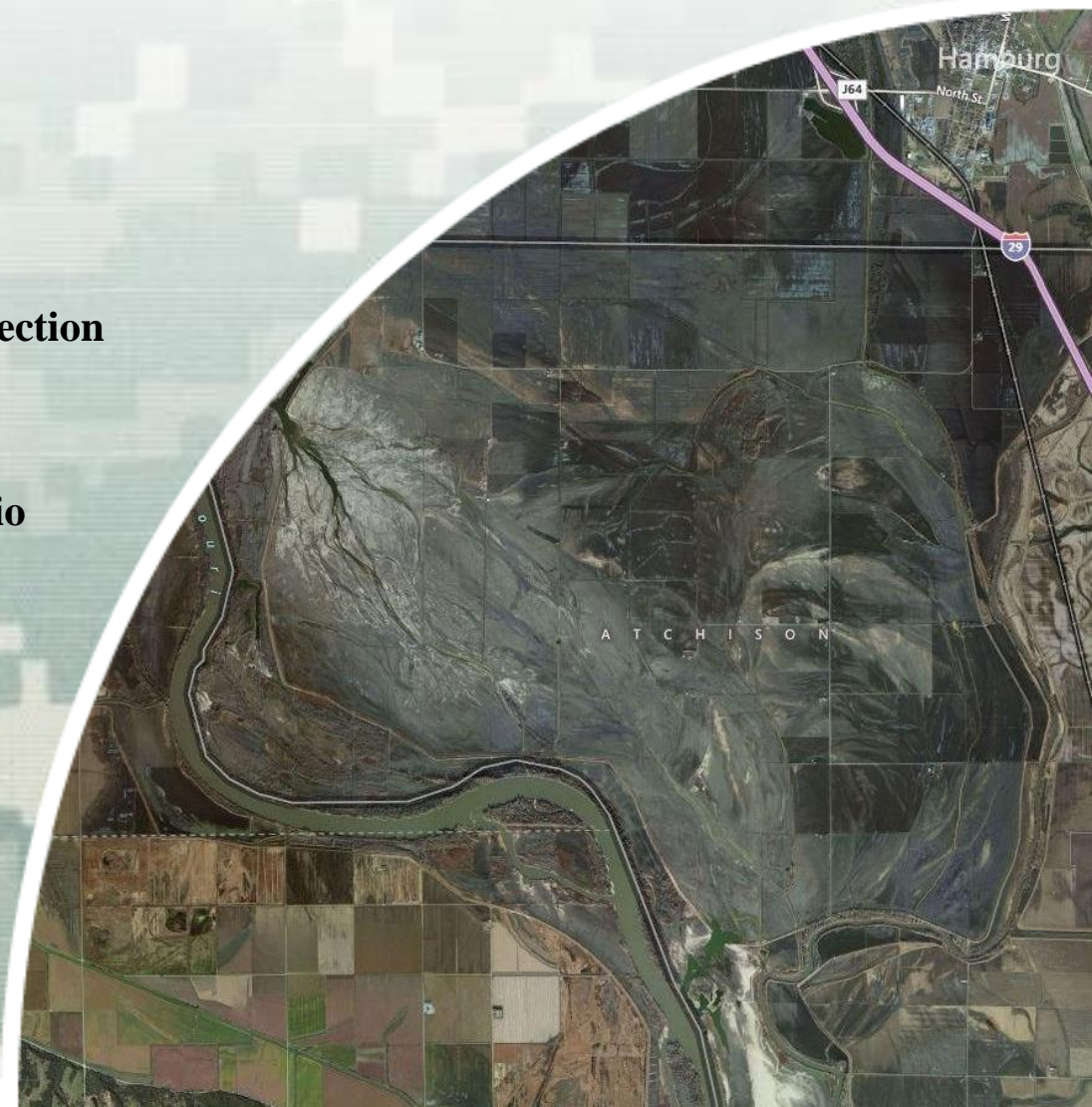


# Assessment of Conceptual Nonstructural Alternative Levee Setbacks along the Missouri River (Lower L-575 / Upper L-550 and Lower L-550)

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**Flood Risk and Floodplain Management Section**  
**USACE-Omaha District**

**ASFPM National Conference – San Antonio**  
**May 23, 2012**



# Assessment Background



## Historic Flooding along Missouri River

- long duration
- large discharges
- high stages
- high velocities
- levee breaches
- levee erosion
- excessive damages
- recurring damage locations

## Conceptual Levee Setbacks

- alternative to repairs in-place
- risk based assessment
- flood risk considerations
  - reduced damages
  - sustainable
  - reliable
- enhanced environmental benefits
- reconnected floodplain





