400 | 3.16 |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 | CD-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 0-2' | 0-2' | 4-6' | 4-6' | 10-12' | 10-12' | 22-24' | 22-24' | 36-38' | 36-38' |
| | | | Sample Date | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 | 2/23/2022 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| | | | | Eco 0-3 | Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 11.3 | 9.5 | 15.6 | 13.7 | 22.6 | 19.1 | 25.7 | 24.0 | 23.2 | 22.2 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | 52.4 | NA | 93.2 | NA | 81.6 | NA | 88.6 | NA | 49.3 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | 13.1 | 14.5 | 25.1 | 27.2 | 32.0 | 36.6 | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.560 | 0.33 | 0.243 | 0.58 | 0.371 | 0.37 | 0.414 | 0.38 | 0.368 | 0.34 |
| Exchangeable Sodium Percentage | % | NS | NS | 0.4 | 0.52 | 3.6 | 4.49 | 3.0 | 2.50 | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | 1.77 | 0.81 | 9.51 | 4.57 | 5.21 | 2.02 | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | 1.44 | 1.50 | 0.061 | 0.66 | 0.530 | 0.94 | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | NS | NS | 0.775 | 0.60 | <0.410 | 0.46 | <0.410 | 0.63 | NA | NA | NA | NA |
| Soluble Sodium | meq/L | NS | NS | 1.86 | 0.83 | 1.66 | 3.43 | 2.68 | 1.79 | NA | NA | NA | NA |
| pH | S.U. | NS | NS | 6.22 | NA | 6.40 | NA | 7.35 | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | NS | NS | 7.84 | 31.9 | 9.32 | 117 | 11.2 | 34.6 | 6.17 | 34.0 | 7.71 | 18.7 |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-1 | CD-1 | CD-1 | CD-1 | CD-1R | CD-2 | CD-2 | CD-2 | CD-2 | CD-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 46-48' | 46-48' | 56-58' | 56-58' | 0-2' | 14-16' | 14-16' | 28-30' | 28-30' | 38-40' |
| | | | Sample Date | 2/23/2022 | 2/23/2022 | 2/24/2022 | 2/24/2022 | 4/30/2025 | 3/3/2022 | 3/3/2022 | 3/3/2022 | 3/3/2022 | 3/3/2022 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ERM | ICON | ERM | ICON | ERM |
| | | | | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | NA | NA | NA | NA | 1295 | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NS | NS | NA | NA | NA | NA | 17700 | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 11 | 44 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | 0.502 | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | 0.516 | 4.06 | NA | 261 | NA | 125 | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |



Castex-ERM-RPT-000193
BP/Castex-Ltd Adm-Apx L-000194

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-1 | CD-1 | CD-1 | CD-1 | CD-1R | CD-2 | CD-2 | CD-2 | CD-2 | CD-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 46-48' | 46-48' | 56-58' | 56-58' | 0-2' | 14-16' | 14-16' | 28-30' | 28-30' | 38-40' |
| | | | Sample Date | 2/23/2022 | 2/23/2022 | 2/24/2022 | 2/24/2022 | 4/30/2025 | 3/3/2022 | 3/3/2022 | 3/3/2022 | 3/3/2022 | 3/3/2022 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ERM | ICON | ERM | ICON | ERM |
| | | | | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 24.7 | 26.1 | 19.4 | 22.3 | 8.87 | 23.0 | 21.9 | 19.2 | 22.5 | 25.5 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | 53.8 | NA | 32.9 | NA | NA | 167 | NA | 69.7 | NA | 37.0 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 0.569 | 0.59 | 0.685 | 0.62 | NA | 13.3 | 16.3 | 18.3 | 20.5 | 27.3 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Sodium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| pH | S.U. | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | NS | NS | 7.32 | 39.1 | 8.93 | 60.0 | NA | 5560 | 7120 | 2840 | 3680 | 3610 |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-2 | CD-2 | CD-2 | CD-2 | CD-2 | CD-2 | CD-2 | CD-3 | CD-3 | CD-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 38-40' | 46-48' | 46-48' | 52-54' | 52-54' | 60-62 | 60-62 | 18-20' | 18-20' | 28-30' |
| | | | Sample Date | 3/3/2022 | 3/3/2022 | 3/3/2022 | 3/4/2022 | 3/4/2022 | 3/4/2022 | 3/4/2022 | 3/8/2022 | 3/8/2022 | 3/8/2022 |
| | | | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| | | | | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 11 | 44 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | 57.9 | NA | NA | NA | 107 | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-2 | CD-2 | CD-2 | CD-2 | CD-2 | CD-2 | CD-2 | CD-3 | CD-3 | CD-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 38-40' | 46-48' | 46-48' | 52-54' | 52-54' | 60-62 | 60-62 | 18-20' | 18-20' | 28-30' |
| | | | Sample Date | 3/3/2022 | 3/3/2022 | 3/3/2022 | 3/4/2022 | 3/4/2022 | 3/4/2022 | 3/4/2022 | 3/8/2022 | 3/8/2022 | 3/8/2022 |
| | | | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| | | | | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 21.7 | 22.0 | 20.1 | 31.8 | 29.7 | 21.6 | 26.1 | 20.8 | 22.3 | 23.7 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 37.9 | NA | 88.1 | NA | 47.0 | NA | 217 | NA | 41.2 |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 27.1 | 21.5 | 12.0 | 5.65 | 5.72 | 4.19 | 4.44 | 5.44 | 4.92 | 34.6 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Sodium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| pH | S.U. | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | NS | NS | 3860 | 2260 | 1550 | 1170 | 1560 | 499 | 694 | 2930 | 2440 | 4640 |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-3 | CD-3 | CD-3 | CD-3 | CD-3 | CD-3 | CD-3 | CD-3 | CD-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 28-30' | 44-46' | 44-46' | 52-54' | 52-54' | 60-62' | 60-62' | 64-66' | 64-66' |
| | | | Sample Date | 3/8/2022 | 3/8/2022 | 3/8/2022 | 3/8/2022 | 3/8/2022 | 3/9/2022 | 3/9/2022 | 3/9/2022 | 3/9/2022 |
| | | | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| | | | | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 2424 | 775 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | 0.36 | 0.8 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 26 | 84 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 11 | 44 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | NS | 0.11 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | 0.52 | 1 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | 4.2 | ND | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NS | 203 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 46 | 140 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | 188 | NA | NA | NA | 14.0 | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | CD-3 | CD-3 | CD-3 | CD-3 | CD-3 | CD-3 | CD-3 | CD-3 | CD-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 28-30' | 44-46' | 44-46' | 52-54' | 52-54' | 60-62' | 60-62' | 64-66' | 64-66' |
| | | | Sample Date | 3/8/2022 | 3/8/2022 | 3/8/2022 | 3/8/2022 | 3/8/2022 | 3/9/2022 | 3/9/2022 | 3/9/2022 | 3/9/2022 |
| | | | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| | | | | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 20.6 | 41.3 | 30.0 | 30.1 | 25.9 | 23.0 | 23.2 | 26.8 | 23.2 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | NA | 99.1 | NA | 81.7 | NA | 55.5 | NA | 57.6 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NS | NS | 28.7 | 30.6 | 24.9 | 17.1 | 24.1 | 3.74 | 4.31 | 2.49 | 2.35 |
| Exchangeable Sodium Percentage | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Soluble Sodium | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| pH | S.U. | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | NS | NS | 4170 | 9870 | 7470 | 4490 | 4850 | 546 | 620 | 352 | 365 |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-4 | HA-4 | HA-4 | HA-4 | HA-4 | HA-4 | HA-5 | HA-5 | HA-5 | HA-5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 0-2' | 0-2' | 2-4' | 2-4' |
| | | | Sample Date | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| | | | | Eco 0-3 | Eco 0-3 | Eco 0-3 | Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Eco 0-3 | Eco 0-3 | Eco 0-3 | Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | 7.98 | 5.84 | 5.65 | 5.43 | 5.09 | 5.21 | 10.13 | 7.46 | 6.6 | 6.55 |
| Barium | mg/Kg | 2424 | 775 | 1913 | 3640 | 1506 | 1330 | 790 | 1530 | 2793 | 3320 | 1316 | 4230 |
| True Total Barium | mg/Kg-dry | NS | NS | 13,100 | 19,100 | 1,250 | 2,330 | 2,100 | 2,480 | 6,030 | 4,850 | 68,900 | 30,700 |
| Cadmium | mg/Kg | 0.36 | 0.8 | 0.6 | <0.472 | <0.26 | <0.469 | <0.284 | <0.476 | 0.43 | <0.491 | 1.35 | 0.734 |
| Chromium | mg/Kg | 26 | 84 | 120.9 | 29.1 | 24 | 18.9 | 11.26 | 18.5 | 172 | 96.7 | 107 | 73.3 |
| Lead | mg/Kg | 11 | 44 | 45.3 | 22.6 | 24.4 | 15.5 | 10.71 | 14.6 | 53.1 | 33.7 | 87.3 | 55.2 |
| Mercury | mg/Kg | NS | 0.11 | 0.166 | <0.102 | 0.044 | <0.104 | 0.024 | <0.0981 | 0.233 | 0.186 | 0.328 | 0.233 |
| Selenium | mg/Kg | 0.52 | 1 | 1.86 | <3.78 | <1.3 | <3.76 | <1.42 | <3.81 | <1.45 | <3.93 | <1.46 | <3.96 |
| Silver | mg/Kg | 4.2 | ND | 1.155 | NA | <0.649 | NA | <0.709 | NA | 1.094 | NA | 0.843 | NA |
| Strontium | mg/Kg | NS | 203 | NA | 187 | NA | 101 | NA | 132 | NA | 511 | NA | 354 |
| Zinc | mg/Kg | 46 | 140 | 513 | 65.8 | 48.4 | 36.9 | 22 | 36.8 | 259 | 173 | 354 | 187 |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | 1.26 | 1.26 |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1053 |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | 748 |
| Aliphatic C6-C8 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | <3.38 | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | <3.38 | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | <9.1 | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | 30.7 | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | 199 | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | <67.8 | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | <9.1 | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | <9.1 | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | <9.1 | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | 33.7 | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-4 | HA-4 | HA-4 | HA-4 | HA-4 | HA-4 | HA-5 | HA-5 | HA-5 | HA-5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 0-2' | 0-2' | 2-4' | 2-4' |
| | | | Sample Date | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| | | | | Eco 0-3 | Eco 0-3 | Eco 0-3 | Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 | Eco 0- | Eco 0-3 | Eco 0-3 | Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1801 |
| Sum TPH Fraction | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | 263.4 | NA |
| Sum Total PAH | mg/kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 26.3 | 24.2 | 23.0 | 21.9 | 29.5 | 22.7 | 30.9 | 29.7 | 31.7 | 27.1 |
| % Moisture Secondary[2] | % | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | 34.1 | NA |
| % Saturation | % | NS | NS | 100 | NA | 180 | NA | 144 | NA | 89.7 | NA | 86.5 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | 25.0 | 34.8 | 25.7 | 38.9 | 25.3 | 40.2 | 26.1 | 43.4 | 18.8 | 33.1 |
| Electrical Conductivity | mmhos/cm | NS | NS | 2.14 | 2.36 | 3.51 | 2.01 | 5.79 | 3.65 | 0.808 | 1.28 | 4.83 | 1.14 |
| Exchangeable Sodium Percentage | % | NS | NS | 7.12 | 12.2 | 17.6 | 22.6 | 22.5 | 32.8 | 2.80 | 4.30 | 4.54 | 3.40 |
| Sodium Adsorption Ratio | Unitless | NS | NS | 14.6 | 12.0 | 23.1 | 15.1 | 55.0 | 24.0 | 3.29 | 4.72 | 7.38 | 4.75 |
| Soluble Calcium | meq/L | NS | NS | 2.68 | 3.14 | 3.16 | 1.31 | 1.65 | 1.83 | 2.43 | 3.16 | 2.24 | 2.55 |
| Soluble Magnesium | meq/L | NS | NS | <0.820 | 0.94 | <1.64 | 0.69 | <1.64 | 0.90 | 0.860 | 1.10 | <1.64 | 1.32 |
| Soluble Sodium | meq/L | NS | NS | 16.9 | 17.1 | 29.0 | 15.0 | 50.0 | 28.1 | 4.22 | 6.89 | 7.81 | 6.60 |
| pH | S.U. | NS | NS | 8.13 | NA | 8.19 | NA | 8.02 | NA | 7.71 | NA | 7.69 | NA |
| Chloride | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-5 | HA-5 | HA-9 | HA-9 | HA-9 | HA-9 | HA-9 | HA-9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 4-6' | 4-6' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' |
| | | | Sample Date | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| | | | | Not Eco 0-3 | Not Eco 0-3 | Eco 0-3 | Eco 0-3 | Eco 0-3 | Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | |
| Arsenic | mg/Kg | 18 | 12 | 8.75 | 5.26 | 3.17 | 4.95 | 1.89 | 4.27 | <1.21 | 2.57 |
| Barium | mg/Kg | 2424 | 775 | 1381 | 3640 | 92.2 | 2630 | 162 | 2420 | 80 | 183 |
| True Total Barium | mg/Kg-dry | NS | NS | 10,600 | 11,700 | 784 | 4,240 | <500 | 4,280 | <500 | 342 |
| Cadmium | mg/Kg | 0.36 | 0.8 | 0.479 | 0.518 | <0.245 | <0.490 | <0.249 | <0.472 | <0.242 | <0.475 |
| Chromium | mg/Kg | 26 | 84 | 169.4 | 31.6 | 10.27 | 18.8 | 8.42 | 12.8 | 6 | 6.97 |
| Lead | mg/Kg | 11 | 44 | 47.4 | 41.6 | 7.1 | 23.0 | 9.19 | 18.3 | 8.24 | 14.6 |
| Mercury | mg/Kg | NS | 0.11 | 0.263 | 0.189 | 0.0346 | <0.109 | 0.0244 | <0.102 | <0.0188 | <0.0974 |
| Selenium | mg/Kg | 0.52 | 1 | 2.61 | <3.90 | <1.22 | <3.92 | <1.25 | <3.77 | <1.21 | <3.80 |
| Silver | mg/Kg | 4.2 | ND | 1.172 | NA | <0.612 | NA | <0.623 | NA | <0.605 | NA |
| Strontium | mg/Kg | NS | 203 | NA | 112 | NA | 129 | NA | 93.0 | NA | 39.1 |
| Zinc | mg/Kg | 46 | 140 | 297 | 99.9 | 17.5 | 92.3 | 14.8 | 15.7 | 14.9 | 13.3 |
| **SPLP** | | | | | | | | | | | |
| SPLP Barium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | |
| Oil & Grease | dry wt % | NS | NS | 5.42 | 5.22 | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NS | NS | NA | 3684 | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NS | NS | NA | 411 | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NS | NS | 105.7 | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NS | NS | 241 | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NS | NS | 162.9 | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NS | NS | 842 | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NS | NS | 2562 | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NS | NS | 126.8 | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NS | NS | 18.4 | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NS | NS | 63.1 | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NS | NS | 57 | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NS | NS | 218 | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NS | NS | 1.319 | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NS | NS | 1.67 | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NS | NS | <0.108 | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NS | NS | <0.108 | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NS | NS | <0.054 | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NS | NS | <0.108 | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NS | NS | <0.054 | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NS | NS | <0.108 | NA | NA | NA | NA | NA | NA | NA |

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | Sample ID | HA-5 | HA-5 | HA-9 | HA-9 | HA-9 | HA-9 | HA-9 | HA-9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Depth | 4-6' | 4-6' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' |
| | | | Sample Date | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| | | | Data Provider | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| | | | | Not Eco 0-3 | Not Eco 0-3 | Eco 0-3 | Eco 0-3 | Eco 0-3 | Eco 0-3 | Not Eco 0-3 | Not Eco 0-3 |
| **Parameters** | **Units** | **Soil Screening Value** | **Background USGS** | | | | | | | | |
| Benzo(g,h,i)perylene | mg/Kg | NS | NS | <0.054 | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NS | NS | <0.054 | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NS | NS | <0.108 | NA | NA | NA | NA | NA | NA | NA |
| Dibenz(a,h)anthracene | mg/Kg | NS | NS | <0.108 | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NS | NS | 0.062 | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NS | NS | 0.317 | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NS | NS | <0.054 | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NS | NS | 0.998 | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NS | NS | 0.704 | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NS | NS | 0.076 | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NS | NS | NA | 4095 | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NS | NS | 4396.9 | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NS | NS | 3.827 | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | 1.1 | NS | 3.689 | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | 29 | NS | 0.138 | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | |
| % Moisture Primary[1] | % | NS | NS | 44.1 | 37.3 | 18.3 | 15.9 | 19.7 | 16.4 | 17.4 | 15.7 |
| % Moisture Secondary[2] | % | NS | NS | 39.1 | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NS | NS | 99.9 | NA | 101 | NA | 189 | NA | 219 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | NS | NS | 25.7 | 38.1 | 19.8 | 20.5 | 22.6 | 33.9 | 20.2 | 31.7 |
| Electrical Conductivity | mmhos/cm | NS | NS | 4.85 | 5.40 | 4.72 | 3.01 | 5.63 | 3.31 | 6.31 | 3.77 |
| Exchangeable Sodium Percentage | % | NS | NS | 9.12 | 13.0 | 11.9 | 17.3 | 25.0 | 28.9 | 26.7 | 43.5 |
| Sodium Adsorption Ratio | Unitless | NS | NS | 13.6 | 12.9 | 35.7 | 18.8 | 46.3 | 21.8 | 52.5 | 25.5 |
| Soluble Calcium | meq/L | NS | NS | 11.7 | 14.2 | 2.25 | 2.58 | <1.00 | 1.60 | <1.00 | 1.72 |
| Soluble Magnesium | meq/L | NS | NS | <1.64 | 0.65 | <1.64 | 0.94 | <1.64 | 0.79 | <1.64 | 0.94 |
| Soluble Sodium | meq/L | NS | NS | 33.0 | 35.2 | 37.9 | 25.0 | 46.3 | 23.8 | 52.5 | 29.4 |
| pH | S.U. | NS | NS | 9.12 | NA | 8.43 | NA | 6.49 | NA | 7.84 | NA |
| Chloride | mg/Kg | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg-dry | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NS | NS | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5B
Soil Analytical Data and Screening: Former Anadarko Operations Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

**Notes:**
meq/100g = milliequivalents per 100 grams of soil
mmhos/cm = millimhos per centimeter
mg/kg = milligram per kilogram
meq/L = milliequivalents per liter
s.u. = standard units
NA - Not analyzed; N/S - No standard; ND - non-detect; PAH - polycylic aromatic hydrocarbons
H - Laboratory qualifier: beyond holding time
< - Not detected at or above the reporting limit shown
Metals and hydrocarbons were reported in, or converted to, dry weight.
Sum TPH Mixture is the calculated sum of TPH-DRO and TPH-ORO.
Sum TPH Fraction is the calculated sum of aliphatic (C6-C8, >C8-C10, >C10-C-12, >C12-C16, >C16-C35) and aromatic (>C8-C10, >C10-C-12, >C12-C16, >C16-21, >C21-C35) fractions.
Sum Total PAH is the calculated sum of 16 RECAP PAH (2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene.
Sum HMW PAH is the calculated sum of High Molecular Weight PAH (benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, fluoranthene, and pyrene).
Sum LMW PAH is the calculated sum of Low Molecular Weight PAH (2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene).
Non-detect results were treated as zero concentration (0 mg/kg) for summation.
Samples (0-3') were assessed using soil screening values and Louisiana soil background.
Brown font indicates exceedance of soil screening value (USEPA Eco-SSL, calculated soil screening value [barium]).
Yellow shading indicates exceedance of Louisiana soil background (USGS).
Light grey shading indicates that soil/sediment sample is deeper than 3 ft and not assessed.

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 |
| | ***Sample Depth*** | 2-4' | 4-6' | 4-6' | 8-10' | 8-10' | 26-28' | 26-28' | 36-38' | 36-38' | 58-60' | 58-60' |
| | ***Sample Date*** | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 |
| | ***Data Provider*** | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | |
| Arsenic | mg/Kg | 3.02 | 2.71 | 3.21 | 7.69 | 5.51 | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 403 | 153 | 296 | 236 | 226 | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | 417 | 614 | 388 | <500 | 296 | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | <0.499 | <0.243 | <0.500 | 0.493 | <0.500 | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 10.8 | 11.61 | 11.2 | 19.3 | 14.2 | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 11.8 | 8.6 | 12.6 | 10.95 | 15.5 | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | <0.106 | <0.181 | <0.0979 | <0.18 | <0.0961 | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | NA | <1.22 | NA | <1.27 | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | NA | <0.608 | NA | <0.634 | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | 25.5 | NA | 24.7 | NA | 30.5 | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 19.5 | 20.6 | 23.4 | 46.4 | 40.2 | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | |
| SPLP Barium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NA | NA | NA | NA | 89.9 | 0.763 | 7.20 | 1.44 | 9.28 | NA | NA |
| SPLP Sodium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(g,h,i)perylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | Sample ID | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 | CD-7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Depth | 2-4' | 4-6' | 4-6' | 8-10' | 8-10' | 26-28' | 26-28' | 36-38' | 36-38' | 58-60' | 58-60' |
| | Sample Date | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 | 4/14/2022 |
| | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| Dibenz(a,h)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | |
| % Moisture Primary[1] | % | 14.7 | 17.8 | 14.6 | 21.1 | 19.9 | 27.2 | 23.4 | 21.9 | 22.7 | 39.8 | 26.5 |
| % Moisture Secondary[2] | % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NA | 111 | NA | 120 | NA | 114 | NA | 45.9 | NA | 67.2 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | 34.4 | 30.7 | 35.7 | 50.4 | 42.8 | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | 0.98 | 1.39 | 1.06 | 0.921 | 0.72 | 0.320 | 0.25 | 0.467 | 0.35 | 0.745 | 0.63 |
| Exchangeable Sodium Percentage | % | 12.0 | 8.70 | 11.5 | 7.23 | 10.6 | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | 9.55 | 15.3 | 11.0 | 13.1 | 7.72 | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | 0.68 | 0.553 | 0.71 | 0.382 | 0.53 | NA | NA | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | 0.50 | 0.439 | 0.57 | 0.224 | 0.57 | NA | NA | NA | NA | NA | NA |
| Soluble Sodium | meq/L | 7.32 | 10.8 | 8.79 | 7.21 | 5.72 | NA | NA | NA | NA | NA | NA |
| pH | S.U. | NA | 7.91 | NA | 8.06 | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | 193 | 258 | 252 | 217 | 156 | 14.7 | 21.8 | 27.8 | 21.4 | 27.3 | 28.5 |
| Chloride | mg/Kg-dry | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 |
| | ***Sample Depth*** | 2-4' | 4-6' | 4-6' | 8-10' | 8-10' | 18-20' | 18-20' | 48-50' | 48-50' | 62-64' | 62-64' |
| | ***Sample Date*** | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 |
| | ***Data Provider*** | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | |
| Arsenic | mg/Kg | 4.30 | 2.44 | 4.98 | 10.31 | 5.79 | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 266 | 133 | 527 | 228 | 349 | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | 351 | <500 | 544 | <500 | 435 | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | <0.498 | <0.245 | <0.499 | <0.238 | <0.499 | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 14.0 | 7.71 | 9.94 | 11.03 | 10.3 | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 14.9 | 7.2 | 12.5 | 11.33 | 7.64 | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | <0.0992 | <0.187 | <0.105 | <0.161 | <0.104 | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | NA | <1.22 | NA | <1.19 | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | NA | <0.612 | NA | <0.595 | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | 23.4 | NA | 25.5 | NA | 24.4 | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 19.2 | 22.5 | 23.9 | 47.7 | 37.3 | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | |
| SPLP Barium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NA | NA | NA | NA | NA | <0.400 | 3.81 | 0.908 | 12.6 | NA | NA |
| SPLP Sodium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(g,h,i)perylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 | CD-8 |
| | ***Sample Depth*** | 2-4' | 4-6' | 4-6' | 8-10' | 8-10' | 18-20' | 18-20' | 48-50' | 48-50' | 62-64' | 62-64' |
| | ***Sample Date*** | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 | 4/21/2022 |
| | ***Data Provider*** | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| Dibenz(a,h)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | |
| % Moisture Primary[1] | % | 22.6 | 18.3 | 15.5 | 15.9 | 16.2 | 26.7 | 25.2 | 35.1 | 25.3 | 27.0 | 25.0 |
| % Moisture Secondary[2] | % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NA | 78.1 | NA | 75.9 | NA | 107 | NA | 64.2 | NA | 59.1 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | 46.5 | 33.5 | 44.0 | 27.4 | 30.9 | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | 0.28 | 0.557 | 0.43 | 0.422 | 0.27 | 0.244 | 0.23 | 0.740 | 0.53 | 0.721 | 0.57 |
| Exchangeable Sodium Percentage | % | 0.49 | 0.853 | 0.71 | 0.795 | 0.90 | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | 0.74 | 1.25 | 1.03 | 1.20 | 1.08 | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | 1.55 | 2.32 | 2.10 | 2.33 | 1.25 | NA | NA | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | 0.55 | 0.769 | 0.65 | 0.753 | 0.52 | NA | NA | NA | NA | NA | NA |
| Soluble Sodium | meq/L | 0.76 | 1.55 | 1.21 | 1.49 | 1.01 | NA | NA | NA | NA | NA | NA |
| pH | S.U. | NA | 8.17 | NA | 8.19 | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | 24.4 | 43.8 | 63.6 | 12.0 | 18.2 | <4.00 | 9.03 | 11.6 | 16.5 | 43.0 | 40.0 |
| Chloride | mg/Kg-dry | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 |
| | ***Sample Depth*** | 2-4' | 6-8' | 6-8' | 10-12' | 10-12' | 22-24' | 22-24' | 56-58' | 56-58' | 58-60' | 58-60' |
| | ***Sample Date*** | 4/27/2022 | 4/27/2022 | 4/27/2022 | 4/27/2022 | 4/27/2022 | 4/27/2022 | 4/27/2022 | 4/28/2022 | 4/28/2022 | 4/28/2022 | 4/28/2022 |
| | ***Data Provider*** | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | |
| Arsenic | mg/Kg | 3.63 | 2.7 | 3.19 | 4.7 | 6.86 | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 257 | 135 | 187 | 231 | 260 | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | 590 | <500 | 481 | 2350 | 389 | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | <0.477 | <0.237 | <0.500 | <0.239 | <0.498 | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 10.5 | 8.65 | 10.0 | 9.64 | 11.9 | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 10.2 | 5.99 | 8.09 | 11.82 | 8.55 | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | <0.0992 | <0.189 | <0.100 | <0.177 | <0.0988 | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | 21.4 | 25 | 20.8 | 30.4 | 28.3 | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 16.5 | 22 | 16.8 | 32.9 | 33.5 | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | |
| SPLP Barium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NA | NA | NA | NA | NA | 0.410 | 3.23 | 0.990 | 9.41 | NA | NA |
| SPLP Sodium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(g,h,i)perylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 | CD-9 |
| | ***Sample Depth*** | 2-4' | 6-8' | 6-8' | 10-12' | 10-12' | 22-24' | 22-24' | 56-58' | 56-58' | 58-60' | 58-60' |
| | ***Sample Date*** | 4/27/2022 | 4/27/2022 | 4/27/2022 | 4/27/2022 | 4/27/2022 | 4/27/2022 | 4/27/2022 | 4/28/2022 | 4/28/2022 | 4/28/2022 | 4/28/2022 |
| | ***Data Provider*** | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| Dibenz(a,h)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | |
| % Moisture Primary[1] | % | 17.2 | 15.5 | 91.7 | 16.4 | 14.9 | 28.9 | 26.4 | 27.2 | 30.8 | 22.5 | 23.3 |
| % Moisture Secondary[2] | % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NA | 63.9 | NA | 65.5 | NA | 67.1 | NA | 90.8 | NA | 30.7 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | 30.3 | 27.9 | 24.0 | 30.0 | 29.5 | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | 0.33 | 0.307 | 0.16 | 0.37 | 0.29 | 0.337 | 0.26 | 0.651 | 0.61 | 0.671 | 0.49 |
| Exchangeable Sodium Percentage | % | 3.41 | 2.22 | 2.99 | 1.69 | 1.94 | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | 3.00 | 1.59 | 2.32 | 2.19 | 2.32 | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | 0.73 | 2.17 | 0.26 | 1.72 | 0.55 | NA | NA | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | 0.43 | 1.14 | 0.20 | <0.820 | 0.40 | NA | NA | NA | NA | NA | NA |
| Soluble Sodium | meq/L | 2.29 | 2.05 | 1.11 | 2.03 | 1.60 | NA | NA | NA | NA | NA | NA |
| pH | S.U. | NA | 7.81 | NA | 7.98 | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | 7.99 | 10.9 | 14.8 | 22.9 | 34.6 | 7.05 | 14.3 | 17.7 | 38.7 | 14.4 | 22.2 |
| Chloride | mg/Kg-dry | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 |
| | ***Sample Depth*** | 2-4' | 6-8' | 6-8' | 8-10' | 8-10' | 28-30' | 28-30' | 52-24' | 52-24' | 60-62' | 60-62' |
| | ***Sample Date*** | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 |
| | ***Data Provider*** | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | |
| Arsenic | mg/Kg | 3.77 | 2 | 2.15 | 8.69 | 4.84 | NA | NA | NA | NA | NA | NA |
| Barium | mg/Kg | 240 | 157 | 184 | 343 | 265 | NA | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | 305 | <500 | 351 | <500 | 425 | NA | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | <0.500 | <0.234 | <0.495 | <1.24 | <0.501 | NA | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | 12.2 | 9.12 | 10.5 | 17 | 17.0 | NA | NA | NA | NA | NA | NA |
| Lead | mg/Kg | 16.3 | 9.03 | 8.05 | 11.2 | 10.1 | NA | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | <0.101 | <0.165 | <0.0986 | <0.178 | <0.0956 | NA | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | 13.5 | 16.7 | 18.4 | 34 | 31.1 | NA | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 15.8 | 17.3 | 20.5 | 52.2 | 41.4 | NA | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | |
| SPLP Barium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NA | NA | NA | NA | NA | 0.418 | NA | 0.491 | NA | NA | NA |
| SPLP Sodium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(g,h,i)perylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 | CD-10 |
| | ***Sample Depth*** | 2-4' | 6-8' | 6-8' | 8-10' | 8-10' | 28-30' | 28-30' | 52-24' | 52-24' | 60-62' | 60-62' |
| | ***Sample Date*** | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 | 5/4/2022 |
| | ***Data Provider*** | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| Dibenz(a,h)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | |
| % Moisture Primary[1] | % | 12.6 | 14.4 | 16.6 | 19.3 | 21.3 | 21.0 | 22.2 | 29.7 | 24.4 | 21.9 | 21.0 |
| % Moisture Secondary[2] | % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NA | 85.3 | NA | 120 | NA | 42.8 | NA | 56.9 | NA | 36.9 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | 26.2 | 28.4 | 28.1 | 51.7 | 44.8 | NA | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | 0.33 | 0.414 | 0.39 | 0.188 | 0.21 | 0.291 | 0.32 | 0.762 | 0.63 | 0.428 | 0.41 |
| Exchangeable Sodium Percentage | % | 1.88 | 2.42 | 2.96 | 2.52 | 2.90 | NA | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | 2.97 | 2.31 | 3.16 | 2.29 | 2.47 | NA | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | 0.67 | 2.50 | 0.70 | 0.585 | 0.30 | NA | NA | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | 0.39 | 1.40 | 0.42 | <0.820 | 0.20 | NA | NA | NA | NA | NA | NA |
| Soluble Sodium | meq/L | 2.17 | 3.22 | 2.37 | 1.24 | 1.23 | NA | NA | NA | NA | NA | NA |
| pH | S.U. | NA | 8.69 | NA | 8.16 | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | 10.8 | 6.28 | 28.8 | 6.48 | 34.3 | 8.89 | 13.1 | 6.73 | 17.2 | 11.6 | 17.4 |
| Chloride | mg/Kg-dry | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NA | NA | NA | NA | NA | NA | 3.51 | NA | 4.23 | NA | NA |
| Chloride | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | Sample ID | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Depth | 2-4' | 4-6' | 4-6' | 10-12' | 10-12' | 28-30' | 58-60' | 58-60' | 64-66' | 64-66' | 2-4' |
| | Sample Date | 5/2/2022 | 5/2/2022 | 5/2/2022 | 5/2/2022 | 5/2/2022 | 5/2/2022 | 5/3/2022 | 5/3/2022 | 5/3/2022 | 5/3/2022 | 6/10/2022 |
| | Data Provider | ICON | ERM | ICON | ERM | ICON | ICON | ERM | ICON | ERM | ICON | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | |
| Arsenic | mg/Kg | 2.54 | 4.34 | 3.19 | 26.4 | 6.51 | NA | NA | NA | NA | NA | 5.46 |
| Barium | mg/Kg | 185 | 186 | 260 | 455 | 304 | NA | NA | NA | NA | NA | 457 |
| True Total Barium | mg/Kg-dry | 265 | 541 | 467 | 697 | 694 | NA | NA | NA | NA | NA | 3400 |
| Cadmium | mg/Kg | <0.500 | <0.24 | <0.497 | 1.207 | <0.502 | NA | NA | NA | NA | NA | <0.466 |
| Chromium | mg/Kg | 14.6 | 8.4 | 13.5 | 23.8 | 24.5 | NA | NA | NA | NA | NA | 17.2 |
| Lead | mg/Kg | 13.0 | 18.9 | 12.4 | 26.4 | 15.5 | NA | NA | NA | NA | NA | 14.7 |
| Mercury | mg/Kg | <0.101 | <0.163 | <0.101 | <0.194 | <0.0997 | NA | NA | NA | NA | NA | <0.108 |
| Selenium | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | 17.7 | 20.2 | 23.7 | 92.1 | 61.9 | NA | NA | NA | NA | NA | 34.0 |
| Zinc | mg/Kg | 16.9 | 14.5 | 19.9 | 104.2 | 61.1 | NA | NA | NA | NA | NA | 22.8 |
| **SPLP** | | | | | | | | | | | | |
| SPLP Barium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NA | NA | NA | NA | NA | NA | 0.787 | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(g,h,i)perylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-11 | CD-14 |
| | ***Sample Depth*** | 2-4' | 4-6' | 4-6' | 10-12' | 10-12' | 28-30' | 58-60' | 58-60' | 64-66' | 64-66' | 2-4' |
| | ***Sample Date*** | 5/2/2022 | 5/2/2022 | 5/2/2022 | 5/2/2022 | 5/2/2022 | 5/2/2022 | 5/3/2022 | 5/3/2022 | 5/3/2022 | 5/3/2022 | 6/10/2022 |
| | ***Data Provider*** | ICON | ERM | ICON | ERM | ICON | ICON | ERM | ICON | ERM | ICON | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| Dibenz(a,h)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | |
| % Moisture Primary[1] | % | 15.8 | 16.8 | 13.4 | 25.7 | 21.8 | 21.7 | 31.9 | 34.9 | 22.4 | 25.1 | 21.0 |
| % Moisture Secondary[2] | % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NA | 111 | NA | 172 | NA | NA | 86.0 | NA | 39.8 | NA | NA |
| Cation Exchange Capacity (CEC) | meq/100g | 34.7 | 33.5 | 35.9 | 57.4 | 46.1 | NA | NA | NA | NA | NA | 44.6 |
| Electrical Conductivity | mmhos/cm | 0.85 | 0.839 | 0.96 | 0.571 | 0.84 | 1.08 | 0.457 | 0.74 | 0.654 | 0.78 | 5.20 |
| Exchangeable Sodium Percentage | % | 2.78 | 4.62 | 7.00 | 3.21 | 5.91 | NA | NA | NA | NA | NA | 14.8 |
| Sodium Adsorption Ratio | Unitless | 6.07 | 3.96 | 7.92 | 2.87 | 6.05 | NA | NA | NA | NA | NA | 17.4 |
| Soluble Calcium | meq/L | 0.90 | 2.79 | 0.74 | 2.46 | 0.92 | NA | NA | NA | NA | NA | 5.18 |
| Soluble Magnesium | meq/L | 0.63 | 1.61 | 0.54 | 1.62 | 0.63 | NA | NA | NA | NA | NA | 3.68 |
| Soluble Sodium | meq/L | 5.30 | 5.88 | 6.35 | 4.10 | 5.32 | NA | NA | NA | NA | NA | 36.7 |
| pH | S.U. | NA | 7.36 | NA | 8.40 | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg | 125 | 132 | 208.0 | 110 | 181 | 110 | 16.6 | 47.5 | 11.5 | 53.9 | 1260 |
| Chloride | mg/Kg-dry | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NA | NA | NA | NA | NA | 21.0 | NA | 9.72 | NA | NA | NA |
| Chloride | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-16 |
| | ***Sample Depth*** | 4-6' | 4-6' | 6-8' | 6-8' | 8-10' | 8-10' | 26-28' | 26-28' | 64-66' | 64-66' | 10-12' |
| | ***Sample Date*** | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/11/2024 |
| | ***Data Provider*** | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | |
| Arsenic | mg/Kg | 5.47 | 4.22 | 3.12 | 3.76 | 7.64 | 4.49 | NA | NA | NA | NA | 14.9 |
| Barium | mg/Kg | 339 | 595 | 292 | 294 | 373 | 649 | NA | NA | NA | NA | 311 |
| True Total Barium | mg/Kg-dry | 532 | 751 | 561 | 715 | <500 | 11500 | NA | NA | NA | NA | 349 |
| Cadmium | mg/Kg | <0.252 | <0.500 | 0.325 | <0.497 | 0.689 | <0.500 | NA | NA | NA | NA | <0.273 |
| Chromium | mg/Kg | 16.1 | 16.0 | 13.4 | 14.5 | 25.5 | 22.8 | NA | NA | NA | NA | 44.3 |
| Lead | mg/Kg | 14.1 | 11.5 | 11.26 | 10.5 | 21.5 | 15.4 | NA | NA | NA | NA | 22 |
| Mercury | mg/Kg | <0.199 | <0.108 | <0.169 | <0.107 | <0.178 | <0.107 | NA | NA | NA | NA | <0.0253 |
| Selenium | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | <1.37 |
| Silver | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | <0.683 |
| Strontium | mg/Kg | 28.6 | 30.8 | 28.8 | 31.4 | 64.0 | 54.3 | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | 36.8 | 35.6 | 34.2 | 37.0 | 67.8 | 59.2 | NA | NA | NA | NA | 149 |
| **SPLP** | | | | | | | | | | | | |
| SPLP Barium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NA | NA | NA | NA | NA | NA | 32.8 | NA | NA | NA | <1.60 |
| SPLP Sodium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(g,h,i)perylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-14 | CD-16 |
| | ***Sample Depth*** | 4-6' | 4-6' | 6-8' | 6-8' | 8-10' | 8-10' | 26-28' | 26-28' | 64-66' | 64-66' | 10-12' |
| | ***Sample Date*** | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/10/2022 | 6/11/2024 |
| | ***Data Provider*** | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | | | | | | | | | | | |
| Dibenz(a,h)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | |
| % Moisture Primary[1] | % | 20.7 | 16.9 | 18.5 | 17.4 | 24.2 | 23.0 | 21.8 | 21.9 | 23.9 | 25.3 | 26.8 |
| % Moisture Secondary[2] | % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | 80.1 | NA | 82.4 | NA | 122 | NA | 114 | NA | 42.7 | NA | 147 |
| Cation Exchange Capacity (CEC) | meq/100g | 32.6 | 48.6 | 31.1 | 48.8 | 49.1 | 60.9 | NA | NA | NA | NA | 49.1 |
| Electrical Conductivity | mmhos/cm | 5.02 | 3.97 | 2.47 | 2.39 | 1.74 | 1.97 | 2.56 | 2.69 | 9.67 | 7.85 | 0.313 |
| Exchangeable Sodium Percentage | % | 3.74 | 5.50 | 1.96 | 2.63 | 2.12 | 3.32 | NA | NA | NA | NA | 1.51 |
| Sodium Adsorption Ratio | Unitless | 5.58 | 5.49 | 2.62 | 2.51 | 3.19 | 3.91 | NA | NA | NA | NA | 2.67 |
| Soluble Calcium | meq/L | 13.5 | 9.63 | 8.54 | 8.58 | 4.98 | 5.69 | NA | NA | NA | NA | 0.925 |
| Soluble Magnesium | meq/L | 11.2 | 8.13 | 5.91 | 5.75 | 3.07 | 3.36 | NA | NA | NA | NA | 0.395 |
| Soluble Sodium | meq/L | 19.6 | 16.4 | 7.05 | 6.71 | 6.39 | 8.32 | NA | NA | NA | NA | 2.17 |
| pH | S.U. | 7.09 | NA | 7.51 | NA | 7.68 | NA | NA | NA | NA | NA | 8.29 |
| Chloride | mg/Kg | 1150 | 963 | 499 | 440 | 477 | 558 | 542 | 694 | 972 | 1100 | NA |
| Chloride | mg/Kg-dry | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NA | NA | NA | NA | NA | NA | NA | 181 | NA | NA | NA |
| Chloride | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-16 | CD-16 | CD-16 | CD-16 | CD-16 | CD-17 | CD-17 | CD-17 | CD-17 | CD-17 | CD-17 |
| | ***Sample Depth*** | 10-12' | 14-16' | 14-16' | 54-56' | 54-56' | 8-10' | 8-10' | 14-16' | 14-16' | 60-62' | 60-62' |
| | ***Sample Date*** | 6/11/2024 | 6/11/2024 | 6/11/2024 | 6/11/2024 | 6/11/2024 | 6/14/2024 | 6/14/2024 | 6/14/2024 | 6/14/2024 | 6/17/2024 | 6/17/2024 |
| | ***Data Provider*** | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | |
| Arsenic | mg/Kg | 7.06 | NA | NA | NA | NA | 4.4 | 3.25 | NA | NA | NA | NA |
| Barium | mg/Kg | 722 | NA | NA | NA | NA | 271 | 397 | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | 4450 | NA | NA | NA | NA | 448 | 942 | NA | NA | NA | NA |
| Cadmium | mg/Kg | <0.481 | NA | NA | NA | NA | <0.259 | <0.496 | NA | NA | NA | NA |
| Chromium | mg/Kg | 22.1 | NA | NA | NA | NA | 30.4 | 15.5 | NA | NA | NA | NA |
| Lead | mg/Kg | 12.9 | NA | NA | NA | NA | 17.7 | 10.8 | NA | NA | NA | NA |
| Mercury | mg/Kg | <0.107 | NA | NA | NA | NA | <0.0215 | <0.107 | NA | NA | NA | NA |
| Selenium | mg/Kg | NA | NA | NA | NA | NA | <1.3 | NA | NA | NA | NA | NA |
| Silver | mg/Kg | NA | NA | NA | NA | NA | <0.648 | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | 52.6 | NA | NA | NA | NA | NA | 31.3 | NA | NA | NA | NA |
| Zinc | mg/Kg | 53.6 | NA | NA | NA | NA | 145 | 32.6 | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | |
| SPLP Barium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NA | <1.60 | NA | <1.60 | NA | 14.4 | NA | 10.3 | NA | 5.58 | NA |
| SPLP Sodium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(g,h,i)perylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-16 | CD-16 | CD-16 | CD-16 | CD-16 | CD-17 | CD-17 | CD-17 | CD-17 | CD-17 | CD-17 |
| | ***Sample Depth*** | 10-12' | 14-16' | 14-16' | 54-56' | 54-56' | 8-10' | 8-10' | 14-16' | 14-16' | 60-62' | 60-62' |
| | ***Sample Date*** | 6/11/2024 | 6/11/2024 | 6/11/2024 | 6/11/2024 | 6/11/2024 | 6/14/2024 | 6/14/2024 | 6/14/2024 | 6/14/2024 | 6/17/2024 | 6/17/2024 |
| | ***Data Provider*** | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| Dibenz(a,h)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | |
| % Moisture Primary[1] | % | 20 | 27.4 | 20.5 | 27.6 | 26.6 | 22.8 | 16.2 | 21.2 | 19.8 | 29.5 | 25 |
| % Moisture Secondary[2] | % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NA | 159 | NA | 77.7 | NA | 142 | NA | 116 | NA | 74.9 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | 36.2 | 58.7 | NA | 37.8 | NA | 41.8 | 33.4 | 42.7 | NA | 33.8 | NA |
| Electrical Conductivity | mmhos/cm | 0.77 | 0.27 | 0.44 | 0.526 | 0.97 | 1.44 | 1.57 | 1.2 | 1.53 | 1.12 | 1.02 |
| Exchangeable Sodium Percentage | % | 6.08 | 1.16 | NA | 1.3 | NA | 11.8 | 18.8 | 2.77 | NA | 1.26 | NA |
| Sodium Adsorption Ratio | Unitless | 3.43 | 1.92 | NA | 2.2 | NA | 16.7 | 12.8 | 5.07 | NA | 2.51 | NA |
| Soluble Calcium | meq/L | 1.61 | 0.832 | NA | 1.73 | NA | 0.643 | 0.68 | 2.33 | NA | 3.91 | NA |
| Soluble Magnesium | meq/L | 1.04 | 0.457 | NA | 0.754 | NA | 0.456 | 0.8 | 1.53 | NA | 1.67 | NA |
| Soluble Sodium | meq/L | 3.95 | 1.54 | NA | 2.45 | NA | 12.4 | 11 | 7.04 | NA | 4.2 | NA |
| pH | S.U. | NA | 8.34 | NA | 8.34 | NA | 7.27 | NA | 7.73 | NA | 7.9 | NA |
| Chloride | mg/Kg | 114 | NA | 36.9 | NA | 64.3 | NA | 289 | NA | 255 | NA | 130 |
| Chloride | mg/Kg-dry | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NA | NA | 5.5 | NA | 8.13 | NA | NA | NA | 69.7 | NA | 55.7 |
| Chloride | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 |
| | ***Sample Depth*** | 0-4' | 0-4' | 6-8' | 6-8' | 8-10' | 8-10' | 22-24' | 22-24' | 30-32' | 30-32' | 46-48' |
| | ***Sample Date*** | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 |
| | ***Data Provider*** | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | |
| Arsenic | mg/Kg | NA | 4.74 | 3.47 | 3.77 | 2.69 | <1.97 | NA | NA | NA | NA | NA |
| Barium | mg/Kg | NA | 212 | 315 | 298 | 251 | 203 | NA | NA | NA | NA | NA |
| True Total Barium | mg/Kg-dry | NA | 243 | 387 | 377 | 285 | 192 | NA | NA | NA | NA | NA |
| Cadmium | mg/Kg | NA | <0.458 | <0.264 | <0.493 | <0.242 | <0.493 | NA | NA | NA | NA | NA |
| Chromium | mg/Kg | NA | 11.6 | 33.4 | 14.4 | 31.4 | 11.7 | NA | NA | NA | NA | NA |
| Lead | mg/Kg | NA | 14.7 | 12.08 | 14.2 | 9.04 | 7.46 | NA | NA | NA | NA | NA |
| Mercury | mg/Kg | NA | <0.0993 | <0.0243 | <0.101 | <0.0219 | <0.102 | NA | NA | NA | NA | NA |
| Selenium | mg/Kg | NA | NA | <1.32 | NA | <1.21 | NA | NA | NA | NA | NA | NA |
| Silver | mg/Kg | NA | NA | <0.66 | NA | <0.605 | NA | NA | NA | NA | NA | NA |
| Strontium | mg/Kg | NA | 13.1 | 47 | 29.2 | 40.7 | 26.5 | NA | NA | NA | NA | NA |
| Zinc | mg/Kg | NA | 63.8 | 70.3 | 33.7 | 68.2 | 29.9 | NA | NA | NA | NA | NA |
| **SPLP** | | | | | | | | | | | | |
| SPLP Barium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NA | NA | NA | NA | <1.60 | NA | NA | NA | 5.17 | NA | 2.71 |
| SPLP Sodium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(g,h,i)perylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 |
| | ***Sample Depth*** | 0-4' | 0-4' | 6-8' | 6-8' | 8-10' | 8-10' | 22-24' | 22-24' | 30-32' | 30-32' | 46-48' |
| | ***Sample Date*** | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/29/2024 |
| | ***Data Provider*** | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | | | | | | | | | | | |
| Dibenz(a,h)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | |
| % Moisture Primary[1] | % | NA | 19.5 | 24.2 | 16.9 | 17.4 | 16.8 | 27.6 | 20.1 | 29.1 | 23.7 | 34.8 |
| % Moisture Secondary[2] | % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NA | NA | 139 | NA | 91.5 | NA | 97.4 | NA | 80.7 | NA | 109 |
| Cation Exchange Capacity (CEC) | meq/100g | NA | 32.2 | 47.8 | 39.2 | 33.3 | 30.6 | NA | NA | NA | NA | NA |
| Electrical Conductivity | mmhos/cm | NA | 0.49 | 0.714 | 0.33 | 0.552 | 0.52 | 1.21 | 1.13 | 1.07 | 0.84 | 0.647 |
| Exchangeable Sodium Percentage | % | NA | 3.43 | 12.1 | 14.5 | 12 | 11.2 | NA | NA | NA | NA | NA |
| Sodium Adsorption Ratio | Unitless | NA | 5.46 | 13.2 | 4.29 | 13.40 | 5.94 | NA | NA | NA | NA | NA |
| Soluble Calcium | meq/L | NA | 0.68 | 0.308 | 0.43 | 0.19 | 0.67 | NA | NA | NA | NA | NA |
| Soluble Magnesium | meq/L | NA | 0.44 | 0.138 | 0.55 | 0.114 | 0.56 | NA | NA | NA | NA | NA |
| Soluble Sodium | meq/L | NA | 4.09 | 6.21 | 2.99 | 5.23 | 4.64 | NA | NA | NA | NA | NA |
| pH | S.U. | NA | NA | 7.98 | NA | 8.39 | NA | 7.84 | NA | 7.9 | NA | 8.24 |
| Chloride | mg/Kg | NA | 42.2 | 93 | 59.7 | 18.3 | 41.5 | 220 | 186 | 135 | 115 | 61.8 |
| Chloride | mg/Kg-dry | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NA | NA | NA | NA | NA | NA | NA | NA | NA | 49.2 | NA |
| Chloride | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Sample ID*** | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | HA-6 | HA-6 | HA-6 | HA-6 | HA-6 | HA-6 | HA-7 |
| | ***Sample Depth*** | 46-48' | 66-68' | 66-68' | 78-80' | 78-80' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 0-2' |
| | ***Sample Date*** | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/30/2024 | 7/30/2024 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| | ***Data Provider*** | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | | | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | | |
| Arsenic | mg/Kg | NA | NA | NA | NA | NA | 4.13 | 6.99 | 2.87 | 4.12 | 2.59 | 3.15 | 4.66 |
| Barium | mg/Kg | NA | NA | NA | NA | NA | 2710 | 3460 | 547 | 552 | 311 | 527 | 2234 |
| True Total Barium | mg/Kg-dry | NA | NA | NA | NA | NA | 14,300 | 13,700 | 899 | 1,050 | 850 | 699 | 7,890 |
| Cadmium | mg/Kg | NA | NA | NA | NA | NA | <0.248 | 0.586 | <0.246 | <0.469 | <0.238 | <0.485 | 0.56 |
| Chromium | mg/Kg | NA | NA | NA | NA | NA | 30 | 102 | 13.8 | 10.9 | 10.49 | 9.90 | 48.1 |
| Lead | mg/Kg | NA | NA | NA | NA | NA | 25.1 | 38.8 | 15 | 12.6 | 6.20 | 12.5 | 45.8 |
| Mercury | mg/Kg | NA | NA | NA | NA | NA | 0.0457 | 0.117 | 0.031 | <0.0973 | 0.0325 | <0.103 | 0.205 |
| Selenium | mg/Kg | NA | NA | NA | NA | NA | <1.24 | <3.73 | <1.23 | <3.75 | <1.19 | <3.88 | <1.19 |
| Silver | mg/Kg | NA | NA | NA | NA | NA | <0.619 | NA | <0.616 | NA | <0.596 | NA | <0.597 |
| Strontium | mg/Kg | NA | NA | NA | NA | NA | NA | 555 | NA | 27.9 | NA | 31.8 | NA |
| Zinc | mg/Kg | NA | NA | NA | NA | NA | 45 | 190 | 18.7 | 15.9 | 18.8 | 17.6 | 143 |
| **SPLP** | | | | | | | | | | | | | |
| SPLP Barium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NA | NA | NA | <0.400 | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(g,h,i)perylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Sample ID*** | | CD-19 | CD-19 | CD-19 | CD-19 | CD-19 | HA-6 | HA-6 | HA-6 | HA-6 | HA-6 | HA-6 | HA-7 |
| ***Sample Depth*** | | 46-48' | 66-68' | 66-68' | 78-80' | 78-80' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 0-2' |
| ***Sample Date*** | | 7/29/2024 | 7/29/2024 | 7/29/2024 | 7/30/2024 | 7/30/2024 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| ***Data Provider*** | | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM |
| **Parameters** | **Units** | | | | | | | | | | | | |
| Dibenz(a,h)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | | |
| % Moisture Primary[1] | % | 30.2 | 26 | 27.4 | 27 | 24 | 19.2 | 16.1 | 18.8 | 17.1 | 16.1 | 13.9 | 16.3 |
| % Moisture Secondary[2] | % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NA | 73.8 | NA | 78.8 | NA | 63.5 | NA | 101 | NA | 114 | NA | 70.7 |
| Cation Exchange Capacity (CEC) | meq/100g | NA | NA | NA | NA | NA | 16.8 | 23.1 | 25.3 | 35.8 | 23.2 | 33.1 | 18.8 |
| Electrical Conductivity | mmhos/cm | 0.49 | 0.73 | 0.66 | 0.629 | 0.47 | 0.528 | 1.07 | 0.711 | 1.18 | 0.748 | 0.70 | 0.478 |
| Exchangeable Sodium Percentage | % | NA | NA | NA | NA | NA | 0.869 | 1.10 | 4.21 | 6.91 | 7.96 | 9.05 | 1.18 |
| Sodium Adsorption Ratio | Unitless | NA | NA | NA | NA | NA | 1.28 | 1.74 | 9.62 | 6.82 | 7.15 | 5.25 | 1.57 |
| Soluble Calcium | meq/L | NA | NA | NA | NA | NA | 2.59 | 5.39 | 0.540 | 1.48 | 1.53 | 1.07 | 2.17 |
| Soluble Magnesium | meq/L | NA | NA | NA | NA | NA | 0.933 | 1.83 | <0.820 | 1.10 | <0.820 | 0.62 | 0.859 |
| Soluble Sodium | meq/L | NA | NA | NA | NA | NA | 1.70 | 3.31 | 5.00 | 7.74 | 6.25 | 4.83 | 1.93 |
| pH | S.U. | NA | 8.32 | NA | 8.32 | NA | 8.00 | NA | 6.29 | NA | 7.68 | NA | 8.12 |
| Chloride | mg/Kg | 28.9 | 19.3 | 30.6 | 12.7 | 15.2 | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg-dry | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | 25.5 | NA | NA | NA | 6.63 | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | Sample ID | HA-7 | HA-7 | HA-7 | HA-7 | HA-7 | HA-8 | HA-8 | HA-8 | HA-8 | HA-8 | HA-8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Depth | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' |
| | Sample Date | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| **Metals (dry weight)** | | | | | | | | | | | | |
| Arsenic | mg/Kg | 5.12 | 4.04 | 4.42 | 2.46 | 3.96 | 8.64 | 5.33 | 1.89 | 3.89 | 1.75 | 3.36 |
| Barium | mg/Kg | 3080 | 606 | 454 | 181 | 548 | 4132 | 4620 | 312 | 493 | 68.7 | 355 |
| True Total Barium | mg/Kg-dry | 12,600 | 900 | 823 | 597 | 812 | 16,100 | 22,200 | 611 | 988 | <500 | 451 |
| Cadmium | mg/Kg | <0.498 | <0.244 | <0.499 | <0.241 | <0.489 | 1.3 | 0.625 | <0.242 | <0.470 | <0.242 | <0.486 |
| Chromium | mg/Kg | 31.1 | 15.6 | 9.93 | 6.33 | 9.62 | 309 | 63.5 | 7.35 | 9.88 | 4.21 | 8.25 |
| Lead | mg/Kg | 33.5 | 6.67 | 13.7 | 10.82 | 11.8 | 143 | 50.3 | 8.23 | 10.5 | 5.67 | 9.05 |
| Mercury | mg/Kg | 0.109 | 0.043 | <0.105 | <0.0191 | <0.102 | 0.316 | 0.289 | 0.029 | <0.104 | 0.0331 | <0.103 |
| Selenium | mg/Kg | <3.99 | <1.22 | <3.99 | <1.21 | <3.91 | <1.24 | <3.94 | <1.21 | <3.76 | <1.21 | <3.88 |
| Silver | mg/Kg | NA | <0.61 | NA | <0.603 | NA | 0.84 | NA | <0.606 | NA | <0.605 | NA |
| Strontium | mg/Kg | 113 | NA | 23.9 | NA | 25.2 | NA | 178 | NA | 32.0 | NA | 23.9 |
| Zinc | mg/Kg | 92.6 | 28.0 | 15.0 | 15.7 | 17.1 | 403 | 188 | 13 | 14.9 | 10.40 | 15.9 |
| **SPLP** | | | | | | | | | | | | |
| SPLP Barium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chromium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Lead | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Chloride | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SPLP Sodium | mg/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Hydrocarbons (dry weight)** | | | | | | | | | | | | |
| Oil & Grease | dry wt % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-DRO (>C10-C28) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-ORO (>C28-C35) | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic C6-C8 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aliphatic >C16-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C8-C10 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C10-C12 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C12-C16 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C16-C21 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aromatic >C21-C35 | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **PAH (dry weight)** | | | | | | | | | | | | |
| 1-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Methylnaphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(a)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(b)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(g,h,i)perylene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Benzo(k)fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chrysene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

| | Sample ID | HA-7 | HA-7 | HA-7 | HA-7 | HA-7 | HA-8 | HA-8 | HA-8 | HA-8 | HA-8 | HA-8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Depth | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' | 0-2' | 0-2' | 2-4' | 2-4' | 4-6' | 4-6' |
| | Sample Date | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 | 6/29/2021 |
| | Data Provider | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON | ERM | ICON |
| **Parameters** | **Units** | | | | | | | | | | | |
| Dibenz(a,h)anthracene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluoranthene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Fluorene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Indeno(1,2,3-cd)pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Naphthalene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Phenanthrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Pyrene | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Calculated Sums (dry weight)** | | | | | | | | | | | | |
| Sum TPH Mixture | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum TPH Fraction | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum Total PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum LMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sum HMW PAH | mg/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Salts** | | | | | | | | | | | | |
| % Moisture Primary[1] | % | 17.4 | 18.0 | 15.6 | 17.1 | 16.7 | 19.4 | 16.6 | 17.5 | 17.8 | 17.3 | 15.5 |
| % Moisture Secondary[2] | % | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| % Saturation | % | NA | 85.3 | NA | 105 | NA | 63.9 | NA | 110 | NA | 79.5 | NA |
| Cation Exchange Capacity (CEC) | meq/100g | 32.3 | 20.4 | 35.5 | 22.6 | 31.4 | 16.8 | 27.4 | 22.0 | 29.2 | 18.9 | 27.1 |
| Electrical Conductivity | mmhos/cm | 0.71 | 0.917 | 0.90 | 1.15 | 0.86 | 0.46 | 0.51 | 0.542 | 0.57 | 0.49 | 1.06 |
| Exchangeable Sodium Percentage | % | 1.06 | 5.89 | 8.16 | 6.55 | 8.28 | 0.625 | 0.64 | 3.51 | 4.55 | 6.22 | 8.95 |
| Sodium Adsorption Ratio | Unitless | 2.05 | 11.3 | 5.93 | 16.0 | 5.68 | 0.972 | 1.12 | 7.50 | 3.37 | 3.57 | 6.19 |
| Soluble Calcium | meq/L | 3.37 | 0.722 | 1.23 | 0.613 | 1.19 | 2.54 | 2.93 | 0.487 | 1.19 | <0.250 | 1.36 |
| Soluble Magnesium | meq/L | 1.33 | <0.820 | 0.85 | <0.820 | 0.82 | 0.609 | 0.85 | <0.410 | 0.70 | <0.410 | 0.89 |
| Soluble Sodium | meq/L | 3.14 | 6.78 | 6.04 | 8.86 | 5.69 | 1.22 | 1.53 | 3.70 | 3.27 | 3.57 | 6.57 |
| pH | S.U. | NA | 7.87 | NA | 7.48 | NA | 7.82 | NA | 7.19 | NA | 7.18 | NA |
| Chloride | mg/Kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | mg/Kg-dry | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Leachate Cl | mg/l | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Alkalinity | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | meq/L | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Table 5C
Soil Analytical Data: Other Areas
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

**Notes:**
meq/100g = milliequivalents per 100 grams of soil
mmhos/cm = millimhos per centimeter
mg/kg = milligram per kilogram
meq/L = milliequivalents per liter
s.u. = standard units
NA - Not analyzed; N/S - No standard; ND - non-detect; PAH - polycylic aromatic hydrocarbons
< - Not detected at or above the reporting limit shown
Metals and hydrocarbons were reported in, or converted to, dry weight.
Sum TPH Mixture is the calculated sum of TPH-DRO and TPH-ORO.
Sum TPH Fraction is the calculated sum of aliphatic (C6-C8, >C8-C10, >C10-C-12, >C12-C16, >C16-C35) and aromatic (>C8-C10, >C10-C-12, >C12-C16, >C16-21, >C21-C35) fractions.
Sum Total PAH is the calculated sum of 16 RECAP PAH (2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene.
Sum HMW PAH is the calculated sum of High Molecular Weight PAH (benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, fluoranthene, and pyrene).
Sum LMW PAH is the calculated sum of Low Molecular Weight PAH (2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene).
Non-detect results were treated as zero concentration (0 mg/kg) for summation.
Samples results are presented for completeness, and not assessed.

*Table 6*
*Barium Speciation Data*
*Castex Development, LLC v. Andarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| | Sample Location | | HA-2R | CD-1R | SB-3 | HA-10R |
|---|---|---|---|---|---|---|
| | Depth (ft bgs) | | 0-2 | 0-2 | 0-2 | 0-2 |
| | Sample Date | | 4/23/2025 | 4/30/2025 | 4/25/2025 | 4/25/2025 |
| | Data Provider | | HET | ERM | HET | HET |
| Parameters | Analytical Method | Units | | | | |
| ***Elemental Composition*** | | | | | | |
| Carbon (C) | EDX | wt% | 0.97 | 7.15 | 1.29 | 3.30 |
| Oxygen (O) | EDX | wt% | 48.37 | 45.04 | 48.13 | 47.88 |
| Sodium (Na) | EDX | wt% | 0.52 | 0.34 | 0.42 | 0.20 |
| Magnesium (Mg) | EDX | wt% | 0.68 | 0.21 | 0.83 | 0.50 |
| Aluminum (Al) | EDX | wt% | 8.20 | 4.86 | 7.42 | 8.18 |
| Silicon (Si) | EDX | wt% | 32.50 | 33.56 | 32.89 | 32.83 |
| Phosphorous (P) | EDX | wt% | ND | ND | ND | ND |
| Sulfur (S) | EDX | wt% | Tr | 0.88 | ND | ND |
| Chlorine (Cl) | EDX | wt% | ND | 0.05 | 0.14 | ND |
| Potassium (K) | EDX | wt% | 1.90 | 1.05 | 2.07 | 1.59 |
| Calcium (Ca) | EDX | wt% | 1.18 | 0.20 | 1.82 | 0.22 |
| Chromium (Cr) | EDX | wt% | ND | ND | ND | ND |
| Manganese (Mn) | EDX | wt% | ND | ND | ND | 0.08 |
| Iron (Fe) | EDX | wt% | 4.80 | 3.14 | 4.20 | 4.41 |
| Zinc (Zn) | EDX | wt% | ND | ND | ND | ND |
| Strontium (Sr) | EDX | wt% | ND | ND | ND | ND |
| Barium (Ba) | EDX | wt% | 0.17 | 3.19 | 0.22 | 0.14 |
| Titanium (Ti) | EDX | wt% | 0.70 | 0.33 | 0.58 | 0.68 |
| Total | EDX | wt% | 100 | 100 | 100 | 100 |
| ***Mineral Phase*** | | | | | | |
| Quartz ($SiO_2$) | XRD | wt% | 49.9 | 81.3 | 61.5 | 59.7 |
| K-Feldspars ($KAlSi_3O_8$) | XRD | wt% | 0.6 | 1.1 | 1.6 | 0.8 |
| Plagioclase ($NaAlSi_3O_8$) | XRD | wt% | 3.0 | 1.0 | 5.2 | 2.6 |
| Calcite ($CaCO_3$) | XRD | wt% | 0.6 | ND | 2.0 | ND |
| Pyrite ($FeS_2$) | XRD | wt% | ND | ND | ND | ND |
| Fe Dolomite ($FeMgCa(CO_3)_2$) | XRD | wt% | ND | ND | ND | ND |
| Halite (NaCl) | XRD | wt% | ND | NA | ND | ND |
| Barium Sulfide (BaS) | XRD | wt% | ND | ND | ND | ND |
| Barite ($BaSO_4$) | XRD | wt% | Tr | 5.5 | Tr | Tr |
| Witherite ($BaCO_3$) | XRD | wt% | ND | ND | ND | ND |
| Barium Chloride ($BaCl_2$) | XRD | wt% | ND | ND | ND | ND |
| Baria (BaO) | XRD | wt% | ND | ND | ND | ND |
| Barium Peroxide ($BaO_2$) | XRD | wt% | ND | ND | ND | ND |
| Total Clay | XRD | wt% | 45.9 | 11.1 | 29.8 | 36.9 |
| Total | XRD | wt% | 100 | 100 | 100 | 100 |

**Notes:**
NA - Not Analyzed
ND - Not Detected
Tr - Trace Amount
EDX - Energy Dispersive X-Ray Spectrometry
XRD - X-Ray Diffraction
* - Sample Reanalyzed

*Table 7*
*Toxicity Reference Values (TRVs) for BERA*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Constituent | TRV | | | |
|---|---|---|---|---|
| | Avian<br>Mourning Dove, Northern Cardinal, White-eyed Vireo, Red-tailed Hawk | | Mammal<br>Swamp Rabbit, White-tailed Deer, Raccoon, Coyote | |
| | mg/kg/day | Source | mg/kg/day | Source |
| Barium | 600[a] | Brown et al. (2014); Silverman and Tell (2010); Kubiak (2012) | 5433[b] | Boyd and Abel (1966) |
| Cadmium | 1.47 | USEPA (2005d) | 0.77 | USEPA (2005d) |
| Chromium | 2.66 | USEPA (2008) | 2.4 | USEPA (2008) |
| Lead | 1.63 | USEPA (2005e) | 4.7 | USEPA (2005e) |
| Mercury | 3.25[c] | USEPA (1999; Table E-8) | 1.01[d] | USEPA (1999; Table E-7) |
| Zinc | 66.1 | USEPA (2007c) | 75.4 | USEPA (2007c) |

Notes:

[a]Barium sulfate; Recommended x-ray imaging dose for birds of 6,000 to 15,000 mg/kg bw. Low range value of 6,000 mg/kg bw used as proxy NOAEL; uncertainty factor of 10 for acute to chronic endpoint applied.

[b]Barium sulfate; Acute (14 day) NOAEL (mortality) for rat of 163,000 mg/kg bw; uncertainty factor of 10 for acute to chronic endpoint; and 3 for species variability.

[c]Mercuric chloride; Acute (5 day) LOAEL (mortality) for quail of 325 mg/kg/d; uncertainty factor of 10 applied to estimate from an acute to chronic endpoint (produces a very conservative TRV estimate.)

[d]Mercuric chloride; Chronic (6 month) NOAEL (reproduction) for mink of 1.01 mg/kg/day.

*Table 8*
*Soil/Sediment Bioavailability Factors for BERA*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| COPEC | Soil/Sediment Bioavailability Factor | Citation |
|---|---|---|
| Barium | 0.0002 | Engdahl et al. (2008); Cappuyns (2018); Environment International Ltd. (2010); USGS (2002) |
| Cadmium | 0.036 | Prokop et al. (2003); Shaheen et al. (2016); Feijtel (1986) |
| Chromium | 0.015 | Han et al. 2004 |
| Lead | 0.01 | Hettiarachchi and Pierzynski (2004); Luo et al. (2014); Feijtel (1986) |
| Mercury | 0.00031 | Xu et al. (2019); Chibunda et al. (2009); Chalmers et al. (2013) |
| Zinc | 0.01 - 0.1 | USEPA (2007); Feijtel (1986) |

*Table 9*
*Biota Accumulation Factors (BAFs) for Food Items for BERA*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| COPEC | Soil-Plant BAF | Citation | Soil-Earthworm BAF | Citation |
|---|---|---|---|---|
| Barium | 0.0046 | Nelson et al. (1984); Lamb et al. (2013) | 0.091 | Sample et al. (1998a; Table C.1) |
| Cadmium | 0.586 | Bechtel-Jacobs (1998a; Table 6) | 7.708 | Sample et al. (1998a; Table 11) |
| Chromium | 0.016 | Xie (2016) | 0.306 | Sample et al. (1998a; Table 11) |
| Lead | 0.0389 | Bechtel-Jacobs (1998a; Table 6) | 0.266 | Sample et al. (1998a; Table 11) |
| Mercury | 0.27 | Fernández-Martínez (2015); Rodriguez (2007); Hamilton (2008) | 1.693 | Sample et al. (1998a; Table 11) |
| Zinc | 0.366 | Bechtel-Jacobs (1998a; Table 6) | 3.201 | Sample et al. (1998a; Table 11) |

*Table 9*
*Biota Accumulation Factors (BAFs) for Food Items for BERA*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| COPEC | Soil-Mammal BAF | Citation | Soil-Bird BAF | Citation |
|---|---|---|---|---|
| Barium | 0.0566 | Sample et al. (1998b; Table 7) | 0.0566 | Sample et al. (1998b; Table 7) [Barium soil-mammal BCF used as surrogate] |
| Cadmium | 0.333 | Sample et al. (1998b; Table 7) | 0.113 | Beyer et al. (1985) |
| Chromium | 0.0846 | Sample et al. (1998b; Table 7) | 0.718 | Egwumah et al. (2017); Kraus (1989) |
| Lead | 0.1504 | Sample et al. (1998b; Table 7) | 0.191 | Beyer et al. (1985) |
| Mercury | 0.0534 | Sample et al. (1998b; Table 7) | 0.148 | White and Cromartie (1985); Adair et al. (2003) |
| Zinc | 0.7717 | Sample et al. (1998b; Table 7) | 0.0645 | Beyer et al. (1985) |

*Table 10*
*Species Factors for HQ Calculations for BERA*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Parameter | Description | Units | Mourning Dove | Source | Northern Cardinal | Source |
|---|---|---|---|---|---|---|
| BW | Body weight of receptor | Kg | 0.12 | The Cornell Lab (2020)[a] | 0.045 | The Cornell Lab (2021b)[e] |
| Food IR | Ingestion rate of food | Kg/Kg BW/d | 0.14 | Nagy (2001)[b] | 0.19 | Nagy (2001)[f] |
| Soil / Sediment Ingestion | Ingestion proportion of soil or sediment | Fraction of Total Diet | 0.093 | Beyer et al. (1994)[c] | 0.093 | Beyer et al. (1994)[g] |
| Fd (plants) | Fraction of diet consisting of plants | | 1 | The Cornell Lab (2020)[d] | 0.71 | The Cornell Lab (2021b)[h] |
| Fd (inverts) | Fraction of diet consisting of soil invertebrates | | 0 | | 0.29 | The Cornell Lab (2021b)[h] |
| Fd (mammals) | Fraction of diet consisting of mammals | | 0 | | 0 | |
| Fd (benthic inverts) | Fraction of diet consisting of benthic invertebrates | | 0 | | 0 | |
| Fd (fish) | Fraction of diet consisting of fish | | 0 | | 0 | |
| Fd (birds) | Fraction of diet consisting of birds | | 0 | | 0 | |

Notes:

[a] Mourning Dove body weight: average of mean body weights for adult males and females.
[b] Mourning Dove food ingestion rate: using all birds dry matter intake equation.
[c] Mourning Dove soil/sediment ingestion rate: surrogate soil/sediment ingestion rate based on an avian consumer of terrestrial plants and insects.

[d] Mourning Dove diet: 99% seeds, with insignificant animal and leaf matter incidentally ingested; modeled as 100% plant diet.

[e] Northern Cardinal body weight: average of body weight range for adults (42-48 g).
[f] Northern Cardinal food ingestion rate: using all birds dry matter intake equation.
[g] Northern Cardinal soil/sediment ingestion rate: surrogate soil/sediment ingestion rate based on an avian consumer of terrestrial plants and insects.
[h] Northern Cardinal diet: average annual consumption of 29% animal matter and 71% plant matter.

*Table 10*
*Species Factors for HQ Calculations for BERA*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Parameter | Description | Units | White-eyed Vireo | Source | Red-tailed Hawk | Source |
|---|---|---|---|---|---|---|
| BW | Body weight of receptor | Kg | 0.0114 | The Cornell Lab (2022)[a] | 1.1 | USEPA (1993; Page 2-82); [Source: Craighead & Craighead (1956), Steenhof (1983), Springer & Osborne (1983)][e] |
| Food IR | Ingestion rate of food | Kg/Kg BW/d | 0.3 | Nagy (2001)[b] | 0.070 | Nagy (2001)[f] |
| Soil / Sediment Ingestion | Ingestion Proportion of soil or sediment | Fraction of Total Diet | 0.093 | Beyer et al. (1994)[c] | 0 | Sample & Suter (1994; Section 4.15)[g] |
| Fd (plants) | Fraction of diet consisting of plants | | 0.1 | The Cornell Lab (2022)[d] | 0 | |
| Fd (inverts) | Fraction of diet consisting of soil invertebrates | | 0.9 | The Cornell Lab (2022)[d] | 0 | |
| Fd (mammals) | Fraction of diet consisting of mammals | | 0 | | 0.87 | USEPA (1993; Page 2-83); [Source: Adamcik et al. (1979), Janes (1984), Fitch et al. (1946)][h] |
| Fd (benthic inverts) | Fraction of diet consisting of benthic invertebrates | | 0 | | 0 | |
| Fd (fish) | Fraction of diet consisting of fish | | 0 | | 0 | |
| Fd (birds) | Fraction of diet consisting of birds | | 0 | | 0.13 | USEPA (1993; Page 2-83); [Source: Adamcik et al. (1979), Janes (1984), Fitch et al. (1946)][h] |

Notes:

[a] White-eyed Vireo body weight: average body weight of adult males and females (Heimbuch (2016), Odum (1993), Hartman (1955)).
[b] White-eyed Vireo food ingestion rate: using all birds dry matter intake equation.
[c] White-eyed Vireo soil/sediment ingestion rate: surrogate soil/sediment ingestion rate based on an avian consumer of terrestrial plants and insects.
[d] White-eyed Vireo diet: primarily soil invertebrates based on stomach contents of 221 individuals (Chapin, 1925); stomach contents of 67 individuals (Nolan and Wooldridge,1962).
[e] Red-tailed Hawk body weight: Average of adult males and adult females, all studies in USEPA 1993.
[f] Red-tailed Hawk food ingestion rate: ingestion rate using all bird dry matter intake equation.
[g] Red-tailed Hawk soil/sediment ingestion rate: amount of soil ingested from prey is negligible.
[h] Red-tailed Hawk: average for diet items of mammals and birds, all studies in USEPA 1993.



Castex-ERM-RPT-000231
**BP/Castex-Ltd Adm-Apx L-000232**

*Table 10*
*Species Factors for HQ Calculations for BERA*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Parameter | Description | Units | Swamp Rabbit | Source | White-tailed Deer | Source |
|---|---|---|---|---|---|---|
| BW | Body weight of receptor | Kg | 2.118 | Bond et al. (2006)[a] | 97 | University of Michigan (2003a)[e] |
| Food IR | Ingestion rate of food | Kg/Kg BW/d | 0.13 | Sample & Suter (1994; Section 4.5, Page 16)[b] | 0.031 | Nagy (2001)[f] |
| Soil / Sediment Ingestion | Ingestion Proportion of soil or sediment | Fraction of Total Diet | 0.063 | Sample & Suter (1994; Section 4.5, Page 17)[c] | 0.02 | Beyer et al. (1994)[g] |
| Fd (plants) | Fraction of diet consisting of plants | | 1 | USEPA (1993; Page 2-356); [Source: Spencer & Chapman (1986)][d] | 1 | University of Michigan (2003a)[h] |
| Fd (inverts) | Fraction of diet consisting of soil invertebrates | | 0 | | 0 | |
| Fd (mammals) | Fraction of diet consisting of mammals | | 0 | | 0 | |
| Fd (benthic inverts) | Fraction of diet consisting of benthic invertebrates | | 0 | | 0 | |
| Fd (fish) | Fraction of diet consisting of fish | | 0 | | 0 | |
| Fd (birds) | Fraction of diet consisting of birds | | 0 | | 0 | |

Notes:

[a] Swamp rabbit body weight: arithmetic mean of adult males and females.
[b] Swamp rabbit ingestion rate: ingestion rate using all mammals dry matter intake equation.
[c] Swamp rabbit soil/sediment ingestion rate: black-tailed jackrabbit used as surrogate.
[d] Swamp rabbit diet: (based on Eastern cottontail) is converted to dry weight assuming 45% moisture in food.
[e] White-tailed deer body weight: midpoint of range.
[f] White-tailed deer food ingestion rate: using all mammals dry matter intake equation.
[g] White-tailed deer soil/sediment ingestion rate: <2% based on white-tailed deer in Maryland.
[h] White-tailed deer diet: plants.

*Table 10*
*Species Factors for HQ Calculations for BERA*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Parameter | Description | Units | Raccoon | Source | Coyote | Source |
|---|---|---|---|---|---|---|
| BW | Body weight of receptor | Kg | 5.78 | USEPA (1993; Page 2-236); [source: Sanderson (1984); Nagel (1943); Johnson (1970); Hamilton (1936)][a] | 14 | University of Michigan (2001)[e] |
| Food IR | Ingestion rate of food | Kg/Kg BW/d | 0.035 | Nagy (2001)[b] | 0.028 | Nagy (2001)[f] |
| Soil / Sediment Ingestion | Ingestion Proportion of soil or sediment | Fraction of Total Diet | 0.094 | Beyer et al. (1994)[c] | 0.028 | Beyer et al. (1994)[g] |
| Fd (plants) | Fraction of diet consisting of plants | | 0.743 | USEPA (1993; Page 2-237); [Source:Tabatabai & Kennedy (1988), Hamilton (1951)][d] | 0.1 | University of Michigan (2001)[h] |
| Fd (inverts) | Fraction of diet consisting of soil invertebrates | | 0.123 | USEPA (1993; Page 2-237); [Source:Tabatabai & Kennedy (1988), Hamilton (1951)][d] | 0 | |
| Fd (mammals) | Fraction of diet consisting of mammals | | 0.089 | USEPA (1993; Page 2-237); [Source:Tabatabai & Kennedy (1988), Hamilton (1951)][d] | 0.9 | University of Michigan (2001)[h] |
| Fd (benthic inverts) | Fraction of diet consisting of benthic invertebrates | | 0.02 | USEPA (1993; Page 2-237); [Source:Tabatabai & Kennedy (1988), Hamilton (1951)][d] | 0 | |
| Fd (fish) | Fraction of diet consisting of fish | | 0.004 | USEPA (1993; Page 2-237); [Source:Tabatabai & Kennedy (1988), Hamilton (1951)][d] | 0 | |
| Fd (birds) | Fraction of diet consisting of birds | | 0.02 | USEPA (1993; Page 2-237); [Source:Tabatabai & Kennedy (1988), Hamilton (1951)][d] | 0 | |

Notes:

[a] Raccoon body weight: average of adult males and adult females, all studies in USEPA 1993.
[b] Raccoon ingestion rate: using all mammal dry matter intake equation.
[c] Raccoon soil/sediment ingestion rate: measured in Beyer et al., 1994,
[d] Raccoon diet: average of diet items for Tennessee and New York, terrestrial food consumption habitats,
[e] Coyote body weight: midpoint of range.
[f] Coyote food ingestion rate: using all mammals dry matter intake equation.
[g] Coyote soil/sediment ingestion rate: red fox was used as surrogate.
[h] Coyote diet: 90% mammals; coyotes also consume birds, fish, and invertebrates.



Castex-ERM-RPT-000233
**BP/Castex-Ltd Adm-Apx L-000234**

*Table 11*
*Exposure Modifying Factors (EMFs) for Receptors for BERA*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Parameter | Description | Mourning Dove | Northern Cardinal | White-eyed Vireo | Red-tailed Hawk | Swamp Rabbit | White-tailed Deer | Raccoon | Coyote |
|---|---|---|---|---|---|---|---|---|---|
| Home Range | Home Range of receptor (acres) | 27,157[a] | 34[b] | 2.2[c] | 2081[d] | 7.9[e] | 282[f] | 366[g] | 70,026[h] |
| Spatial Factor | | Spatial Factor = potentially affected area ÷ receptor home range, with an upperbound value of 1 (100%) | | | | | | | |
| Time (Temporal) Factor | Fraction of time spent in presumed contaminated area | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |

Notes:
[a] Mourning Dove: Average of maximum home ranges for adult males and females in Missouri and Idaho, distances as circle radii (Cornell Lab of Ornithology, 2020).
[b] Northern Cardinal: Average of mean breeding and winter home ranges for adults in Tennesse, Kentucky, and Ontario (Cornell Lab of Ornithology, 2021).
[c] White-eyed Vireo: Average of territory ranges for Florida, Illinois, Virginia, and Texas (Cornell Lab of Ornithology, 2022).
[d] Red-tailed Hawk: Average of all territory ranges in USEPA 1993 [Source: Fitch et al. (1946), Craighead & Craighead (1956), Andersen & Rongsted (1989)].
[e] Swamp Rabbit: Average of adult male (10.6 acres) and female (5.14 acres) home ranges (Gould 1974).
[f] White-tailed Deer: Average of adult male spring (153.4 ha), summer (70.4 ha), and fall (118.0 ha) home ranges, Louisiana bottomland hardwood forest in south-central Louisiana (Thayer et al., 2009).
[g] Raccoon: Average of adult male and female home ranges, all seasons, Louisiana Atchafalaya bottomland hardwood habitat (Byrne and Chamberlain, 2011).
[h] Coyote: Maximum home range 19km diameter around den, based on circle (University of Michigan, 2022).

| | | | Spatial Factor | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Preliminary AOI | Estimated Area (acres) | Matrix | Mourning Dove | Northern Cardinal | White-eyed Vireo | Red-tailed Hawk | Swamp Rabbit | White-tailed Deer | Raccoon | Coyote |
| HA-2 | 0.05 | Soil | 1.8E-06 | 1.5E-03 | 2.3E-02 | 2.4E-05 | 6.3E-03 | 2.0E-04 | 1.4E-04 | 7.1E-07 |
| HA-4 | 0.3 | Soil | 1.1E-05 | 8.8E-03 | 1.4E-01 | 1.4E-04 | 3.8E-02 | 1.2E-03 | 8.2E-04 | 4.3E-06 |
| HA-5 | 0.5 | Soil | 1.8E-05 | 1.5E-02 | 2.3E-01 | 2.4E-04 | 6.3E-02 | 2.0E-03 | 1.4E-03 | 7.1E-06 |
| CD-1 | 0.05 | Soil | 1.8E-06 | 1.5E-03 | 2.3E-02 | 2.4E-05 | 6.3E-03 | 2.0E-04 | 1.4E-04 | 7.1E-07 |

# FIGURES

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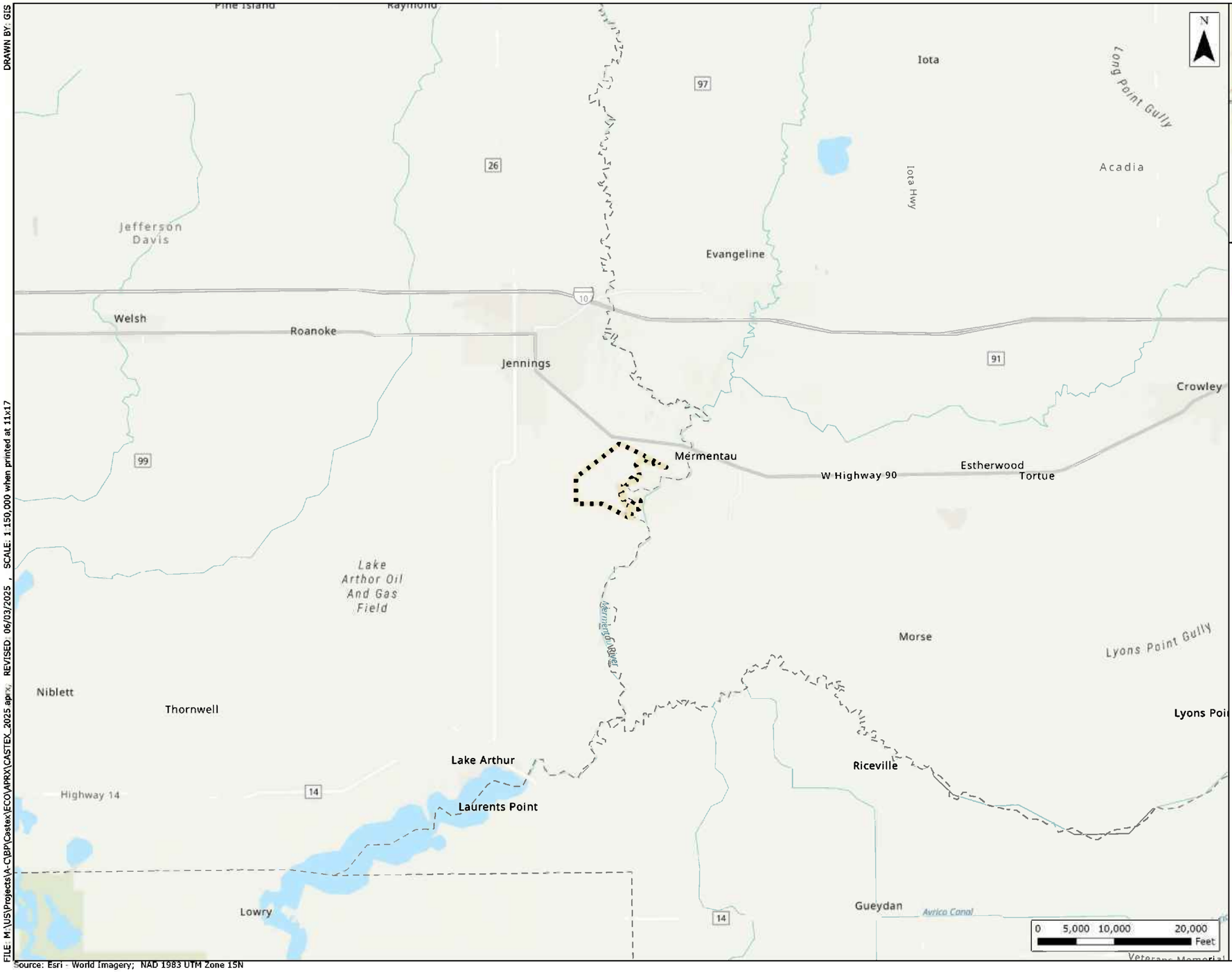
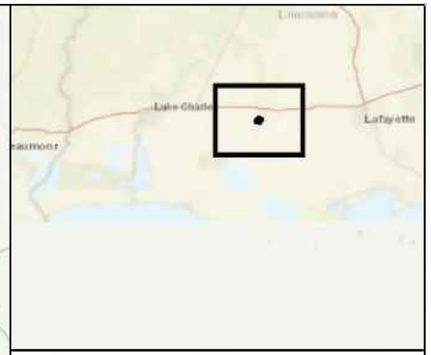


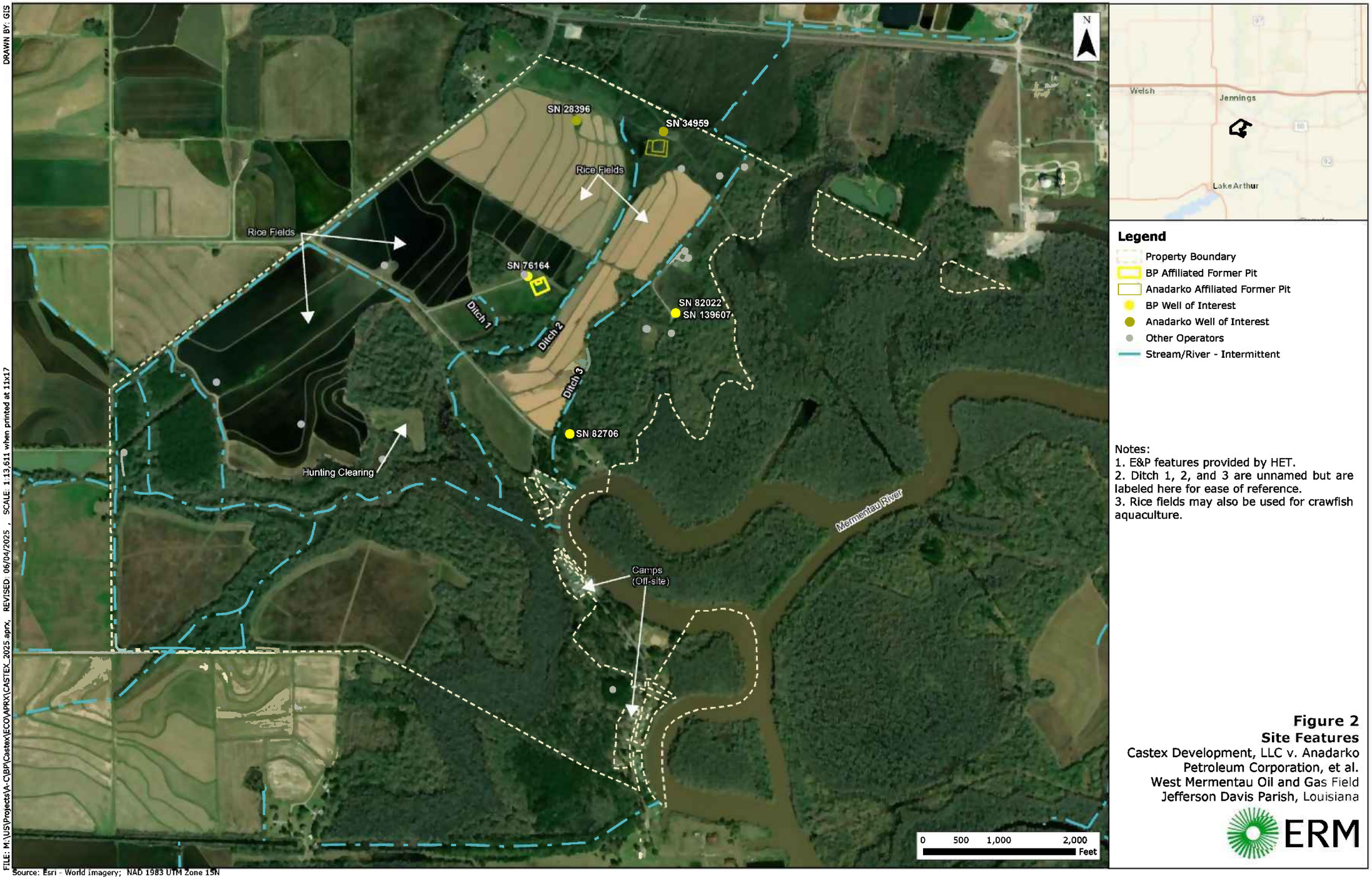

**Legend**

Property Boundary

**Figure 1**
**Site Location**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N




**Legend**

- Property Boundary
- BP Affiliated Former Pit
- Anadarko Affiliated Former Pit
- BP Well of Interest
- Anadarko Well of Interest
- Other Operators
- Stream/River - Intermittent

Notes:
1. E&P features provided by HET.
2. Ditch 1, 2, and 3 are unnamed but are labeled here for ease of reference.
3. Rice fields may also be used for crawfish aquaculture.

**Figure 2**
**Site Features**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

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Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Legend**

- Property Boundary
- Soil Sample Location

**Figure 3**
**Soil Sample Locations: Property**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

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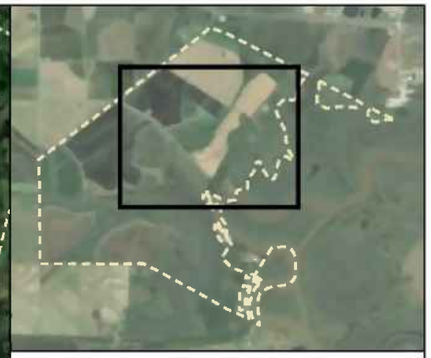

**Legend**

- Property Boundary
- Soil Sample Location
- BP Well of Interest

Notes:
1. Samples in the vicinity of BP wells of interest are shown here. Some of these sample locations are also near E&P activity not associated with BP.

**Figure 4**
**Soil Sample Locations:**
**Former BP Operations Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

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**Legend**

- Property Boundary
- Soil Sample Location
- Anadarko Well of Interest

Note:
1. Samples in the vicinity of Anadarko wells of interest are shown here. Some of these sample locations are also near E&P activity not associated with Anadarko.

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Figure 5**
**Soil Sample Locations:**
**Former Anadarko**
**Operations Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

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DRAWN BY: GIS

FILE: M:\US\Projects\A-C\BP\Castex\ECO\APRX\CASTEX 2025.aprx, REVISED: 06/04/2025 , SCALE: 1:13,611 when printed at 11x17

Source: Esri - World Imagery, NAD 1983 UTM Zone 15N

**Legend**

- Property Boundary
- Monitoring Well

**Figure 6**
**Groundwater Sample Locations:**
**A Zone**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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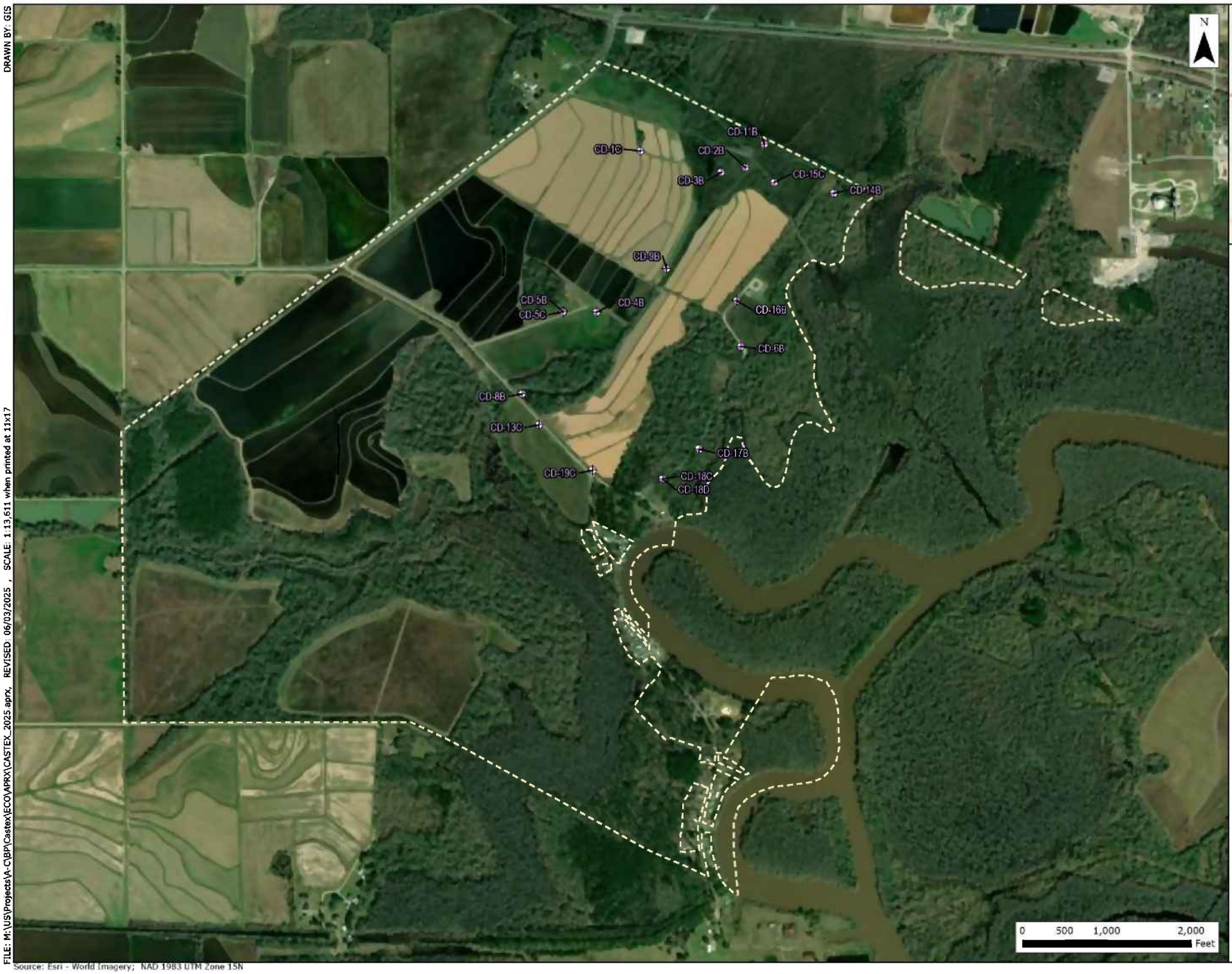


Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Legend**

- Property Boundary
- Monitoring Well

**Figure 7**
**Groundwater Sample Locations: B Zone**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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**Legend**

- Property Boundary
- Monitoring Well

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Figure 8**
**Groundwater Sample Locations: Transition Zone**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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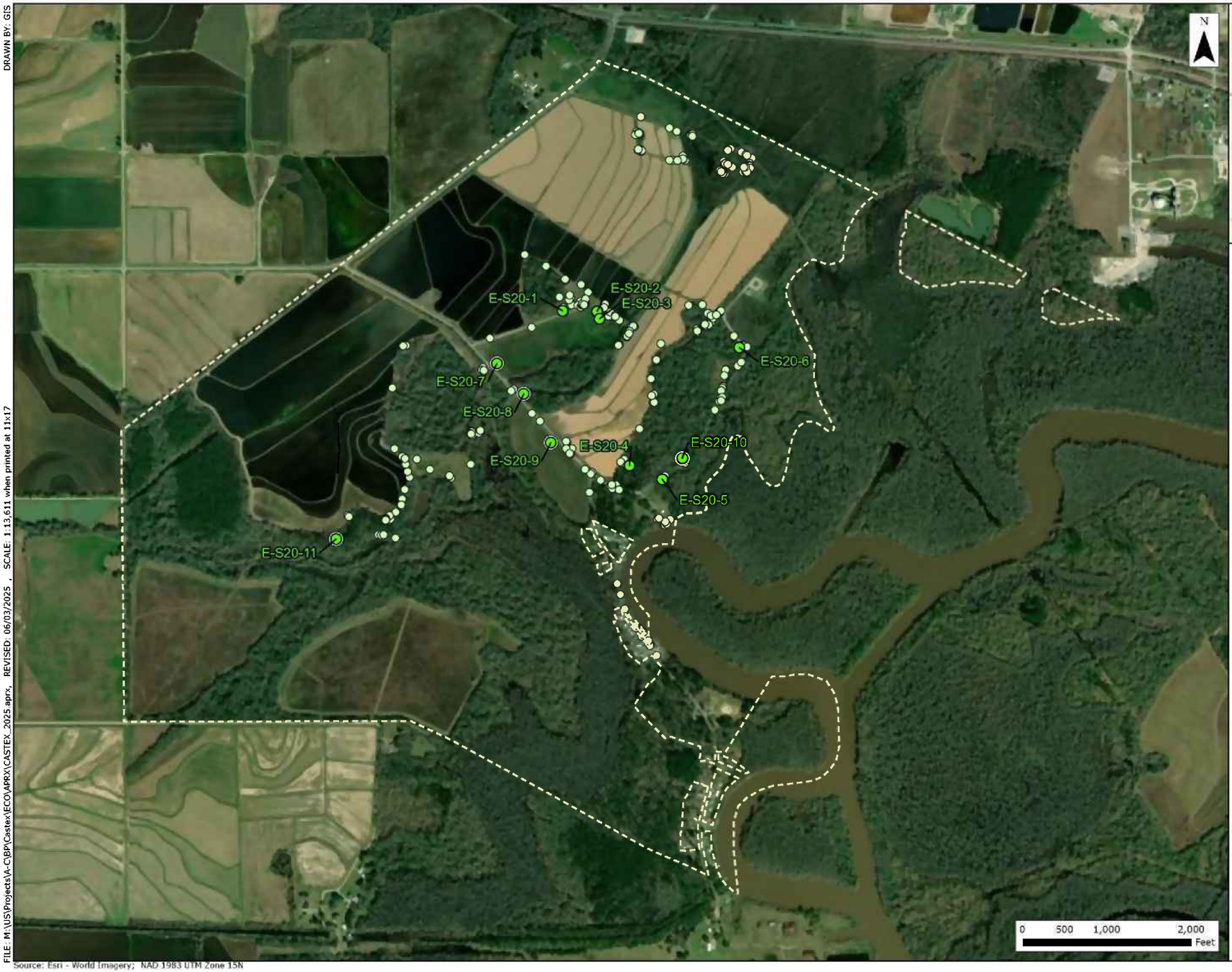


Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Legend**

- Property Boundary
- 20-ft Survey Location
- On-Site Reference Location
- Incidental Observation Location

**Figure 9**
**Ecological Survey Locations**
Castex Development, LLC v. Andarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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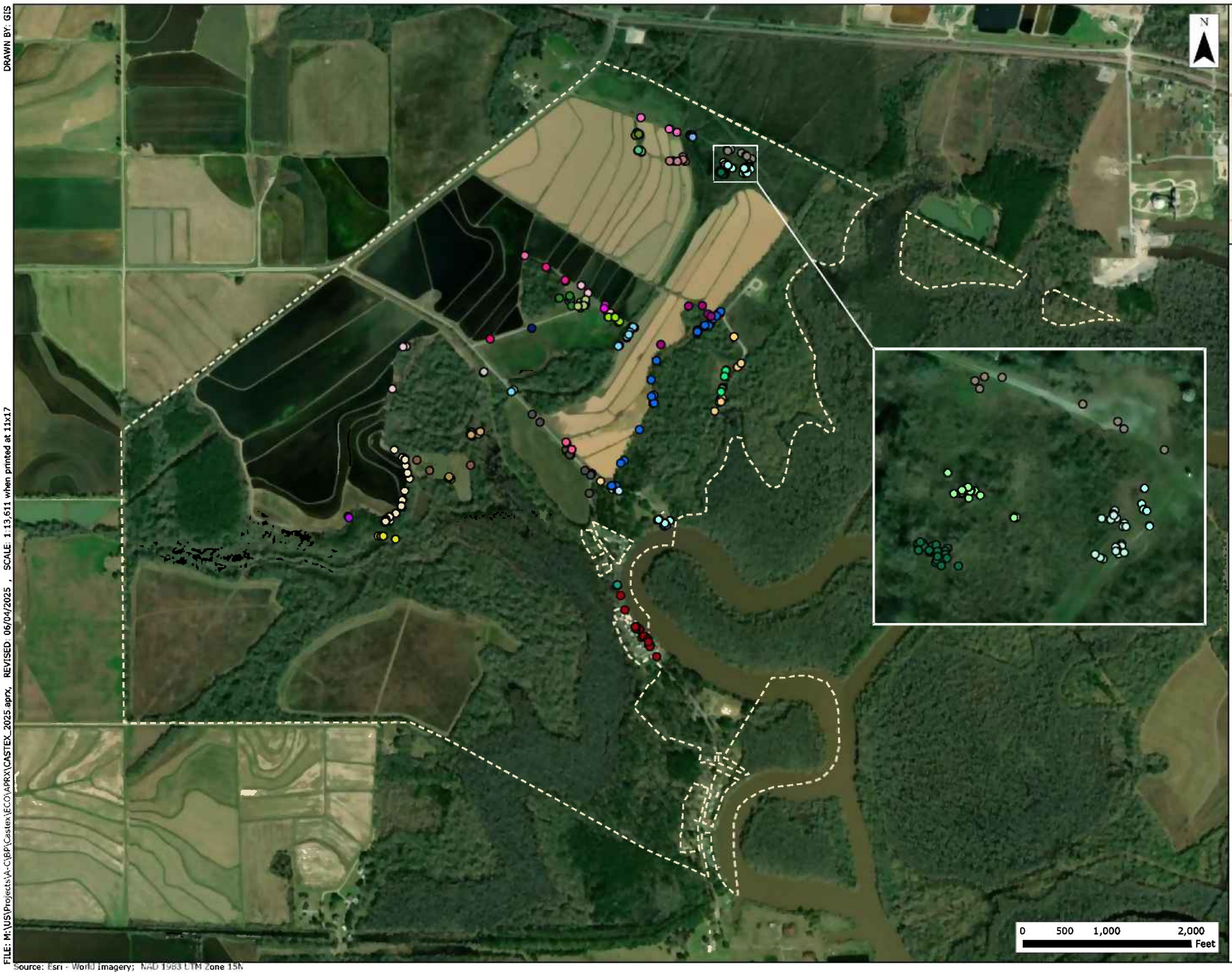


Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Legend**

- Property Boundary

E&P Area
- CD-1
- E-Inc-A1
- E-S20-1 Vicinity
- E-S20-3 Vicinity
- HA-4
- HA-5/CD-3
- HA-9/CD-2
- SN 200772 Area
- SN 28396
- SN 76164 Area
- SN 78514 Area

Rice Field
- E-Inc-R1
- E-Inc-R1 Vicinity
- E-Inc-R2
- E-Inc-R2 Vicinity
- E-Inc-R3
- E-Inc-R4 Area
- E-Inc-R5 Area
- E-Inc-R6 Area
- E-Inc-R7
- E-Inc-R8

Ditch/River
- E-Inc-D1
- E-Inc-D2
- E-Inc-D2-A
- E-Inc-D3
- E-Inc-D3 Vicinity
- E-Inc-M1
- E-Inc-M1 Vicinity
- E-Inc-M2

Hunting
- E-Inc-H1
- E-Inc-H1 Vicinity
- E-Inc-HP

Road/Path
- E-Inc-BL
- E-Inc-CL
- E-Inc-P
- E-Inc-P2

Camp
- E-Inc-C1

Other
- E-S20-11 Vicinity

**Figure 10**
**Incidental Observation Location Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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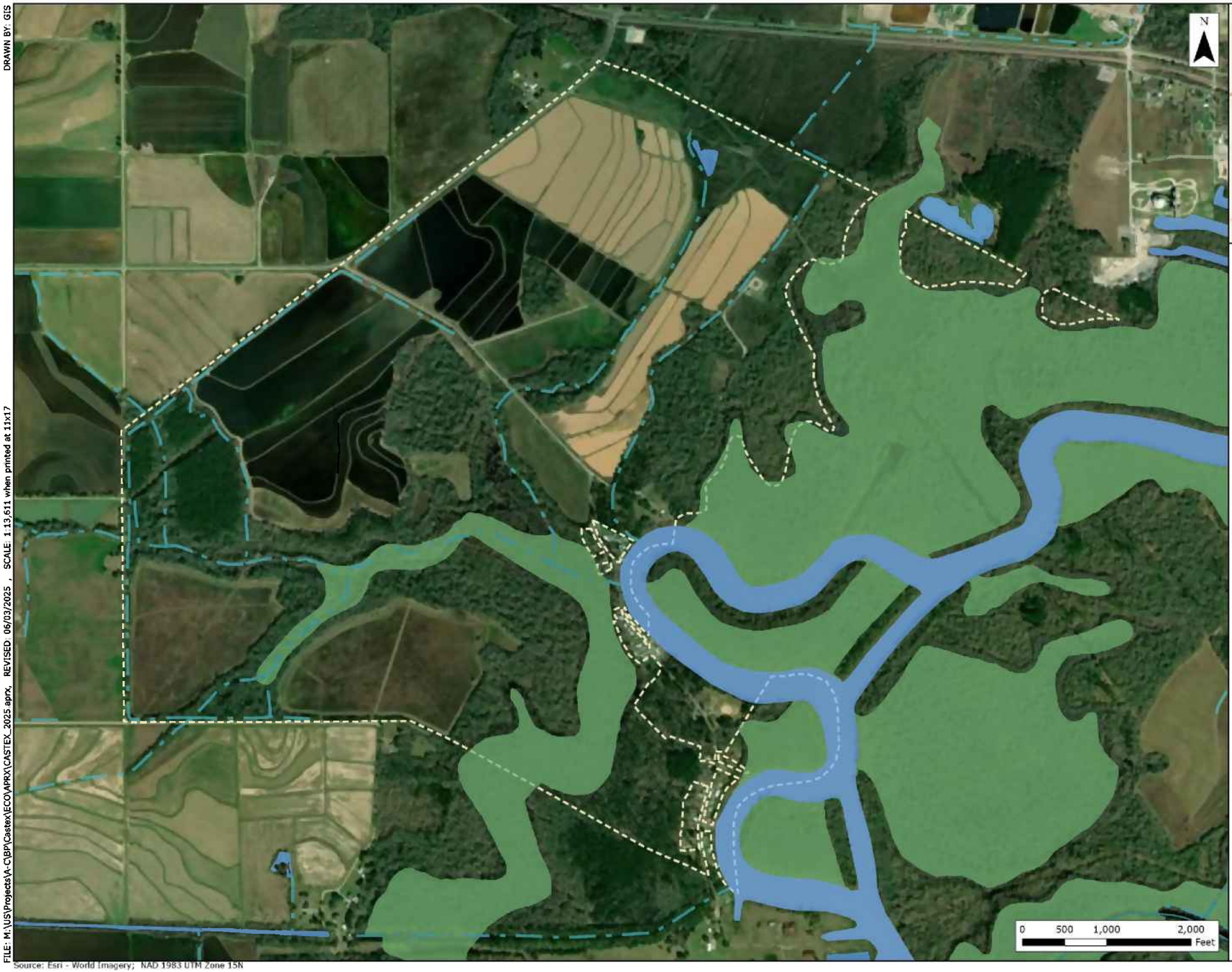


**Legend**

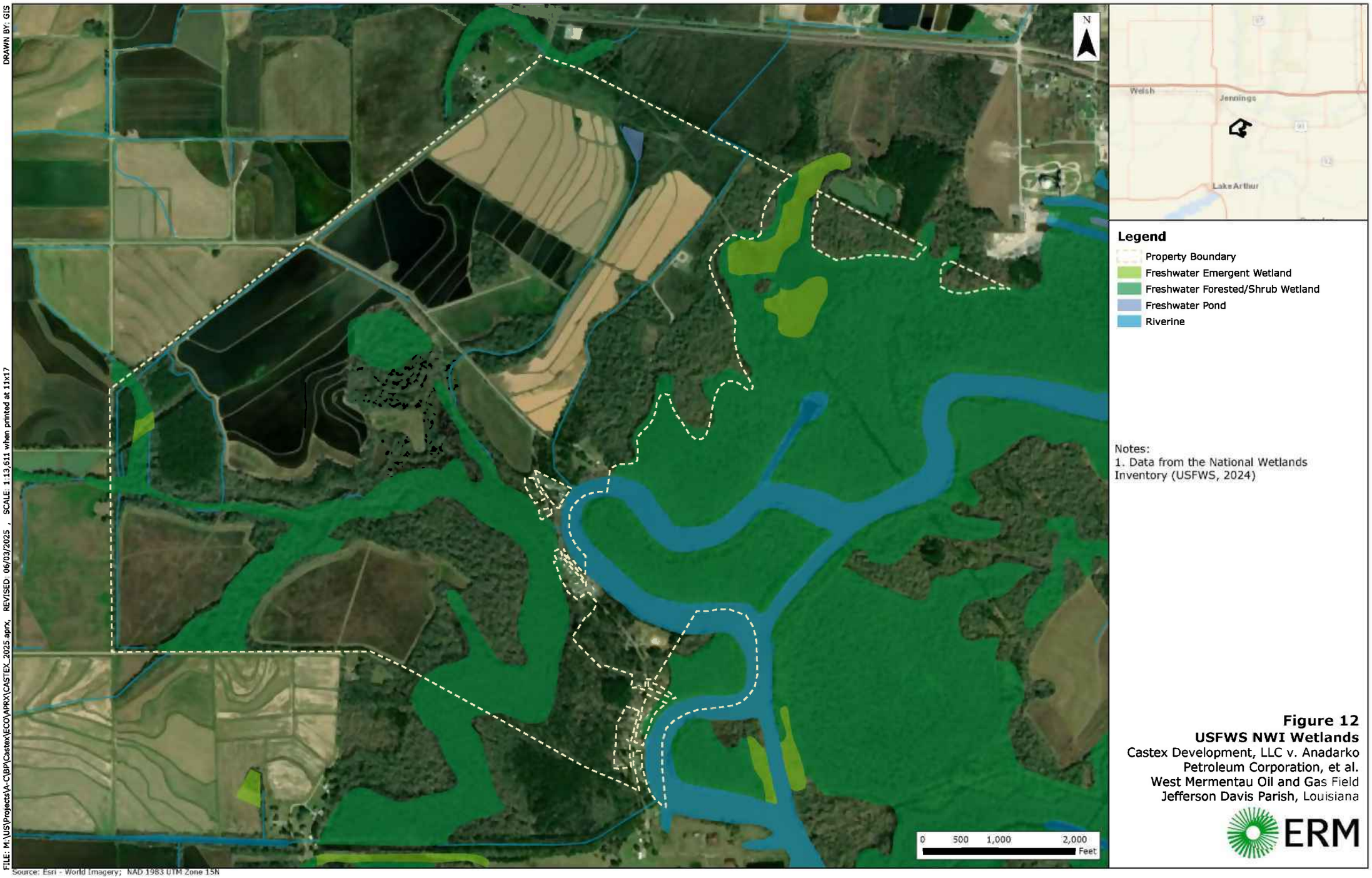
- Property Boundary
- Stream/River - Perennial
- Stream/River - Intermittent
- Stream/River
- Lake/Pond
- Swamp/Marsh

Notes:
1. Surface Water Features from the National Hydrography Dataset (USGS, 2023)

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Figure 11**
**Surface Water Features**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

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Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Figure 12**
**USFWS NWI Wetlands**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Legend**

- Property Boundary
- 34a Northern Humid Gulf Coastal Prairies
- 34c Floodplains and Low Terraces

Notes:
1. Data from USEPA Ecoregions (2024)

**Figure 13**
**USEPA Ecoregions**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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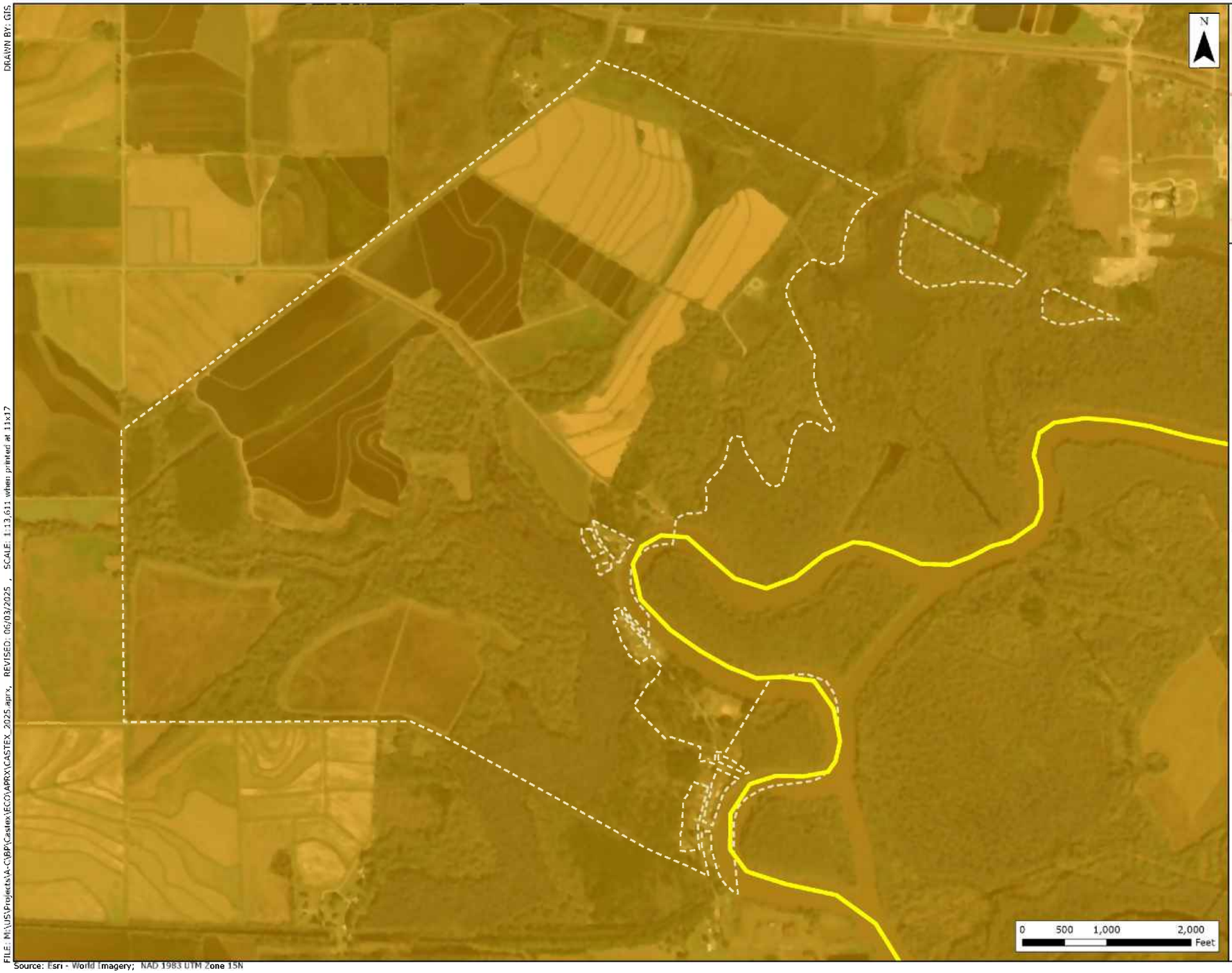

