

**ExxonMobil Environmental Services
Company**

Cove Restoration Planting Plan

Mayflower Pipeline Incident Response
Mayflower, Arkansas

February 2015

Revision 1



A handwritten signature in black ink that reads "Joseph Shisler".

Joseph Shisler, PhD, PWS
Principal Ecologist

A handwritten signature in black ink that reads "Lora de Marffy".

Lora de Marffy
Senior Scientist

A handwritten signature in black ink that reads "Mike Long".

Michael Long
Environmental Scientist 2

Cove Restoration Planting Plan

Mayflower Pipeline Incident
Response
Mayflower, Arkansas

Prepared for:
ExxonMobil Environmental Services
Company

Prepared by:
ARCADIS U.S., Inc.
630 Plaza Drive
Suite 100
Highlands Ranch
Colorado 80129
Tel 720 344 3500
Fax 720 344 3535

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1. Introduction

ARCADIS U.S., Inc. (ARCADIS) prepared this Cove Restoration Planting Plan (CRPP) for ExxonMobil Environmental Services Company (EMES) on behalf of ExxonMobil Pipeline Company (EMPCo) for the Mayflower Pipeline Incident Response located in Mayflower, Arkansas (site; Figure 1). In April 2013, the U.S. Army Corps of Engineers (USACE) issued a Nationwide Permit 38 Cleanup of Toxic and Hazardous Waste (NWP 38) to EMPCo (Permit No. 2013-00129) for the cleanup of a crude oil release on March 29, 2013.

Initial response actions in 2013 and sheen mitigation actions in the fall of 2014 temporarily disturbed portions of the site. These response actions included vegetation removal in the marsh between Interstate 40 and Highway 89 (herein referred to as “the cove”). This plan outlines the proposed restoration activities for the cove and the subsequent monitoring requirements.

A Stream and Wetland Compensatory Restoration Plan (ARCADIS 2014b) was submitted to the USACE in June 2014 and proposed the level of stream and wetland mitigation to meet the compensatory mitigation rule outlined by the U.S. federal government. The Stream and Wetland Compensatory Restoration Plan included an overview of the proposed on-site restoration. Arkansas Game and Fish Commission (AGFC; 2014) and the Arkansas Natural Heritage Commission (ANHC; 2014) provided comments to EMES on the proposed on-site restoration and these letters are included in Appendix A. Through discussions between EMES and the USACE, the USACE indicated that the Stream and Wetland Compensatory Restoration Plan will address the NWP 38 requirements and that the AGFC and ANHC comments should be incorporated into a detailed planting plan for the site. The CRPP addresses the AGFC and ANHC comments and provides detailed planting plan associated with the proposed level of mitigation. This current CRPP (Revision 1) incorporates additional comments on the CRPP received from the ADEQ on February 12, 2015,

2. Project Description

On March 29, 2013, a breach in a pipeline operated by EMPCo (the 20-inch Pegasus Pipeline) released crude oil in Mayflower, Arkansas (Figure 1). The crude oil was identified as Wabasca heavy crude oil (herein referred to as “crude oil”). An emergency response action was implemented immediately to mitigate the release, and a substantial amount of the crude oil was removed. Wetland, riparian and upland habitats of the cove were disturbed during the 2013 initial response action and 2014 mitigation activities.

Response action cleanup activities affected approximately 17.1 acres of forested wetlands and approximately 1,300 linear feet of an unnamed stream (referred to as the Inlet Channel) in the cove. Sheen mitigation actions described in the Mitigation Action Plan (ARCADIS 2014a) were completed in November 2014. The remedial action objective was to mitigate surface water sheens related to crude oil from the Pegasus Pipeline, to the

extent technologically feasible. The completed mitigation actions in three areas of the cove are summarized below (areas are shown on Figure 2):

- *Inlet Channel.* Targeted removal of sheen-bearing sediment along the bottom of the main channel between Interstate 40 and the Open Water Area. Removal depths varied from 6 to 18 inches. Approximately 750-800 cubic yards of sediment were removed from along approximately 1,300 feet of the Inlet Channel. Excavation areas with depths greater than 6 inches were backfilled with clean material.
- *Open Water Area.* A thin-layer reactive cap was placed over approximately 4.5 acres in the open marsh and water area located between the Inlet Channel and the Heavily Vegetated Area. The reactive cap consisted of an approximate 3- to 6-inch layer of clean sand mixed with organoclay placed directly over the sediment surface. Organoclay is an effective sorptive medium for petroleum hydrocarbons and sheens.
- *Heavily Vegetated Area.* The Heavily Vegetated Area is located downstream of the Open Water Area, extends east, and includes several natural channels. Targeted in-situ amendment in the Heavily Vegetated Area consisted of organoclay placed directly over the sediment, limiting disturbance to the existing vegetation. This vegetation was preserved during the response activities because of its habitat value and the relatively light degree of oiling that occurred in this area.

These activities completed in the Inlet Channel and Heavily Vegetated Area were followed by cap installation in the Open Water Area in November 2014.

3. Wetland Delineation and Assessment

The outline of disturbed wetlands is shown on Figure 2. This CRPP focuses on restoring the disturbed Inlet Channel and forested wetlands in the cove. The following sections discuss the cove hydrology, the wetland delineation performed in April 2014, and the supplemental wetland assessment performed in September 2014.

3.1 Cove Hydrology

Lake Conway hydrology is the controlling factor for the wetlands habitat in the cove as well as other habitats surrounding the lake. The AGFC began impounding Palarm Creek in 1948 to create the state-owned recreational fishing lake known as Lake Conway (AGFC 2013). From April 15 through November 15, the water surface elevation in Lake Conway is controlled by the dam elevation, which is at approximately 262.87 feet (NAVD88). During winter, November 16 through April 14, the lake level is lowered to an elevation of 261.87 feet (NAVD88) for flood control purposes. Due to the controlling effect of the cove outlet culverts (invert elevation of 262.2 feet [NAVD88]), normal seasonal water levels in the cove are 262.2 feet (NAVD88)

during winter (or possibly lower) and 262.87 feet (NAVD88) during summer, as controlled by the Lake Conway dam.

As a result of the seasonal flooding of Lake Conway, portions of the cove are periodically inundated. As shown on the National Wetland Inventory Map (Figure 3), this results in the creation of two vegetation communities:

- Palustrine Forested Broad-Leaved Deciduous (PFO1Ah) with a temporary non-tidal water regime that has been diked/impounded
- Palustrine Scrub-Shrub Broad-leaved Deciduous (PSS1Fh) with a semi-permanent non-tidal regime that has been diked/impounded

3.2 Wetland Delineation

Wetlands in the cove were delineated by Conestoga-Rovers & Associates in April 2014, and documented in a memorandum provided in the Stream and Wetland Compensatory Restoration Plan (ARCADIS 2014b). The delineation was conducted using the following U.S. Army Corps of Engineers (USACE) guidance:

- Wetlands Delineation Manual (USACE 1987)
- Eastern Mountains and Piedmont Regional Supplement (USACE 2012)
- Regulatory Guidance Letter 08-02 (USACE 2008)

The wetlands delineation classified the 17.1 acres of disturbed wetlands as 8.8 acres as Palustrine Forested Wetland – Broad-leaved Deciduous (PFO1) and 8.3 acres as Palustrine Scrub-Shrub Wetland – Broad-leaved Deciduous (PSS1). A summary figure is provided Appendix B.

3.3 Wetland Assessment

In September 2014, ARCADIS conducted a supplemental wetland assessment to evaluate current site conditions, sample reference wetland areas around Lake Conway, and develop a restoration planting plan for the cove. The assessment was performed in response to correspondence from the AGFC and ANHC to EMES (Appendix A) that requested similar wetlands in the area of high natural quality be used as reference areas to determine the most appropriate species to plant for the site restoration.

Three nearby wetlands (Figure 4) were assessed to determine which plant species would be proposed in the CRPP. The Hydrogeomorphic Approach, as outlined in “A Regional Guidebook for Conducting Functional

Assessments of Forested Wetlands in the Arkansas Valley Region of Arkansas” (USACE 2008b), was used for the assessment, with the following modification. In place of detailed transects recommended in the Hydrogeomorphic Approach, forested wetland habitats around Lake Conway were sampled. This modification allowed for an efficient assessment of the existing wetland communities affected by the Lake Conway hydrology.

The surveys conducted in three reference areas are summarized in the following sections. Appendix C provides the U.S. Department of Agriculture (USDA) Soil Survey data for each of the three reference areas (2013). Table 1 provides the plant species observed.

3.3.1 Forested Wetland Reference Area A

Reference Area A is a late successional forested wetland representing a typical undisturbed system for the cove. It is part of the forested wetland areas associated with Palarm Creek in the northeast portion of Lake Conway and is classified as Fringe Forested Wetlands.

The community located in and adjacent to standing water in the drainage swales of Reference Area A was dominated by a bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*). The upper edge was dominated by the sweet gum (*Liquidambar styraciflua*) and red maple (*Acer rubrum*) community. There was an absence of a dense shrub and herbaceous community due to the closed tree canopy. The sampling plots in Reference Area A are shown in Figure 5.

3.3.2 Forested Wetland Reference Area B

Reference Area B is an undisturbed young forested wetland, representative of an early successional wetland forest as would be present in the cove. It lies southeast of Lake Conway. This forested wetland consists of a dense stand of small diameter-at-breast height sweet gum trees with little to no shrub community as a result of the closed canopy. Two plots were sampled in Reference Area B (Figure 6).

3.3.3 Forested Wetland Reference Area C

Reference Area C is a mature forest on the fringe of Lake Conway. It is representative of emergent hydrological regimes such as the edges of the cove. Two plots were sampled in this area, along the eastern shore of Lake Conway (Figure 7). In this area, Wetland Fringe and Forested Wetland habitats were observed. Their vegetation community was dominated by bald cypress trees. These were growing in 6 inches of water, with water marks on the trunks approximately 12 inches above the water line, indicating the range of water levels these habitats experience.

3.4 Project Area Current Conditions

In September 2014, an assessment was conducted in the cove to document current conditions. Plant species presence and abundance, hydrology and habitat descriptions were recorded. A number of trees remain within the disturbed area of the cove. For each of these individual trees, the species was identified, it was located with a global positioning system device, and its diameter at breast height was measured and recorded (Figure 8; Table 1). The trees in the upland forest edge (i.e., undisturbed areas) around the cove were not surveyed. Soil survey data from USDA shows that the cove exhibits similar soils to the reference areas (Appendix C).

The following plant communities, habitats, and conditions were observed in the cove:

- The higher elevations of the cove are dominated by the beggar ticks (*Bidens frondosa*) and water pepper (*Polygonum hydropiper*) community. This community has naturally colonized the area during 2014 and it is expected to be replaced by other species in subsequent years as the plant community matures. This dense herbaceous community provides important organic matter for the soils and traps waterborne seeds for colonization.
- Wetland swales are located throughout the cove. The majority of on-site swales have established new vegetation through waterborne seed deposition and are dominated by a mixture of spikerushes (*Eleocharis spp.*), Virginia buttonweed (*Diodia virginiana*), ditch stonecrop (*Penthorum sedoides*), soft rush (*Juncus effusus*), and beaksedge (*Rhynchospora corniculata*). In September 2014, the swales were retaining water, which is assumed to be at the same elevation as the water level in Lake Conway.
- The Inlet Channel was undergoing remediation at the time of the assessment and was largely devoid of vegetation due to the removal of sediments and placement of clean backfill.

Several wetland communities have developed over the last two growing seasons in the cove from natural seed deposition and the seed bank. It is expected that existing trees in the disturbed area and along the upland forest edge will also function as a seed source for natural recruitment of tree species in the cove.

4. Restoration Objectives and Planting Plan

This CRPP describes the methods that will be used to restore areas temporarily disturbed during the response action and sheen mitigation activities.

4.1 Objectives

The objectives of the restoration include:

- Restore the Inlet Channel in accordance with the Little Rock District Stream Method (Little Rock Method) (USACE Little Rock District 2011).
- Revegetate riparian and wetland habitats temporarily disturbed by cleanup activities and the sheen mitigation activities. Use the wetlands assessment to verify the species for planting.
- Provide slope stability and erosion control through revegetation and restoration activities.
- Use local obtained native plants (as available) to match local vegetation dormancy periods, fruiting, leafing out, and hardiness.
- Develop a monitoring program to measure restoration success and report results.

4.2 Planting Plan for Disturbed Wetlands

The cove wetlands contain three distinct hydrologic zones and associated plant communities: Upper Edge Forested Wetland habitat, Wetland Fringe habitat, and Forested Wetland habitat (Figure 9). The three reference wetland areas associated with Lake Conway were evaluated in order to find examples of each type of habitat with the respective hydrology to aid the restoration planning. The reference wetlands are driven by Lake Conway hydrology, as are the wetland habitats in the cove.

Figure 10 shows a conceptual drawing of a cross-section of the proposed planting plan across the range of habitats as well as the species recommended for each hydrological condition. The approximate locations of these habitats are shown on Figure 11. Based on current site conditions and the assessment of other hydrologically comparable forested wetlands associated with Lake Conway, the planned restoration of the cove is as follows:

- *Upper Edge Forested Habitat (3.2 acres)*. The cleared, higher elevations of the cove currently dominated by beggar ticks (*Bidens frondosa*)/water pepper (*Polygonum hydropiper*) community and associated with the Upper Edge Forested Wetland habitats of Lake Conway will be planted with bare root seedlings of sweet gum, red maple and persimmon. The area will be seeded with riparian herbaceous seed mix (NC Piedmont Riparian Mix, ERNMX-307; Table 2) to reduce erosion and stabilize slopes until the seedlings establish root systems.
- *Forested Wetland Habitat (8.4 acres)*. In both the Reference Areas and the cove, a collection of tree species were identified in those areas of the forested wetlands that occurred in areas with seasonal flooding. These species included: overcup oak (*Quercus lyrata*), willow oak (*Quercus phellos*), silver maple (*Acer saccharinum*), and river birch (*Betula nigra*). Bare root seedlings of these species will be planted in the Forested Wetland habitat of the cove in areas of appropriate hydrology. A combination of

the Riparian and Wet Meadow seed mixes (NC Piedmont Riparian Mix [ERNMX-307] and NC Piedmont FACW Mix [ERNMX-308]; Table 2) will be applied to the Forested Wetland habitat.

