Fargo-Moorhead Metropolitan
FLOOD RISK MANAGEMENT

Path Forward

- Model testing and final documentation are scheduled to be complete in December.
- Preparation of plans and specifications for the aqueduct structure and appurtenant structures, and 7,700 feet of diversion channel, will begin in September.

Artist's rendering of aqueduct

Challenges

- The Fargo-Moorhead Metropolitan Flood Risk Management Project was **authorized by Congress on June 10, 2014**. Funding is available to continue design of the Maple River Aqueduct, however, construction funding will need to be appropriated by Congress before construction can begin.
- Initial test results from the Maple River model have already indicated some potential design changes, most significantly the alignment of the spillway.
- Two aspects of the Maple River Aqueduct are noteworthy:
    - The extreme cold associated with Fargo-Moorhead area.
    - The aqueduct will carry a natural river over a man-made channel. Most aqueducts carry the man-made channel over a natural river.

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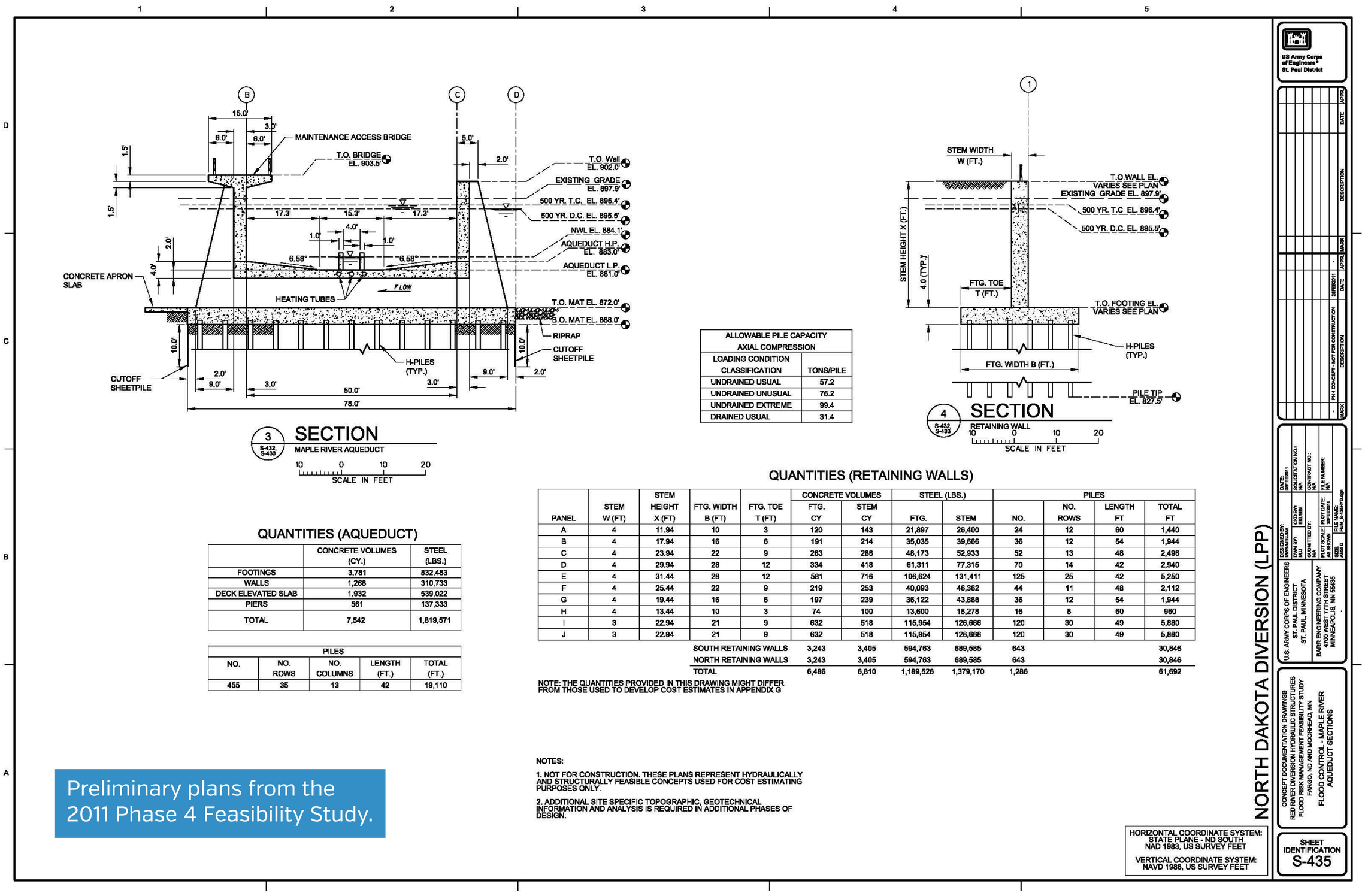
Design, Plans and Specifications

