

MEMORANDUM



DATE: May 5, 2015 **ACE PROJECT NO.:** NEHEADWATERS04-04
TO: Jerry Kenny, PhD, P.E., Headwaters Corporation
Justin Brei, P.E., Headwaters Corporation
FROM: Brad Anderson, P.E., Anderson Consulting Engineers, Inc.
Michelle Martin, P.E., Anderson Consulting Engineers, Inc.
SUBJECT: North Platte Choke Point: Feasibility Assessment of Recommended Alternatives

The Executive Director's Office (EDO) of the Platte River Recovery Implementation Program (PRRIP) requested assistance from Anderson Consulting Engineers, Inc. (ACE) to evaluate methods to improve flood conveyance through the Choke Point on the North Platte River in order to accommodate short duration high flows. Specifically, the objective of the evaluation was to identify alternatives that would achieve a 6-foot flood stage at the gage located downstream of Highway 83 during a short duration high flow (SDHF) of 3,000 cfs. This work was initiated in 2012 with a preliminary analyses of alternatives, supported by sediment transport analyses and modeling. Additional work was completed and the results provided in a memorandum completed by ACE (January 2015). The results of the January 2015 memorandum identified an improvement alternative that satisfied the objective identified above. Furthermore, the memorandum recommended that additional analyses be completed to: (a) determine the feasibility and practical implementation of the recommended alternative improvement, and (b) compare the feasibility of the recommended alternative improvement with the feasibility of the alternative associated with compensation for inundation of property.

This memorandum summarizes the results of the feasibility investigation of the two alternatives identified below:

Recommended Construction Alternative: Channel Widening Upstream of Highway 83 and channel dredging along with construction of jetties/bendway weirs downstream of Highway 83.

Property Inundation Compensation Alternative: The parcels impacted by the SDHF of 3,000 cfs are identified along with specific information related to land or structure impact fees.

Recommended Construction Alternative: Channel Widening Upstream of Highway 83 and channel dredging along with construction of jetties/bendway weirs downstream of Highway 83

An overview of the construction limits associated with the Recommended Improvement Alternative is presented on Figures 1, 2 and 3. As indicated previously and on Figure 1, this alternative includes construction both upstream and downstream of Highway 83. The construction upstream of Highway 83 is intended to achieve a braided channel condition to promote deposition of sediment within the limits of construction (see Figure 2). The details associated with the construction upstream of Highway 83 include the following:

- Limits of the channel construction encompass length and width of approximately 16,200 feet and 350 feet, respectively resulting in an area of approximately 130 acres.

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- Treatment for vegetation removal of approximately 31 acres (reflects the area of the mid-channel bar)
- Channel widening, material movement and slope grading (130 acres).
- Mobilization and demobilization of equipment.
- Access and management easements.

Downstream of Highway 83, construction of the improvements is intended to: (a) create a wider channel to promote additional transport during the high flow events, and (b) integrate a constricted low-flow channel that increases the sediment transport during relatively low flows (see Figure 3). The specific details of the proposed improvements are listed below:

- Limits of the channel improvements encompass a length of approximately 6,000 feet.
- Creation of a compound channel through channel widening/dredging and placement of jetties/bendway weirs
- Channel widening to increase the average channel width from 270 feet to a minimum of 300 feet; channel dredging to lower the channel thalweg 1.25 feet to 3 feet.
- Placement of 19 jetties/bendway weirs to constrict the dredged channel to a width of 150 feet. Maximum height of the jetties/bendway weirs not to exceed 2 feet above the channel thalweg. Length varies from 50 feet to 215 feet (reference Figure 3). Typical channel cross section and detail of a typical jetty/bendway weir are provided in Figure 4.
- Mobilization and demobilization of equipment.
- Access and management easements.

