Evaluation of Environmental Benefits for Louisiana Coastal Area (LCA) Small Diversion at Convent / Blind River Project with the Wetland Value Assessment (WVA) Methodology

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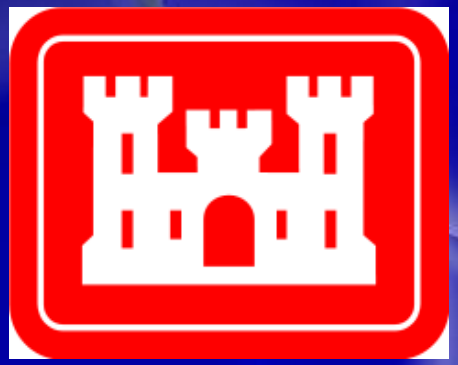
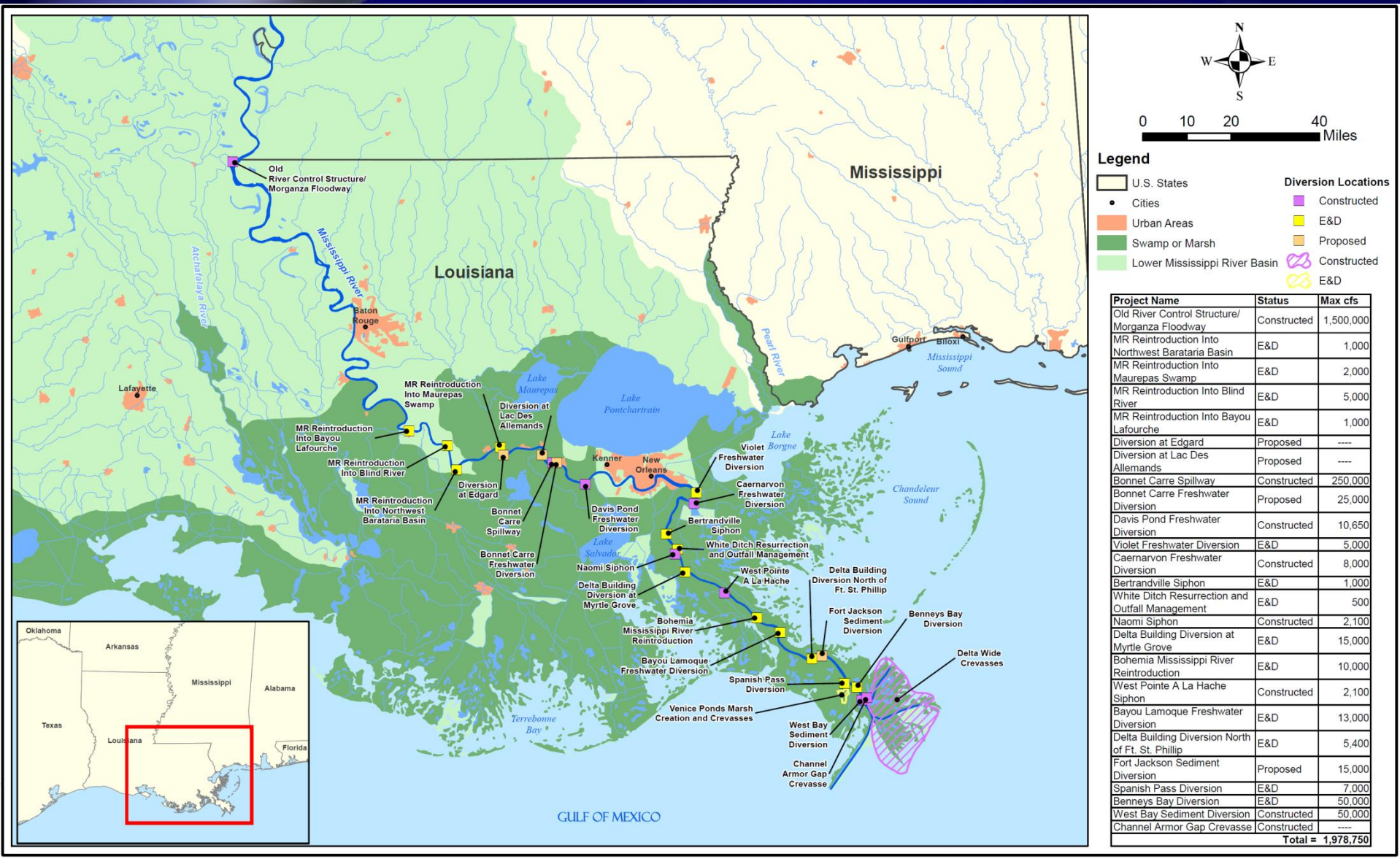


CDM

Lower Mississippi River Diversions of Freshwater, Nutrients and Sediments for Wetland Restoration

