

February 13, 2024

NORTH PLATTE RIVER CHOKEPOINT
ANDERSON CONSULTING ENGINEERS, INC.
RIVER WORKS, LTD

NORTH PLATTE CHOKEPOINT

FEBRUARY 13, 2024

MEETING OVERVIEW



Purpose: Project Status, Review and Discuss Chokepoint Alternatives



Chokepoint Project Overview



Presentation of Chokepoint Alternatives – Anderson Consulting Team



Discussion and Feedback from Workgroup

PROJECT GOALS AND OBJECTIVES

Project Goal

Identify and screen alternative solutions to increase hydraulic capacity through the chokepoint and/or provide delivery of flows downstream of the chokepoint through other systems.

Project Objectives

1. Identify, screen, and rank past and potential new alternatives
2. Update and calibrate baseline models.
3. Conduct detailed hydraulic and/or sediment transport modeling as needed
4. Complete assessment of permitting requirements, estimated costs, and implementation timeline for selected alternatives.

PROJECT APPROACH

Phase I

Project Kickoff



Review of Previous
Studies/Alternatives



Alternative Full List 2005-2023
Initial Screening



Alternatives Short List
Selected for Phase II



Phase II

Geomorphic Investigation,
Field Work, and Existing Modeling

Evaluation of Short List
Bring Short List to Equal Level of Eval
Leverage Previous Alts Info
Develop Evaluation of New Alts



Light Multi Criterion
Decision Analysis



Alternatives Selection for Phase III

Phase III

Detailed Alternative Development

Technical Analysis/Conc Design
2D Hydraulic and Sediment Transport /
Morphodynamic Modeling

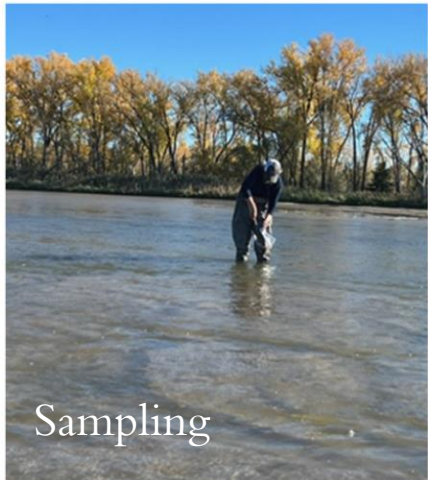
Multi Criterion
Decision Analysis

Alternative Selection

EDO and Chokepoint
Planning Workgroup

PROJECT UPDATE

- October Field Work - Completed
- Geomorphic Analyses - Ongoing
- Development of SRH-2D Hydraulic and Morphodynamic Model-Ongoing
- Phase II Alternative Evaluation - Completed



FIELD WORK

- Survey of 50 Channel Cross Section (TC Engineering)
- Meeting with CNPPID at Tri-County Diversion
- Floated 9 miles of the Chokepoint Study Reach
- Collected 12 Bed Material Samples
- Visited road crossings and diversion structures between Lake McConaughey and Chokepoint Study Reach

GEOMORPHIC ASSESSMENT

- Morphology

Historic Changes using Aerial Photography/GIS (1938, 58, 65, 74, 81, 93, 99, 2020)