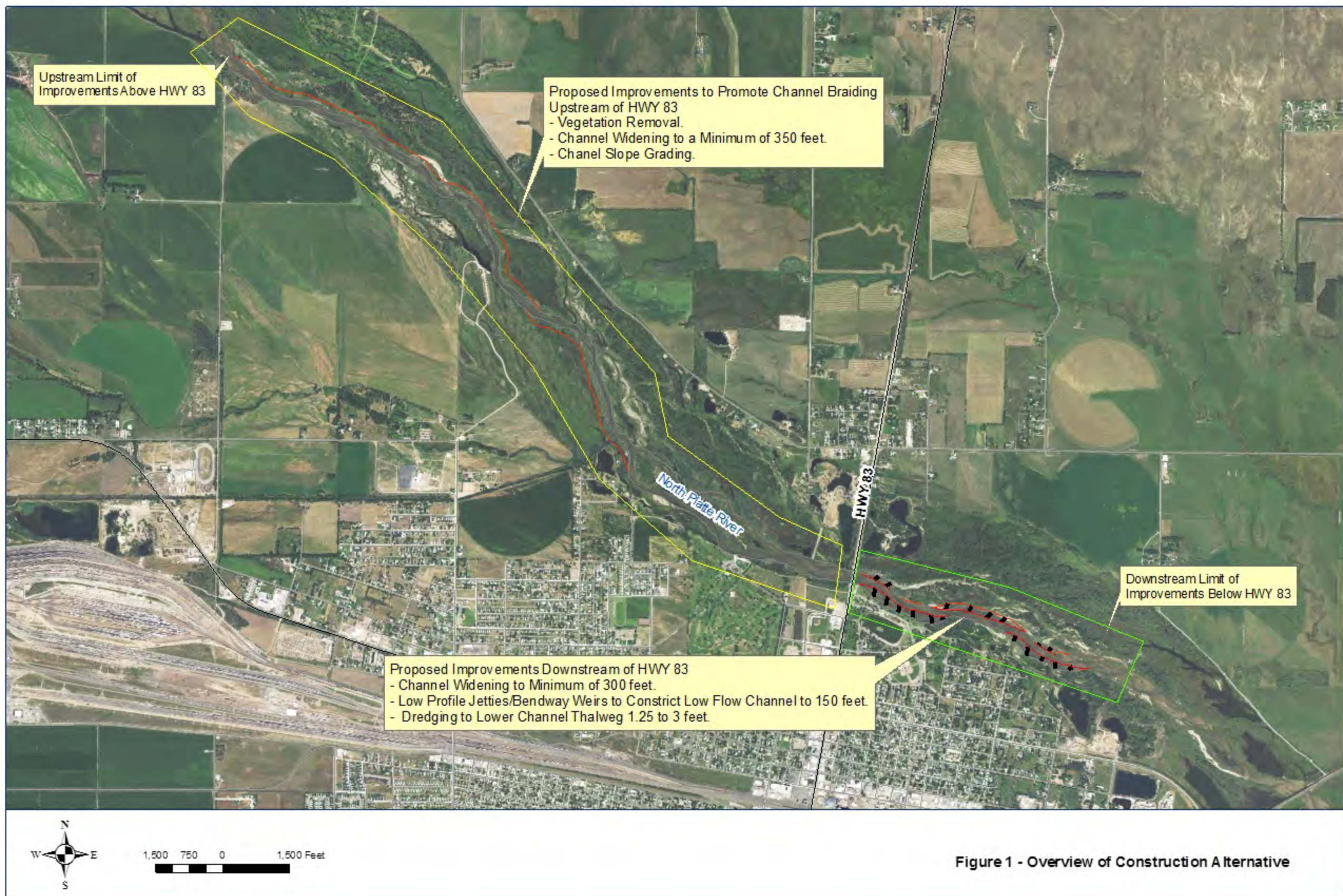
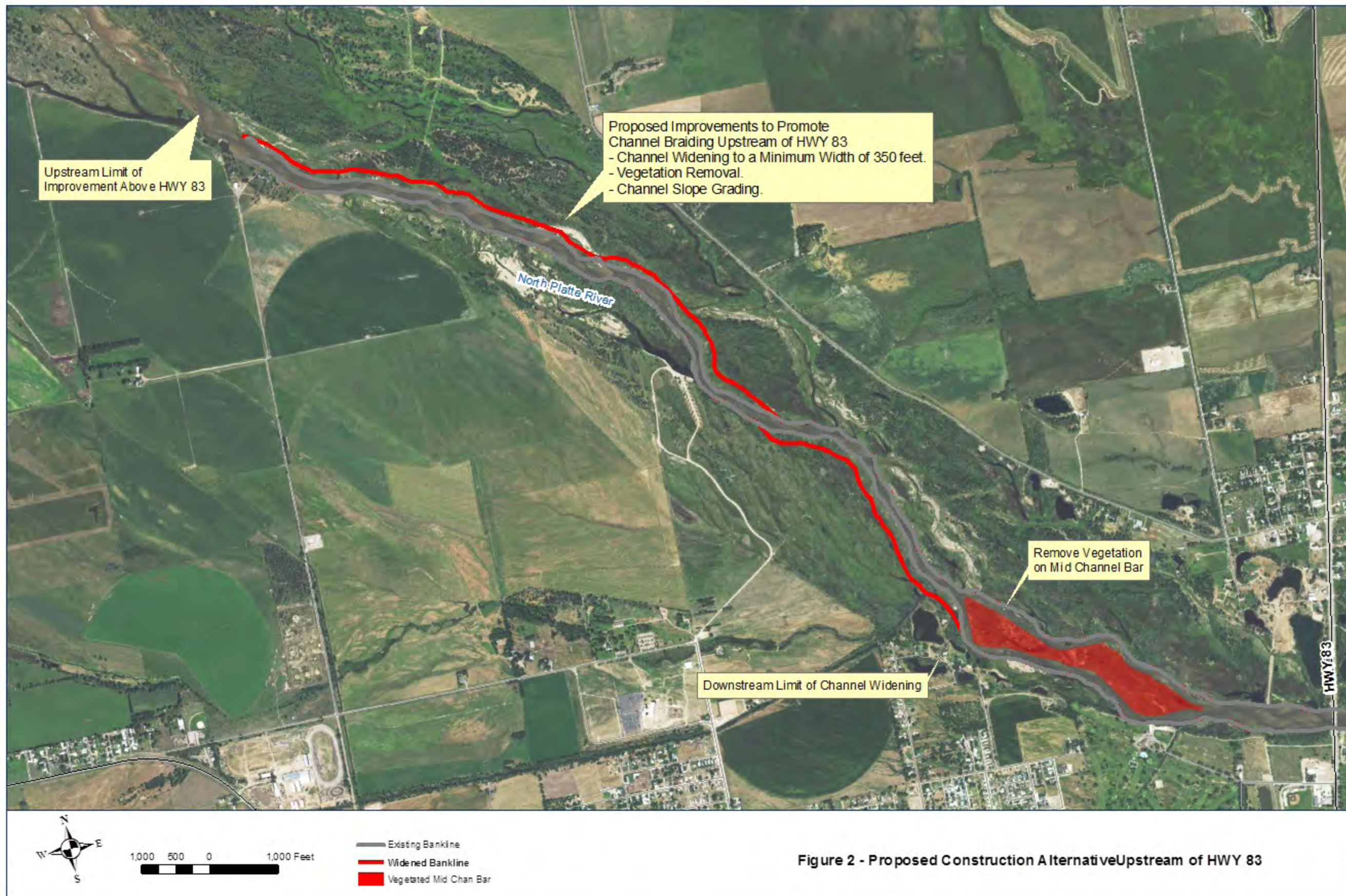