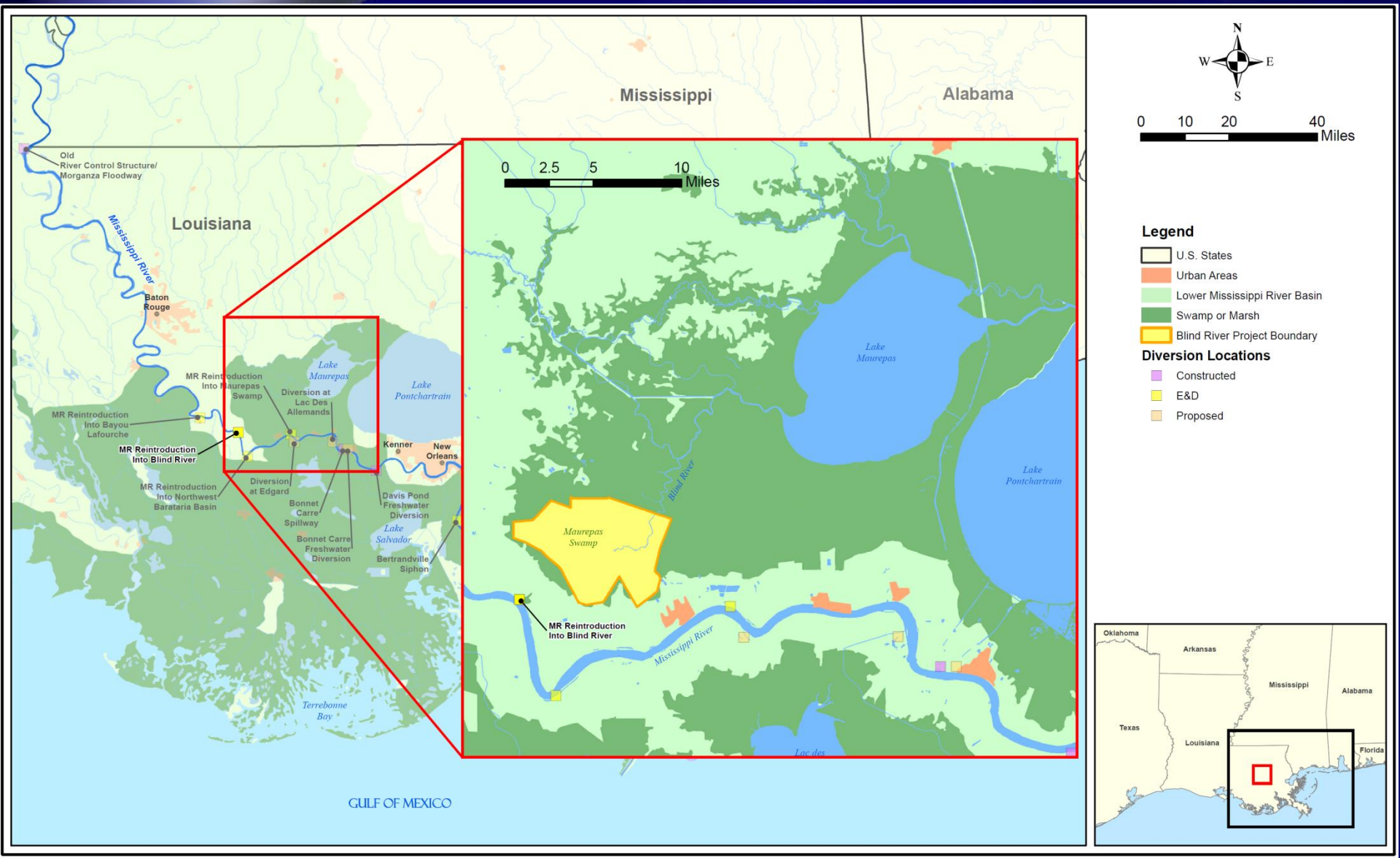


Project Name	Status	Max cfs
Old River Control Structure/ Morganza Floodway	Constructed	1,500,000
MR Reintroduction Into Northwest Barataria Basin	E&D	1,000
MR Reintroduction Into Maurepas Swamp	E&D	2,000
MR Reintroduction Into Blind River	E&D	5,000
MR Reintroduction Into Bayou Lafourche	E&D	1,000
Diversion at Edgard	Proposed	----
Diversion at Lac Des Allemands	Proposed	----
Bonnet Carre Spillway	Constructed	250,000
Bonnet Carre Freshwater Diversion	Proposed	25,000
Davis Pond Freshwater Diversion	Constructed	10,650
Violet Freshwater Diversion	E&D	5,000
Caernarvon Freshwater Diversion	Constructed	8,000
Bertrandville Siphon	E&D	1,000
White Ditch Resurrection and Outfall Management	E&D	500
Naomi Siphon	Constructed	2,100
Delta Building Diversion at Myrtle Grove	E&D	15,000
Bohemia Mississippi River Reintroduction	E&D	10,000
West Pointe A La Hache Siphon	Constructed	2,100
Bayou Lamoque Freshwater Diversion	E&D	13,000
Delta Building Diversion North of Ft. St. Phillip	E&D	5,400
Fort Jackson Sediment Diversion	Proposed	15,000
Spanish Pass Diversion	E&D	7,000
Benneys Bay Diversion	E&D	50,000
West Bay Sediment Diversion	Constructed	50,000
Channel Armor Gap Crevasse	Constructed	----
	Total =	1,978,750

Overall Goal of Diversion Projects

- Diversions of freshwater, nutrients and sediments from the Mississippi River are implemented to enhance and restore forested wetlands and lower the effect of large scale storm surges as compared to a future condition with continuous degradation and loss of these ecosystems.

Project Area
Diversion at Convent to Blind River



Historic Impacts to Maurepas Swamp

- The Mississippi River levee system isolated Maurepas Swamp and Blind River from natural, periodic flooding cycles that provided nutrients, sediment and pulsing for swamp growth and development

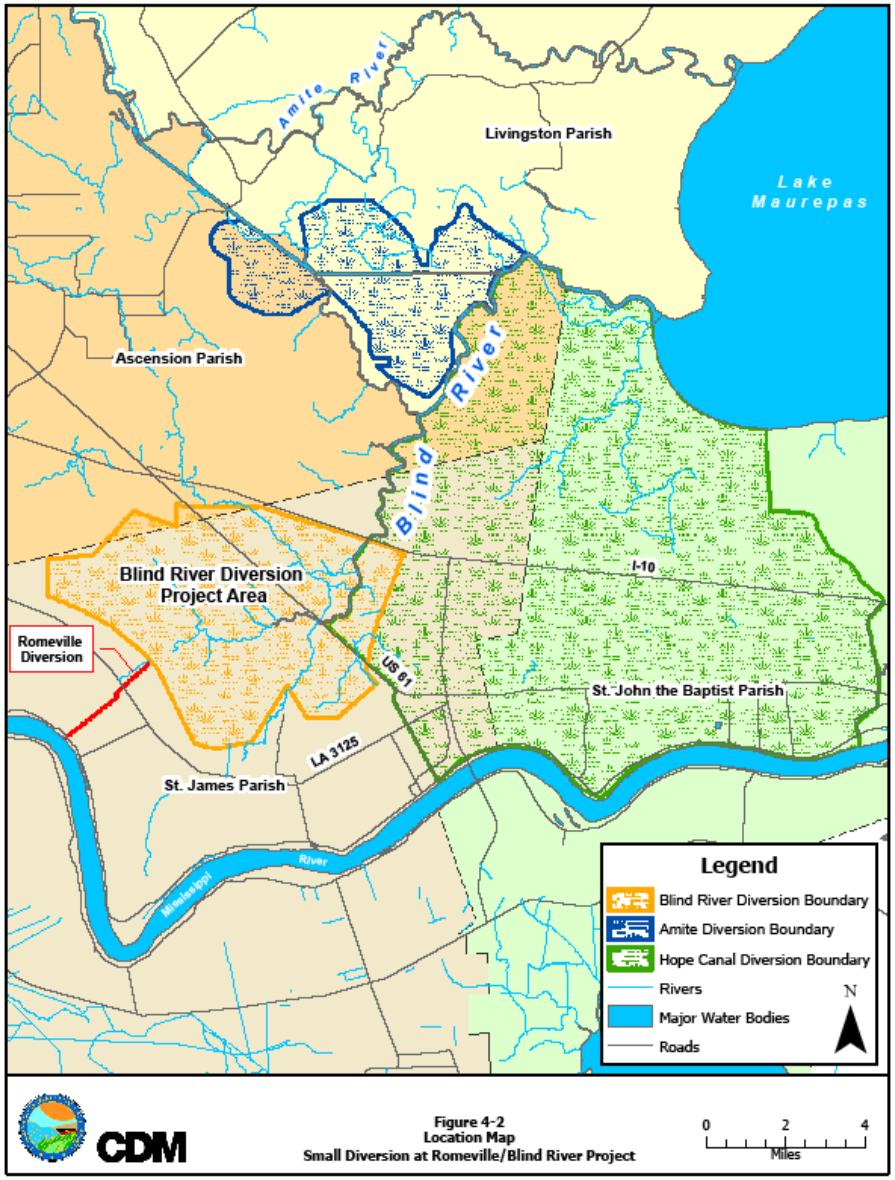
- Other impacts to Maurepas Swamp include logging, natural subsidence, sea level rise, construction of drainage canals, roads, pipelines and other utilities, storm surges, and saltwater intrusion

Historic Impacts to Maurepas Swamp

- The lack of freshwater, nutrients and sediment input from the Mississippi River combined with other impacts has resulted in degradation, reduced biological productivity, and loss of accretion in the swamp
- The overall impact to Maurepas Swamp is the conversion to marsh and open water and loss of storm surge buffering provided by forested wetlands