**Legend**

- Property Boundary
- Jefferson Davis Parish
- Global

Notes:
1. Important Bird Areas via National Audubon Society (2024)

**Figure 14**
**Important Bird Area**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Figure 15**
**Tree Cover**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

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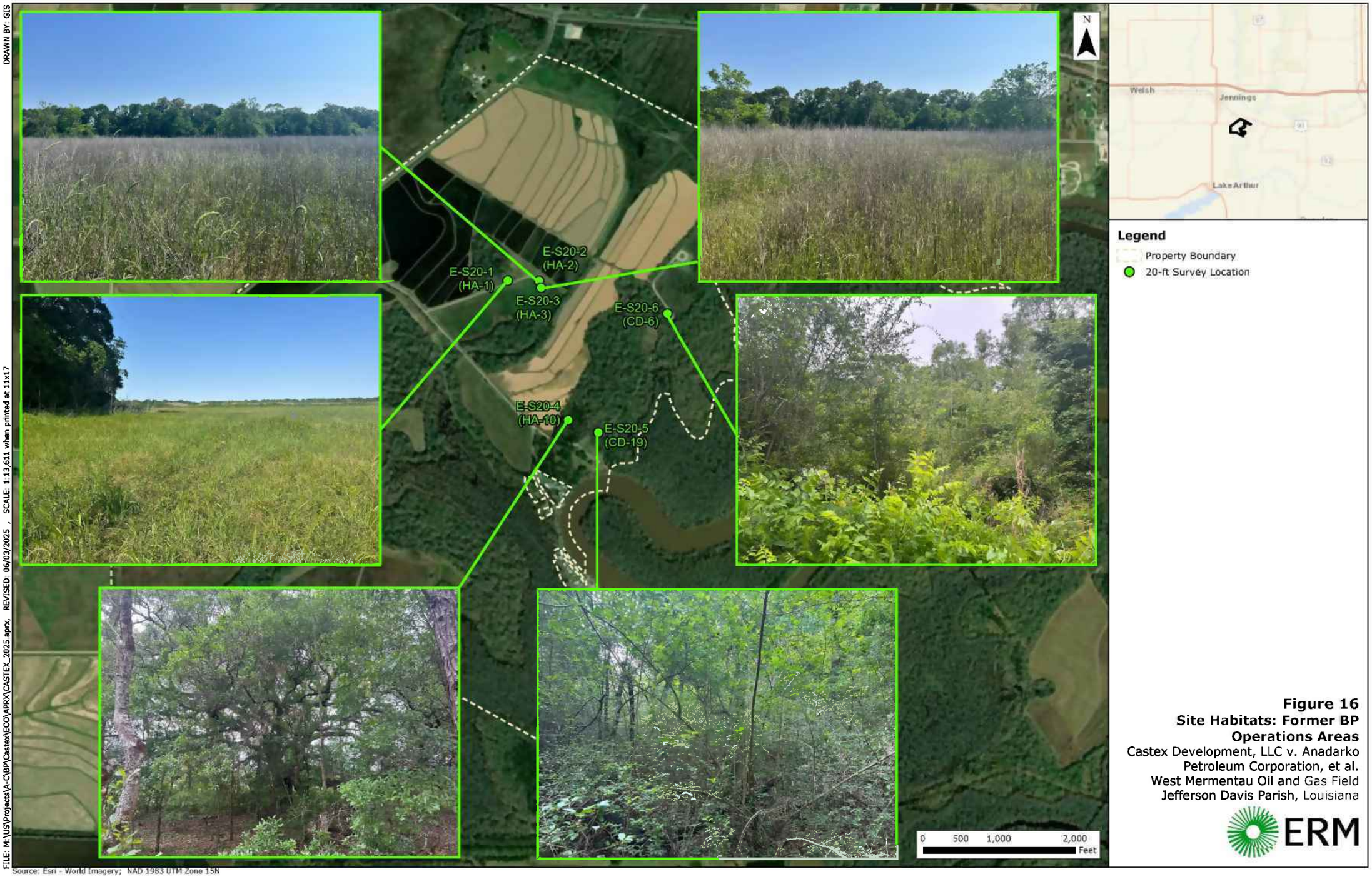


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Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Figure 16**
**Site Habitats: Former BP Operations Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

Teams\OPC\0778889\DM\32909H(Figures)

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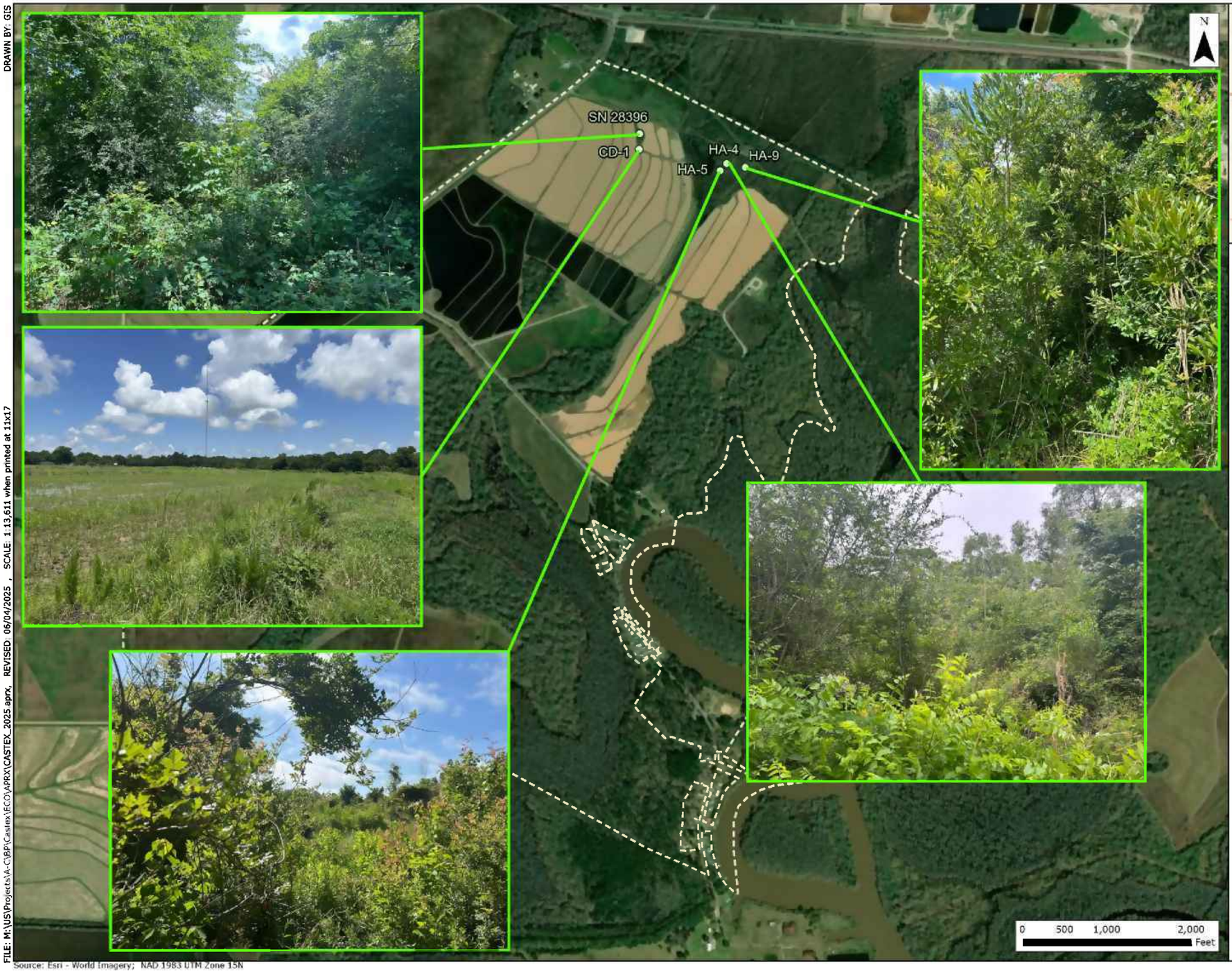

**Legend**

- Property Boundary
- Incidental Observation Locations

**Figure 17**
**Site Habitats: Former Anadarko Operations Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

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**Legend**

- Property Boundary
- Ditch
- Photo Location

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Figure 18**
**Ditch 1 Habitat**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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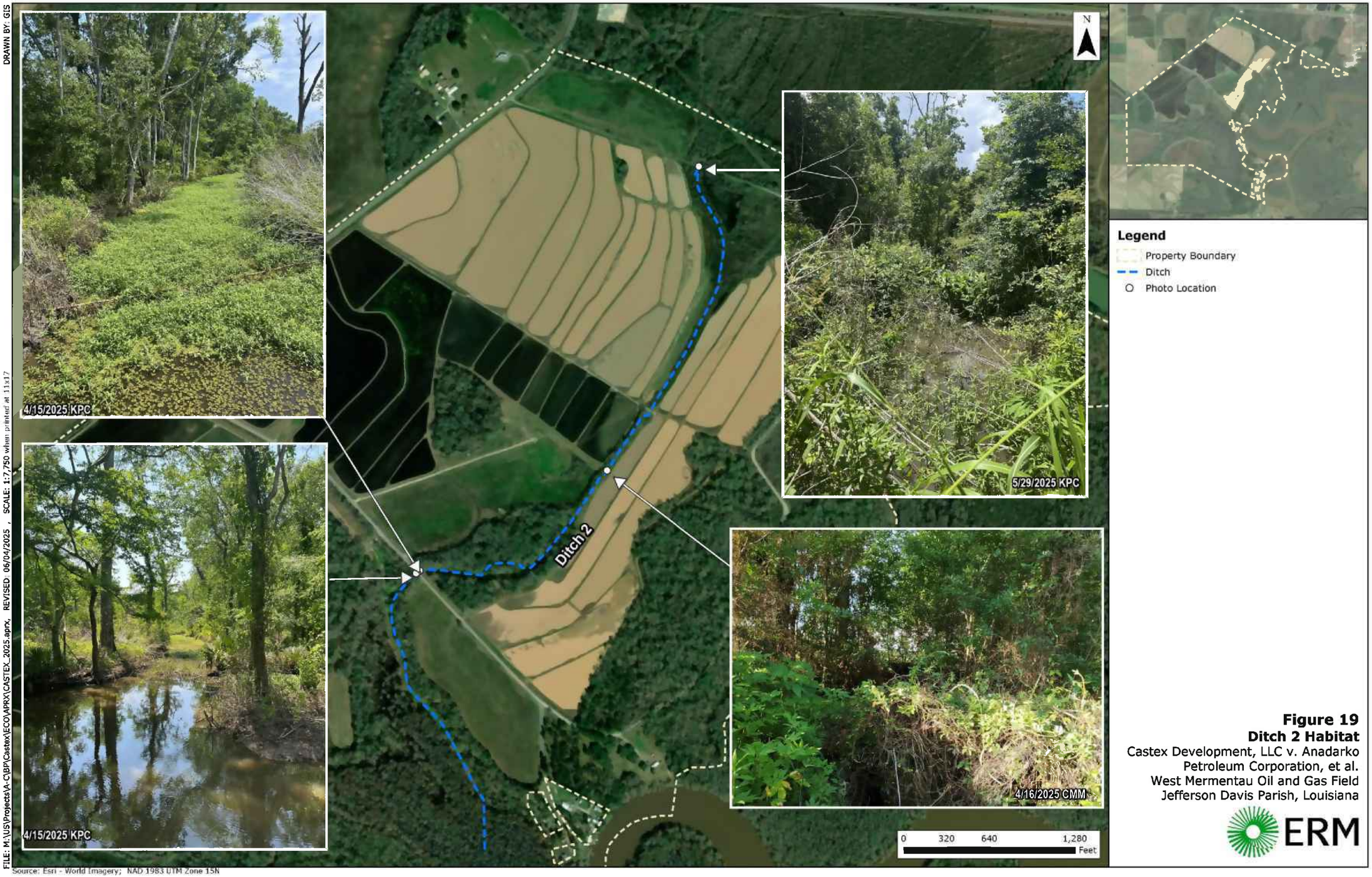


**Figure 19**
**Ditch 2 Habitat**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

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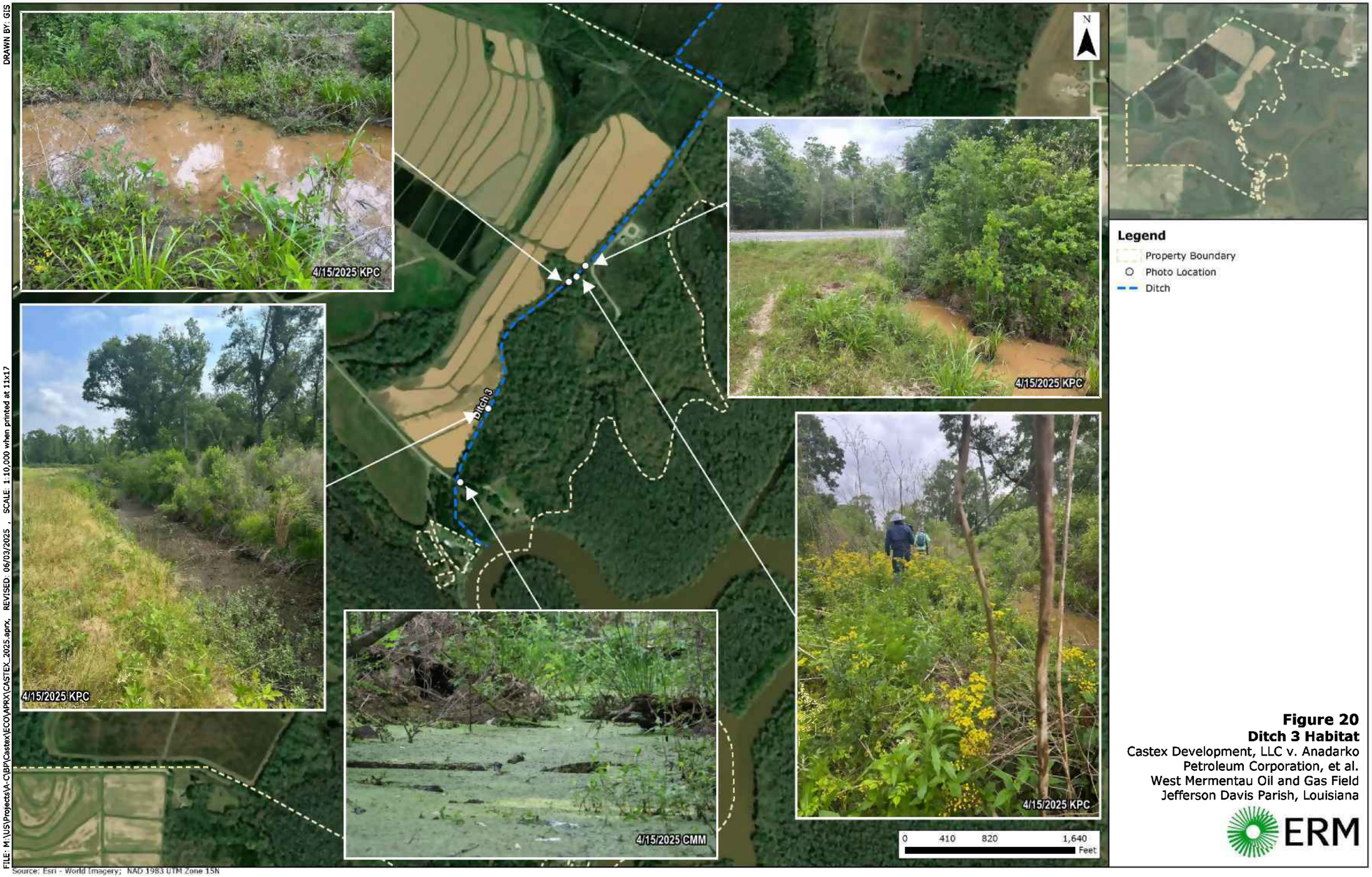


**Figure 20**
**Ditch 3 Habitat**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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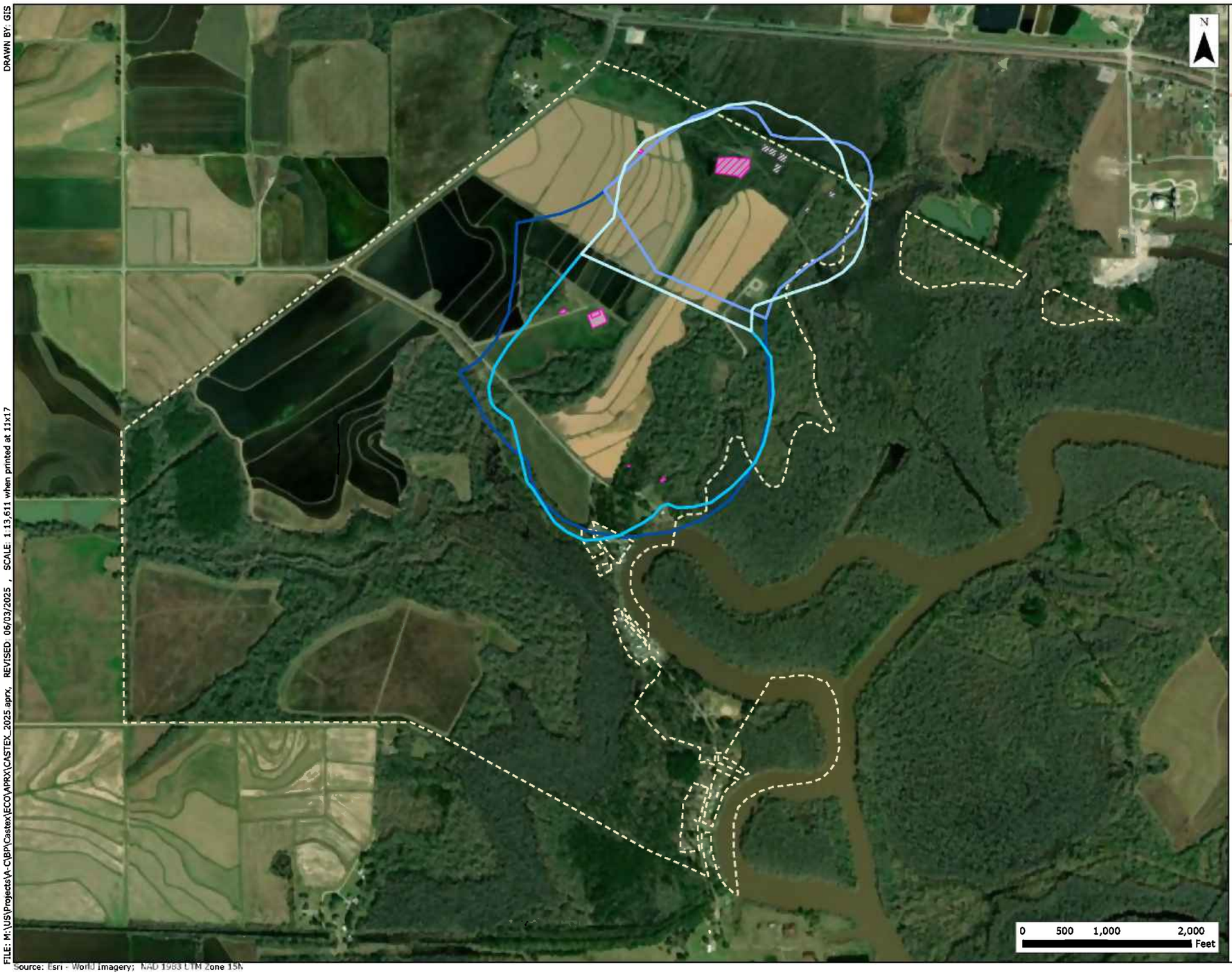

**Legend**

- Property Boundary
- ICON Soil Remediation Areas - Former BP Operations Areas
- ICON Soil Remediation Areas - Former Anadarko Operations Areas
- ICON Soil Remediation Areas - Other
- ICON Groundwater Remediation Zone A Plume 1
- ICON Groundwater Remediation Zone A Plume 2
- ICON Groundwater Remediation Zone B Plume 3
- ICON Groundwater Remediation Zone B Plume 4

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Figure 21**
**Plaintiff Remediation Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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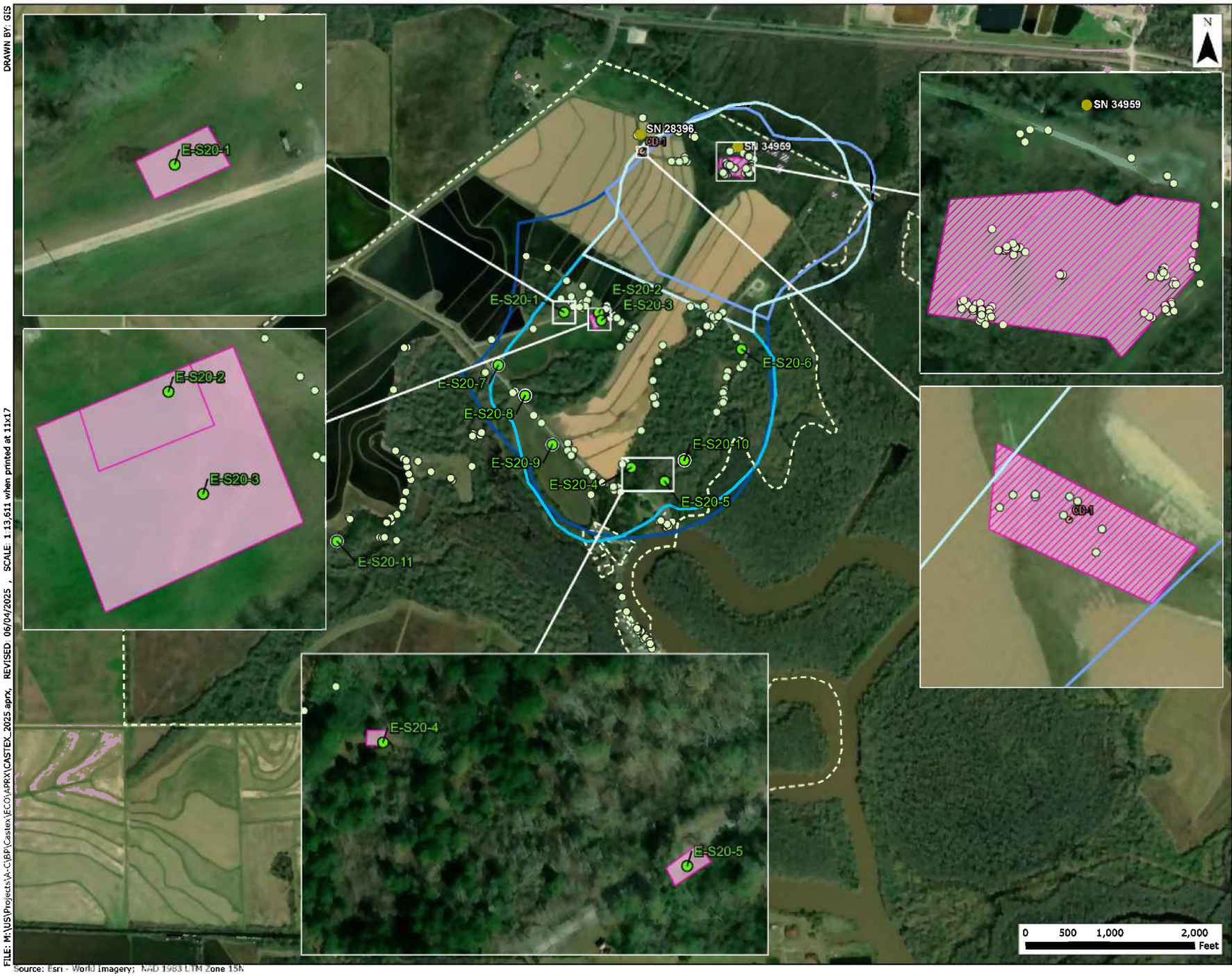

**Legend**

- Property Boundary
- ICON Soil Remediation Areas - Former BP Operations Areas
- ICON Soil Remediation Areas - Former Anadarko Operations Areas
- ICON Soil Remediation Areas - Other
- ICON Groundwater Remediation Zone A Plume 1
- ICON Groundwater Remediation Zone A Plume 2
- ICON Groundwater Remediation Zone B Plume 3
- ICON Groundwater Remediation Zone B Plume 4
- 20-ft Survey Location
- On-Site Reference Location
- Incidental Observation Locations
- Soil Sample Location

**Figure 22**
**Ecological Survey Locations and Plaintiff Remediation Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

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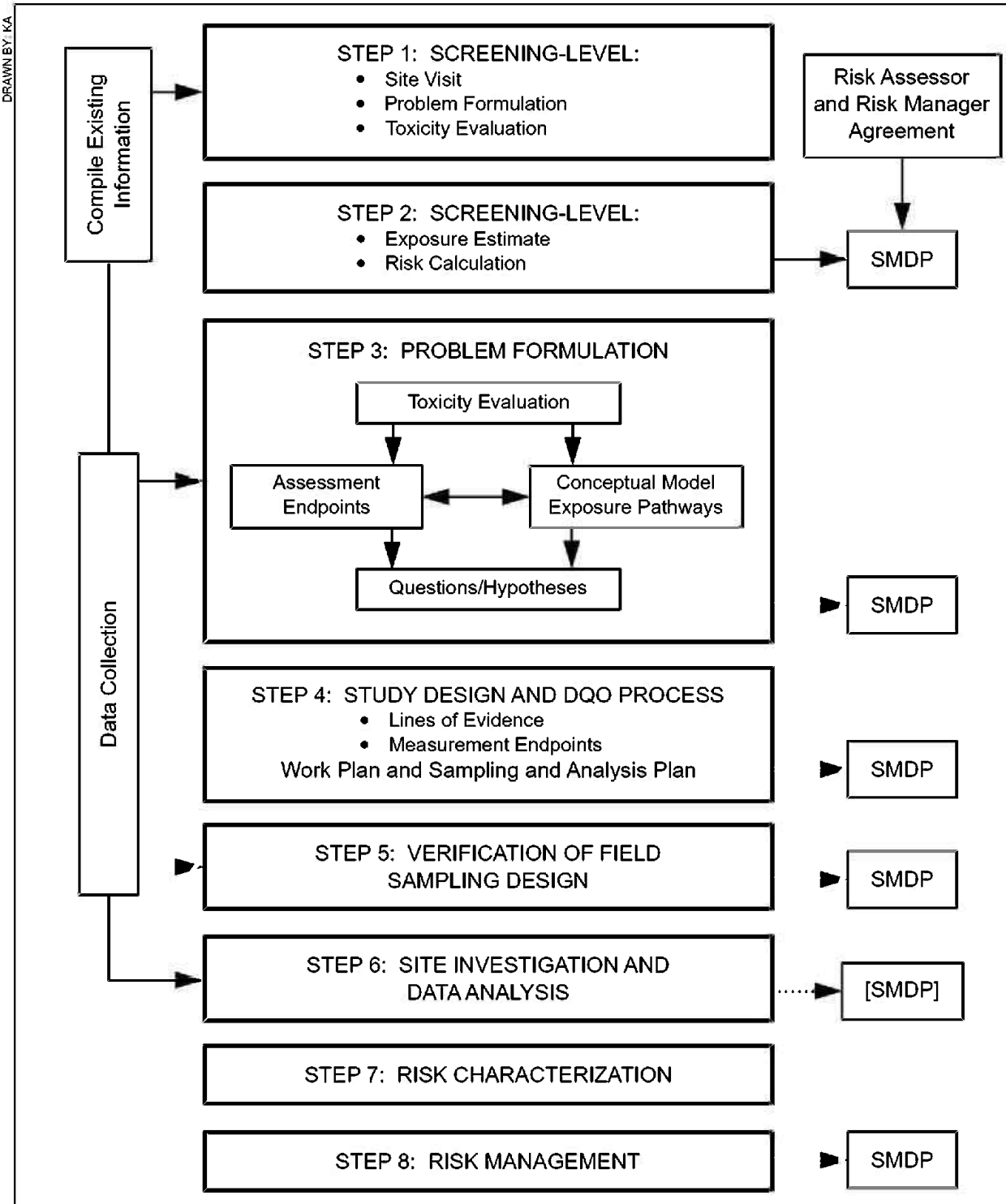


**Figure 23**
**USEPA 8-Step Ecological Risk Assessment Process**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

Notes:
From EPA "Ecological Risk Assessment Guidance for Superfund:
Process for Designing and Conducting Ecological Risk Assessments" June 1997

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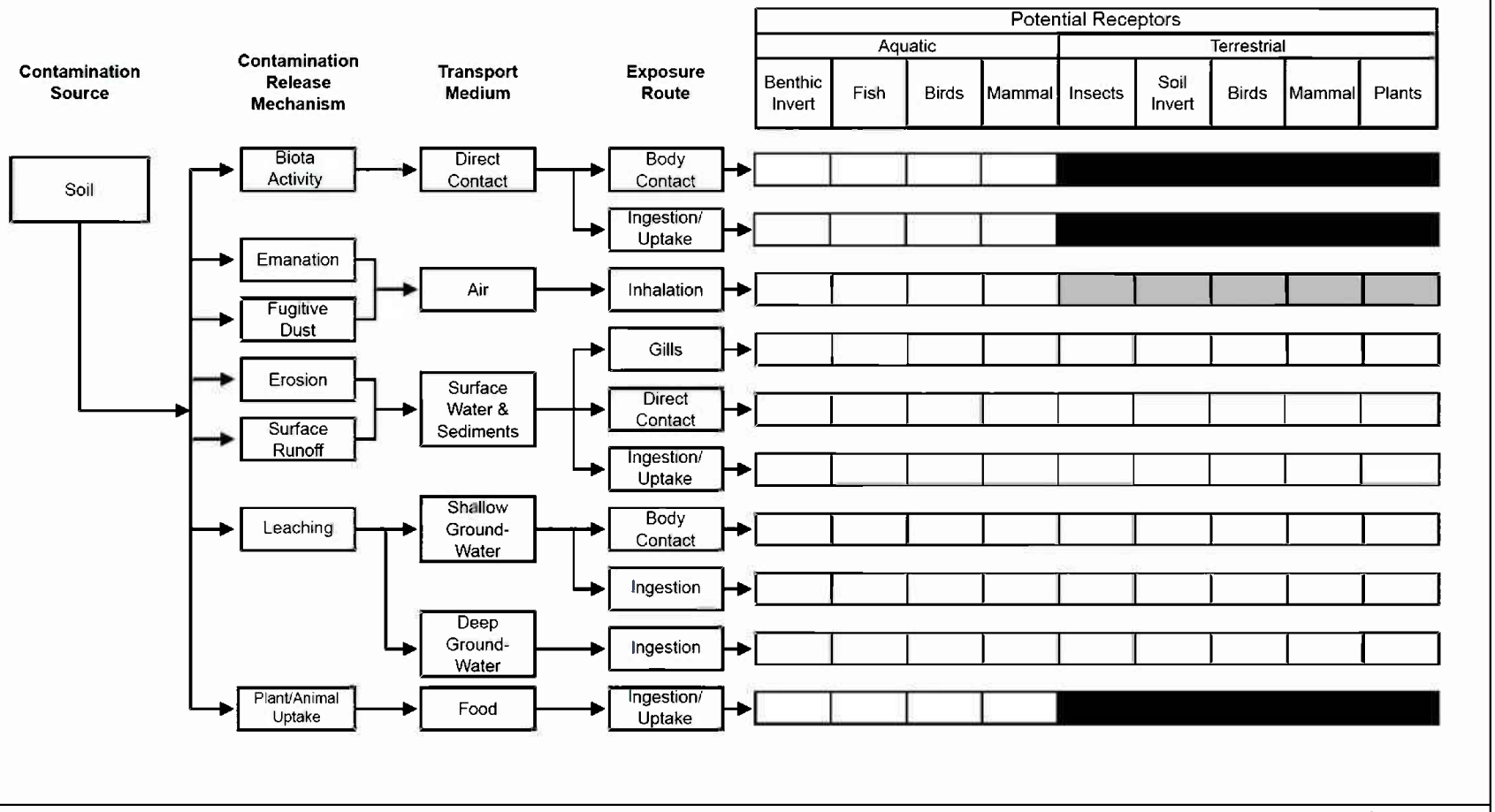
Drawn By: Katy.Albano




Major

Minor

Incomplete

**Figure 24**
**Ecological Conceptual Site Model**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

Source: ESRI - World Topographic Map; WGS 1984 Web Mercator Auxiliary Sphere

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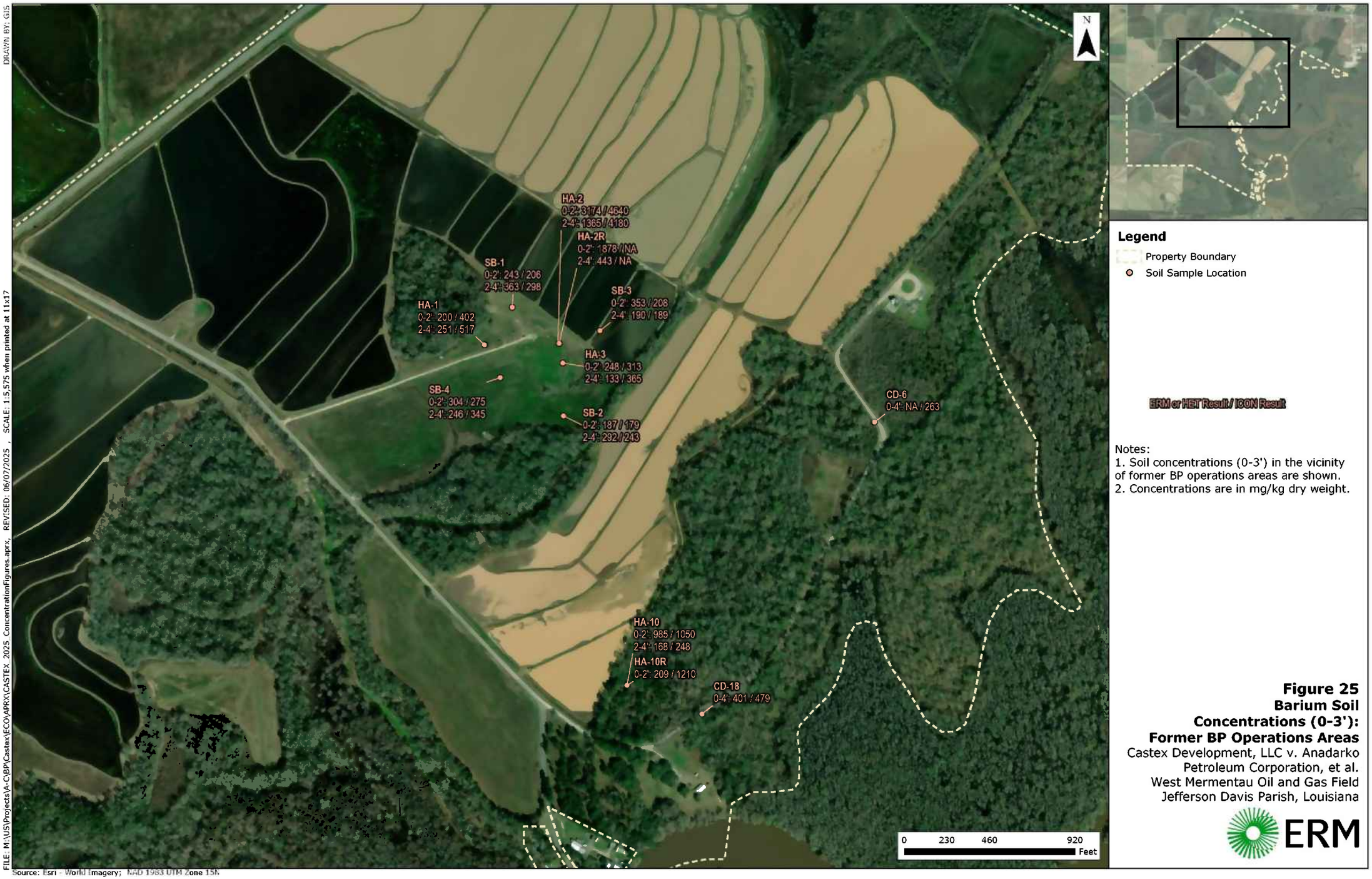


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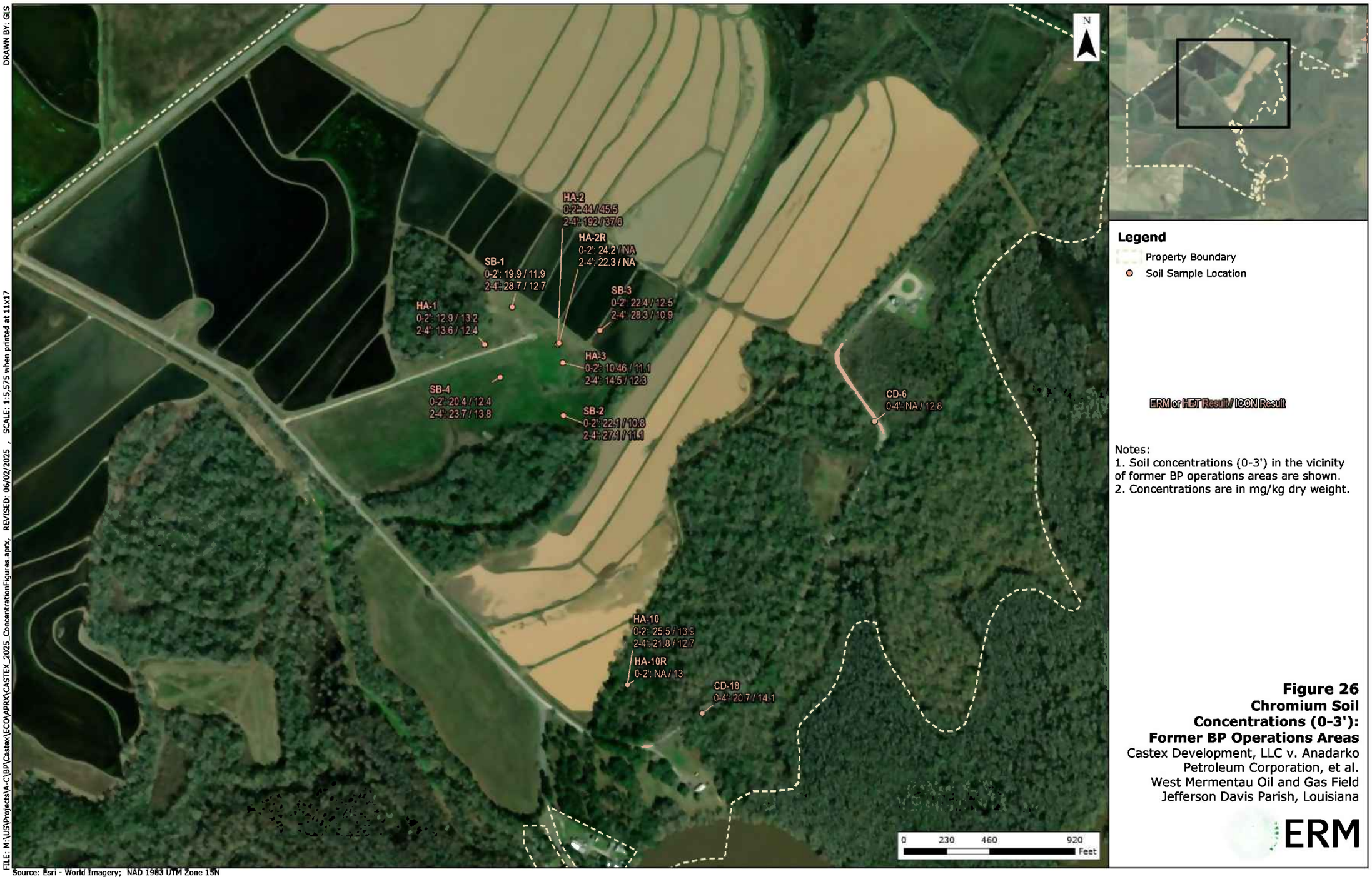
Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Figure 25**
**Barium Soil Concentrations (0-3'): Former BP Operations Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM




**Legend**

- Property Boundary
- Soil Sample Location

ERM or HET Result / ICON Result

Notes:
1. Soil concentrations (0-3') in the vicinity of former BP operations areas are shown.
2. Concentrations are in mg/kg dry weight.

**Figure 26**
**Chromium Soil Concentrations (0-3'): Former BP Operations Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

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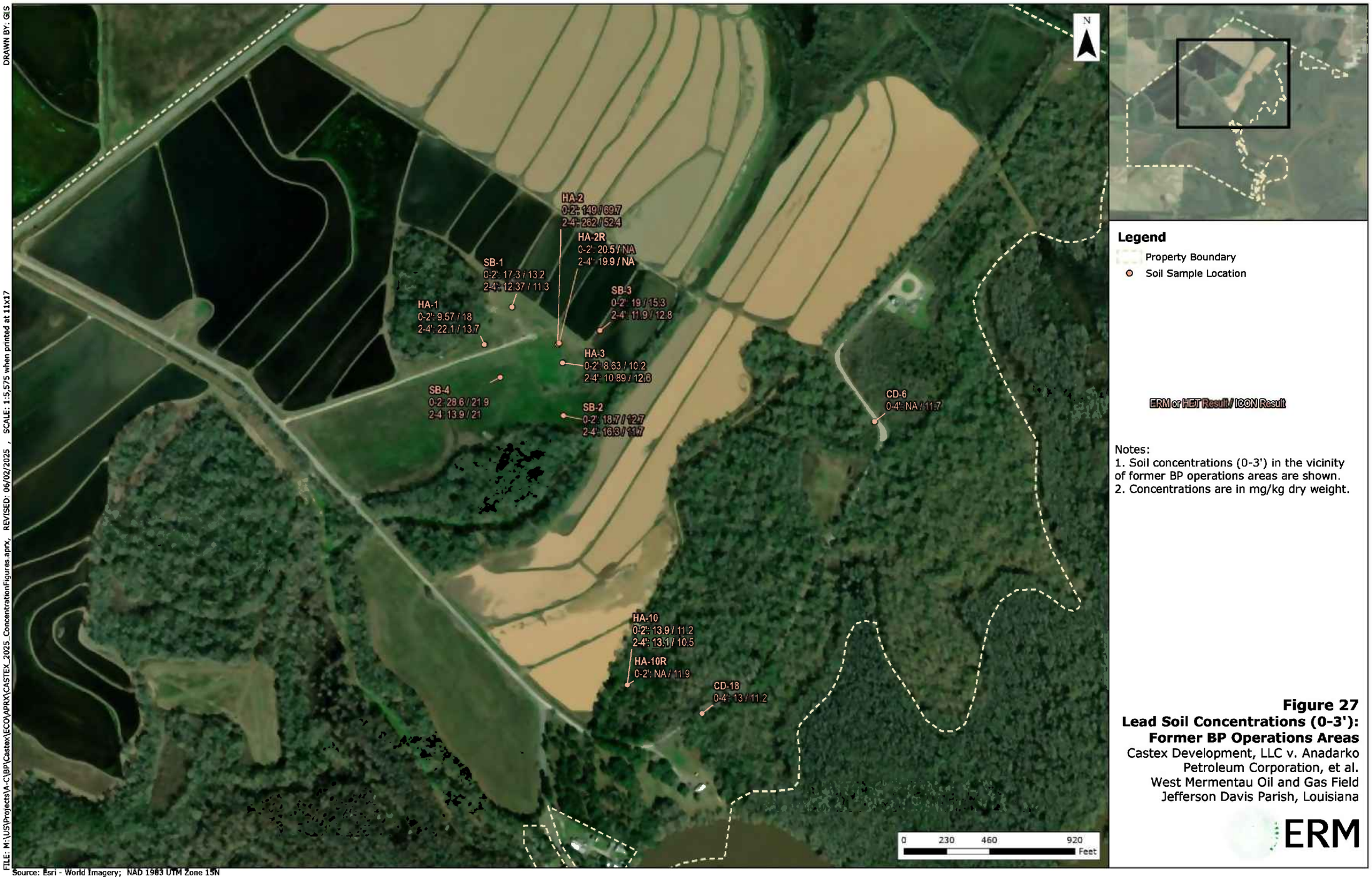


**Legend**

- Property Boundary
- Soil Sample Location

ERM or HET Result / ICON Result

Notes:
1. Soil concentrations (0-3') in the vicinity of former BP operations areas are shown.
2. Concentrations are in mg/kg dry weight.

**Figure 27**
**Lead Soil Concentrations (0-3'): Former BP Operations Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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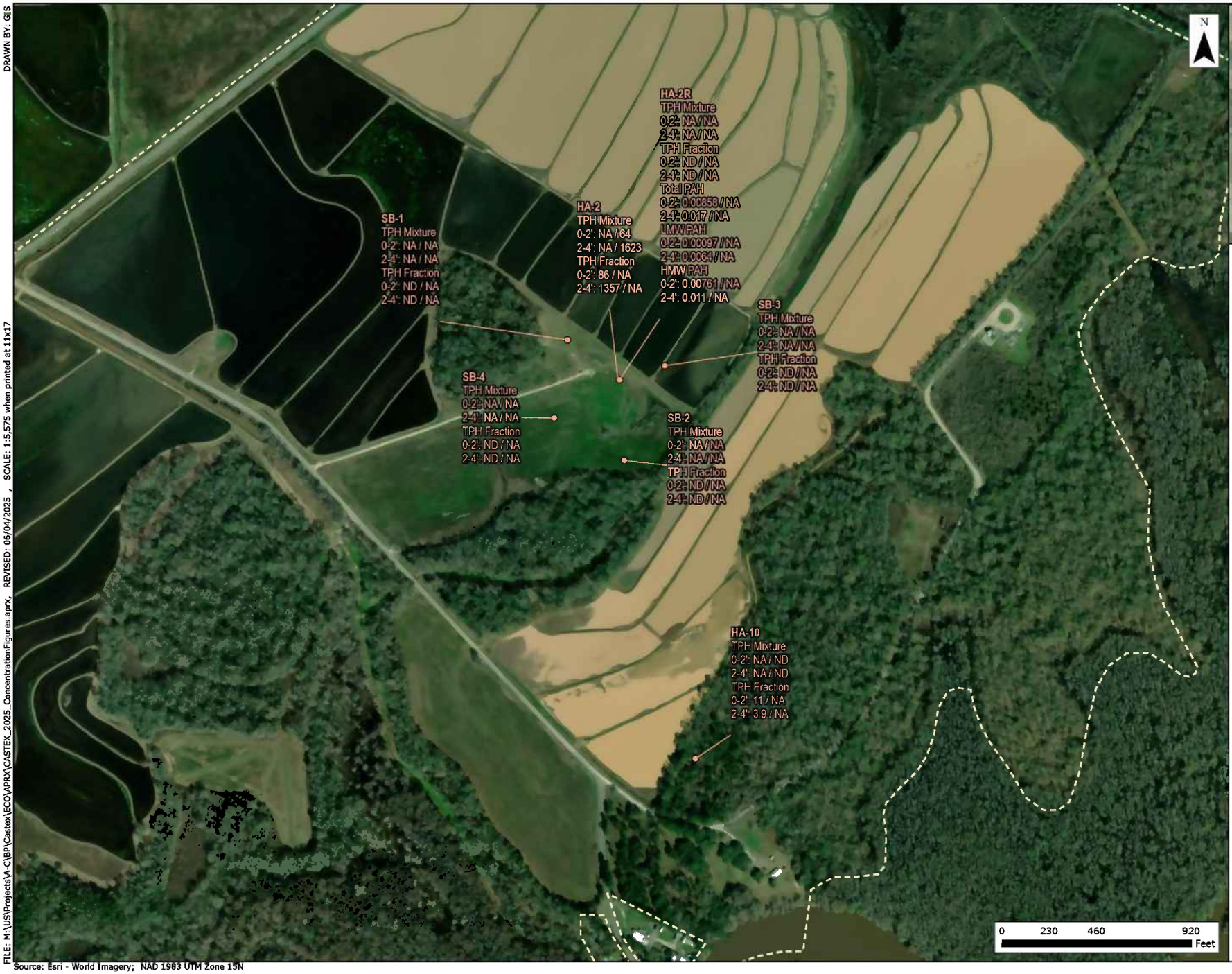


Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Legend**

- Property Boundary
- Soil Sample Location

ERM or HET Result / ICON Result

Notes:
1. Soil concentrations (0-3') in the vicinity of former BP operations areas are shown.
2. Concentrations are in mg/kg dry weight.
3. TPHm is the sum of TPH mixtures.
4. TPHf is the sum of TPH aliphatic and aromatic fractions.
5. TPH sums are rounded to the nearest whole number.
6. Total PAH is the sum of 16 RECAP PAH.
7. LPAH is the sum of low molecular weight PAH.
8. HPAH is the sum of high molecular weight PAH.
9. ND = Not Detected

**Figure 28**
**TPH/PAH Soil Concentrations (0-3'): Former BP Operations Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

**Legend**

- Property Boundary
- Soil Sample Location all

ERM or HET Result / ICON Result

Notes:
1. Soil concentrations (0-3') in the vicinity of former Anadarko operations areas are shown.
2. Concentrations are in mg/kg dry weight.

**Figure 29**
**Soil Concentrations (0-3'): Former Anadarko Operations Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

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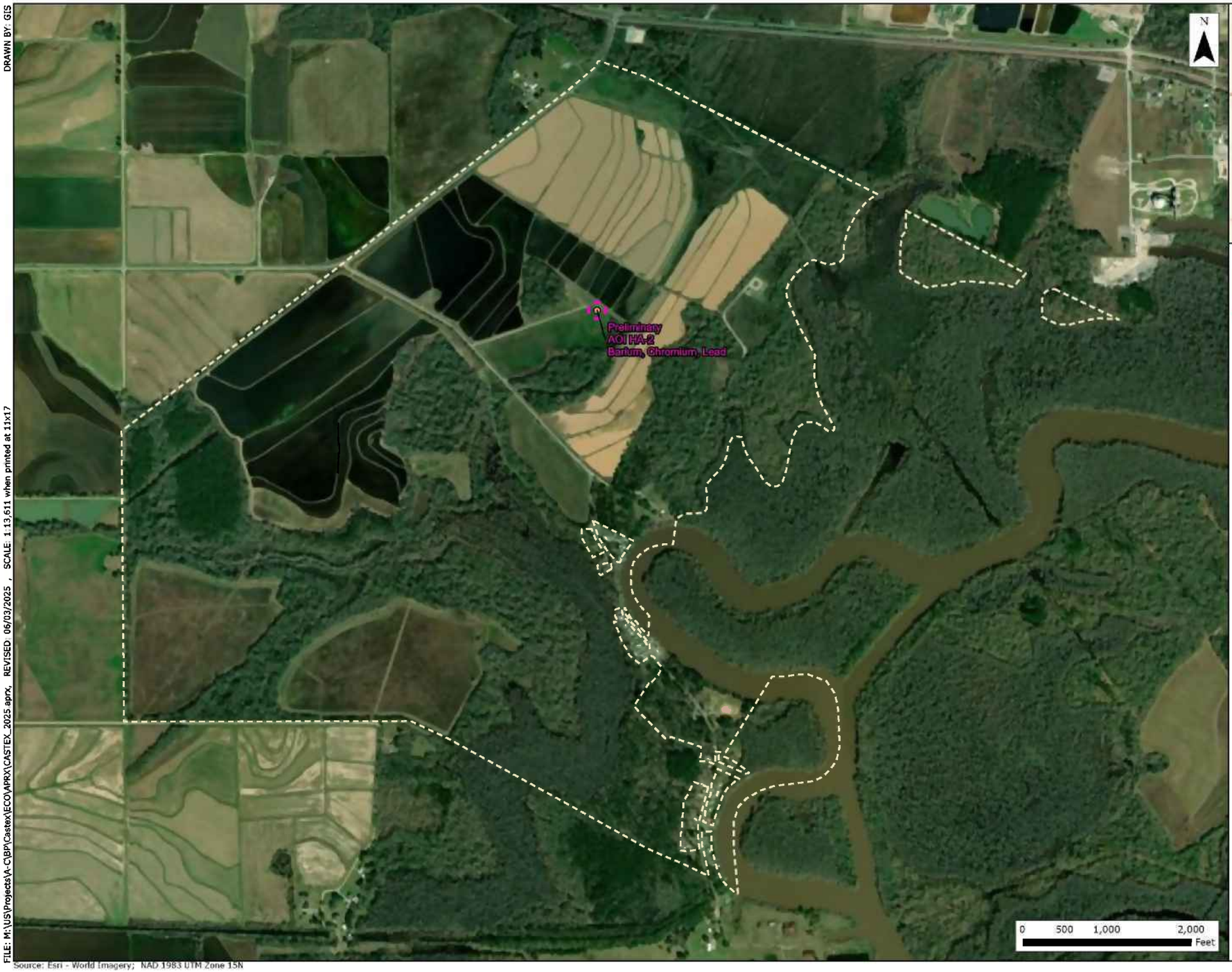


Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Legend**

- Property Boundary
- BP Preliminary Area of Investigation
- Soil Sample Location

**Figure 30**
**Preliminary Area of Investigation:**
**Former BP Operations Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

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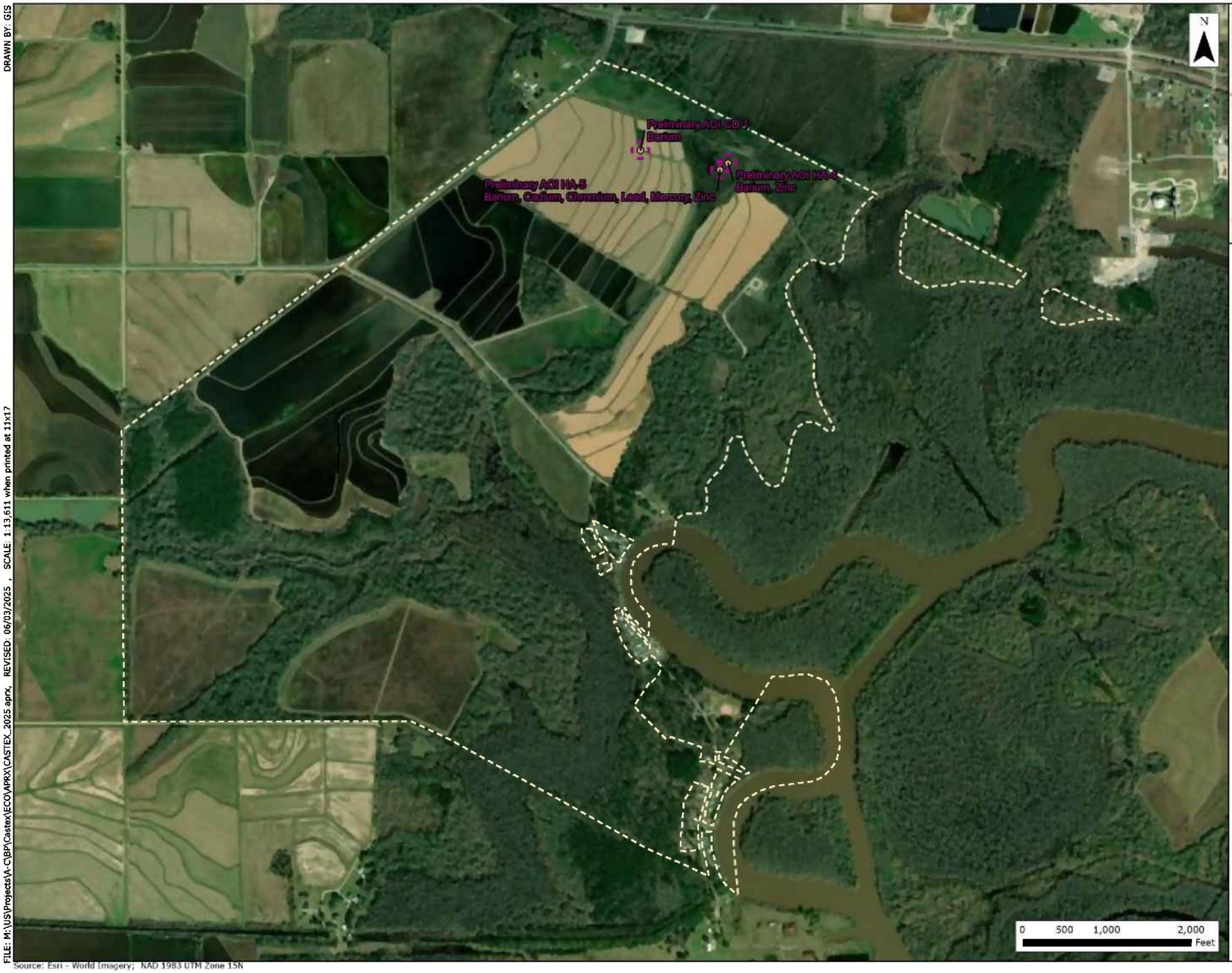
FILE: M:\US\Projects\A-C\BP\Castex\ECO\APRX\CASTEX_2025 aprx, REVISED 06/03/2025 , SCALE: 1:13,611 when printed at 11x17




Source: Esri - World Imagery; NAD 1983 UTM Zone 15N

**Legend**

- Property Boundary
- Anadarko Preliminary Area of Investigation
- Soil Sample Location

**Figure 31**
**Preliminary Areas of Investigation: Former Anadarko Operations Areas**
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
West Mermentau Oil and Gas Field
Jefferson Davis Parish, Louisiana

ERM

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# APPENDIX A CV

# Karen Cejas, PhD

## Ecological Risk Assessor

Dr. Cejas has expertise in aquatic and terrestrial ecotoxicology, ecological risk assessment, and contaminated site investigation. Her professional career has focused on conducting and managing ecological risk assessments and applying environmental hazard and risk characterization to support site remediation in accordance with the Comprehensive Environmental Response and Compensation Liability Act (CERCLA). She has worked closely with clients and Natural Resource Trustees to evaluate site data for Natural Resource Damage Assessments (NRDAs) in support of CERCLA and the Oil Pollution Act (OPA).

EXPERIENCE: 15 years' experience in Ecological Risk Assessment, Natural Resource Damage Assessment, Litigation Support, Aquatic/Marine Ecotoxicology

LINKEDIN: https://www.linkedin.com/in/karen-cejas-02336237/

EMAIL: karen.cejas@erm.com

### EDUCATION

- Ph.D., Biological Sciences, Minor in Environmental Toxicology, Louisiana State University, Baton Rouge, LA, 2009
- B.S., Zoology, Louisiana State University, Baton Rouge, LA, 2002

### PROFESSIONAL AFFILIATIONS AND REGISTRATIONS

- Society of Environmental Toxicology and Chemistry (SETAC)
- 40 hour OSHA HAZWOPER Certification

### LANGUAGES

- English, native speaker

### FIELDS OF COMPETENCE

- Ecological risk assessment
- Comprehensive Environmental Response and Compensation Liability Act (CERCLA)
- Natural Resource Damage Assessment (NRDA)

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- Environmental toxicology
- Marine and aquatic ecotoxicology
- Oil spill response
- Product stewardship
- Litigation support
- Invasive species management

## KEY INDUSTRY SECTORS

- Oil and gas
- Mining

## PUBLICATIONS

- Favret, K.P., Lynn, J.W. 2010. Archives of Environmental Contamination and Toxicology 58:973-984. Flow-cytometric analyses of viability biomarkers in pesticide-exposed sperm of three aquatic invertebrates.
- Perry, K.D., Lynn, J.W. 2009. Hydrobiologia 628:153-164. Detecting physiological and pesticide-induced apoptosis in early developmental stages of invasive bivalves.
- Lynn, J.W., Perry, K.D., Wilson, V.L., Kennedy, A.J., Millward, R.N., Steevens, J.A. 2007. ANSRP Technical Notes Collection (ERDC TN-ANSRP-07-2), U.S. Army Engineer Research and Development Center, Vicksburg, MS. Detection of apoptotic cells to evaluate chemical control strategies in early life stages.
- Millward, R.N., Kennedy, A.J., Lynn, J., Perry, K.D., Ruiz, S. 2007. ANSRP Technical Notes Collection (ERDC TN-ANSRP-07-1), U.S. Army Engineer Research and Development Center, Vicksburg, MS. Application of life-stage sensitivity data to optimize chemical control strategies for invasive species.
- Kennedy, A.J., Millward, R.N., Steevens, J.A., Lynn, J.W., Perry, K.D. 2006. Journal of Great Lakes Research 32:596-606. Relative sensitivity of zebra mussel (Dreissena polymorpha) life-stages to two copper sources.

## PRESENTATIONS

- Using the USEPA Benchmark Dose Software to Develop an Avian Pb Toxicity Reference Value. Society of Environmental Toxicology and Chemistry Annual North American Meeting Minneapolis, Minnesota. November 12, 2017.
- Critical Review of Pb Ecological Benchmarks in Sediment. Society of Environmental Toxicology and Chemistry Annual North American Meeting, Salt Lake City, Utah. November 1, 2015.
- Critical Review of Pb and Hg Ecological Benchmarks in Soil. Society of Environmental Toxicology and Chemistry Annual North American Meeting, Salt Lake City, Utah. November 1, 2015.
- Detecting Spermiotoxicity to Pesticides with Flow Cytometric Analyses of Viability Biomarkers. Society of Environmental Toxicology and Chemistry Annual North America Meeting, New Orleans, Louisiana. November 22, 2009.

## KEY PROJECTS

### ECOLOGICAL RISK ASSESSMENT

**BERA and Expert Report, West Baton Rouge Parish, Louisiana, Expert/Principal Scientist**

Conducted a BERA for ecological receptors in a bottomland hardwood setting of former oil and gas exploration and production (E&P) operations. Constituents of interest include salt, metals, and PAHs. Performed surveys of vegetation, birds, and other fauna for vegetation community and bird trophic structure analyses. Calculated health risk for fish, aquatic and terrestrial invertebrates, birds, and mammals for exposure to soil and sediment PAH, metals, and other constituents.

**BERA and Expert Report, Plaquemines Parish, Louisiana, Expert/Principal Scientist**

Conducted a BERA for ecological receptors in a coastal marsh setting of former oil and gas E&P operations. Constituents of interest include PAHs, PCBs, metals, dioxins, and methylmercury. Performed vegetation surveys, bird surveys, and other fauna surveys for marsh classification and bird trophic structure analyses in a coastal marsh setting. Collected and analyzed sediment and soil chemistry bioavailability metrics. Calculated health risk for fish, aquatic and terrestrial invertebrates, birds, and mammals for exposure to sediment PAH, metals, and other constituents.

**BERA and Expert Report, Cameron Parish, Louisiana, Expert/Principal Scientist**

Conducted a BERA for ecological receptors in a coastal marsh setting of former oil and gas E&P operations. Performed vegetation surveys, bird surveys, and other fauna surveys for marsh classification and bird trophic structure analyses. Collected and analyzed sediment and soil chemistry data such as oxidation-reduction potential (ORP), pH, sulfides, and organic carbon. Calculating health risk for fish, aquatic and terrestrial invertebrates, birds, and mammals for exposure to sediment PAH, metals, and other constituents.

**Upper Columbia River Site Remedial Investigation and Feasibility Study (RI/FS), Kettle Falls, WA, Task Manager/Lead Author/Principal Scientist**

Managed large team in providing scientific support for RI/FS of a site that extends over 150 miles from the U.S/Canadian border where a metal smelting facility operated. Compounds of concern include metals from smokestack emissions and direct releases of slag and liquid effluent. Lead author on the Aquatic Baseline Ecological Risk Assessment (BERA) and Upland BERA.

**U.S Magnesium Superfund RI/FS, Tooele County, UT, Task Manager/Lead Author/Principal Scientist**

Evaluated risk to terrestrial and hypersaline aquatic receptors in soil, sediment, surface water, and air at an existing industrial facility. Compounds of concern include dioxin/furan, polychlorinated biphenyls, hexachlorobenzene, metals, and chlorine. Lead author on BERA Work Plans and BERA reports. Prepared presentations, technical approaches, and materials for discussions with U.S. Environmental Protection Agency (EPA) Region 8 and other stakeholders.

**North Maybe Mine RI/FS, Caribou County, ID, Senior Scientist**

Developed TRV and bioaccumulation factor (BAF) refinements for aquatic and terrestrial receptors evaluated in the BERA. Compounds of concern include metals. Prepared white papers and presentation materials for discussions with stakeholders.

**South Maybe Canyon Mine RI/FS, Caribou County, ID, Senior Scientist**

Developed TRV and BAF refinements for aquatic and terrestrial receptors evaluated in the BERA. Compounds of concern include metals. Prepared white papers and presentation materials for discussions with stakeholders.

**Naval Air Station North Island Installation Restoration (IR) Site 9 BERA, Coronado, CA, Senior Scientist**

Developed a refined lead (Pb) Preliminary Cleanup Level (PCL) for a sensitive avian species, the California Least Tern, using the Benchmark Dose Model (BMD) software.

**Naval Model Boat Range IR Site 25 Preliminary Assessment/Site Inspection, Naval Base Point Loma, CA, Senior Scientist**

Developed a screening level ecological risk assessment at a military industrial use site. Compounds of concern include lead and radium.

**Naval Auxiliary Landing Field San Clemente Island IR Sites 11 and 13 Screening Level Ecological Risk Assessment (SLERA), San Clemente Island, CA, Senior Scientist**

Provided scientific support for the refinements to the SLERA including the evaluations on the bioaccessibility of metals. Developed a framework and decision criteria for evaluating blood lead levels collected from the Sage Sparrow, a sensitive avian species.

**San Diego Bay Investigative Order R9-2017-0083, CP Kelco, Project Manager/Principal Scientist**

Provided critical reviews and public comments to the San Diego Regional Water Quality Control Board on an Investigative Order, Sediment Investigation Work Plan, and Sediment Chemistry Assessment Report. Conducted a chemical fingerprinting analysis of PCBs. Provided scientific and strategical support on potential liability of PCBs, PAHs, and metals.

**Critical Review of Engineering Evaluation/Cost Analysis (EE/CA), Sweetwater Marsh National Wildlife Refuge, San Diego Bay, CA, Prologis, Project Manager/Senior Scientist**

Provided a critique of several EE/CAs in a coastal marsh habitat of the San Diego Bay Wildlife Refuge. Reviewed documents and submitted public comments to Department of Wildlife and Fisheries on scientific methodology for ecological and human health risk assessments, as well as development of preliminary remediation goals (PRGs).

**Westmoreland, Senior Scientist**

Provided a critical review of EPA's Draft Field-Based Methods for Developing Aquatic Life Criteria for Specific Conductivity. Developed recommendations for public comments to USEPA.

**Ekati Diamond Mine Short-term Site-specific Water Quality Objective for Chloride, Northwest Territories, Canada, Senior Scientist**

Assisted in development of a refined water quality objective for chloride at a mine in the Arctic. Refinements include a focus on acute exposures and applying hardness-based regressions in the species sensitivity distribution (SSD).

**SLERA, Pontos, Brazil, Senior Scientist**

Provided strategical support and senior review of ecological risk assessment conducted at an existing facility in South America. Evaluation ecological receptors unique to South America as well as incorporation of various international regulatory guidelines.

**Brucejack Gold Mine Science-Based Environmental Benchmark for Zinc, British Columbia, Canada, Senior Scientist**

Assisted in development of a site-specific water quality objective for zinc at a mine in British Columbia. Refinements include a focus on species relevant to the site and applying hardness-based regressions in the species sensitivity distribution (SSD).

**Greenstone Oil Field Ecological Risk Assessment, Indonesia, Chevron, Senior Scientist**

Evaluated risk to aquatic receptors in an oil field. Compounds of concern include PAHs, BTEX, metals, and ammonia.

## NATURAL RESOURCE DAMAGE ASSESSMENT

**Refugio Oil Spill NRDA, California, Plains All American Pipeline, Senior Scientist**

Provided litigation support for NRDA related to oil spill in Central California. Lead author on draft Damage Assessment and Restoration Plan (DARP). Evaluated injury to ecological receptors in shoreline and subtidal areas, developed estimates of baseline levels. Prepared presentations, technical approaches, white papers, and materials for discussions with Trustees.

## IMPACT ASSESSMENT

**Produced Water Discharge from Floating Production Storage and Offloading Vessels, Guyana, Exxon, Principal Scientist**

Developed water quality monitoring program for offshore discharges of produced water and drilling muds in accordance with global guidance and regulation of produced water.

**Confidential Client, Senior Scientist**

Developed conceptual site models (CSMs) to understand fate and transport of spilled chemically enhanced oil recovery products in a terrestrial and aquatic environment.

**Chad Polymer EIA, Exxon, Project Manager/Senior Scientist**

Developed CSMs to understand fate and transport of spilled polymer products in a terrestrial and aquatic environment.

## PRODUCT STEWARDSHIP

**Halliburton Angola Workstream Product Declaration, TX, Senior Scientist**

Scored ecological safety of products in the Angola Workstream using local and international guidelines including toxicity to microbes, fish, and invertebrates, bioaccumulation, and biodegradation.

## NATIONAL ENVIRONMENTAL POLICY ACT

**Tesoro Anacortes Refinery Clean Products Upgrade Project Final Environmental Impact Statement (FEIS), Seattle, WA, Senior Scientist**

Conducted research, provided scientific support and prepared sections in the FEIS on the toxic effects of a xylene spill to marine birds and mammals.

## KEY PROJECTS PRIOR TO JOINING ERM

## ECOLOGICAL RISK ASSESSMENT

**Star Lake Canal Superfund Site RI/FS, Port Neches, TX, Project Manager/Lead Scientist**

Evaluated the nature and extent of contamination in surface water, sediments, soils, and biota for the baseline ecological risk assessment as part of the Tier 2 RI. Quantified risk estimates to benthic invertebrates using a weighted line of evidence approach and used food web models to determine risk to mammalian and avian receptors. Constituents of concern included metals, PAHs, organochlorine pesticides, and PCBs. Prepared presentations, technical approaches, and materials for discussions with U.S. EPA Region 6 and the Trustees. Coordinated closely with the Client, Trustees, and EPA Region 6 for regulatory approval of the Tier 2 RI/FS and the Record of Decision (ROD), and in preparation for the remediation and monitoring phase of the CERCLA Site.

**Critical Review of Metals Surface Water, Soil, and Sediment Benchmarks and Models for Ecological Risk Assessment, Port Neches, TX, Project Manager/Lead Scientist**

Conducted a critical scientific review on the science underlying metal ecological benchmarks for benthos, fish, and wildlife. Evaluated the scientific merit and technical reliability of the data used to establish the metal benchmarks as well as the data from relevant studies that have not been included in establishing these regulatory-approved values. A critical review of the robustness of study methodology and data analysis techniques was conducted as part of this evaluation.

**Critical Evaluation of Ecological Risk Assessment Soil and Sediment Benchmarks and Models, Port Neches, TX, Project Manager/Lead Scientist**

Conducted a high-level cost assessment that demonstrated the range of remediation costs associated with the use of different regulatory approved ecological benchmarks and the contribution of remediation decision criteria and non-detect (ND) concentrations to overall cost. Evaluated the range of costs of varying degrees of remedial action for various toxicants and toxicant classes based on the use of different benchmarks.

**Burnet Bay Decommissioning Project, Baytown, TX, Project Scientist**

Scientific advisor on the determination of a pipeline abandonment or removal, on the basis of potential ecological and environmental issues associated with working in Burnet Bay, including potential impacts to oyster reef and wetland areas, and potential sediment toxicity issues. Reviewed existing sediment chemistry data and provided a technical memorandum to the US Army Corps of Engineers (USACE) and the Texas Commission on Environmental Quality (TCEQ) on the existing sediment chemistry data, previous interpretations of the data, and recommendations for pipeline abandonment.

**Effects of Fluoridated Drinking Water on Salmonids, Sonoma County, CA, Project Scientist**

Provided scientific support in the evaluation of potential impacts of the County of Sonoma's proposal to fluoridate the Sonoma County Water Agency potable water supply on salmonids and their habitat within the geographic extents that define the reach of the Water Agency's potable water. Conducted a comprehensive literature review on fluoride toxicity to salmonids using documented laboratory and field studies and other relevant research reports. With this information, estimates of acceptable, protective fluoride concentrations to salmonids in District waterways were provided to Sonoma County.

## NATURAL RESOURCE DAMAGE ASSESSMENT

**Star Lake Canal Superfund Site NRDA, Port Neches, TX, Project Manager/Lead Scientist**

Provided strategic and scientific support to Chevron for the Star Lake Canal Superfund Site NRDA. Worked closely with the Natural Resource Trustees as part of a cooperative assessment to estimate injuries associated with historical wastewater discharges from the chemical manufacturing complex. Conducted a comprehensive evaluation of potential injury using estimates of ecological risk of PAHs, metals, and pesticides incorporated into a Habitat Equivalency Analysis (HEA). Approaches to injury estimations included probability of toxicity calculations in sediment, bioavailability assessments using passive samplers, and normalized difference vegetation index (NDVI).

**Texas City Y Oil Spill NRDA, Kirby Inland Marine, TX, Project Scientist**

Provided support to the NRDA Team responding to the Texas City Y Oil Spill. Conducted a Net Environmental Benefit Analysis (NEBA) to evaluate potential outcomes from various clean-up options on the Matagorda Island National Wildlife Refuge. Specific considerations evaluated in the NEBA included potential exposure to remaining oil on the shoreline and physical disturbance of nesting species due to the presence of heavy equipment on the Wildlife Refuge.

**Deepwater Horizon Incident, Gulf of Mexico, Project Scientist**

Member of the NRDA team responding to the Deepwater Horizon accident and oil spill in the Gulf of Mexico. Provided support to the Aquatic Toxicology, Water Column & Water Chemistry, Deepwater Habitat, Nearshore Aquatic, Marine Mammals & Turtles, and Human Use technical working groups. Participated in the design or implementation of the following cooperative NRDA studies: Water-Column Profiling to measure dissolved aromatic hydrocarbons and free oil droplets

as a function of depth and location relative to the subsurface oil release, and Water Column Injury Ephemeral Data Collections: NRDA Cruise 4.

**West Shore Pipeline Incident, Lockport, IL, Senior Staff Scientist**

Evaluated toxicity in threatened and endangered species, as well as aquatic and benthic organisms, using state and federal guidelines and measures of PAH bioavailability. Also evaluated the potential for phytoremediation as a viable means of clean up at the West Shore Pipeline Incident site.

**Oil Spill NRDA, Illinois, Confidential Client, Senior Staff Scientist**

Evaluated PAH bioavailability in sediment and surface water using the equilibrium partitioning theory as part of NRDA support of a pipeline oil spill.

**Calcasieu Estuary Oil Spill Wildlife Injury Assessment, Lake Charles, LA, Staff Scientist**

Evaluated PAH contamination and depuration in bivalves as part of the wildlife injury assessment phase of the NRDA for the CITGO Calcasieu Estuary Oil Spill.

## LITIGATION SUPPORT

**East White Lake, Louisiana, Chevron, Senior Scientist**

Provided scientific support for an expert report critiquing several ecological risk assessments conducted on an historical oil and gas field. As part of the litigation support, evaluated the selection of ecological benchmarks and the parameters and assumptions used in food web models assessing risk to birds and mammals from a number of chemicals typically present in produced water.

**Litigation Support, Connecticut, Confidential Client, Project Manager/Senior Scientist**

Assisted in document review and preparation of an expert report on enforcement actions under the Resource, Conservation, and Recovery Act (RCRA) Voluntary Corrective Action Program.

## PRODUCT STEWARDSHIP

**Green Ranking Development, TX, Staff Scientist**

Assisted in the development and implementation of a "Green Ranking" system to provide products with green chemistry attributes. Used the ranking system to score the relative hazards and risks associated with the client's chemical products. Also provided support to the client's chemical suppliers using the ranking system.

**HPV Chemical Registration, TX, Baker Hughes, Staff Scientist**

Worked closely with the client to develop registration dossiers for several High Production Volume (HPV) chemical substances under the European Union (EU) Registration, Evaluation, Authorization, and Registration of Chemicals (REACh) Regulation. Contributed substantially to the hazard assessment phase of Chemical Safety Reports (CSRs). Also generated robust study summaries, endpoint summaries, and data waivers for mammalian toxicity studies.

**HPV Chemical Registration, TX, Sasol, Staff Scientist**

Developed two registration dossiers and CSRs for new HPV surfactant substances under the EU REACh Regulation. Generated robust study summaries, endpoint summaries, and data waivers for mammalian toxicity studies.

## ENVIRONMENTAL TOXICOLOGY/MARINE AND AQUATIC ECOTOXICOLOGY

**Aquatic and Sediment Toxicity Testing, Graduate Research, Baton Rouge, LA, Research Scientist**

Assisted with aquatic and sediment toxicity tests conducted on amphipods to study PAH-metal joint toxicity. Responsibilities included experimental dosing, water renewals, recording test data, measuring and recording various test parameters, statistical analysis of results, and maintaining test organism cultures.

**Pesticide Assessment, Doctoral Dissertation, Baton Rouge, LA, Research Scientist**

Designed and conducted analyses for assessing physiological effects of chemical control agents (Bayluscide, Roundup, copper sulfate, and hypochlorite), as measured by cellular biomarkers in sperm, embryonic, and early larval stages of zebra mussels, eastern oysters, and sea urchins. Experiments included toxicity tests on germ cells and early life stages with analyses on DNA fragmentation, differential stress protein expression, mitochondrial depolarization, and membrane permeability. Analyses were conducted using fluorescent microscopy, confocal microscopy, Western blotting, spectrophotometry, flow cytometry, and immunohistochemistry.

## INVASIVE SPECIES MANAGEMENT

**Quagga Mussel Rapid Response, Monitoring, and Control Plan, Lake Piru, CA, Project Manager/Lead Scientist**

The reservoir in Ventura County, CA was invaded by the invasive quagga mussel. The rapid response and monitoring components of the Plan focused on identifying and locating adults, larval stages (veligers), and water quality changes to characterize the initial infestation level, track the population growth and ecological impacts, and evaluate the effectiveness of containment, control, and/or eradication measures. Containment and control measures involved inspections and decontamination requirements for all watercraft and a range of mechanical and biological controls, including site-specific fish biocontrol and physical removal via divers. Challenges of this project included population containment during the water releases into the downstream watershed, which is a National Marine Fisheries Service (NMFS) requirement for maintaining critical habitat for the endangered Southern California steelhead.

**Mollusk Experiments, Graduate Research, Vicksburg, MS, Research Scientist**

Worked with the USACE Environmental Research and Development Center (ERDC) to investigate chemical control strategies targeted at embryonic and early larval stages of invasive bivalves. Work focused on using biomarkers of cellular stress in sperm, embryos, and veligers to detect effects on fertilization and larval development after brief exposures to various molluscidal agents. By targeting these sensitive life stages during spawning events, found that chemical

concentrations can be applied at much lower concentrations and in small pulsed applications, resulting in control of population recruitment while reducing effects on non-target species.

## NATIONAL ENVIRONMENTAL POLICY ACT

**NEPA Project, Texas, Georgia, Arkansas, Mississippi, and Alabama, Confidential Client, Senior Staff Scientist**

Assisted with the preparation of the NEPA documentation required to secure DOE funds for the development of biorefineries. The scope of work included research and documentation support to complete the application documents required by the DOE and coordination with state and federal agencies including the USACE, US Fish and Wildlife Service, State Historic Preservation Offices, and state wildlife and fisheries departments.

**Listing of Cases in which Karen Cejas, Ph.D. Provided Testimony**

| | Year | Description | Expertise |
|---|---|---|---|
| **Deposition Testimony** | | | |
| Parish of Plaquemines v Rozel Operating Company, et al. Docket No. 60-996, 25th JDC | 2025 | Screening level and baseline ecological site-specific risk assessment: coastal marsh vegetative structure and ecological health, avian and mammalian quantitative health risk assessment | Toxicology and ecological risk assessment |

# APPENDIX B PHOTOGRAPHS

# Appendix B-1:
# Former BP Operations Areas

Sustainability is our business

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# Photographs of Natural Communities

BP/Castex-Ltd Adm-Apx L-000283

**E-S20-1 (HA-1)**

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

BP/Castex-Ltd Adm-Apx L-000284

**E-S20-1 (HA-1)**

## Cajun Prairie

Natural Community

K. Cejas
April 15, 2025

E-S20-1 (HA-1)

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

E-S20-1 (HA-1)

Cajun Prairie

Natural Community

K. Cejas
April 15, 2025

E-S20-1 (HA-1)

**Cajun Prairie**

Natural Community

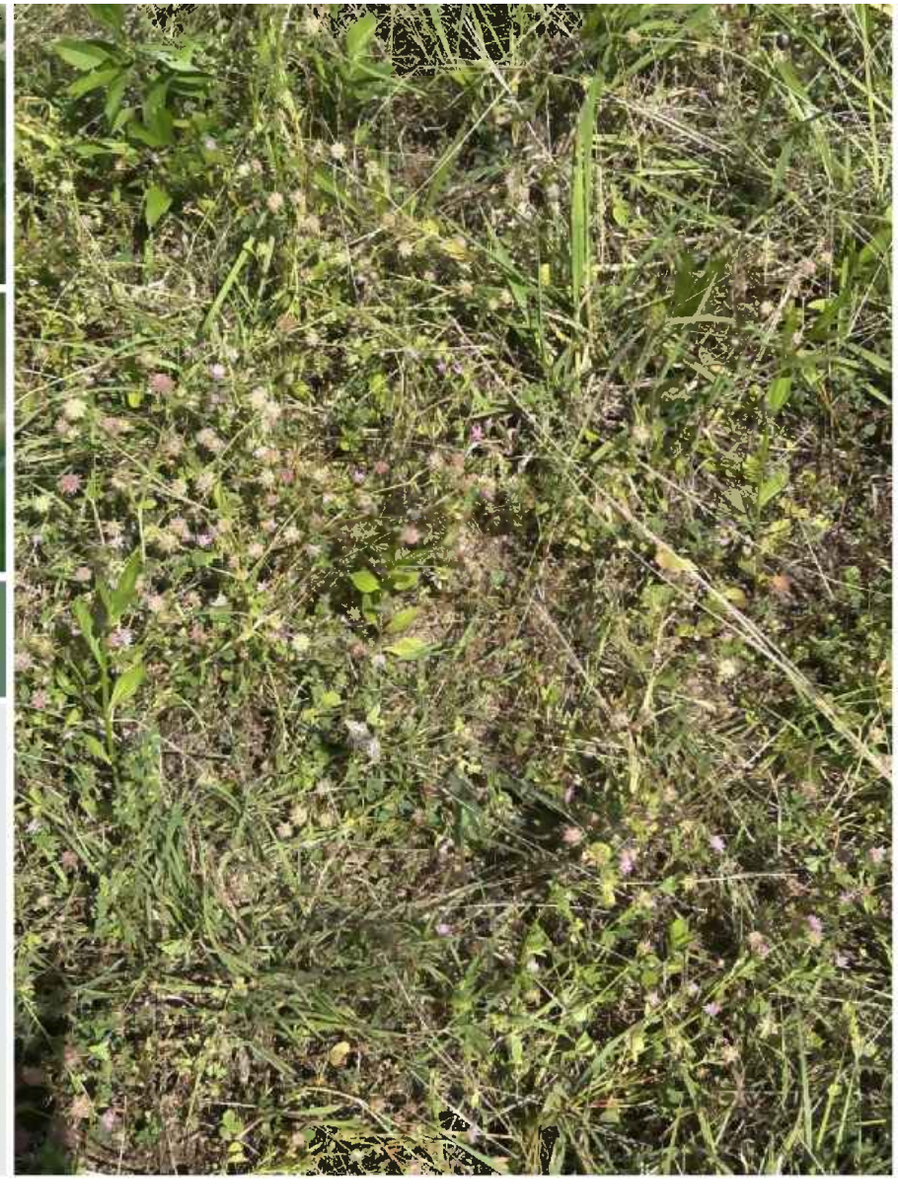
K. Cejas
April 15, 2025

E-S20-1 (HA-1)

Cajun Prairie

Natural Community

K. Cejas
April 15, 2025



E-S20-2 (HA-2)

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

**E-S20-2 (HA-2)**

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

Castex-ERM-RPT-000289
**BP/Castex-Ltd Adm-Apx L-000290**

E-S20-2 (HA-2)

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

Castex-ERM-RPT-000290
**BP/Castex-Ltd Adm-Apx L-000291**

E-S20-2 (HA-2)

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

E-S20-2 (HA-2)

Cajun Prairie

Natural Community

K. Cejas
April 15, 2025

E-S20-3 (HA-3)

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

E-S20-3 (HA-3)

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

**E-S20-3 (HA-3)**

**Cajun Prairie**

Natural Community

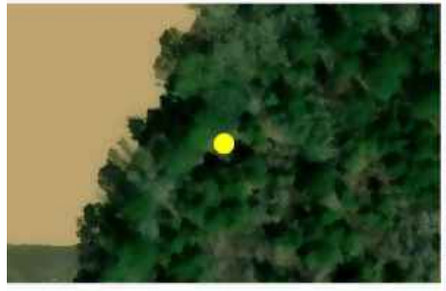
K. Cejas
April 15, 2025

**E-S20-3 (HA-3)**

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

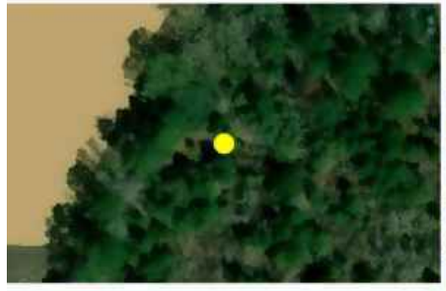


E-S20-4 (HA-10)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

C. Matherne
April 15, 2025

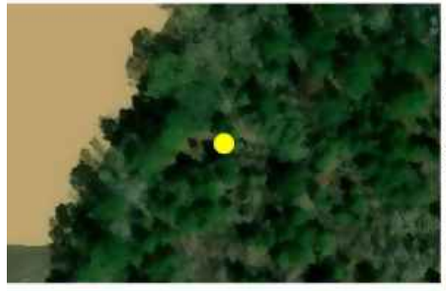


E-S20-4 (HA-10)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

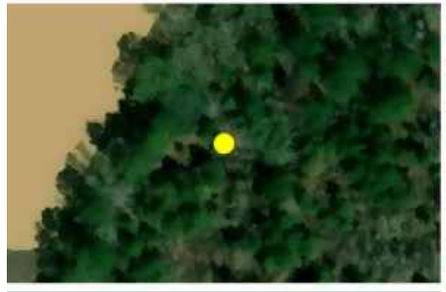


E-S20-4 (HA-10)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

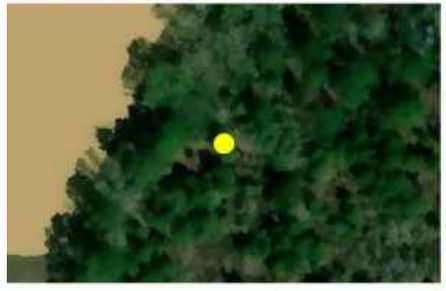


E-S20-4 (HA-10)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025



E-S20-4 (HA-10)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

E-S20-5 (CD-18)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

E-S20-5 (CD-18)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

E-S20-5 (CD-18)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

E-S20-5 (CD-18)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

ERM

Appendix B-1: Former BP Operations Areas

Teams\OPC\0778889\DM\32909H(AppB)



Castex-ERM-RPT-000305

BP/Castex-Ltd Adm-Apx L-000306

E-S20-6 (CD-6)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

**E-S20-6 (CD-6)**

## Sweetgum-Water Oak Bottomland Hardwood Forest

Natural Community

K. Cejas
April 15, 2025

E-S20-6 (CD-6)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

E-S20-6 (CD-6)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

C. Matherne
April 15, 2025

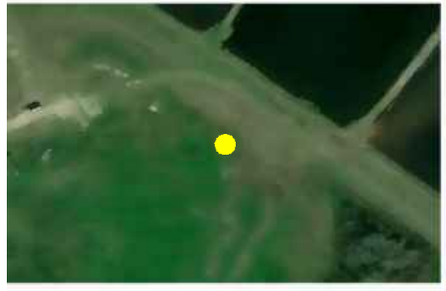
E-S20-6 (CD-6)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

# Photographs of Vegetative Species



E-S20-2 (HA-2)

**Texas vervain**

*Verbena halei*

J. Shugart
April 15, 2025

**E-S20-2 (HA-2)**

**Burclover**

*Medicago polymorpha*

**FACU**

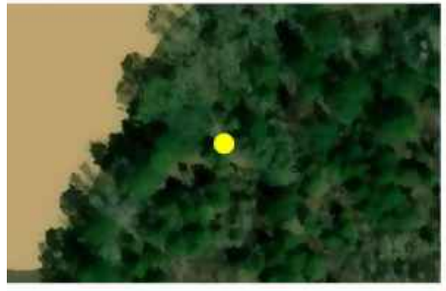
J. Shugart
April 15, 2025

ERM

Appendix B-1: Former BP Operations Areas



Castex-ERM-RPT-000313
BP/Castex-Ltd Adm-Apx L-000314



E-S20-4 (HA-10)

**Common boneset**

*Eupatorium perfoliatum*

FACW

J. Shugart
April 15, 2025

E-S20-5 (CD-18)

**Canadian black snakeroot**

*Sanicula canadensis*

FACU

J. Shugart
April 15, 2025

E-S20-6 (CD-6)

**Cherrybark oak**

*Quercus pagoda*

**FAC**

J. Shugart
April 15, 2025

E-S20-6 (CD-6)

**Winged elm**

*Ulmus alata*

FACU

J. Shugart
April 15, 2025

E-S20-6 (CD-6)

**Winged elm**

*Ulmus alata*

FACU

J. Shugart
April 15, 2025

**E-S20-6 (CD-6)**

**Bushy bluestem**

*Andropogon glomeratus*

FACW

C. Matherne
April 15, 2025

# Photographs of Birds

E-S20-1 (HA-1)

**Great Egret**

*Ardea alba*

Fish

C. Matherne
April 15, 2025

E-S20-1 (HA-1)

**White-faced Ibis**

*Plegadis chihi*

Aquatic Invertebrates

C. Matherne
April 15, 2025

E-S20-1 (HA-1)

**Turkey Vulture**

*Cathartes aura*

Carrion

C. Matherne
April 15, 2025

E-S20-2 (HA-2)

**Red-tailed Hawk**

*Buteo jamaicensis*

Small Animals

C. Matherne
April 15, 2025

E-S20-2 (HA-2)

**Snowy Egret**

*Egretta thula*

Fish

C. Matherne
April 15, 2025

E-S20-3 (HA-3)

**Turkey Vulture**

*Cathartes aura*

Carrion

C. Matherne
April 15, 2025

E-S20-5 (CD-18)

**White-eyed Vireo**

*Vireo griseus*

Insects

J. Shugart
April 15, 2025

E-S20-6 (CD-6)

**Great Egret**

*Ardea alba*

Fish

C. Matherne
April 15, 2025

E-S20-6 (CD-6)

**Tree Swallow**

*Tachycineta bicolor*

Insects

C. Matherne
April 15, 2025

E-S20-6 (CD-6)

**Laughing Gull**

*Leucophaeus atricilla*

Aquatic Invertebrates

C. Matherne
April 15, 2025

E-S20-6 (CD-6)

**Ruby-throated Hummingbird**

*Archilochus colubris*

Nectar

C. Matherne
April 15, 2025

E-S20-6 (CD-6)

**Snowy Egret**

*Egretta thula*

Fish

C. Matherne
April 15, 2025

# Photographs of Non-Avian Fauna

E-S20-1 (HA-1)

**Tropical checkered skipper**

*Burnsius oileus*

Primary Consumer

J. Shugart
April 15, 2025

E-520-1 (HA-1)

**Bee**

*Family Apidae*

Primary Consumer

K. Cejas
April 15, 2025



BP/Castex-Ltd Adm-Apx L-000336

BP/Castex-Ltd Adm-Apx L-000337

E-S20-1 (HA-1)

**Bee**

*Family Apidae*

Primary Consumer

K. Cejas
April 15, 2025

E-520-1 (HA-1)





## Tropical checkered skipper

*Burnisius oileus*

Primary Consumer

K. Cejas
April 15, 2025



BP/Castex-Ltd Adm-Apx L-000338

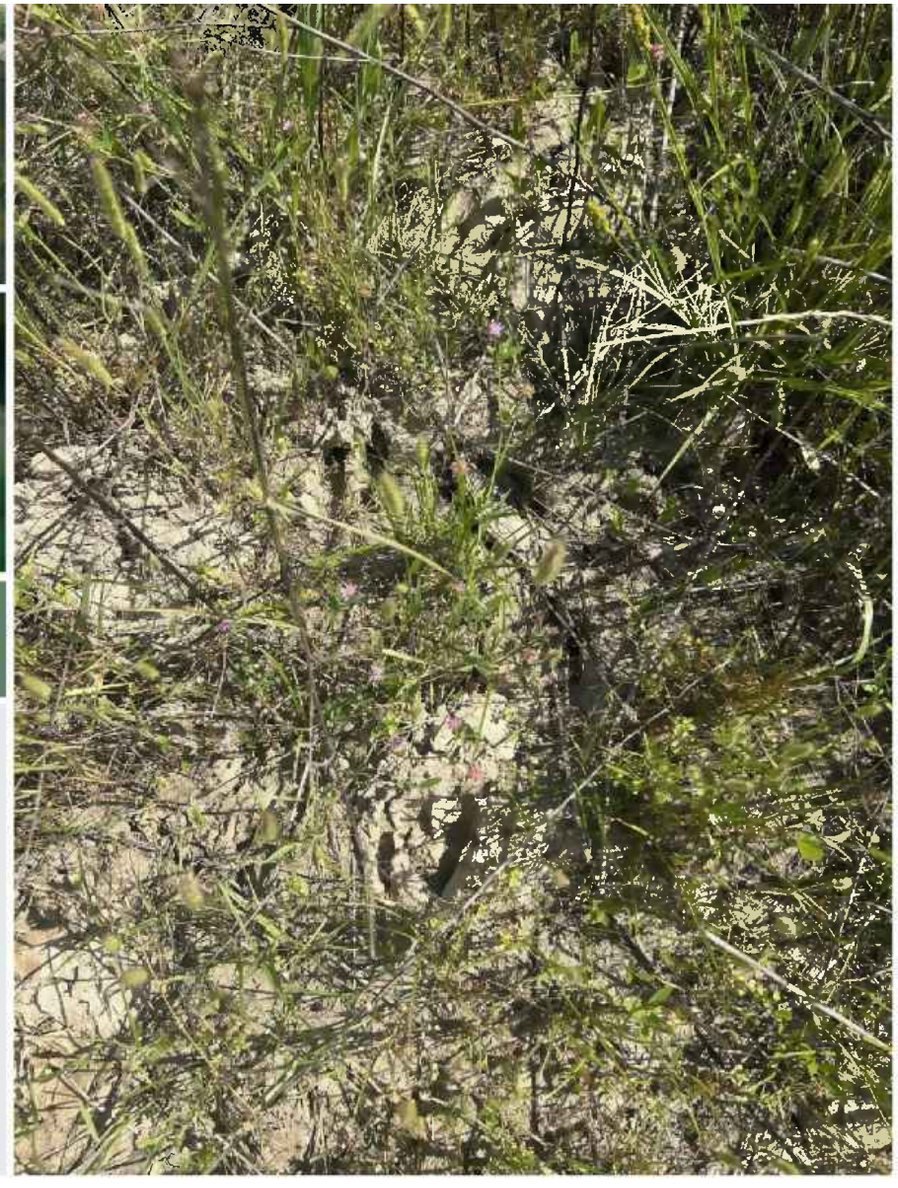
E-S20-3 (HA-3)

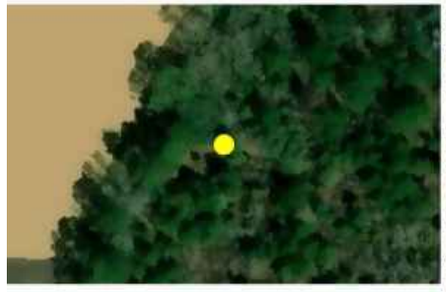
**Feral hog tracks**

*Sus scrofa*

Tertiary Consumer

K. Cejas
April 15, 2025





E-S20-4 (HA-10)

**Coyote scat**

*Canis latrans*

Apex

K. Cejas
April 15, 2025

E-S20-4 (HA-10)

**Crawfish tower**

*Order Decapoda*

Secondary Consumer

K. Cejas
April 15, 2025

Appendix B-1: Former BP Operations Areas

E-S20-5 (CD-18)

**Mammal burrow**

*Class Mammalia*

Secondary Consumer

J. Shugart
April 15, 2025

**E-S20-5 (CD-18)**

**Mammal burrow**

*Class Mammalia*

Secondary Consumer

J. Shugart
April 15, 2025

E-S20-5 (CD-18)

**Forest tent caterpillar moth**

*Malacosoma disstria*

Primary Consumer

C. Matherne
April 15, 2025

E-S20-5 (CD-18)

**Forest tent caterpillar moth**

*Malacosoma disstria*

Primary Consumer

K. Cejas
April 15, 2025

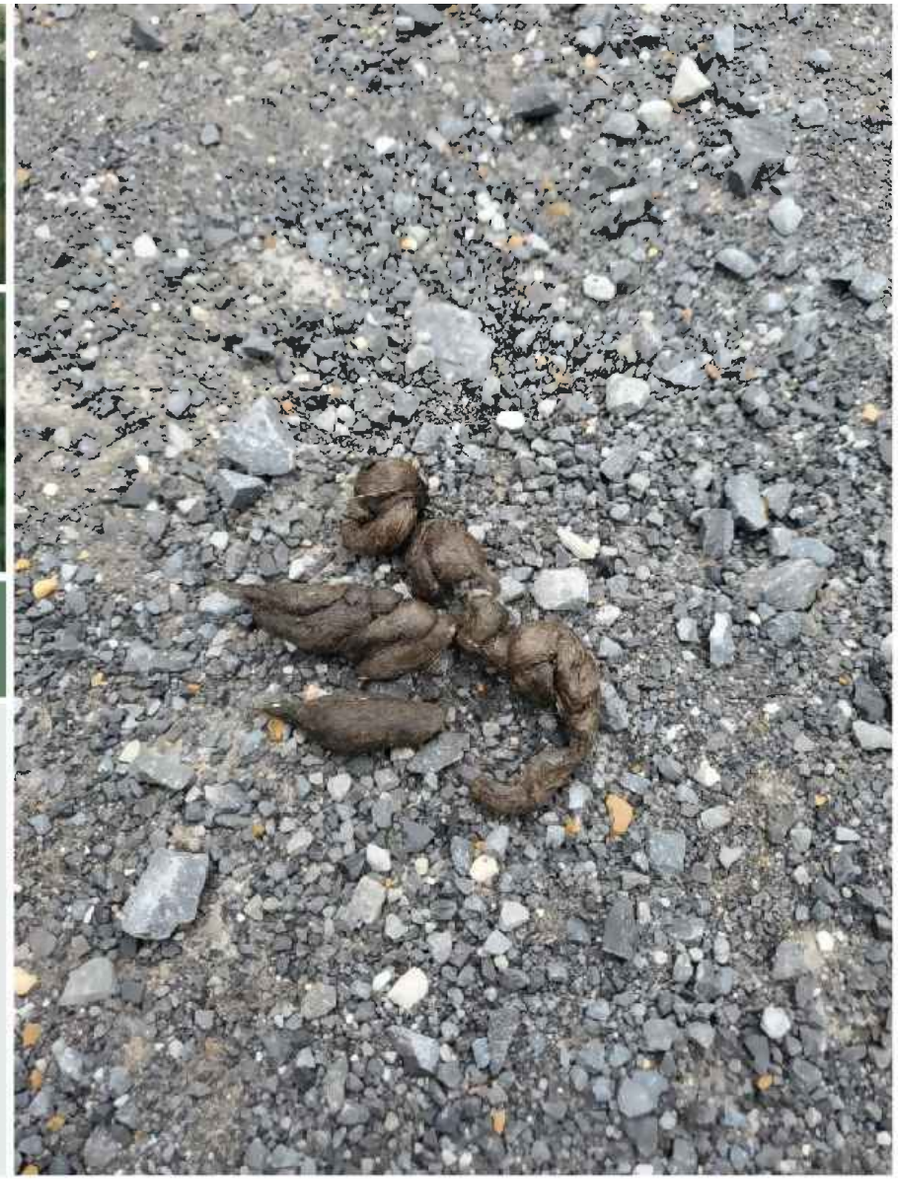
E-S20-6 (CD-6)

**Coyote scat**

*Canis latrans*

Apex

C. Matherne
April 15, 2025



E-S20-6 (CD-6)

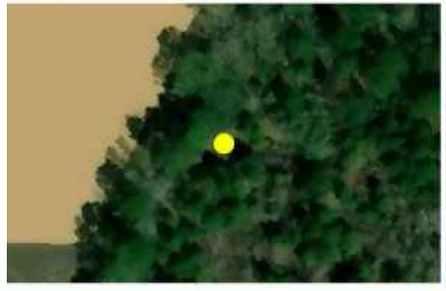
**Eastern buckmoth**

*Hemileuca maia*

Primary Consumer

K. Cejas
April 15, 2025

# Photographs of Recreational Activities



E-S20-4 (HA-10)

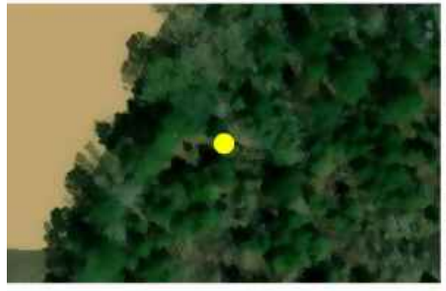
**Deer Stand**

C. Matherne
April 15, 2025

E-S20-4 (HA-10)

**Deer Feeder**

C. Matherne
April 15, 2025



**E-S20-4 (HA-10)**

**Deer Feeder**

K. Cejas
April 15, 2025

# Appendix B-2: On-site Reference

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Teams\OPC\0778889\DM\32909H(AppB)

# Photographs of Natural Communities

**E-S20-7**

## Cajun Prairie

Natural Community

K. Cejas
April 15, 2025

**E-S20-7**

## Cajun Prairie

Natural Community

K. Cejas
April 15, 2025

**E-S20-7**

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

Castex-ERM-RPT-000355
**BP/Castex-Ltd Adm-Apx L-000356**

E-S20-7

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

E-S20-8 (CD-8)

## Sweetgum-Water Oak Bottomland Hardwood Forest

Natural Community

K. Cejas
April 15, 2025

E-S20-8 (CD-8)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

E-S20-8 (CD-8)

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

**E-S20-8 (CD-8)**

## Sweetgum-Water Oak Bottomland Hardwood Forest

Natural Community

K. Cejas
April 15, 2025

E-S20-9

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

E-S20-9

Cajun Prairie

Natural Community

K. Cejas
April 15, 2025

E-S20-9

Cajun Prairie

Natural Community

K. Cejas
April 15, 2025

**E-S20-9**

**Cajun Prairie**

Natural Community

K. Cejas
April 15, 2025

**E-S20-10**

## Sweetgum-Water Oak Bottomland Hardwood Forest

Natural Community

K. Cejas
April 15, 2025

E-S20-10

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

E-S20-10

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

**E-S20-10**

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

**E-S20-11**

## Sweetgum-Water Oak Bottomland Hardwood Forest

Natural Community

K. Cejas
April 15, 2025

E-S20-11

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025

**E-S20-11**

## Sweetgum-Water Oak Bottomland Hardwood Forest

Natural Community

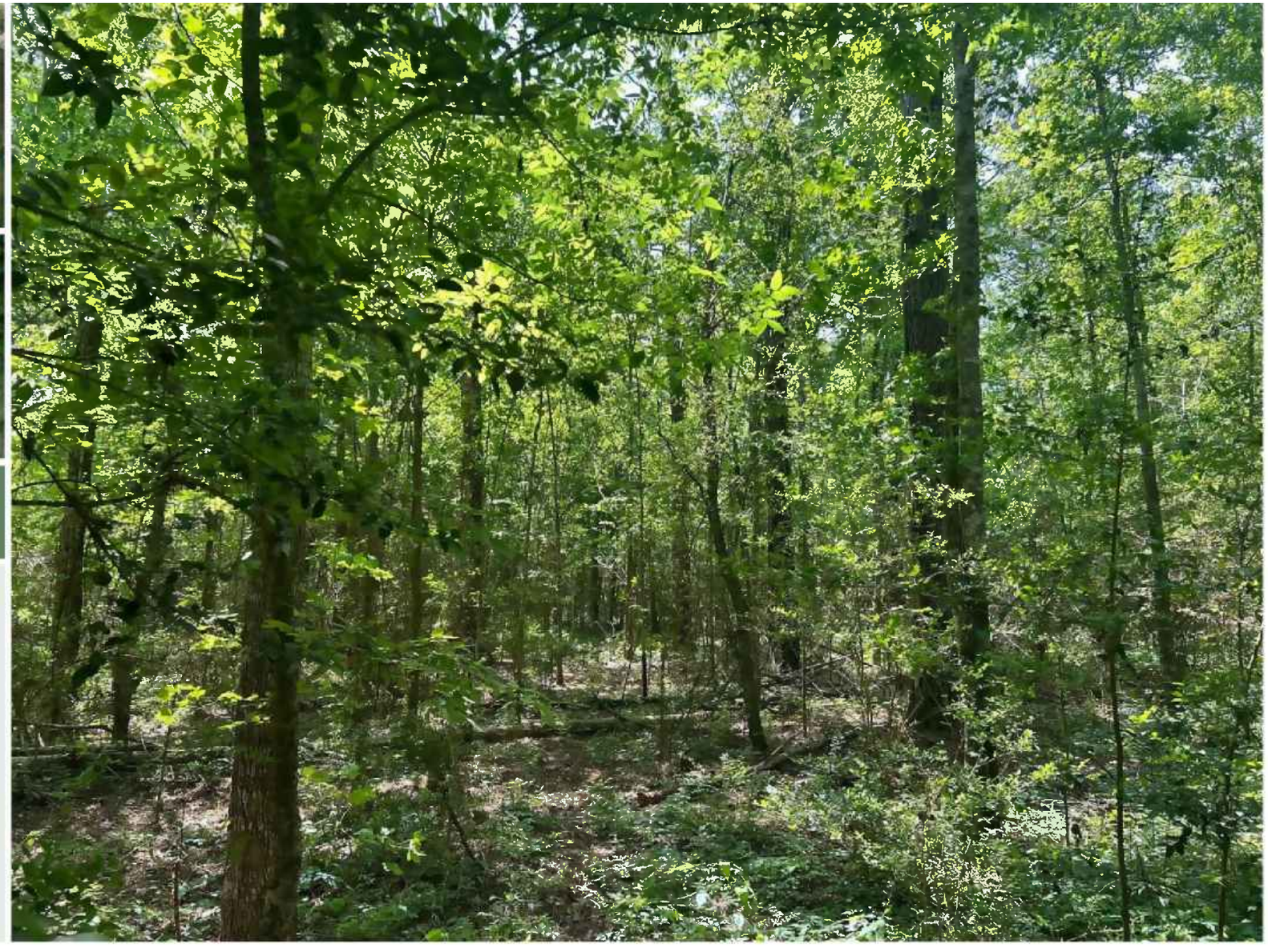
K. Cejas
April 15, 2025

**E-S20-11**

**Sweetgum-Water Oak Bottomland Hardwood Forest**

Natural Community

K. Cejas
April 15, 2025



# Photographs of Vegetative Species

E-S20-7

**Common sheep sorrel**

*Rumex acetosella*

FACU

J. Shugart
April 15, 2025

E-S20-8 (CD-8)

**Swamp leather flower**

*Clematis crispa*

**FACW**

J. Shugart
April 15, 2025

E-S20-8 (CD-8)

**Swamp leather flower**

*Clematis crispa*

FACW

J. Shugart
April 15, 2025

E-S20-9

**Unknown plant**

*Kingdom Plantae*

K. Cejas
April 15, 2025

E-S20-10

**Hardy orange**

*Poncirus trifoliata*

J. Shugart
April 15, 2025

E-S20-10

**Southern arrowwood**

*Viburnum dentatum*

FAC

J. Shugart
April 15, 2025

**E-S20-11**

**Callery pear**

*Pyrus calleryana*

J. Shugart
April 15, 2025

ERM

Appendix B-2: On-site Reference



Castex-ERM-RPT-000380

BP/Castex-Ltd Adm-Apx L-000381

E-S20-11

**Butterweed**

*Packera glabella*

OBL

J. Shugart
April 15, 2025

E-S20-11

**Butterweed**

*Packera glabella*

OBL

J. Shugart
April 15, 2025

E-S20-11

**Callery pear**

*Pyrus calleryana*

J. Shugart
April 15, 2025

# Photographs of Birds

E-S20-10

**Red-bellied Woodpecker**

*Melanerpes carolinus*

Insects

C. Matherne
April 15, 2025

E-S20-10

**Red-bellied Woodpecker**

*Melanerpes carolinus*

Insects

C. Matherne
April 15, 2025

E-S20-10

**Red-bellied Woodpecker**

*Melanerpes carolinus*

Insects

C. Matherne
April 15, 2025

E-S20-10

**Red-bellied Woodpecker**

*Melanerpes carolinus*

Insects

C. Matherne
April 15, 2025

E-S20-10

**Red-bellied Woodpecker**

*Melanerpes carolinus*

Insects

C. Matherne
April 15, 2025

E-S20-11

**Bird nest**

*Class Aves*

C. Matherne
April 15, 2025

# Photographs of Non-Avian Fauna



Castex-ERM-RPT-000391
BP/Castex-Ltd Adm-Apx L-000392

E-S20-8 (CD-8)

**Green anole**

*Anolis carolinensis*

Secondary Consumer

J. Shugart
April 15, 2025

E-S20-8 (CD-8)

**Giant leopard moth**

*Hypercompe scribonia*

Primary Consumer

C. Matherne
April 15, 2025

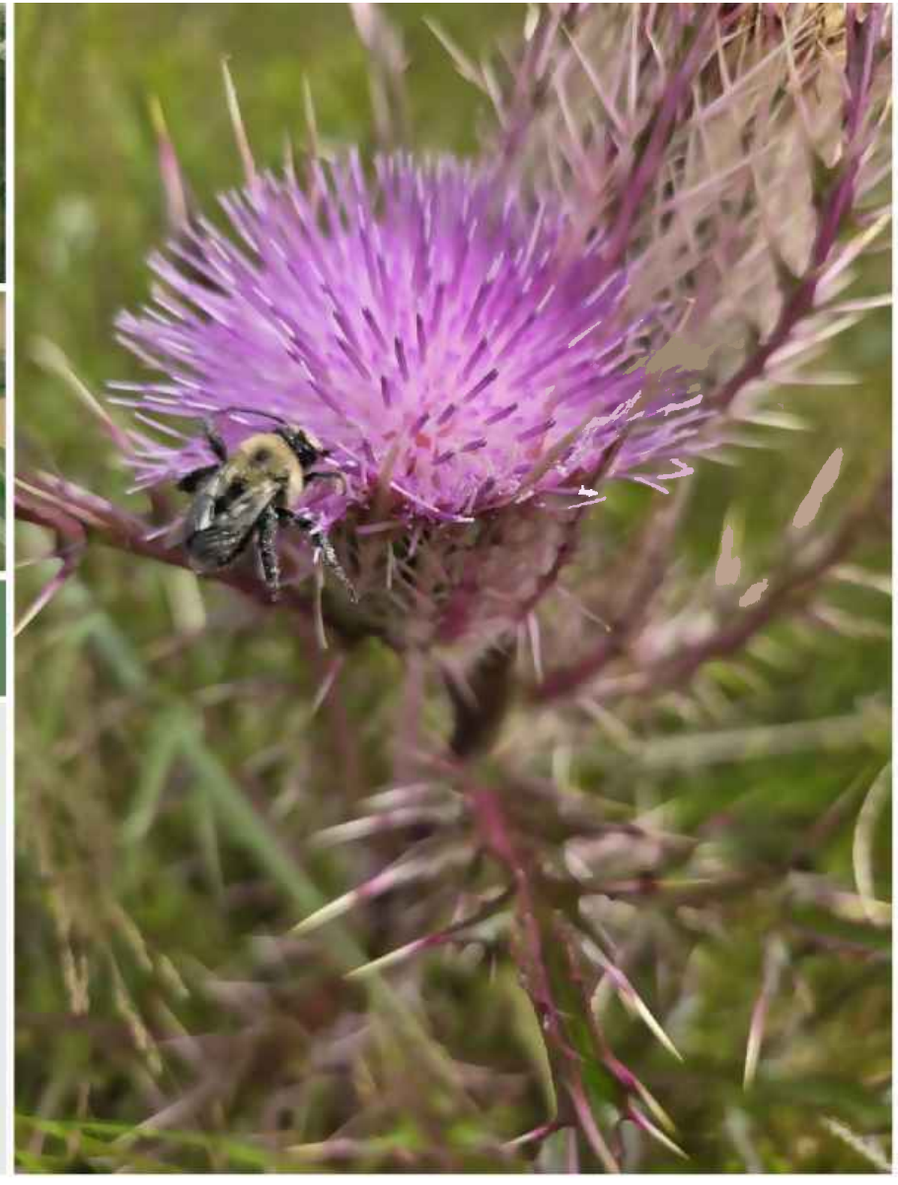
E-S20-9

**Bumblebee**

*Bombus sp.*

Primary Consumer

J. Shugart
April 15, 2025



E-S20-11

**Eastern pondhawk**

*Erythemis simplicicollis*

Secondary Consumer

J. Shugart
April 15, 2025

E-S20-11

**Eastern pondhawk**

*Erythemis simplicicollis*

Secondary Consumer

C. Matherne
April 15, 2025

E-S20-11

**Eastern pondhawk**

*Erythemis simplicicollis*

Secondary Consumer

C. Matherne
April 15, 2025

E-S20-11

**Eastern pondhawk**

*Erythemis simplicicollis*

Secondary Consumer

C. Matherne
April 15, 2025

# Appendix B-3: Other Areas

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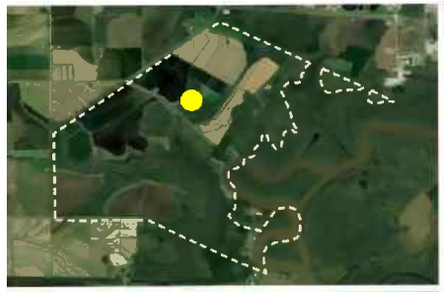
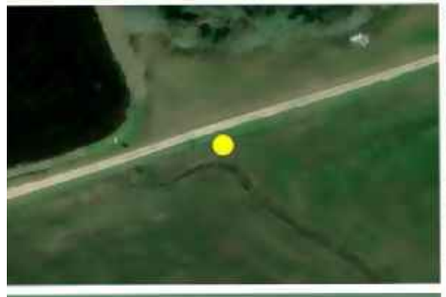
Teams\OPC\0778889\DM\32909H(AppB)

