Louisiana Coastal Area
Medium Diversion at White Ditch

PED Assessment of
Diversion Locations and Benefits

September 10, 2013

Briefing Agenda

- Overview of Feasibility Study Recommendation
- Evaluation of Different River Locations (Flow-3D Model Analysis)
- SAND Model Analysis of Different River Locations
- Design Features and Location Comparison
- Update on AdH Basin Model Development
- Discussion/Questions/Recommendation

Why are We Here?

- Questions about SAND Model benefits
- Questions about variables used as model inputs
- Questions about how important location on the river is to capturing sediment
- Questions about the effects of individual and multiple diversions on the Mississippi River
- To incorporate new science, understanding, and technical aspects into the decision-making process

BLUF

- This PED effort has been underway for ~20 months
- Our understanding of the river/sediment transport has increased significantly since the 2010 Chief's Report
- Benefits predicted during feasibility cannot be achieved at the recommended location
  - Benefits can be achieved by moving upriver ~8 miles
  - Project can be built for less money than feasibility estimate (though more work to be done)
  - Additional sediment transport modeling is underway
  - Greater confidence about project performance

Feasibility Study Background

- Study authorized under 2007 WRDA Section 7006(e)(3)(B)
- Civil Works Review Board comments in August 2010
- Mississippi River Commission report received in November 2010
- MVD DIVR 1110-1-403 received in March 2011
- Due to project cost, reauthorization is necessary (original maximum cost of ~$127M*)

*- 902b analysis will increase project budget

Feasibility Study Objectives

- Maintain the current area of marsh habitat, of all types (41,206 acres) that provide life requisite habitat conditions for native coastal marsh fish and wildlife.

- Restore adequate freshwater and nutrient inputs into the project area such that sustainable areas of fresh, intermediate, brackish and saline marsh are present and existing areas of marsh acres are maintained.

- Restore sediment inputs into the project area equivalent to an average of approximately 1,300,000 cubic yards of sediment per year.

Feasibility Study Details

Benefits

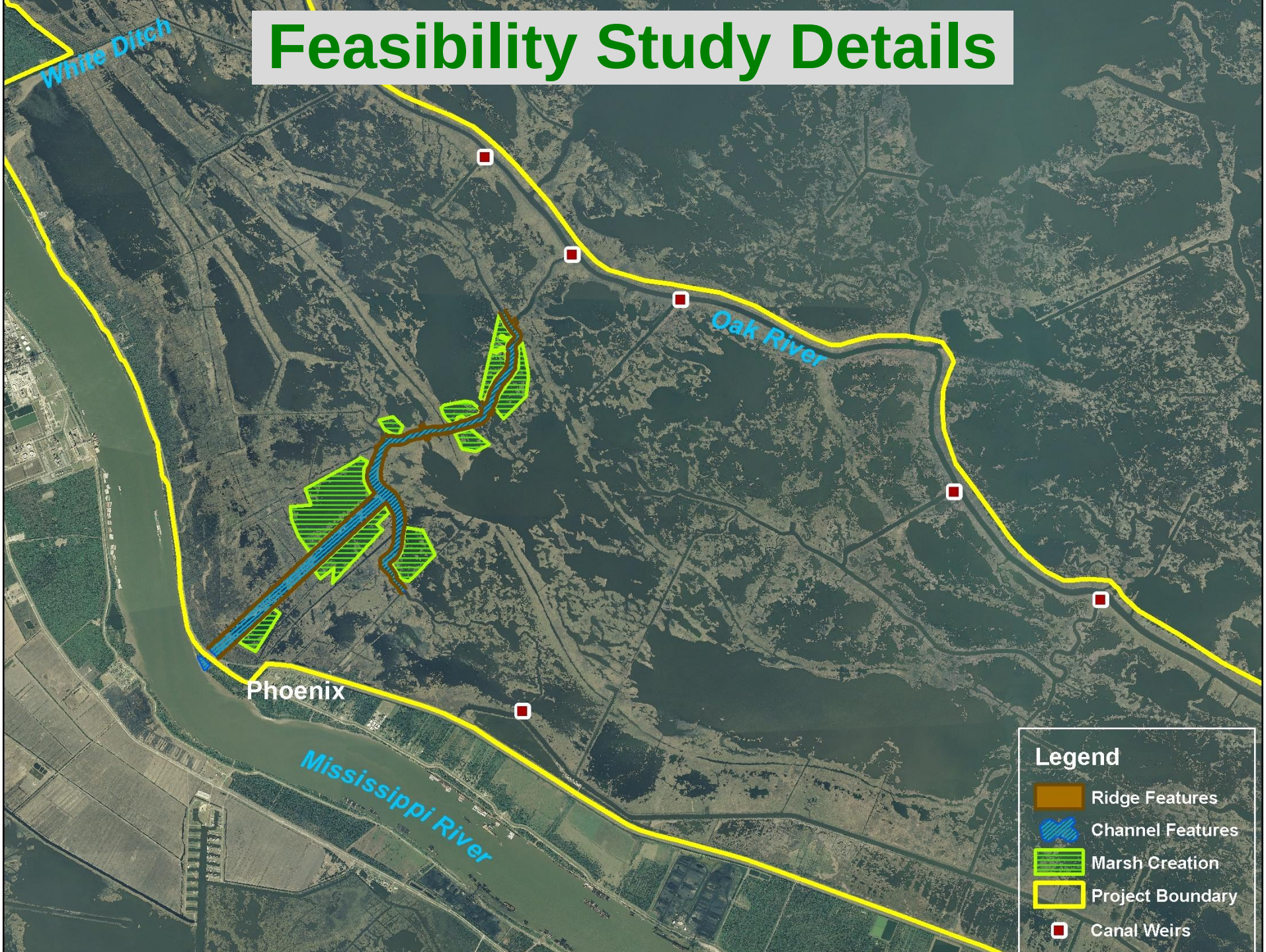
Location	AAHU's	Marsh Habitat	Ridge Habitat
Location 3 (Phoenix)	13,355	385 Acres	31 Acres

Costs

Total First Cost	Federal Cost	Non-Fed Cost	Total Monitoring	Total Adaptive Management	Annual OMRR&R
$365,201,000	$237,831,000	$127,820,000	$8,807,000	$2,336,000	$1,468,000

Fully Funded Cost Estimate: $387,620,000

Feasibility Study Details



What Have We Been Working On?

- Utilizing the FLOW-3D Model for an assessment of different diversion locations on the Mississippi River
- Updating the SAND Model with new calculation tools and better input values
- Improving the ADH Model with new field data and developing a sediment transport module
- Modifying feasibility recommendations such as the structure and channel design to improve sediment capture and delivery
- Assessing preliminary costs for project features

FLOW-3D Model Activities

- The FLOW-3D model has been used to analyze suspended sediment concentrations at discrete Mississippi River locations

- Other design features have been incorporated:
  - Diversion alignment
  - Structure depth
  - Channel design and slope
  - Structure and channel type

- Assessed multiple scenarios at Location 3 then looked at other locations (1, 2.5, & 4)

FLOW-3D Modeling

- Five different scenarios tested at Location 3

Locations of Diversions Analyzed

Locations	Alternative	Model Applied	River Mile	Entrance of Approach Channel		Outfall Channel Boundary	
				Latitude	Longitude	Latitude	Longitude
3	A	Initial	60.0	29º39'1.91''N	89º57'11.20''W	29º39'59.00''N	89º55'43.85''W
3	B	Initial	60.0	29º39'1.91''N	89º57'11.20''W	29º39'59.00''N	89º55'43.85''W
3	C	Initial	59.8	29º38'59.23''N	89º57'09.98''W	29º39'12.82''N	89º56'22.75''W
3	D	Initial	59.8	29º38'59.23''N	89º57'09.98''W	29º39'12.82''N	89º56'22.75''W
3	F	Extended	60.0	29º39'1.91''N	89º57'11.20''W	29º39'59.00''N	89º55'43.85''W