Cypress in Maurepas Swamp prior to 1900

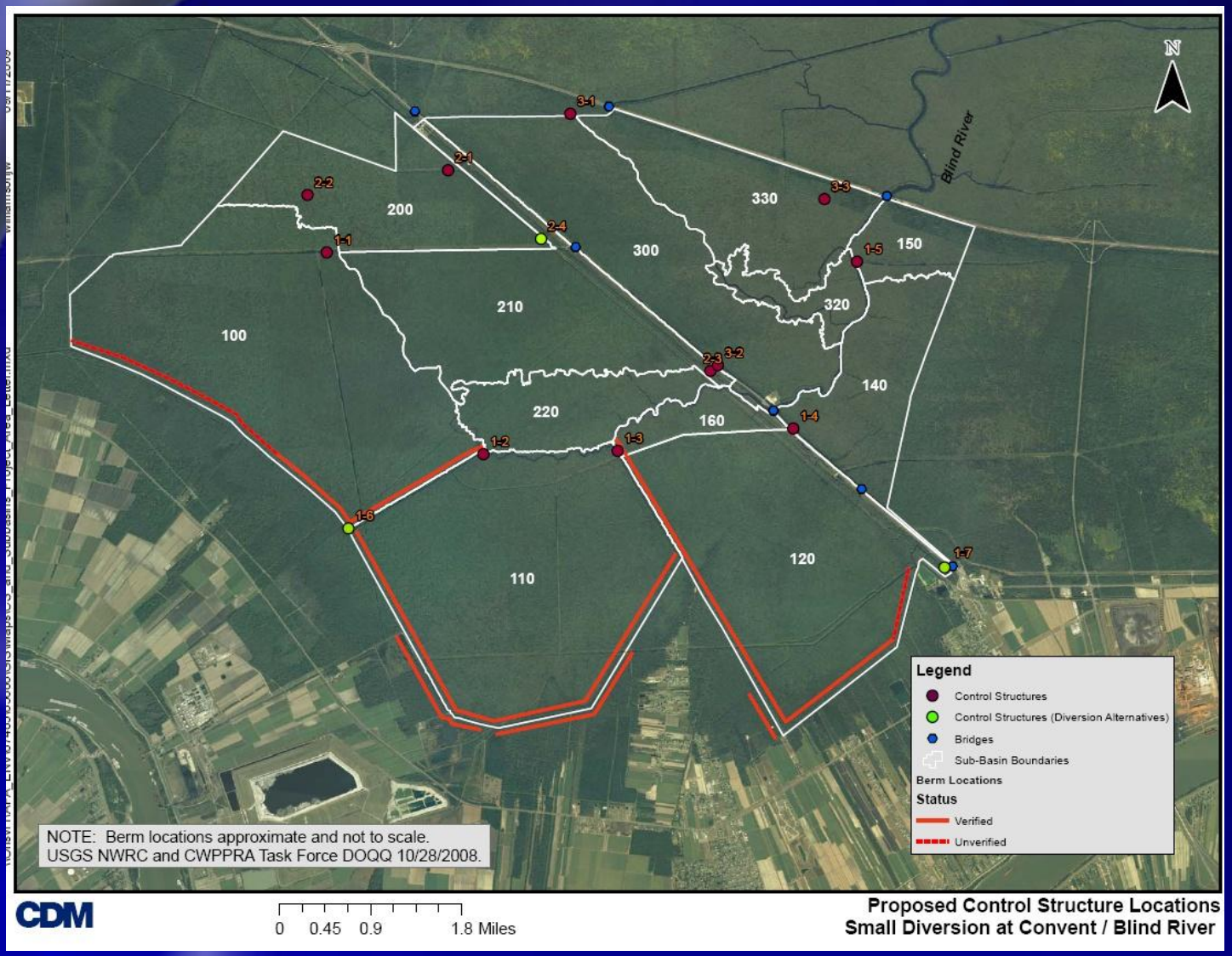
Project Area



Project Components

- Getting the flow from the Mississippi River
- Conveying the flow to the swamp
- Distributing flow in the swamp

Drainage Canals Connected to Blind River



Blind River Channelized

Hurricane Water Level in Mauerpas Swamp

Hurricane High Water Level

Project Objectives

- The overall project goal is to reverse the deterioration of Maurepas Swamp and prevent the transition to marsh and open water
- Facilitate swamp building with sediment and nutrients
- Improve water distribution in the swamp to maximize distribution of sediment and nutrients for swamp building
- Establish hydroperiod fluctuation in the swamp, including dry periods for seed germination and seedling survival
- Improve water quality, fish and wildlife habitat in the swamp and in Blind River

Components in All Alternatives

- Culverts or Siphon to move water from the Mississippi River through or over the existing levee when needed
- Earthern transmission channel to convey water from the Mississippi River to the swamp
- Large and small scale gaps in exisiing berms with variable spacing surrounding the swamp to maximize flow distribution throughout the swamp
- Control structures at critical locations in channelized portions of Blind River to maximize flow distribution throughout the swamp and to provide flood control

EIS Plan Formulation and Screening Provided Final Array of Alternatives

- No Action –required

  Establishes baseline condition for comparison of alternatives and their benefits

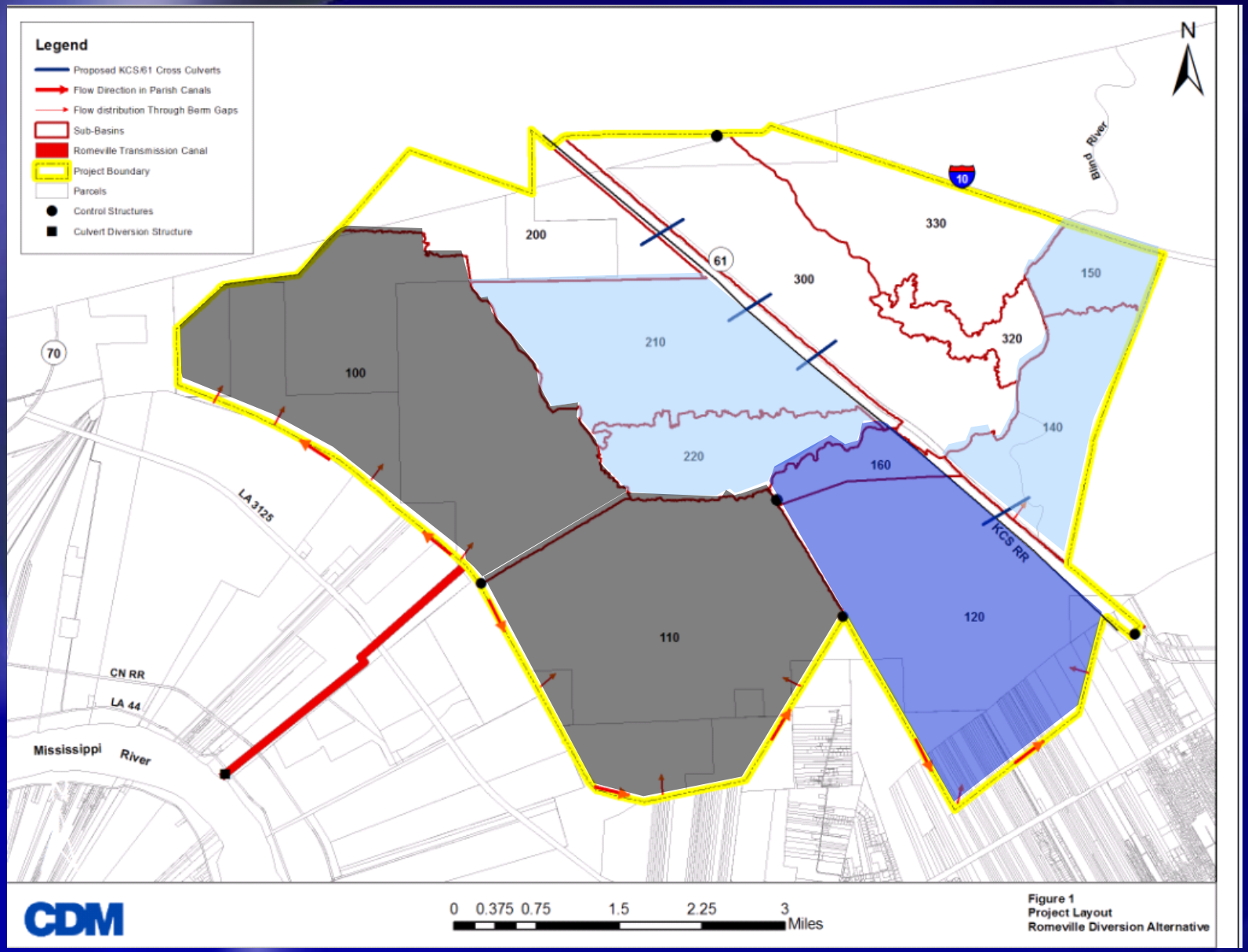
- Alternative 2 – 3000 CFS Diversion at Romeville