- *Forested Wetland Fringe Habitat (5.5 acres)*. The lower elevations of the cove wetlands will be planted with bare root seedlings of bald cypress and water tupelo trees. Historical Lake Conway water elevations will be used to estimate average hydrologic conditions and select seedling placement within the cove. Wetland swales provide ideal hydrology for the development of cypress/water tupelo communities as observed in Reference Area C. A native wet meadow seed mix (NC Piedmont FACW Mix, ERNMX-308; Table 2) will be applied in the saturated soils of the Fringe Forested Wetland habitat to provide species diversity with modifications.

The reactive cap was placed in October through November 2014 and portions of the cap cover the three habitat types within the cove. The Site Planting Plan (Figure 11) shows the location and hydrology of the cap and the proposed plant communities to be restored. In these areas with the reactive cap, special measures will be taken to not compromise the cap's integrity with restoration activities. Areas of the cap that can be reached from adjacent uncapped areas will be planted with seedlings and seeded with a Wetland mixes (Obligate Wetland Mix, ERNMX-131; Table 2) will be applied to accessible edges of the cap. For the remainder of the area, methods of access will be used that prevent damage to the cap:

- A shallow-draft small boat (e.g., jon-boat with electric motor) to access submerged areas of the cap
- The use of boards/mats to walk out on the cap and plant seedlings.

A Standard Operating Procedure for planting and seeding in the reactive cap area is included in Appendix D. The seedling frequency will be reduced and the planting techniques may also be modified in the field as necessary. For example, mesh bags may be filled with seeds and weighted with rocks and placed in the open waters to hold the seeds to bottom until roots develop. Other ways to plant seeds or seedlings will be evaluated as necessary in the field for their efficacy and safety in application.

4.3 Planting Plan for the Inlet Channel

The Inlet Channel (1,300 linear feet) will be restored in accordance with the Little Rock Method (USACE Little Rock District 2011). Figure 12 shows a conceptual drawing of the restoration plan for the Inlet Channel. These restoration activities include installing root wads, and live stakes and planting bare root seedlings to armor stream banks, establish a riparian buffer, and create a diverse habitat structure for fish, reptiles, and amphibians (Figure 12).

4.4 Seed and Plant Types

Table 2 shows the proposed seed mixes. The seed mixture have been modified as requested by the agencies in accordance with correspondence from AGFC and ANHC to EMES (Appendix A).

Existing trees, shrubs, and herbaceous species in the cove, as well as plant communities upstream of the cove, are important seed sources for revegetation of the cove, as evidenced by the naturally recruited black willow (*Salix nigra*), water willow (*Decodon verticillatus*), and buttonbush (*Cephalanthus occidentalis*) are already abundant in the cove. Given their natural recruitment, these species will not be included in the initial restoration planting.

4.5 Planting Density

Trees and shrubs will be planted at sufficient density to account for natural competition and mortality among seedlings. The target planting density will be approximately 10 percent greater than observed for seedlings and young trees in reference areas. The plant stem density in the early successional forested system in Reference Area B was approximately 890 stems per acre and the bare root seedlings on site will be planted at a rate of up to 1000 stems per acre. In the areas with the reactive cap, the planting frequency will be reduced to approximately 500 stems per acre to reduce the impact on the reactive cap.

4.6 Schedule

Planting activities are scheduled to begin in March 2015 to maximize time in the first growing season and help establish the plant community. The restoration activities are anticipated to take 2 to 3 weeks to complete.

5. Restoration Monitoring Program

Monitoring and adaptive management of the restoration will be conducted, as proposed in this section, to ensure the wetland plant communities and habitats are reestablished in the cove after completion of the restoration and planting activities. The first monitoring of the restored wetlands will occur at the conclusion of the first full growing season. Wetland scientists will conduct subsequent monitoring events in the following spring and fall to evaluate conditions relative to the restoration goals. The schedule of additional monitoring events will be determined based on completed monitoring results and adaptive management activities.

5.1 Success Criteria

Success criteria provide measureable objectives to gauge project success. The goals for restoration in the cove include:

- Restore habitats temporarily disturbed by remedial activities.
- Restore Inlet Channel in accordance with the Little Rock Method (USACE Little Rock District 2011).

Performance standards associated with habitat restoration will be based on the criteria of 70 percent areal coverage of restoration plantings and/or target hydrophytes.

5.2 Monitoring Methods

This section presents the methods to be used during the collection and analysis of qualitative and quantitative data from the mitigation project area.

5.2.1 Qualitative Data

During each field visit, wetland ecologists will record observations of wetland hydrology (e.g., standing water, saturated soils) in restored wetland habitats. Photographs will be taken from permanent monitoring locations, to be established in the field following restoration activities, to supplement recorded field notes. At least one permanent photograph location will be established for each habitat type.

In addition, observations of wildlife use in and around the site will be recorded during field events. Records will include both direct sightings of wildlife as well as visual and audible indications of wildlife use (e.g., burrows, scat, calls). When possible, an activity associated with a sighting (e.g., fly over, roosting, feeding) will be recorded.

5.2.2 Quantitative Data

A representative plot approach will be used to assess the vegetative community during the annual monitoring events. This method provides a direct measure of success criteria metrics. Representative plots will be selected at random prior to the start of each monitoring event in each habitat type (Upper Edge Forested Habitat, Forested Wetland Habitat, and Forested Wetland Fringe Habitat). Plot sizes corresponded to each vegetative stratum as follows:

- Sapling/shrub¹ – 15-foot radius circular plot, with a minimum of five plots per habitat

¹ Sapling/shrub defined as woody vegetation greater than 2 feet but not more than 20 feet in height.

- Herbaceous – 1 square meter quadrat with a minimum of five plots per habitat

Within each plot, shrub/sapling community composition, stem count and percent cover by community type will be recorded. Within each quadrat, herbaceous community species composition, average height and percent cover will be recorded, as well as the composition, abundance and stem height of any shrubs or saplings. Quadrat and plot locations will be recorded using a global position system device. Information will be collected on monitoring data sheets (Appendix E).

Minimum sampling areas specific to each tree/shrub community type (Tiner 1999) will be used to establish the number of plots. This commonly-accepted approach for evaluating composition and structure of multi-layered communities provides multiple lines of data/evidence to support achievement of success criteria, accounts for natural recruitment/colonization, and facilitates the identification of changes in communities over time.

5.3 Adaptive Management

Adaptive management assesses the success of a restoration project at a particular point in time based on monitoring results, and based on those results, adjusts the state of the project through maintenance to improve the likelihood of project success. As such, the adaptive management program for the cove restoration project will evaluate the habitat types relative to the success criteria listed above and make recommendations for management activities (e.g., invasive species control), as necessary, that would further the attainment of these goals.

If determined that invasive species control is needed, it would be accomplished by the broadcast spraying of glyphosphate herbicide, such as Rodeo®, and/or physical removal of invasive species. Monitoring results and invasive species control activities, along with any additional recommendations for the following year, will be summarized in the annual mitigation monitoring report.

5.4 Schedule

The following schedule is proposed for annual monitoring and maintenance inspections:

- September 2015 – Quantitative monitoring event at the end of the first growing season
- December 2015 – Annual Monitoring Report
- April 2016 – Spring qualitative monitoring event
- September 2016 – Annual monitoring event at the end of the second growing season

- December 2016 – Annual Monitoring Report

The results of the annual monitoring events and future recommendations, if any, will be submitted to the USACE, ADEQ, and AGFC by December 31 of each year. If results indicate that the success criteria have not been met, then recommendations will be discussed in cooperation with the USACE, ADEQ, and AGFC.

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Tables

Table 1
Species Observed During Wetland Assessment (September 2014)

Cove Restoration Planting Plan
ExxonMobil Environmental Services Company
Mayflower Pipeline Incident Response, Mayflower, Arkansas

Common Name	Scientific Name	Cove	Reference Area A	Reference Area B	Reference Area C
American elm	<i>Ulmus americana</i>	X	X		
Arrowwood viburnum	<i>Viburnum dentatum</i>		X		
Asiatic dayflower	<i>Commelina communis</i>	X	X		X
Bald cypress	<i>Taxodium distichum</i>		X		X
Bamboo vine	<i>Smilax laurifolia</i>			X	
Barnyard grass	<i>Echinochloa crusgalli</i>	X			
Beak rush	<i>Rhynchospora spp.</i>	X			
Beggar ticks	<i>Bidens frondosa</i>	X		X	
Black gum	<i>Nyssa silvatica</i>		X		X
Black willow	<i>Salix nigra</i>	X			
Blackberry	<i>Rubus allegheniensis</i>	X			
Blackjack oak	<i>Quercus marilandica</i>	X			
Blue lobelia	<i>Lobelia siphilitica</i>			X	
Blue mist flower	<i>Conoclinium coelestinum</i>	X	X	X	
Buttonbush	<i>Cephalanthus occidentalis</i>	X	X		X
Camphorweed	<i>Pluchea camphorata</i>	X			
Cardinal flower	<i>Lobelia cardinalis</i>	X	X		
Catbriar	<i>Smilax rotundifolia</i>		X	X	X
Clear weed	<i>Pilea pumila</i>		X		
Climbing boneset	<i>Mikania scandens</i>	X			
Common Nettle	<i>Urtica dioica</i>	X	X		
Common Persimmon	<i>Diospyros virginiana</i>	X			
Ditch stonecrop	<i>Penthorum sedoides</i>	X			
Duck potato	<i>Sagittaria latifolia</i>		X		
Eastern red cedar	<i>Juniperus virginiana</i>		X		
Elderberry	<i>Sambucus canadensis</i>		X		
Fall panicum	<i>Panicum dichotomiflorum</i>	X			
Giant ragweed	<i>Ambrosia trifida</i>		X		
Green ash	<i>Fraxinus pennsylvanica</i>	X			
Indian grass	<i>Sorghastrum nutans</i>				X
Japanese Honeysuckle	<i>Lonicera japonica</i>		X		
Japanese stilt grass	<i>Microstegium vimineum</i>		X	X	
Jewelweed	<i>Impatiens capensis</i>		X		
Late goldenrod	<i>Solidago gigantea</i>	X		X	
Lizard's tail	<i>Saururus cernuus</i>		X		
Millet	<i>Pennisetum glaucum</i>	X			
Monkey flower	<i>Mimulus ringens</i>	X			
Musclewood	<i>Carpus caroliniana</i>			X	
Northern sea oats	<i>Chasmanthium latifolium</i>	X	X		
Overcup oak	<i>Quercus lyrata</i>	X	X		
Pignut Hickory	<i>Carya glabra</i>	X	X		X

Table 1
Species Observed During Wetland Assessment (September 2014)

Cove Restoration Planting Plan
ExxonMobil Environmental Services Company
Mayflower Pipeline Incident Response, Mayflower, Arkansas

Common Name	Scientific Name	Cove	Reference Area A	Reference Area B	Reference Area C
Pin Oak	<i>Quercus palustris</i>		X		
Poison ivy	<i>Toxicodendron radicans</i>		X	X	
Red Maple	<i>Acer rubrum</i>	X	X	X	X
Rice cut grass	<i>Leersia oryzoides</i>	X			
River birch	<i>Betula nigra</i>		X		
Sassafras	<i>Sassafras albidum</i>				X
Sensitive fern	<i>Onoclea sensibilis</i>		X		
Silver Maple	<i>Acer saccharinum</i>	X	X		
Small white aster	<i>Aster vimineus</i>	X	X		
Soft rush	<i>Juncus effusus</i>	X			
Spike rush	<i>Eleocharis spp.</i>	X			X
St. John's wort	<i>Hypericum perforatum</i>				X
Swamp Rose Mallow	<i>Hibiscus moscheutos</i>	X			
Sweet gum	<i>Liquidambar styraciflua</i>	X	X	X	X
Tall blue lettuce	<i>Lactuca biennis</i>	X			
Trumpet vine	<i>Campsis radicans</i>		X		X
Unknown sedge	<i>Carex spp</i>		X		X
Upland boneset	<i>Eupatorium sessilifolium</i>	X		X	X
Virginia buttonweed	<i>Diodia virginiana</i>	X			
Virginia creeper	<i>Parthenocissus quincuefolia</i>			X	
Virginia dayflower	<i>Commelina virginica</i>	X	X		
Water horehound	<i>Lycopus americanus</i>	X	X		
Water oak	<i>Quercus nigra</i>	X	X		X
Water pepper	<i>Polygonum hydropiper</i>	X	X		
Water purslane	<i>Ludwigia palustris</i>	X			
Water tupelo	<i>Nyssa aquatica</i>	X	X		X
Willow oak	<i>Quercus phellos</i>		X	X	X
Yellow nut sedge	<i>Cyperus esculentus</i>	X			

**Table 2
Proposed Seed Mixes**

**Cove Restoration Planting Plan
ExxonMobil Environmental Services Company
Mayflower Pipeline Incident Response, Mayflower, Arkansas**

Riparian Seed Mix	
Common Name	Scientific Name/Ecotype
NC Piedmont Riparian Mix, ERNMX-307	
Redtop Panicgrass	<i>Panicum rigidulum (P. stipitatum)</i> , Coastal Plain NC Ecotype
Virginia Wildrye	<i>Elymus virginicus</i> , 'Suther'-NC Ecotype
River Oats	<i>Chasmanthium latifolium (Uniola latifolia)</i> , Coastal Plain NC Ecotype
Beaked Panicgrass	<i>Panicum anceps</i> , SC Ecotype
Indiangrass	<i>Sorghastrum nutans</i> , NC Ecotype
Winter Bentgrass	<i>Agrostis hyemalis</i> , Piedmont NC Ecotype
Mistflower	<i>Eupatorium coelestinum (Conoclinium c.)</i> , VA Ecotype
Leathery Rush	<i>Juncus coriaceus</i> , Coastal Plain NC Ecotype

Wet Meadow and Wetland Seed Mix	
Common Name	Scientific Name/Ecotype
NC Piedmont FACW Mix, ERNMX-308	
Redtop Panicgrass	<i>Panicum rigidulum (P. stipitatum)</i> , Coastal Plain NC Ecotype
Beaked Panicgrass	<i>Panicum anceps</i> , SC Ecotype
Virginia Wildrye	<i>Elymus virginicus</i> , 'Suther'-NC Ecotype
Lurid (Shallow) Sedge	<i>Carex lurida</i> , NC Ecotype
Hop Sedge	<i>Carex lupulina</i> , Coastal Plain NC Ecotype
Squarrose Sedge	<i>Carex squarrosa</i> , VA Ecotype
Soft Rush	<i>Juncus effusus</i> , Coastal Plain NC Ecotype
Lizard's Tail	<i>Saururus cernuus</i> , NC Ecotype
Woolgrass	<i>Scirpus cyperinus</i> , Coastal Plain NC Ecotype
Mistflower	<i>Eupatorium coelestinum (Conoclinium c.)</i> , VA Ecotype
Showy Tickseed Sunflower	<i>Bidens aristosa</i> , Coastal Plain NC Ecotype
Path Rush	<i>Juncus tenuis</i> , NC Ecotype
Green Bulrush	<i>Scirpus atrovirens</i> , 'Suther'-NC Ecotype

Note:

1. New York ironweed (*Vernonia noveboracensis*), and crimsoneyed rosemallow (*Hibiscus moscheutos*) are part of the standard seed mix, but will be excluded from the seed mix for this site.