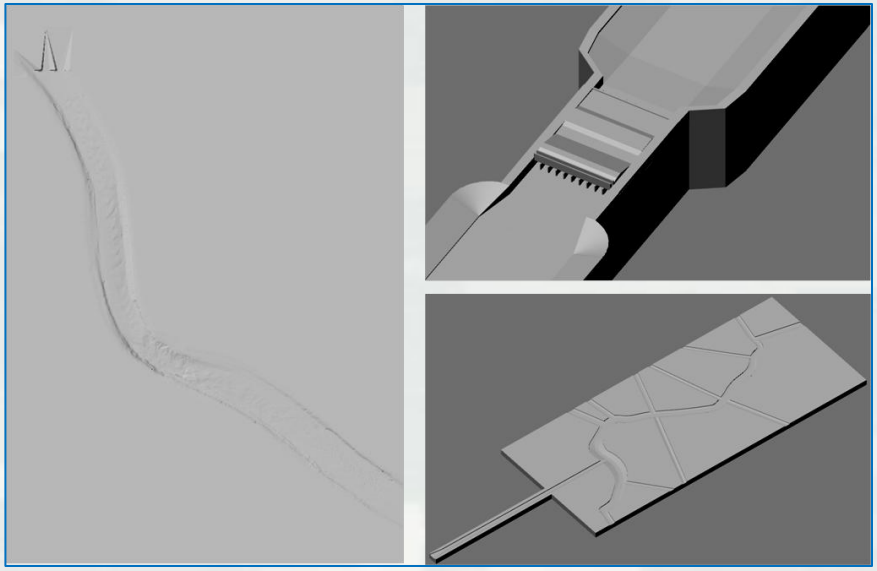
Diversion Design Properties for Each Alternative

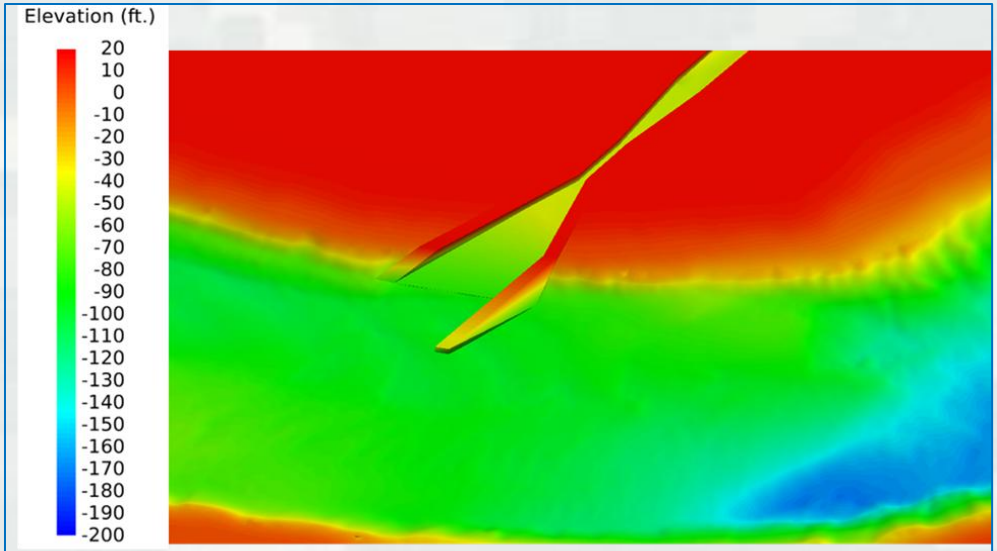
Alternatives	Type of Intake Structure	Effective Width (ft)	Height (ft)	Length (ft)	Invert Elev. (ft NAVD88)	Angle of Intersection with the River	Shape of Inflow/ Approach Channel	Guide Vane
A	box culvert	150	15	200	(-) 16	90 degree	straight	No
B	box culvert	150	15	200	(-) 40	90 degree	curve and wide entrance	No
C	open channel	52	n/a	360	(-) 40	45 degree	wide entrance	No
D	open channel	52	n/a	360	(-) 40	45 degree	wide entrance	Yes
F	open channel	72	n/a	360	(-) 40	45 degree	wide entrance	No

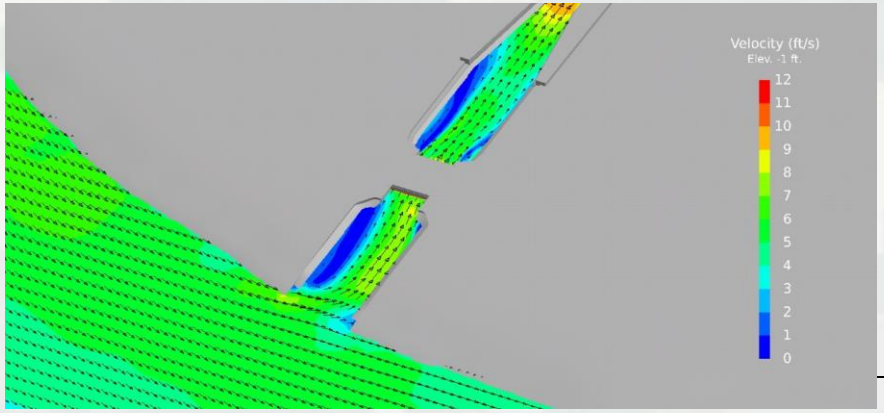
Note: All intake conduits and channels were rectangular in cross-section.

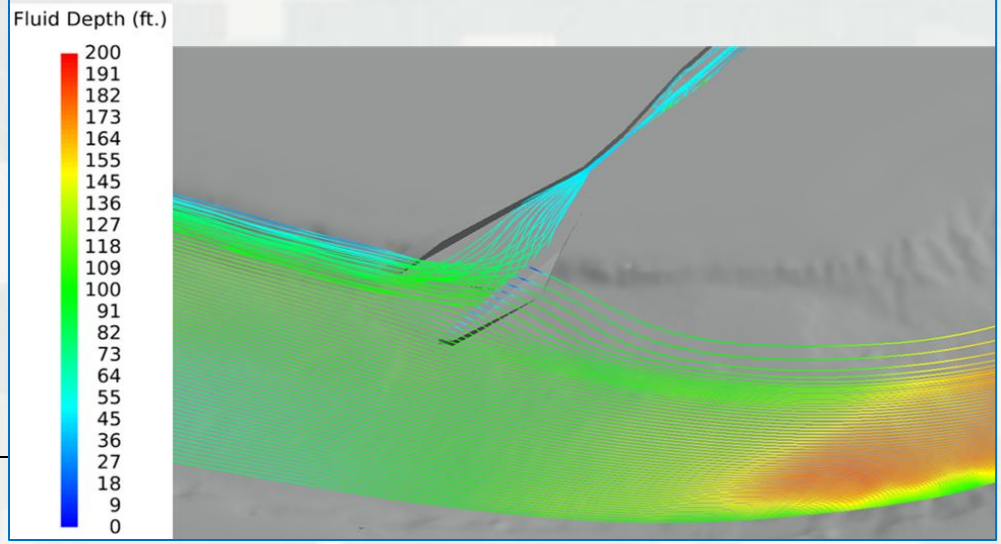
FLOW-3D Modeling (cont'd)