- A significant amount of design will need to be completed on the aqueduct, spillway, and diversion channel.

- Design is expected to take one to two years to complete. The overall cost for design and construction of Reach 7, including the aqueduct, is approximately $80 - $120 million.

- Additional investigations could include surveys, geotechnical borings, pile load testing, additional hydraulic modeling.



ALLOWABLE PILE CAPACITY AXIAL COMPRESSION	
LOADING CONDITION CLASSIFICATION	TONS/PILE
UNDRAINED USUAL	57.2
UNDRAINED UNUSUAL	76.2
UNDRAINED EXTREME	99.4
DRAINED USUAL	31.4

QUANTITIES (AQUEDUCT)

	CONCRETE VOLUMES (CY.)	STEEL (LBS.)
FOOTINGS	3,781	832,483
WALLS	1,268	310,733
DECK ELEVATED SLAB	1,932	539,022
PIERS	561	137,333
TOTAL	7,542	1,819,571

PILES				
NO.	NO. ROWS	NO. COLUMNS	LENGTH (FT.)	TOTAL (FT.)
455	35	13	42	19,110

QUANTITIES (RETAINING WALLS)

PANEL	STEM W (FT)	STEM HEIGHT X (FT)	FTG. WIDTH B (FT)	FTG. TOE T (FT)	CONCRETE VOLUMES FTG. CY	CONCRETE VOLUMES STEM CY	STEEL (LBS.) FTG.	STEEL (LBS.) STEM	PILES NO.	PILES NO. ROWS	PILES LENGTH FT	PILES TOTAL FT
A	4	11.94	10	3	120	143	21,897	26,400	24	12	60	1,440
B	4	17.94	16	6	191	214	35,035	39,666	36	12	54	1,944
C	4	23.94	22	9	263	286	48,173	52,933	52	13	48	2,496
D	4	29.94	28	12	334	418	61,311	77,315	70	14	42	2,940
E	4	31.44	28	12	581	716	106,624	131,411	125	25	42	5,250
F	4	25.44	22	9	219	253	40,093	46,362	44	11	48	2,112
G	4	19.44	16	6	197	239	36,122	43,888	36	12	54	1,944
H	4	13.44	10	3	74	100	13,600	18,278	16	8	60	960
I	3	22.94	21	9	632	518	115,954	126,666	120	30	49	5,880
J	3	22.94	21	9	632	518	115,954	126,666	120	30	49	5,880
SOUTH RETAINING WALLS					3,243	3,405	594,763	689,585	643			30,846
NORTH RETAINING WALLS					3,243	3,405	594,763	689,585	643			30,846
TOTAL					6,486	6,810	1,189,526	1,379,170	1,286			61,692

NOTE: THE QUANTITIES PROVIDED IN THIS DRAWING MIGHT DIFFER FROM THOSE USED TO DEVELOP COST ESTIMATES IN APPENDIX G

NOTES:

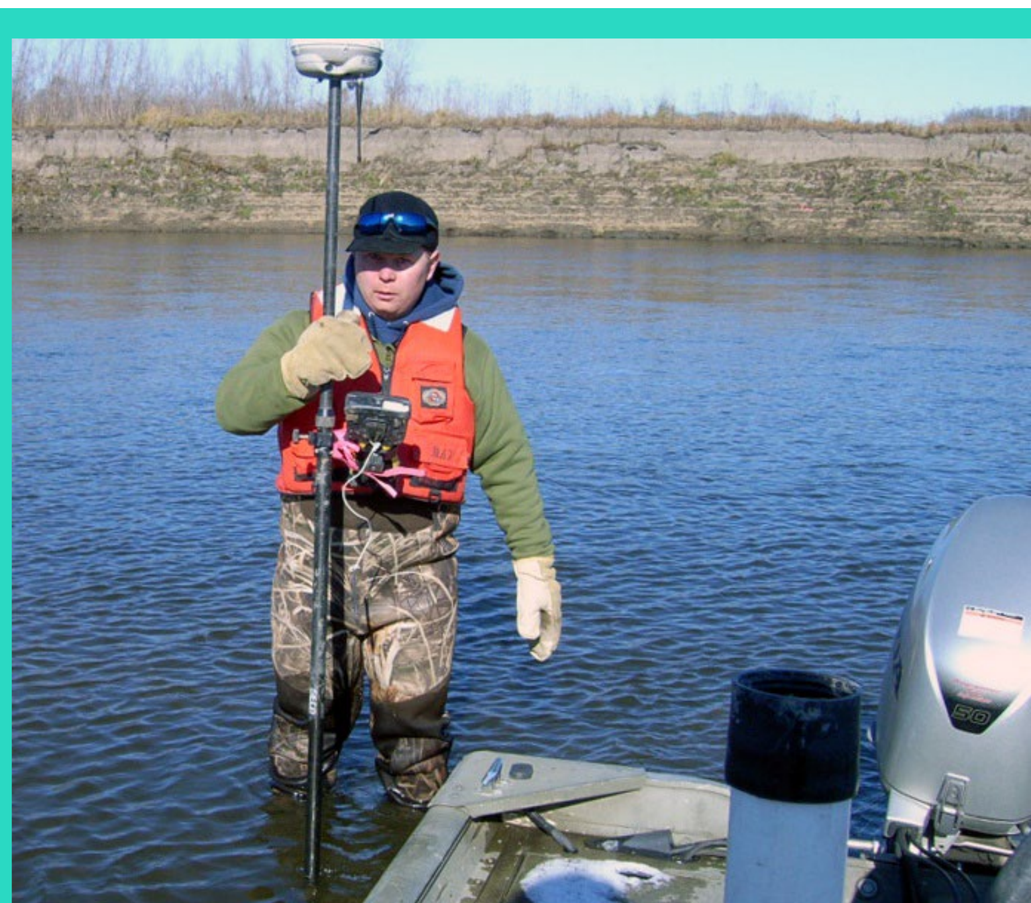
1. NOT FOR CONSTRUCTION. THESE PLANS REPRESENT HYDRAULICALLY AND STRUCTURALLY FEASIBLE CONCEPTS USED FOR COST ESTIMATING PURPOSES ONLY.

2. ADDITIONAL SITE SPECIFIC TOPOGRAPHIC, GEOTECHNICAL INFORMATION AND ANALYSIS IS REQUIRED IN ADDITIONAL PHASES OF DESIGN.

HORIZONTAL COORDINATE SYSTEM: STATE PLANE - ND SOUTH NAD 1983, US SURVEY FEET

VERTICAL COORDINATE SYSTEM: NAVD 1988, US SURVEY FEET

Preliminary plans from the 2011 Phase 4 Feasibility Study.