Channel Lengths, Area of Active Channel, Sinuosity

Existing Channel Geometry (2011, 2017, 2020, 2023): Width, Depth, Slope

Relative Elevation Model using 2017 LiDAR

- Bed Material

- Hydrology

Specific Gage Analysis, Flow Duration, Flood Freq, Annual Peaks/Volume

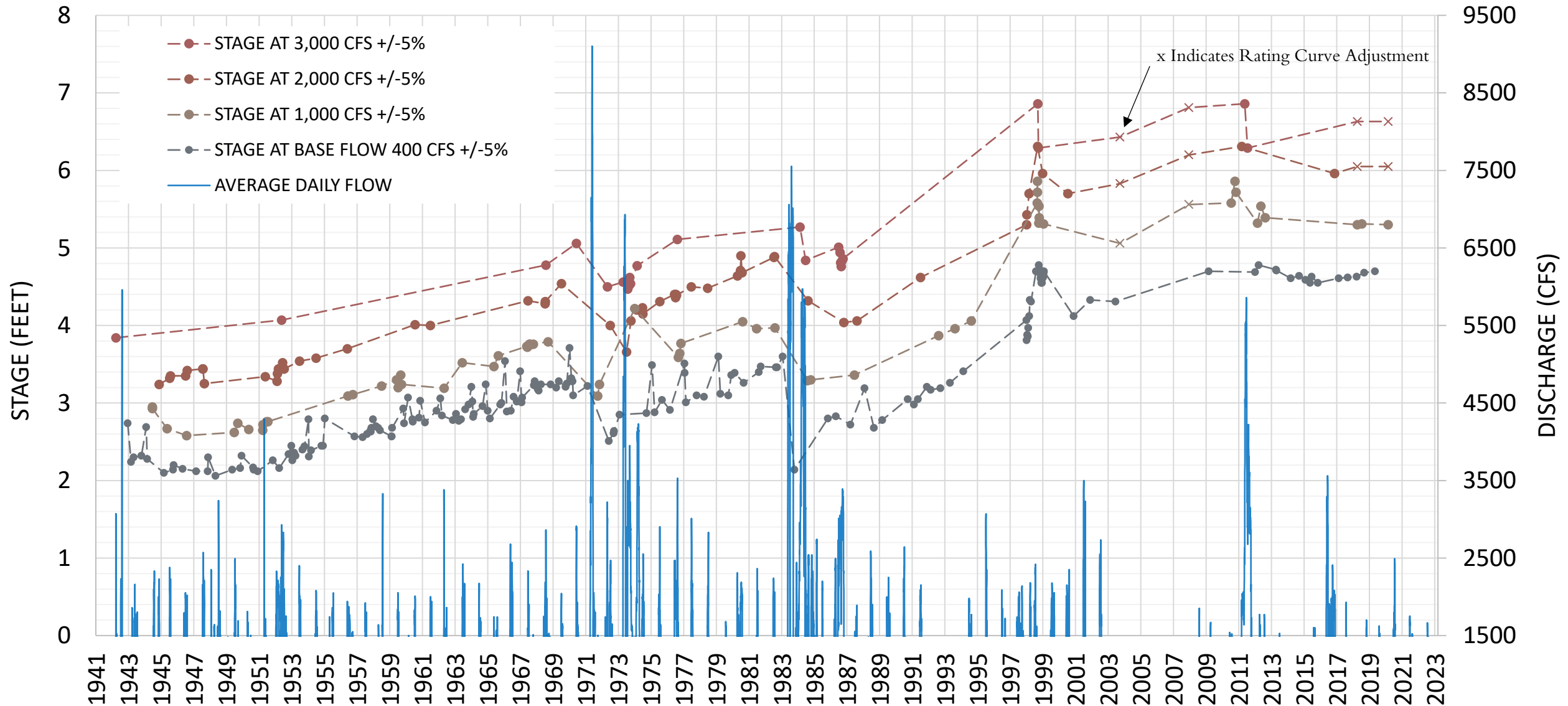
- Hydraulics

Water Surface Profiles, Depth, Velocity, Shear Stress

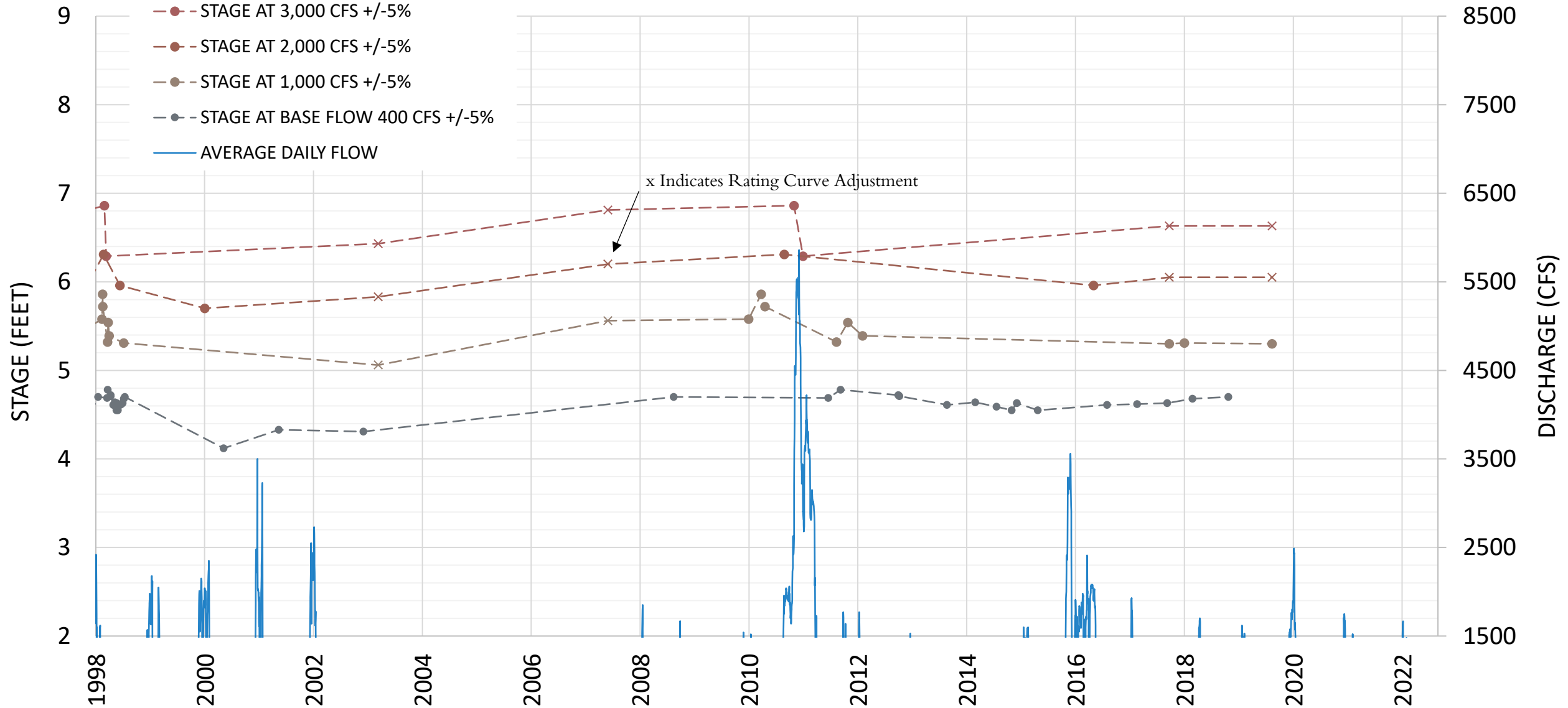
- Sediment Continuity

Trends in Mass Bed Change (2011 vs 2017 vs 2023)

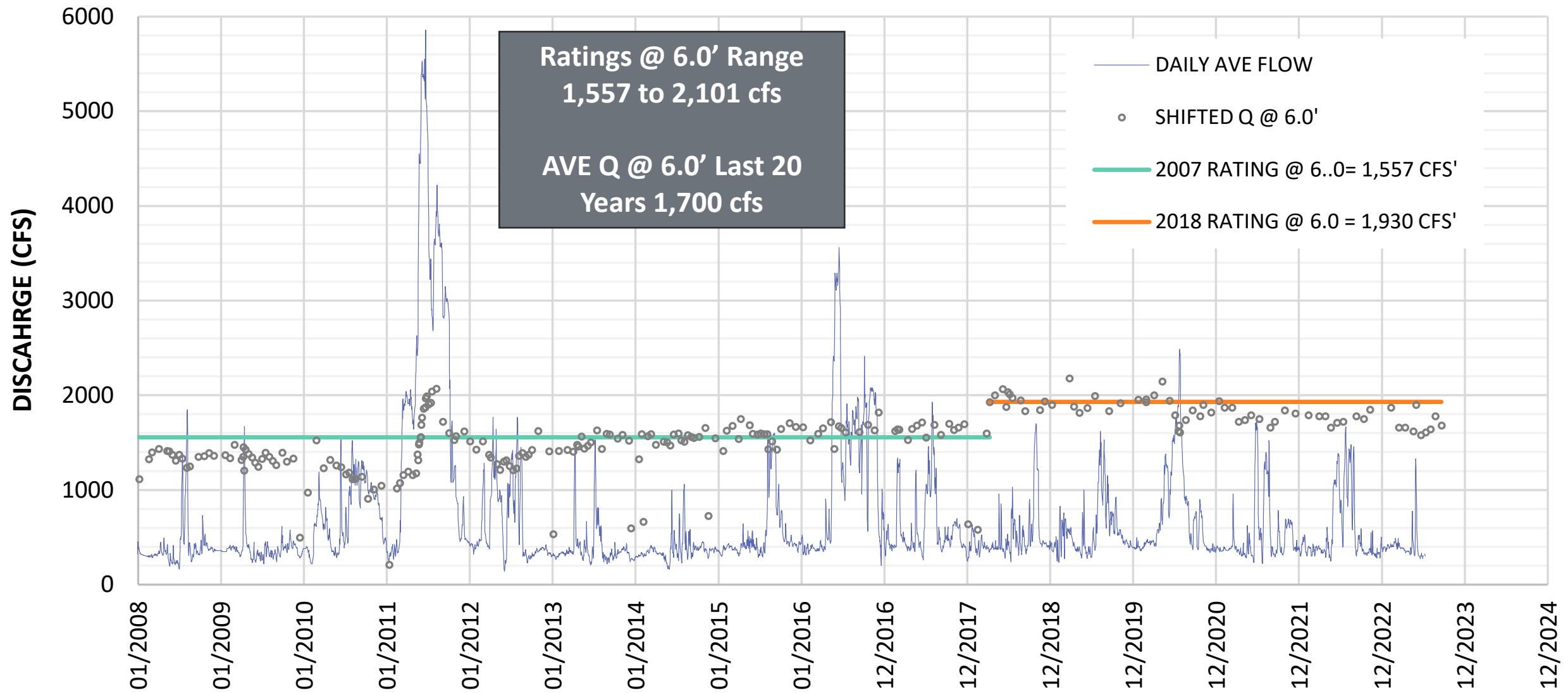
Specific Gage Analysis 1940-2020



Specific Gage Analysis 1940-2023



Rating Curves & Shift Adjusted Discharge 2008 - 2023



An aerial photograph showing a large, brownish reservoir in the center. To the left, a multi-lane road runs vertically. Above the reservoir, there are several smaller, irregularly shaped ponds surrounded by green trees and vegetation. The overall landscape is a mix of water, land, and infrastructure.

ALTERNATIVE EVALUATION

Project Goal

Identify and screen alternative solutions to increase hydraulic capacity through the chokepoint and/or provide delivery of flows downstream of the chokepoint through other systems.

Performance Metrics/ Considerations

- Additional Flow Capacity above 1,700 cfs
- % of 3,000 cfs Target Flow Delivered to Central Platte
- Cost
- Sustainability / Long Term O&M
- Permitting
- Impact to Private Properties



ALTERNATIVES SHORT LIST

- ❖ **No-Action**
- ❖ **Reduce/Control Upstream Sediment Sources**
- ❖ **South Platte Storage**
- ❖ **Purchase Existing Irrigation Infrastructure**
- ❖ **Construct New Canal for Bypass**
- ❖ **Channel Modification/Sediment Removal**
- ❖ **Modification to Tri-County Canal Diversion**



NO-ACTION (BASELINE)

Concept: Continuation of existing actions including vegetation control and CNPPID dredging at the Tri-County Canal Diversion (TCCD). Defining conditions under no-action provides a baseline for which alternatives can be compared.

- Preliminary geomorphic evaluation indicates state of quasi-equilibrium
- Continuation of hydraulic capacity that has held steady for last 20-years
- Ave Capacity at minor flood stage of 1,700cfs (w/ range 1,550–2,150 cfs)
- **Flow Capacity at Confluence vs Flow Target (3,000 cfs): 1,700 cfs (56%)**
- **Est Cost: \$0**

REDUCE/CONTROL UPSTREAM SEDIMENT SOURCES

Concept: Investigate possibility of reducing upstream sediment sources. The intent of this concept is to minimize incoming sediment load to the Chokepoint to maintain and/or improve hydraulic capacity at HWY 83.

- Limited field investigation did not identify specific sources that might be reduced.
- Detailed sediment source study/watershed assessment could be conducted upstream of Chokepoint
- Prelim geomorphic eval indicates that river has shifted towards a stable form with limited reach-scale bed aggradation, and is generally inactive laterally, limiting bank derived sediment into the system, managing sediment sources across the watershed would likely not significantly change the rating curve or increase the flow passing through the Chokepoint at the minor flood stage.