- Multiple design variables tested at Location 3



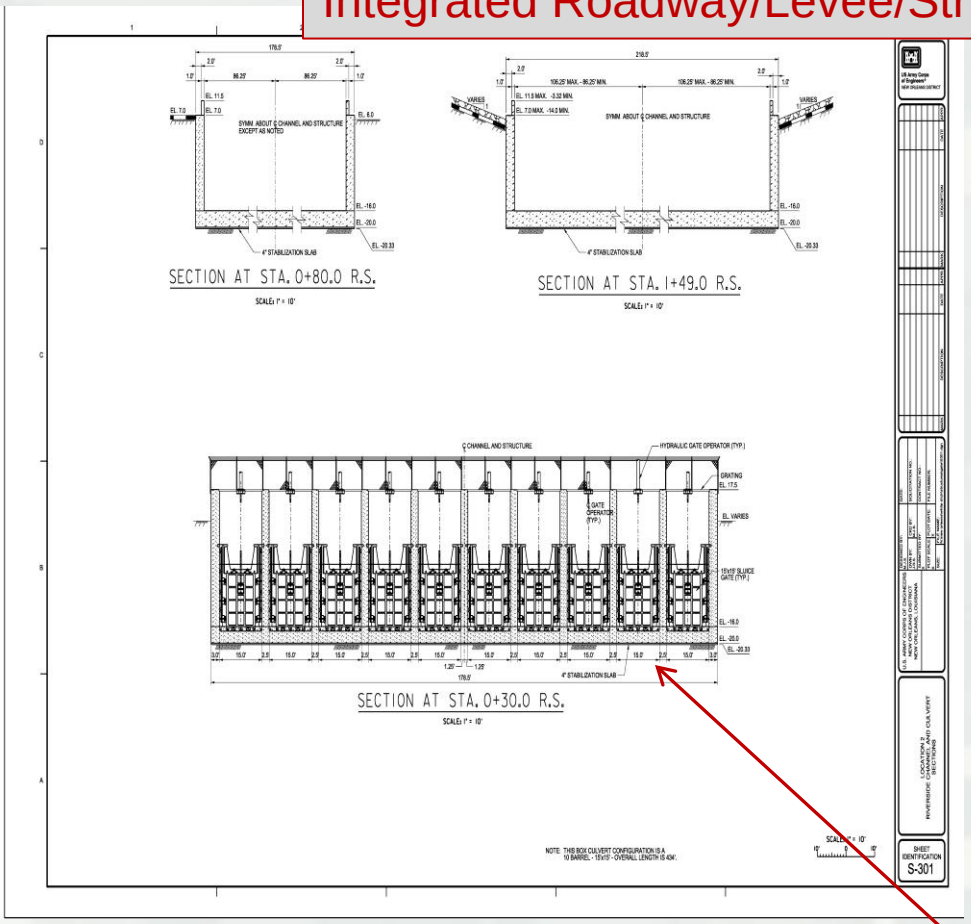


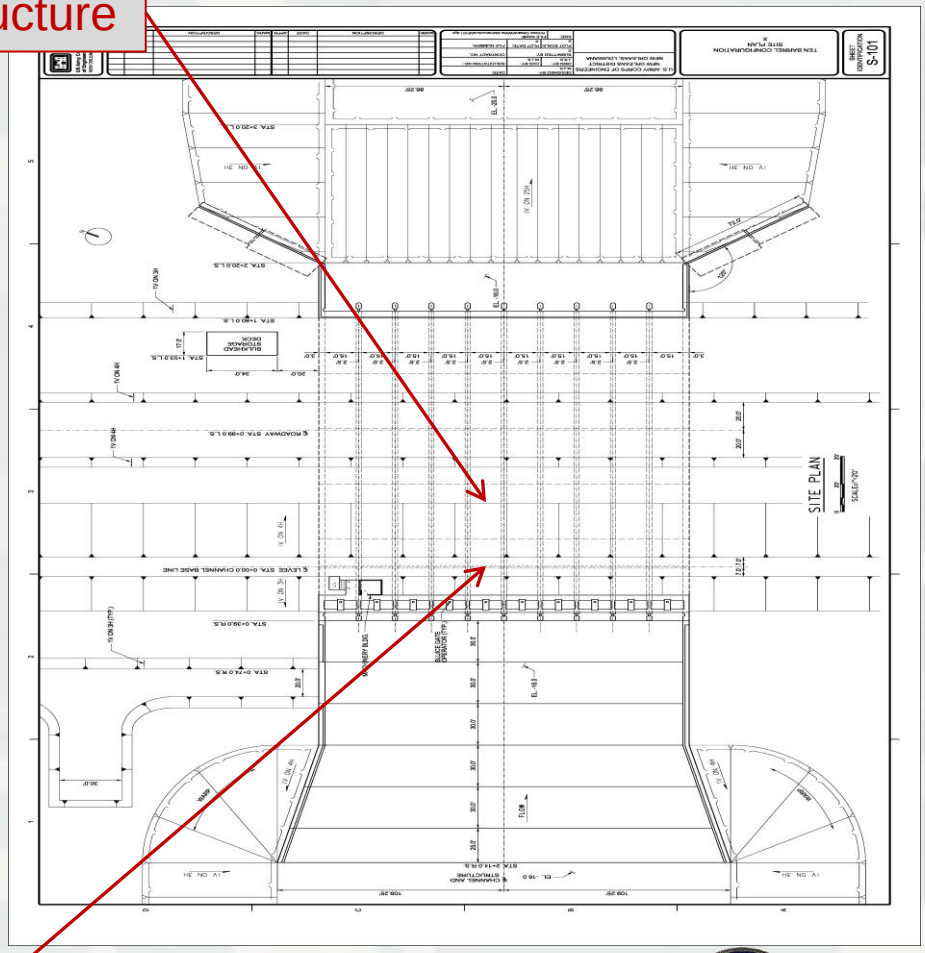




Former Conceptual Drawings

Integrated Roadway/Levee/Structure



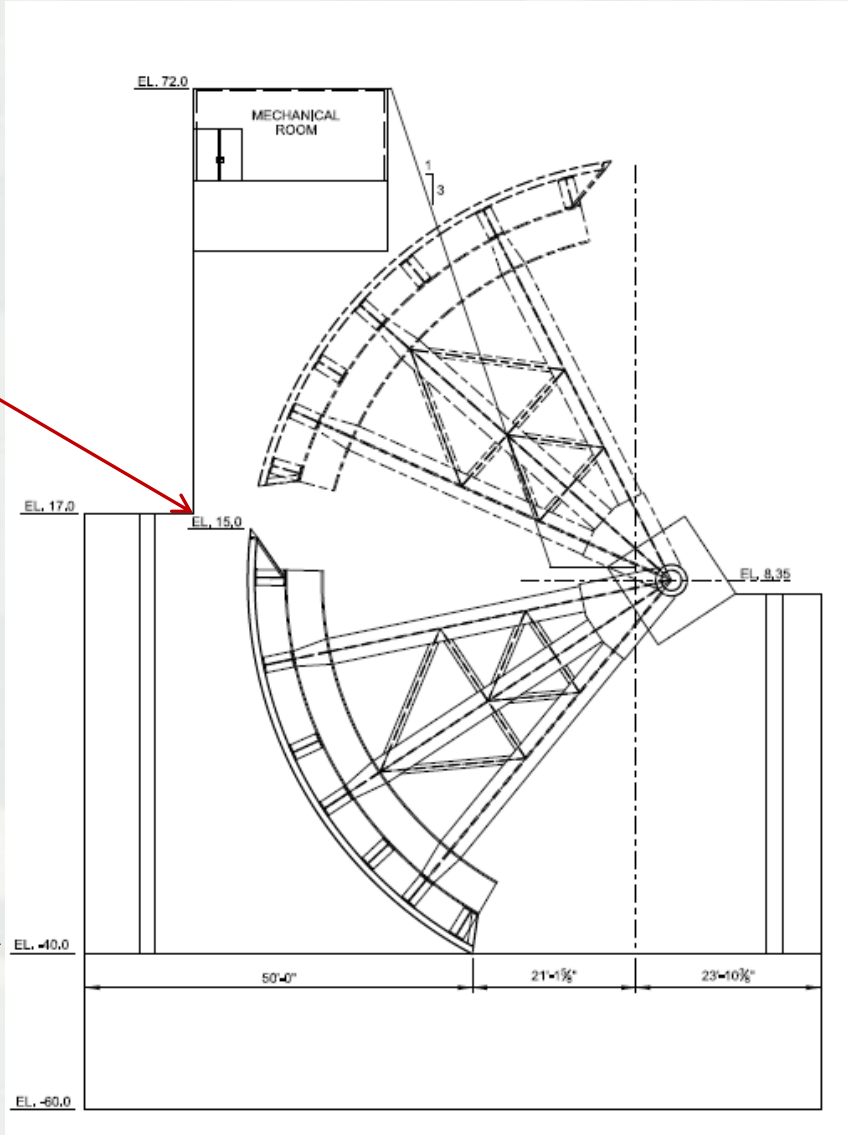


Ten 15’ x 15’ Box Culverts (-16’ Invert)