# Photographs of Natural Communities





**E-Inc-D1**

**Ditch**

Natural Community

K. Cejas
April 15, 2025

E-Inc-D2

**Ditch**

Natural Community

C. Matherne
April 16, 2025

E-Inc-D2

**Ditch**

Natural Community

C. Matherne
April 16, 2025

E-Inc-D2

**Ditch**

Natural Community

C. Matherne
April 16, 2025

E-Inc-D2

**Ditch**

Natural Community

K. Cejas
April 15, 2025

E-Inc-D2

**Ditch**

Natural Community

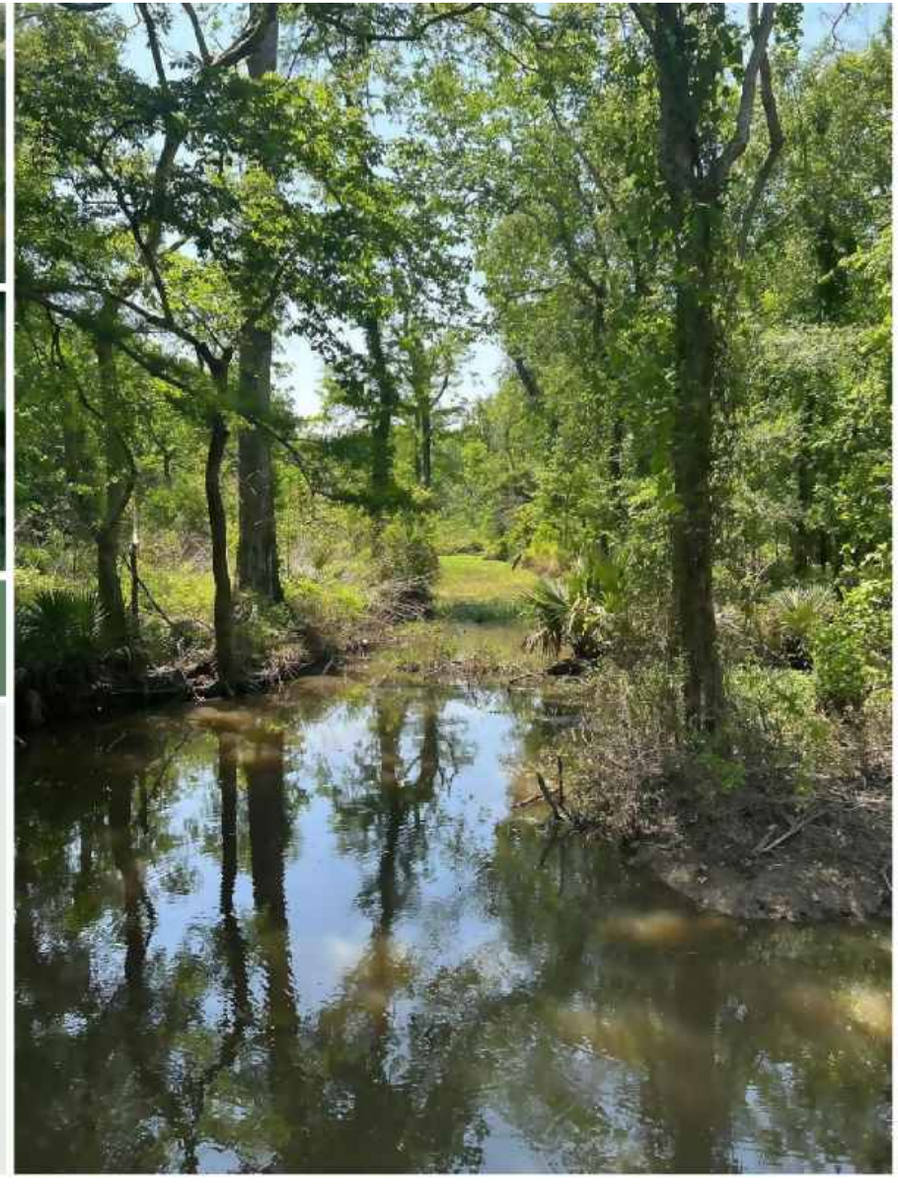
K. Cejas
April 15, 2025

E-Inc-D2

**Ditch**

Natural Community

K. Cejas
April 15, 2025

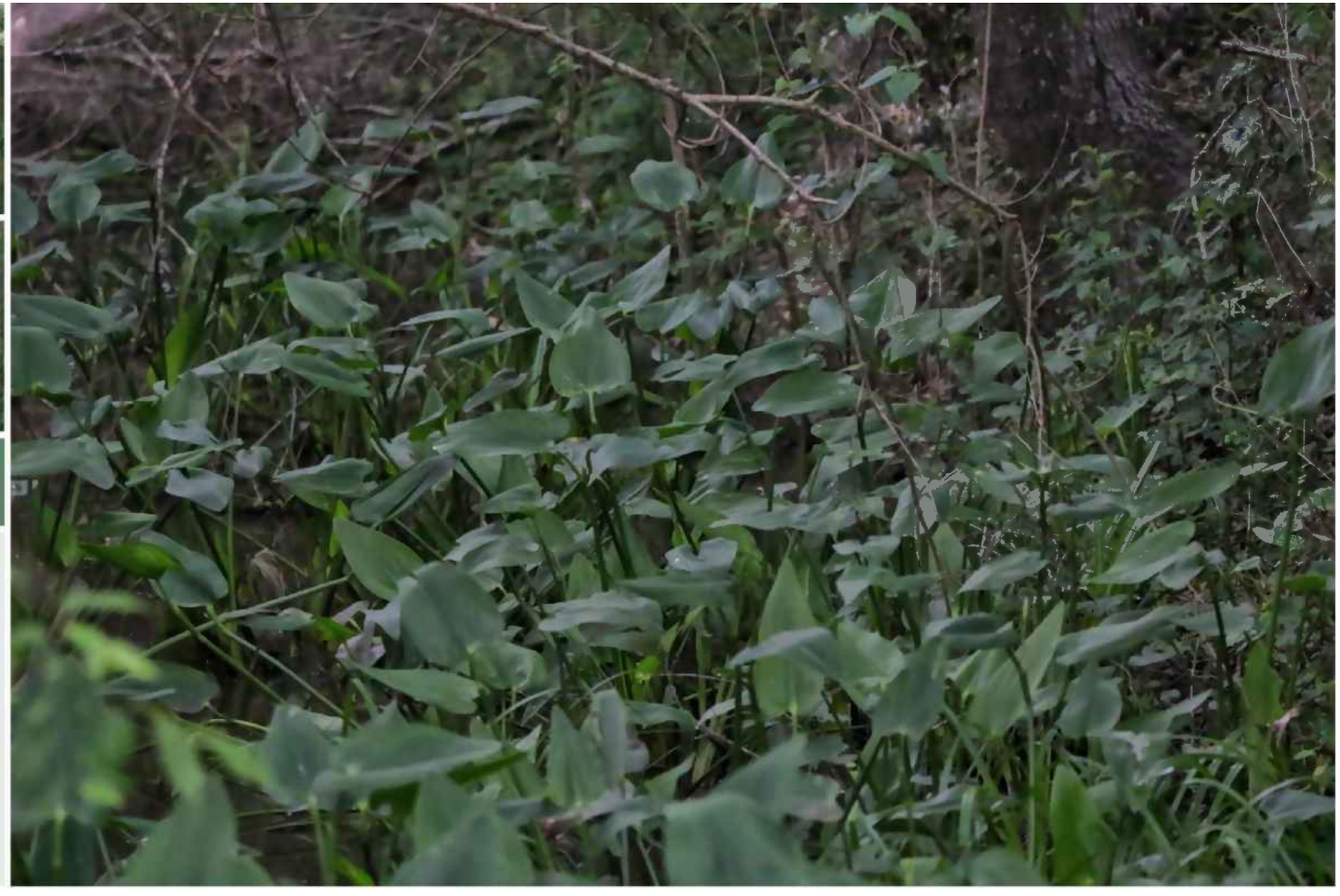


E-Inc-D3

**Ditch**

Natural Community

C. Matherne
April 15, 2025



E-Inc-D3

**Ditch**

Natural Community

K. Cejas
April 15, 2025

E-Inc-D3

**Ditch**

Natural Community

K. Cejas
April 15, 2025

E-Inc-D3

**Ditch**

Natural Community

K. Cejas
April 15, 2025

E-Inc-D3

**Ditch**

Natural Community

K. Cejas
April 15, 2025

E-Inc-D3

**Ditch**

Natural Community

C. Matherne
April 15, 2025

E-Inc-D3

**Ditch**

Natural Community

K. Cejas
April 15, 2025

E-Inc-D3

**Ditch**

Natural Community

K. Cejas
April 15, 2025

E-Inc-D3

**Ditch**

Natural Community

K. Cejas
April 15, 2025

E-Inc-D3

**Ditch**

Natural Community

K. Cejas
April 15, 2025

E-Inc-D3

**Ditch**

Natural Community

C. Matherne
April 15, 2025

E-Inc-D3

**Ditch**

Natural Community

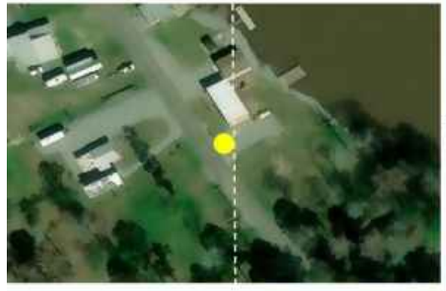
K. Cejas
April 15, 2025

E-Inc-D3

**Ditch**

Natural Community

C. Matherne
April 15, 2025

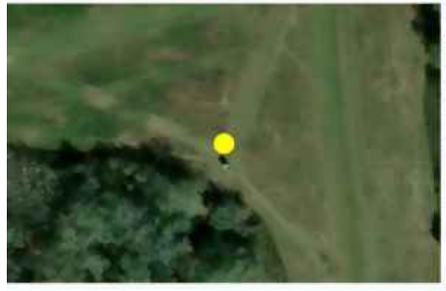


E-Inc-C1

**Camp**

Natural Community

K. Cejas
April 15, 2025

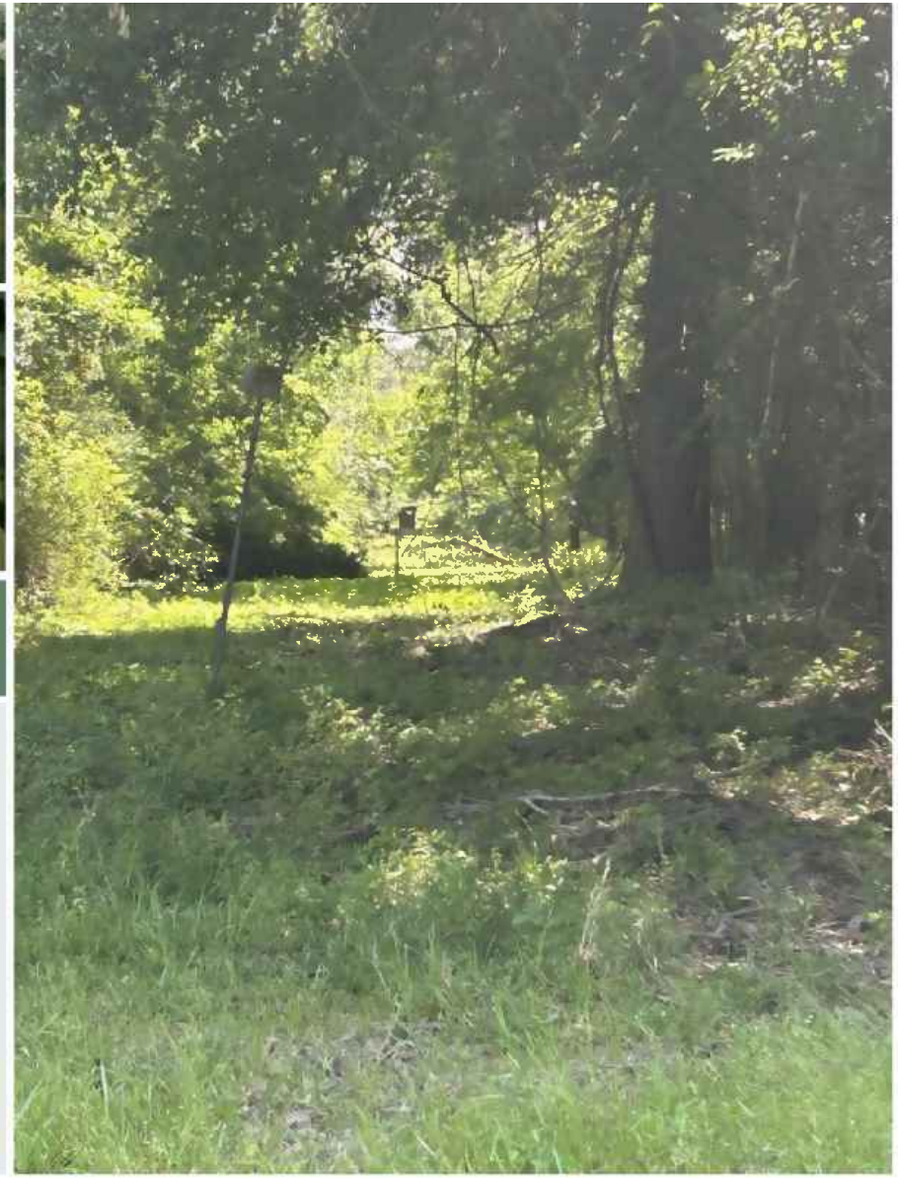


**E-Inc-H1**

**Hunting**

Natural Community

K. Cejas
April 15, 2025



E-Inc-H1

**Hunting**

Natural Community

K. Cejas
April 15, 2025

E-Inc-M1

**Mermentau River**

Natural Community

K. Cejas
April 15, 2025

E-Inc-R1

**Rice Pond**

Natural Community

K. Cejas
April 15, 2025

E-Inc-R1

**Rice Pond**

Natural Community

K. Cejas
April 15, 2025

E-Inc-R1

**Rice Pond**

Natural Community

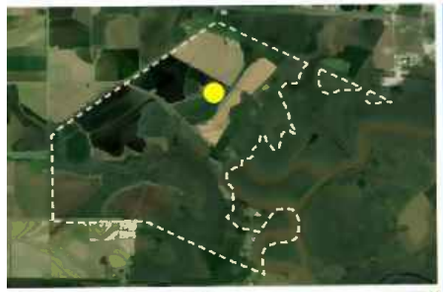
K. Cejas
April 15, 2025

E-Inc-R1

**Rice Pond**

Natural Community

K. Cejas
April 15, 2025



**E-Inc-R2**

**Rice Pond**

Natural Community

K. Cejas
April 15, 2025

E-Inc-R2

**Rice Pond**

Natural Community

K. Cejas
April 15, 2025

E-Inc-R2

**Rice Pond**

Natural Community

K. Cejas
April 15, 2025

E-Inc-R3

**Rice Pond**

Natural Community

K. Cejas
April 15, 2025

E-Inc-R3

**Rice Pond**

Natural Community

K. Cejas
April 15, 2025

E-Inc-R3

**Rice Pond**

Natural Community

K. Cejas
April 15, 2025

**E-Inc-R3**

**Rice Pond**

Natural Community

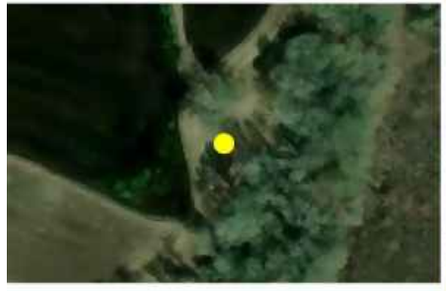
K. Cejas
April 15, 2025

E-Inc-R4 Area

**Rice Pond**

Natural Community

C. Matherne
April 15, 2025



E-Inc-R6 Area

**Rice Pond**

Natural Community

J. Shugart
April 15, 2025

E-Inc-HP

## Hunting

Natural Community

J. Shugart
April 16, 2025

E-Inc-HP

**Hunting**

Natural Community

J. Shugart
April 16, 2025

E-Inc-HP

Hunting

Natural Community

J. Shugart
April 16, 2025

**E-Inc-P**

## Natural Community

K. Cejas
May 29, 2025

SN 78514 Area

**ND**

Natural Community

C. Matherne
April 16, 2025

E-Inc-H1 Vicinity

**Hunting**

Natural Community

K. Cejas
April 15, 2025

# Photographs of Vegetative Species

E-Inc-D3

**Pickerelweed**

*Pontederia cordata*

OBL

J. Shugart
April 15, 2025

E-Inc-D3

**Pickerelweed**

*Pontederia cordata*

OBL

J. Shugart
April 15, 2025

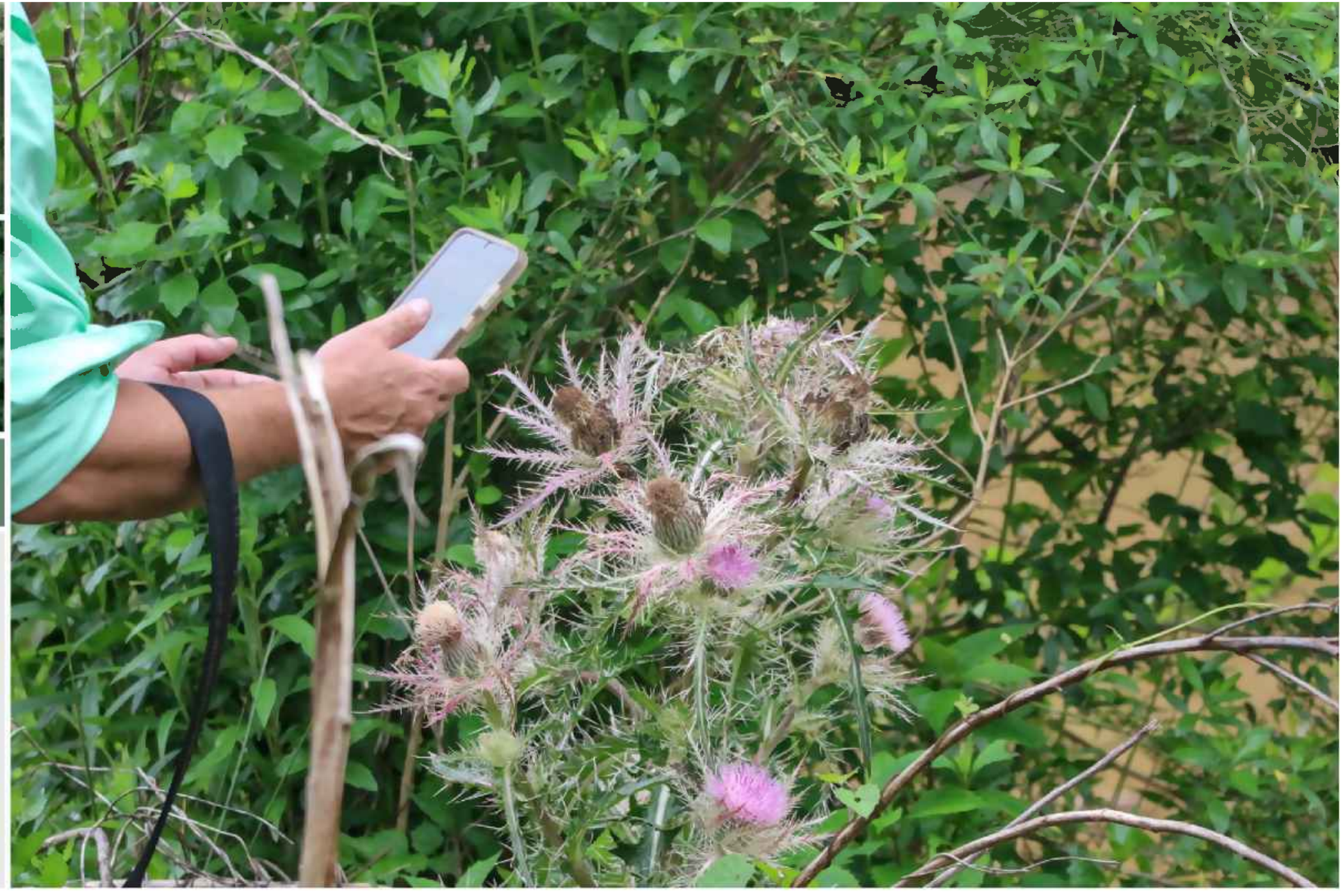
E-Inc-D3

**Yellow thistle**

*Cirsium horridulum*

FAC

C. Matherne
April 15, 2025



E-Inc-D3

**Yellow thistle**

*Cirsium horridulum*

FAC

J. Shugart
April 15, 2025

E-Inc-D3

**Unknown plant**

*Kingdom Plantae*

J. Shugart
April 15, 2025

E-Inc-D3

**Virginia creeper,**
**Eastern poison ivy**

*Parthenocissus quinquefolia,*
*Toxicodenron radicans*

FACU, FAC

C. Matherne
April 15, 2025

E-Inc-D3

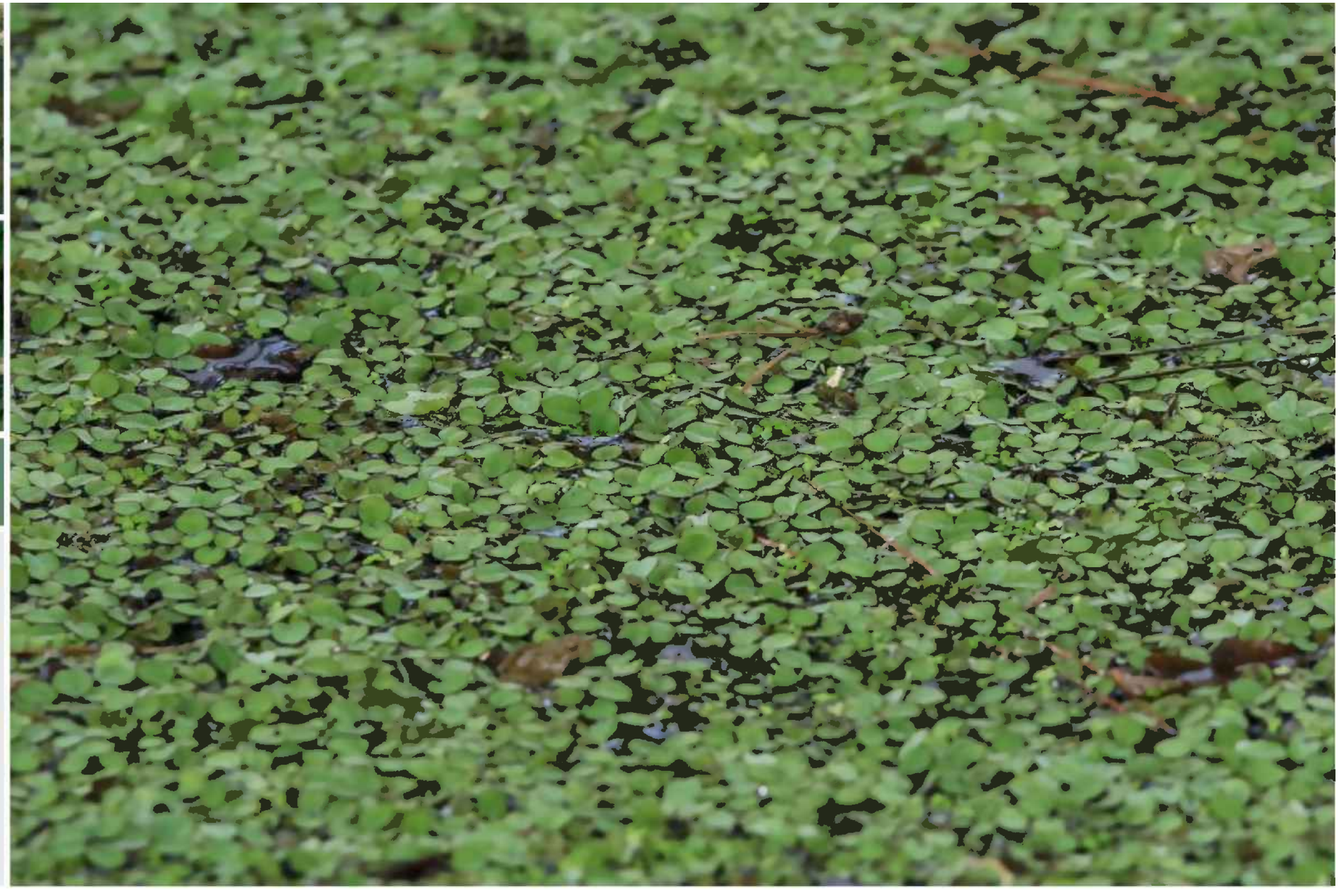
BP/Castex-Ltd Adm-Apx L-000452

**Water spangles, Frog**

*Salvinia minima, Class Amphibia*

OBL, Secondary Consumer

C. Matherne
April 15, 2025



E-Inc-HP

**Savannah-panicgrass**

*Phanopyrum gymnocarpon*

OBL

C. Matherne
April 16, 2025

E-S20-1 (HA-1) Vicinity

**Common sheep sorrel**

*Rumex acetosella*

FACU

J. Shugart
April 15, 2025

E-S20-1 (HA-1) Vicinity

**Common sheep sorrel**

*Rumex acetosella*

FACU

J. Shugart
April 15, 2025

# Photographs of Birds



Castex-ERM-RPT-000455

BP/Castex-Ltd Adm-Apx L-000456

E-Inc-C1

**Great Egret**

*Ardea alba*

Fish

C. Matherne
April 16, 2025

E-Inc-C1

**Red-shouldered Hawk**

*Buteo lineatus*

Mammals

C. Matherne
April 16, 2025

E-Inc-C1

**Carolina Chickadee**

*Poecile carolinensis*

Insects

C. Matherne
April 16, 2025

E-Inc-C1

**Great Egret**

*Ardea alba*

Fish

C. Matherne
April 16, 2025

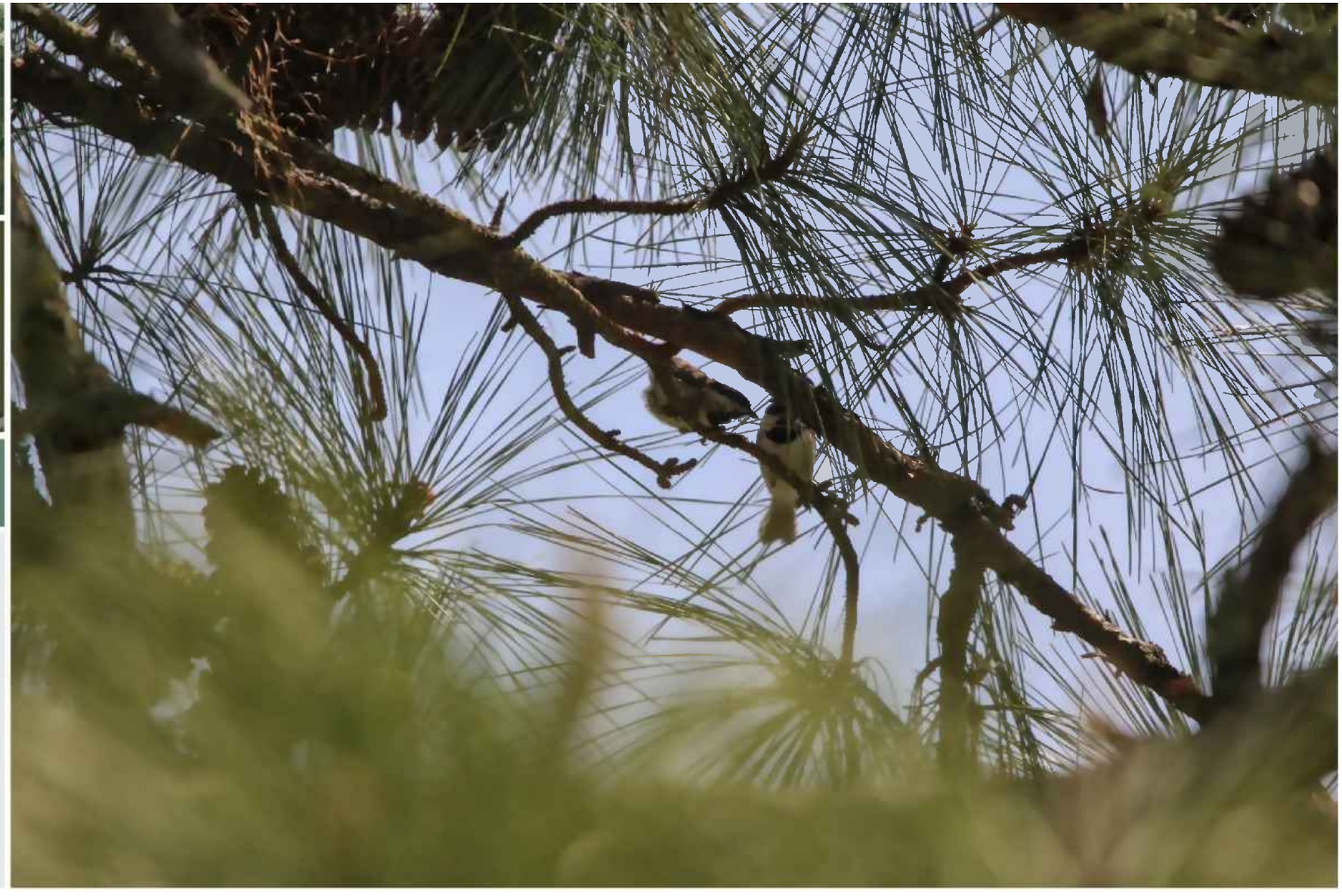
**E-Inc-C1**

**Carolina Chickadee**

*Poecile carolinensis*

Insects

C. Matherne
April 16, 2025



E-Inc-C1

**Neotropic Cormorant**

*Nannopterum brasilianum*

Fish

C. Matherne
April 16, 2025

E-Inc-C1

**Great Blue Heron**

*Ardea herodias*

Fish

C. Matherne
April 16, 2025

E-Inc-C1

**Brown-headed Cowbird**

*Molothrus ater*

Seeds

C. Matherne
April 16, 2025

E-Inc-C1

**Great Blue Heron**

*Ardea herodias*

Fish

C. Matherne
April 16, 2025

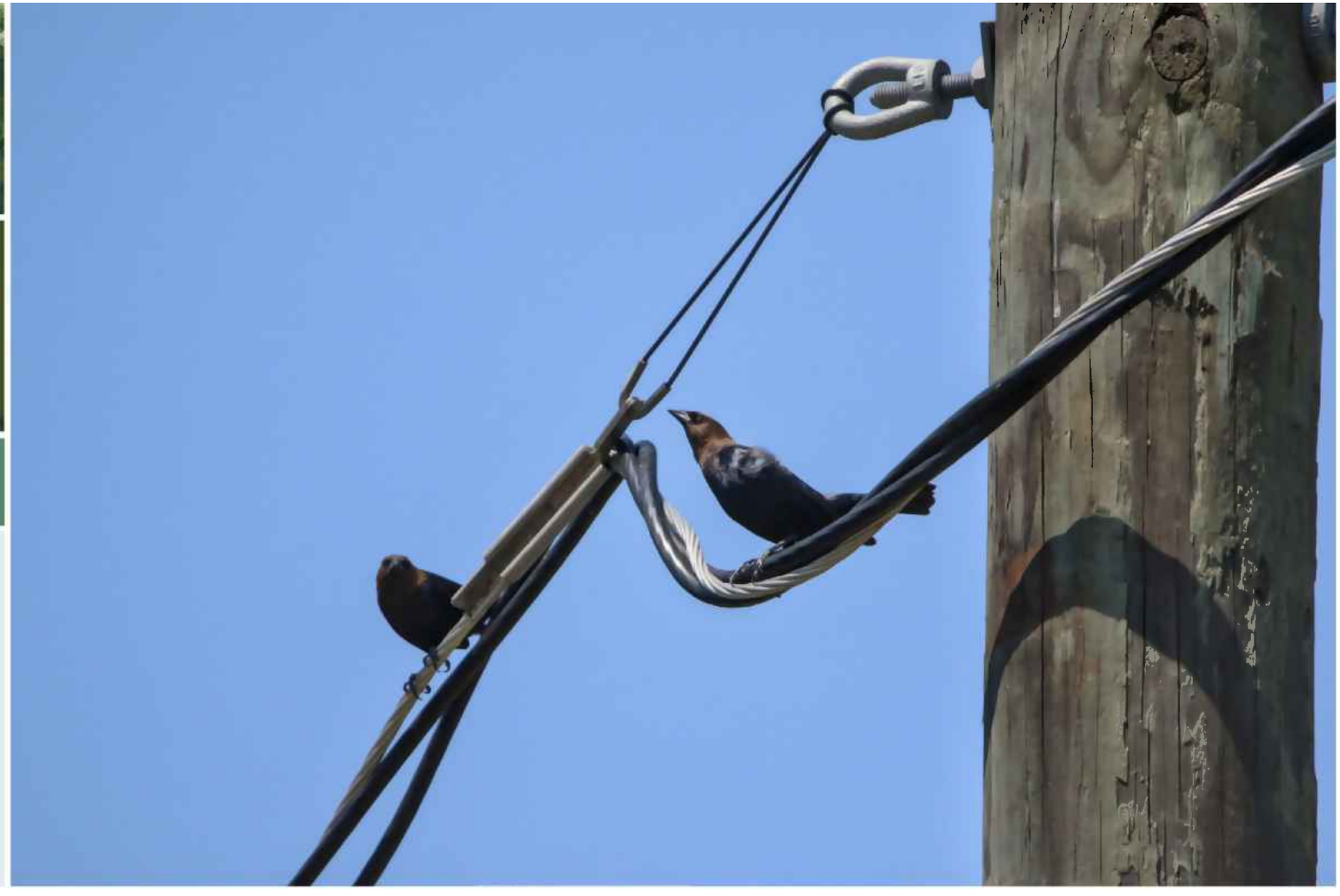
E-Inc-C1

**Brown-headed Cowbird**

*Molothrus ater*

Seeds

C. Matherne
April 16, 2025



**E-Inc-C1**

**Brown-headed Cowbird**

*Molothrus ater*

Seeds

C. Matherne
April 16, 2025

E-Inc-C1

**Eastern Kingbird**

*Tyrannus tyrannus*

Insects

C. Matherne
April 16, 2025

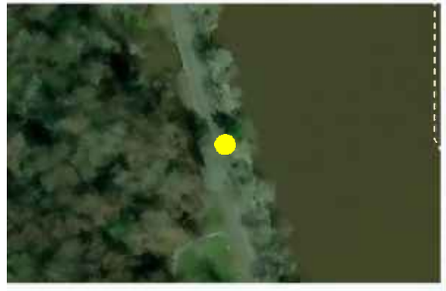
E-Inc-C1

**Great Blue Heron**

*Ardea herodias*

Fish

C. Matherne
April 16, 2025



E-Inc-C1

**Downy Woodpecker**

*Dryobates pubescens*

Insects

C. Matherne
April 16, 2025

**E-Inc-D2**

**Yellow-billed Cuckoo**

*Coccyzus americanus*

Insects

J. Shugart
April 16, 2025

E-Inc-D2

**Little Blue Heron**

*Egretta caerulea*

Fish

J. Shugart
April 16, 2025

**E-Inc-D2**

## Yellow-billed Cuckoo

*Coccyzus americanus*

Insects

C. Matherne
April 16, 2025

E-Inc-D2

**Grackle**

*Quiscalus sp.*

**Omnivore**

C. Matherne
April 16, 2025

E-Inc-D2

**Little Blue Heron**

*Egretta caerulea*

Fish

C. Matherne
April 16, 2025

E-Inc-D2

**Northern Cardinal**

*Cardinalis cardinalis*

Seeds

C. Matherne
April 16, 2025

E-Inc-D3

**Turkey Vulture**

*Cathartes aura*

**Carrion**

C. Matherne
April 15, 2025

E-Inc-D3

**Turkey Vulture**

*Cathartes aura*

**Carrion**

C. Matherne
April 15, 2025

E-Inc-R2

**Blue Grosbeak**

*Passerina caerulea*

Insects

J. Shugart
April 16, 2025

E-Inc-R4 Area

**Great Egret**

*Ardea alba*

Fish

C. Matherne
April 15, 2025

E-Inc-R4 Area

**American Crow**

*Corvus brachyrhynchos*

Omnivore

C. Matherne
April 16, 2025

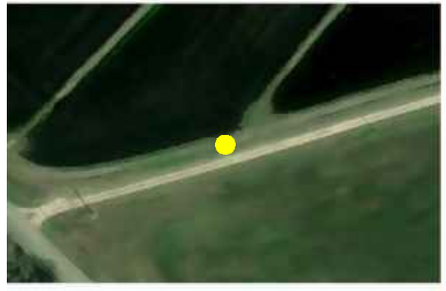
E-Inc-R4 Area

**Bank Swallow**

*Riparia riparia*

Insects

C. Matherne
April 16, 2025



E-Inc-R5 Area

**Tree Swallow**

*Tachycineta bicolor*

Insects

C. Matherne
April 16, 2025

E-Inc-R6 Area

**Eastern Kingbird**

*Tyrannus tyrannus*

Insects

J. Shugart
April 16, 2025

**E-Inc-R6 Area**

**Indigo Bunting**

*Passerina cyanea*

Insects

J. Shugart
April 16, 2025

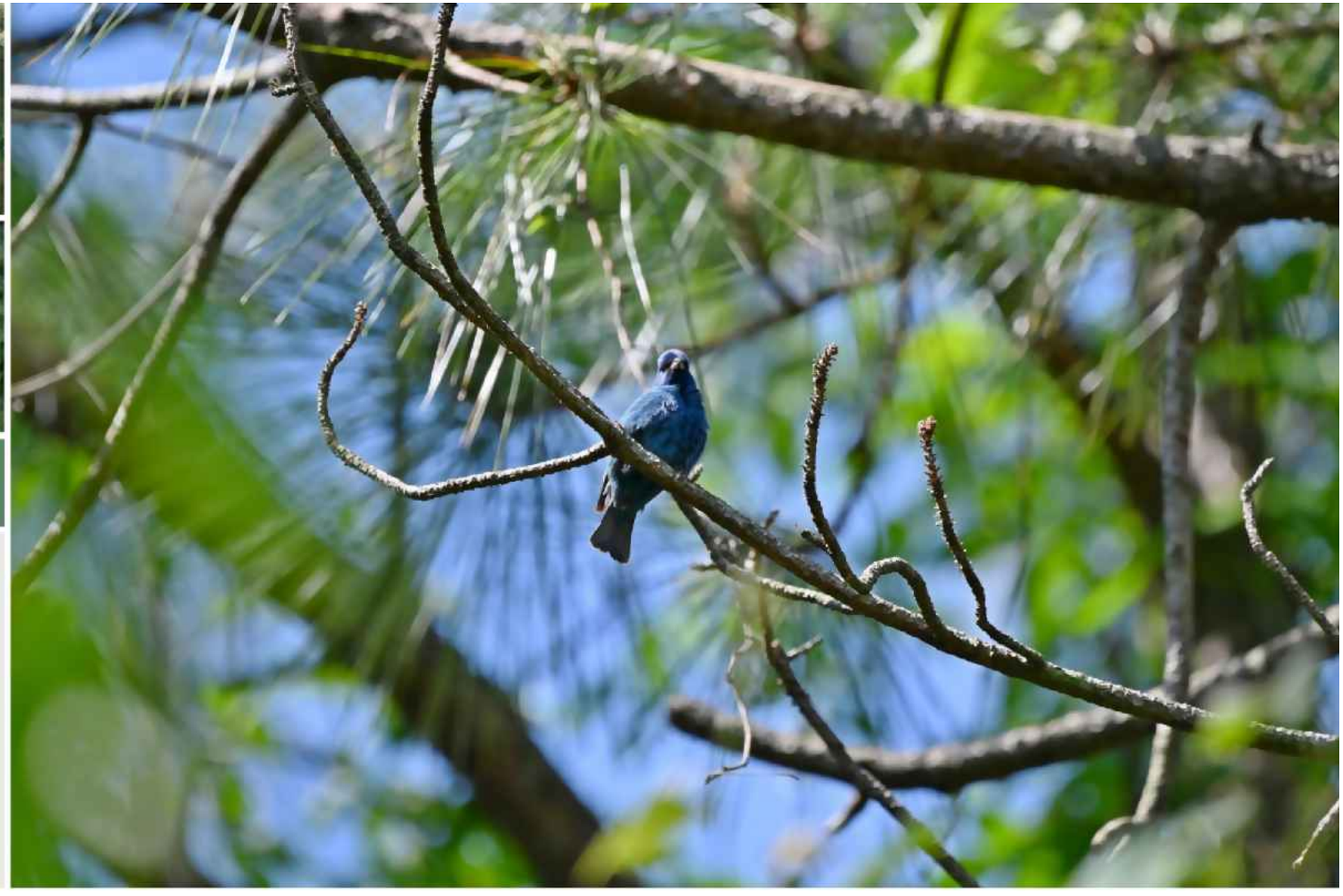
**E-Inc-R6 Area**

**Indigo Bunting**

*Passerina cyanea*

Insects

J. Shugart
April 16, 2025



**E-Inc-R6 Area**

**Indigo Bunting**

*Passerina cyanea*

Insects

J. Shugart
April 16, 2025

E-Inc-R6 Area

**Tufted Titmouse**

*Baeolophus bicolor*

Insects

J. Shugart
April 16, 2025

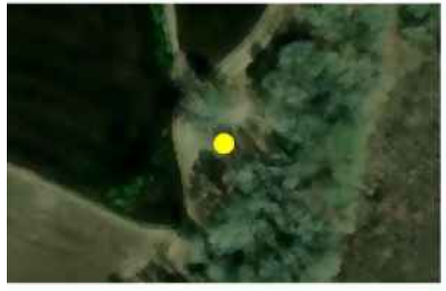
E-Inc-R6 Area

**Brown-headed Cowbird**

*Molothrus ater*

Seeds

J. Shugart
April 16, 2025



E-Inc-R6 Area

**Great Egret**

*Ardea alba*

Fish

C. Matherne
April 15, 2025

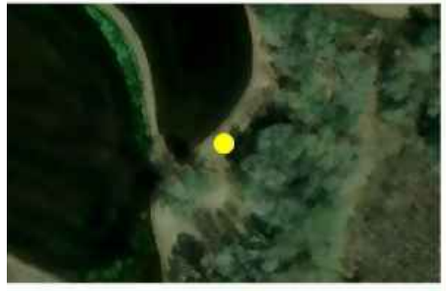
E-Inc-R6 Area

**Red-shouldered Hawk**

*Buteo lineatus*

Mammals

C. Matherne
April 15, 2025



E-Inc-R6 Area

**Eastern Kingbird**

*Tyrannus tyrannus*

Insects

C. Matherne
April 16, 2025

Castex-ERM-RPT-000491
**BP/Castex-Ltd Adm-Apx L-000492**

E-Inc-R6 Area

**Indigo Bunting**

*Passerina cyanea*

Insects

C. Matherne
April 16, 2025

E-Inc-R6 Area

**Northern Cardinal**

*Cardinalis cardinalis*

Seeds

C. Matherne
April 16, 2025

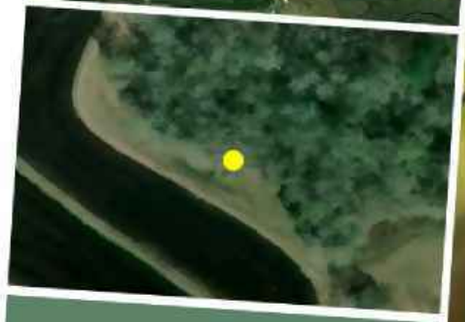
E-Inc-R6 Area

**Tufted Titmouse**

*Baeolophus bicolor*

Insects

C. Matherne
April 16, 2025



E-Inc-R6 Area

**Tufted Titmouse**

*Baeolophus bicolor*

Insects

C. Matherne
April 16, 2025

ERM

E-Inc-R6 Area

**Brown-headed Cowbird**

*Molothrus ater*

Seeds

C. Matherne
April 16, 2025

E-Inc-BL

**Western Cattle-Egret**

*Ardea ibis*

Insects

J. Shugart
April 16, 2025

E-Inc-BL

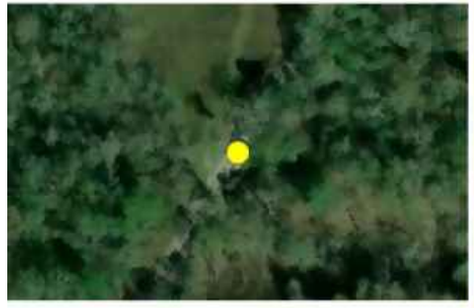
**Summer Tanager**

*Piranga rubra*

Insects

J. Shugart
April 16, 2025

BP/Castex-Ltd Adm-Apx L-000499



E-Inc-BL

BP/Castex-Ltd Adm-Apx L-000500

**Summer Tanager**

*Piranga rubra*

Insects

J. Shugart
April 16, 2025

E-Inc-BL

**Gray Catbird**

*Dumetella carolinensis*

Insects

J. Shugart
April 16, 2025

E-Inc-BL

**Great Blue Heron**

*Ardea herodias*

Fish

J. Shugart
April 16, 2025

E-Inc-BL

**Unknown bird**

*Class Aves*

C. Matherne
April 15, 2025

E-Inc-BL

**Blue Jay**

*Cyanocitta cristata*

**Omnivore**

C. Matherne
April 16, 2025

E-Inc-BL

**Snowy Egret**

*Egretta thula*

**Fish**

C. Matherne
April 16, 2025

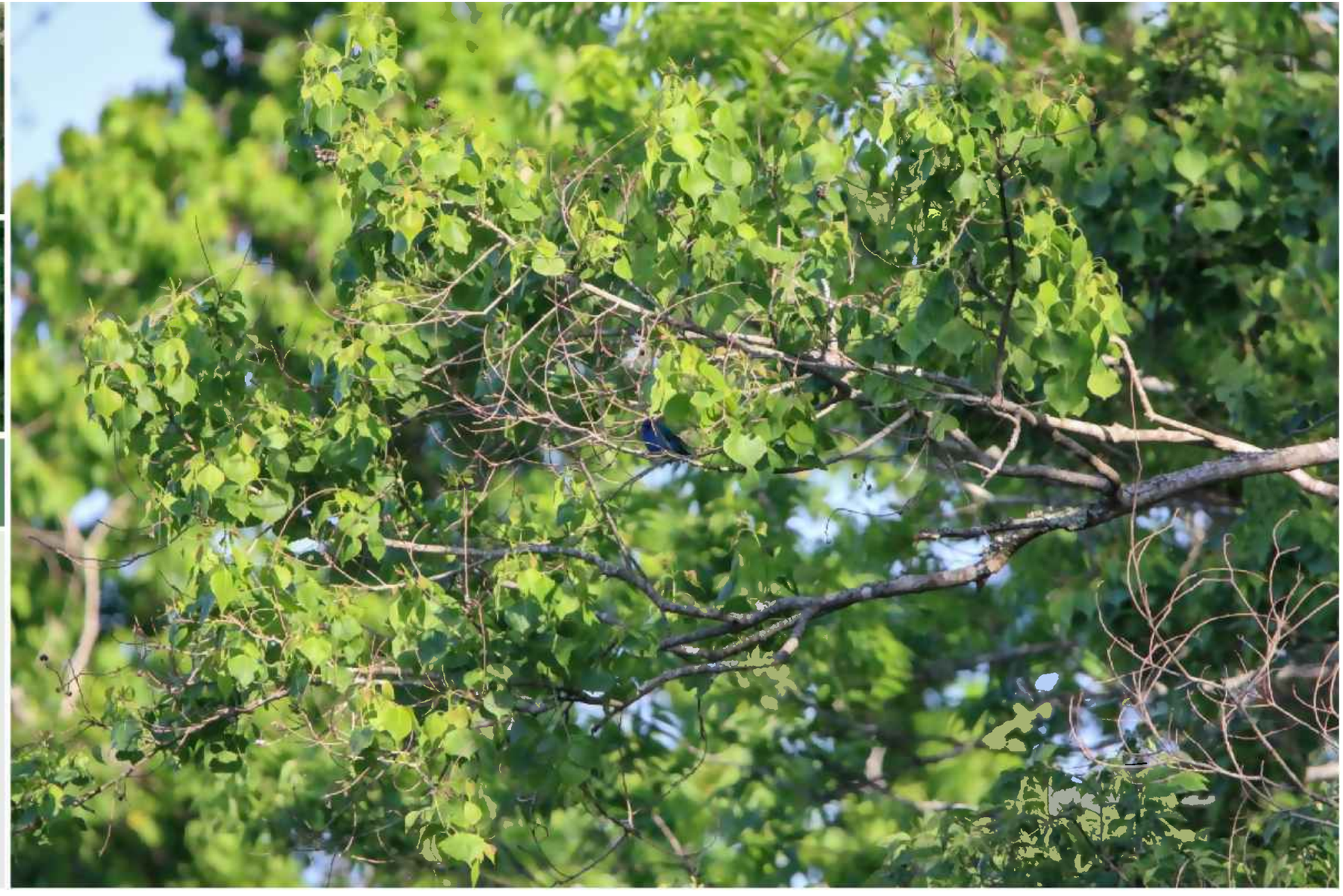
**E-Inc-BL**

**Indigo Bunting**

*Passerina cyanea*

Insects

C. Matherne
April 16, 2025



**E-Inc-BL**

**Cedar Waxwing**

*Bombycilla cedrorum*

Fruit

C. Matherne
April 16, 2025

E-Inc-BL

**Summer Tanager**

*Piranga rubra*

Insects

C. Matherne
April 16, 2025

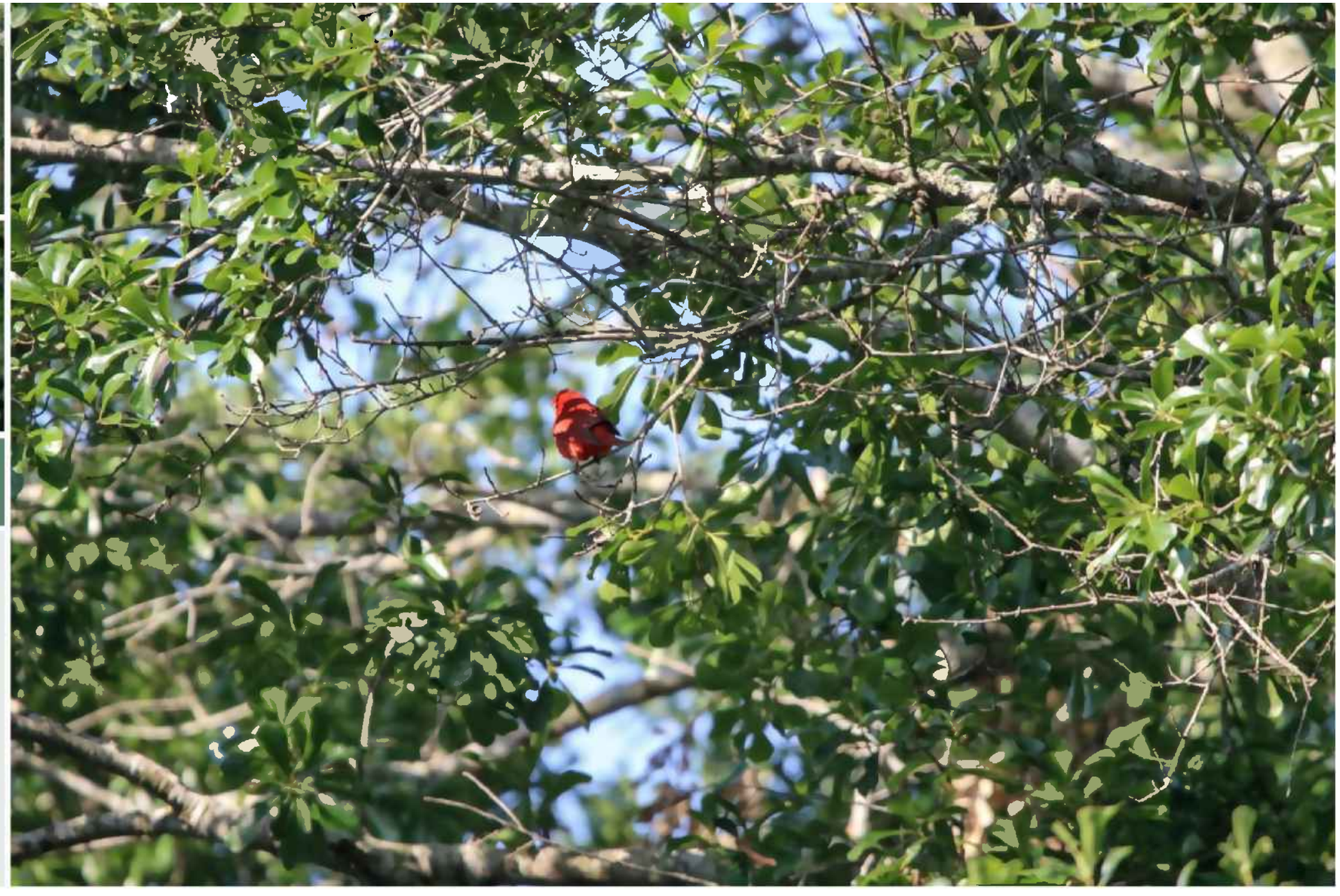
E-Inc-BL

**Summer Tanager**

*Piranga rubra*

Insects

C. Matherne
April 16, 2025



**E-Inc-BL**

**Gray Catbird**

*Dumetella carolinensis*

Insects

C. Matherne
April 16, 2025

E-Inc-BL

**Summer Tanager**

*Piranga rubra*

Insects

C. Matherne
April 16, 2025

E-Inc-CL

**Northern Rough-winged Swallow**

*Stelgidopteryx serripennis*

Insects

J. Shugart
April 16, 2025

E-Inc-CL

**Northern Rough-winged Swallow**

*Stelgidopteryx serripennis*

Insects

J. Shugart
April 16, 2025

E-Inc-CL

**Red-shouldered Hawk**

*Buteo lineatus*

Mammals

J. Shugart
April 16, 2025

E-Inc-CL

**Red-shouldered Hawk**

*Buteo lineatus*

Mammals

J. Shugart
April 16, 2025

E-Inc-CL

**Yellow-crowned Night Heron**

*Nyctanassa violacea*

Aquatic Invertebrates

C. Matherne
April 16, 2025

E-Inc-CL

**Great Blue Heron**

*Ardea herodias*

Fish

C. Matherne
April 16, 2025

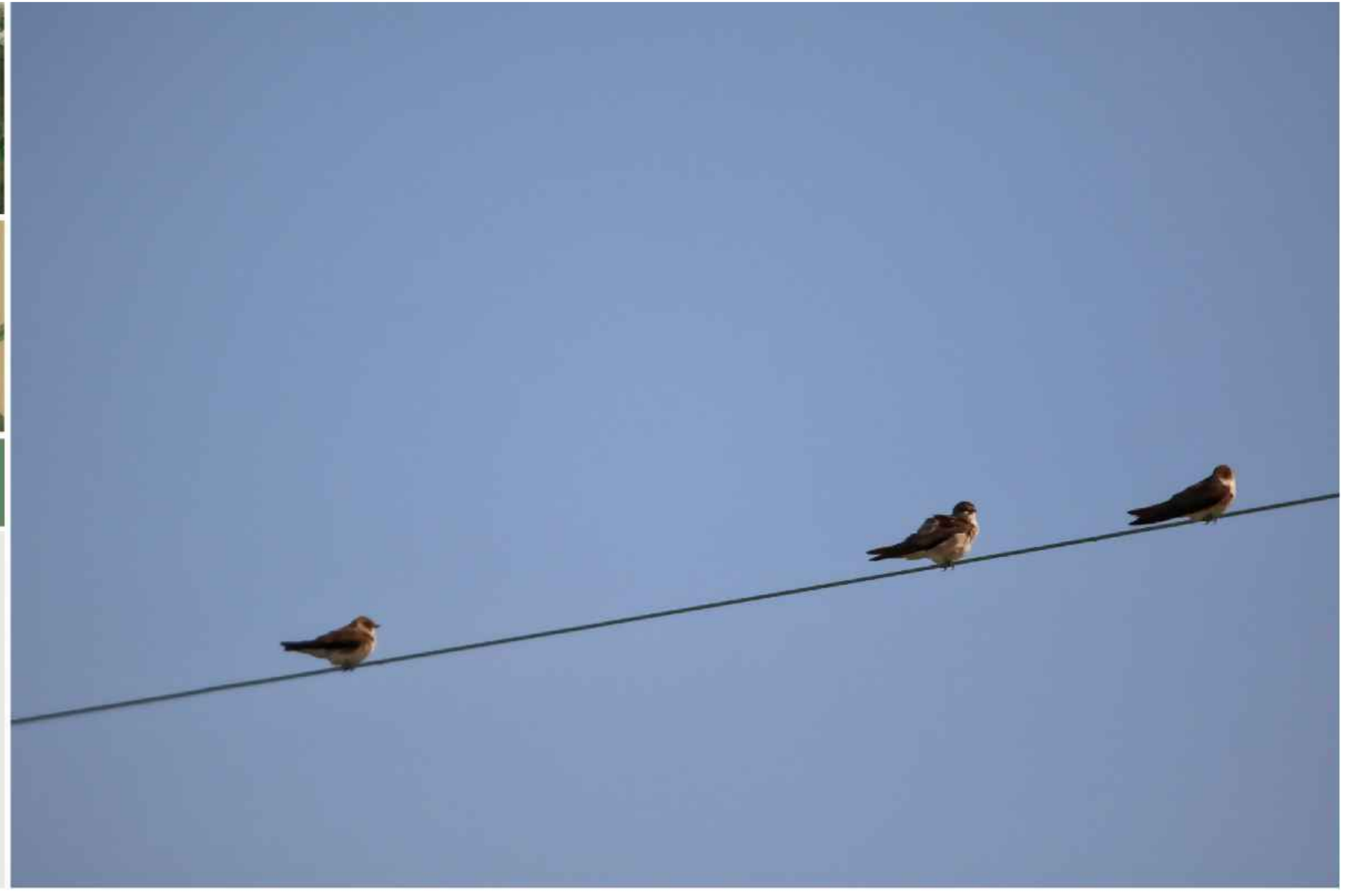
E-Inc-CL

**Northern Rough-winged Swallow**

*Stelgidopteryx serripennis*

Insects

C. Matherne
April 16, 2025



E-Inc-CL

**Northern Rough-winged Swallow**

*Stelgidopteryx serripennis*

Insects

C. Matherne
April 16, 2025

E-Inc-CL

**Northern Rough-winged Swallow**

*Stelgidopteryx serripennis*

Insects

C. Matherne
April 16, 2025

E-Inc-CL

**Red-shouldered Hawk**

*Buteo lineatus*

Mammals

C. Matherne
April 16, 2025

E-Inc-CL

**Red-shouldered Hawk**

*Buteo lineatus*

Mammals

C. Matherne
April 16, 2025

E-Inc-CL

**Black Vulture**

*Coragyps atratus*

Carrion

C. Matherne
April 16, 2025

E-Inc-HP

**Prothonotary Warbler**

*Protonotaria citrea*

Insects

J. Shugart
April 16, 2025

E-Inc-HP

**Northern Parula**

*Setophaga americana*

Insects

J. Shugart
April 16, 2025

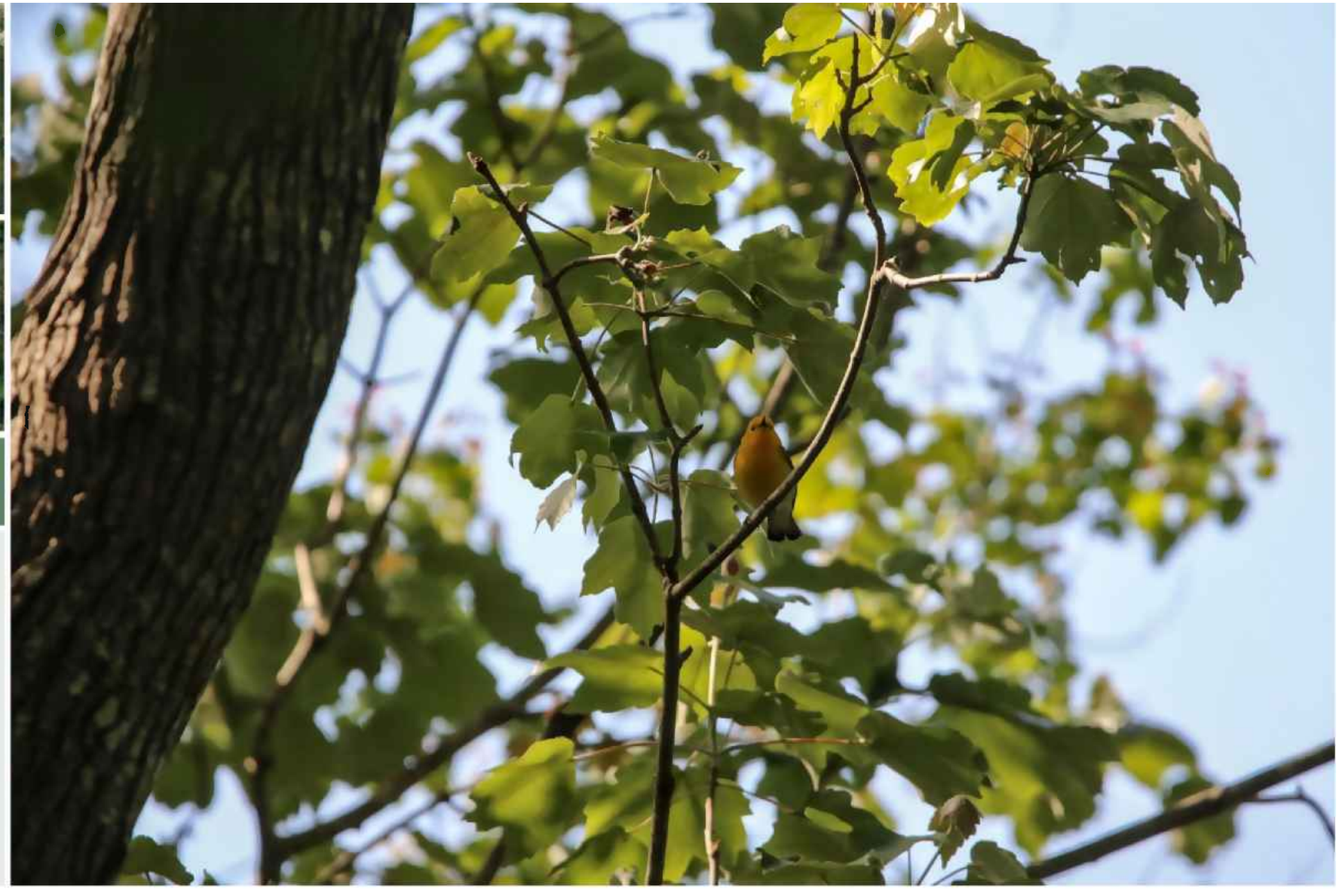
E-Inc-HP

## Prothonotary Warbler

*Protonotaria citrea*

Insects

C. Matherne
April 16, 2025



BP/Castex-Ltd Adm-Apx L-000527

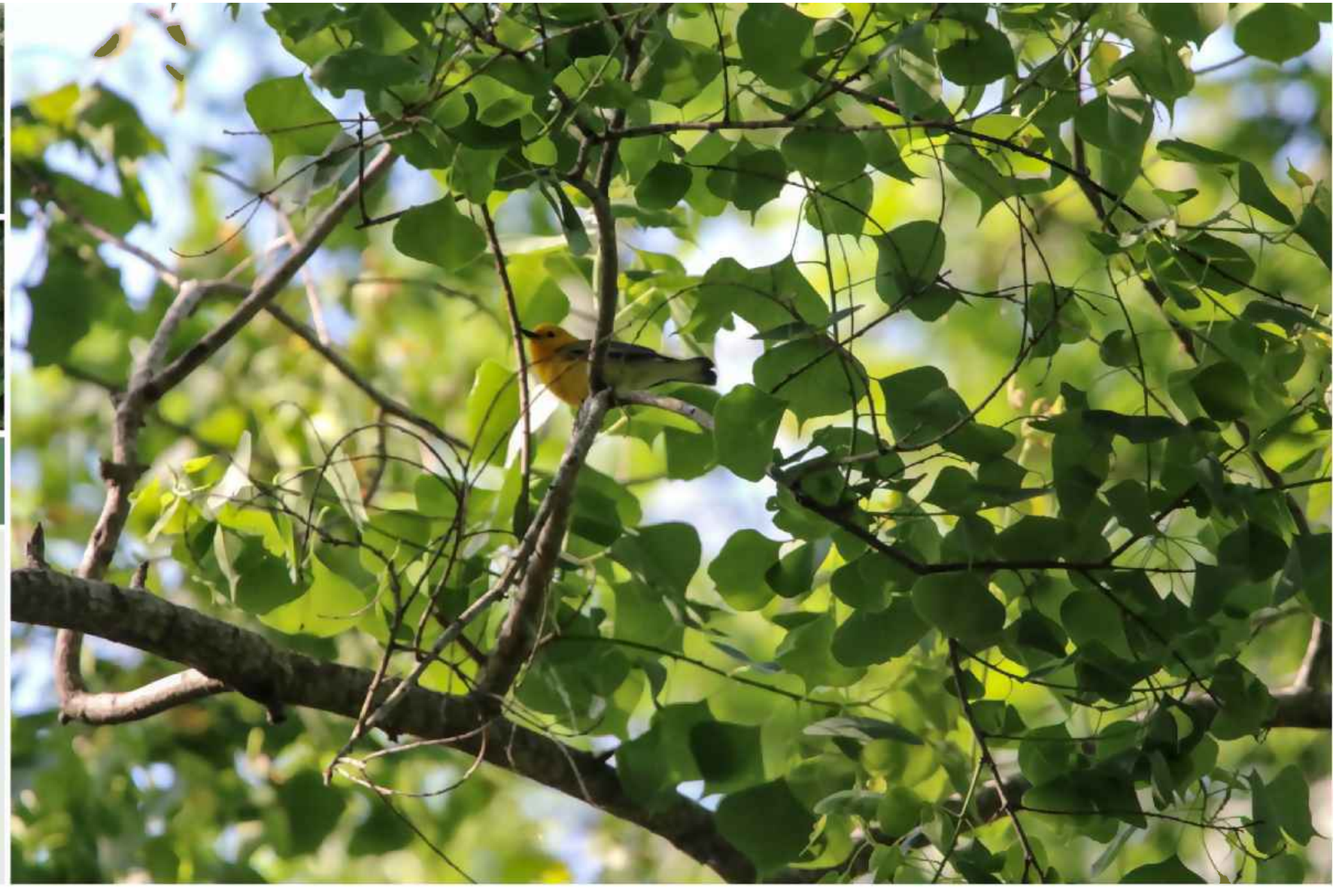
E-Inc-HP

## Prothonotary Warbler

*Protonotaria citrea*

Insects

C. Matherne
April 16, 2025



E-Inc-HP

## Prothonotary Warbler

*Protonotaria citrea*

Insects

C. Matherne
April 16, 2025

E-Inc-HP

**Red-bellied Woodpecker**

*Melanerpes carolinus*

Insects

C. Matherne
April 16, 2025

SN 200772 Area

**Ring-billed Gull**

*Larus delawarensis*

Omnivore

J. Shugart
April 16, 2025

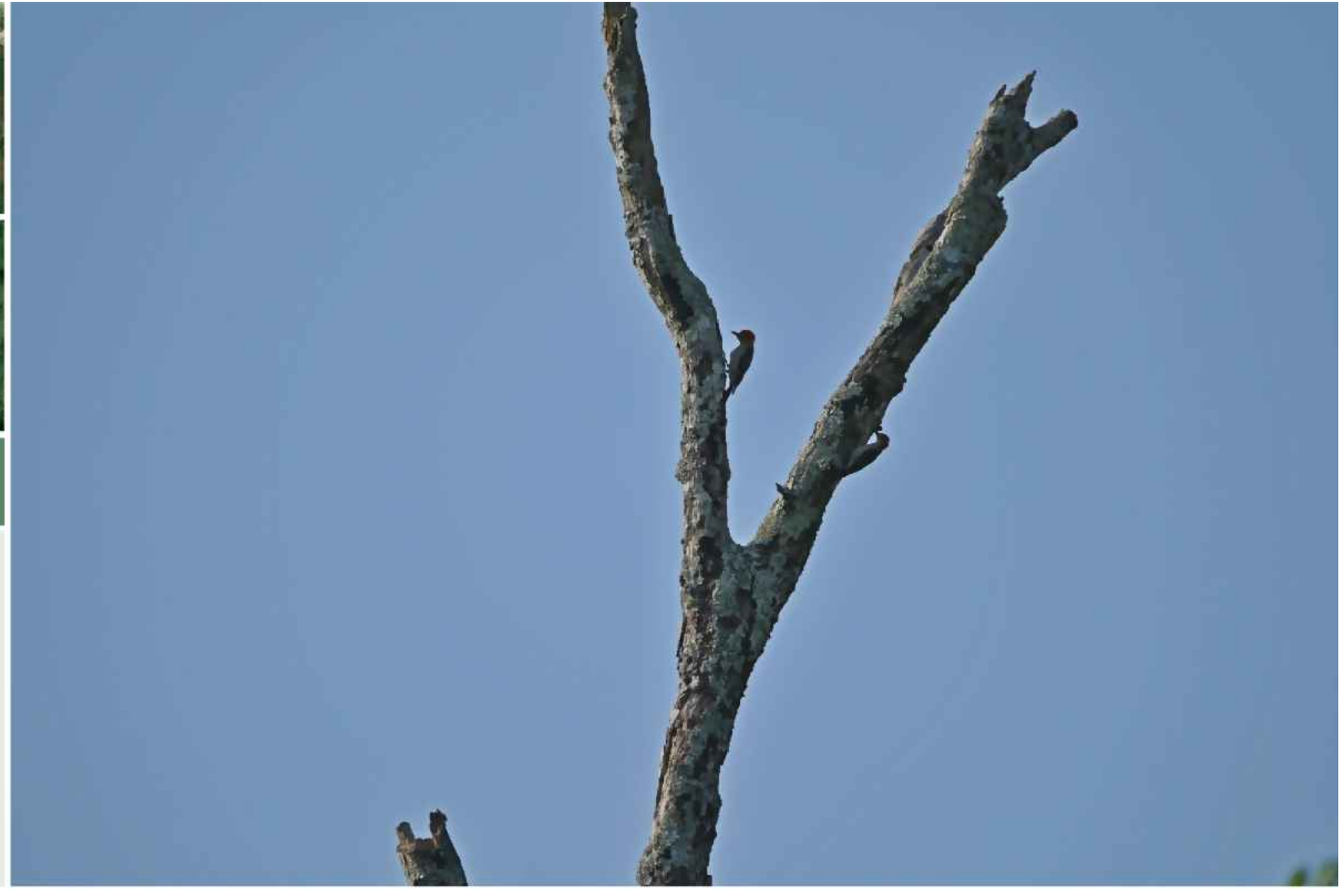
SN 200772 Area

**Red-bellied Woodpecker**

*Melanerpes carolinus*

Insects

J. Shugart
April 16, 2025



SN 200772 Area

**Great Egret**

*Ardea alba*

Fish

J. Shugart
April 16, 2025

SN 200772 Area

**Cedar Waxwing**

*Bombycilla cedrorum*

**Fruit**

J. Shugart
April 16, 2025

SN 200772 Area

**Tree Swallow**

*Tachycineta bicolor*

Insects

C. Matherne
April 16, 2025

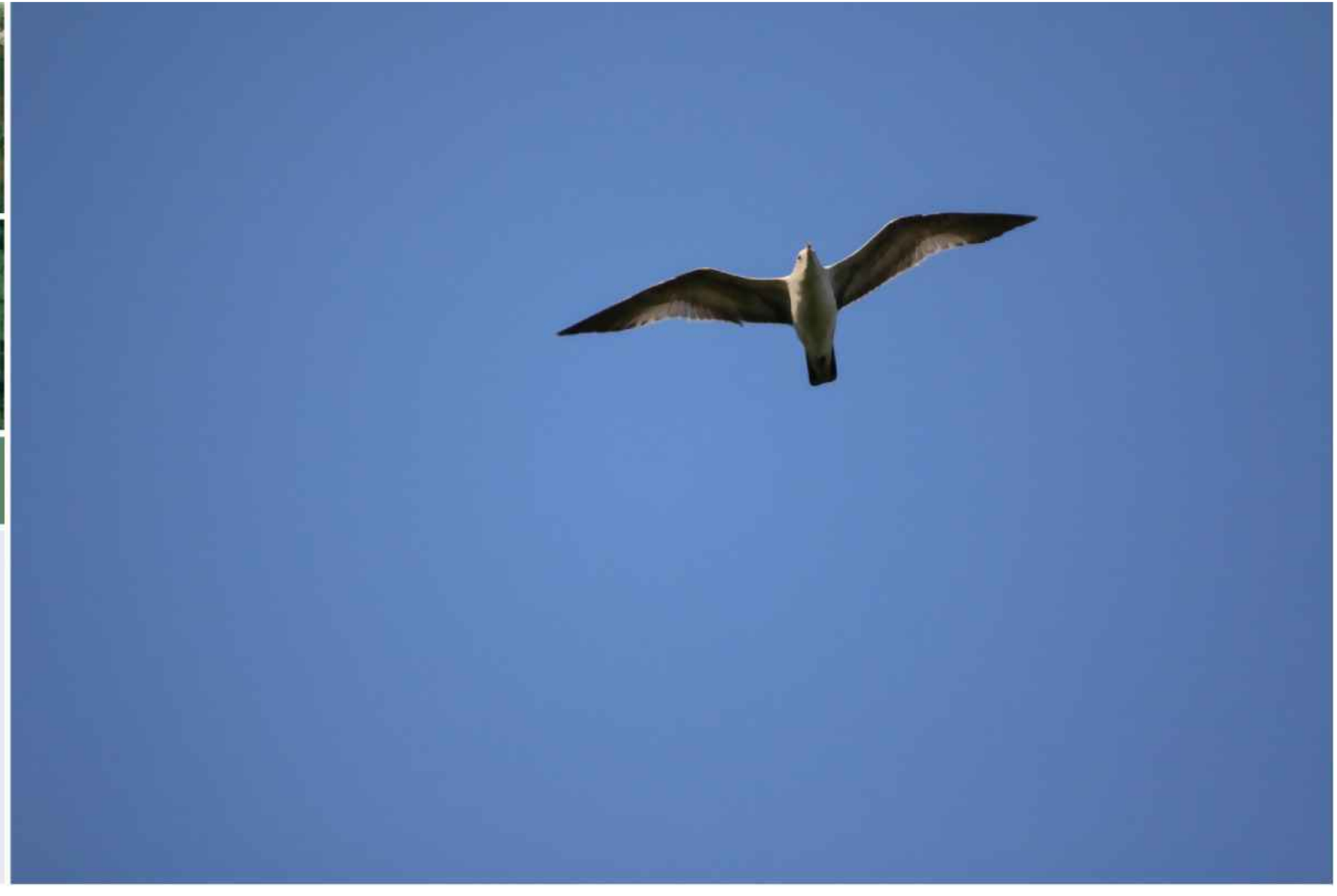
SN 200772 Area

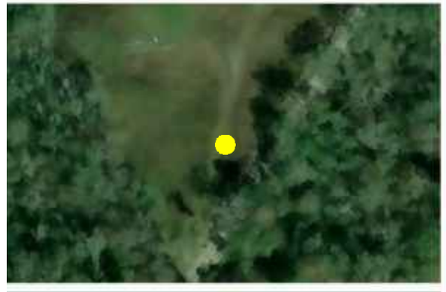
**Ring-billed Gull**

*Larus delawarensis*

Omnivore

C. Matherne
April 16, 2025





SN 200772 Area

**Tree Swallow**

*Tachycineta bicolor*

Insects

C. Matherne
April 16, 2025

SN 200772 Area

**Red-bellied Woodpecker**

*Melanerpes carolinus*

Insects

C. Matherne
April 16, 2025

SN 78514 Area

**Bird nest**

*Class Aves*

C. Matherne
April 16, 2025

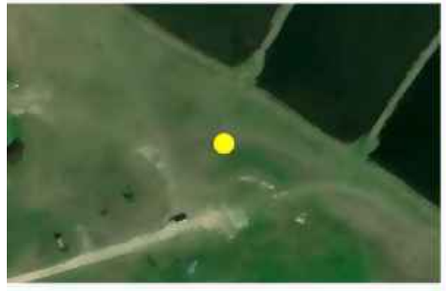
SN 76164 Area

**Chimney Swift**

*Chaetura pelagica*

Insects

J. Shugart
April 15, 2025



SN 76164 Area

**Great Blue Heron**

*Ardea herodias*

Fish

J. Shugart
April 15, 2025

SN 76164 Area

**Tree Swallow**

*Tachycineta bicolor*

Insects

J. Shugart
April 16, 2025

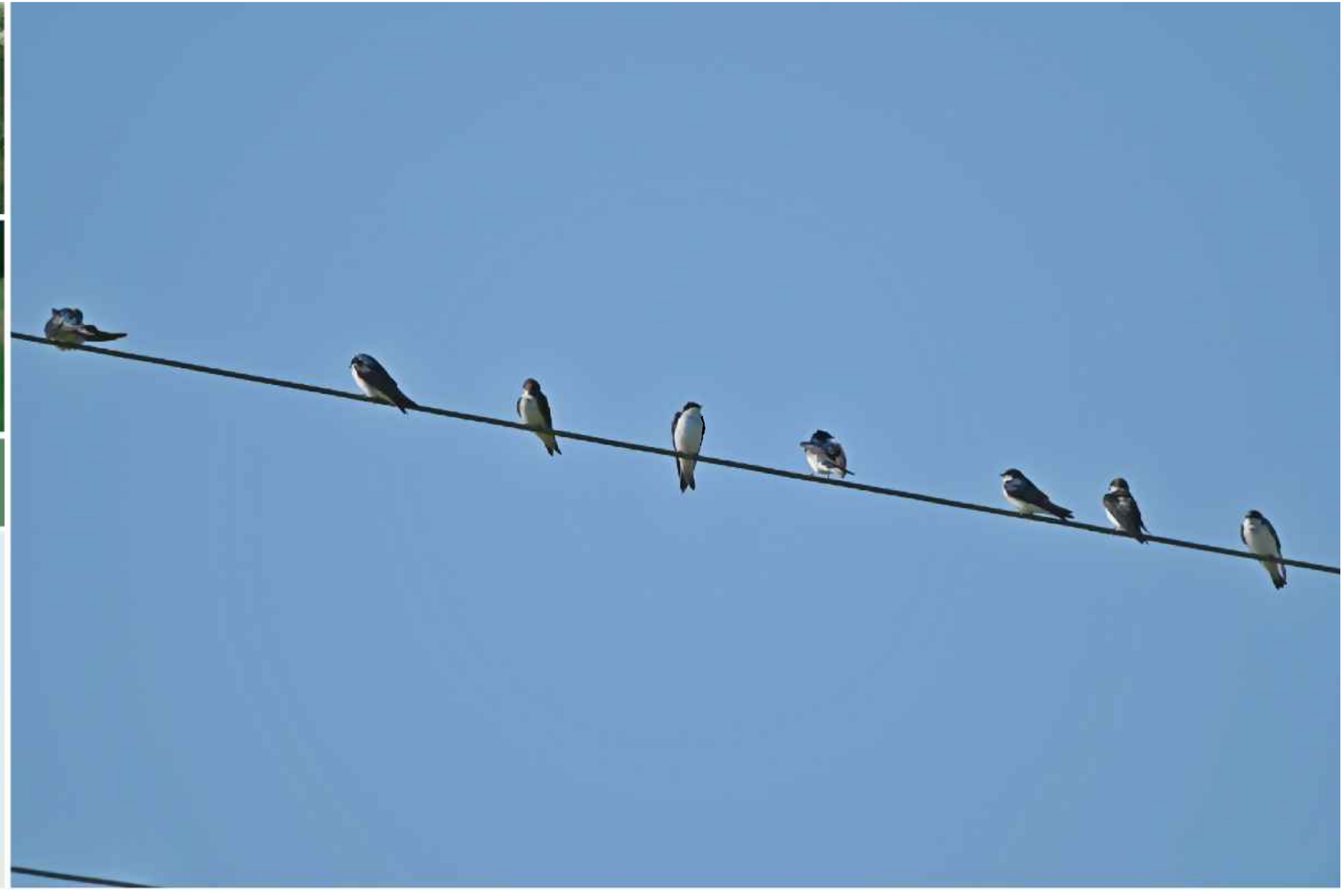
SN 76164 Area

**Tree Swallow**

*Tachycineta bicolor*

Insects

J. Shugart
April 16, 2025



SN 76164 Area

**Red-winged Blackbird**

*Agelaius phoeniceus*

Insects

C. Matherne
April 15, 2025

SN 76164 Area

**Brown-headed Cowbird**

*Molothrus ater*

Seeds

C. Matherne
April 15, 2025

SN 76164 Area

**American Crow**

*Corvus brachyrhynchos*

**Omnivore**

C. Matherne
April 15, 2025

SN 76164 Area

**Black-bellied Whistling Duck**

*Dendrocygna autumnalis*

Plants

C. Matherne
April 15, 2025

SN 76164 Area

**Great Blue Heron**

*Ardea herodias*

Fish

C. Matherne
April 15, 2025

SN 76164 Area

**American Crow**

*Corvus brachyrhynchos*

Omnivore

C. Matherne
April 15, 2025

SN 76164 Area

**Black-bellied Whistling Duck**

*Dendrocygna autumnalis*

Plants

C. Matherne
April 15, 2025

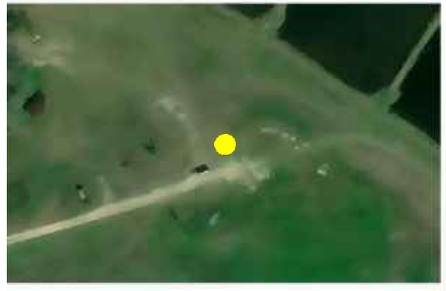
SN 76164 Area

**Red-winged Blackbird**

*Agelaius phoeniceus*

Insects

C. Matherne
April 15, 2025



SN 76164 Area

**Red-winged Blackbird**

*Agelaius phoeniceus*

Insects

C. Matherne
April 15, 2025

**SN 76164 Area**

**Red-winged Blackbird**

*Agelaius phoeniceus*

Insects

C. Matherne
April 15, 2025

SN 76164 Area

**Brown-headed Cowbird**

*Molothrus ater*

Seeds

C. Matherne
April 15, 2025

SN 76164 Area

**Great Egret**

*Ardea alba*

Fish

C. Matherne
April 15, 2025

SN 76164 Area

**Brown-headed Cowbird**

*Molothrus ater*

Seeds

C. Matherne
April 15, 2025

**SN 76164 Area**

**American Crow**

*Corvus brachyrhynchos*

**Omnivore**

C. Matherne
April 15, 2025

SN 76164 Area

**Ring-billed Gull**

*Larus delawarensis*

Omnivore

C. Matherne
April 16, 2025

SN 76164 Area

**Laughing Gull**

*Leucophaeus atricilla*

Aquatic Invertebrates

C. Matherne
April 16, 2025

SN 76164 Area

**Tree Swallow**

*Tachycineta bicolor*

Insects

C. Matherne
April 16, 2025

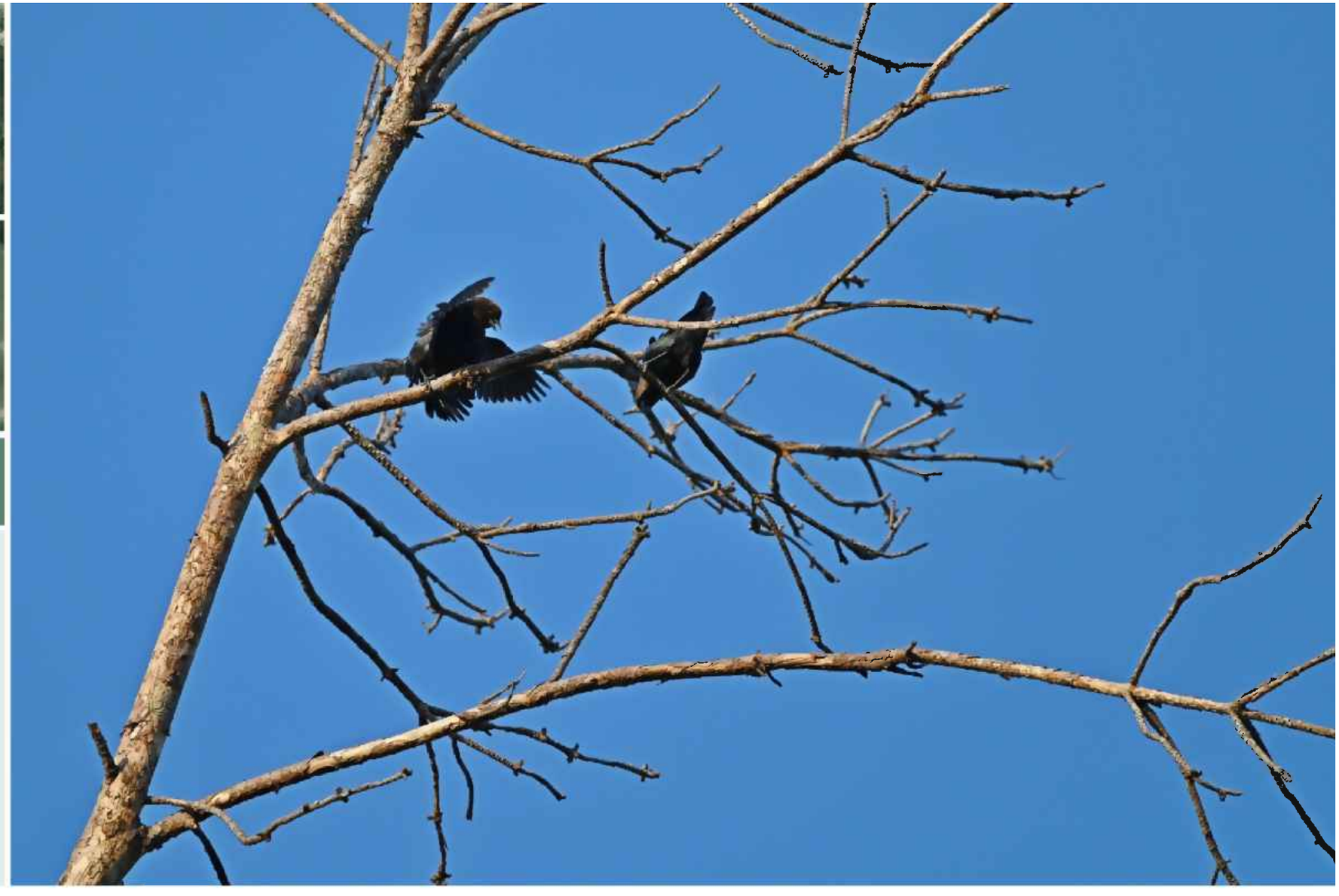
E-S20-1 (HA-1) Vicinity

**Brown-headed Cowbird**

*Molothrus ater*

Seeds

J. Shugart
April 16, 2025



E-S20-1 (HA-1) Vicinity

**Brown-headed Cowbird**

*Molothrus ater*

Seeds

J. Shugart
April 16, 2025

E-S20-1 (HA-1) Vicinity

**Tree Swallow**

*Tachycineta bicolor*

Insects

J. Shugart
April 16, 2025

E-S20-1 (HA-1) Vicinity

**Turkey Vulture**

*Cathartes aura*

Carrion

C. Matherne
April 15, 2025

E-S20-1 (HA-1) Vicinity

**Red-shouldered Hawk**

*Buteo lineatus*

Mammals

C. Matherne
April 16, 2025

E-S20-3 (HA-3) Vicinity

**Indigo Bunting**

*Passerina cyanea*

Insects

J. Shugart
April 16, 2025

E-S20-3 (HA-3) Vicinity

**Indigo Bunting**

*Passerina cyanea*

Insects

J. Shugart
April 16, 2025

E-S20-3 (HA-3) Vicinity

**Indigo Bunting**

*Passerina cyanea*

Insects

J. Shugart
April 16, 2025

**E-S20-3 (HA-3) Vicinity**

**Orchard Oriole**

*Icterus spurius*

Insects

J. Shugart
April 16, 2025

E-S20-3 (HA-3) Vicinity

**Blue Grosbeak**

*Passerina caerulea*

Insects

C. Matherne
April 16, 2025

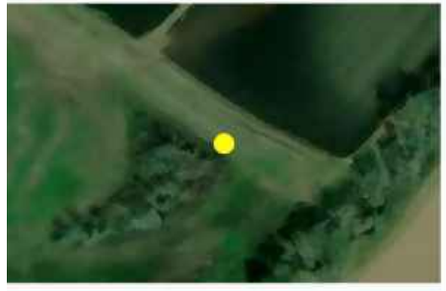
E-S20-3 (HA-3) Vicinity

**Blue Grosbeak**

*Passerina caerulea*

Insects

C. Matherne
April 16, 2025



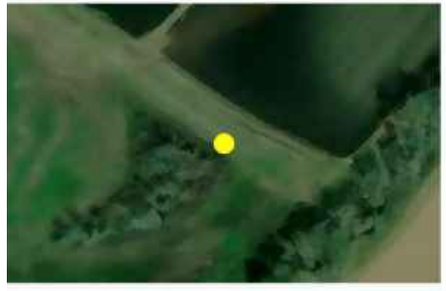
E-S20-3 (HA-3) Vicinity

**Indigo Bunting**

*Passerina cyanea*

Insects

C. Matherne
April 16, 2025



E-S20-3 (HA-3) Vicinity

**Indigo Bunting**

*Passerina cyanea*

Insects

C. Matherne
April 16, 2025

E-S20-3 (HA-3) Vicinity

**Bank Swallow**

*Riparia riparia*

Insects

C. Matherne
April 16, 2025

E-S20-3 (HA-3) Vicinity

**Orchard Oriole**

*Icterus spurius*

Insects

C. Matherne
April 16, 2025

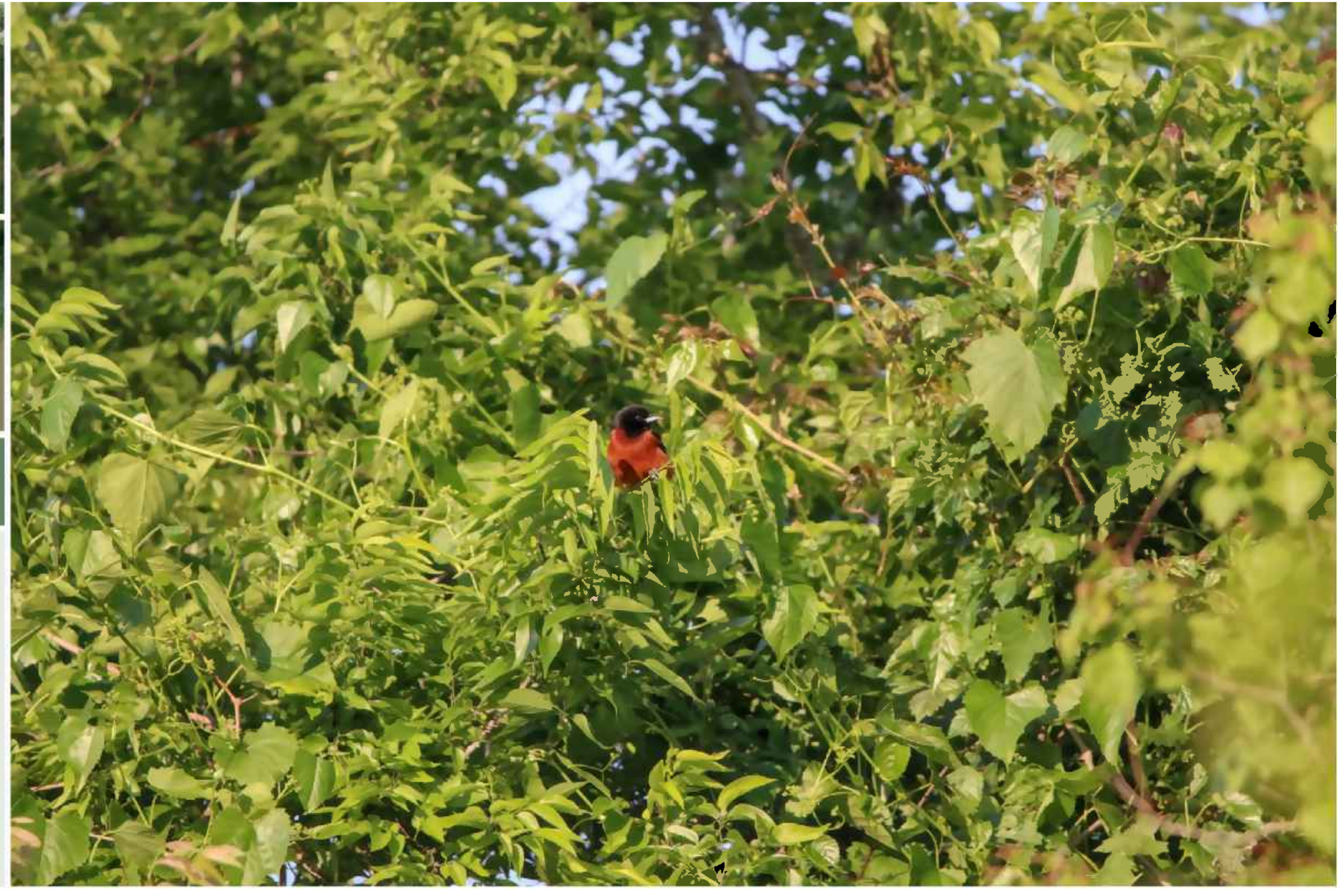
E-S20-3 (HA-3) Vicinity

**Orchard Oriole**

*Icterus spurius*

Insects

C. Matherne
April 16, 2025



E-S20-3 (HA-3) Vicinity

**Orchard Oriole**

*Icterus spurius*

Insects

C. Matherne
April 16, 2025

E-S20-3 (HA-3) Vicinity

**White-faced Ibis**

*Plegadis chihi*

Aquatic Invertebrates

C. Matherne
April 16, 2025

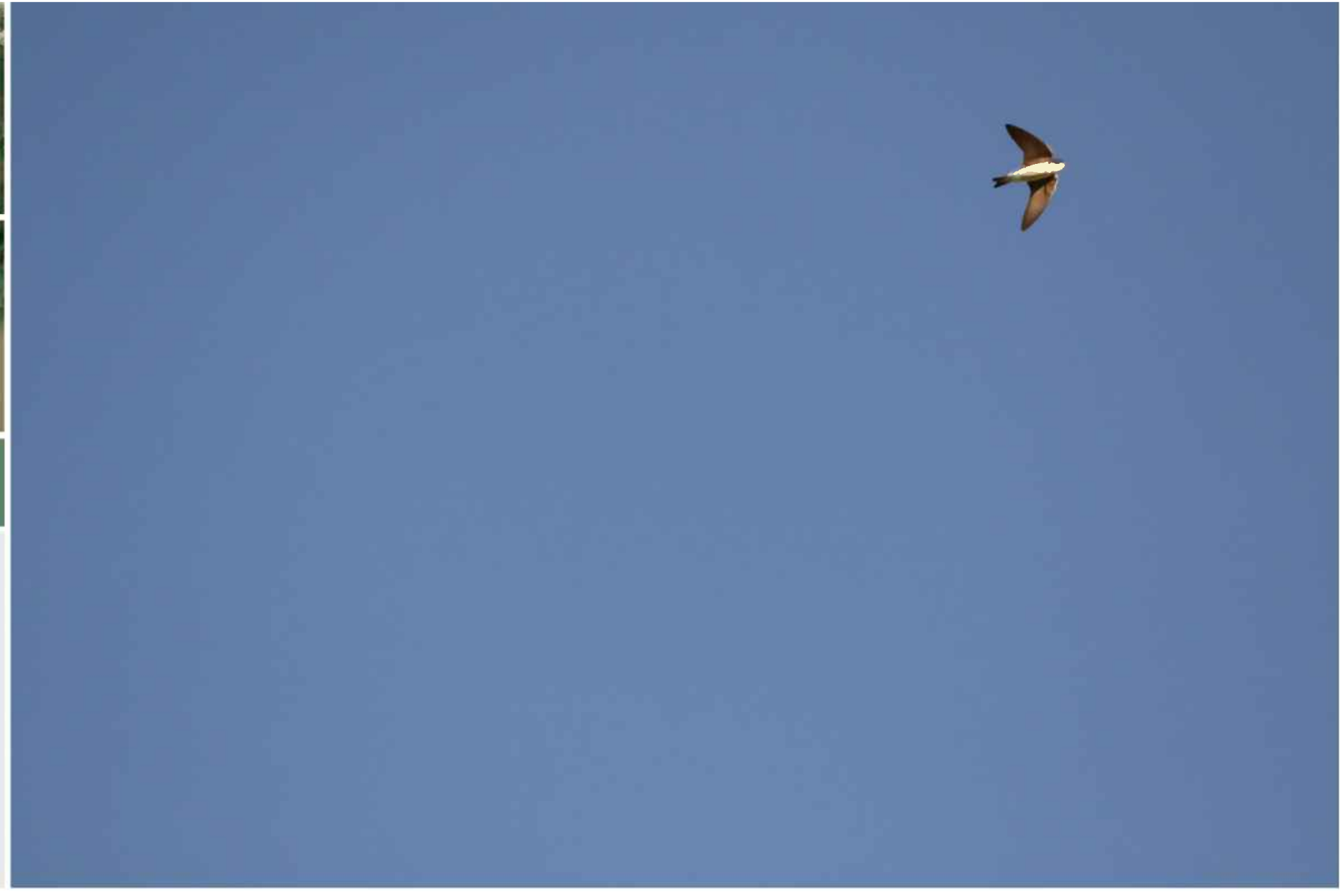
E-S20-3 (HA-3) Vicinity

**Tree Swallow**

*Tachycineta bicolor*

Insects

C. Matherne
April 16, 2025



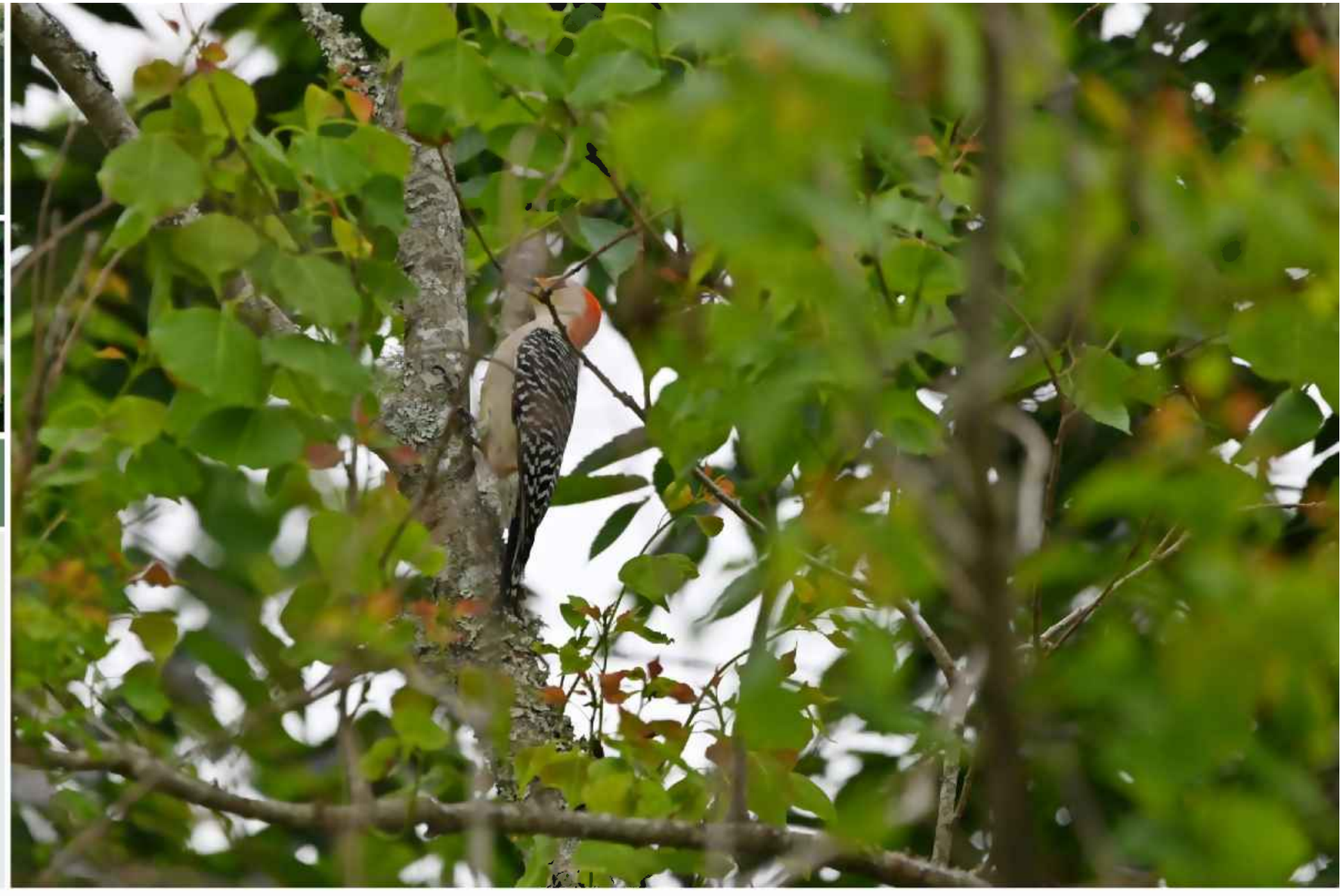
E-Inc-D3 Vicinity

**Red-bellied Woodpecker**

*Melanerpes carolinus*

Insects

J. Shugart
April 15, 2025



E-Inc-D3 Vicinity

**Red-bellied Woodpecker**

*Melanerpes carolinus*

Insects

J. Shugart
April 15, 2025

E-Inc-H1 Vicinity

**American Crow**

*Corvus brachyrhynchos*

**Omnivore**

C. Matherne
April 16, 2025

E-Inc-M1 Vicinity

**Black-bellied Whistling Duck**

*Dendrocygna autumnalis*

Plants

J. Shugart
April 16, 2025

E-Inc-M1 Vicinity

**Great Egret**

***Ardea alba***

**Fish**

C. Matherne
April 15, 2025

**E-Inc-M1 Vicinity**

**Great Egret**

*Ardea alba*

**Fish**

C. Matherne
April 15, 2025

E-Inc-M1 Vicinity

**Pileated Woodpecker**

*Dryocopus pileatus*

Insects

C. Matherne
April 16, 2025

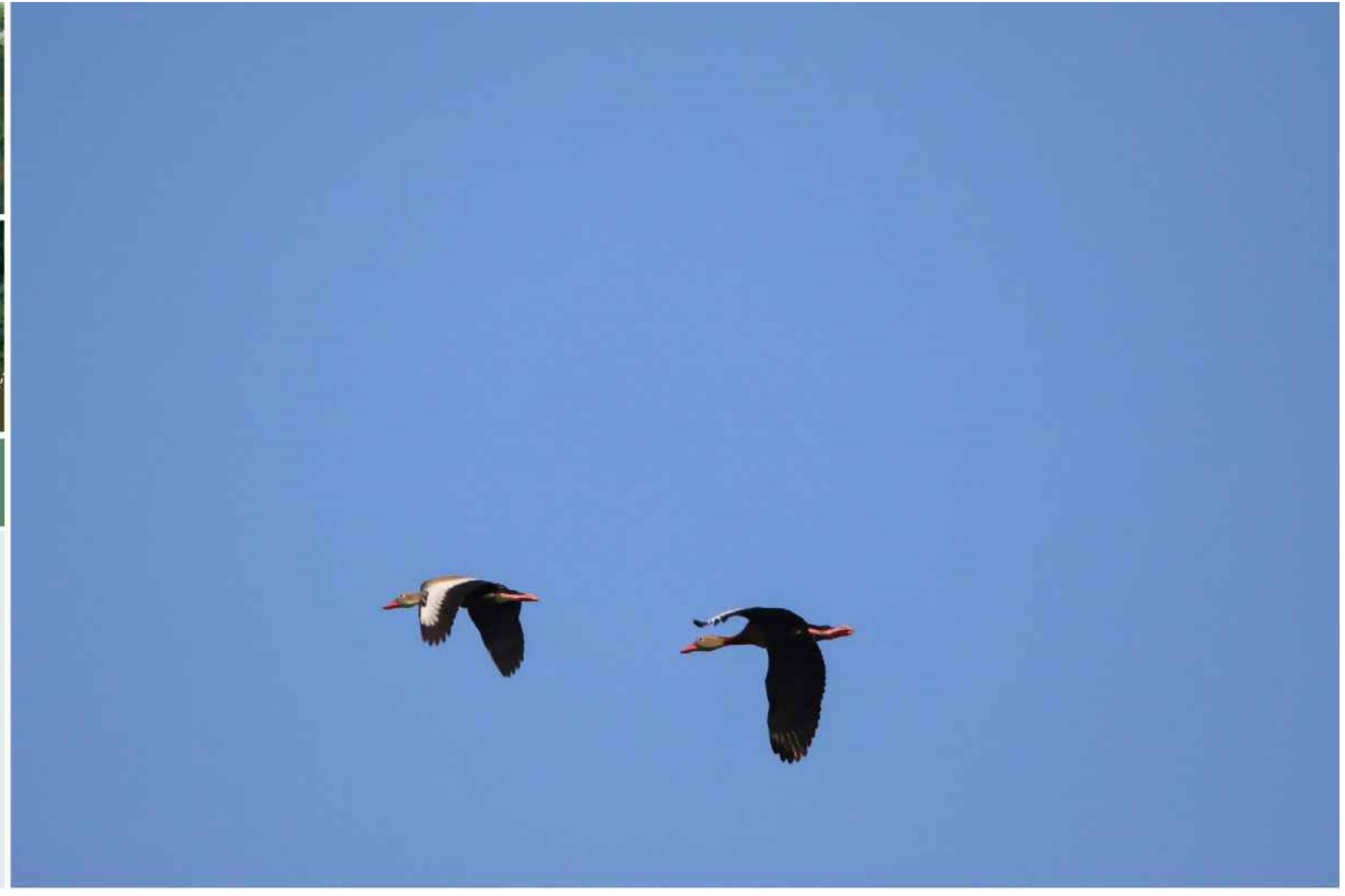
E-Inc-M1 Vicinity

**Black-bellied Whistling Duck**

*Dendrocygna autumnalis*

Plants

C. Matherne
April 16, 2025



E-Inc-M1 Vicinity

**Inca Dove**

*Columbina inca*

Seeds

C. Matherne
April 16, 2025

**E-Inc-R1 Vicinity**

**Blue Grosbeak**

*Passerina caerulea*

Insects

C. Matherne
April 16, 2025

**E-Inc-R1 Vicinity**

**Snowy Egret**

*Egretta thula*

**Fish**

C. Matherne
April 16, 2025

**E-Inc-R1 Vicinity**

**Laughing Gull**

*Leucophaeus atricilla*

Aquatic Invertebrates

C. Matherne
April 16, 2025

**E-Inc-R1 Vicinity**

**Snowy Egret**

*Egretta thula*

**Fish**

C. Matherne
April 16, 2025

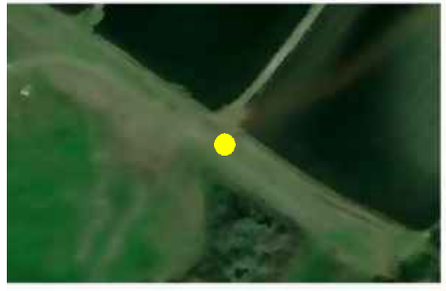
E-Inc-R2 Vicinity

**Great Blue Heron**

*Ardea herodias*

Fish

J. Shugart
April 15, 2025



**E-Inc-R2 Vicinity**

**Blue Grosbeak**

*Passerina caerulea*

Insects

J. Shugart
April 16, 2025

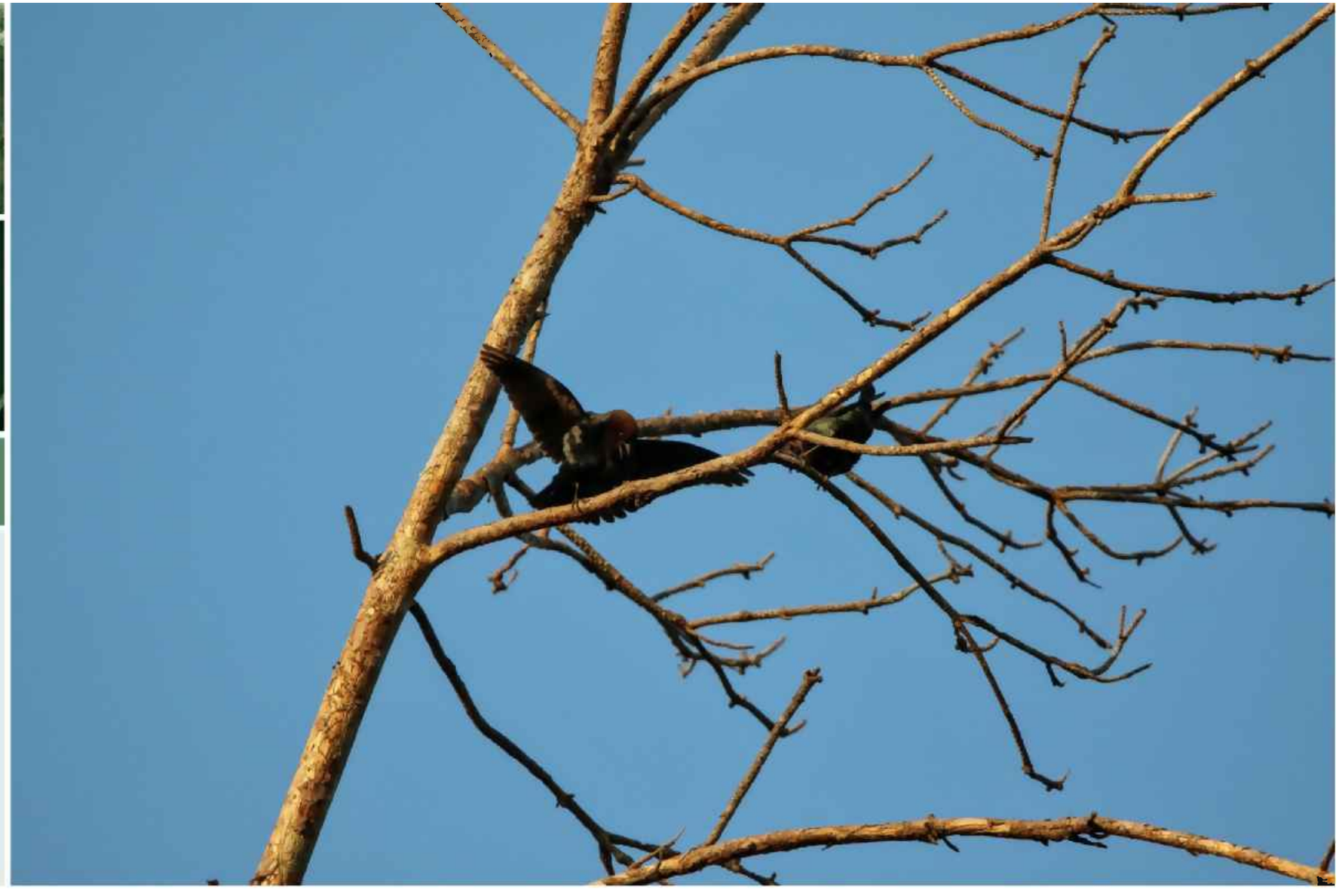
**E-Inc-R2 Vicinity**

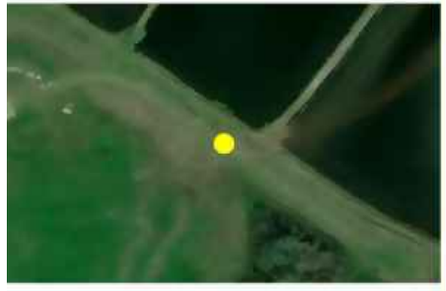
**Brown-headed Cowbird**

*Molothrus ater*

Seeds

C. Matherne
April 16, 2025





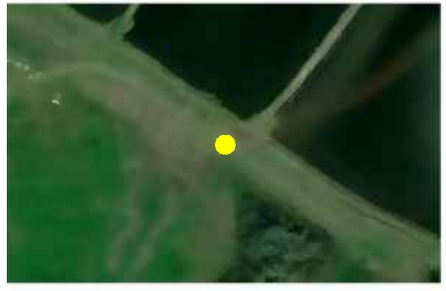
E-Inc-R2 Vicinity

**Snowy Egret**

*Egretta thula*

**Fish**

C. Matherne
April 16, 2025



**E-Inc-R2 Vicinity**

## Tree Swallow

*Tachycineta bicolor*

Insects

C. Matherne
April 16, 2025

**E-Inc-R2 Vicinity**

**Blue Grosbeak**

*Passerina caerulea*

Insects

C. Matherne
April 16, 2025

# Photographs of Non-Avian Fauna



Castex-ERM-RPT-000597
BP/Castex-Ltd Adm-Apx L-000598

E-Inc-D2

**Green anole**

*Anolis carolinensis*

Secondary Consumer

J. Shugart
April 16, 2025

E-Inc-D3

Leopard frog

*Lithobates sp.*

Secondary Consumer

J. Shugart
April 15, 2025

E-Inc-D3

**Southern leopard frog**

*Lithobates sphenocephalus*

Secondary Consumer

C. Matherne
April 15, 2025

E-Inc-D3

**Rabbit**

*Family Leporidae*

Primary Consumer

C. Matherne
April 15, 2025

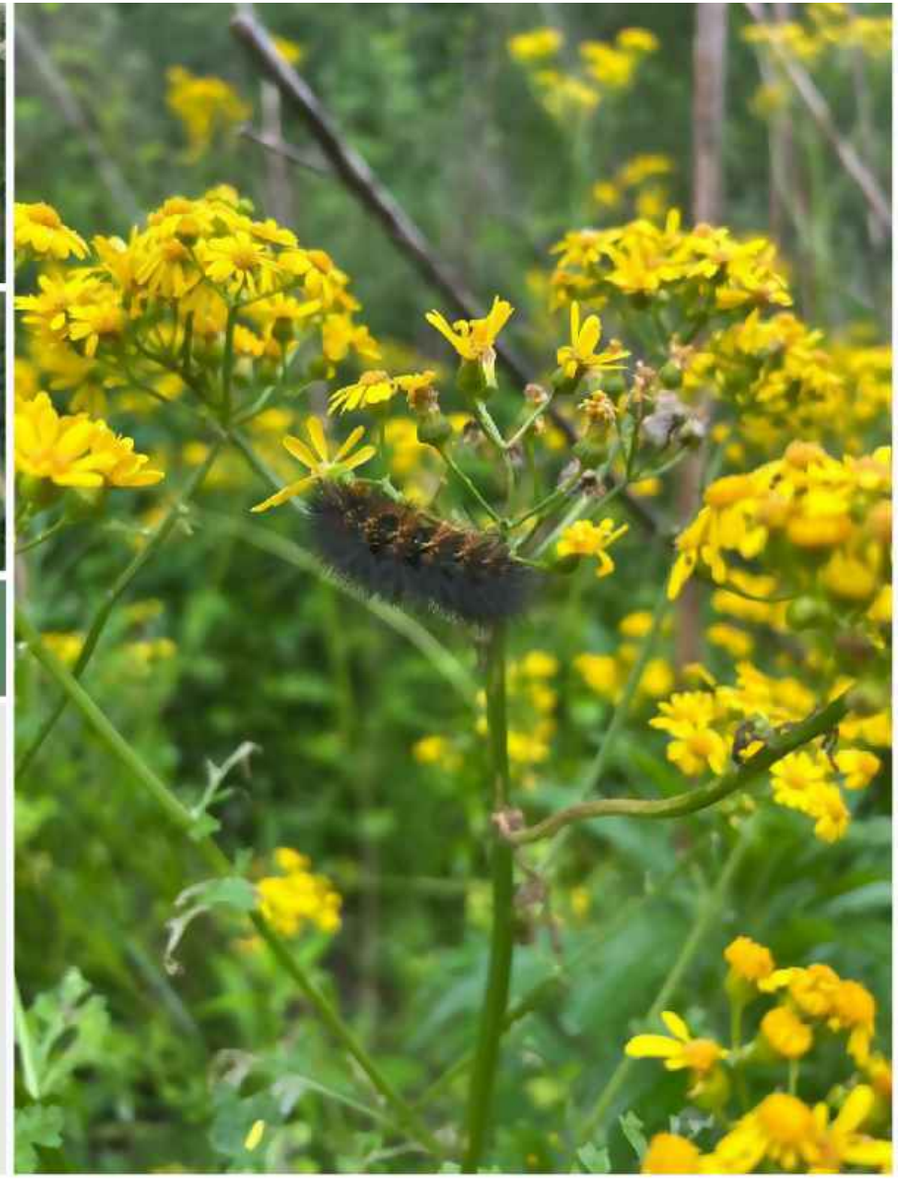
E-Inc-D3

**Salt marsh moth**

*Estigmene acrea*

Primary Consumer

K. Cejas
April 15, 2025



E-Inc-D3

**Spittlebug**

*Family Cercopidae*

Primary Consumer

K. Cejas
April 15, 2025

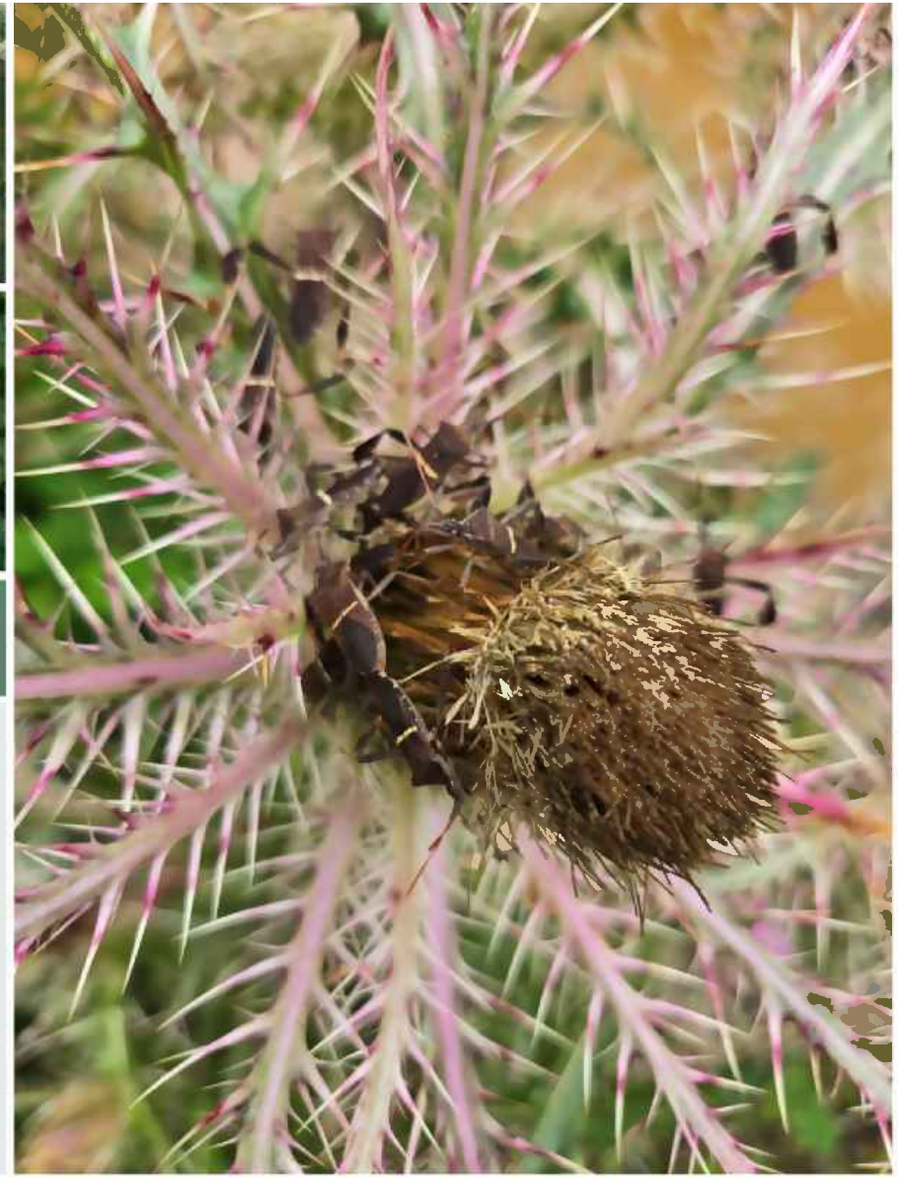
E-Inc-D3

**Eastern leaf-footed bug**

*Leptoglossus phyllopus*

Primary Consumer

J. Shugart
April 15, 2025



E-Inc-D3

**Eastern leaf-footed bug**

*Leptoglossus phyllopus*

Primary Consumer

K. Cejas
April 15, 2025

E-Inc-D3

**Monarch butterfly**

*Danaus plexippus*

Primary Consumer

C. Matherne
April 15, 2025

E-Inc-D3

**Monarch butterfly**

*Danaus plexippus*

Primary Consumer

J. Shugart
April 15, 2025

E-Inc-D3

**Spotted orbweaver**

*Neoscona sp.*

Secondary Consumer

C. Matherne
April 15, 2025

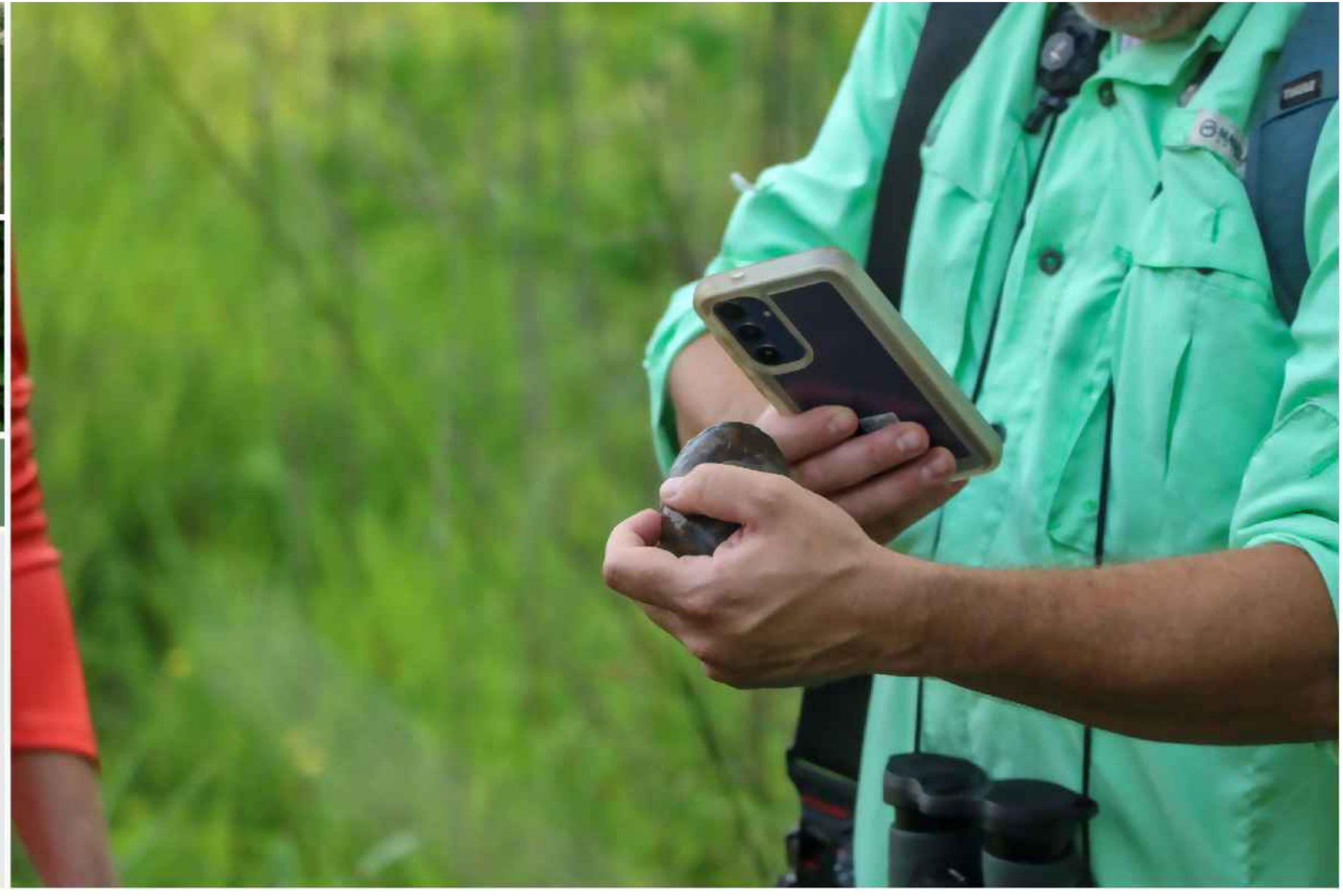
E-Inc-D3

**Eastern mud turtle**

*Kinosternon subrubrum*

Tertiary Consumer

C. Matherne
April 15, 2025



E-Inc-D3

**Eastern mud turtle**

*Kinosternon subrubrum*

Tertiary Consumer

J. Shugart
April 15, 2025

E-Inc-D3

**Eastern mud turtle**

*Kinosternon subrubrum*

Tertiary Consumer

J. Shugart
April 15, 2025

E-Inc-D3

**Eastern mud turtle**

*Kinosternon subrubrum*

Tertiary Consumer

J. Shugart
April 15, 2025

E-Inc-M2

**American alligator**

*Alligator mississippiensis*

Apex

C. Matherne
April 16, 2025

E-Inc-M2

**Turtle**

*Class Reptilia*

Secondary Consumer

C. Matherne
April 16, 2025

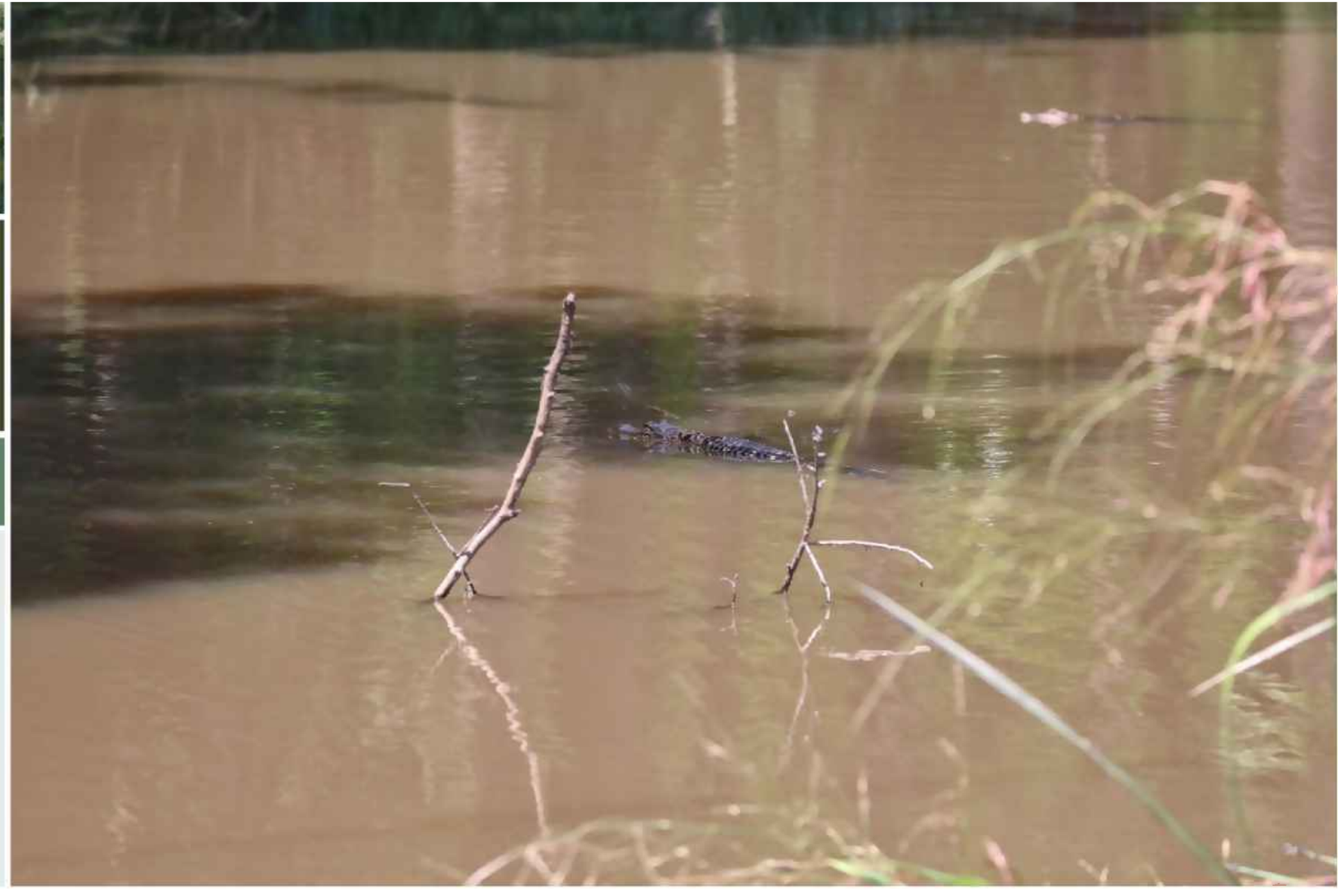
E-Inc-M2

**American alligator**

*Alligator mississippiensis*

Apex

C. Matherne
April 16, 2025



E-Inc-R6 Area

**Salt marsh moth**

*Estigmene acrea*

Primary Consumer

J. Shugart
April 15, 2025

E-Inc-R6 Area

**Rabbit**

*Family Leporidae*

Primary Consumer

J. Shugart
April 16, 2025

E-Inc-R6 Area

**Tiger beetle**

*Subfamily Cicindelinae*

Secondary Consumer

J. Shugart
April 16, 2025

E-Inc-R6 Area

Green tree frog

*Hyla cinerea*

Secondary Consumer

J. Shugart
April 16, 2025

E-Inc-R6 Area

**Feral hog**

*Sus scrofa*

Tertiary Consumer

J. Shugart
April 16, 2025

**E-Inc-R6 Area**

**Green tree frog**

*Hyla cinerea*

Secondary Consumer

J. Shugart
April 16, 2025

E-Inc-R6 Area

**Tiger beetle**

*Subfamily Cicindelinae*

Secondary Consumer

J. Shugart
April 16, 2025

E-Inc-R6 Area

**Common watersnake**

*Nerodia sipedon*

Tertiary Consumer

J. Shugart
April 16, 2025

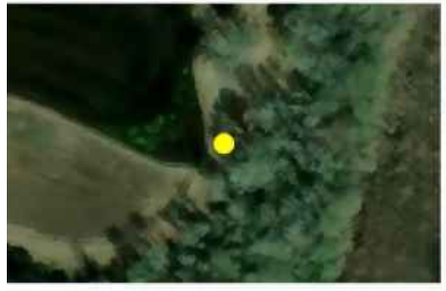
E-Inc-R6 Area

**Garter snake**

*Thamnophis sp.*

Tertiary Consumer

C. Matherne
April 16, 2025



E-Inc-R6 Area

**Bee**

*Family Apidae*

Primary Consumer

C. Matherne
April 16, 2025

E-Inc-R6 Area

**Bee**

*Family Apidae*

Primary Consumer

C. Matherne
April 16, 2025

E-Inc-R6 Area

**Bee**

*Family Apidae*

Primary Consumer

C. Matherne
April 16, 2025

E-Inc-R6 Area

Tiger beetle

*Subfamily Cicindelinae*

Secondary Consumer

C. Matherne
April 16, 2025

E-Inc-R6 Area

**Green tree frog**

*Hyla cinerea*

Secondary Consumer

C. Matherne
April 16, 2025

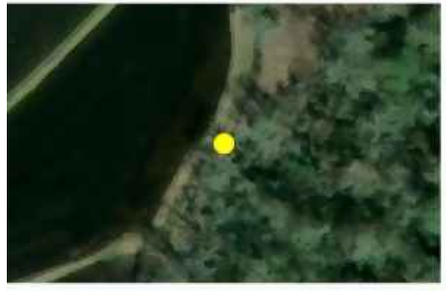
E-Inc-R6 Area

**Western ribbonsnake**

*Thamnophis proximus*

Tertiary Consumer

C. Matherne
April 16, 2025



E-Inc-R6 Area

**Western ribbonsnake**

*Thamnophis proximus*

Tertiary Consumer

C. Matherne
April 16, 2025

E-Inc-R6 Area

**Feral hog**

*Sus scrofa*

Tertiary Consumer

C. Matherne
April 16, 2025

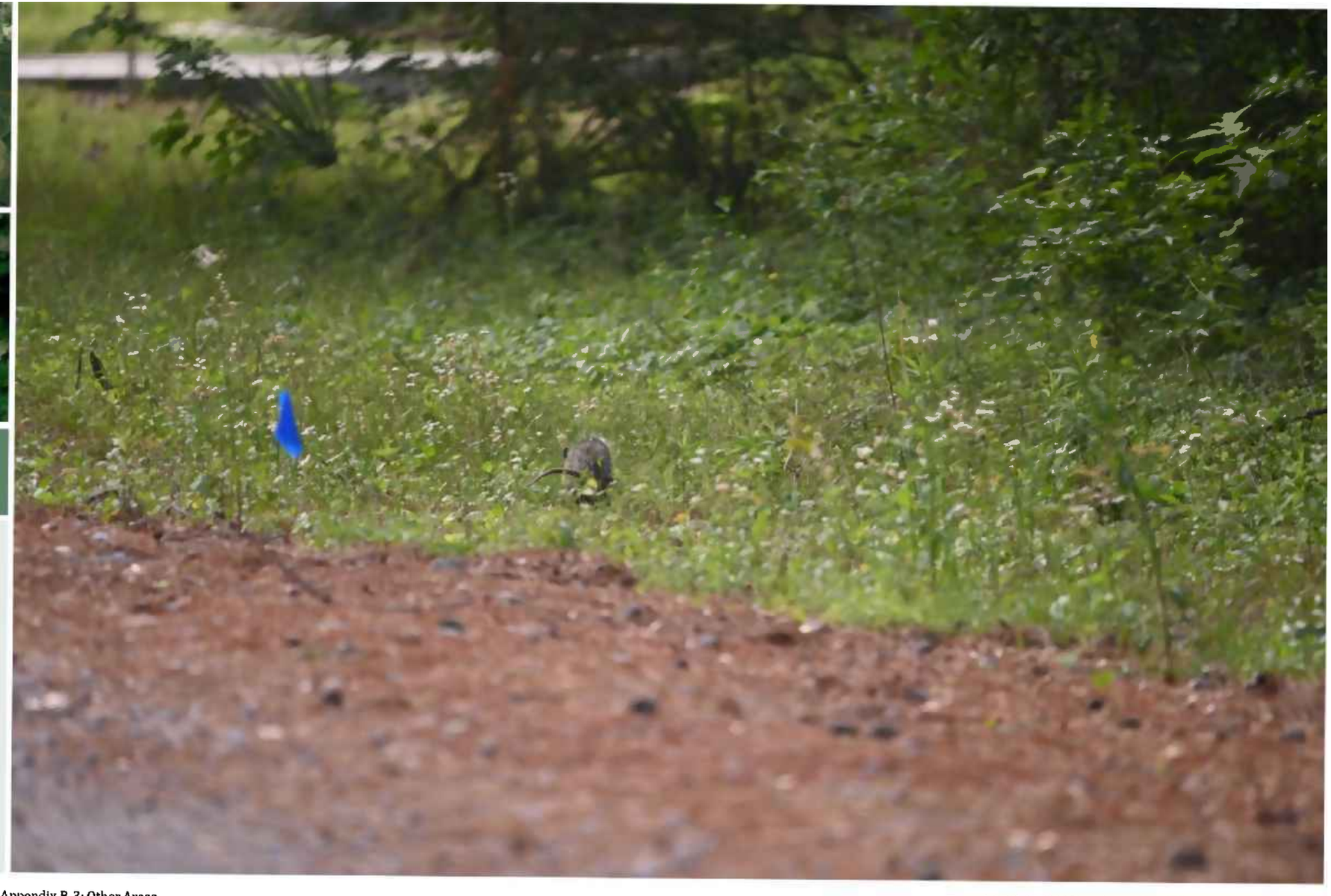
E-Inc-BL

## Virginia opossum

*Didelphis virginiana*

Tertiary Consumer

J. Shugart
April 15, 2025



**E-Inc-BL**

**Eastern gray squirrel nest**

*Sciurus carolinensis*

Primary Consumer

C. Matherne
April 16, 2025

E-Inc-P

**Pond slider**

*Trachemys elegans*

Secondary Consumer

J. Shugart
April 15, 2025

E-Inc-HP

**Eastern gray squirrel nest**

*Sciurus carolinensis*

Primary Consumer

C. Matherne
April 16, 2025

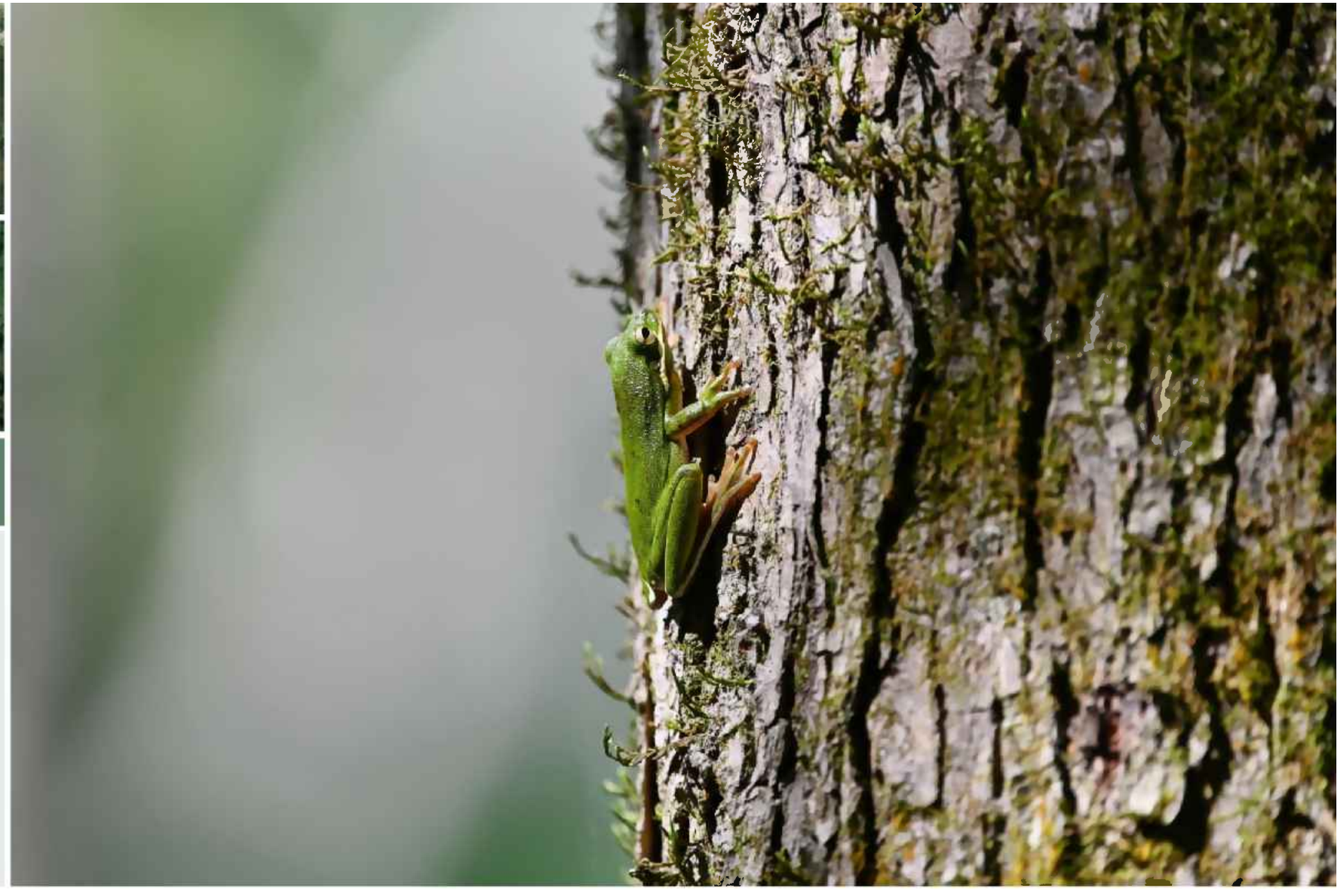
SN 78514 Area

**Green tree frog**

*Hyla cinerea*

Secondary Consumer

J. Shugart
April 16, 2025