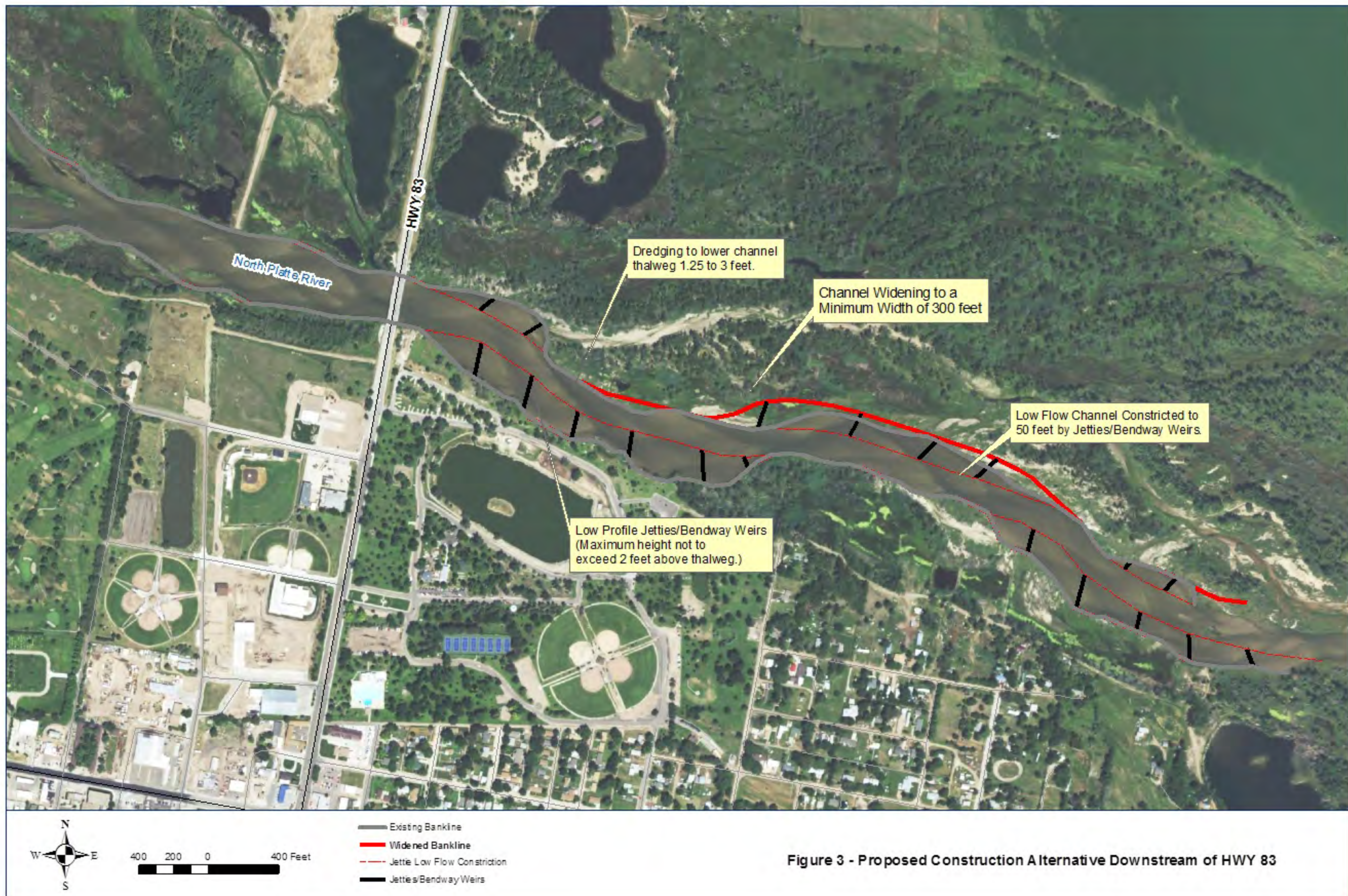