# Levee System Authorization



## Flood Control Act of 1944

### Design discharges:

- 250,000 cfs at Omaha
- 295,000 cfs at Nebraska City

**Freeboard:** 2-feet

**Minimum conveyance width:** 3,000 feet



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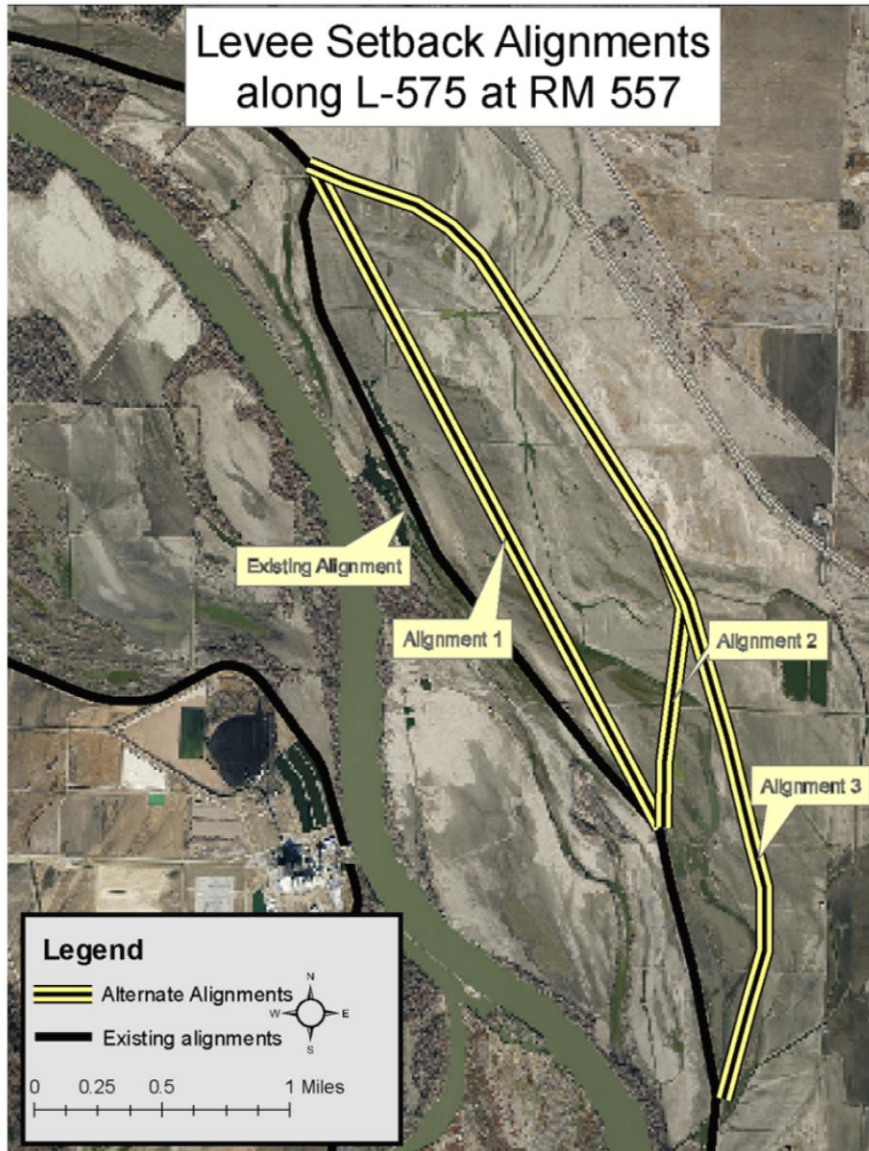
# Levee System Constrictions

Federal Levee System	Levee to Levee (feet)	Levee to Bluff (feet)	Width at Bridge (feet)
R-520		34,390	
L-536		3,280	
L-550	3,170	2,730	1,770
R-548	3,170		
R-562	3,780		
L-575	3,780	3,140	1,090
R-573	4,960		
L-594	4,090	2,780	
Lake Waconda	4,091		
L-601		3,010	
L-611-614	2,910	2,390	1,260
R-613	2,950		
R-616	2,910		2,500
L-624		10,510	
L-627	2,760		1,180
Omaha	3,000	2,890	1,180

**Significant Pinch Points**



# Levee Setback Fundamentals



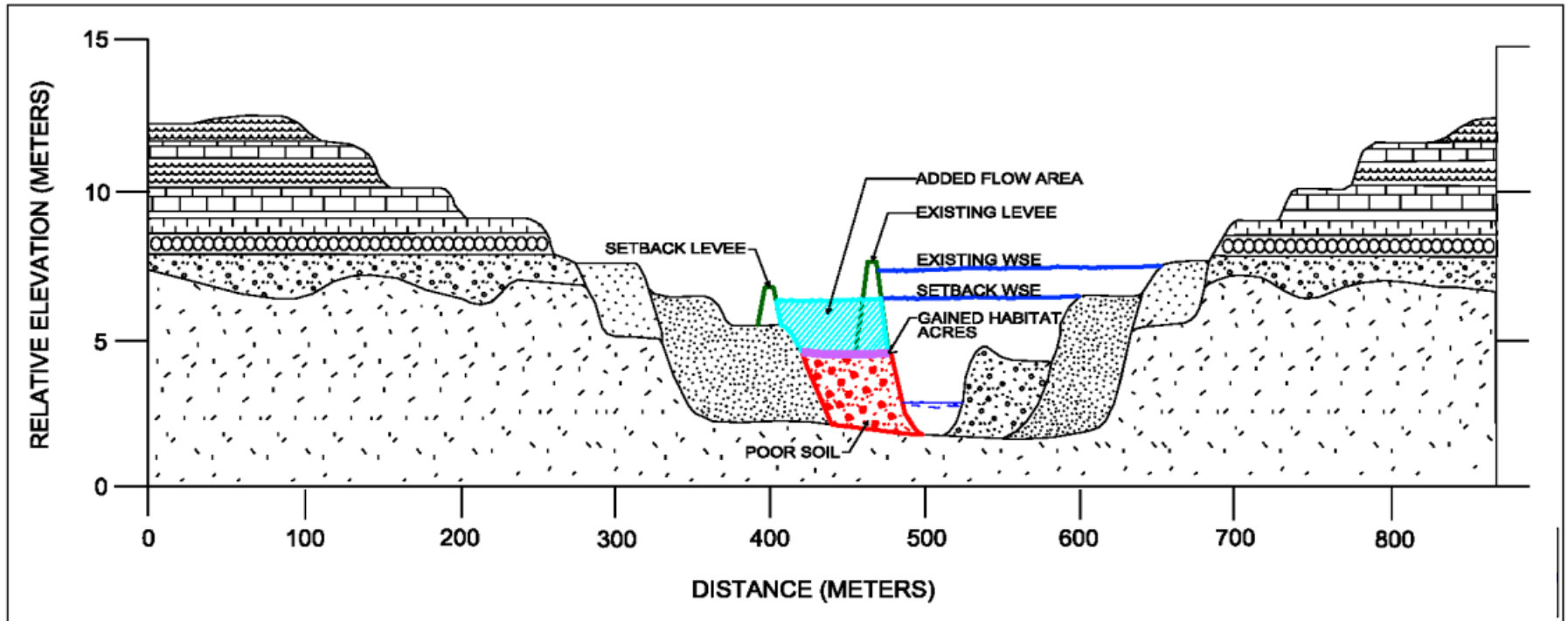
**Levee Setbacks are a localized realignment using risk based levee design**

