



National R&D TOPICS

Western Hydraulics Conference

Stevenson, Washington

April 15-17, 2003

J. Sterling Jones



FHWA Contracts

- **FESWMS**

- Contractor: Univ of Ky/Parsons Brinkerhoff
P.I.: Dave Froehlich

- FHWA-RD-03-023 FESWMS 2DH Manual

- FHWA-RD-03-028 FESWMS 1D Manual

- **Performance of Bridges During Floods**

- Contractor: USGS; P.I.: Dave Mueller

- FHWA-RD-01-041 508 captions complete



FHWA Contracts

- **Extrapolation of Laboratory Model Scour Results to Field Conditions**
 - **Contractor: Univ. of FI/USGS BRD Lab at Turner's Falls, Mass./Univ of Auckland**
 - **P.I.: Max Sheppard**
 - **Phase 1 Report on CD available on request (Sterling Jones 202-493-3043)**



FHWA Contracts

- **Abutment Scour for Compound Channels**
 - Contractor: Ga Tech (Sturm)
 - FHWA-RD-99-156 PDF file available on request
- **Effects of Gradation and Cohesion on Bridge Scour**
 - Contractor: Hydrautech (Molinas)
 - FHWA-RD-99- 189 Editorial corrections required



FHWA Contracts

- **SC Abutment Scour DATA**
 - Contractor: USGS (Stephen Benedict)
 - Report and Data to be published as USGS Open File Report
- **Bridge Scour Prediction Event at First International Conference on Scour at Foundations (1st ICSF)**
 - Contractor: Texas A&M (Briaud)
 - Volume 3 of Conference Proceedings to be posted on Texas A&M Web page for five years



FHWA Contracts

- **Coastal Transportation Engineering Research**
 - Contractor: USA (Scott Douglas)
 - Advisory Panel met in Mobile

FHWA Hydraulics Lab

- Scour at Complex Piers
 - Extending Curves to Pile Caps Located Below Orig Bed
- Scour and Scour Protection of Bottomless Culverts
- Culvert Entrance Studies for SD



FHWA Hydraulics Lab

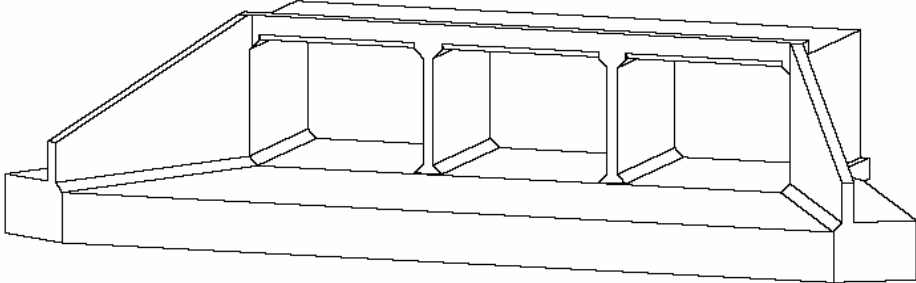
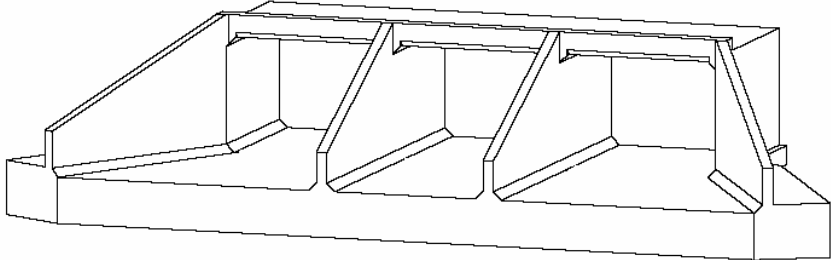
- **Woodrow Wilson Bridge Study**
 - Physical and Numerical 3-D Models
- **Enhancements to HYRISK**
 - multi-purpose prioritization program for bridge scour evaluations

Debris Sweeper Tests

SD DOT BOX CULVERT EXPERIMENTS

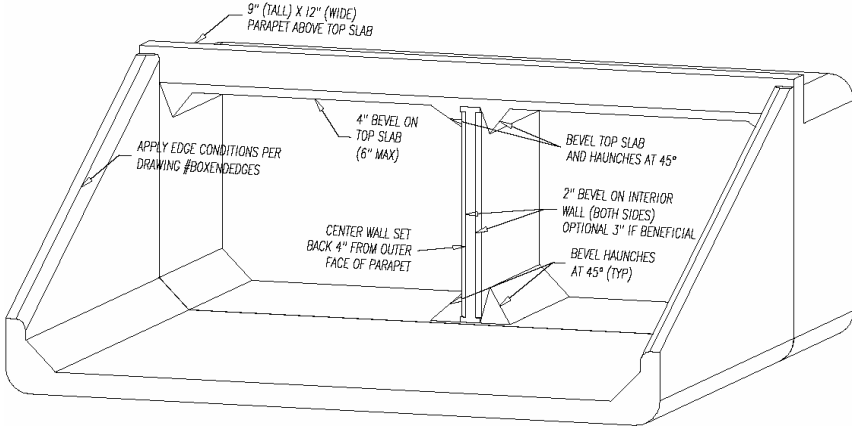
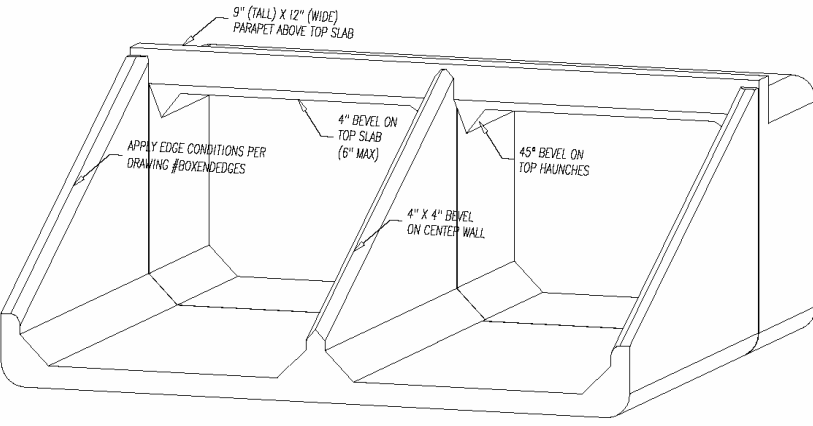


MULTIPLE BARREL TESTS (CIP) SD DOT

	<p>FC-T-30</p>
	<p>FC-T-0-30-E</p>



MULTIPLE BARREL TESTS (PRECAST)

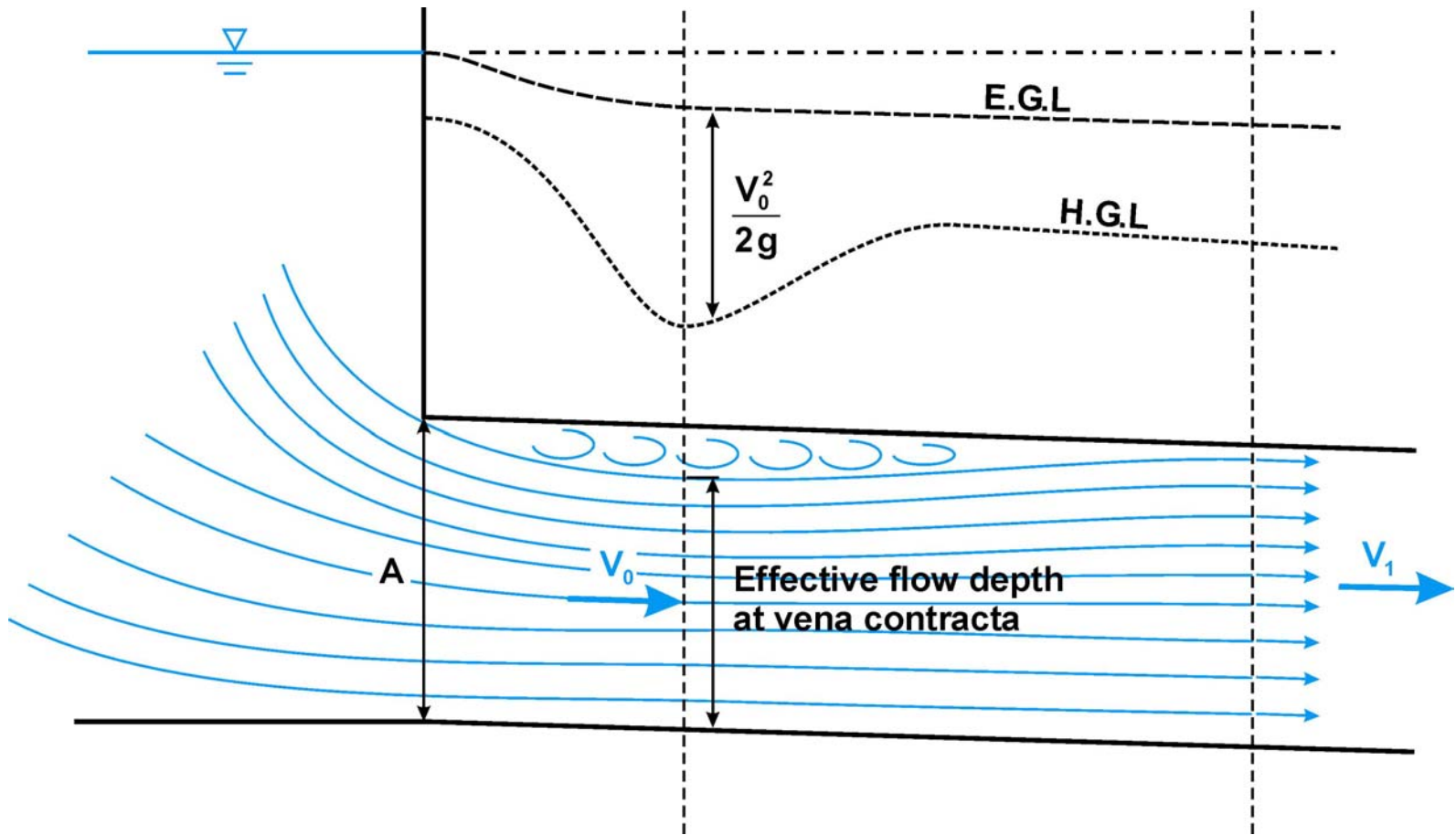
 <p>9" (TALL) X 12" (WIDE) PARAPET ABOVE TOP SLAB</p> <p>4" BEVEL ON TOP SLAB (6" MAX)</p> <p>BEVEL TOP SLAB AND HAUNCHES AT 45°</p> <p>2" BEVEL ON INTERIOR WALL (BOTH SIDES) OPTIONAL 3" IF BENEFICIAL</p> <p>BEVEL HAUNCHES AT 45° (TYP)</p> <p>CENTER WALL SET BACK 4" FROM OUTER FACE OF PARAPET</p> <p>APPLY EDGE CONDITIONS PER DRAWING #BOXEDGEDGES</p>	<p>PC-D-1 or PC-D-3</p>
 <p>9" (TALL) X 12" (WIDE) PARAPET ABOVE TOP SLAB</p> <p>4" BEVEL ON TOP SLAB (6" MAX)</p> <p>45° BEVEL ON TOP HAUNCHES</p> <p>4" X 4" BEVEL ON CENTER WALL</p> <p>APPLY EDGE CONDITIONS PER DRAWING #BOXEDGEDGES</p>	<p>PC-D-E</p>



