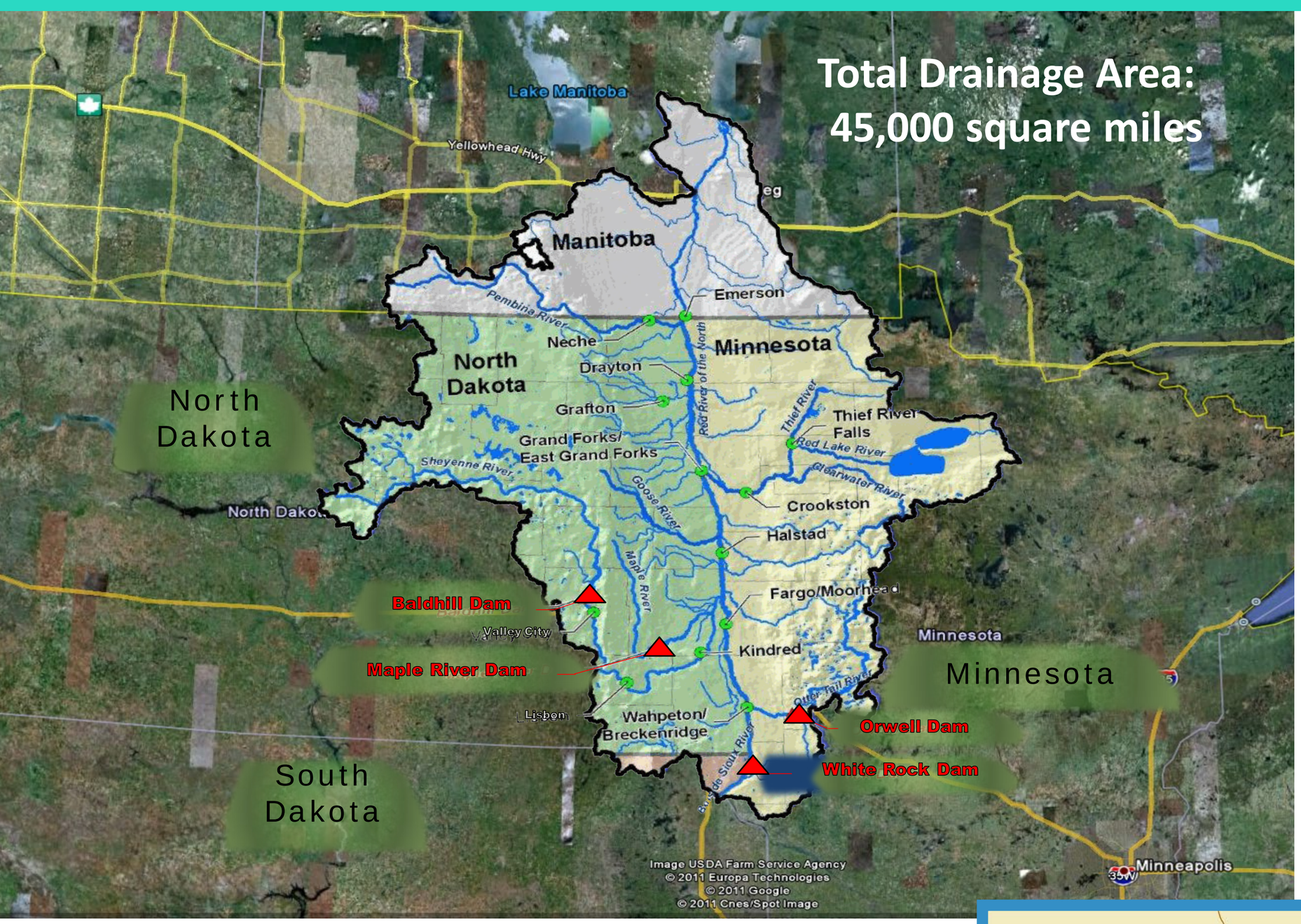
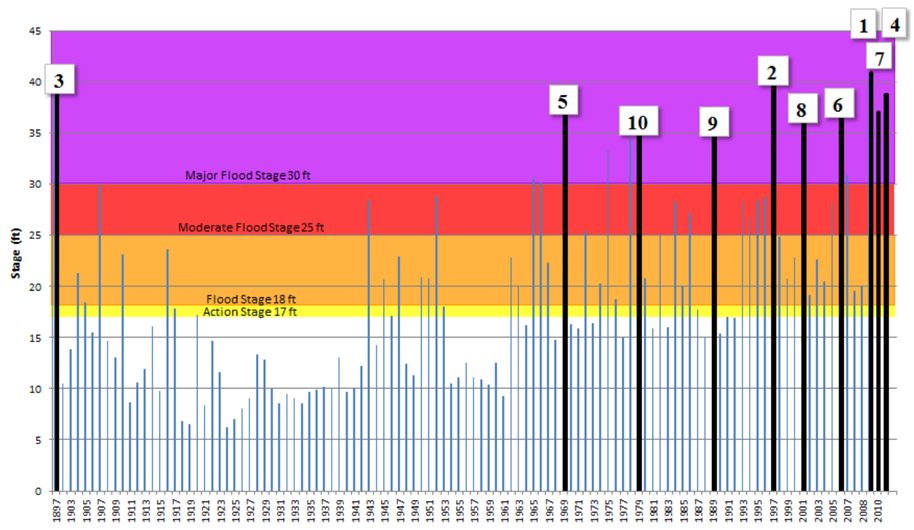
Fargo-Moorhead Metropolitan
FLOOD RISK MANAGEMENT