Current Conceptual Drawings

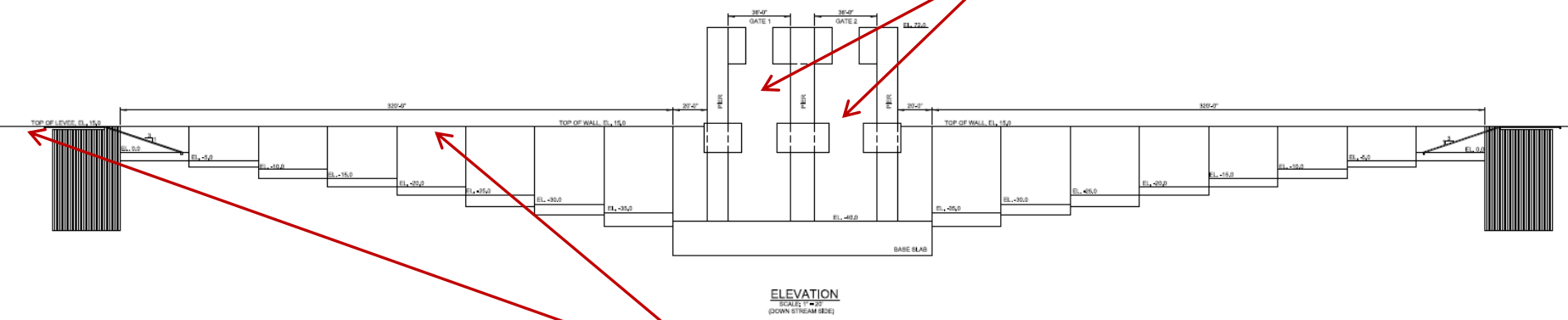
Wall/Levee Elevation (+15’)

Invert Elevation (-40’)

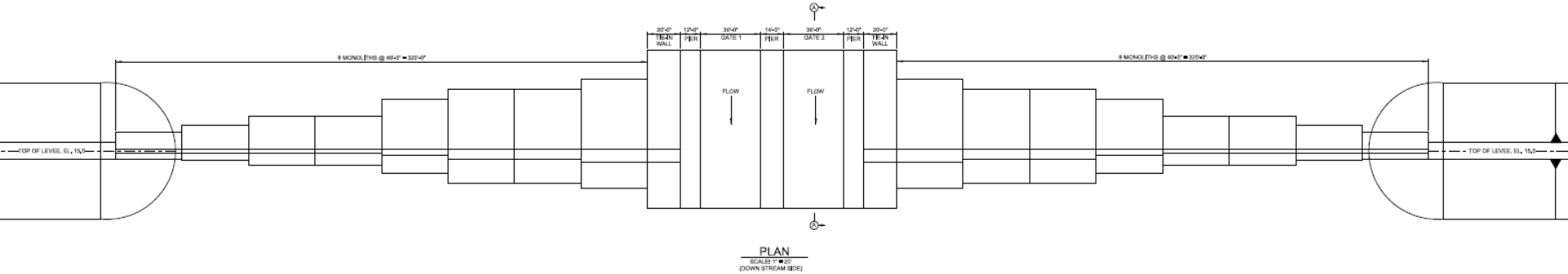


Current Conceptual Drawings

Two Tainter Gates (-40’ Invert)



Wall/Levee Elevation (+15’)

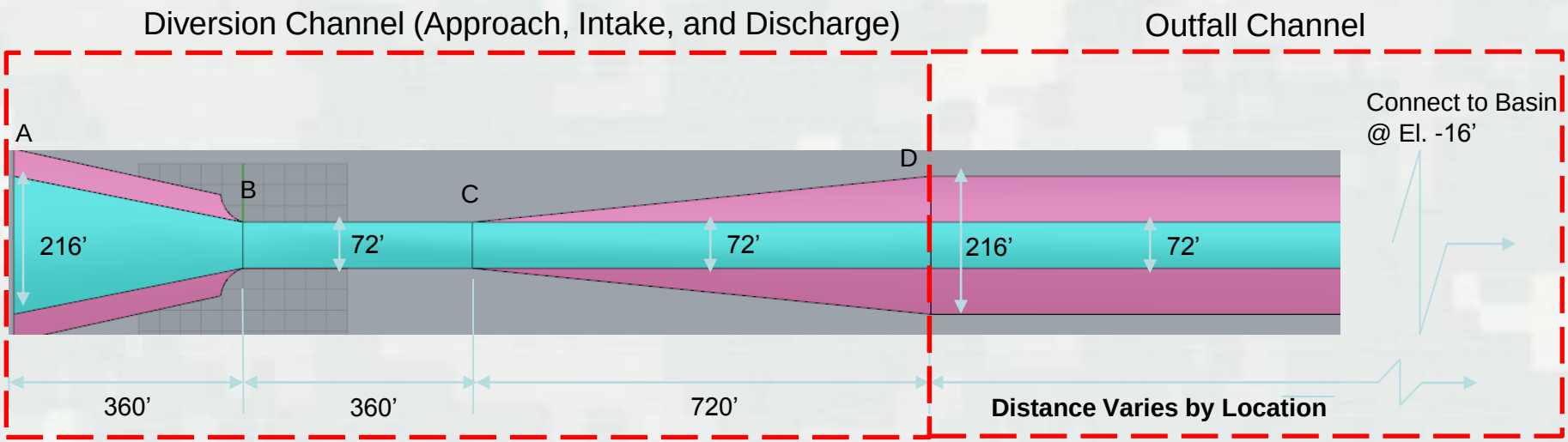


Former Channel Features

REVISED Channel Dimensions - Location 3: 35,000 cfs

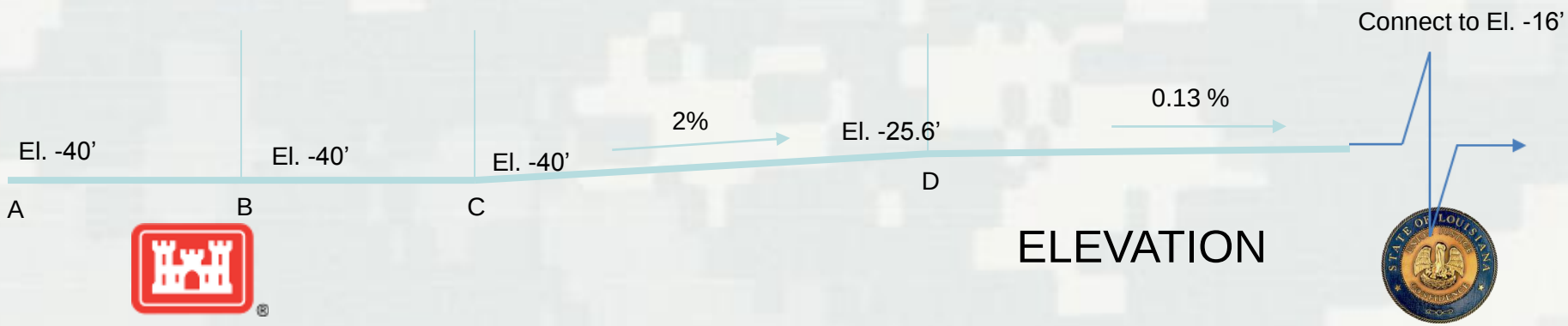
	Width at 0 (ft)	Bottom Elevation (ft)	Bottom Width (ft)	Side Slope (1v:_h)	Top Elevation (ft)	Top Width (ft)	Cross Sectional Area (ft^2)
Main Outfall Channel 1	x	-16	365	5	2	545	8190
1	190	-6	118	6	2	214	1328
2	300	-8	204	6	2	324	2640
3	x	-3	450	5	2	500	2375
4	450	-15	270	6	2	474	6324
5	425	-16	265	5	2	445	6390
6	x	-16	185	5	2	365	4950
7	80	-5	20	6	2	104	434
8	315	-15	165	5	2	335	4250
9	174	-6	102	6	2	198	1200
10	310	-14	170	5	2	330	4000
11	275	-14	135	5	2	295	3440
12	140	-4	92	6	2	164	768
13	140	-4	92	6	2	164	768
14	280	-11	148	6	2	304	2938
15	275	-10	155	6	2	299	2724
16	150	-4	102	6	2	174	828
17	100	-4	52	6	2	124	528
18	250	-8	154	6	2	274	2140
19	225	-8	129	6	2	249	1890
19 b.	85	-6	25	5	2	105	520
20	200	-6	104	8	2	232	1344
21	180	-4	116	8	2	212	984
22	150	-4	86	8	2	182	804

Current Channel Features



PLAN

Note: The size (width) of the intake channel is subject to adjustment until we get the correct flow.