**Table 2
Proposed Seed Mixes**

**Cove Restoration Planting Plan
ExxonMobil Environmental Services Company
Mayflower Pipeline Incident Response, Mayflower, Arkansas**

Obligate Wetland Seed Mix	
Common Name	Scientific Name, Ecotype
<i>Obligate Wetland Mix, ERNMX-131</i>	
Fox Sedge	<i>Carex vulpinoidea</i> , PA Ecotype
Lurid (Shallow) Sedge	<i>Carex lurida</i> , PA Ecotype
Hop Sedge	<i>Carex lupulina</i> , PA Ecotype
Green Bulrush	<i>Scirpus atrovirens</i> , PA Ecotype
Eastern Bur Reed	<i>Sparganium americanum</i>
Blue Vervain	<i>Verbena hastata</i> , PA Ecotype
Soft Rush	<i>Juncus effusus</i> , PA Ecotype
Boneset	<i>Eupatorium perfoliatum</i> , PA Ecotype
Joe Pye Weed	<i>Eupatorium fistulosum</i> , PA Ecotype
Fringed (Nodding) Sedge	<i>Carex crinita</i> , PA Ecotype
Swamp Milkweed	<i>Asclepias incarnata</i> , PA Ecotype
Square Stemmed Monkeyflower	<i>Mimulus ringens</i> , PA Ecotype
Softstem Bulrush	<i>Scirpus validus</i> , PA Ecotype
Swamp (Narrowleaf) Sunflower	<i>Helianthus angustifolius</i> , Coastal Plain NC Ecotype
Woolgrass	<i>Scirpus cyperinus</i> , PA Ecotype
Roughleaf Goldenrod	<i>Solidago patula</i> , PA Ecotype
Nodding Bur Marigold	<i>Bidens cernua</i> , PA Ecotype

Note:

1. Blueflag (*Iris versicolor*), Giant Bur Reed (*Sparganium eurycarpum*), and Rattlesnake Grass (*Glyceria canadensis*) are part of the standard seed mix, but will be excluded from the seed mix for this site.

Figures



LEGEND

- Source Point
- Drainage Path
- Approximate Limit of Work



**MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
COVE RESTORATION PLANTING PLAN**

SITE LOCATION MAP



**FIGURE
1**

Map Date: 1/19/2015

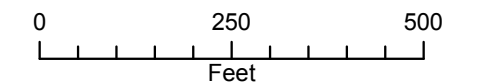


Legend

- - - Drainage Path
- - - Approximate Water's Edge
- Approximate Limit of Work
- ▨ Areas with Heavy Vegetation
- Disturbed Wetlands Outline

NOTES:

1. The Heavily Vegetated Area shown in this plan was digitized based on the February 2014 aerial photo that was acquired via Google Enterprise Geo Master License.
2. The water's edge changes based on season and recent rainfall. The approximate water's edge is based on conditions during the pre-design study in April 2014.



**MAYFLOWER PIPELINE INCIDENT RESPONSE
 EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
 COVE RESTORATION PLANTING PLAN**

SITE PLAN

Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
 IMAGE: FEB 2014; Google Earth

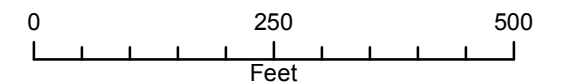




Legend

- Drainage Path
 - Approximate Water's Edge
 - Approximate Limit of Work
- Wetlands**
- Freshwater Forested/Shrub Wetland
 - Cove

NOTE:
 1. NATIONAL WETLAND INVENTORY DATA DOWNLOADED FROM THE U.S. FISH & WILDLIFE SERVICE AT: <http://www.fws.gov/wetlands/Data/index.html>



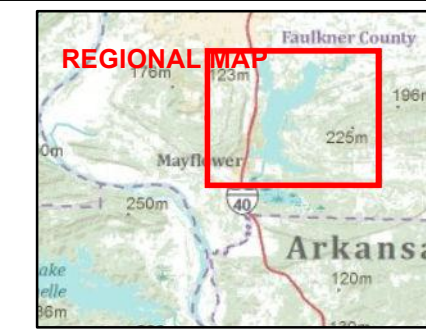
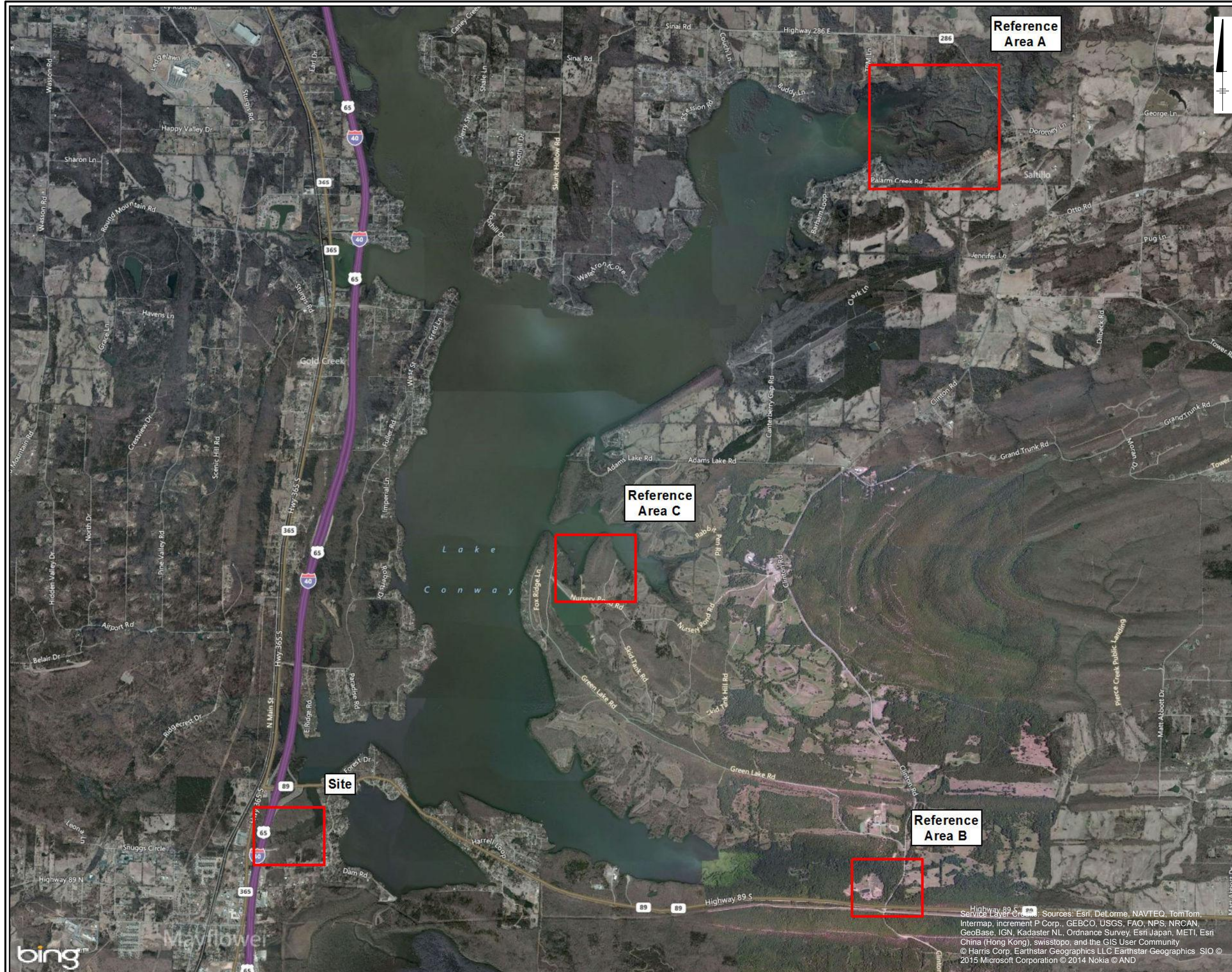
MAYFLOWER PIPELINE INCIDENT RESPONSE
 EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
 COVE RESTORATION PLANTING PLAN

SITE NATIONAL WETLAND
 INVENTORY MAP

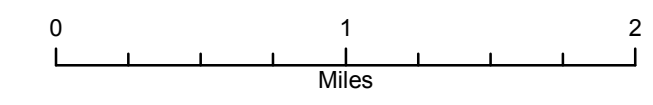


FIGURE
 3

Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
 IMAGE: FEB 2014; Google Earth



Legend
 Forested Wetland Assessment Areas



**MAYFLOWER PIPELINE INCIDENT RESPONSE
 EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
 COVE RESTORATION PLANTING PLAN**

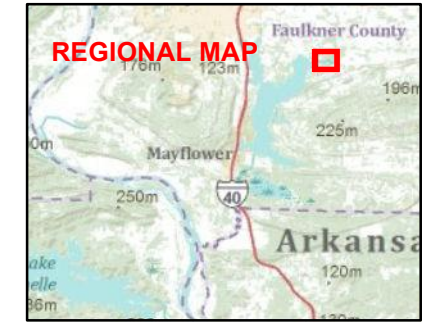
2014 WETLAND ASSESSMENT OVERVIEW




**FIGURE
 4**

Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
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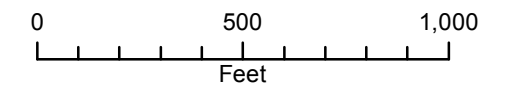




Legend

-  Wetland Assessment Area Plot and Transect Center

NOTE:
 1. ALL LOCATIONS ARE APPROXIMATE. INDIVIDUAL POINTS WERE SURVEYED USING A TRIMBLE GeoXH HANDHELD GLOBAL POSITIONING SYSTEM (GPS) EQUIPPED WITH REAL-TIME CORRECTION. THE GPS DATA SET WAS CORRECTED USING A REFERENCE POSITION FROM BASE PROVIDER LITTLE ROCK (ARLR).

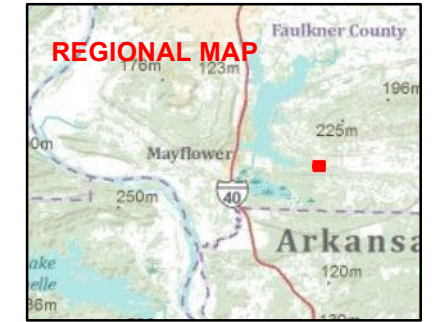


MAYFLOWER PIPELINE INCIDENT RESPONSE
 EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
 COVE RESTORATION PLANTING PLAN


**FORESTED WETLAND
 REFERENCE AREA A**

Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
 Copyright: © 2013 Esri, DeLorme, NAVTEQ, TomTom
 Source: Esri, DigitalGlobe, GeoEye, I-cubed, USDA, USGS, AEX,

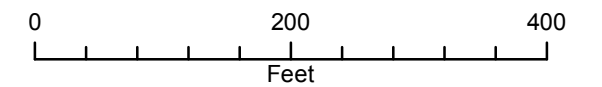




Legend

-  Wetland Assessment Area Plot and Transect Center

NOTE:
1. ALL LOCATIONS ARE APPROXIMATE. INDIVIDUAL POINTS WERE SURVEYED USING A TRIMBLE GeoXH HANDHELD GLOBAL POSITIONING SYSTEM (GPS) EQUIPPED WITH REAL-TIME CORRECTION. THE GPS DATA SET WAS CORRECTED USING A REFERENCE POSITION FROM BASE PROVIDER LITTLE ROCK (ARLR).



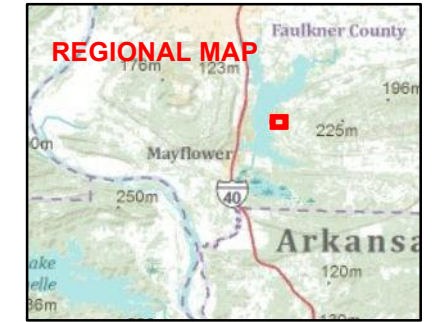
MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
COVE RESTORATION PLANTING PLAN

**FORESTED WETLAND
REFERENCE AREA B**




**FIGURE
6**

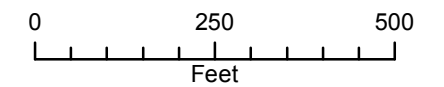
Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community. Copyright © 2013 Esri, DeLorme, NAVTEQ, TomTom. Source: Esri, DigitalGlobe, GeoEye, I-cubed, USDA, USGS, AEX,



Legend

-  Wetland Assessment Area Plot and Transect Center

NOTE:
1. ALL LOCATIONS ARE APPROXIMATE. INDIVIDUAL POINTS WERE SURVEYED USING A TRIMBLE GeoXH HANDHELD GLOBAL POSITIONING SYSTEM (GPS) EQUIPPED WITH REAL-TIME CORRECTION. THE GPS DATA SET WAS CORRECTED USING A REFERENCE POSITION FROM BASE PROVIDER LITTLE ROCK (ARLR).