**Levee Setbacks are not the complete removal of levee systems or the complete realignment of levee systems**



# Levee Setback Fundamentals

(potential benefits associated with levee setback)

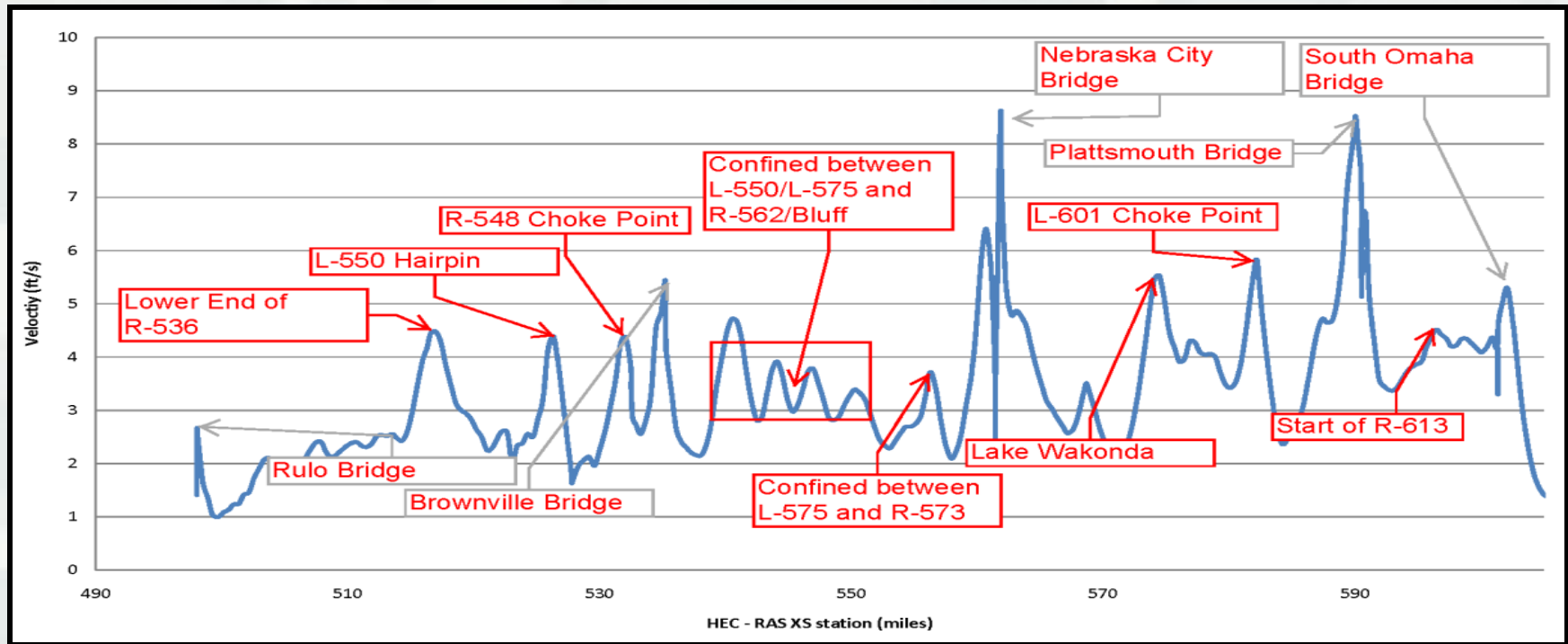


- Reduced flood stages**
- Reduced flood velocities**
- Potentially more favorable foundation soils**
- Reduced O&M RRR**
- Reconnected historic floodplain**





