Fargo-Moorhead Metropolitan
FLOOD RISK MANAGEMENT

Physical Model Construction

1:50 linear scale
1ft in the model = 50 feet in the field

Materials ▶ lightweight concrete, lumber, cinder blocks, and rubber membrane.

- 2000 cinderblocks placed in the model.
- 124 steel profiles used to form topography
- 30 cubic yards of concrete was poured and screed to steel forms

Topography ▶ The model surface carefully formed in lightweight concrete.

1. Extract channel cross sections from field scale topography and design.
2. Scale down cross-sections to model scale.
3. Laser cut steel cross-sections
4. Locate and anchor cross-sections in the model.
5. Fill between sections with block and gravel.
6. Place lightweight concrete and screed to final surface.

Maple River Approach

START → **FINISH**

START → **FINISH**

Diversion Channel

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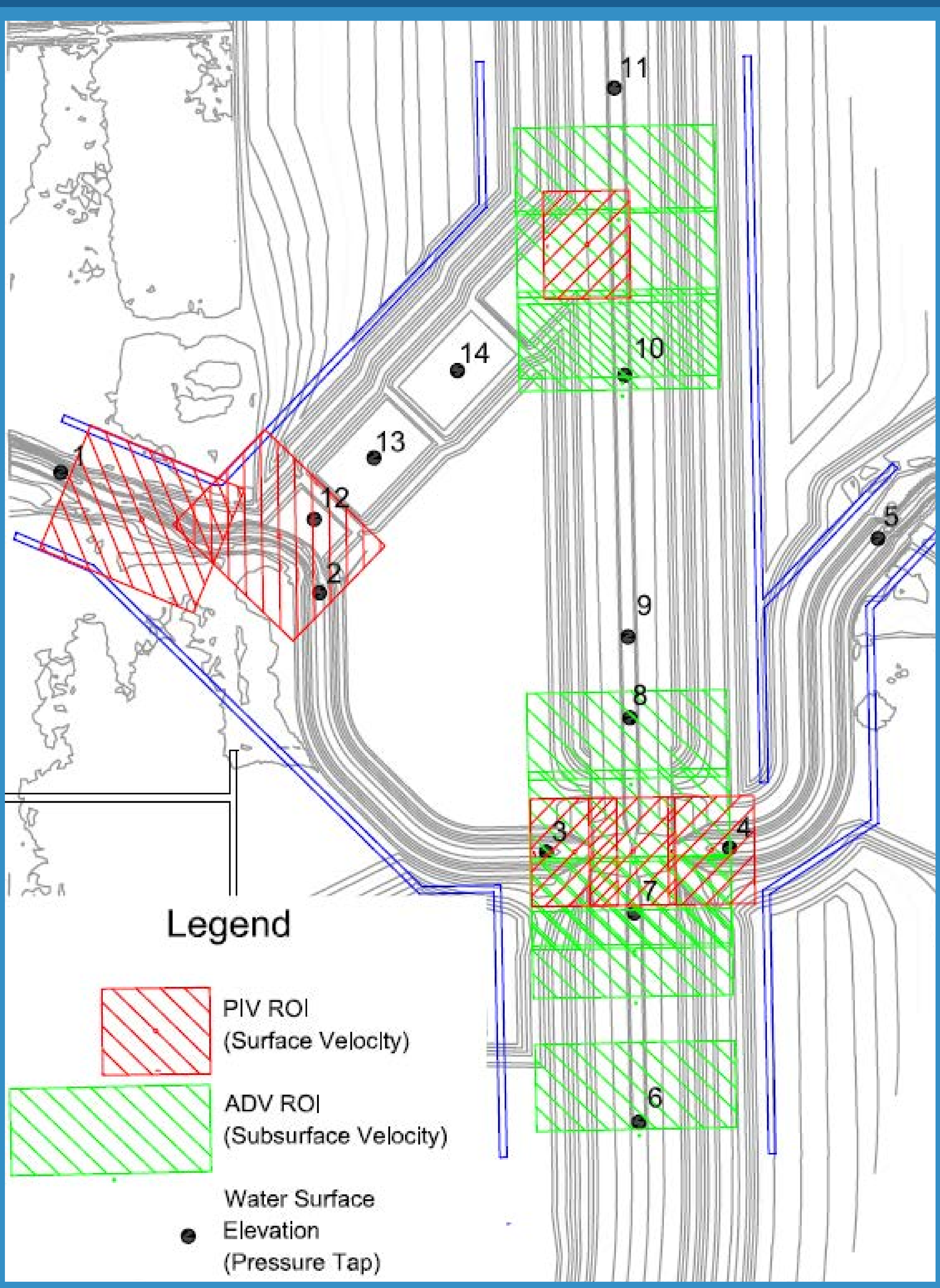
Physical Model Implementation Overview