North Platte at Prairie Trace Rd



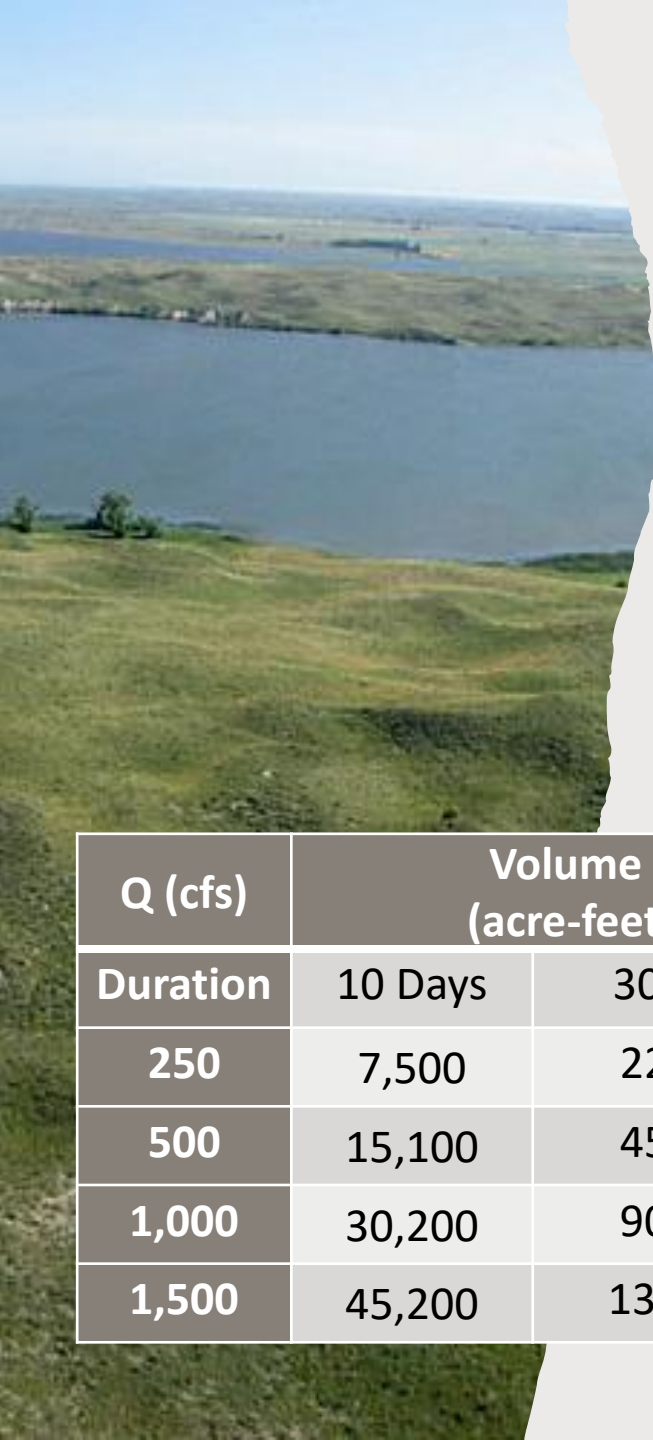
North Platte River at Keystone Roscoe Rd



North Platte Canal Diversion



North Platte River at Hershey Rd,
Looking upstream



SOUTH PLATTE STORAGE

Concept: Estimate storage volume required to achieve bypass flows of varying magnitudes and durations. (No specific storage project identified or proposed).

Volume est. assumes max release of up to 1,500 cfs, duration of 10 – 30 Days
Would supplement 1,500 capacity at Chokepoint
Release of 1,500 cfs for germination suppression at peak of irrigation season
Volume est. accounts for evaporative and transport losses

Q (cfs)	Volume (acre-feet)	
Duration	10 Days	30 days
250	7,500	22,600
500	15,100	45,200
1,000	30,200	90,400
1,500	45,200	135,600

- Range of Storage Volume Required: 45,200 – 135,600 acre-feet
- Flow Capacity at Confluence vs Flow Target (3,000 cfs): 3,000 cfs (100 %)
- Percent Increase to Flow Target: +44% (56% - 100%)
- Est Cost: TBD

PURCHASE OF EXISTING IRRIGATION INFRASTRUCTURE

Concept: Acquire existing irrigation infrastructure that can be used to divert EA flows from the North Platte to the South Platte, bypassing the Chokepoint. This concept includes conversion of existing surface water users of the canal to groundwater, allowing for the full capacity of the canal to be dedicated to EA water routing.

Candidates★: North Platte Canal & Suburban Canal



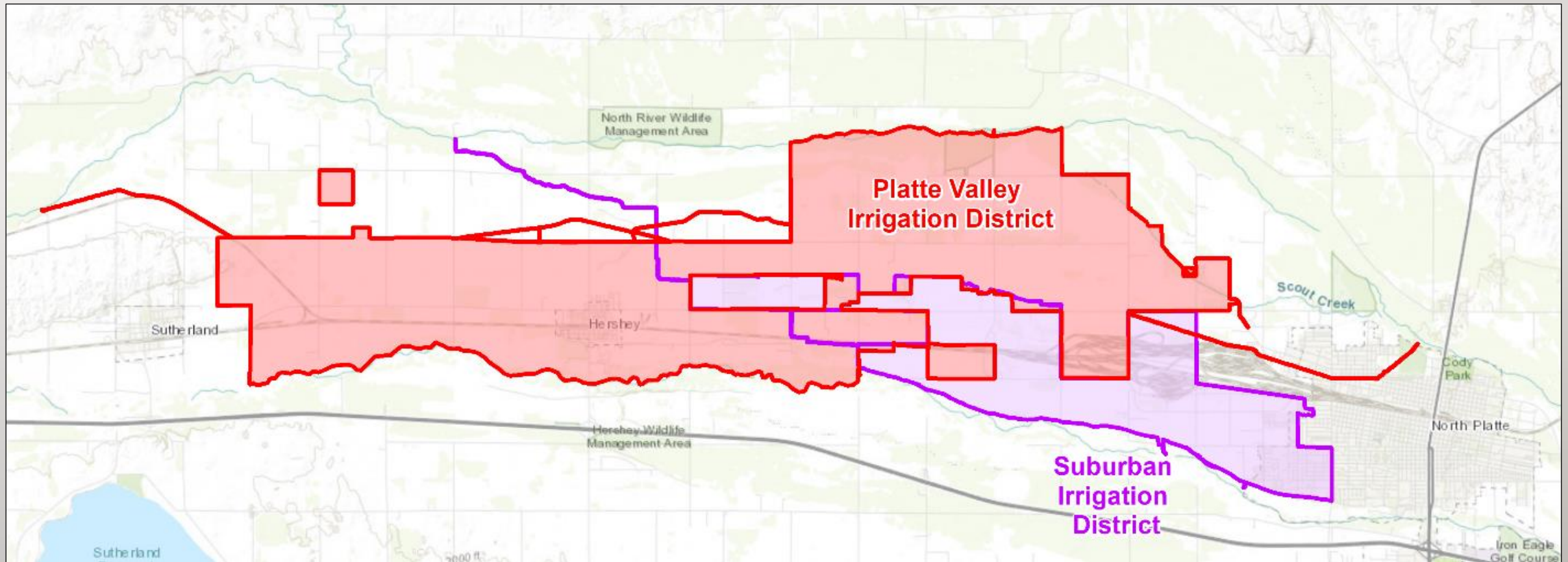
* These specific districts are identified only for purposes of a preliminary conceptual analysis; representatives of the districts have NOT been contacted to discuss actual feasibility of the alternative.