- Alternative 4A – 3000 CFS Diversion at South Bridge

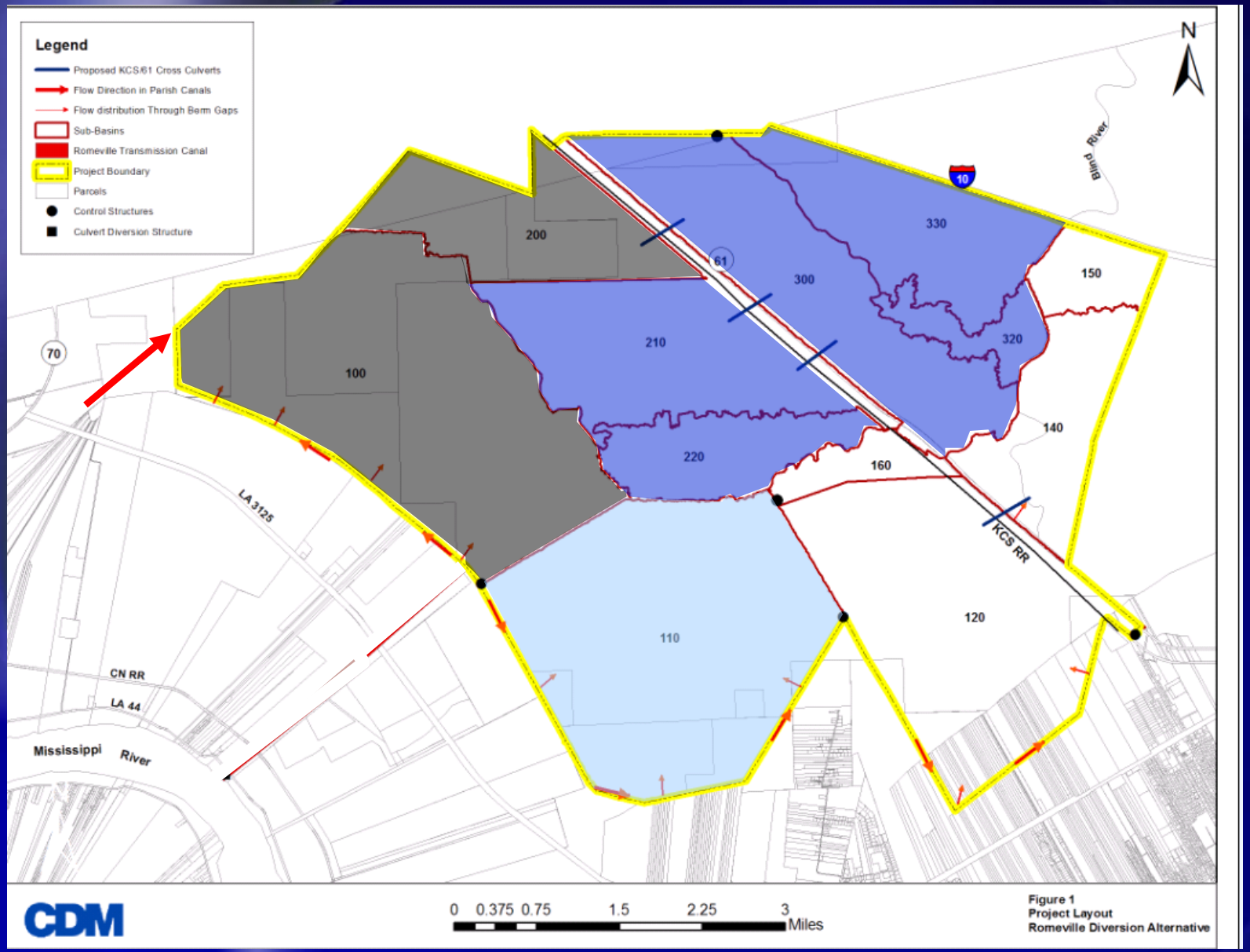
- Alternative 4B – 3000 CFS Diversion at South Bridge with split flows

- Alternative 6 – Two 1500 CFS Diversions; Romeville and South Bridge

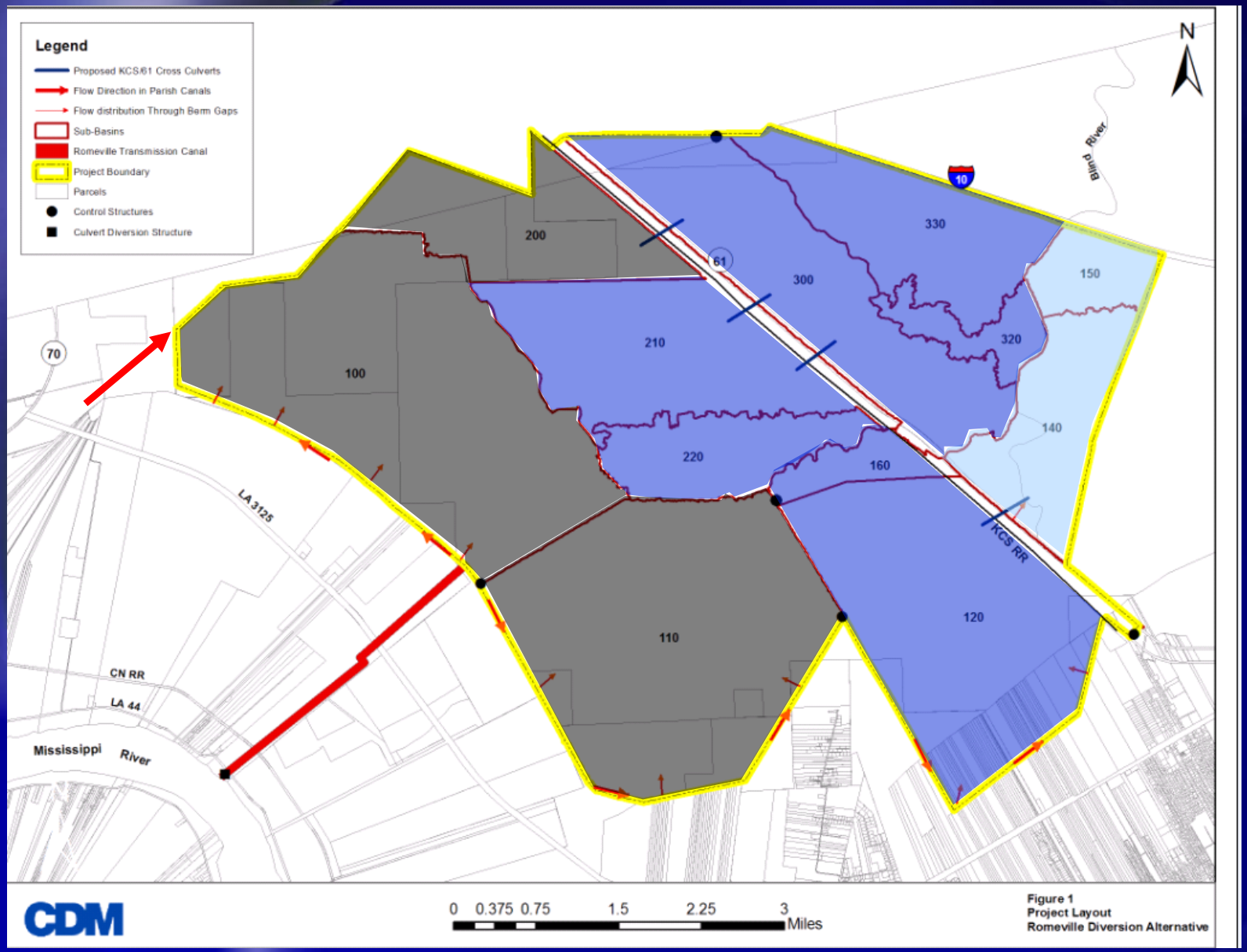
Romeville Diversion - 3,000 CFS (Alt 2)