ELEVATION

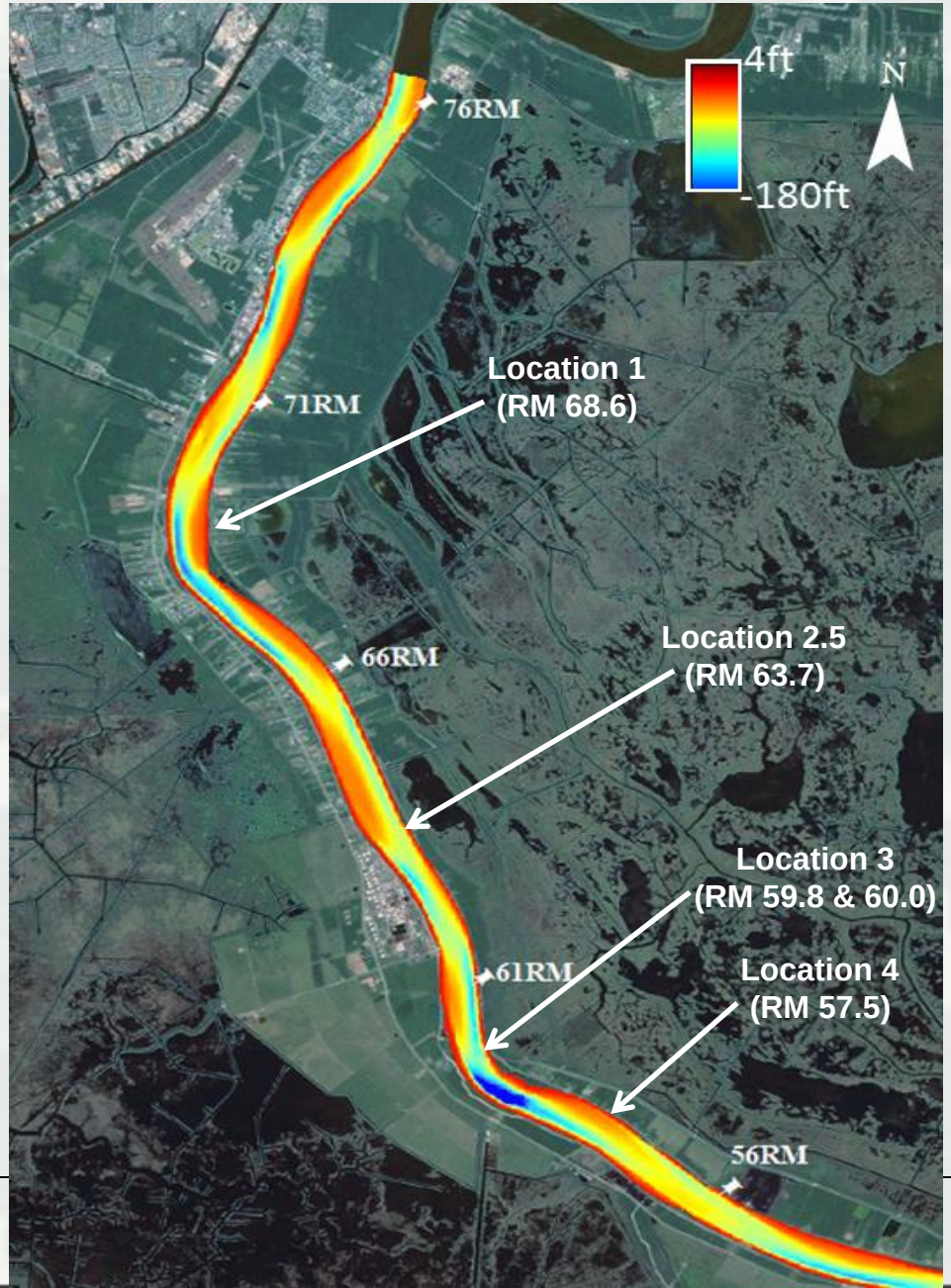
Location 3 Conclusions

- 1st Evaluation: Feasibility Study recommendation

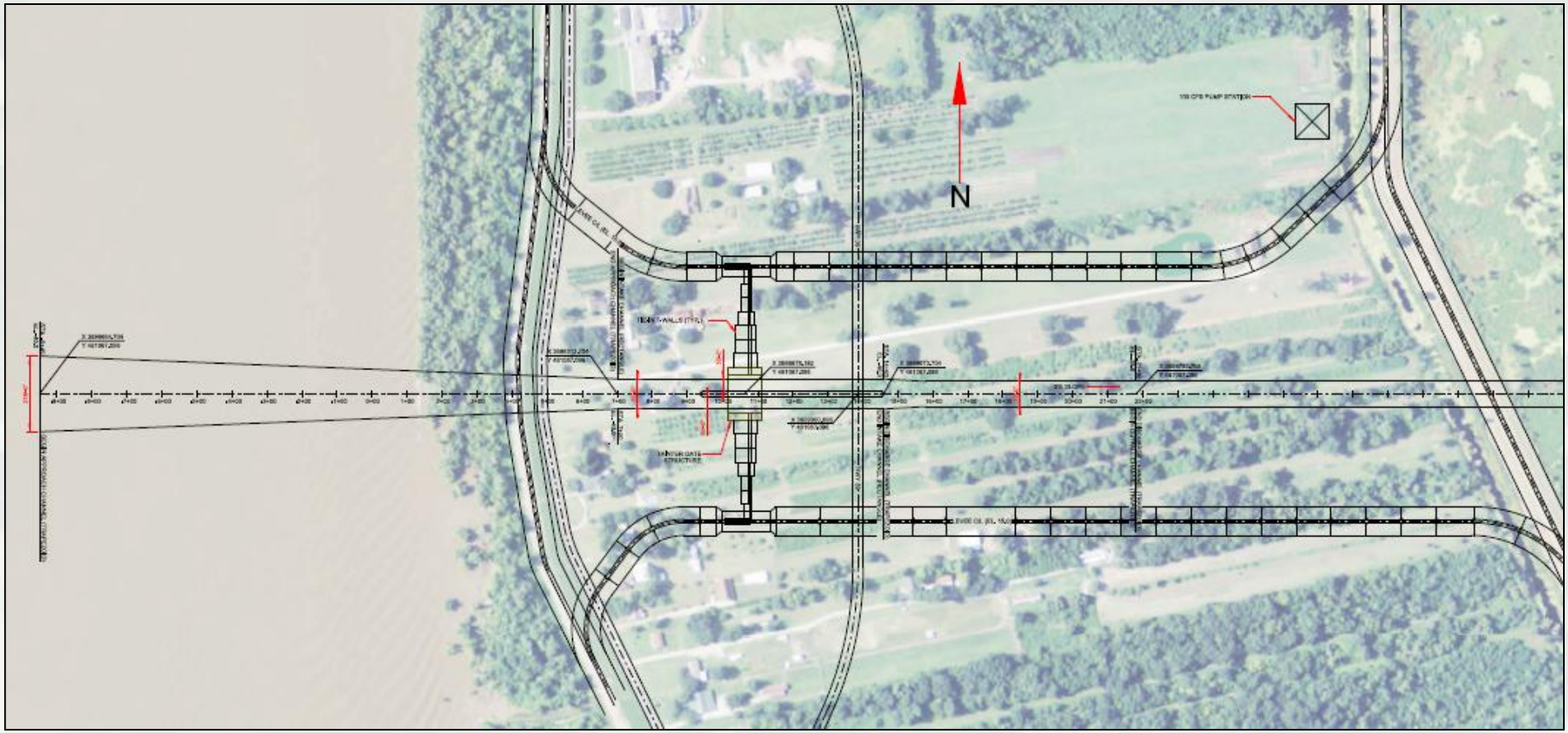
- Next Evaluations: Location 3 with various design adjustments

- Conclusions:
  - Increasing sill depth greatly improves performance
  - Channel alignment improves performance
  - Even modest location changes (+/- 1,000') can improve performance
  - All adjustments at Location 3 did not result in meeting feasibility objectives

