

2012 COLUMBIA RIVER ESTUARY CONFERENCE

STRUCTURAL & HYDRAULIC ANALYSIS OF LOWER COLUMBIA RIVER PILE DIKES (LCR STUDY)

Presented by:

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Our Message



AECOM

PILE DIKES ARE BENEFICIAL TO JUVENILE SALMONIDS!

- Existing pile dikes created (and are now protecting) over 6,100 acres of shallow water habitat important to juvenile salmonids.
- Removal (or loss of) pile dikes would significantly reduce available shallow-water habitat in the LCR.



LCR Study Description



AECOM

LCR STUDY AREA



REASONS FOR LCR STUDY

- Comprehensive structural and functional condition pile dike assessment
 - Channel stabilization
 - Reducing dredging requirements
 - Bank protection
 - Dredged disposal sites protection.
- Federal Columbia River Power System National Marine Fisheries Service Biological Opinion (BiOp) Reasonable and Prudent Alternative (RPA) #38 which states

To increase access to productive habitat and to reduce avian predation, the Action Agencies will develop and implement a piling and pile dike removal program.



TYPES OF PILE DIKES IN THE LCR



Spur Pile Dike



Training Pile Dike

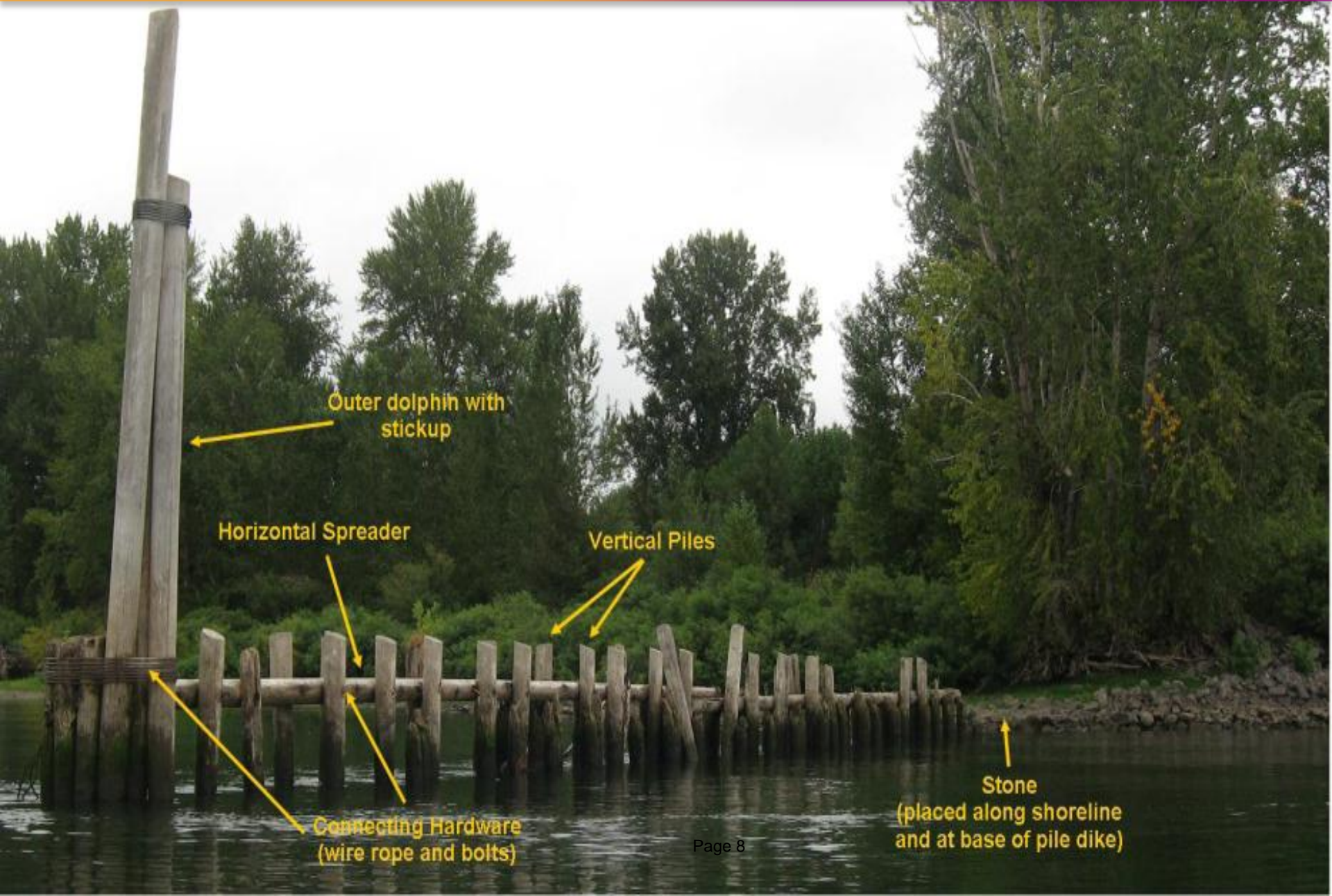


Transverse Pile Dike



Pile Field

PILE DIKE DESIGN ELEMENTS



Outer dolphin with
stickup

Horizontal Spreader

Vertical Piles

Connecting Hardware
(wire rope and bolts)

Stone
(placed along shoreline
and at base of pile dike)

LCR STUDY

PILE DIKE INSPECTIONS

SEPTEMBER 2010

October 28, 2011



AECOM

PILE DIKE 61.28 (SEPTEMBER 2010)



Pile Dike 56.64

For this dike the following structural ratings were given:

Structural

- Outer Dolphin (OD) = Present (+1), Fair Condition (0)
- Pile Braces = Absent (0), Not Present (0)
- Spreader = Present (+1), Good (+1)
- Wood Rot = Minor (+1)
- Hardware = All Intact (+1)
- Overall Damage = < 10% damage (+1);