Hydrology and Hydraulics

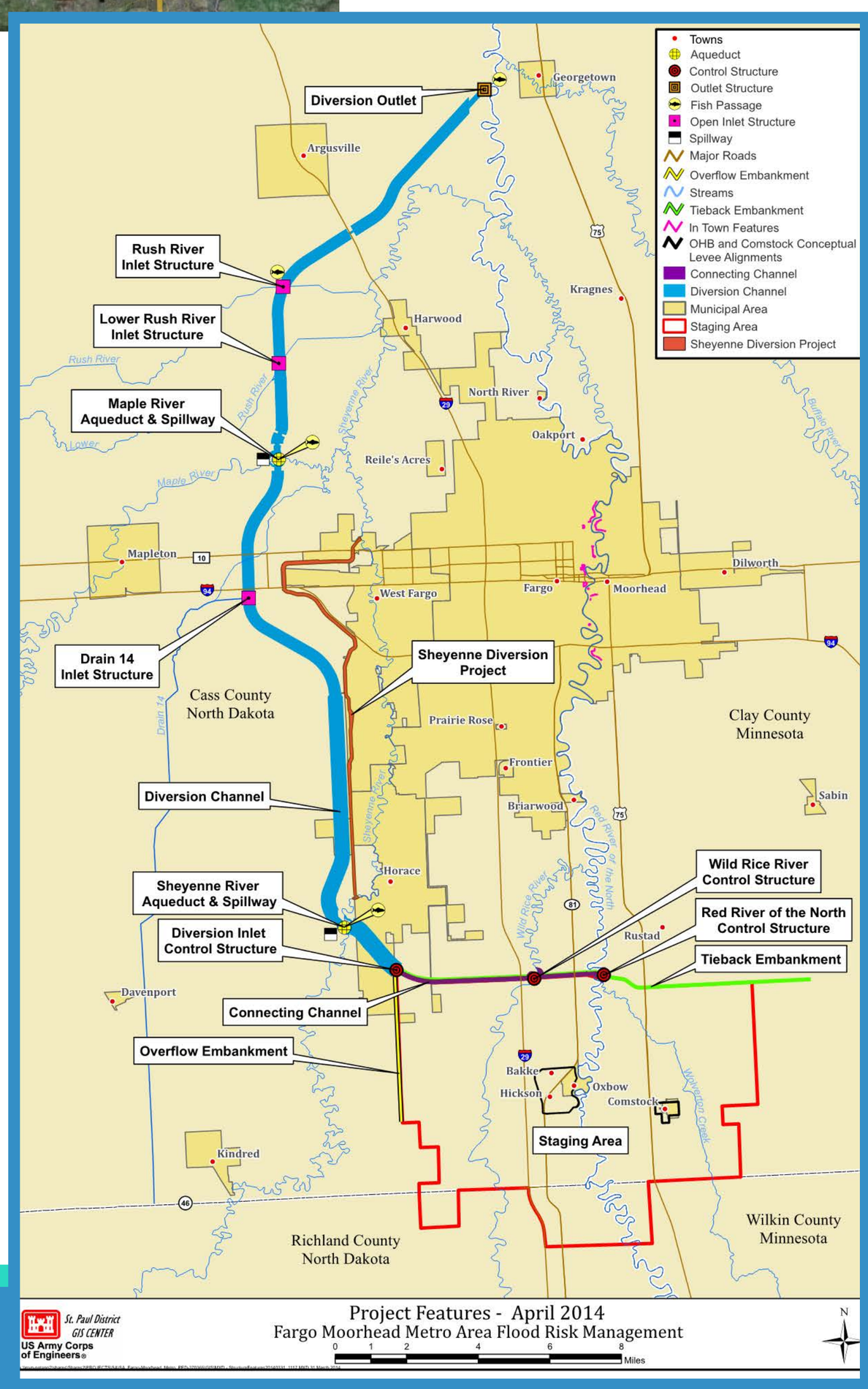
Hydrology

- Hydrology = the amount of flow
- Red River event of record 2009
  29,000 cfs at Fargo
- Maple River 100-year design flow 9,300 cfs



Hydraulics

- Hydraulics – flow depth and velocity
- Red River event of record 2009
  - 40.8 ft stage at Fargo
- Maple River 100-year existing condition depth and velocity are generally 16 ft deep and 6 ft per second in the vicinity of the aqueduct.