FLOW-3D Model Domain



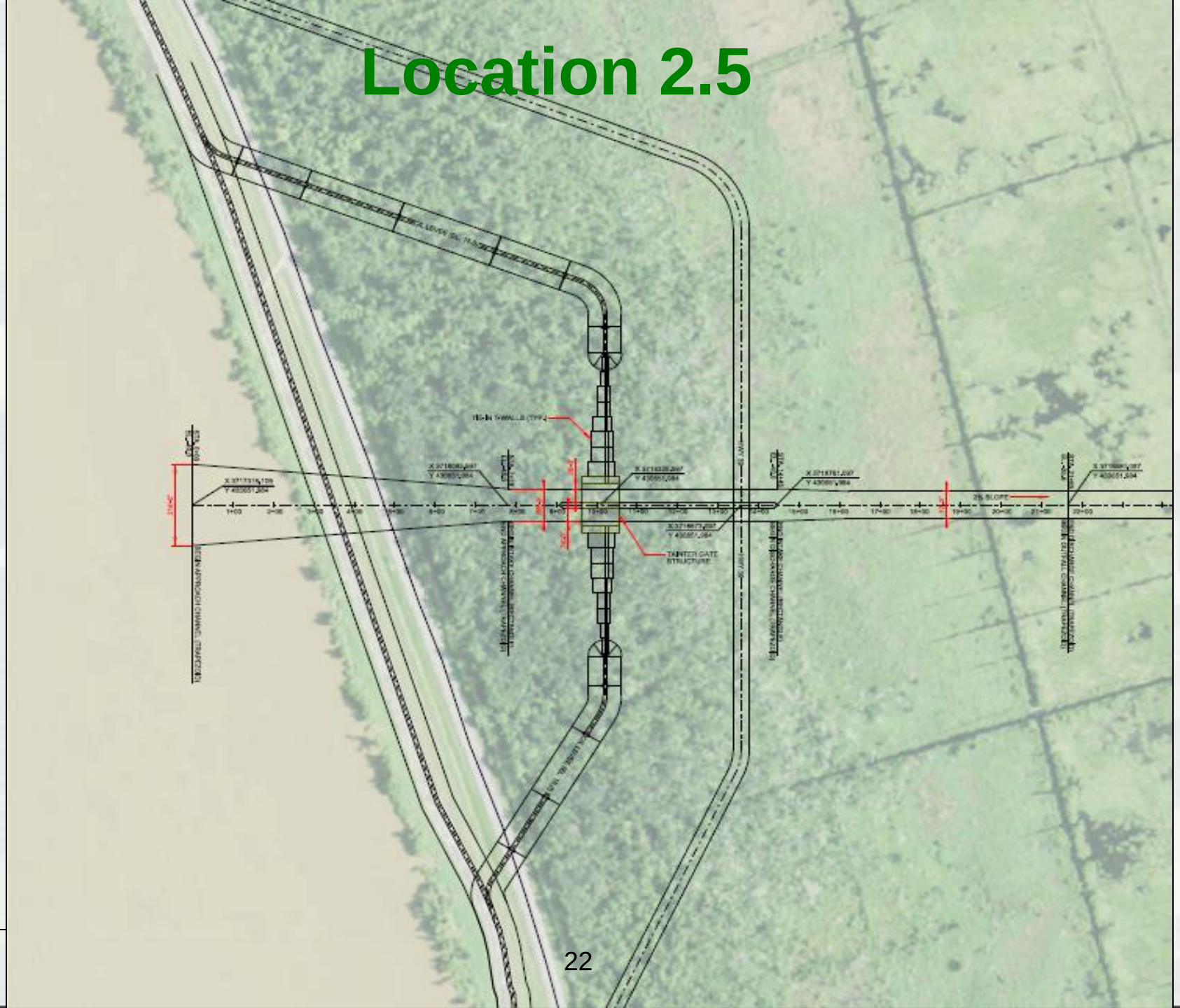
Location 1



Location 1

Outfall Channel: ~24,000’
39
23
© 2013 Google
©2010
Imagery Date: 10/29/2012
29°44'34.27" N 89°58'29.34" W elev 1 ft
Eye a

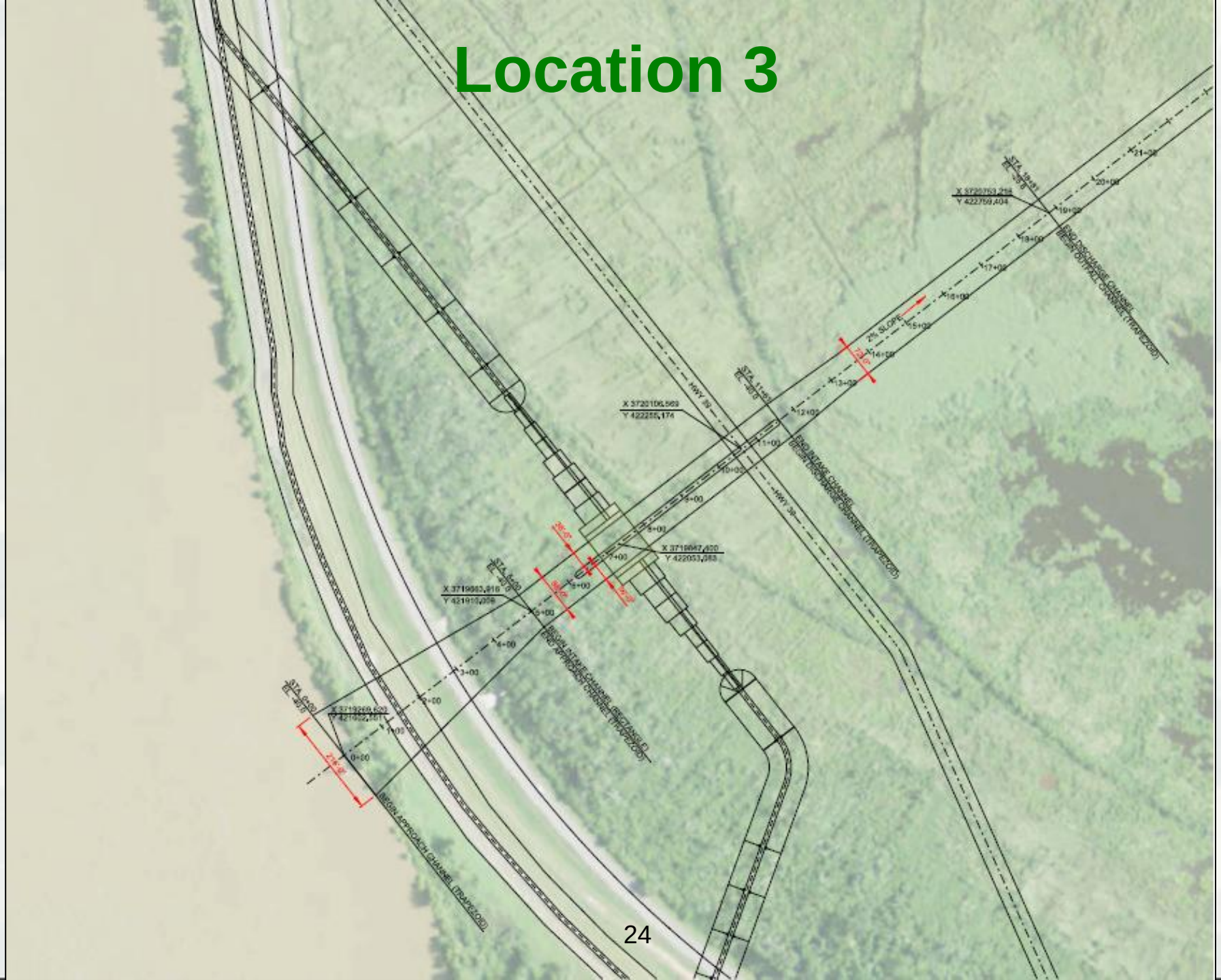
Location 2.5



Location 2.5

Outfall Channel: ~9,900'
© 2013 Google
©2010 Google
39
29°40'42.08" N 89°56'35.71" W elev 0 ft
Eye alt 9259