Southbridge Diversion – 3,000 CFS (Alt 4A)



2 Diversions
(Alt 4B - 3,000 CFS, Alt 6 – 1,500 CFS)



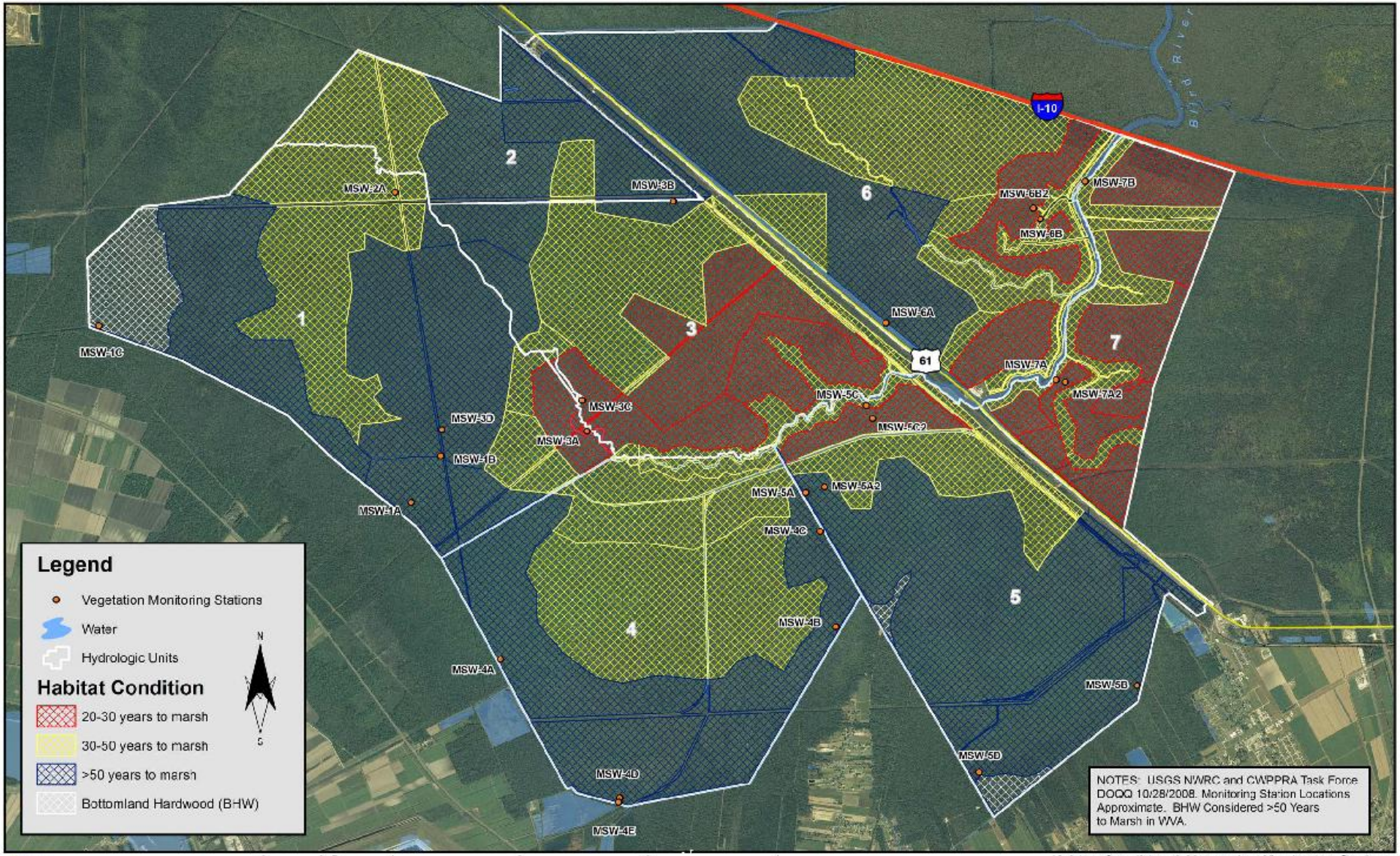
Evaluation of Environmental Benefits for Alternatives with Wetland Value Assessment Model (WVA)

- Habitat Field Data Collection
- Habitat Condition Type Classification Map by Hydrologic Units and Drainage Basins
- H & H Model Results
- Habitat Suitability Index (HSI)
- Benefits in terms of Avg. Annual Habitat Units (AAHUs)
- Incorporated into IWR Plan (costs)

Habitat Condition Type Classification Existing and New Field Data Collection

- > 50 years to marsh — 9 stations
- 30 - 50 years to marsh — 7 stations
- 20 – 30 years to marsh — 7 stations

Habitat Condition Classification Map



CDM

Habitat Condition & Vegetation Monitoring Stations
Small Diversion at Convent / Blind River

> 50 years to marsh

30 – 50 years to marsh

20 – 30 years to marsh

Application of WVA Model

- Model provides Habitat Suitability Index (HSI) for each Hydrologic Unit and Drainage Basins for each Alternatives in terms of:
  - Field Measurements
  - H&H Model Results
    - Average annual water depth
    - Frequency of dry-out
    - Backflow prevention
  - Habitat Condition Type
  - Alternative Influence Area
- Determine Habitat Units (HUs) = HSI x Area
- Determine Annual Average Habitat Units (AAHUs) for project life (50 years)

WVA Habitat Suitability Index (HSI)

- **Stand structure**
  - Field measurement

    % cover by cover class (canopy, mid-story, understory)
- **Stand maturity**
  - Field measurement

    Cypress dbh, tupelo dbh

    % composition (# of individuals) and mortality rate for tupelo
  - WVA model uses growth rates to calculate basal area change over time
- **Water Regime**
  - Field measurement