PURCHASE OF EXISTING IRRIGATION INFRASTRUCTURE

Preliminary Evaluation

- Identification of Potential Systems
- Review of Route to South Platte
- Identify Potential Capacity based on Max Diversion Records
- Estimated Acres/Cost to Convert Users from Surface Water to Groundwater
- Purchase/Lease Structure
 - Purchase of Infrastructure or
 - Agreement for Conversion and Use of Canal for Routing
 - Current groundwater recharge operations would need to continue

PURCHASE OF EXISTING IRRIGATION INFRASTRUCTURE



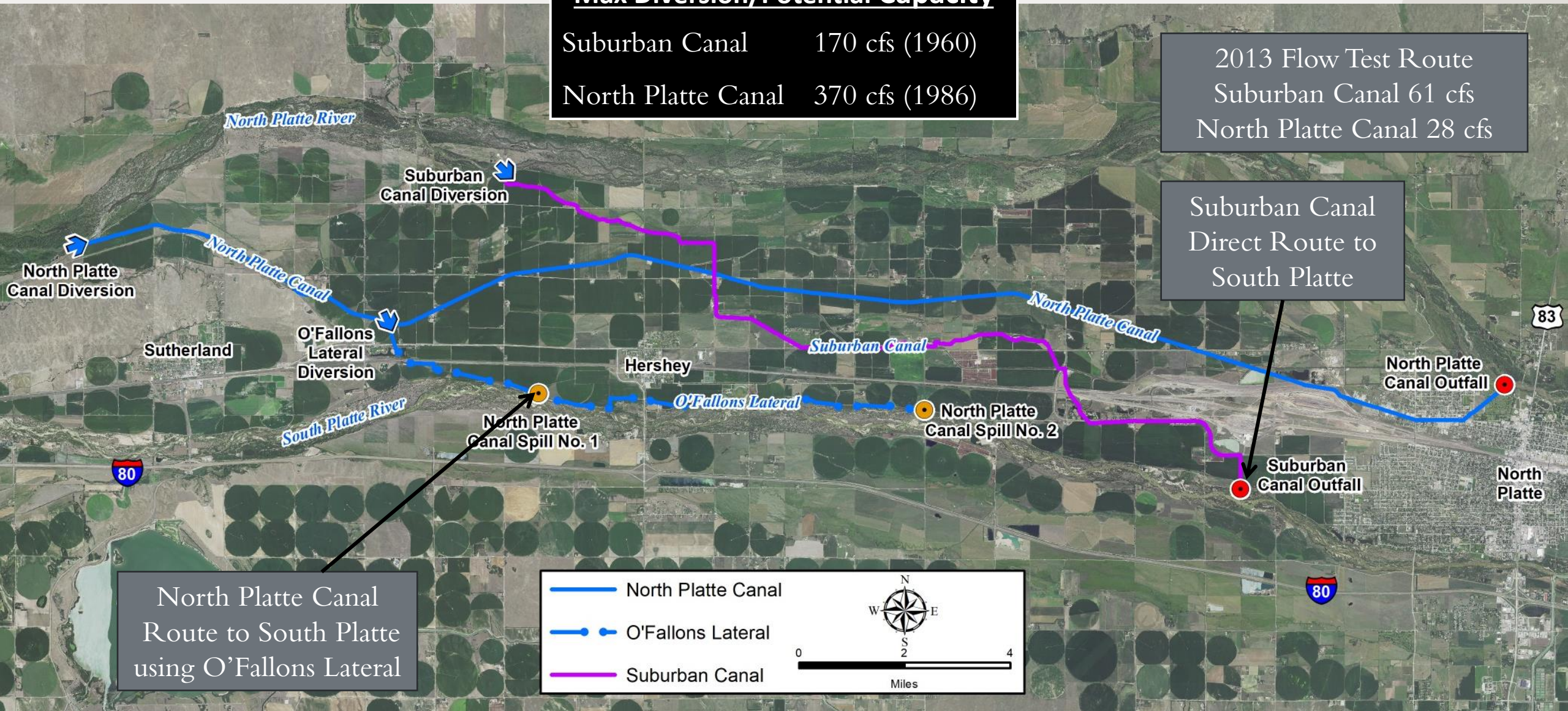
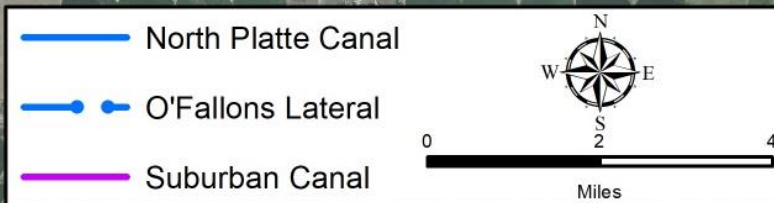
Max Diversion/Potential Capacity

Suburban Canal	170 cfs (1960)
North Platte Canal	370 cfs (1986)

2013 Flow Test Route
Suburban Canal 61 cfs
North Platte Canal 28 cfs

Suburban Canal
Direct Route to
South Platte

North Platte Canal
Route to South Platte
using O'Fallons Lateral

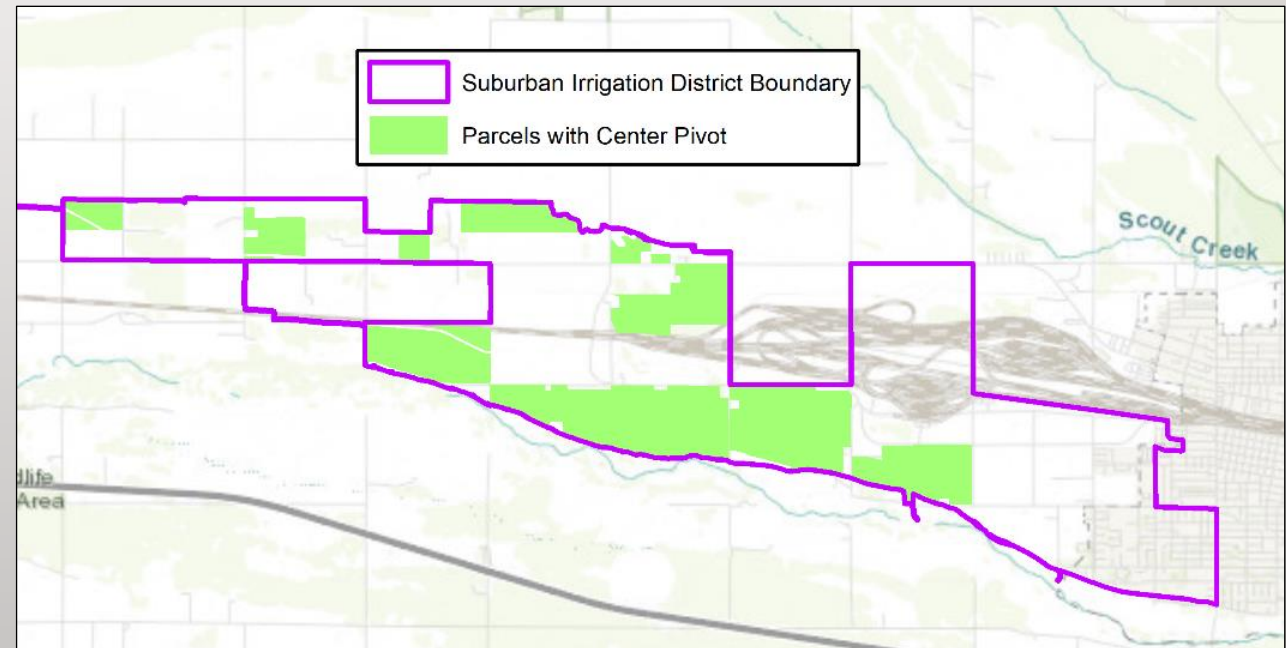
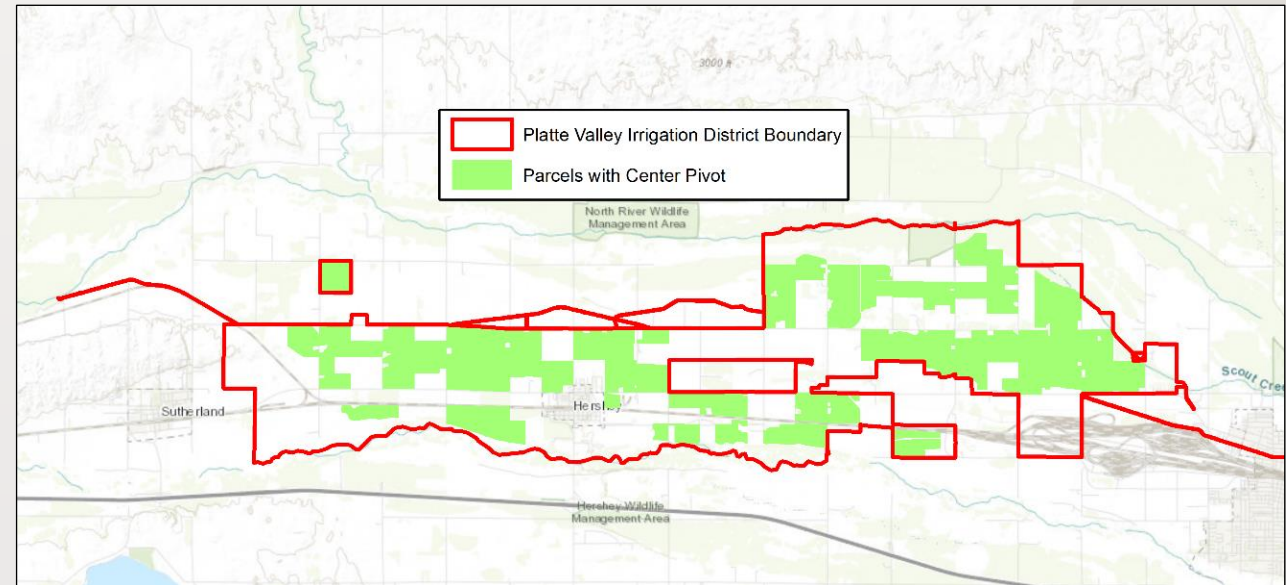


PURCHASE OF EXISTING IRRIGATION INFRASTRUCTURE

Preliminary Evaluation of Conversion from Surface to Groundwater using GIS

- NDNR Water Rights/Groundwater Well GIS Data & Aerial Photography
- Estimated Acreage with Center Pivots
- Estimated Acreage with Center Pivots/no Well
- Estimate Acreage without Center Pivot/Well
- Cost Estimate: Suburban \$3.0 M
 North Platte \$6.5 M

Purchase and O&M costs estimates would involve evaluation of irrigation district structure/ assets/ maintenance/personnel/ etc.