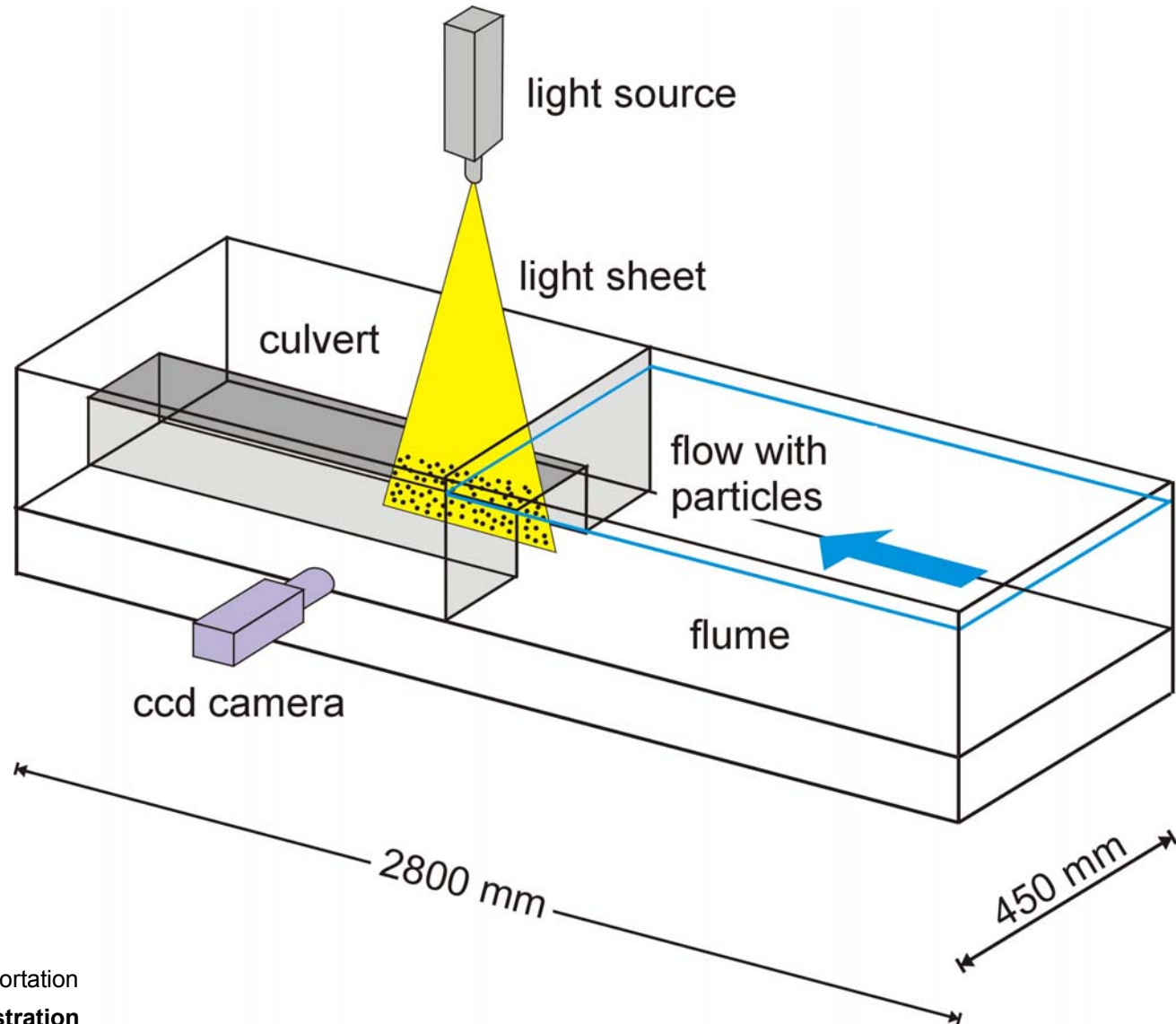
CULVERT SET-UP AT FHWA HYDRAULICS LAB



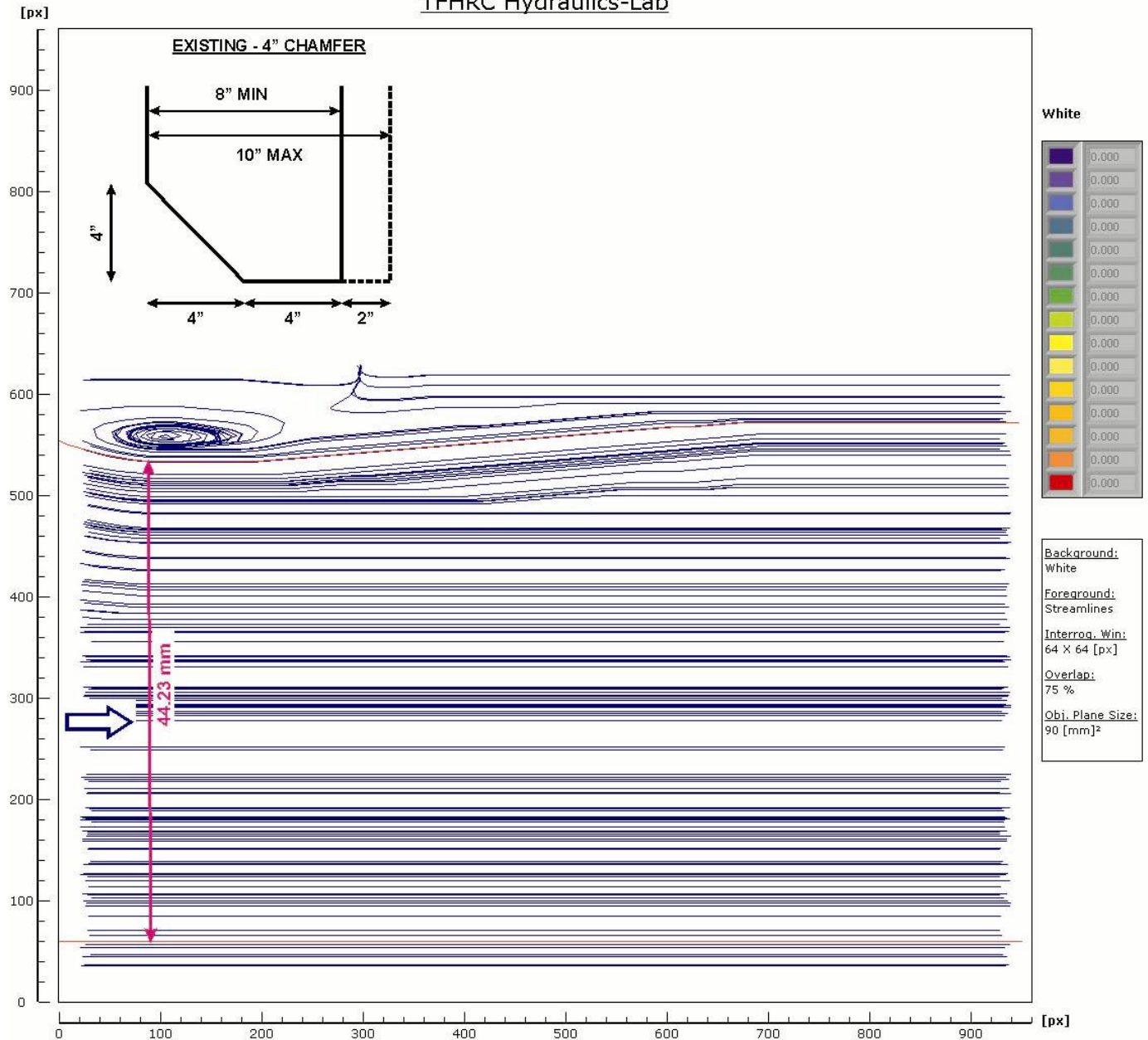
TASK 1. Optimize Bevel Edges for WW and Top Edges