Figure 1 - Overview of Construction Alternative





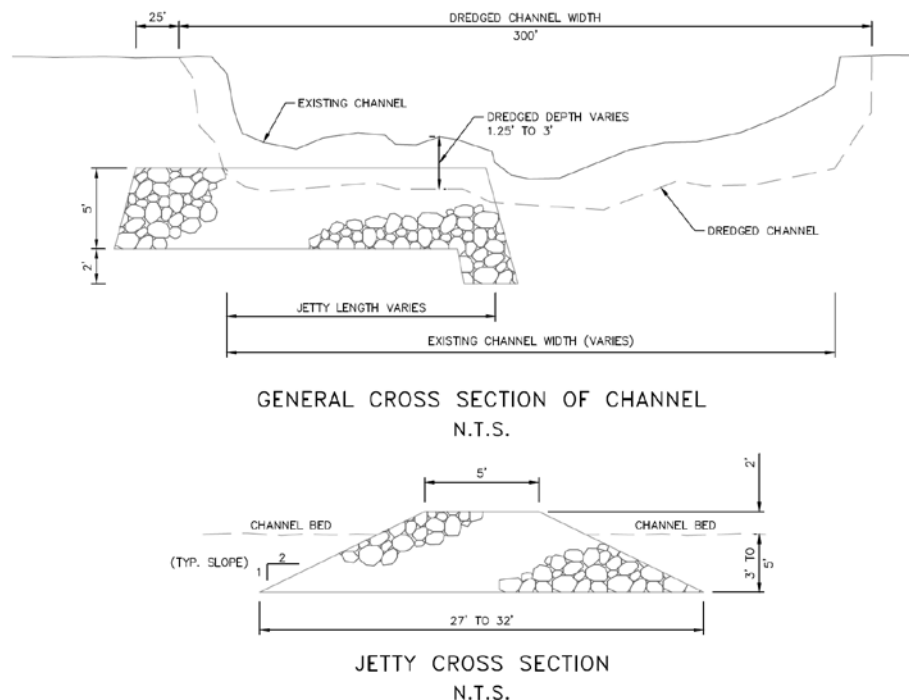


Figure 4 Jettie/Bendway Weir Detail

Property Inundation Compensation Alternative

This intent of this alternative is to identify the costs to compensate for repetitive inundation of parcels/structures related to an increase in the frequency of SDHFs of 3,000 cfs. The following tasks were completed to support the feasibility assessment of the alternative:

- A hydraulic model of the North Platte River was utilized to determine the limits of flooding associated with a SDHF of 3,000 cfs. The hydraulic model assumed improvements associated with the State Channel (east of Highway 83) were installed.
- The hydraulic model was also utilized to determine the limits of flooding associated with a flood discharge of 1,560 cfs. The water surface elevation associated with a peak discharge of 1,560 cfs presently coincides with a minor flood stage of 6.0 feet as defined by the National Weather Service (NWS).
- The area determined by the difference in the limits of inundation between 3,000 cfs and 1,560 cfs was developed to represent the impact associated with the SDHF.
- Parcel information within the limits of inundation was obtained from the Lincoln County Assessor's office. This information included the assessed value of the land and all improvements including insurable structures.