PURCHASE OF EXISTING IRRIGATION INFRASTRUCTURE

	Suburban Canal	North Platte Canal
Potential Capacity	170 cfs	370 cfs
Capacity at Confluence vs Flow Target (3,000 cfs)	1,870 cfs (62%)	2,060 cfs (69%)
Percent Increase to Flow Target:	+ 6%	+ 13%
Est Cost for Purchase of Infrastructure	TBD	TBD
Est Cost for Conversion to Groundwater	\$3.0 M	6.5M
Est Cost for Canal Improvements	TBD	~\$1-2M
Long Term O&M Costs:	TBD	TBD

DISCUSSION/FEEDBACK

PURCHASE OF EXISTING IRRIGATION INFRASTRUCTURE

Next Steps / Questions

- Gather information from CPNRD on similar projects (Six Mile etc.)
- Potential for partnerships
- Refine Costs for Purchase or Lease
- Long Term O&M
- Other?

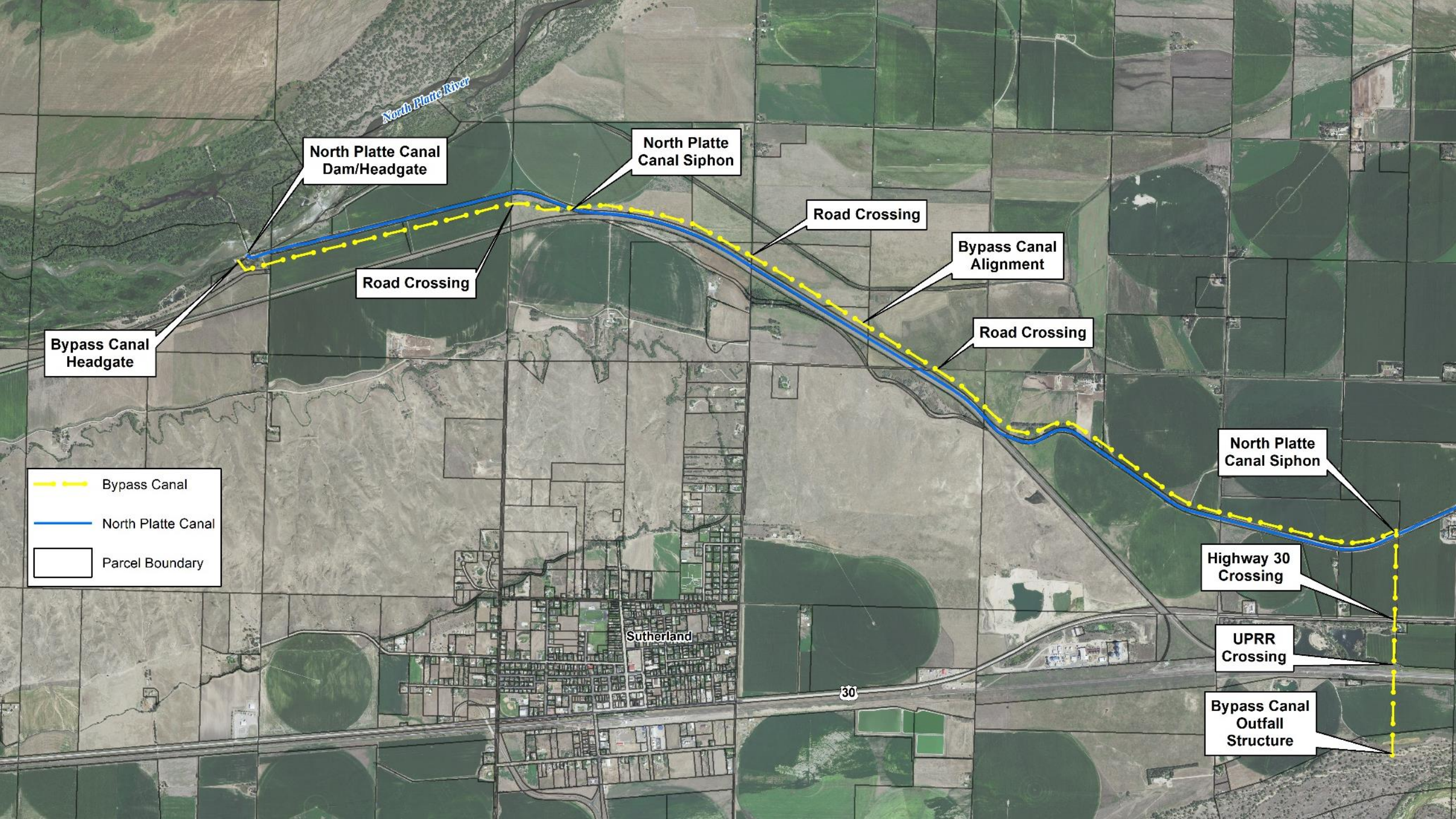
Workgroup Feedback

- Additional Information?
- Fatal Flaws?

BYPASS CANAL

Concept: Construct a bypass canal dedicated to routing EA flows around the Chokepoint. The canal would divert flow from the North Platte to the South Platte, bypassing the Chokepoint.

- 2016 Bypass Canal Reviewed
- Updated Alignment – eliminated UPRR crossing structure
- 1,500 cfs Capacity: 60' bottom width, 96' top width, 6' depth, 24' access rd
- 500 cfs Capacity: 13' bottom width, 49' top width, 6' depth, 24' access rd
- Cost Estimate Updated



North Platte River

North Platte Canal
Dam/Headgate

North Platte
Canal Siphon

Road Crossing

Bypass Canal
Alignment

Road Crossing

Bypass Canal
Headgate

Road Crossing

North Platte
Canal Siphon

Highway 30
Crossing

UPRR
Crossing

Bypass Canal
Outfall
Structure

Sutherland

30

- Bypass Canal
- North Platte Canal
- Parcel Boundary

BYPASS CANAL

Canal Capacity	500 cfs	1,500 cfs
Capacity at Confluence vs Flow Target (3,000 cfs)	2,200 cfs (7%)	3,000 cfs (100%)
Percent Increase to Flow Target:	+ 17%	+ 44%
Est Capital Cost	\$7.4 M	\$13.6 M
Long Term O&M Costs:	TBD	TBD
Number of Private Parcels Impacted	23	23

BYPASS CANAL OPERATION & MAINTENANCE

Management Organization/Administration

Personnel (~4 part time for maintenance/admin)

Upfront Cost for Maintenance Equipment

Annual Maintenance

- Canal cleaning and prep at start of season

- Flushing and monitoring of all crossings

- Daily monitoring during operation / record keeping

- Regular maintenance after shutdown (repairs, erosion, sedimentation)

- Equipment Maintenance

DISCUSSION / FEEDBACK

BYPASS CANAL

Next Steps / Questions

- Refine Cost Estimates
- Long Term O&M Costs
- Additional Beneficial Uses of Canal (flood bypass, recharge, etc.)
- Potential for Partnerships
- Operational considerations to keep maximum amount of water in North Platte River
- Other?

Workgroup Feedback

- Additional Information?
- Fatal Flaws?