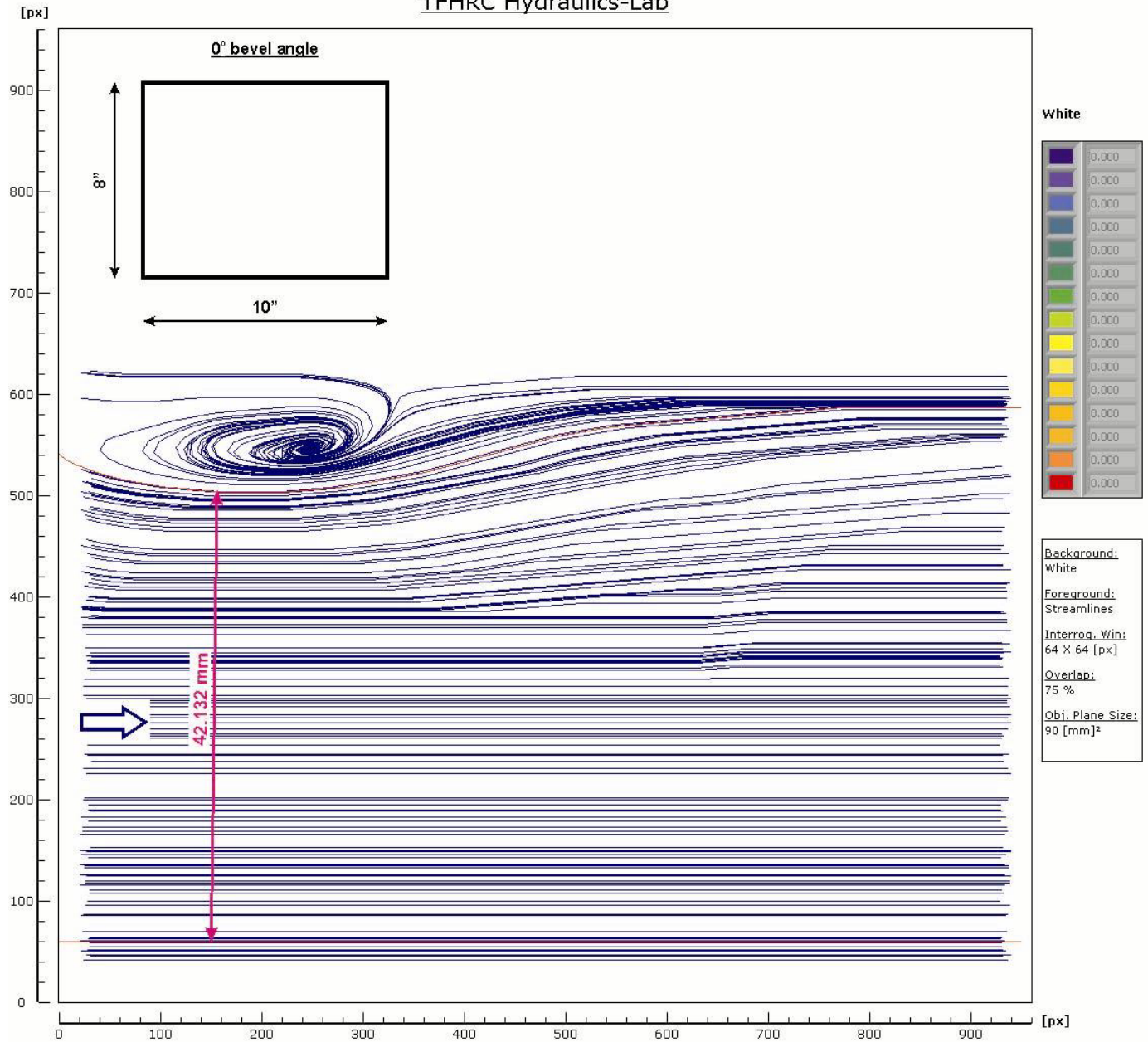
EXPERIMENTAL ARRANGEMENT FOR PIV WITH VERTICAL LIGHT SHEET



STREAMLINES FOR EXISTING 4" CHAMFER

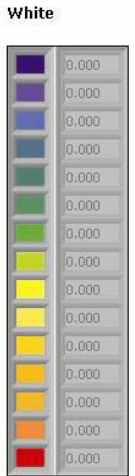
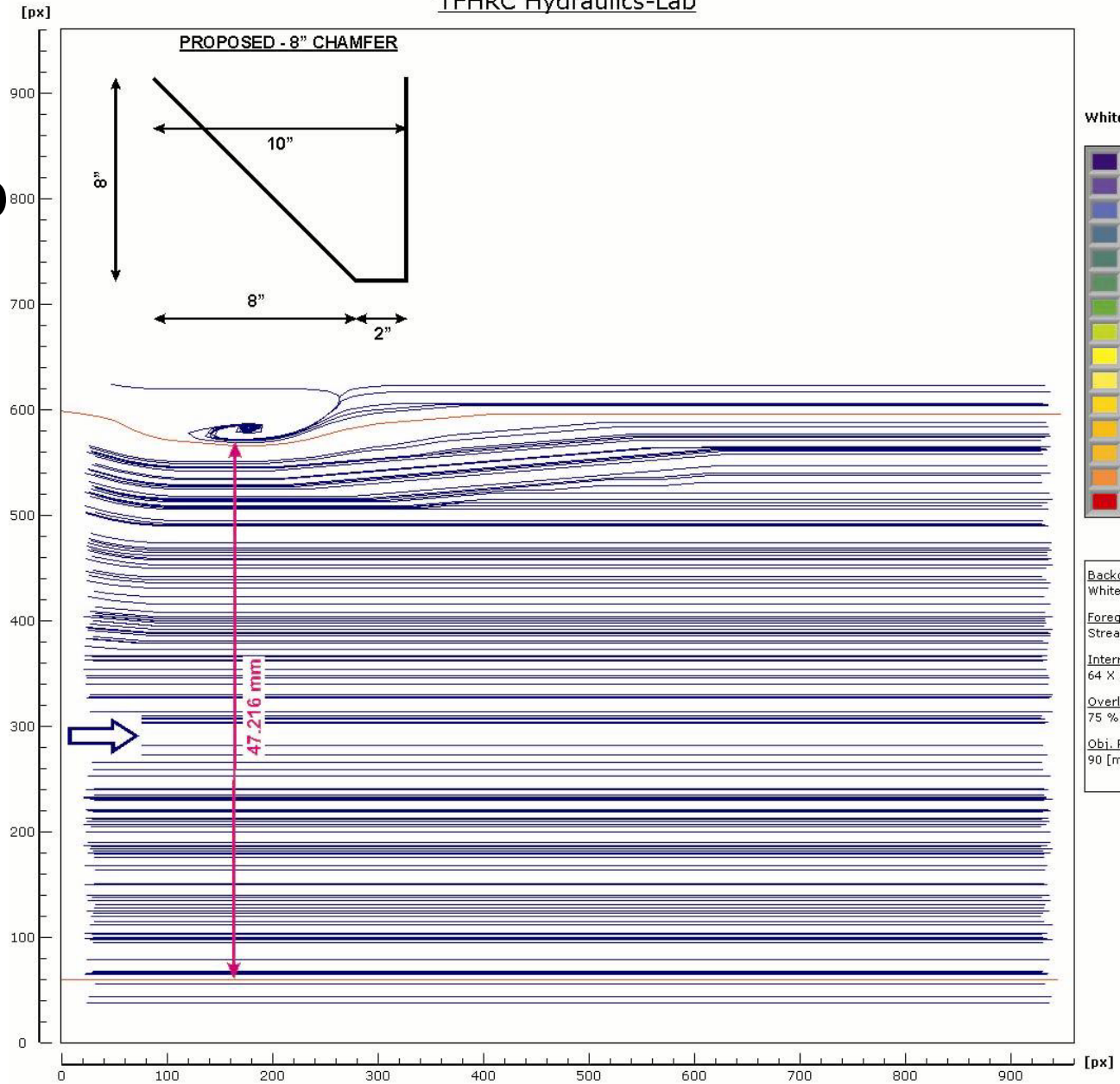