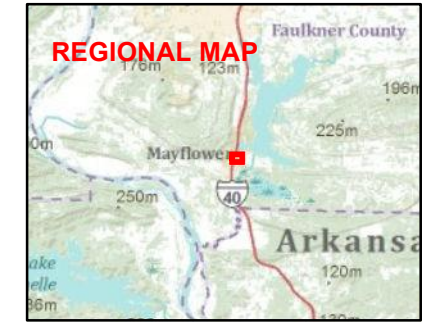
MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
COVE RESTORATION PLANTING PLAN

FORESTED WETLAND
REFERENCE AREA C



FIGURE
7

Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
Copyright: © 2013 Esri, DeLorme, NAVTEQ, TomTom
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX,



Legend

- Existing Forested Wetlands
- Existing Vegetated Wetlands
- Disturbed Wetlands

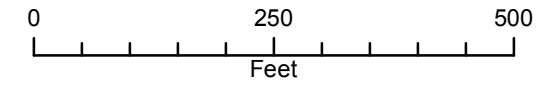
Tree Code

- AE AE - American Elm
- BO BO - Blackjack Oak
- BW BW - Black Willow
- GA GA - Green Ash
- OO OO - Overcup Oak
- PH PH - Pignut Hickory
- PS PS - Persimmon
- RM RM - Red Maple
- SG SG - Sweet Gum
- SM SM - Silver Maple
- SN SN - Snag
- WL WL - Willow Oak
- WO WO - Water Oak
- WT WT - Water Tupelo

DBH

- 4-9 4 - 9
- 9-14 9 - 14
- 14-20 14 - 20
- 20-28 20 - 28
- 28-38 28 - 38
- + Wetland Assessment Area Plot and Transect Center

NOTES:
 1. ALL LOCATIONS ARE APPROXIMATE. INDIVIDUAL POINTS WERE SURVEYED USING A TRIMBLE GeoXH HANDHELD GLOBAL POSITIONING SYSTEM (GPS) EQUIPPED WITH REAL-TIME CORRECTION. THE GPS DATA SET WAS CORRECTED USING A REFERENCE POSITION FROM BASE PROVIDER LITTLE ROCK (ARLR).
 2. DBH IS THE DIAMETER AT BREAST HEIGHT MEASURED IN INCHES.

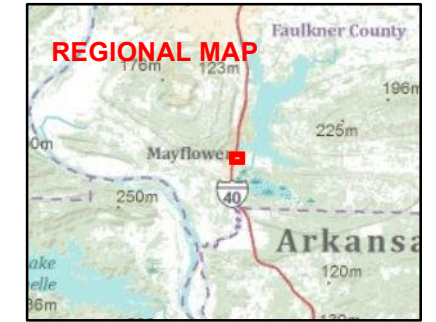
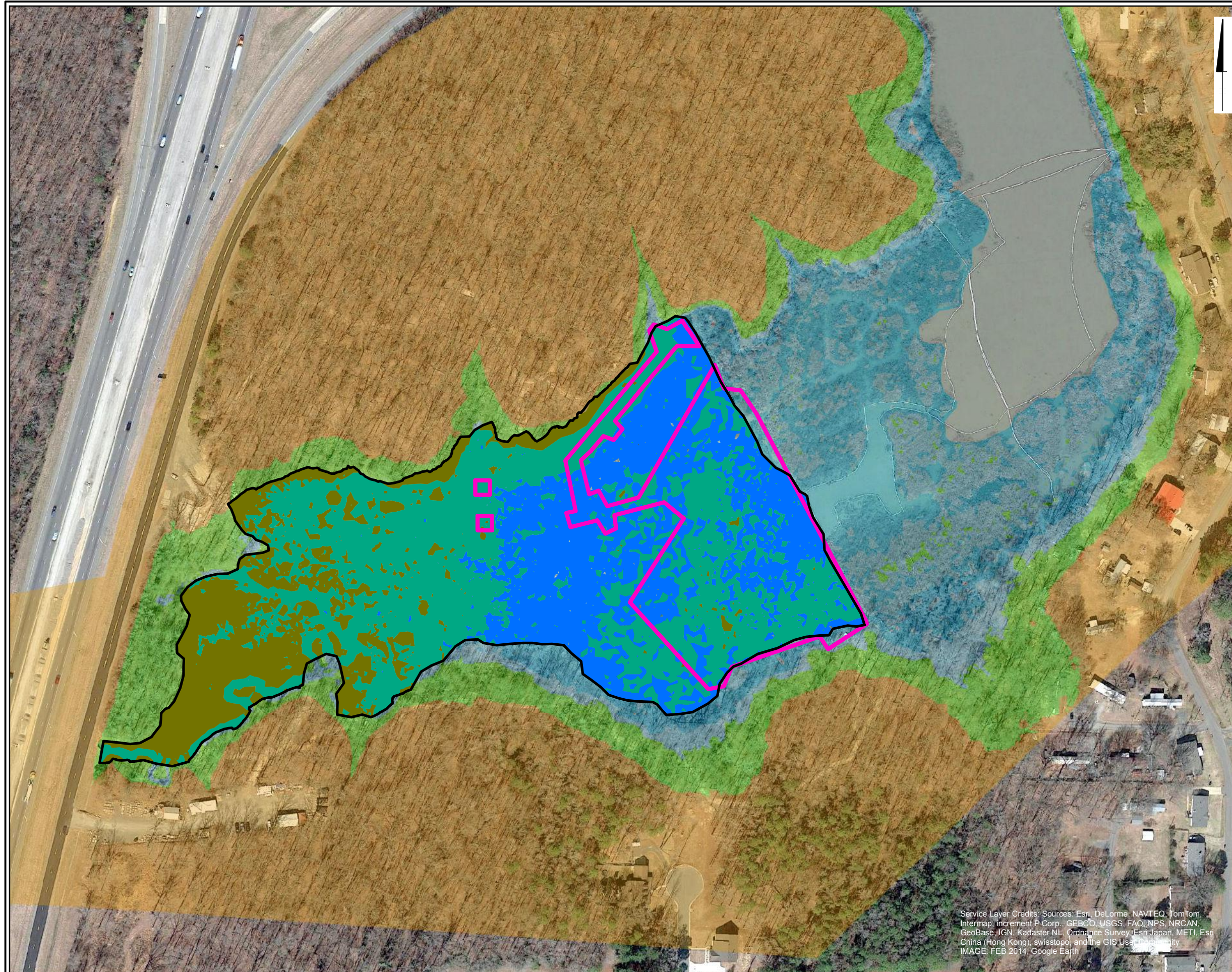


**MAYFLOWER PIPELINE INCIDENT RESPONSE
 EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
 COVE RESTORATION PLANTING PLAN**

PROJECT AREA FORESTED WETLAND

Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
 IMAGE: FEB 2014; Google Earth



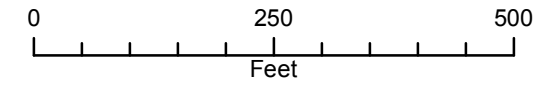


Legend

- Reactive Cap Extent
- Cove Topography (feet)**
- < 262.99
- Forested Wetland Fringe Habitat
263 - 263.99
- Forested Wetland Habitat
264 - 264.99
- Upper Edge Forested Habitat
265 - 267.99
- > 268.00
- Disturbed Wetlands Outline (17.1 acres)
- Disturbed Wetlands**
- 5.5 acres of Disturbed Forested Wetland Fringe Habitat
- 8.4 acres of Disturbed Forested Wetland Habitat
- 3.2 acres of Disturbed Upper Edge Forested Habitat

NOTES:

1. SURVEY DATA COLLECTED DURING FIELD ACTIVITIES INTERPOLATED BY THE INVERSE DISTANCE WEIGHTING (IDW) METHOD USING AN OPTIMIZED POWER TERM TO DEVELOP A DIGITAL ELEVATION MODEL (DEM) FOR THE AREA SHOWN.
2. HYDROLOGIC CONDITIONS SHOWN ARE BASED ON LAKE CONWAY MEAN WATER ELEVATIONS CALCULATED USING DATA RECORDED IN NATIONAL GEODETIC VERTICAL DATUM (NGVD) 29 FROM FEBRUARY 18, 2008 THROUGH JULY 10, 2013.
3. TOPOGRAPHY AND PLANTING PLAN IN AREA OF REACTIVE CAP SUBJECT TO CHANGE.



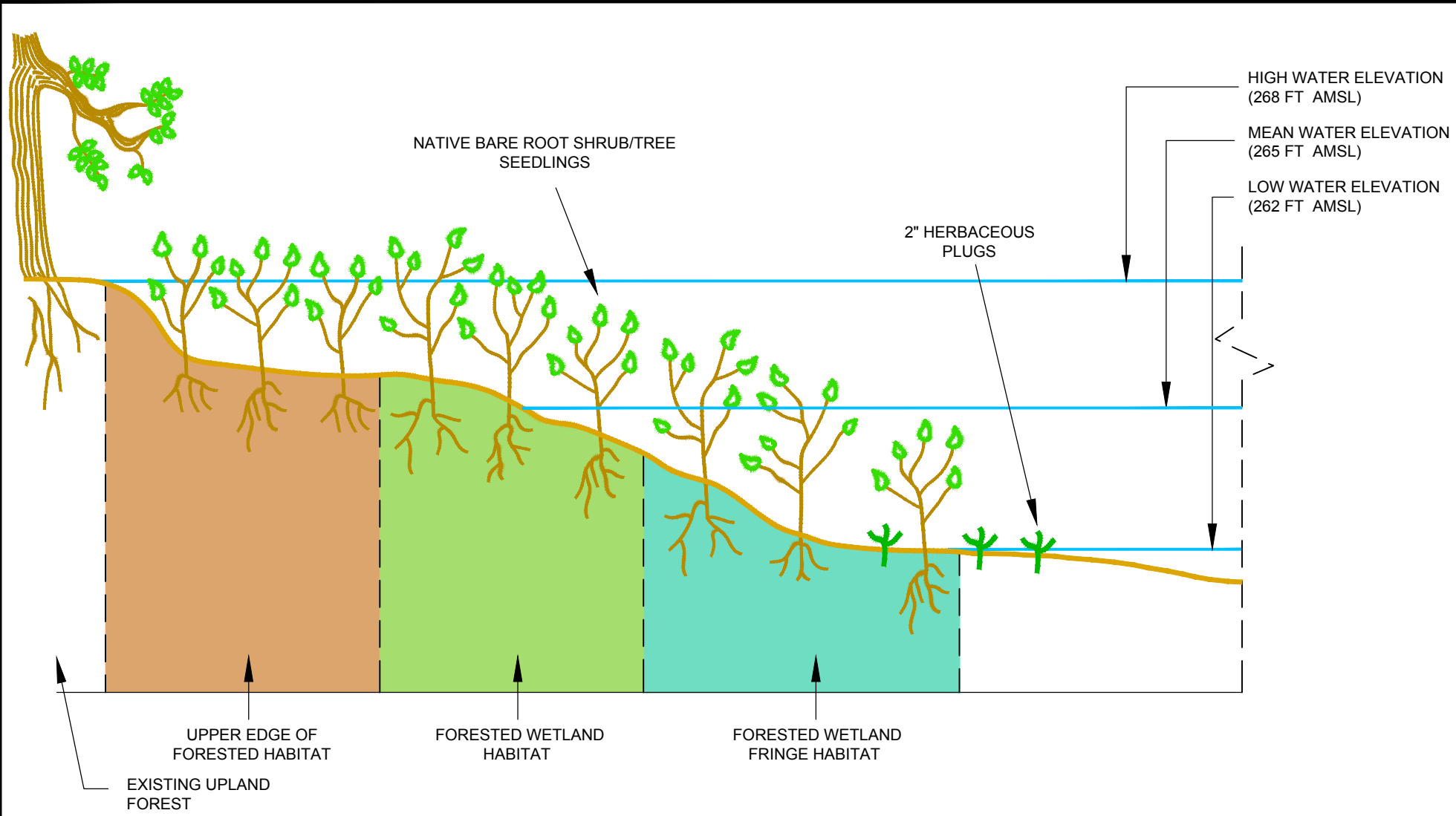
MAYFLOWER PIPELINE INCIDENT RESPONSE
 EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
 COVE RESTORATION PLANTING PLAN

SITE HYDROLOGIC CONDITIONS

Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
 IMAGE: FEB 2014; Google Earth



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 XREFS: IMAGES: PROJECTNAME:



BARE ROOT SEEDLING NOTES:

1. SELECTED SHRUB AND TREE SEEDLING SPECIES BASED ON OBSERVATIONS OF HIGH-VALUE FORESTED WETLAND SYSTEMS ASSOCIATED WITH UNDISTURBED PORTIONS OF LAKE CONWAY CONDUCTED DURING THE SEPTEMBER 2014 WETLAND ASSESSMENT. SPECIES AND THE LOCATION THAT THEY WERE OBSERVED CAN BE FOUND IN TABLE 1.
2. 2" NATIVE HERBACEOUS PLUGS WILL BE PLANTED AS NEEDED IN THE "FORESTED WETLAND FRINGE HABITAT".
3. DURING THE SEPTEMBER 2014 WETLAND ASSESSMENT THE FOLLOWING SPECIES WERE OBSERVED TO BE NATURALLY RECOLONIZING THE PROJECT AREA: BLACK WILLOW, BUTTONBUSH, WATER WILLOW. NO BARE ROOT SEEDLINGS OF THESE SPECIES WILL BE PLANTED DURING THE INITIAL RESTORATION EFFORTS.
4. SHRUB AND TREE SEEDLING SPECIES AND HERBACEOUS PLUGS WILL BE PLANTED AS AVAILABLE.
5. LOCATIONS OF THE FEATURES SHOWN HAVE BEEN APPROXIMATED. ACTUAL PLANT PLACEMENT WILL BE SELECTED BY AN ECOLOGIST IN THE FIELD.
6. RESTORATION PLANTING WILL TARGET A DENSITY OF 1,000 SEEDLINGS PER ACRE.