    Flood duration: seasonal, temporary, semi-permanent, permanent

    Flow exchange: high, moderate, low, none
  - H & H model results

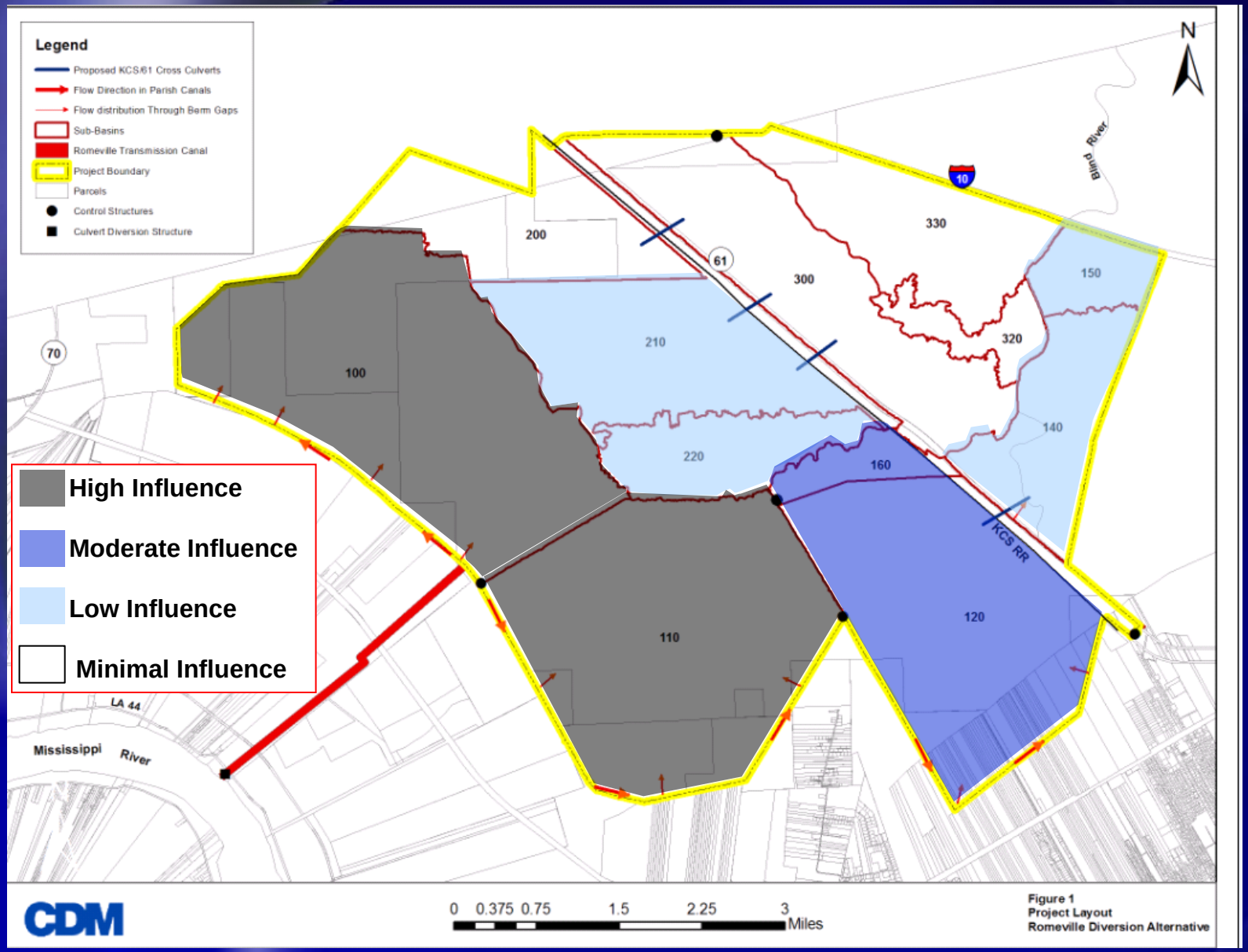
    Average annual water depth, frequency of dry-out, backflow prevention
- **Salinity**
  - Field measurement

    mean high salinity during growing season

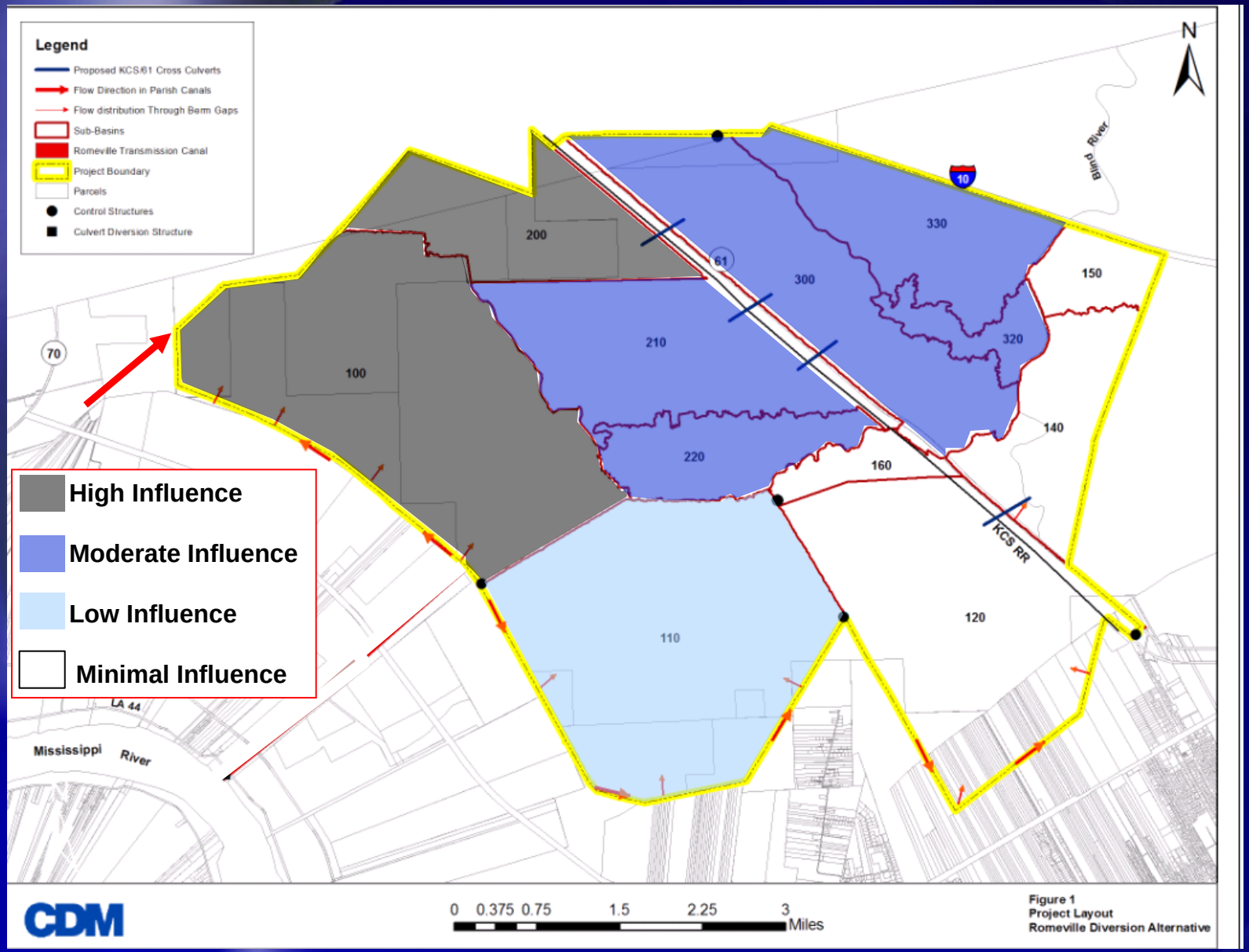
Alternative Influence Areas

- High Influence Area (High IA)
- Moderate Influence Area (Moderate IA)
- Low Influence Area (Low IA)
- Minimal Influence Area (Minimal IA)