- Parcels/structures along the south bank of the North Platte River within the corporate limits of the City of North Platte were specifically identified to determine the impact of the SDHF within the city limits.
- Residential properties in Lincoln County that are developed along the north bank (adjacent to North River Road) were also identified and included in the information provided by the Lincoln County Assessor's office.

The area of interest for this study focused on residential properties or parcels with structures along both the south and north bank of the North Platte River. The area of interest is illustrated on Figure 5 along with the results of the inundation mapping along the North Platte River in the vicinity of Highway 83. As indicated on Figure 5, the impacts of the SDHF are focused on the properties along the north bank (south of North River Road) of the river. Containment of the impact area along the south channel bank of the river is also largely reflected on the inundation mapping. Figure 5 also identifies specific parcels/structures within the inundation limits. The information obtained from the Lincoln County Assessor's office was utilized to determine the impact of the inundation on the individual parcels. Based on the evaluation of the parcel data and the inundation mapping, the following information is provided:

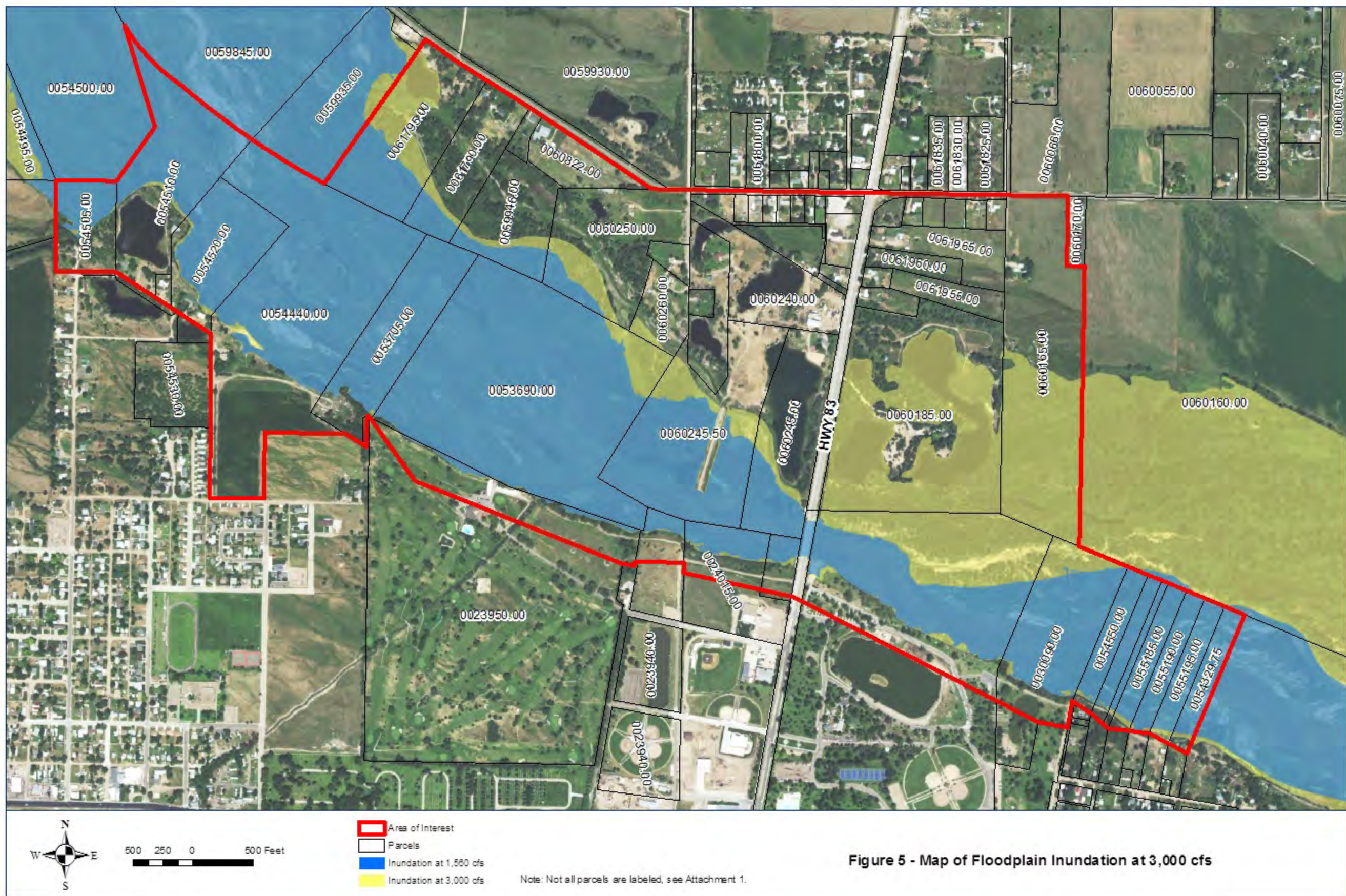
- Twenty-eight parcels along the north river bank (adjacent to North River Road) and the south bank in the vicinity of the City of North Platte are impacted by the SDHF and identified for compensation attributed to inundation.
- No insurable structure was determined to be within the limits of the inundation.
- Two (2) secondary buildings were determined to be within the limits of the inundation.
- The total area of property inundated, and representing the area where compensation for inundation may be required, is estimated to be 87 acres. The land inundation area does not include acreage associated with existing ponds within the parcels.