- Stone blanket = Absent (-1)

PILE DIKE 105.04 (SEPTEMBER 2010)



Pile Dike 105.04

For this dike the following structural ratings were given:

Structural

- Outer Dolphin (OD) = Absent (-1), Not Present (0)
- Pile Braces = Absent (0), Not Present (0)
- Spreader = Absent (-1), Not Present (0)
- Wood Rot = Major (-1)
- Hardware = >30% missing (-1)
- Overall Damage = > 30% damage (-1);
- Stone blanket = Absent (-1)

PILE DIKE 105.04 (SEPTEMBER 2010)



Pile Dike 61.28

For this dike the following structural ratings were given:

Structural

- Outer Dolphin (OD) = Present (+1), Fair Condition (0)
- Pile Braces = Present (+1), 50%-90% (0)
- Spreader = Present (+1), Fair Condition (0)
- Wood Rot = Minor (+1)
- Hardware = >30% missing (-1)
- Overall Damage = 10%-30% damage (0); assigned as result of 125 ft hole
- Stone blanket = Present (+1)

Vertical

FINDINGS AND RECOMMENDATIONS



LCR STUDY RECOMMENDATIONS

- Retain/Repair
 - 169 pile dikes
- Implement Habitat Improvement Study
 - 101 of the 169 pile dikes receiving retain/repair (dual recommendation)
 - 3 pile dikes (only recommendation)
- Monitor/Optional Removal
 - Monitor (only) - 16 pile dikes
 - Optional removal or monitor - 39 pile dikes
- Further Study/Analysis
 - 6 pile dikes
- Remove (detrimental to function or habitat)
 - No pile dikes identified



FINDINGS

- Pile dikes are necessary and vital to the proper continuing functioning of the LCR navigation system
- Without the pile dikes
 - Substantial bank erosion would occur
 - The navigation channel location (widths and depths) would become destabilized.
- Pile dikes have created (and are currently protecting) over 6,100 acres of shallow water habitat
- Near-term maintenance is required to protect existing shallow water habitat



WHAT WAS THE PROCESS TO DEFINE SHALLOW WATER HABITAT AREAS?