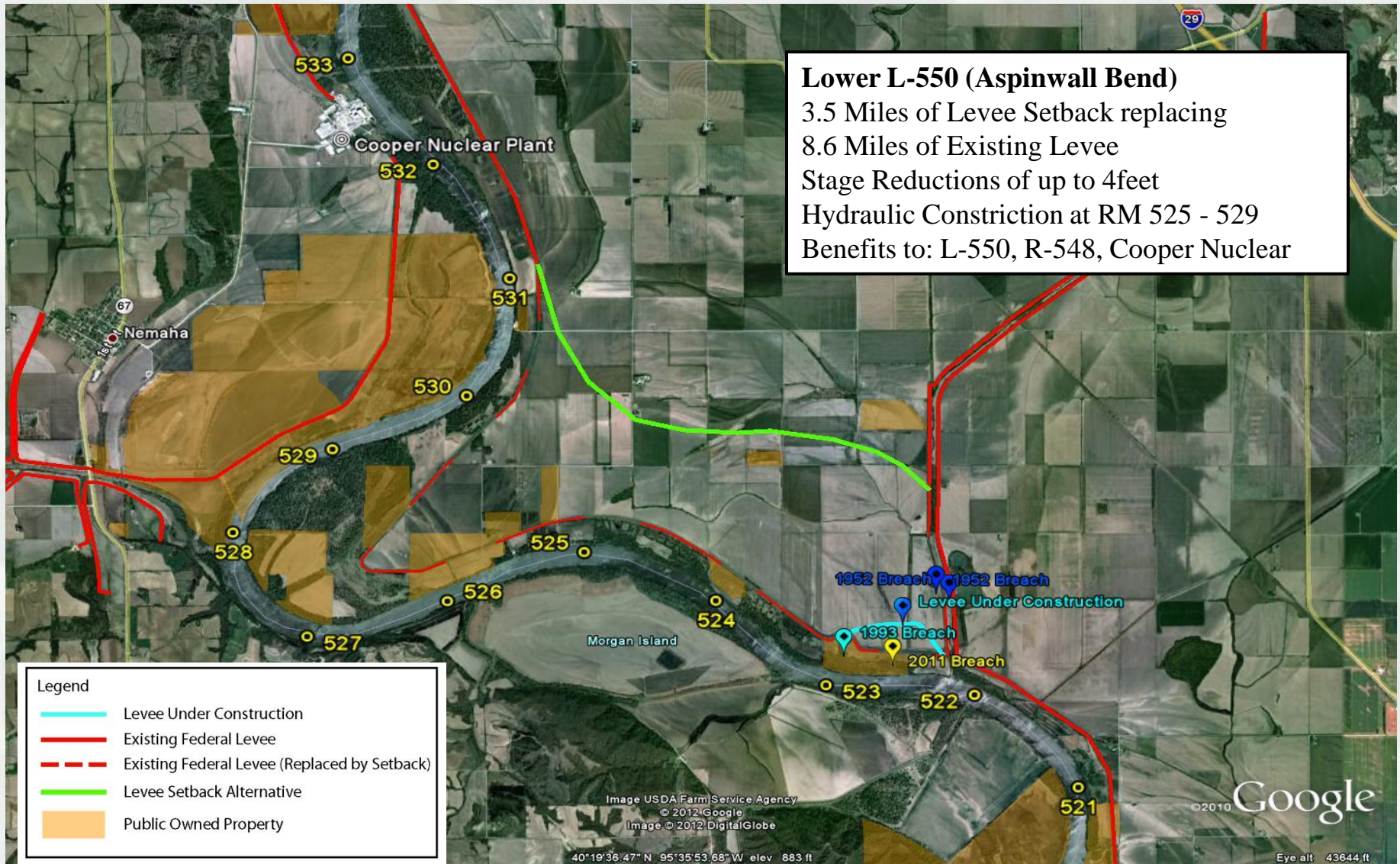
# Levee Setback Site Selection Process



- Hydraulic (conveyance/velocities/scour/deposition)
- Geotechnical (soils/seepage/slopes)
- Habitat (aerial photos/ wetlands)
- Critical Facilities (live risk/economics)