SEED MIX NOTES:

1. NATIVE SEED MIXES WILL BE APPLIED THROUGHOUT THE PROJECT AREA IN ADDITION TO THE PLANTED TREES AND SHRUBS. THE SPECIES INCLUDED IN THE SEED MIXES ARE LISTED IN TABLE 2.
2. RIPARIAN SEED MIX (NC Piedmont Riparian Mix, ERNMX-307) WILL BE APPLIED TO THE "UPPER EDGE FORESTED HABITAT" AND "FORESTED WETLAND HABITAT" AREAS.
3. WET MEADOW AND WETLAND SEED MIX (NC Piedmont FACW Mix, ERNMX-308) WILL BE APPLIED TO THE "FORESTED WETLAND FRINGE HABITAT" AND "FORESTED WETLAND HABITAT" AREAS.
4. OBLIGATE SEED MIX (OBL Wetland Mix, ERNMX-131) WILL BE APPLIED TO THE WETTER LOCATIONS OF THE "FORESTED WETLAND FRINGE HABITAT" AND "FORESTED WETLAND HABITAT."
5. THE SEEDING RATE WILL BE APPROXIMATELY 5 POUNDS PER ACRE.

ABBREVIATIONS:

STRATUM "T" IS TREE
 STRATUM "S" IS SHRUB
 STRATUM "H" IS HERBACEOUS
 FT AMSL - FEET ABOVE MEAN SEA LEVEL

Upper Edge Forested Habitat		
Scientific Name	Common Name	Stratum
<i>Acer negundo</i>	Box elder	T
<i>Acer rubrum</i>	Red maple	T
<i>Diospyros virginiana</i>	Persimmon	T
<i>Liquidambar styraciflua</i>	Sweetgum	T
<i>Nyssa sylvatica</i>	Black gum	T
<i>Quercus pallustris</i>	Pin oak	T
<i>Quercus phellos</i>	Willow oak	T

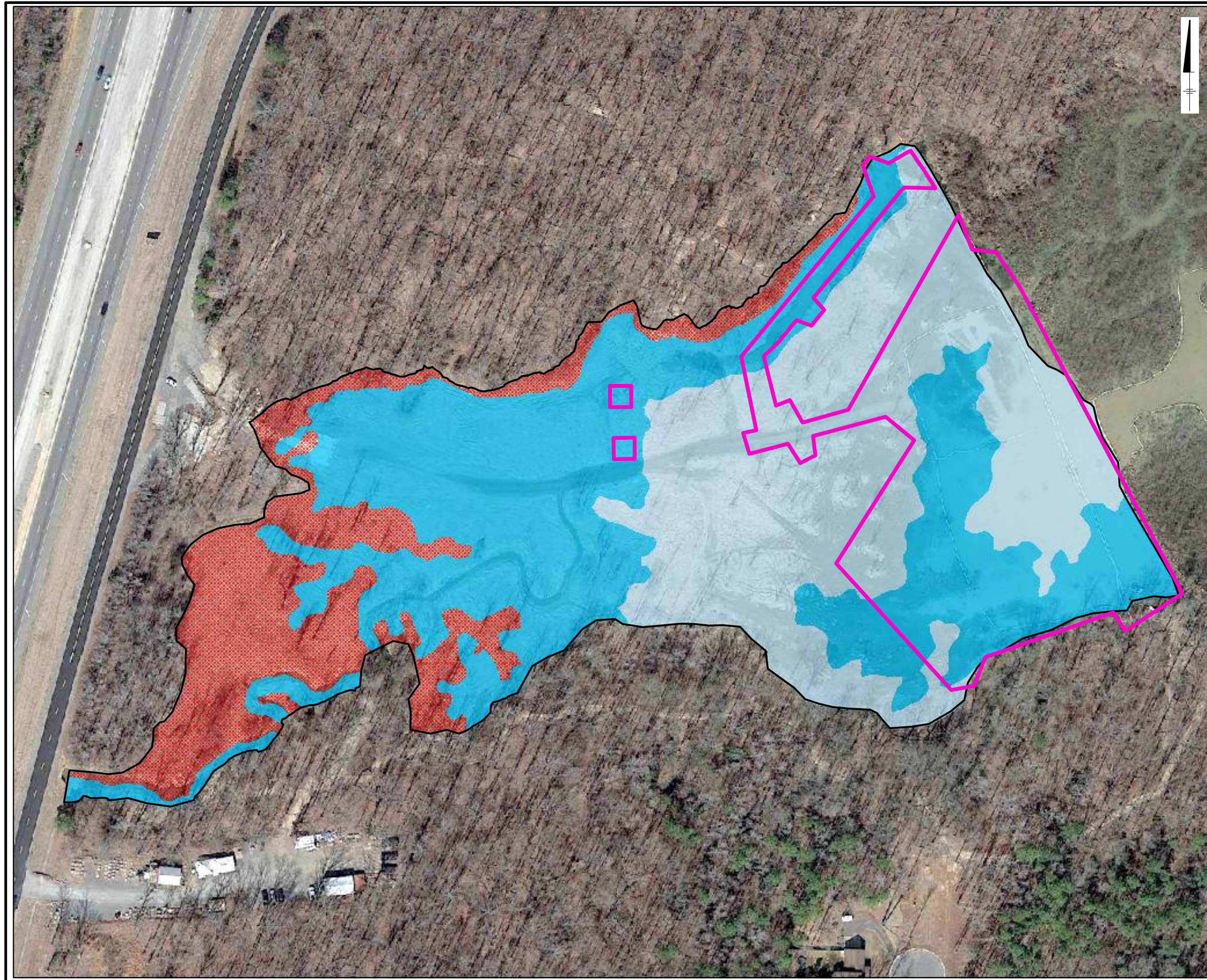
Forested Wetland Habitat		
Scientific Name	Common Name	Stratum
<i>Acer negundo</i>	Box elder	T
<i>Acer rubrum</i>	Red maple	T
<i>Acer saccharinum</i>	Silver maple	T
<i>Betula nigra</i>	River birch	T
<i>Celtis laevigata</i>	Sugarberry	T
<i>Nyssa sylvatica</i>	Black gum	T
<i>Quercus lyrata</i>	Overcup oak	T
<i>Quercus nigra</i>	Water oak	T
<i>Quercus phellos</i>	Willow oak	T
<i>Ulmus americana</i>	American elm	T
<i>Cornus foemina</i>	Stiff dogwood	S
<i>Decodon verticillatus</i>	Water willow	S
<i>Forestiera acuminata</i>	Swamp privet	S
<i>Ilex decidua</i>	Deciduous holly	S
<i>Planera aquatic</i>	Water elm	S

Forested Wetland Fringe Habitat		
Scientific Name	Common Name	Stratum
<i>Nyssa aquatica</i>	Water tupelo	T
<i>Quercus nigra</i>	Water oak	T
<i>Taxodium distichum</i>	Bald cypress	T
<i>Salix nigra</i>	Black willow	T
<i>Cephalanthus occidentalis</i>	Buttonbush	S
<i>Sambucus canadensis</i>	Common elderberry	S
<i>Nuphar lutea</i>	Spatterdock	H
<i>Nymphaea odorata</i>	Fragrant water lily	H
<i>Pontederia cordata</i>	Pickelweed	H
<i>Sagittaria latifolia</i>	Common arrow head	H
<i>Schoenoplectus pungens</i>	Common three	H
<i>Schoenoplectus tabernaemontani</i>	Softstem bulrush	H

MAYFLOWER PIPELINE INCIDENT RESPONSE
 EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
 COVE PLANTING PLAN

PLANTING PLAN DETAILS

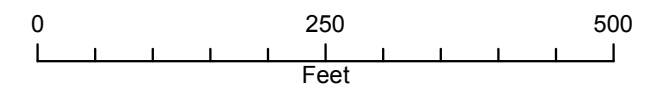
FIGURE
10



Legend

-  Reactive Cap Extent
-  Upper Edge Forested Habitat
-  Forested Wetland Habitat
-  Forested Wetland Fringe Habitat

NOTES:
1. REFER TO FIGURE 10 FOR PLANTING PLAN DETAILS.
2. SOME TOPOGRAPHIC FEATURES HAVE BEEN GENERALIZED FOR THE PURPOSE OF THIS PLAN. APPROPRIATE PLANT PLACEMENT IN SITE MICROTOPOGRAPHY WILL BE SELECTED BY AN ECOLOGIST IN THE FIELD.



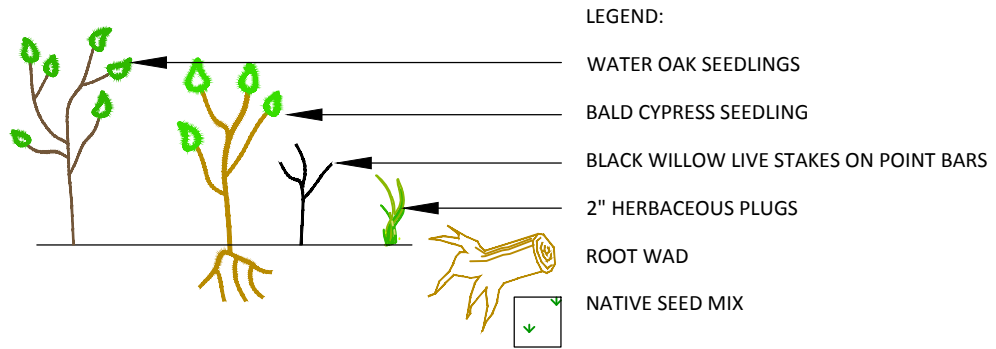
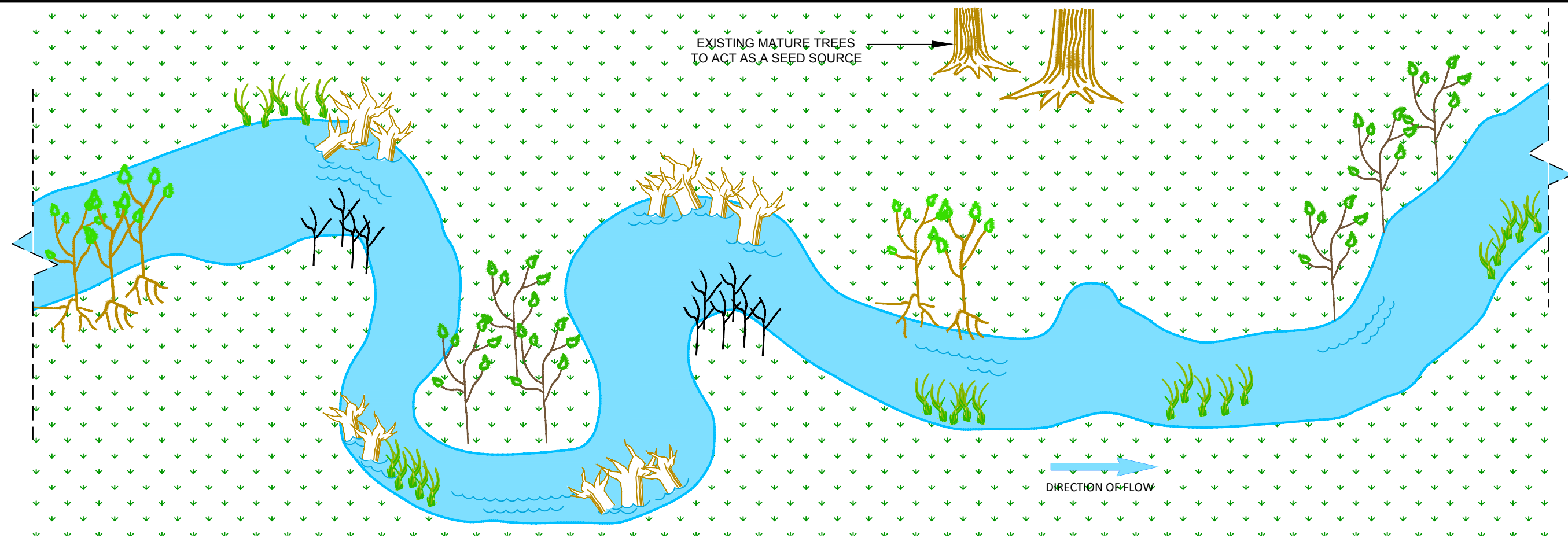
MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
COVE RESTORATION PLANTING PLAN

SITE PLANTING PLAN VIEW

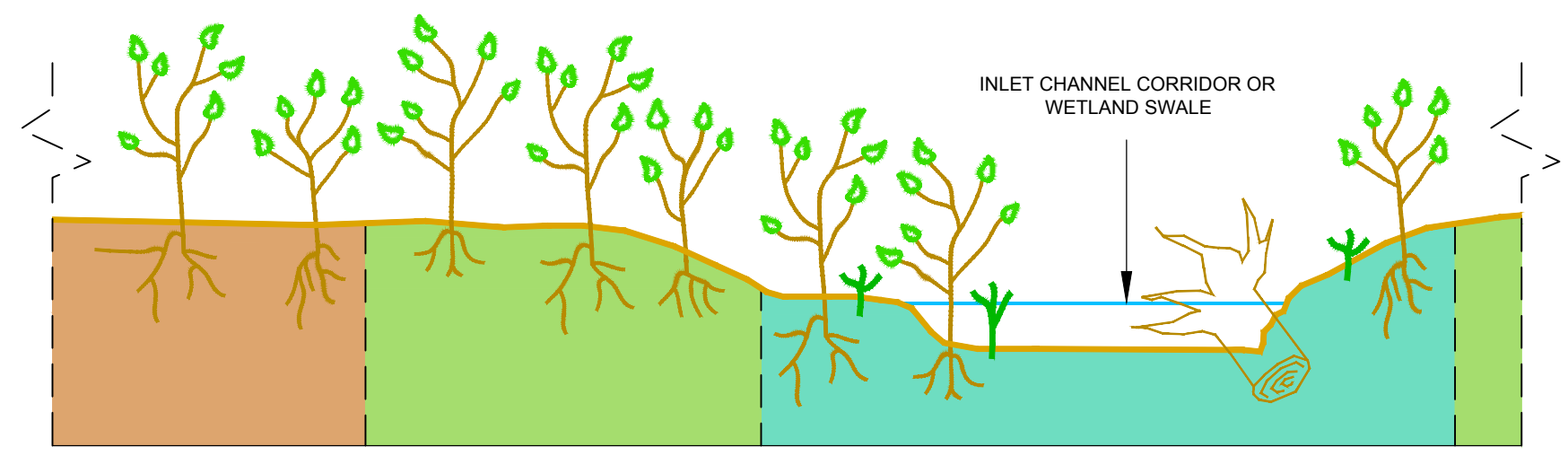


FIGURE
11

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- NOTES:**
1. SELECTED SHRUB AND TREE SEEDLING SPECIES BASED ON OBSERVATIONS OF HIGH VALUE FORESTED WETLAND SYSTEMS ASSOCIATED WITH UNDISTURBED PORTIONS OF LAKE CONWAY CONDUCTED DURING THE SEPTEMBER 2014 WETLAND ASSESSMENT. SPECIES AND THE LOCATION THAT THEY WERE OBSERVED CAN BE FOUND IN TABLE 1.
 2. NATIVE SEED MIXES WILL BE APPLIED THROUGHOUT THE RIPARIAN AREA IN ADDITION TO THE PLANTED TREES AND SHRUBS. THE SPECIES INCLUDED IN THE SEED MIXES ARE LISTED IN TABLE 2. RIPARIAN SEED MIX (NC PIEDMONT RIPARIAN MIX, ERNMX-307) WILL BE APPLIED TO THE INLET CHANNEL BANKS AND ADJACENT FLOODPLAIN. WET MEADOW AND WETLAND SEED MIX (NC PIEDMONT FACW MIX, ERNMX-308) WILL BE APPLIED TO PORTIONS OF THE INLET CHANNEL CORRIDOR EXHIBITING APPROPRIATE HYDROLOGIC CONDITIONS.
 3. 2" NATIVE HERBACEOUS PLUGS WILL BE PLANTED AS NEEDED IN THE INLET CHANNEL CORRIDOR. NATIVE SPECIES WILL BE PLANTED AS AVAILABLE.
 4. BLACK WILLOW LIVE STAKES FROM EXISTING TREES ONSITE WILL BE USED TO REVEGETATE THE INLET CHANNEL CORRIDOR.
 5. SHRUB AND TREE SEEDLING SPECIES WILL BE PLANTED AS AVAILABLE.
 6. LOCATIONS OF THE FEATURES SHOWN HAVE BEEN APPROXIMATED. ACTUAL PLANT PLACEMENT WILL BE SELECTED BY AN ECOLOGIST IN THE FIELD.
 7. ROOT WADS WILL BE PLACED THROUGHOUT THE CORRIDOR TO PROVIDE WILDLIFE HABITAT AND ARMOR INLET CHANNEL BANKS.