SN 76164 Area

**Carpenter bee**

*Xylocopa sp.*

**Primary Consumer**

J. Shugart
April 15, 2025

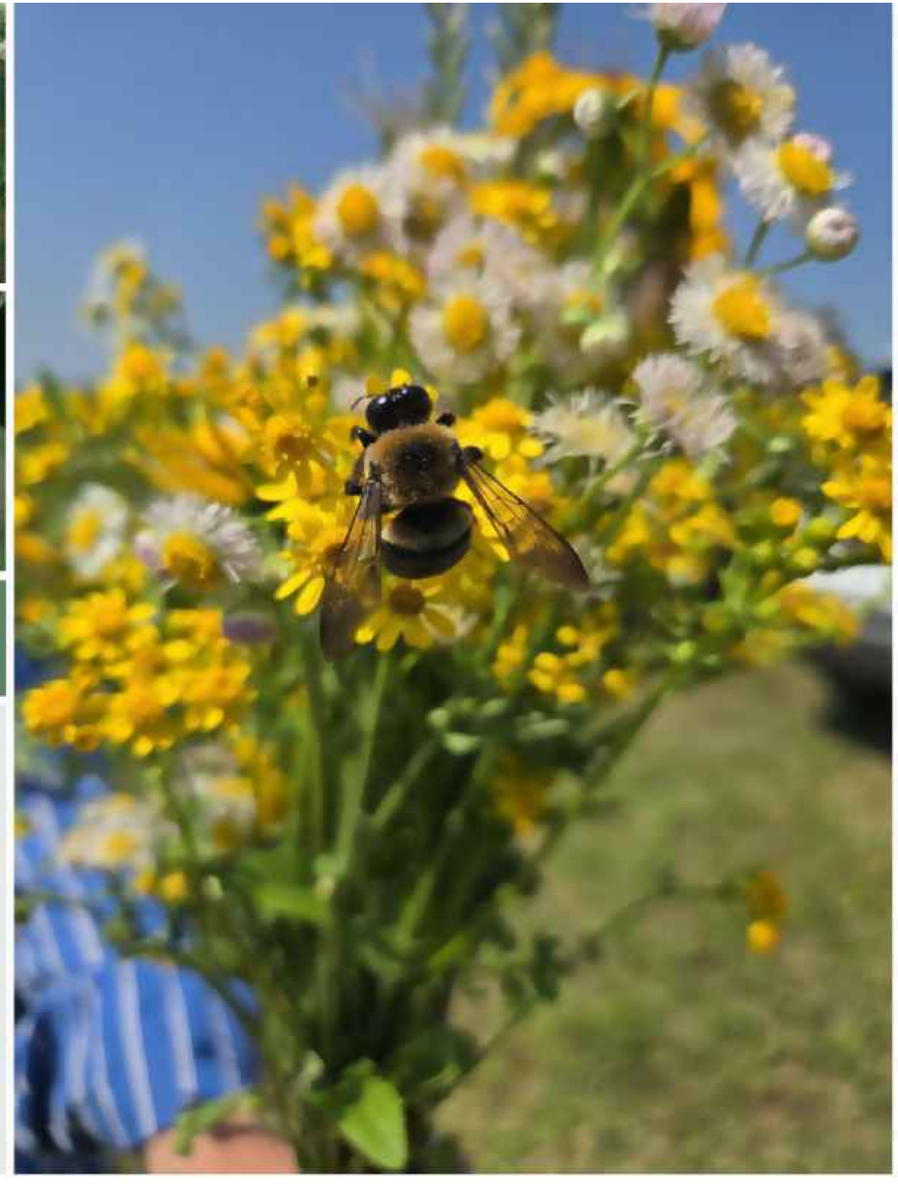
SN 76164 Area

**Carpenter bee**

*Xylocopa sp.*

Primary Consumer

J. Shugart
April 15, 2025



**SN 76164 Area**

**Eastern carpenter bee**

*Xylocopa virginica*

Primary Consumer

C. Matherne
April 15, 2025

SN 76164 Area

**Furrow bee**

*Halictus sp.*

Primary Consumer

C. Matherne
April 16, 2025

**E-S20-11 Vicinity**

**Question mark butterfly**

*Polygonia interrogationis*

Primary Consumer

J. Shugart
April 15, 2025

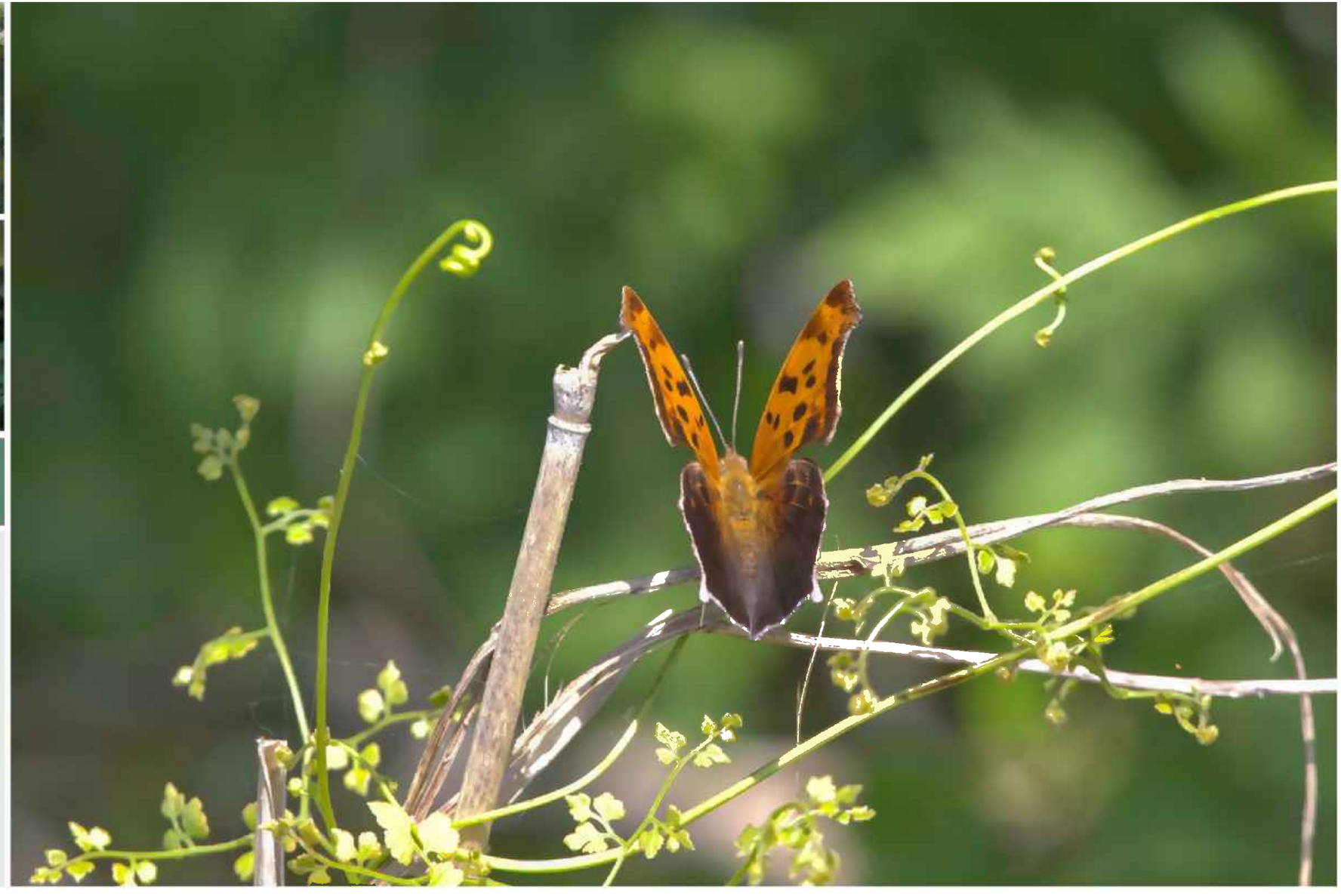
**E-S20-11 Vicinity**

**Question mark butterfly**

*Polygonia interrogationis*

Primary Consumer

C. Matherne
April 15, 2025



E-Inc-H1 Vicinity

**Spilosoma Moth**

*Spilosoma sp.*

Primary Consumer

C. Matherne
April 16, 2025

# Photographs of Recreational Activities

E-Inc-C1

**Camp**

K. Cejas
April 15, 2025

**E-Inc-C1**

**Camp**

K. Cejas
April 15, 2025

E-Inc-C1

**Camp**

K. Cejas
April 15, 2025

E-Inc-C1

**Camp**

K. Cejas
April 15, 2025

E-Inc-D3

**Deer Stand**

C. Matherne
April 15, 2025

E-Inc-H1

**Deer Stand**

K. Cejas
April 15, 2025

E-Inc-M1

**Fisherman**

C. Matherne
April 16, 2025

E-Inc-M1

**Mermentau River**

Natural Community

K. Cejas
April 15, 2025

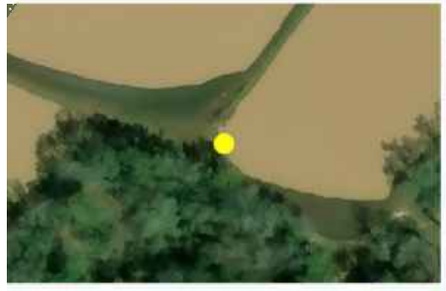
E-Inc-M1

Mermentau River

Natural Community

K. Cejas
April 15, 2025

Castex-ERM-RPT-000654
BP/Castex-Ltd Adm-Apx L-000655



E-Inc-R4 Area

**Honey bee**

**Primary Consumer**

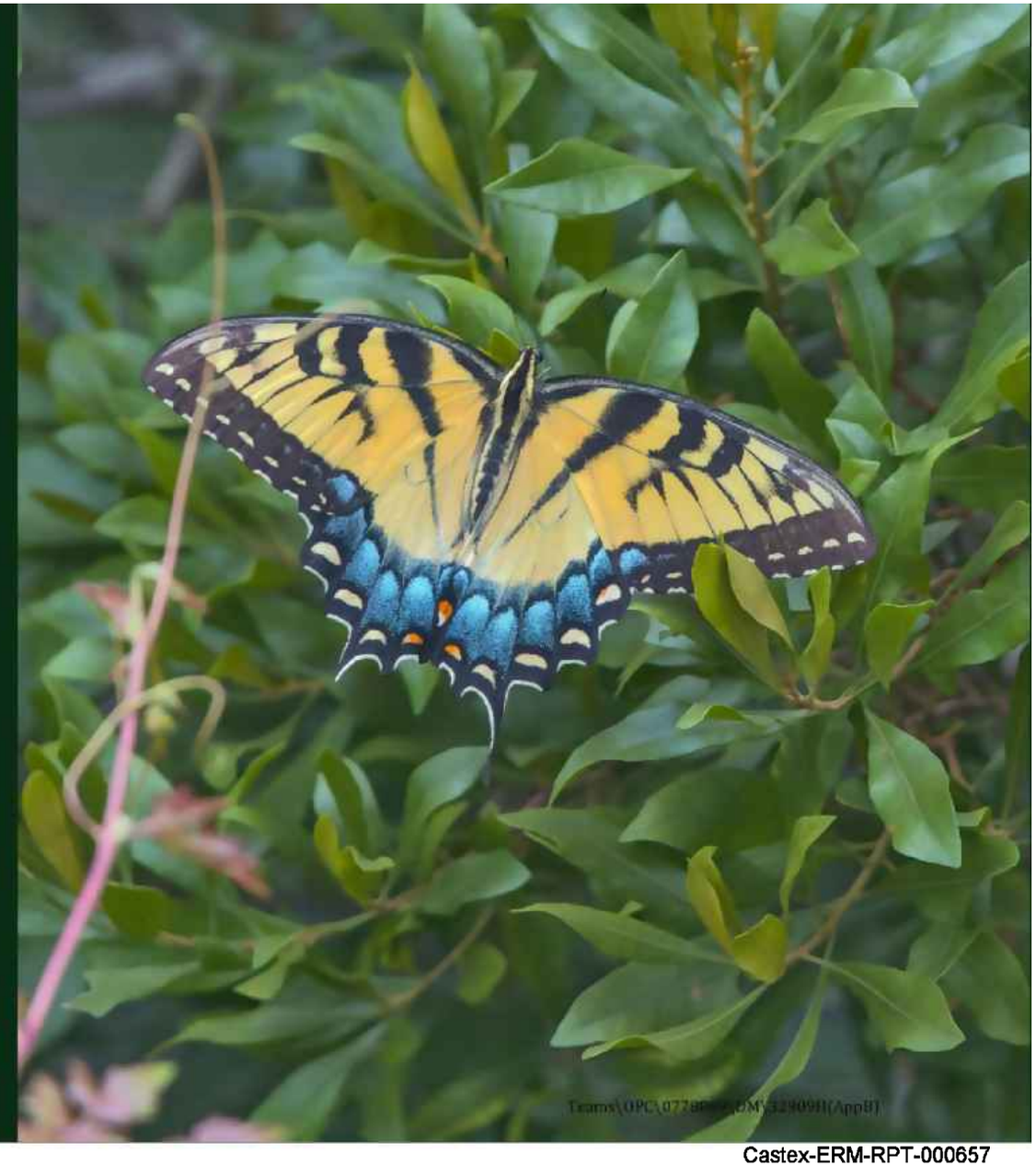
C. Matherne
April 15, 2025

SN 78514 Area

**Deer Stand**

C. Matherne
April 16, 2025

# Appendix B-4: Former Anadarko Operations Areas and Vicinity



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# Photographs of Natural Communities



Castex-ERM-RPT-000658
BP/Castex-Ltd Adm-Apx L-000659

CD-1

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

CD-1

Natural Community

K. Cejas
May 29, 2025

**CD-1**

**Natural Community**

K. Cejas
May 29, 2025

**CD-1**

**Natural Community**

K. Cejas
May 29, 2025

CD-1

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

CD-1

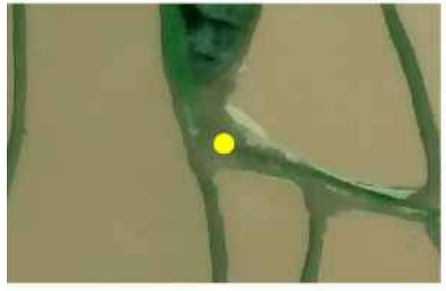
Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}



CD-1

Natural Community

K. Cejas
May 29, 2025

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-4

Natural Community

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

**HA-4**

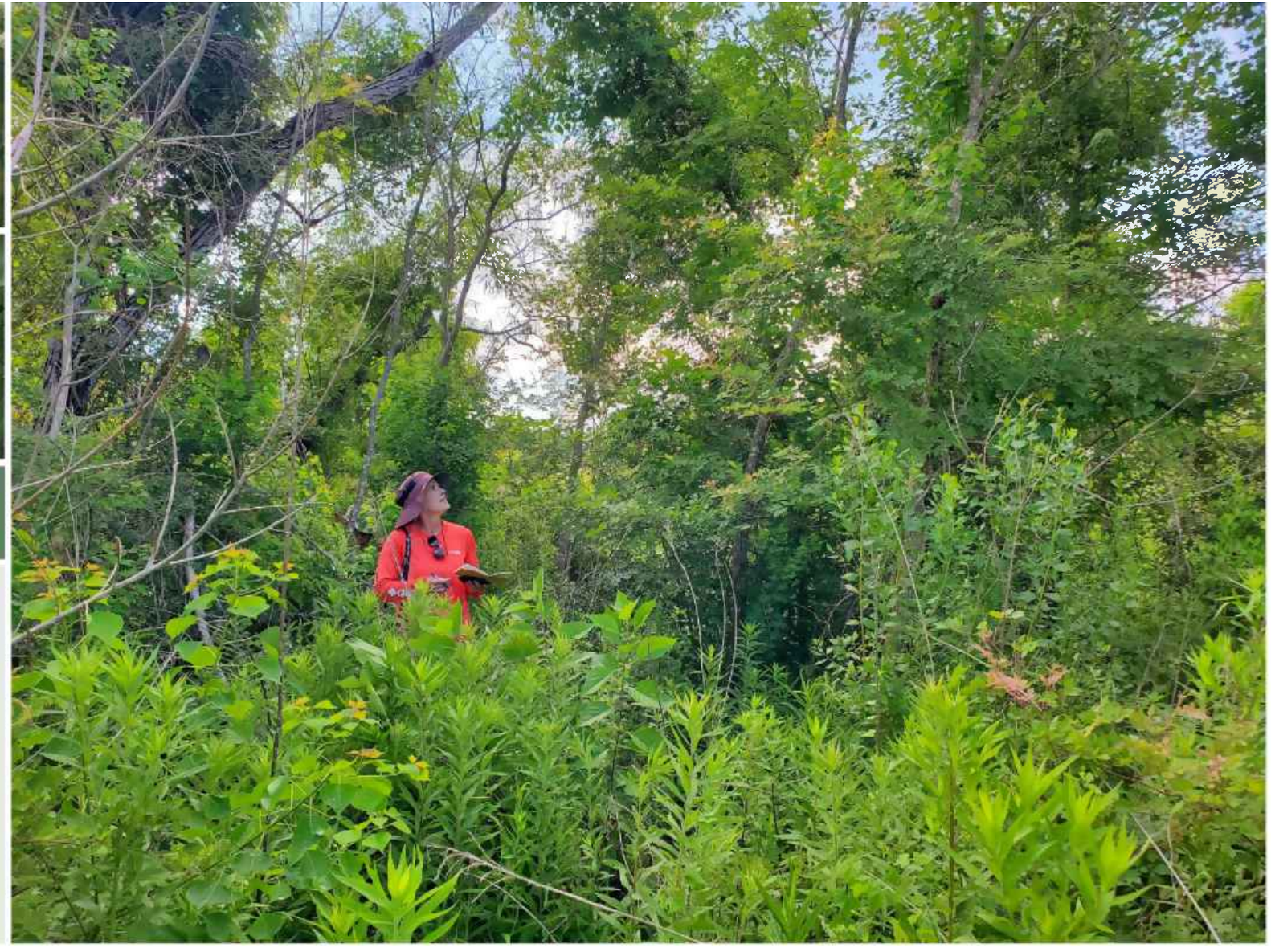
**Natural Community**

A. Sivils
May 29, 2025

HA-4

Natural Community

C. Matherne
May 29, 2025



HA-4

Natural Community

K. Cejas
May 29, 2025

HA-4

Natural Community

K. Cejas
May 29, 2025

HA-4

Natural Community

K. Cejas
May 29, 2025

ERM

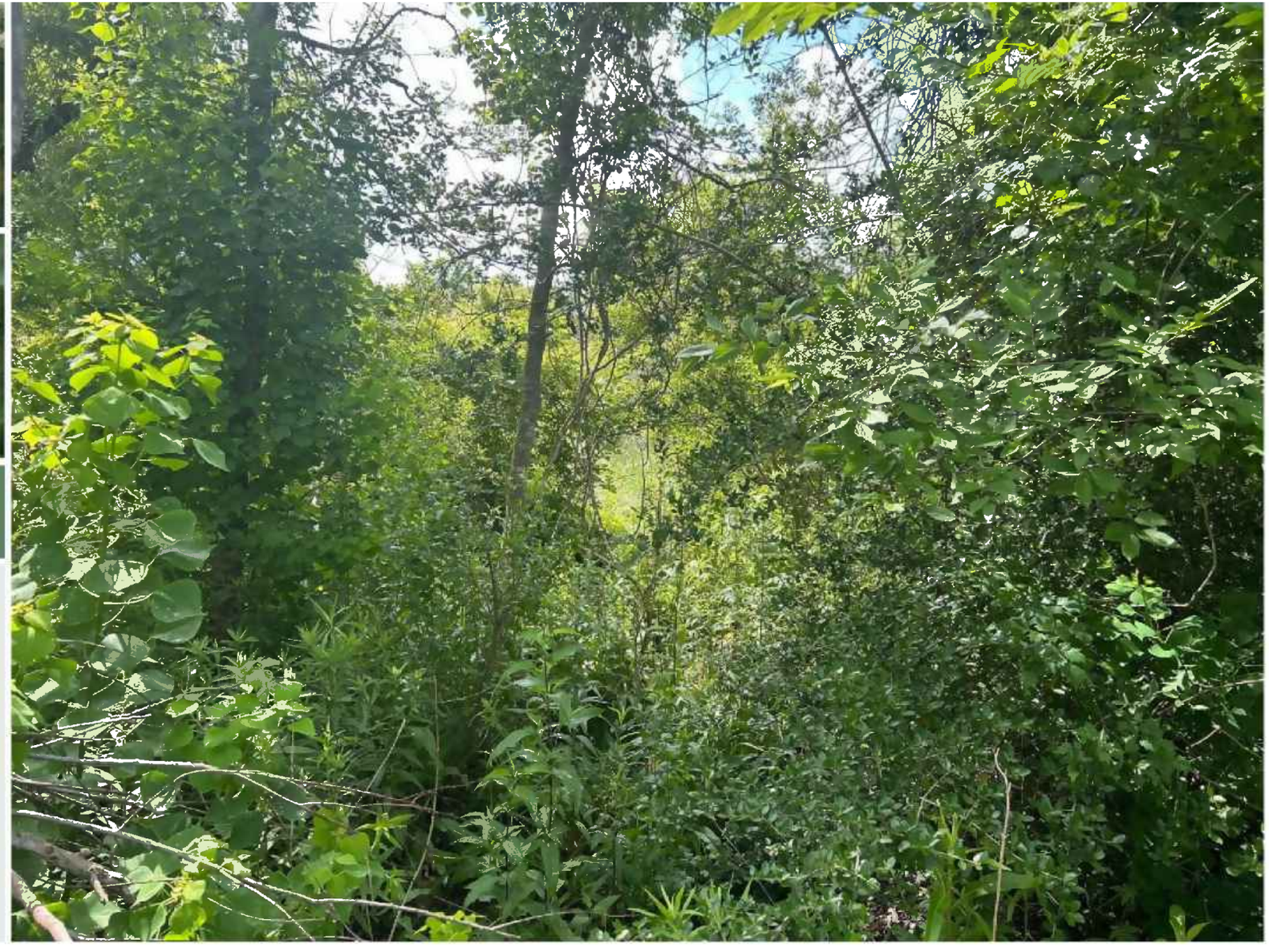
Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-4

Natural Community

K. Cejas
May 29, 2025



**HA-5/CD-3**

**Natural Community**

A. Sivils
May 29, 2025

HA-5/CD-3

**Natural Community**

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}



Castex-ERM-RPT-000674
BP/Castex-Ltd Adm-Apx L-000675

HA-5/CD-3

Natural Community

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-5/CD-3

Natural Community

A. Sivils
May 29, 2025

HA-5/CD-3

Natural Community

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-5/CD-3

Natural Community

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

**HA-5/CD-3**

**Natural Community**

K. Cejas
May 29, 2025

**HA-5/CD-3**

**Natural Community**

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

**HA-5/CD-3**

**Natural Community**

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}



Castex-ERM-RPT-000685
**BP/Castex-Ltd Adm-Apx L-000686**

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-5/CD-3

Natural Community

K. Cejas
May 29, 2025

**HA-9/CD-2**

**Natural Community**

A. Sivils
May 29, 2025

HA-9/CD-2

Natural Community

A. Sivils
May 29, 2025

**HA-9/CD-2**

**Natural Community**

A. Sivils
May 29, 2025

HA-9/CD-2

Natural Community

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-9/CD-2

Natural Community

K. Cejas
May 29, 2025

HA-9/CD-2

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H(AppB)



Castex-ERM-RPT-000699
BP/Castex-Ltd Adm-Apx L-000700

**HA-9/CD-2**

**Natural Community**

K. Cejas
May 29, 2025

**HA-9/CD-2**

**Natural Community**

K. Cejas
May 29, 2025

HA-9/CD-2

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

**HA-9/CD-2**

**Natural Community**

K. Cejas
May 29, 2025

HA-9/CD-2

Natural Community

K. Cejas
May 29, 2025

**E-Inc-A1**

**Natural Community**

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

E-Inc-A1

Natural Community

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

E-Inc-A1

Natural Community

A. Sivils
May 29, 2025

**E-Inc-A1**

**Natural Community**

K. Cejas
May 29, 2025

E-Inc-A1

Natural Community

K. Cejas
May 29, 2025

E-Inc-A1

**Natural Community**

K. Cejas
May 29, 2025

**E-Inc-A1**

**Natural Community**

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

E-Inc-D2-A

Natural Community

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

E-Inc-D2-A

Natural Community

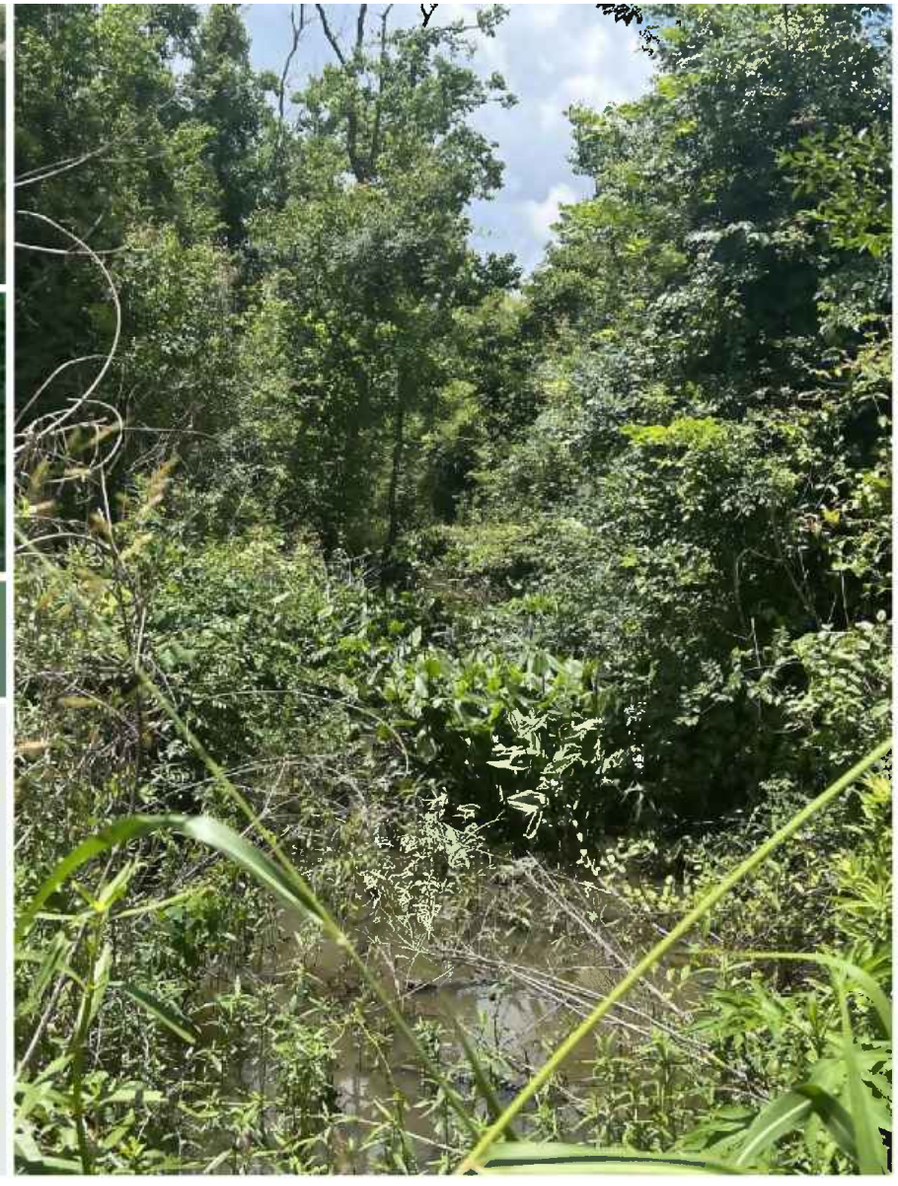
K. Cejas
May 29, 2025

Appendix B-4: Former Anadarko Operations Areas and Vicinity

E-Inc-D2-A

Natural Community

K. Cejas
May 29, 2025



Appendix B-4: Former Anadarko Operations Areas and Vicinity

E-Inc-D2-A

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

E-Inc-D2-A

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

E-Inc-R7

Natural Community

K. Cejas
May 29, 2025

Appendix B-4: Former Anadarko Operations Areas and Vicinity

E-Inc-R7

**Natural Community**

K. Cejas
May 29, 2025

Appendix B-4: Former Anadarko Operations Areas and Vicinity

**E-Inc-R8**

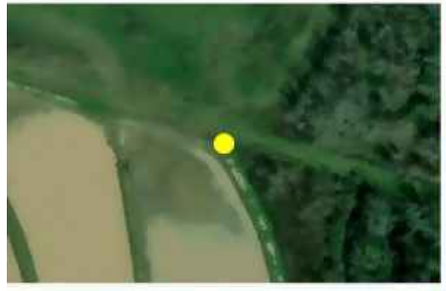
**Natural Community**

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}



**E-Inc-R8**

**Natural Community**

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

SN 28396

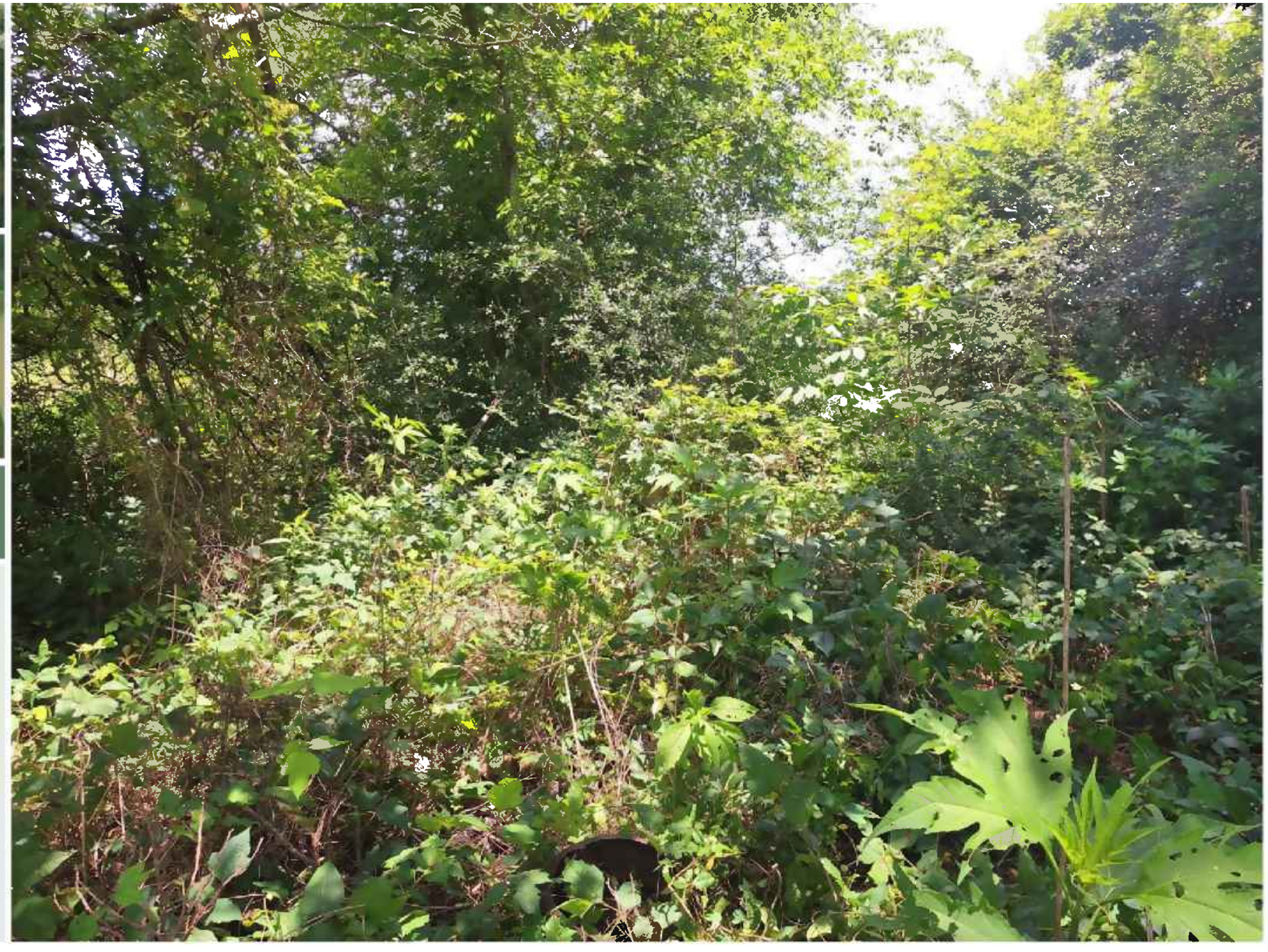
Natural Community

A. Sivils
May 29, 2025

SN 28396

Natural Community

A. Sivils
May 29, 2025



SN 28396

Natural Community

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

SN 28396

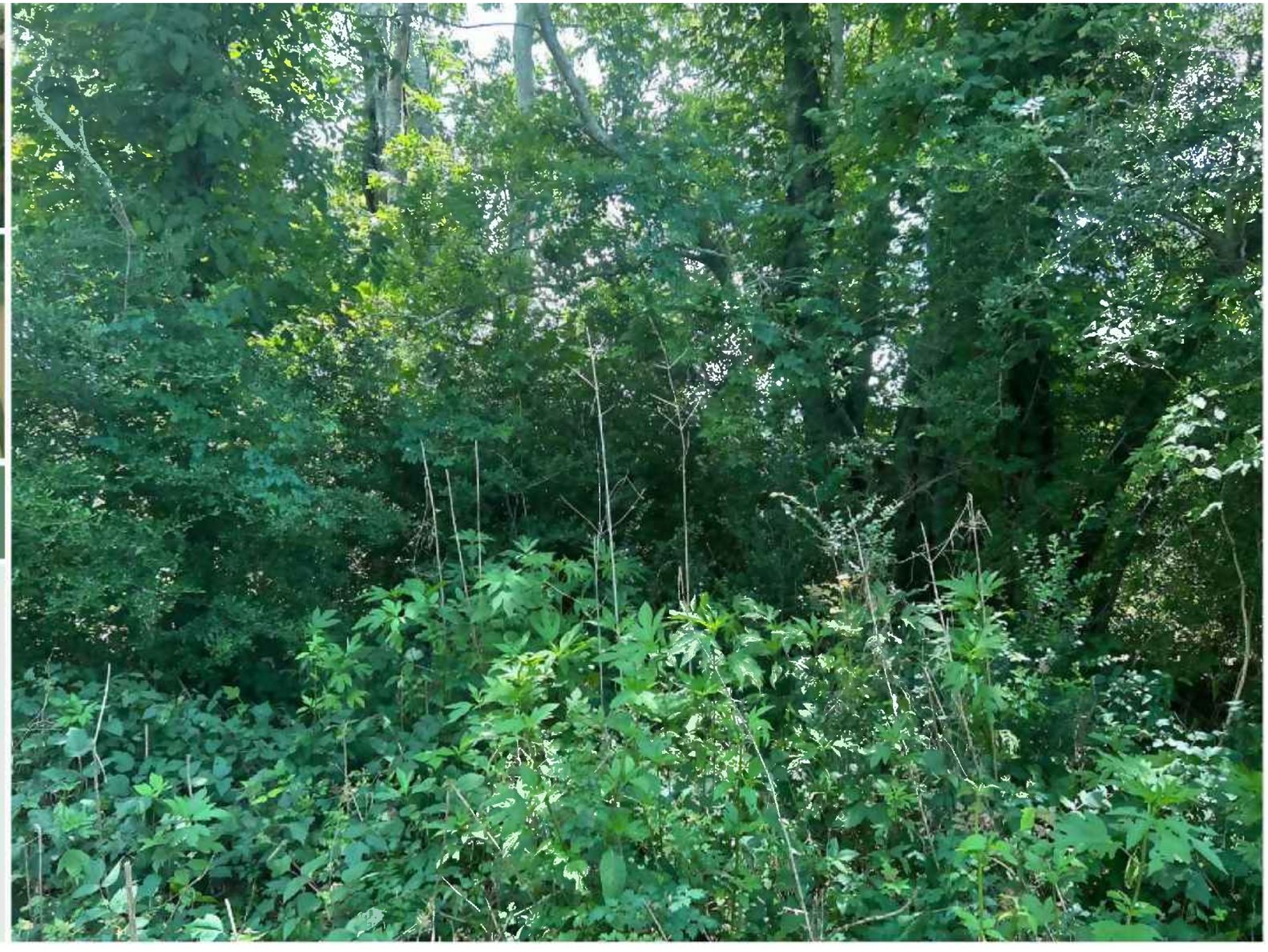
Natural Community

K. Cejas
May 29, 2025

SN 28396

Natural Community

K. Cejas
May 29, 2025



SN 28396

Natural Community

K. Cejas
May 29, 2025

SN 28396

Natural Community

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

# Photographs of Vegetative Species

**CD-1**

**Dogfennel**

*Eupatorium capillifolium*

FACU

A. Sivils
May 29, 2025

**CD-1**

**Horse-nettle**

*Solanum carolinense*

**FACU**

A. Sivils
May 29, 2025

CD-1

**Curly dock**

*Rumex crispus*

**FAC**

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H{AppB}

HA-4

**Japanese honeysuckle, Peppervine**

*Lonicera japonica, Nekemias arborea*

FACU, FAC

A. Sivils
May 29, 2025

HA-4

**Muscadine**

*Vitis rotundifolia*

FAC

A. Sivils
May 29, 2025

**HA-4**

**American beautyberry**

*Callicarpa americana*

FACU

A. Sivils
May 29, 2025

**HA-4**

**American beautyberry**

*Callicarpa americana*

FACU

A. Sivils
May 29, 2025

HA-4

White avens

*Geum canadense*

FAC

A. Sivils
May 29, 2025

HA-4

Smartweed

*Persicaria sp.*

A. Sivils
May 29, 2025

HA-4

Sugarberry

*Celtis laevigata*

FACW

A. Sivils
May 29, 2025

HA-4

**Common boneset**

*Eupatorium perfoliatum*

FACW

A. Sivils
May 29, 2025

HA-4

**Yaupon**

*Ilex vomitoria*

FAC

A. Sivils
May 29, 2025

HA-4

**Chinese tallow, Peppervine, Rush**

*Triadica sebifera, Nekemias arborea, Juncus sp.*

FAC, FAC, ND

K. Cejas
May 29, 2025

HA-5/CD-3

**Lateflowering thoroughwort**

*Eupatorium serotinum*

FAC

A. Sivils
May 29, 2025

**HA-5/CD-3**

**Goldenrod**

*Solidago sp.*

A. Sivils
May 29, 2025

**HA-5/CD-3**

**Brazilian vervain**

*Verbena brasiliensis*

FACU

A. Sivils
May 29, 2025

HA-5/CD-3

**Peppervine**

*Nekemias arborea*

**FAC**

A. Sivils
May 29, 2025

HA-5/CD-3

**Thistle**

*Cirsium sp.*

A. Sivils
May 29, 2025

HA-5/CD-3

**Spikerush**

*Eleocharis sp.*

A. Sivils
May 29, 2025

**HA-5/CD-3**

**Herbwilliam**

*Ptilimnium capillaceum*

**OBL**

A. Sivils
May 29, 2025

**HA-5/CD-3**

**Thistle**

*Cirsium sp.*

A. Sivils
May 29, 2025

HA-5/CD-3

**White avens**

*Geum canadense*

FAC

A. Sivils
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

HA-5/CD-3

**Sugarberry**

*Celtis laevigata*

FACW

A. Sivils
May 29, 2025

Appendix B-4: Former Anadarko Operations Areas and Vicinity

**HA-5/CD-3**

**Smartweed**

*Persicaria sp.*

A. Sivils
May 29, 2025

**HA-5/CD-3**

**Southern dewberry**

*Rubus trivialis*

FACU

A. Sivils
May 29, 2025

HA-9/CD-2

**Purple passionflower**

*Passiflora incarnata*

A. Sivils
May 29, 2025

HA-9/CD-2

**Flatsedge**

*Cyperus sp.*

A. Sivils
May 29, 2025

HA-9/CD-2

**Texas star**

*Sabatia campestris*

FACU

A. Sivils
May 29, 2025

HA-9/CD-2

**Wax myrtle**

*Morella cerifera*

FAC

A. Sivils
May 29, 2025

BP/Castex-Ltd Adm-Apx L-000759

HA-9/CD-2

**Texas star**

*Sabatia campestris*

FACU

A. Sivils
May 29, 2025

HA-9/CD-2

**Seaside goldenrod**

*Solidago sempervirens*

FACW

A. Sivils
May 29, 2025

**HA-9/CD-2**

**Narrowleaf mountainmint**

*Pycnanthemum tenuifolium*

FACW

A. Sivils
May 29, 2025

**HA-9/CD-2**

**Purple passionflower**

*Passiflora incarnata*

A. Sivils
May 29, 2025

HA-9/CD-2

Sedge (Cyperaceae)

*Family Cyperaceae*

A. Sivils
May 29, 2025

HA-9/CD-2

**Grass**

*Family Poaceae*

A. Sivils
May 29, 2025

HA-9/CD-2

**Pinkladies**

*Oenothera speciosa*

K. Cejas
May 29, 2025

E-Inc-A1

**Spikerush**

*Eleocharis sp.*

A. Sivils
May 29, 2025

BP/Castex-Ltd Adm-Apx L-000767

**E-Inc-D2-A**

**False nettle**

*Boehmeria sp.*

A. Sivils
May 29, 2025

SN 28396

**Sugarberry**

*Celtis laevigata*

FACW

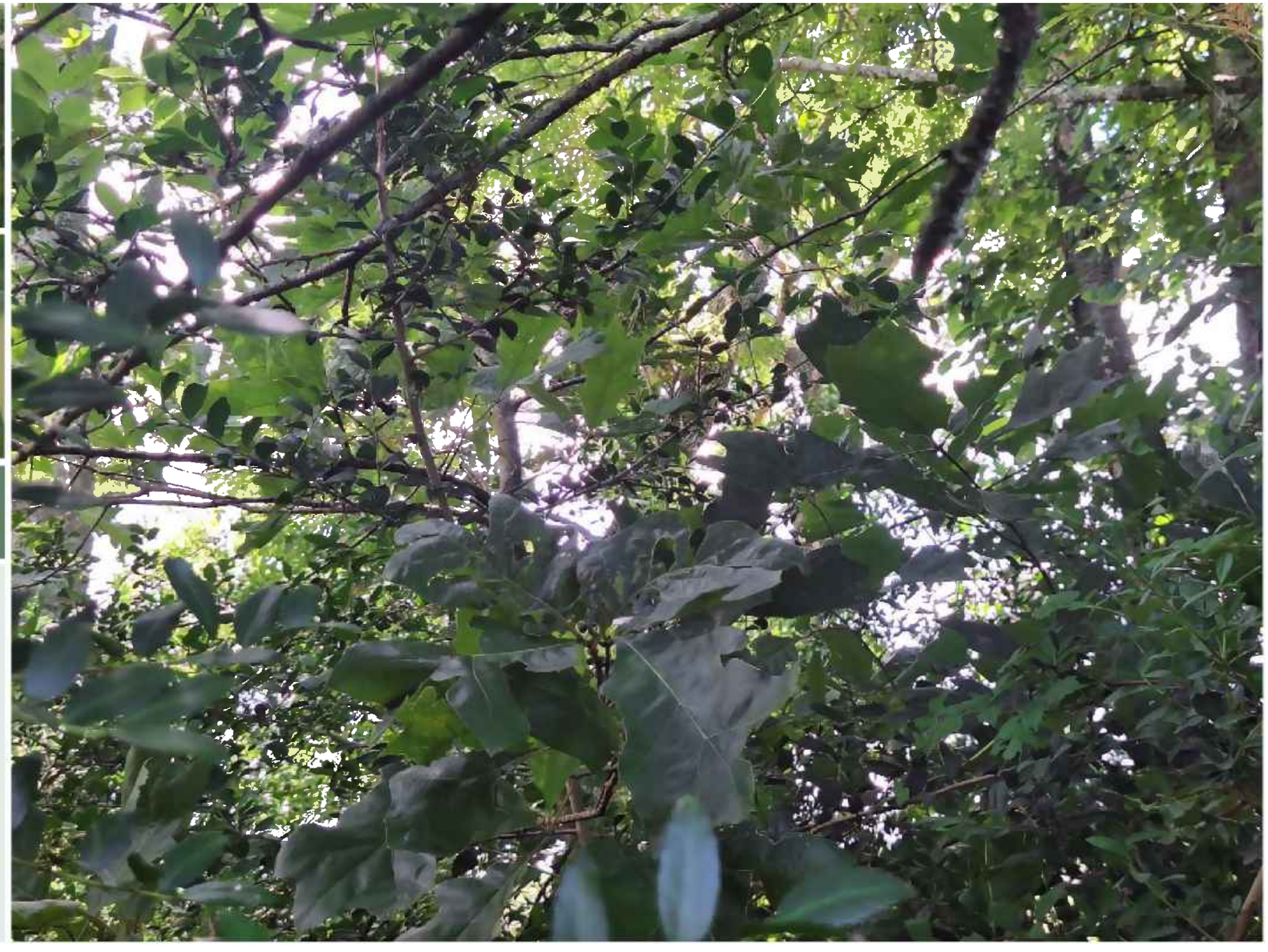
A. Sivils
May 29, 2025

SN 28396

**Oak**

*Quercus sp.*

A. Sivils
May 29, 2025



SN 28396

**Tievine**

*Ipomoea cordatotriloba*

FACU

A. Sivils
May 29, 2025

SN 28396

**Eastern poison ivy**

*Toxicodendron radicans*

FAC

A. Sivils
May 29, 2025

# Photographs of Birds

**CD-1**

**Little Blue Heron**

*Egretta caerulea*

Fish

C. Matherne
May 29, 2025

CD-1

Great Egret

*Ardea alba*

Fish

C. Matherne
May 29, 2025

**HA-4**

**Anhinga**

*Anhinga anhinga*

Fish

C. Matherne
May 29, 2025

HA-5/CD-3

**Indigo Bunting**

*Passerina cyanea*

Insects

C. Matherne
May 29, 2025

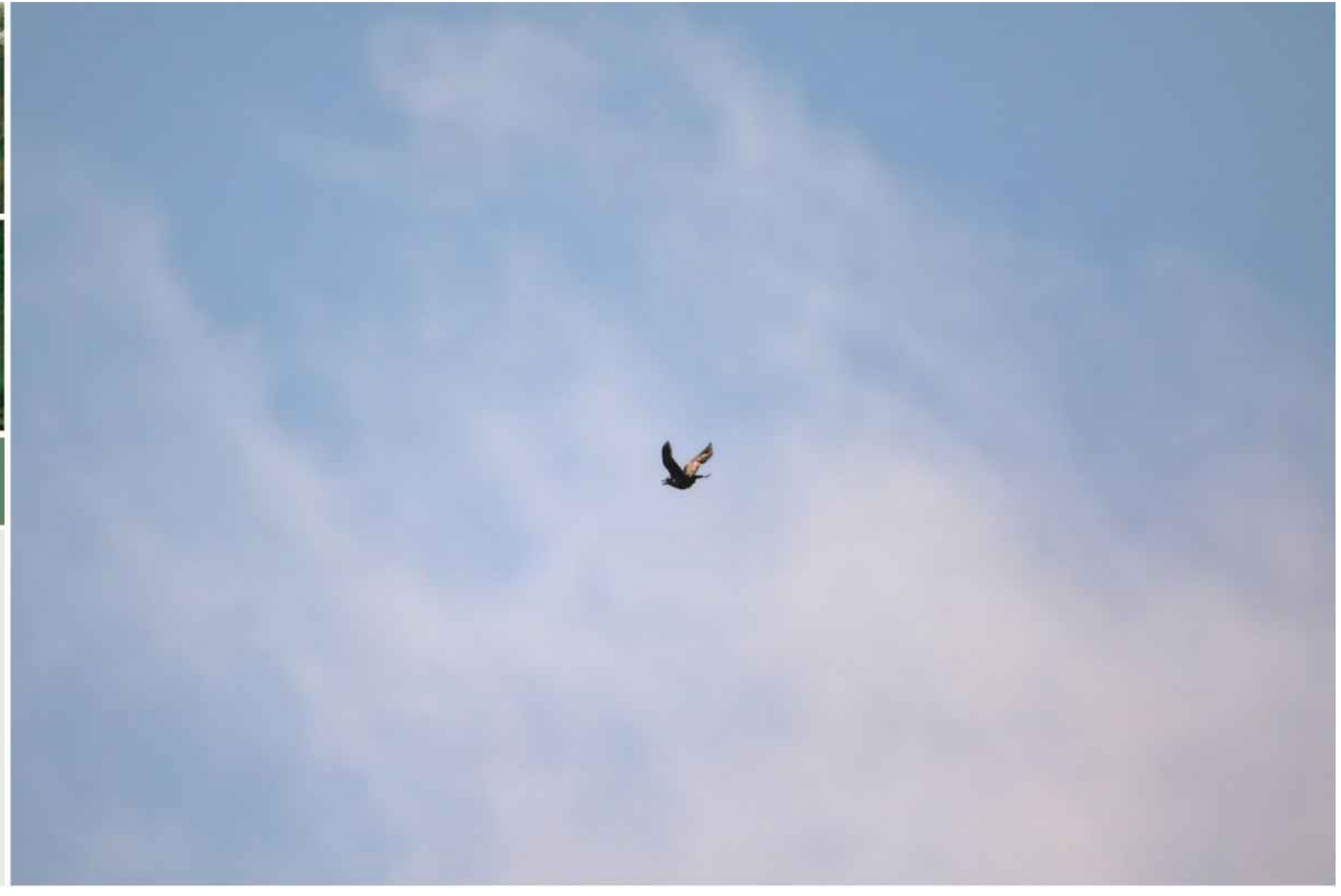
HA-5/CD-3

**Boat-tailed Grackle**

*Quiscalus major*

Omnivore

C. Matherne
May 29, 2025



**HA-5/CD-3**

**Indigo Bunting**

*Passerina cyanea*

Insects

C. Matherne
May 29, 2025

HA-5/CD-3

**Yellow-crowned Night Heron**

*Nyctanassa violacea*

Aquatic Invertebrates

C. Matherne
May 29, 2025

HA-5/CD-3

**Turkey Vulture**

*Cathartes aura*

Carrion

C. Matherne
May 29, 2025

HA-5/CD-3

**Wood Stork**

*Mycteria Americana*

Fish

C. Matherne
May 29, 2025

**HA-5/CD-3**

**Turkey Vulture**

*Cathartes aura*

Carrion

C. Matherne
May 29, 2025

**HA-5/CD-3**

**Great Egret**

*Ardea alba*

Fish

C. Matherne
May 29, 2025

**HA-5/CD-3**

## Western Cattle-Egret

*Ardea ibis*

Insects

C. Matherne
May 29, 2025

HA-5/CD-3

**Black-necked Stilt**

*Himantopus mexicanus*

Aquatic Invertebrates

C. Matherne
May 29, 2025

**HA-5/CD-3**

**Red-shouldered Hawk**

*Buteo lineatus*

Mammals

C. Matherne
May 29, 2025

**HA-5/CD-3**

**White Ibis**

*Eudocimus albus*

Aquatic Invertebrates

C. Matherne
May 29, 2025

**HA-5/CD-3**

**Turkey Vulture**

*Cathartes aura*

Carrion

C. Matherne
May 29, 2025

**HA-5/CD-3**

**Little Blue Heron**

*Egretta caerulea*

Fish

C. Matherne
May 29, 2025

**HA-5/CD-3**

**White Ibis**

*Eudocimus albus*

Aquatic Invertebrates

C. Matherne
May 29, 2025

**HA-5/CD-3**

**White Ibis**

*Eudocimus albus*

Aquatic Invertebrates

C. Matherne
May 29, 2025

**HA-5/CD-3**

**White Ibis**

*Eudocimus albus*

Aquatic Invertebrates

C. Matherne
May 29, 2025

HA-5/CD-3

**Turkey Vulture**

*Cathartes aura*

Carrion

C. Matherne
May 29, 2025

HA-5/CD-3

**Black-crowned Night Heron**

*Nycticorax nycticorax*

Fish

C. Matherne
May 29, 2025

HA-5/CD-3

**American Crow**

*Corvus brachyrhynchos*

Omnivore

C. Matherne
May 29, 2025

**HA-9/CD-2**

**Little Blue Heron**

*Egretta caerulea*

Fish

C. Matherne
May 29, 2025

**HA-9/CD-2**

**Brown-headed Cowbird**

*Molothrus ater*

Seeds

C. Matherne
May 29, 2025

**HA-9/CD-2**

**Black-necked Stilt**

*Himantopus mexicanus*

Aquatic Invertebrates

C. Matherne
May 29, 2025

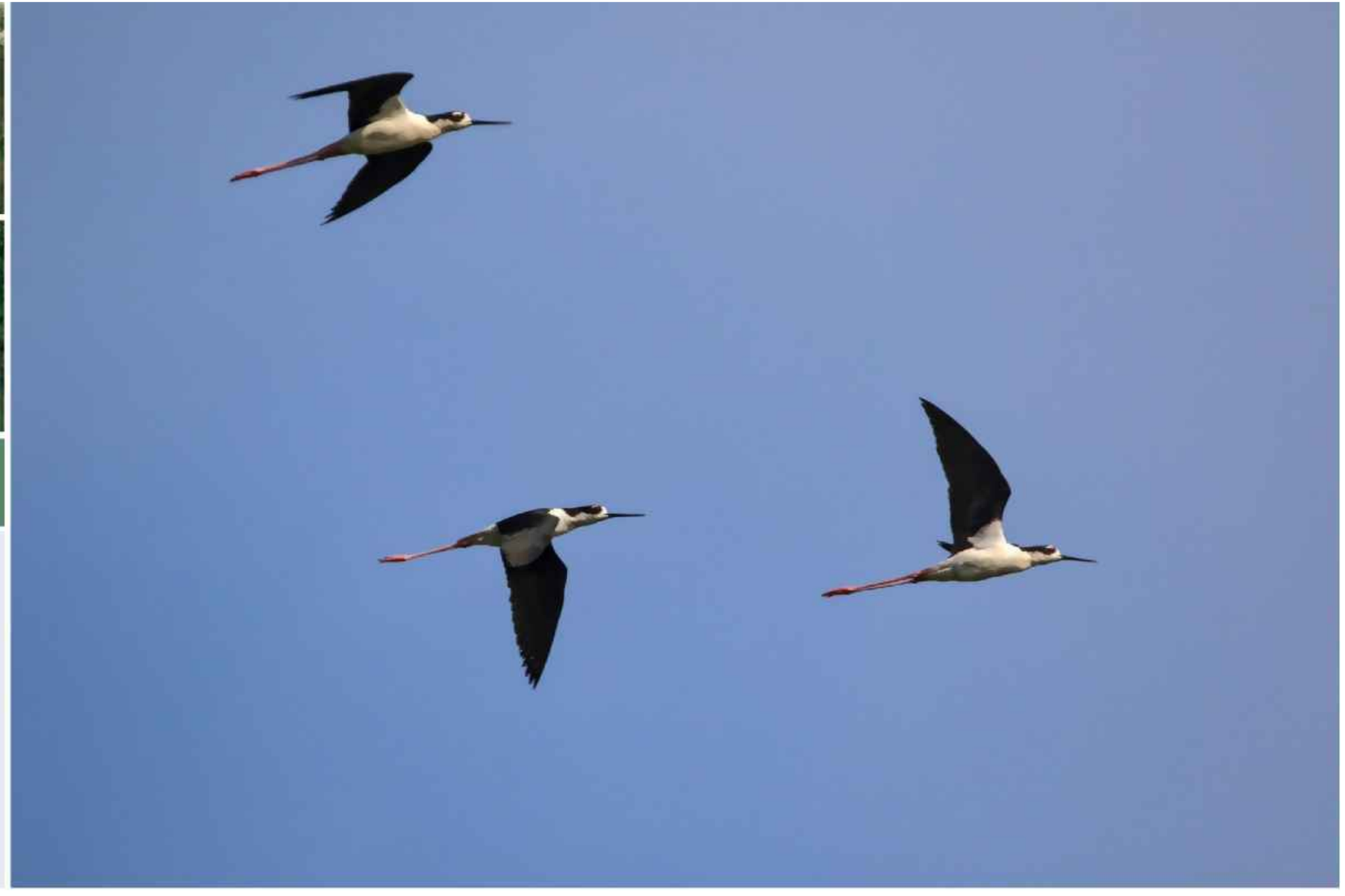
HA-9/CD-2

**Black-necked Stilt**

*Himantopus mexicanus*

Aquatic Invertebrates

C. Matherne
May 29, 2025



**HA-9/CD-2**

**White Ibis**

*Eudocimus albus*

Aquatic Invertebrates

C. Matherne
May 29, 2025

**HA-9/CD-2**

**Painted Bunting**

*Passerina ciris*

Seeds

C. Matherne
May 29, 2025

**HA-9/CD-2**

**Painted Bunting**

*Passerina ciris*

Seeds

C. Matherne
May 29, 2025

**HA-9/CD-2**

**Painted Bunting**

*Passerina ciris*

Seeds

C. Matherne
May 29, 2025

**HA-9/CD-2**

**Painted Bunting**

*Passerina ciris*

Seeds

C. Matherne
May 29, 2025

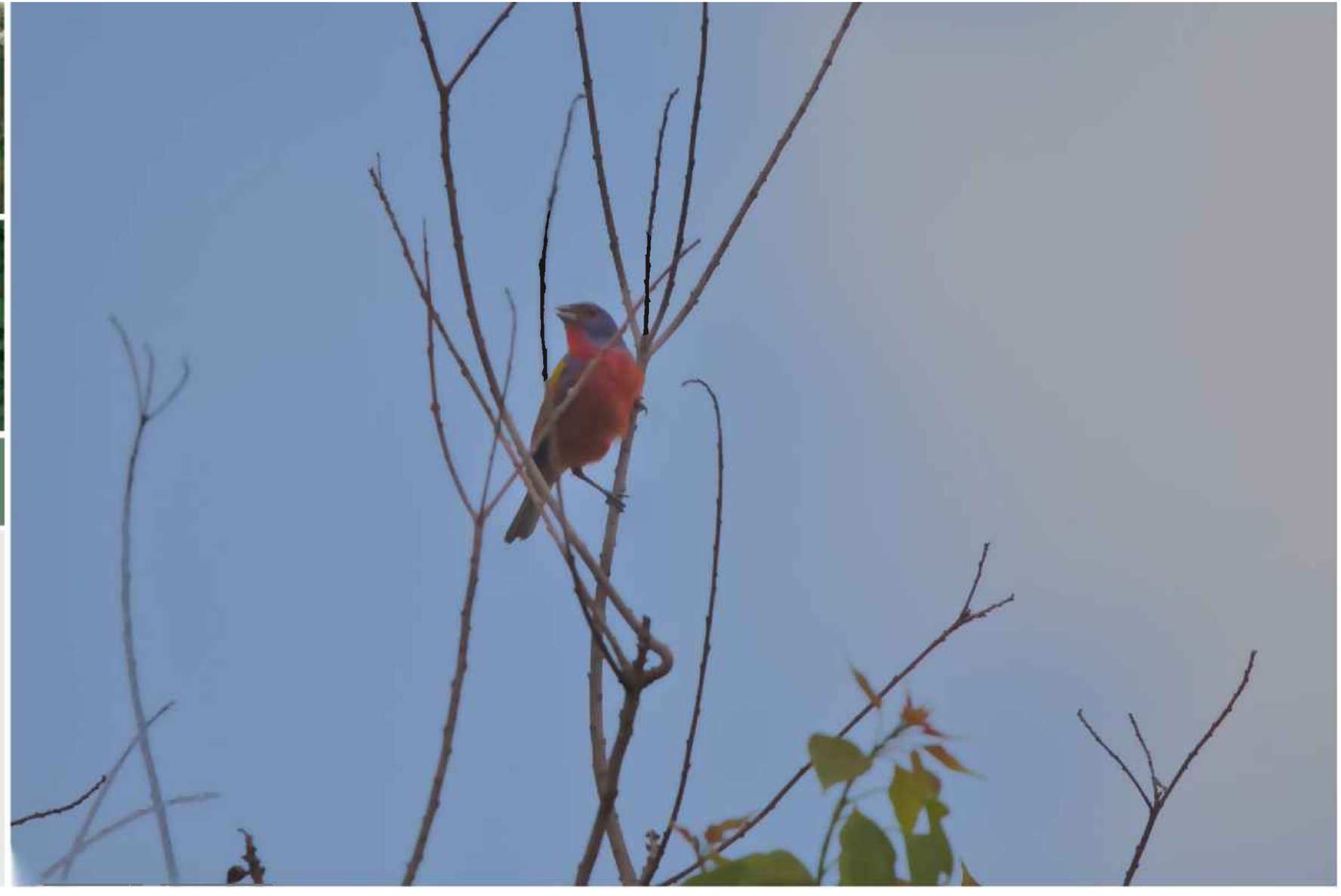
**HA-9/CD-2**

**Painted Bunting**

*Passerina ciris*

Seeds

C. Matherne
May 29, 2025



HA-9/CD-2

**Painted Bunting**

*Passerina ciris*

Seeds

C. Matherne
May 29, 2025

BP/Castex-Ltd Adm-Apx L-000807

HA-9/CD-2

**Common Yellowthroat**

*Geothlypis trichas*

Insects

C. Matherne
May 29, 2025

HA-9/CD-2

**Common Yellowthroat**

*Geothlypis trichas*

Insects

C. Matherne
May 29, 2025

HA-9/CD-2

**Common Yellowthroat**

*Geothlypis trichas*

Insects

C. Matherne
May 29, 2025

HA-9/CD-2

**Common Yellowthroat**

*Geothlypis trichas*

Insects

C. Matherne
May 29, 2025

HA-9/CD-2

**Common Yellowthroat**

*Geothlypis trichas*

Insects

C. Matherne
May 29, 2025

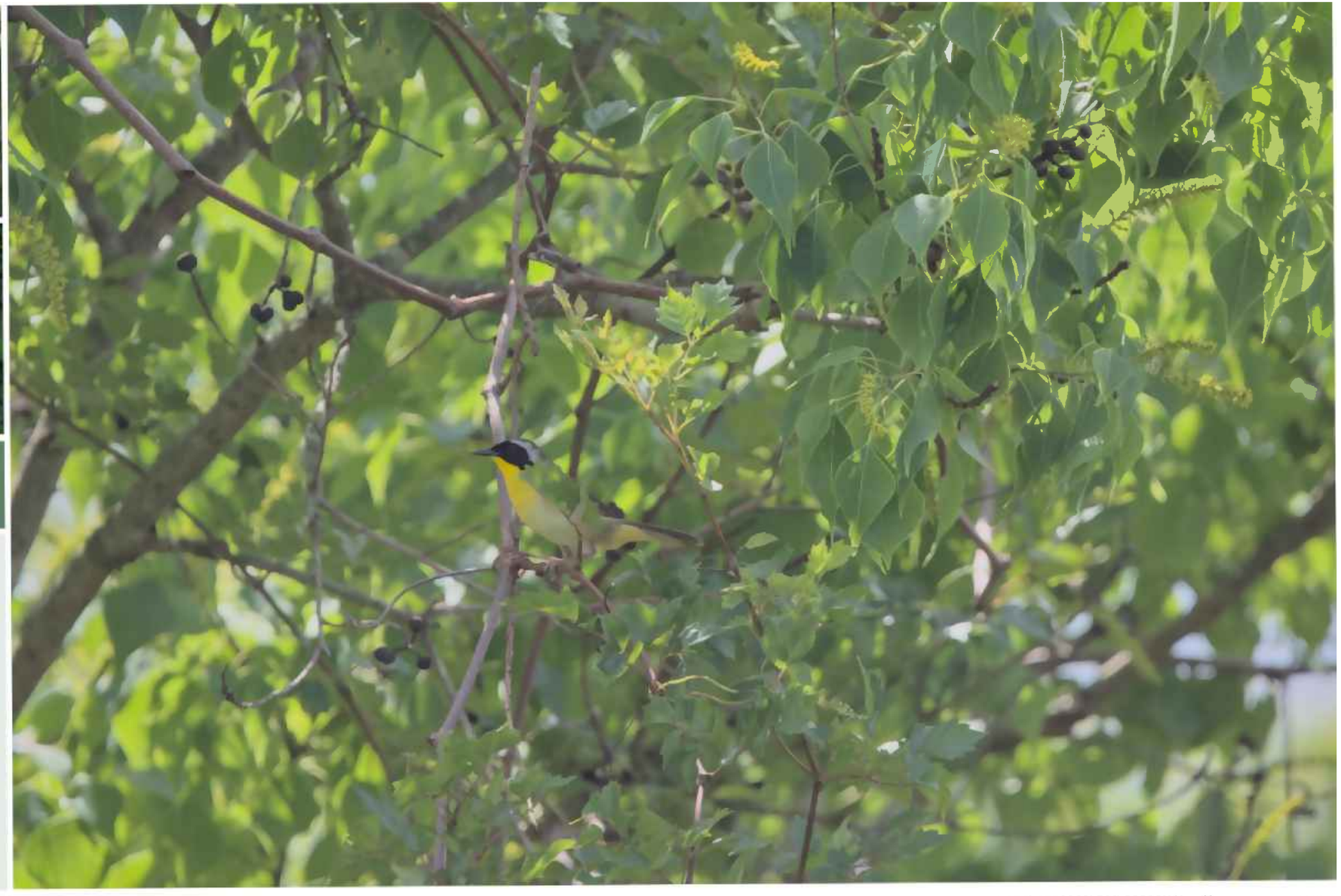
HA-9/CD-2

**Common Yellowthroat**

*Geothlypis trichas*

Insects

C. Matherne
May 29, 2025



**HA-9/CD-2**

**Great Blue Heron**

*Ardea herodias*

**Fish**

C. Matherne
May 29, 2025

E-Inc-D2-A

**Painted Bunting**

*Passerina ciris*

Seeds

C. Matherne
May 29, 2025

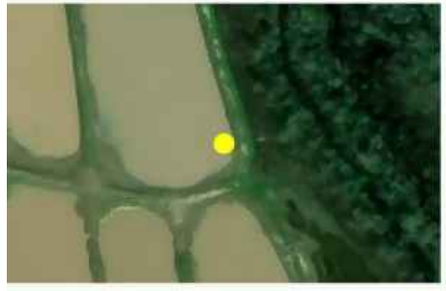
**E-Inc-P2**

**White Ibis**

*Eudocimus albus*

Aquatic Invertebrates

C. Matherne
May 29, 2025



E-Inc-R7

**Little Blue Heron**

*Egretta caerulea*

Fish

C. Matherne
May 29, 2025

E-Inc-R7

**Little Blue Heron**

*Egretta caerulea*

**Fish**

C. Matherne
May 29, 2025

E-Inc-R7

**Black-necked Stilt**

*Himantopus mexicanus*

Aquatic Invertebrates

C. Matherne
May 29, 2025

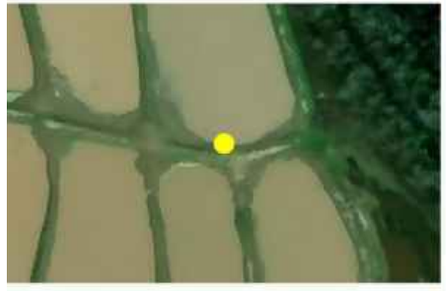
ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

Teams\OPC\0778889\DM\32909H(AppB)



Castex-ERM-RPT-000817
BP/Castex-Ltd Adm-Apx L-000818



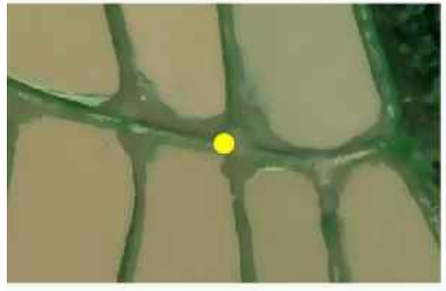
E-Inc-R7

**Little Blue Heron**

*Egretta caerulea*

Fish

C. Matherne
May 29, 2025



E-Inc-R7

**White Ibis**

*Eudocimus albus*

Aquatic Invertebrates

C. Matherne
May 29, 2025

**E-Inc-R8**

**Killdeer**

*Charadrius vociferus*

Insects

C. Matherne
May 29, 2025

SN 28396

**Black-bellied Whistling Duck**

*Dendrocygna autumnalis*

Plants

C. Matherne
May 29, 2025

# Photographs of Non-Avian Fauna

SN 28396

**Squirrel tree frog**

*Hyla squirrella*

Secondary Consumer

A. Sivils
May 29, 2025

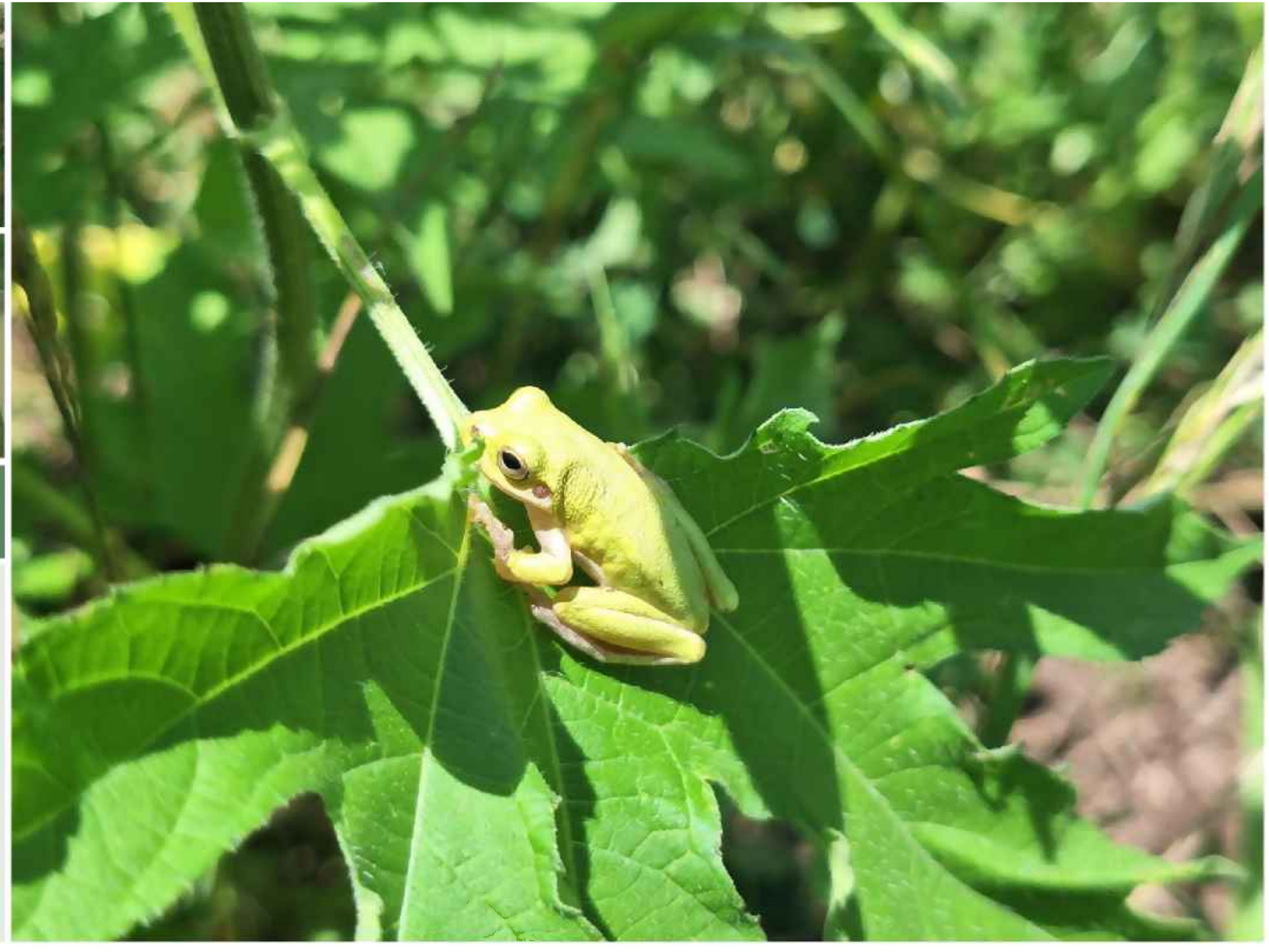
SN 28396

**Green tree frog**

*Hyla cinerea*

Secondary Consumer

A. Sivils
May 29, 2025



SN 28396

**Squirrel tree frog**

*Hyla squirrella*

Secondary Consumer

C. Matherne
May 29, 2025

SN 28396

**Squirrel tree frog**

*Hyla squirrella*

Secondary Consumer

C. Matherne
May 29, 2025

HA-4

**Crawfish tower**

*Order Decapoda*

Secondary Consumer

A. Sivils
May 29, 2025

**HA-4**

**Crawfish tower**

*Order Decapoda*

Secondary Consumer

K. Cejas
May 29, 2025

**HA-5/CD-3**

**Crawfish tower**

*Order Decapoda*

Secondary Consumer

A. Sivils
May 29, 2025

HA-5/CD-3

**Crawfish tower**

*Order Decapoda*

Secondary Consumer

A. Sivils
May 29, 2025

HA-9/CD-2

**Crawfish tower**

*Order Decapoda*

Secondary Consumer

K. Cejas
May 29, 2025

HA-9/CD-2

**Crawfish**

*Order Decapoda*

Secondary Consumer

K. Cejas
May 29, 2025

HA-4

**Shelf fungus**

*Group Polypores*

Decomposer

A. Sivils
May 29, 2025

HA-4

**Shelf fungus**

*Group Polypores*

Decomposer

K. Cejas
May 29, 2025

Appendix B-4: Former Anadarko Operations Areas and Vicinity



Castex-ERM-RPT-000834

**BP/Castex-Ltd Adm-Apx L-000835**

HA-9/CD-2

**Feral hog wallow**

*Sus scrofa*

Tertiary Consumer

C. Matherne
May 29, 2025

**HA-9/CD-2**

**Rabbit scat**

*Family Leporidae*

Primary Consumer

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity



Castex-ERM-RPT-000836
**BP/Castex-Ltd Adm-Apx L-000837**

E-Inc-P2

**Unknown mammal scat**

*Class Mammalia*

Secondary Consumer

C. Matherne
May 29, 2025

E-Inc-P2

**Unknown mammal scat**

*Class Mammalia*

Secondary Consumer

K. Cejas
May 29, 2025

E-Inc-P2

**Rabbit scat**

*Family Leporidae*

Primary Consumer

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity

HA-9/CD-2 Vicinity

**Unknown mammal burrow**

*Class Mammalia*

Secondary Consumer

A. Sivils
May 29, 2025

HA-9/CD-2 Vicinity

**Unknown mammal burrow**

*Class Mammalia*

Secondary Consumer

A. Sivils
May 29, 2025

HA-4

**Terrestrial isopod**

*Order Isopoda*

Primary Consumer

A. Sivils
May 29, 2025

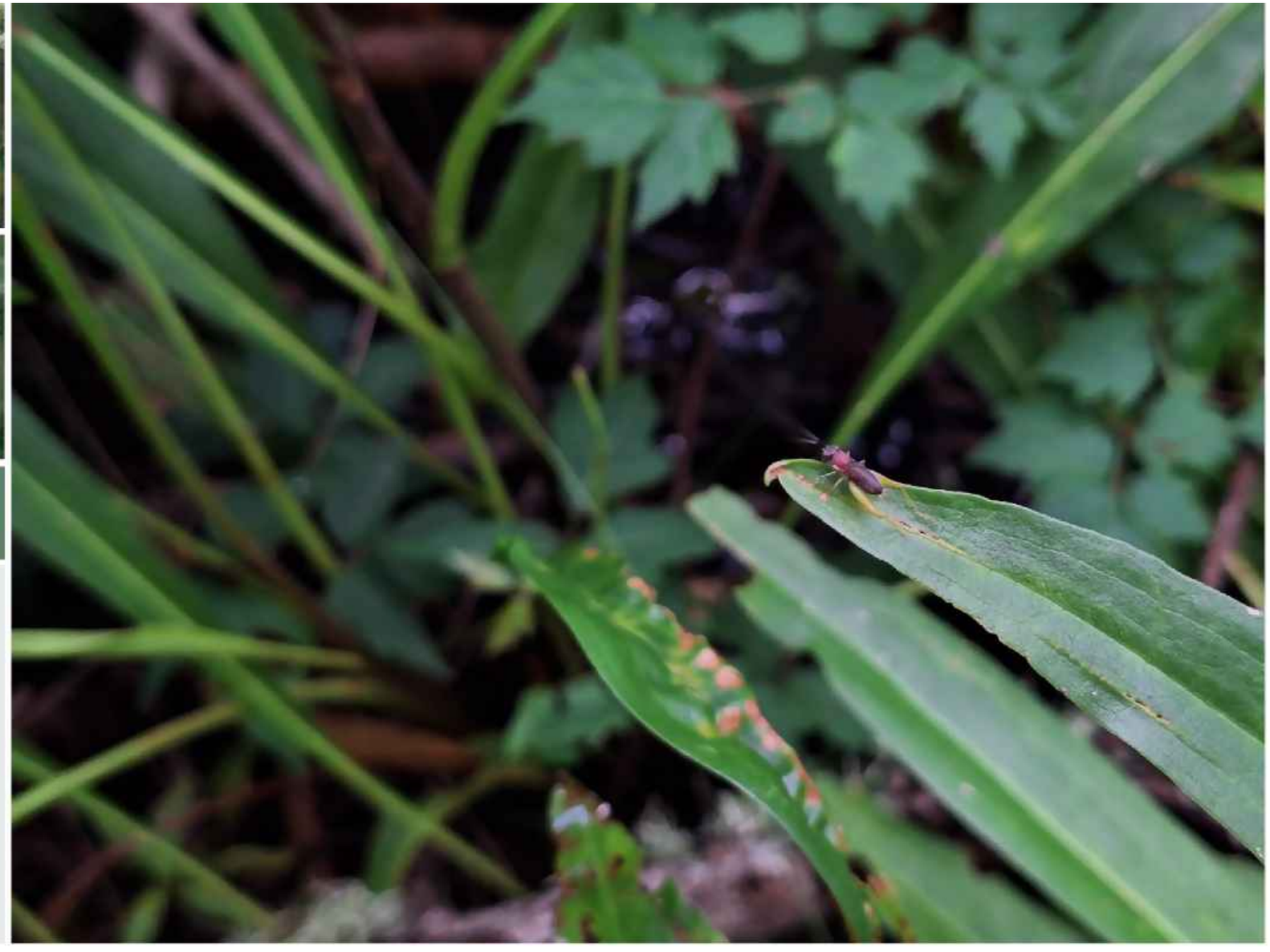
HA-4

**Red-headed bush cricket**

*Phyllopalpus pulchellus*

Secondary Consumer

A. Sivils
May 29, 2025



HA-4

**Katydid**

*Family Tettigoniidae*

Primary Consumer

A. Sivils
May 29, 2025

HA-4

**Beetle**

*Order Coleoptera*

Primary Consumer

A. Sivils
May 29, 2025

HA-4

**Grasshopper**

*Infraorder Acrididea*

Primary Consumer

A. Sivils
May 29, 2025

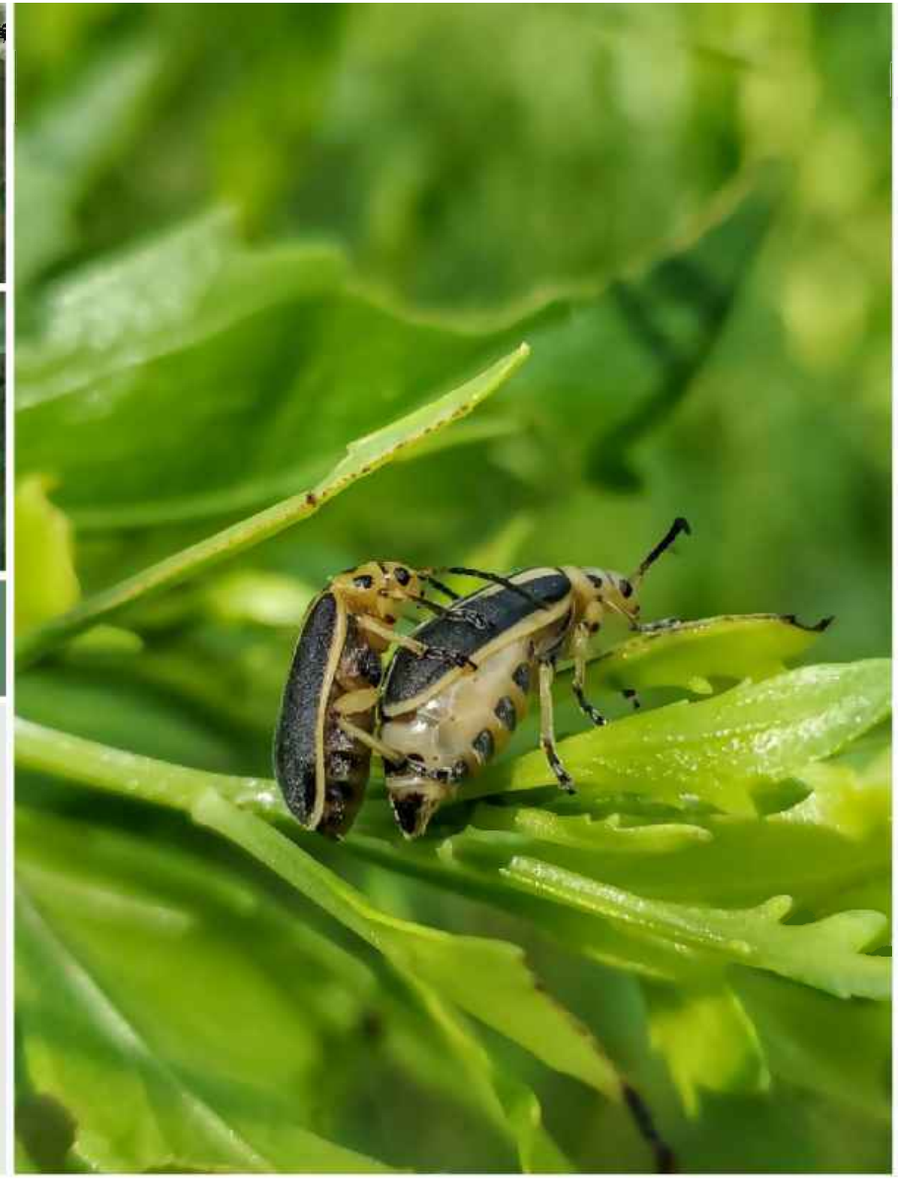
**HA-4**

**Soldier beetle**

*Family Cantharidae*

Primary Consumer

C. Matherne
May 29, 2025



**HA-5/CD-3**

**Katydid**

*Family Tettigoniidae*

Primary Consumer

A. Sivils
May 29, 2025

HA-5/CD-3

**Great blue skimmer**

*Libellula vibrans*

Secondary Consumer

C. Matherne
May 29, 2025

HA-9/CD-2

**Northern walkingstick**

*Diapheromera femorata*

Primary Consumer

A. Sivils
May 29, 2025

**HA-9/CD-2**

**Spicebush swallowtail**

*Papilio troilus*

Primary Consumer

C. Matherne
May 29, 2025

**HA-9/CD-2**

**Viceroy butterfly**

*Limenitis archippus*

Primary Consumer

C. Matherne
May 29, 2025

E-Inc-D2-A

**Giant swallowtail, Pickerelweed**

*Papilio cresphontes, Pontederia cordata*

Primary Consumer, OBL

A. Sivils
May 29, 2025

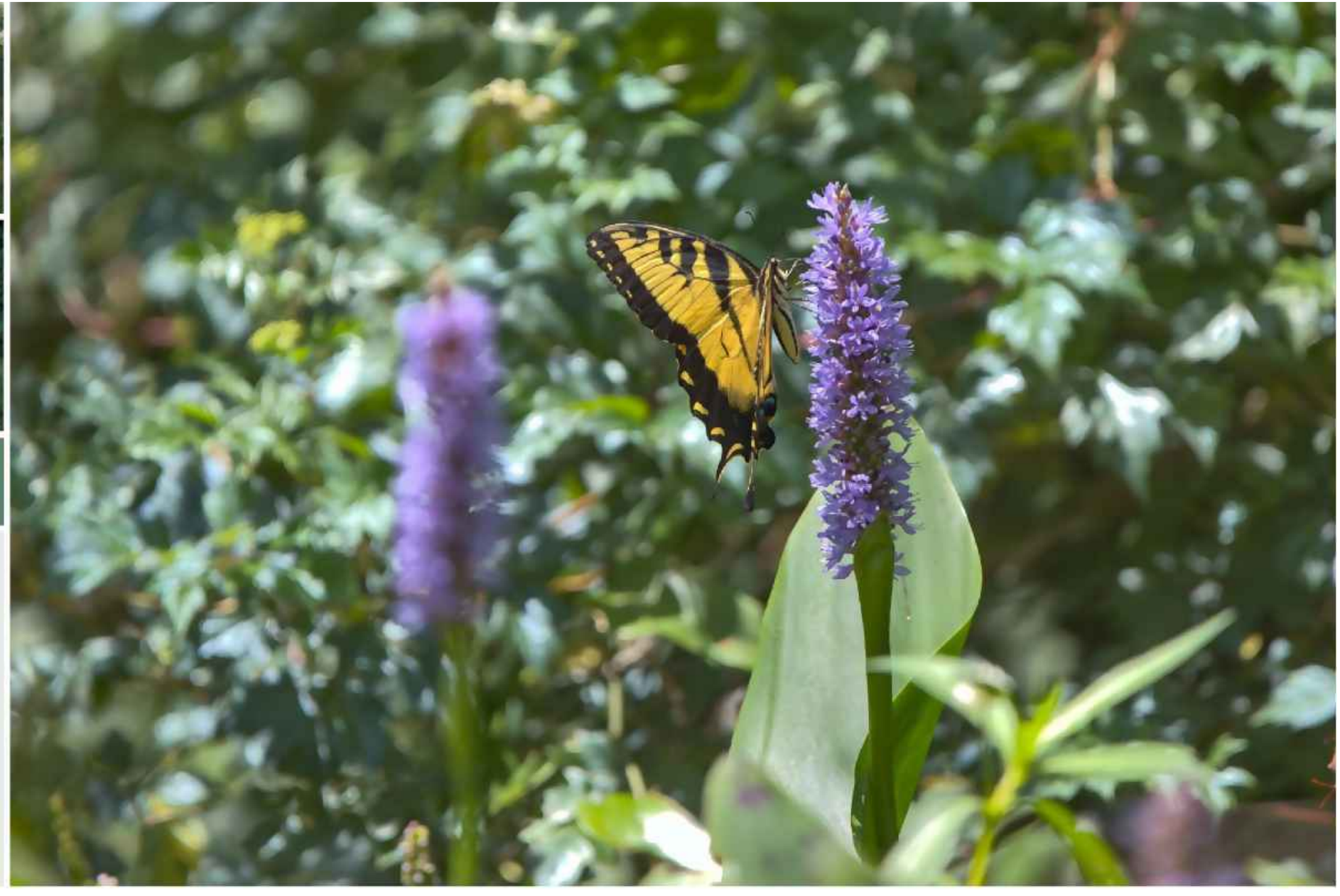
E-Inc-D2-A

**Giant swallowtail**

*Papilio cresphontes*

Primary Consumer

C. Matherne
May 29, 2025



BP/Castex-Ltd Adm-Apx L-000855

E-Inc-P2

**Black-footed yellow sac spider**

*Cheiracanthium inclusum*

Secondary Consumer

C. Matherne
May 29, 2025

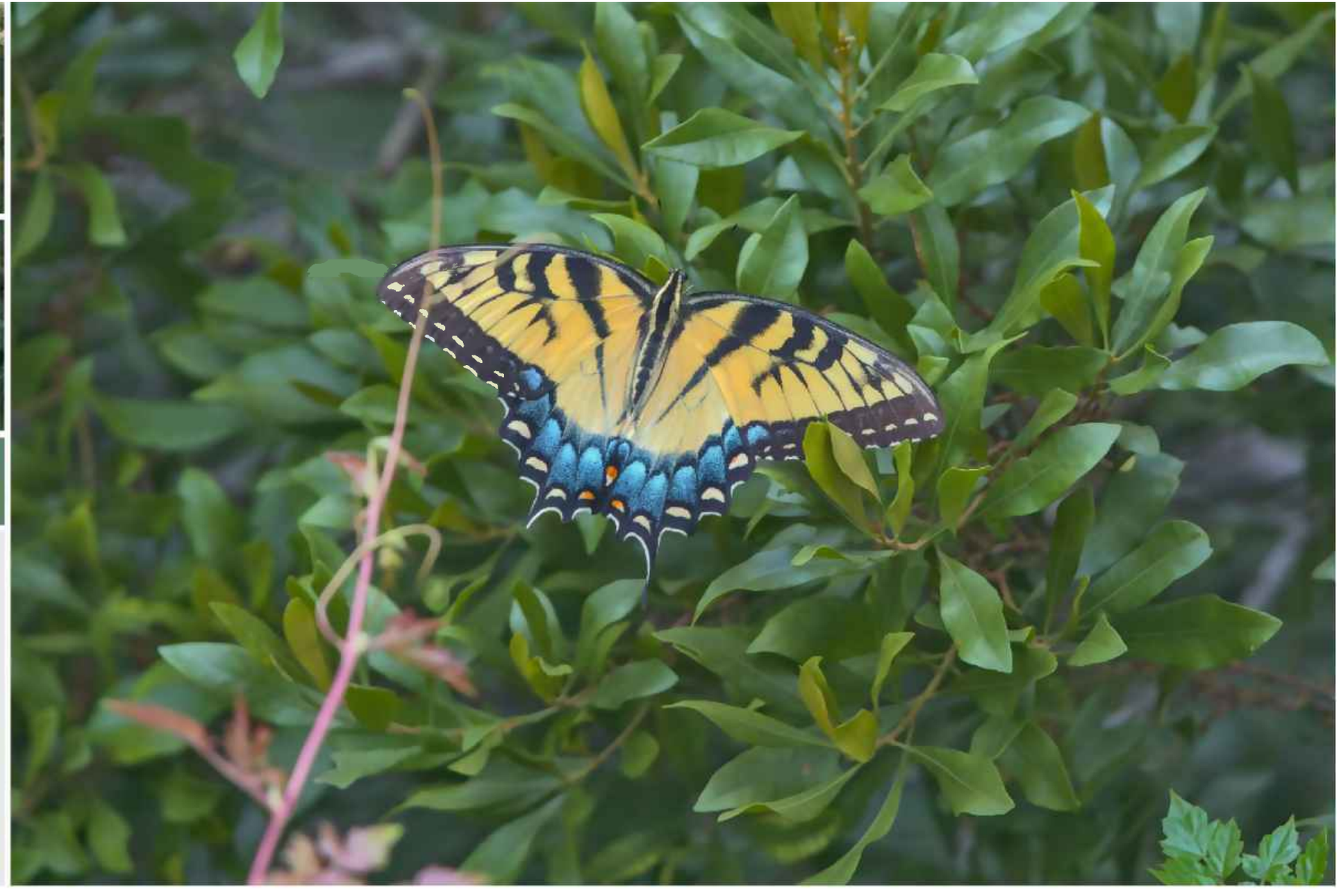
E-Inc-P2

**Eastern tiger swallowtail**

*Papilio glaucus*

Primary Consumer

C. Matherne
May 29, 2025



# Photographs of Recreational Activities



Castex-ERM-RPT-000857
BP/Castex-Ltd Adm-Apx L-000858

E-Inc-P2

**Deer Stand**

C. Matherne
May 29, 2025

**E-Inc-P2**

**Deer Stand**

K. Cejas
May 29, 2025

ERM

Appendix B-4: Former Anadarko Operations Areas and Vicinity



Castex-ERM-RPT-000859
BP/Castex-Ltd Adm-Apx L-000860

E-Inc-R8

Infrastructure

K. Cejas
May 29, 2025

# APPENDIX C FIELD NOTES

07788889 4/15/25

0730 Meet at Site

Karon Cejas
Jody Shugart
Connor Matherne
Sam Schlippert
Ashley Bergeron

0743 Safety Meeting

0825 Start E-520-5

~~30.178339 92~~ KC

30.178343
92.617981

lichen caterpillars

3 landscape photos, 2 incidental photos

0849 End E-520-5

Scale: 1 square = _____

0778889 4/15/25

~~KC~~ KC

9:07 Start E-520-06

30. 182626
92. 615090

3 landscape photos, 1 caterpillar photo

9:38 End E-520-06

~~E-520-10~~ KC

9:45 Walk along ditch E-Inc-D3

9 landscape photos, 3 inc. photos

10:49 start E-520-4

30. 178789
92. 619233

4 landscape photos

3 inc. photos - soil sample, scat, tower

11:12 End E-520-4

KC

Scale: 1 square = _____

Rite in the Rain

4 0778889 4/15/25

11:27 Start E-520-10

30.179026

92.617246

4 landscape photos

11:44 End E-520-10

Observations @ Mermentau River

3 inc. photos of dock/river

12:34 Start E-520-9

4 landscape photos, 1 inc photo - flower

12:54 End E-520-9

Observations & 4 photos of rice field E-Inc-R3

2 photos of ditch E-Inc-D2

1:05 Start E-520-8

4 landscape photos

1:24 End E-520-8

1 photo @ E-Inc-D2

1:36 Start E-520-7

4 landscape photos

1:47 End E-520-7

2 photos of Jody + Connor photographing a turtle

KS

Scale: 1 square = _____

0778889 4/15/25

~~2.22~~ KC

2:12 Start E-520-11

30.176426

92.630253

4 landscape photos

KC

~~2~~:32 End E-520-11

4 incidental photos - hunting structures

3:04 Start E520-02

5 landscape photos

Took 3 pics of Inc-R2 during veg survey

3:20 End ~~E520~~ E-520-02

3:25 Start E520-03

4 landscape photos, 1 hog track photo

3:37 End E-520-03

KC

Scale: 1 square = ___

Rite in the Rain

6 0778889 4/15/25

3:39 Start E-S 0-5 landscape photos, 2 bee photos, 2 butterfly

4:06 End E-520-1

4:15 Walked to E-Inc-R1

4 landscape photos of E-Inc-R1

4:33 1 photo E-Inc-D1

Most of ditch is dry

4:45 5 photos of camps along Mermentau River

4:50 Leave Site

KL

Scale: 1 square =

Location C Date 04/15/25

Project / Client 0778881 / Castex

7:45 am ERM Safety meeting

Jody Swigart
Maren Cefas
Connor Matherne
Sam Schwippert
Ashley Burgeron (ICON)

8:00 am HET Safety meeting w/ crew and ERM

Location E-S20-5 Date 04/15/25 45

Project / Client 0778889 / Castex

E-S20-5

4/15/25 SS

~~30.178343 92.617981~~

start = 8:25

End = 8:49

30.178343
92.617981 N

| | I | S1 SS | S2 | H1 | H2 |
|---|---|---|---|---|---|
| | | ~~40~~ 4/15/25 | | | |
| Chinese privet (Ligustrum sinense) | | 90 | | | |
| American elm (Ulmus Americana) | | | | | |
| Trumpet Creeper (Campsis radicans) | | | | 20 | |
| Water oak (Quercus nigra) | 25 | | | | |
| Virginia Creeper | | | | 10 | |
| Dwarf palmetto (Sabal minor) | | | 2 | | |
| Sugarberry (Celtis laevigia) | 10 | | | | |
| Lichen Sp | | | | | |
| Japanese climbing fern (Lygodium japanicum) | | | | 2 | |

Castex-ERM-RPT-000868

BP/Castex-Ltd Adm-Apx L-000869

46

Location E-S20-5 Date 04/15/25

Project / Client 0778889 / castex

E-S20-5 S6

yellow billed cuckoo

BBWD white eyed vireo

~~White Ibis~~ swans Brown Headed cowbird

Carolina wren

N. cardinal Caterpillar sp ⊕

Red bellied Woodpecker

Downey Woodp. Mammal den ⊕

Blue jay

American Crow

Mosquito

Crawfish towers

~~SS~~ SS

| | T | S1 | S2 | H1 | H2 | H3 |
|---|---|---|---|---|---|---|
| poison ivy | | | | | | 2 |
| High bush blackberry (Rubis arguDus) | | | | 5 | | |
| Carolina Snailseed (Cephrola carolina) | | | | 1 | | |
| Japanese Honeysuckle (Lonicera japanica) | | | | 3 | | |
| Lactuca Sp. 4/17/25 | | | | | 2 | |
| ~~Canadian~~ black snake root (Senicula canadensis) Canadian | | | | | 3 | |
| Variable panic grass (Dichanthelium commutatum) | | | | 2 | | |

Location E-S20-5 Date 04/15/25

Project / Client 0778889 / castex

| | T | S1 | S2 | H1 | H2 |
|---|---|---|---|---|---|
| Sweet gum | 15 | | | | |
| Lyre leaf sage) | | | 2 | | |
| Csalvia lyrata) | | | | | |

48

Location E-S20-6 Date 04/15/25

Project / Client 0778889 / Castex

0778889

Start = 9:07 am
End = 9:39 am

Hairy Woodpecker
~~Hummingbird sp.~~ SS 4/17/25
Deer tracks
N. Cardinal
Ruby throated Hummingbird
Brown eyed cowbird
carolina wren
red bellied woodpecker
American crow
Blue jay
Chimney Swift
Snowy Egret
~~White Ibis~~ SS 4/17/25

20.182602
92.615090

great blue heron
mosquitos
Tree swallow
canada goose
Brown thrasher
Grey Catbird

Catfish tower
laughing gull
BBWD
coyote scat
yellow billed cuckoo
Great Egret
White-eyed Vireo
White throated Sparrow

Location E-820-C Date 04/15/25 49.