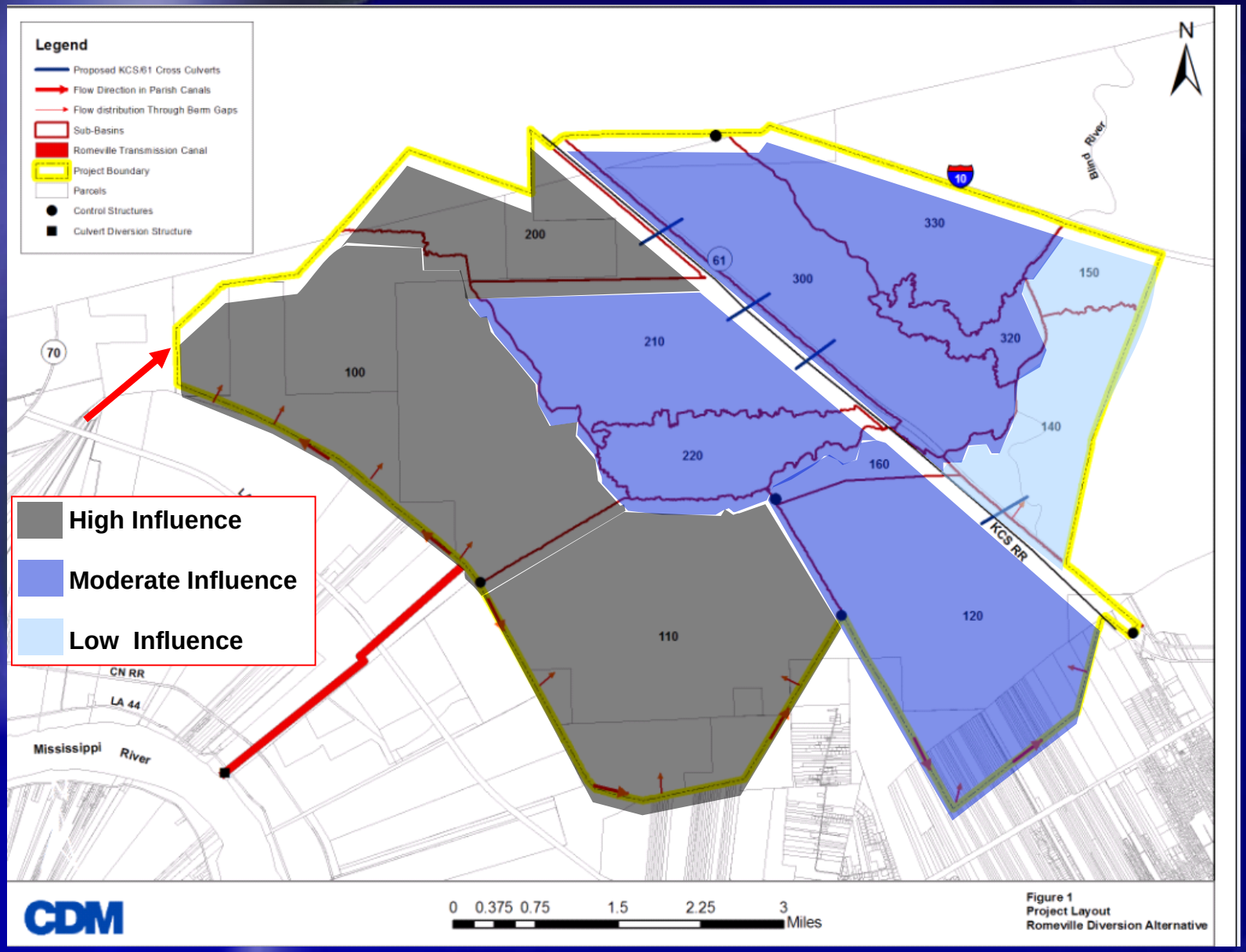
Influence Areas
Romeville Diversion - 3,000 CFS (Alt 2)



Influence Areas
Sunshine Bridge Diversion – 3,000 CFS (Alt 4A)



Influence Areas
2 Diversions (Alt 4B - 3,000 CFS, Alt 6 – 1,500 CFS)



Example HSI results

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Swamp

Project..... Alternative 2_High IA_Swamp WVA_20-30_YRS_Marsh

Project Area..... 169

Condition: **Future Without Project**

Variable		TY 0		TY 1		TY 20		TY 30		TY 50	
		Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		23		23		<33		<33		<33	
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		33		33							
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		80		80							
		Class		Class		Class		Class		Class	
		1	0.10	1	0.10	1	0.10	1	0.10	1	0.10
V2	Stand Maturity	Cypress %		Cypress %		Cypress %		Cypress %		Cypress %	
		18		10.42		18.87		18.87		100	
		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		11.21		11.87		13.96		14.6		15.88	
		Tupelo et al. %		Tupelo et al. %		Tupelo et al. %		Tupelo et al. %		Tupelo et al. %	
		82		89.58		81.13		81.13		0	
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		13.08	0.93	13.56	0.97	15.08	0.97	15.81	0.98	0	0.99
		Basal Area		Basal Area		Basal Area		Basal Area		Basal Area	
		113.85	0.56	122	0.77	82.98	0.58	90.81	0.59	18.42	0.20
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		low		low		low		low		low	
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		semipermanent	0.45	semipermanent	0.45	permanent	0.30	permanent	0.30	permanent	0.30
V4	Mean High Salinity										
		1.0	1	1.0	1	1.0	1	1.0	1	1.0	1
		HSI =	0.34	HSI =	0.37	HSI =	0.31	HSI =	0.31	HSI =	0.23

Example AAHU Calculation

AAHU CALCULATION

Project: Alternative 2_High IA_Swamp WVA_20-30_YRS_Marsh

Future Without Project			Total	Cumulative
TY	Acres	x HSI	HUs	HUs
0	169	0.34	57.64	
1	169	0.37	62.52	60.08
20	169	0.31	51.61	1084.23
30	169	0.31	51.72	516.62
50	169	0.23	39.39	911.07

Total CHUs =	2572.00
AAHUs =	51.44

Future With Project			Total	Cumulative
TY	Acres	x HSI	HUs	HUs
0	169	0.34	57.64	
1	169	0.47	79.47	68.55
20	169	0.91	153.14	2209.76
30	169	0.86	144.99	1490.64
50	169	0.79	133.00	2779.88

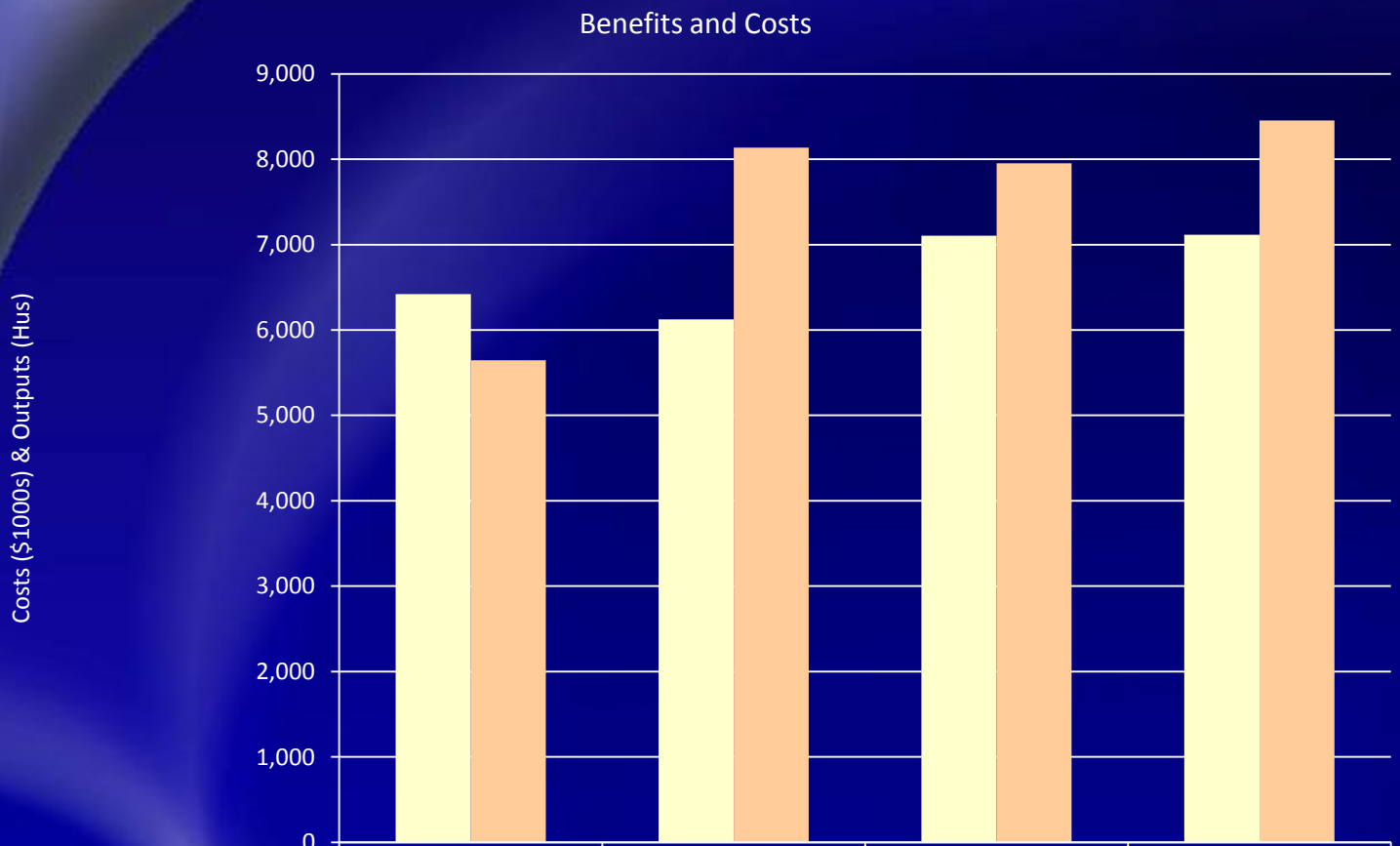
Total CHUs =	6548.83
AAHUs =	130.98

NET CHANGE IN AAHUs DUE TO PROJECT		
A. Future With Project AAHUs	=	130.98
B. Future Without Project AAHUs	=	51.44
Net Change (FWP - FWOP) =		79.54