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Measurements and Data Collection

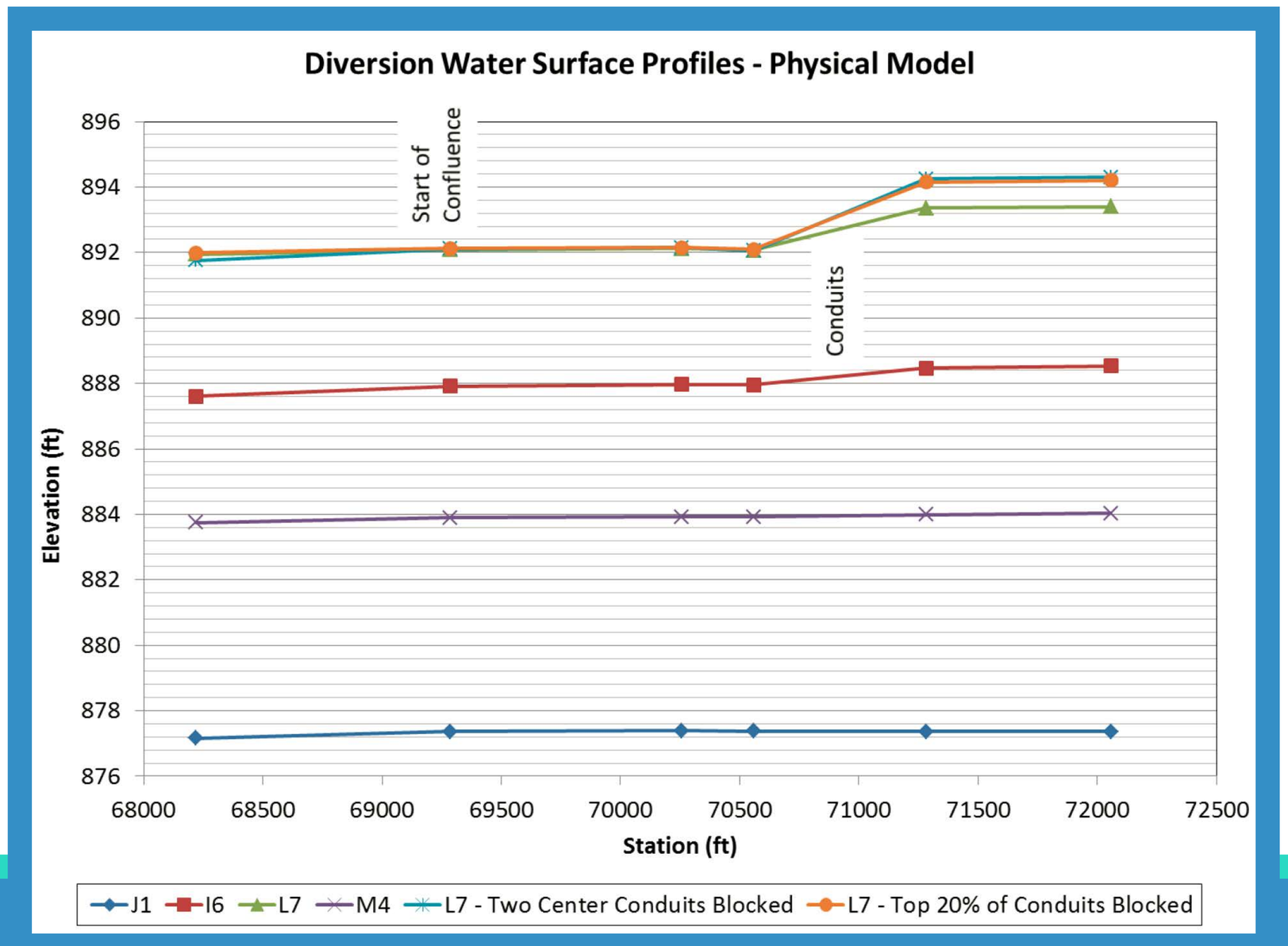
The model is an important **design tool that allows the designers to make observations and measurements that will improve the performance of the design**. Data collected here are "scaled up" to field scale and give accurate prediction of what can be anticipated in the final system.

Water Flow Measurement and Water Surface Control

- **Orifice plates** used to measure Diversion and Maple River inflow.
- **V-notch weir** measures Maple River Outflow.
- Diversion and Maple tail water set with adjustable gates.
- Real-time display of discharges and stage are displayed at data computer.