Fargo-Moorhead Metropolitan
FLOOD RISK MANAGEMENT

1-Dimensional Hydraulic Model

1-D Hydraulic Input

- Flows
- Geometry
- Roughness
- Downstream boundary condition

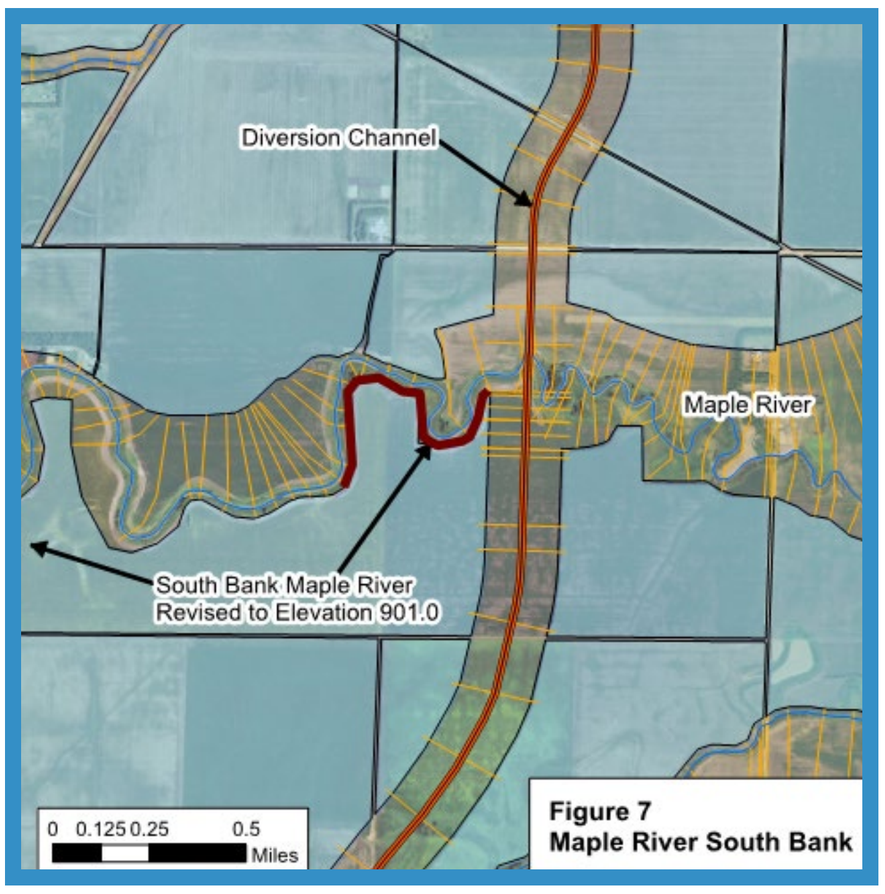
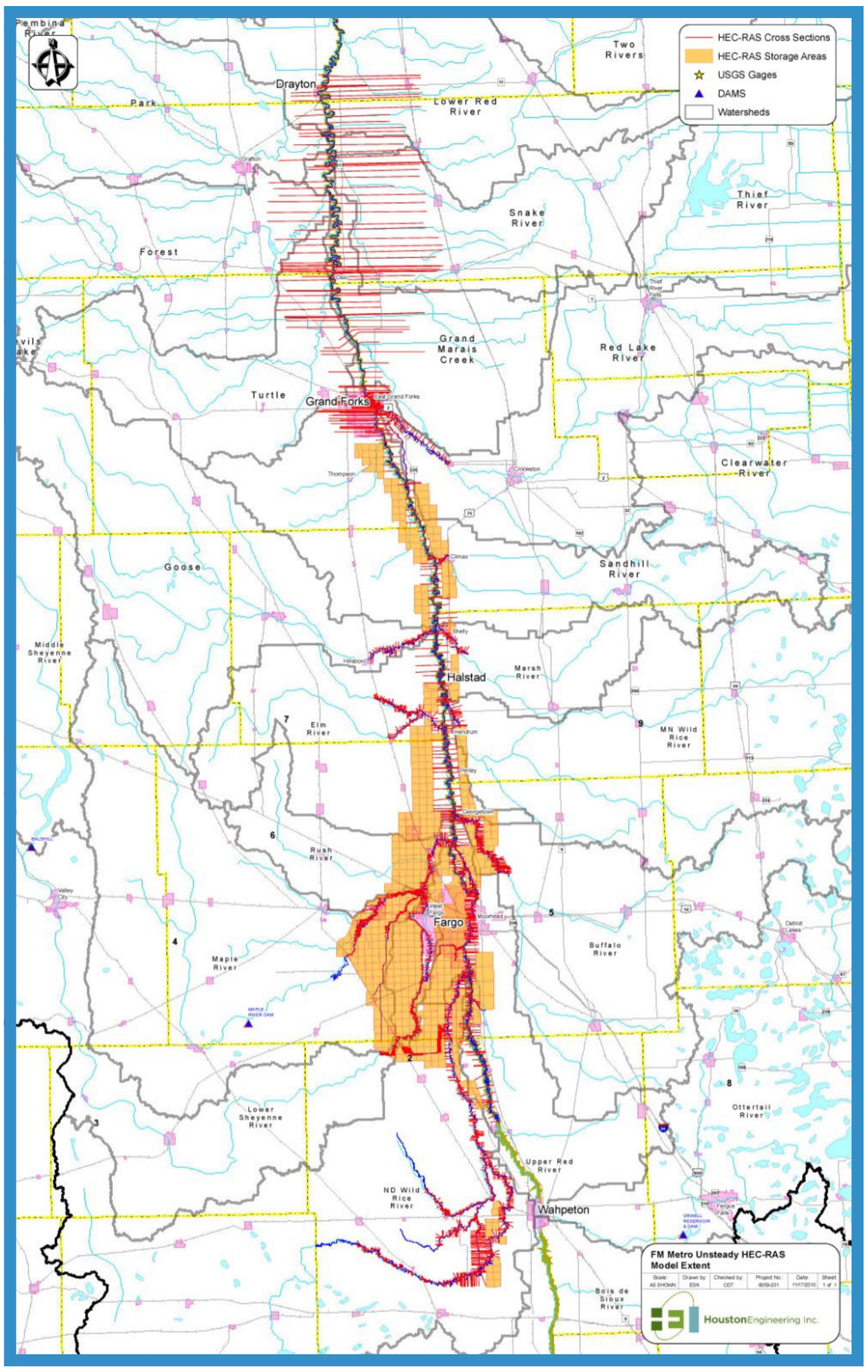
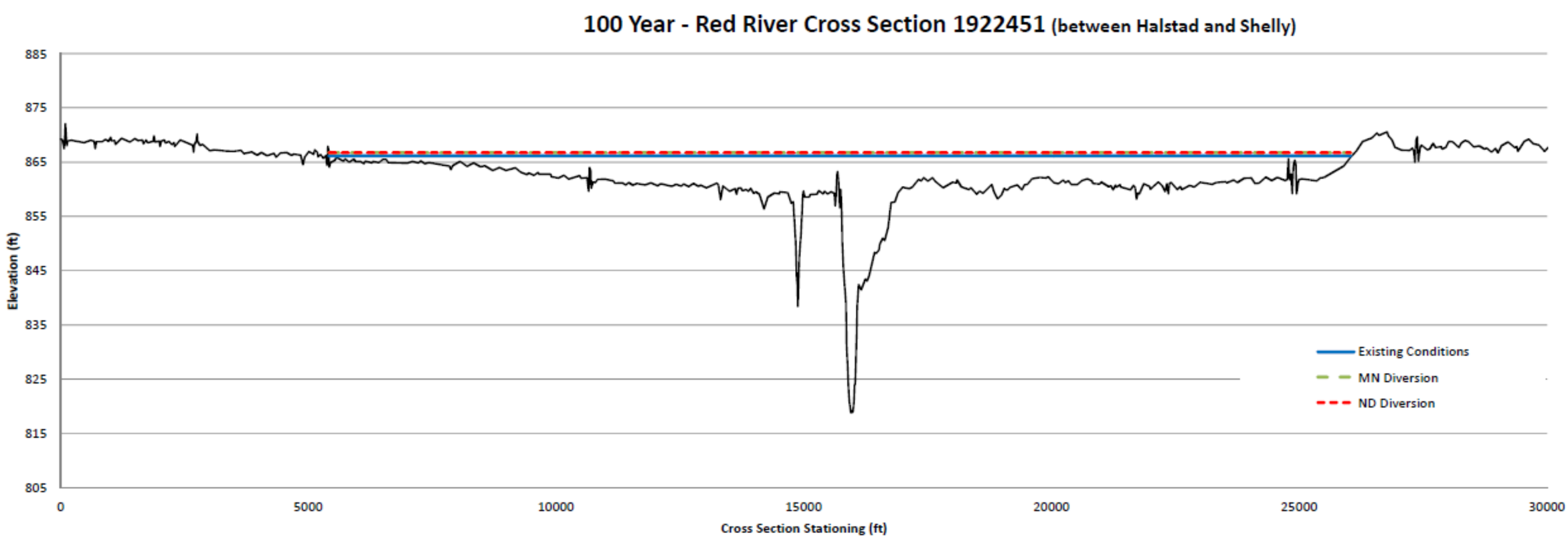