Project / Client 0778889 / Castex

| | T# | S1 | S2 | H1 |
|---|---|---|---|---|
| Trumpet creeper | | | | 75 |
| Chinese Tallow | | 10 | 10 | |
| Chinese privet | | | 25 | |
| High bush blackberry | | | | 10 |
| Southern dewberry (Roobis trivalis) | | | | 10 |
| pepper vine (Nekemias arborea) | | | | 15 |
| Butter weed (packera glabella) | | | | 2 |
| J. climbing fern | | | | 10 |
| Cherokee sedge (carex cherokee) | | | | 25 |
| cotton mouth grass (phano. pyrom gymnocarpon) | | | | 4 |
| Bushy blue stem (Andropogen glomeratis) | | | | |
| Carolina Snailseed Baccharis (Baccharis halimifolia) | | | 5 | 1 |
| philadelphia fleabane (erigeron p.) | | | (philadelphia fleabane) | 3 |
| fall golden rod (solidago altissima) | | | | 2 |

Location E-S20-6 Date 4/15/25

Project / Client 077889 / Castex

| | T | SS | S1 | S2 | H1 | H2 | H3 |
|---|---|---|---|---|---|---|---|
| water oak | 5 | | | | | | |
| sweet gum | 15 | | | | | | |
| America elm | 8 | | | | | | |
| poison ivy | | | | | | | 2 |
| ~~Oak sp. ⊕ 9:25~~ | | SS 4/15/25 | | | | | |
| winged elm (almis alata) | 10 | | 8 | | | | |
| Seg side goldenrod (Solidago simpemiren) | | | | | 2 | | |
| ~~Crawfish Chinaberry~~ | | SS 4/15/25 | | | | | |
| Japanese Honeysuckle | | | | | 6 | | |
| Chenry bark Oak (previously Oak sp ⊕ 9:25) | 10 | SS 4/15/25 | | | | | |
| (Quercus pagoda) | | | | | | | |

Location E-INC-D3 Date 04/15/25

Project / Client 07788897 / Castex

~~Cattle footsteps (tracks)~~ SS 4/15/25

- approximately 6 in Surface wate
- Turbid water
- Brown, not flowing water
- ~~Evidence of cattle usage~~ SS 4/15/25
- Ditch connects to BNC lane art road
- pig tracks, eviden of pig caused disturbance (rooting)
- Fully vegetated
- Unidentified scat
- Mode trail
- Wolf Spider
- Toad ⊕
- Caterpillar Sp.
- Rabbit Scat
- Chimney Swift
- Blue jay
- Fish Sp.
- Spiney back orbweaver
- Cardinal
- Raccoon scat & tracks
- Spittle bug nest on water
- Deer tracks
- Deer hunting stand ⊕
- Turtle (mosk or mud)

52 Location 8-820 4/15 SS 4 Date 4/15/25

Project / Client 07788889 / Castex 8S

Start = 10:49am
end = 11:12am

| | T | S1 | S2 | H1 | H2 | H3 |
|---|---|---|---|---|---|---|
| Live oak | 30 | | | | | |
| (Quercus virgini.) | | | | | | |
| Chinese privet | | | 5 | | | |
| Water oak | 20 | | | | | |
| Chinese pillow | 5 | | | | | |
| Trumpet creeper | | | | 5 | | |
| seaside goldenrod | | | | | 6 | |
| deciduous holly | 2 | | | | | |
| (Ilex decidua) | | | | | | |
| Emerald Sedge | | | | | 3 | |
| Boneset sp. ⊕ 10:43 | | | | | 2 | |
| High bush BB | | | | | 7 | |
| Chicory Bark Oak | 20 | | | | | |
| American Beauty | | | 4 | | | |
| (Callicarpa Americana) | | | | | | |
| American Elm | | | 4 | | | |
| St. Johns Wort sp. | | | | 15 | | |
| Frost Weed | | | | 1 | | |
| Carolina ponysfoot | | | | | 1 | |
| peppervine | | | 5 | | | |
| Gamochaeta sp. | | | | 1 | | |
| Japanese Climbing fern | | | 7 | | | |

Location E-S20-4 Date 4/15/25

Project / Client 0978889 / Castex

30.17781
92.60233

Start = 10:49
End = 11:12

Red belly woodpecker
American crow
Carolina wren
Crawfish tower/chimney
Mosquito sp.
Tufted titmouse
Rabbit scat
Coyote scat
Great egret
Laughing gull

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Slender woodoats (Chasmanthium L.) | TI | S1 | S2 | H1 | H2 | H3 | |
| Loblolly pine (Pinus taeda) | 60 | | | 25 | | | |
| Bacchanis | | 15 | | | | | |
| Sedge sp. | | | | | 3 | | |
| Oxalis Stricta | | | | | | 2 | |
| Variable panic grass | | | | 3 | | | |
| Poison ivy | | | | | | 5 | |
| Virginia creeper | | | | | | 10 | |
| Yaupon | | | 4 | | | | |

Kite on the River

Location E-S20-10

Project / Client 0778889 / castex

Date 4/15/25

30.179026
92.617246

SS 4/15/25

start = 11:27
End = 11:44

N. Cardinal
C. Wren
Red belly woodp
Cricket
American Crow
Mosquito sp.
Chimney Swift
Crawfish Power
Titmouse (tufted)
Spotted tiger beatle
fish crow

Bluejay
Great blue Heron

| | T | S1 | S2 | H1 | H2 | H3 |
|---|---|---|---|---|---|---|
| water oak | 50 | 10 | | | | |
| Yaupon | | 25 | | | | |
| Beautyberry | | | 4 | | | |
| Honeysuckle | | | | | 5 | |
| Chinese privet | | | 10 | 25 | | |
| muscadine (Vitis rotundifolia) round leaves → Vitis rotundifolia muscadine grape | | | | | 50 | |
| ~~Deciduous~~ holly | | | | | | |
| Deciduous holly | | | 3 | | | |

4/17/25

Location E-S20-10 Date 4/15/25

Project / Client 0778889 / castex

| | T | S1 | S2 | H1 | H2 |
|---|---|---|---|---|---|
| Trifoliate orange | | | 12 | | |
| ~~Trifoliate orange~~ 4/17/25 | | | ~~12~~ 35 | 4/17/25 | |
| high bush BBerry | | | | 2 | |
| Trumpet creeper | | | | 15 | |
| 4/17/25 ~~persimmon~~ persimmon | | | 4 | | |
| Cherokee Sedge | | | | 5 | |
| Slender wood oats | | | | 15 | |
| Viburnum dentatum | | | 13 | | |
| Sweet gum | 75 | | | | |
| Cherry Bark Oak | | | | | |
| Smilax Sp. | | 5 | | 3 | |

Castex-ERM-RPT-000878
BP/Castex-Ltd Adm-Apx L-000879

Location E-S20-9

Date 4/15/25

Project / Client 0778889 / castex

30.179545
92.622181

Start = 12:34
End = 12:54

Great egret
N. cardinal
C. wren
White Ibis
dragonfly sp.
Crawfish flivers
Red bellied wood p.
Blue jay
~~Lady~~ Asian beetle
HIS Bumble bee
arm swallow

80

| | H1 | H2 | H3 |
|---|---|---|---|
| Johnson Grass | 50 | | |
| Lovegrass Sp. (purple) | 15 | | |
| Gamochaeta Sp. (gamochaeta) | 15 | | |
| Venus looking glass Sp. | | 5 | |
| Oxalis Sp. | | 15 | |
| annual blue eyed grass | | | 15 |
| Canary grass sp. | | 3 | |
| primrose (split leaf evening) | 3 | | |
| Ludwigia ~~repens~~ repens | | SS 4/17/25 | 50 |

Location E-S20-9 Date 4/15/25 57

Project / Client 077888 9 / Castex

| | | H1 | H2 | H3 |
|---|---|---|---|---|
| Italian rye grass | | 5 | | |
| Brazilian ~~Vetch~~ SS 4/17 Vetch | | 8 | | |
| Vetch Sp. (winged) | | 10 | | |
| Scarlett pimpernel | | | | 5 |
| little quaking grass | | 5 | | |
| carex group | | 15 | | |
| misc. Sedge group | | 50 | | |
| pale Rulstre | | 4 | | |
| Bushy blue stem | | 8 | | |
| Chicory | | 1 | | |
| Little bluestem | | 2 | | |

58

Location E-820-8 Date 4/15/25

Project / Client 0778889 / Castex

30.181138
92.623191

Start = 13:05
End = 13:24

4/15/25

~~White Ibis~~ 55
N. cardinal
C. Wren
RWBB
monarch
Bumble bee
Green Anole ⊕
Wh-eyed vireo
Fish Crow
Tiger swallowtail

| | T | S1 | S2 | H1 | H2 | H |
|---|---|---|---|---|---|---|
| S. Dewberry | | | | 80 | | |
| H. bush BB | | | | 2 | | |
| J. honeysuckle | | | | 2 | | |
| Swamp leather flower | | | | 4 | | |
| Clematis (hispa) | | | | | | |
| Trumpet creeper | | | | 5 | | |
| pepper vine (pepper vine) | | | | 3 | | |
| Saw green brier (Smilax rhinox) | | | | 3 | | |
| Florida hedge nettle (Stachys floridana) | | | | 3 | | |
| muscadine | | | | 2 | | |
| Chinese privet | | 10 | | | | |

Location E-S20-8 Date 4/15/25 59

Project / Client 07788889 / castex

| | T | S1 | S2 | H1 | H2 |
|---|---|---|---|---|---|
| Water oak | 15 | | | | |
| ~~Red Sour Gum~~ SS 4/15/25 | | | | | |
| Round leaf green brier (smilax rotunda Rotd) | | | | 8 | |
| American Elm | 20 | | | | |
| ~~Red Mulberry~~ SS 4/15/25 | | | | | |
| Cunsiha. Vetch (Vicca louisiana) | | | | 1 | |
| Giant ragweed | | | | 4 | |
| Tall golden rod | | | | 7 | |
| Live Oak | | | 3 | | |
| Carolina Snailseed (snailseed) | | | | 5 | |
| sugarberry | 25 | | | | |
| sweet gum | 25 | 3 | | | |
| Butter weed | | | | 5 | |
| Sticky willy (willy) | | | | 6 | |
| (Galium pinetorum) | | | | | |
| Cherokee Sedge | | | | 8 | |
| poison ivy | | | | 25 | 15 |

60

Location E-S20-7 Date 4/15/25

Project / Client 07788889 / castex

30.182133
92.624193

Start = 13:36
End = 13:47

Dragonfly Sp.
N. Cardinal
Fish Crow
Rodent burrow Sp.
Rodent Sp.
American Crow
C. Wren

88

| | S1 | S2 | H1 | H2 | H3 |
|---|---|---|---|---|---|
| plant Sp. @ 13:37 | | | 3 | | |
| Western ragweed | | | | 10 | |
| little quaking grass | | | | 15 | |
| Carolina geranium (Geranium Carolinia) | | | 90 | | |
| Louisiana vetch | | | 5 | | |
| Dog fennel | | | | 1 | |
| Love grass Sp. (purple) | | | 8 | | |
| Tall golden rod 4/17/25 | | | 10 | | |
| ~~Scarlet pimpernel~~ Scarlet pimpernel | | | | 4 | |

Location E-S20-7 Date 4/15/25

Project / Client 0778889 / Castex

| | S1 | S2 | H1 | H2 | H3 |
|---|---|---|---|---|---|
| Giant ragweed | | | 7 | | |
| Johnsons grass | | | 2 | | |
| Clasping Vervain grass | | | 2 | | |
| ~~(Iva annua)~~ 4/17/25 | | | | | |
| Sump weed (Iva annua) | | | 5 | | |

Return the Rain

62

Location E-820-11 Date 4/15/25

Project / Client 0778889 / CAS X

30.176426
92.630253

Start = 14:12
End = 14:32

Red bellied woodpecker
N. Cardinal
American crow Blue jay
C. wren
White ~~Heron~~ eyed vireo
Skink sp.
Bullfrog sp.
~~Butterfly swallowtail~~ sp. 4/17/25
pipevine swallowtail

| | T | S1 | S2 | H1 | H2 | H3 |
|---|---|---|---|---|---|---|
| Youpon | 20 | | 35 | | | |
| poison ivy | | | | 75 | | |
| Chinese privet | | 20 | | | | |
| J. climbing fern | | | | 3 | | |
| American elm | | 20 | | | | |
| Trumpet creeper | | | | 10 | | |
| Virginia creeper | | | | | 15 | |
| Canada blacksnakeroot | | | | 1 | | |
| ~~Bat~~ SS 4/17 | | | | | | |
| Sweet gum | 16 | | | | | |
| Oak sp. | | | 10 | | | |

Location e-S20-11 Date 4/15/25 63

Project / Client 0778889 / castex

| muscadine | T | S1 | S2 | H1 | H2 | H3 |
|---|---|---|---|---|---|---|
| ~~muscadine~~ | | | | 4 | | |
| loblolly pine | 70 | | | | | |
| sugar berry | | 10 | | | | |
| Bradford pear (Pyrus calleryana) aka Calleny pear | | 5 | 8 | | | |

Rite in the Rain

64

Location E-S20-2 Date 04/15/25

Project / Client 0778889 / castex

20.183822
92.620426

start = 15:04
end = 15:20

N. Cardinal Carolina wren white eyed morning dove

| | S1 | S2 | H1 | H2 | H3 |
|---|---|---|---|---|---|
| Timothy canary grass | | | 50 | | |
| Italian rye & little quailing grass | | | 75 | | |
| annual rabbits foot grass | | | 15 | | |
| Brazilian vervain | | | 10 | | |
| Carex Sp. | | | 20 | | |
| ~~Camanda fl~~ 55 4/15/25 Texas vervain | | | 10 | | |
| (Verbena Halei) → (verbena halei | | | 15 | | |
| Reverse Clover (Trifolium resupinatum) | | | 40 | | |
| Buttercup Sp. | | | 10 | | |
| Carolina geranium | | | 5 | | |
| Branched Certrum | | | ~~55~~ 30 | | 2 |
| Bur C (Meticago polymorpha) | | | 90 | | |
| Western ragweed 4/15/25 | | | 5 | | |
| Scarlett ~~peppermint~~ 35 pimpenel | | | | | 3 |
| Vetch Sp. (wings) | | | 2 | | |

Location e-S20-2 Date 4/15/25

Project / Client 0778889/castex

Great crested fly catcher
American crow
Great Heron
Red ~~Shouldered~~ SS Hawk
↑ Tailed ↗
4/15/25

~~Hall~~ SS

66

Location E-S20-3 Date 04/15/25

Project / Client 0778889 / castex

30.18 577
92.603033

Start = 15:25
End = 15:27

Red tailed Hawk
Turkey Vulture
White Eyed Vireo
N. Cardinal
American Crow
Brown ~~Eyerded~~ cowbird
Hog Trackes

Swamp Sparrow
red bellied Woodpeck
~~Mourning~~ dove
Northern Flicker

↳ (Brown eyed cowbird)

| | H1 | H2 | H3 |
|---|---|---|---|
| Carolina geranium | 5 | | |
| annual rabbits foot | 5 | | |
| Bur Clover | 10 | | |
| Scarlett pimpernel | 3 | | |
| Italian Rye | 20 | | |
| lil quaking grass | 12 | | |
| Brazilian Vervain | 4 | | |
| Green flat Sedge (Cyperus Virens) | 2 | | |
| Carex Sp. | 25 | | |
| Branched centaury | 5 | | |
| Marsh bristle grass (Setaria parviflora) | 60 | | |

Location E-S20-3 Date 4/15/25

Project / Client 0778889 / Castex

| | | #1 | #2 | #3 |
|---|---|---|---|---|
| Texas | Vervain | 4 | | |
| Buttercup | sp | 3 | | |
| lovegrass | Cpurple) | 2 | | |
| timothy | Canary | 5 | | |
| reverse | clover | 15 | | |

Rite in the Rain

68

Location E-S20-1 Date 4/15/25

Project / Client 0778889 / castex

S8

30.183844
92.021724

Start = 15:39
End = 16:06

White eyed vireo
Bumble Bee
Great Egret
Stink bug
N. Cardinal
Carolina wren
Fire ants
White faced ibis
Asian lady beetle
Skipper butterfly
Turkey vulture
American crow
Chimney

| | | T1 | T2 | T3 |
|---|---|---|---|---|
| Brazilian Vervain | | 3 | | |
| Reverse Clover | | 25 | | |
| Johnsons grass | | 20 | | |
| Buttercup Sp. | | 2 | | |
| lil quailing grass | | 5 | | |
| Bur Clover | | 10 | | |
| Carolina Geranium | | 10 | | |
| Italian Rye | | 10 | | |
| Louisiana Vetch | | 2 | | |
| Bermuda grass | | | | 20 |
| Windmill grass | Sp | 1 | | |
| Southern dewberry | | 4 | | |
| Branched Centaury | | | 2 | |

Location E-S20-1 Date 04/15/25

Project / Client 0778889 / castex

| | H1 | H2 | H3 |
|---|---|---|---|
| Western ragweed | | 3 | |
| Carolina horse foot | | | 10 |
| Philadelphia fleabane | 2 | | |
| yellow sweet clover (Melilotus indicus) | 6 | | |
| Giant ragweed | 5 | | |
| Tall goldenrod | 3 | | |

Left site @ 4:50 pm

Rite in the Rain.

Location JEFFERSON DAVIS Date 4/16/25

Project / Client CASTEX

| | |
|---|---|
| 715 | C. MATHERNE + J. SHUGART |
| | ON SITE AT WELL PAD |
| | - SAFETY MEETING |
| | - BEGIN TO WALK TREE LINES |
| 800 | WALK E-INC-DZ |
| ~820 | WALK TO BRUCE LANE |
| ~850 | MERMENTAU RIVER |
| ~905 | HEAD TO WELL PAD |
| 930 | BACK AT TRUCK, CALL HOME |
| 945 | WALK TO DEER BLIND AREA |
| ~1030 | WALK ALONG RICE FIELDS |
| 1100 | BEGIN HEADING BACK TO TRUCKS |
| 1130 | BACK AT TRUCK |
| | - JOEY TO HEAD OUT, [redacted] TO VISIT CAMPS ON RIVER |
| 145 | JCS OFF SITE |
| 730 | ASHLEY BERGERON (ICON) ON SITE |
| 1145 | ASHLEY TO CONTINUE OVERSIGHT OF C. MATHERNE |
| 1155 | CM PARK ON BRUCE LANE, WALK CASTEX LANDING, BEGIN EBIRD TRACKING |
| 1250 | STOP TRACK, ALL OFF SITE |

078889

Jeff. Davis Parish, LA

castex — Connor & Anna M. (ERM) — May 29, 2025

0830 Meet Karen C (ERM) & MET (Matt & Brent P.)
- Prairie cut @ BP well pad

0840 Check out irrigation ditch

0845 Head to HA-4

0853 @ HA-4
- 200K @ HA-9

0915 MET offsite

CD-3

rush
goldenrod
peppervine
wax mrytle - saplings & mature
Chinese tallow
Rubus
Brazillian verbene
thistle
crawfish holes
yupon / illex

CD-3
Ground covered in clumping juncus, 2-3' tall solidago, peppervine covering over ground veg. large thistle & wax mrytle & chinese tallow sapplings covered in rubus poison ivy along ground

HA-5

smart weed
goldenrod & privet
rubus
rush
water hemlock ? or herbicidism

HA-5, WET ~ 12-18"
Chinese tallow saplings, rush, goldenrod, smartweed
Blk willow, more rubus & peppervines

Castex 078889 5/22/25

~~HA-9~~ AS

CD-~~BK~~ 2

cutleaf evening primrose

yellow puff

grass ? dom.

honeysuckle Jp.

rubus (s. dewberry)

primrose

Giant ragweed

goldenrod

grass leaves - 3-4', heads to 6'

Braz verbena

covered in clumping grasses

up to 6' & other shorter grass species

dewberry & jap honeysuckle vines cross over

paths. / yellow puff, false dandelion

false dandelion

frog fruit

@ HA-9 location tucked under

wax myrtle shrubs.

ground veg is goldenrod (some blooming)

rose-gerium, peppervine, braz verbena,

grass 3-4', carex sedge (w/ heads)

rubus

Castex 678889 5/29/25

HA -4

1005

Willow / BLK. ~~oak willow~~

Chinese tallow

Smartweed -

Solidago,

wax myrtle

Am beat berry.

rush / sedge

poison ivy,

rubus

peppermint

bone set

green anole, cricket, grasshopper

majority trees here are tallows

yupon, some sugar huckleberry, BLK willow, ~~Eastern red cedar~~, chinese tallow

HA-4 has ~18" water

dom herbaceous layer. smartweed

poison ivy, some Boneset.

BB, rush, solidago cover ground outside of wet area

Castex 078889 5/29/25

Back to area around CD-3

passion vine

v. wet. here

peppervine

---

@ SN-34959

Area covered in needle rush clumps

3-4' diameter

surrounded by sawgrass, BC willow

& ch. tallow

covered by peppervine, vines

Some, curly dock,

goldenrod

Cenchrus

horsenettle?

Break

castex 078889 5/24/25

@ unnamed ditch 1
roadside

giant ragweed, grass, goldenrod
on edge

water in ditch
pickerelweed
trumpet creeper
smartweeds,
rush
nettle
alligator weed
Butterfly

- Dont need photos here?

- following ditch

- Not going further into ditch

Castex 077889 5/29/25, femmy

@ CD-01 @ 1239

Bermuda grass covering 90%
w/ other grass sp.

Verbenas – 2 kinds? Braz & other
giant ragweed
dog fennel 1-3' – surrounding well
evening primrose
~~(light glaucous poppy splendor)~~ #8
– look up poppy plant took photo.
nightshade plt.

1245 @ 29396

Trees surrounding well
– Ilex, Elm
~ 2 more

hackberry?? could get any closer to tree too much poison ivy

well reg –
covered in poison ivy 90%. DOMINANT
peppervine
green briars on trees
rubus
golden rod
Giant ragweed
frog

1310 Done, offsite

5/29/25 0778889 9

8:32 Meet Connor
Anna
HET < Brent
Matt
at BP area
Observed mowed HA2, irrigation ditch
8:45 Drove to Guadalupe area

8:45 53 KC Parked near HA-9

9:15 Walked to CD-3
Inundated with water in
entire area
- Observations @ CD-3
- very densely vegetated
- 2-3' tall herbaceous plants
- trees
- very green, no chlorosis

KC

Scale: 1 square = _____

Kate in the Rain

10 5/29/25 0778889

little blue heron
BBWD
little blue cuckoo
black necked stilt
great egret
great blue heron
red-shouldered hawk
red-tailed hawk
red-bellied woodpecker
pileated "
Am. crow
Carolina wren
red-winged blackbird
brown-headed cowbird
common yellowthroat
North. cardinal
painted bunting
Eurkey vulture
wide eyed vireo
tufted titmouse
Indigo bunting
grackle

Scale: 1 square = _____

5/29/25 0778889 11

false monarch

bullfrog

Mayfly

dragonflies

Swallow-tailed butterfly

white ibis

caterpillar

crawfish tower

9:45 Walk to HA-5 (close-by)

- location is under ~2' water.

Vegetation looks similar to CD-3 but location is inundated. Tallow trees near inundated water.

Anna-photos of inundation

Scale: 1 square = _____

Kate in the Rain.

12 5/29/25 0778889

downy woodpecker
black-crowned night heron

10:05 Walked to HA-5

- very densely vegetated
- sample location is under ~18" water.
- densely vegetated on each of 5 sides of sample location (about 2 ft each side)

dragonfly
bullfrog
150 pod

Scale: 1 square = _____

5/29/25 0778889 13

cicadas

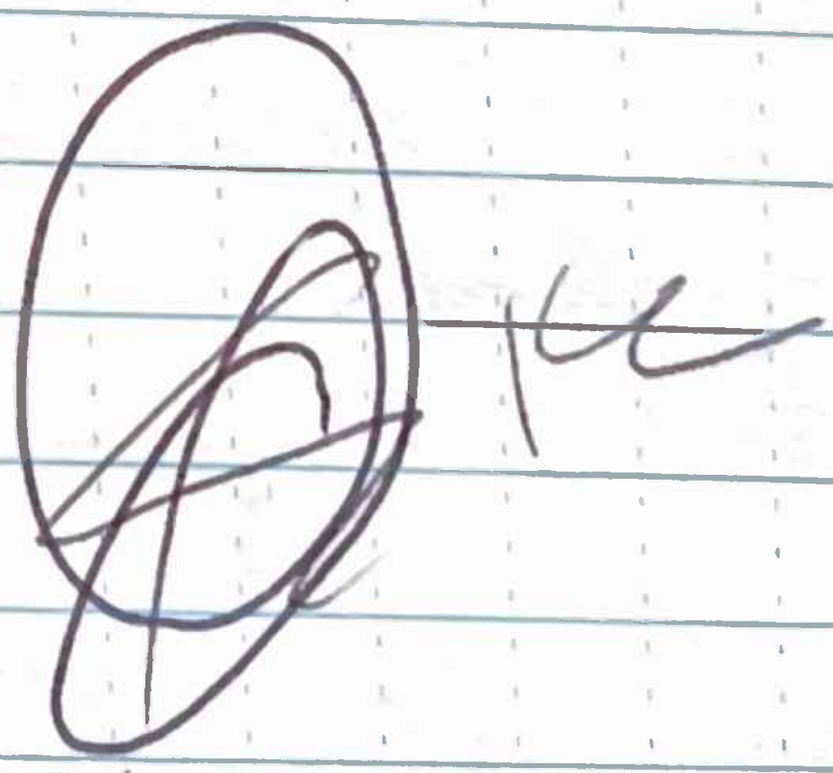
anole

anhinga

spider wasp
(Entypus genus)

giant swallow-tailed butterfly

grasshopper - photo



10:32 Walking to road

large SCat - Corna photo
bear?
horse?



Rite in the Rain

14

5/29/25 0778889

rabbit scat - photo

10:40 Water break in car

11:05 Walk to CD-2

area is inundated
w/ water

painted bunting

white ibis

horsefly

landscape photos

no chlorosis or
salt scarring

Scale: 1 square = _____

5/22/25 0778889

11'14 HA KL 9 area

Very densely vegetated too thick to get into exact spot.

Photo about 5 ft from location

dragon fly

bees

wasps

hog rooting

common yellow throat

red shouldered hawk

blue jay

chimney swift

white-eyed vireo

Scale: 1 square = _____

Rite in the Rain

16

5/29/25

0778889

yellow-billed cuckoo

orange/isl

stalk bug

12:00 walked to

SN 34959

very densely vegetated

lots of rush

inundated 1-2"

no chlorosis

Scale: 1 square = _____

5/29/25 0778889 17

12'08 Price to
Ditch point
photos of ditch
submerged vegetation
densely vegetated
6" depth water
alligator weed

Walk along ditch
near rice ponds
photos rice ponds

Ke

Scale: 1 square = _____

Rite in the Rain.

18

5/29/25 0778889

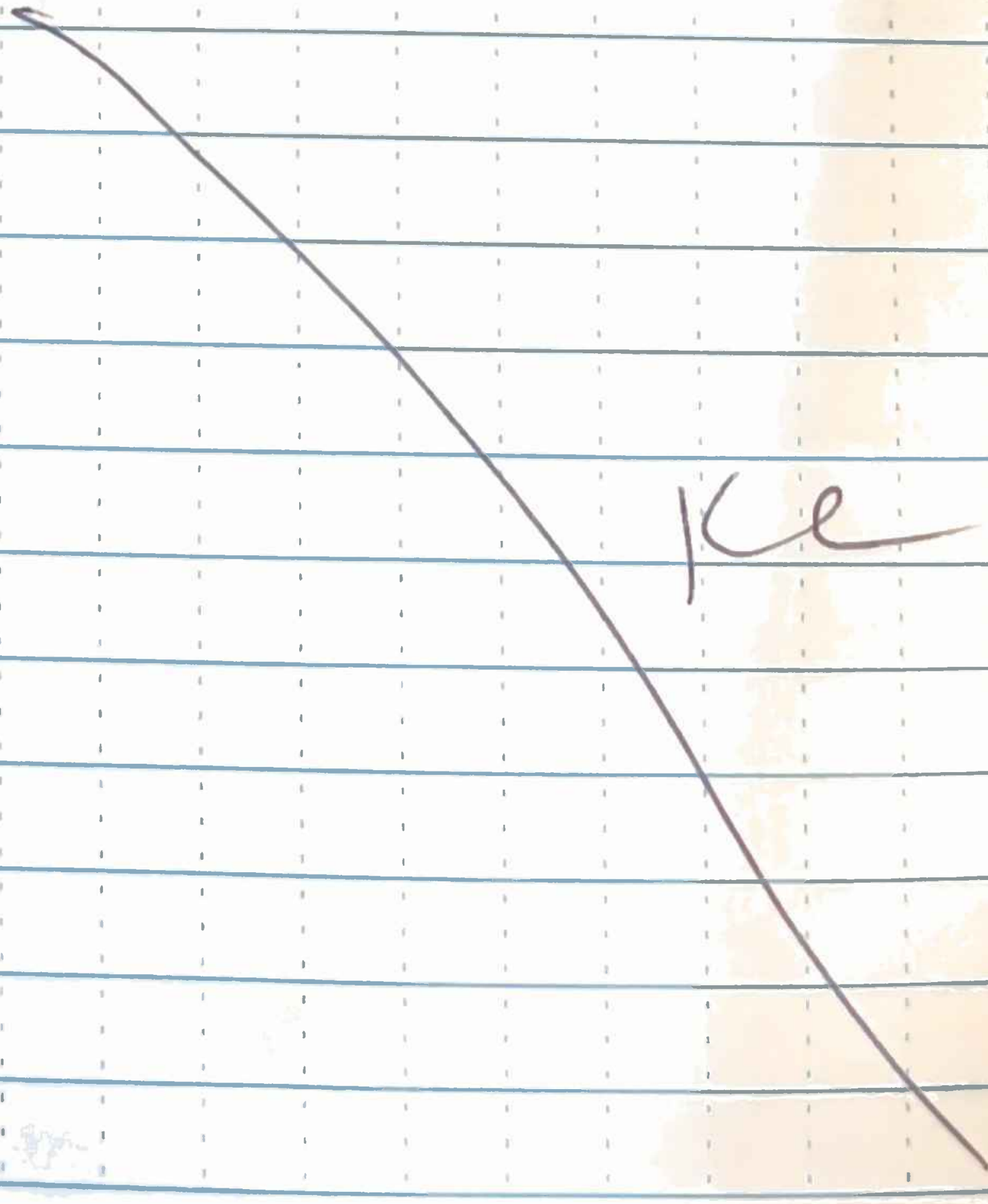
12:38 CD-1

photos - landscape

photos - rice fields

vegetation on berm

no chlorosis



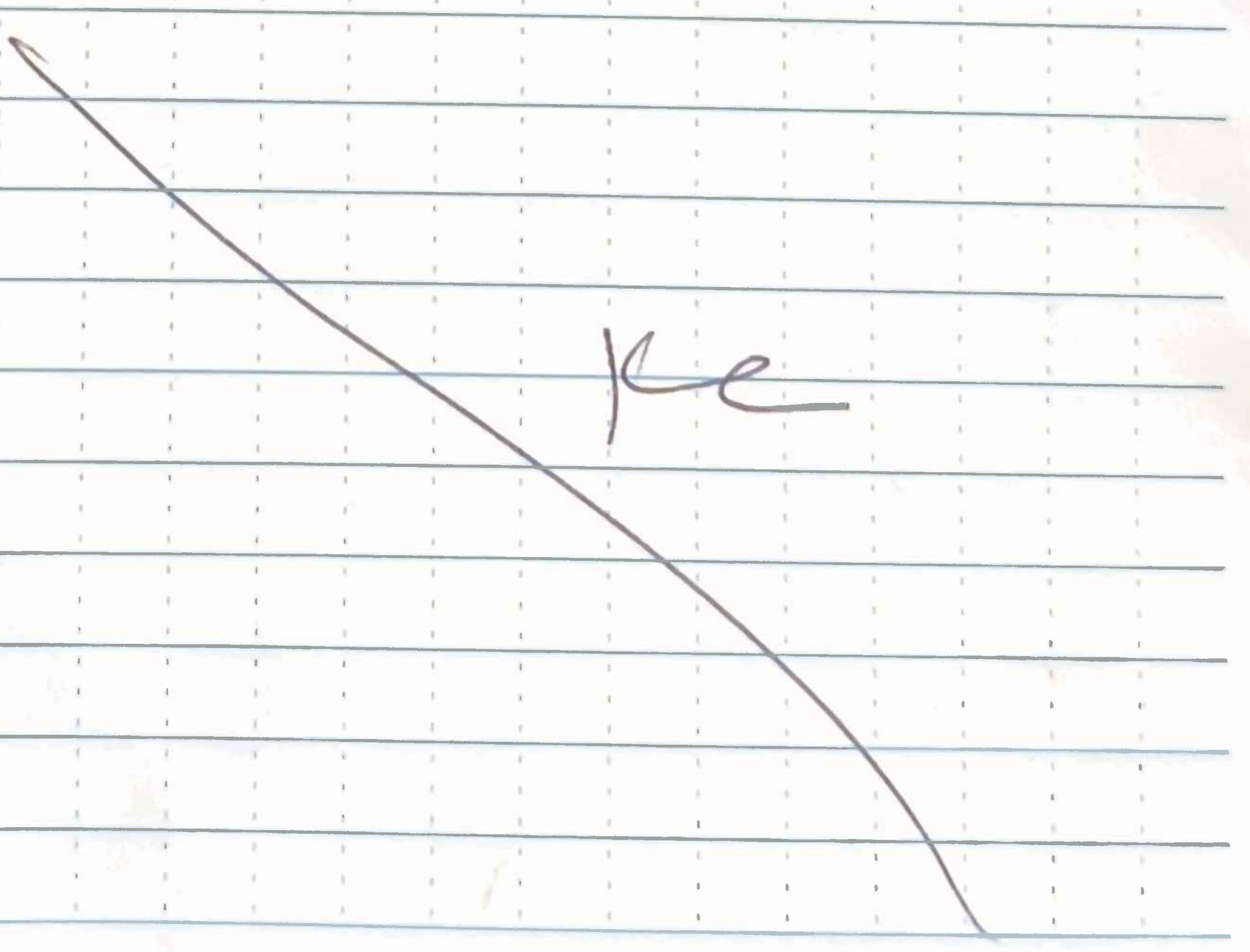

Scale: 1 square = _____

5/29/25 0778887 19

12:47 SN28396

1013 of herbaceous plants, trees landscape photos tree frogs snake

102 Back to car




Scale: 1 square = _____

Rite in the Rain

eBird

CHECKLIST S226279620

# Tue 15 Apr 2025 7:28 AM

**Jennings, Louisiana, US (30.184, -92.621)** Jefferson Davis Parish, Louisiana, United States

Connor Matherne
Jody Shugart

**Traveling** Complete

1 9 hr, 12 min 3 mi

Submitted from eBird for Android, version 3.2.2

## 25 Species Observed

| | |
|---|---|
| 20 | Black-bellied Whistling-Duck |
| 2 | duck sp. |
| 2 | Mourning Dove |
| 4 | Yellow-billed Cuckoo |
| 4 | Chimney Swift |
| 2 | Ruby-throated Hummingbird |
| 1 | Lesser Yellowlegs |
| 4 | Laughing Gull |
| 1 | Great Egret |
| 1 | Great Blue Heron |
| 3 | Red-bellied Woodpecker |
| 1 | Downy Woodpecker |
| 1 | Hairy Woodpecker |

| | |
|---|---|
| 3 | White-eyed Vireo |
| 4 | American Crow |
| 1 | Fish Crow |
| 1 | Barn Swallow |
| 5 | Carolina Wren |
| 2 | Gray Catbird |
| 1 | White-throated Sparrow |
| 1 | Eastern Meadowlark |
| 5 | Red-winged Blackbird |
| 10 | Brown-headed Cowbird |
| 1 | Hooded Warbler |
| 1 | Yellow-rumped Warbler |
| 9 | Northern Cardinal |

eBird

CHECKLIST S226124806

# Wed 16 Apr 2025 11:56 AM

**Castex** Jefferson Davis Parish, Louisiana, United States

Connor Matherne

**Traveling** Complete

1 46 min 0.91 mi

Submitted from eBird for Android, **version 3.2.2**

## 21 Species Observed

1 Mourning Dove

1 Ruby-throated Hummingbird

4 Laughing Gull

6 Double-crested Cormorant

6 Great Egret

4 Great Blue Heron

3 Turkey Vulture

1 Barred Owl

3 Red-bellied Woodpecker

1 Downy Woodpecker

1 Pileated Woodpecker

1 Eastern Kingbird

2 White-eyed Vireo

1 Blue Jay

3 American Crow

1 Fish Crow

3 Carolina Chickadee

3 Tufted Titmouse

3 Carolina Wren

6 Brown-headed Cowbird

2 Northern Cardinal

eBird

CHECKLIST S226279810

# Wed 16 Apr 2025 7:26 AM

**Jennings, Louisiana, US (30.184, -92.621)** Jefferson Davis Parish, Louisiana, United States

Connor Matherne
Jody Shugart

**Traveling** Complete

2 4 hr, 6 min 4.13 mi

Submitted from eBird for Android, version 3.2.2

**48** Species Observed

**18** Species with Photos

11 Black-bellied Whistling-Duck

1 Inca Dove

2 Mourning Dove

5 Yellow-billed Cuckoo
3 seen at once, 2 more heard elsewhere

1 Chimney Swift

1 Killdeer

7 Laughing Gull

1 Ring-billed Gull

3 White-faced Ibis

1 Yellow-crowned Night Heron

1 Little Blue Heron

5 Western Cattle-Egret



Castex-ERM-RPT-000915
**BP/Castex-Ltd Adm-Apx L-000916**

4 Great Egret

2 Great Blue Heron

2 Red-shouldered Hawk

1 Barred Owl

2 Red-bellied Woodpecker

1 Downy Woodpecker

2 Pileated Woodpecker

1 Eastern Kingbird

5 White-eyed Vireo

1 Yellow-throated Vireo

2 Red-eyed Vireo

3 Blue Jay

5 American Crow

1 Fish Crow

1 Carolina Chickadee

2 Tufted Titmouse

10 Tree Swallow

3 Northern Rough-winged Swallow

1 Barn Swallow

7 Carolina Wren

4 Gray Catbird

2 Cedar Waxwing

1 Swamp Sparrow

| | |
|---|---|
| 2 | Orchard Oriole |
| 4 | Red-winged Blackbird |
| 12 | Brown-headed Cowbird |
| 3 | Common Grackle |
| 1 | Great-tailed Grackle |
| 1 | Prothonotary Warbler |
| 1 | Common Yellowthroat |
| 1 | Northern Parula |
| 1 | Yellow-rumped Warbler |
| 2 | Summer Tanager |
| 24 | Northern Cardinal |
| 3 | Blue Grosbeak |
| 6 | Indigo Bunting |

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Castex-ERM-RPT-000917
**BP/Castex-Ltd Adm-Apx L-000918**

eBird

CHECKLIST S244186926

# Thu 29 May 2025 8:52 AM

**Jennings, Louisiana, US (30.184, -92.621)** Jefferson Davis Parish, Louisiana, United States

Connor Matherne

**Traveling** Complete

1 1 hr, 16 min 0.25 mi

CD-03 / HA-5

**Submitted from eBird for** Android, version 3.2.2

## 25 Species Observed

8 Black-bellied Whistling-Duck

7 Yellow-billed Cuckoo

8 Black-necked Stilt

33 White Ibis

1 Black-crowned Night Heron

1 Little Blue Heron

3 Great Egret

1 Great Blue Heron

5 Turkey Vulture

5 Red-shouldered Hawk

1 Red-tailed Hawk

3 Red-bellied Woodpecker



Castex-ERM-RPT-000918
BP/Castex-Ltd Adm-Apx L-000919

1 Downy Woodpecker

1 Pileated Woodpecker

3 White-eyed Vireo

2 Blue Jay

9 American Crow

2 Tufted Titmouse

9 Carolina Wren

5 Red-winged Blackbird

9 Brown-headed Cowbird

2 Boat-tailed/Great-tailed Grackle

2 Common Yellowthroat

6 Northern Cardinal

4 Indigo Bunting

1 Painted Bunting

eBird

CHECKLIST S244195731

# Thu 29 May 2025 10:10 AM

**Jennings, Louisiana, US (30.184, -92.621)** Jefferson Davis Parish, Louisiana, United States

Connor Matherne

**Stationary** Complete

1 22 min

HA-5

**Submitted from eBird for** Android, version 3.2.2

## 11 Species Observed

1 Yellow-billed Cuckoo

3 Black-necked Stilt

1 Anhinga

1 Red-shouldered Hawk

1 Red-tailed Hawk

1 Red-bellied Woodpecker

1 Pileated Woodpecker

2 American Crow

2 Carolina Wren

2 Common Yellowthroat

3 Northern Cardinal

eBird

CHECKLIST S244222131

# Thu 29 May 2025 10:57 AM

**Jennings, Louisiana, US (30.184, -92.621)** Jefferson Davis Parish, Louisiana, United States

Connor Matherne

**Traveling** Complete

1 38 min 0.11 mi

CD-3 HA-9

**Submitted from eBird for Android, version 3.2.2**

## 15 Species Observed

1 Yellow-billed Cuckoo

5 Chimney Swift

1 Black-necked Stilt

2 Great Egret

1 Great Blue Heron

2 Red-shouldered Hawk

1 Red-bellied Woodpecker

1 White-eyed Vireo

2 Blue Jay

1 American Crow

5 Carolina Wren

1 Brown-headed Cowbird

3 Common Yellowthroat

4 Northern Cardinal

2 Painted Bunting

eBird

CHECKLIST S244237674

# Thu 29 May 2025 11:56 AM

**Castex** Jefferson Davis Parish, Louisiana, United States

Connor Matherne

**Stationary** Complete

1 11 min

SN34959

**Submitted from eBird for Android, version 3.2.2**

## 5 Species Observed

1 Black-necked Stilt

1 Carolina Wren

1 Common Yellowthroat

2 Northern Cardinal

1 Painted Bunting

eBird

CHECKLIST S244247047

# Thu 29 May 2025 12:33 PM

**Castex** Jefferson Davis Parish, Louisiana, United States

Connor Matherne

**Traveling** Complete

1 11 min 0.1 mi

CD-01

**Submitted from eBird for Android, version 3.2.2**

## 13 Species Observed

1 Yellow-billed Cuckoo

2 Killdeer

2 White Ibis

2 Little Blue Heron

2 Snowy Egret

2 Western Cattle-Egret

1 Great Egret

5 Blue Jay

1 Carolina Wren

2 Red-winged Blackbird

2 Brown-headed Cowbird

3 Northern Cardinal

1 **Painted Bunting**

eBird

CHECKLIST S244242946

# Thu 29 May 2025 12:18 PM

**Castex** Jefferson Davis Parish, Louisiana, United States

Connor Matherne

**Traveling** Complete

1 14 min 0.17 mi

**Ditch**

**Submitted from eBird for Android, version 3.2.2**

## 8 Species Observed

| | |
|---|---|
| 6 | Black-necked Stilt |
| 1 | Killdeer |
| 1 | Little Blue Heron |
| 1 | Red-bellied Woodpecker |
| 1 | Carolina Wren |
| 2 | Common Yellowthroat |
| 2 | Northern Cardinal |
| 2 | Painted Bunting |

eBird

CHECKLIST S244252704

# Thu 29 May 2025 12:44 PM

**Castex** Jefferson Davis Parish, Louisiana, United States

Connor Matherne

**Traveling** Complete

1 15 min 0.11 mi

SN 28396

**Submitted from eBird for Android, version 3.2.2**

## 9 Species Observed

4 Black-bellied Whistling-Duck

1 Green Heron

2 Great Egret

1 Red-shouldered Hawk

1 Red-tailed Hawk

1 Pileated Woodpecker

2 Blue Jay

1 Carolina Wren

1 Northern Cardinal

# APPENDIX D RECAP FORM 18

ERM

## APPENDIX D

## RECAP Form 18
## Ecological Checklist

### Section 1 - Facility Information

1. Name of facility: Property

2. Location of facility: The Property is located in the West Mermentau Oil and Gas Field.

   Parish: Jefferson Davis

3. Mailing address: NA

4. Type of facility and/or operations associated with AOC:
   Former oil and gas exploration and production (E&P)

5. Name of AOC or AOI: Property

6. If available, attach a USGS topographic map of the facility and/or aerial or other photographs of the release site and surrounding areas.

### Section 2 - Land Use Information

1. Describe land use at and in the vicinity of the AOC/AOI: The Property is approximately 1130 acres in total and supports industrial operations (former oil and gas E&P), rice farming, and recreation (hunting).
2. Describe land use adjacent to the facility: Land use adjacent to the Property is similar to use on the Property. Additional uses in the surrounding areas included residential use southwest of the Property and agriculture north of the Property.

3. Provide the following information regarding the nearest surface water body which has been impacted or has the potential to be impacted by COC migrating from the AOC/AOC:

a) Name of the surface water body: The Property contains freshwater wetlands. The closest surface water bodies are the ditches and pond on the Property, and the Mermentau River abuts the southeast Property boundary. The Property lies within the the LDEQ Drainage Basin Subsegment #050301 Bayou Nezpique – From headwaters to Mermentau River and the LDEQ Drainage Basin Subsegment #050401 Mermentau River- From headwaters to Lake Arthur.

b) Type of surface water body:
   [X] freshwater river or stream
   [X] freshwater swamp/marsh/wetland
   [ ] saltwater or brackish swamp/marsh/wetland
   [ ] lake or pond
   [ ] bayou or estuary
   [X] drainage ditch
   [ ] other: _____

c) Designated use of the segment/subsegment of the surface water body (LAC 33:IX): Designated uses for Subsegment #050301 and Subsegment #050401 include primary and secondary contact recreation, propagation of fish and wildlife, and agriculture.

d) Distance from the AOC/AOI to nearest surface water body: The closest surface water body in the vicinity of the Property are the unnamed ditches and pond. The Mermentau River abuts the southeast boundary of the Property.

4. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., federal and state parks, national and state monuments, wetlands, etc?
[ X ] Yes [ ] No

If yes, explain:
Wetlands are present on the Property.

**Section 3 - Release Information**

1. Nature of the release: Investigation of potential releases associated with former oil and gas E&P operations.

2. Location of the release (within the facility): Former oil and gas E&P wells and features are present within the Property.

3. Location of the release with respect to the facility property boundaries: Former oil and gas E&P wells and features are present within the Property boundaries.

4. Constituents known or suspected to have been released: Constituents associated with former oil and gas E&P include salts, metals and petroleum hydrocarbons.

5. Indicate which media are known or suspected to be impacted and if sampling data are available:

| | | | | |
|---|---|---|---|---|
| [X] | soil 0 - 3 feet bgs | [X] yes | [ ] no | *sampling data available to assess impact* |
| [X] | soil 0 - 15 feet bgs | [X] yes | [ ] no | *sampling data available to assess impact* |
| [X] | soil >15 feet bgs | [X] yes | [ ] no | *sampling data available to assess impact* |
| [X] | groundwater | [X] yes | [ ] no | *sampling data available to assess impact* |
| [ ] | surface water/sediment | [ ] yes | [X] no | *sampling data available to assess impact* |

6. Has migration occurred outside the facility property boundaries? [ ] yes [ X ] no
If yes, describe the designated use of the offsite land impacted:

**Section 4 - Criteria for Further Assessment**

If the AOI meets **all** of the criteria presented below, then typically no further ecological evaluation shall be required. If the AOI **does not** meet **all** of the criteria, then a screening level ecological risk shall be conducted. The Submitter should make the initial decision regarding whether or not a screening level ecological risk assessment is warranted based on compliance of the AOI with criteria listed below. After review of the ecological checklist and other available site information, the Department will make a final determination on the need for a screening level ecological risk assessment. If site conditions at the AOI change such that one or more of the criteria are not met, then a screening level ecological risk assessment shall be conducted. Answers shall be based on current site conditions (i.e., shall not consider future remedial actions or institutional or engineering controls).

Indicate if the AOI meets the following criteria:

(1) The area of impacted soil is approximately 5 acres or less in size (based on the AOI identified for the human health assessment) and it is not expected that the COC will migrate such that the soil AOI becomes greater than 5 acres in size. [X] yes [ ] no

(2) There is no current release or demonstrable long-term threat of release (via runoff or groundwater discharge) of COC from the AOI to a surface water body. [X] yes [ ] no

(3) Recreational species, commercial species, threatened or endangered species, and/or their habitats are not currently being exposed, or expected to be exposed, to COC present at or migrating from the AOI.
[ ] yes[X] no *Recreational species, and their habitats are present on the Property.*

(4) There are no obvious impacts to ecological receptors or their habitats and none are expected in the future. [X] yes [ ] no

**Is further ecological evaluation required at this AOI?** [X] yes [ ] no
An ecological evaluation based on the data collected from the Property is being conducted as a part of this investigation.

**Section 5 - Site Summary**

**Section 6 - Submitter Information**

Date: 29 May 2025

Name of person submitting this checklist: Karen P. Cejas, PhD

Affiliation: Environmental Resources Management

Signature: _____ Date: 29 May 2025

Additional Preparers: _____

# APPENDIX E DEVELOPMENT OF BARIUM SCREENING AND TOXICITY VALUES

# APPENDIX E

## Development of Barium Ecological Values

## 1. INTRODUCTION

This study presents barium ecological benchmark values that have been calculated for use in risk assessment and a literature review to support the calculations. Included in this study are calculations for soil, sediment, and surface water barium ecological toxicity screening values, and calculations for barium toxicity reference values for mammals and birds.

### 1.1 BARIUM IN LOUISIANA ENVIRONMENTAL MEDIA

Barium in soils and sediments in south Louisiana wetlands, exists primarily in the form of barium sulfate ($BaSO_4$, barite). Barite is the commonly detected form of barium in locations of oil and gas exploration and production (E&P) activities onshore, as well as in locations unrelated to E&P.

Barite is a dense, naturally occurring mineral used in drilling mud as a weighting agent to counteract formation pressures during oil and gas drilling. The chemical formula for barite/barium sulfate is $BaSO_4$. Barium is an element that exists naturally in soils and sediments throughout the world, however in the footprint of oil and gas operations, it can be elevated above natural background concentrations. In Louisiana, barium in unimpacted soils ranges in concentrations up to approximately 847 mg/kg dry weight in the upper eight inches of soil, as measured by the US Geologic Survey (USGS) (Smith et al., 2013).

The toxicity of barium is very limited, due to its strong affinity to sulfate. When bound to sulfate, barium is poorly water soluble and very non-reactive. For these reasons, barium sulfate is of very low toxicity to wildlife and aquatic species. The physical, chemical, and toxicological properties of barium in soils, sediments, and waters are discussed in the next few sections.

## 2. BARIUM COMPOUNDS: WATER SOLUBILITY, BIOAVAILABILITY, AND TOXICITY

The environmental toxicity of a compound is related to its water solubility, and this is true for barium compounds. Water soluble barium compounds are only of low toxicity, and barium compounds of poor water solubility are of extremely low toxicity, due to very low bioavailability. When a soluble barium compound dissolves in water, barium ions ($Ba^{2+}$) are released, and are available to be absorbed into an organism's tissues. Alternatively, a barium compound that is poorly water soluble, remains primarily in its original crystalline structure, rather than dissociating into ions when in water, and most of the barium is unavailable for absorption by organisms.

The water solubility of barium compounds is summarized in the Inset Table 2-1 below. Barium sulfate is poorly soluble at about 1.6 mg/L in water and barium chloride is very soluble at 375,000 mg/L. Experiments performed to determine barium toxicity, published in the scientific literature, are generally performed with barium chloride or other soluble barium compounds because soluble barium compounds have the greatest ability to release barium ions into water that organisms drink or are swimming in. Poorly soluble barium compounds, such as barium sulfate, are not as frequently studied because they are generally non-toxic.

TABLE 2-1: BARIUM COMPOUNDS SOLUBILITY

| Compound | Molecular Formula | Solubility (mg/L) | Notes |
|---|---|---|---|
| Barium nitrate | $Ba(NO_3)_2$ | Free soluble | |
| Barium acetate | $Ba(CH_3COO)_2$ | 666,666 | |
| Barium chloride | $BaCl_2$ | 375,000 | 26° C |
| Barium chloride dehydrate | $BaCl_2 \cdot 2H_2O$ | 375,000 | 26° C |
| Barium carbonate | $BaCO_3$ | 20 | 20° C |
| Barium sulfate | $BaSO_4$ | 1.6 | 20° C |
| Barium sulfide | BaS | 11 | |

Source: Data from Budavari, 1989

Reference: Ramanathan, R. 2007. Spacecraft Water Exposure Guidelines for Selected Contaminants: Volume 2, Appendix 3 Barium and Barium Salts, NASA, The National Academies Press

Because of its poor solubility, barium sulfate, when ingested, is not absorbed but is rapidly eliminated and excreted. This is illustrated when barium sulfate is used as a contrast agent for X-ray imaging in animals and humans. For example, dogs and birds quickly excrete a barium sulfate dose given as an X-ray image contrast agent. Dogs excrete a dose of 5,000 – 10,000 mg/kg body weight barium sulfate in three hours (Root and Morgan, 1969). Birds excrete a 5,000 mg/kg body weight dose of barium sulfate in about five hours (Krautwald-Junghanns et al., 2011).

## 2.1 FORMATION AND STABILITY OF BARIUM SULFATE IN WATER AND SEDIMENTS/SOILS

The formation of barium sulfate in water when barium ions are present is a chemically favored reaction. The reaction of barium ions and sulfate ions to form barium sulfate has a large negative Gibbs free energy of formation value, -1362.2 kJ/Mol, at standard temperature and pressure (Kots et al., 2006). The negative Gibbs free energy value indicates that the reaction requires no input of energy, and instead releases energy to the environment as the reaction occurs. The reaction of barium and sulfate to form barium sulfate occurs spontaneously. The spontaneous reaction to precipitate barium sulfate, from equal concentrations of barium and sulfate, in an aerobic aqueous solution at standard temperature and pressure, is rapid and takes less than 10 minutes (Nielsen, 1958).

Barium and sulfate readily and quickly combine in water to form stable barium sulfate. The reaction of barium and sulfate is more thermodynamically favorable, meaning more likely to occur, than the reaction of barium and carbonate, barium and chloride, or barium and oxygen (Kots et al., 2006). In fact, the reaction of barium and sulfate to form barium sulfate is one of the most thermodynamically favored reactions amongst the commonly occurring metal sulfates, carbonates and chlorides, evidenced by barium sulfate having the largest negative Gibbs free energy of activation (Kots et al., 2006) of these possible reactions.

Barium sulfate in water is very stable. Barite solubility in water is low (1.6 mg/L at 20°C) due to the strong affinity of the barium ion for the sulfate ion (Alberta Environment, 2009). The barium ion concentration in surface waters is usually inversely related to the sulfate ion concentration in water because barite immediately forms when barium and sulfate are present (Alberta Environment, 2009). Natural waters containing barium typically contain enough sulfate for barium sulfate to form and precipitate out of solution.

# 3. BARIUM ANALYTICAL METHODS

Laboratory analytical methods for barium, specifically USEPA Methods 6010 and 6020, Scanning Electron Microscopy with Energy Dispersive Spectrometry (SEM-EDX), X-ray Diffraction (XRD), and scanning electron microscopy, are discussed in the following sections.

## 3.1 BARIUM 6010 AND 6020 ANALYSES

USEPA Method 6010 and 6020 are commonly used in environmental site investigations to determine sediment barium concentrations. USEPA Method 6010 and 6020 are standard SW-846 methods for analysis of barium in soils and solids. USEPA Methods 6010 and 6020 typically involve extracting metals from media using USEPA method 3050B acid digestion extraction (pH of 2.0), which is an acid digestion process that uses nitric acid, hydrogen peroxide, and heating. Method 3050B is the USEPA SW-846 method for acid digestion of sediments, sludges, and soils.

## 3.2 BARIUM ANALYSES: XRD, EDX

Laboratory analytical methods to identify the crystalline and atomic structure of barium compounds include XRD and EDX. Core Minerology, Inc. of Broussard, Louisiana analyzes barium in sediments and soils using XRD and EDX. These methods are discussed in the next few paragraphs.

XRD analysis can be used to determine the mineral composition of a sample. In XRD analysis, samples are bombarded with electrons by an XRD diffractometer, causing the sample to release energy in the form of X-rays. The characteristic X-ray spectra generated are compared to a database of spectra to identify the mineral composition of the sample. Specifically, this analysis has been used to identify the barium compound, barium sulfate. XRD provides results in percent chemical composition.

The terms EDX and SEM EDX are used interchangeably and refer to "scanning electron microscopy, energy dispersive spectrometry". This analytical method is used to determine the elemental composition of a sample. An EDX analysis involves directing electrons onto a sample and the resultant X-Rays, that are released from the sample, are characteristic of atomic species and are interpreted to determine sample elemental composition. This method has been used to identify percent barium composition of soil and sediment samples.

## 3.3 BARIUM ANALYSES: SEM EDS (QEMSCAN)

Barium speciation can be determined in a soil or sediment sample through QEMSCAN. QEMSCAN is the quantitative evaluation of minerals by scanning electron microscopy. The method produces a mineral map and allows for quantitation of constituents. QEMSCAN uses a scanning electron microscope (SEM) with an electron beam source in conjunction with four energy dispersive X-ray spectrometers (EDS). The measured electron backscattered emission spectra from the sediment sample and the electron-induced secondary X-ray emission spectra are used to identify minerals in the sample.

In QEMSCAN automated particle analysis, a background image is generated that has sufficient contrast for the background and the mineral particles to be differentiated. A particle is defined as a set of contiguous pixels, all of which are brighter than the background pixels. The particles are

recognized by the image analysis system software, and the microscope conducts a chemical analysis of each particle to classify the minerals based on its composition. Once every particle in the field of view is recognized and its dimensions and composition are saved, the microscope moves to a new field of view, and the process is repeated. Using this systematic analysis allows for the characterization (size, shape, composition) of thousands of particles in a few hours.
When the sample is bombarded by the SEM's electron beam, electrons are ejected from the atoms in the surface of the sample. The electron vacancies that are created are filled by electrons from a higher energy state, and this causes energy to be emitted in the form of an X-ray. The X-ray energy that is emitted is characteristic of a specific element. The EDS X-ray detector converts the X-ray energy to a spectrum that can be determined to be a specific element or mineral.

# 4. CALCULATION OF BARIUM SEDIMENT SCREENING VALUE

A sediment screening value for barium has been calculated in this study to be used in ecological risk assessments. A literature review was performed to identify studies of barium sulfate sediment toxicity to aquatic life, and three large studies were identified that are all based on the same sediment database (Leung et al., 2005; Bjørgesæter, 2006; Lui et al., 2014). The studies are of marine sediment toxicity to invertebrates due to barium (Table 1). Freshwater sediment studies of barium sulfate toxicity are not available. Metal sediment toxicity is similar in fresh and marine settings, with metals being generally slightly more toxic in marine settings than in fresh (Buchman, 2008). In the absence of freshwater-specific data, using marine sediment studies is a valid and conservative approach for developing sediment screening values for use in fresh to marine settings and makes use of the best available data.

The three referenced toxicity studies do not identify the form of barium investigated (e.g., barium sulfate), but the studies are field studies of barium in sediment at sites associated with oil and gas production. These studies are therefore more relevant than laboratory studies performed with a soluble form of barium such as barium chloride. The studies provide the most appropriate data available for use in calculating a barium screening value. In the three sediment studies, the highest barium probable no effects concentration (PNEC) of 4,876 mg/kg dry weight (Leung et al., 2005) is similar in magnitude to NOEC (no observed effects concentration) values for barium sulfate in soil for invertebrates of 10,000 – 1,000,000 mg/kg (Kuperman et al., 2006; Menzie et al., 2008). The similarity between the sediment PNEC and soil NOEC values supports that the sediment effects values are within the expected range and are reasonable for use in calculating a barium sediment screening value.

The studies used for calculating the sediment screening value are based on invertebrate abundance data in the vicinity of oil production in Norway and include data from more than 1900 invertebrate species (> 1 mm in size) from more than 1900 locations (Leung et al., 2005; Bjørgesæter, 2006; Lui et al., 2014). The studies include effects concentrations that estimate the concentrations of barium at which toxicity to invertebrates is not expected (called PNEC or HC5-10 in the studies). These effects values have been used to calculate a barium screening value for sediments.

To calculate the barium sediment screening value (Table 2), a geometric mean was calculated of reported concentrations associated with the PNEC and the hazardous concentrations (HC5-10) based on median values affecting 5 – 10% of benthic communities in sediments (that are not exclusively sand). The PNEC and HC5-10 values used to calculate a barium screening value are equivalent to NOEC values. The geometric mean of the PNEC and HC5-10 values was calculated to be 2,197 mg/kg dry weight barium in sediment, and is presented in this study as the barium sediment screening value.

# 5. CALCULATION OF BARIUM SOIL SCREENING VALUE

A barium soil screening value was calculated for this study, using toxicity studies of barium sulfate. A screening value based on soluble barium is already available from USEPA (2005), but this is not the form of barium found in soils throughout Louisiana and in other soils of standard pH. Therefore, a screening value was calculated for this study based on invertebrate and plant exposure to barium sulfate in soil. There is sufficient scientific information on this exposure pathway, whereas there is only limited information in the scientific literature for other organisms, such as mammals and birds, and soil exposure. Therefore, the calculated barium soil screening value is based on studies of invertebrate and plant exposure to barium sulfate in soil.

## 5.1 LITERATURE REVIEW

To calculate the barium soil screening value, a literature review was performed and seven scientific studies were identified that report invertebrate and/or plant effects associated with barium sulfate in soil. These scientific studies are specific to barium sulfate, rather than other more soluble forms of barium. The studies identified are shown in Tables 3A through 3F (Lamb et al., 2013; ESG International, 2003; Simini et al., 2002; Kuperman et al., 2006; Kuperman et al., 2002; Honarvar, 1975; and Miller et al., 1980).

In the seven barium sulfate studies identified in the literature review, there are 19 "no observed effects concentrations" (NOECs) and 7 "lowest observed effects concentrations" (LOECs) reported that were used to develop the soil screening value. A NOEC is defined as the highest tested concentration in a laboratory or field toxicity test at which no statistically or biologically significant adverse effects are observed. A LOEC is the lowest value at which an adverse effect is observed. NOECs and LOECs for the health effects of reproduction, growth, and survival in plants and invertebrates were included in developing the screening value (USEPA, 1997). The seven studies also report effects concentrations (NOECs and LOECs) that were not used in developing the screening value, however the 19 NOECs and 7 LOECs were the lowest values for each health effect studied, making these NOECs and LOECs the most conservative choices for developing the screening value. Both NOECs and LOECs are reported and used in ecological risk assessment (USEPA, 1997).

## 5.2 BARIUM ANALYTICAL METHODS

To calculate a screening value, we used barium results from scientific studies that used various methods to analyze barium. The analytical methods in these studies produced three types of results: 1) "nominal barium", 2) "total barium", or 3) "barium".

"Nominal" barium sulfate concentrations are the result of intentionally mixing known amounts of barium sulfate and soil in the lab, in order to achieve a specific soil concentration for toxicity testing. "Total barium" concentrations are the result of analyzing the amount of barium that can be extracted from a sample using concentrated and heated acid, or from analyzing a sample using a mineralogic analysis, such as XRF. "Barium" concentrations are the result of acid extraction and analysis of barium containing soils using methods similar to USEPA method 3050/6010 that is used in LDEQ investigations.

Generally, "nominal" or "total barium" concentrations are larger concentrations than "barium" concentrations, however, the concentration differences are related to the analytical method used, rather than to the amount of barium in the sample. That is, the same soil sample would be reported as having different amounts of barium, based on whether the analytical procedure used measured "nominal barium", "total barium", or "barium" concentrations. The smallest concentrations would result from using a "barium" method, and higher concentrations would result from using "nominal" and "total barium" methods. The amount of barium reported in a given soil sample varies based on the analytical method used to measure the concentration.

To calculate the soil screening value in this study, "barium" concentrations were used. "Barium" concentration data (as defined here) are the type of data previously used by ERM to develop a sediment barium screening value (ERM, 2019) and are the type of data used by LDEQ (RECAP, 2003).

"Barium" NOECs and LOECs were used to calculate the soil barium screening value (Tables 3A and 3B). The NOEC and LOEC data from "total barium" and "nominal" studies, while not used to calculate a screening value, support that barium sulfate is of very low toxicity to soil invertebrates and plants.

The following sections summarize "nominal", "total barium", and "barium" NOEC and LOECs reported for plants and soil invertebrates from the literature search. All data support that barium sulfate is of very low toxicity to soil invertebrates and plants.

### 5.2.1 "NOMINAL" DATA: BARIUM SULFATE TOXICITY

In the three studies that report "nominal" barium sulfate concentrations (ESG International, 2003; Honavar, 1975; Miller et al., 1980), barium sulfate is shown to be of extremely low toxicity to soil invertebrates (insects and earthworms), with a NOEC value of 1,000,000 mg/kg dw barium sulfate (no effect due to exposure to 100% barium sulfate). For plants, such as clovers, grasses, green beans, and corn, the average NOEC value is 297,777 mg/kg dw barium sulfate. This represents no effect to plants at higher concentrations than are generally encountered at legacy exploration and production (E&P) sites. In summary, invertebrates and plants exposed to large amounts of nominally measured barium sulfate in soil, in laboratory settings, do not result in adverse effects to growth and survival. "Nominally" measured barium sulfate toxicity data are shown in Tables 3C and 3D.

### 5.2.2 "TOTAL BARIUM" DATA: BARIUM SULFATE TOXICITY

NOECs and LOECs based on "total barium" concentrations (literature review) demonstrate no effects to growth, reproduction, and survival for invertebrates in "total barium" concentrations up to 29,200 mg/kg dw barium in soil. The average "total barium" no effects concentration is 10,900 mg/kg dw barium in soil for worms and insects, however this is likely a low estimate for no effects. That is, higher concentrations likely would also cause no effects. For most of these studies, the highest concentrations tested in each experiment (e.g., 10,000 – 29,200 mg/kg dw) did not cause adverse effects. The actual no effects value may be higher, if higher concentrations had been tested.

In some instances, there are "total barium" LOEC values that are lower than NOEC values (Simini et al., 2002; Kuperman et al., 2006). This is due to there being multiple types of tests performed

and species used, which results in some variation. The authors of these studies (Simini et al., 2002; Kuperman et al., 2006) reported in their papers that they found barium sulfate to be so non-toxic, including in the LOECs mentioned here, that they elected to shift their studies to soluble forms of barium, rather than barium sulfate, and then calculated a USEPA toxicity value for soluble barium (which is not the form of barium identified in Louisiana soils). In summary, barium sulfate, measured as "total barium" is shown to be of very low toxicity. "Total barium" toxicity data are shown in Tables 3E and 3F.

### 5.2.3 "BARIUM" DATA: BARIUM SULFATE TOXICITY

The barium soil screening value calculated for this study used "barium" NOEC data for invertebrates (earthworms) and plants (ryegrass). The "barium" concentrations used in calculating this screening value are from studies that used the same type of analytical methods that we used previously to develop a barium sediment screening value (2,197 mg/kg dw barium). That is, the sediment barium screening value of 2,197 mg/kg dw that we calculated previously and the soil screening value (2,424 mg/kg dw) that we calculated for this study are based on barium concentrations that were measured using similar laboratory extraction and analytical methods.

As explained, barium analytical results vary widely, depending on the methods used to measure concentrations. Therefore, it is important that barium concentrations selected for calculating a screening value are the result of analytical methods similar to the methods typically used to analyze Site soils. For this reason, "barium" NOECs (rather than "nominal" NOECs or "total" NOECs) have been used to calculate the soil screening value, because the "barium" NOEC studies used similar acid digestion and inductively coupled plasma (ICP) analysis (Lamb et al., 2013; ESG International, 2003), as used by ERM (USEPA SW 846 methods 3050/6010) to analyze Site soils (RECAP, 2003). Therefore, "barium" NOECs are the most appropriate values for calculating a barium soil screening value.

## 5.3 BARIUM SOIL SCREENING VALUE: CALCULATION

There are 3 "barium" invertebrate NOECs and one "barium" plant NOEC identified in the literature review of barium sulfate toxicity in soil. The four NOEC values are similar, which lends confidence to the results: 2033, 3377, 2080, 1910 (all mg/kg dw barium in soil). The three invertebrate NOECs of 2033, 3377, 2080 (mg/kg dw) are for no adverse effects to earthworm growth and survival (Lamb et al., 2013; ESG International, 2003), and the plant NOEC of 1,910 mg/kg dw is for no adverse effect to ryegrass growth (ESG International, 2003). There is a plant LOEC from Lamb et al. (2013) that is a lower value than the plant NOEC, but it is not included, as this plant study uniformly produced effects at all concentrations, other than the control, indicating interference from other factors. The authors (Lamb et al., 2013) identified that their results are not in agreement with other barium plant studies.

To calculate the barium soil screening value for the Site, the three invertebrate NOECs (2033 mg/kg dw, 3377 mg/kg dw, 2080 mg/kg dw) were used to calculate an average (2,493 mg/kg dw), a geometric mean (2,424 mg/kg dw) and a median (2,080 mg/kg dw). These three values were compared to the plant NOEC of 1,910 mg/kg dw, and the invertebrate values were selected for use, based on being similar to the plant value, and based on having more data to support them.

The geometric mean value of 2,424 mg/kg dw was selected as the soil screening value, as this represents the most commonly used measure of central tendency for toxicity values (USEPA, 2005). Values above 2,424 mg/kg dw do not represent toxicity, but can be further evaluated in a baseline ecological risk assessment.

Calculations for the soil screening value are shown on Inset Table 5-1, below. Data used in calculating the soil screening value are shown on Tables 3A through 3F.

TABLE 5-1 DEVELOPMENT OF BARIUM SOIL SCREENING VALUE

| Barium Sulfate Invertebrate NOEC | Reference | Barium Sulfate Plant NOEC | Reference |
|---|---|---|---|
| 2,033 | Lamb et al., 2013 | 1,910 | ESG International, 2003 |
| 3,377 | Lamb et al., 2013 | | |
| 2,080 | ESG International, 2003 | | |
| 2,424 | Geometric Mean NOEC mg/kg dry weight | | |

# 6. BARIUM TOXICITY REFERENCE VALUES FOR CALCULATING ECOLOGICAL RISK

The hazard quotient (HQ) model for risk assessment uses a toxicity reference value (TRV) to express the dose of a constituent that an animal can ingest each day without adverse health effects. Because a TRV for barium in the form of barium sulfate is not available from USEPA or LDEQ, one has been calculated and is discussed below.

Published barium ecological toxicity values include US Eco-SSLs for soil terrestrial organisms, NOAA marine SQuiRT benchmarks, and TRVs from the USDOE (USEPA, 2005; Buchman, 2008; Sample et al., USDOE, 1996). These barium screening values and toxicity factors are based on studies of water soluble forms of barium, such as barium chloride, barium acetate, barium nitrate, and barium hydroxide. Because site-specific analyses have demonstrated that barium in soils and sediments is in the form of barium sulfate, the above-referenced ecological toxicity values are not appropriate for site-specific risk evaluation. Specifically, benchmarks and toxicity factors based on the effects of barium sulfate, which is the form of barium in site soils, are not available from U.S. regulatory agencies.

As discussed previously, most of the scientific literature on barium toxicity is based on barium compounds that are readily soluble and that can exert toxicity through organism absorption of the barium ion. Barite is not considered toxic, and the scientific literature concerning the toxicity of barium sulfate is limited. Although limited, the available barium sulfate toxicity studies in the scientific literature were identified and used to calculate toxicity reference values (TRVs) for use in ecological risk calculations.

## 6.1 CALCULATION OF BARIUM TRVS

TRVs for mammals and birds were calculated according to USEPA protocol (1995), using toxicity information for barium sulfate. A mammal TRV was calculated using a rat "no observed adverse effects level" (NOAEL) value for barium sulfate (Boyd and Abel, 1966), and a bird TRV was calculated using data from veterinary medical literature (Brown and Brown, 2014; Silverman and Tell, 2010; Kubiak and Forbes, 2012) (Inset Table 6-1). These calculated TRVs were determined to be more appropriate than published TRVs for birds and mammals that are based on soluble barium toxicity (Sample et al., USDOE, 1996; USEPA, 2005), i.e., forms of barium that have been demonstrated to not be present in site soils and sediments.

TABLE 6-1 BARIUM TOXICITY REFERENCE VALUE (TRV) CALCULATIONS

| Avian TRV | | | |
|---|---|---|---|
| ***Toxicity Endpoint*** | NOAEL | 6,000 | mg/kg bw/day |
| ***Uncertainty Factor*** $_i$ | $UF_{interspecies}$ | 1 | unitless |
| ***Uncertainty Factor*** $_a$ | $UF_{acute\ to\ chronic}$ | 10 | unitless |
| ***Uncertainty Factor*** $_L$ | $UF_{LOAEL\ to\ NOAEL}$ | 1 | unitless |
| ***Total UF*** $_T$ | $= UF_i \times UF_a \times UF_L$ | 10 | unitless |
| ***TRV*** | $=NOAEL/UF_T$ | 600 | mg/kg bw/day |

| Mammalian TRV | | | |
|---|---|---|---|
| ***Toxicity Endpoint*** | NOAEL | 163,000 | mg/kg bw/day |
| ***Uncertainty Factor*** $_i$ | $UF_{interspecies}$ | 10 | unitless |
| ***Uncertainty Factor*** $_a$ | $UF_{acute\ to\ chronic}$ | 3 | unitless |
| ***Uncertainty Factor*** $_L$ | $UF_{LOAEL\ to\ NOAEL}$ | 1 | unitless |
| ***Total UF*** $_T$ | $= UF_i \times UF_a \times UF_L$ | 30 | unitless |
| ***TRV*** | $=NOAEL/UF_T$ | 5433 | mg/kg bw/day |

Notes:

mg/kg bw/day = milligram/kilogram body weight/day

NOAEL is the No Observed Adverse Effect Level: lowest concentration at which there are no adverse effects to mortality, growth, or reproduction.

LOAEL is the Lowest Observed Adverse Effect Level: lowest concentration at which there is an adverse effect to mortality, growth, or reproduction.

Toxicity Reference Value (TRV) is the the dose above which ecologically relevant effects might occur to wildlife species following chronic dietary exposure and below which it is reasonably expected that effects will not occur.

Uncertainty Factors (UF) correct a TRV by adjusting for variation between species, between LOAELs and NOAELs, or acute studies to chronic studies.

## 6.2 MAMMALIAN BARIUM TRV

A literature search was conducted to identify mammalian barium sulfate studies to be used to calculate a TRV. Two toxicity studies are available in the scientific literature for barium sulfate ingestion by mammals (mice and rats) that report a lethal dose 50% (LD50) and two NOAEL values. One study was carried out at a single ingested dose of 8 mg/kg body weight for three sequential generations of mice (Hutcheson et al., 1975). At an 8 mg/kg body weight dose, there were no effects (NOAEL) to growth, reproduction, or mortality in mice. The second study was performed with intragastric dosing of rats, and the LD50 after 28-52 hours was 364,000 mg/kg body weight. In that same study, a NOAEL is reported for no mortality at 163,000 mg/kg body weight dose in rats over a 14-day period (Boyd and Abel, 1966). NOAELs, such as the ones reported for barium sulfate for mice and rats, can be used to calculate chronic doses of a constituent that are not predicted to have adverse health effects. The calculated chronic doses are equivalent to TRVs.

To calculate the barium TRV for mammals exposed to barium sulfate, the ingestion NOAEL value of 163,000 mg/kg body weight of barium sulfate in rats (Boyd and Abel, 1966) was used. This NOAEL is one of two available in the scientific literature. The Hutcheson study (Hutcheson et al., 1975) reports an unbounded NOAEL (higher doses were not tested) in which only one dose of 8

mg/kg body weight was used. The Boyd and Abel study, which tested multiple doses and showed no mortality over 14 days, provides the more reliable data for estimating a TRV.

To calculate the TRV, the NOAEL of 163,000 mg/kg body weight was adjusted by uncertainty factors (UFs) to address the following possible variables: 1) variability amongst mammalian species, 2) use of a LOAEL rather than a NOAEL (when that is the case), and 3) variation between acute and chronic toxicity. UFs between 1 and 10 are recommended by USEPA for adjusting NOAEL values in TRV development (USEPA, 1995). Based on USEPA protocol for calculating TRVs, the highest UF of 10 is applied for the uncertainty associated with variability in species (rat used to represent all mammals), and a UF of 3 is applied to account for using an acute toxicity value (NOAEL) to estimate chronic toxicity. These UFs, 10 and 3, were selected using USEPA guidance for appropriate UFs (USEPA, 1995). For example, per USEPA guidance, a UF of 10 is used for species variability and values between 1 and 3 are used to estimate uncertainty associated with scaling toxicity from acute to chronic. The relatively large UF of 3 is used for scaling from acute to chronic in this calculation because there was only one bounded (tested at several concentrations) NOAEL study available. In calculating this TRV, no UF is needed to adjust from a LOAEL to a NOAEL, because a NOAEL is used in the calculation. The two UFs selected are multiplied: 10 x 3 = 30, and the NOAEL of 163,000 mg/kg body weight is divided by the UF of 30 to yield a TRV of 5,433 mg/kg body weight (Inset Table 6-1).

The calculated TRV of 5,433 mg/kg bw is consistent with the scientific literature that demonstrates barium sulfate is practically non-toxic in humans, terrestrial invertebrates, aquatic species, and other vertebrates. Barium sulfate is not absorbed through biological membranes, and the amount of barium that can be solubilized from barium sulfate in the acidic environment of the digestive tract or acidic anaerobic natural settings has not been shown to be toxic to wildlife or aquatic species. A calculated TRV of 5,433 mg/kg/day for barium sulfate is also comparable to other published TRVs for insoluble metals of low toxicity in mammals. For example, $Cr_2O_3$ is essentially insoluble in water and has mammalian TRVs of 768 – 7,154 mg/kg/day (Sample et al., USDOE, 1996).

## 6.3 BARIUM AVIAN TRV

To calculate a TRV for birds exposed to barium in the form of barium sulfate, a proxy NOAEL value has been used because there are no studies of barium sulfate toxicity in birds in the scientific literature. Barium sulfate is used in birds, as it is in humans, mammals, and reptiles, as a contrast agent for X-ray imaging. The recommended dose of barium sulfate to be used in birds for X-ray imaging is 6,000 – 15,000 mg/kg body weight (Brown and Brown, 2014; Silverman and Tell, 2010; Kubiak and Forbes, 2012). The low end of this range (6,000 mg/kg body weight) was used as a proxy NOAEL for calculating an avian barium sulfate TRV.

To calculate the avian TRV, the NOAEL was multiplied by UFs as necessary to account for interspecies variability among birds, scaling from acute to chronic dosing, and uncertainty in transitioning from LOAEL to NOAEL values (USEPA, 1995). For calculating the TRV, an interspecies UF of 1 has been used. This represents a low level of uncertainty and is used because the uncertainty for avian interspecies variability has been accounted for by using the lowest X-ray contrast dose, which is protective of the smallest birds. The medical literature for dosing birds with barium sulfate for X-ray imaging indicates smaller birds are given the low end of the dosing

régime (6,000 – 15,000 mg/kg body weight), therefore a UF for interspecies variability is accounted for by assuming the most sensitive species (the smallest). For scaling from an acute toxicity value to a chronic toxicity value, the highest UF of 10 has been used because the NOAEL is not from a specific study measuring "no effect," but rather, is a dose that has been demonstrated to have no effect by its continued use in the medical field over decades. A NOAEL is used in the calculation, so no UF is needed to adjust a LOAEL to a NOAEL, as a NOAEL is used. Using the UFs of 10 for acute to chronic and 1 for interspecies variability, the total UF is 10, and the NOAEL of 6,000 mg/kg body weight divided by 10 gives an avian TRV of 600 mg/kg/day (Inset Table 6-1).

The avian TRV of 600 mg/kg/day is less than the calculated mammalian barium sulfate TRV of 5,433 mg/kg/day. This result is expected because the proxy bird NOAEL value of 6,000 mg/kg body weight, used to calculate the avian TRV, already has safety factors incorporated into it to provide a safe, recommended dose for X-ray imaging. The avian TRV is likely to be overly conservative, as no instances of avian toxicity due to barium are present in the scientific literature.

# 7. BARIUM IN SURFACE WATER CRITERIA

In this study, barium water quality criteria were calculated for surface waters. These criteria can be used to assess the safety of surface waters for aquatic life. The calculations for barium water quality criteria were performed per USEPA protocol (Stephen et al., 1985). It is important to note that the barium criteria calculated in this study are based on data for soluble forms of barium. That is, the assumption used in calculating the criteria is that an aquatic species can be exposed via water to solubilized forms of barium that are bioavailable for uptake and absorption into the body. Therefore, the criteria are based on soluble forms of barium which have some limited toxicity, rather than being based on poorly soluble barium sulfate which is of low to no toxicity.

To calculate water quality criteria for barium, acute and chronic toxicity data for barium were evaluated to determine whether the data meet the qualifications for data usability as defined in USEPA guidance (Stephen et al., 1985). Specifically, the data were screened to determine their usability based on the following USEPA criteria:

- For freshwater criteria, only data on freshwater organisms is included. Because freshwater and saltwater have different chemical compositions, which may affect chemical toxicity, USEPA guidelines calculate separate criteria for freshwater and saltwater.
- Only data on organisms resident in North America were used. Species that do not have reproducing wild populations in North America are rejected because the criteria are designed to protect those organisms that may reside in potential receiving waters.
- Data obtained using previously exposed organisms were not used. Pre-exposure of test organisms may bias toxicity test results by increasing the organism's sensitivity or resistance to a particular chemical.
- Questionable data, such as data reported without accompanying description of methods and protocol procedures were not used.

## 7.1 ACUTE DATA

Acute toxicity data which met the requirements listed above were subjected to further screening on the basis of the following USEPA criteria (Stephen et al., 1985):

- Studies in which test organisms were fed during the test were not included. Feeding during the acute exposure period may cause problems with the tests, such as the possible alteration of the toxicant concentration, or the build-up of food and metabolic wastes and the change in resulting biological oxygen demand.
- Tests conducted in unusual dilution water were screened out. The quality of water used for dilution water may affect test results by influencing organism sensitivity (e.g., through the presence of other stressors) and/or chemical toxicity (e.g., presence of synergists or antagonists).
- Studies in which data on most sensitive life stages were obtained were preferred. Criteria based on toxicity data for sensitive life stages will be protective of other life stages as well.
- Questionable data relative to other data for the same or similar species were not included. Specific test results that differ greatly from the rest of the data set may have been due to unknown factors not related to the chemical in question. According to USEPA guidelines, if the

acute values available for a species or genus differ by more than a factor of 10, some or all of the values probably should not be used.

- When available, endpoints from tests in which the concentrations were actually measured were preferred over those in which the concentrations were not measured. Analytical confirmation of nominal concentrations provides assurance regarding the concentrations to which organisms were actually exposed.

As a final screening of the acute toxicity data, results were evaluated based on the USEPA (Stephen et al., 1985) criteria for recommended acute toxicity endpoints:

- Cladocerans (e.g., Daphnia sp.): tests should be started with organisms less than 24 h old; acceptable endpoints are 48-h "effects concentration 50%" (EC50) for immobility plus mortality (preferred) or 48-h "lethal concentration 50%: (LC50).
- Bivalve mollusks: tests should be conducted with embryos and larvae; acceptable endpoints are 96-h EC50 shell development plus mortality (preferred) or 96-h LC50.
- All other species and older life stages: 96-h EC50 for loss of equilibrium, immobility, plus mortality (preferred) or 96-h LC50.

## 7.2 CHRONIC DATA

Chronic data which met the general criteria were further screened based on the USEPA (Stephen et al., 1985) criteria for recommended endpoints:

- Fish: tests should begin with embryos or newly hatched young, and tests should not end less than 24 days (90 days for salmonids) after the hatching of the next generation; acceptable endpoints include survival and growth of adults and young, maturation, eggs spawned, embryo viability (salmonids only), and hatchability; partial life-cycle and early life-stage tests are also acceptable.
- Cladocerans (e.g., Daphnia sp.): tests should begin with organisms less than 24-h old, and last for not less than 21 days; acceptable endpoints include survival and number of young per female.

## 7.3 ACUTE TOXICITY TO FRESHWATER AQUATIC ANIMALS

This section presents a summary of acute toxicity data for barium gathered from the scientific literature. Barium studies selected for this data set are studies done using soluble forms of barium. All freshwater studies identified were performed using barium in chemical forms that solubilize in water, such as barium chloride, barium carbonate or barium nitrate. USEPA guidance (Stephen et al., 1985) treats all chemical forms that ionize substantially in natural bodies of water (such as barium salts and complexes of barium) as one material.

### 7.3.1 FRESHWATER DATA FROM THE LITERATURE

The literature search identified a number of studies on soluble barium toxicity to fish and aquatic invertebrates (Table 4) and some studies of barium sulfate (poorly soluble) toxicity values (Table 5).

The criteria derived in this study were calculated using toxicity values for soluble barium and are based on the values presented in Table 4. The studies included many different species and a

variety of life stages. Although a range of endpoints are available from these studies, the acceptable acute toxicity endpoints for fish are considered by USEPA (Stephen et al., 1985) to include the 96-h EC50 (preferred) and the 96-h LC50. Using these recommendations as a guideline, the acceptable toxicity endpoints for fish (presented in Table 4) are described by species as follows.

#### 7.3.1.1 FRESHWATER FISH DATA

Several studies on the toxicity of barium to freshwater fish have been reviewed. The studies include a variety of fish including threatened and endangered species (*Oncorhynchus mykiss*), warmwater fish, and small and large fish from different trophic feeding levels. Seven species of fish with acute toxicity values (LC50 values) ranging from 62 to >10,000 mg/L are included in the data. A summary of the data used to calculate ambient water quality criteria follows.

The most sensitive species of fish identified is *Oncorhynchus mykiss*, rainbow trout. It is a cold water fish found in northern parts of the U.S. It is listed as threatened or endangered under the Endangered Species Act. The 96-hour LC50 for *Oncorhynchus mykiss* is 62 mg/L (USEPA, 1992), which indicates less sensitivity to soluble barium than *Daphnia magna*, which is the most sensitive invertebrate (48-hour LC50 genus mean acute value (GMAV) of 21 mg/L). The GMAV is an average LC50 and is further discussed in Section 7.3.2. *Oncorhynchus mykiss* is in the family Salmonidae, along with *Salmo trutta,* which is also included in our data set. *Salmo trutta* is not endangered and is found in both warm and cold water. The 48-hour LC50 for *Salmo trutta*, for comparison, is 150 mg/L (Woodiwiss and Fretwell, 1974).

The two species of fish from the family Cyprinidae that are included in the data set have similar 96-hour LC50 values: *Rasbora heteromorpha* (145 mg/L) and *Danio rerio* (148 mg/L). The similarity in LC50 values from the two different studies (Tooby et al., 1975, Egeler and Kiefer, 2010) gives a high degree of confidence in the results.

There are two 96-hour LC50 studies, both done by USEPA (USEPA, 1992 and 1978), for *Lepomis macrochirus*, a warm water fish. The results are in the same order of magnitude (151 mg/L and 198 mg/L), giving confidence to the results.

*Leuciscus idus melanotus* is a carp with a 48-hour LC50 of 870 mg/L. This study (Juhnke and Luedemann, 1978) is included in the data set, even though it is a 48-hour study, rather than a 96-hour study, and is included as representative of best available data for soluble barium and fish.

*Gambusia affinis* (Western mosquitofish) is included in the data set and is one of the most abundant freshwater fish (Hitch et al., 2011; Martin et al., 2009; Piazza and La Peyre, 2009; and Troutman et al., 2007). There are two 96-hour LC50 studies for Gambusia that are one order of magnitude different in value (1,640 mg/L and >10,000 mg/L). We have included both LC50 values in the data set, as both studies were done by the same author in the same lab (Wallen et al., 1957). Both values are plausible as the 1,640 mg/L LC50 is a result of barium chloride as the source of barium and the >10,000 mg/L LC50 is the result of barium carbonate as the source of barium. According to USEPA guidance, both barium studies should be included due to the fact that both forms of barium ionize substantially in water. The author of the study (Wallen et al., 1957) assumed that the greater toxicity associated with barium chloride had to do with particles that precipitated out of the water in the barium chloride study (dilution water was from farm ponds),

and that toxicity to fish had something to do with the precipitate. The two LC50 values for Gambusia (barium chloride and barium carbonate) are the two highest fish 96-hr LC50 values in the data set.

To summarize, the lowest LC50 value of 62 mg/L (96-hour LC50) is associated with *Oncorhynchus mykiss* (rainbow trout), a coldwater fish, and the highest LC50 value of 4,050 mg/L (GMAV 96 hour LC50) is associated with *Gambusia affinis* (western mosquito fish), an abundant freshwater fish. This represents a broad range of values for acute toxicity.

#### 7.3.1.2 FRESHWATER INVERTEBRATE DATA

Several studies on the toxicity of barium to freshwater invertebrates have been reviewed. The studies apply to a variety of different organisms, including insects, crustaceans, rotifers, and worms. GMAV values identified for freshwater invertebrates based on LC50 and EC50 values range from 21 to 3,321 mg/L. A summary of this invertebrate data used to calculate ambient water quality criteria follows.

The most sensitive invertebrate is *Daphnia magna*, with a GMAV of 21 mg/L soluble barium. We identified five studies based on 48-hour LC50 or EC50 (immobilization and mortality) barium toxicity to *Daphnia magna*. The results of three of the studies were within the same order of magnitude (Khangarot and Ray, 1989, Biesinger and Christensen, 1972 and USEPA, 1992) and two studies were one order of magnitude higher (LeBlanc, 1980), so the three studies of the lower order of magnitude were used to calculate the GMAV. The three studies included 2 EC50 studies (preferred) and 1 LC50 study. All three study results were used in calculating the GMAV, since the LC50 value was the lowest value identified in the literature search (14.5 mg/L).

Studies on two crawfish species were identified (Boutet and Chaisemartin, 1973) for *Austropotamobius pallipes ssp. pallipes* and *Orconectes limosus*. Both studies were 96-hour LC50 studies, with *Orconectes* (78 mg/L) being less sensitive than *Austropotamobius* (46 mg/L).

One 96-hour LC50 study (97 mg/L) was identified for the platyhelminth worm, *Dugesia tigrina* (Piontek, 1999) and is included in the data set.

96-hour LC50 studies for two amphipod species (Vincent et al., 1986) were identified for Echinogammarus berilloni (125 mg/L) and *Gammarus pulex* (232 mg/L). These studies were done in both eucalcique and oligocalcique water. The results were similar in both water types, indicating that barium toxicity is not affected by water hardness.

One rotifer LC50 24-hour study was identified for *Brachionus calyciflorus* (Calleja et al., 1994). This study was included, even though it was a 24-hour study, because the study represents a significant portion of the organism's life span (3.4 to 4.4 days), and this was the only study identified representing rotifers. Barium is of low toxicity to *Brachionus*, with a 24-hour LC50 of 708 mg/L.

Two 96-hour LC50 insect studies were identified for *Drosophila* (Christie et al., 1983 and Williams et al., 1982). Both studies were done with insects ages 0-1 day (pre-adult), and barium was found to be of low toxicity in both studies (1,505 – 7,328 mg/L). *Drosophila* was identified in this literature review to be the invertebrate that is least sensitive to barium.

To summarize, the acute toxicity of barium to freshwater invertebrate crustaceans ranges from 21 mg/L (*Daphnia magna*) – 232 mg/L (*Gammarus pulex*). The platyhelminthes species is similar to the crustaceans in acute toxicity (97 mg/L). The least sensitive are the rotifer (708 mg/L) and *Drosophila* (1,505 – 7,328 mg/L).

### 7.3.2 FINAL ACUTE VALUE

In order to calculate ambient water quality criteria, USEPA (Stephen et al., 1985) recommends that the data include the results of acceptable acute tests with at least one species of freshwater animal in at least eight different families. According to the guidelines, these families should include the following:

1. The family Salmonidae in the class Osteichthyes;
2. A second family in the class Osteichthyes, preferably a warmwater species;
3. A third family in the phylum chordata;
4. A planktonic crustacean (e.g., cladoceran, copepod);
5. A benthic crustacean (e.g., ostracod, isopod, amphipod);
6. An insect;
7. A family in a phylum other than Arthropoda or Chordata (ex: Rotifera, Annelida, Mollusca);
8. A family in any order of insect or any phylum not already represented.

Collectively, the acute barium toxicity data collected and presented in this study meets the above USEPA species requirements for calculating freshwater criteria. The usable acute toxicity values for fish and invertebrates are presented in Table 6.

As specified in the USEPA guidance, when more than one data point is available for a given species, a species mean acute value (SMAV) is calculated as the geometric mean of the individual acute values. If data for more than one species within the same genus are available, then a genus mean acute value (GMAV) is calculated as the geometric mean of the relevant SMAVs. A summary of the available GMAVs for fish and invertebrates is presented in Table 6.

The GMAVs for aquatic species are used to calculate a final acute value (FAV, Table 6). The FAV is an estimated concentration assumed to protect 95% of aquatic organisms from acute effects. The FAV is calculated from the data using the four lowest GMAVs, using the following approach (Stephen et al., 1985):

- Order the GMAVs from high to low (Table 7).
    1. Assign ranks (R) to the GMAVs from 1 (lowest) to N (highest).
    2. Calculate the cumulative probability (P) for each GMAV as R/(N + 1).
    3. Select the four GMAVs which have the cumulative probabilities closest to 0.05.
    4. Using the selected GMAVs and cumulative probabilities, calculate a FAV as follows:

$$S^2 = \frac{\sum((\ln GMAV)^2) - \left((\sum \ln GMAV)\right)^2/4}{\sum(F) - \left(\left(\sum(\sqrt{P})\right)^2/4\right)}$$

$$L = \left(\sum(\ln GMAV) - S\left(\sum(\sqrt{P})\right)\right)/4$$

$$A = S(\sqrt{0.05}) + L$$

$$FAV = e^{A}$$

## 7.4 CHRONIC TOXICITY TO FRESHWATER AQUATIC ANIMALS

Chronic toxicity data can be used calculate a final chronic value for water quality criteria. According to USEPA (Stephen et al., 1985), depending on the amount of chronic toxicity data available, a final chronic value may be calculated in the same manner as the FAV, or may be calculated by dividing the FAV by a final acute-chronic ratio (ACR). Due to the lack of appropriate chronic toxicity data for eight different families for barium (necessary data for eight families not available), a final chronic value for barium has been calculated using the ACR approach.

According to USEPA (Stephen et al., 1985), chronic values should be based on endpoints and lengths of exposure appropriate to the species. Therefore, only results of the following kinds of chronic toxicity tests should be used:

1. Life-cycle toxicity tests with fish should begin with embryos or newly hatched young less than 48 hours old, continue through maturation and reproduction, and should end not less than 24 days (90 days for salmonids) after the hatching of the next generation. Tests with daphnids should begin with young less than 24 hours old and last for not less than 21 days. Tests with mysids should begin with young less than 24 hours old and continue until 7 days past the median time of first brood release in the 19 controls. For fish, data should be on survival and growth of adults and young, maturation of males and females, eggs spawned per female, embryo viability (salmonids only), and hatchability. For daphnids, data should be on survival and young per female. For mysids, data should be on survival, growth, and young per female.
2. Partial life-cycle toxicity tests consisting of exposures of fish species that require more than a year to reach sexual maturity, so that all major life stages can be exposed to the test material in less than 15 months. Exposure to the test material should begin with immature juveniles at least 2 months prior to active gonad development, continue through maturation and reproduction, and end not less than 24 days (90 days for salmonids) after the hatching of the next generation. Data should be on survival and growth of adults and young, maturation of males and females, eggs spawned per female, embryo viability (salmonids only), and hatchability.
3. Early life-stage toxicity tests consisting of 28- to 32-day (60 days post hatch for salmonids) exposures of the early life stages of a species of fish from shortly after fertilization through embryonic, larval, and early juvenile development. Data should be on survival and growth. When results of a life-cycle or partial life-cycle test are available, results of an early life-stage test with the same species should not be used.

### 7.4.1 CHRONIC FRESHWATER DATA

According to USEPA (Stephen et al., 1985), the acute to chronic ratio is calculated using species from at least three different families, provided that of the three species:

- at least one is a fish;
- at least one is an invertebrate; and
- at least one is an acutely sensitive freshwater species (the other two may be saltwater).

The following chronic studies meet the above requirements:

- *Daphnia magna* (Water Flea): 21-day LC50;
- *Oncorhynchus mykiss* (Rainbow Trout): 28-day LC50;
- *Austropotamobius pallipes ssp. pallipes* (Crayfish): 30-day LC50; and
- *Orconectes limosus* (Crayfish): 30-day LC50.

According to USEPA (Stephen et al., 1985), chronic studies of *Daphnia magna* should be at least 21 days. No guidance is given for the suggested length of chronic invertebrate studies (such as crawfish). Chronic studies of salmonids should be at least 90 days. The chronic studies we identified meet requirements, except the salmonid study (*Oncorhynchus mykiss*) is 28 days, instead of 90 days. We have included the *Oncorhynchus mykiss* study in the calculations, as was performed according to all other USEPA specifications and is the best available data.

### 7.4.2 ACUTE TO CHRONIC RATIO (ACR)

Each chronic value is compared to an acute value for the same species. The chronic studies we identified for *Austropotamobius pallipes ssp. pallipes* and *Orconectes limosus* have accompanying acute studies done by the same authors (Boutet and Chaisemartin, 1973). The chronic *Oncorhynchus mykiss* study (Gale, 1980) and acute *Oncorhynchus mykiss* study (USEPA, 1992) are not by the same author. The acute *Daphnia magna* value is a geometric mean of three studies (USEPA, 1992, Biesinger and Christensen, 1972, and Khangarot and Ray, 1989) and the chronic *Daphnia magna* value is from the Biesinger study (Biesinger and Christensen, 1972).

TABLE 7-1 ACUTE AND CHRONIC BARIUM TOXICITY VALUES AND RATIOS

| Species Name | Species Common Name | Acute Toxicity Value (mg/L) | Chronic Toxicity Value (mg/L) | Ratio of Acute/Chronic |
|---|---|---|---|---|
| *Orconectes limosus* | Crayfish | 78.00 | 59.00 | 1.322 |
| *Daphnia magna* | Water Flea | 20.67 | 10.96 | 1.886 |
| *Oncorhynchus mykiss* | Rainbow Trout | 62.00 | 42.70 | 1.452 |
| *Austropotamobius pallipes ssp. pallipes* | Crayfish | 46.00 | 39.00 | 1.179 |
| | | | **Geometric Mean of Ratios** | **1.440** |

#### 7.4.2.1 FINAL ACUTE-CHRONIC RATIO

According to USEPA (Stephen et al., 1985), the final acute to chronic ratio (ACR) is calculated as the geometric mean of the species' ACRs. The USEPA (Stephen et al., 1985) guidelines are not explicit as to how the ACRs should be combined to calculate a final ACR. For purposes of this report, the final ACR is calculated as the geometric mean of the family specific ACRs. Using these data, the final ACR is 1.44 (Inset Table 7-1). According to USEPA guidance (Stephen et al., 1985), if the mean acute-chronic ratio is less than 2.0, the Final Acute Chronic Ratio should be assumed to be 2.0. Therefore, because the calculated ACR is less than 2.0 (1.44), the Final Acute Chronic Ratio used for this study is 2.0.

### 7.4.3 FINAL CHRONIC VALUE (FRESHWATER)

To calculate the Final Chronic Value, the FAV of 19.50 (Inset Table 7) is divided by the Final Acute to Chronic Ratio of 2.0. Therefore, the Final Chronic Value for protection of freshwater aquatic life based on exposure to soluble barium in surface water is 9.75 mg/L.

## 7.5 CRITERIA DERIVATION

Criteria were derived in accordance with the procedures in Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses (Stephen et al., 1985).

A USEPA ambient water criterion consists of two concentrations: the Criterion Maximum Concentration and the Criterion Continuous Concentration. The Criterion Maximum Concentration (CMC) is equal to one-half the FAV. The FAV calculated from the data presented in this report is 19.50 mg/L. Therefore, the Freshwater Criterion Maximum Concentration (CMC), which is calculated as one-half the FAV, is 9.75 mg/L.

The Criterion Continuous Concentration, according to the guidelines, is equal to the lowest of the calculated Final Chronic Value (9.75 mg/L), the Final Plant Value, and the Final Residue Value. The lowest of these is the Criterion Continuous Concentration. The Final Chronic Value is 9.75 mg/L (which is equivalent to the Freshwater Criterion Maximum Concentration). Plant values and residue values were not calculated in this study, as there was not sufficient information in the scientific literature to calculate these values. Therefore, the Freshwater Criterion Continuous Concentration is 9.75 mg/L.

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*Appendix E. Table 1*
*Barium Sediment Literature Review*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Endpoint | Derivation of Endpoint | Description of Endpoint/Organisms Protected | Result mg/kg-dry | Species | Media | Reference |
|---|---|---|---|---|---|---|
| HC5 | Median HC5 (hazardous conc. 5%) for 343 different sensitive species | Conc. at which 5% of sensitive species exhibit reduction in abundance | 130 | sensitive benthic invertebrates | marine sediment | 1 |
| HC28 | Median HC28 for 343 different sensitive species | Community HC5, protects 95% of community, concentrations below which harmful effects unlikely | 2218 | sensitive benthic invertebrates | marine sediment | 1 |
| HC56 | Median HC56 for 343 different sensitive species | Community HC10, protects 90% of community, concentrations below which harmful effects are unlikely | 4876 | sensitive benthic invertebrates | marine sediment | 1 |
| F-PNEC$_{13}$ | Median F-PNEC for 191 most common species (lowest value at which abundance effects are observed in 13% of species) | F-PNEC below which harmful effects for 95% of the macro benthos (> 1 mm) community are unlikely | 1718 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$ | Median F-PNEC for 2206 species (lowest value at which abundance effects are observed in 13% of species) | F-PNEC in mud sediment below which harmful effects for 95% of the community are unlikely | 2645 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{10}$ | Median F-PNEC for 2206 species (lowest value at which abundance effects are observed in 10% of species) | F-PNEC in mud-fine sand sediment below which harmful effects for 95% of the community are unlikely | 2263 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{9}$ | Median F-PNEC for 2206 species (lowest value at which abundance effects are observed in 9% of species) | F-PNEC in fine sand-sand sediment below which harmful effects for 95% of the community are unlikely | 1951 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{mean}$ | Mean of grain sized based median F-PNECs for 2206 species | F-PNEC in sediments below which harmful effects for 95% of the community are unlikely | 2286 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$ | Median F-PNEC at 5% protection level for 191 most common species using bootstrapping method | Median F-PNEC for 191 most common species (lowest value at which abundance effects are observed in 5% of species) | 1718 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$95%-low | Confidence Interval (95%-low) F-PNEC at 5% protection level for 191 most common species using bootstrapping method | 95% lower confidence limit F-PNEC$_{5}$ | 1644 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$95%-high | Confidence Interval (95%-high) F-PNEC at 5% protection level for 191 most common species using bootstrapping method | 95% upper confidence limit F-PNEC$_{5}$ | 2020 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$ | Median F-PNEC adjusted for non-sensitive species for 191 most common species using bootstrapping method | Median F-PNEC$_{13}$ (Adjusted protection value from PNEC$_{5}$ to PNEC$_{13}$ to account for non-sensitive species) | 2283 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$95%-low | Confidence Interval (95%-low) F-PNEC at 13% protection level for 191 most common species using bootstrapping method | 95% lower confidence limit F-PNEC$_{13}$ | 1938 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$95%-high | Confidence Interval (95%-high) F-PNEC at 13% protection level for 191 most common species using bootstrapping method | 95% upper confidence limit F-PNEC$_{13}$ | 2522 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$ | F-PNEC at 5% protection level for 191 most common species using logistic function | Median F-PNEC for 191 most common species (lowest value at which abundance effects are observed in 5% of species) | 1148 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$ | F-PNEC adjusted for non-sensitive species for 191 most common species using logistic function | Median F-PNEC for the adjusted 5% protection level (5% adjusted to 13% to account for non-sensitive species) | 1793 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$-mud | Median F-PNEC at 5% protection level in mud substrate for 191 most common species using bootstrapping method | Median F-PNEC for 191 most common species (lowest value at which abundance effects are observed in 5% of species) | 1977 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$95%-low-mud | Confidence Interval (95%-low) F-PNEC at 5% protection level for 191 most common species using bootstrapping method | 95% lower confidence limit for F-PNEC$_{5}$95%-low-mud | 1808 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$95%-high-mud | Confidence Interval (95%-high) F-PNEC at 5% protection level for 191 most common species using bootstrapping method | 95% upper confidence limit for F-PNEC$_{5}$95%-high-mud | 2275 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$-mud | Median F-PNEC adjusted for non-sensitive species in mud substrate for 191 most common species using bootstrapping method | Median F-PNEC for the adjusted 5% protection level in mud substrate (5% adjusted to 13% to account for non-sensitive species) | 2645 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$95%-low-mud | Confidence Interval (95%-low) F-PNEC in mud substrate for 191 most common species using bootstrapping method | 95% lower confidence limit for F-PNEC$_{13}$95%-low-mud | 2409 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$95%-high-mud | Confidence Interval (95%-high) F-PNEC in mud substrate for 191 most common species using bootstrapping method | 95% upper confidence limit for F-PNEC$_{13}$95%-high-mud | 3181 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$-mud-fine-sand | Median F-PNEC at 5% protection level in mud-fine sand substrate for 191 most common species using bootstrapping method | Median F-PNEC for 191 most common species (lowest value at which abundance effects are observed in 5% of species) | 1720 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$95%-low-mud-fine sand | Confidence Interval (95%-low) F-PNEC at 5% protection level for 191 most common species using bootstrapping method | 95% lower confidence limit for F-PNEC$_{5}$95%-low-mud-fine sand | 1372 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$95%-high-mud-fine sand | Confidence Interval (95%-high) F-PNEC at 5% protection level for 191 most common species using bootstrapping method | 95% upper confidence limit for F-PNEC$_{5}$95%-high-mud-fine sand | 2200 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{10}$-mud-fine sand | Median F-PNEC adjusted for non-sensitive species for 191 most common species using bootstrapping method | Median F-PNEC for the adjusted 5% protection level (5% adjusted to 10% to account for non-sensitive species) | 2263 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{10}$95%-low-mud-fine sand | Confidence Interval (95%-low) F-PNEC in mud-fine sand substrate for 191 most common species using bootstrapping method | 95% lower confidence limit for F-PNEC$_{10}$95%-low-mud-fine sand | 2141 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{10}$95%-high-mud-fine sand | Confidence Interval (95%-high) F-PNEC in mud-fine sand substrate for 191 most common species using bootstrapping method | 95% upper confidence limit for F-PNEC$_{10}$95%-high-mud-fine sand | 2490 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$-fine sand-sand | Median F-PNEC at 5% protection level in fine sand-sand substrate for 191 most common species using bootstrapping method | Median F-PNEC for 191 most common species (lowest value at which abundance effects are observed in 5% of species) | 1711 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$95%-low-fine sand-sand | Confidence Interval (95%-low) F-PNEC at 5% protection level for 191 most common species using bootstrapping method | 95% lower confidence limit for F-PNEC$_{5}$95%-low-mud-fine sand | 1498 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{5}$95%-high-fine sand-sand | Confidence Interval (95%-high) F-PNEC at 5% protection level for 191 most common species using bootstrapping method | 95% upper confidence limit for F-PNEC$_{5}$95%-high-mud-fine sand | 1929 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{9}$-fine sand-sand | Median F-PNEC adjusted for non-sensitive species for 191 most common species using bootstrapping method | Median F-PNEC for the adjusted 5% protection level (5% adjusted to 9% to account for non-sensitive species) | 1951 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{10}$95%-fine sand-sand | Confidence Interval (95%-low) F-PNEC in fine sand-sand substrate for 191 most common species using bootstrapping method | 95% lower confidence limit for F-PNEC$_{9}$95%-low-mud-fine sand | 1816 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{10}$95%-fine sand-sand | Confidence Interval (95%-high) F-PNEC in fine sand-sand substrate for 191 most common species using bootstrapping method | 95% upper confidence limit for F-PNEC$_{9}$95%-high-mud-fine sand | 2254 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$-mud | Probable no effects concentration derived using logistic function (5% is adjusted to 13% to account for non-sensitive species) | Actual conc. level below which harmful effects on the benthic community are unlikely to be observed in 95% of the community | 2200 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{10}$-mud-fine sand | Probable no effects concentration derived using logistic function (5% is adjusted to 10% to account for non-sensitive species) | Actual conc. level below which harmful effects on the benthic community are unlikely to be observed in 95% of the community | 1931 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{9}$-fine sand-sand | Probable no effects concentration derived using logistic function (5% is adjusted to 9% to account for non-sensitive species) | Actual conc. level below which harmful effects on the benthic community are unlikely to be observed in 95% of the community | 1942 | macro benthos (> 1 mm) | marine sediment | 2 |
| HC$_{5}$-median | Median hazardous concentration causing effects in 5% of the invertebrate sediment population | Median concentration causing reduction in density of 5% of a marine benthic organism population | 765 | benthic sediment species | marine sediment | 3 |
| HC$_{10}$-median | Median hazardous concentration causing effects in 10% of the invertebrate sediment population | Median concentration causing reduction in density of 10% of a marine benthic organism population | 3424 | benthic sediment species | marine sediment | 3 |
| HC$_{5}$-mode | The mode hazardous concentration causing effects in 5% of the invertebrate sediment population | Mode concentration causing reduction in density of 5% of a marine benthic organism population | 401 | benthic sediment species | marine sediment | 3 |
| HC$_{10}$-mode | The mode hazardous concentration causing effects in 10% of the invertebrate sediment population | Mode concentration causing reduction in density of 10% of a marine benthic organism population | 1085 | benthic sediment species | marine sediment | 3 |


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*Appendix E. Table 2*
*Barium Sediment Screening Value Calculations*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Endpoint | Derivation of Endpoint | Description of Endpoint/Organisms Protected | Result mg/kg-dry | Species | Media | Reference |
|---|---|---|---|---|---|---|
| HC28 | Median HC28 for 343 different sensitive species | Community HC5, protects 95% of community, concentrations below which harmful effects unlikely | 2218 | sensitive benthic invertebrates | marine sediment | 1 |
| HC56 | Median HC56 for 343 different sensitive species | Community HC10, protects 90% of community, concentrations below which harmful effects are unlikely | 4876 | sensitive benthic invertebrates | marine sediment | 1 |
| F-PNEC$_{13}$ | Median F-PNEC for 191 most common species (lowest value at which abundance effects are observed in 13% of species) | Median F-PNEC below which harmful effects for 95% of the macro benthos (> 1 mm) community are unlikely | 1718 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$ | Median F-PNEC adjusted for non-sensitive species for 191 most common species using bootstrapping method | Median F-PNEC$_{13}$ (Adjusted protection value from PNEC$_5$ to PNEC$_{13}$ to account for non-sensitive species) | 2283 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$ | F-PNEC adjusted for non-sensitive species for 191 most common species using logistic function | Median F-PNEC for the adjusted 5% protection level (5% adjusted to 13% to account for non-sensitive species) | 1793 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{13}$-mud | Median F-PNEC adjusted for non-sensitive species in mud substrate for 191 most common species using bootstrapping method | Median F-PNEC for the adjusted 5% protection level in mud substrate (5% adjusted to 13% to account for non-sensitive species) | 2645 | macro benthos (> 1 mm) | marine sediment | 2 |
| F-PNEC$_{10}$-mud-fine sand | Median F-PNEC adjusted for non-sensitive species for 191 most common species using bootstrapping method | Median F-PNEC for the adjusted 5% protection level (5% adjusted to 10% to account for non-sensitive species) | 2263 | macro benthos (> 1 mm) | marine sediment | 2 |
| HC$_5$-median | Median hazardous concentration causing effects in 5% of the invertebrate sediment population | Median concentration causing reduction in density of 5% of a marine benthic organism population | 765 | benthic sediment species | marine sediment | 3 |
| HC$_{10}$-medain | Median hazardous concentration causing effects in 10% of the invertebrate sediment population | Median concentration causing reduction in density of 10% of a marine benthic organism population | 3424 | benthic sediment species | marine sediment | 3 |
| | | Geometric Mean Barium Screening Standard | 2197 | | | |

Sources:
1. Leung, K.M.Y., et al. 2005. Deriving Sediment Quality Guidelines from Field-Based Species Sensitivity Distributions. Environ. Sci. Technol. 39: 5148-5156.
2. Bjørgesæter, A. 2006. Field Based Predicted No Effect Concentrations (F-PNECs) for macro benthos on the Norwegian Continental Shelf. Environmental Risk Management System. Report No. 15.
3. Lui et al. 2014. Deriving field-based sediment quality guidelines from the relationship between species density and contaminant level using a novel nonparametric empirical Bayesian approach. Environ. Sci. Pollut. Res. 21:177-192.