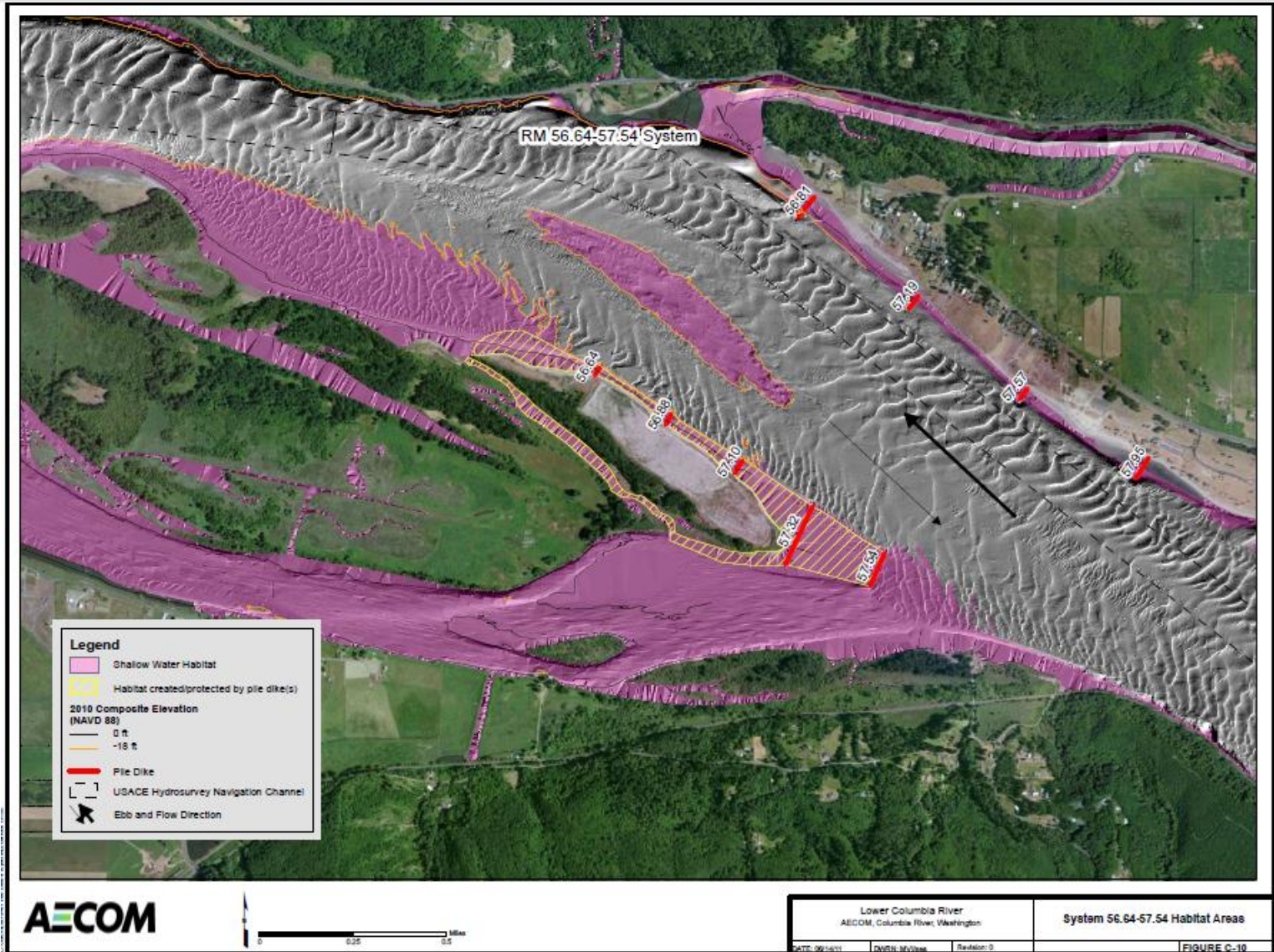


SHALLOW WATER AREA CALCULATIONS APPROACH

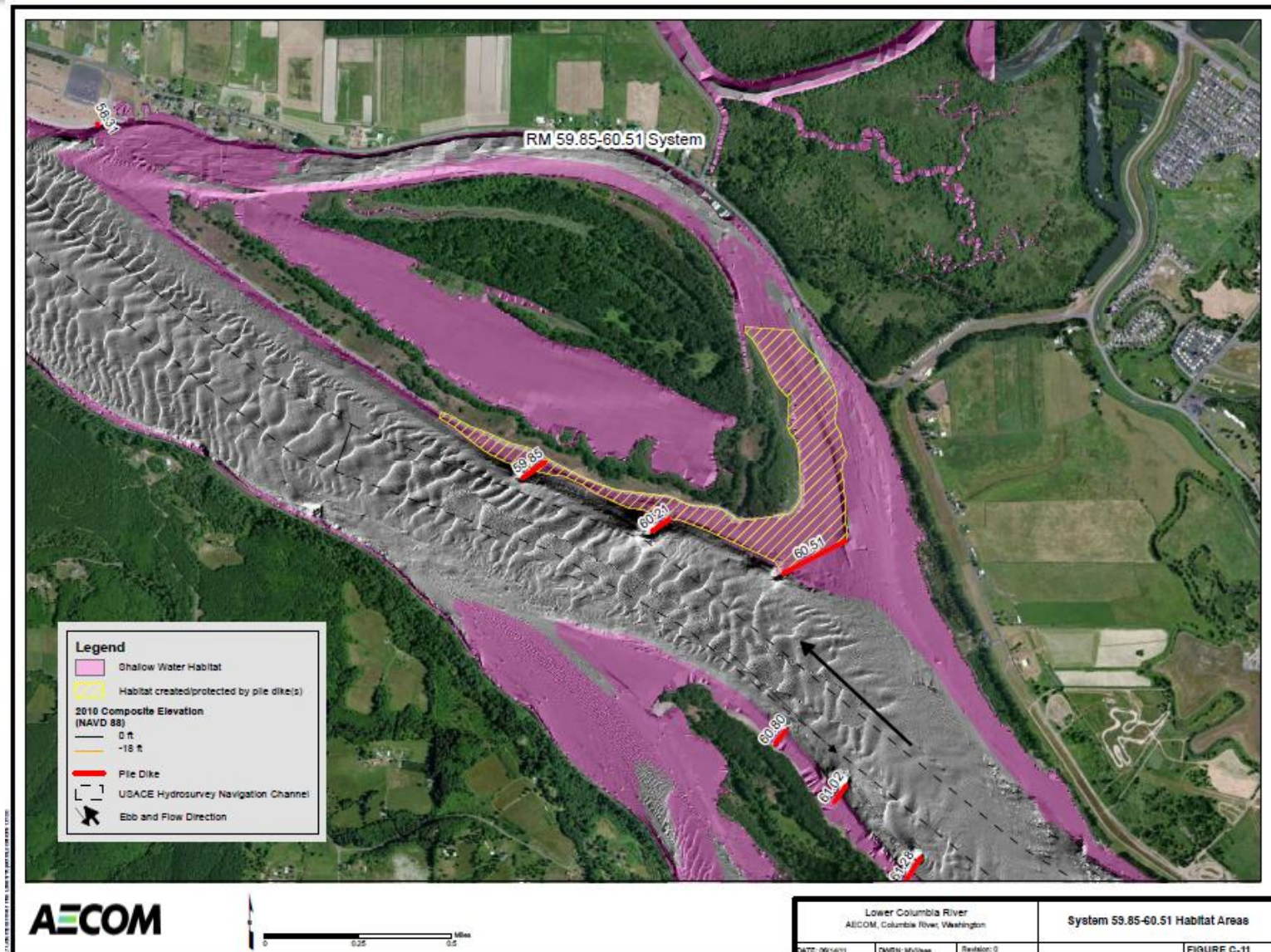
- GIS tool to analyze all existing bathymetric data, and utilizing composite overlays to develop depth contours
- Reasonable (probable) case assumptions to calculate shallow water areas (>6,100 acres)
 - Influence 2,500 feet downstream of pile dike
 - Area elevations are below high water and above -18 feet NAVD88
 - Area boundaries follow flow stream
- Conservative case assumptions to calculate shallow water areas (1,700 acres)
 - 2,500 feet downstream of pile dike
 - Area elevations are below 0 feet and above -18 feet NAVD88
 - Area boundaries follow flow stream