Figure 7
Maple River South Bank



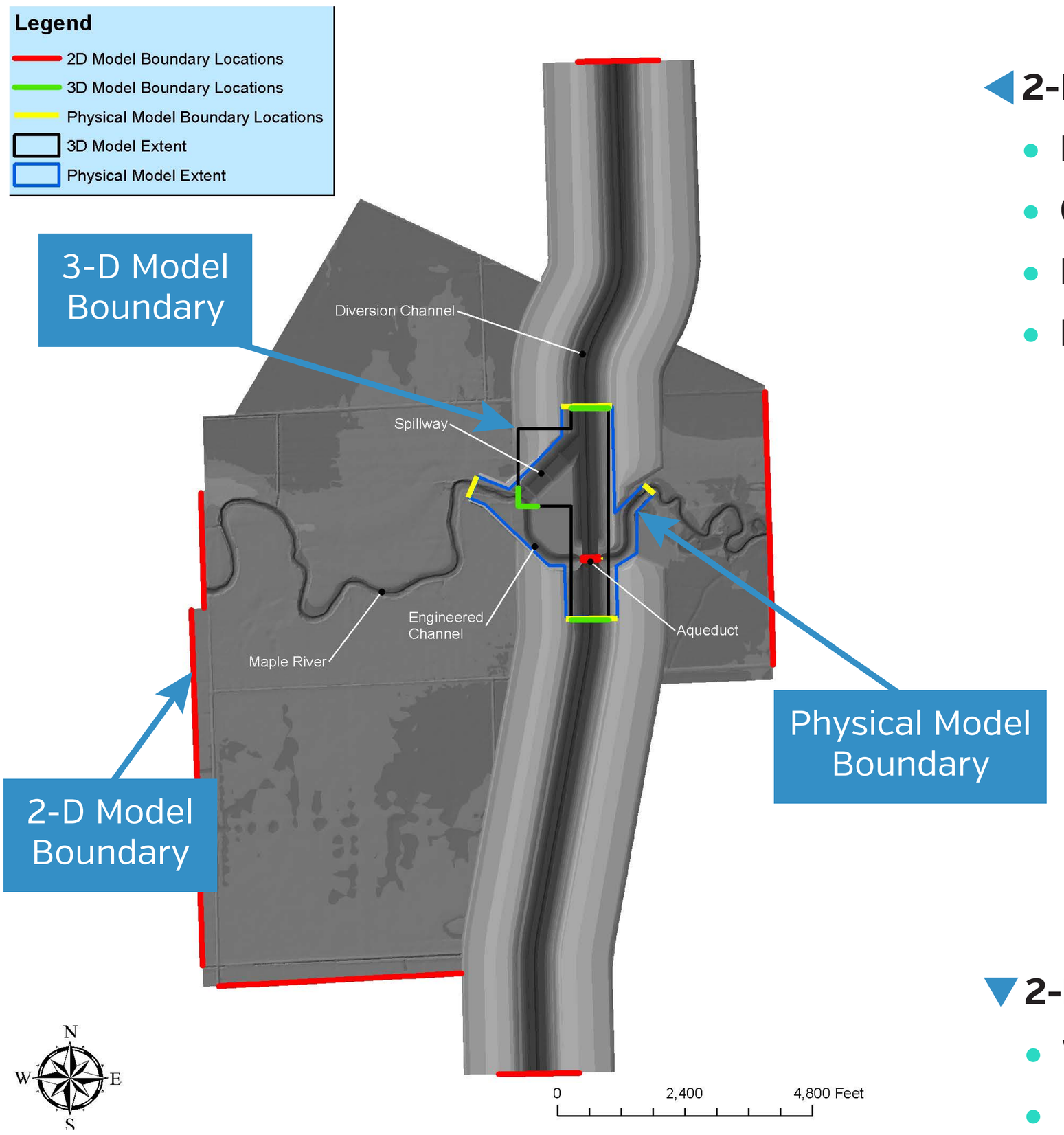
1-D Hydraulic Ouput

- Water surface elevation
- Depth
- Velocity



Fargo-Moorhead Metropolitan
FLOOD RISK MANAGEMENT

2-Dimensional Hydraulic Model

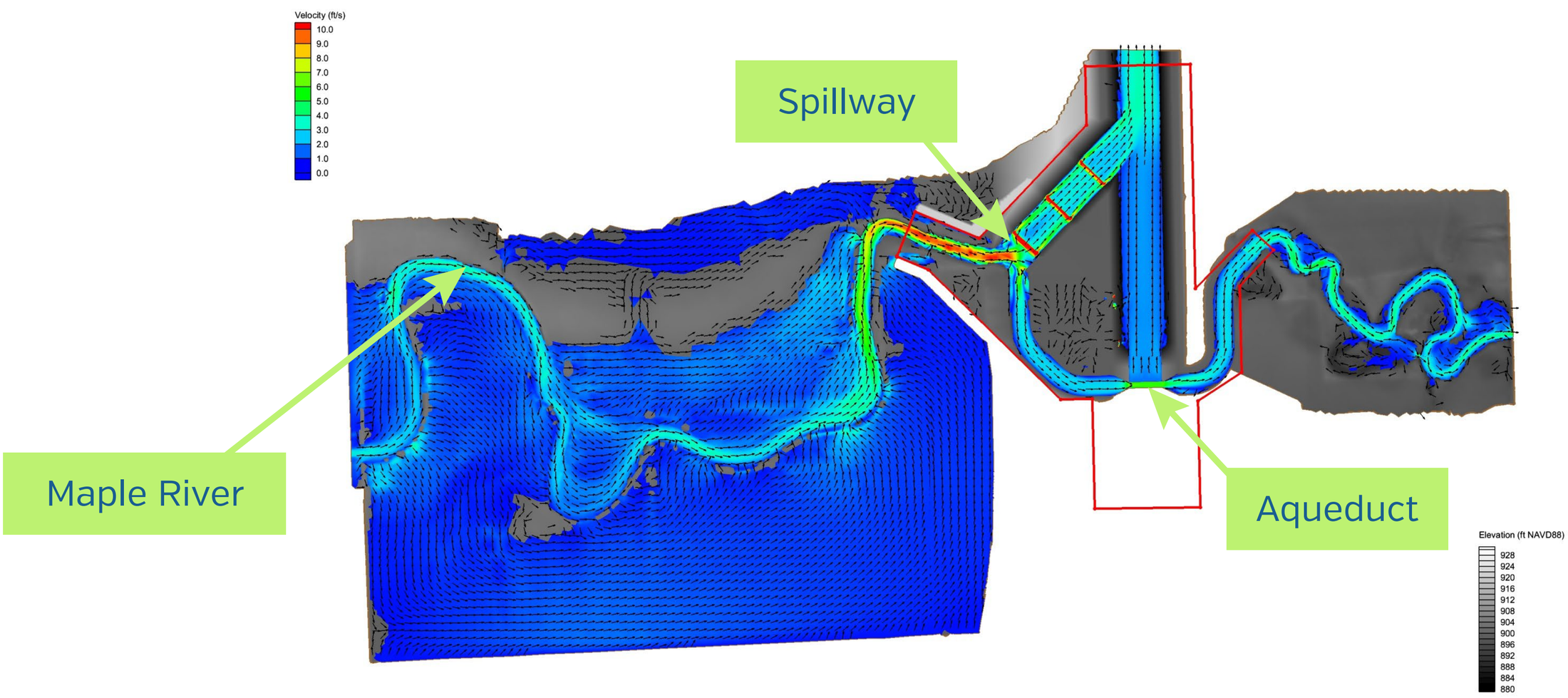


2-D Hydraulic Input