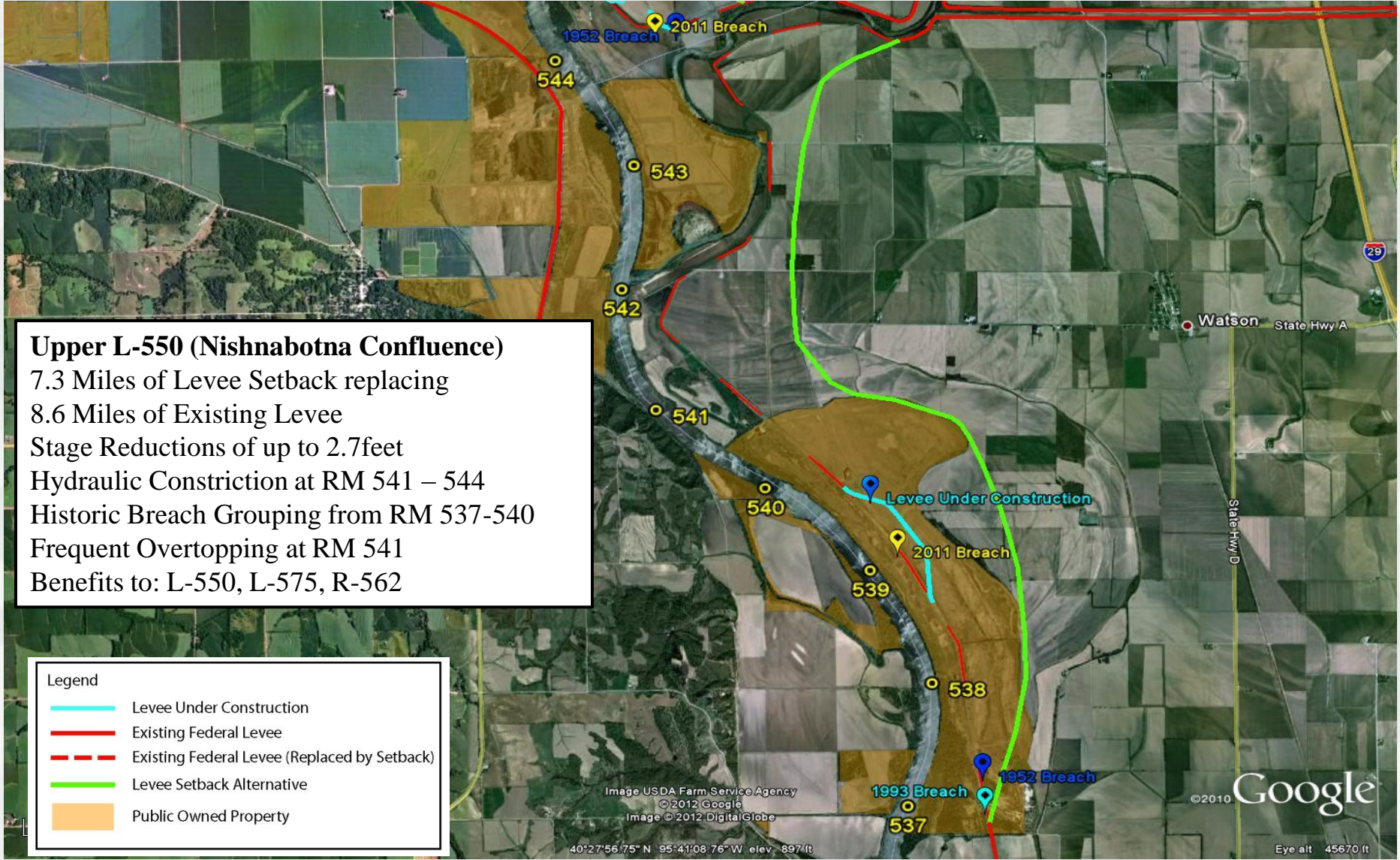


# Levee Setback Details for Lower L-550





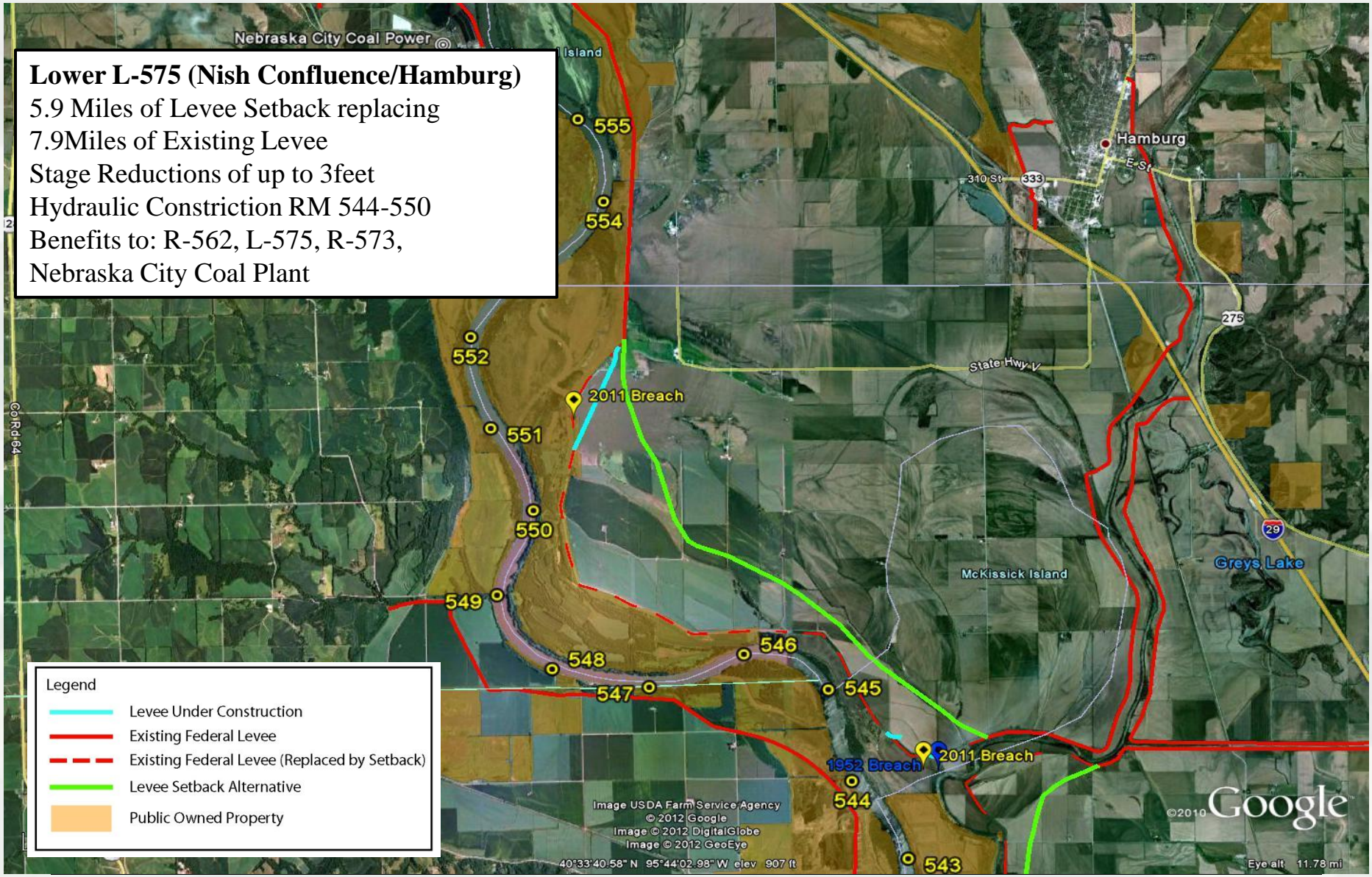
# Levee Setback Details for Upper L-550





# Levee Setback Details for Lower L-575

**Lower L-575 (Nish Confluence/Hamburg)**  
5.9 Miles of Levee Setback replacing  
7.9 Miles of Existing Levee  
Stage Reductions of up to 3feet  
Hydraulic Constriction RM 544-550  
Benefits to: R-562, L-575, R-573,  
Nebraska City Coal Plant



Legend

- Levee Under Construction
- Existing Federal Levee
- Existing Federal Levee (Replaced by Setback)
- Levee Setback Alternative
- Public Owned Property

Image USDA Farm Service Agency  
© 2012 Google  
Image © 2012 DigitalGlobe  
Image © 2012 GeoEye  
40°33'40.58" N 95°44'02.98" W elev 907 ft