STREAMLINES FOR 0° BEVEL ANGLE



STREAMLINES FOR PROPOSED 8" CHAMFER

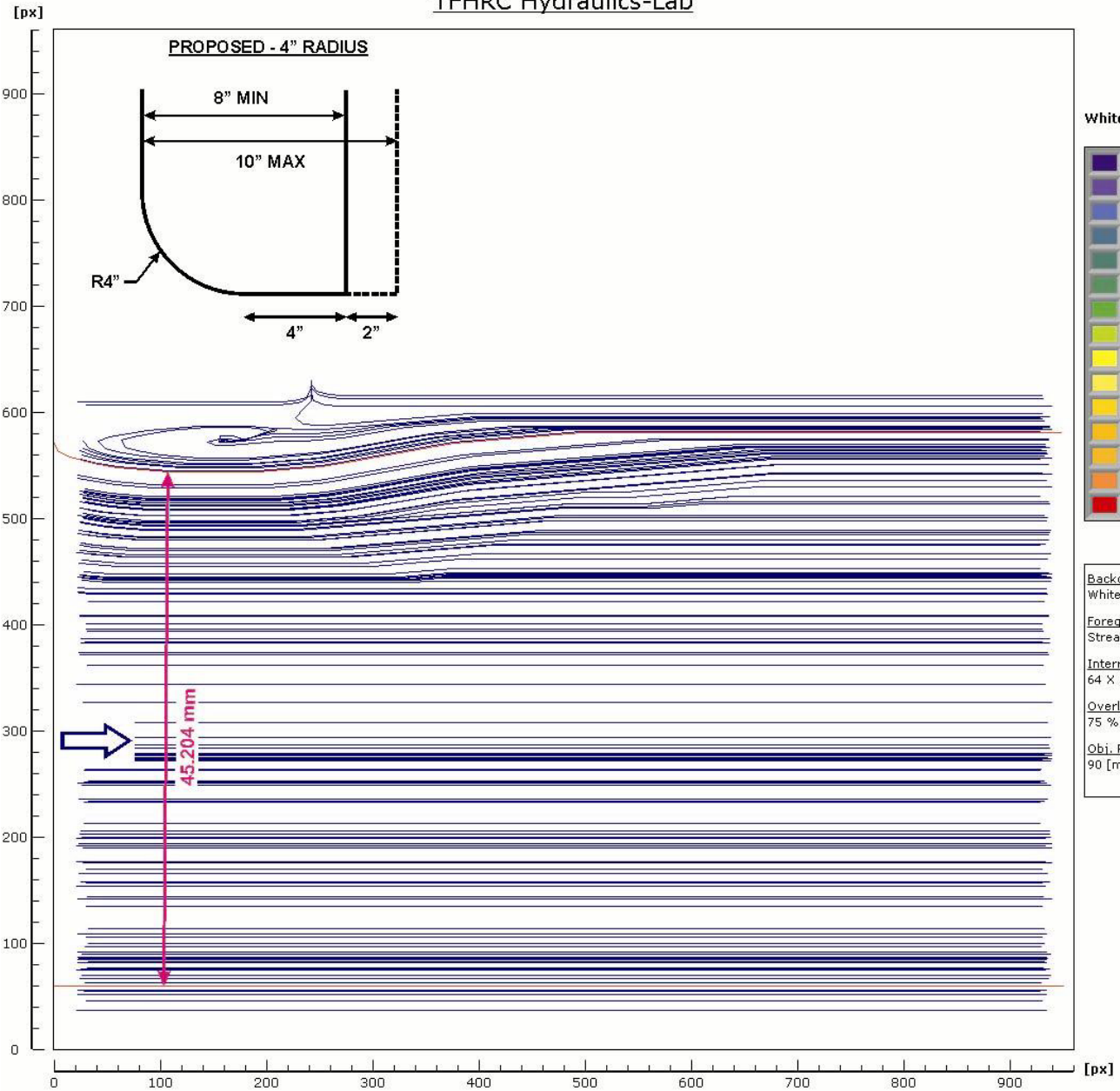
TFHRC Hydraulics-Lab



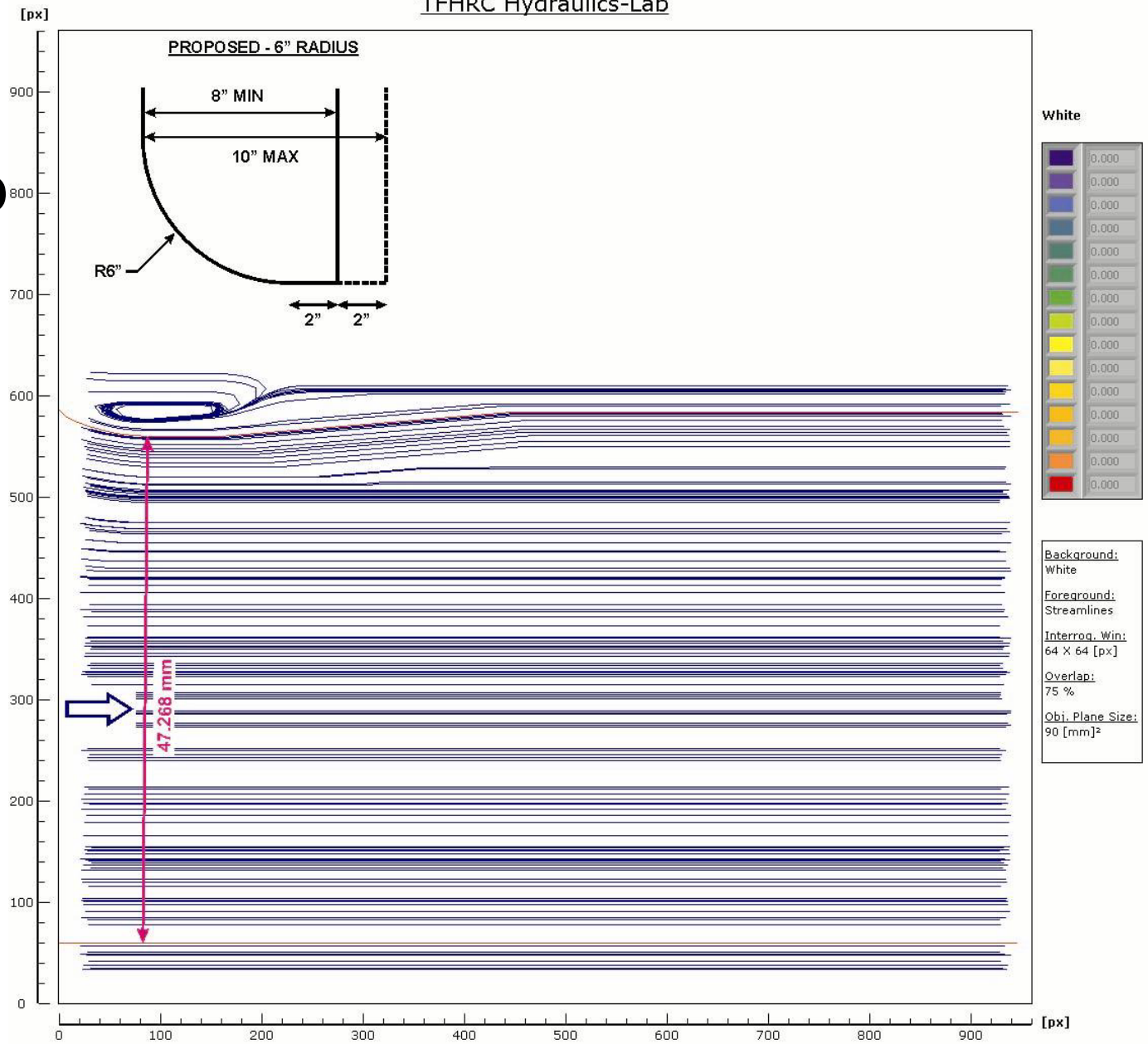
Background: White
 Foreground: Streamlines
 Interrog. Win: 64 X 64 [px]
 Overlap: 75 %
 Obj. Plane Size: 90 [mm]²