- Flows
- Geometry
- Roughness
- Downstream boundary condition

2-D Hydraulic Ouput

- Water surface elevation
- Depth
- Velocity



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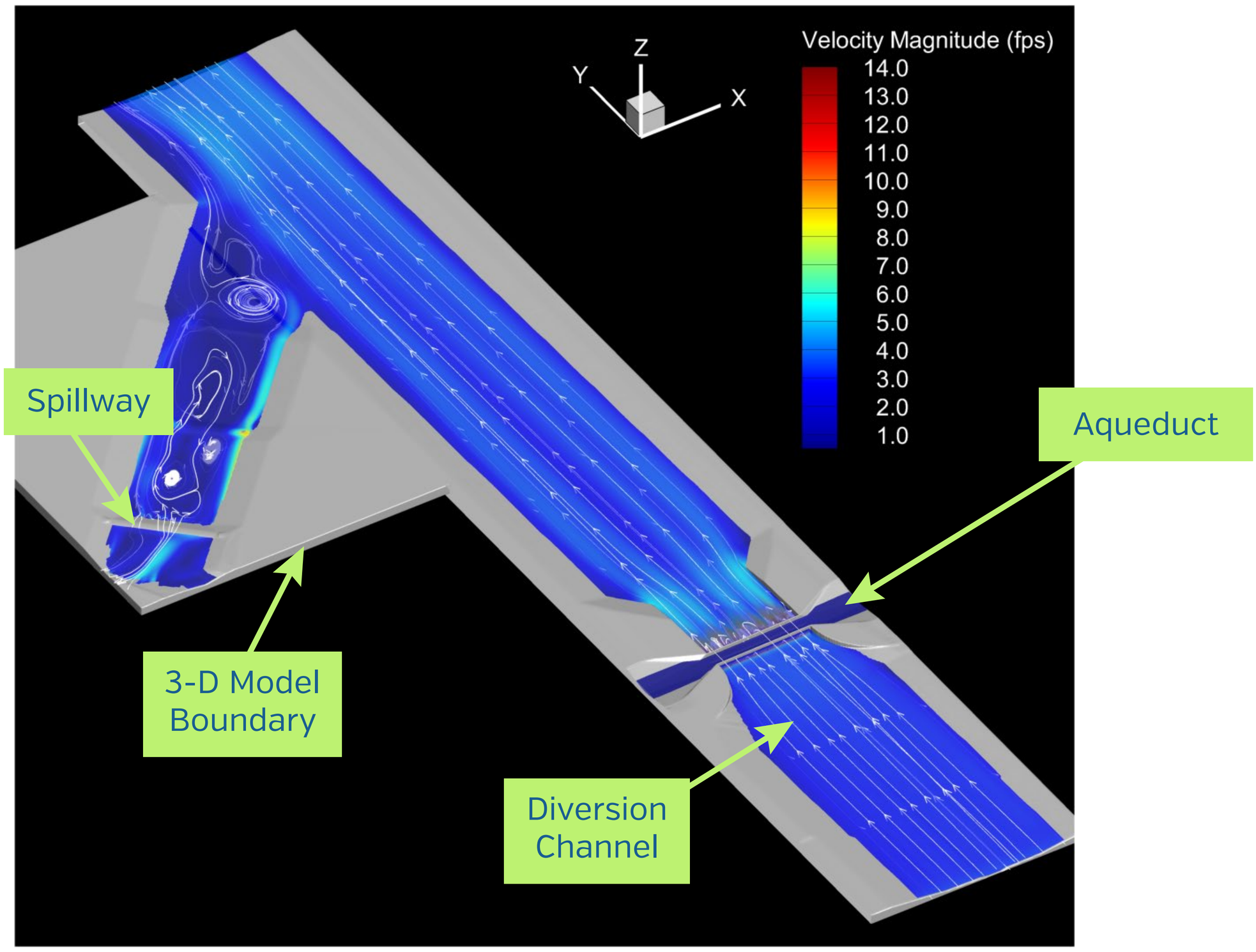
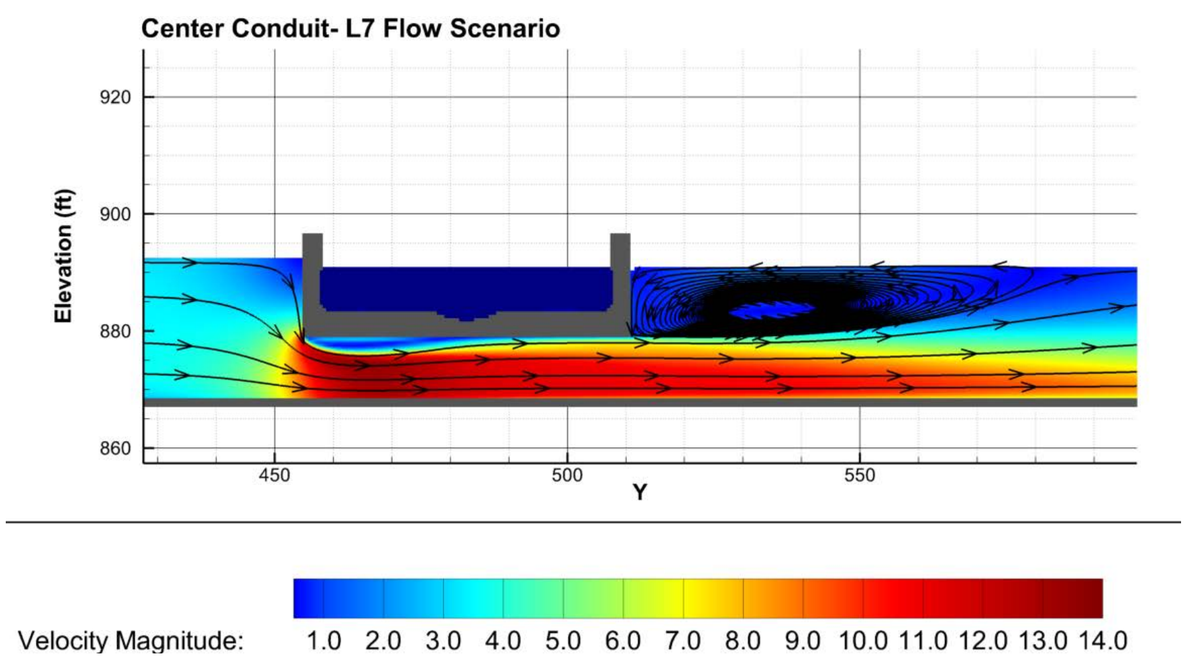
FLOOD RISK MANAGEMENT