Water Surface Elevation

- Orifice Measured using local pressure taps poured in concrete.
- Measurements provides information on local water surface elevations and head losses.



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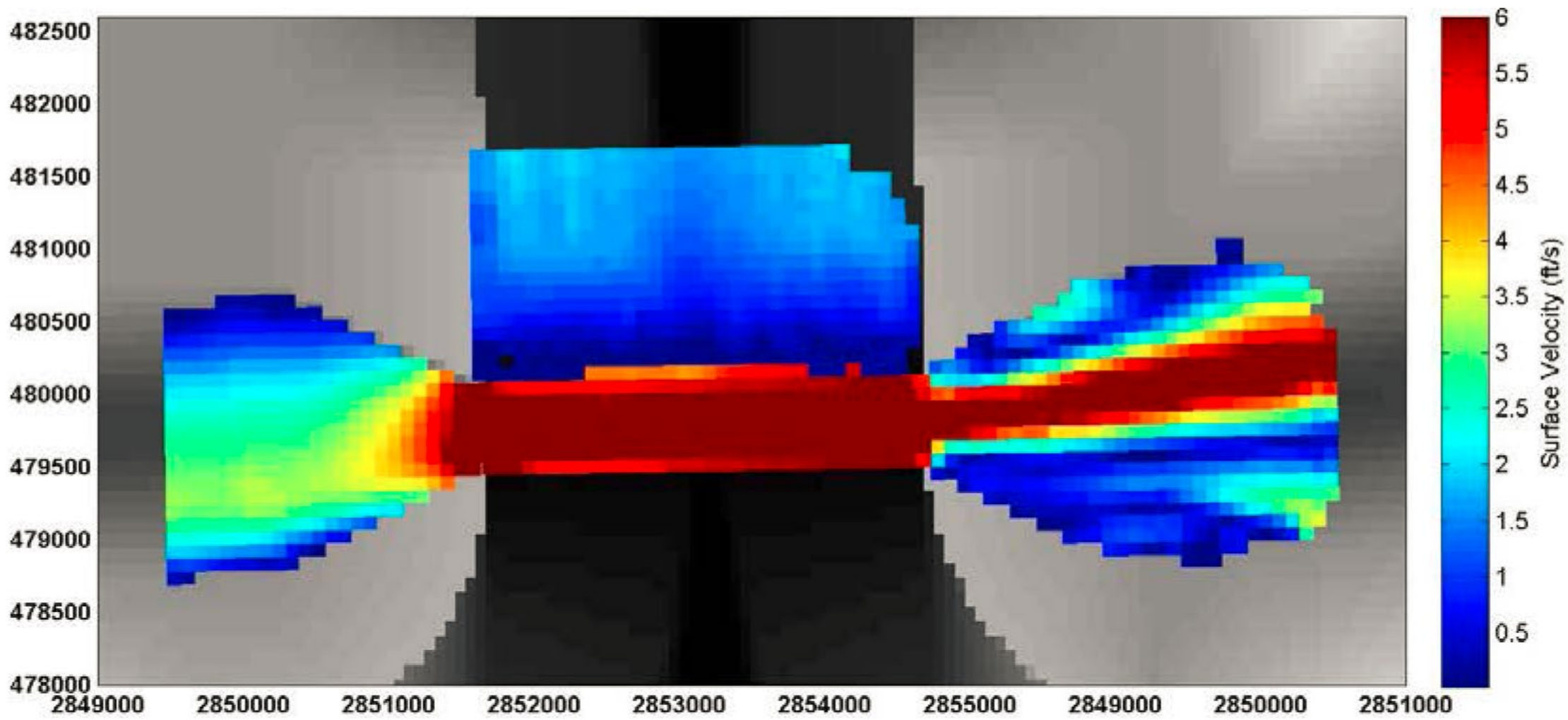
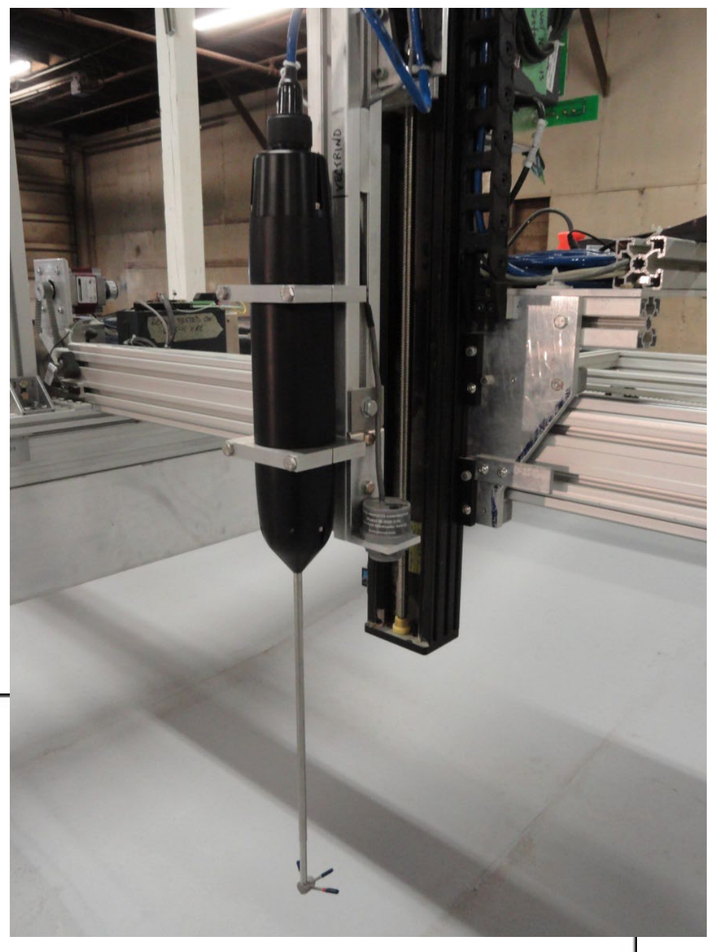
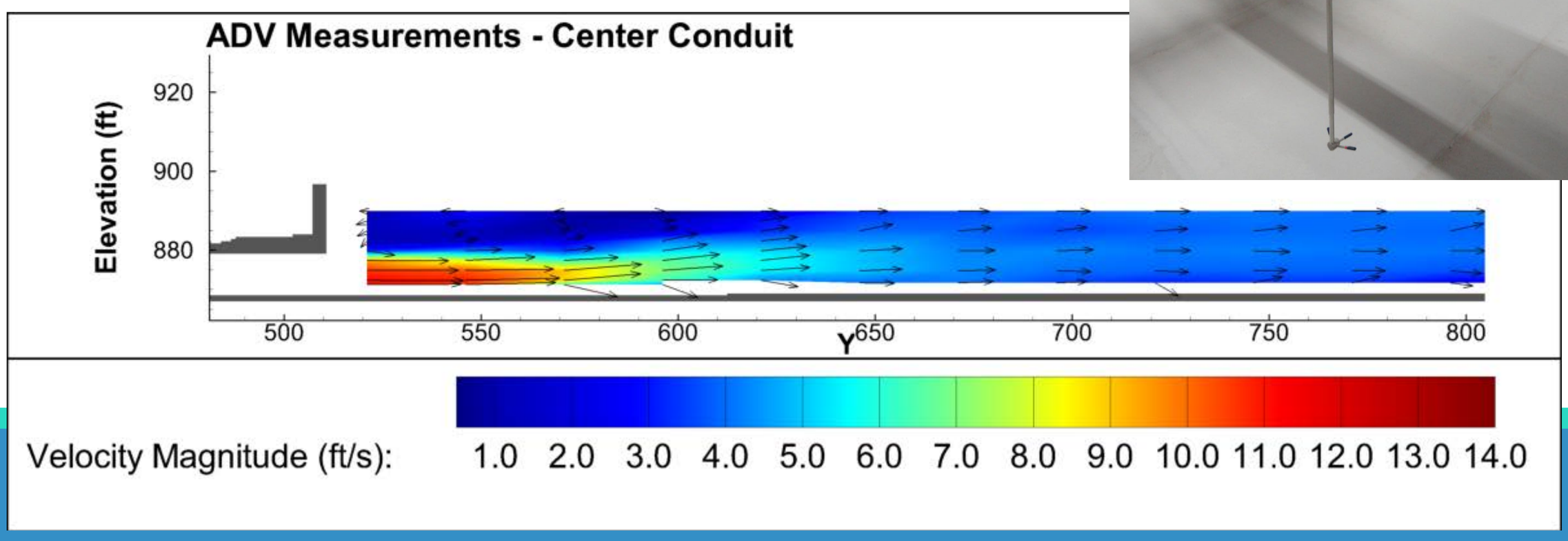
Water Surface Velocity Mapping (PIV)

- Particle Image Velocimetry (PIV) is a technique used to map movement of water surface.
- Floating particles (paper punches) are placed on water and overhead images are collected.
- Images are post-processed to created velocity maps.



Subsurface Velocity Measurement

- Acoustic Doppler Velocimeter (ADV) used for velocity below surface.
- ADV located by Data Acquisition Carriage.
- ADV samples 20 times per second.