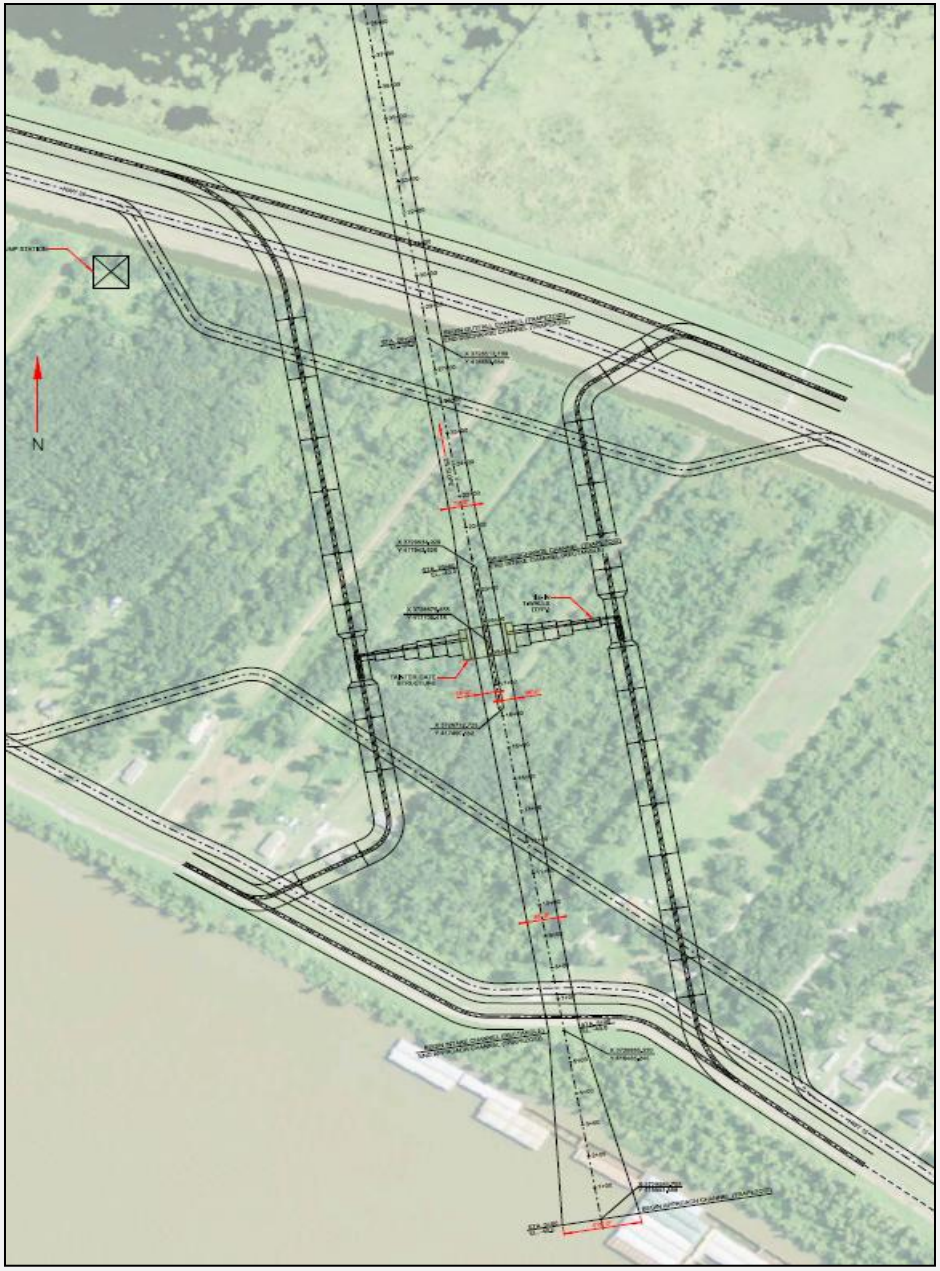
Location 3


HWY 39
2% SLOPE
BEGIN INTAKE CHANNEL (GROUNDED)
BEGIN APPROACH CHANNEL (TRAPEZOID)
END INTAKE CHANNEL
BEGIN DISCHARGE CHANNEL (TRAPEZOID)
END DISCHARGE CHANNEL
BEGIN OUTFALL CHANNEL (TRAPEZOID)

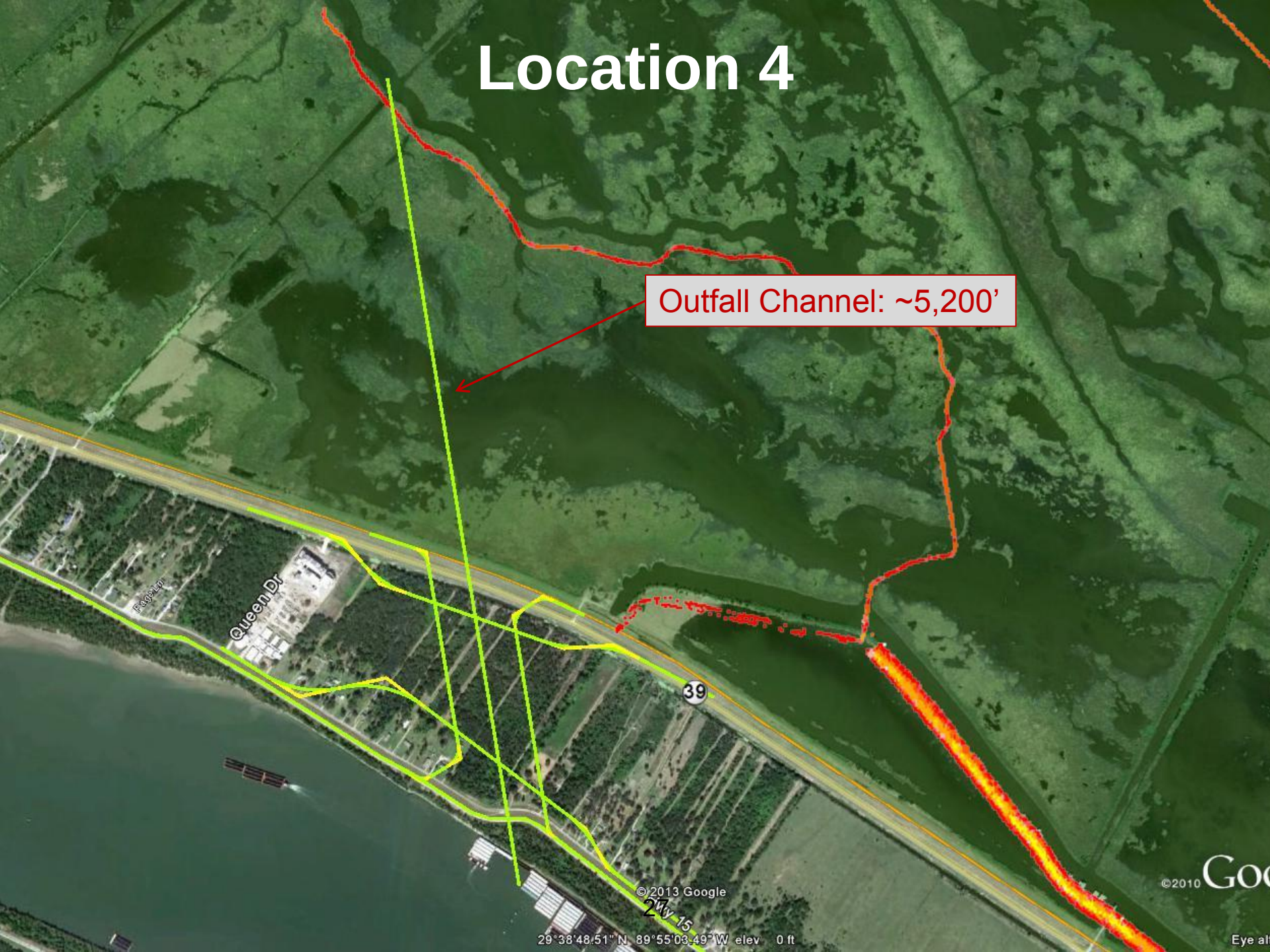
Location 3

Outfall Channel: ~9,300’
39
Hwy 16
© 2013 Google
©2010 Google
29°39'30.01" N 89°56'39.63" W elev 0 ft
Eye alt 9673