3-Dimensional Hydraulic Model



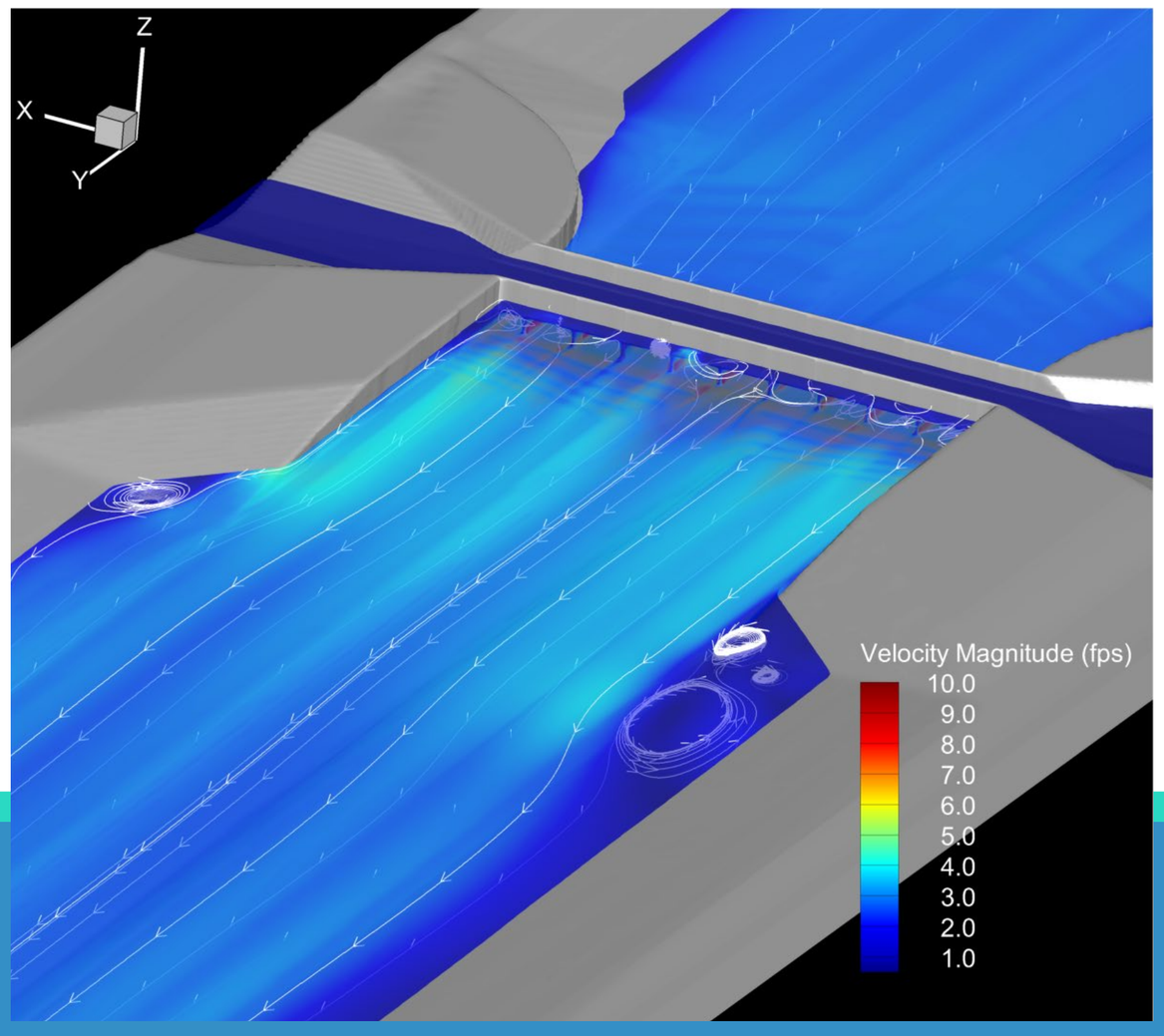


3-D Hydraulic Input

- Depth
- Flow
- Downstream boundary condition

3-D Hydraulic Ouput

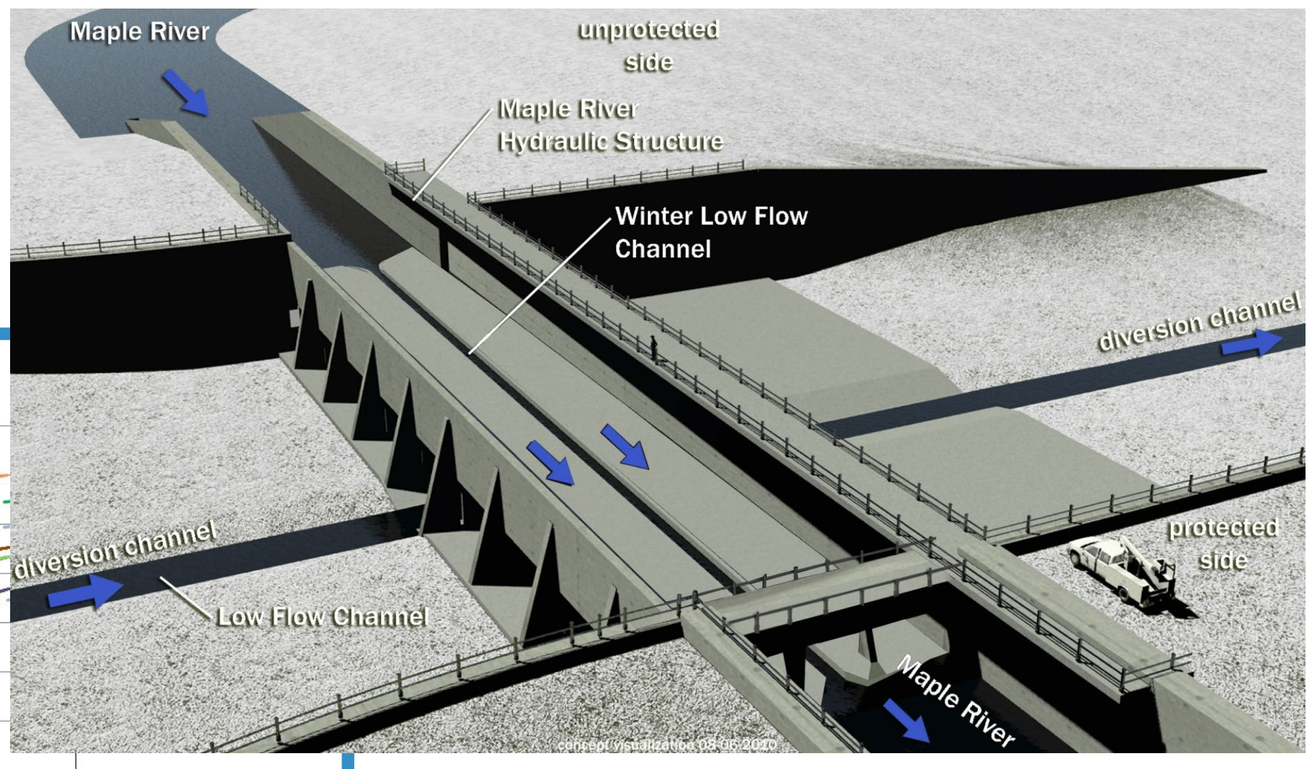
- Water surface elevation
- Depth
- Velocity
- Turbulence characteristics