CROSS SECTION VIEW

MAYFLOWER PIPELINE INCIDENT RESPONSE EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY COVE PLANTING PLAN	
INLET CHANNEL RESTORATION PLAN	
	FIGURE 12



Appendix A

Letter Correspondence



Mike Knoedl
Director
Mike Armstrong
Deputy Director

Keeping the Natural State natural.

Arkansas Game and Fish Commission

Ricky Chastain
Deputy Director
Jeff Crow
Deputy Director

July 15, 2014

Mr. Michael Sixsmith
ExxonMobil Environmental Services Company
13401 North Freeway
Houston, TX 77060

Dear Mr. Sixsmith:

An integrated team of Arkansas Game and Fish Commission staff has reviewed the Draft Stream and Wetland Compensatory Restoration Plan prepared by ARCADIS U.S., Inc. and submitted on behalf of ExxonMobil as requested by the U.S. Army Corp of Engineers under a Nationwide Permit 38 to determine the level of stream and wetland mitigation required to meet the compensatory mitigation rule outlined by the US federal government. The plan proposes to conduct on-site restoration by planting and reseeding 17.1 acres of wetlands and 1,300 linear feet of the inlet channel. The treatment of 17.1 acres of wetlands includes 8.8 acres of wetlands that will be restored to palustrine forested wetlands and 8.3 acres of wetlands that will be restored to palustrine scrub-shrub wetlands. The Arkansas Game and Fish Commission staff is providing the following comments on the draft restoration plan, and specifically the proposed re-vegetation portion of the plan.

- While the species lists included in the Proposed Bareroot Plants for Forested Habitat (PF01) and Proposed Bareroot Plants for Emergent Habitat (PSS1) may suggest some generic restoration composition, similar wetlands in the area of high natural quality and diversity should be used as a more precise reference to determine the most appropriate species to plant in the restored areas.
- Specifically in the restored forested wetlands site, the Arkansas Game and Fish Commission requests to be consulted in the development of a more detailed restoration map and planting guide. The previously developed topographic survey of Dawson Cove should be used, in collaboration with the AGFC, to develop a planting guide based on site elevation to determine which species, or assemblage of species, should be planted to mimic natural transitional wetland forests.
- All plants and seedlings used for re-vegetation should be secured from local genotypes.
- Restoration activities for the woody plantings (planting seedlings) and the herbaceous plants (seeding) should be timed to promote the optimal survival of the two plantings. Ideally, tree seedlings would be planted in the late fall/winter while dormant and the herbaceous species would be planted in the spring to allow for a full growing season during establishment.
- Several of the emergent wetland species proposed for use are not appropriate for this site:

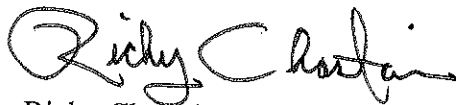
2 Natural Resources Drive • Little Rock, AR 72205 • www.agfc.com
Phone (800) 364-4263 • (501) 223-6300 • Fax (501) 223-6448

The Arkansas Game and Fish Commission's mission is to conserve and enhance Arkansas's fish and wildlife and their habitats while promoting sustainable use, public understanding and support.

- *Acorus americanus* is a northern species and not native to Arkansas. No *Acorus* species should be used in the restoration plantings.
- *Iris versicolor* (Harlequin blueflag iris) is not native to Arkansas. *Iris virginica* would be an acceptable replacement for this site.
- *Schoenoplectus acutus* (hardstem bullrush) is a rare species in the Arkansas and is not known to occur in this region. The use of this species on this site is not appropriate.
- *Vernonia noveboracensis* (New York ironweed) is an eastern species and is not native to Arkansas. *Vernonia gigantea* is a common wetland species in central Arkansas and would be a suitable alternative.
- *Hibiscus moscheutos* (crimson-eyed rosemallow) is not native to Arkansas. *H. lasiocarpus* is present in Arkansas and *H. laevis* is known from this region and may be an appropriate alternative.

The Arkansas Game and Fish Commission appreciates the opportunity to provide constructive comments regarding the Draft Stream and Wetland Compensatory Restoration Plan. The Commission would welcome any opportunity to further collaborate in finalizing this restoration plan.

Sincerely,



Ricky Chastain
Deputy Director

CC: Jim Ellis, Corps of Engineers, Little Rock District
Jennifer Sheehan, Arkansas Game and Fish Commission
Lindsey Lewis, U. S. Fish and Wildlife Service



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Governor

Martha Miller
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*

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Arkansas Natural Heritage
Commission

323 Center Street, Suite 1500

Little Rock, AR 72201

(501) 324-9619

fax: (501) 324-9618

tdd: (501) 324-9811

e-mail:

arkansas@naturalheritage.com

website:

www.naturalheritage.com

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Date: July 10, 2014

Subject: Stream and Wetland Compensatory Restoration Plan
Mayflower, Arkansas Oil Spill

ANHC No.: P-CORP-14-010

Mr. Mike Sixsmith

ExxonMobil Environmental Services Company

13401 North Freeway

Houston, TX 77060

Dear Mr. Sixsmith:

Staff members of the Arkansas Natural Heritage Commission have reviewed the Stream and Wetland Compensatory Restoration Plan prepared by ARCADIS U.S., Inc. for ExxonMobil Environmental Services Company on behalf of ExxonMobil Pipeline Company for the Mayflower Pipeline Incident Response in Mayflower, Arkansas. The purpose of the plan was to determine the level of wetlands/stream mitigation required to meet the federal rules on compensatory mitigation. The plan proposes to conduct on-site restoration by planting and reseeding 17.1 acres of wetlands and 1,300 linear feet of the inlet channel.

The restoration plan identifies 8.8 acres of wetlands that will be restored to palustrine forested wetlands and 8.3 acres that will be restored to palustrine scrub-shrub wetlands. It is proposed that the forested wetlands will be planted with bareroot seedlings from a list of 21 species and seeded with North Carolina Piedmont Riparian Mix and North Carolina Piedmont FACW Mix. The scrub-shrub wetlands will be planted with bareroot seedlings from a list of 13 species. We have the following comments on the proposed revegetation:

- Ideally, similar wetlands in the area of high natural quality should be used as reference areas to determine the most appropriate species to plant in the restoration site.
- Plants and seeds used for revegetation should be secured from local genotypes.
- The woody plants proposed for use (listed in Table 1 of the plan) appear appropriate to this region of the state and are probably present around Lake Conway in suitable habitat.
- Several of the emergent wetland species proposed for use are not appropriate for this site:
 - *Acorus americanus* (sweet flag) is a northern species and not native to Arkansas. No *Acorus* species should be used as this genus is not native to the state.
 - *Iris versicolor* (Harlequin blueflag iris) is not native to Arkansas. *Iris virginica* would be the native iris in wetlands in this part of Arkansas.
 - *Schoenoplectus acutus* (hardstem bullrush) is a rare species in the state and is not known from this region. Although

- we support planting native species, rare species should only be planted within their documented range and, because they may have genetic distinctiveness, only local genotypes should be used.
- Several of the species in the Piedmont FACW Mix are not appropriate for this area:
 - *Vernonia noveboracensis* (New York ironweed). This is an eastern species, not native to Arkansas. The common Vernonia species in central Arkansas are *V. baldwinii*, *V. gigantea*, and *V. missurica*. Of these, *V. gigantea* is the most frequently encountered in wetlands.
 - *Hibiscus moscheutos* (crimson-eyed rosemallow) is not native to Arkansas. *H. lasiocarpus* is present in Arkansas (once considered a variety of *H. moscheutos* but now considered distinct - different from what is in Virginia). *H. laevis* is known from the region and might be appropriate.

Your attention to these concerns is appreciated.

Sincerely,



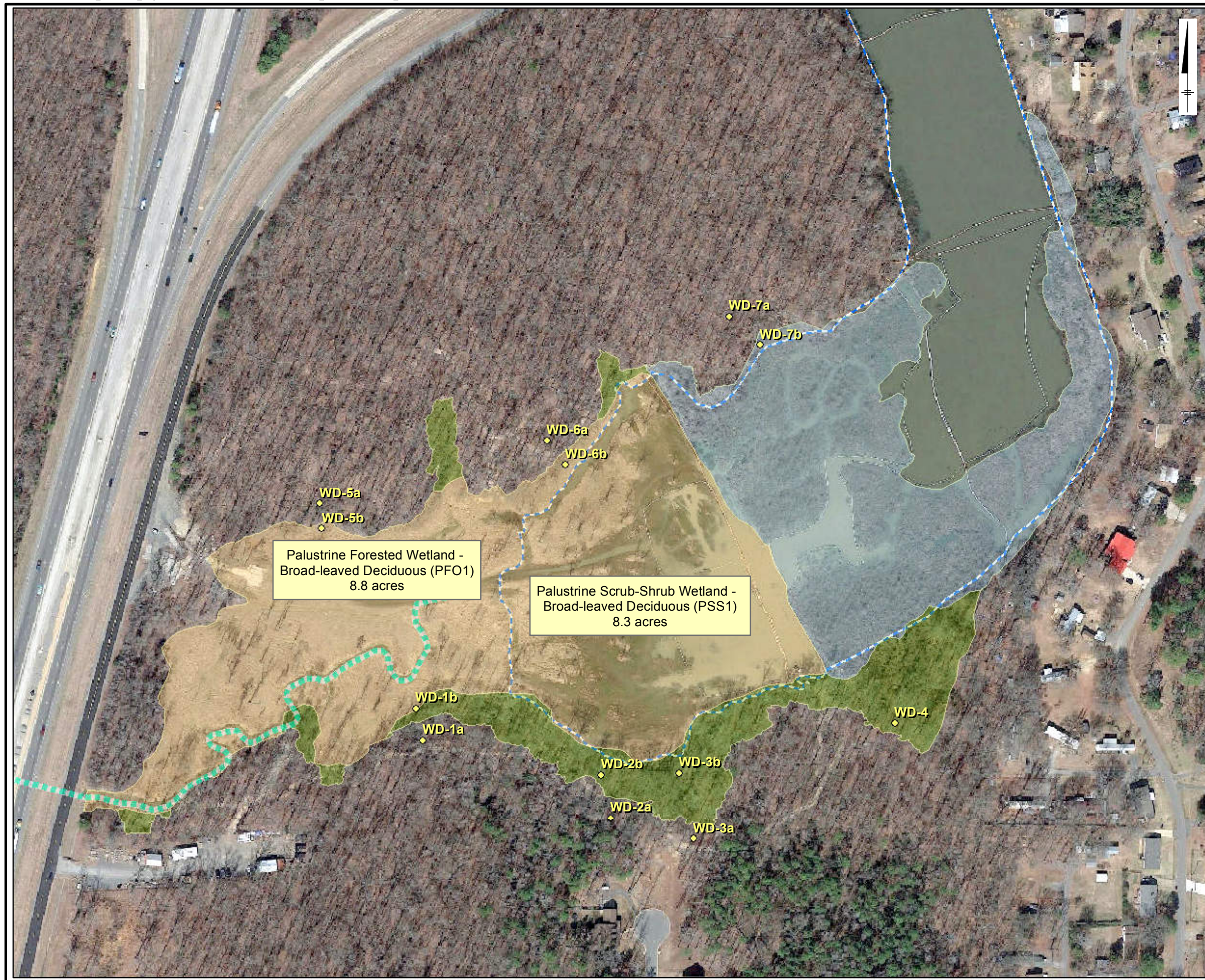
Cindy Osborne
Data Manager/Environmental Review Coordinator

CC: Jim Ellis, Corps of Engineers, Little Rock District
Jen Sheehan, Arkansas Game and Fish Commission
Lindsey Lewis, U.S. Fish and Wildlife Service



Appendix B

Wetland Delineation Summary

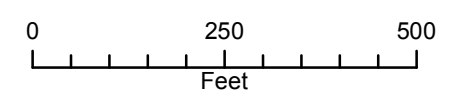


Legend

- Wetland Delineation Points
- Drainage Path
- Approximate Waters Edge
- Existing Forested Wetlands (4.4 acres)
- Existing Vegetated Wetlands (10.3 acres)
- Disturbed Wetlands (17.1 acres)

Notes:

1. Conastoga-Rovers & Associates conducted a wetland delineation in April 2014 using the methodology outlined in the 1987 USACE Wetland Delineation Manual, including the Atlantic and Gulf Coast Regional Supplement, and Regulatory Guidance Letter 08-02.
2. The vegetated area shown in this plan was digitized based on the February 2014 aerial photo that was acquired via Google Enterprise Geo Master License
3. The water's edge changes based on season and recent rainfall. The approximate water's edge is based on conditions during the pre-design study in April 2014.
4. Vegetation was not cleared from the areas labeled "Existing Forested Wetland" and "Existing Vegetated".