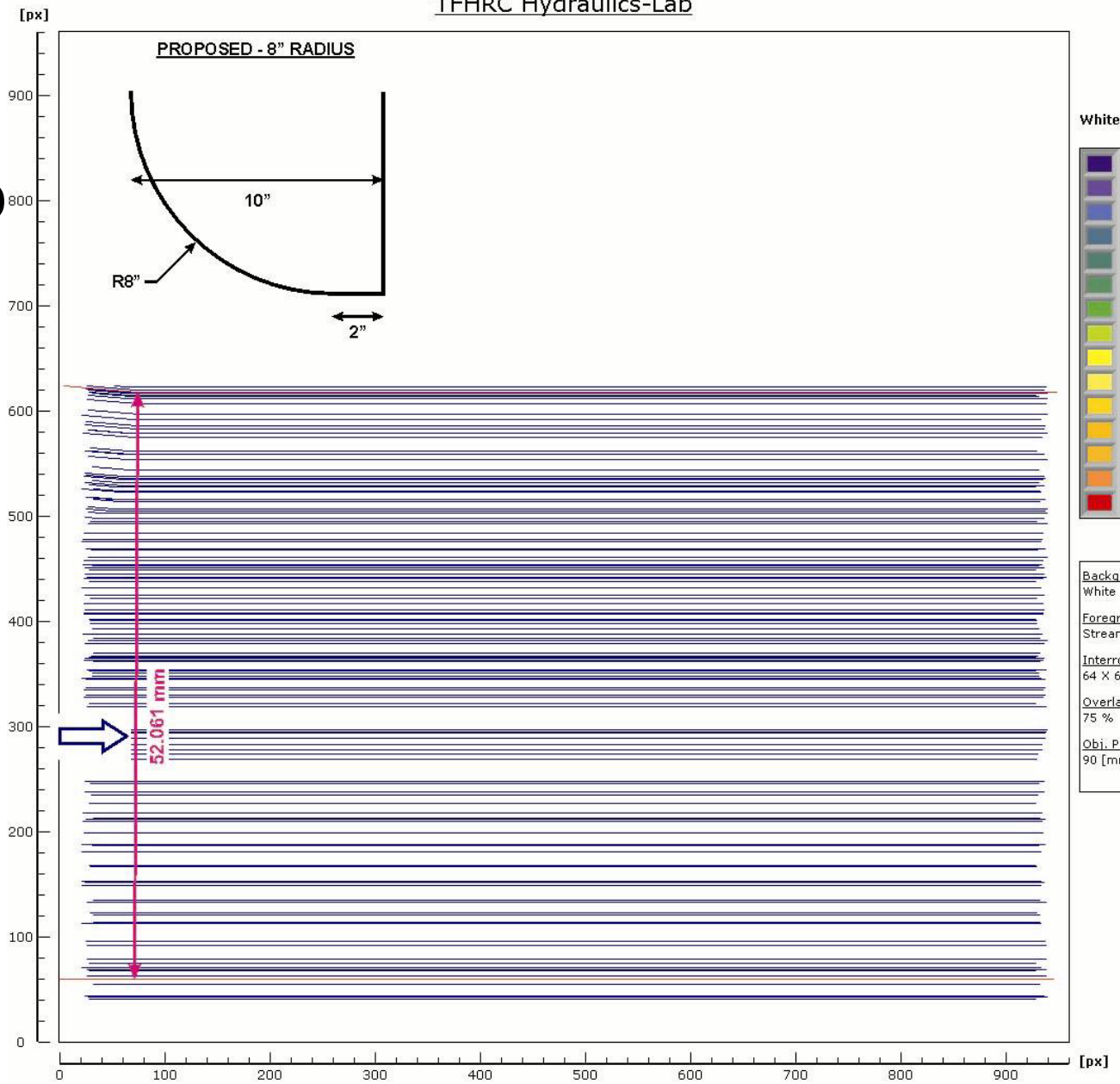
STREAMLINES FOR PROPOSED 4" RADIUS



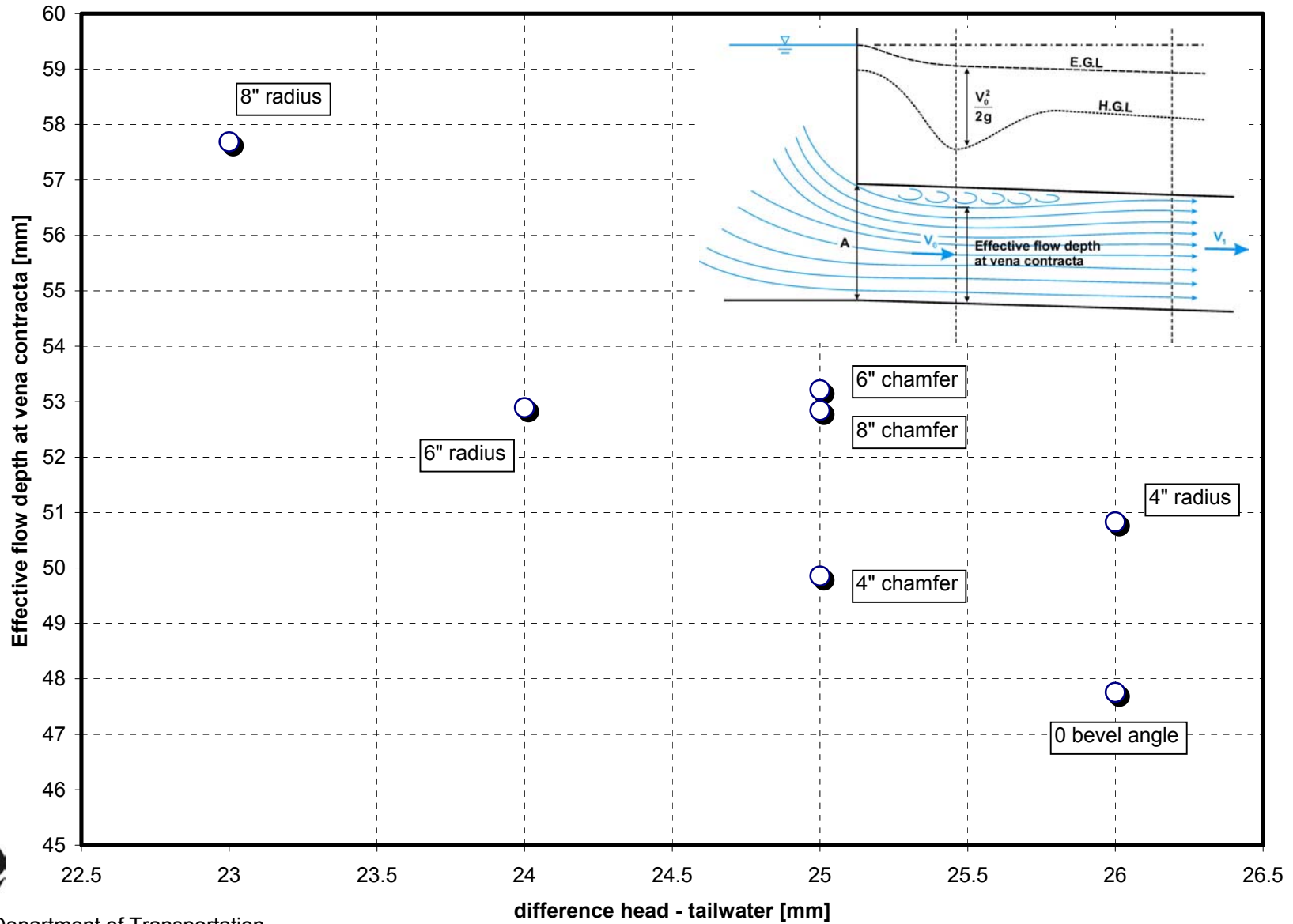
STREAMLINES FOR PROPOSED 6" RADIUS



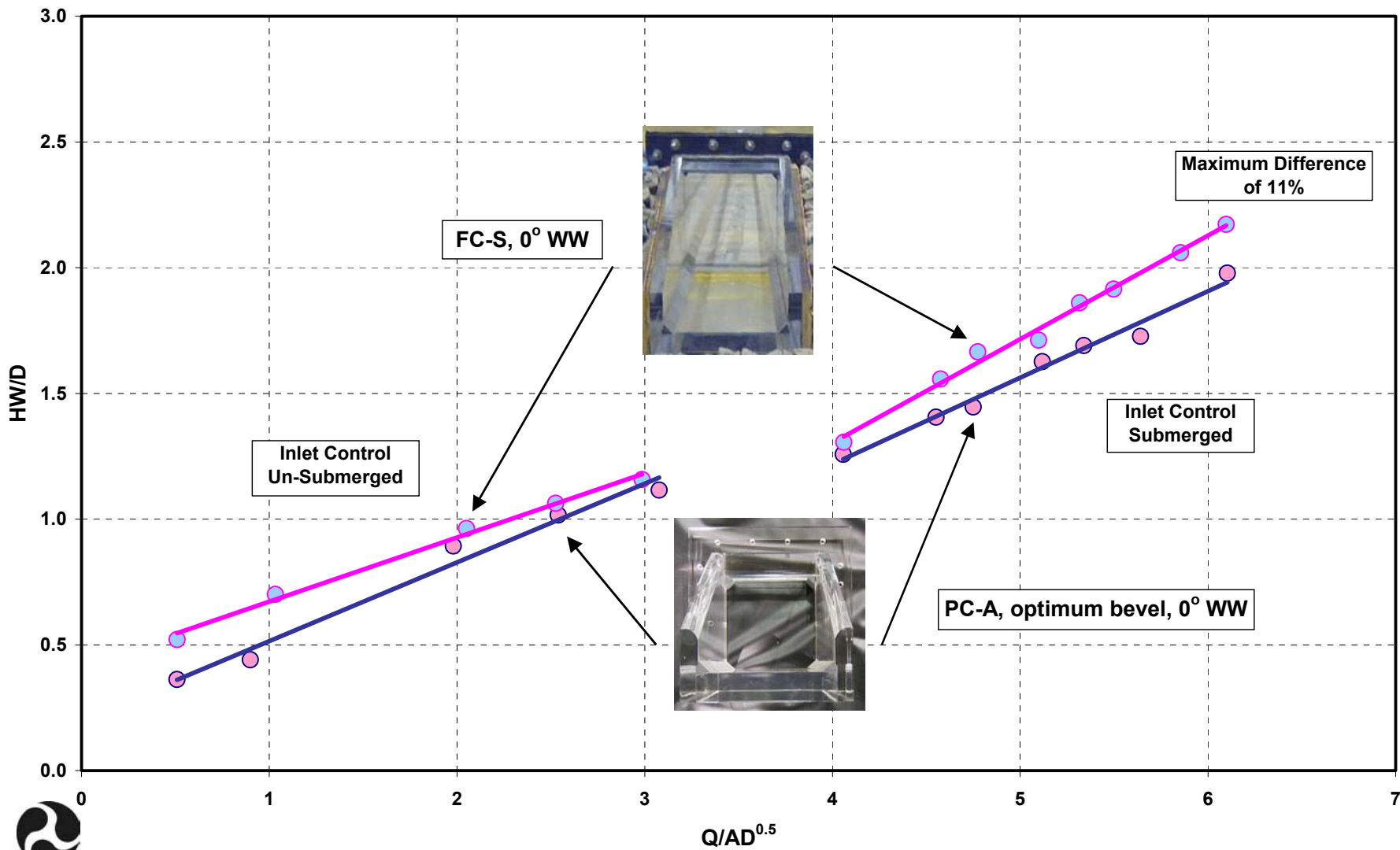
STREAMLINES FOR PROPOSED 8" RADIUS



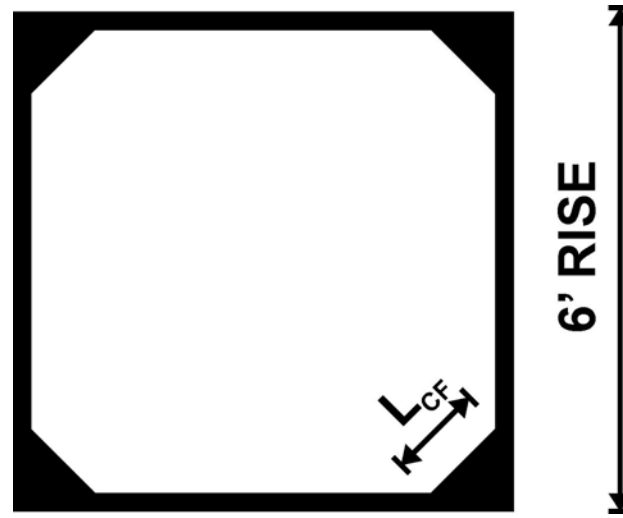