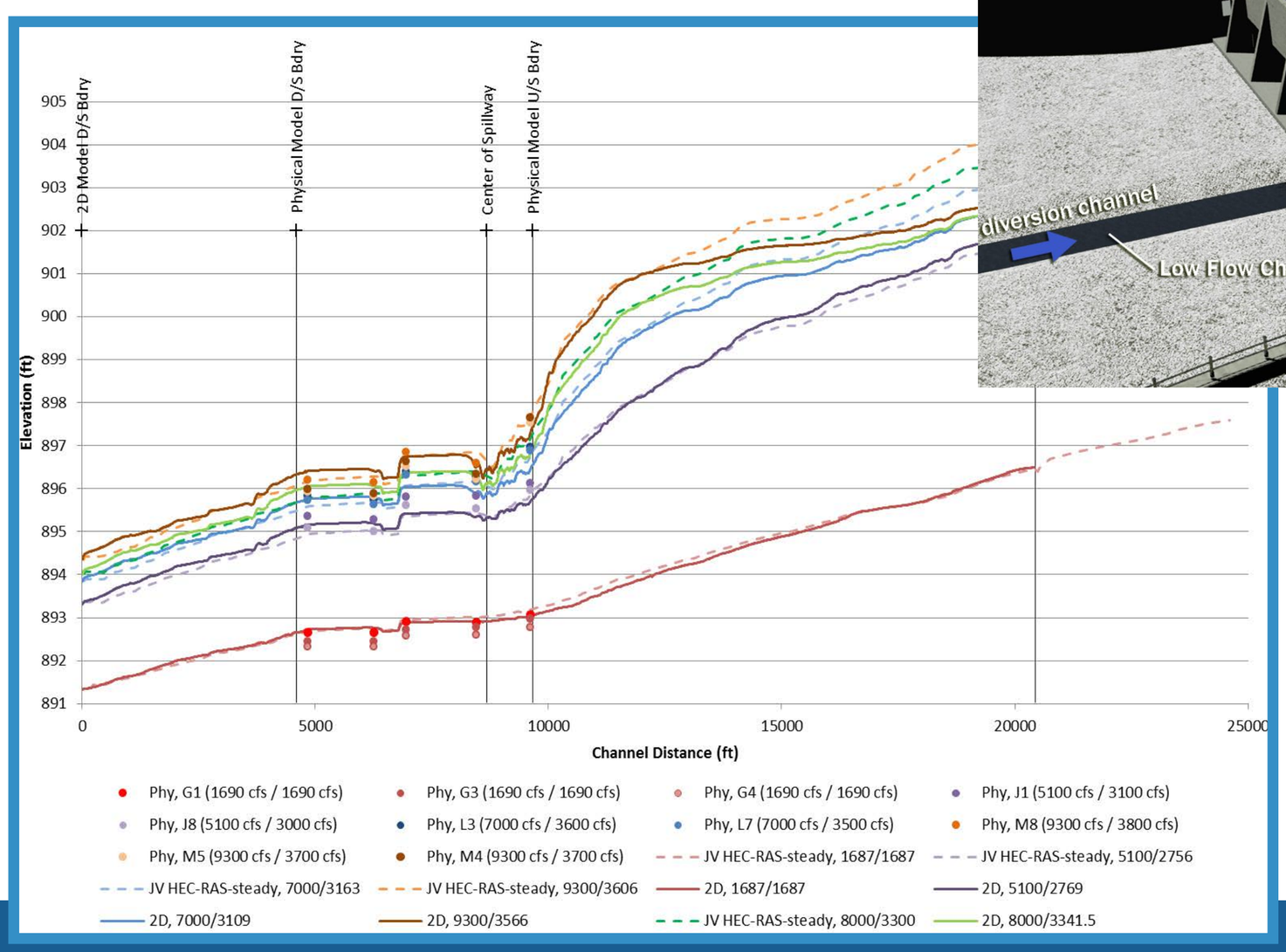
Fargo-Moorhead Metropolitan
FLOOD RISK MANAGEMENT