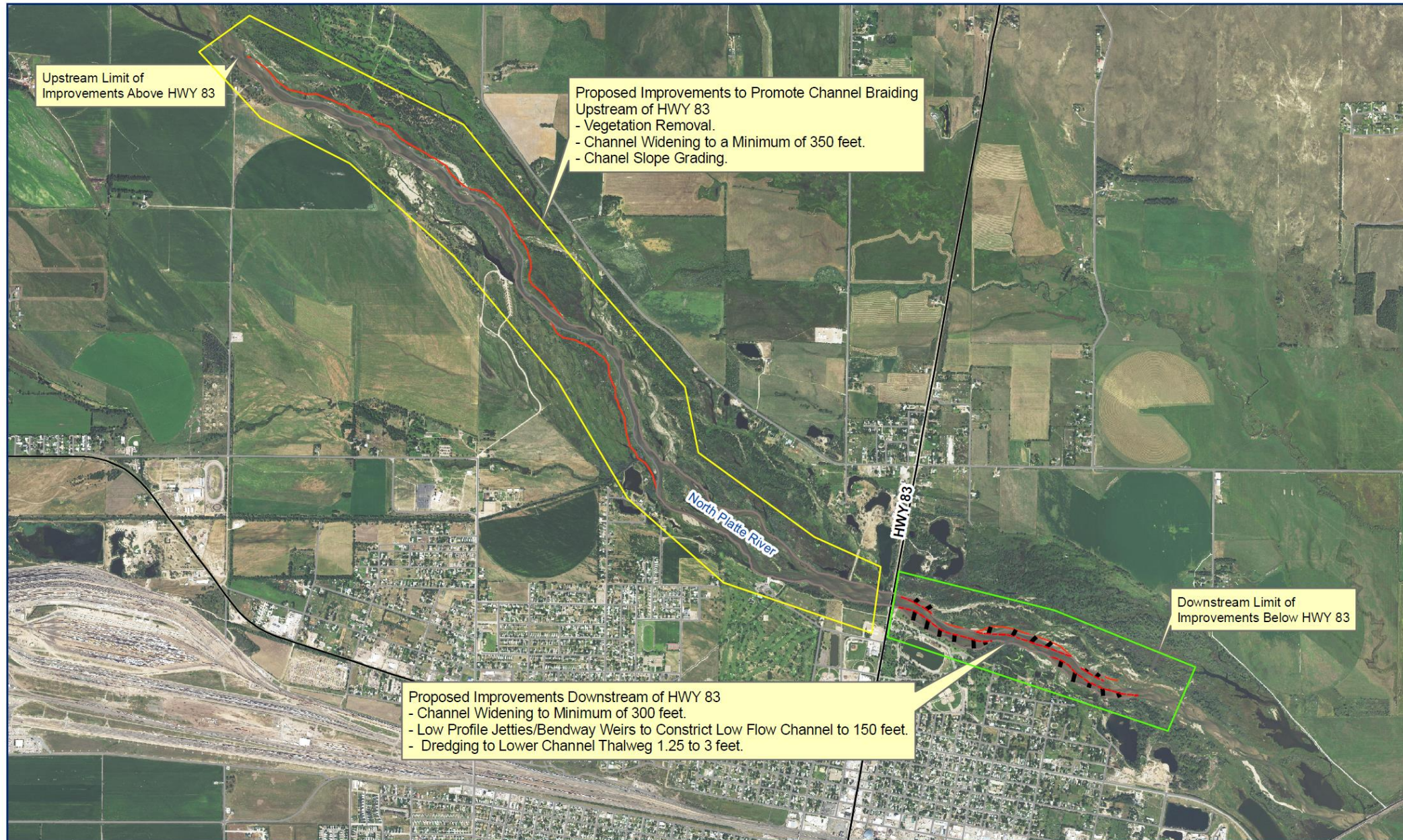
CHANNEL MODIFICATION / SEDIMENT REMOVAL

Concept: Construct channel modifications and remove sediment along the North Platte River through the Chokepoint to increase and maintain hydraulic capacity at HWY 83.

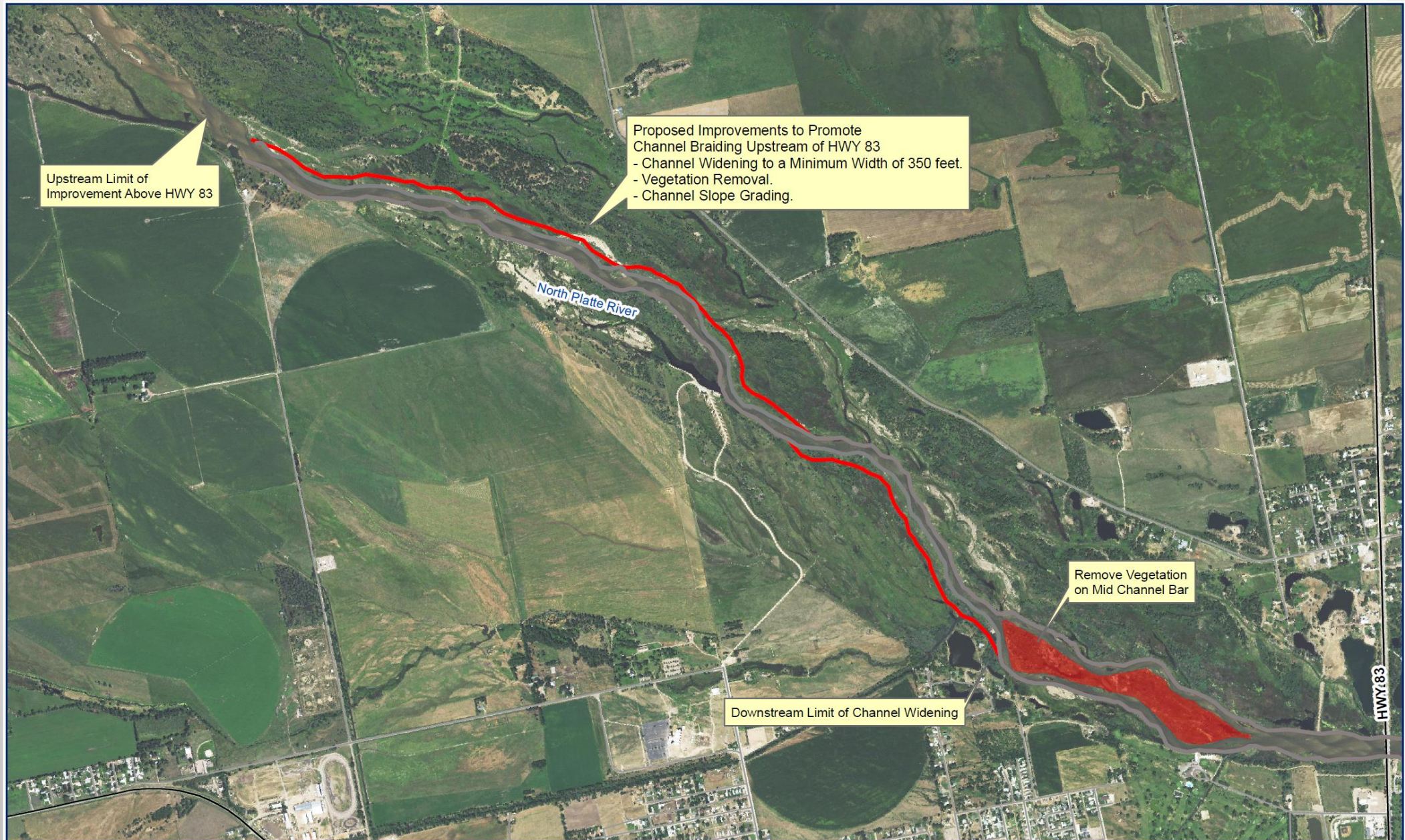
- Modification Concept ACE 2016
- Sediment Removal Concept VESPR/RDG 2023
- Both provide ample capacity
- Revised Concept to be developed using results of geomorphic study and new SRH-2D sediment transport modeling