PROTECTED HABITAT (RM 56.64-57.54 SYSTEM)



PROTECTED HABITAT (RM 59.85-60.51 SYSTEM)



IMMEDIATE NEEDS



NEAR-TERM MAINTENANCE NEEDS

- First Priority
 - Maintain (repair) pile dikes identified as “essential” for protecting shallow water habitat
- Second Priority
 - Maintain (repair) pile dikes identified as “important” for protecting shallow water habitat



RESEARCH AND SCIENCE OPPORTUNITIES



PILE DIKE HABITAT IMPROVEMENT ACTIONS (GUIDANCE AND CRITERIA)

- Practice good science and engineering principles
- Respond to RPA #38 concerns
- Focus on pile dike modifications/improvements to:
 - Reduce avian predation
 - Increase salmonid access to shallow water areas behind pile dikes
 - Increase complexity of habitats by physical land forming
 - Create new shallow water habitat



HABITAT ENHANCEMENT WITH PILE DIKES

- Retrofit existing pile dikes to enhance/create habitat
- Install new pile dikes to create new habitat



PILE DIKE ROLE

- The role of pile dikes for habitat enhancement or creation is predominately physical:
 - To reduce/control downstream energy (flow velocities) adequately to protect the habitat type being enhanced or constructed



OPTIONAL HABITATS TO BE CREATED/ENHANCED

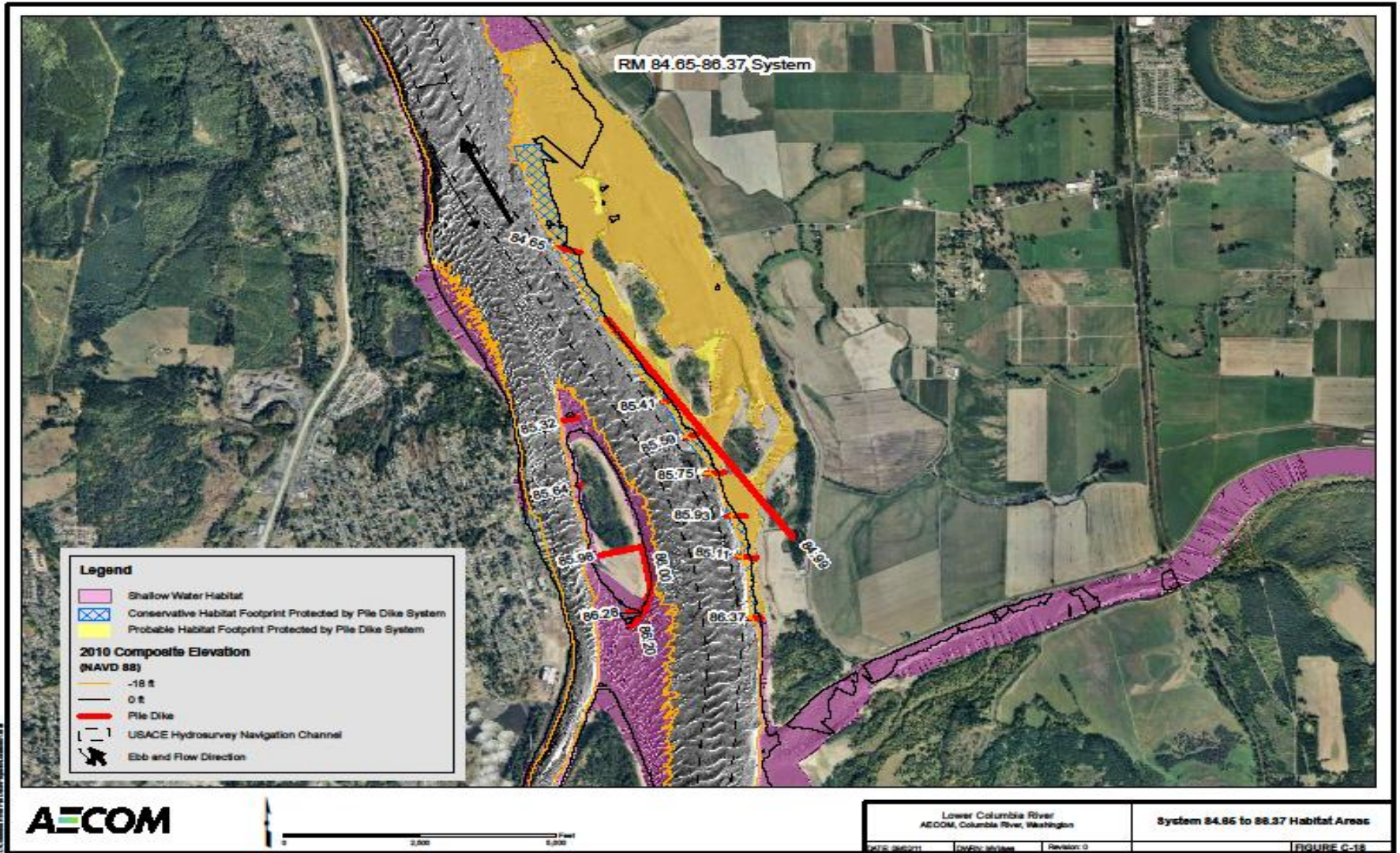
- Place dredged material (or upland materials) in the protected (reduced energy) zone behind the pile dike to improved habitat and complexity with:
 - Submerged bench (island or mound)
 - Nearshore slope
 - Marsh
 - Wetland mosaic
- Other - Place in protected (reduced energy zone) behind the pile dike to improve complexity:
 - Large woody debris (LWD)



