LAR BPWG
Technical Presentation
Investigation of Erosion Sites of Concern
September 20, 2016
Presentation Outline

• Review Approaches to Date
  – LAR Erosion Monitoring (MBK)
  – DWR ESP Methodology (NHC)
  – Geomorphic Assessment (NHC)

• Identify Sites of Concern Identified to Date

• Path Forward

• Next Step Site Selection
LAR Erosion Monitoring (MBK)

- Annual monitoring of bank erosion.
  - Visual inspection by boat
  - RM 12 to 0
  - LAR BPWG January 19, 2016 Presentation

- Provides inventory of active erosion sites

- Does not predict future/large event erosion.
DWR ESP Methodology

- Planning level tool for evaluating potential for levee failure due to erosion in extreme events at individual sites.
  - Couples hydraulic, levee geometry, levee composition, and surface material properties
  - LAR BPWG May 17, 2016 Presentation
- Does not identify erosion processes

Competence vs. Capacity

**Competence:** Can the flow move it?

**Capacity:** How much can it move?
Geomorphologic Assessment

- System based approach to understand processes and relationships through the LAR system.
  - Interaction of
    - Hydrology
    - Geology
    - Sediment Supply
    - Sediment Transport
    - Downstream/Upstream controls

- Does not identify specific sites or local conditions
Grouping Sites

Sites are initially grouped by proximity

• **Upstream Sites**
  – Sites upstream of Watt Avenue

• **Mid-stream Sites**
  – Sites located between Paradise Bend and Watt Avenue

• **Downstream Sites**
  – Sites located downstream of Paradise Bend
Upstream Sites

• **Subreaches 5.1, 5.3, and 4.1**
  - Located well away from existing levees, no ongoing erosion sites are currently located here, and the ESP doesn’t predict concerns in 160k cfs event.

• **Erosion Sites 10.5L, 10.8R, 10.9L**
  - Located in Subreach 4.2 which is expected to be relatively stable in geomorphic assessment. ESP doesn’t predict concerns in 160k cfs event.
Upstream RMA-2 Velocities
(160 kcf/s)
Upstream RMA-2 Depths (160 kcfs)
Erosion Sites

RM 10.8 R

RM 10.9 L

RM 10.5 L
Upstream Sites-Next Steps

• Continued Monitoring and Observations
  – Channel instabilities

• Erosion Causes (Anthropogenic? Local Scour?)
  – Better understand causes of erosion sites

• Resource Mapping
  – Identify critical parkway resources other than levee and bike trail which may require protection
Sites to Date
Downstream Sites

- **ESP RM 1.75L to RM 2.25L, and RM 2.65L to RM 2.85L, Erosion Site**
  - Located in Reach 1. Both ESP sites are at locations with minimum levee bench with modeled velocities of about 6-7 ft/s during a 160 kcfs event. Erosion on steepend bank near floodwall at RM 2.75.

- **ESP RM 3.75L to 4.25L**
  - Located in Subreach 2.3. Minimum levee bench, modeled velocities of about 8 ft/s during 160 kcfs event. Existing island in channel center.
Downstream Sites RMA-2 Velocity (160 kcfs)
Downstream Sites RMA-2 Depth (160 kcfs)
Downstream Site Photos

RM 2.8L

RM 1.95L

RM 4.0L
Downstream Sites-Next Steps

• Continued Monitoring and Observation
• Identify Erosion Causes
• Detailed Revetment Mapping/Evaluation
  – Revetment is noted near all three sites. Is revetment size adequate to 160k event? Is layout adequate to provide erosion protection to areas of concern?
• Resource and structure surveys
  – Unmapped structures at RM 3.7 (8” pipe under river) and RM 2.75 (pump intake). Others which may increase local scour risk?
Sites to Date
Mid-Stream Sites

• **Subreach 2.2 Paradise Bend**
  - Historically Active reach. A chute across paradise bend could lower water levels on the upstream the sub-reach increasing friction slope and sediment transport capacity and lowering bed levels upstream. Bike path located near channel on outside of bend is also at risk due to erosion in existing conditions.

• **Subreach 2.1 (Paradise Bend to H Street)**
  - Ongoing deposition is causing erosion of the right bank (golf course). ESP identifies left bank high risk as the levee bench is minimal, and instream velocities are over 10 ft/s. Development of a chute at Paradise bend may affect deposition, velocity, or impinge levee toe.
Paradise Bend RMA-2 WSEL (160 kcfs)
Paradise Bend RMA-2 Velocities (160kcfs)
Paradise Bend RMA-2 Depths (160kcfs)
Sites to Date
Mid-Stream Sites

• Subreach 3.3 (H street to Fairbairn Intake):
  – Regime equations show the channel likely to widen, and erodible soils in the overbank. ESP shows potential for erosion on the left levee near H street, and on the right levee near the intake. 1986 event had significant erosion on the right overbank. In-channel velocities above 10 ft/s.

• ESP RM 7 to 8.5 R
  – Located in Subreaches 3.1 and 3.2. Velocities of about 6 ft/s on levee toe.
Mid-Stream Sites

• **Erosion Sites 7.5R and 8.8R**
  - Site 7.5R is located in subreach 3.2, while 8.8R is located in subreach 4.4. Both sites are located where mining on the left overbank artificially widened the channel. Both sites are near medial bars which likely pushes flow into the bank exasperating erosion.

• **ESP RM 8.2L to 9.5L**
  - Located in subreaches 3.1 and 4.4. Velocities along levee toe can be up to 6 ft/s.
Mid-Stream Sites RMA-2 Velocities (160 kcfs)
Mid-Stream Sites RMA-2 Depths (160 kcfs)
Mid-stream Sites
Midstream Sites Next Steps

• Continued Monitoring and Observation

• Evaluate impacts of Paradise Bend Chute formation.
  – Model chute hydraulics and upstream/downstream impacts.

• Detailed Revetment Mapping/Evaluation
  – Identify existing revetment and transitions. Verify existing revetment suitable for 160 kcfs, 160 kcfs with chute downstream, and with potentially lowered bed elevation.

• Resource and structure surveys
Overall Path Forward

• Focus on 2-4 Select Sites
• Develop Site Assessment Approach
• Evaluate Sites and Approach
Example Site Specific Analyses

- RM 2.75L-Sample Site
  - Site Specific Survey
  - Existing Resources
  - Existing Infrastructure
  - Upstream Revetment Design
  - Local Hydraulics
  - Bank Material
  - Erosion Process
  - What happens if it erodes?
Example Site Specific Analyses

• RM 8.8 R-Sample Site
  – Site Specific Survey
  – Existing Resources
  – Existing Infrastructure
  – Downstream Revetment Design
  – Local Hydraulics
  – Bank Material/Location of Lower Unit?
  – Erosion Process
  – What happens if it erodes?
Site Selection

• Selection Criteria
  – Sites which fit into existing programs?
    • Resource Management Plan or Sac Bank
  – Historically active sites?
  – Geomorphic Assessment
  – Proximity to levee
  – Loss of parkway
Site Selection

• Specific Sites
Questions?