EFFECTS OF BEVELS



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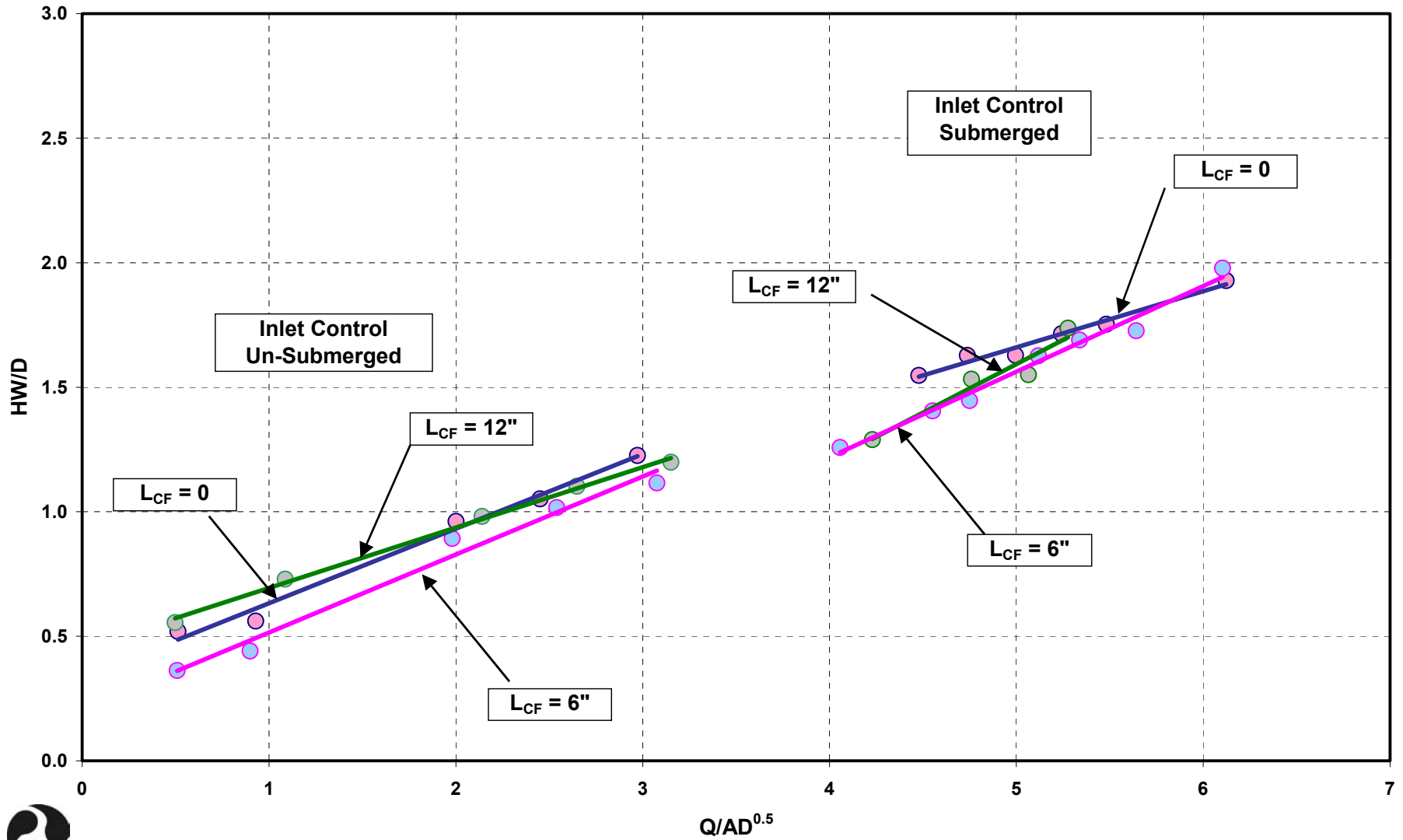
EFFECTS OF CORNER FILLETS



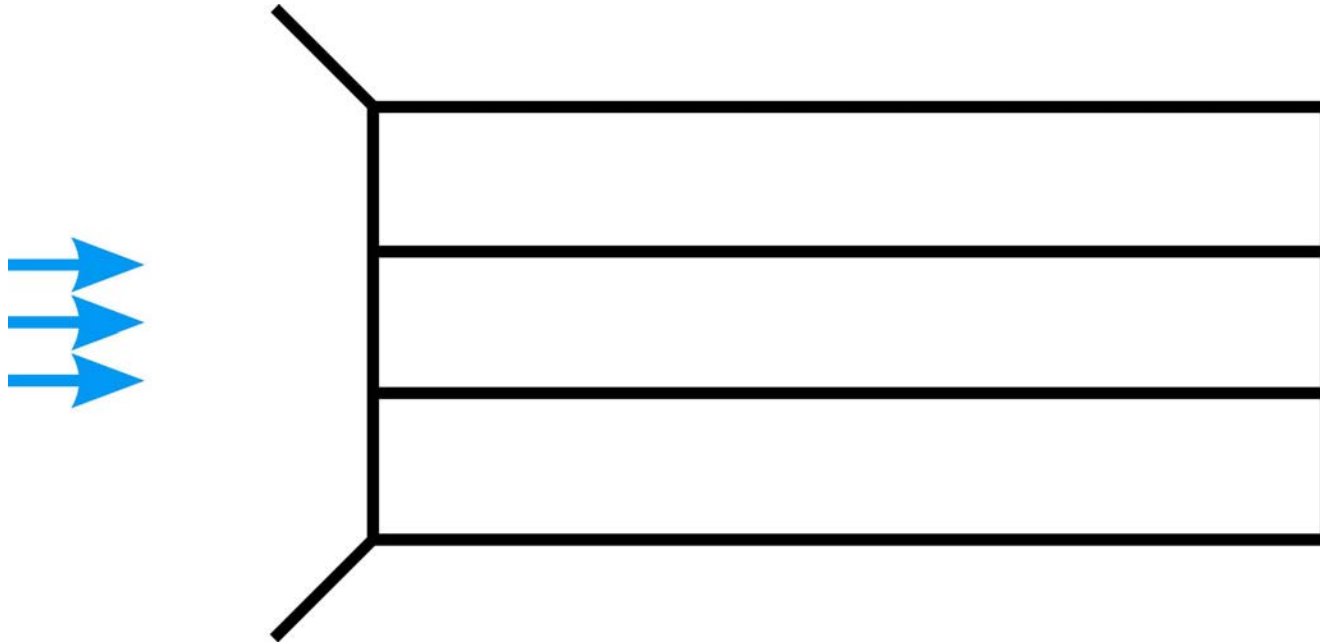
L_{CF} = LENGTH OF CORNER FILLET = 0", 6" AND 12"