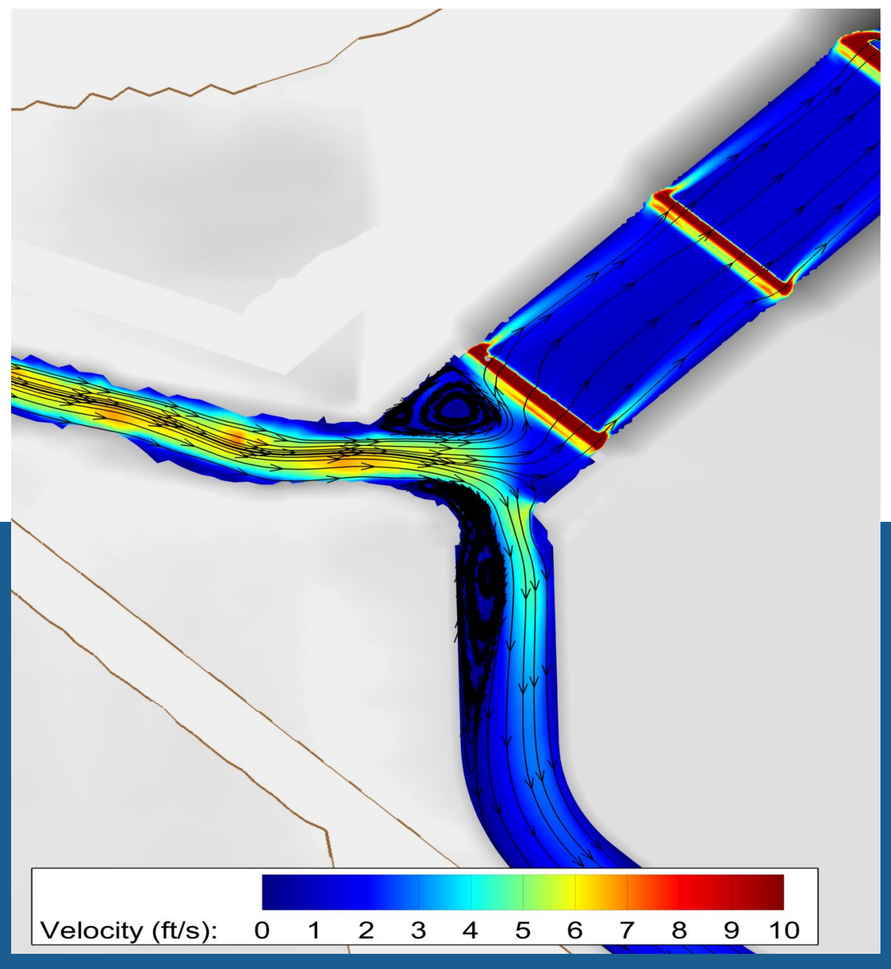
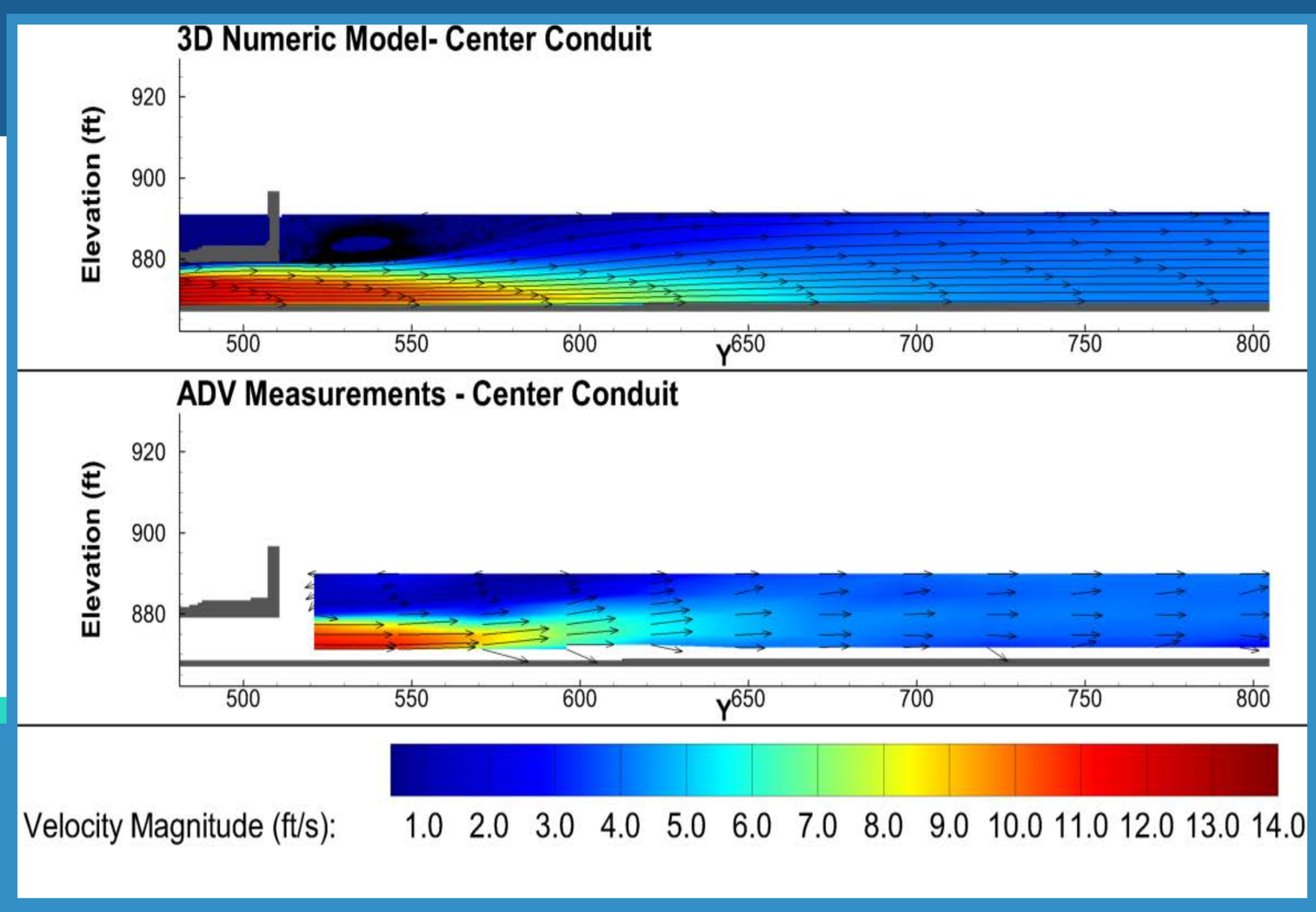
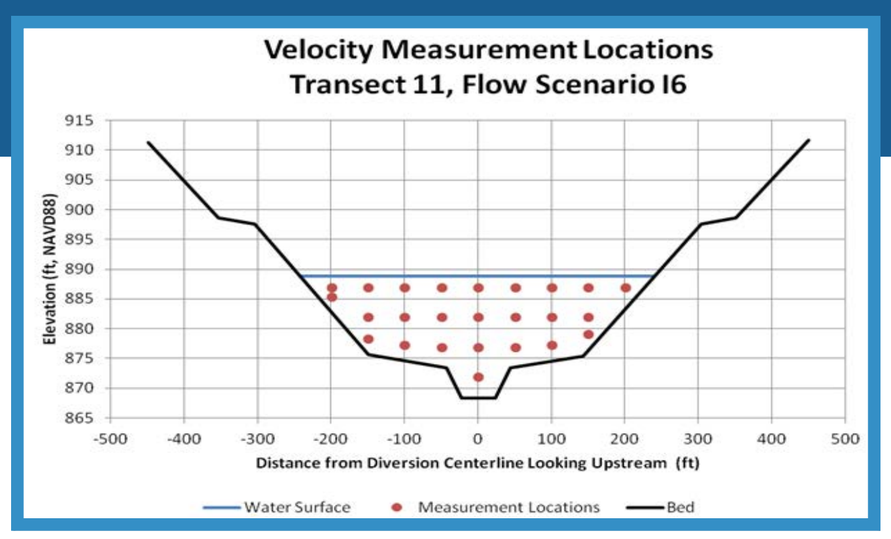
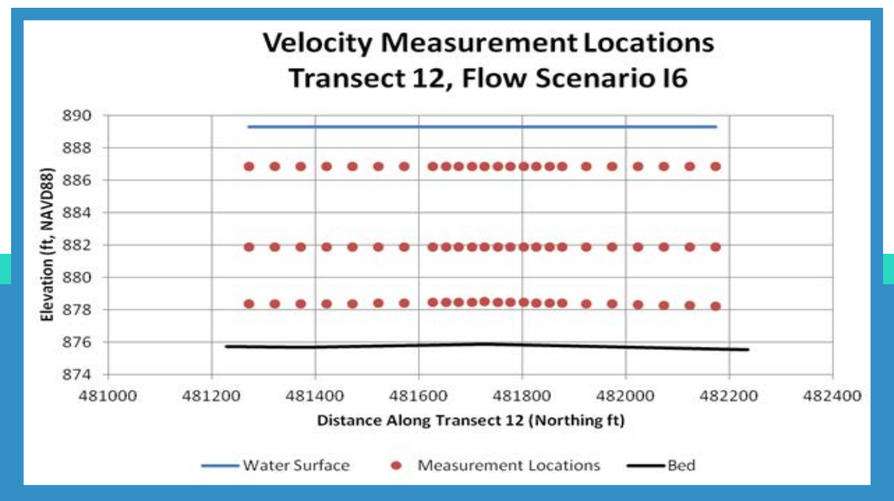
Hydraulic Model Comparison

- Numeric models used for design optimization



WSEL Comparison Between 1-D and 2-D Modeling





- 1-D model – large scale model of the area
- 2-D model - identifies flow split and erosive flows
- 3-D model - assesses flow through conduits and turbulence in the diversion channel
- Physical model used for model validation and detailed results