© 2010 Google  
Eye alt: 11.78 mi



# Potential Environmental Attributes L-550/L-575

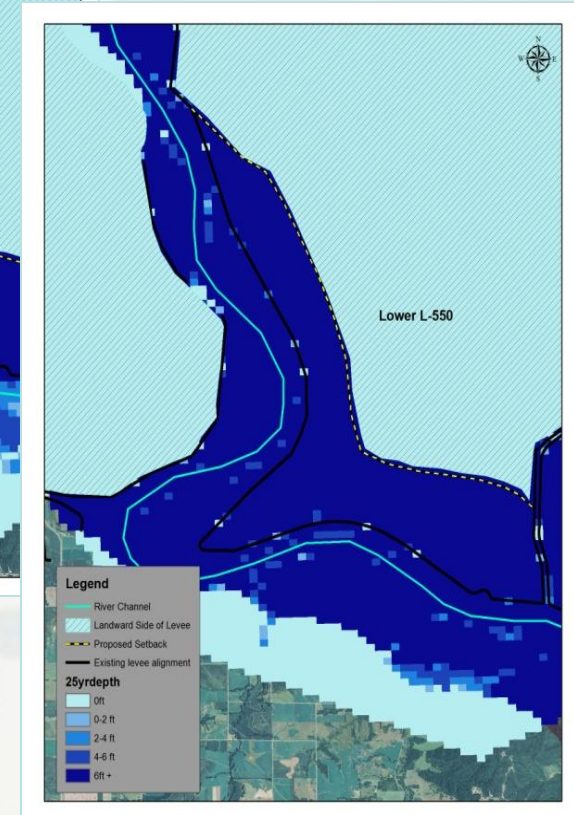
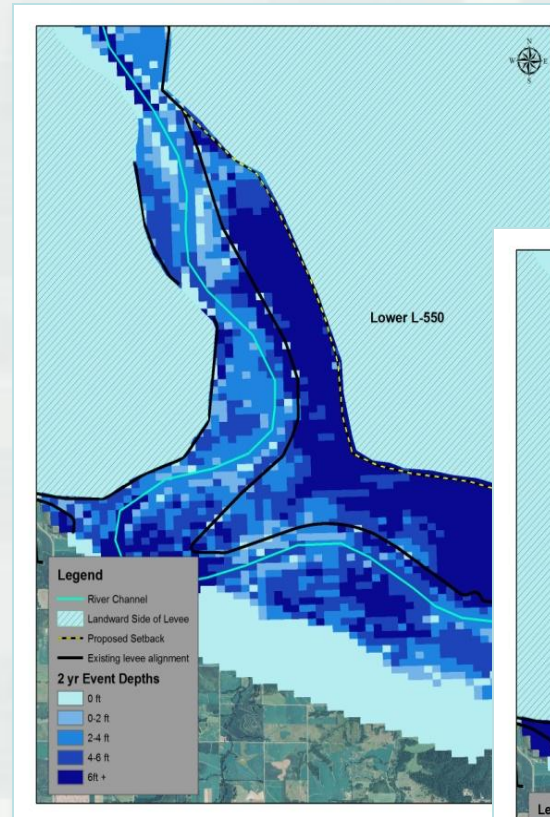
**11.75 square miles of new floodplain connectivity**

**Improved inundation depth and duration frequency**

**Positive habitat potential**

**Potential to enhance habitat thru use of levee setback borrow areas**

**Data indicate that on low elevation areas along the Missouri River, adult and juvenile pallid sturgeon have been found to utilize submerged floodplains for feeding (Integrated Science, February 2012)**





**BCR Summary for Conceptual Levee Setback Alternatives**

	<b>Fix In-Place Alternative (from PIRs)</b>	<b>Setback Alternative with Original Level of Protection</b>	<b>Setback Alternative with Original Levee Height</b>
L-550 Level of Protection	20 years	20 years	28 years
L-575 Level of Protection	30 years	30 years	30 yrs upper L-575 56 yrs lower L575
System Protected Area	72.9 sq miles	64.6 sq miles	64.6 sq miles
<b>Traditional BCR computations:</b>			
Total Cost	\$166.8M	\$193.8M	\$212.6M
Annual Cost	\$10.7M	\$12.7M	\$14.0M
Annual Benefit	\$33.3M	\$32.1M	\$32.3M
<b>BCR</b>	<b>3.11</b>	<b>2.52</b>	<b>2.30</b>
<b>BCR computations including R,R&amp;R benefit:</b>			
Annual Cost	\$10.7M	\$12.7M	\$14.0M
Annual Benefit (including R,R&R)	\$33.3M	\$32.5M	\$33.2M to \$34.5M
Annual R,R&R Cost- Savings	\$0.0M	\$0.4M	\$1.0M to \$1.8M
<b>BCR</b>	<b>3.11</b>	<b>2.55</b>	<b>2.37 to 2.59</b>
<b>Other Benefits Associated with Setback Alternatives:</b>			
<ul style="list-style-type: none"> <li>•Critical Facilities – \$2.4M Cooper Nuclear, \$4.4M Neb City Coal, Transportation</li> <li>•System Benefits – Increased Level of Protection on adjacent systems</li> <li>•Reduced O&amp;M RR&amp;R on adjacent systems</li> <li>•Less Frequency of Emergency Operations and flood-related activities</li> <li>•6,471 acres of potential habitat</li> </ul>			

Levee setbacks would be a more expensive construction effort than repair in-place



All levee setback options result in a positive benefit-cost ratio and would be worth consideration of federal investment



Reduced RR&R costs increases BCR



# Constraints of taking Concepts to Reality

## Time and Costs

- **Construction costs are likely higher than repairing levees**
- **Development of setback plan thru construction takes longer than repairs**

## Authorities

- **The PL 84-99 program relies on sponsor for real estate**
- **Levee repairs generally require little or no real estate**