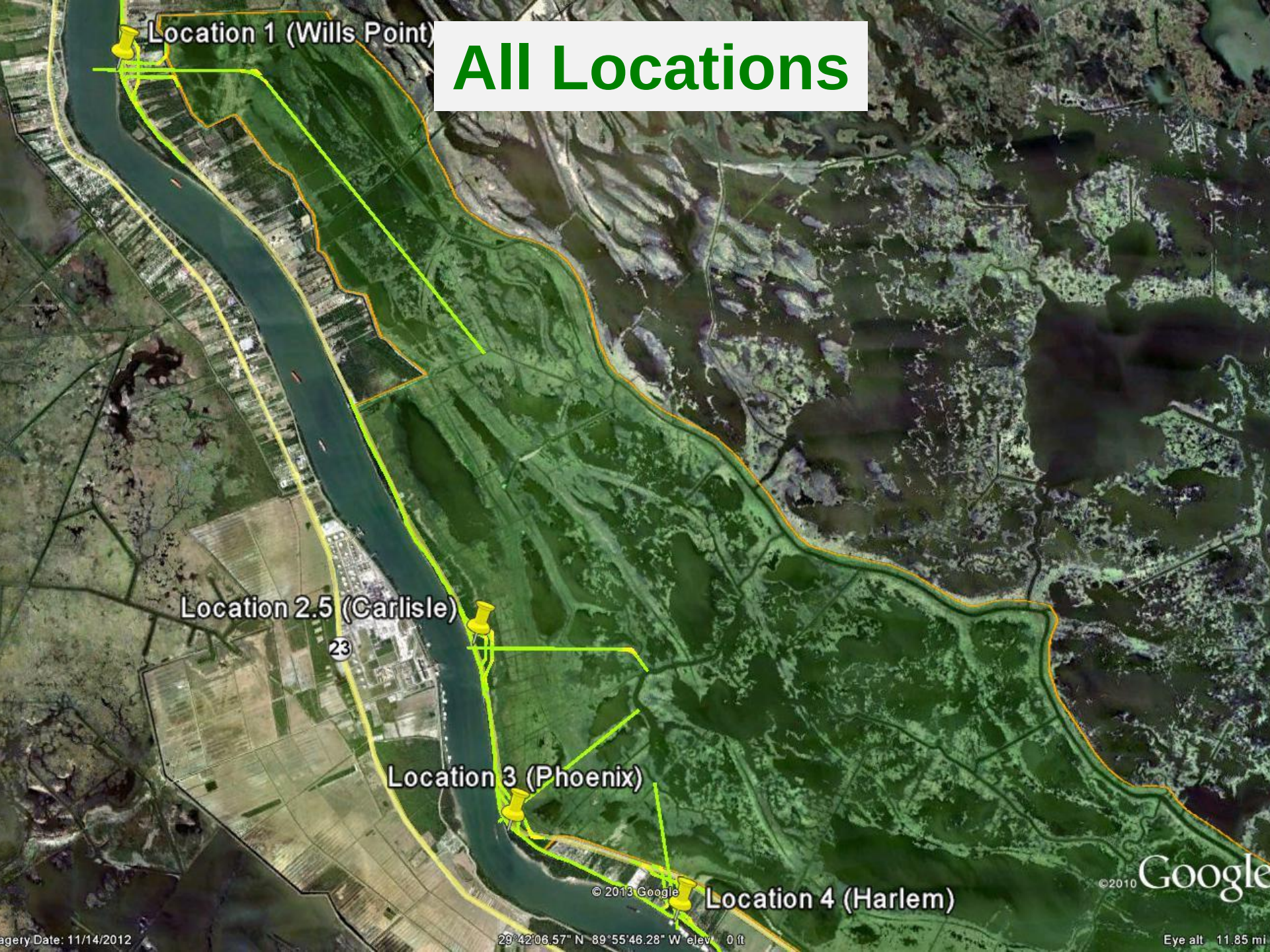
Location 4



Location 4


Outfall Channel: ~5,200’
Queen Dr
39
©2013 Google
29°38'48.51" N 89°55'03.49" W elev 0 ft

All Locations



All Locations Full View

SAND Model Activities

- Several updates to the SAND model have occurred since the feasibility assessment (v2.0 vs v2.3)

- The PDT has used new input values for these variables:
  - Average water depth of the study area
  - Mississippi River sediment rating curve
  - Sediment class fractions
  - Marsh soil bulk density values on receiving side

- New acreage and cubic yardage outputs have been calculated based on sediment inputs from the FLOW-3D model

Draft 1D Hydro-Model Activities*

- MDWD 1D model production run is currently underway
- Compared to FWOP with intermediate SLR, there was an overall reduction in dredging of about 4 percent for the 2020 -2069 period
- Reduction was primarily due to reduction in HOP dredging of about 7 percent
- Dredging - Even though dredging did not increase over a 50-Yr simulation, at some point in the future it will as the deep water between RM 60 and 10 fills in. It just takes longer than 50 years.

**- Model runs completed for MDMG (larger diversion size w/ more frequent operational plan)*

Location Comparisons #1

Benefits			
Location	AAHU's	Marsh Acres	Ridge Acres
Location 1 (Wills Point)	TBD	997*	80*
Location 2.5 (Carlisle)	TBD	409*	33*
Location 3 (Phoenix)	13,355	385	31
Location 4 (Harlem)	TBD	216*	17*
Impacts			
Location	Marsh Acres	Batture Acres	Total Acres#
Location 1 (Wills Point)	175	6	321
Location 2.5 (Carlisle)	73	3	153
Location 3 (Phoenix)	76	4	145
Location 4 (Harlem)	46	4	156

**- Preliminary estimates based on parametric design (likely to change)*
#- Total footprint acres includes protected side areas

Location Comparisons #2

Sample of Preliminary Costs*						
Location	**Structures**	**Levees/ Channels**	**Roads**	**Other Relocations**	**Real Estate**	**Total#**
Location 1** (Wills Point)	$166,540,000	$61,155,000	$4,195,000	$136,000	$9,374,000	$324,896,000
Location 2.5 (Carlisle)	$147,437,000	$28,594,000	$2,212,000	$122,000	$4,114,000	$248,226,000
Location 3 (Phoenix)	$147,270,000	$26,884,000	$2,212,000	$115,000	$3,493,000	$245,611,000
Location 4** (Harlem)	$258,298,000	$32,247,000	$12,787,000	$168,000	$6,569,000	$424,232,000

**- Preliminary cost estimates (will be refined during full PED)*
***- These sites require a pump station for drainage purposes ($1.5M cost estimate)*
#- Total costs do not include O&M estimates

Location Comparisons #3

Model Benefits					
Location	**Flow-3D Sediment: Water Ratio**	**Flow-3D Cubic Yards (Avg. Annual)**	**SAND Cubic Yards (Avg. Annual)**	**SAND Acres (per year)**	**Best Assets**
Location 1 (Wills Point)	1.4	1,376,663	539,386	694	High Basin Vicinity; Best Sediment Location
Location 2.5 (Carlisle)	0.7	570,066	253,446	346	Mid Basin Location; Lack of Infrastructure; Lower Costs
Location 3 (Phoenix)	0.6	525,434	238,523	328	Feasibility Recommendation; Lack of Infrastructure; Lowest Costs
Location 4 (Harlem)	1.2	1,254,184	452,812	593	Great Sediment Location

**- Preliminary cost estimates (will be refined during full PED)*

Remaining PED Activities

- Completion of FLOW-3D Optimization Runs
  - Testing for sill depth, angle, high flow
- Basin Hydrodynamic/Sediment Modeling (AdH)
  - Riverside sediment transport model is running
  - Outfall sediment transport model is built
  - Sediment modules will be used to further assess sediment deposition and distribution
  - Salinity and stage will be analyzed in the basin
  - AdH will be used for CASM (fisheries) modeling
- Modeling for Induced Shoaling Effects (LCA Hydro Study)
  - 1D model run will be completed by 1 Sept

Moving Forward

- Determine how to proceed to detailed design phase
- Build off of existing cost-share agreement
- Agree to and create new PMP for full design
- Utilize current funding to transition to next PED phase (Corps)
- Initiate P&S for all project features and proceed to construction

Questions/Discussion