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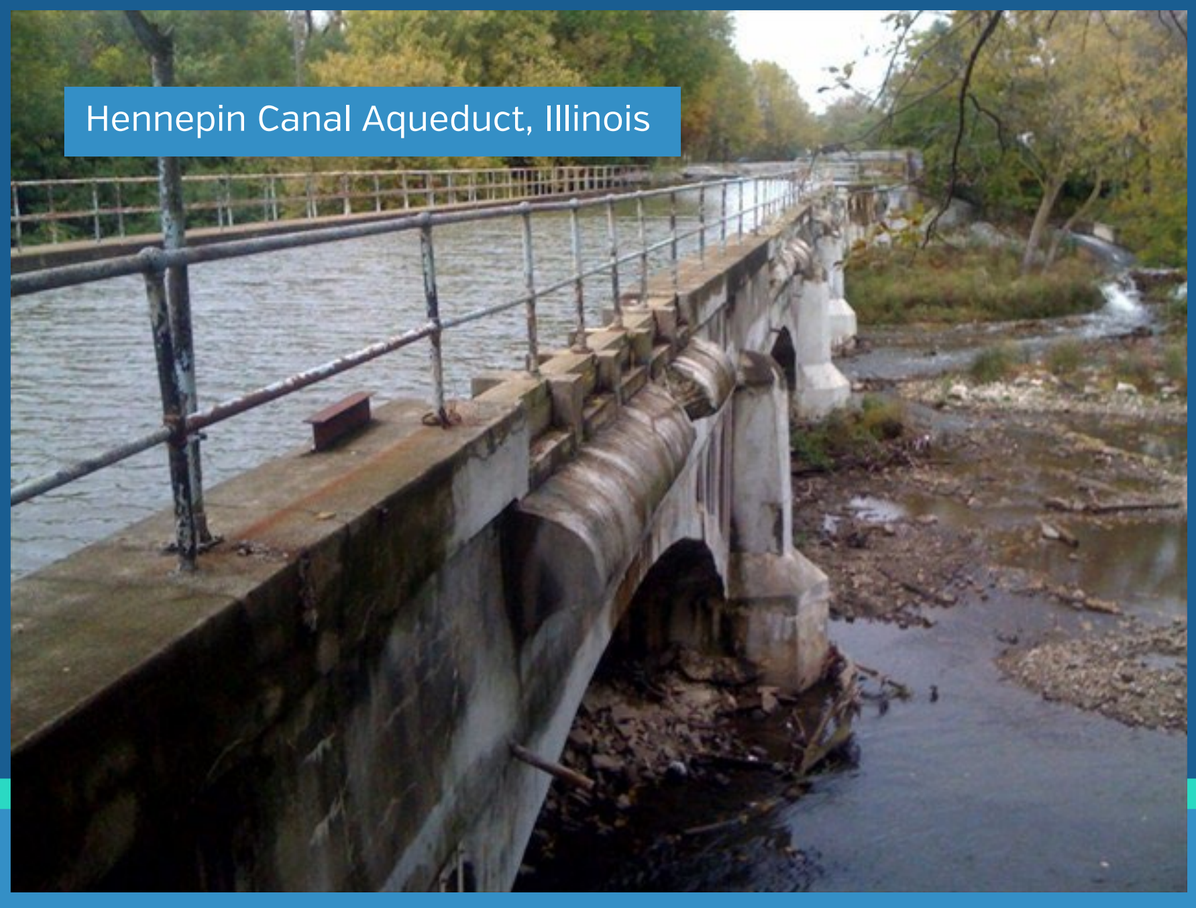
Existing Aqueducts

Pont du Gard, France

Nine Mile Creek Aqueduct, New York


Hennepin Canal Aqueduct, Illinois

Superpassage, India

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Design, Plans and Specifications

- Optimum geometry of aqueduct, spillway and engineered channels.
- Areas where erosion would be a concern.
- Areas where ice buildup in the channel will create problems.
- What the effect of debris blocking a portion of the diversion channel below the aqueduct is.
- Water velocities in the spillway, to determine what material can be used to line the spillway.
- How to maintain fish passage along the Maple River and across the aqueduct.
- How to safely pass maximum design floods into the diversion channel while still maintaining flow in the Maple River for normal conditions.
- Whether numerical modeling can be used to design the Sheyenne River Aqueduct without having to construct another physical model.