Benefits for Final Array of Alternatives AAHU Summary

	Average Annual Habitat Units (AAHUs)			
Influence, Habitat Condition Class	Alt. 2	Alt. 4A	Alt. 4B	Alt. 6
High IA, 20-30 years to marsh	77	77	77	77
High IA, 30-50 years to marsh	1,350	733	1,545	1,545
High IA, >50 years to marsh	1,293	1,014	1,532	1,532
Moderate IA, 20-30 years to marsh	93	828	919	919
Moderate IA, 30-50 years to marsh	243	1,182	1,423	1,423
Moderate IA, >50 years to marsh	745	585	1,325	1,325
Low IA, 20-30 years to marsh	935	0	354	354
Low IA, 30-50 years to marsh	527	663	137	137
Low IA, >50 years to marsh	110	447	0	0
No IA, 20-30 years to marsh	72	163	0	0
No IA, 30-50 years to marsh	585	237	0	0
No IA, >50 years to marsh	431	373	0	0
Gross AAHUs	6,462	6,302	7,313	7,313
Wetland Impacts	-41	-178	-210	-199
Net AAHU's	**6,421**	**6,124**	**7,103**	**7,114**

Final Array Benefits and Costs



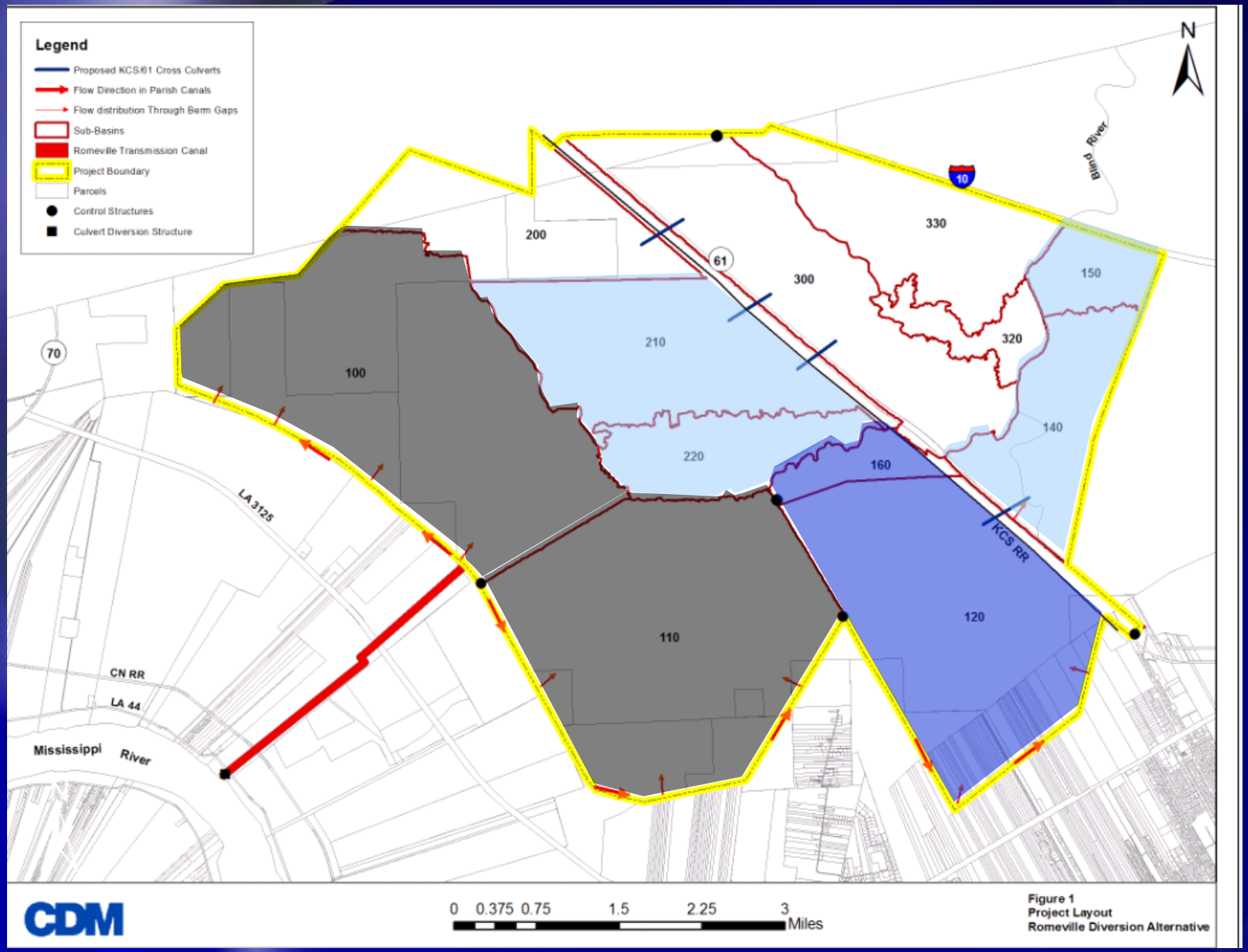
	2 - Rmvl. -- 3000 CFS	4A - Hwy 70 -- 3000 CFS	4B - Hwy 70 -- 3000 CFS	6 - Dual -- 3000 CFS
Habitat values (Hus)	6,421	6,124	7,103	7,114
Ave. Annual Costs ($1000s)	$5,646	$8,135	$7,954	$8,455
Cost Effective/Best Buy	Best Buy	No	Best Buy	Best Buy

Final Array Benefits and Costs Tentatively Selected Plan

	Alt. 2	Alt. 4A	Alt. 4B	Alt. 6
HUs	6,421	6,124	7,103	7,114
Cost ($1,000s)	$5,646	$8,135	$7,954	$8,455
Cost-effective	Yes	No	Yes	Yes
Best Buy	Yes	No	Yes	Yes
Cost/HU	$879	$1,328	$1,120	$1,189
ΔCost/HU			$3,385	$4,054

- Alternative 4A has lower benefits and higher costs than alternative 2 and is not a cost effective solution
- Alternative 4B has a 44.9% increase in cost for a 9.6% increase in benefits vs. Alternative 2
- Alternative 6 has a 53.6 % increase in cost for a 9.7% increase in benefits vs. Alternative 2
- **Tentatively Selected Plan TSP: Alternative 2 - 3000 CFS Diversion at Romeville**

TSP- Romeville Diversion - 3,000 CFS (Alt 2)



Summary

- The goal of diversion projects is to restore or enhance forested wetlands and minimize impacts of storm surges
- Alternatives were developed to convey water, nutrients and sediments from the Mississippi River to reverse the trend of swamp deterioration
- The Wetland Value Assessment (WVA) model used to evaluate environmental benefits for each alternative
- An alternative has been selected to restore Maurepas Swamp and Blind River that maximizes environmental benefits at a reasonable cost