## Benefit to Cost Quantification

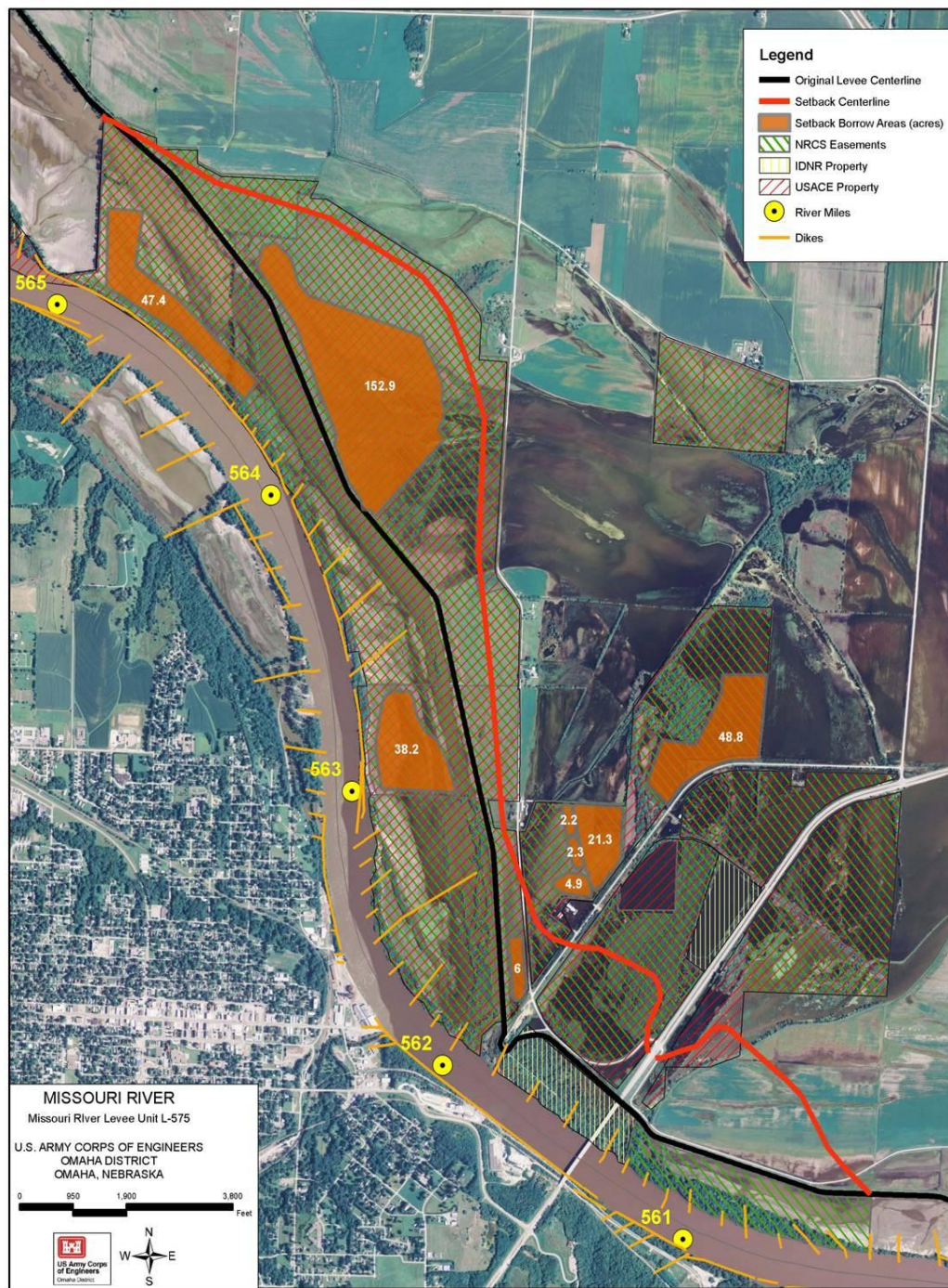
- **Current methodology inhibits innovation**
- **Quantify O&M RRR, habitat, adjacent Systems, critical facilities**
- **Frequency of damages to levee system (recurring damages)**

## Societal Concerns

- **Unfamiliar processes**
- **“Not on my Land” initial responses**



# L575 Levee Setback Final Layout



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# L575 Levee Setback Construction Completed in 2013