Feasibility Considerations

The feasibility assessment of each alternative included an evaluation of several factors and considerations as indicated below.

- Implementation costs including estimates of construction quantities, unit costs, and total construction cost, or equivalent land and structure inundation impact fees.
- Estimates of long-term operation and maintenance costs.
- Identification of potential permitting requirements.
- Determination of the impact on regulatory 100-year base flood elevations.
- Schedule associated with implementation of the alternative.

A discussion of information pertinent to each consideration is presented in the following paragraphs.





Implementation Costs

For the Recommended Construction Alternative, construction quantities, unit costs, and total construction costs were developed for construction of the improvements upstream of Highway 83 as well as downstream of Highway 83. Pertinent information regarding the implementation costs for these two components is provided in Table 1. It should be noted that no costs have been assumed for access easements or management agreements. Based on previous channel widening projects, an access easement and management agreement has been obtained from the landowner at no cost. As indicated in Table 1, the total cost estimated for the Recommended Construction Alternative is \$3,334,016.

The parcels impacted by the SDHF are specifically identified in Table 2 along with specific information related to land or structure impact fees. The total cost associated with the Property Inundation Mitigation Alternative is also presented in Table 2. These costs reflect information obtained from the Lincoln County assessor's office. Total assessed value was increased by 20% for the purpose of this assessment. As indicated in Table 2, pertinent data for each parcel impacted by the SDHF of 3,000 cfs was compiled and reviewed. Areas of inundation were determined for each parcel along with identification of structures that were inundated. No insurable structures were inundated. For two parcels, it appears that secondary buildings are impacted and fees determined. Structure impact fees for secondary structures were conservatively assumed to represent 40% of the improvement value associated with each parcel. The unit cost associated with the land impact fee is based on the average per acre land value multiplied by a factor of 60% associated with the impact of inundation. The land impact unit cost was determined to be \$1,200/acre and was applied to each acre impacted by the SDHF of 3,000 cfs. As indicated in Table 2, the total cost for the Property Inundation Mitigation Alternative is estimated to be \$373,790. This cost reflects a one-time inundation impact fee associated with land and structures. Individual parcel maps for all properties identified in Table 2 are included in Attachment 1 to this memorandum.

It should be noted that the costs in Table 2 do not assume *acquisition* of the land or structures impacted by the inundation. This information represents a reasonably conservative estimate to initiate the negotiation and development of inundation compensation agreements with each individual parcel owner. In addition, it assumes that the owner of the parcel/structure is willing to enter into a compensation agreement associated with the inundation impacts within the parcel. During the development of the compensation agreements, other considerations may be discussed and included in the agreement such as implementation/construction of improvements to floodproof portions of the parcel/structure through placement of berms, walls, etc.

Long-Term Operation and Maintenance Costs

Long-term operation and maintenance costs for the Recommended Construction Alternative largely reflect vegetation treatment and dredging costs. For the area upstream of Highway 83, vegetation treatment within the mid-channel bar may be required over 100% of the acreage every 3 years based on experience on previous projects. Assuming vegetation treatment is required every 3 years, the long-term operation and maintenance cost becomes \$15,500 per year. Costs associated with dredging (within the 300-ft channel section) may be required periodically in the area downstream of Highway 83. Assuming the channel section requires removal of 1.5 feet of sediment over a length of 600 feet once every 5 years, approximately 10,000 CY of dredging/hauling may be required. Under this assumption,