SALMONID HABITAT ENHANCEMENT OPPORTUNITIES



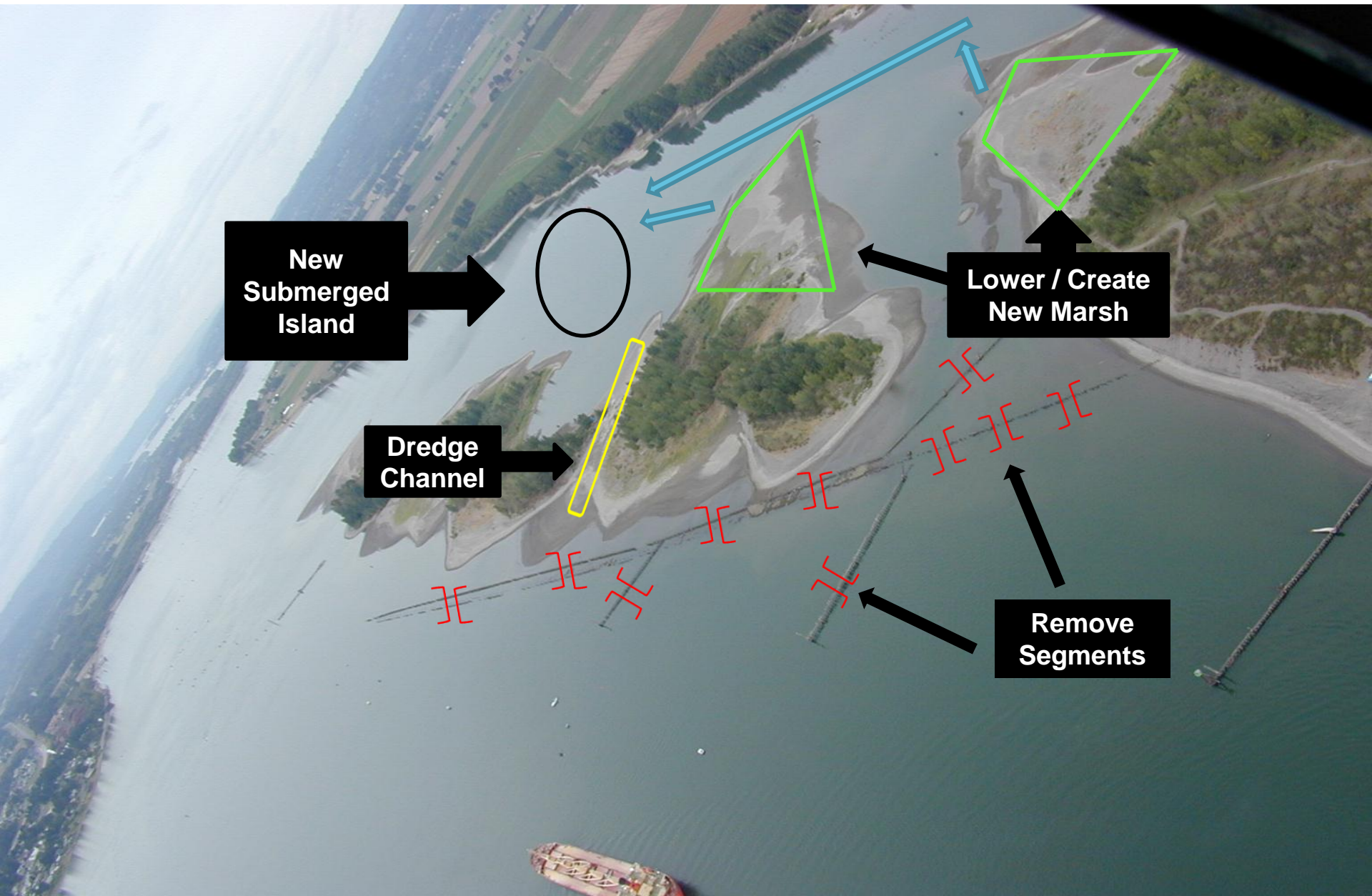
PROTECTED HABITAT (RM 84.65-86.37 SYSTEM)



HABITAT IMPROVEMENT OPPORTUNITIES



HABITAT IMPROVEMENT OPPORTUNITIES



**New
Submerged
Island**

**Dredge
Channel**

**Lower / Create
New Marsh**

**Remove
Segments**

SUMMARY



PILE DIKES ARE BENEFICIAL TO JUVENILE SALMONIDS!

- Existing pile dikes created (and are now protecting) over 6,100 acres of shallow water habitat important to juvenile salmonids.
- Removal or loss of pile dikes would significantly reduce available shallow-water habitat in the LCR.
- Pile dikes are in substantial disrepair; maintenance is required to maintain existing shallow water habitat areas in the LCR.
- Significant opportunity to create/improve juvenile salmonid habitat with use of pile dikes.



CONTACT INFORMATION

- For copy of:

Structural and Hydraulic Analysis of Columbia River Pile Dikes Final Report
(W9127N-10-D-0002, Task Order No. 02), October 3, 2011

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QUESTIONS FOR AUDIENCE



QUESTIONS

- What are your thoughts about using pile dikes as a tool to enhance/create shallow water habitat?
- Do you have study design recommendations for pilot scale testing of design concepts?
- Are pile dikes a “habitat tool” worthy of scientific research?
- Other?