MAYFLOWER PIPELINE INCIDENT RESPONSE EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY WETLAND DELINEATION
WETLAND DELINEATION
FIGURE 1



Appendix C

USDA Soil Survey



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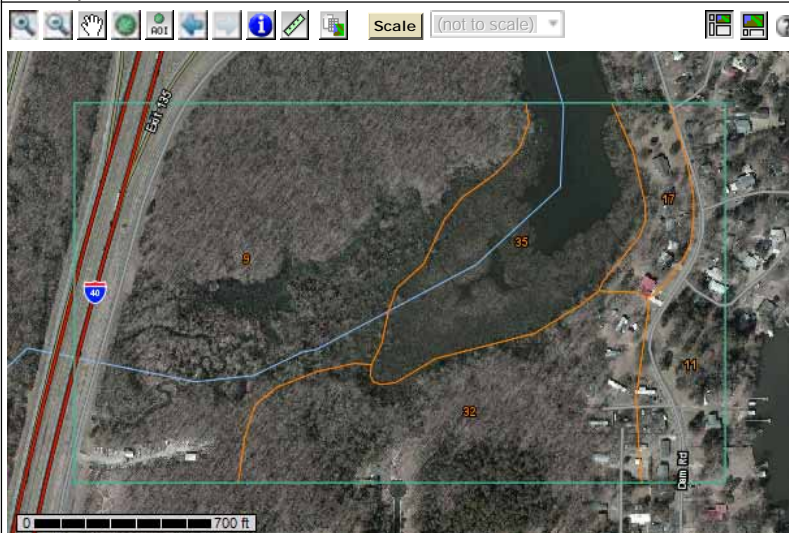
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Map Unit Legend

Faulkner County, Arkansas (AR045)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
9	Leadvale silt loam, 3 to 8 percent slopes	43.1	48.2%
11	Linker fine sandy loam, 3 to 8 percent slopes	8.6	9.7%
17	Mountainburg gravelly fine sandy loam, 3 to 8 percent slopes	3.7	4.2%
32	Taft silt loam, 0 to 2 percent slopes	19.0	21.2%
35	Water	14.9	16.7%
Totals for Area of Interest		89.3	100.0%

Soil Map



Warning: Soil Map may not be valid at this scale.

You have zoomed in beyond the scale at which the soil map for this area is intended to be used. Mapping of soils is done at a particular scale. The soil surveys that comprise your AOI were mapped at 1:20,000. The design of map units and the level of detail shown in the resulting soil map are dependent on that map scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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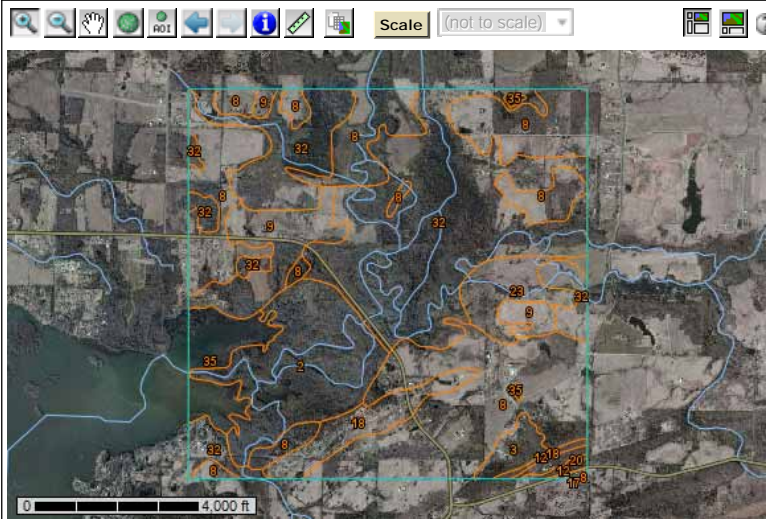
Search

Map Unit Legend

Faulkner County, Arkansas (AR045)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Amy soils, frequently flooded	242.1	11.3%
3	Enders gravelly fine sandy loam, 3 to 8 percent slopes	31.9	1.5%
8	Leadvale silt loam, 1 to 3 percent slopes	733.6	34.3%
9	Leadvale silt loam, 3 to 8 percent slopes	137.5	6.4%
12	Linker fine sandy loam, 8 to 12 percent slopes	13.1	0.6%
17	Mountainburg gravelly fine sandy loam, 3 to 8 percent slopes	2.9	0.1%
18	Mountainburg gravelly fine sandy loam, 8 to 12 percent slopes	86.1	4.0%
20	Mountainburg very stony fine sandy loam, 12 to 40 percent slopes	1.6	0.1%
23	Ouachita silt loam, occasionally flooded	75.6	3.5%
32	Taft silt loam, 0 to 2 percent slopes	722.7	33.8%
35	Water	89.3	4.2%
Totals for Area of Interest		2,136.4	100.0%

Soil Map



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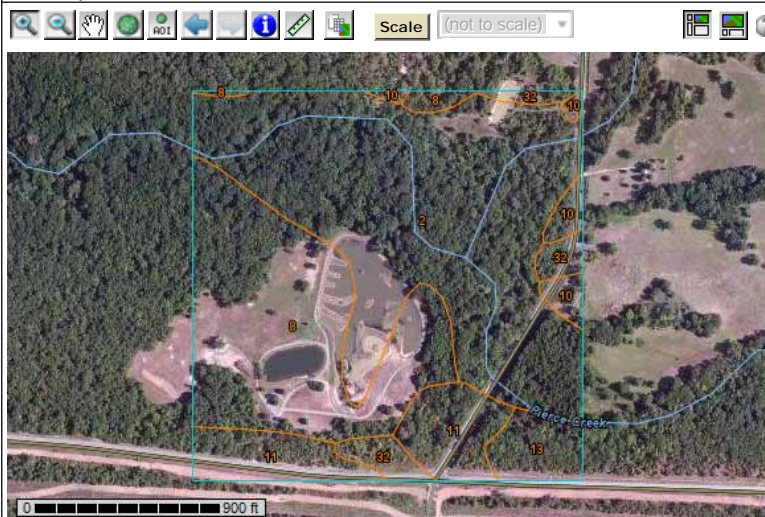
Search

Map Unit Legend

Faulkner County, Arkansas (AR045)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Amy soils, frequently flooded	41.6	49.9%
8	Leadvale silt loam, 1 to 3 percent slopes	24.8	29.8%
10	Linker fine sandy loam, 1 to 3 percent slopes	2.1	2.6%
11	Linker fine sandy loam, 3 to 8 percent slopes	8.7	10.4%
13	Linker-Mountainburg association, 8 to 12 percent slopes	3.2	3.8%
32	Taft silt loam, 0 to 2 percent slopes	2.9	3.5%
Totals for Area of Interest		83.4	100.0%

Soil Map



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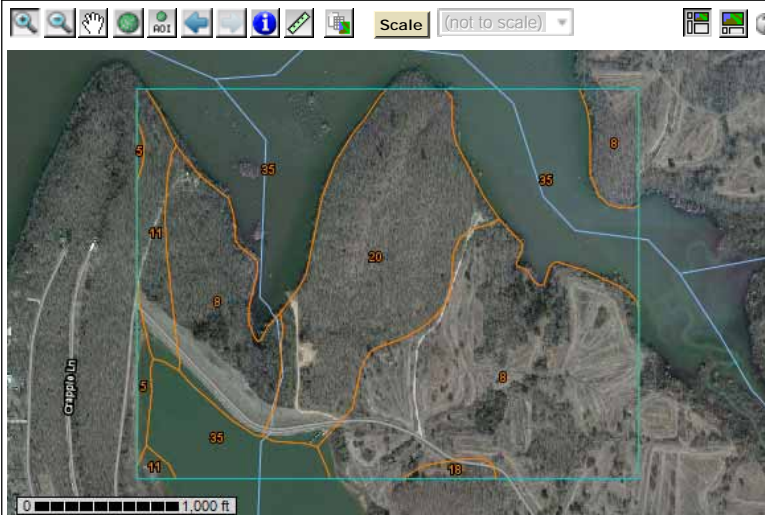
Search

Map Unit Legend

Faulkner County, Arkansas (AR045)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
5	Enders gravelly fine sandy loam, 12 to 45 percent slopes	2.3	1.0%
8	Leadvale silt loam, 1 to 3 percent slopes	89.6	41.2%
11	Linker fine sandy loam, 3 to 8 percent slopes	9.6	4.4%
18	Mountainburg gravelly fine sandy loam, 8 to 12 percent slopes	1.5	0.7%
20	Mountainburg very stony fine sandy loam, 12 to 40 percent slopes	46.6	21.4%
35	Water	67.9	31.2%
Totals for Area of Interest		217.5	100.0%

Soil Map



Warning: Soil Map may not be valid at this scale.

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Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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Appendix D

Standard Operating Procedure

**Standard Operating
Procedure: Planting of
Emergent Aquatic
Vegetation on a Reactive
Sediment Cap**

Rev. #: 2

Rev Date: February 19, 2015

Approval Signatures

Lera de Marffy

Prepared by: _____

Date: 2/19/2015

Joseph Lusker

Reviewed by: _____

Date: 2/19/2015

(Technical Expert)

I. Scope and Application

This document describes the procedures for planting emergent vegetation on a reactive sediment cap. The reactive sediment cap contains sand and organoclay. The cap placement area was formerly vegetated with a mix of emergent vegetation and shrubs, with open water in deeper areas. To restore vegetation to the cap area, the cap will be planted with seedlings of select species native to the area, live stakes from nearby vegetation, and seed mix placement. The restoration will be completed in a manner that does not disrupt the integrity of the cap and/or reduce its effectiveness in mitigating oil sheens from the underlying sediments.

During planting, it is anticipated that portions of the reactive cap area will be inundated with water up to 3 feet. The seedling will be planted in areas with less than 0.5 feet of water (as determined in the field). Planting of live stakes will be conducted in areas with water depths between 0.5 and 1 foot. Seed mix placement (by hand) will occur throughout the cap area regardless of water depth.

The following sections list the necessary equipment and provide detailed instructions for planting with seedlings, planting with live stakes from nearby vegetation, and seeding by hand.

II. Personnel Qualifications

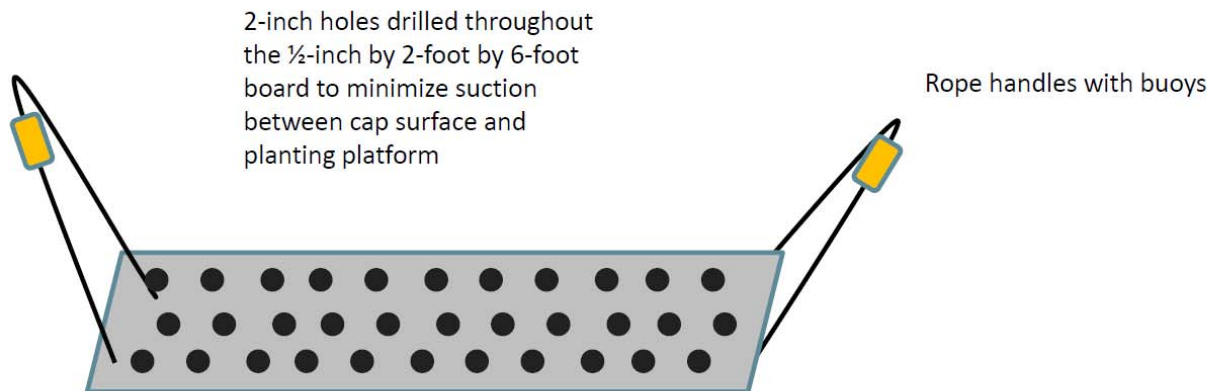
ARCADIS field personnel will have current health and safety training, including 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training, and site-specific health and safety training. In addition, personnel overseeing, directing, or supervising planting will be versed in the applicable Standard Operating Procedures (SOPs) to successfully complete the planting, and will have familiarity with restoration of vegetation.

III. Equipment List

The following equipment will be required during the planting activities:

- Personal protective equipment (PPE) and safety equipment required by the Health and Safety Plan
- Global Positioning System (GPS) equipment with sub-meter accuracy
- Wading staff
- Non-motorized flat bottomed boat (aluminum Jon boat) and oars
- Laminated site location map (with the reactive cap and water depths less than 0.5 feet estimated)
- Indelible ink pen and ball point pen
- Field log book
- Digital camera

- 3 Steel tree-planting bars (dibble)
- Loppers or hand shears to cut live stakes from nearby vegetation
- Fertilizer tablets, mycorrhizal tablets, and water gel (Safety Data Sheets are attached to this SOP)
- Purchased seedlings per the plan
- Purchased seed mixes per the plan
- Four 2 feet by 6 feet textured composite wood boards (non-sorbent) at least ½ inch thick with deck grip tape applied for extra non slip protection and ropes attached through holes at both ends of the sheet of composite board for walking on the cap to plant seedlings (See below for example).



IV. Cautions

Plants should be watered regularly until planting. This can be done by using the water in the cove.

Premix water gel prior to loading the boat to minimize activities being performed over water.

If inclement weather occurs (lighting or sever storm), then planting will be discontinued and personnel should take appropriate cover per the Health and Safety Plan.

V. Procedures

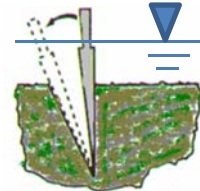
Preparation of seedlings:

1. Seedlings will be kept wet and shaded until time for planting. This will be done by either using water from the cove or from a hose and a woven fabric cover (such as burlap). They will be checked at the beginning of each day to ensure that they are wet.
2. Seedling roots will be dipped in a mixture of "Soil Moist Root Dip" to inoculate the bare roots before they are planted.