*Appendix E. Table 3A*
*Barium Invertebrate NOEC for Barite*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Chemical Name | Species Scientific Name | Species Common Name | Species Group | Organism Age/ Weight | Organism Lifestage | Chemical Concentration | Total Barium/ Barium Sulfate | Media Type | Test Location | Observed Duration (Days) | Observed Duration Units (Days) | Endpoint | Effect | Effect Measure-ment | NOEC/ LOEC | Concentration | Concentration Units (dw) | pH | Authors | Title | Source | Publication Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Barium sulfate | *Eisenia fetida* | Earthworm | Invertebrate | Adult | NR | Acid Digestion, ICP/MS | Barium | Soil | Lab | NR | NR | Growth | Weight loss | No effect | NOEC | 2,033 | mg/kg | 6.1 - 8.3 | Lamb, D., Matanitobua, V., Palanisami, T., Megharaj, M. and Naidu, R. | Bioavailability of Barium to Plants and Invertebrates in Soils Contaminated by Barite | Environmental Science and Technology, No. 47, pp. 4670-4676 | 2013 |
| Barium sulfate | *Eisenia fetida* | Earthworm | Invertebrate | Adult | NR | Acid Digestion, ICP/MS | Barium | Soil | Lab | NR | NR | Survival | Mortality | No effect | NOEC | 3,367 | mg/kg | 6.1 - 8.3 | Lamb, D., Matanitobua, V., Palanisami, T., Megharaj, M. and Naidu, R. | Bioavailability of Barium to Plants and Invertebrates in Soils Contaminated by Barite | Environmental Science and Technology, No. 47, pp. 4670-4676 | 2013 |
| Barium sulfate | *Eisenia andrei* | Earthworm | Invertebrate | Adult | NR | E3073A aqua regia digest | Barium | Soil | Lab | 14 | Days | Survival | Mortality | No Effect | NOEC | 2,080 | mg/kg | 8.01-8.48 | ESG International, Guelph, Ontario | Ecotoxicity Evaluation of Reference Site Soils Amended with Barium Sulphate | Technical Appendices for Barite Soil Remediation Guidelines, Alberta, Canada | 2003 |

*Appendix E. Table 3B*
*Barium Plant NOEC for Barite*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Chemical Name | Species Scientific Name | Species Common Name | Species Group | Organism Age/Weight | Organism Lifestage | Chemical Concentration | Total Barium/ Barium Sulfate | Media Type | Test Location | Observed Duration (Days) | Observed Duration Units (Days) | Endpoint | Effect | Effect Measure-ment | NOEC/ LOEC | Concentration | Concentration Units (dw) | pH | Authors | Title | Source | Publication Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Barium sulfate | *Lactuca sativa L.* | Great Lakes lettuce | Plant | Seed | Juvenile | Acid Digestion, ICP/MS | Barium | Soil | Lab | 56 | Days | Growth | Shoot Biomass | Lowest Effect | **LOEC** | **483** | mg/kg | 6.5 | Lamb, D., Matanitobua, V., Palanisami, T., Megharaj, M. and Naidu, R. | Bioavailability of Barium to Plants and Invertebrates in Soils Contaminated by Barite | Environmental Science and Technology, No. 47, pp. 4670-4676 | **2013** |
| Barium sulfate | *Lolium perenne* | Ryegrass | Plant | Seed | Juvenile | E3073A aqua regia digest | Barium | Soil | Lab | 14 | Days | Growth | Root length | No Effect | **NOEC** | **1,910** | mg/kg | 7.98-8.65 | ESG International, Guelph, Ontario | Ecotoxicity Evaluation of Reference Site Soils Amended with Barium Sulphate | Technical Appendices for Barite Soil Remediation Guidelines, Alberta, Canada | 2003 |

*Appendix E. Table 3C*
*Nominally Measured Barium Sulfate Invertebrate Effects Due to Barite*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Chemical Name | Species Scientific Name | Species Common Name | Species Group | Organism Age/Weight | Organism Lifestage | Chemical Concentration | Total Barium/ Barium Sulfate | Media Type | Test Location | Observed Duration (Days) | Observed Duration Units (Days) | Endpoint | Effect | Effect Measurement | NOEC/ LOEC | Concentration | Concentration Units (dw) | pH | Authors | Title | Source | Publication Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Barium sulfate | *Onychiurus folsomi* | Springtail insect | Invertebrate | Adult | NR | Nominal | Barium sulfate | Soil | Lab | 7 | Days | Survival | Mortality | No Effect | NOEC | 1,000,000 | mg/kg | 7.8-8.01 | ESG International, Guelph, Ontario | Ecotoxicity Evaluation of Reference Site Soils Amended with Barium Sulphate | Technical Appendices for Barite Soil Remediation Guidelines, Alberta, Canada | 2003 |
| Barium sulfate | *Eisenia andrei* | Earthworm | Invertebrate | Adult | NR | Nominal | Barium sulfate | Soil | Lab | 14 | Days | Survival | Mortality | No Effect | NOEC | 1,000,000 | mg/kg | 8.01-8.48 | ESG International, Guelph, Ontario | Ecotoxicity Evaluation of Reference Site Soils Amended with Barium Sulphate | Technical Appendices for Barite Soil Remediation Guidelines, Alberta, Canada | 2003 |

*Appendix E. Table 3D*
*Nominally Measured Barium Sulfate Plant Effects Barite*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Chemical Name | Species Scientific Name | Species Common Name | Species Group | Organism Age/Weight | Organism Lifestage | Chemical Concentration | Total Barium/ Barium Sulfate | Media Type | Test Location | Observed Duration (Days) | Observed Duration Units (Days) | Endpoint | Effect | Effect Measurement | NOEC/ LOEC | Concentration | Concentration Units (dw) | pH | Authors | Title | Source | Publication Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Barium sulfate | *Phaseolus vulgaris* | Green beans | Plant | Seed | Juvenile | Nominal | Barium sulfate | Soil | Lab | 56 | Days | Growth | Biomass | No effect | NOEC | 795,833 | mg/kg | 6.0 - 6.2 | Honarvar, S.<br>Miller, R., Honarvar, S., and Hunsaker, B. | Effect of Drilling Fluid Components and Mixtures on Plants and Soils<br>Effects of Drilling Fluids on Soils and Plants: I. Individual Fluid Components | Utah State University DigitalCommons, Masters Degree<br>J. Environ. Qual., Vol. 9, no. 4 | 1975<br>1980 |
| Barium sulfate | *Phaseolus vulgaris* | Green beans | Plant | Seed | Juvenile | Nominal | Barium sulfate | Soil | Lab | 56 | Days | Growth | Biomass | No effect | NOEC | 227,500 | mg/kg | 6.0 - 6.2 | Honarvar, S.<br>Miller, R., Honarvar, S., and Hunsaker, B. | Effect of Drilling Fluid Components and Mixtures on Plants and Soils<br>Effects of Drilling Fluids on Soils and Plants: I. Individual Fluid Components | Utah State University DigitalCommons, Masters Degree<br>J. Environ. Qual., Vol. 9, no. 5 | 1975<br>1980 |
| Barium sulfate | *Zea mays saccharate* | Sweet corn | Plant | Seed | Juvenile | Nominal | Barium sulfate | Soil | Lab | 56 | Days | Growth | Biomass | No effect | NOEC | 227,500 | mg/kg | 6.0 - 6.2 | Honarvar, S.<br>Miller, R., Honarvar, S., and Hunsaker, B. | Effect of Drilling Fluid Components and Mixtures on Plants and Soils<br>Effects of Drilling Fluids on Soils and Plants: I. Individual Fluid Components | Utah State University DigitalCommons, Masters Degree<br>J. Environ. Qual., Vol. 9, no. 5 | 1975<br>1980 |
| Barium sulfate | *Trifolium hybridum* | Alsike Clover | Plant | Seed | Juvenile | Nominal | Barium Sulfate | Soil | Lab | 21 | Days | Growth | Root Biomass | No Effect | NOEC | 30,000 | mg/kg | 7.98-9.06 | ESG International, Guelph, Ontario | Ecotoxicity Evaluation of Reference Site Soils Amended with Barium Sulphate | Technical Appendices for Barite Soil Remediation Guidelines, Alberta, Canada | 2003 |
| Barium sulfate | *Dactylis glomerata* | Orchardgrass | Plant | Seed | Juvenile | Nominal | Barium sulfate | Soil | Lab | 14 | Days | Growth | Shoot Biomass | No Effect | NOEC | 1,000 | mg/kg | 7.86-8.58 | ESG International, Guelph, Ontario | Ecotoxicity Evaluation of Reference Site Soils Amended with Barium Sulphate | Technical Appendices for Barite Soil Remediation Guidelines, Alberta, Canada | 2003 |
| Barium sulfate | *Dactylis glomerata* | Orchardgrass | Plant | Seed | Juvenile | Nominal | Barium sulfate | Soil | Lab | 14 | Days | Survival | Emergence | No Effect | NOEC | 1,000,000 | mg/kg | 7.86-8.58 | ESG International, Guelph, Ontario | Ecotoxicity Evaluation of Reference Site Soils Amended with Barium Sulphate | Technical Appendices for Barite Soil Remediation Guidelines, Alberta, Canada | 2003 |
| Barium sulfate | *Lolium perenne* | Ryegrass | Plant | Seed | Juvenile | Nominal | Barium sulfate | Soil | Lab | 14 | Days | Growth | Root length | No Effect | NOEC | 300,000 | mg/kg | 7.98-8.65 | ESG International, Guelph, Ontario | Ecotoxicity Evaluation of Reference Site Soils Amended with Barium Sulphate | Technical Appendices for Barite Soil Remediation Guidelines, Alberta, Canada | 2003 |
| Barium sulfate | *Zea mays saccharate* | Sweet corn | Plant | Seed | Juvenile | Nominal | Barium sulfate | Soil | Lab | 56 | Days | Growth | Biomass | 20% Reduction in weight | LOEC | 795,833 | mg/kg | 6.0 - 6.2 | Honarvar, S.<br>Miller, R., Honarvar, S., and Hunsaker, B. | Effect of Drilling Fluid Components and Mixtures on Plants and Soils<br>Effects of Drilling Fluids on Soils and Plants: I. Individual Fluid Components | Utah State University DigitalCommons, Masters Degree<br>J. Environ. Qual., Vol. 9, no. 4 | 1975<br>1980 |

*Appendix E. Table 3E*
*Total Barium Invertebrate Effects Due to Barite*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Chemical Name | Species Scientific Name | Species Common Name | Species Group | Organism Age/Weight | Organism Lifestage | Chemical Concentration | Total Barium/ Barium Sulfate | Media Type | Test Location | Observed Duration (Days) | Observed Duration Units (Days) | Endpoint | Effect | Effect Measurement | NOEC/LOEC | Conc. | Concentration Units (dw) | pH | Authors | Title | Source | Publication Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Barium sulfate | *Eisenia fetida* | Earthworm | Invertebrate | 0.3 - 0.6 gms | Adult | USEPA Method 200.8, ICP-MS | Total barium | Soil | Lab | 21 | Days | Reproduct. | Cocoons | 70% Reduction in number | LOEC | 100 - 1,000 | mg/kg | 5.0 | Simini, M. Checkai, R., Kuperman, R., and Phillips, C.<br><br>Kuperman, R., Simini, M., Checkai, R., Phillips, C., Speicher, J., and Barclift, D. | Toxicity Assessments of Antimony, Barium, Beryllium, and Manganese for Development of Ecological Soil Screening Levels (ECO-SSL) Using Earthworm (*Eisenia fetida*) Benchmark Values<br><br>Toxicity Benchmarks for Antimony, Barium, and Beryllium Determined Using Reproduction Endpoints for *Folsomia candida*, *Eisenia fetida*, and *Enchytraeus crypticus* | U.S. Army Soldier and Biological Chemical Command<br><br>Environmental Toxicology and Chemistry, Vol. 25, No. 3, pp. 754-762 | 2002<br><br>2006 |
| Barium sulfate | *Enchytraeus crypticus* | Potworm | Invertebrate | Adult | Adult 1 cm long, with eggs | USEPA Method 200.8, ICP-MS | Total barium | Soil | Lab | 28 | Days | Reproduct. | No. of offspring | EC20 | LOEC | 5,000 | mg/kg | 5.0 | Kuperman, R., Simini, M., Checkai, R., and Phillips, C.<br><br>Kuperman, R., Simini, M., Checkai, R., Phillips, C., Speicher, J., and Barclift, D. | Toxicity Assessments of Antimony, Barium, Beryllium, and Manganese for Development of Ecological Screening Levels (ECO-SSL) Using Enchytraeid Reproduction Benchmark Values<br><br>Toxicity Benchmarks for Antimony, Barium, and Beryllium Determined Using Reproduction Endpoints for *Folsomia candida*, *Eisenia fetida*, and *Enchytraeus crypticus* | U.S. Army Soldier and Biological Chemical Command<br><br>Environmental Toxicology and Chemistry, Vol. 25, No. 3, pp. 754-762 | 2002<br><br>2006 |
| Barium sulfate | *Enchytraeus crypticus* | Potworm | Invertebrate | Adult | Adult 1 cm long, with eggs | USEPA Method 200.8, ICP-MS | Total barium | Soil | Lab | 28 | Days | Reproduct. | No. of offspring | Lowest Effect | LOEC | 500 - 1,000 | mg/kg | 5.0 | Kuperman, R., Simini, M., Checkai, R., and Phillips, C.<br><br>Kuperman, R., Simini, M., Checkai, R., Phillips, C., Speicher, J., and Barclift, D. | Toxicity Assessments of Antimony, Barium, Beryllium, and Manganese for Development of Ecological Screening Levels (ECO-SSL) Using Enchytraeid Reproduction Benchmark Values<br><br>Toxicity Benchmarks for Antimony, Barium, and Beryllium Determined Using Reproduction Endpoints for *Folsomia candida*, *Eisenia fetida*, and *Enchytraeus crypticus* | U.S. Army Soldier and Biological Chemical Command<br><br>Environmental Toxicology and Chemistry, Vol. 25, No. 3, pp. 754-762 | 2002<br><br>2006 |
| Barium sulfate | *Eisenia fetida* | Earthworm | Invertebrate | 0.3 - 0.6 gms | Adult | USEPA Method 200.8, ICP-MS | Total barium | Soil | Lab | 21 | Days | Reproduct. | Cocoons | 10% Reduction in number | NOEC | 500 - 5000 | mg/kg | 5.0 | Simini, M., Checkai, R., Kuperman, R., and Phillips, C.<br><br>Kuperman, R., Simini, M., Checkai, R., Phillips, C., Speicher, J., and Barclift, D. | Toxicity Assessments of Antimony, Barium, Beryllium, and Manganese for Development of Ecological Soil Screening Levels (ECO-SSL) Using Earthworm (*Eisenia fetida*) Benchmark Values<br><br>Toxicity Benchmarks for Antimony, Barium, and Beryllium Determined Using Reproduction Endpoints for *Folsomia candida*, *Eisenia fetida*, and *Enchytraeus crypticus* | U.S. Army Soldier and Biological Chemical Command<br><br>Environmental Toxicology and Chemistry, Vol. 25, No. 3, pp. 754-762 | 2002<br><br>2006 |
| Barium sulfate | *Enchytraeus crypticus* | Potworm | Invertebrate | Adult | Adult 1 cm long, with eggs | USEPA Method 200.8, ICP-MS | Total barium | Soil | Lab | 14 | Days | Survival | Mortality | No effect | NOEC | 10,000 | mg/kg | 5.0 | Kuperman, R., Simini, M., Checkai, R., and Phillips, C.<br><br>Kuperman, R., Simini, M., Checkai, R., Phillips, C., Speicher, J., and Barclift, D. | Toxicity Assessments of Antimony, Barium, Beryllium, and Manganese for Development of Ecological Screening Levels (ECO-SSL) Using Enchytraeid Reproduction Benchmark Values<br><br>Toxicity Benchmarks for Antimony, Barium, and Beryllium Determined Using Reproduction Endpoints for *Folsomia candida*, *Eisenia fetida*, and *Enchytraeus crypticus* | U.S. Army Soldier and Biological Chemical Command<br><br>Environmental Toxicology and Chemistry, Vol. 25, No. 3, pp. 754-762 | 2002<br><br>2006 |
| Barium sulfate | *Folsomia candida* | Springtail insect | Invertebrate | Adult | NR | USEPA Method 200.8, ICP-MS | Total barium | Soil | Lab | 14 | Days | Survival | Mortality | No effect | NOEC | 10,000 | mg/kg | 5.29 | Kuperman, R., Simini, M., Checkai, R., Phillips, C., Speicher, J., and Barclift, D. | Toxicity Benchmarks for Antimony, Barium, and Beryllium Determined Using Reproduction Endpoints for *Folsomia candida*, *Eisenia fetida*, and *Enchytraeus crypticus* | Environmental Toxicology and Chemistry, Vol. 25, No. 3, pp. 754-762 | 2006 |
| Barium sulfate | *Folsomia candida* | Springtail insect | Invertebrate | Adult | NR | USEPA Method 200.8, ICP-MS | Total barium | Soil | Lab | 28 | Days | Reproduct. | No. of offspring | No effect | NOEC | 10,000 | mg/kg | 5.29 | Kuperman, R., Simini, M., Checkai, R., Phillips, C., Speicher, J., and Barclift, D. | Toxicity Benchmarks for Antimony, Barium, and Beryllium Determined Using Reproduction Endpoints for *Folsomia candida*, *Eisenia fetida*, and *Enchytraeus crypticus* | Environmental Toxicology and Chemistry, Vol. 25, No. 3, pp. 754-762 | 2006 |
| Barium sulfate | *Eisenia fetida* | Earthworm | Invertebrate | Adult | NR | XRF | Total Barium | Soil | Lab | NR | NR | Survival | Mortality | No effect | NOEC | 29,200 | mg/kg | 6.1 - 8.3 | Lamb, D., Matanitobua, V., Palanisami, T., Megharaj, M. and Naidu, R. | Bioavailability of Barium to Plants and Invertebrates in Soils Contaminated by Barite | Environmental Science and Technology, No. 47, pp. 4670-4676 | 2013 |
| Barium sulfate | *Eisenia fetida* | Earthworm | Invertebrate | Adult | NR | XRF | Total Barium | Soil | Lab | NR | NR | Growth | Weight loss | No effect | NOEC | 5,700 | mg/kg | 6.1 - 8.3 | Lamb, D., Matanitobua, V., Palanisami, T., Megharaj, M. and Naidu, R. | Bioavailability of Barium to Plants and Invertebrates in Soils Contaminated by Barite | Environmental Science and Technology, No. 47, pp. 4670-4676 | 2013 |

*Appendix E. Table 3F*
*Total Barium Plant Effects Due to Barite*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Chemical Name | Species | Common Name | Species Group | Age/ Weight | Life-stage | Method | Total Barium/ Barium Sulfate | Media | Test Location | Duration (Days) | Duration Units (Days) | End point | Effect | Effect Measurement | NOEC/ LOEC | Conc. | Conc. Units (dw) | pH | Authors | Title | Source | Publ. Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Barium sulfate | *Lactuca sativa L.* | Great Lakes lettuce | Plant | Seed | Juvenile | XRF | Total Barium | Soil | Lab | 55 | Days | Growth | Shoot Biomass | Lowest Effect | LOEC | 1300 | mg/kg | 6.5 | Lamb, D., Matanitobua, V., Palanisami, T., Megharaj, M. and Naidu, R. | Bioavailability of Barium to Plants and Invertebrates in Soils Contaminated by Barite | Environmental Science and Technology, No. 47, pp. 4670-4676 | 2013 |

*Appendix E. Table 4*
*Soluble Barium Freshwater LC50 and EC50 Toxicity Summary*
Castex Development, LLC v. Anadarko Petroleum Corporation, et al.
*West Hermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| CAS Number | Chemical Name | Chemical Purity | Species Scientific Name | Species Common Name | Species Group | Organism Age | Age Units | Organism Lifestage | Exposure Type | Chemical Analysis | Media Type | Test Location | Observed Duration (Days) | Observed Duration Units (Days) | Endpoint | Effect | Effect Measurement | Response Site | Concentration | Concentration Units | Temperature | pH | Authors | Title | Source | Publication Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10326279 | Barium chloride dihydrate | NR | *Austropotamobius pallipes ssp. pallipes* | Crayfish | Crustaceans | NR | NR | intermolt cycle, stage C4 | Static | Measured | Fresh water | Lab | 4 | Day(s) | LC50 | Immobilization | Mortality | Not reported | 46000 | ug/L | 15 -17°C | 7 | Boutet,C., and C. Chaisemartin | Specific Toxic Properties of Metallic Salts in Austropotamobius pallipes pallipes and Orconectes limosus | Comptes Rendus Seances Soc. Biol. Fil.167(12): 1933-1938 | 1973 |
| 10022318 | Barium Nitrate | NR | *Brachionus calyciflorus* | Rotifer | Invertebrates | NR | NR | Not reported | Aquatic - not reported | Unmeasured | Fresh water | Lab | 1 | Day(s) | LC50 | Mortality | Mortality | Not reported | 708223 | ug/L | NR | NR | Calleja,M.C., G. Persoone, and P. Geladi | Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates | Arch. Environ. Contam. Toxicol.26(1): 69-78 | 1994 |
| 10326279 | Barium chloride dihydrate | NR | *Danio rerio* | zebrafish | Fish | 0.12 | gm | Not reported | Static | Unmeasured | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not reported | 149000 | ug/L | 21.3 - 22.4°C | 7.1 - 7.5 | Egeler, P. and Kiefer | ECHA (European Chemicals Agency) | ECHA Barium Registration Dossier | 2010 |
| 10326279 | Barium chloride dihydrate | NR | *Daphnia magna* | Water Flea | Crustaceans | 12 | Hour(s) | Not reported | Static | Unmeasured | Fresh water | Lab | 2 | Day(s) | LC50 | Mortality | Immobile | Not reported | 14500 | ug/L | NR | NR | Biesinger,K.E., and G.M. Christensen | Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna | J. Fish. Res. Board Can.29(12): 1691-1700 | 1972 |
| | Barium ion | Not reported | *Daphnia magna* | Water Flea | Crustaceans | NR | NR | NR | Static | Unmeasured | Fresh water | Lab | 2 | Day(s) | EC50 | Intoxication | Immobile | Not reported | 32000 | ug/L | 13°C | 7.6 | Khangarot, B.S. and Ray, P.K. | Investigation of Correlation between Physicochemical Properties of Metals and Their Toxicity to the Water Flea *Daphnia magna* Straus | Ecotoxicol. Environ. Saf. 18, 109-120 | 1989 |
| 7440393 | Barium | >=80 | *Daphnia magna* | Water Flea | Crustaceans | <=24 | Hour(s) | Not reported | Static | Unmeasured | Fresh water | Lab | 2 | Day(s) | LC50 | Mortality | Mortality | Not reported | 410000 | ug/L | 22°C | 8 | LeBlanc,G.A. | Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna) | Bull. Environ. Contam. Toxicol.24(5): 684-691 | 1980 |
| 7440393 | Barium | >=80 | *Daphnia magna* | Water Flea | Crustaceans | <=24 | Hour(s) | Not reported | Static | Unmeasured | Fresh water | Lab | 2 | Day(s) | LC50 | Mortality | Mortality | Not reported | 530000 | ug/L | 22°C | 8 | LeBlanc,G.A. | Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna) | Bull. Environ. Contam. Toxicol.24(5): 684-691 | 1980 |
| 13701592 | Boric acid, Barium salt | 90 | *Daphnia magna* | Water Flea | Crustaceans | 1st | Instar | Not coded | Static | Not coded | Fresh water | Lab | 2 | Day(s) | EC50 | Intoxication | Immobile | Not coded | 19030 | ug/L | NR | NR | U.S. Environmental Protection Agency | Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)) | Environmental Fate and Effects Division, U.S.EPA, Washington, D.C.: | 1992 |
| 10361372 | Barium Chloride | NR | *Drosophila* | Fruit Fly | Insects/Spiders | 0-1 | day | Pre-adult | Aquatic - not reported | Unmeasured | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not reported | 1505000 | ug/L | NR | NR | Christie, N., Gosslee, D., Bate, L., and Jacobson, K. | Quantitative Aspects of Metal Ion Content and Toxicity in Drosophila | Toxicology, 26, 295-312 | 1983 |
| 10326279 | Barium Chloride dihydrate | >98 | *Drosophila* | Fruit Fly | Insects/Spiders | 0-1 | day | Pre-adult | | | Fresh water | Lab | 4 | | LC50 | | | | 7327710 | ug/L | 25°C | NR | Williams, M., Hoeschele, J., Turner, J., Jacobson, K., Christie, N., Paton, C., Smith, L., Witschi, H., and Lee, E. | Chemical Softness and Acute Metal Toxicity in Mice and Drosophila | Toxicology and Applied Pharmacology 63, 461-469 | 1982 |
| 10022318 | Barium Nitrate | NR | *Dugesia tigrina* | Platyhelminth | Worm | 20 | days | NR | NR | Unmeasured | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not reported | 97000 | ug/L | 18 - 22°C | 7.2 - 8.2 | Piontek, M. | Use of the planarian Dugesia tigrina Girard in studies of acute intoxication | Pol. Arch. Hydrobiol., 46, 1, 41-48 | 1999 |
| 10361372 | Barium chloride | NR | *Echinogammarus berilloni* | Scud | Crustaceans | NR | Not reported | Adults | Static | Unmeasured | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not reported | 122000 | ug/L | 22 -17°C | NR | Vincent,M., B. Penicaut, and J. Debord | Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni | Ann. Rech. Vet.17(4): 441-446 | 1986 |
| 10361372 | Barium chloride | NR | *Echinogammarus berilloni* | Scud | Crustaceans | NR | Not reported | Adults | Static | Unmeasured | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not reported | 129000 | ug/L | 23 -17°C | NR | Vincent,M., B. Penicaut, and J. Debord | Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni | Ann. Rech. Vet.17(4): 441-446 | 1986 |
| 10361372 | Barium chloride | NR | *Gambusia affinis* | Western Mosquitofish | Fish | NR | Not reported | Adult(s) | Static | Unmeasured | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not reported | 1640000 | ug/L | NR | 7.1 - 7.6 | Wallen,I.E., W.C. Greer, and R. Lasater | Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters | Sewage Ind. Wastes29(6): 695-711 | 1957 |
| 513779 | Barium carbonate | NR | *Gambusia affinis* | Western Mosquitofish | Fish | NR | Not reported | Adult(s) | Static | Unmeasured | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not reported | >10000000 | ug/L | NR | 7.6 - 8.5 | Wallen,I.E., W.C. Greer, and R. Lasater | Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters | Sewage Ind. Wastes29(6): 695-711 | 1957 |
| 10361372 | Barium chloride | NR | *Gammarus pulex* | Scud | Crustaceans | NR | Not reported | adults | Static | Unmeasured | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not reported | 238000 | ug/L | 19°C | NR | Vincent,M., B. Penicaut, and J. Debord | Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni | Ann. Rech. Vet.17(4): 441-446 | 1986 |
| 10361372 | Barium chloride | NR | *Gammarus pulex* | Scud | Crustaceans | NR | Not reported | adults | Static | Unmeasured | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not reported | 227000 | ug/L | 19°C | NR | Vincent,M., B. Penicaut, and J. Debord | Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni | Ann. Rech. Vet.17(4): 441-446 | 1986 |
| 13701592 | Boric acid, Barium salt | 90 | *Lepomis macrochirus* | Bluegill | Fish | NC | Not coded | Not coded | Static | Not coded | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not coded | 151000 | ug/L | NR | NR | U.S. Environmental Protection Agency | Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)) | Environmental Fate and Effects Division, U.S.EPA, Washington, D.C.: | 1992 |
| 7440393 | Barium | NR | *Lepomis macrochirus* | Bluegill | Fish | NR | Not reported | Not reported | Static | Unmeasured | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not reported | 198000 | ug/L | NR | NR | U.S. Environmental Protection Agency | In-Depth Studies on Health and Environmental Impacts of Selected Water Pollutants | U.S.EPA Contract No.68-01-4646, Duluth, MN:9 p. | 1978 |
| 10361372 | Barium chloride | NR | *Leuciscus idus melanotus* | Carp | Fish | NR | Not reported | Not reported | Aquatic - not reported | Not reported | Fresh water | Not reported | 2 | Day(s) | LC50 | Mortality | Mortality | Not reported | 870000 | ug/L | NR | NR | Juhnke,I., and D. Luedemann | Results of the Investigation of 200 Chemical Compounds for Acute Fish Toxicity with the Golden Orfe Test | Z. Wasser-Abwasser-Forsch.11(5): 161-164 | 1978 |



Castex-ERM-RPT-000968
**BP/Castex-Ltd Adm-Apx L-000969**

*Appendix E. Table 4*
*Soluble Barium Freshwater LC50 and EC50 Toxicity Summary*
**Castex Development, LLC v. Anadarko Petroleum Corporation, et al.**
*West Hermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| CAS Number | Chemical Name | Chemical Purity | Species Scientific Name | Species Common Name | Species Group | Organism Age | Age Units | Organism Lifestage | Exposure Type | Chemical Analysis | Media Type | Test Location | Observed Duration (Days) | Observed Duration Units (Days) | Endpoint | Effect | Effect Measure-ment | Response Site | Concentration | Concentration Units | Temperature | pH | Authors | Title | Source | Publication Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13701592 | Boric acid, Barium salt | 90 | *Oncorhynchus mykiss* | Rainbow Trout | Fish | NC | Not coded | Not coded | Static | Not coded | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not coded | 62000 | ug/L | NR | NR | U.S. Environmental Protection Agency | Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)) | Environmental Fate and Effects Division, U.S.EPA, Washington, D.C.: | 1992 |
| 10361372 | Barium chloride | NR | *Orconectes limosus* | Crayfish | Crustaceans | NR | Not reported | Intermolt cycle, stage C4 | Static | Measured | Fresh water | Lab | 4 | Day(s) | LC50* | Immobilization | Mortality | Not reported | 78000 | ug/L | 15 - 17°C | 7 | Boutet,C., and C. Chaisemartin | Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus | Comptes Rendus Seances Soc. Biol. Fil.167(12): 1933-1938 | 1973 |
| 13701592 | Boric acid, Barium salt | 90 | *Rasbora heteromorpha* | Harlequinfish, Red Rasbora | Fish | NR | Not reported | Not reported | Static | Unmeasured | Fresh water | Lab | 4 | Day(s) | LC50 | Mortality | Mortality | Not reported | 145000 | ug/L | 20°C | 8.1 | Tooby,T.E., P.A. Hursey, and J.S. Alabaster | The Acute Toxicity of 102 Pesticides and Miscellaneous Substances to Fish | Chem. Ind. (Lond.)21:523-526 | 1975 |
| 10361372 | Barium chloride | NR | *Salmo trutta* | Brown Trout | Fish | NR | Not reported | Organisms at different lifestages | Aquatic - not reported | Unmeasured | Fresh water | Lab | 2 | Day(s) | LC50 | Mortality | Mortality | Not reported | 150000 | ug/L | 15°C | NR | Woodiwiss,F.S., and G. Fretwell | The Toxicities of Sewage Effluents, Industrial Discharges and Some Chemical Substances to Brown Trout (Salmo trutta) in the Trent River Authority Area | Water Pollut. Control 73:396-405 | 1974 |

*Appendix E. Table 5*
*Barium Sulfate Toxicity Studies*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Endpoint | Result | Units | Exposure | Duration | Media | Salinity | Organism Scientific Name | Common Name | Life Stage | Effect | Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **AQUATIC STUDIES** | | | | | | | | | | | |
| ***Freshwater*** | | | | | | | | | | | |
| EC50 | 32 | mg/L | direct contact | 48 hrs | water | freshwater | *Daphnia magna Straus* | water flea | not reported | immobility | 1. Khangarot,B.S., and P.K. Ray, 1989 |
| EC50 | 33.65 | mg/L | direct contact | 48 hrs | water | freshwater | *Tubifex tubifex* | Tubificid Worm | not reported | immobility | 2. Khangarot,B.S., 1991 |
| EC50 | 33.65 | mg/L | direct contact | 96 hrs | water | freshwater | *Tubifex tubifex* | Tubificid Worm | not reported | immobility | 2. Khangarot,B.S., 1991 |
| EC50 | 44.98 | mg/L | direct contact | 24 hrs | water | freshwater | *Tubifex tubifex* | Tubificid Worm | not reported | immobility | 2. Khangarot,B.S., 1991 |
| EC50 | 52.82 | mg/L | direct contact | 24 hrs | water | freshwater | *Daphnia magna Straus* | water flea | not reported | immobility | 1. Khangarot,B.S., and P.K. Ray, 1989 |
| EC50 | 634-798 | mg/L | direct contact | 48 hr | water | freshwater | *C. subglobosa Sowerby* | freshwater ostracod | various | immobility | 3. Khangarot, B.S. and Das, S., 2009 |
| LC50 | > 7500 | mg/L | direct contact | 96 hrs | water | freshwater | *Salmo gairdneri* Richardson | rainbow trout | 2.5 - 4.0 cm | mortality | 4. Falk, M. et al., 1973 |
| LC50 | 76000 | mg/L | direct contact | 96 hrs | water | freshwater | *Oncorhynchus mykiss* | rainbow trout | 1 gram weight | mortality | 5. Sprague, J. et al., 1979 |
| LC0 | 100000 | mg/L | direct contact | 96 hrs | water | freshwater | *Poecilia sp.* | Mollies | not reported | mortality | 6. Grantham,C.K., and J.P. Sloan, 1975 |
| ***Saltwater*** | | | | | | | | | | | |
| NOAEL | 10 | mg/L | direct contact | 7 days | water | 34 ppt salinity | *Cancer anthonyi* | yellow crab | embryo | mortality/reproduct. | 7. Macdonald J.M. et al., 1988 |
| NOAEL | 200 | mg/L | direct contact | 24 hours | water | marine | *Mallotus villosus* | capelin | larvae | survival | 8. Payne, J.F. et al., 2006 |
| LC50 | 1000 | mg/L | direct contact | 7 days | water | 34 ppt salinity | *Cancer anthonyi* | yellow crab | embryo | mortality | 7. Macdonald J.M. et al., 1988 |
| NOAEL | 1000 | mg/L | direct contact | 24 hours | water | marine | *Chionoecetes opilio* | snow crab | larvae | survival | 8. Payne, J.F. et al., 2006 |
| NOAEL | 1000 | mg/L | direct contact | 24 hours | water | marine | jellyfish | jellyfish | planktonic | survival | 8. Payne, J.F. et al., 2006 |
| NOAEL | 1000 | mg | ingestion | 4x/one month | water | marine | *Pseudopleuronectes americanus* | winter flounder | 300 gram weight | survival | 8. Payne, J.F. et al., 2006 |
| EC50 | 16200 | mg/L | direct contact | 96 hour | water | 28-31 ppt salinity | *Pandalus danae* | dock shrimp | larvae | swimming | 9. Carls, M.G. et al., 1984 |
| EC50 | 71400 | mg/L | direct contact | 96 hour | water | 28-31 ppt salinity | *Metacarcinus magister* | dungeness crab | larvae | swimming | 9. Carls, M.G. et al., 1984 |
| NOAEL | 200000 | mg/L | direct contact | 10 month | water | seawater | *Tautogolabrus adspersus* | cunner | 70.7 +/-20.8 gms | growth | 10. Payne, J. et al., 2011 |
| **TERRESTRIAL STUDIES** | | | | | | | | | | | |
| ***Mammals*** | | | | | | | | | | | |
| NOAEL | 8 | mg/kg | ingestion | apprx 60 days [a] | diet | NA | CF-1 mice | mice | weanling | growth/repro/mortal | 11. Hutcheson, D., 1975 |
| LD50 | 364000 | mg/kg | intragastric | 28 -52 hours | dosed | NA | CBL-Wistar Albino Rats | rat | 130-160 gm wght | mortality | 12. Boyd, M.D. and Abel, M., 1966 |
| LD0 | 163000 | mg/kg | intragastric | 14 days | dosed | NA | CBL-Wistar Albino Rats | rat | 130-160 gm wght | mortality | 12. Boyd, M.D. and Abel, M., 1966 |
| ***Terrestrial Invertebrates*** | | | | | | | | | | | |
| NOAEL | 10000 | mg/kg | direct contact | | sandy loam soil | NA | *Folsomia Candida* | soil arthropod | adult | mortality | 13. Kuperman, R.G. et al., 2006 |
| NOAEL | 10000 | mg/kg | direct contact | | sandy loam soil | NA | *Eisenia Fetida* | earth worm | adult | mortality | 13. Kuperman, R.G. et al., 2006 |
| NOAEL | 10000 | mg/kg | direct contact | | sandy loam soil | NA | *Enchytraeus Crypticus* | white worm | adult | mortality | 13. Kuperman, R.G. et al., 2006 |
| NOAEL | 1000000 | mg/kg | direct contact | 14 days | clayey soil | NA | *Onychiurus folsomi* | springtail insect | not reported | mortality | 14. Menzie et al., 2008 |
| NOAEL | 300000 | mg/kg | direct contact | 14 days | loamy soil | NA | *Eisenia andrei* | worm | not reported | mortality | 14. Menzie et al., 2008 |

Notes:
a) Three generations of mice

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3. Khangarot, B.S. and Das, S., 2009, Acute toxicity of metals and reference toxicants to a freshwater ostracod, Cypris subglobosa Sowerby, 1840 and correlation to EC50 values of other test models, Journal of Hazardous Materials 172, 641–649
4. Falk, M. et al., Acute Toxicity of Petrochemical Drilling Fluids Components and Wastes to Fish, 1973, Environment Canada,Technical Report Series
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9. Carls, M.G. et al., 1984, Toxic Contributions of Specific Drilling Mud Components to Larval Shrimp and Crabs, Marine Environmental Research 12, 45-62.
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11. Hutcheson, D. et al., 1975, Studies of Nutritional Safety of Some Heavy Metals in Mice, The Journal of Nutrition, Vol 105, no.6.
12. Boyd, M.D. and Abel, M., 1966, The Acute Toxicity of Barium Sulfate Administered Intragastrically, Canad. Med. Ass. J.
13. Kuperman, R.G. et al., 2006, Toxicity Benchmarks for Antimony, Barium, and Beryllium Determin. using Reproduc. Endpoints for Folsomia Candida, Eisenia Fetida, and Enchytraeus Crypticus, Environ. Toxicol. and Chem., Vol. 25, No. 3, pp. 754–762
14. Menzie, C. et al., 2008, The Importance of Understanding the Chemical Form of a Metal in the Environment: The Case of Barium Sulfate, Human and Ecological Risk Assessment, 14: 974–991

*Appendix E. Table 6*
*Soluble Barium Genus Mean Acute Values (GMAV)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Species Scientific Name | Species Common Name | EC50 and LC50 Concentrations Included in Geometric Mean (mg/L) | Final GMAV Concentration (mg/L) |
|---|---|---|---|
| *Gambusia affinis* | Western Mosquitofish | 1640, 10,000 | **4050** |
| *Drosophila* | fruit fly | 1505, 7328 | **3321** |
| *Leuciscus idus melanotus* | Carp | 870 | **870** |
| *Brachionus calyciflorus* | Rotifer | 708 | **708** |
| *Gammarus pulex* | Scud | 238, 227 | **232** |
| *Lepomis macrochirus* | Bluegill | 151, 198 | **173** |
| *Salmo trutta* | Brown Trout | 150 | **150** |
| *Danio rerio* | zebrafish | 149 | **149** |
| *Rasbora heteromorpha* | Harlequinfish, Red Rasbora | 145 | **145** |
| *Echinogammarus berilloni* | Scud | 122, 129 | **125** |
| *Dugesia tigrina* | platyhelminth | 97 | **97** |
| *Orconectes limosus* | Crayfish | 78 | **78** |
| *Oncorhynchus mykiss* | Rainbow Trout | 62 | **62** |
| *Austropotamobius pallipes ssp. pallipes* | Crayfish | 46 | **46** |
| *Daphnia magna* | Water Flea | 14.5, 32, 19 | **21** |

Notes:

The two concentrations not used (410 mg/L and 530 mg/L) to calculate the GMAV for Daphnia magna were not included because they were an order of magnitude higher than the three values used.

GMAV is the genus mean acute value, and is the geometric mean of the values.

*Appendix E. Table 7*
*Barium Final Acute Value*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

The FAV is calculated from the data using the four lowest GMAVs:

1. Order the GMAVs from high to low.
2. Assign ranks (R) to the GMAVs from 1 (lowest) to N (highest).
3. Calculate the cumulative probability (P) for each GMAV as R/(N + 1).
4. Select the four GMAVs which have the cumulative probabilities closest to 0.05.
5. Using the selected GMAVs and cumulative probabilities, calculate a FAV:

| Rank | Genus Mean Acute Value | ln(GMAV) | $(\ln(GMAV))^2$ | Cumulative Probability (P) | $\sqrt{P}$ |
|---|---|---|---|---|---|
| 1 | 21 | 3.03 | 9.17 | 0.0625 | 0.25 |
| 2 | 46 | 3.83 | 14.66 | 0.1250 | 0.35 |
| 3 | 62 | 4.13 | 17.03 | 0.1875 | 0.43 |
| 4 | 78 | 4.36 | 18.98 | 0.2500 | 0.50 |
| SUM | 207 | 15.34 | 59.85 | 0.63 | 1.54 |

| | |
|---|---|
| Total GMAVs | 15 |
| $S^2$ | 29.01 |
| S | 5.39 |
| L | 1.77 |
| A | 2.97 |
| Final Acute Value (FAV) | 19.50 |

$$S^2 = \frac{\sum((\ln GMAV)^2) - \left(\left(\sum \ln GMAV\right)\right)^2/4}{\sum(F) - \left(\left(\sum(\sqrt{P})\right)^2/4\right)}$$

$$L = \left(\sum(\ln GMAV) - S\left(\sum(\sqrt{P})\right)\right)/4$$

$$A = S(\sqrt{0.05}) + L$$

$$FAV = e^A$$

# APPENDIX F LOUISIANA SOIL BACKGROUND (USGS)

*Appendix F-1*
*Background Data Collected by USGS*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| SiteID | StateID | CollDate | Depth (cm) | Ag (mg/kg) | D_Ag (mg/kg) | As (mg/kg) | D_As (mg/kg) | Ba (mg/kg) | D_Ba (mg/kg) | Cd (mg/kg) | D_Cd (mg/kg) | Cr (mg/kg) | D_Cr (mg/kg) | Hg (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120 | LA | 7/30/2008 | 0-5 | 1 | 0 | 4.9 | 1 | 514 | 1 | 0.3 | 1 | 66 | 1 | 0.09 |
| 140 | LA | 8/6/2008 | 0-5 | 1 | 0 | 2 | 1 | 111 | 1 | 0.1 | 0 | 19 | 1 | 0.01 |
| 204 | LA | 7/26/2008 | 0-5 | 1 | 0 | 5.7 | 1 | 296 | 1 | 0.3 | 1 | 35 | 1 | 0.08 |
| 332 | LA | 8/2/2008 | 0-5 | 1 | 0 | 2.5 | 1 | 187 | 1 | 0.1 | 0 | 20 | 1 | 0.02 |
| 460 | LA | 7/26/2008 | 0-5 | 1 | 0 | 3 | 1 | 210 | 1 | 0.1 | 0 | 27 | 1 | 0.05 |
| 588 | LA | 8/6/2008 | 0-5 | 1 | 0 | 4.8 | 1 | 138 | 1 | 0.1 | 0 | 31 | 1 | 0.02 |
| 824 | LA | 7/30/2008 | 0-5 | 1 | 0 | 4.2 | 1 | 448 | 1 | 0.1 | 0 | 39 | 1 | 0.03 |
| 1072 | LA | 7/28/2008 | 0-5 | 1 | 0 | 10 | 1 | 652 | 1 | 0.6 | 1 | 70 | 1 | 0.06 |
| 1144 | LA | 7/30/2008 | 0-5 | 1 | 0 | 11.4 | 1 | 654 | 1 | 0.4 | 1 | 71 | 1 | 0.05 |
| 1356 | LA | 8/2/2008 | 0-5 | 1 | 0 | 2.1 | 1 | 232 | 1 | 0.1 | 0 | 18 | 1 | 0.01 |
| 1612 | LA | 8/5/2008 | 0-5 | 1 | 0 | 5.1 | 1 | 520 | 1 | 0.3 | 1 | 62 | 1 | 0.07 |
| 1740 | LA | 8/3/2008 | 0-5 | 1 | 0 | 5.4 | 1 | 641 | 1 | 1.1 | 1 | 65 | 1 | 0.09 |
| 1848 | LA | 7/28/2008 | 0-5 | 1 | 0 | 5.5 | 1 | 542 | 1 | 0.4 | 1 | 38 | 1 | 0.05 |
| 2168 | LA | 7/29/2008 | 0-5 | 1 | 0 | 10.7 | 1 | 765 | 1 | 0.3 | 1 | 40 | 1 | 0.03 |
| 2380 | LA | 8/4/2008 | 0-5 | 1 | 0 | 1.9 | 1 | 236 | 1 | 0.1 | 0 | 30 | 1 | 0.03 |
| 2636 | LA | 8/6/2008 | 0-5 | 1 | 0 | 1.7 | 1 | 304 | 1 | 0.1 | 0 | 23 | 1 | 0.01 |
| 2872 | LA | 7/28/2008 | 0-5 | 1 | 0 | 7.4 | 1 | 712 | 1 | 0.3 | 1 | 52 | 1 | 0.05 |
| 2892 | LA | 8/6/2008 | 0-5 | 1 | 0 | 3.2 | 1 | 231 | 1 | 0.1 | 0 | 34 | 1 | 0.01 |
| 3404 | LA | 8/4/2008 | 0-5 | 1 | 0 | 2.9 | 1 | 425 | 1 | 0.1 | 0 | 24 | 1 | 0.07 |
| 3640 | LA | 7/31/2008 | 0-5 | 1 | 0 | 6.9 | 1 | 576 | 1 | 0.2 | 1 | 48 | 1 | 0.06 |
| 3896 | LA | 7/27/2008 | 0-5 | 1 | 0 | 1.3 | 1 | 104 | 1 | 0.1 | 1 | 12 | 1 | 0.05 |
| 3980 | LA | 8/1/2008 | 0-5 | 1 | 0 | 9.4 | 1 | 514 | 1 | 0.4 | 1 | 80 | 1 | 0.06 |
| 4216 | LA | 7/30/2008 | 0-5 | 1 | 0 | 5.4 | 1 | 648 | 1 | 0.2 | 1 | 39 | 1 | 0.04 |
| 4236 | LA | 8/6/2008 | 0-5 | 1 | 0 | 3.6 | 1 | 180 | 1 | 0.2 | 1 | 28 | 1 | 0.13 |
| 4300 | LA | 8/1/2008 | 0-5 | 1 | 0 | 4.3 | 1 | 624 | 1 | 0.2 | 1 | 58 | 1 | 0.04 |
| 4428 | LA | 8/2/2008 | 0-5 | 1 | 0 | 3.3 | 1 | 102 | 1 | 0.1 | 0 | 21 | 1 | 0.02 |
| 4492 | LA | 8/6/2008 | 0-5 | 1 | 0 | 5.6 | 1 | 342 | 1 | 0.1 | 0 | 32 | 1 | 0.06 |
| 4664 | LA | 7/31/2008 | 0-5 | 1 | 0 | 3.9 | 1 | 471 | 1 | 0.1 | 0 | 20 | 1 | 0.01 |
| 4684 | LA | 8/6/2008 | 0-5 | 1 | 0 | 2.6 | 1 | 75 | 1 | 0.1 | 0 | 22 | 1 | 0.02 |
| 4920 | LA | 7/31/2008 | 0-5 | 1 | 0 | 1 | 1 | 283 | 1 | 0.1 | 0 | 5 | 1 | 0.01 |
| 5240 | LA | 8/1/2008 | 0-5 | 1 | 0 | 10.1 | 1 | 2690 | 1 | 0.3 | 1 | 23 | 1 | 4.43 |
| 5452 | LA | 8/2/2008 | 0-5 | 1 | 0 | 4 | 1 | 363 | 1 | 0.1 | 1 | 34 | 1 | 0.01 |
| 5688 | LA | 7/31/2008 | 0-5 | 1 | 0 | 1.5 | 1 | 228 | 1 | 0.1 | 0 | 25 | 1 | 0.02 |
| 5708 | LA | 8/6/2008 | 0-5 | 1 | 0 | 6.8 | 1 | 378 | 1 | 0.1 | 1 | 66 | 1 | 0.06 |
| 5836 | LA | 8/4/2008 | 0-5 | 1 | 0 | 10.8 | 1 | 603 | 1 | 1 | 1 | 67 | 1 | 0.07 |
| 5944 | LA | 7/26/2008 | 0-5 | 1 | 0 | 3.8 | 1 | 264 | 1 | 0.2 | 1 | 15 | 1 | 0.05 |
| 6264 | LA | 7/29/2008 | 0-5 | 1 | 0 | 7 | 1 | 842 | 1 | 0.2 | 1 | 38 | 1 | 0.03 |
| 6476 | LA | 8/2/2008 | 0-5 | 1 | 0 | 2.8 | 1 | 103 | 1 | 0.1 | 0 | 18 | 1 | 0.03 |
| 6712 | LA | 7/31/2008 | 0-5 | 1 | 0 | 5.9 | 1 | 376 | 1 | 0.2 | 1 | 19 | 1 | 0.03 |
| 6968 | LA | 7/28/2008 | 0-5 | 1 | 0 | 5.8 | 1 | 728 | 1 | 0.4 | 1 | 60 | 1 | 0.05 |
| 7500 | LA | 8/4/2008 | 0-5 | 1 | 0 | 2.9 | 1 | 196 | 1 | 0.1 | 0 | 15 | 1 | 0.02 |
| 7736 | LA | 7/31/2008 | 0-5 | 1 | 0 | 5.6 | 1 | 269 | 1 | 0.1 | 0 | 30 | 1 | 0.03 |
| 7992 | LA | 7/28/2008 | 0-5 | 1 | 0 | 11.5 | 1 | 632 | 1 | 0.5 | 1 | 47 | 1 | 0.11 |
| 8012 | LA | 8/6/2008 | 0-5 | 1 | 0 | 3.8 | 1 | 368 | 1 | 0.1 | 0 | 28 | 1 | 0.04 |
| 8076 | LA | 8/1/2008 | 0-5 | 1 | 0 | 6.9 | 1 | 688 | 1 | 0.5 | 1 | 57 | 1 | 0.06 |
| 8312 | LA | 7/30/2008 | 0-5 | 1 | 0 | 7.6 | 1 | 692 | 1 | 0.3 | 1 | 54 | 1 | 0.04 |
| 8332 | LA | 8/6/2008 | 0-5 | 1 | 0 | 10.1 | 1 | 471 | 1 | 0.1 | 1 | 72 | 1 | 0.02 |
| 8396 | LA | 8/3/2008 | 0-5 | 1 | 0 | 9.3 | 1 | 606 | 1 | 0.4 | 1 | 75 | 1 | 0.05 |
| 8524 | LA | 8/4/2008 | 0-5 | 1 | 0 | 4.4 | 1 | 348 | 1 | 0.1 | 0 | 31 | 1 | 0.03 |
| 8780 | LA | 8/6/2008 | 0-5 | 1 | 0 | 3.2 | 1 | 273 | 1 | 0.1 | 1 | 19 | 1 | 0.02 |
| 8908 | LA | 8/4/2008 | 0-5 | 1 | 0 | 8.7 | 1 | 484 | 1 | 0.1 | 1 | 39 | 1 | 0.06 |
| 9016 | LA | 7/30/2008 | 0-5 | 1 | 0 | 3.3 | 1 | 687 | 1 | 0.1 | 0 | 27 | 1 | 0.02 |
| 9336 | LA | 7/30/2008 | 0-5 | 1 | 0 | 5.4 | 1 | 599 | 1 | 0.1 | 1 | 37 | 1 | 0.03 |
| 9548 | LA | 8/3/2008 | 0-5 | 1 | 0 | 1.6 | 1 | 408 | 1 | 0.1 | 0 | 22 | 1 | 0.03 |
| 9804 | LA | 8/6/2008 | 0-5 | 1 | 0 | 1.9 | 1 | 88 | 1 | 0.1 | 0 | 25 | 1 | 0.01 |
| 9932 | LA | 8/4/2008 | 0-5 | 1 | 0 | 12.7 | 1 | 649 | 1 | 0.2 | 1 | 46 | 1 | 0.02 |

*Appendix F-1*
*Background Data Collected by USGS*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| SiteID | StateID | CollDate | Depth (cm) | Ag (mg/kg) | D_Ag (mg/kg) | As (mg/kg) | D_As (mg/kg) | Ba (mg/kg) | D_Ba (mg/kg) | Cd (mg/kg) | D_Cd (mg/kg) | Cr (mg/kg) | D_Cr (mg/kg) | Hg (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10040 | LA | 7/29/2008 | 0-5 | 1 | 0 | 8.2 | 1 | 638 | 1 | 1.1 | 1 | 55 | 1 | 0.07 |
| 10060 | LA | 8/6/2008 | 0-5 | 1 | 0 | 1.2 | 1 | 64 | 1 | 0.1 | 0 | 10 | 1 | 0.01 |
| 10572 | LA | 7/31/2008 | 0-5 | 1 | 0 | 6.3 | 1 | 185 | 1 | 0.1 | 0 | 38 | 1 | 0.02 |
| 10808 | LA | 7/31/2008 | 0-5 | 1 | 0 | 4.4 | 1 | 203 | 1 | 0.1 | 0 | 31 | 1 | 0.04 |
| 11064 | LA | 7/28/2008 | 0-5 | 1 | 0 | 14.5 | 1 | 606 | 1 | 0.8 | 1 | 61 | 1 | 0.08 |
| 11148 | LA | 8/1/2008 | 0-5 | 1 | 0 | 4.3 | 1 | 634 | 1 | 0.2 | 1 | 55 | 1 | 0.08 |
| 11340 | LA | 8/4/2008 | 0-5 | 1 | 0 | 5.6 | 1 | 452 | 1 | 0.1 | 0 | 22 | 1 | 0.01 |
| 11468 | LA | 7/26/2008 | 0-5 | 1 | 0 | 3.4 | 1 | 206 | 1 | 0.1 | 0 | 35 | 1 | 0.06 |
| 11596 | LA | 8/4/2008 | 0-5 | 1 | 0 | 1.1 | 1 | 156 | 1 | 0.1 | 0 | 19 | 1 | 0.02 |
| 11724 | LA | 8/4/2008 | 0-5 | 1 | 0 | 17.4 | 1 | 710 | 1 | 0.1 | 1 | 32 | 1 | 0.01 |
| 11832 | LA | 7/30/2008 | 0-5 | 1 | 0 | 5.1 | 1 | 217 | 1 | 0.1 | 0 | 33 | 1 | 0.02 |
| 11852 | LA | 8/2/2008 | 0-5 | 1 | 0 | 32.6 | 1 | 198 | 1 | 0.1 | 0 | 77 | 1 | 0.04 |
| 12088 | LA | 7/29/2008 | 0-5 | 1 | 0 | 8.4 | 1 | 703 | 1 | 0.3 | 1 | 60 | 1 | 0.04 |
| 12408 | LA | 7/30/2008 | 0-5 | 1 | 0 | 8.7 | 1 | 710 | 1 | 0.5 | 1 | 59 | 1 | 0.04 |
| 12620 | LA | 8/2/2008 | 0-5 | 1 | 0 | 2 | 1 | 149 | 1 | 0.1 | 0 | 18 | 1 | 0.02 |
| 12856 | LA | 7/31/2008 | 0-5 | 1 | 0 | 2 | 1 | 144 | 1 | 0.1 | 0 | 24 | 1 | 0.02 |
| 12876 | LA | 8/6/2008 | 0-5 | 1 | 0 | 4.1 | 1 | 211 | 1 | 0.1 | 0 | 27 | 1 | 0.03 |
| 13004 | LA | 8/3/2008 | 0-5 | 1 | 0 | 6.5 | 1 | 731 | 1 | 0.1 | 0 | 44 | 1 | 0.02 |
| 13112 | LA | 7/31/2008 | 0-5 | 1 | 0 | 3.7 | 1 | 163 | 1 | 0.1 | 0 | 23 | 1 | 0.03 |
| 120 | LA | 7/30/2008 | 0-15 | 1 | 0 | 4.8 | 1 | 448 | 1 | 0.2 | 1 | 67 | 1 | 0.07 |
| 140 | LA | 8/6/2008 | 0-30 | 1 | 0 | 1.8 | 1 | 132 | 1 | 0.1 | 0 | 11 | 1 | 0.01 |
| 204 | LA | 7/26/2008 | 0-5 | 1 | 0 | 6.1 | 1 | 271 | 1 | 0.3 | 1 | 37 | 1 | 0.08 |
| 332 | LA | 8/2/2008 | 0-15 | 1 | 0 | 1 | 1 | 147 | 1 | 0.1 | 0 | 16 | 1 | 0.04 |
| 460 | LA | 7/26/2008 | 0-10 | 1 | 0 | 3.1 | 1 | 199 | 1 | 0.1 | 0 | 33 | 1 | 0.04 |
| 588 | LA | 8/6/2008 | 0-20 | 1 | 0 | 5.3 | 1 | 168 | 1 | 0.1 | 0 | 25 | 1 | 0.02 |
| 824 | LA | 7/30/2008 | 0-20 | 1 | 0 | 4 | 1 | 353 | 1 | 0.1 | 0 | 32 | 1 | 0.03 |
| 1072 | LA | 7/28/2008 | 0-20 | 1 | 0 | 6.8 | 1 | 474 | 1 | 0.6 | 1 | 57 | 1 | 0.04 |
| 1144 | LA | 7/30/2008 | 0-20 | 1 | 0 | 11 | 1 | 667 | 1 | 0.4 | 1 | 61 | 1 | 0.05 |
| 1356 | LA | 8/2/2008 | 0-20 | 1 | 0 | 1.4 | 1 | 226 | 1 | 0.1 | 0 | 21 | 1 | 0.01 |
| 1612 | LA | 8/5/2008 | 0-30 | 1 | 0 | 6.8 | 1 | 503 | 1 | 0.2 | 1 | 84 | 1 | 0.07 |
| 1740 | LA | 8/3/2008 | 0-20 | 1 | 0 | 7.9 | 1 | 624 | 1 | 0.8 | 1 | 62 | 1 | 0.07 |
| 1848 | LA | 7/28/2008 | 0-10 | 1 | 0 | 5 | 1 | 607 | 1 | 0.3 | 1 | 45 | 1 | 0.03 |
| 2168 | LA | 7/29/2008 | 0-8 | 1 | 0 | 9.6 | 1 | 775 | 1 | 0.3 | 1 | 53 | 1 | 0.03 |
| 2380 | LA | 8/4/2008 | 0-20 | 1 | 0 | 2.5 | 1 | 254 | 1 | 0.1 | 0 | 23 | 1 | 0.02 |
| 2636 | LA | 8/6/2008 | 0-15 | 1 | 0 | 1.4 | 1 | 267 | 1 | 0.1 | 0 | 19 | 1 | 0.01 |
| 2872 | LA | 7/28/2008 | 0-10 | 1 | 0 | 5.7 | 1 | 565 | 1 | 0.3 | 1 | 37 | 1 | 0.05 |
| 2892 | LA | 8/6/2008 | 0-20 | 1 | 0 | 3 | 1 | 234 | 1 | 0.1 | 0 | 19 | 1 | 0.01 |
| 3404 | LA | 8/4/2008 | 0-30 | 1 | 0 | 3.2 | 1 | 447 | 1 | 0.1 | 0 | 29 | 1 | 0.06 |
| 3640 | LA | 7/31/2008 | 0-30 | 1 | 0 | 6.9 | 1 | 468 | 1 | 0.2 | 1 | 37 | 1 | 0.05 |
| 3896 | LA | 7/27/2008 | 0-20 | 1 | 0 | 2.3 | 1 | 111 | 1 | 0.1 | 1 | 19 | 1 | 0.04 |
| 3980 | LA | 8/1/2008 | 0-10 | 1 | 0 | 8.7 | 1 | 535 | 1 | 0.4 | 1 | 79 | 1 | 0.05 |
| 4216 | LA | 7/30/2008 | 0-20 | 1 | 0 | 5.7 | 1 | 629 | 1 | 0.2 | 1 | 51 | 1 | 0.04 |
| 4236 | LA | 8/6/2008 | 0-20 | 1 | 0 | 3.8 | 1 | 154 | 1 | 0.2 | 1 | 30 | 1 | 0.11 |
| 4300 | LA | 8/1/2008 | 0-5 | 1 | 0 | 5.6 | 1 | 592 | 1 | 0.2 | 1 | 60 | 1 | 0.04 |
| 4428 | LA | 8/2/2008 | 0-20 | 1 | 0 | 1.8 | 1 | 86 | 1 | 0.1 | 0 | 18 | 1 | 0.02 |
| 4492 | LA | 8/6/2008 | 0-10 | 1 | 0 | 5.3 | 1 | 291 | 1 | 0.1 | 0 | 31 | 1 | 0.06 |
| 4664 | LA | 7/31/2008 | 0-15 | 1 | 0 | 3.9 | 1 | 432 | 1 | 0.1 | 0 | 6 | 1 | 0.01 |
| 4684 | LA | 8/6/2008 | 0-30 | 1 | 0 | 5.7 | 1 | 68 | 1 | 0.1 | 0 | 13 | 1 | 0.01 |
| 4920 | LA | 7/31/2008 | 0-5 | 1 | 0 | 1.4 | 1 | 364 | 1 | 0.1 | 0 | 7 | 1 | 0.02 |
| 5240 | LA | 8/1/2008 | 0-15 | 1 | 0 | 14 | 1 | 2530 | 1 | 0.3 | 1 | 35 | 1 | 6.24 |
| 5452 | LA | 8/2/2008 | 0-20 | 1 | 0 | 4 | 1 | 339 | 1 | 0.1 | 1 | 31 | 1 | 0.01 |
| 5688 | LA | 7/31/2008 | 0-30 | 1 | 0 | 2.7 | 1 | 242 | 1 | 0.1 | 0 | 22 | 1 | 0.02 |
| 5708 | LA | 8/6/2008 | 0-20 | 1 | 0 | 6.6 | 1 | 318 | 1 | 0.1 | 0 | 69 | 1 | 0.04 |
| 5836 | LA | 8/4/2008 | 0-20 | 1 | 0 | 13.7 | 1 | 686 | 1 | 0.8 | 1 | 78 | 1 | 0.06 |
| 5944 | LA | 7/26/2008 | 0-20 | 1 | 0 | 4.5 | 1 | 304 | 1 | 0.2 | 1 | 28 | 1 | 0.05 |
| 6264 | LA | 7/29/2008 | 0-20 | 1 | 0 | 7.5 | 1 | 847 | 1 | 0.3 | 1 | 37 | 1 | 0.04 |

*Appendix F-1*
*Background Data Collected by USGS*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| SiteID | StateID | CollDate | Depth (cm) | Ag (mg/kg) | D_Ag (mg/kg) | As (mg/kg) | D_As (mg/kg) | Ba (mg/kg) | D_Ba (mg/kg) | Cd (mg/kg) | D_Cd (mg/kg) | Cr (mg/kg) | D_Cr (mg/kg) | Hg (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6476 | LA | 8/2/2008 | 0-20 | 1 | 0 | 2.9 | 1 | 97 | 1 | 0.1 | 0 | 24 | 1 | 0.02 |
| 6712 | LA | 7/31/2008 | 0-25 | 1 | 0 | 6.7 | 1 | 354 | 1 | 0.2 | 1 | 35 | 1 | 0.05 |
| 6968 | LA | 7/28/2008 | 0-25 | 1 | 0 | 8.4 | 1 | 667 | 1 | 0.3 | 1 | 47 | 1 | 0.06 |
| 7500 | LA | 8/4/2008 | 0-15 | 1 | 0 | 3 | 1 | 205 | 1 | 0.1 | 0 | 17 | 1 | 0.02 |
| 7736 | LA | 7/31/2008 | 0-15 | 1 | 0 | 5.6 | 1 | 287 | 1 | 0.1 | 0 | 26 | 1 | 0.03 |
| 7992 | LA | 7/28/2008 | 0-8 | 1 | 0 | 11.4 | 1 | 647 | 1 | 0.4 | 1 | 53 | 1 | 0.09 |
| 8012 | LA | 8/6/2008 | 0-20 | 1 | 0 | 3.9 | 1 | 370 | 1 | 0.1 | 0 | 39 | 1 | 0.06 |
| 8076 | LA | 8/1/2008 | 0-20 | 1 | 0 | 7.3 | 1 | 694 | 1 | 0.4 | 1 | 47 | 1 | 0.06 |
| 8312 | LA | 7/30/2008 | 0-30 | 1 | 0 | 4.9 | 1 | 657 | 1 | 0.3 | 1 | 52 | 1 | 0.03 |
| 8332 | LA | 8/6/2008 | 0-70 | 1 | 0 | 10.4 | 1 | 536 | 1 | 0.1 | 1 | 84 | 1 | 0.01 |
| 8396 | LA | 8/3/2008 | 0-30 | 1 | 0 | 8.9 | 1 | 597 | 1 | 0.3 | 1 | 60 | 1 | 0.05 |
| 8524 | LA | 8/4/2008 | 0-20 | 1 | 0 | 3.9 | 1 | 387 | 1 | 0.1 | 0 | 22 | 1 | 0.02 |
| 8780 | LA | 8/6/2008 | 0-10 | 1 | 0 | 3.8 | 1 | 232 | 1 | 0.1 | 1 | 24 | 1 | 0.02 |
| 8908 | LA | 8/4/2008 | 0-20 | 1 | 0 | 8.8 | 1 | 479 | 1 | 0.1 | 0 | 35 | 1 | 0.04 |
| 9016 | LA | 7/30/2008 | 0-30 | 1 | 0 | 3.3 | 1 | 238 | 1 | 0.1 | 0 | 25 | 1 | 0.01 |
| 9336 | LA | 7/30/2008 | 0-20 | 1 | 0 | 6.9 | 1 | 646 | 1 | 0.1 | 0 | 51 | 1 | 0.03 |
| 9548 | LA | 8/3/2008 | 0-20 | 1 | 0 | 5.8 | 1 | 403 | 1 | 0.1 | 0 | 21 | 1 | 0.03 |
| 9804 | LA | 8/6/2008 | 0-15 | 1 | 0 | 2 | 1 | 74 | 1 | 0.1 | 0 | 19 | 1 | 0.01 |
| 9932 | LA | 8/4/2008 | 0-30 | 1 | 0 | 11.1 | 1 | 648 | 1 | 0.2 | 1 | 39 | 1 | 0.02 |
| 10040 | LA | 7/29/2008 | 0-30 | 1 | 0 | 9.6 | 1 | 708 | 1 | 1 | 1 | 78 | 1 | 0.07 |
| 10060 | LA | 8/6/2008 | 0-25 | 1 | 0 | 1.2 | 1 | 74 | 1 | 0.1 | 0 | 16 | 1 | 0.01 |
| 10572 | LA | 7/31/2008 | 0-10 | 1 | 0 | 6.3 | 1 | 187 | 1 | 0.1 | 0 | 38 | 1 | 0.02 |
| 10808 | LA | 7/31/2008 | 0-10 | 1 | 0 | 3.4 | 1 | 162 | 1 | 0.1 | 0 | 26 | 1 | 0.04 |
| 11064 | LA | 7/28/2008 | 0-8 | 1 | 0 | 13.9 | 1 | 654 | 1 | 0.8 | 1 | 56 | 1 | 0.09 |
| 11148 | LA | 8/1/2008 | 0-20 | 1 | 0 | 4.8 | 1 | 575 | 1 | 0.2 | 1 | 65 | 1 | 0.1 |
| 11340 | LA | 8/4/2008 | 0-30 | 1 | 0 | 6.4 | 1 | 402 | 1 | 0.1 | 0 | 23 | 1 | 0.02 |
| 11468 | LA | 7/26/2008 | 0-30 | 1 | 0 | 3.4 | 1 | 223 | 1 | 0.1 | 0 | 24 | 1 | 0.05 |
| 11596 | LA | 8/4/2008 | 0-30 | 1 | 0 | 1.9 | 1 | 170 | 1 | 0.1 | 0 | 13 | 1 | 0.02 |
| 11724 | LA | 8/4/2008 | 0-50 | 1 | 0 | 18 | 1 | 617 | 1 | 0.2 | 1 | 22 | 1 | 0.02 |
| 11832 | LA | 7/30/2008 | 0-20 | 1 | 0 | 4.9 | 1 | 243 | 1 | 0.1 | 0 | 32 | 1 | 0.03 |
| 11852 | LA | 8/2/2008 | 0-20 | 1 | 0 | 38.2 | 1 | 180 | 1 | 0.1 | 0 | 75 | 1 | 0.03 |
| 12088 | LA | 7/29/2008 | 0-30 | 1 | 0 | 8 | 1 | 638 | 1 | 0.3 | 1 | 41 | 1 | 0.04 |
| 12408 | LA | 7/30/2008 | 0-30 | 1 | 0 | 8.6 | 1 | 749 | 1 | 0.5 | 1 | 63 | 1 | 0.04 |
| 12620 | LA | 8/2/2008 | 0-25 | 1 | 0 | 1.8 | 1 | 159 | 1 | 0.1 | 0 | 17 | 1 | 0.02 |
| 12856 | LA | 7/31/2008 | 0-20 | 1 | 0 | 1.9 | 1 | 141 | 1 | 0.1 | 0 | 17 | 1 | 0.02 |
| 12876 | LA | 8/6/2008 | 0-10 | 1 | 0 | 3.3 | 1 | 218 | 1 | 0.1 | 0 | 22 | 1 | 0.05 |
| 13004 | LA | 8/3/2008 | 0-20 | 1 | 0 | 6.7 | 1 | 701 | 1 | 0.1 | 0 | 47 | 1 | 0.01 |
| 13112 | LA | 7/31/2008 | 0-20 | 1 | 0 | 3.8 | 1 | 169 | 1 | 0.1 | 0 | 33 | 1 | 0.02 |

*Appendix F-1*
*Background Data Collected by USGS*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| SiteID | StateID | CollDate | Depth (cm) | D_Hg (mg/kg) | Pb (mg/kg) | D_Pb (mg/kg) | Se (mg/kg) | D_Se (mg/kg) | Sr (mg/kg) | D_Sr (mg/kg) | Zn (mg/kg) | D_Zn (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120 | LA | 7/30/2008 | 0-5 | 1 | 90.8 | 1 | 1 | 1 | 87.3 | 1 | 87 | 1 |
| 140 | LA | 8/6/2008 | 0-5 | 1 | 6.7 | 1 | 0.2 | 0 | 11 | 1 | 8 | 1 |
| 204 | LA | 7/26/2008 | 0-5 | 1 | 18.7 | 1 | 0.7 | 1 | 45 | 1 | 38 | 1 |
| 332 | LA | 8/2/2008 | 0-5 | 1 | 10.7 | 1 | 0.2 | 0 | 15.6 | 1 | 10 | 1 |
| 460 | LA | 7/26/2008 | 0-5 | 1 | 15.3 | 1 | 0.3 | 1 | 22.8 | 1 | 21 | 1 |
| 588 | LA | 8/6/2008 | 0-5 | 1 | 10.1 | 1 | 0.2 | 0 | 14.2 | 1 | 24 | 1 |
| 824 | LA | 7/30/2008 | 0-5 | 1 | 18.3 | 1 | 0.4 | 1 | 82.8 | 1 | 28 | 1 |
| 1072 | LA | 7/28/2008 | 0-5 | 1 | 47.2 | 1 | 0.7 | 1 | 122 | 1 | 135 | 1 |
| 1144 | LA | 7/30/2008 | 0-5 | 1 | 20.9 | 1 | 0.5 | 1 | 121 | 1 | 98 | 1 |
| 1356 | LA | 8/2/2008 | 0-5 | 1 | 10.9 | 1 | 0.2 | 0 | 21.2 | 1 | 15 | 1 |
| 1612 | LA | 8/5/2008 | 0-5 | 1 | 35 | 1 | 0.7 | 1 | 95.5 | 1 | 119 | 1 |
| 1740 | LA | 8/3/2008 | 0-5 | 1 | 25.4 | 1 | 1 | 1 | 96.4 | 1 | 111 | 1 |
| 1848 | LA | 7/28/2008 | 0-5 | 1 | 26 | 1 | 0.4 | 1 | 149 | 1 | 90 | 1 |
| 2168 | LA | 7/29/2008 | 0-5 | 1 | 19.6 | 1 | 0.2 | 1 | 167 | 1 | 70 | 1 |
| 2380 | LA | 8/4/2008 | 0-5 | 1 | 14.1 | 1 | 0.2 | 0 | 25.7 | 1 | 9 | 1 |
| 2636 | LA | 8/6/2008 | 0-5 | 1 | 11.3 | 1 | 0.2 | 0 | 32.4 | 1 | 9 | 1 |
| 2872 | LA | 7/28/2008 | 0-5 | 1 | 24.1 | 1 | 0.3 | 1 | 177 | 1 | 77 | 1 |
| 2892 | LA | 8/6/2008 | 0-5 | 1 | 9.8 | 1 | 0.2 | 0 | 30.8 | 1 | 11 | 1 |
| 3404 | LA | 8/4/2008 | 0-5 | 1 | 17.5 | 1 | 0.3 | 1 | 52 | 1 | 38 | 1 |
| 3640 | LA | 7/31/2008 | 0-5 | 1 | 24.8 | 1 | 0.5 | 1 | 142 | 1 | 140 | 1 |
| 3896 | LA | 7/27/2008 | 0-5 | 1 | 25.7 | 1 | 0.5 | 1 | 112 | 1 | 19 | 1 |
| 3980 | LA | 8/1/2008 | 0-5 | 1 | 41.7 | 1 | 0.7 | 1 | 96.3 | 1 | 112 | 1 |
| 4216 | LA | 7/30/2008 | 0-5 | 1 | 18.9 | 1 | 0.5 | 1 | 150 | 1 | 71 | 1 |
| 4236 | LA | 8/6/2008 | 0-5 | 1 | 26.3 | 1 | 0.2 | 0 | 24.6 | 1 | 98 | 1 |
| 4300 | LA | 8/1/2008 | 0-5 | 1 | 19.2 | 1 | 0.4 | 1 | 114 | 1 | 73 | 1 |
| 4428 | LA | 8/2/2008 | 0-5 | 1 | 11.1 | 1 | 0.2 | 0 | 12.9 | 1 | 25 | 1 |
| 4492 | LA | 8/6/2008 | 0-5 | 1 | 21.3 | 1 | 0.4 | 1 | 48 | 1 | 18 | 1 |
| 4664 | LA | 7/31/2008 | 0-5 | 0 | 13.9 | 1 | 0.2 | 0 | 203 | 1 | 55 | 1 |
| 4684 | LA | 8/6/2008 | 0-5 | 1 | 7.6 | 1 | 0.2 | 0 | 9.1 | 1 | 16 | 1 |
| 4920 | LA | 7/31/2008 | 0-5 | 1 | 9.3 | 1 | 0.2 | 0 | 31.2 | 1 | 8 | 1 |
| 5240 | LA | 8/1/2008 | 0-5 | 1 | 31.8 | 1 | 0.2 | 0 | 160 | 1 | 54 | 1 |
| 5452 | LA | 8/2/2008 | 0-5 | 1 | 19.2 | 1 | 0.2 | 0 | 75.5 | 1 | 33 | 1 |
| 5688 | LA | 7/31/2008 | 0-5 | 1 | 13.6 | 1 | 0.4 | 1 | 34.7 | 1 | 15 | 1 |
| 5708 | LA | 8/6/2008 | 0-5 | 1 | 27.6 | 1 | 0.9 | 1 | 78.3 | 1 | 75 | 1 |
| 5836 | LA | 8/4/2008 | 0-5 | 1 | 30.5 | 1 | 1.2 | 1 | 92.3 | 1 | 121 | 1 |
| 5944 | LA | 7/26/2008 | 0-5 | 1 | 26.2 | 1 | 0.3 | 1 | 104 | 1 | 37 | 1 |
| 6264 | LA | 7/29/2008 | 0-5 | 1 | 13.6 | 1 | 0.2 | 0 | 182 | 1 | 45 | 1 |
| 6476 | LA | 8/2/2008 | 0-5 | 1 | 11.3 | 1 | 0.2 | 0 | 11.3 | 1 | 10 | 1 |
| 6712 | LA | 7/31/2008 | 0-5 | 1 | 12.7 | 1 | 0.2 | 1 | 275 | 1 | 53 | 1 |
| 6968 | LA | 7/28/2008 | 0-5 | 1 | 27.9 | 1 | 0.6 | 1 | 124 | 1 | 95 | 1 |
| 7500 | LA | 8/4/2008 | 0-5 | 1 | 10.8 | 1 | 0.2 | 0 | 21.6 | 1 | 17 | 1 |
| 7736 | LA | 7/31/2008 | 0-5 | 1 | 16.4 | 1 | 0.3 | 1 | 37.2 | 1 | 21 | 1 |
| 7992 | LA | 7/28/2008 | 0-5 | 1 | 46.7 | 1 | 0.7 | 1 | 127 | 1 | 119 | 1 |
| 8012 | LA | 8/6/2008 | 0-5 | 1 | 17.8 | 1 | 0.4 | 1 | 44.7 | 1 | 32 | 1 |
| 8076 | LA | 8/1/2008 | 0-5 | 1 | 22.2 | 1 | 0.8 | 1 | 135 | 1 | 87 | 1 |
| 8312 | LA | 7/30/2008 | 0-5 | 1 | 17.5 | 1 | 0.4 | 1 | 160 | 1 | 75 | 1 |
| 8332 | LA | 8/6/2008 | 0-5 | 1 | 19.6 | 1 | 0.3 | 1 | 98 | 1 | 76 | 1 |
| 8396 | LA | 8/3/2008 | 0-5 | 1 | 25.9 | 1 | 0.9 | 1 | 104 | 1 | 118 | 1 |
| 8524 | LA | 8/4/2008 | 0-5 | 1 | 18.9 | 1 | 0.2 | 0 | 69.9 | 1 | 34 | 1 |
| 8780 | LA | 8/6/2008 | 0-5 | 1 | 14.6 | 1 | 0.2 | 0 | 30.6 | 1 | 76 | 1 |
| 8908 | LA | 8/4/2008 | 0-5 | 1 | 19.7 | 1 | 0.3 | 1 | 70.7 | 1 | 51 | 1 |
| 9016 | LA | 7/30/2008 | 0-5 | 1 | 17.2 | 1 | 0.3 | 1 | 27.9 | 1 | 14 | 1 |
| 9336 | LA | 7/30/2008 | 0-5 | 1 | 31.3 | 1 | 0.4 | 1 | 143 | 1 | 55 | 1 |
| 9548 | LA | 8/3/2008 | 0-5 | 1 | 22.2 | 1 | 0.2 | 0 | 74.9 | 1 | 17 | 1 |
| 9804 | LA | 8/6/2008 | 0-5 | 1 | 10 | 1 | 0.2 | 0 | 11.9 | 1 | 7 | 1 |
| 9932 | LA | 8/4/2008 | 0-5 | 1 | 17.5 | 1 | 0.4 | 1 | 136 | 1 | 56 | 1 |

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*Background Data Collected by USGS*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| SiteID | StateID | CollDate | Depth (cm) | D_Hg (mg/kg) | Pb (mg/kg) | D_Pb (mg/kg) | Se (mg/kg) | D_Se (mg/kg) | Sr (mg/kg) | D_Sr (mg/kg) | Zn (mg/kg) | D_Zn (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10040 | LA | 7/29/2008 | 0-5 | 1 | 80.6 | 1 | 1.1 | 1 | 124 | 1 | 148 | 1 |
| 10060 | LA | 8/6/2008 | 0-5 | 0 | 8.1 | 1 | 0.2 | 0 | 7 | 1 | 4 | 1 |
| 10572 | LA | 7/31/2008 | 0-5 | 1 | 16 | 1 | 0.3 | 1 | 20.1 | 1 | 13 | 1 |
| 10808 | LA | 7/31/2008 | 0-5 | 1 | 22.4 | 1 | 0.4 | 1 | 32.7 | 1 | 65 | 1 |
| 11064 | LA | 7/28/2008 | 0-5 | 1 | 34.1 | 1 | 0.7 | 1 | 152 | 1 | 385 | 1 |
| 11148 | LA | 8/1/2008 | 0-5 | 1 | 32.1 | 1 | 0.5 | 1 | 131 | 1 | 88 | 1 |
| 11340 | LA | 8/4/2008 | 0-5 | 1 | 11.8 | 1 | 0.2 | 0 | 83.5 | 1 | 19 | 1 |
| 11468 | LA | 7/26/2008 | 0-5 | 1 | 19.8 | 1 | 0.6 | 1 | 20.5 | 1 | 24 | 1 |
| 11596 | LA | 8/4/2008 | 0-5 | 1 | 9.3 | 1 | 0.2 | 0 | 15.4 | 1 | 8 | 1 |
| 11724 | LA | 8/4/2008 | 0-5 | 1 | 11.8 | 1 | 0.2 | 0 | 213 | 1 | 30 | 1 |
| 11832 | LA | 7/30/2008 | 0-5 | 1 | 13.3 | 1 | 0.3 | 1 | 27.4 | 1 | 20 | 1 |
| 11852 | LA | 8/2/2008 | 0-5 | 1 | 36.2 | 1 | 1 | 1 | 28.1 | 1 | 55 | 1 |
| 12088 | LA | 7/29/2008 | 0-5 | 1 | 19.8 | 1 | 0.4 | 1 | 145 | 1 | 79 | 1 |
| 12408 | LA | 7/30/2008 | 0-5 | 1 | 23.2 | 1 | 0.7 | 1 | 143 | 1 | 86 | 1 |
| 12620 | LA | 8/2/2008 | 0-5 | 1 | 9.3 | 1 | 0.2 | 0 | 12.6 | 1 | 5 | 1 |
| 12856 | LA | 7/31/2008 | 0-5 | 1 | 8.8 | 1 | 0.2 | 0 | 16 | 1 | 11 | 1 |
| 12876 | LA | 8/6/2008 | 0-5 | 1 | 11.4 | 1 | 0.2 | 0 | 30.5 | 1 | 73 | 1 |
| 13004 | LA | 8/3/2008 | 0-5 | 1 | 13.3 | 1 | 0.2 | 0 | 136 | 1 | 40 | 1 |
| 13112 | LA | 7/31/2008 | 0-5 | 1 | 16.2 | 1 | 0.4 | 1 | 19.3 | 1 | 15 | 1 |
| 120 | LA | 7/30/2008 | 0-15 | 1 | 35.2 | 1 | 0.8 | 1 | 98.8 | 1 | 92 | 1 |
| 140 | LA | 8/6/2008 | 0-30 | 1 | 8.1 | 1 | 0.2 | 0 | 13 | 1 | 10 | 1 |
| 204 | LA | 7/26/2008 | 0-5 | 1 | 22.5 | 1 | 0.7 | 1 | 49.6 | 1 | 38 | 1 |
| 332 | LA | 8/2/2008 | 0-15 | 1 | 9.3 | 1 | 0.2 | 0 | 18 | 1 | 10 | 1 |
| 460 | LA | 7/26/2008 | 0-10 | 1 | 13.4 | 1 | 0.3 | 1 | 23.4 | 1 | 15 | 1 |
| 588 | LA | 8/6/2008 | 0-20 | 1 | 11.5 | 1 | 0.2 | 0 | 16.8 | 1 | 27 | 1 |
| 824 | LA | 7/30/2008 | 0-20 | 1 | 16.8 | 1 | 0.4 | 1 | 65.5 | 1 | 23 | 1 |
| 1072 | LA | 7/28/2008 | 0-20 | 1 | 35.7 | 1 | 0.4 | 1 | 82.5 | 1 | 228 | 1 |
| 1144 | LA | 7/30/2008 | 0-20 | 1 | 22.5 | 1 | 0.4 | 1 | 114 | 1 | 105 | 1 |
| 1356 | LA | 8/2/2008 | 0-20 | 1 | 11.1 | 1 | 0.2 | 1 | 26.1 | 1 | 10 | 1 |
| 1612 | LA | 8/5/2008 | 0-30 | 1 | 31 | 1 | 0.7 | 1 | 96.4 | 1 | 121 | 1 |
| 1740 | LA | 8/3/2008 | 0-20 | 1 | 28 | 1 | 1 | 1 | 104 | 1 | 123 | 1 |
| 1848 | LA | 7/28/2008 | 0-10 | 1 | 26.8 | 1 | 0.3 | 1 | 181 | 1 | 70 | 1 |
| 2168 | LA | 7/29/2008 | 0-8 | 1 | 15.5 | 1 | 0.2 | 0 | 173 | 1 | 71 | 1 |
| 2380 | LA | 8/4/2008 | 0-20 | 1 | 13.6 | 1 | 0.2 | 0 | 26.3 | 1 | 9 | 1 |
| 2636 | LA | 8/6/2008 | 0-15 | 0 | 9.4 | 1 | 0.2 | 0 | 28.1 | 1 | 7 | 1 |
| 2872 | LA | 7/28/2008 | 0-10 | 1 | 23.4 | 1 | 0.4 | 1 | 172 | 1 | 72 | 1 |
| 2892 | LA | 8/6/2008 | 0-20 | 1 | 11.2 | 1 | 0.2 | 0 | 31.5 | 1 | 11 | 1 |
| 3404 | LA | 8/4/2008 | 0-30 | 1 | 16 | 1 | 0.3 | 1 | 53.1 | 1 | 36 | 1 |
| 3640 | LA | 7/31/2008 | 0-30 | 1 | 20.8 | 1 | 0.3 | 1 | 139 | 1 | 127 | 1 |
| 3896 | LA | 7/27/2008 | 0-20 | 1 | 23.6 | 1 | 0.5 | 1 | 128 | 1 | 18 | 1 |
| 3980 | LA | 8/1/2008 | 0-10 | 1 | 33.3 | 1 | 0.6 | 1 | 101 | 1 | 114 | 1 |
| 4216 | LA | 7/30/2008 | 0-20 | 1 | 18.4 | 1 | 0.4 | 1 | 144 | 1 | 65 | 1 |
| 4236 | LA | 8/6/2008 | 0-20 | 1 | 25.5 | 1 | 0.3 | 1 | 21.2 | 1 | 88 | 1 |
| 4300 | LA | 8/1/2008 | 0-5 | 1 | 20 | 1 | 0.4 | 1 | 124 | 1 | 72 | 1 |
| 4428 | LA | 8/2/2008 | 0-20 | 1 | 9.7 | 1 | 0.2 | 0 | 16.3 | 1 | 13 | 1 |
| 4492 | LA | 8/6/2008 | 0-10 | 1 | 20.3 | 1 | 0.6 | 1 | 52 | 1 | 19 | 1 |
| 4664 | LA | 7/31/2008 | 0-15 | 1 | 16.4 | 1 | 0.2 | 0 | 225 | 1 | 60 | 1 |
| 4684 | LA | 8/6/2008 | 0-30 | 1 | 8.2 | 1 | 0.2 | 0 | 8.9 | 1 | 18 | 1 |
| 4920 | LA | 7/31/2008 | 0-5 | 1 | 10.9 | 1 | 0.2 | 1 | 32.4 | 1 | 9 | 1 |
| 5240 | LA | 8/1/2008 | 0-15 | 1 | 18.4 | 1 | 0.2 | 0 | 156 | 1 | 52 | 1 |
| 5452 | LA | 8/2/2008 | 0-20 | 0 | 17.5 | 1 | 0.2 | 1 | 82.9 | 1 | 37 | 1 |
| 5688 | LA | 7/31/2008 | 0-30 | 1 | 16.3 | 1 | 0.4 | 1 | 40.3 | 1 | 15 | 1 |
| 5708 | LA | 8/6/2008 | 0-20 | 1 | 24.6 | 1 | 0.6 | 1 | 78.7 | 1 | 67 | 1 |
| 5836 | LA | 8/4/2008 | 0-20 | 1 | 31.4 | 1 | 1.1 | 1 | 115 | 1 | 134 | 1 |
| 5944 | LA | 7/26/2008 | 0-20 | 1 | 31.9 | 1 | 0.3 | 1 | 100 | 1 | 31 | 1 |
| 6264 | LA | 7/29/2008 | 0-20 | 1 | 18.5 | 1 | 0.3 | 1 | 159 | 1 | 63 | 1 |

*Appendix F-1*
*Background Data Collected by USGS*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| SiteID | StateID | CollDate | Depth (cm) | D_Hg (mg/kg) | Pb (mg/kg) | D_Pb (mg/kg) | Se (mg/kg) | D_Se (mg/kg) | Sr (mg/kg) | D_Sr (mg/kg) | Zn (mg/kg) | D_Zn (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6476 | LA | 8/2/2008 | 0-20 | 1 | 10.4 | 1 | 0.2 | 0 | 10 | 1 | 6 | 1 |
| 6712 | LA | 7/31/2008 | 0-25 | 1 | 12.1 | 1 | 0.3 | 1 | 290 | 1 | 46 | 1 |
| 6968 | LA | 7/28/2008 | 0-25 | 1 | 27 | 1 | 0.7 | 1 | 133 | 1 | 93 | 1 |
| 7500 | LA | 8/4/2008 | 0-15 | 1 | 11.6 | 1 | 0.2 | 0 | 21.4 | 1 | 14 | 1 |
| 7736 | LA | 7/31/2008 | 0-15 | 1 | 18 | 1 | 0.3 | 1 | 38 | 1 | 21 | 1 |
| 7992 | LA | 7/28/2008 | 0-8 | 1 | 44.2 | 1 | 0.7 | 1 | 117 | 1 | 123 | 1 |
| 8012 | LA | 8/6/2008 | 0-20 | 1 | 19.6 | 1 | 0.4 | 1 | 47 | 1 | 31 | 1 |
| 8076 | LA | 8/1/2008 | 0-20 | 1 | 22.2 | 1 | 0.9 | 1 | 133 | 1 | 90 | 1 |
| 8312 | LA | 7/30/2008 | 0-30 | 1 | 16 | 1 | 0.4 | 1 | 174 | 1 | 74 | 1 |
| 8332 | LA | 8/6/2008 | 0-70 | 1 | 20.5 | 1 | 0.2 | 1 | 113 | 1 | 86 | 1 |
| 8396 | LA | 8/3/2008 | 0-30 | 1 | 24.5 | 1 | 1 | 1 | 93.9 | 1 | 117 | 1 |
| 8524 | LA | 8/4/2008 | 0-20 | 1 | 16.2 | 1 | 0.2 | 0 | 75.2 | 1 | 34 | 1 |
| 8780 | LA | 8/6/2008 | 0-10 | 1 | 12.8 | 1 | 0.2 | 0 | 29.1 | 1 | 80 | 1 |
| 8908 | LA | 8/4/2008 | 0-20 | 1 | 16.1 | 1 | 0.3 | 1 | 68.2 | 1 | 32 | 1 |
| 9016 | LA | 7/30/2008 | 0-30 | 1 | 10.9 | 1 | 0.2 | 0 | 26 | 1 | 12 | 1 |
| 9336 | LA | 7/30/2008 | 0-20 | 1 | 19 | 1 | 0.5 | 1 | 139 | 1 | 71 | 1 |
| 9548 | LA | 8/3/2008 | 0-20 | 1 | 14 | 1 | 0.2 | 0 | 85.7 | 1 | 23 | 1 |
| 9804 | LA | 8/6/2008 | 0-15 | 0 | 7.2 | 1 | 0.2 | 0 | 10.3 | 1 | 6 | 1 |
| 9932 | LA | 8/4/2008 | 0-30 | 1 | 20.1 | 1 | 0.3 | 1 | 134 | 1 | 68 | 1 |
| 10040 | LA | 7/29/2008 | 0-30 | 1 | 41.6 | 1 | 1 | 1 | 132 | 1 | 140 | 1 |
| 10060 | LA | 8/6/2008 | 0-25 | 0 | 4.4 | 1 | 0.2 | 0 | 8.1 | 1 | 4 | 1 |
| 10572 | LA | 7/31/2008 | 0-10 | 1 | 17.4 | 1 | 0.3 | 1 | 20.4 | 1 | 14 | 1 |
| 10808 | LA | 7/31/2008 | 0-10 | 1 | 20.3 | 1 | 0.4 | 1 | 31.7 | 1 | 57 | 1 |
| 11064 | LA | 7/28/2008 | 0-8 | 1 | 38 | 1 | 0.6 | 1 | 143 | 1 | 220 | 1 |
| 11148 | LA | 8/1/2008 | 0-20 | 1 | 20.9 | 1 | 0.5 | 1 | 115 | 1 | 80 | 1 |
| 11340 | LA | 8/4/2008 | 0-30 | 1 | 14.1 | 1 | 0.2 | 0 | 87.1 | 1 | 22 | 1 |
| 11468 | LA | 7/26/2008 | 0-30 | 1 | 19.7 | 1 | 0.5 | 1 | 21.5 | 1 | 23 | 1 |
| 11596 | LA | 8/4/2008 | 0-30 | 1 | 10.5 | 1 | 0.2 | 0 | 18.9 | 1 | 8 | 1 |
| 11724 | LA | 8/4/2008 | 0-50 | 1 | 13.2 | 1 | 0.2 | 0 | 196 | 1 | 36 | 1 |
| 11832 | LA | 7/30/2008 | 0-20 | 1 | 15.2 | 1 | 0.4 | 1 | 28.9 | 1 | 14 | 1 |
| 11852 | LA | 8/2/2008 | 0-20 | 1 | 37.4 | 1 | 1.2 | 1 | 31.6 | 1 | 61 | 1 |
| 12088 | LA | 7/29/2008 | 0-30 | 1 | 19 | 1 | 0.4 | 1 | 152 | 1 | 78 | 1 |
| 12408 | LA | 7/30/2008 | 0-30 | 1 | 23.9 | 1 | 0.6 | 1 | 151 | 1 | 93 | 1 |
| 12620 | LA | 8/2/2008 | 0-25 | 1 | 8.8 | 1 | 0.2 | 0 | 12.2 | 1 | 5 | 1 |
| 12856 | LA | 7/31/2008 | 0-20 | 1 | 9.6 | 1 | 0.2 | 1 | 14.3 | 1 | 9 | 1 |
| 12876 | LA | 8/6/2008 | 0-10 | 1 | 13.2 | 1 | 0.3 | 1 | 27 | 1 | 50 | 1 |
| 13004 | LA | 8/3/2008 | 0-20 | 0 | 13.8 | 1 | 0.2 | 0 | 132 | 1 | 49 | 1 |
| 13112 | LA | 7/31/2008 | 0-20 | 1 | 15.2 | 1 | 0.4 | 1 | 19.9 | 1 | 17 | 1 |

*Appendix F-2*
*ProUCL Output: Outlier Test*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

**Outlier Tests**

**Outlier Tests for Selected Variables excluding nondetects**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.17/14/2020 1:20:12 PM |
| From File | ProUCL data_USGS Bkg_Top 5 cm and A horizon_LA.xls |
| Full Precision | OFF |

**Rosner's Outlier Test for 5 Outliers in As (mg/kg)**

| | |
|---|---|
| **Total N** | **150** |
| **Number NDs** | **0** |
| **Number Detects** | **150** |
| **Mean of Detects** | **5.988** |
| **SD of Detects** | **4.832** |
| **Number of data** | **150** |
| **Number of suspected outliers** | **5** |
| **NDs not included in the following:** | |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 5.988 | 4.816 | 38.2 | 143 | 6.689 | 3.52 | 3.89 |
| 2 | 5.772 | 4.056 | 32.6 | 68 | 6.615 | 3.51 | 3.89 |
| 3 | 5.591 | 3.41 | 18 | 141 | 3.639 | 3.51 | 3.89 |
| 4 | 5.506 | 3.263 | 17.4 | 66 | 3.645 | 3.51 | 3.88 |
| 5 | 5.425 | 3.121 | 14.5 | 61 | 2.908 | 3.51 | 3.88 |

For 5% significance level, there are 4 Potential Outliers
38.2, 32.6, 18, 17.4

For 1% Significance Level, there are 2 Potential Outliers
38.2, 32.6

*Appendix F-2*
*ProUCL Output: Outlier Test*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

**Outlier Tests**

**Rosner's Outlier Test for 5 Outliers in Ba (mg/kg)**

| | |
|---|---|
| **Total N** | **150** |
| **Number NDs** | **0** |
| **Number Detects** | **150** |
| **Mean of Detects** | **429.3** |
| **SD of Detects** | **333.7** |
| **Number of data** | **150** |
| **Number of suspected outliers** | **5** |
| **NDs not included in the following:** | |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 429.3 | 332.6 | 2690 | 31 | 6.798 | 3.52 | 3.89 |
| 2 | 414.1 | 278.1 | 2530 | 106 | 7.609 | 3.51 | 3.89 |
| 3 | 399.8 | 217.2 | 847 | 112 | 2.059 | 3.51 | 3.89 |
| 4 | 396.8 | 214.8 | 842 | 37 | 2.073 | 3.51 | 3.88 |
| 5 | 393.7 | 212.3 | 775 | 89 | 1.796 | 3.51 | 3.88 |

For 5% significance level, there are 2 Potential Outliers
2690, 2530

For 1% Significance Level, there are 2 Potential Outliers
2690, 2530

**Rosner's Outlier Test for 5 Outliers in Cd (mg/kg)**

| | |
|---|---|
| **Total N** | **150** |
| **Number NDs** | **77** |
| **Number Detects** | **73** |
| **Mean of Detects** | **0.34** |
| **SD of Detects** | **0.243** |
| **Number of data** | **73** |
| **Number of suspected outliers** | **5** |
| **NDs not included in the following:** | |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.34 | 0.241 | 1.1 | 6 | 3.149 | 3.275 | 3.635 |
| 2 | 0.329 | 0.227 | 1.1 | 33 | 3.391 | 3.265 | 3.635 |
| 3 | 0.318 | 0.209 | 1 | 19 | 3.257 | 3.265 | 3.625 |
| 4 | 0.309 | 0.194 | 1 | 68 | 3.565 | 3.255 | 3.618 |
| 5 | 0.299 | 0.176 | 0.8 | 34 | 2.847 | 3.255 | 3.615 |

For 5% significance level, there are 4 Potential Outliers
1.1, 1.1, 1, 1

For 1% Significance Level, there is no Potential Outlier

*Appendix F-2*
*ProUCL Output: Outlier Test*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

**Outlier Tests**

**Rosner's Outlier Test for 5 Outliers in Cr (mg/kg)**

| | |
|---|---|
| **Total N** | **150** |
| **Number NDs** | **0** |
| **Number Detects** | **150** |
| **Mean of Detects** | **37.67** |
| **SD of Detects** | **19.3** |
| **Number of data** | **150** |
| **Number of suspected outliers** | **5** |
| **NDs not included in the following:** | |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 37.67 | 19.24 | 84 | 86 | 2.408 | 3.52 | 3.89 |
| 2 | 37.36 | 18.99 | 84 | 122 | 2.456 | 3.51 | 3.89 |
| 3 | 37.05 | 18.66 | 80 | 22 | 2.302 | 3.51 | 3.89 |
| 4 | 36.76 | 18.38 | 79 | 97 | 2.298 | 3.51 | 3.88 |
| 5 | 36.47 | 18.1 | 78 | 110 | 2.294 | 3.51 | 3.88 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for 5 Outliers in Pb (mg/kg)**

| | |
|---|---|
| **Total N** | **150** |
| **Number NDs** | **0** |
| **Number Detects** | **150** |
| **Mean of Detects** | **20.12** |
| **SD of Detects** | **11.61** |
| **Number of data** | **150** |
| **Number of suspected outliers** | **5** |
| **NDs not included in the following:** | |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 20.12 | 11.57 | 90.8 | 1 | 6.107 | 3.52 | 3.89 |
| 2 | 19.64 | 10.09 | 80.6 | 57 | 6.042 | 3.51 | 3.89 |
| 3 | 19.23 | 8.776 | 47.2 | 8 | 3.187 | 3.51 | 3.89 |
| 4 | 19.04 | 8.495 | 46.7 | 43 | 3.256 | 3.51 | 3.88 |
| 5 | 18.85 | 8.206 | 44.2 | 118 | 3.089 | 3.51 | 3.88 |

For 5% significance level, there are 2 Potential Outliers
90.8, 80.6

For 1% Significance Level, there are 2 Potential Outliers
90.8, 80.6

*Appendix F-2*
*ProUCL Output: Outlier Test*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

**Outlier Tests**

**Rosner's Outlier Test for 5 Outliers in Hg (mg/kg)**

| | |
|---|---|
| **Total N** | **150** |
| **Number NDs** | **7** |
| **Number Detects** | **143** |
| **Mean of Detects** | **0.114** |
| **SD of Detects** | **0.634** |
| **Number of data** | **143** |
| **Number of suspected outliers** | **5** |
| **NDs not included in the following:** | |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.114 | 0.631 | 6.24 | 103 | 9.702 | 3.5 | 3.87 |
| 2 | 0.0708 | 0.369 | 4.43 | 30 | 11.81 | 3.492 | 3.87 |
| 3 | 0.0399 | 0.0242 | 0.13 | 24 | 3.719 | 3.492 | 3.87 |
| 4 | 0.0393 | 0.0231 | 0.11 | 42 | 3.066 | 3.49 | 3.86 |
| 5 | 0.0388 | 0.0223 | 0.11 | 96 | 3.188 | 3.49 | 3.86 |

For 5% significance level, there are 3 Potential Outliers
6.24, 4.43, 0.13

For 1% Significance Level, there are 2 Potential Outliers
6.24, 4.43

**Rosner's Outlier Test for 5 Outliers in Se (mg/kg)**

| | |
|---|---|
| **Total N** | **150** |
| **Number NDs** | **53** |
| **Number Detects** | **97** |
| **Mean of Detects** | **0.511** |
| **SD of Detects** | **0.253** |
| **Number of data** | **97** |
| **Number of suspected outliers** | **5** |
| **NDs not included in the following:** | |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.511 | 0.252 | 1.2 | 21 | 2.733 | 3.371 | 3.741 |
| 2 | 0.504 | 0.244 | 1.2 | 92 | 2.846 | 3.368 | 3.738 |
| 3 | 0.497 | 0.235 | 1.1 | 36 | 2.567 | 3.368 | 3.738 |
| 4 | 0.49 | 0.228 | 1.1 | 70 | 2.677 | 3.361 | 3.728 |
| 5 | 0.484 | 0.22 | 1 | 1 | 2.348 | 3.358 | 3.728 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

*Appendix F-2*
*ProUCL Output: Outlier Test*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

**Outlier Tests**

**Rosner's Outlier Test for 5 Outliers in Sr (mg/kg)**

| | |
|---|---|
| **Total N** | **150** |
| **Number NDs** | **0** |
| **Number Detects** | **150** |
| **Mean of Detects** | **81.84** |
| **SD of Detects** | **61.29** |
| **Number of data** | **150** |
| **Number of suspected outliers** | **5** |
| **NDs not included in the following:** | |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 81.84 | 61.08 | 290 | 114 | 3.408 | 3.52 | 3.89 |
| 2 | 80.44 | 59.05 | 275 | 39 | 3.295 | 3.51 | 3.89 |
| 3 | 79.13 | 57.02 | 225 | 103 | 2.558 | 3.51 | 3.89 |
| 4 | 78.13 | 55.92 | 213 | 66 | 2.412 | 3.51 | 3.88 |
| 5 | 77.21 | 54.97 | 203 | 28 | 2.288 | 3.51 | 3.88 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for 5 Outliers in Zn (mg/kg)**

| | |
|---|---|
| **Total N** | **150** |
| **Number NDs** | **0** |
| **Number Detects** | **150** |
| **Mean of Detects** | **55.21** |
| **SD of Detects** | **51.06** |
| **Number of data** | **150** |
| **Number of suspected outliers** | **5** |
| **NDs not included in the following:** | |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 55.21 | 50.89 | 385 | 61 | 6.481 | 3.52 | 3.89 |
| 2 | 52.99 | 43.42 | 228 | 83 | 4.031 | 3.51 | 3.89 |
| 3 | 51.81 | 41.08 | 220 | 136 | 4.094 | 3.51 | 3.89 |
| 4 | 50.67 | 38.79 | 148 | 57 | 2.509 | 3.51 | 3.88 |
| 5 | 50 | 38.07 | 140 | 20 | 2.364 | 3.51 | 3.88 |

For 5% significance level, there are 3 Potential Outliers
385, 228, 220

For 1% Significance Level, there are 3 Potential Outliers
385, 228, 220

*Appendix F-3*
*ProUCL Output: Background Threshold Values*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

**Background Threshold Values**

**Background Statistics for Data Sets with Non-Detects**

**User Selected Options**

| | |
|---|---|
| ate/Time of Computation | ProUCL 5.17/14/2020 1:22:06 PM |
| From File | ProUCL data_USGS Bkg_Top 5 cm and A horizon_LA.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| or Future K Observations | 1 |
| r of Bootstrap Operations | 2000 |

**As (mg/kg)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 150 | Number of Distinct Observations | 86 |
| Minimum | 1 | First Quartile | 3.2 |
| Second Largest | 32.6 | Median | 5.05 |
| Maximum | 38.2 | Third Quartile | 7.375 |
| Mean | 5.988 | SD | 4.832 |
| Coefficient of Variation | 0.807 | Skewness | 3.415 |
| Mean of logged Data | 1.557 | SD of logged Data | 0.683 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 1.868 | d2max (for USL) | 3.343 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.738 | **Normal GOF Test** |
| 5% Shapiro Wilk P Value | 0 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.158 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.0727 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | | | |
|---|---|---|---|---|---|
| 95% UTL with | 95% Coverage | 15.01 | 90% Percentile (z) | 12.18 |
| | 95% UPL (t) | 14.01 | 95% Percentile (z) | 13.94 |
| | 95% USL | 22.14 | 99% Percentile (z) | 17.23 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.659 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.764 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.0636 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.0774 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.302 | k star (bias corrected MLE) | 2.261 |
| Theta hat (MLE) | 2.601 | Theta star (bias corrected MLE) | 2.649 |
| nu hat (MLE) | 690.7 | nu star (bias corrected) | 678.2 |
| MLE Mean (bias corrected) | 5.988 | MLE Sd (bias corrected) | 3.983 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 13.56 | 90% Percentile | 11.32 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 13.73 | 95% Percentile | 13.67 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 15.02 | 99% Percentile | 18.85 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 15.31 | | |
| 95% WH USL | 28.48 | 95% HW USL | 30.91 |

**Background Threshold Values**

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.979 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk P Value | 0.334 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.0534 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.0727 | Data appear Lognormal at 5% Significance Level |

**Data appear Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | | |
|---|---|---|---|---|
| 95% UTL with | 95% Coverage | 17 | 90% Percentile (z) | 11.39 |
| | 95% UPL (t) | 14.76 | 95% Percentile (z) | 14.6 |
| | 95% USL | 46.59 | 99% Percentile (z) | 23.26 |

**Nonparametric Distribution Free Background Statistics**
**Data appear Gamma Distributed at 5% Significance Level**

**Nonparametric Upper Limits for Background Threshold Values**

| | | | | |
|---|---|---|---|---|
| Order of Statistic, r | 146 | 95% UTL with | 95% Coverage | 14.5 |
| Approx, f used to compute achieved CC | 1.537 | Approximate Actual Confidence Coefficient achieved by UTL | | 0.874 |
| | | Approximate Sample Size needed to achieve specified CC | | 181 |
| 95% Percentile Bootstrap UTL with | 95% Coverage | 14.5 | 95% BCA Bootstrap UTL with 95% Coverage | 14.5 |
| 95% UPL | | 13.79 | 90% Percentile | 10.71 |
| 90% Chebyshev UPL | | 20.53 | 95% Percentile | 13.25 |
| 95% Chebyshev UPL | | 27.12 | 99% Percentile | 25.45 |
| 95% USL | | 38.2 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**Ba (mg/kg)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 150 | Number of Distinct Observations | 134 |
| Minimum | 64 | First Quartile | 207 |
| Second Largest | 2530 | Median | 373 |
| Maximum | 2690 | Third Quartile | 624 |
| Mean | 429.3 | SD | 333.7 |
| Coefficient of Variation | 0.777 | Skewness | 3.749 |
| Mean of logged Data | 5.832 | SD of logged Data | 0.697 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 1.868 | d2max (for USL) | 3.343 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.704 | **Normal GOF Test** |
| 5% Shapiro Wilk P Value | 0 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.138 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.0727 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | | |
|---|---|---|---|---|
| 95% UTL with | 95% Coverage | 1053 | 90% Percentile (z) | 856.9 |
| | 95% UPL (t) | 983.4 | 95% Percentile (z) | 978.1 |
| | 95% USL | 1545 | 99% Percentile (z) | 1206 |

**Background Threshold Values**

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 1.966 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.764 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.0888 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.0774 | Data Not Gamma Distributed at 5% Significance Level |

**Data Not Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.328 | k star (bias corrected MLE) | 2.285 |
| Theta hat (MLE) | 184.4 | Theta star (bias corrected MLE) | 187.8 |
| nu hat (MLE) | 698.3 | nu star (bias corrected) | 685.6 |
| MLE Mean (bias corrected) | 429.3 | MLE Sd (bias corrected) | 284 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 971 | 90% Percentile | 809.4 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 988.3 | 95% Percentile | 976.8 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 1075 | 99% Percentile | 1345 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 1102 | | |
| 95% WH USL | 2032 | 95% HW USL | 2225 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.944 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk P Value | 6.1525E-6 | Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.0997 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.0727 | Data Not Lognormal at 5% Significance Level |

**Data Not Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 1254 | 90% Percentile (z) | 833.5 |
| 95% UPL (t) | 1086 | 95% Percentile (z) | 1074 |
| 95% USL | 3508 | 99% Percentile (z) | 1727 |

**Nonparametric Distribution Free Background Statistics**
**Data do not follow a Discernible Distribution (0.05)**

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 146 | 95% UTL with 95% Coverage | 775 |
| Approx, f used to compute achieved CC | 1.537 | Approximate Actual Confidence Coefficient achieved by UTL | 0.874 |
| | | Approximate Sample Size needed to achieve specified CC | 181 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 775 | 95% BCA Bootstrap UTL with 95% Coverage | 775 |
| 95% UPL | 739.1 | 90% Percentile | 694.7 |
| 90% Chebyshev UPL | 1434 | 95% Percentile | 729.7 |
| 95% Chebyshev UPL | 1889 | 99% Percentile | 1705 |
| 95% USL | 2690 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Threshold Values**

**Cd (mg/kg)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 150 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 9 | | |
| Number of Detects | 73 | Number of Non-Detects | 77 |
| Number of Distinct Detects | 9 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.1 | Minimum Non-Detect | 0.1 |
| Maximum Detect | 1.1 | Maximum Non-Detect | 0.1 |
| Variance Detected | 0.0591 | Percent Non-Detects | 51.33% |
| Mean Detected | 0.34 | SD Detected | 0.243 |
| Mean of Detected Logged Data | -1.291 | SD of Detected Logged Data | 0.646 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 1.868 | d2max (for USL) | 3.343 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.786 | **Normal GOF Test on Detected Observations Only** |
| 5% Shapiro Wilk P Value | 1.266E-14 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.25 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.104 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.217 | KM SD | 0.207 |
| 95% UTL95% Coverage | 0.603 | 95% KM UPL (t) | 0.56 |
| 90% KM Percentile (z) | 0.482 | 95% KM Percentile (z) | 0.557 |
| 99% KM Percentile (z) | 0.698 | 95% KM USL | 0.908 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.191 | SD | 0.223 |
| 95% UTL95% Coverage | 0.607 | 95% UPL (t) | 0.561 |
| 90% Percentile (z) | 0.477 | 95% Percentile (z) | 0.558 |
| 99% Percentile (z) | 0.709 | 95% USL | 0.936 |

**DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons**

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 2.18 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.76 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.177 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.105 | Data Not Gamma Distributed at 5% Significance Level |

**Data Not Gamma Distributed at 5% Significance Level**

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.521 | k star (bias corrected MLE) | 2.426 |
| Theta hat (MLE) | 0.135 | Theta star (bias corrected MLE) | 0.14 |
| nu hat (MLE) | 368.1 | nu star (bias corrected) | 354.3 |
| MLE Mean (bias corrected) | 0.34 | | |
| MLE Sd (bias corrected) | 0.218 | 95% Percentile of Chisquare (2kstar) | 10.84 |

**Background Threshold Values**

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 0.173 |
| Maximum | 1.1 | Median | 0.0531 |
| SD | 0.235 | CV | 1.363 |
| k hat (MLE) | 0.548 | k star (bias corrected MLE) | 0.542 |
| Theta hat (MLE) | 0.315 | Theta star (bias corrected MLE) | 0.318 |
| nu hat (MLE) | 164.5 | nu star (bias corrected) | 162.6 |
| MLE Mean (bias corrected) | 0.173 | MLE Sd (bias corrected) | 0.234 |
| 95% Percentile of Chisquare (2kstar) | 4.045 | 90% Percentile | 0.459 |
| 95% Percentile | 0.644 | 99% Percentile | 1.096 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 0.718 | 0.777 | 95% Approx. Gamma UPL | 0.604 | 0.637 |
| 95% Gamma USL | 1.968 | 2.548 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.217 | SD (KM) | 0.207 |
| Variance (KM) | 0.0427 | SE of Mean (KM) | 0.017 |
| k hat (KM) | 1.099 | k star (KM) | 1.081 |
| nu hat (KM) | 329.6 | nu star (KM) | 324.4 |
| theta hat (KM) | 0.197 | theta star (KM) | 0.2 |
| 80% gamma percentile (KM) | 0.346 | 90% gamma percentile (KM) | 0.489 |
| 95% gamma percentile (KM) | 0.631 | 99% gamma percentile (KM) | 0.96 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 0.572 | 0.571 | 95% Approx. Gamma UPL | 0.512 | 0.509 |
| 95% KM Gamma Percentile | 0.508 | 0.504 | 95% Gamma USL | 1.129 | 1.197 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Approximate Test Statistic | 0.915 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk P Value | 4.3261E-5 | Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.147 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.104 | Data Not Lognormal at 5% Significance Level |

**Data Not Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.195 | Mean in Log Scale | -2.171 |
| SD in Original Scale | 0.221 | SD in Log Scale | 1.071 |
| 95% UTL95% Coverage | 0.843 | 95% BCA UTL95% Coverage | 0.8 |
| 95% Bootstrap (%) UTL95% Coverage | 0.8 | 95% UPL (t) | 0.675 |
| 90% Percentile (z) | 0.45 | 95% Percentile (z) | 0.664 |
| 99% Percentile (z) | 1.377 | 95% USL | 4.089 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -1.81 | 95% KM UTL (Lognormal)95% Coverage | 0.578 |
| KM SD of Logged Data | 0.676 | 95% KM UPL (Lognormal) | 0.502 |
| 95% KM Percentile Lognormal (z) | 0.497 | 95% KM USL (Lognormal) | 1.565 |

**Background Threshold Values**

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.191 | Mean in Log Scale | -2.166 |
| SD in Original Scale | 0.223 | SD in Log Scale | 0.966 |
| 95% UTL95% Coverage | 0.696 | 95% UPL (t) | 0.57 |
| 90% Percentile (z) | 0.395 | 95% Percentile (z) | 0.561 |
| 99% Percentile (z) | 1.084 | 95% USL | 2.895 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**
**Data do not follow a Discernible Distribution (0.05)**

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 146 | 95% UTL with95% Coverage | 0.8 |
| Approx, f used to compute achieved CC | 1.537 | Approximate Actual Confidence Coefficient achieved by UTL | 0.874 |
| Approximate Sample Size needed to achieve specified CC | 181 | 95% UPL | 0.8 |
| 95% USL | 1.1 | 95% KM Chebyshev UPL | 1.121 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**Cr (mg/kg)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 150 | Number of Distinct Observations | 64 |
| Minimum | 5 | First Quartile | 22 |
| Second Largest | 84 | Median | 33 |
| Maximum | 84 | Third Quartile | 52.75 |
| Mean | 37.67 | SD | 19.3 |
| Coefficient of Variation | 0.512 | Skewness | 0.637 |
| Mean of logged Data | 3.488 | SD of logged Data | 0.557 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 1.868 | d2max (for USL) | 3.343 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.918 | **Normal GOF Test** |
| 5% Shapiro Wilk P Value | 5.049E-11 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.126 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.0727 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | | | |
|---|---|---|---|---|---|
| 95% UTL with | 95% Coverage | 73.73 | 90% Percentile (z) | 62.41 |
| | 95% UPL (t) | 69.73 | 95% Percentile (z) | 69.43 |
| | 95% USL | 102.2 | 99% Percentile (z) | 82.58 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 1.034 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.757 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.0655 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.0769 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data follow Appr. Gamma Distribution at 5% Significance Level**

**Background Threshold Values**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 3.707 | k star (bias corrected MLE) | 3.637 |
| Theta hat (MLE) | 10.16 | Theta star (bias corrected MLE) | 10.36 |
| nu hat (MLE) | 1112 | nu star (bias corrected) | 1091 |
| MLE Mean (bias corrected) | 37.67 | MLE Sd (bias corrected) | 19.75 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 75.05 | 90% Percentile | 64.16 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 76.4 | 95% Percentile | 74.92 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 81.67 | 99% Percentile | 98 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 83.64 | | |
| 95% WH USL | 140.4 | 95% HW USL | 151 |

**Lognormal GOF Test**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.957 | **Shapiro Wilk Lognormal GOF Test** | |
| 5% Shapiro Wilk P Value | 9.2132E-4 | Data Not Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.0673 | **Lilliefors Lognormal GOF Test** | |
| 5% Lilliefors Critical Value | 0.0727 | Data appear Lognormal at 5% Significance Level | |

**Data appear Approximate Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 92.55 | 90% Percentile (z) | 66.78 |
| 95% UPL (t) | 82.47 | 95% Percentile (z) | 81.75 |
| 95% USL | 210.4 | 99% Percentile (z) | 119.5 |

**Nonparametric Distribution Free Background Statistics**
**Data appear Approximate Gamma Distribution at 5% Significance Level**

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 146 | 95% UTL with 95% Coverage | 78 |
| Approx, f used to compute achieved CC | 1.537 | Approximate Actual Confidence Coefficient achieved by UTL | 0.874 |
| | | Approximate Sample Size needed to achieve specified CC | 181 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 78 | 95% BCA Bootstrap UTL with 95% Coverage | 78 |
| 95% UPL | 75.9 | 90% Percentile | 66.1 |
| 90% Chebyshev UPL | 95.78 | 95% Percentile | 75 |
| 95% Chebyshev UPL | 122.1 | 99% Percentile | 82.04 |
| 95% USL | 84 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**Pb (mg/kg)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 150 | Number of Distinct Observations | 114 |
| Minimum | 4.4 | First Quartile | 12.73 |
| Second Largest | 80.6 | Median | 18.15 |
| Maximum | 90.8 | Third Quartile | 24.05 |
| Mean | 20.12 | SD | 11.61 |
| Coefficient of Variation | 0.577 | Skewness | 2.792 |
| Mean of logged Data | 2.878 | SD of logged Data | 0.484 |