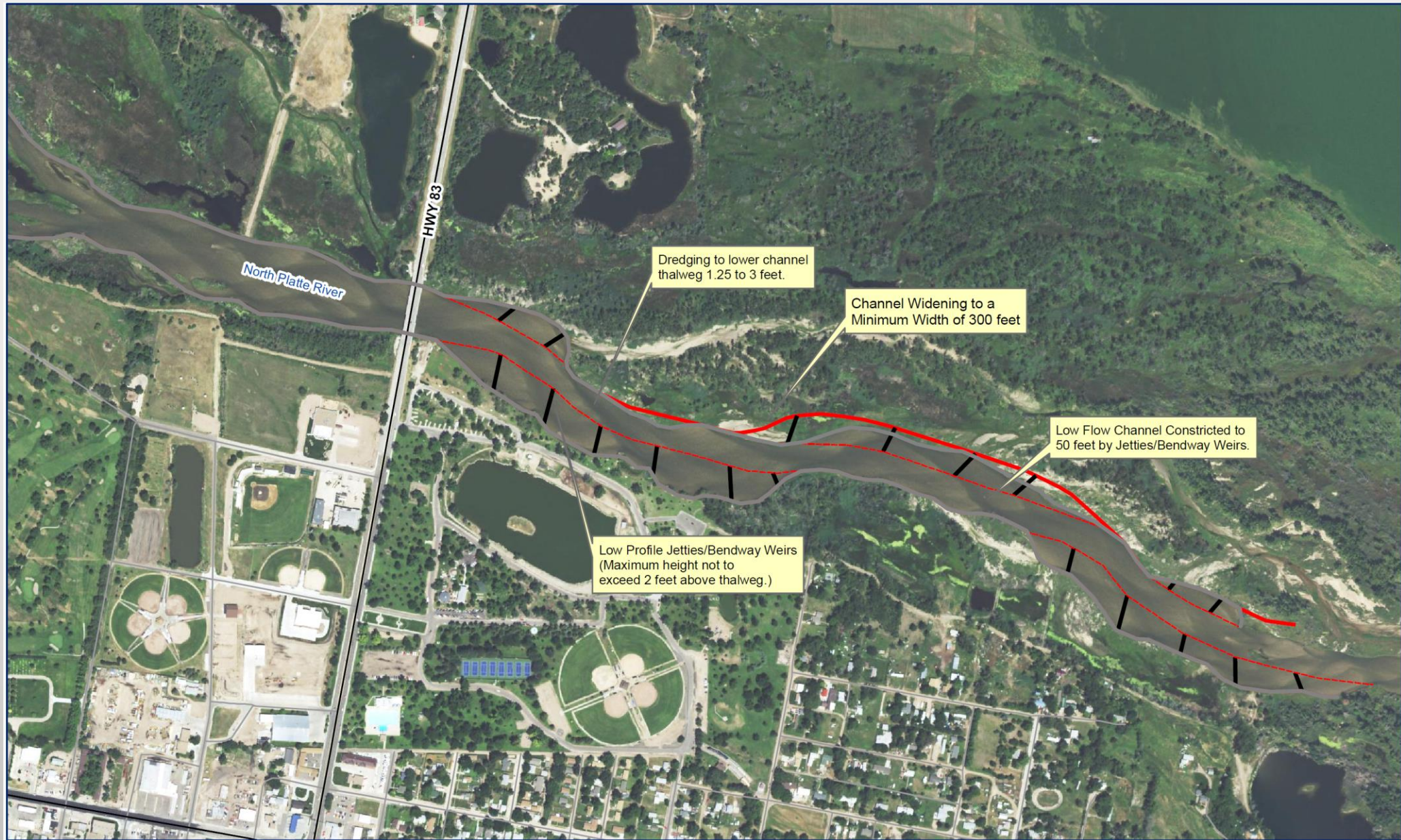
2016 CHANNEL MODIFICATION (ACE)



2016 CHANNEL MODIFICATION (ACE)



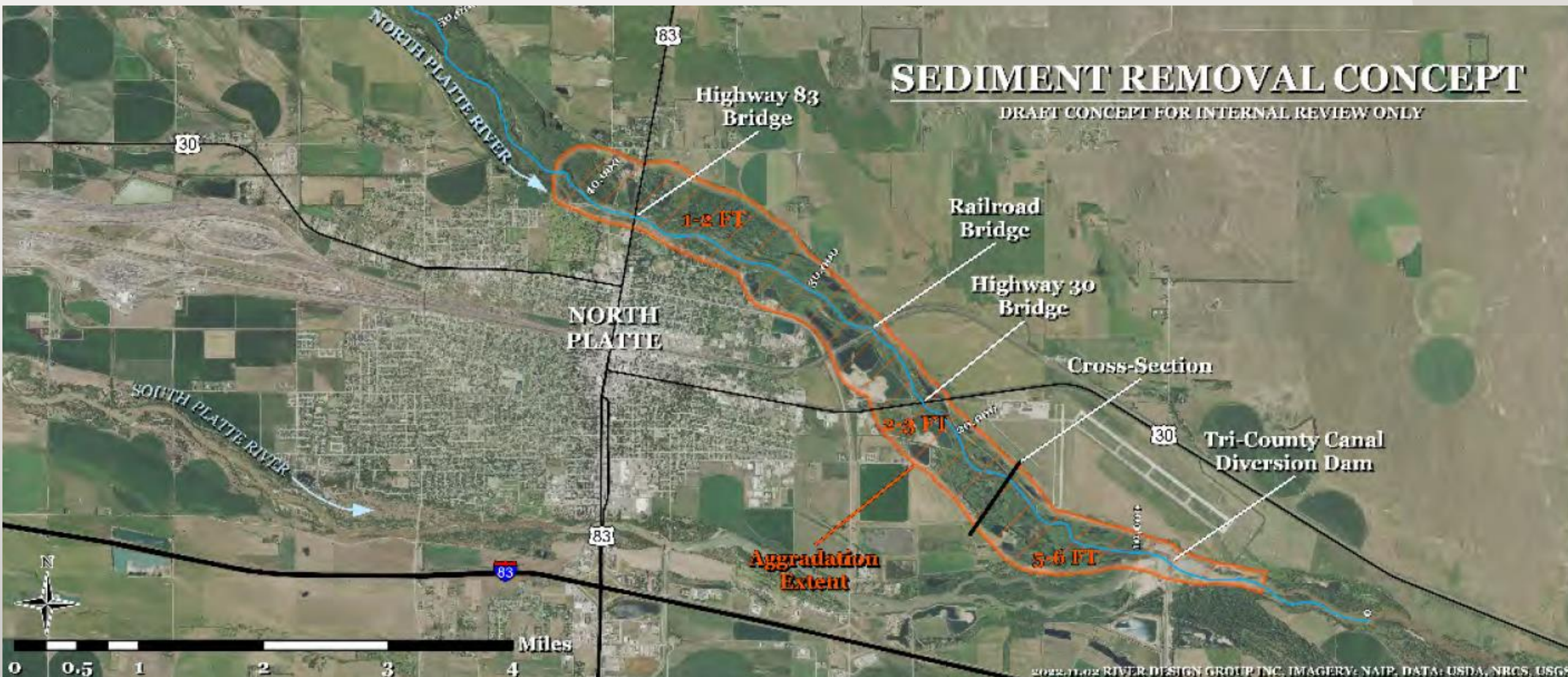
2016 CHANNEL MODIFICATION (ACE)



2016 CHANNEL MODIFICATION (ACE)

- Developed using 1D hydraulics and sediment transport modeling
- Provides target capacity of 3,000 cfs
- Maintenance/sediment removal estimated every 3-5 years d/s of HWY 83 (per modeling)
- Updated Capital Cost Estimate: \$5.2 M
- Est Long Term O&M Costs: \$35,000/yr. (vegetation treatment/sediment removal)
- Number of Private Parcels Impacted: 62
- Permitting: Individual 404/401/FEMA CLOMR/LOMR
- Questions: additional sediment modeling to determine sustainability, sediment disposal, private landowner buy-in

SEDIMENT REMOVAL – VESPR/RDG 2023



SEDIMENT REMOVAL – VESPR / RDG 2023

- VESPR 2023 Concept: Removal of sediment to restore historic slope, 200ft wide channel excavation, ~1.5 Mcyds of sediment removal over 7-mile reach upstream of Tri-County Canal Diversion. Includes modification of TCCD for sediment passage. (No sediment transport modeling conducted due to scope of study)
- Revised to consider sediment removal to restore historic slope along 6-mile reach above TCCD, not including modification to TCCD. Required removal of ~700,000 cyds of sediment.
- Provides target capacity of +3,000 cfs
- Estimated Cost for Sediment Removal: \$7.7 M (Cost w/ Modification of TCCD \$29M)
- Est Long Term O&M Costs: TBD
- Number of Private Parcels Impacted: 65
- Permitting: Individual 404/401/FEMA CLOMR/LOMR
- Questions: sustainability (no current modeling), impact to wetlands, sediment disposal, private landowner buy-in

REFINED CHANNEL MODIFICATION/SEDIMENT REMOVAL ALT

- Next Phase: Develop a Refined Channel Modification/Sediment Removal Concept
- Informed by Results of Geomorphic Investigation (currently ongoing)
- Utilize new SRH-2D Hydraulics/Sediment Transport Model to develop concept
- Goals and Objectives
 - Meet Target Hydraulic Capacity
 - Maximize Sustainability
 - Minimize Long Term O&M
 - Minimize Project Size and Cost
- Questions: Sustainability, impact to wetlands, sediment disposal, private landowner buy-in

REFINED CHANNEL MODIFICATION/SEDIMENT REMOVAL

	ACE Channel Modification	VESPR Sediment Removal	Refined Alternative
Capacity at Confluence vs Flow Target (3,000 cfs)	3,000 cfs+ (100%)	3,000 cfs (100%)	3,000 cfs (100%)
Percent Increase to Flow Target:	44%	44%	44%
Est Capital Cost	\$5.2 M	\$7.7 M (\$29M w/ TCCD)	TBD
Long Term O&M Costs:	\$35,000/yr	TBD	
Permitting	Individual 404, FEMA CLOMR/LOMR, 401 Permit		
Number of Private Parcels Impacted	62	65	TBD

MODIFICATION TO TRI-COUNTY CANAL DIVERSION

Concept: Modify the Tri-County Canal Diversion to allow for sediment passage which has potential to enhance performance and sustainability of the channel modification and sediment removal alternative by promoting sediment continuity.