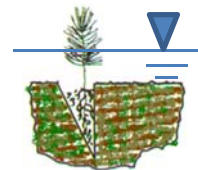
Planting seedlings in inundated areas (less than 0.5 feet of water):

In areas of the cap where low water levels prevent access via boat, field staff will plant seedlings on foot. To avoid compromising the integrity of the cap, a planting platform will be utilized to spread out the weight of field personnel and minimize the possibility of damaging the cap surface.

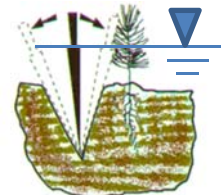
1. Use textured composite wood boards to avoid absorbing water and gaining unnecessary weight. Carefully place the composite board on the cap without disturbing the cap surface.
2. Make sure that the composite board is in full contact with the cap material before stepping on to ensure sheet will not move while working on it. If movement is observed place weights on board (rocks, hand weights or sand bags) to hold boards in place.
3. Place the second composite board next to the first one to allow for access on the cap. Always work on the sheets and not the cap.
4. The relocation of the sheets is done by lifting up the end with the rope and then slowly lifting the rest while standing on the other sheet.
5. The dibble will be placed through the surface of the cap and any overlying erosion protection mats to a depth of about 10 inches and pushed forward and removed.



6. The seedling roots will be placed in the dibble hole along with fertilizer and mycorrhizal tablets.



7. The dibble will be placed 2-3 inches behind the seedling and pushed into the ground and pushed against the seedling to close the hole.



If numerous planted seedlings are observed to be uprooted by wildlife or inclement weather, new methods will be utilized and/or the area will be revegetated via hand seeding only.

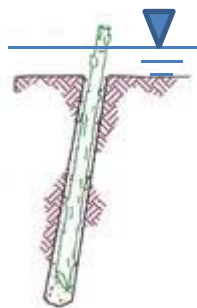
Relocating plants into inundated areas (0.5 to 1 feet of water):

In areas of the cap where the water is between 0.5 to 1 feet, some plants and live stakes can be planted from the adjacent vegetated area.

1. Plants will be collected throughout the adjacent wetland by using loppers and shears to cut live stakes or by pulling the plants up with their roots.
2. To harvest live stakes, cut branches that are roughly ½ to 1 ½ inches in diameter (some thinner widths may be successful as well) in 2 to 3 foot lengths. Collect live stakes from multiple locations in the adjacent wetland.
3. Cut the bottom of the stake on an angle to form a point. This will help with inserting the stakes.



4. Deploy the boat into the water body closest to where plants will be installed.
5. Plants will be relocated to the cap area in water depths up to 1 foot. Relocation will be completed in the same day.
6. Plants pulled up with their roots will be placed on the cap with their roots in contact with the cap material by hand.
7. Live stakes cut from nearby vegetation can be placed into the cap by pushing them in by hand or use of a dibble as outlined for seedling planting if the stake will not advance.



Spreading seed by hand on to the cap (all water depths):

Seed mixes will be placed on the entire surface of the cap by hand, regardless of water depth.

1. The seed mix selected for the cap area will be spread by hand over the entire cap area.
2. When working in water less than 6 inches composite board will be used to spread the seed by hand over the water surface.
3. When working in water deeper than 6 inches a boat will be used to spread the seed by hand over the water surface.

VI. Waste Management

Waste materials such as excess gel and planting materials (e.g., shipping boxes, wrapping materials) generated during the planting activities will be minimal and along with disposable equipment will be transported for off-site disposal in accordance with project requirements and applicable State regulations. PPE such as gloves will be collected for proper disposal.

VII. Data Recording and Management

Daily planting activities will be recorded in the field notebook, including total number of seedlings planted, live stakes, pounds of seed mix and additives used. Water depth levels and planting methods will be documented on a figure. Photographs of planting and field activities will be taken as appropriate, and photographs taken will be recorded (e.g., subject matter, photograph location, and photograph facing) in the field notebook. Copies of the field notebook will be forwarded to the Project Manager or designee, as requested. Upon completion of the field activities, field notebooks will be maintained in the project files.

Attachments: Safety Data Sheets

Fertilizer Tabs

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072



IDENTITY (As Used on Label and List)
REMKE Planting Tablets 20-10-5

Note: Blank spaces are not permitted. If any form is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name Remke Enterprises, Inc.	Emergency Telephone Number 630/810-1662
Address (Number, Street, City, State, and ZIP Code) P.O. BOX 893 Addison, IL 60101	Telephone Number for Information 630/351-9915
	Date Prepared 1/19/89
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Non-Hazardous: A non-hazardous blend of Ureaformaldehyde, Mono-Ammonium Phosphate, Potassium Sulphate, Calcium Sulphate and other non-hazardous fertilizer slow release agents and carriers.				
*Oral LD-50 - greater than 20gm/kg for male rat.				

Section III — Physical/Chemical Characteristics

Boiling Point	not known	Specific Gravity (H ₂ O = 1)	1.5
Vapor Pressure (mm Hg.)	not known	Melting Point	240°C
Vapor Density (AIR = 1)	not known	Evaporation Rate (Butyl Acetate = 1)	not volatile
Solubility in Water	75%		

Appearance and Odor
Blue tablet - No odor.

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Not flammable	Flammable Limits	LEL Not flammable	UEL Not flammable
		Not flammable		

Extinguishing Media
Water

Special Fire Fighting Procedures
Remove ignition source. Minimize breathing of fumes.

Unusual Fire and Explosion Hazards
Excessive inhalation of fumes from metals can produce metal fume fever. Toxic and irritating gas may be evolved in a fire.

(Reproduce locally)

OSHA 174, Sept. 1985

Fertilizer Tablets

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid	None known
	Stable	X		

Incompatibility (Materials to Avoid) None known

Hazardous Decomposition or Byproducts

Hazardous Polymerization	May Occur		Conditions to Avoid	None known
	Will Not Occur	X		

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? No Skin? No Ingestion? Yes

Health Hazards (Acute and Chronic) Rat oral LD-50 greater than 20gm/kg.

Carcinogenicity: NTP? No IARC Monographs? No OSHA Regulated? No

Signs and Symptoms of Exposure Ingestion can lead to gastrointestinal disturbances.

Medical Conditions Generally Aggravated by Exposure Ingestion can aggravate gastrointestinal problems.

Emergency and First Aid Procedures For ingestion, if victim is conscious, give large quantities of water and induce vomiting. Call doctor. For inhalation, remove to fresh air.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled Sweep up

Waste Disposal Method Apply as fertilizer to field.

Precautions to Be Taken in Handling and Storing store in dry area. Mildly corrosive to copper, brass alloys and metals. Store away from strong acids and oxidizers.

Other Precautions Keep away from children. Keep away from feed and foodstuffs.

Section VIII — Control Measures

Respiratory Protection (Specify Type) None required

Ventilation No special requirements	Local Exhaust	Special
	Mechanical (General)	Other
Protective Gloves	Eye Protection	

Other Protective Clothing or Equipment None required

Work/Hygienic Practices Wash hands after handling.

JRM Chemical, Inc.

MSDS MATERIAL SAFETY DATA SHEET

MSDS: 521A

Date: 01/14/2015

Page 1 of 3

IDENTIFICATION

Product Name
Chemical Family
Emergency Telephone
Company

FINES
Crosslinked polymer
216-475-8488
JRM Chemical, Inc.
4881 NEO Parkway
Cleveland, OH 44128
Telephone: 216-475-8488
Fax: 216-475-6517

HAZARDOUS INGREDIENTS

Non hazardous under OSHA 29 CFR 1910.1200
HMIS Rating 1
0
1
B

FIRST AID

Skin Wash with warm soapy water after use.
Eye contact Immediately flush with water. If irritation continues, consult a physician.
Inhalation If dust is present, do not breathe. Move to open air with fresh air.
Ingestion Do not give any medication unless specified by a physician.

FIRE FIGHTING MEASURES

Flash Point N/A
LEL N/A
EUL N/A
Extinguishing Media Use water, carbon dioxide, foam.
Special precautions Material is slippery when wet
Special Protective Equipment None

ACCIDENTAL RELEASE

Sweep up spill and dispose. Spilled material is very slippery when wet.

MSDS
MATERIAL SAFETY DATA SHEET
FINES

HANDLING AND STORAGE

Storage	Store in a cool dry location. Keep lid tightly secured, avoid water and moisture.
Handling	Practice good industrial hygiene. Immediately sweep up any spills. To avoid potential dust, maintain good housekeeping. Do not smoke when using.

PERSONAL PROTECTION

Respiratory Protection	Use NIOSH approved respirator if dust accumulation is more than 15 mg/m ³ .
Protective Gloves	Recommended if prolonged use of product.
Eye Protection	Goggles
Skin/Body Protection	No special suits required
Other	Wash affected areas after use.

PHYSICAL/CHEMICAL PROPERTIES

Appearance and color	White powder
Odor	None
pH	N/A
Melting Point	N/A
Flash Point	N/A
Vapor Density	N/A
Auto ignition	N/A

STABILITY

Stability	Stable
Polymerization	Will not occur
Conditions to avoid	N/A
Incompatible Material	Strong oxidizing agents

TOXICOLOGICAL

Acute Toxicity	
Inhalation	Non-toxic by inhalation
Dermal	Non-toxic
Oral	LD50 Acute oral on rats > 5.0 gm/Kg.

IRRITATION

Eyes	Non-irritating
Skin	Non-irritating
Product does not contain any OSHA hazardous components.	

**MSDS
MATERIAL SAFETY DATA SHEET
FINES**

ECOLOGICAL

Considered non-toxic to the aquatic environment.
LC 50/ Fathead minnow (Pimephales Promelas) , 48 hrs. > 1000 mg./l
LC 50/ Daphina magna 48 hrs. > 700 mg./l
IC50/ Scenedesmus subspicatus / 72 h>500 mg/L

DISPOSAL

Dispose in accordance with city, state and federal regulations.

TRANSPORTATION

Not regulated by Department of Transportation.

REGULATORY

Components are on TSCA and Canada DSL.
Not regulated by OSHA. 29 CFR 1910.1200.

Hazardous Waster Number	N/A
RCRA Status	Not a hazardous waste
Reportable Quantity (40CFR 302)	N/A
Threshold planning Quantity (40CFR 335)	N/A

OTHER

NFPA	
Fire	1
Health	0
Reactivity	1

**CONTACT
PERSON**

Safety Manager

This information is given without any warranty or representation. We do not assume any legal responsibility for same. It is offered solely for your consideration, investigation and verification. Before using any product, read its label.

JRM Chemical, Inc.

4881 NEO Parkway
Cleveland, OH 44128
Phone: 216-475-8488
Fax: 216-475-6517

JRM Chemical, Inc.

MSDS MATERIAL SAFETY DATA SHEET

MSDS: 592
Date: 01/13/15
Page 1 of 3

IDENTIFICATION

Product Name	Soil Moist
Chemical Family	Cross linked polyacrylamide
Emergency Telephone	216-475-8488
Company	JRM Chemical, Inc. 4881 NEO Parkway Cleveland, OH 44128 Telephone: 216-475-8488 Fax: 216-475-6517

HAZARDOUS INGREDIENTS

Non hazardous under OSHA 29 CFR 1910.1200
HMIS Rating 1
0
1
B

FIRST AID

Skin	Wash with warm soapy water after use.
Eye contact	Immediately flush with water. If irritation continues, consult a physician.
Inhalation	If dust is present, do not breathe. Move to open air with fresh air.
Ingestion	Do not give any medication unless specified by a physician.

FIRE FIGHTING MEASURES

Flash Point	N/A
LEL	N/A
EUL	N/A
Extinguishing Media	Use water, carbon dioxide, foam.
Special precautions	Material is slippery when wet
Special Protective Equipment	None

ACCIDENTAL RELEASE

Sweep up spill and dispose. Spilled material is very slippery when wet.

MSDS
MATERIAL SAFETY DATA SHEET
SOIL MOIST

HANDLING AND STORAGE

Storage	Store in a cool dry location. Keep lid tightly secured, avoid water and moisture.
Handling	Practice good industrial hygiene. Immediately sweep up any spills. To avoid potential dust, maintain good housekeeping. Do not smoke when using.

PERSONAL PROTECTION

Respiratory Protection	N/A
Protective Gloves	Recommended if prolonged use of product.
Eye Protection	N/A
Skin/Body Protection	No special suits required
Other	Wash affected areas after use.

PHYSICAL/CHEMICAL PROPERTIES

Appearance and color	White granular
Odor	None
pH	6.0-7.0
Melting Point	N/A
Flash Point	N/A
Vapor Density	N/A
Auto ignition	N/A

STABILITY

Stability	Stable
Polymerization	Will not occur
Conditions to avoid	None
Incompatible Material	Strong oxidizing agents

TOXICOLOGICAL

Acute Toxicity	
Inhalation	Non toxic by inhalation
Dermal	Non toxic
Oral	Non toxic; large amounts can cause GI Tract disturbance. LD50 Acute oral on rats > 5.0 gm/Kg.

IRRITATION

Eyes	Non irritating
Skin	Non irritating
Product does not contain any OSHA hazardous components.	

MSDS
MATERIAL SAFETY DATA SHEET
SOIL MOIST

ECOLOGICAL

Considered non toxic to the environment

Fish: LC50/Danio rerio/96hr>150mg/l (OECD 203)
Algae: IC/50/scenedesmus subspicatis/72hr>100mg/l (OECD 201)
Daphnia: EC/50 daphnia magna/48hr>100mg/l (OECD 202)
Persistence/degradability: Not readily biodegradable

DISPOSAL

Dispose in accordance with city, state and federal regulations.

TRANSPORTATION

Not regulated by Department of Transportation.

REGULATORY

Components are on TSCA and Canada DSL.
Not regulated by OSHA. 29 CFR 1910.1200.

Hazardous Waster Number	N/A
RCRA Status	Not a hazardous waste

Reportable Quantity (40CFR 302)	N/A
Threshold planning Quantity (40CFR 335)	N/A

OTHER

NFPA	
Fire	1
Health	0
Reactivity	1

CONTACT

PERSON

Safety Manager

This information is given without any warranty or representation. We do not assume any legal responsibility for same. It is offered solely for your consideration, investigation and verification. Before using any product, read its label.

JRM Chemical, Inc.

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Cleveland, OH 44128
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Appendix E

Example Monitoring Forms