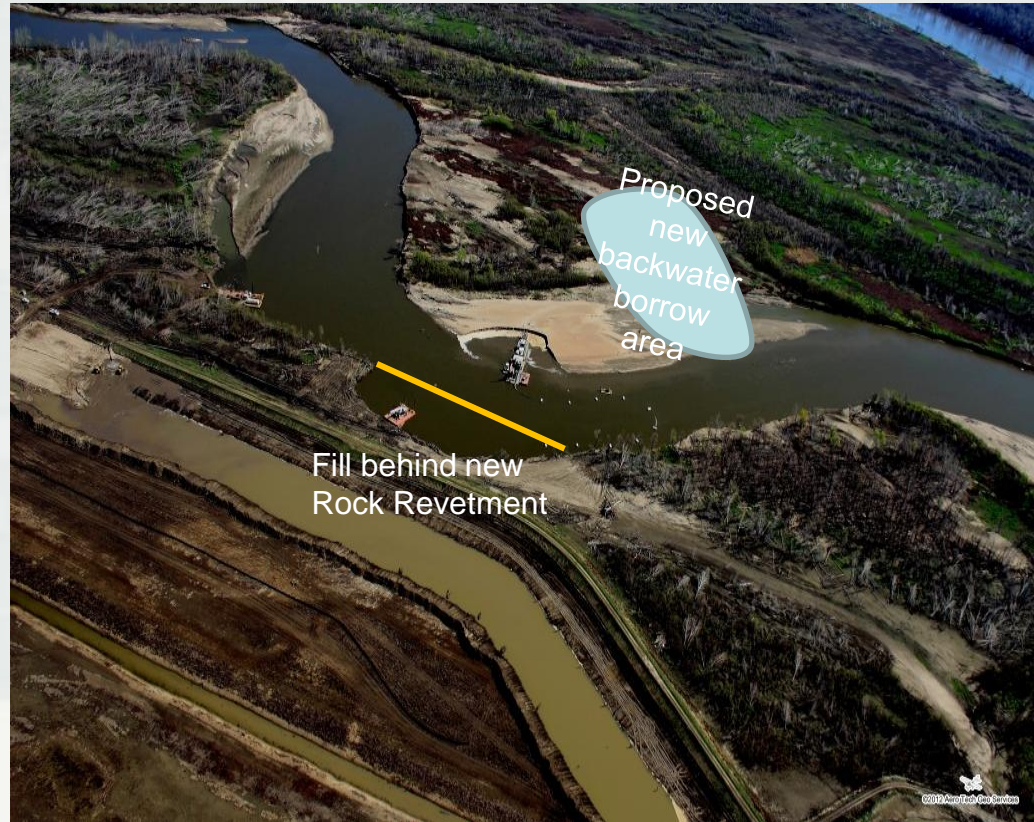
### Hamburg Bend Chute Levee

#### Goals/Issues to Address

- Missouri River erosion in Upper Hamburg Bend Chute, which encroached on the toe of the Federal levee
- Reconstruction and protection of the levee toe required

#### RSM Integrated Solution

- To prevent further damage to levee, a rock revetment was added at the failure point
- 40,000 tons of riprap placed to create fill area, dredge backfill. Also dredge to create seepage berm
- Initial dredging from point bar, additional dredging done to create backwater for shallow water habitat



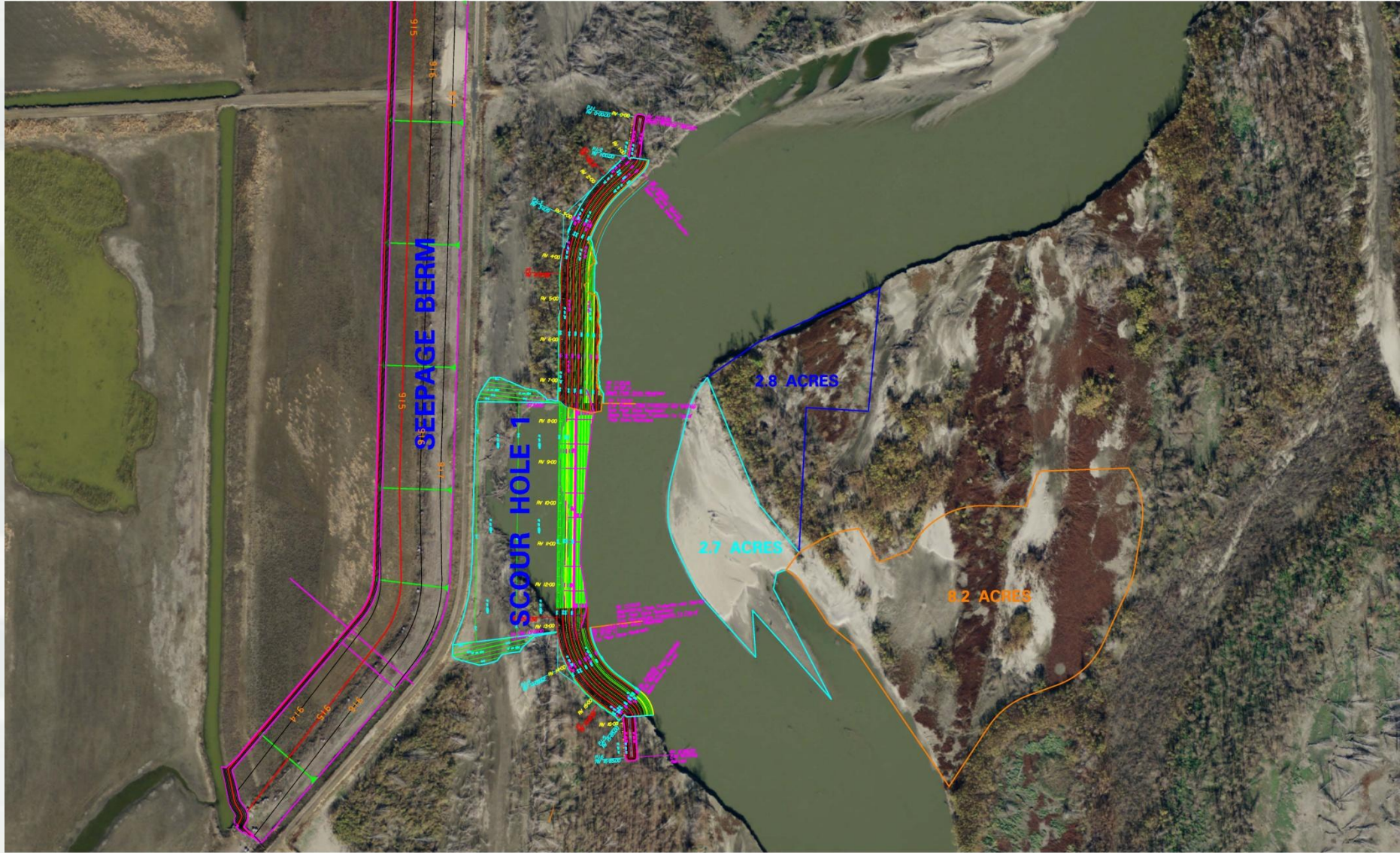
**BLUF:** Dredging of backwater for shallow water habitat provides fill for repair at less cost as other sources while supporting habitat creation for the MRRP





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- Hamburg Bend Chute Levee Repair







2 May 2012

Scour fill  
7 May 2012





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# Questions / Comments



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