- Promotes sediment continuity
- Enhancement to channel modification/sediment removal alt
- Not a stand-alone solution
- Estimated Cost: \$21.3 M
- Sediment Passage and Fish Barrier Difficult
- BioAcoustic Fish Fence (BAFF) – cost not included
- Existing Dredging Operations by CNPPID provide benefit



DISCUSSION/FEEDBACK

CHANNEL MODIFICATION/SEDIMENT REMOVAL

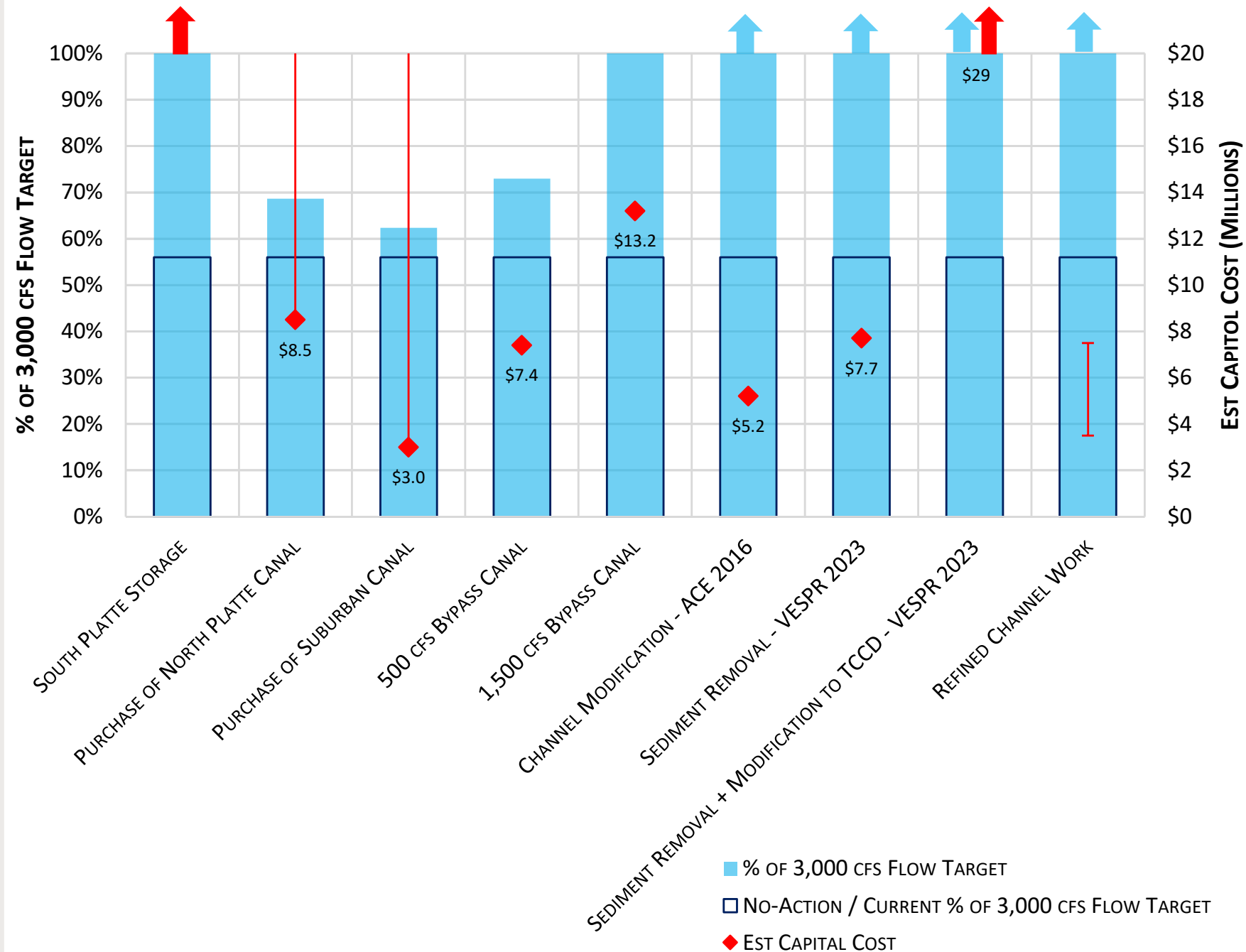
Next Steps / Questions

- Develop Refined Alternative w/ SRH-2D
Mobile Bed Modeling
- Determine Sustainability / Define
Uncertainty
- Update Cost Est / Long Term O&M Costs
- Impact to wetlands / wetland delineations
- Permitting
- Landowner Impacts
- Ideas for Sediment Disposal
- Other?

Workgroup Feedback

- Additional Information?
- Fatal Flaws?

CHOKEPOINT CAPACITY VS CAPITAL COST



Alternative	Flow Capacity at HWY 83 (cfs)	Bypass Flow (cfs)	Total Flow to Central Platte (cfs)	% of 3,000 cfs Flow Target	Estimated Capital Cost	Long Term O&M Required?	Long Term O&M Costs	Permitting	Number of Private Parcels Impacted
No-Action	1,700	--	1,700	56%	\$0	No	none	none	n/a
South Platte Storage	1,700	1,500	3,200	100%	>> \$20 M ²	Yes	TBD		TBD
Purchase of Irrigation Infrastructure North Platte Canal	1,700	360 ¹	2,060	69%	Purchase: TBD ³ Conversion: \$6.5M Improvements: \$1-2M	Yes	TBD	Groundwater UPRR Permit	n/a
Purchase of Irrigation Infrastructure Suburban Canal	1,700	170	1,870	62%	Purchase: TBD ³ Conversion: \$3.0 M	Yes	TBD	Groundwater	n/a
500 cfs Bypass Canal	1,700	500	2,200	73%	\$7.4 M	Yes	TBD	Nationwide 404/401 UPRR Permit FEMA Floodplain	23
1,500 cfs Bypass Canal	1,700	1,500	3,200	100%	\$13.2 M	Yes	TBD	Nationwide 404/401 UPRR Permit FEMA Floodplain	23
Channel Modification (ACE 2016)	3,000 +	--	3,000 +	100% +	\$5.2 M	Yes	\$35,000/yr	Individual 404/401 FEMA Floodplain	62
Sediment Removal (VESPR 2023)	3,000 +	--	3,000 +	100% +	\$7.7 M	TBD	TBD	Individual 404/401 FEMA Floodplain	65
Sediment Removal (VESPR 2023) + Modification to TCCD	3,000 +	--	3,000 +	100% +	\$29 M	TBD	TBD	Individual 404/401 FEMA Floodplain	65
Channel Mod/Sed Removal (TBD)	3,000 +	--	3,000 +	100% +	TBD	TBD	TBD	Individual 404/401 FEMA Floodplain	TBD

ALTERNATIVES EVALUATION

- Alternatives that are identified for further study will be evaluated using a Multi-Criterion Decision Analysis (MCDA).
 - Consistent and transparent method.
 - Provides a structured process to guide alternative selection by considering a wide range of criteria.
- Criteria and corresponding weights applied to the MCDA will be determined through collaboration with the EDO and Chokepoint Planning Workgroup.
- Example criteria
 - Hydraulic capacity
 - Long-term solution
 - Capital cost
 - Addresses sediment source
 - Social Impact
 - Sustainability
 - Standalone alternative
 - Maintenance cost
 - Permitting timeline
 - Upstream/Downstream Impacts

NEXT STEPS

Phase III

- Identify Additional Information to Provide Additional Focus
- Detailed Alternatives Evaluations
- 2D Hydraulic/Sediment Transport Modeling
- Permitting Requirements
- Long Term O&M
- Cost Estimation
- Implementation Timeline
- Multi-Criterion Decision Analysis (MCDA)

WORKGROUP FEEDBACK