Table 1. Recommended Construction Alternative Implementation Cost

Item Number	Description	Unit	Estimated Quantity	Unit Cost (\$)	Item Cost (\$)
<i>Upstream of HWY 83</i>					
1	Vegetation Treatment (see Note 1)	AC	31	\$1,500.00	\$46,500
2	Channel Widening (see Note 2)	CY	315,000	\$1.50	\$472,500
	Subtotal				\$519,000
<i>Downstream of HWY 83</i>					
4	Channel Widening/Dredging (See Note 3)	CY	134,000	\$7.50	\$1,005,000
5	Rock Riprap for 19 jetties/bendway weirs, haul and placement (See Note 4)	CY	8,000	\$90.00	\$720,000
6	Excavation for Rock Riprap (See Note 5)	CY	11,500	\$7.50	\$86,250
	Subtotal				\$1,811,250
7	Mobilization/Demobilization	LS	1		\$233,025
	Cost of Project Components				\$2,563,275
	Engineering Costs	LS	1		\$75,000
	Subtotal				\$2,638,275
	Contingency (15%)	LS	1		\$395,741
	Total Project Construction Costs				\$3,034,016
	Permitting-Section 404/401 Certification/Floodplain (See Note 6)	LS	1	\$300,000.00	\$300,000
	Easements/Management Agreements (See Note 7)	LS	1	\$0.00	\$0
	TOTAL PROJECT COSTS				\$3,334,016
<p>Note 1 Removal of vegetation/trees from mid-channel bar (unit cost reflects removal of large trees)</p> <p>Note 2 1.5 ft of depth, 130 acres, 350 ft wide; no haul off site required</p> <p>Note 3 Average depth of 2 ft, 300 ft wide; \$5/CY for haul included</p> <p>Note 4 Rock quantities include jetty/dike, tie-back into bank, and toe; 2-ft height, 3-ft burial depth</p> <p>Note 5 Includes excavation for tie-back, jetty/dike section, toe protection; \$5/CY for haul included</p> <p>Note 6 Assumes Individual Permit/EA, CLOMR/LOMR floodplain permits, and 401 permit</p> <p>Note 7 No costs assumed based on previous projects involving "No harm, channel improvements".</p>					

Table 2. Cost Information for Property Inundation Compensation Alternative

ACE Parcel #	Data provided by Lincoln County Assessor's Office						3,000 cfs Floodplain Inundation (Mapping Based upon Tetra Tech Permit Model & 2009 LiDAR)			
	PID	OWNER NAME	TOTAL VALUE	LAND VALUE	IMPROVEMENTS	PARCEL AREA (acres)	Inundated Area (sq ft)	Inundated Area (acres)	Does Property Have a Structure?	Primary or Secondary Structure Inundated?
1	23950	COUNTRY CLUB OF NORTH PLATTE	\$ 749,725	\$ 233,760	\$ 515,965	115.05	7,637	0.18	YES	NO
2	24015	FIRST CHURCH OF THE NAZARENE	\$ 498,165	\$ 3,465	\$ 494,700	15.26	9,737	0.22	YES	NO
3	54440	VIEYRA, JEROME & DONNA	\$ 203,650	\$ 70,920	\$ 132,730	62.55	19,935	0.46	YES	NO
4	54505	MAC MILLAN, CHARLES P.	\$ 96,175	\$ 23,890	\$ 72,285	8.72	5,595	0.13	YES	NO
5	54510	MC QUADE, TIMOTHY J. & WF.	\$ 182,555	\$ 56,675	\$ 125,880	24.89	14,984	0.34	YES	NO
6	54520	ALBRECHT, JAMES E.	\$ 287,730	\$ 37,400	\$ 250,330	15.98	15,995	0.37	YES	NO
7	60165	PUTMAN, CHARLES FRANCIS & WF.	\$ 116,190	\$ 46,165	\$ 70,025	40.74	896,826	20.59	YES	NO
8	60185	T.C. LAND & CATTLE CO.	\$ 382,480	\$ 63,525	\$ 318,955	53.37	993,611	22.81	YES	Secondary*
9	60245	EWING, DARRYL L. & CATHERINE S.	\$ 270,720	\$ 28,445	\$ 242,275	19.85	62,598	1.44	YES	Secondary*
10	60250	JENSON, KENNETH & SHERRY L. ET AL	\$ 75,525	\$ 40,235	\$ 35,290	22.57	131,980	3.03	YES	NO
11	60260	RUPP, RYAN DAVID & TRACY L. DRUEKE	\$ 132,050	\$ 15,340	\$ 116,710	5.90	27,202	0.62	YES	NO
12	61790	MEAD, CHARLES B. & CHERYL L.	\$ 206,555	\$ 22,550	\$ 184,005	13.14	28,642	0.66	YES	NO
13	61795	DISHMAN, SCOTT & LINDA K.	\$ 145,240	\$ 29,020	\$ 116,220	21.85	205,841	4.73	YES	NO
14	30090	CITY OF NORTH PLATTE	\$ -	\$ -	\$ -	26.17	141,370	3.25	NO	
15	53685	CITY OF NORTH PLATTE	\$ -	\$ -	\$ -	3.42	2,185	0.05	NO	
16	53690	JENSON, KENNETH & SHERRY L. ET AL	\$ 57,000	\$ 57,000	\$ -	71.77	157,539	3.62	NO	
17	53695	STATE OF NEBRASKA	\$ -	\$ -	\$ -	3.13	5,897	0.14	NO	
18	53705	VIEYRA, JEROME F. & DONNA L.	\$ 13,360	\$ 13,360	\$ -	19.08	2,489	0.06	NO	
19	54329.75	CHRISMAN, ALAN M. & SANDY	\$ 4,515	\$ 4,515	\$ -	5.14	6,599	0.15	NO	
20	54550	COLLINS, JESS PATRICK E AL	\$ 4,275	\$ 4,275	\$ -	5.18	2,914	0.07	NO	
21	55175	YOUNG, ROGER L.	\$ 1,425	\$ 1,425	\$ -	1.66	1,762	0.04	NO	
22	55180	ENGEL, BARRY & THOMAS COLLINS	\$ 2,850	\$ 2,850	\$ -	3.62	923	0.02	NO	
23	55185	MARTIN, JEFFREY D.	\$ 4,465	\$ 4,465	\$ -	4.97	6,984	0.16	NO	
24	55190	BALANGA, SHIRLEY I.	\$ 4,560	\$ 4,560	\$ -	4.68	3,144	0.07	NO	
25	55195	CHRISMAN, ALAN M. & SANDRA	\$ 4,515	\$ 4,515	\$ -	5.07	7,378	0.17	NO	
26	59946	PANKONIN, JOHN L.	\$ 11,400	\$ 11,400	\$ -	13.60	51,776	1.19	NO	
27	60245.5	BAKER, MICHAEL L. &	\$ 44,720	\$ 44,720	\$ -	33.83	165,274	3.79	NO	
28	n/a	n/a (Cody Park)	\$ -	\$ -	\$ -	112.33	831,214	19.08	NO	