EFFECTS OF CORNER FILLETS FOR 6x6 PC-A CULVERT



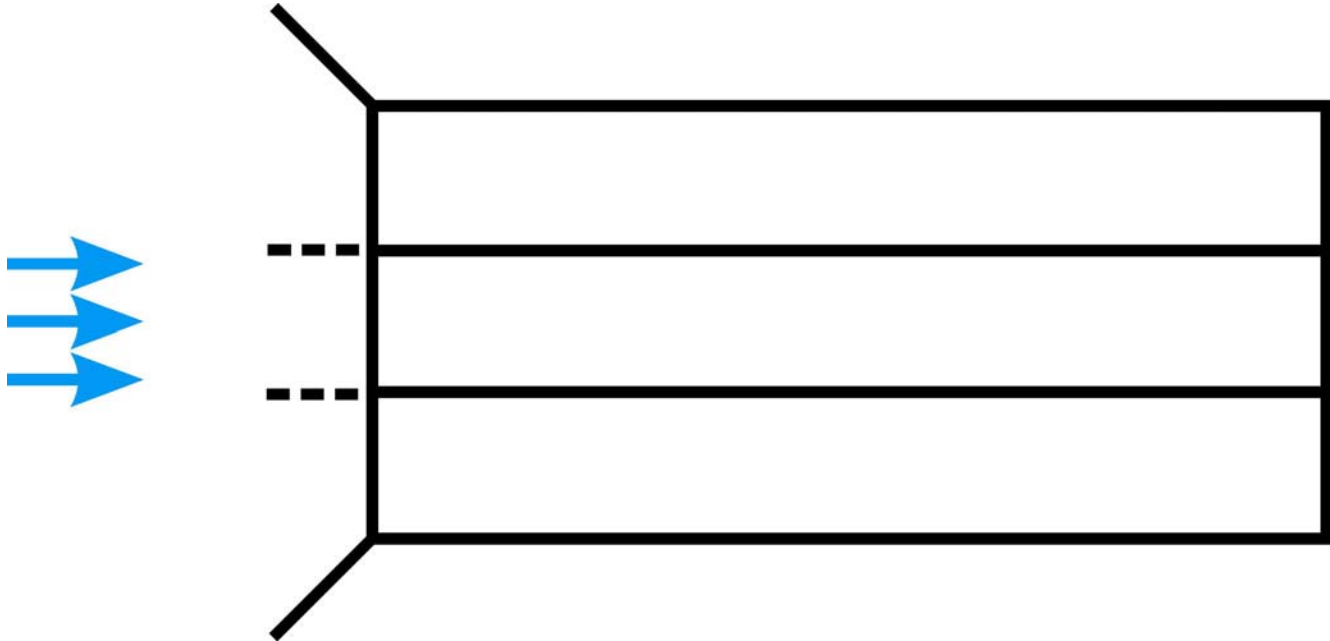
TASK 2: Effects of Multiple Barrels



2, 3 AND 4 BARRELS
0° PRECAST (PC) WW
0° AND 30° FC WW



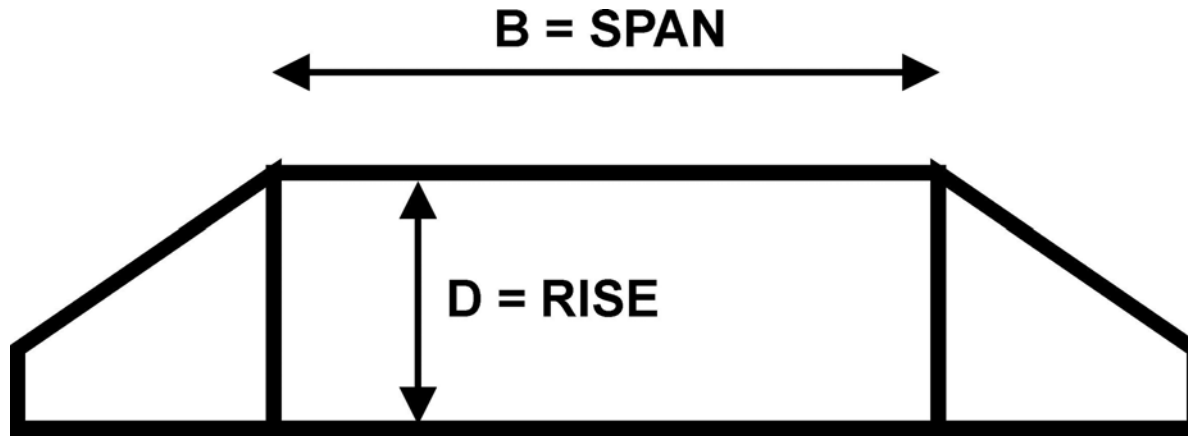
MULTIPLE BARREL TESTS (CONT'D)



SOME SERIES W/ INNER WALLS EXTENDED



TASK 3: Effects of Span to Rise



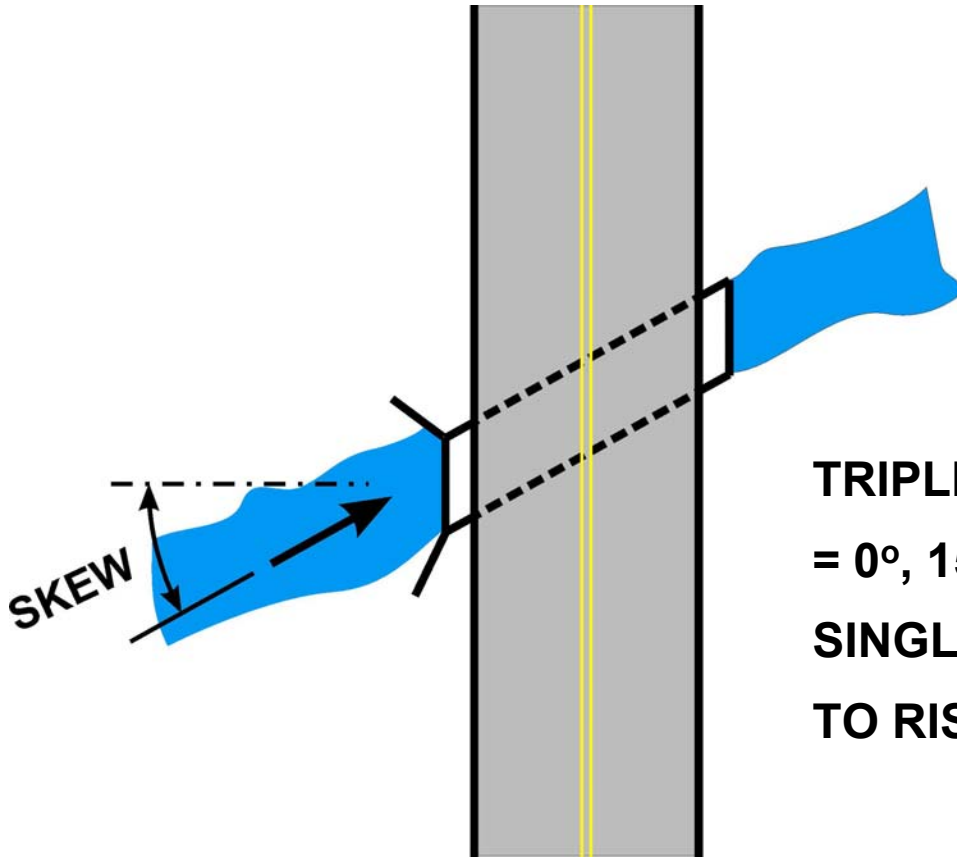
$B/D = 1:1, 2:1, 3:1$ AND $4:1$

single bbl w/ FC WW = 0° AND 30°

EXTRA: USE OPTIMUM P.C. WW's AT 0°



TASK 4: Effects of Skewed Flow



TRIPLE BARREL CULVERT SKEW ANGLE

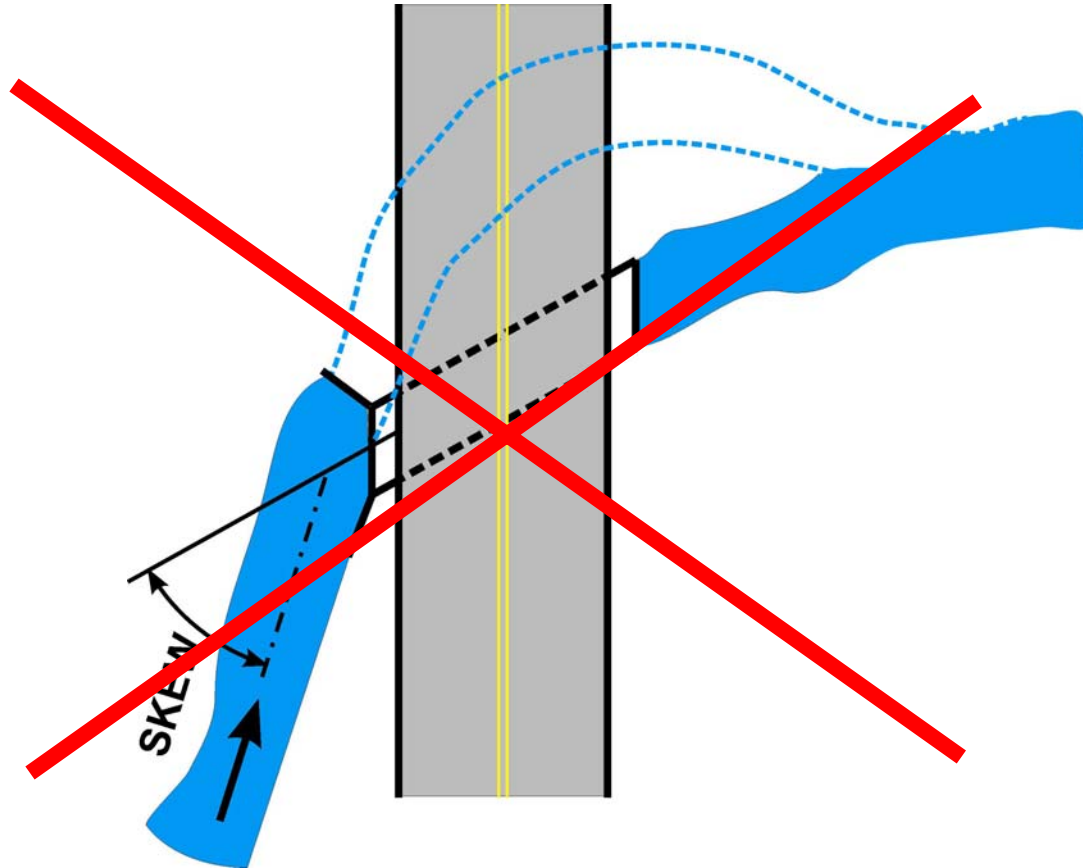
= 0°, 15°, 30° AND 45°

SINGLE BARREL CULVERT W/ 3:1 SPAN

TO RISE, SKEW ANGLES = 0°, 30°



SKEWED FLOW (CONT'D)