**Background Threshold Values**

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 1.868 | d2max (for USL) | 3.343 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.794 | **Normal GOF Test** |
| 5% Shapiro Wilk P Value | 0 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.146 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.0727 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | | |
|---|---|---|---|---|
| 95% UTL with | 95% Coverage | 41.81 | 90% Percentile (z) | 35 |
| | 95% UPL (t) | 39.4 | 95% Percentile (z) | 39.22 |
| | 95% USL | 58.94 | 99% Percentile (z) | 47.13 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 1.111 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.756 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.0779 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.0768 | Data Not Gamma Distributed at 5% Significance Level |

**Data Not Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 4.217 | k star (bias corrected MLE) | 4.137 |
| Theta hat (MLE) | 4.771 | Theta star (bias corrected MLE) | 4.863 |
| nu hat (MLE) | 1265 | nu star (bias corrected) | 1241 |
| MLE Mean (bias corrected) | 20.12 | MLE Sd (bias corrected) | 9.891 |

**Background Statistics Assuming Gamma Distribution**

| | | | | |
|---|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | | 38.55 | 90% Percentile | 33.37 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | | 38.71 | 95% Percentile | 38.65 |
| 95% WH Approx. Gamma UTL with | 95% Coverage | 41.77 | 99% Percentile | 49.91 |
| 95% HW Approx. Gamma UTL with | 95% Coverage | 42.12 | | |
| | 95% WH USL | 69.98 | 95% HW USL | 73.25 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.988 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk P Value | 0.873 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.0427 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.0727 | Data appear Lognormal at 5% Significance Level |

**Data appear Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | | |
|---|---|---|---|---|
| 95% UTL with | 95% Coverage | 43.92 | 90% Percentile (z) | 33.07 |
| | 95% UPL (t) | 39.73 | 95% Percentile (z) | 39.43 |
| | 95% USL | 89.68 | 99% Percentile (z) | 54.83 |

**Nonparametric Distribution Free Background Statistics**
**Data appear Lognormal at 5% Significance Level**

**Background Threshold Values**

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 146 | 95% UTL with 95% Coverage | 44.2 |
| Approx, f used to compute achieved CC | 1.537 | Approximate Actual Confidence Coefficient achieved by UTL | 0.874 |
| | | Approximate Sample Size needed to achieve specified CC | 181 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 44.2 | 95% BCA Bootstrap UTL with 95% Coverage | 44.2 |
| 95% UPL | 39.62 | 90% Percentile | 32.22 |
| 90% Chebyshev UPL | 55.07 | 95% Percentile | 37.73 |
| 95% Chebyshev UPL | 70.9 | 99% Percentile | 64.23 |
| 95% USL | 90.8 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**Hg (mg/kg)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 150 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 14 | | |
| Number of Detects | 143 | Number of Non-Detects | 7 |
| Number of Distinct Detects | 14 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.01 | Minimum Non-Detect | 0.01 |
| Maximum Detect | 6.24 | Maximum Non-Detect | 0.01 |
| Variance Detected | 0.401 | Percent Non-Detects | 4.667% |
| Mean Detected | 0.114 | SD Detected | 0.634 |
| Mean of Detected Logged Data | -3.34 | SD of Detected Logged Data | 0.874 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 1.868 | d2max (for USL) | 3.343 |

**Normal GOF Test on Detects Only**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.143 | **Normal GOF Test on Detected Observations Only** | |
| 5% Shapiro Wilk P Value | 0 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.482 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.0745 | Data Not Normal at 5% Significance Level | |

**Data Not Normal at 5% Significance Level**

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.109 | KM SD | 0.617 |
| 95% UTL95% Coverage | 1.261 | 95% KM UPL (t) | 1.134 |
| 90% KM Percentile (z) | 0.9 | 95% KM Percentile (z) | 1.124 |
| 99% KM Percentile (z) | 1.544 | 95% KM USL | 2.171 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.109 | SD | 0.619 |
| 95% UTL95% Coverage | 1.265 | 95% UPL (t) | 1.137 |
| 90% Percentile (z) | 0.902 | 95% Percentile (z) | 1.127 |
| 99% Percentile (z) | 1.549 | 95% USL | 2.178 |

**DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons**

**Background Threshold Values**

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 26.29 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.816 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.347 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.0827 | Data Not Gamma Distributed at 5% Significance Level |

**Data Not Gamma Distributed at 5% Significance Level**

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.538 | k star (bias corrected MLE) | 0.531 |
| Theta hat (MLE) | 0.212 | Theta star (bias corrected MLE) | 0.215 |
| nu hat (MLE) | 153.8 | nu star (bias corrected) | 151.9 |
| MLE Mean (bias corrected) | 0.114 | | |
| MLE Sd (bias corrected) | 0.156 | 95% Percentile of Chisquare (2kstar) | 3.994 |

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 0.109 |
| Maximum | 6.24 | Median | 0.03 |
| SD | 0.619 | CV | 5.672 |
| k hat (MLE) | 0.532 | k star (bias corrected MLE) | 0.525 |
| Theta hat (MLE) | 0.205 | Theta star (bias corrected MLE) | 0.208 |
| nu hat (MLE) | 159.5 | nu star (bias corrected) | 157.6 |
| MLE Mean (bias corrected) | 0.109 | MLE Sd (bias corrected) | 0.151 |
| 95% Percentile of Chisquare (2kstar) | 3.966 | 90% Percentile | 0.292 |
| 95% Percentile | 0.412 | 99% Percentile | 0.705 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 0.307 | 0.253 | 95% Approx. Gamma UPL | 0.259 | 0.213 |
| 95% Gamma USL | 0.824 | 0.722 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.109 | SD (KM) | 0.617 |
| Variance (KM) | 0.381 | SE of Mean (KM) | 0.0505 |
| k hat (KM) | 0.0313 | k star (KM) | 0.0351 |
| nu hat (KM) | 9.389 | nu star (KM) | 10.53 |
| theta hat (KM) | 3.487 | theta star (KM) | 3.108 |
| 80% gamma percentile (KM) | 0.00312 | 90% gamma percentile (KM) | 0.0919 |
| 95% gamma percentile (KM) | 0.481 | 99% gamma percentile (KM) | 2.692 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 0.305 | 0.252 | 95% Approx. Gamma UPL | 0.258 | 0.212 |
| 95% KM Gamma Percentile | 0.255 | 0.21 | 95% Gamma USL | 0.819 | 0.717 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Approximate Test Statistic | 0.803 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk P Value | 0 | Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.144 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.0745 | Data Not Lognormal at 5% Significance Level |

**Data Not Lognormal at 5% Significance Level**

**Background Threshold Values**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.109 | Mean in Log Scale | -3.427 |
| SD in Original Scale | 0.619 | SD in Log Scale | 0.942 |
| 95% UTL95% Coverage | 0.189 | 95% BCA UTL95% Coverage | 0.0955 |
| 95% Bootstrap (%) UTL95% Coverage | 0.11 | 95% UPL (t) | 0.155 |
| 90% Percentile (z) | 0.109 | 95% Percentile (z) | 0.153 |
| 99% Percentile (z) | 0.291 | 95% USL | 0.757 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -3.399 | 95% KM UTL (Lognormal)95% Coverage | 0.177 |
| KM SD of Logged Data | 0.891 | 95% KM UPL (Lognormal) | 0.147 |
| 95% KM Percentile Lognormal (z) | 0.145 | 95% KM USL (Lognormal) | 0.657 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.109 | Mean in Log Scale | -3.431 |
| SD in Original Scale | 0.619 | SD in Log Scale | 0.948 |
| 95% UTL95% Coverage | 0.19 | 95% UPL (t) | 0.156 |
| 90% Percentile (z) | 0.109 | 95% Percentile (z) | 0.154 |
| 99% Percentile (z) | 0.294 | 95% USL | 0.77 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**
**Data do not follow a Discernible Distribution (0.05)**

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 146 | 95% UTL with95% Coverage | 0.11 |
| Approx, f used to compute achieved CC | 1.537 | Approximate Actual Confidence Coefficient achieved by UTL | 0.874 |
| Approximate Sample Size needed to achieve specified CC | 181 | 95% UPL | 0.09 |
| 95% USL | 6.24 | 95% KM Chebyshev UPL | 2.807 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**Se (mg/kg)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 150 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 11 | | |
| Number of Detects | 97 | Number of Non-Detects | 53 |
| Number of Distinct Detects | 11 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.2 | Minimum Non-Detect | 0.2 |
| Maximum Detect | 1.2 | Maximum Non-Detect | 0.2 |
| Variance Detected | 0.0641 | Percent Non-Detects | 35.33% |
| Mean Detected | 0.511 | SD Detected | 0.253 |
| Mean of Detected Logged Data | -0.782 | SD of Detected Logged Data | 0.467 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 1.868 | d2max (for USL) | 3.343 |

**Normal GOF Test on Detects Only**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.857 | **Normal GOF Test on Detected Observations Only** | |
| 5% Shapiro Wilk P Value | 1.499E-13 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.237 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.0902 | Data Not Normal at 5% Significance Level | |

**Data Not Normal at 5% Significance Level**

**Background Threshold Values**

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.401 | KM SD | 0.251 |
| 95% UTL95% Coverage | 0.871 | 95% KM UPL (t) | 0.819 |
| 90% KM Percentile (z) | 0.724 | 95% KM Percentile (z) | 0.815 |
| 99% KM Percentile (z) | 0.986 | 95% KM USL | 1.242 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.366 | SD | 0.283 |
| 95% UTL95% Coverage | 0.895 | 95% UPL (t) | 0.836 |
| 90% Percentile (z) | 0.729 | 95% Percentile (z) | 0.832 |
| 99% Percentile (z) | 1.025 | 95% USL | 1.313 |

**DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons**

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 2.705 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.755 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.205 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.0911 | Data Not Gamma Distributed at 5% Significance Level |

**Data Not Gamma Distributed at 5% Significance Level**

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 4.672 | k star (bias corrected MLE) | 4.534 |
| Theta hat (MLE) | 0.109 | Theta star (bias corrected MLE) | 0.113 |
| nu hat (MLE) | 906.4 | nu star (bias corrected) | 879.7 |
| MLE Mean (bias corrected) | 0.511 | | |
| MLE Sd (bias corrected) | 0.24 | 95% Percentile of Chisquare (2kstar) | 17.02 |

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 0.358 |
| Maximum | 1.2 | Median | 0.3 |
| SD | 0.293 | CV | 0.82 |
| k hat (MLE) | 1.007 | k star (bias corrected MLE) | 0.991 |
| Theta hat (MLE) | 0.356 | Theta star (bias corrected MLE) | 0.361 |
| nu hat (MLE) | 302 | nu star (bias corrected) | 297.3 |
| MLE Mean (bias corrected) | 0.358 | MLE Sd (bias corrected) | 0.36 |
| 95% Percentile of Chisquare (2kstar) | 5.956 | 90% Percentile | 0.826 |
| 95% Percentile | 1.076 | 99% Percentile | 1.656 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**

**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 1.223 | 1.361 | 95% Approx. Gamma UPL | 1.066 | 1.163 |
| 95% Gamma USL | 2.796 | 3.588 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.401 | SD (KM) | 0.251 |
| Variance (KM) | 0.0632 | SE of Mean (KM) | 0.0206 |
| k hat (KM) | 2.549 | k star (KM) | 2.502 |
| nu hat (KM) | 764.6 | nu star (KM) | 750.6 |
| theta hat (KM) | 0.157 | theta star (KM) | 0.16 |
| 80% gamma percentile (KM) | 0.585 | 90% gamma percentile (KM) | 0.741 |
| 95% gamma percentile (KM) | 0.888 | 99% gamma percentile (KM) | 1.211 |

**Background Threshold Values**

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 0.9 | 0.909 | 95% Approx. Gamma UPL | 0.824 | 0.827 |
| 95% KM Gamma Percentile | 0.818 | 0.821 | 95% Gamma USL | 1.587 | 1.676 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Approximate Test Statistic | 0.924 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk P Value | 7.3138E-6 | Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.18 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.0902 | Data Not Lognormal at 5% Significance Level |

**Data Not Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.386 | Mean in Log Scale | -1.177 |
| SD in Original Scale | 0.266 | SD in Log Scale | 0.688 |
| 95% UTL95% Coverage | 1.113 | 95% BCA UTL95% Coverage | 1 |
| 95% Bootstrap (%) UTL95% Coverage | 1 | 95% UPL (t) | 0.965 |
| 90% Percentile (z) | 0.744 | 95% Percentile (z) | 0.955 |
| 99% Percentile (z) | 1.526 | 95% USL | 3.071 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -1.074 | 95% KM UTL (Lognormal)95% Coverage | 0.945 |
| KM SD of Logged Data | 0.545 | 95% KM UPL (Lognormal) | 0.844 |
| 95% KM Percentile Lognormal (z) | 0.837 | 95% KM USL (Lognormal) | 2.109 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.366 | Mean in Log Scale | -1.319 |
| SD in Original Scale | 0.283 | SD in Log Scale | 0.82 |
| 95% UTL95% Coverage | 1.238 | 95% UPL (t) | 1.044 |
| 90% Percentile (z) | 0.765 | 95% Percentile (z) | 1.031 |
| 99% Percentile (z) | 1.803 | 95% USL | 4.151 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**
**Data do not follow a Discernible Distribution (0.05)**

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 146 | 95% UTL with95% Coverage | 1 |
| Approx, f used to compute achieved CC | 1.537 | Approximate Actual Confidence Coefficient achieved by UTL | 0.874 |
| Approximate Sample Size needed to achieve specified CC | 181 | 95% UPL | 1 |
| 95% USL | 1.2 | 95% KM Chebyshev UPL | 1.501 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Threshold Values**

**Sr (mg/kg)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 150 | Number of Distinct Observations | 131 |
| Minimum | 7 | First Quartile | 26.15 |
| Second Largest | 275 | Median | 76.9 |
| Maximum | 290 | Third Quartile | 131.8 |
| Mean | 81.84 | SD | 61.29 |
| Coefficient of Variation | 0.749 | Skewness | 0.706 |
| Mean of logged Data | 4.039 | SD of logged Data | 0.939 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 1.868 | d2max (for USL) | 3.343 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.898 | **Normal GOF Test** |
| 5% Shapiro Wilk P Value | 1.332E-15 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.162 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.0727 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | | | |
|---|---|---|---|---|---|
| 95% UTL with | 95% Coverage | 196.3 | 90% Percentile (z) | 160.4 |
| | 95% UPL (t) | 183.6 | 95% Percentile (z) | 182.6 |
| | 95% USL | 286.7 | 99% Percentile (z) | 224.4 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 3.313 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.77 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.128 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.078 | Data Not Gamma Distributed at 5% Significance Level |

**Data Not Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.514 | k star (bias corrected MLE) | 1.488 |
| Theta hat (MLE) | 54.05 | Theta star (bias corrected MLE) | 54.99 |
| nu hat (MLE) | 454.2 | nu star (bias corrected) | 446.4 |
| MLE Mean (bias corrected) | 81.84 | MLE Sd (bias corrected) | 67.09 |

**Background Statistics Assuming Gamma Distribution**

| | | | | |
|---|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | | 214 | 90% Percentile | 170.9 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | | 223 | 95% Percentile | 213.7 |
| 95% WH Approx. Gamma UTL with | 95% Coverage | 241.3 | 99% Percentile | 310.6 |
| 95% HW Approx. Gamma UTL with | 95% Coverage | 254.7 | | |
| | 95% WH USL | 504.7 | 95% HW USL | 587.8 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.912 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk P Value | 2.240E-12 | Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.141 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.0727 | Data Not Lognormal at 5% Significance Level |

**Data Not Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | | |
|---|---|---|---|---|
| 95% UTL with | 95% Coverage | 328.1 | 90% Percentile (z) | 189.2 |
| | 95% UPL (t) | 270.1 | 95% Percentile (z) | 266.1 |
| | 95% USL | 1311 | 99% Percentile (z) | 504.6 |

**Background Threshold Values**

**Nonparametric Distribution Free Background Statistics**
**Data do not follow a Discernible Distribution (0.05)**

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 146 | 95% UTL with 95% Coverage | 203 |
| Approx, f used to compute achieved CC | 1.537 | Approximate Actual Confidence Coefficient achieved by UTL | 0.874 |
| | | Approximate Sample Size needed to achieve specified CC | 181 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 203 | 95% BCA Bootstrap UTL with 95% Coverage | 203 |
| 95% UPL | 181.5 | 90% Percentile | 159.1 |
| 90% Chebyshev UPL | 266.3 | 95% Percentile | 179.2 |
| 95% Chebyshev UPL | 349.9 | 99% Percentile | 250.5 |
| 95% USL | 290 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**Zn (mg/kg)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 150 | Number of Distinct Observations | 86 |
| Minimum | 4 | First Quartile | 16.25 |
| Second Largest | 228 | Median | 39 |
| Maximum | 385 | Third Quartile | 78.75 |
| Mean | 55.21 | SD | 51.06 |
| Coefficient of Variation | 0.925 | Skewness | 2.454 |
| Mean of logged Data | 3.589 | SD of logged Data | 0.985 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 1.868 | d2max (for USL) | 3.343 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.811 | **Normal GOF Test** |
| 5% Shapiro Wilk P Value | 0 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.158 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.0727 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 150.6 | 90% Percentile (z) | 120.6 |
| 95% UPL (t) | 140 | 95% Percentile (z) | 139.2 |
| 95% USL | 225.9 | 99% Percentile (z) | 174 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 1.524 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.775 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.0841 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.0783 | Data Not Gamma Distributed at 5% Significance Level |

**Data Not Gamma Distributed at 5% Significance Level**

**Background Threshold Values**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.328 | k star (bias corrected MLE) | 1.306 |
| Theta hat (MLE) | 41.58 | Theta star (bias corrected MLE) | 42.28 |
| nu hat (MLE) | 398.3 | nu star (bias corrected) | 391.7 |
| MLE Mean (bias corrected) | 55.21 | MLE Sd (bias corrected) | 48.31 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 149.4 | 90% Percentile | 119 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 154.8 | 95% Percentile | 150.7 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 169.4 | 99% Percentile | 223 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 177.9 | | |
| 95% WH USL | 365.8 | 95% HW USL | 425.3 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.949 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk P Value | 5.4134E-5 | Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.11 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.0727 | Data Not Lognormal at 5% Significance Level |

**Data Not Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 228.1 | 90% Percentile (z) | 128 |
| 95% UPL (t) | 186 | 95% Percentile (z) | 183.1 |
| 95% USL | 976 | 99% Percentile (z) | 358.4 |

**Nonparametric Distribution Free Background Statistics**
**Data do not follow a Discernible Distribution (0.05)**

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 146 | 95% UTL with 95% Coverage | 140 |
| Approx, f used to compute achieved CC | 1.537 | Approximate Actual Confidence Coefficient achieved by UTL | 0.874 |
| | | Approximate Sample Size needed to achieve specified CC | 181 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 140 | 95% BCA Bootstrap UTL with 95% Coverage | 140 |
| 95% UPL | 134.5 | 90% Percentile | 118.1 |
| 90% Chebyshev UPL | 208.9 | 95% Percentile | 130.9 |
| 95% Chebyshev UPL | 278.5 | 99% Percentile | 224.1 |
| 95% USL | 385 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

# APPENDIX G EXPOSURE POINT CONCENTRATIONS

*Appendix G-1*
*Data for Exposure Point Concentrations for BERA: Former BP Operations Areas*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Preliminary AOI | Sample | Sample Date | Sampler | COPEC | Result (mg/kg dry) | Average EPC (mg/kg dry) | Maximum EPC (mg/kg dry) |
|---|---|---|---|---|---|---|---|
| Prelim AOI HA-2 | HA-2 (0-2) | 6/29/2021 | ERM | Barium | 3174 | 2613 | 4640 |
| Prelim AOI HA-2 | HA-2 (0-2) | 6/29/2021 | ICON | Barium | 4640 | | |
| Prelim AOI HA-2 | HA-2 (2-4) | 6/29/2021 | ERM | Barium | 1365 | | |
| Prelim AOI HA-2 | HA-2 (2-4) | 6/29/2021 | ICON | Barium | 4180 | | |
| Prelim AOI HA-2 | HA-2R (0-2) | 4/23/2025 | HET | Barium | 1878 | | |
| Prelim AOI HA-2 | HA-2R (2-4) | 4/23/2025 | HET | Barium | 443 | | |
| Prelim AOI HA-2 | HA-2 (0-2) | 6/29/2021 | ERM | Chromium | 44 | 61 | 192 |
| Prelim AOI HA-2 | HA-2 (0-2) | 6/29/2021 | ICON | Chromium | 45.5 | | |
| Prelim AOI HA-2 | HA-2 (2-4) | 6/29/2021 | ERM | Chromium | 192 | | |
| Prelim AOI HA-2 | HA-2 (2-4) | 6/29/2021 | ICON | Chromium | 37.6 | | |
| Prelim AOI HA-2 | HA-2R (0-2) | 4/23/2025 | HET | Chromium | 24.2 | | |
| Prelim AOI HA-2 | HA-2R (2-4) | 4/23/2025 | HET | Chromium | 22.3 | | |
| Prelim AOI HA-2 | HA-2 (0-2) | 6/29/2021 | ERM | Lead | 149 | 96 | 262 |
| Prelim AOI HA-2 | HA-2 (0-2) | 6/29/2021 | ICON | Lead | 69.7 | | |
| Prelim AOI HA-2 | HA-2 (2-4) | 6/29/2021 | ERM | Lead | 262 | | |
| Prelim AOI HA-2 | HA-2 (2-4) | 6/29/2021 | ICON | Lead | 52.4 | | |
| Prelim AOI HA-2 | HA-2R (0-2) | 4/23/2025 | HET | Lead | 20.5 | | |
| Prelim AOI HA-2 | HA-2R (2-4) | 4/23/2025 | HET | Lead | 19.9 | | |

*Appendix G-2*
*Data for Exposure Point Concentrations for BERA: Former Anadarko Operations Areas*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Preliminary AOI | Sample | Sample Date | Sampler | COPEC | Result (mg/kg dry) | Average EPC (mg/kg dry) | Maximum EPC (mg/kg dry) |
|---|---|---|---|---|---|---|---|
| Prelim AOI HA-4 | HA-4 (0-2) | 6/29/2021 | ERM | Barium | 1913 | 2097 | 3640 |
| Prelim AOI HA-4 | HA-4 (0-2) | 6/29/2021 | ICON | Barium | 3640 | | |
| Prelim AOI HA-4 | HA-4 (2-4) | 6/29/2021 | ERM | Barium | 1506 | | |
| Prelim AOI HA-4 | HA-4 (2-4) | 6/29/2021 | ICON | Barium | 1330 | | |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ERM | Barium | 2793 | 2915 | 4230 |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ICON | Barium | 3320 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ERM | Barium | 1316 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ICON | Barium | 4230 | | |
| Prelim AOI CD-1, CD-1R | CD-1 (0-2) | 2/23/2022 | ERM | Barium | 3134 | 3340 | 5590 |
| Prelim AOI CD-1, CD-1R | CD-1 (0-2) | 2/23/2022 | ICON | Barium | 5590 | | |
| Prelim AOI CD-1, CD-1R | CD-1R (0-2) | 4/30/2025 | HET | Barium | 1295 | | |
| Prelim AOI HA-4 | HA-4 (0-2) | 6/29/2021 | ERM | Zinc | 513 | 166 | 513 |
| Prelim AOI HA-4 | HA-4 (0-2) | 6/29/2021 | ICON | Zinc | 65.8 | | |
| Prelim AOI HA-4 | HA-4 (2-4) | 6/29/2021 | ERM | Zinc | 48.4 | | |
| Prelim AOI HA-4 | HA-4 (2-4) | 6/29/2021 | ICON | Zinc | 36.9 | | |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ERM | Cadmium | 0.43 | 0.69 | 1.35 |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ICON | Cadmium | 0.2455 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ERM | Cadmium | 1.35 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ICON | Cadmium | 0.734 | | |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ERM | Chromium | 172 | 112 | 172 |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ICON | Chromium | 96.7 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ERM | Chromium | 107 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ICON | Chromium | 73.3 | | |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ERM | Lead | 53.1 | 57 | 87.3 |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ICON | Lead | 33.7 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ERM | Lead | 87.3 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ICON | Lead | 55.2 | | |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ERM | Mercury | 0.213 | 0.25 | 0.328 |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ICON | Mercury | 0.186 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ERM | Mercury | 0.328 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ICON | Mercury | 0.233 | | |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ERM | Zinc | 259 | 243 | 354 |
| Prelim AOI HA-5 | HA-5 (0-2) | 6/29/2021 | ICON | Zinc | 173 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ERM | Zinc | 354 | | |
| Prelim AOI HA-5 | HA-5 (2-4) | 6/29/2021 | ICON | Zinc | 187 | | |

*Appendix G-3*
*Future Use Assessment: Data for Metals Concentrations in the Former BP Operations Areas and Vicinity*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Sample | Sample Date | Sampler | COPEC | Result (mg/kg dry) | Average Concentration (mg/kg dry) | Maximum Concentration (mg/kg dry) |
|---|---|---|---|---|---|---|
| CD-6 (0-4) | 4/12/2022 | ICON | Arsenic | 4.86 | | |
| CD-18 (0-4) | 7/23/2024 | ERM | Arsenic | 4.83 | | |
| CD-18 (0-4) | 7/23/2024 | ICON | Arsenic | 5.09 | | |
| HA-1 (0-2) | 6/29/2021 | ERM | Arsenic | 3.57 | | |
| HA-1 (0-2) | 6/29/2021 | ICON | Arsenic | 5.95 | | |
| HA-1 (2-4) | 6/29/2021 | ERM | Arsenic | 4.65 | | |
| HA-1 (2-4) | 6/29/2021 | ICON | Arsenic | 4.97 | | |
| HA-2 (0-2) | 6/29/2021 | ERM | Arsenic | 8.31 | | |
| HA-2 (0-2) | 6/29/2021 | ICON | Arsenic | 6.9 | | |
| HA-2 (2-4) | 6/29/2021 | ERM | Arsenic | 13.1 | | |
| HA-2 (2-4) | 6/29/2021 | ICON | Arsenic | 5.64 | | |
| HA-3 (0-2) | 6/29/2021 | ERM | Arsenic | 5.43 | | |
| HA-3 (0-2) | 6/29/2021 | ICON | Arsenic | 5.48 | | |
| HA-3 (2-4) | 6/29/2021 | ERM | Arsenic | 3.59 | | |
| HA-3 (2-4) | 6/29/2021 | ICON | Arsenic | 7.31 | 5.4 | 13.1 |
| HA-10 (0-2) | 8/2/2024 | ERM | Arsenic | 5.26 | | |
| HA-10 (0-2) | 8/2/2024 | ICON | Arsenic | 3.67 | | |
| HA-10 (2-4) | 8/2/2024 | ERM | Arsenic | 4.71 | | |
| HA-10 (2-4) | 8/2/2024 | ICON | Arsenic | 3.52 | | |
| HA-10R (0-2) | 4/25/2025 | ICON | Arsenic | 3.99 | | |
| SB-1 (0-2) | 4/24/2025 | ICON | Arsenic | 4.58 | | |
| SB-1 (2-4) | 4/25/2025 | ICON | Arsenic | 4.82 | | |
| SB-2 (0-2) | 4/24/2025 | ICON | Arsenic | 4.13 | | |
| SB-2 (2-4) | 4/24/2025 | ICON | Arsenic | 4.04 | | |
| SB-3 (0-2) | 4/25/2025 | ICON | Arsenic | 5.59 | | |
| SB-3 (2-4) | 4/25/2025 | ICON | Arsenic | 3.55 | | |
| SB-4 (0-2) | 4/24/2025 | ICON | Arsenic | 7.05 | | |
| SB-4 (2-4) | 4/24/2025 | ICON | Arsenic | 6.31 | | |
| CD-6 (0-4) | 4/12/2022 | ICON | Barium | 263 | | |
| CD-18 (0-4) | 7/23/2024 | ERM | Barium | 401 | | |
| CD-18 (0-4) | 7/23/2024 | ICON | Barium | 479 | | |
| HA-1 (0-2) | 6/29/2021 | ERM | Barium | 200 | | |
| HA-1 (0-2) | 6/29/2021 | ICON | Barium | 402 | | |
| HA-1 (2-4) | 6/29/2021 | ERM | Barium | 251 | | |
| HA-1 (2-4) | 6/29/2021 | ICON | Barium | 517 | | |
| HA-2 (0-2) | 6/29/2021 | ERM | Barium | 3174 | | |
| HA-2 (0-2) | 6/29/2021 | ICON | Barium | 4640 | | |
| HA-2 (2-4) | 6/29/2021 | ERM | Barium | 1365 | | |
| HA-2 (2-4) | 6/29/2021 | ICON | Barium | 4180 | | |
| HA-2R (0-2) | 4/23/2025 | HET | Barium | 1878 | | |
| HA-2R (2-4) | 4/23/2025 | HET | Barium | 443 | | |
| HA-3 (0-2) | 6/29/2021 | ERM | Barium | 248 | | |
| HA-3 (0-2) | 6/29/2021 | ICON | Barium | 313 | | |
| HA-3 (2-4) | 6/29/2021 | ERM | Barium | 133 | | |
| HA-3 (2-4) | 6/29/2021 | ICON | Barium | 365 | | |
| HA-10 (0-2) | 8/2/2024 | ERM | Barium | 985 | | |
| HA-10 (0-2) | 8/2/2024 | ICON | Barium | 1050 | | |
| HA-10 (2-4) | 8/2/2024 | ERM | Barium | 168 | 699 | 4640 |
| HA-10 (2-4) | 8/2/2024 | ICON | Barium | 248 | | |
| HA-10R (0-2) | 4/25/2025 | HET | Barium | 209 | | |
| HA-10R (0-2) | 4/25/2025 | ICON | Barium | 1210 | | |
| SB-1 (0-2) | 4/24/2025 | HET | Barium | 243 | | |
| SB-1 (0-2) | 4/24/2025 | ICON | Barium | 206 | | |
| SB-1 (2-4) | 4/24/2025 | HET | Barium | 363 | | |
| SB-1 (2-4) | 4/25/2025 | ICON | Barium | 298 | | |
| SB-2 (0-2) | 4/24/2025 | HET | Barium | 187 | | |
| SB-2 (0-2) | 4/24/2025 | ICON | Barium | 179 | | |
| SB-2 (2-4) | 4/25/2025 | HET | Barium | 292 | | |
| SB-2 (2-4) | 4/24/2025 | ICON | Barium | 243 | | |
| SB-3 (0-2) | 4/25/2025 | HET | Barium | 353 | | |
| SB-3 (0-2) | 4/25/2025 | ICON | Barium | 208 | | |
| SB-3 (2-4) | 4/25/2025 | HET | Barium | 190 | | |
| SB-3 (2-4) | 4/25/2025 | ICON | Barium | 189 | | |
| SB-4 (0-2) | 4/24/2025 | HET | Barium | 304 | | |
| SB-4 (0-2) | 4/24/2025 | ICON | Barium | 275 | | |
| SB-4 (2-4) | 4/24/2025 | HET | Barium | 246 | | |
| SB-4 (2-4) | 4/24/2025 | ICON | Barium | 345 | | |

*Appendix G-3*
*Future Use Assessment: Data for Metals Concentrations in the Former BP Operations Areas and Vicinity*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Sample | Sample Date | Sampler | COPEC | Result (mg/kg dry) | | Average Concentration (mg/kg dry) | Maximum Concentration (mg/kg dry) |
|---|---|---|---|---|---|---|---|
| CD-6 (0-4) | 4/12/2022 | ICON | Cadmium | <0.500 | * | | |
| CD-18 (0-4) | 7/23/2024 | ERM | Cadmium | <0.257 | * | | |
| CD-18 (0-4) | 7/23/2024 | ICON | Cadmium | <0.494 | * | | |
| HA-1 (0-2) | 6/29/2021 | ERM | Cadmium | <0.238 | * | | |
| HA-1 (0-2) | 6/29/2021 | ICON | Cadmium | <0.460 | * | | |
| HA-1 (2-4) | 6/29/2021 | ERM | Cadmium | <0.256 | * | | |
| HA-1 (2-4) | 6/29/2021 | ICON | Cadmium | <0.494 | * | | |
| HA-2 (0-2) | 6/29/2021 | ERM | Cadmium | <0.251 | * | | |
| HA-2 (0-2) | 6/29/2021 | ICON | Cadmium | <0.472 | * | | |
| HA-2 (2-4) | 6/29/2021 | ERM | Cadmium | <0.262 | * | | |
| HA-2 (2-4) | 6/29/2021 | ICON | Cadmium | <0.479 | * | | |
| HA-3 (0-2) | 6/29/2021 | ERM | Cadmium | <0.255 | * | | |
| HA-3 (0-2) | 6/29/2021 | ICON | Cadmium | <0.461 | * | | |
| HA-3 (2-4) | 6/29/2021 | ERM | Cadmium | <0.257 | * | ND | ND |
| HA-3 (2-4) | 6/29/2021 | ICON | Cadmium | <0.474 | * | | |
| HA-10 (0-2) | 8/2/2024 | ERM | Cadmium | <0.258 | * | | |
| HA-10 (0-2) | 8/2/2024 | ICON | Cadmium | <0.492 | * | | |
| HA-10 (2-4) | 8/2/2024 | ERM | Cadmium | <0.245 | * | | |
| HA-10 (2-4) | 8/2/2024 | ICON | Cadmium | <0.488 | * | | |
| HA-10R (0-2) | 4/25/2025 | ICON | Cadmium | <0.499 | * | | |
| SB-1 (0-2) | 4/24/2025 | ICON | Cadmium | <0.498 | * | | |
| SB-1 (2-4) | 4/25/2025 | ICON | Cadmium | <0.498 | * | | |
| SB-2 (0-2) | 4/24/2025 | ICON | Cadmium | <0.499 | * | | |
| SB-2 (2-4) | 4/24/2025 | ICON | Cadmium | <0.498 | * | | |
| SB-3 (0-2) | 4/25/2025 | ICON | Cadmium | <0.499 | * | | |
| SB-3 (2-4) | 4/25/2025 | ICON | Cadmium | <0.499 | * | | |
| SB-4 (0-2) | 4/24/2025 | ICON | Cadmium | <0.499 | * | | |
| SB-4 (2-4) | 4/24/2025 | ICON | Cadmium | <0.500 | * | | |
| CD-6 (0-4) | 4/12/2022 | ICON | Chromium | 12.8 | | | |
| CD-18 (0-4) | 7/23/2024 | ERM | Chromium | 20.7 | | | |
| CD-18 (0-4) | 7/23/2024 | ICON | Chromium | 14.1 | | | |
| HA-1 (0-2) | 6/29/2021 | ERM | Chromium | 12.9 | | | |
| HA-1 (0-2) | 6/29/2021 | ICON | Chromium | 13.2 | | | |
| HA-1 (2-4) | 6/29/2021 | ERM | Chromium | 13.6 | | | |
| HA-1 (2-4) | 6/29/2021 | ICON | Chromium | 12.4 | | | |
| HA-2 (0-2) | 6/29/2021 | ERM | Chromium | 44 | | | |
| HA-2 (0-2) | 6/29/2021 | ICON | Chromium | 45.5 | | | |
| HA-2 (2-4) | 6/29/2021 | ERM | Chromium | 192 | | | |
| HA-2 (2-4) | 6/29/2021 | ICON | Chromium | 37.6 | | | |
| HA-2R (0-2) | 4/23/2025 | HET | Chromium | 24.2 | | | |
| HA-2R (2-4) | 4/23/2025 | HET | Chromium | 22.3 | | | |
| HA-3 (0-2) | 6/29/2021 | ERM | Chromium | 10.46 | | | |
| HA-3 (0-2) | 6/29/2021 | ICON | Chromium | 11.1 | | | |
| HA-3 (2-4) | 6/29/2021 | ERM | Chromium | 14.5 | | | |
| HA-3 (2-4) | 6/29/2021 | ICON | Chromium | 12.3 | | | |
| HA-10 (0-2) | 8/2/2024 | ERM | Chromium | 25.5 | | | |
| HA-10 (0-2) | 8/2/2024 | ICON | Chromium | 13.9 | | 23 | 192 |
| HA-10 (2-4) | 8/2/2024 | ERM | Chromium | 21.8 | | | |
| HA-10 (2-4) | 8/2/2024 | ICON | Chromium | 12.7 | | | |
| HA-10R (0-2) | 4/25/2025 | ICON | Chromium | 13 | | | |
| SB-1 (0-2) | 4/24/2025 | HET | Chromium | 19.9 | | | |
| SB-1 (0-2) | 4/24/2025 | ICON | Chromium | 11.9 | | | |
| SB-1 (2-4) | 4/24/2025 | HET | Chromium | 28.7 | | | |
| SB-1 (2-4) | 4/25/2025 | ICON | Chromium | 12.7 | | | |
| SB-2 (0-2) | 4/24/2025 | HET | Chromium | 22.1 | | | |
| SB-2 (0-2) | 4/24/2025 | ICON | Chromium | 10.8 | | | |
| SB-2 (2-4) | 4/25/2025 | HET | Chromium | 27.1 | | | |
| SB-2 (2-4) | 4/24/2025 | ICON | Chromium | 11.1 | | | |
| SB-3 (0-2) | 4/25/2025 | HET | Chromium | 22.4 | | | |
| SB-3 (0-2) | 4/25/2025 | ICON | Chromium | 12.5 | | | |
| SB-3 (2-4) | 4/25/2025 | HET | Chromium | 28.3 | | | |
| SB-3 (2-4) | 4/25/2025 | ICON | Chromium | 10.9 | | | |
| SB-4 (0-2) | 4/24/2025 | HET | Chromium | 20.4 | | | |
| SB-4 (0-2) | 4/24/2025 | ICON | Chromium | 12.4 | | | |
| SB-4 (2-4) | 4/24/2025 | HET | Chromium | 23.7 | | | |
| SB-4 (2-4) | 4/24/2025 | ICON | Chromium | 13.8 | | | |

*Appendix G-3*
*Future Use Assessment: Data for Metals Concentrations in the Former BP Operations Areas and Vicinity*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Sample | Sample Date | Sampler | COPEC | Result (mg/kg dry) | | Average Concentration (mg/kg dry) | Maximum Concentration (mg/kg dry) |
|---|---|---|---|---|---|---|---|
| CD-6 (0-4) | 4/12/2022 | ICON | Lead | 11.7 | | | |
| CD-18 (0-4) | 7/23/2024 | ERM | Lead | 13 | | | |
| CD-18 (0-4) | 7/23/2024 | ICON | Lead | 11.2 | | | |
| HA-1 (0-2) | 6/29/2021 | ERM | Lead | 9.57 | | | |
| HA-1 (0-2) | 6/29/2021 | ICON | Lead | 18 | | | |
| HA-1 (2-4) | 6/29/2021 | ERM | Lead | 22.1 | | | |
| HA-1 (2-4) | 6/29/2021 | ICON | Lead | 13.7 | | | |
| HA-2 (0-2) | 6/29/2021 | ERM | Lead | 149 | | | |
| HA-2 (0-2) | 6/29/2021 | ICON | Lead | 69.7 | | | |
| HA-2 (2-4) | 6/29/2021 | ERM | Lead | 262 | | | |
| HA-2 (2-4) | 6/29/2021 | ICON | Lead | 52.4 | | | |
| HA-2R (0-2) | 4/23/2025 | HET | Lead | 20.5 | | | |
| HA-2R (2-4) | 4/23/2025 | HET | Lead | 19.9 | | | |
| HA-3 (0-2) | 6/29/2021 | ERM | Lead | 8.63 | | | |
| HA-3 (0-2) | 6/29/2021 | ICON | Lead | 10.2 | | | |
| HA-3 (2-4) | 6/29/2021 | ERM | Lead | 10.89 | | | |
| HA-3 (2-4) | 6/29/2021 | ICON | Lead | 12.6 | | | |
| HA-10 (0-2) | 8/2/2024 | ERM | Lead | 13.9 | | | |
| HA-10 (0-2) | 8/2/2024 | ICON | Lead | 11.2 | | 27 | 262 |
| HA-10 (2-4) | 8/2/2024 | ERM | Lead | 13.1 | | | |
| HA-10 (2-4) | 8/2/2024 | ICON | Lead | 10.5 | | | |
| HA-10R (0-2) | 4/25/2025 | ICON | Lead | 11.9 | | | |
| SB-1 (0-2) | 4/24/2025 | HET | Lead | 17.3 | | | |
| SB-1 (0-2) | 4/24/2025 | ICON | Lead | 13.2 | | | |
| SB-1 (2-4) | 4/25/2025 | HET | Lead | 12.37 | | | |
| SB-1 (2-4) | 4/25/2025 | ICON | Lead | 11.3 | | | |
| SB-2 (0-2) | 4/24/2025 | HET | Lead | 18.7 | | | |
| SB-2 (0-2) | 4/24/2025 | ICON | Lead | 12.7 | | | |
| SB-2 (2-4) | 4/25/2025 | HET | Lead | 16.3 | | | |
| SB-2 (2-4) | 4/24/2025 | ICON | Lead | 11.7 | | | |
| SB-3 (0-2) | 4/25/2025 | HET | Lead | 19 | | | |
| SB-3 (0-2) | 4/25/2025 | ICON | Lead | 15.3 | | | |
| SB-3 (2-4) | 4/25/2025 | HET | Lead | 11.9 | | | |
| SB-3 (2-4) | 4/25/2025 | ICON | Lead | 12.8 | | | |
| SB-4 (0-2) | 4/24/2025 | HET | Lead | 28.6 | | | |
| SB-4 (0-2) | 4/24/2025 | ICON | Lead | 21.9 | | | |
| SB-4 (2-4) | 4/24/2025 | HET | Lead | 13.9 | | | |
| SB-4 (2-4) | 4/24/2025 | ICON | Lead | 21 | | | |
| CD-6 (0-4) | 4/12/2022 | ICON | Mercury | <0.107 | * | | |
| CD-18 (0-4) | 7/23/2024 | ERM | Mercury | 0.0311 | | | |
| CD-18 (0-4) | 7/23/2024 | ICON | Mercury | <0.103 | * | | |
| HA-1 (0-2) | 6/29/2021 | ERM | Mercury | 0.028 | | | |
| HA-1 (0-2) | 6/29/2021 | ICON | Mercury | <0.107 | * | | |
| HA-1 (2-4) | 6/29/2021 | ERM | Mercury | 0.0266 | | | |
| HA-1 (2-4) | 6/29/2021 | ICON | Mercury | <0.105 | * | | |
| HA-2 (0-2) | 6/29/2021 | ERM | Mercury | 0.0814 | | | |
| HA-2 (0-2) | 6/29/2021 | ICON | Mercury | <0.105 | * | | |
| HA-2 (2-4) | 6/29/2021 | ERM | Mercury | 0.0593 | | | |
| HA-2 (2-4) | 6/29/2021 | ICON | Mercury | <0.108 | * | | |
| HA-3 (0-2) | 6/29/2021 | ERM | Mercury | 0.0211 | | | |
| HA-3 (0-2) | 6/29/2021 | ICON | Mercury | <0.104 | * | | |
| HA-3 (2-4) | 6/29/2021 | ERM | Mercury | 0.023 | | 0.045 | 0.081 |
| HA-3 (2-4) | 6/29/2021 | ICON | Mercury | <0.0983 | * | | |
| HA-10 (0-2) | 8/2/2024 | ERM | Mercury | <0.022 | * | | |
| HA-10 (0-2) | 8/2/2024 | ICON | Mercury | <0.0979 | * | | |
| HA-10 (2-4) | 8/2/2024 | ERM | Mercury | <0.0209 | * | | |
| HA-10 (2-4) | 8/2/2024 | ICON | Mercury | <0.107 | * | | |
| HA-10R (0-2) | 4/25/2025 | ICON | Mercury | <0.0963 | * | | |
| SB-1 (0-2) | 4/24/2025 | ICON | Mercury | <0.104 | * | | |
| SB-1 (2-4) | 4/25/2025 | ICON | Mercury | <0.109 | * | | |
| SB-2 (0-2) | 4/24/2025 | ICON | Mercury | <0.101 | * | | |
| SB-2 (2-4) | 4/24/2025 | ICON | Mercury | <0.103 | * | | |
| SB-3 (0-2) | 4/25/2025 | ICON | Mercury | <0.0942 | * | | |
| SB-3 (2-4) | 4/25/2025 | ICON | Mercury | <0.0926 | * | | |
| SB-4 (0-2) | 4/24/2025 | ICON | Mercury | <0.0991 | * | | |
| SB-4 (2-4) | 4/24/2025 | ICON | Mercury | <0.101 | * | | |

*Appendix G-3*
*Future Use Assessment: Data for Metals Concentrations in the Former BP Operations Areas and Vicinity*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Sample | Sample Date | Sampler | COPEC | Result (mg/kg dry) | | Average Concentration (mg/kg dry) | Maximum Concentration (mg/kg dry) |
|---|---|---|---|---|---|---|---|
| CD-18 (0-4) | 7/23/2024 | ERM | Selenium | <1.28 | * | | |
| HA-1 (0-2) | 6/29/2021 | ERM | Selenium | <1.19 | * | | |
| HA-1 (0-2) | 6/29/2021 | ICON | Selenium | <3.68 | * | | |
| HA-1 (2-4) | 6/29/2021 | ERM | Selenium | <1.28 | * | | |
| HA-1 (2-4) | 6/29/2021 | ICON | Selenium | <3.95 | * | | |
| HA-2 (0-2) | 6/29/2021 | ERM | Selenium | <1.25 | * | | |
| HA-2 (0-2) | 6/29/2021 | ICON | Selenium | <3.78 | * | | |
| HA-2 (2-4) | 6/29/2021 | ERM | Selenium | <1.31 | * | ND | ND |
| HA-2 (2-4) | 6/29/2021 | ICON | Selenium | <3.83 | * | | |
| HA-3 (0-2) | 6/29/2021 | ERM | Selenium | <1.28 | * | | |
| HA-3 (0-2) | 6/29/2021 | ICON | Selenium | <3.69 | * | | |
| HA-3 (2-4) | 6/29/2021 | ERM | Selenium | <1.29 | * | | |
| HA-3 (2-4) | 6/29/2021 | ICON | Selenium | <3.79 | * | | |
| HA-10 (0-2) | 8/2/2024 | ERM | Selenium | 1.49 | | | |
| HA-10 (2-4) | 8/2/2024 | ERM | Selenium | <1.22 | * | | |
| CD-18 (0-4) | 7/23/2024 | ERM | Silver | <0.642 | * | | |
| HA-1 (0-2) | 6/29/2021 | ERM | Silver | <0.594 | * | | |
| HA-1 (2-4) | 6/29/2021 | ERM | Silver | <0.639 | * | | |
| HA-2 (0-2) | 6/29/2021 | ERM | Silver | <0.627 | * | | |
| HA-2 (2-4) | 6/29/2021 | ERM | Silver | <0.656 | * | ND | ND |
| HA-3 (0-2) | 6/29/2021 | ERM | Silver | <0.639 | * | | |
| HA-3 (2-4) | 6/29/2021 | ERM | Silver | <0.644 | * | | |
| HA-10 (0-2) | 8/2/2024 | ERM | Silver | <0.644 | * | | |
| HA-10 (2-4) | 8/2/2024 | ERM | Silver | <0.612 | * | | |
| CD-6 (0-4) | 4/12/2022 | ICON | Strontium | 24.3 | | | |
| CD-18 (0-4) | 7/23/2024 | ERM | Strontium | 58.2 | | | |
| CD-18 (0-4) | 7/23/2024 | ICON | Strontium | 43.4 | | | |
| HA-1 (0-2) | 6/29/2021 | ICON | Strontium | 31.5 | | | |
| HA-1 (2-4) | 6/29/2021 | ICON | Strontium | 21.7 | | | |
| HA-2 (0-2) | 6/29/2021 | ICON | Strontium | 218 | | | |
| HA-2 (2-4) | 6/29/2021 | ICON | Strontium | 162 | | | |
| HA-3 (0-2) | 6/29/2021 | ICON | Strontium | 140 | | | |
| HA-3 (2-4) | 6/29/2021 | ICON | Strontium | 163 | | | |
| HA-10 (0-2) | 8/2/2024 | ERM | Strontium | 39.7 | | | |
| HA-10 (0-2) | 8/2/2024 | ICON | Strontium | 31.4 | | 53 | 218 |
| HA-10 (2-4) | 8/2/2024 | ERM | Strontium | 25 | | | |
| HA-10 (2-4) | 8/2/2024 | ICON | Strontium | 21.8 | | | |
| HA-10R (0-2) | 4/25/2025 | ICON | Strontium | 33.7 | | | |
| SB-1 (0-2) | 4/24/2025 | ICON | Strontium | 11.9 | | | |
| SB-1 (2-4) | 4/25/2025 | ICON | Strontium | 16.8 | | | |
| SB-2 (0-2) | 4/24/2025 | ICON | Strontium | 20.3 | | | |
| SB-2 (2-4) | 4/24/2025 | ICON | Strontium | 25.1 | | | |
| SB-3 (0-2) | 4/25/2025 | ICON | Strontium | 19.9 | | | |
| SB-3 (2-4) | 4/25/2025 | ICON | Strontium | 23 | | | |
| SB-4 (0-2) | 4/24/2025 | ICON | Strontium | 11.4 | | | |
| SB-4 (2-4) | 4/24/2025 | ICON | Strontium | 17.7 | | | |

*Appendix G-3*
*Future Use Assessment: Data for Metals Concentrations in the Former BP Operations Areas and Vicinity*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Sample | Sample Date | Sampler | COPEC | Result (mg/kg dry) | Average Concentration (mg/kg dry) | Maximum Concentration (mg/kg dry) |
|---|---|---|---|---|---|---|
| CD-6 (0-4) | 4/12/2022 | ICON | Zinc | 19.6 | 32 | 162 |
| CD-18 (0-4) | 7/23/2024 | ERM | Zinc | 162 | | |
| CD-18 (0-4) | 7/23/2024 | ICON | Zinc | 39.9 | | |
| HA-1 (0-2) | 6/29/2021 | ERM | Zinc | 16.7 | | |
| HA-1 (0-2) | 6/29/2021 | ICON | Zinc | 11.5 | | |
| HA-1 (2-4) | 6/29/2021 | ERM | Zinc | 16.1 | | |
| HA-1 (2-4) | 6/29/2021 | ICON | Zinc | 17.3 | | |
| HA-2 (0-2) | 6/29/2021 | ERM | Zinc | 53.2 | | |
| HA-2 (0-2) | 6/29/2021 | ICON | Zinc | 33.2 | | |
| HA-2 (2-4) | 6/29/2021 | ERM | Zinc | 122.8 | | |
| HA-2 (2-4) | 6/29/2021 | ICON | Zinc | 30.1 | | |
| HA-3 (0-2) | 6/29/2021 | ERM | Zinc | 18.5 | | |
| HA-3 (0-2) | 6/29/2021 | ICON | Zinc | 28.8 | | |
| HA-3 (2-4) | 6/29/2021 | ERM | Zinc | 19 | | |
| HA-3 (2-4) | 6/29/2021 | ICON | Zinc | 41.5 | | |
| HA-10 (0-2) | 8/2/2024 | ERM | Zinc | 44.8 | | |
| HA-10 (0-2) | 8/2/2024 | ICON | Zinc | 19.6 | | |
| HA-10 (2-4) | 8/2/2024 | ERM | Zinc | 44.6 | | |
| HA-10 (2-4) | 8/2/2024 | ICON | Zinc | 20.9 | | |
| HA-10R (0-2) | 4/25/2025 | ICON | Zinc | 17.2 | | |
| SB-1 (0-2) | 4/24/2025 | ICON | Zinc | 13 | | |
| SB-1 (2-4) | 4/25/2025 | ICON | Zinc | 19.3 | | |
| SB-2 (0-2) | 4/24/2025 | ICON | Zinc | 12.3 | | |
| SB-2 (2-4) | 4/24/2025 | ICON | Zinc | 16.2 | | |
| SB-3 (0-2) | 4/25/2025 | ICON | Zinc | 13.8 | | |
| SB-3 (2-4) | 4/25/2025 | ICON | Zinc | 15.6 | | |
| SB-4 (0-2) | 4/24/2025 | ICON | Zinc | 12 | | |
| SB-4 (2-4) | 4/24/2025 | ICON | Zinc | 17.6 | | |

Note:
*For non-detect results, one-half the detection limit was used to calculate the average concentration.

*Appendix G-4*
*Future Use Assessment: Data for Metals Concentrations in the Former Anadarko Operations Areas*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Sample | Sample Date | Sampler | COPEC | Result (mg/kg dry) | Average Concentration (mg/kg dry) | Maximum Concentration (mg/kg dry) |
|---|---|---|---|---|---|---|
| HA-4 (0-2) | 6/29/2021 | ERM | Arsenic | 7.98 | | |
| HA-4 (0-2) | 6/29/2021 | ICON | Arsenic | 5.84 | | |
| HA-4 (2-4) | 6/29/2021 | ERM | Arsenic | 5.65 | | |
| HA-4 (2-4) | 6/29/2021 | ICON | Arsenic | 5.43 | | |
| HA-5 (0-2) | 6/29/2021 | ERM | Arsenic | 10.13 | | |
| HA-5 (0-2) | 6/29/2021 | ICON | Arsenic | 7.46 | | |
| HA-5 (2-4) | 6/29/2021 | ERM | Arsenic | 6.6 | 5.5 | 10.13 |
| HA-5 (2-4) | 6/29/2021 | ICON | Arsenic | 6.55 | | |
| HA-9 (0-2) | 6/29/2021 | ERM | Arsenic | 3.17 | | |
| HA-9 (0-2) | 6/29/2021 | ICON | Arsenic | 4.95 | | |
| HA-9 (2-4) | 6/29/2021 | ERM | Arsenic | 1.89 | | |
| HA-9 (2-4) | 6/29/2021 | ICON | Arsenic | 4.27 | | |
| CD-1 | 2/23/2022 | ERM | Arsenic | 3 | | |
| CD-1 | 2/23/2022 | ICON | Arsenic | 4.54 | | |
| HA-4 (0-2) | 6/29/2021 | ERM | Barium | 1913 | | |
| HA-4 (0-2) | 6/29/2021 | ICON | Barium | 3640 | | |
| HA-4 (2-4) | 6/29/2021 | ERM | Barium | 1506 | | |
| HA-4 (2-4) | 6/29/2021 | ICON | Barium | 1330 | | |
| HA-5 (0-2) | 6/29/2021 | ERM | Barium | 2793 | | |
| HA-5 (0-2) | 6/29/2021 | ICON | Barium | 3320 | | |
| HA-5 (2-4) | 6/29/2021 | ERM | Barium | 1316 | | |
| HA-5 (2-4) | 6/29/2021 | ICON | Barium | 4230 | 2358 | 5590 |
| HA-9 (0-2) | 6/29/2021 | ERM | Barium | 92.2 | | |
| HA-9 (0-2) | 6/29/2021 | ICON | Barium | 2630 | | |
| HA-9 (2-4) | 6/29/2021 | ERM | Barium | 162 | | |
| HA-9 (2-4) | 6/29/2021 | ICON | Barium | 2420 | | |
| CD-1 | 2/23/2022 | ERM | Barium | 3134 | | |
| CD-1 | 2/23/2022 | ICON | Barium | 5590 | | |
| CD-1R | 4/30/2025 | HET | Barium | 1295 | | |
| HA-4 (0-2) | 6/29/2021 | ERM | Cadmium | 0.6 | | |
| HA-4 (0-2) | 6/29/2021 | ICON | Cadmium | 0.236 | | |
| HA-4 (2-4) | 6/29/2021 | ERM | Cadmium | 0.13 | | |
| HA-4 (2-4) | 6/29/2021 | ICON | Cadmium | 0.2345 | | |
| HA-5 (0-2) | 6/29/2021 | ERM | Cadmium | 0.43 | | |
| HA-5 (0-2) | 6/29/2021 | ICON | Cadmium | 0.2455 | | |
| HA-5 (2-4) | 6/29/2021 | ERM | Cadmium | 1.35 | 0.36 | 1.35 |
| HA-5 (2-4) | 6/29/2021 | ICON | Cadmium | 0.734 | | |
| HA-9 (0-2) | 6/29/2021 | ERM | Cadmium | 0.1225 | | |
| HA-9 (0-2) | 6/29/2021 | ICON | Cadmium | 0.245 | | |
| HA-9 (2-4) | 6/29/2021 | ERM | Cadmium | 0.1245 | | |
| HA-9 (2-4) | 6/29/2021 | ICON | Cadmium | 0.236 | | |
| CD-1 | 2/23/2022 | ERM | Cadmium | 0.1125 | | |
| CD-1 | 2/23/2022 | ICON | Cadmium | 0.2315 | | |
| HA-4 (0-2) | 6/29/2021 | ERM | Chromium | 120.9 | | |
| HA-4 (0-2) | 6/29/2021 | ICON | Chromium | 29.1 | | |
| HA-4 (2-4) | 6/29/2021 | ERM | Chromium | 24 | | |
| HA-4 (2-4) | 6/29/2021 | ICON | Chromium | 18.9 | | |
| HA-5 (0-2) | 6/29/2021 | ERM | Chromium | 172 | | |
| HA-5 (0-2) | 6/29/2021 | ICON | Chromium | 96.7 | | |
| HA-5 (2-4) | 6/29/2021 | ERM | Chromium | 107 | 51 | 172 |
| HA-5 (2-4) | 6/29/2021 | ICON | Chromium | 73.3 | | |
| HA-9 (0-2) | 6/29/2021 | ERM | Chromium | 10.27 | | |
| HA-9 (0-2) | 6/29/2021 | ICON | Chromium | 18.8 | | |
| HA-9 (2-4) | 6/29/2021 | ERM | Chromium | 8.42 | | |
| HA-9 (2-4) | 6/29/2021 | ICON | Chromium | 12.8 | | |
| CD-1 | 2/23/2022 | ERM | Chromium | 8.2 | | |
| CD-1 | 2/23/2022 | ICON | Chromium | 9.53 | | |

*Appendix G-4*
*Future Use Assessment: Data for Metals Concentrations in the Former Anadarko Operations Areas*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Sample | Sample Date | Sampler | COPEC | Result (mg/kg dry) | | Average Concentration (mg/kg dry) | Maximum Concentration (mg/kg dry) |
|---|---|---|---|---|---|---|---|
| HA-4 (0-2) | 6/29/2021 | ERM | Lead | 45.3 | | | |
| HA-4 (0-2) | 6/29/2021 | ICON | Lead | 22.6 | | | |
| HA-4 (2-4) | 6/29/2021 | ERM | Lead | 24.4 | | | |
| HA-4 (2-4) | 6/29/2021 | ICON | Lead | 15.5 | | | |
| HA-5 (0-2) | 6/29/2021 | ERM | Lead | 53.1 | | | |
| HA-5 (0-2) | 6/29/2021 | ICON | Lead | 33.7 | | | |
| HA-5 (2-4) | 6/29/2021 | ERM | Lead | 87.3 | | 30 | 87.3 |
| HA-5 (2-4) | 6/29/2021 | ICON | Lead | 55.2 | | | |
| HA-9 (0-2) | 6/29/2021 | ERM | Lead | 7.1 | | | |
| HA-9 (0-2) | 6/29/2021 | ICON | Lead | 23 | | | |
| HA-9 (2-4) | 6/29/2021 | ERM | Lead | 9.19 | | | |
| HA-9 (2-4) | 6/29/2021 | ICON | Lead | 18.3 | | | |
| CD-1 | 2/23/2022 | ERM | Lead | 15 | | | |
| CD-1 | 2/23/2022 | ICON | Lead | 15.6 | | | |
| HA-4 (0-2) | 6/29/2021 | ERM | Mercury | 0.166 | | | |
| HA-4 (0-2) | 6/29/2021 | ICON | Mercury | <0.102 | * | | |
| HA-4 (2-4) | 6/29/2021 | ERM | Mercury | 0.044 | | | |
| HA-4 (2-4) | 6/29/2021 | ICON | Mercury | <0.104 | * | | |
| HA-5 (0-2) | 6/29/2021 | ERM | Mercury | 0.233 | | | |
| HA-5 (0-2) | 6/29/2021 | ICON | Mercury | 0.186 | | | |
| HA-5 (2-4) | 6/29/2021 | ERM | Mercury | 0.328 | | 0.11 | 0.328 |
| HA-5 (2-4) | 6/29/2021 | ICON | Mercury | 0.233 | | | |
| HA-9 (0-2) | 6/29/2021 | ERM | Mercury | 0.0346 | | | |
| HA-9 (0-2) | 6/29/2021 | ICON | Mercury | <0.109 | * | | |
| HA-9 (2-4) | 6/29/2021 | ERM | Mercury | 0.0244 | | | |
| HA-9 (2-4) | 6/29/2021 | ICON | Mercury | <0.102 | * | | |
| CD-1 | 2/23/2022 | ERM | Mercury | 0.021 | | | |
| CD-1 | 2/23/2022 | ICON | Mercury | <0.0926 | * | | |
| HA-4 (0-2) | 6/29/2021 | ERM | Silver | 1.155 | | | |
| HA-4 (2-4) | 6/29/2021 | ERM | Silver | <0.649 | * | | |
| HA-5 (0-2) | 6/29/2021 | ERM | Silver | 1.094 | | | |
| HA-5 (2-4) | 6/29/2021 | ERM | Silver | 0.843 | | 0.62 | 1.155 |
| HA-9 (0-2) | 6/29/2021 | ERM | Silver | <0.612 | * | | |
| HA-9 (2-4) | 6/29/2021 | ERM | Silver | <0.623 | * | | |
| CD-1 | 2/23/2022 | ERM | Silver | <0.564 | * | | |
| HA-4 (0-2) | 6/29/2021 | ERM | Zinc | 513 | | | |
| HA-4 (0-2) | 6/30/2021 | ICON | Zinc | 65.8 | | | |
| HA-4 (2-4) | 6/29/2021 | ERM | Zinc | 48.4 | | | |
| HA-4 (2-4) | 6/29/2021 | ICON | Zinc | 36.9 | | | |
| HA-5 (0-2) | 6/29/2021 | ERM | Zinc | 259 | | | |
| HA-5 (0-2) | 6/29/2021 | ICON | Zinc | 173 | | | |
| HA-5 (2-4) | 6/29/2021 | ERM | Zinc | 354 | | 129 | 513 |
| HA-5 (2-4) | 6/29/2021 | ICON | Zinc | 187 | | | |
| HA-9 (0-2) | 6/29/2021 | ERM | Zinc | 17.5 | | | |
| HA-9 (0-2) | 6/29/2021 | ICON | Zinc | 92.3 | | | |
| HA-9 (2-4) | 6/29/2021 | ERM | Zinc | 14.8 | | | |
| HA-9 (2-4) | 6/29/2021 | ICON | Zinc | 15.7 | | | |
| CD-1 | 2/23/2022 | ERM | Zinc | 12.5 | | | |
| CD-1 | 2/23/2022 | ICON | Zinc | 12.8 | | | |

Note:
*For non-detect results, one-half the detection limit was used to calculate the average concentration.

# APPENDIX H HQ INPUT FACTORS

*Appendix H-1 Table 1*
*Summary: Soil/Sediment Barium Bioavailability Factors*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Geometric Mean Barium Soil/Sediment Bioavailability Factor | Reference |
|---|---|
| 0.00072 | Engdahl, A. et al., 2008 |
| 0.00013 | Environment International Ltd, 2010 |
| 0.000086 | USGS, 2002 |
| | |
| **0.00020** | **Geometric Mean Barium Soil Bioavailability Factor** |

**Note:**
Soil bioavailability factors in each study are based on mean soil and porewater concentrations.

**References:**
Engdahl, A. et al. 2008. Oskarshamm and Forsmark site investigation, Chemical composition of suspended material, sediment and pore water in lakes and sea bays. Swedish Nuclear Fuel and Waste Management Co., P-08-81: 80 pgs.

Environment International Ltd. 2010. Upper Columbia River in-Situ Porewater Assessment Sampling and Quality Assurance Plan, Washington State Attorney General's Office.

USGS. 2002. Vertical Distribution of Trace-Element Concentrations and Occurrence of Metallurgical Slag Particles in Accumulated Bed Sediments of Lake Roosevelt, Washington. Scientific Investigations Report 2004-5090.

*Appendix H-1 Table 2*
*Barium in Soils/Sediments/Porewaters and Soil Bioavailability Calculations (Engdahl et al., 2008)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

**Barium Sediment Concentration**

| | Sample ID | Eck | Eck | Lab | Lab | Bol | Bol | Geometric Mean Ba Sediment Concentration |
|---|---|---|---|---|---|---|---|---|
| Sample Depth | *cm* | 0-5 | 25-30 | 0-5 | 25-30 | 0-5 | 25-30 | 86 |
| Concentration | mg/kg-dry | 40 | 46 | 59 | 59 | 220 | 280 | |

**Barium Porewater Concentration**

| | Sample ID | Eck | Eck | Lab | Lab | Bol | Bol | Geometric Mean Ba Porewater Concentration |
|---|---|---|---|---|---|---|---|---|
| Sample Depth | *cm* | 0-5 | 25-30 | 0-5 | 25-30 | 0-5 | 25-30 | 0.062 |
| Concentration | mg/L | 0.03 | 0.06 | 0.06 | 0.08 | 0.04 | 0.17 | |

**Barium Soil Bioavailability**

| | Sample ID | Eck | Eck | Lab | Lab | Bol | Bol | **Geometric Mean Barium Soil/Sed. Bioavailability Factor** |
|---|---|---|---|---|---|---|---|---|
| Porewater conc. ÷ Sediment | unitless | 0.0008 | 0.0013 | 0.0009 | 0.0013 | 0.0002 | 0.0006 | **0.00072** |

**Note:**
Ba=Barium

**Reference:**
Engdahl, A. et al. 2008. Oskarshamm and Forsmark site investigation, Chemical composition of suspended material, sediment and pore water in lakes and sea bays. Swedish Nuclear Fuel and Waste Management Co., P-08-81: 80 pgs.

*Appendix H-1 Table 3*
*Barium in Soils/Sediments/Porewaters and Soil Bioavailability Calculations (Environment International Ltd, 2010)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| | Barium Soil Concentrations (mg/kg) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sample ID | UDE 2 SED | BSB 2 SED | BSB 1 SED | DE 2 SED | DE 1 SED | MSB 1 SED | MSB 2 SED | UDE 1 SED |
| | 347 | 1010 | 1250 | 845 | 415 | 268 | 468 | 678 |
| | **Barium Porewater Concentrations (mg/L)** | | | | | | | |
| Collected AM | 0.109 | 0.058 | 0.154 | 0.129 | 0.115 | 0.040 | 0.047 | 0.029 |
| Collected PM | 0.129 | 0.055 | 0.146 | 0.173 | 0.117 | 0.039 | 0.044 | 0.029 |
| Mean of AM and PM | 0.119 | 0.057 | 0.150 | 0.151 | 0.116 | 0.0392 | 0.046 | 0.029 |
| | **Barium Soil/Sediment Bioavailability Factor** | | | | | | | |
| porewater conc.÷ soil conc. | 0.00034 | 0.000056 | 0.00012 | 0.00018 | 0.00028 | 0.00015 | 0.00010 | 0.000042 |
| | **Geometric Mean Soil/Sediment Barium Bioavailability Factor** | | | | | | | **0.00013** |

**Reference:**

Environment International Ltd. 2010. Upper Columbia River in-Situ Porewater Assessment Sampling and Quality Assurance Plan, Washington State Attorney General's Office.

*Appendix H-1 Table 4*
*Barium in Lake Roosevelt in Soils/Sediments/Porewaters and Soil Bioavailability Calculations (USGS, 2002*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Sample ID | Depth cm | Barium Porewater mg/L | Barium Sediment mg/kg | Barium Soil/Sediment Bioavailability Factor (porewater conc. ÷ sediment conc.) |
|---|---|---|---|---|
| 1 | 1-2 | 0.091 | 1100 | 0.000083 |
| | 9-11 | 0.14 | 1100 | 0.00013 |
| 2 | 1-2 | 0.11 | 1200 | 0.000092 |
| | 9-11 | 0.18 | 1500 | 0.00012 |
| 3 | 1-2 | 0.068 | 1200 | 0.000057 |
| | 9-11 | 0.08 | 1300 | 0.000062 |
| **Geometric Mean Barium Soil/Sediment Bioavailability Factor** | | | | **0.000086** |

**Reference:**

USGS. 2002. Vertical Distribution of Trace-Element Concentrations and Occurrence of Metallurgical Slag Particles in Accumulated Bed Sediments of Lake Roosevelt, Washington. Scientific Investigations Report 2004-5090.

*Appendix H-2 Table 1*
*Calculation of Barium Soil-to-Bird Bioconcentration Factor (Chromium Surrogate)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Matrix | Chromium (mg/kg) | Soil-to-Tissue BCF | Reference |
|---|---|---|---|
| Soil[a] | 28.32 | - | Egwumah et al., 2017 |
| Whole Body[b,c] | 35.35 | 1.25 | |
| Liver | 6.26 | - | |
| Heart | 0.7 | - | |
| Skin | 4.43 | - | |
| Carcass | 23.96 | - | |

| Matrix | Chromium (mg/kg) | Soil-to-Tissue BCF | Reference |
|---|---|---|---|
| Soil[d] | 1098.6 | - | Kraus, 1989 |
| Whole Body[e,f] | 454 | 0.413 | |
| Brain | 211.7 | - | |
| Liver | 101.8 | - | |
| Muscle | 56.1 | - | |
| Gizzard | 84.4 | - | |

| Soil-to-Bird BCF (Geometric Mean) | 0.718 |
|---|---|

**Notes:**
Chromium soil-to-bird BCF was used as a surrogate for barium soil-bird BCF.

a) Chromium in Daudu soil ranged from 25.01 mg/kg to 28.32 mg/kg. The maximum soil concentration was used to calculate the BCF.

b) Mean tissue concentration from 10 black-headed orioles (*Oriolus brachyrhynchus*) in Daudu, Benue State, Nigeria.

c) Chromium concentrations reported for liver, heart, skin, and carcass were summed to estimate a whole body concentration.

d) Chromium in sediment is mean of 10 samples.

e) Mean tissue concentration from 6 pre-fledgling tree swallows from Hackensack River Estuary in New Jersey.

f) Chromium concentrations reported for brain, liver, muscle, and gizzard were summed to estimate a whole body concentration.

**References:**

Egwumah, F.A., Egwumah, P.O, and B.T. Tyowua. 2017. An investigation of chromium toxicity in the wild population of black-headed oriole *Oriolus brachyrhynchus* (swaison, 1837) using atomic absorption spectrometry (AAS). Int'l Journal of Avian & Wildlife Biology 2(5): 141-146.

Kraus, M. 1989. Bioaccumulation of Heavy Metals in Pre-fledgling Tree Swallows, Tachycineta bicolor Bull. Environ. Contam. Toxicol. 43:407-414.

*Appendix H-3 Table 1*
*Calculation of Cadmium Soil-to-Bird Bioaccumulation Factor*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| **Matrix[a]** | **Cadmium (mg/kg dry)** | |
|---|---|---|
| **Location:** | **Bake Oven Knob** | **Palmerton** |
| Soil horizon | | |
| 01 | 5.8 | 250 |
| 02 | 13 | 710 |
| A1 | 2.7 | 35 |
| A2 | 0.83 | 3 |
| Average Soil Concentration | 3.61 | 66 |
| Songbird Carcass (average) | 1.2 | 2.5 |
| | | |
| Soil-to-bird BAF | 0.333 | 0.0380 |
| | | |
| **Soil-to-bird BAF (Geometric Mean)** | **0.113** | |

**Notes:**

a) Each soil sample is a pool of 10 samples.

Bake Oven Knob birds: catbird, wood thrush, black-and-white warbler, warbler, ovenbird, orchard oriole, common grackle, scarlet tanager, rose-breasted grosbeak.

Palmerton birds: Carolina chickadee, catbird, brown thrasher, robin, wood thrush, black-and-white warbler, yellow-throated warbler, common grackle, rufous-sided towhee, and field sparrow.

**Reference:**

Beyer, W.N., Pattee, O.H., Sileo, L., Hoffman, D.J., and B.M. Mulhern. 1985. Metal Contamination in Wildlife Living Near Two Zinc Smelters. Environmental Pollution (Series A) 38: 63-86.

*Appendix H-4 Table 1*
*Summary: Total Mercury Soil/Sediment Bioavailability Factors*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Location | Geometric Mean Total Mercury Soil/Sed. Bioavailability Factors (conc. in porewater ÷ conc. in | Reference |
|---|---|---|
| Savannah River | 0.00009 | Xu et al., 2019 |
| Spiked Sediment | 0.018 | Chibunda et al., 2009 |
| Chloralkalai Plant | 0.00002 | Chalmers et al., 2013 |
| | | |
| **Geometric Mean** | **0.00031** | |

**References:**

Xu, X. et al. 2019. Mercury speciation, bioavailability, and biomagnification in contaminated streams on the Savannah River Site (SC, USA), Science of The Total Environment. 668, 261-270.

Chibunda, R. T. et al. 2009. Chronic Toxicity of Mercury (HgCl2) to the Benthic Midge *Chironomus riparius.* Int. J. Environ. Res., 3(3):455-462

Chalmers, A. et al. 2013. Characterization of Mercury Contamination in the Androscoggin River, Coos County, New Hampshire, USGS, USEPA, USDOI

*Appendix H-4 Table 2*
*Total Mercury In Savannah River Soil/Sediment/Porewaters and Bioavailabilty Calculations (Xu et al., 2019)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Area | Soil Total Mercury (ng/kg dw) | Soil Methylmercury (ng/g dw) | MeHg (%) | Total Mercury in Porewater (ng/L) | **Total Mercury Soil/Sed. Bioavailability (Total Hg porewater conc.÷Total Hg sediment conc.)** |
|---|---|---|---|---|---|
| MB-a | 50000 | 0.9 | 1.8 | 6.9 | 0.00014 |
| MB-b | 51000 | 0.6 | 1.1 | 4 | 0.00008 |
| MB-c | 52000 | 0.6 | 1.1 | 4 | 0.00008 |
| FMC-a | 77000 | 1.2 | 1.5 | 7.2 | 0.00009 |
| FMC-b | 76000 | 1 | 1.3 | 4.5 | 0.00006 |
| FMC-c | 58000 | 1.4 | 2.5 | 8.4 | 0.00014 |
| | | | | **Geometric Mean Total Mercury Soil/Sediment Bioavailability Factor** | **0.00009** |

**Reference:**
Xu, X. et al. 2019. Mercury speciation, bioavailability, and biomagnification in contaminated streams on the Savannah River Site (SC, USA), Science of The Total Environment. 668, 261-270.
Volume 668, 10 June 2019, Pages 261-270
Xiaoyu Xu *, Albert L. Bryan, Gary L. Mills, Alexis M. Korotasz 1
Savannah River Ecology Laboratory, University of Georgia. PO Drawer E, Aiken, SC 29802, USA

*Appendix H-4 Table 3*
*Total Mercury in Spiked Soil/Sediment/Porewater and Bioavailability Calculations (Chibunda et al., 2009)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Conc. in Sediment (mg /Kg dry weight) | Conc. in Porewater (mg/L) | Total Mercury Soil/Sed. Bioavailability Factor (conc. in porewater ÷ conc. in sediment) |
|---|---|---|
| 0.59 | 0.00001 | 0.00002 |
| 0.93 | 0.09 | 0.09 |
| 2.42 | 0.14 | 0.06 |
| 3.84 | 0.32 | 0.08 |
| 7.20 | 0.51 | 0.07 |
| 12.68 | 0.80 | 0.06 |

| **Geometric Mean Total Mercury Soil/Sed. Bioavailability Factor** | **0.018** |
|---|---|

**Reference:**
Chibunda, R. T. et al. 2009. Chronic Toxicity of Mercury ($HgCl_2$) to the Benthic Midge *Chironomus riparius.* Int. J. Environ. Res., 3(3):455-462.

*Appendix H-4 Table 4*

*Total Mercury In Soil/Sediment/Porewater near a Chloralkali Plant and Bioavailabilty Calculations (Chalmers et al., 2013)*

*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*

*West Mermentau Oil and Gas Field*

*Jefferson Davis Parish, Louisiana*

| Location | Total Mercury Soil/Sediment Concentration (mg/kg) | Total Mercury Porewater Concentration (mg/L) | Soil/Sediment Bioavailability Factor |
|---|---|---|---|
| Sed. Reference 1 Location | 0.03 | 0.0000007 | 0.000023 |
| Sed. Downstream | 0.114 | 0.00000172 | 0.000015 |
| Sed. Reference 2 Location | 0.026 | 0.0000007 | 0.000027 |
| Sed. Nearstream Reach | 0.117 | 0.00000132 | 0.000011 |
| Sed. Farstream | 0.111 | 0.00000172 | 0.000015 |
| **otal Geometric Mean Total Mercury Soil/Sed. Bioavailability Factor** | | | **0.00002** |

Note:
Sediment and porewater are median concentrations.

**Reference:**

Chalmers, A. et al. 2013. Characterization of Mercury Contamination in the Androscoggin River, Coos County, New Hampshire, USGS, USEPA, USDOI.

*Appendix H-5 Table 1*
*Calculation of Mercury Soil-to-Bird Bioaccumuluation Factor*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Matrix[a] | Mercury (mg/kg wet weight) | Soil-to-Bird BAF | Reference |
|---|---|---|---|
| Sediment | 0.5 | | White and Cromartie, 1985 |
| Liver | 0.1 | 0.200 | |
| | | | |
| **Matrix[b]** | **Mercury (mg/kg)** | **Soil-to-Bird BAF** | **Reference** |
| Soil | 2 | | Adair et al., 2003. |
| Kidney | 0.22 | 0.110 | |
| | | | |
| **Soil-to-Bird BAF (Geometric Mean)** | | **0.148** | |

Notes:

a) Livers: 10 samples American advocet and 10 samples Black-necked stilt. Sediment: 3 samples, range (0.4 - 0.7 mg/kg), geomean = 0.5 mg/kg
b) Soil concentration is the minimum site geometric mean of four samples at a location. Kidney concentration is the maximum site geometric mean of kidneys at a nesting location. Minimum soil and maximum kidney are used as a conservative approach.

**References:**

White, D.H. and E. Cromartie. 1985. Bird Use and Heavy Metal Accumulation in Waterbirds at Dredge Disposal Impoundments, Corpus Christi, Texas. Bulletin of Environmental Contamination and Toxicology 34: 295-300.

Adair, B.M., Reynolds, K.D., McMurray, S.T., and G.P. Cobb. 2003. Mercury Occurrence in Prothonotary Warblers (Protonotaria citrea) Inhabiting a National Priorities List Site and Reference Areas in Southern Alabama. Archives of Environmental Contamination and

*Appendix H-6 Table 1*
*Summary: Total Mercury Soil to Plant Bioconcentration Factors*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Reference | Geometric Means | |
|---|---|---|
| Fernández-Martínez et al., 2015 | Geometric Mean Total Mercury Plant BAF | 0.02 |
| Rodriguez et al., 2007 | Geometric Mean Total Mercury Plant BAF | 0.95 |
| Hamilton et al., 2008 | Geometric Mean Total Mercury Plant BAF | 1.02 |
| | **Total Geometric Mean Total Mercury Plant BAF** | 0.27 |

Note:
BAF=Bioaccumulation Factor

**References:**

Fernández-Martínez, R. et al. 2015. Mercury accumulation and speciation in plants and soils from abandoned cinnabar mines. Geoderma 253–254, 30–38.

Rodriguez, L. et al. 2007. Capability of Selected Crop Plants for Shoot Mercury Accumulation from Polluted Soils: Phytoremediation Perspectives. Journal of Phytoremediation, 9:1–13, 2007.

Hamilton, M. et al. 2008. Determination and comparison of heavy metals in selected seafood, water,vegetation and sediments by inductively coupled plasma-optical emission spectrometry from an industrialized and pristine waterway in Southwest Louisiana. Microchemical Journal 88 (2008) 52–55.

*Appendix H-6 Table 2*
*Total Mercury in Soils and Plants near Cinnabar Mines and Bioconcentration Factor Calculations (Fernández-Martínez et. al., 2015)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Mining area | Sampling Location | Plant species | Soil to Plant BAF |
|---|---|---|---|
| La Soterraña | P1-E1 | *Crupina vulgaris* | 0.029 |
| | P3-E4 | *Typha latifolia* | 0.014 |
| | P3-E5 | *Phyllitis scolopendrium* | 0.013 |
| | P3-H6 | *Dryopteris filix-mas* | 0.186 |
| Los Rueldos | P8-E7 | *Calluna vulgaris* | 0.010 |
| | P8-H7 | *Dryopteris affinis* | 0.017 |
| | | **Geometric Mean Total Hg Plant BAF** | 0.02 |

**Reference:**
Fernández-Martínez, R. et al. 2015. Mercury accumulation and speciation in plants and soils from abandoned cinnabar mines. Geoderma 253–254, 30–38.

*Appendix H-6 Table 3*
*Total Mercury in Soils and Plants and Bioconcentration Factor Calculations (Rodriguez et. al., 2007)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Media: Soil and Vegetation | Total Mercury (mg/kg) | Soil to Plant BAF |
|---|---|---|
| Soil | 33.56 | |
| Lupine | 30.65 | 0.91 |
| Lentil | 33.25 | 0.99 |
| Chickpea | 31 | 0.92 |
| Barley | 32.53 | 0.97 |
| | | |
| **Geometric Mean Total Hg Plant BAF** | | **0.95** |

**Reference:**

Rodriguez, L. et al. 2007. Capability of Selected Crop Plants for Shoot Mercury Accumulation from Polluted Soils: Phytoremediation Perspectives. Journal of Phytoremediation, 9:1–13, 2007.

*Appendix H-6 Table 4*
*Total Mercury in Southwest Louisiana Soils and Plants and Bioconcentration Factor Calculations (Hamilton et. al., 2008)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Sample Location | Total Hg (mg/kg) | Sample Location | Total Hg (mg/kg) |
|---|---|---|---|
| Vegetation 63–64, Site 1 | 6.41 | Sediments 75, 78, Site 1 | 6.2 |
| Vegetation 65–66, Site 2 | 6.69 | Sediments 76, 79, Site 2 | 6.22 |
| Vegetation 67–68, Site 3 | 6.36 | | |
| Vegetation 69–70, Site 4 | 6.25 | | |
| Vegetation 71–72, Site 5 | 6.25 | | |
| Vegetation 73–74, Site 6 | 6.14 | | |
| Geometric Veg. Mean | 6.35 | Geometric Sed. Mean | 6.21 |

| | |
|---|---|
| **Geometric Mean Hg Plant BAF** (conc. in veg/conc. in sed.) | **1.02** |

**Reference:**

Hamilton, M. et al. 2008. Determination and comparison of heavy metals in selected seafood, water,vegetation and sediments by inductively coupled plasma-optical emission spectrometry from an industrialized and pristine waterway in Southwest Louisiana. Microchemical Journal 88 (2008) 52–55.

*Appendix H-7 Table 1*
*Calculation of Zinc Soil-to-Bird Bioaccumulation Factor*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| **Matrix[a]** | **Zinc (mg/kg dry)** | |
|---|---|---|
| **Location:** | **Bake Oven Knob** | **Palmerton** |
| Soil horizon | | |
| 01 | 460 | 9900 |
| 02 | 960 | 24000 |
| A1 | 230 | 2900 |
| A2 | 83 | 480 |
| Average Soil Concentration | 433 | 9320 |
| Songbird Carcass (average) | 120 | 140 |
| | | |
| Soil-to-bird BAF | 0.277 | 0.0150 |
| | | |
| **Soil-to-bird BAF (Geometric Mea** | **0.0645** | |

**Notes:**

a) Each soil sample is a pool of 10 samples.

Bake Oven Knob birds: catbird, wood thrush, black-and-white warbler, warbler, ovenbird, orchard oriole, common grackle, scarlet tanager, rose-breasted grosbeak.

Palmerton birds: Carolina chickadee, catbird, brown thrasher, robin, wood thrush, black-and-white warbler, yellow-throated warbler, common grackle, rufous-sided towhee, and field sparrow.

**Reference:**

Beyer, W.N., Pattee, O.H., Sileo, L., Hoffman, D.J., and B.M. Mulhern. 1985. Metal Contamination in Wildlife Living Near Two Zinc Smelters. Environmental Pollution (Series A) 38: 63-86.

# APPENDIX I HQ CALCULATIONS

*Appendix I-1. Table 1*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-2 (0-3'): Mourning Dove*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Mourning Dove** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.12 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.14 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0000018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000005 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 2613 | 600 | 0.0002 | 0.0046 | 0.0068 | 1.68 | 0.0000000014 |
| Chromium | 61 | 2.66 | 0.015 | 0.016 | 0.0119 | 0.137 | 0.000000028 |
| Lead | 96 | 1.63 | 0.01 | 0.0389 | 0.0125 | 0.523 | 0.00000016 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-1. Table 2*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-2 (0-3'): Northern Cardinal*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Northern Cardinal** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.045 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.19 | FIR |
| Proportion of diet, plants | 0.71 | Pp |
| Proportion of diet, soil inverts | 0.29 | Pi |
| Spatial factor | 0.0015 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00045 | AUF |

**Calculations based on average values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 2613 | 600 | 0.0002 | 0.0046 | 0.091 | 0.00923 | 1.62 | 13.1 | 0.000011 |
| Chromium | 61 | 2.66 | 0.015 | 0.016 | 0.306 | 0.0162 | 0.132 | 1.03 | 0.0002 |
| Lead | 96 | 1.63 | 0.01 | 0.0389 | 0.266 | 0.017 | 0.504 | 1.41 | 0.00053 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-1. Table 3*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-2 (0-3'): White-eyed Vireo*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-eyed Vireo | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.0114 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.3 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, soil inverts | 0.9 | Pi |
| Spatial factor | 0.023 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0069 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 2613 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0146 | 0.361 | 64.2 | 0.00074 |
| Chromium | 61 | 2.66 | 0.015 | 0.016 | 0.306 | 0.0255 | 0.0293 | 5.04 | 0.013 |
| Lead | 96 | 1.63 | 0.01 | 0.0389 | 0.266 | 0.0268 | 0.112 | 6.89 | 0.03 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-1. Table 4*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-2 (0-3'): Red-tailed Hawk*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Red-tailed Hawk** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 1.1 | BW |
| Soil ingestion proportion | 0 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.07 | FIR |
| Proportion of diet, mammals | 0.87 | Pm |
| Proportion of diet, birds | 0.13 | Pb |
| Spatial factor | 0.000024 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000072 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF mammals** | **BAF birds** | **Soil** | **Mammals** | **Birds** | **HQ** |
| Barium | 2613 | 600 | 0.0002 | 0.0566 | 0.0566 | 0 | 9.01 | 1.35 | 0.00000012 |
| Chromium | 61 | 2.66 | 0.015 | 0.0846 | 0.718 | 0 | 0.314 | 0.399 | 0.0000019 |
| Lead | 96 | 1.63 | 0.01 | 0.1054 | 0.191 | 0 | 0.616 | 0.167 | 0.0000035 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-1. Table 5*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-2 (0-3'): Swamp Rabbit*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Swamp Rabbit** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 2.118 | BW |
| Soil ingestion proportion | 0.063 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.13 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0063 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0019 | AUF |

**Calculations based on average values**

| | | | **Absorbed Fraction (AF)** | | **Absorbed Concentration from Medium and Biota** | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 2613 | 5433 | 0.0002 | 0.0046 | 0.00428 | 1.56 | 0.00000055 |
| Chromium | 61 | 2.4 | 0.015 | 0.016 | 0.00749 | 0.127 | 0.00011 |
| Lead | 96 | 4.7 | 0.01 | 0.0389 | 0.00786 | 0.485 | 0.0002 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-1. Table 6*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-2 (0-3'): White-Tailed Deer*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-Tailed Deer | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 97 | BW |
| Soil ingestion proportion | 0.02 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.031 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0002 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00006 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 2613 | 5433 | 0.0002 | 0.0046 | 0.000324 | 0.373 | 0.0000000041 |
| Chromium | 61 | 2.4 | 0.015 | 0.016 | 0.000567 | 0.0303 | 0.00000077 |
| Lead | 96 | 4.7 | 0.01 | 0.0389 | 0.000595 | 0.116 | 0.0000015 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-1. Table 7*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-2 (0-3'): Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.743 | Pp |
| Proportion of diet, soil inverts | 0.123 | Pi |
| Proportion of diet, mammals | 0.089 | Pm |
| Proportion of diet, birds | 0.02 | Pb |
| Proportion of diet, benthic inverts | 0.021 | Pbi |
| Proportion of diet, fish | 0.004 | Pf |
| Spatial factor | 0.00014 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.000042 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | | | | | Absorbed Concentration from Medium and Biota | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **BAF mammals** | **BAF birds** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Plants** | **Soil Inverts** | **Mammals** | **Birds** | **Benthic Inverts** | **Fish** | **HQ** |
| Barium | 2613 | 5433 | 0.0002 | 0.0046 | 0.091 | 0.0566 | 0.0566 | - | - | 0.00172 | 0.313 | 1.02 | 0.461 | 0.104 | NA | NA | 0.000000015 |
| Chromium | 61 | 2.4 | 0.015 | 0.016 | 0.306 | 0.0846 | 0.718 | - | - | 0.00301 | 0.0254 | 0.0804 | 0.0161 | 0.0307 | NA | NA | 0.0000027 |
| Lead | 96 | 4.7 | 0.01 | 0.0389 | 0.266 | 0.1054 | 0.191 | - | - | 0.00316 | 0.0971 | 0.11 | 0.0315 | 0.0128 | NA | NA | 0.0000023 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-1. Table 8*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-2 (0-3'): Coyote*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Coyote | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 14 | BW |
| Soil ingestion proportion | 0.028 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.028 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, mammals | 0.9 | Pm |
| Spatial factor | 0.0000007 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000002 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **Soil** | **Plants** | **Mammals** | **HQ** |
| Barium | 2613 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.00041 | 0.0337 | 3.73 | 0.00000000014 |
| Chromium | 61 | 2.4 | 0.015 | 0.016 | 0.0846 | 0.000717 | 0.00273 | 0.13 | 0.000000011 |
| Lead | 96 | 4.7 | 0.01 | 0.0389 | 0.1054 | 0.000753 | 0.0105 | 0.255 | 0.000000011 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-2. Table 1*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-4 (0-3'): Mourning Dove*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Mourning Dove** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.12 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.14 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.000011 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000033 | AUF |

**Calculations based on average values**

| | | | **Absorbed Fraction (AF)** | | **Absorbed Concentration from Medium and Biota** | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 2097 | 600 | 0.0002 | 0.0046 | 0.00546 | 1.35 | 0.0000000075 |
| Zinc | 166 | 66.1 | 0.1 | 0.366 | 0.216 | 8.51 | 0.00000044 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-2. Table 2*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-4 (0-3'): Northern Cardinal*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Northern Cardinal** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.045 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.19 | FIR |
| Proportion of diet, plants | 0.71 | Pp |
| Proportion of diet, soil inverts | 0.29 | Pi |
| Spatial factor | 0.0088 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0026 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 2097 | 600 | 0.0002 | 0.0046 | 0.091 | 0.00741 | 1.3 | 10.5 | 0.000051 |
| Zinc | 166 | 66.1 | 0.1 | 0.366 | 3.201 | 0.293 | 8.2 | 29.3 | 0.0015 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-2. Table 3*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-4 (0-3'): White-eyed Vireo*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-eyed Vireo | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.0114 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.3 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, soil inverts | 0.9 | Pi |
| Spatial factor | 0.14 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.042 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 2097 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0117 | 0.289 | 51.5 | 0.0036 |
| Zinc | 166 | 66.1 | 0.1 | 0.366 | 3.201 | 0.463 | 1.82 | 143 | 0.092 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-2. Table 4*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-4 (0-3'): Red-tailed Hawk*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Red-tailed Hawk** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 1.1 | BW |
| Soil ingestion proportion | 0 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.07 | FIR |
| Proportion of diet, mammals | 0.87 | Pm |
| Proportion of diet, birds | 0.13 | Pb |
| Spatial factor | 0.00014 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.000042 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF mammals** | **BAF birds** | **Soil** | **Mammals** | **Birds** | **HQ** |
| Barium | 2097 | 600 | 0.0002 | 0.0566 | 0.0566 | 0 | 7.23 | 1.08 | 0.00000058 |
| Zinc | 166 | 66.1 | 0.1 | 0.7717 | 0.0645 | 0 | 7.8 | 0.0974 | 0.000005 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-2. Table 5*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-4 (0-3'): Swamp Rabbit*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Swamp Rabbit** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 2.118 | BW |
| Soil ingestion proportion | 0.063 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.13 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.038 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.011 | AUF |

**Calculations based on average values**

| | | | **Absorbed Fraction (AF)** | | **Absorbed Concentration from Medium and Biota** | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 2097 | 5433 | 0.0002 | 0.0046 | 0.00343 | 1.25 | 0.0000025 |
| Zinc | 166 | 75.4 | 0.1 | 0.366 | 0.136 | 7.9 | 0.0012 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-2. Table 6*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-4 (0-3'): White-Tailed Deer*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-Tailed Deer | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 97 | BW |
| Soil ingestion proportion | 0.02 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.031 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0012 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00036 | AUF |

**Calculations based on average values**

| | | | **Absorbed Fraction (AF)** | | **Absorbed Concentration from Medium and Biota** | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 2097 | 5433 | 0.0002 | 0.0046 | 0.00026 | 0.299 | 0.0000000200 |
| Zinc | 166 | 75.4 | 0.1 | 0.366 | 0.0103 | 1.88 | 0.000009 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-2. Table 7*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-4 (0-3'): Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon Parameter | Value | Symbol |
|---|---|---|
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.743 | Pp |
| Proportion of diet, soil inverts | 0.123 | Pi |
| Proportion of diet, mammals | 0.089 | Pm |
| Proportion of diet, birds | 0.02 | Pb |
| Proportion of diet, benthic inverts | 0.021 | Pbi |
| Proportion of diet, fish | 0.004 | Pf |
| Spatial factor | 0.00082 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00025 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | | | | | Absorbed Concentration from Medium and Biota | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COPEC | Average Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF soil inverts | BAF mammals | BAF birds | BAF benthic inverts | BAF fish | Soil | Plants | Soil Inverts | Mammals | Birds | Benthic Inverts | Fish | HQ |
| Barium | 2097 | 5433 | 0.0002 | 0.0046 | 0.091 | 0.0566 | 0.0566 | - | - | 0.00138 | 0.251 | 0.822 | 0.37 | 0.0831 | NA | NA | 0.00000007 |
| Zinc | 166 | 75.4 | 0.1 | 0.366 | 3.201 | 0.7717 | 0.0645 | - | - | 0.0546 | 1.58 | 2.29 | 0.399 | 0.00749 | NA | NA | 0.000014 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-2. Table 8*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-4 (0-3'): Coyote*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Coyote | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 14 | BW |
| Soil ingestion proportion | 0.028 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.028 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, mammals | 0.9 | Pm |
| Spatial factor | 0.0000043 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000013 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **Soil** | **Plants** | **Mammals** | **HQ** |
| Barium | 2097 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.000329 | 0.027 | 2.99 | 0.00000000072 |
| Zinc | 166 | 75.4 | 0.1 | 0.366 | 0.7717 | 0.013 | 0.17 | 3.23 | 0.000000059 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-3. Table 1*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-5 (0-3'): Mourning Dove*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Mourning Dove** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.12 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.14 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.000018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000054 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 2915 | 600 | 0.0002 | 0.0046 | 0.00759 | 1.88 | 0.0000000170 |
| Cadmium | 0.69 | 1.47 | 0.036 | 0.586 | 0.000323 | 0.0566 | 0.00000021 |
| Chromium | 112 | 2.66 | 0.015 | 0.016 | 0.0219 | 0.251 | 0.00000055 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-3. Table 2*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-5 (0-3'): Northern Cardinal*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Northern Cardinal** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.045 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.19 | FIR |
| Proportion of diet, plants | 0.71 | Pp |
| Proportion of diet, soil inverts | 0.29 | Pi |
| Spatial factor | 0.015 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0045 | AUF |

**Calculations based on average values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 2915 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0103 | 1.81 | 14.6 | 0.00012 |
| Cadmium | 0.69 | 1.47 | 0.036 | 0.586 | 7.708 | 0.000439 | 0.0545 | 0.293 | 0.0011 |
| Chromium | 112 | 2.66 | 0.015 | 0.016 | 0.306 | 0.0297 | 0.242 | 1.89 | 0.0037 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-3. Table 3*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-5 (0-3'): White-eyed Vireo*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **White-eyed Vireo** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.0114 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.3 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, soil inverts | 0.9 | Pi |
| Spatial factor | 0.23 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.069 | AUF |

**Calculations based on average values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 2915 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0163 | 0.402 | 71.6 | 0.0083 |
| Cadmium | 0.69 | 1.47 | 0.036 | 0.586 | 7.708 | 0.000693 | 0.0121 | 1.44 | 0.068 |
| Chromium | 112 | 2.66 | 0.015 | 0.016 | 0.306 | 0.0469 | 0.0538 | 9.25 | 0.24 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-3. Table 4*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-5 (0-3'): Red-tailed Hawk*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Red-tailed Hawk** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 1.1 | BW |
| Soil ingestion proportion | 0 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.07 | FIR |
| Proportion of diet, mammals | 0.87 | Pm |
| Proportion of diet, birds | 0.13 | Pb |
| Spatial factor | 0.00024 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.000072 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF mammals** | **BAF birds** | **Soil** | **Mammals** | **Birds** | **HQ** |
| Barium | 2915 | 600 | 0.0002 | 0.0566 | 0.0566 | 0 | 10 | 1.5 | 0.0000014 |
| Cadmium | 0.69 | 1.47 | 0.036 | 0.3333 | 0.113 | 0 | 0.014 | 0.00071 | 0.00000072 |
| Chromium | 112 | 2.66 | 0.015 | 0.0846 | 0.718 | 0 | 0.577 | 0.732 | 0.000035 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-3. Table 5*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-5 (0-3'): Swamp Rabbit*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Swamp Rabbit** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 2.118 | BW |
| Soil ingestion proportion | 0.063 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.13 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.063 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.019 | AUF |

**Calculations based on average values**

| | | | **Absorbed Fraction (AF)** | | **Absorbed Concentration from Medium and Biota** | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 2915 | 5433 | 0.0002 | 0.0046 | 0.00477 | 1.74 | 0.0000061 |
| Cadmium | 0.69 | 0.77 | 0.036 | 0.586 | 0.000203 | 0.0526 | 0.0013 |
| Chromium | 112 | 2.4 | 0.015 | 0.016 | 0.0138 | 0.233 | 0.002 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-3. Table 6*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-5 (0-3'): White-Tailed Deer*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-Tailed Deer | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 97 | BW |
| Soil ingestion proportion | 0.02 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.031 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.002 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0006 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 2915 | 5433 | 0.0002 | 0.0046 | 0.000361 | 0.416 | 0.0000000460 |
| Cadmium | 0.69 | 0.77 | 0.036 | 0.586 | 0.0000154 | 0.0125 | 0.0000098 |
| Chromium | 112 | 2.4 | 0.015 | 0.016 | 0.00104 | 0.0556 | 0.000014 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-3. Table 7*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-5 (0-3'): Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon Parameter | Value | Symbol |
|---|---|---|
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.743 | Pp |
| Proportion of diet, soil inverts | 0.123 | Pi |
| Proportion of diet, mammals | 0.089 | Pm |
| Proportion of diet, birds | 0.02 | Pb |
| Proportion of diet, benthic inverts | 0.021 | Pbi |
| Proportion of diet, fish | 0.004 | Pf |
| Spatial factor | 0.0014 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00042 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | | | | | Absorbed Concentration from Medium and Biota | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COPEC | Average Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF soil inverts | BAF mammals | BAF birds | BAF benthic inverts | BAF fish | Soil | Plants | Soil Inverts | Mammals | Birds | Benthic Inverts | Fish | HQ |
| Barium | 2915 | 5433 | 0.0002 | 0.0046 | 0.091 | 0.0566 | 0.0566 | - | - | 0.00192 | 0.349 | 1.14 | 0.514 | 0.115 | NA | NA | 0.00000016 |
| Cadmium | 0.69 | 0.77 | 0.036 | 0.586 | 7.708 | 0.3333 | 0.113 | - | - | 0.0000817 | 0.0105 | 0.0229 | 0.000716 | 0.0000546 | NA | NA | 0.000019 |
| Chromium | 112 | 2.4 | 0.015 | 0.016 | 0.306 | 0.0846 | 0.718 | - | - | 0.00553 | 0.0466 | 0.148 | 0.0295 | 0.0563 | NA | NA | 0.00005 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-3. Table 8*
*Soil HQ Calculations (Average Conc.): Preliminary AOI HA-5 (0-3'): Coyote*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Coyote | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 14 | BW |
| Soil ingestion proportion | 0.028 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.028 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, mammals | 0.9 | Pm |
| Spatial factor | 0.0000071 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000021 | AUF |

**Calculations based on average values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **Soil** | **Plants** | **Mammals** | **HQ** |
| Barium | 2915 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.000457 | 0.0375 | 4.16 | 0.00000000160 |
| Cadmium | 0.69 | 0.77 | 0.036 | 0.586 | 0.3333 | 0.0000195 | 0.00113 | 0.0058 | 0.000000019 |
| Chromium | 112 | 2.4 | 0.015 | 0.016 | 0.0846 | 0.00132 | 0.00502 | 0.239 | 0.00000021 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-4. Table 1*
*Soil HQ Calculations (Average Conc.): Preliminary AOI CD-1 (0-3'): Mourning Dove*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Mourning Dove | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.12 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.14 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0000018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000005 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 3340 | 600 | 0.0002 | 0.0046 | 0.0087 | 2.15 | 0.0000000018 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-4. Table 2*
*Soil HQ Calculations (Average Conc.): Preliminary AOI CD-1 (0-3'): Northern Cardinal*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Northern Cardinal | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.045 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.19 | FIR |
| Proportion of diet, plants | 0.71 | Pp |
| Proportion of diet, soil inverts | 0.29 | Pi |
| Spatial factor | 0.0015 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00045 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 3340 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0118 | 2.07 | 16.7 | 0.000014 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-4. Table 3*
*Soil HQ Calculations (Average Conc.): Preliminary AOI CD-1 (0-3'): White-eyed Vireo*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-eyed Vireo | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.0114 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.3 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, soil inverts | 0.9 | Pi |
| Spatial factor | 0.023 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0069 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 3340 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0186 | 0.461 | 82.1 | 0.00095 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-4. Table 4*
*Soil HQ Calculations (Average Conc.): Preliminary AOI CD-1 (0-3'): Red-tailed Hawk*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Red-tailed Hawk** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 1.1 | BW |
| Soil ingestion proportion | 0 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.07 | FIR |
| Proportion of diet, mammals | 0.87 | Pm |
| Proportion of diet, birds | 0.13 | Pb |
| Spatial factor | 0.000024 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000072 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF mammals** | **BAF birds** | **Soil** | **Mammals** | **Birds** | **HQ** |
| Barium | 3340 | 600 | 0.0002 | 0.0566 | 0.0566 | 0 | 11.5 | 1.72 | 0.00000016 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-4. Table 5*
*Soil HQ Calculations (Average Conc.): Preliminary AOI CD-1 (0-3'): Swamp Rabbit*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Swamp Rabbit | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 2.118 | BW |
| Soil ingestion proportion | 0.063 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.13 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0063 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0019 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 3340 | 5433 | 0.0002 | 0.0046 | 0.00547 | 2 | 0.0000007 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-4. Table 6*
*Soil HQ Calculations (Average Conc.): Preliminary AOI CD-1 (0-3'): White-Tailed Deer*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-Tailed Deer | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 97 | BW |
| Soil ingestion proportion | 0.02 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.031 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0002 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00006 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 3340 | 5433 | 0.0002 | 0.0046 | 0.000414 | 0.476 | 0.0000000053 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-4. Table 7*
*Soil HQ Calculations (Average Conc.): Preliminary AOI CD-1 (0-3'); Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food Ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.743 | Pp |
| Proportion of diet, soil inverts | 0.123 | Pi |
| Proportion of diet, mammals | 0.089 | Pm |
| Proportion of diet, birds | 0.02 | Pb |
| Proportion of diet, benthic inverts | 0.021 | Pbi |
| Proportion of diet, fish | 0.004 | Pf |
| Spatial factor | 0.00014 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.000042 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | | | | | Absorbed Concentration from Medium and Biota | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Average Soil Concentration (0-3') | **TRV** | Soil bio-factor | BAF plants | BAF soil inverts | BAF mammals | BAF birds | BAF benthic inverts | BAF fish | **Soil** | **Plants** | Soil Inverts | Mammals | **Birds** | Benthic Inverts | **Fish** | **HQ** |
| Barium | 3340 | 5433 | 0.0002 | 0.0046 | 0.091 | 0.0566 | 0.0566 | - | - | 0.0022 | 0.4 | 1.31 | 0.589 | 0.132 | NA | NA | 0.000000019 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix I-4. Table 8*
*Soil HQ Calculations (Average Conc.): Preliminary AOI CD-1 (0-3'): Coyote*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Coyote | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 14 | BW |
| Soil ingestion proportion | 0.028 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.028 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, mammals | 0.9 | Pm |
| Spatial factor | 0.0000007 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000002 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **Soil** | **Plants** | **Mammals** | **HQ** |
| Barium | 3340 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.000524 | 0.043 | 4.76 | 0.00000000018 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

# APPENDIX J SUPPLEMENTAL ANALYSIS

*Appendix J-1. Table 1*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-2 (0-3'): Mourning Dove*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Mourning Dove** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.12 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.14 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0000018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000005 | AUF |

**Calculations based on maximum values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 4640 | 600 | 0.0002 | 0.0046 | 0.0121 | 2.99 | 0.0000000025 |
| Chromium | 192 | 2.66 | 0.015 | 0.016 | 0.0375 | 0.43 | 0.000000088 |
| Lead | 262 | 1.63 | 0.01 | 0.0389 | 0.0341 | 1.43 | 0.00000045 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-1. Table 2*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-2 (0-3'): Northern Cardinal*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Northern Cardinal** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.045 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.19 | FIR |
| Proportion of diet, plants | 0.71 | Pp |
| Proportion of diet, soil inverts | 0.29 | Pi |
| Spatial factor | 0.0015 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00045 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 4640 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0164 | 2.88 | 23.3 | 0.00002 |
| Chromium | 192 | 2.66 | 0.015 | 0.016 | 0.306 | 0.0509 | 0.414 | 3.24 | 0.00063 |
| Lead | 262 | 1.63 | 0.01 | 0.0389 | 0.266 | 0.0463 | 1.37 | 3.84 | 0.0015 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-1. Table 3*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-2 (0-3'): White-eyed Vireo*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-eyed Vireo | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.0114 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.3 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, soil inverts | 0.9 | Pi |
| Spatial factor | 0.023 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0069 | AUF |

**Calculations based on maximum values**

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 4640 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0259 | 0.64 | 114 | 0.0013 |
| Chromium | 192 | 2.66 | 0.015 | 0.016 | 0.306 | 0.0804 | 0.0922 | 15.9 | 0.042 |
| Lead | 262 | 1.63 | 0.01 | 0.0389 | 0.266 | 0.0731 | 0.306 | 18.8 | 0.081 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-1. Table 4*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-2 (0-3'): Red-tailed Hawk*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Red-tailed Hawk** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 1.1 | BW |
| Soil ingestion proportion | 0 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.07 | FIR |
| Proportion of diet, mammals | 0.87 | Pm |
| Proportion of diet, birds | 0.13 | Pb |
| Spatial factor | 0.000024 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000072 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Maximum Soil Concentration (0-3') | **TRV** | **Soil bio-factor** | **BAF mammals** | **BAF birds** | **Soil** | **Mammals** | **Birds** | **HQ** |
| Barium | 4640 | 600 | 0.0002 | 0.0566 | 0.0566 | 0 | 16 | 2.39 | 0.00000022 |
| Chromium | 192 | 2.66 | 0.015 | 0.0846 | 0.718 | 0 | 0.989 | 1.25 | 0.0000061 |
| Lead | 262 | 1.63 | 0.01 | 0.1054 | 0.191 | 0 | 1.68 | 0.455 | 0.0000094 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-1. Table 5*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-2 (0-3'): Swamp Rabbit*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Swamp Rabbit** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 2.118 | BW |
| Soil ingestion proportion | 0.063 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.13 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0063 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0019 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | **Absorbed Concentration from Medium and Biota** | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 4640 | 5433 | 0.0002 | 0.0046 | 0.0076 | 2.77 | 0.00000097 |
| Chromium | 192 | 2.4 | 0.015 | 0.016 | 0.0236 | 0.399 | 0.00033 |
| Lead | 262 | 4.7 | 0.01 | 0.0389 | 0.0215 | 1.32 | 0.00054 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-1. Table 6*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-2 (0-3'): White-Tailed Deer*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-Tailed Deer | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 97 | BW |
| Soil ingestion proportion | 0.02 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.031 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0002 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00006 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 4640 | 5433 | 0.0002 | 0.0046 | 0.000575 | 0.662 | 0.0000000073 |
| Chromium | 192 | 2.4 | 0.015 | 0.016 | 0.00179 | 0.0952 | 0.0000024 |
| Lead | 262 | 4.7 | 0.01 | 0.0389 | 0.00162 | 0.316 | 0.0000041 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-1. Table 7*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-2 (0-3'): Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon Parameter | Value | Symbol |
|---|---|---|
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.743 | Pp |
| Proportion of diet, soil inverts | 0.123 | Pi |
| Proportion of diet, mammals | 0.089 | Pm |
| Proportion of diet, birds | 0.02 | Pb |
| Proportion of diet, benthic inverts | 0.021 | Pbi |
| Proportion of diet, fish | 0.004 | Pf |
| Spatial factor | 0.00014 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.000042 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | | | | | Absorbed Concentration from Medium and Biota | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COPEC | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF soil inverts | BAF mammals | BAF birds | BAF benthic inverts | BAF fish | Soil | Plants | Soil Inverts | Mammals | Birds | Benthic Inverts | Fish | HQ |
| Barium | 4640 | 5433 | 0.0002 | 0.0046 | 0.091 | 0.0566 | 0.0566 | - | - | 0.00305 | 0.555 | 1.82 | 0.818 | 0.184 | NA | NA | 0.000000026 |
| Chromium | 192 | 2.4 | 0.015 | 0.016 | 0.306 | 0.0846 | 0.718 | - | - | 0.00948 | 0.0799 | 0.253 | 0.0506 | 0.0965 | NA | NA | 0.0000086 |
| Lead | 262 | 4.7 | 0.01 | 0.0389 | 0.266 | 0.1054 | 0.191 | - | - | 0.00862 | 0.265 | 0.3 | 0.086 | 0.035 | NA | NA | 0.0000062 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_1^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-1. Table 8*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-2 (0-3'): Coyote*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Coyote | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 14 | BW |
| Soil ingestion proportion | 0.028 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.028 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, mammals | 0.9 | Pm |
| Spatial factor | 0.0000007 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000002 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **Soil** | **Plants** | **Mammals** | **HQ** |
| Barium | 4640 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.000728 | 0.0598 | 6.62 | 0.00000000025 |
| Chromium | 192 | 2.4 | 0.015 | 0.016 | 0.0846 | 0.00226 | 0.0086 | 0.409 | 0.000000035 |
| Lead | 262 | 4.7 | 0.01 | 0.0389 | 0.1054 | 0.00205 | 0.0285 | 0.696 | 0.000000031 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in Preliminary AOI HA-2, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-2. Table 1*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-4 (0-3'): Mourning Dove*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Mourning Dove** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.12 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.14 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.000011 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000033 | AUF |

**Calculations based on maximum values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 4230 | 600 | 0.0002 | 0.0046 | 0.011 | 2.72 | 0.0000000150 |
| Zinc | 513 | 66.1 | 0.1 | 0.366 | 0.668 | 26.3 | 0.0000013 |
| - | - | - | - | - | - | - | - |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-2. Table 2*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-4 (0-3'): Northern Cardinal*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Northern Cardinal** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.045 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.19 | FIR |
| Proportion of diet, plants | 0.71 | Pp |
| Proportion of diet, soil inverts | 0.29 | Pi |
| Spatial factor | 0.0088 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0026 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 4230 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0149 | 2.62 | 21.2 | 0.0001 |
| Zinc | 513 | 66.1 | 0.1 | 0.366 | 3.201 | 0.906 | 25.3 | 90.5 | 0.0046 |
| - | - | - | - | - | - | - | - | - | - |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-2. Table 3*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-4 (0-3'): White-eyed Vireo*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-eyed Vireo | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.0114 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.3 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, soil inverts | 0.9 | Pi |
| Spatial factor | 0.14 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.042 | AUF |

**Calculations based on maximum values**

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 4230 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0236 | 0.584 | 104 | 0.0073 |
| Zinc | 513 | 66.1 | 0.1 | 0.366 | 3.201 | 1.43 | 5.63 | 443 | 0.29 |
| - | - | - | - | - | - | - | - | - | - |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-2. Table 4*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-4 (0-3'): Red-tailed Hawk*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Red-tailed Hawk** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 1.1 | BW |
| Soil ingestion proportion | 0 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.07 | FIR |
| Proportion of diet, mammals | 0.87 | Pm |
| Proportion of diet, birds | 0.13 | Pb |
| Spatial factor | 0.00014 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.000042 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF mammals** | **BAF birds** | **Soil** | **Mammals** | **Birds** | **HQ** |
| Barium | 4230 | 600 | 0.0002 | 0.0566 | 0.0566 | 0 | 14.6 | 2.18 | 0.0000012 |
| Zinc | 513 | 66.1 | 0.1 | 0.7717 | 0.0645 | 0 | 24.1 | 0.301 | 0.000016 |
| - | - | - | - | - | - | - | - | - | - |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-2. Table 5*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-4 (0-3'): Swamp Rabbit*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Swamp Rabbit** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 2.118 | BW |
| Soil ingestion proportion | 0.063 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.13 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.038 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.011 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | **Absorbed Concentration from Medium and Biota** | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 4230 | 5433 | 0.0002 | 0.0046 | 0.00693 | 2.53 | 0.0000051 |
| Zinc | 513 | 75.4 | 0.1 | 0.366 | 0.42 | 24.4 | 0.0036 |
| - | - | - | - | - | - | - | - |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-2. Table 6*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-4 (0-3'): White-Tailed Deer*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **White-Tailed Deer** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 97 | BW |
| Soil ingestion proportion | 0.02 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.031 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0012 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00036 | AUF |

**Calculations based on maximum values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 4230 | 5433 | 0.0002 | 0.0046 | 0.000525 | 0.603 | 0.0000000400 |
| Zinc | 513 | 75.4 | 0.1 | 0.366 | 0.0318 | 5.82 | 0.000028 |
| - | - | - | - | - | - | - | - |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-2. Table 7*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-4 (0-3'): Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon Parameter | Value | Symbol |
|---|---|---|
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food Ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.743 | Pp |
| Proportion of diet, soil inverts | 0.123 | Pi |
| Proportion of diet, mammals | 0.089 | Pm |
| Proportion of diet, birds | 0.02 | Pb |
| Proportion of diet, benthic inverts | 0.021 | Pbi |
| Proportion of diet, fish | 0.004 | Pf |
| Spatial factor | 0.00082 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00025 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | | | | | Absorbed Concentration from Medium and Biota | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COPEC | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF soil inverts | BAF mammals | BAF birds | BAF benthic inverts | BAF fish | Soil | Plants | Soil Inverts | Mammals | Birds | Benthic Inverts | Fish | HQ |
| Barium | 4230 | 5433 | 0.0002 | 0.0046 | 0.091 | 0.0566 | 0.0566 | - | - | 0.00278 | 0.506 | 1.66 | 0.746 | 0.168 | NA | NA | 0.00000014 |
| Zinc | 513 | 75.4 | 0.1 | 0.366 | 3.201 | 0.7717 | 0.0645 | - | - | 0.169 | 4.88 | 7.07 | 1.23 | 0.0252 | NA | NA | 0.000044 |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_1^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-2. Table 8*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-4 (0-3'): Coyote*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Coyote | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 14 | BW |
| Soil ingestion proportion | 0.028 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.028 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, mammals | 0.9 | Pm |
| Spatial factor | 0.0000043 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000013 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **Soil** | **Plants** | **Mammals** | **HQ** |
| Barium | 4230 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.000663 | 0.0545 | 6.03 | 0.00000000150 |
| Zinc | 513 | 75.4 | 0.1 | 0.366 | 0.7717 | 0.0402 | 0.526 | 9.98 | 0.00000018 |
| - | - | - | - | - | - | - | - | - | - |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-4, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-3. Table 1*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-5 (0-3'): Mourning Dove*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Mourning Dove** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.12 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.14 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.000018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000054 | AUF |