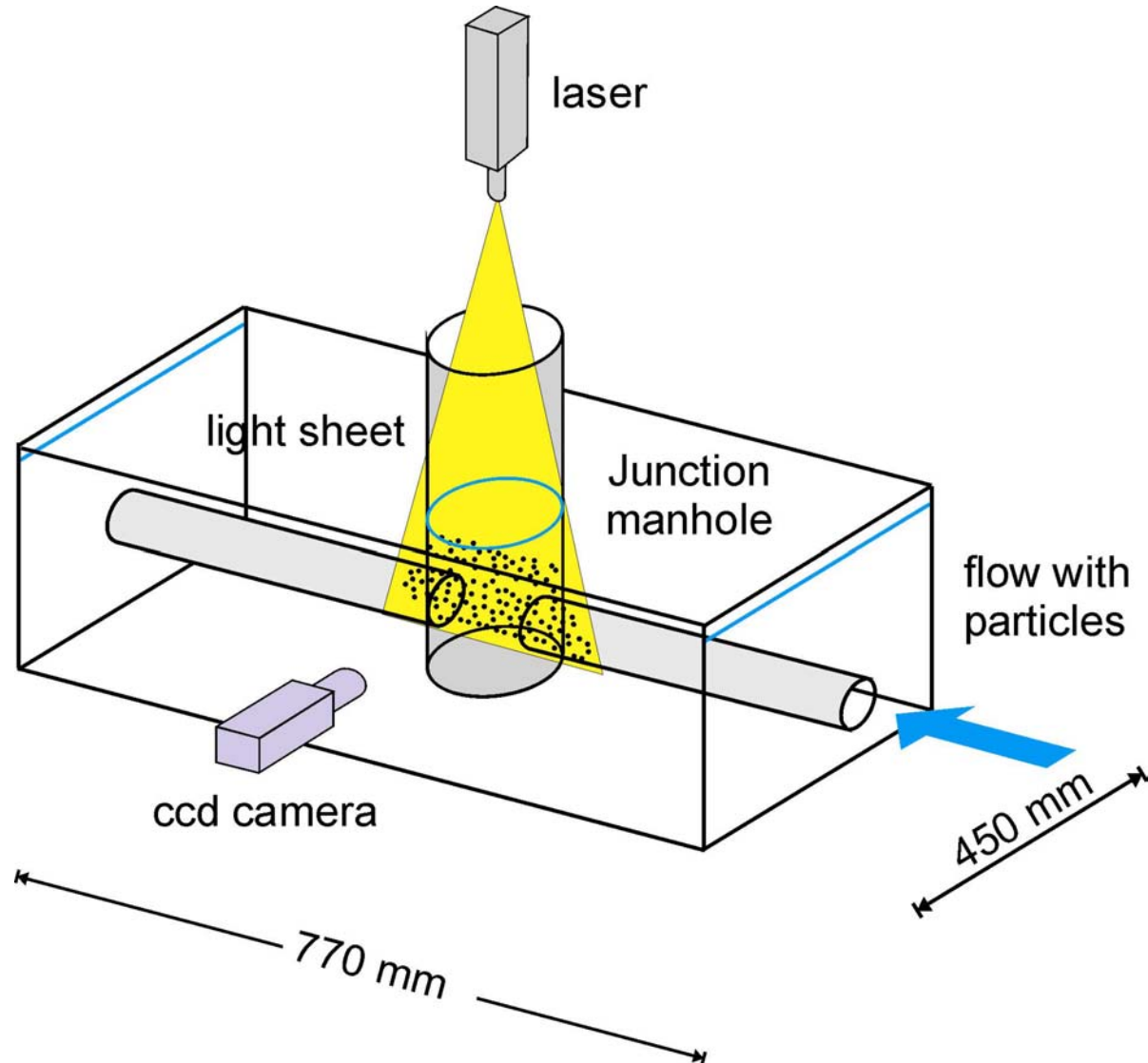
SKEWED FLOW TEST NOT BEING DONE!



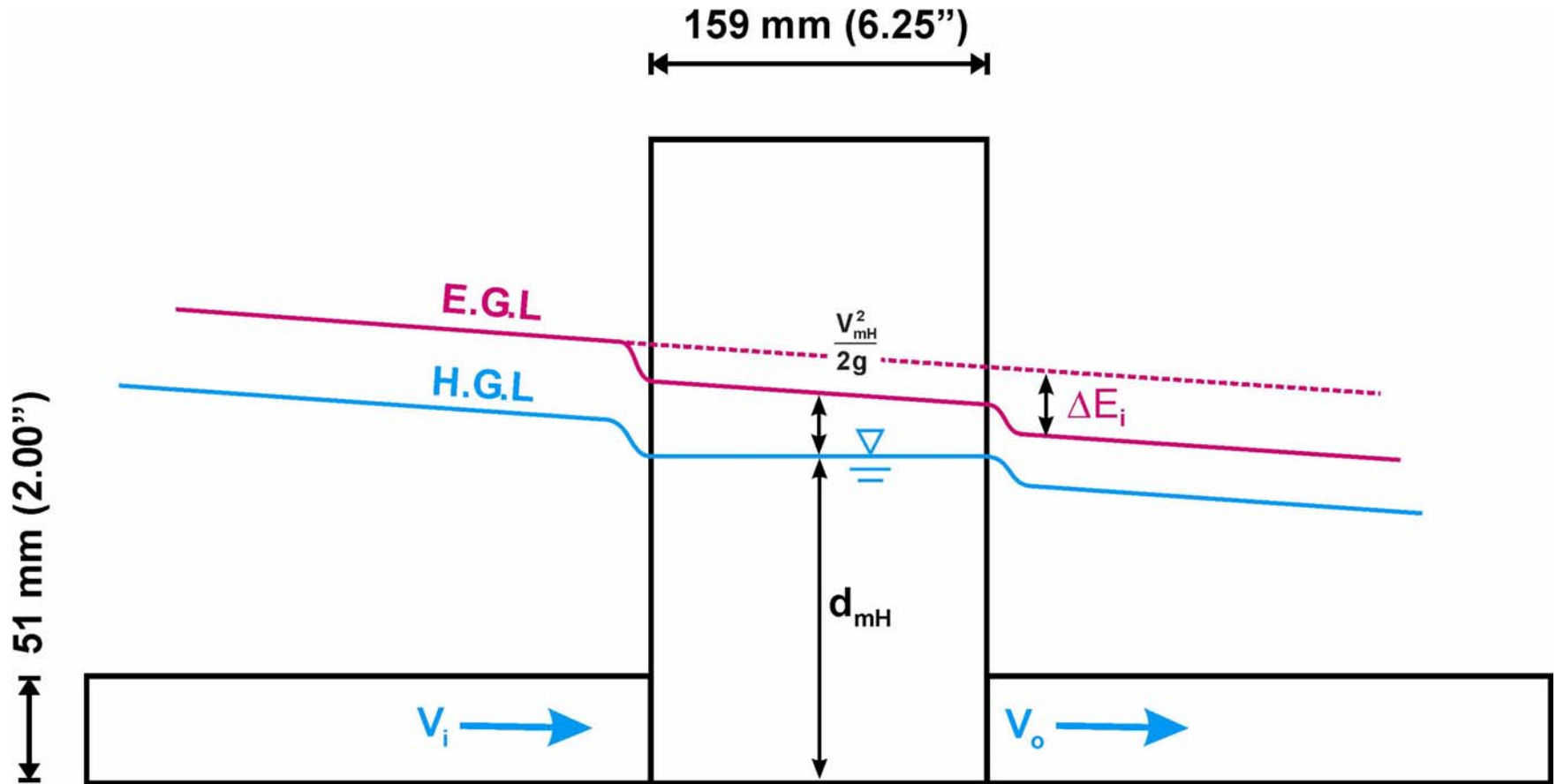
ENERGY LOSSES THROUGH JUNCTION MANHOLES



EXPERIMENTAL ARRANGEMENT FOR JUNCTION MANHOLE TESTS USING PIV WITH VERTICAL LIGHT SHEET



ENERGY GRADE LINE AT A JUNCTION MANHOLE





NCHRP



NCHRP

- **15-23 Unit Conversions for AASHTO MDM & Guidelines**
 - Contractor: Roy Jorgenson ASSOC. (Shearin)
 - Effective Dates 7/11/01 to 3/11/03
- **15-24 Hydraulic Loss Coefficients for Culverts**
 - Utah State Univ. (Dr. Tullis)
- **21-7 Portable Scour Monitoring Equipment**
 - Contractor: Ayres (Jim Schall)
 - Effective Dates: 5/2/00 to _____



NCHRP

- **21-5(2) Determination of Unknown Subsurface Bridge Foundations**
 - Contractor: Olson Engineering
 - P.I. Larry Olson
 - COMPLETE
- **24-14 Scour at Contracted Bridge Sites**
 - Contractor: Univ of Louisville/USGS
 - P.I.: Art Parola and Dave Mueller



NCHRP

- **24-15 Bridge Scour in Fine Grained (Cohesive) Sediments**
 - Contractor: Texas A&M (Briaud)
- **24-16 Effect of Incremental Channel Change on Bridge Scour**
 - Contractor: Ayres Assoc. (Lagasse)
 - Dates: 1/11/99 to _____



NCHRP

- **24-18 Countermeasures to Protect Abutments**
 - Contractor: Univ of Miss/Mich Tech (Brian Barksdale)
 - Dates:7/11/01 to 3/11/03
- **24-19 Environmentally Sensitive Channel and Bank Protection**
 - Contractor: Salix Applied Earthcare (McCullah)
 - Dates:5/30/01 to 5/30/04
- **24-7(2) Countermeasures to Protect Piers**
 - Contractor: Ayres Assoc. (Lagasse & Clopper)
 - Dates:4/01/01 to 10/01/04



NCHRP

- **24-20 Prediction of Abutment Scour**
 - **Contractor: Univ of Iowa (Ettema)**

- **24-23 Riprap Design Criteria**
 - **Contractor: Ayres Assoc.**



NCHRP

NEW for 2004:

- **RISK BASED COUNTERMEASURE SELECTION for Scour Critical Bridges**
- **EFFECTS OF DEBRIS ON SCOUR AT PIERS**

BUBBLE:

Scour at Long and Wide Piers