**Calculations based on maximum values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 4230 | 600 | 0.0002 | 0.0046 | 0.011 | 2.72 | 0.0000000250 |
| Cadmium | 1.35 | 1.47 | 0.036 | 0.586 | 0.000633 | 0.111 | 0.00000041 |
| Chromium | 107 | 2.66 | 0.015 | 0.016 | 0.0209 | 0.24 | 0.00000053 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-3. Table 2*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-5 (0-3'): Northern Cardinal*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Northern Cardinal** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.045 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.19 | FIR |
| Proportion of diet, plants | 0.71 | Pp |
| Proportion of diet, soil inverts | 0.29 | Pi |
| Spatial factor | 0.015 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0045 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 4230 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0149 | 2.62 | 21.2 | 0.00018 |
| Cadmium | 1.35 | 1.47 | 0.036 | 0.586 | 7.708 | 0.000859 | 0.107 | 0.573 | 0.0021 |
| Chromium | 107 | 2.66 | 0.015 | 0.016 | 0.306 | 0.0284 | 0.231 | 1.8 | 0.0035 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-3. Table 3*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-5 (0-3'): White-eyed Vireo*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **White-eyed Vireo** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.0114 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.3 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, soil inverts | 0.9 | Pi |
| Spatial factor | 0.23 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.069 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 4230 | 600 | 0.0002 | 0.0046 | 0.091 | **0.0236** | 0.584 | 104 | 0.012 |
| Cadmium | 1.35 | 1.47 | 0.036 | 0.586 | 7.708 | **0.00136** | 0.0237 | 2.81 | 0.13 |
| Chromium | 107 | 2.66 | **0.015** | **0.016** | **0.306** | **0.0448** | **0.0514** | **8.84** | 0.23 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-3. Table 4*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-5 (0-3'): Red-tailed Hawk*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Red-tailed Hawk** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 1.1 | BW |
| Soil ingestion proportion | 0 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.07 | FIR |
| Proportion of diet, mammals | 0.87 | Pm |
| Proportion of diet, birds | 0.13 | Pb |
| Spatial factor | 0.00024 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.000072 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Maximum Soil Concentration (0-3') | **TRV** | **Soil bio-factor** | **BAF mammals** | **BAF birds** | **Soil** | **Mammals** | **Birds** | **HQ** |
| Barium | 4230 | 600 | 0.0002 | 0.0566 | 0.0566 | 0 | 14.6 | 2.18 | 0.000002 |
| Cadmium | 1.35 | 1.47 | 0.036 | 0.3333 | 0.113 | 0 | 0.0274 | 0.00139 | 0.0000014 |
| Chromium | 107 | 2.66 | 0.015 | 0.0846 | 0.718 | 0 | 0.551 | 0.699 | 0.000034 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-3. Table 5*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-5 (0-3'): Swamp Rabbit*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Swamp Rabbit** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 2.118 | BW |
| Soil ingestion proportion | 0.063 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.13 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.063 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.019 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | **Absorbed Concentration from Medium and Biota** | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 4230 | 5433 | 0.0002 | 0.0046 | 0.00693 | 2.53 | 0.0000089 |
| Cadmium | 1.35 | 0.77 | 0.036 | 0.586 | 0.000398 | 0.103 | 0.0026 |
| Chromium | 107 | 2.4 | 0.015 | 0.016 | 0.0131 | 0.223 | 0.0019 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-3. Table 6*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-5 (0-3'): White-Tailed Deer*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-Tailed Deer | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 97 | BW |
| Soil ingestion proportion | 0.02 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.031 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.002 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0006 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 4230 | 5433 | 0.0002 | 0.0046 | 0.000525 | 0.603 | 0.0000000670 |
| Cadmium | 1.35 | 0.77 | 0.036 | 0.586 | 0.0000301 | 0.0245 | 0.000019 |
| Chromium | 107 | 2.4 | 0.015 | 0.016 | 0.000995 | 0.0531 | 0.000014 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-3. Table 7*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-5 (0-3'): Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon Parameter | Value | Symbol |
|---|---|---|
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food Ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.743 | Pp |
| Proportion of diet, soil inverts | 0.123 | Pi |
| Proportion of diet, mammals | 0.089 | Pm |
| Proportion of diet, birds | 0.02 | Pb |
| Proportion of diet, benthic inverts | 0.021 | Pbi |
| Proportion of diet, fish | 0.004 | Pf |
| Spatial factor | 0.0014 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00042 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | | | | | Absorbed Concentration from Medium and Biota | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COPEC | Maximum Soil Concentration (mg/kg) | TRV | Soil bio-factor | BAF plants | BAF soil inverts | BAF mammals | BAF birds | BAF benthic inverts | BAF fish | Soil | Plants | Soil Inverts | Mammals | Birds | Benthic Inverts | Fish | HQ |
| Barium | 4230 | 5433 | 0.0002 | 0.0046 | 0.091 | 0.0566 | 0.0566 | - | - | 0.00278 | 0.506 | 1.66 | 0.746 | 0.168 | NA | NA | 0.00000024 |
| Cadmium | 1.35 | 0.77 | 0.036 | 0.586 | 7.708 | 0.3333 | 0.113 | - | - | 0.00016 | 0.0206 | 0.0448 | 0.0014 | 0.000107 | NA | NA | 0.000037 |
| Chromium | 107 | 2.4 | 0.015 | 0.016 | 0.306 | 0.0846 | 0.718 | - | - | 0.00528 | 0.0445 | 0.141 | 0.0282 | 0.0538 | NA | NA | 0.000048 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_1^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-3. Table 8*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI HA-5 (0-3'): Coyote*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Coyote | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 14 | BW |
| Soil ingestion proportion | 0.028 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.028 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, mammals | 0.9 | Pm |
| Spatial factor | 0.0000071 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000021 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **Soil** | **Plants** | **Mammals** | **HQ** |
| Barium | 4230 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.000663 | 0.0545 | 6.03 | 0.00000000240 |
| Cadmium | 1.35 | 0.77 | 0.036 | 0.586 | 0.3333 | 0.0000381 | 0.00222 | 0.0113 | 0.000000037 |
| Chromium | 107 | 2.4 | 0.015 | 0.016 | 0.0846 | 0.00126 | 0.00479 | 0.228 | 0.0000002 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI HA-5, including split samples.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-4. Table 1*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI CD-1 (0-3'): Mourning Dove*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Mourning Dove** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.12 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.14 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0000018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000005 | AUF |

**Calculations based on maximum values**

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 5590 | 600 | 0.0002 | 0.0046 | 0.0146 | 3.6 | 0.0000000030 |
| - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-4. Table 2*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI CD-1 (0-3'): Northern Cardinal*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Northern Cardinal** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.045 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.19 | FIR |
| Proportion of diet, plants | 0.71 | Pp |
| Proportion of diet, soil inverts | 0.29 | Pi |
| Spatial factor | 0.0015 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00045 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 5590 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0198 | 3.47 | 28 | 0.000024 |
| - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-4. Table 3*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI CD-1 (0-3'): White-eyed Vireo*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-eyed Vireo | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.0114 | BW |
| Soil ingestion proportion | 0.093 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.3 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, soil inverts | 0.9 | Pi |
| Spatial factor | 0.023 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0069 | AUF |

**Calculations based on maximum values**

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF soil inverts** | **Soil** | **Plants** | **Soil Inverts** | **HQ** |
| Barium | 5590 | 600 | 0.0002 | 0.0046 | 0.091 | 0.0312 | 0.771 | 137 | 0.0016 |
| - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-4. Table 4*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI CD-1 (0-3'): Red-tailed Hawk*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Red-tailed Hawk** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 1.1 | BW |
| Soil ingestion proportion | 0 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.07 | FIR |
| Proportion of diet, mammals | 0.87 | Pm |
| Proportion of diet, birds | 0.13 | Pb |
| Spatial factor | 0.000024 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000072 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF mammals** | **BAF birds** | **Soil** | **Mammals** | **Birds** | **HQ** |
| Barium | 5590 | 600 | 0.0002 | 0.0566 | 0.0566 | 0 | 19.3 | 2.88 | 0.00000027 |
| - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-4. Table 5*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI CD-1 (0-3'): Swamp Rabbit*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Swamp Rabbit** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 2.118 | BW |
| Soil ingestion proportion | 0.063 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.13 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0063 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0019 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | **Absorbed Concentration from Medium and Biota** | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 5590 | 5433 | 0.0002 | 0.0046 | 0.00916 | 3.34 | 0.0000012 |
| - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-4. Table 6*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI CD-1 (0-3'): White-Tailed Deer*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| White-Tailed Deer | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 97 | BW |
| Soil ingestion proportion | 0.02 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.031 | FIR |
| Proportion of diet, plants | 1 | Pp |
| Spatial factor | 0.0002 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00006 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | Absorbed Concentration from Medium and Biota | | |
|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **Soil** | **Plants** | **HQ** |
| Barium | 5590 | 5433 | 0.0002 | 0.0046 | 0.000693 | 0.797 | 0.0000000088 |
| - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-4. Table 7*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI CD-1 (0-3'): Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon Parameter | Value | Symbol |
|---|---|---|
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food Ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.743 | Pp |
| Proportion of diet, soil inverts | 0.123 | Pi |
| Proportion of diet, mammals | 0.089 | Pm |
| Proportion of diet, birds | 0.02 | Pb |
| Proportion of diet, benthic inverts | 0.021 | Pbi |
| Proportion of diet, fish | 0.004 | Pf |
| Spatial factor | 0.00014 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.000042 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | | | | | Absorbed Concentration from Medium and Biota | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COPEC | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF soil inverts | BAF mammals | BAF birds | BAF benthic inverts | BAF fish | Soil | Plants | Soil Inverts | Mammals | Birds | Benthic Inverts | Fish | HQ |
| Barium | 5590 | 5433 | 0.0002 | 0.0046 | 0.091 | 0.0566 | 0.0566 | - | - | 0.00368 | 0.669 | 2.19 | 0.986 | 0.221 | NA | NA | 0.000000031 |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_1^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-4. Table 8*
*Soil HQ Calculations (Maximum Conc.): Preliminary AOI CD-1 (0-3'): Coyote*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Coyote | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 14 | BW |
| Soil ingestion proportion | 0.028 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.028 | FIR |
| Proportion of diet, plants | 0.1 | Pp |
| Proportion of diet, mammals | 0.9 | Pm |
| Spatial factor | 0.0000007 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0000002 | AUF |

**Calculations based on maximum values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **Soil** | **Plants** | **Mammals** | **HQ** |
| Barium | 5590 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.000877 | 0.072 | 7.97 | 0.00000000030 |
| - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentration (0-3') in Preliminary AOI CD-1, including split samples and resample.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-5. Table 1*
*Soil HQ Calculations (Average Conc.): HA-4 (0-3') Standing Water Scenario: Black-bellied Whistling Duck*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Black-bellied Whistling Duck | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.82 | BW |
| Soil ingestion proportion | 0.025 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.077 | FIR |
| Proportion of diet, plants | 0.95 | Pp |
| Proportion of diet, benthic inverts | 0.05 | Pbi |
| Spatial factor | 0.016 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0048 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF benthic inverts** | **Soil** | **Plants** | **Benthic Inverts** | **HQ** |
| Barium | 2097 | 600 | 0.0002 | 0.0046 | 0.023 | 0.000807 | 0.706 | 0.186 | **0.0000071** |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in HA-4, including split samples.
Assumed 0.3 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium was the only constituent at HA-4 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-5. Table 2*
*Soil HQ Calculations (Average Conc.): HA-4 (0-3') Standing Water Scenario: Yellow-crowned Night Heron*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Yellow-crowned Night Heron | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.683 | BW |
| Soil ingestion proportion | 0.073 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.082 | FIR |
| Proportion of diet, benthic inverts | 0.78 | Pbi |
| Proportion of diet, fish | 0.22 | Pf |
| Spatial factor | 0.0013 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00039 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Benthic Inverts** | **Fish** | **HQ** |
| Barium | 2097 | 600 | 0.0002 | 0.023 | 0.028 | 0.00251 | 3.08 | 1.06 | 0.0000027 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in HA-4, including split samples.
Assumed 0.3 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium was the only constituent at HA-4 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-5. Table 3*
*Soil HQ Calculations (Average Conc.): HA-4 (0-3') Standing Water Scenario: Snowy Egret*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Snowy Egret** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.371 | BW |
| Soil ingestion proportion | 0.005 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.116 | FIR |
| Proportion of diet, benthic inverts | 0.1 | Pbi |
| Proportion of diet, fish | 0.9 | Pf |
| Spatial factor | 0.0018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00054 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Average Soil Concentration (0-3') | TRV | Soil bio-factor | BAF benthic inverts | BAF fish | Soil | Benthic Inverts | Fish | HQ |
| Barium | 2097 | 600 | 0.0002 | 0.023 | 0.028 | 0.000243 | 0.559 | 6.13 | 0.000006 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in HA-4, including split samples.
Assumed 0.3 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium was the only constituent at HA-4 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-5. Table 4*
*Soil HQ Calculations (Average Conc.): HA-4 (0-3') Standing Water Scenario: Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.46 | Pp |
| Proportion of diet, mammals | 0.06 | Pm |
| Proportion of diet, benthic inverts | 0.46 | Pbi |
| Proportion of diet, fish | 0.02 | Pf |
| Spatial factor | 0.0025 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00075 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | | | | Absorbed Concentration from Medium and Biota | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Plants** | **Mammals** | **Benthic Inverts** | **Fish** | **HQ** |
| Barium | 2097 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.023 | 0.028 | 0.00138 | 0.155 | 0.249 | 0.777 | 0.0411 | 0.00000017 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in HA-4, including split samples.
Assumed 0.3 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium was the only constituent at HA-4 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-6. Table 1*
*Soil HQ Calculations (Average Conc.): HA-5 (0-3') Standing Water Scenario: Black-bellied Whistling Duck*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Black-bellied Whistling Duck | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.82 | BW |
| Soil ingestion proportion | 0.025 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.077 | FIR |
| Proportion of diet, plants | 0.95 | Pp |
| Proportion of diet, benthic inverts | 0.05 | Pbi |
| Spatial factor | 0.016 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0048 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF benthic inverts** | **Soil** | **Plants** | **Benthic Inverts** | **HQ** |
| Barium | 2915 | 600 | 0.0002 | 0.0046 | 0.023 | 0.00112 | 0.981 | 0.258 | 0.0000099 |
| Chromium | 112 | 2.66 | 0.015 | 0.016 | 0.108 | 0.00323 | 0.131 | 0.0466 | 0.00033 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in HA-5, including split samples.
Assumed 0.5 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium and chromium were the only constituents at HA-5 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-6. Table 2*
*Soil HQ Calculations (Average Conc.): HA-5 (0-3') Standing Water Scenario: Yellow-crowned Night Heron*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Yellow-crowned Night Heron | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.683 | BW |
| Soil ingestion proportion | 0.073 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.082 | FIR |
| Proportion of diet, benthic inverts | 0.78 | Pbi |
| Proportion of diet, fish | 0.22 | Pf |
| Spatial factor | 0.0013 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00039 | AUF |

Calculations based on average values

| | | Absorbed Fraction (AF) | | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Benthic Inverts** | **Fish** | **HQ** |
| Barium | 2915 | 600 | 0.0002 | 0.023 | 0.028 | 0.00349 | 4.29 | 1.47 | 0.0000037 |
| Chromium | 112 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.0101 | 0.774 | 0.00754 | 0.00012 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in HA-5, including split samples.
Assumed 0.5 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium and chromium were the only constituents at HA-5 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-6. Table 3*
*Soil HQ Calculations (Average Conc.): HA-5 (0-3') Standing Water Scenario: Snowy Egret*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Snowy Egret | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.371 | BW |
| Soil ingestion proportion | 0.005 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.116 | FIR |
| Proportion of diet, benthic inverts | 0.1 | Pbi |
| Proportion of diet, fish | 0.9 | Pf |
| Spatial factor | 0.0018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00054 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Average Soil Concentration (0-3') | TRV | Soil bio-factor | BAF benthic inverts | BAF fish | Soil | Benthic Inverts | Fish | HQ |
| Barium | 2915 | 600 | 0.0002 | 0.023 | 0.028 | 0.000338 | 0.778 | 8.52 | 0.0000084 |
| Chromium | 112 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.000974 | 0.14 | 0.0436 | 0.000037 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in HA-5, including split samples.
Assumed 0.5 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium and chromium were the only constituents at HA-5 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-6, Table 4*
*Soil HQ Calculations (Average Conc.): HA-5 (0-3') Standing Water Scenario: Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.46 | Pp |
| Proportion of diet, mammals | 0.06 | Pm |
| Proportion of diet, benthic inverts | 0.46 | Pbi |
| Proportion of diet, fish | 0.02 | Pf |
| Spatial factor | 0.0025 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00075 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | | | | Absorbed Concentration from Medium and Biota | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Average Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF mammals | BAF benthic inverts | BAF fish | **Soil** | **Plants** | **Mammals** | **Benthic Inverts** | **Fish** | **HQ** |
| Barium | 2915 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.023 | 0.028 | 0.00192 | 0.216 | 0.346 | 1.08 | 0.0571 | 0.00000023 |
| Chromium | 112 | 2.4 | 0.015 | 0.016 | 0.0846 | 0.108 | 0.00373 | 0.00553 | 0.0289 | 0.0199 | 0.195 | 0.000292 | 0.000078 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in HA-5, including split samples.
Assumed 0.5 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium and chromium were the only constituents at HA-5 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-7. Table 1*
*Soil HQ Calculations (Maximum Conc.): HA-4 (0-3') Standing Water Scenario: Black-bellied Whistling Duck*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Black-bellied Whistling Duck Parameter | Value | Symbol |
|---|---|---|
| Body weight (kg) | 0.82 | BW |
| Soil ingestion proportion | 0.025 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.077 | FIR |
| Proportion of diet, plants | 0.95 | Pp |
| Proportion of diet, benthic inverts | 0.05 | Pbi |
| Spatial factor | 0.016 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0048 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| COPEC | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF benthic inverts | Soil | Plants | Benthic Inverts | HQ |
| Barium | 3640 | 600 | 0.0002 | 0.0046 | 0.023 | 0.0014 | 1.22 | 0.322 | 0.000012 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in HA-4, including split samples.
Assumed 0.3 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium was the only constituent at HA-4 exceeding NOAA freshwater PEC (considering 0-3' results, including Maximum of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-7. Table 2*
*Soil HQ Calculations (Maximum Conc.): HA-4 (0-3') Standing Water Scenario: Yellow-crowned Night Heron*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Yellow-crowned Night Heron | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.683 | BW |
| Soil ingestion proportion | 0.073 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.082 | FIR |
| Proportion of diet, benthic inverts | 0.78 | Pbi |
| Proportion of diet, fish | 0.22 | Pf |
| Spatial factor | 0.0013 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00039 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Benthic Inverts** | **Fish** | **HQ** |
| Barium | 3640 | 600 | 0.0002 | 0.023 | 0.028 | 0.00436 | 5.35 | 1.84 | 0.0000047 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in HA-4, including split samples.
Assumed 0.3 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium was the only constituent at HA-4 exceeding NOAA freshwater PEC (considering 0-3' results, including Maximum of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-7. Table 3*
*Soil HQ Calculations (Maximum Conc.): HA-4 (0-3') Standing Water Scenario: Snowy Egret*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Snowy Egret | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.371 | BW |
| Soil ingestion proportion | 0.005 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.116 | FIR |
| Proportion of diet, benthic inverts | 0.1 | Pbi |
| Proportion of diet, fish | 0.9 | Pf |
| Spatial factor | 0.0018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00054 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF benthic inverts | BAF fish | Soil | Benthic Inverts | Fish | HQ |
| Barium | 3640 | 600 | 0.0002 | 0.023 | 0.028 | 0.000422 | 0.971 | 10.6 | 0.00001 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in HA-4, including split samples.
Assumed 0.3 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium was the only constituent at HA-4 exceeding NOAA freshwater PEC (considering 0-3' results, including Maximum of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-7, Table 4*
*Soil HQ Calculations (Maximum Conc.): HA-4 (0-3') Standing Water Scenario: Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.46 | Pp |
| Proportion of diet, mammals | 0.06 | Pm |
| Proportion of diet, benthic inverts | 0.46 | Pbi |
| Proportion of diet, fish | 0.02 | Pf |
| Spatial factor | 0.0025 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00075 | AUF |

Calculations **based on** maximum values

| | | | **Absorbed Fraction (AF)** | | | | | **Absorbed Concentration from Medium and Biota** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF mammals | BAF benthic inverts | BAF fish | **Soil** | **Plants** | Mammals | **Benthic Inverts** | **Fish** | **HQ** |
| **Barium** | 3640 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.023 | 0.028 | 0.0024 | 0.27 | 0.433 | 1.35 | 0.0713 | 0.00000029 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in HA-4, including split samples.
Assumed 0.3 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium was the only constituent at HA-4 exceeding NOAA freshwater PEC (considering 0-3' results, including Maximum of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-8. Table 1*
*Soil HQ Calculations (Maximum Conc.): HA-5 (0-3') Standing Water Scenario: Black-bellied Whistling Duck*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Black-bellied Whistling Duck Parameter | Value | Symbol |
|---|---|---|
| Body weight (kg) | 0.82 | BW |
| Soil ingestion proportion | 0.025 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.077 | FIR |
| Proportion of diet, plants | 0.95 | Pp |
| Proportion of diet, benthic inverts | 0.05 | Pbi |
| Spatial factor | 0.016 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0048 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| COPEC | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF benthic inverts | Soil | Plants | Benthic Inverts | HQ |
| Barium | 4230 | 600 | 0.0002 | 0.0046 | 0.023 | 0.00163 | 1.42 | 0.375 | 0.000014 |
| Chromium | 172 | 2.66 | 0.015 | 0.016 | 0.108 | 0.00497 | 0.201 | 0.0715 | 0.0005 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in HA-5, including split samples.
Assumed 0.5 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium and chromium were the only constituents at HA-5 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-8. Table 2*
*Soil HQ Calculations (Maximum Conc.): HA-5 (0-3') Standing Water Scenario: Yellow-crowned Night Heron*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Yellow-crowned Night Heron | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.683 | BW |
| Soil ingestion proportion | 0.073 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.082 | FIR |
| Proportion of diet, benthic inverts | 0.78 | Pbi |
| Proportion of diet, fish | 0.22 | Pf |
| Spatial factor | 0.0013 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00039 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Benthic Inverts** | **Fish** | **HQ** |
| Barium | 4230 | 600 | 0.0002 | 0.023 | 0.028 | 0.00506 | 6.22 | 2.14 | 0.0000054 |
| Chromium | 172 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.0154 | 1.19 | 0.0116 | 0.00018 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in HA-5, including split samples.
Assumed 0.5 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium and chromium were the only constituents at HA-5 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-8. Table 3*
*Soil HQ Calculations (Maximum Conc.): HA-5 (0-3') Standing Water Scenario: Snowy Egret*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Snowy Egret** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.371 | BW |
| Soil ingestion proportion | 0.005 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.116 | FIR |
| Proportion of diet, benthic inverts | 0.1 | Pbi |
| Proportion of diet, fish | 0.9 | Pf |
| Spatial factor | 0.0018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00054 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF benthic inverts | BAF fish | Soil | Benthic Inverts | Fish | HQ |
| Barium | 4230 | 600 | 0.0002 | 0.023 | 0.028 | 0.000491 | 1.13 | 12.4 | 0.000012 |
| Chromium | 172 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.0015 | 0.215 | 0.067 | 0.000058 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in HA-5, including split samples.
Assumed 0.5 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium and chromium were the only constituents at HA-5 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-8. Table 4*
*Soil HQ Calculations (Maximum Conc.): HA-5 (0-3') Standing Water Scenario: Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.46 | Pp |
| Proportion of diet, mammals | 0.06 | Pm |
| Proportion of diet, benthic inverts | 0.46 | Pbi |
| Proportion of diet, fish | 0.02 | Pf |
| Spatial factor | 0.0025 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00075 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | | | Absorbed Concentration from Medium and Biota | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Plants** | **Mammals** | **Benthic Inverts** | **Fish** | **HQ** |
| Barium | 4230 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.023 | 0.028 | 0.00278 | 0.313 | 0.503 | 1.57 | 0.0829 | 0.00000034 |
| Chromium | 172 | 2.4 | 0.015 | 0.016 | 0.0846 | 0.108 | 0.00373 | 0.00849 | 0.0443 | 0.0306 | 0.299 | 0.000449 | 0.00012 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in HA-5, including split samples.
Assumed 0.5 acre for calculation of spatial factor.
Standing water scenario - modeling hypothetical soil exposure to aquatic food web.
Barium and chromium were the only constituents at HA-5 exceeding NOAA freshwater PEC (considering 0-3' results, including average of splits).

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-9. Table 1*
*Soil HQ Calculations (Average Conc.): Future Use - Former BP Operations Areas (0-3'): Black-bellied Whistling Duck*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Black-bellied Whistling Duck** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.82 | BW |
| Soil ingestion proportion | 0.025 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.077 | FIR |
| Proportion of diet, plants | 0.95 | Pp |
| Proportion of diet, benthic inverts | 0.05 | Pbi |
| Spatial factor | 0.0081 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0024 | AUF |

**Calculations based on average values**

| | | | **Absorbed Fraction (AF)** | | | **Absorbed Concentration from Medium and Biota** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF benthic inverts** | **Soil** | **Plants** | **Benthic Inverts** | **HQ** |
| Arsenic | 5.4 | 2.24 | 0.01 | 0.0375 | 0.127 | 0.000104 | 0.0148 | 0.00264 | 0.000019 |
| Barium | 699 | 600 | 0.0002 | 0.0046 | 0.023 | 0.000269 | 0.235 | 0.0619 | 0.0000012 |
| Chromium | 23 | 2.66 | 0.015 | 0.016 | 0.108 | 0.000664 | 0.0269 | 0.00956 | 0.000033 |
| Lead | 27 | 1.63 | 0.01 | 0.0389 | 0.066 | 0.00052 | 0.0768 | 0.00686 | 0.00012 |
| Mercury | 0.045 | 3.25 | 0.00031 | 0.27 | 0.48 | 0.0000000269 | 0.000889 | 0.0000832 | 0.00000072 |
| Zinc | 32 | 66.1 | 0.1 | 0.366 | 2.33 | 0.00616 | 0.857 | 0.287 | 0.000042 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in former BP operations areas and vicinity, including split samples and resamples.
Assumed 0.45 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-9. Table 2*
*Soil HQ Calculations (Average Conc.): Future Use - Former BP Operations Areas (0-3'): Yellow-crowned Night Heron*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Yellow-crowned Night Heron | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.683 | BW |
| Soil ingestion proportion | 0.073 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.082 | FIR |
| Proportion of diet, benthic inverts | 0.78 | Pbi |
| Proportion of diet, fish | 0.22 | Pf |
| Spatial factor | 0.00064 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00019 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Average Soil Concentration (0-3') | TRV | Soil bio-factor | BAF benthic inverts | BAF fish | Soil | Benthic Inverts | Fish | HQ |
| Arsenic | 5.4 | 2.24 | 0.01 | 0.127 | 0.00065 | 0.000323 | 0.0439 | 0.0000633 | 0.0000038 |
| Barium | 699 | 600 | 0.0002 | 0.023 | 0.028 | 0.000837 | 1.03 | 0.353 | 0.00000044 |
| Chromium | 23 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.00207 | 0.159 | 0.00155 | 0.000012 |
| Lead | 27 | 1.63 | 0.01 | 0.066 | 0.0000018 | 0.00162 | 0.114 | 0.000000877 | 0.000013 |
| Mercury | 0.045 | 3.25 | 0.00031 | 0.48 | 1.1 | 0.0000000835 | 0.00138 | 0.000893 | 0.00000013 |
| Zinc | 32 | 66.1 | 0.1 | 2.33 | 0.138 | 0.0192 | 4.77 | 0.0797 | 0.000014 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in former BP operations areas and vicinity, including split samples and resamples.
Assumed 0.45 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-9. Table 3*
*Soil HQ Calculations (Average Conc.): Future Use - Former BP Operations Areas (0-3'): Snowy Egret*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Snowy Egret** | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.371 | BW |
| Soil ingestion proportion | 0.005 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.116 | FIR |
| Proportion of diet, benthic inverts | 0.1 | Pbi |
| Proportion of diet, fish | 0.9 | Pf |
| Spatial factor | 0.00092 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00028 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Average Soil Concentration (0-3') | TRV | Soil bio-factor | BAF benthic inverts | BAF fish | Soil | Benthic Inverts | Fish | HQ |
| Arsenic | 5.4 | 2.24 | 0.01 | 0.127 | 0.00065 | 0.0000313 | 0.00796 | 0.000366 | 0.000001 |
| Barium | 699 | 600 | 0.0002 | 0.023 | 0.028 | 0.0000811 | 0.186 | 2.04 | 0.000001 |
| Chromium | 23 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.0002 | 0.0288 | 0.00896 | 0.000004 |
| Lead | 27 | 1.63 | 0.01 | 0.066 | 0.0000018 | 0.000157000 | 0.0207 | 0.00000507 | 0.0000036 |
| Mercury | 0.045 | 3.25 | 0.00031 | 0.48 | 1.1 | 8.09E-09 | 0.000251 | 0.00517 | 0.00000047 |
| Zinc | 32 | 66.1 | 0.1 | 2.33 | 0.138 | 0.00186 | 0.865 | 0.461 | 0.0000056 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in former BP operations areas and vicinity, including split samples and resamples.
Assumed 0.45 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-9, Table 4*
*Soil HQ Calculations (Average Conc.): Future Use - Former BP Operations Areas (0-3'): Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.46 | Pp |
| Proportion of diet, mammals | 0.06 | Pm |
| Proportion of diet, benthic inverts | 0.46 | Pbi |
| Proportion of diet, fish | 0.02 | Pf |
| Spatial factor | 0.0012 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00036 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | | | | Absorbed Concentration from Medium and Biota | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Plants** | **Mammals** | **Benthic Inverts** | **Fish** | **HQ** |
| Arsenic | 5.4 | 1.04 | 0.01 | 0.0375 | 0.0025 | 0.127 | 0.00065 | 0.000178 | 0.00326 | 0.0000284 | 0.011 | 0.00000246 | 0.000005 |
| Barium | 699 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.023 | 0.028 | 0.00046 | 0.0518 | 0.0831 | 0.259 | 0.0137 | 0.000000027 |
| Chromium | 23 | 2.4 | 0.015 | 0.016 | 0.0846 | 0.108 | 0.00373 | 0.00114 | 0.00592 | 0.00409 | 0.04 | 0.0000601 | 0.0000077 |
| Lead | 27 | 4.7 | 0.01 | 0.0389 | 0.1054 | 0.066 | 0.0000018 | 0.000888 | 0.0169 | 0.00598 | 0.0287 | 0.0000000340 | 0.000004 |
| Mercury | 0.045 | 1.01 | 0.00031 | 0.27 | 0.0534 | 0.48 | 1.1 | 0.0000000459 | 0.000196 | 0.00000505 | 0.000348 | 0.0000347 | 0.00000021 |
| Zinc | 72 | 75.4 | 0.1 | 0.366 | 0.7717 | 2.33 | 0.138 | 0.0105 | 0.189 | 0.0519 | 1.2 | 0.00309 | 0.0000069 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in former BP operations areas and vicinity, including split samples and resamples.
Assumed 0.45 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-10. Table 1*
*Soil HQ Calculations (Maximum Conc.): Future Use - Former BP Operations Areas (0-3'): Black-bellied Whistling Duck*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Black-bellied Whistling Duck | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.82 | BW |
| Soil ingestion proportion | 0.025 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.077 | FIR |
| Proportion of diet, plants | 0.95 | Pp |
| Proportion of diet, benthic inverts | 0.05 | Pbi |
| Spatial factor | 0.0081 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0024 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF benthic inverts** | **Soil** | **Plants** | **Benthic Inverts** | **HQ** |
| Arsenic | 13.1 | 2.24 | 0.01 | 0.0375 | 0.127 | 0.000252 | 0.0359 | 0.00641 | 0.000046 |
| Barium | 4640 | 600 | 0.0002 | 0.0046 | 0.023 | 0.00179 | 1.56 | 0.411 | 0.0000079 |
| Chromium | 192 | 2.66 | 0.015 | 0.016 | 0.108 | 0.00554 | 0.225 | 0.0798 | 0.00028 |
| Lead | 262 | 1.63 | 0.01 | 0.0389 | 0.066 | 0.00504 | 0.746 | 0.0666 | 0.0012 |
| Mercury | 0.0814 | 3.25 | 0.00031 | 0.27 | 0.48 | 4.86E-08 | 0.00161 | 0.00015 | 0.0000013 |
| Zinc | 162 | 66.1 | 0.1 | 0.366 | 2.33 | 0.0312 | 4.34 | 1.45 | 0.00021 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in former BP operations areas and vicinity, including split samples and resamples.
Assumed 0.45 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{al}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{al}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-10. Table 2*
*Soil HQ Calculations (Maximum Conc.): Future Use - Former BP Operations Areas (0-3'): Yellow-crowned Night Heron*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Yellow-crowned Night Heron | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.683 | BW |
| Soil ingestion proportion | 0.073 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.082 | FIR |
| Proportion of diet, benthic inverts | 0.78 | Pbi |
| Proportion of diet, fish | 0.22 | Pf |
| Spatial factor | 0.00064 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00019 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Benthic Inverts** | **Fish** | **HQ** |
| Arsenic | 13.1 | 2.24 | 0.01 | 0.127 | 0.00065 | 0.000784 | 0.106 | 0.000154 | 0.0000091 |
| Barium | 4640 | 600 | 0.0002 | 0.023 | 0.028 | 0.00556 | 6.83 | 2.34 | 0.0000029 |
| Chromium | 192 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.0172 | 1.33 | 0.0129 | 0.000097 |
| Lead | 262 | 1.63 | 0.01 | 0.066 | 0.0000018 | 0.0157 | 1.11 | 0.00000851 | 0.00013 |
| Mercury | 0.0814 | 3.25 | 0.00031 | 0.48 | 1.1 | 0.000000151 | 0.0025 | 0.00162 | 0.00000024 |
| Zinc | 162 | 66.1 | 0.1 | 2.33 | 0.138 | 0.097 | 24.1 | 0.403 | 0.000071 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in former BP operations areas and vicinity, including split samples and resamples.
Assumed 0.45 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-10. Table 3*
*Soil HQ Calculations (Maximum Conc.): Future Use - Former BP Operations Areas (0-3'): Snowy Egret*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Snowy Egret | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.371 | BW |
| Soil ingestion proportion | 0.005 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.116 | FIR |
| Proportion of diet, benthic inverts | 0.1 | Pbi |
| Proportion of diet, fish | 0.9 | Pf |
| Spatial factor | 0.00092 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00028 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF benthic inverts | BAF fish | Soil | Benthic Inverts | Fish | HQ |
| Arsenic | 13.1 | 2.24 | 0.01 | 0.127 | 0.00065 | 0.000076 | 0.0193 | 0.000889 | 0.0000025 |
| Barium | 4640 | 600 | 0.0002 | 0.023 | 0.028 | 0.000538 | 1.24 | 13.6 | 0.0000069 |
| Chromium | 192 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.00167 | 0.241 | 0.0748 | 0.000033 |
| Lead | 262 | 1.63 | 0.01 | 0.066 | 0.0000018 | 0.001520000 | 0.201 | 0.0000492 | 0.000035 |
| Mercury | 0.0814 | 3.25 | 0.00031 | 0.48 | 1.1 | 1.46E-08 | 0.000453 | 0.00935 | 0.00000084 |
| Zinc | 162 | 66.1 | 0.1 | 2.33 | 0.138 | 0.0094 | 4.38 | 2.33 | 0.000028 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in former BP operations areas and vicinity, including split samples and resamples.
Assumed 0.45 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-10. Table 4*
*Soil HQ Calculations (Maximum Conc.): Future Use - Former BP Operations Areas (0-3'): Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.46 | Pp |
| Proportion of diet, mammals | 0.06 | Pm |
| Proportion of diet, benthic inverts | 0.46 | Pbi |
| Proportion of diet, fish | 0.02 | Pf |
| Spatial factor | 0.0012 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00036 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | | | Absorbed Concentration from Medium and Biota | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF plants** | **BAF mammals** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Plants** | **Mammals** | **Benthic Inverts** | **Fish** | **HQ** |
| Arsenic | 13.1 | 1.04 | 0.01 | 0.0375 | 0.0025 | 0.127 | 0.00065 | 0.000431 | 0.00791 | 0.0000688 | 0.0268 | 0.00000596 | 0.000012 |
| Barium | 4640 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.023 | 0.028 | 0.00305 | 0.344 | 0.552 | 1.72 | 0.0909 | 0.00000018 |
| Chromium | 192 | 2.4 | 0.015 | 0.016 | 0.0846 | 0.108 | 0.00373 | 0.00948 | 0.0495 | 0.0341 | 0.334 | 0.000501 | 0.000064 |
| Lead | 262 | 4.7 | 0.01 | 0.0389 | 0.1054 | 0.066 | 0.0000018 | 0.00862 | 0.164 | 0.058 | 0.278 | 0.00000033 | 0.000039 |
| Mercury | 0.0814 | 1.01 | 0.00031 | 0.27 | 0.0534 | 0.48 | 1.1 | 0.000000083 | 0.000354 | 0.00000913 | 0.000629 | 0.0000627 | 0.00000038 |
| Zinc | 162 | 75.4 | 0.1 | 0.366 | 0.7717 | 2.33 | 0.138 | 0.0533 | 0.955 | 0.263 | 6.08 | 0.0156 | 0.000035 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in former BP operations areas and vicinity, including split samples and resamples.
Assumed 0.45 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-11. Table 1*
*Soil HQ Calculations (Average Conc.): Future Use - Former Anadarko Operations Areas (0-3'): Black-bellied Whistling Duck*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Black-bellied Whistling Duck | | |
|---|---|---|
| Parameter | Value | Symbol |
| Body weight (kg) | 0.82 | BW |
| Soil ingestion proportion | 0.025 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.077 | FIR |
| Proportion of diet, plants | 0.95 | Pp |
| Proportion of diet, benthic inverts | 0.05 | Pbi |
| Spatial factor | 0.016 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0048 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| COPEC | Average Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF benthic inverts | Soil | Plants | Benthic Inverts | HQ |
| Arsenic | 5.5 | 2.24 | 0.01 | 0.0375 | 0.127 | 0.000106 | 0.0151 | 0.00269 | 0.000038 |
| Barium | 2358 | 600 | 0.0002 | 0.0046 | 0.023 | 0.000908 | 0.793 | 0.209 | 0.000008 |
| Cadmium | 0.36 | 1.47 | 0.036 | 0.586 | 0.614 | 0.0000249 | 0.0154 | 0.000851 | 0.000053 |
| Chromium | 51 | 2.66 | 0.015 | 0.016 | 0.108 | 0.00147 | 0.0597 | 0.0212 | 0.00015 |
| Lead | 30 | 1.63 | 0.01 | 0.0389 | 0.066 | 0.000578 | 0.0854 | 0.00762 | 0.00028 |
| Mercury | 0.11 | 3.25 | 0.00031 | 0.27 | 0.48 | 0.0000000656 | 0.00217 | 0.000203 | 0.0000035 |
| Silver | 0.62 | 2.02 | 0.036 | 0.014 | 0.614 | 0.000043 | 0.000635 | 0.00147 | 0.0000051 |
| Zinc | 129 | 66.1 | 0.1 | 0.366 | 2.33 | 0.0248 | 3.45 | 1.16 | 0.00034 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in former Anadarko operations areas, including split samples and resamples.
Assumed 0.9 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-11. Table 2*
*Soil HQ Calculations (Average Conc.): Future Use - Former Anadarko Operations Areas (0-3'): Yellow-crowned Night Heron*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Yellow-crowned Night Heron | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.683 | BW |
| Soil ingestion proportion | 0.073 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.082 | FIR |
| Proportion of diet, benthic inverts | 0.78 | Pbi |
| Proportion of diet, fish | 0.22 | Pf |
| Spatial factor | 0.0013 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00039 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Average Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Benthic Inverts** | **Fish** | **HQ** |
| Arsenic | 5.5 | 2.24 | 0.01 | 0.127 | 0.00065 | 0.000329 | 0.0447 | 0.0000645 | 0.0000079 |
| Barium | 2358 | 600 | 0.0002 | 0.023 | 0.028 | 0.00282 | 3.47 | 1.19 | 0.000003 |
| Cadmium | 0.36 | 1.47 | 0.036 | 0.614 | 0.42 | 0.0000776 | 0.0141 | 0.00273 | 0.0000045 |
| Chromium | 51 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.00458 | 0.352 | 0.00343 | 0.000053 |
| Lead | 30 | 1.63 | 0.01 | 0.066 | 0.0000018 | 0.0018 | 0.127 | 0.000000974 | 0.000031 |
| Mercury | 0.11 | 3.25 | 0.00031 | 0.48 | 1.1 | 0.000000204 | 0.00338 | 0.00218 | 0.00000067 |
| Silver | 0.62 | 2.02 | 0.036 | 0.614 | 0.42 | 0.000134 | 0.0243 | 0.0047 | 0.0000056 |
| Zinc | 129 | 66.1 | 0.1 | 2.33 | 0.138 | 0.0772 | 19.2 | 0.321 | 0.00012 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in former Anadarko operations areas, including split samples and resamples.
Assumed 0.9 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-11. Table 3*
*Soil HQ Calculations (Average Conc.): Future Use - Former Anadarko Operations Areas (0-3'): Snowy Egret*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Snowy Egret | | |
|---|---|---|
| Parameter | Value | Symbol |
| Body weight (kg) | 0.371 | BW |
| Soil ingestion proportion | 0.005 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.116 | FIR |
| Proportion of diet, benthic inverts | 0.1 | Pbi |
| Proportion of diet, fish | 0.9 | Pf |
| Spatial factor | 0.0018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00054 | AUF |

Calculations based on average values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| COPEC | Average Soil Concentration (0-3') | TRV | Soil bio-factor | BAF benthic inverts | BAF fish | Soil | Benthic Inverts | Fish | HQ |
| Arsenic | 5.5 | 2.24 | 0.01 | 0.127 | 0.00065 | 0.0000319 | 0.0081 | 0.000373 | 0.0000021 |
| Barium | 2358 | 600 | 0.0002 | 0.023 | 0.028 | 0.000274 | 0.629 | 6.89 | 0.0000068 |
| Cadmium | 0.36 | 1.47 | 0.036 | 0.614 | 0.42 | 0.00000752 | 0.00256 | 0.0158 | 0.0000067 |
| Chromium | 51 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.000444000 | 0.0639 | 0.0199 | 0.000017 |
| Lead | 30 | 1.63 | 0.01 | 0.066 | 0.0000018 | 0.000174 | 0.023 | 0.00000564 | 0.0000077 |
| Mercury | 0.11 | 3.25 | 0.00031 | 0.48 | 1.1 | 0.000000020 | 0.000612 | 0.0126 | 0.0000022 |
| Silver | 0.62 | 2.02 | 0.036 | 0.614 | 0.42 | 0.0000129 | 0.00442 | 0.0272 | 0.0000085 |
| Zinc | 129 | 66.1 | 0.1 | 2.33 | 0.138 | 0.00748 | 3.49 | 1.86 | 0.000044 |

Notes:
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in former Anadarko operations areas, including split samples and resamples.
Assumed 0.9 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-11. Table 4*
*Soil HQ Calculations (Average Conc.): Future Use - Former Anadarko Operations Areas (0-3'): Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.46 | Pp |
| Proportion of diet, mammals | 0.06 | Pm |
| Proportion of diet, benthic inverts | 0.46 | Pbi |
| Proportion of diet, fish | 0.02 | Pf |
| Spatial factor | 0.0025 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00075 | AUF |

**Calculations based on average values**

| | | | Absorbed Fraction (AF) | | | | | Absorbed Concentration from Medium and Biota | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Average Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF mammals | BAF benthic inverts | BAF fish | **Soil** | **Plants** | **Mammals** | **Benthic Inverts** | **Fish** | **HQ** |
| Arsenic | 5.5 | 1.04 | 0.01 | 0.0375 | 0.0025 | 0.127 | 0.00065 | 0.000181 | 0.00332 | 0.0000289 | 0.0112 | 0.0000025 | 0.000011 |
| Barium | 2358 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.023 | 0.028 | 0.00155 | 0.175 | 0.28 | 0.873 | 0.0462 | 0.00000019 |
| Cadmium | 0.36 | 0.77 | 0.036 | 0.586 | 0.3333 | 0.614 | 0.42 | 0.0000426 | 0.0034 | 0.000252 | 0.00356 | 0.000106 | 0.0000072 |
| Chromium | 51 | 2.4 | 0.015 | 0.016 | 0.0846 | 0.108 | 0.00373 | 0.00252 | 0.0131 | 0.00906 | 0.0887 | 0.000133 | 0.000035 |
| Lead | 30 | 4.7 | 0.01 | 0.0389 | 0.1054 | 0.066 | 0.0000018 | 0.000987 | 0.0188 | 0.00664 | 0.0319 | 0.0000000378 | 0.0000093 |
| Mercury | 0.11 | 1.01 | 0.00031 | 0.27 | 0.0534 | 0.48 | 1.1 | 0.000000112 | 0.000478 | 0.0000123 | 0.00085 | 0.0000847 | 0.0000011 |
| Silver | 0.62 | 6.02 | 0.036 | 0.014 | 0.004 | 0.614 | 0.42 | 0.0000734 | 0.00014 | 0.00000521 | 0.00613 | 0.000182 | 0.00000081 |
| Zinc | 129 | 75.4 | 0.1 | 0.366 | 0.7717 | 2.33 | 0.138 | 0.0424 | 0.76 | 0.209 | 4.84 | 0.0125 | 0.000058 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Average soil concentrations (0-3') in former Anadarko operations areas, including split samples and resamples.
Assumed 0.9 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-12. Table 1*
*Soil HQ Calculations (Maximum Conc.): Future Use - Former Anadarko Operations Areas (0-3'): Black-bellied Whistling Duck*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Black-bellied Whistling Duck | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.82 | BW |
| Soil ingestion proportion | 0.025 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.077 | FIR |
| Proportion of diet, plants | 0.95 | Pp |
| Proportion of diet, benthic inverts | 0.05 | Pbi |
| Spatial factor | 0.016 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.0048 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF benthic inverts | **Soil** | **Plants** | Benthic Inverts | **HQ** |
| Arsenic | 10.13 | 2.24 | 0.01 | 0.0375 | 0.127 | 0.000195 | 0.0278 | 0.00495 | 0.000071 |
| Barium | 5590 | 600 | 0.0002 | 0.0046 | 0.023 | 0.00215 | 1.88 | 0.495 | 0.000019 |
| Cadmium | 1.35 | 1.47 | 0.036 | 0.586 | 0.614 | 0.0000936 | 0.0579 | 0.00319 | 0.0002 |
| Chromium | 172 | 2.66 | 0.015 | 0.016 | 0.108 | 0.00497 | 0.201 | 0.0715 | 0.0005 |
| Lead | 87.3 | 1.63 | 0.01 | 0.0389 | 0.066 | 0.00168 | 0.248 | 0.0222 | 0.0008 |
| Mercury | 0.328 | 3.25 | 0.00031 | 0.27 | 0.48 | 0.000000196 | 0.00648 | 0.000606 | 0.00001 |
| Silver | 1.155 | 2.02 | 0.036 | 0.014 | 0.614 | 0.00008 | 0.00118 | 0.00273 | 0.0000095 |
| Zinc | 513 | 66.1 | 0.1 | 0.366 | 2.33 | 0.0988 | 13.7 | 4.6 | 0.0013 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in former Anadarko operations areas, including split samples and resamples.
Assumed 0.9 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-12. Table 2*
*Soil HQ Calculations (Maximum Conc.): Future Use - Former Anadarko Operations Areas (0-3'): Yellow-crowned Night Heron*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Yellow-crowned Night Heron | | |
|---|---|---|
| **Parameter** | **Value** | **Symbol** |
| Body weight (kg) | 0.683 | BW |
| Soil ingestion proportion | 0.073 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.082 | FIR |
| Proportion of diet, benthic inverts | 0.78 | Pbi |
| Proportion of diet, fish | 0.22 | Pf |
| Spatial factor | 0.0013 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00039 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPEC** | **Maximum Soil Concentration (0-3')** | **TRV** | **Soil bio-factor** | **BAF benthic inverts** | **BAF fish** | **Soil** | **Benthic Inverts** | **Fish** | **HQ** |
| Arsenic | 10.13 | 2.24 | 0.01 | 0.127 | 0.00065 | 0.000606 | 0.0823 | 0.000119 | 0.000014 |
| Barium | 5590 | 600 | 0.0002 | 0.023 | 0.028 | 0.00669 | 8.22 | 2.82 | 0.0000072 |
| Cadmium | 1.35 | 1.47 | 0.036 | 0.614 | 0.42 | 0.000291 | 0.053 | 0.0102 | 0.000017 |
| Chromium | 172 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.0154 | 1.19 | 0.0116 | 0.00018 |
| Lead | 87.3 | 1.63 | 0.01 | 0.066 | 0.0000018 | 0.00523 | 0.369 | 0.00000283 | 0.00009 |
| Mercury | 0.328 | 3.25 | 0.00031 | 0.48 | 1.1 | 0.000000609 | 0.0101 | 0.00651 | 0.000002 |
| Silver | 1.155 | 2.02 | 0.036 | 0.614 | 0.42 | 0.000249 | 0.0454 | 0.00875 | 0.000011 |
| Zinc | 513 | 66.1 | 0.1 | 2.33 | 0.138 | 0.307 | 76.5 | 1.28 | 0.00046 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in former Anadarko operations areas, including split samples and resamples.
Assumed 0.9 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-12. Table 3*
*Soil HQ Calculations (Maximum Conc.): Future Use - Former Anadarko Operations Areas (0-3'): Snowy Egret*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Snowy Egret | | |
|---|---|---|
| Parameter | Value | Symbol |
| Body weight (kg) | 0.371 | BW |
| Soil ingestion proportion | 0.005 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.116 | FIR |
| Proportion of diet, benthic inverts | 0.1 | Pbi |
| Proportion of diet, fish | 0.9 | Pf |
| Spatial factor | 0.0018 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00054 | AUF |

Calculations based on maximum values

| | | | Absorbed Fraction (AF) | | | Absorbed Concentration from Medium and Biota | | | |
|---|---|---|---|---|---|---|---|---|---|
| COPEC | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF benthic inverts | BAF fish | Soil | Benthic Inverts | Fish | HQ |
| Arsenic | 10.13 | 2.24 | 0.01 | 0.127 | 0.00065 | 0.0000588 | 0.0149 | 0.000687 | 0.0000038 |
| Barium | 5590 | 600 | 0.0002 | 0.023 | 0.028 | 0.000648 | 1.49 | 16.3 | 0.000016 |
| Cadmium | 1.35 | 1.47 | 0.036 | 0.614 | 0.42 | 0.0000282 | 0.00962 | 0.0592 | 0.000025 |
| Chromium | 172 | 2.66 | 0.015 | 0.108 | 0.00373 | 0.001500000 | 0.215 | 0.067 | 0.000058 |
| Lead | 87.3 | 1.63 | 0.01 | 0.066 | 0.0000018 | 0.000506 | 0.0668 | 0.0000164 | 0.000022 |
| Mercury | 0.328 | 3.25 | 0.00031 | 0.48 | 1.1 | 0.000000059 | 0.00183 | 0.0377 | 0.0000066 |
| Silver | 1.155 | 2.02 | 0.036 | 0.614 | 0.42 | 0.0000241 | 0.00823 | 0.0506 | 0.000016 |
| Zinc | 513 | 66.1 | 0.1 | 2.33 | 0.138 | 0.0298 | 13.9 | 7.39 | 0.00017 |

Notes:
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in former Anadarko operations areas, including split samples and resamples.
Assumed 0.9 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-12. Table 4*
*Soil HQ Calculations (Maximum Conc.): Future Use - Former Anadarko Operations Areas (0-3'): Raccoon*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Raccoon Parameter | Value | Symbol |
|---|---|---|
| Body weight (kg) | 5.78 | BW |
| Soil ingestion proportion | 0.094 | Ps |
| Food ingestion Rate (kg/kgBW/d) | 0.035 | FIR |
| Proportion of diet, plants | 0.46 | Pp |
| Proportion of diet, mammals | 0.06 | Pm |
| Proportion of diet, benthic inverts | 0.46 | Pbi |
| Proportion of diet, fish | 0.02 | Pf |
| Spatial factor | 0.0025 | SF |
| Temporal factor | 0.3 | TF |
| Area use factor | 0.00075 | AUF |

Calculations **based on** maximum values

| | | | Absorbed Fraction (AF) | | | | | Absorbed Concentration from Medium and Biota | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COPEC | Maximum Soil Concentration (0-3') | TRV | Soil bio-factor | BAF plants | BAF mammals | BAF benthic inverts | BAF fish | Soil | Plants | Mammals | Benthic Inverts | Fish | HQ |
| Arsenic | 10.13 | 1.04 | 0.01 | 0.0375 | 0.0025 | 0.127 | 0.00065 | 0.000333 | 0.00612 | 0.0000532 | 0.0207 | 0.00000461 | 0.00002 |
| Barium | 5590 | 5433 | 0.0002 | 0.0046 | 0.0566 | 0.023 | 0.028 | 0.00368 | 0.414 | 0.664 | 2.07 | 0.11 | 0.00000045 |
| Cadmium | 1.35 | 0.77 | 0.036 | 0.586 | 0.3333 | 0.614 | 0.42 | 0.00016 | 0.0127 | 0.000945 | 0.0133 | 0.000397 | 0.000027 |
| Chromium | 172 | 2.4 | 0.015 | 0.016 | 0.0846 | 0.108 | 0.00373 | 0.00849 | 0.0443 | 0.0306 | 0.299 | 0.000449 | 0.00012 |
| Lead | 87.3 | 4.7 | 0.01 | 0.0389 | 0.1054 | 0.066 | 0.0000018 | 0.00287 | 0.0547 | 0.0193 | 0.0928 | 0.00000011 | 0.000027 |
| Mercury | 0.328 | 1.01 | 0.00031 | 0.27 | 0.0534 | 0.48 | 1.1 | 0.000000335 | 0.00143 | 0.0000368 | 0.00253 | 0.000253 | 0.0000032 |
| Silver | 1.155 | 6.02 | 0.036 | 0.014 | 0.004 | 0.614 | 0.42 | 0.000137 | 0.00026 | 0.0000097 | 0.0114 | 0.00034 | 0.0000015 |
| Zinc | 513 | 75.4 | 0.1 | 0.366 | 0.7717 | 2.33 | 0.138 | 0.169 | 3.02 | 0.831 | 19.2 | 0.0496 | 0.00023 |

**Notes:**
Soil concentrations are in mg/kg dry weight.
Maximum soil concentrations (0-3') in former Anadarko operations areas, including split samples and resamples.
Assumed 0.9 acre for calculation of spatial factor.
Hypothetical future use for rice farming and crawfish aquaculture.

$$\frac{\left([Soil_a \times P_s \times FIR \times AF_{as}] + [\sum_i^N B_i \times P_i \times FIR \times AF_{ai}]\right) \times AUF}{TRV} = HQ$$

Where:

$HQ_a$ = Hazard Quotient for analyte a (COPEC a) (unitless)
$Soil_a$ = Concentration of analyte a (COPEC a) in soil (mg/kg dry weight)
N = Number of different biota types in diet (food types)
$B_i$ = Analyte a (COPEC a) in biota type (i) (mg/kg dry weight)
$P_i$ = Proportion of biota type (i) in diet
FIR = Food ingestion rate (kg food [dry weight]/kg BW [wet weight]/day); BW = body weight
$AF_{ai}$ = Absorbed fraction of analyte a (COPEC a) from biota type (i)
$AF_{as}$ = Absorbed fraction of analyte a (COPEC a) from soil (s)
$TRV_a$ = The estimated no adverse effect dose (mg/kg BW/day) for the surrogate species
$P_s$ = Soil ingestion as a proportion of diet
AUF = Area use factor ([spatial factor, SF] x [temporal factor, TF])

*Appendix J-13. Table 1*
*Toxicity Reference Values (TRVs) for Future Use and Other Assessment*
*Castex Development, LLC v. Andarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Constituent | TRV | | | |
|---|---|---|---|---|
| | Avian Black-bellied Whistling Duck, Yellow-crowned Night Heron | | Mammal Raccoon | |
| | mg/kg/day | Source | mg/kg/day | Source |
| Arsenic | 2.24 | USEPA (2005b) | 1.04 | USEPA (2005b) |
| Barium | 600[a] | Brown et al. (2014); Silverman and Tell (2010); Kubiak (2012) | 5433[b] | Boyd and Abel (1966) |
| Cadmium | 1.47 | USEPA (2005d) | 0.77 | USEPA (2005d) |
| Chromium | 2.66 | USEPA (2008) | 2.4 | USEPA (2008) |
| Lead | 1.63 | USEPA (2005e) | 4.7 | USEPA (2005e) |
| Mercury | 3.25[c] | USEPA (1999; Table E-8) | 1.01[d] | USEPA (1999; Table E-7) |
| Silver | 2.02 | USEPA (2006) | 6.02 | USEPA (2006) |
| Zinc | 66.1 | USEPA (2007c) | 75.4 | USEPA (2007c) |

Notes:

[a]Barium sulfate; Recommended x-ray imaging dose for birds of 6,000 to 15,000 mg/kg bw. Low range value of 6,000 mg/kg bw used as proxy NOAEL; uncertainty factor of 10 for acute to chronic endpoint applied.

[b]Barium sulfate; Acute (14 day) NOAEL (mortality) for rat of 163,000 mg/kg bw; uncertainty factor of 10 for acute to chronic endpoint; and 3 for species variability.

[c]Mercuric chloride; Acute (5 day) LOAEL (mortality) for quail of 325 mg/kg/d; uncertainty factor of 10 applied to estimate from an acute to chronic endpoint (produces a very conservative TRV estimate.)

[d]Mercuric chloride; Chronic (6 month) NOAEL (reproduction) for mink of 1.01 mg/kg/day.

*Appendix J-13. Table 2*
*Sediment/Soil Bioavailability Factors for Future Use and Other Assessment*
*Castex Development, LLC v. Andarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| COPEC | Soil/Sediment Bioavailability Factor | Citation |
|---|---|---|
| Arsenic | 0.01 | USEPA (2005b); Shaheen et al. (2016) |
| Barium | 0.0002 | Engdahl et al. (2008); Cappuyns (2018); Environment International Ltd. (2010); USGS (2002) |
| Cadmium | 0.036 | Prokop et al. (2003); Shaheen et al. (2016); Feijtel (1986) |
| Chromium | 0.015 | Han et al. 2004 |
| Lead | 0.01 | Hettiarachchi and Pierzynski (2004); Luo et al. (2014); Feijtel (1986) |
| Mercury | 0.00031 | Xu et al. (2019); Chibunda et al. (2009); Chalmers et al. (2013) |
| Silver | 0.036[a] | Prokop et al. (2003); Shaheen et al. (2016); Feijtel (1986) |
| Zinc | 0.01 - 0.1 | USEPA (2007); Feijtel (1986) |

*Appendix J-13. Table 3*
*Biota Accumulation Factors (BAFs) for Food Items for Future Use and Other Assessment*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| COPEC | Soil-Plant BAF | Citation | Soil-Mammal BAF | Citation |
|---|---|---|---|---|
| Arsenic | 0.0375 | Bechtel-Jacobs (1998a; Table 6) | 0.0025 | Sample et al. (1998b; Table 7) |
| Barium | 0.0046 | Nelson et al. (1984); Lamb et al. (2013) | 0.0566 | Sample et al. (1998b; Table 7) |
| Cadmium | 0.586 | Bechtel-Jacobs (1998a; Table 6) | 0.333 | Sample et al. (1998b; Table 7) |
| Chromium | 0.016 | Xie (2016) | 0.0846 | Sample et al. (1998b; Table 7) |
| Lead | 0.0389 | Bechtel-Jacobs (1998a; Table 6) | 0.1504 | Sample et al. (1998b; Table 7) |
| Mercury | 0.27 | Fernández-Martínez (2015); Rodriguez (2007); Hamilton (2008) | 0.0534 | Sample et al. (1998b; Table 7) |
| Silver | 0.014 | USEPA (2006) | 0.004 | USEPA (2006) |
| Zinc | 0.366 | Bechtel-Jacobs (1998a; Table 6) | 0.7717 | Sample et al. (1998b; Table 7) |

*Appendix J-13. Table 3*
*Biota Accumulation Factors (BAFs) for Food Items for Future Use and Other Assessment*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| COPEC | Sediment - Benthic Invertebrate BAF | Citation | Sediment - Fish BAF | Citation |
|---|---|---|---|---|
| Arsenic | 0.127 | Bechtel Jacobs (1998b; Table 2) | 0.00065 | Davis et al. (1996; p.420) |
| Barium | 0.023 | Finerty et al. (1990); ERM (2019) | 0.028 | Ohio EPA (1991); Teck American, Inc. (2010); ERM (2019) |
| Cadmium | 0.614 | Bechtel Jacobs (1998b; Table 2) | 0.42 | Chen and Chen (1999; Table 2) |
| Chromium | 0.108 | Bechtel Jacobs (1998b; Table 2) | 0.00373 | Djikanovic (2018); Aydin-Onen (2015); Nakayama (2010) |
| Lead | 0.066 | Bechtel Jacobs (1998b; Table 2) | 0.0000018 | Davis et al. (1996; p.420) |
| Mercury | 0.48 | Razavi (2013); USFWS (1994); Ridal et al. (2010); ERM (2019) | 1.1 | LDEQ LEAU database (2019); ERM (2019) |
| Silver | 0.614 | Bechtel Jacobs (1998b; Table 2)[a] | 0.42 | Chen and Chen (1992; Table 2)[a] |
| Zinc | 2.33 | Bechtel Jacobs (1998b; Table 2) | 0.138 | Chen and Chen (1999; Table 2) |

*Appendix J-13. Table 4*
*Species Factors for HQ Calculations for Future Use and Other Assessment*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Parameter | Description | Units | Black-bellied Whistling Duck | Source | Yellow-Crowned Night Heron | Source |
|---|---|---|---|---|---|---|
| BW | Body weight of receptor | Kg | 0.82 | The Cornell Lab (2020)[a] | 0.683 | The Cornell Lab (2020)[e] |
| Food IR | Ingestion rate of food | Kg/Kg BW/d | 0.077 | Nagy (2001)[b] | 0.062 | Nagy (2001)[f] |
| Soil / Sediment Ingestion | Ingestion proportion of soil or sediment | Fraction of Total Diet | 0.025 | The Cornell Lab (2020)[c] | 0.073 | Beyer et al. (1994)[g] |
| Fd (plants) | Fraction of diet consisting of plants | | 0.95 | The Cornell Lab (2020)[d] | 0 | |
| Fd (inverts) | Fraction of diet consisting of soil invertebrates | | 0 | | 0 | |
| Fd (mammals) | Fraction of diet consisting of mammals | | 0 | | 0 | |
| Fd (benthic inverts) | Fraction of diet consisting of benthic invertebrates | | 0.05 | The Cornell Lab (2020)[d] | 0.78 | Niethammer and Kaiser (1983)[h] |
| Fd (fish) | Fraction of diet consisting of fish | | 0 | | 0.22 | Niethammer and Kaiser (1983) |
| Fd (birds) | Fraction of diet consisting of birds | | 0 | | 0 | |

Notes:

[a] Black-bellied Whistling Duck body weight: average of mean body weights for adult males and females.
[b] Black-bellied Whistling Duck ingestion rate: using all birds dry matter intake equation.

[c] Black-bellied Whistling Duck soil/sediment ingestion rate: midpoint of grit matter mass, as proportion of food ingestion.

[d] Black-bellied Whistling Duck diet: average of studies.

[e] Yellow-Crowned Night Heron body weight: average of mean body weights for adult males and females.
[f] Yellow-Crowned Night Heron food ingestion rate: using all birds dry matter intake equation.
[g] Yellow-Crowned Night Heron soil/sediment ingestion rate: surrogate soil/sediment ingestion rate based on an avian consumer of benthic invertebrates.
[h] Yellow-Crowned Night Heron diet: diet items by weight (22% fish, 74% crawfish, 2% turtle, 2% insects, modeled as 22% fish, 78% benthic invertebrates), July through September, northeastern Louisiana, oxbow lakes surrounded by cypress-tupelo swamp, agriculture, and lowland hardwood forest.

*Appendix J-13. Table 4*
*Species Factors for HQ Calculations for Future Use and Other Assessment*
*Castex Development, LLC v. Andarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Parameter | Description | Units | Snowy Egret | Source | Raccoon | Source |
|---|---|---|---|---|---|---|
| BW | Body weight of receptor | Kg | 0.371 | Parsons et al. (2000)[a] | 5.78 | USEPA (1993; Page 2-236); [source: Sanderson (1984); Nagel (1943); Johnson (1970); Hamilton (1936)][e] |
| Food IR | Ingestion rate of food | Kg/Kg BW/d | 0.116 | Nagy (2001)[b] | 0.035 | Nagy (2001)[f] |
| Soil / Sediment Ingestion | Ingestion Proportion of soil or sediment | Fraction of Total Diet | 0.005 | Sample & Suter (1994 ; Section 4.13; Page 27)[c] | 0.094 | Beyer et al. (1994)[g] |
| Fd (plants) | Fraction of diet consisting of plants | | 0 | | 0.46 | USEPA (1993; Page 2-237); [Source: Llewellyn & Uhler (1952)][h] |
| Fd (inverts) | Fraction of diet consisting of soil invertebrates | | 0 | | 0 | |
| Fd (mammals) | Fraction of diet consisting of mammals | | 0 | | 0.06 | USEPA (1993; Page 2-237); [Source: Llewellyn & Uhler (1952)][h] |
| Fd (benthic inverts) | Fraction of diet consisting of benthic invertebrates | | 0.1 | Smith (1997)[d] | 0.46 | USEPA (1993; Page 2-237); [Source: Llewellyn & Uhler (1952)][h] |
| Fd (fish) | Fraction of diet consisting of fish | | 0.90 | Smith (1997)[d] | 0.02 | USEPA (1993; Page 2-237); [Source: Llewellyn & Uhler (1952)][h] |
| Fd (birds) | Fraction of diet consisting of birds | | 0 | | 0 | |

Notes:

[a] Snowy Egret body weight: based on typical adult mass of 13.1 oz converted to grams (conversion factor of 28.35).
[b] Snowy Egret food ingestion rate: ingestion rate using carnivorous bird dry matter intake equation.
[c] Snowy Egret soil/sediment ingestion rate: surrogate value based on Great Blue Heron. Table 1 (Beyer 1994).
[d] Snowy Egret diet (based on % biomass stomach contents): fish (91.4%), crayfish (6-7%); frogs (1%); invertebrates (1%; [insects, grass shrimp]); modeled as 90% fish, 10% benthic invertebrates.
[e] Raccoon body weight: average of adult males and adult females, all studies in USEPA 1993.
[f] Raccoon ingestion rate: using all mammal dry matter intake equation.
[g] Raccoon soil/sediment ingestion rate: meadow vole (herbivorous mammal) used as a surrogate for soil/sediment ingestion proportion.
[h] Raccoon diet: average of diet items, excluding amphibians/reptiles, for all seasons for Maryland hardwood bottomland habitat

*Appendix J-13. Table 5*
*Exposure Modifying Factors (EMFs) for Receptors for Future Use and Other Assessment*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Parameter | Description | Black-bellied Whistling Duck | Yellow-Crowned Night Heron | Snowy Egret | Raccoon |
|---|---|---|---|---|---|
| Home Range | Home Range of receptor (acres) | 55.6[a] | 699[b] | 490[d] | 366[c] |
| Spatial Factor | Spatial Factor = potentially affected area ÷ receptor home range, with an upperbound value of 1 (100%) | | | | |
| Time (Temporal) Factor | Fraction of time spent in presumed contaminated area | 0.3 | 0.3 | 0.3 | 0.3 |

Notes:
[a] Black-bellied Whistling Duck: Mean high use area within ponds (Cornell Lab of Ornithology, 2020).
[b] Yellow-Crowned Night Heron: Average distance for foraging flights, areas based on circle radii (Cornell Lab of Ornithology, 2020).
[d] Snowy Egret: Most frequent flight distance 0-2 km, area based on 2 $km^2$ (Custer & Osborn, 1978).
[c] Raccoon: Average of adult male and female home ranges, all seasons, Louisiana Atchafalaya bottomland hardwood habitat (Byrne and Chamberlain, 2011).

| Area | Estimated Area (acres) | Matrix | Spatial Factor | | | |
|---|---|---|---|---|---|---|
| | | | Black-bellied Whistling Duck | Yellow-Crowned Night Heron | Snowy Egret | Raccoon |
| Former BP Operations Areas - Future Use | 0.45 | Soil | 8.1E-03 | 6.4E-04 | 9.2E-04 | 1.2E-03 |
| Former Anadarko Operations Areas - Future Use | 0.9 | Soil | 1.6E-02 | 1.3E-03 | 1.8E-03 | 2.5E-03 |
| HA-4 - Inundation scenario | 0.3 | Soil | 5.4E-03 | 4.3E-04 | 6.1E-04 | 8.2E-04 |
| HA-5 - Inundation scenario | 0.5 | Soil | 9.0E-03 | 7.2E-04 | 1.0E-03 | 1.4E-03 |

*Appendix J-14. Table 1*
*Summary: Barium Sediment to Benthic Invertebrate Biota Accumulation Factors*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| **Location** | **Barium Geometric Mean Sediment to Benthic Invertebrate BAF** | **Reference** |
|---|---|---|
| South Louisiana (Abdominal) | 0.0013 | Finerty et al., 1990 |
| South Louisiana (Hepatopancreas) | 0.012 | Finerty et al., 1990 |
| EWL, LA (EWL Site) | 0.091 | ERM, 2019 |
| EWL, LA (EWL Reference) | 0.21 | ERM, 2019 |
| | | |
| **Total Means: Barium Sediment to Benthic Invertebrate BAF** | **0.023** | |

Notes:
BAF=Biota Accumulation Factor
EWL, LA=East White Lake, Louisiana

References:
Finerty, M.W., Madden, J.D., Feagley, and Grodner, R.M. 1990. Tissues of Wild and Pond-raised Crayfish in Southern Louisiana, Effect of Environs and Seasonality on Metal Residues. Arch. Environ. Contam. Toxicol. 19: 94-100.

ERM. 2019. East White Lake Ecological Risk Assessment, Section 16 Property, East White Lake Oil and Gas Field, Vermilion Parish, Louisiana. September 16, 2019.

*Appendix J-14. Table 2*
*Barium in Sediments and Invertebrates and Biota Accumulation Factor Calculations (Finerty et al., 1990)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Sample ID | Crawfish Mean Abdominal Barium (mg/kg) | Crawfish Mean Hepatopancreas Barium (mg/kg) | Mean Sediment Barium (mg/kg) | Abdominal BAF (conc. in crawfish ÷ conc. in sed.) | Hepatopancreas BAF (conc. in crawfish ÷ conc. in sed.) |
|---|---|---|---|---|---|
| VER | 0.782 | 8.223 | 333.5 | 0.0023 | 0.025 |
| AP | - | 4.84 | 556.4 | - | 0.0087 |
| CRS | 0.532 | 6.869 | 519.3 | 0.0010 | 0.013 |
| LB | 1.288 | 6.177 | 297.6 | 0.0043 | 0.021 |
| STM | 0.043 | 2.193 | 945.9 | 0.000045 | 0.0023 |
| UB | 2.383 | 6.558 | 282.2 | 0.0084 | 0.023 |
| | | | | | |
| **Geometric Mean Barium Sediment to Benthic Invertebrate BAF** | | | | **0.0013** | **0.012** |

Notes:
Outlier removed: Barium soil outlier significantly below background (13.39 mg/kg).
BAF=Biota Accumulation Factor

Reference:

Finerty, M.W., Madden, J.D., Feagley, and Grodner, R.M. 1990. Tissues of Wild and Pond-raised Crayfish in Southern Louisiana, Effect of Environs and Seasonality on Metal Residues. Arch. Environ. Contam. Toxicol. 19: 94-100.

*Appendix J-14. Table 3*
*Barium in Sediments and Crabs and Biota Accumulation Factor Calculations (ERM, 2019)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Area | Sample ID | Barium Concentration in Crab Tissue | Barium Concentration in Sediment | Barium Sediment to Crab BAF (conc. in crab tissue ÷ conc. in sediment) |
|---|---|---|---|---|
| EWL Site | EWL-T-01A-C | 13.1 | | |
| EWL Site | EWL-T-01-C | 22.6 | | |
| EWL Site | EWL-T-02-C | 16.5 | | |
| EWL Site | EWL-T-03-C | 34.1 | | |
| EWL Site | EWL-T-04-C | 20.7 | | |
| EWL Site | EWL-T-05-C | 19.5 | | |
| EWL Site | EWL-T-06-C | 22.9 | | |
| EWL Site | EWL-T-07-C | 20.4 | | |
| EWL Site | EWL-T-08-C | 23.5 | | |
| EWL Site | EWL-T-09-C | 16.1 | | |
| EWL Site | EWL-T-10-C | 37.7 | | |
| EWL Site | EWL-T-11-C | 24.3 | | |
| EWL Site | EWL-T-12-C | 24.9 | | |
| **EWL Site Geometric Mean** | | **21.9** | **241** | **0.091** |
| | | | | |
| EWL Reference | EWL-TR-01-C | 16.8 | | |
| EWL Reference | EWL-TR-02-C | 20.8 | | |
| EWL Reference | EWL-TR-03A-C | 25.8 | | |
| EWL Reference | EWL-TR-03-C | 20.4 | | |
| EWL Reference | EWL-TR-04-C | 22.4 | | |
| EWL Reference | EWL-TR-05-C | 21.1 | | |
| EWL Reference | EWL-TR-06-C | 29.3 | | |
| EWL Reference | EWL-TR-07-C | 14.3 | | |
| EWL Reference | EWL-TR-08-C | 21.8 | | |
| EWL Reference | EWL-TR-09-C | 23.6 | | |
| **EWL Reference Geometric Mean** | | **21.3** | **101** | **0.21** |

Notes:
Concentrations are in mg/kg wet weight.
Concentrations for crab are for tissue.
Crab sampling was performed in December 2010/January 2011.
Sediment data are from 0-2 feet and collected in 2010 at EWL.
BAF=Biota Accumulation Factor
EWL=East White Lake

Reference:
ERM. 2019. East White Lake Ecological Risk Assessment, Section 16 Property, East White Lake Oil and Gas Field, Vermilion Parish, Louisiana. September 16, 2019.

*Appendix J-15. Table 1*
*Summary: Barium Sediment to Fish Biota Accumulation Factors*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Location | **Geometric Mean Barium Sediment to Fish BAF** | Reference |
|---|---|---|
| Ottawa River, Ten Mile Creek, Ohio | 0.012 | Ohio EPA, 1991 |
| Upper Columbia River, Washington | 0.0068 | Teck American, Inc. 2010 |
| EWL, LA (EWL Site) | 0.071 | ERM, 2019 |
| EWL, LA (EWL Reference) | 0.11 | ERM, 2019 |
| **Barium Sediment to Fish BAF** | **0.028** | |

Notes:
BAF=Biota Accumulation Factor
EWL, LA= East White Lake, Louisiana

References:
Ohio EPA. 1991. Fish Tissue Bottom Sediment Surface Water Organic & Metal Chemical Evaluation, Ottawa River, Ten Mile Creek, Toledo, Ohio, Division Of Water Quality Planning And Assessment. US Geological Survey. Pearl, Mississippi.

Teck American, Inc. 2010. Upper Columbia River Screening-Level Ecological Risk Assessment (SLERA) Teck American, Inc., Spokane, WA.

ERM. 2019. East White Lake Ecological Risk Assessment, Section 16 Property, East White Lake Oil and Gas Field, Vermilion Parish, Louisiana. September 16, 2019.

*Appendix J-15. Table 2*
*Barium in Fish and Sediments in Rivers in Ohio and Washington and Biota Accumulation Factor Calculations (Ohio EPA, 1991; Teck American, Inc., 2010)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Ottawa River / Ten Mile Creek[a] | Site Location | Detroit Ave | Adj. Dura Landfill | Suder Ave | Dst Summit St | Sylvania Ave | Highland Meadows Golf |
|---|---|---|---|---|---|---|---|
| Whole body common carp conc. | mg/kg | 1.94 | 0.843 | 0.79 | 1.38 | 1.22 | 1.34 |
| Sediment composite conc. | mg/kg | 96.9 | 126 | 143 | 175 | 55 | 72.6 |
| BCF | fish conc.÷ sed. conc. | 0.020 | 0.0067 | 0.0055 | 0.0079 | 0.022 | 0.018 |
| | | **Geometric Mean Barium Sediment to Fish BAF** | | | | | **0.012** |

| Upper Columbia River[b] | Reach # | 6b | 6a | 5 | 4a | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|
| Mean fish tissue conc. in reach | mg/kg-dry | 10.6 | 10.6 | 10.4 | 9.2 | 8.0 | 6.7 | 7.6 |
| Avg. sediment conc. by location | mg/kg-dry | 1517 | 798 | 1067 | 1190 | 1382 | 1543 | 2008 |
| BCF | fish conc.÷ sed. conc. | 0.0070 | 0.013 | 0.010 | 0.0077 | 0.0058 | 0.0043 | 0.0038 |
| | | | **Geometric Mean Barium Sediment to Fish BAF** | | | | | **0.0068** |

Note:
BAF=Biota Accumulation Factor

References:
[a]Ohio EPA. 1991. Fish Tissue Bottom Sediment Surface Water Organic & Metal Chemical Evaluation, Ottawa River, Ten Mile Creek, Toledo, Ohio, Division Of Water Quality Planning And Assessment. US Geological Survey. Pearl, Mississippi.
[b]Teck American, Inc. 2010. Upper Columbia River Screening-Level Ecological Risk Assessment (SLERA) Teck American, Inc., Spokane, WA.

*Appendix J-15. Table 3*
*Barium in EWL Fish and Sediments and Biota Accumulation Factor Calculations (ERM, 2019)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Area | Sample ID | Barium Concentration in Fish Tissue | Barium Concentration in Sediment | Barium Sediment to Fish BAF (Conc. in Fish Tissue ÷ Conc. in Sediment) |
|---|---|---|---|---|
| EWL Site | EWL-T-01A-F | NA | | |
| EWL Site | EWL-T-01-F | 16.4 | | |
| EWL Site | EWL-T-02-F | 17.0 | | |
| EWL Site | EWL-T-03-F | 15.9 | | |
| EWL Site | EWL-T-04-F | 17.1 | | |
| EWL Site | EWL-T-05-F | 19.1 | | |
| EWL Site | EWL-T-06-F | 16.4 | | |
| EWL Site | EWL-T-07-F | 17.0 | | |
| EWL Site | EWL-T-08-F | 17.1 | | |
| EWL Site | EWL-T-09-F | 16.7 | | |
| EWL Site | EWL-T-10-F | 20.1 | | |
| EWL Site | EWL-T-11-F | 18.0 | | |
| EWL Site | EWL-T-12-F | 14.7 | | |
| **EWL Site Geometric Mean** | | **17.1** | **241** | **0.071** |
| | | | | |
| EWL Reference | EWL-TR-01-F | NA | | |
| EWL Reference | EWL-TR-02-F | 9.1 | | |
| EWL Reference | EWL-TR-03A-F | NA | | |
| EWL Reference | EWL-TR-03-F | 9.5 | | |
| EWL Reference | EWL-TR-04-F | 13.4 | | |
| EWL Reference | EWL-TR-05-F | 13.0 | | |
| EWL Reference | EWL-TR-06-F | 10.8 | | |
| EWL Reference | EWL-TR-07-F | 11.5 | | |
| EWL Reference | EWL-TR-08-F | 11.9 | | |
| EWL Reference | EWL-TR-09-F | 12.1 | | |
| **EWL Reference Geometric Mean** | | **11.3** | **101** | **0.11** |

Notes:
Concentrations are in mg/kg wet weight.
Concentrations for shad fish are for tissue.
Fish sampling was performed in December 2010/January 2011.
Sediment data are from 0-2 feet and collected in 2010 at EWL.
BAF=Biota Accumulation Factor
EWL=East White Lake

Reference:
ERM. 2019. East White Lake Ecological Risk Assessment, Section 16 Property, East White Lake Oil and Gas Field, Vermilion Parish, Louisiana. September 16, 2019.

*Appendix J-16. Table 1*
*Summary: Total Mercury Sediment to Benthic Invertebrate Bioconcentration Factors*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Location | Geometric Mean Total Mercury Sed. to Invert. BAF | Reference |
|---|---|---|
| St. Lawrence, Canada | 0.035 | Razavi, 2013 |
| Lavaca, TX | 1.1 | USFW, 1994 |
| EWL, LA (EWL Site) | 0.90 | ERM, 2019 |
| EWL, LA (EWL Reference) | 2.2 | ERM, 2019 |
| St. Lawrence, Cornwall Zooplankton | 0.40 | Ridal et. al., 2010 |
| St.Lawrence, Cornwall Benthos | 0.40 | Ridal et al., 2010 |
| **Total Mercury Sediment to Invertebrate BAF** | **0.48** | |

Note:
BCF=Bioconcentration Factor

**References:**

Razavi, R. 2013. Ebullition Rates And Mercury Concentrations In St. Lawrence River Sediments And a Benthic Invertebrate. Environmental Toxicology and Chemistry, Vol. 32, No. 4, pp. 857–865.

U.S. Fish And Wildlife Service. 1994. Accumulation Of Mercury In Sediments, Prey, And Shorebirds of Lavaca Bay, Texas, Phase II Report.

ERM. 2019. East White Lake Ecological Risk Assessment, Section 16 Property, East White Lake Oil and Gas Field, Vermilion Parish, Louisiana. September 16, 2019.

Ridal, J. et al. 2010. Potential causes of enhanced transfer of mercury to St. Lawrence River Biota: implications for sedimentmanagement strategies at Cornwall, Ontario, Canada. Hydrobiologia 647:81–98.

*Appendix J-16. Table 2*
*Total Mercury in St. Lawrence Sediments and Benthic Invertebrates and Bioaccumulation Factor Calculations (Razavi, 2013)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Media: Invertebrates and Sediments | Mean Total Mercury (ng/g dw) | **Bioaccumulation Factor (BAF) Total Mercury Sediment to Invertebrates** (amphipod total Hg conc. ÷ sediment total Hg conc.) |
|---|---|---|
| Amphipods | 173 | **0.035** |
| Sediments | 5000 | |

**Reference:**
Razavi, R. 2013. Ebullition Rates And Mercury Concentrations In St. Lawrence River Sediments And a Benthic Invertebrate. Environmental Toxicology and Chemistry, Vol. 32, No. 4, pp. 857–865.

*Appendix J-16. Table 3*
*Total Mercury in Lavaca Bay, TX. Sediments and Benthic Invertebrates and Bioaccumulation Factor Calculations (USFW, 1994)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Matrix / Biota | Mean Total Mercury (mg/kg dw) | Bioconcentration Factor (BAF) Total Mercury Sediment to Invertebrates (invertebrate total mercury conc.÷ total mercury sediment conc.) |
|---|---|---|
| Sediment | 0.26 | |
| Mussel | 0.27 | 1.0 |
| Oyster | 0.26 | 1.0 |
| Polychaete | 0.20 | 0.77 |
| Xanthid crab | 0.18 | 0.69 |
| Fiddler crab | 0.83 | 3.2 |
| | | |
| **Geometric Mean Total Mercury Invertebrate BAF** | | **1.1** |

**Reference:**
U.S. Fish And Wildlife Service. 1994. Accumulation Of Mercury In Sediments, Prey, And Shorebirds of Lavaca Bay, Texas, Phase II Report.

*Appendix J-16. Table 4*
*Total Mercury in EWL Sediments and Crabs and Bioaccumulation Factor Calculations (ERM, 2019)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Area | Sample ID | Total Mercury Concentration in Crab Tissue | Total Mercury Concentration in Sediment | Total Mercury Sediment to Crab BAF (Conc. in Crab Tissue ÷ Conc. in Sediment) |
|---|---|---|---|---|
| EWL Site | EWL-T-01A-C | 0.055 | | |
| EWL Site | EWL-T-01-C | 0.055 | | |
| EWL Site | EWL-T-02-C | 0.047 | | |
| EWL Site | EWL-T-03-C | 0.063 | | |
| EWL Site | EWL-T-04-C | 0.043 | | |
| EWL Site | EWL-T-05-C | 0.050 | | |
| EWL Site | EWL-T-06-C | 0.055 | | |
| EWL Site | EWL-T-07-C | 0.046 | | |
| EWL Site | EWL-T-08-C | 0.049 | | |
| EWL Site | EWL-T-09-C | 0.046 | | |
| EWL Site | EWL-T-10-C | 0.058 | | |
| EWL Site | EWL-T-11-C | 0.047 | | |
| EWL Site | EWL-T-12-C | 0.042 | | |
| **EWL Site Geometric Mean** | | **0.050** | **0.055** | **0.90** |
| EWL Reference | EWL-TR-01-C | 0.045 | | |
| EWL Reference | EWL-TR-02-C | 0.036 | | |
| EWL Reference | EWL-TR-03A-C | 0.063 | | |
| EWL Reference | EWL-TR-03-C | 0.043 | | |
| EWL Reference | EWL-TR-04-C | 0.057 | | |
| EWL Reference | EWL-TR-05-C | 0.035 | | |
| EWL Reference | EWL-TR-06-C | 0.072 | | |
| EWL Reference | EWL-TR-07-C | 0.038 | | |
| EWL Reference | EWL-TR-08-C | 0.035 | | |
| EWL Reference | EWL-TR-09-C | 0.046 | | |
| **EWL Reference Geometric Mean** | | **0.046** | **0.020** | **2.2** |

Notes:
Concentrations are in mg/kg wet weight.
Concentrations for crab are for tissue.
Crab sampling was performed in December 2010/January 2011.
Sediment data are from 0-2 feet and collected in 2010 at EWL.
BAF=Bioaccumulation Factor
EWL=East White Lake

**Reference:**

ERM. 2019. East White Lake Ecological Risk Assessment, Section 16 Property, East White Lake Oil and Gas Field, Vermilion Parish, Louisiana. September 16, 2019.

*Appendix J-16. Table 5*
*Total Mercury in St. Lawrence River Sediments and Benthic Invertebrates and Bioaccumulation Factor Calculations (Ridal et al., 2010)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Matrix / Biota | Sample Location | | | | Total Mercury Bioaccumulation Factors (conc. in invert. ÷ conc. in sed.) |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| Zooplankton (ng/g dw) | 502 | 608 | 245 | 111 | |
| Sediment (ng/g dw) Top 10 cm | 774 | 2238 | 1744 | 104 | **Geometric Mean Total Mercury Zooplankton BAF** |
| Total Hg BAF Zooplankton | 0.65 | 0.27 | 0.14 | 1.1 | **0.40** |
| | | | | | |
| Benthos (ng/g dw) | 338 | 300 | 666 | 118 | |
| Sediment (ng/g dw) Top 10 cm | 774 | 2238 | 1744 | 104 | **Geometric Mean Total Mercury Benthos BAF** |
| Total Hg BAF Benthos | 0.44 | 0.13 | 0.38 | 1.1 | **0.40** |

Note:
BAF=Bioaccumulation Factor

**Reference:**

Ridal, J. et al. 2010. Potential causes of enhanced transfer of mercury to St. Lawrence River Biota: implications for sediment management strategies at Cornwall, Ontario, Canada. Hydrobiologia

*Appendix J-17. Table 1*
*Summary: Total Mercury Sediment to Fish Bioaccumulation Factors*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Location | Geometric Mean Total Mercury Sediment to Fish BAF | Reference |
|---|---|---|
| White Lake at Abbeville, LA | 3.9 | LDEQ LEAU database, 2019 |
| Upper Prong Schooner Bayou, LA | 3.9 | LDEQ LEAU database, 2019 |
| EWL, LA. Site | 0.20 | ERM, 2019 |
| EWL, LA. Reference | 0.51 | ERM, 2019 |
| **Total Mercury Sediment to Fish BAF** | **1.1** | |

**References:**

LDEQ. 2019. Data taken from the LDEQ's Louisiana Environmental Assessment Utility (LEAU) database. https://waterdata.deq.louisiana.gov/

ERM. 2019. East White Lake Ecological Risk Assessment, Section 16 Property, East White Lake Oil and Gas Field, Vermilion Parish, Louisiana. September 16, 2019.

*Appendix J-17. Table 2*
*Total Mercury in Fish and Sediments in White Lake and Schooner Bayou as Collected by LDEQ*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Site | LDEQ Site 310: White Lake at Abbeville, LA | | | | LDEQ Site 756: Upper Prong Schooner Bayou | | | |
|---|---|---|---|---|---|---|---|---|
| Date | 4/2/1998 | 7/23/2003 | 7/12/2004 | 7/10/2008 | 8/31/1998 | 9/30/2002 | 8/4/2004 | 6/22/2009 |
| Fish Tissue Concentration | 0.15 | 0.41 | 0.06 | 0.1978 | 0.08 | 0.72 | 0.51 | 0.0661 |
| | 0.05 | 0.15 | 0.22 | 0.6438 | 0.24 | 0.21 | 0.06 | 0.0577 |
| | 0.02 | 0.4 | 0.28 | 0.2286 | 0.19 | 0.41 | 0.2 | 0.0572 |
| | 0.04 | 0.37 | 0.3 | 0.3809 | 0.35 | 0.2 | 0.27 | 0.0948 |
| | 0.03 | 0.24 | 0.72 | 0.2693 | | 0.61 | 0.08 | 0.0688 |
| | 0.03 | 0.41 | 0.04 | 0.2242 | | 0.5 | 0.11 | 0.0543 |
| | 0.0001 | 0.27 | 0.28 | 0.2079 | | 0.62 | 0.24 | 0.0785 |
| | 0.05 | 0.17 | 0.47 | 0.2628 | | 0.27 | 0.12 | 0.1467 |
| | 0.07 | 0.58 | 0.23 | 0.1911 | | 0.24 | 0.44 | |
| | 0.33 | 0.29 | 0.44 | 0.573 | | 0.21 | 0.09 | |
| | 0.02 | 0.13 | 0.21 | 0.2966 | | | 0.4 | |
| | 0.05 | 0.17 | 0.69 | 0.2683 | | | 0.06 | |
| | 0.14 | 0.3 | | 0.2659 | | | | |
| | 0.18 | 0.17 | | 0.2729 | | | | |
| | | | | 0.1996 | | | | |
| | | | | 0.1778 | | | | |
| | | | | 0.2325 | | | | |
| | | | | 0.2288 | | | | |
| **Geometric Mean Fish Tissue** | 0.038 | 0.264 | 0.251 | 0.266 | 0.189 | 0.355 | 0.165 | 0.074 |
| **Sediment Concentration** | 0.01 | 0.05895 | 0.0849 | 0.0575 | 0.13 | 0.05466 | 0.02558 | NA |
| **Geometric Mean Sediment to Fish** | **3.85** | **4.47** | **2.95** | **4.62** | **1.45** | **6.50** | **6.44** | **NA** |
| **Geometric Mean Sediment to Fish BAF for LDEQ Site** | **3.9** | | | | **3.9** | | | |

Notes:
[a]Fish Tissue Concentration ÷ Sediment Concentration
Concentrations are in mg/kg.
Data from LDEQ's Louisiana Environmental Assessment Utility (LEAU) database. https://waterdata.deq.louisiana.gov/

*Appendix J-17. Table 3*
*Total Mercury in Fish and Sediments and Bioaccumulation Factor Calculations (ERM, 2019)*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field, Jefferson Davis Parish, Louisiana*

| Area | Sample ID | Total Mercury Concentration in Fish Tissue | Total Mercury Concentration in Sediment | Total Mercury Sediment to Fish BAF (Conc. in Fish Tissue ÷ Conc. in Sediment) |
|---|---|---|---|---|
| EWL Site | EWL-T-01A-F | NA | | |
| EWL Site | EWL-T-01-F | 0.0119 | | |
| EWL Site | EWL-T-02-F | 0.0105 | | |
| EWL Site | EWL-T-03-F | 0.0098 | | |
| EWL Site | EWL-T-04-F | 0.0131 | | |
| EWL Site | EWL-T-05-F | 0.0117 | | |
| EWL Site | EWL-T-06-F | 0.0109 | | |
| EWL Site | EWL-T-07-F | 0.0102 | | |
| EWL Site | EWL-T-08-F | 0.0097 | | |
| EWL Site | EWL-T-09-F | 0.0104 | | |
| EWL Site | EWL-T-10-F | 0.0125 | | |
| EWL Site | EWL-T-11-F | 0.0114 | | |
| EWL Site | EWL-T-12-F | 0.0106 | | |
| **EWL Site Geometric Mean** | | **0.0110** | **0.0555** | **0.20** |
| EWL Reference | EWL-TR-01-F | NA | | |
| EWL Reference | EWL-TR-02-F | 0.0120 | | |
| EWL Reference | EWL-TR-03A-F | NA | | |
| EWL Reference | EWL-TR-03-F | 0.0098 | | |
| EWL Reference | EWL-TR-04-F | 0.0116 | | |
| EWL Reference | EWL-TR-05-F | 0.0104 | | |
| EWL Reference | EWL-TR-06-F | 0.0101 | | |
| EWL Reference | EWL-TR-07-F | 0.0098 | | |
| EWL Reference | EWL-TR-08-F | 0.0101 | | |
| EWL Reference | EWL-TR-09-F | 0.0101 | | |
| **EWL Reference Geometric Mean** | | **0.0105** | **0.0205** | **0.51** |

Notes:
Concentrations are in mg/kg wet weight.
Concentrations for shad fish are for tissue.
Fish sampling was performed in December 2010/January 2011.
Sediment data are from 0-2 feet and collected in 2010 at EWL.
BAF=Bioaccumulation Factor
EWL=East White Lake

**Reference:**

ERM. 2019. East White Lake Ecological Risk Assessment, Section 16 Property, East White Lake Oil and Gas Field, Vermilion Parish, Louisiana. September 16, 2019.

# APPENDIX K DEVELOPMENT OF MERCURY SEDIMENT SCREENING VALUE

# APPENDIX K

## Mercury Sediment Screening Value

A total mercury no observed effects concentration (NOEC) screening value was calculated for protection of aquatic invertebrates and fish in fresh to brackish settings.

The NOEC is the highest tested concentration in a laboratory toxicity test at which no statistically or biologically significant adverse effects are observed. A NOEC is appropriate for use as a screening value for ecological risk assessment. A screening value based on invertebrate toxicity is appropriate because invertebrate response to constituent toxicity is more rapid than vertebrate response. Additionally, invertebrates serve as a primary food source for fish. There is sufficient information in the scientific literature to calculate an invertebrate sediment screening level NOEC for the Site, whereas the information in the scientific literature based on vertebrate exposure to sediment and toxicity is limited.

The first step in calculating a screening level NOEC for total mercury in sediment was to perform a literature review of mercury toxicity to invertebrates. This literature review was performed in 2019. The literature review of mercury effects in sediment to invertebrates published by Conder in 2015 represents the most current and comprehensive peer-reviewed summary available (Table 1 and Table 2) and was used as a starting point for identification of relevant studies for mercury invertebrate sediment effects. Source documents for each NOEC identified by Conder were reviewed to identify those NOEC values that were: 1) completed in the laboratory or in fresh or estuarine settings, 2) based on reproduction, growth or survival, and 3) based on effects due to mercury. The NOEC values included in calculating the mercury sediment screening value are shown in Table 3 and Table 4. The following NOEC values in the Conder study did not meet the criteria for inclusion in the calculation of a mercury NOEC: 3.3 mg/kg dry weight (Table 1; Peluso, 2013) and 551 mg/kg dry weight (Table 2; DeWitt, 1997). These excluded NOEC values, if they had been included, would have served to increase the calculated mercury screening value, so their exclusion is a conservative approach.

Calculation of the NOEC Mercury Screening Value: Based on the criteria identified above, five studies (Peluso, 2013; Odin, 1994; Odin, 1995; Gremyatchikh, 2009; Chibunda, 2009) were identified that included total mercury NOEC values based on toxicity to invertebrates in sediments spiked with mercury (in the laboratory), and seven studies (Horne, 1999; Winger, 1993; Flanders, 2019; Parametrix, 1997; RETEC, 2006; Anchor QEA, 2010; Chalmers, 2013; Barrick, 1988) performed in the field for total mercury NOEC effects to invertebrates. NOEC values that were included in calculating a total mercury screening value are those based on invertebrate reproduction, growth, and mortality in studies done in the laboratory or in the field in estuarine or freshwater sediment settings. NOEC values used in calculating the mercury screening value are shown in Table 3 and Table 4.

The total mercury screening value is a geometric mean of total mercury NOEC values (Table 5). The NOEC laboratory studies resulted in a NOEC geometric mean of 3.0 mg/kg dry weight and the NOEC field studies resulted in a geometric mean of 3.9 mg/kg dry weight. The value of 3.0 mg/kg dry weight was selected as the total mercury screening value. The lab and field studies NOEC values are similar, however choosing the smaller value of 3.0 mg/kg dry weight as the screening value is a conservative choice.

The geometric mean was used for calculating the NOEC screening value, because using a geometric mean provides an estimate of central tendency that is not unduly affected by extreme values and is the recommended approach for calculating NOECs (USEPA, 2005).

## REFERENCES


Anchor QEA, LLC. 2010. Pre-Remedial Design Investigation Data Report, Whatcom Waterway Site Cleanup, Port of Bellingham, Bellingham, Washington. 297 pgs.

Barrick, R., Becker, S., Brown, L., Beller, H., and R. Pastorok. 1988. Volume I: Sediment Quality Values Refinement: 1988 Update and Evaluation of Puget Sound AET. Puget Sound Estuary Program. 193 pgs.

Chalmers, A.T., Marvin-DiPasquale, M.C., Degnan, J.R., Coles, J.F., Agee, J.L., and D. Luce. 2013. Characterization of Mercury Contamination in the Androscoggin River, Coos County, New Hampshire. USGS and USEPA. 68 pgs.

Chibunda, R.T. 2009. Chronic Toxicity of Mercury (HgCl2) to the Benthic Midge Chironomus riparius. Int. J. Environ. Res. 3, No. 3: 455-462.

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*Appendix K. Table 1*
*Concentrations of Total Mercury in Sediment and Associated Effects in Mercury-spiked Sediment from Conder Review, 2015*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Species | Water salinity | Spiked compound | Equilibrium time [d] | Exposure duration [d] | Measured effect | Endpoint | Total Mercury concentration[a] (mg/kg, dry wt) | Organic carbon content | Study |
|---|---|---|---|---|---|---|---|---|---|
| Amphipod (*Rhepoxynius abronius*) | Salt | Mercury (II) | 1.7 | 10 | Survival | NOEC | 10.2[b] | 0.22% | Swartz, 1998 |
| | | | | | | LOEC | 12.8[b] | | |
| | | | | | | LC50 | 13.1[b] | | |
| Amphipod (*Hyalella curvispina*) | Fresh | Mercury (II) | 7 | 21 | Growth | NOEC | 3.3[c,e] | 3.5% | Peluso, 2013 |
| | | | | | | LOEC | 5.1[c] | | |
| | | | | | Survival | Unbounded NOEC | 11[c] | | |
| | | | | | Growth | NOEC | 7.6[d] | 12% | |
| | | | | | | LOEC | 9.4[d] | | |
| | | | | | Survival | Unbounded NOEC | 9.4[d] | | |
| Midge (*Chironomus riparius*) | Fresh | Mercury (II) | 7 | 14 | Growth | NOEC | 0.93 | 2.5% | Chibunda, 2009 |
| | | | | | | LOEC | 2.42 | | |
| | | | | | Development rate | NOEC | 0.59 | | |
| | | | | | | LOEC | 0.93 | | |
| | | | | | Survival | NOEC | 2.42 | | |
| | | | | | | LOEC | 3.84 | | |
| Midge (*Chironomus riparius*) | Fresh | Mercury (II) | "Minimal" | 21–35 | Growth | Unbounded NOEC | 2.86 | 0.7% | Gremyatchikh, 2009 |
| Nematodes | Salt | Mercury (II) | 7 | 60 | Benthic effect indices | Unbounded LOEC | 0.084 | 1.32% | Hermi, 2009 |
| Mayfly (*Hexagenia rigida*) | Fresh | Mercury (II) | 5 | 15 | Survival and | Unbounded NOEC | 10.5 | 2% | Odin, 1994 |
| | | Methylmercury | 5 | 15 | Survival and | Unbounded NOEC | 1.1 | | |
| Mayfly (*Hexagenia rigida*) | Fresh | Methylmercury | 3 | 15 | Survival and | Unbounded NOEC | 6.3 | 1.5% | Odin, 1995 |

Notes:
[a]Mercury concentrations are measured values, except as noted.
[b]Mercury concentrations are nominal. The LC50 value based on measured concentrations in sediment was reported as 15.2 mg/kg; however, the NOEC and LOEC based on measured values were not presented.
[c]Mercury concentrations are the average of initial and final measured concentrations in artificial sediment.
[d]Mercury concentrations are the average of initial and final measured concentrations in field-collected sediment.
[e]Peluso, 2013 NOEC of 3.3 mg/kg dry weight cannot be confirmed based on the data provided in the study.
LOEC = lowest-observed-effect concentration; NOEC = no-observed-effect concentration.

**Reference:**
Conder, J. et al. 2015. Critical Review of Mercury Sediment Quality Values for the Protection of Benthic Invertebrates. Environ. Toxicol. Chem. 34, No. 1: 6-21.

*Appendix K. Table 2*
*Concentrations of Total Mercury in Sediment and Associated Effects at Mercury Sites from Conder Review, 2015*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Study location (mercury source) | Water salinity | Coconstituent | Species | Exposure duration (d) | Measured effect | Endpoint | Total Mercury conc. (mg/kg, dry wt) | OC content | Study |
|---|---|---|---|---|---|---|---|---|---|
| Androscoggin River, NH, USA (chloralkali plant) | Fresh | Potentially other metals and organic compounds | Amphipod (*Hyalella azteca*), midge (*Chironomus dilutus*), benthic community census | 28 (amphipod) and 20 (midge) | Survival and growth | Unbounded NOEC | 0.3 | 2.50% | Chalmers, 2013 |
| Augusta Bay, Italy (chloralkali plant) | Saltwater | PAHs | Amphipods (*Rhepoxynius abronius*) | 10 | Survival | NOEC | 22 | 14.1% | Bizzotto, 2011 |
| | | | | | | LOEC | 37 | 8.3% | |
| | | | Amphipod (*Leptocheirus plumulosus*) | 10 | Survival | NOEC | 38 | 9.2% | |
| | | | | | | LOEC | 373 | 13.3% | |
| Brunswick estuary, GA, USA (chloralkali plant) | Estuarine[a] | Metals, PAHs, and PCBs | Amphipod (*L. plumulosus*) | 28 | Survival | NOEC | 551 | 7.3% | DeWitt, 1997 |
| | | | | | | LOEC | 972 | 8.4% | |
| | | | Amphipod (*H. azteca*) | 10 | Survival | Unbounded NOEC | 24.7 | 5.90% | Winger, 1993 |
| | | | | | Feeding rate | Unbounded LOEC | 18 | | |
| | | | Amphipod (*L. plumulosus*) | 14 | Behavioral abnormalities and survival | Unbounded NOEC | 170 | 0.78% | Horne, 1999 |
| Clear Lake, CA, USA (mercury mine) | Fresh | DDD and methyl parathion | Benthic invertebrate community | NA | Benthic invertebrate population and community-level effects | Unbounded NOEC | 1200 | Not reported | Suchanek, 2008; Suchanek, 2008 |
| Lake Maggiore and Toce River, Pieve Vergonte, Italy (chemical production factory) | Fresh | DDT | Midge (*C. dilutus*), benthic community census | 28 | Emergence, survival, and growth | Unbounded NOEC | 5.2 | 1.76% | Bizzotto, 2011 |
| Lavaca Bay, Point Comfort, TX, USA (chloralkali plant) | Estuarine | PAH | Polychaete (*Neanthes sp.*), amphipod (*Leptocheirus sp.*), benthic community structure | 20 (polychaete), 28 (amphipod) | Survival (amphipod, polychaete), growth (polychaete), benthic community metrics | Unbounded NOEC | 4.6 | 0.51% | Parametrix, 1997 |
| Mabubi River, Tanzania (artisanal gold mine) | Fresh | Arsenic | Midge (*Chironomus riparius*) | 10 | Growth | NOEC | 1.6 | 0.91% | Chibunda, 2008 |
| | | | | | | LOEC | 2.3 | 0.56% | |
| | | | | | Development rate | NOEC | 0.23 | 1.2% | |
| | | | | | | LOEC | 1.6 | 0.91% | |
| | | | | | Survival, emergence | Unbounded NOEC | 2.3 | 0.56% | |
| New York Harbor, NY, USA (assumed industrial point source) | Estuarine | PCBs and cadmium | Annelid worm (*Nereis virens*), bivalve (*Mercenaria mercenaria*), shrimp (*Palaemonetes pugio*) | 100 | Survival | Unbounded NOEC | 34.89 | 22.30% | Rubinstein, 1983 |
| Peninsula Harbour, Lake Superior, Ontario, Canada (chloralkali plant) | Fresh | PCBs and wood waste | Benthic community assessment, amphipod (*H. azteca*), midge (*C. riparius*), mayfly (*Hexagenia sp.*), worm (*Tubifex tubifex*) | 28 (amphipod and worm), 10 (midge), 21 (mayfly) | Benthic census metrics, survival and growth (amphipod, midge, and mayfly), survival and reproduction | Unbounded NOEC | 19.5 | 6.80% | Milani, 2005 |

**Notes:**
[a]DeWitt 1997 study was performed in seawater.
Mercury conc. = mercury concentration; OC = organic carbon; LOEC = lowest-observed-effect concentration; NOEC = no-observed-effect concentration; PAH = polycyclic aromatic hydrocarbon; PCB = polychlorinated biphenyl; DDD = dichlorodiphenyldichloroethane; DDT = dichlorodiphenyltrichloroethane; NA = not available.

**Reference:**
Conder et al. 2015. Critical Review of Mecury Sediment Quality Values for the Protection of Benthic Invertebrates. Environ. Toxicol. Chem. 34, No. 1: 6-21.

*Appendix F. Table 2 (Cont'd)*
*Concentrations of Total Mercury in Sediment and Associated Effects at Mercury Sites from Conder Review, 2015*
*Wichita Partnership, Ltd., et al. v. Apache Corporation, et al.*
*Second Bayou, Mud Lake, East Mud Lake, and Holly Beach Oil and Gas Fields*
*Cameron Parish, Louisiana*

| Study location (mercury source) | Water salinity | Coconstituent | Species | Exposure duration (d) | Measured effect | Endpoint | Total Mercury conc. (mg/kg, dry wt) | OC content | Study |
|---|---|---|---|---|---|---|---|---|---|
| Ria de Aveiro coastal lagoon, Portugal (chloralkali plant) | Estuarine | PCBs | Benthic community census | NA | Abundance and species richness | NOEC | 3 | Not reported | Nunes, 2008 |
| | | | | | | LOEC | 7 | | |
| | | | Mysid (*Mesopodopsis slabberi*) | NA | Population growth, biomass, and density | Unbounded NOEC | 200 | Not reported | D'Ambrosio, 2013 |
| | | | Mudsnail (*Peringia ulvae*) | NA | | Unbounded NOEC | 82 | Not reported | |
| | | | | | | NOEC | 24 | | Cardoso, 2013 |
| | | | | | Growth, biomass, and density | LOEC | 82 | | |
| | | | Amphipods | NA | | NOEC | 2 | Not reported | |
| | | | | | Population age structure | | | | Cardoso, 2013 |
| | | | Isopods | NA | Density and productivity | Unbounded NOEC | 206 | Not reported | |
| | | | Mysids | NA | Density and productivity | Unbounded NOEC | 206 | Not reported | |
| South River, VA, USA (textile plant) | Fresh | None reported | Amphipod (*H. azteca*) midge (*C. dilutus*), benthic community structure | 10 | Survival and growth, various benthic macroinvertebrate community metrics | Unbounded NOEC | 18.9 | Not reported | Flanders, 2012 |
| | | | Amphipod (*H. azteca*) | 7 | | NOEC | 5.9 | Not reported | Bundschuh, 2011 |
| | | | | | Feeding rate | LOEC | 10.3 | | |
| St. Clair River, Ontario, Canada (chloralkali plant) | Fresh | Hexachlorobenzene, octachlorostyrene (both at low levels) | Benthic community assessment, amphipod (*H. azteca*), midge (*C. riparius*), mayfly (*Hexagenia sp.*), worm (*T. tubifex*) | 28 (amphipod and worm), 10 (midge), 21 (mayfly) | Benthic census metrics, survival and growth (amphipod, midge, and mayfly), survival and reproduction (worm) | Unbounded NOEC | 49 | 1.5% | Milani, 2005 |
| Sudbury River, MA, USA (industrial complex/ Nyanza Chemical Waste Dump Site) | Fresh | Multiple | Mayfly (*Hexagenia sp.*) | 21 | Survival and growth | Unbounded NOEC | 22.1 | 16.6% | Naimo, 2000 |
| Whatcom Waterway, Bellingham Bay,WA, USA (chloralkali plant) | Estuarine | Phenol, 4-methylphenol, 2,4-dimethylphenol | Amphipod (*Eohaustorius estuarius*), sand dollar (*Dendraster excentricus*) or bivalve (*Mytilus sp.* or *Crassostrea sp.*), polychaete (*Neanthes arenaceodentata*) | 10 (amphipod), 2 (bivalve or sand dollar), 20 (polychaete) | Survival (amphipod and sand dollar or bivalve), growth (polychaete) | Unbounded NOEC | 2.6 | 4.1% | RETEC, 2006; Anchor QEA, 2010 |

Notes:
[a]DeWitt 1997 study was performed in seawater.
Mercury conc. = mercury concentration; OC = organic carbon; LOEC = lowest-observed-effect concentration; NOEC = no-observed-effect concentration; PAH = polycyclic aromatic hydrocarbon; PCB = polychlorinated biphenyl; DDD = dichlorodiphenyldichloroethane; DDT = dichlorodiphenyltrichloroethane; NA = not available.
**Reference:**
Conder et al. 2015. Critical Review of Mecury Sediment Quality Values for the Protection of Benthic Invertebrates. Environ. Toxicol. Chem. 34, No. 1: 6-21.



Castex-ERM-RPT-001153
BP/Castex-Ltd Adm-Apx L-001154

*Appendix K. Table 3*
*Total Mercury in Spiked Sediments: Effects to Invertebrates Studies Used in NOEC Calculations*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Species | Water salinity | Spiked compound | Equilibrium time (days) | Exposure duration (days) | Measured effect | Endpoint | Mercury concentration[a] (mg/kg, dry wt) | Organic carbon content | Reference |
|---|---|---|---|---|---|---|---|---|---|
| Amphipod (*Hyalella curvispina*) | Fresh | Mercury (II) chloride | 7 | 21 | Survival | Unbounded NOEC | 11[b] | 3.5% | Peluso (2013) |
| Mayfly (*Hexagenia rigida*) | Fresh | Mercury (II) chloride | 5 | 15 | Survival and growth | Unbounded NOEC | 10.5 | 2% | Odin (1994) |
| Amphipod (*Hyalella curvispina*) | Fresh | Mercury (II) chloride | 7 | 21 | Survival | Unbounded NOEC | 9.4[c] | 12% | Peluso (2013) |
| Midge (*Chironomus riparius*) | Fresh | Mercury (II) chloride | "Minimal" | 21–35 | Growth | Unbounded NOEC | 2.86 | 0.7% | Gremyatchikh (2009) |
| Midge (*Chironomus riparius*) | Fresh | Mercury (II) chloride | 7 | 14 | Survival | Bounded NOEC | 0.59 | 2.5% | Chibunda (2009) |
| Midge (*Chironomus riparius*) | Fresh | Mercury (II) chloride | 7 | 14 | Growth | Bounded NOEC | 0.93 | 2.5% | Chibunda (2009) |
| Midge (*Chironomus riparius*) | Fresh | Mercury (II) chloride | 7 | 14 | Development rate | Bounded NOEC | 0.59 | 2.5% | Chibunda (2009) |
| Mayfly (*Hexagenia rigida*) | Fresh | Methylmercury | 3 | 15 | Survival and growth | Unbounded NOEC | 6.3 | 1.5% | Odin (1995) |

Notes:
[a]Mercury concentrations are measured values, except as noted.
[b]Mercury concentrations are the average of initial and final measured concentrations in artificial sediment.
[c]Mercury concentrations are the average of initial and final measured concentrations in field-collected sediment.
NOEC=No Observed Effects Concentrations
In the Peluso study, data from the sediment with 0% organic carbon is not presented, as it does not represent conditions found in nature.

*Appendix K. Table 4*
*Total Mercury in Fresh and Estuarine Sediments: Field Studies of Effects to Invertebrates Used in NOEC Calculations*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Study location (mercury source) | Water salinity | Constituent | Species | Exposure duration (d) | Measured effect | Endpoint | Total Mercury conc. (mg/kg, dry wt) | Methylmercury conc. (mg/kg, dry wt) | OC content | Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| Brunswick estuary, GA, USA (chloralkali plant) | Estuarine | Metals, PAHs, and PCBs | Amphipod (*L. plumulosus*) | 14 | Behavioral abnormalities and survival | Unbounded NOEC | 170 | | 0.78% | Horne (1999) |
| Brunswick estuary, GA, USA (chloralkali plant) | Estuarine | Metals, PAHs, and PCBs | Amphipod (*H. azteca*) | 10 | Survival | Unbounded NOEC | 24.7 | | 5.90% | Winger (1993) |
| South River, VA, USA (textile plant) | Fresh | Metals, PAHs | Amphipod *(H. azteca)* midge *(C. dilutus)*, benthic community structure | 10 | Survival and growth, various benthic macroinvertebrate community metrics | Unbounded NOEC | 18.9 | | Not reported | Flanders (2019) |
| South River, VA, USA (textile plant) | Fresh | Metals, PAHs | Amphipod *(H. azteca)* midge *(C. dilutus)*, benthic community structure | 10 | Survival and growth, various benthic macroinvertebrate community metrics | Unbounded NOEC | | 0.102 | Not reported | Flanders (2019) |
| Lavaca Bay, Point Comfort, TX, USA (chloralkali plant) | Estuarine | PAH | Polychaete (*Neanthes sp.*), amphipod (Leptocheirus sp.), benthic community structure | 20 (polychaete), 28 (amphipod) | Survival (amphipod, polychaete), growth (polychaete), benthic community metrics | Unbounded NOEC | 4.6 | | 0.51% | Parametrix (1997) |
| Whatcom Waterway, Bellingham Bay, WA, USA (chloralkali plant) | Estuarine | Phenol, 4-methylphenol, 2,4-dimethylphenol | Amphipod *(Eohaustorius estuarius)*, sand dollar *(Dendraster excentricus)* or bivalve *(Mytilus* sp. or *Crassostrea* sp.), polychaete *(Neanthes arenaceodentata)* | 10 (amphipod), 2 (bivalve or sand dollar), 20 (polychaete) | Survival (amphipod and sand dollar or bivalve), growth (polychaete) | Unbounded NOEC | 2.6 | | 3.20% | RETEC (2006), Anchor QEA (2010) |
| Androscoggin River, NH, USA (chloralkali plant) | Fresh | Potentially other metals and organic compounds | Amphipod *(Hyalella azteca)*, midge *(Chironomus dilutus)*, benthic community census | 28 (amphipod) and 20 (midge) | Survival and growth | Unbounded NOEC | 0.3 | | 2.50% | Chalmers (2013) |
| Androscoggin River, NH, USA (chloralkali plant) | Fresh | Potentially other metals and organic compounds | Amphipod *(Hyalella azteca)*, midge *(Chironomus dilutus)*, benthic community census | 28 (amphipod) and 20 (midge) | Survival and growth | Unbounded NOEC | | 0.00035 | 2.50% | Chalmers (2013) |
| Puget Sound, WA, USA | Estuarine | Metals, PAH, Hg, Phenols, Other organics | Amphipods | 10 | Survival | NOEC | 2.1 | | 0.0006 - 0.294 | Barrick (1988) |

Notes:
Mercury conc. = mercury concentration; OC = organic carbon; NOEC = no-observed-effect concentration; PAH = polycyclic aromatic hydrocarbon; PCB = polychlorinated biphenyl

*Appendix K. Table 5*
*Calculation of Total Mercury Sediment Site-Specific Screening Value*
*Castex Development, LLC v. Anadarko Petroleum Corporation, et al.*
*West Mermentau Oil and Gas Field*
*Jefferson Davis Parish, Louisiana*

| Total Mercury Spiked Sediment NOECs | | Field Studies of Total Mercury Impacted Sediments NOECs | |
|---|---|---|---|
| **Total Mercury (mg/kg-dry)** | **Source** | **Total Mercury (mg/kg-dry)** | **Source** |
| 11 | Peluso (2013) | 170[a] | Horne (1999) |
| 10.5 | Odin (1994) | 24.7 | Winger (1993) |
| 9.4 | Peluso (2013) | 18.9 | Flanders (2019) |
| 2.86 | Gremyatchikh (2009) | 4.6 | Parametrix (1997) |
| 0.59 | Chibunda (2009) | 2.6 | RETEC (2006), Anchor QEA (2010) |
| 0.93 | Chibunda (2009) | 0.3 | Chalmers (2013) |
| 0.59 | Chibunda (2009) | 2.1 | Barrick (1988) |
| 6.3 | Odin (1995) | | |
| | | | |
| 3.0 | Geometric mean NOEC spiked studies (mg/kg-dry) | 3.9 | Geometric mean NOEC field studies (mg/kg-dry) |
| **Final Total Mercury Sediment Screening Value: 3.0 mg/kg dry** | | | |

Notes:
[a] Horne value of 170 mg/kg-dry not included in geometric mean calculation.
[b] NOEC values used to calculate Total Mercury sediment screening value are ones performed in lab, or from fresh or estuarine settings, where NOEC can be confirmed.
NOEC=No Observed Effects Concentration

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