STRUCTURE INUNDATION IMPACT FEE	Assessed Value	Value increased by 20%	LAND INUNDATION IMPACT FEE (All Parcels)
Parcel 60185 (Secondary Bldg only)	\$ 127,580	\$ 153,100	Inundated AC 87.0
Parcel 60245 (Secondary Bldg only)	\$ 96,910	\$ 116,290	Unit Cost/AC** \$1,200
			LAND INUNDATION IMPACT FEE \$104,400.00
INUNDATION IMPACT FEE	\$ 224,490	\$ 269,390	
TOTAL STRUCTURE AND LAND INUNDATION IMPACT FEE \$ 373,790			

* Primary insurable structure not inundated. Secondary building(s) inundated. Assume 40% of Assessed Improvements

** Unit cost based on 60% of the average land value per acre.



the annual long-term operation and maintenance cost becomes \$15,000. The combined annual operation and maintenance costs for the Recommended Construction Alternative is estimated to be \$30,500.

No long-term operation and maintenance cost associated with the Property Inundation Mitigation Alternative have been identified. The costs for this alternative assume a one-time inundation impact fee associated with land and structures.

Permitting Requirements

Permitting requirements for the Recommended Construction Alternative include:

- Section 404 of the Federal Clean Water Act
- Section 401 of the Federal Clean Water Act requiring Water Quality Certification
- FEMA documentation documenting no impact on regulatory floodplains

Section 404 of the Clean Water Act regulates the discharge of dredged and/or fill material in waters of the U.S. Fill material may include rock, sand or other materials from excavation activities. Projects involving the discharge of dredged and/or fill material into waters of the U.S. require authorization from the Corps of Engineers.

The Section 404 review process generally involves submittal of a jurisdictional determination report providing descriptions and mapping to identify the limits of the project site as well as the limits of waters of the U.S. For projects such as the Recommended Construction Alternative, a pre-application meeting is encouraged to obtain guidance on the specific permit applicable to the project. Standard Permits or General Permits will be discussed during the meeting. Standard Permits include Individual Permits and Letters of Permission (LOPs) while General Permits include Nationwide Permits and Regional Permits.

Individual Permits typically involve the comprehensive evaluation of specific information related to a proposed project. The process includes the solicitation of input from the public and resource agencies through publication and distribution of a public notice, an evaluation of the aquatic resource effects of the project relative to Section 404(b)(1) Guidelines, full public interest review pursuant to the National Environmental Policy Act of 1969 (NEPA), and ultimately the preparation of an environmental assessment (EA) or environmental impact statement (EIS). Based on the impacts associated with the construction of the project, it is likely that an Individual Permit will be required and may lead to the preparation of an EA.

An applicant for a Section 404 permit must also submit an application to the state for certification under Section 401. A Section 404 permit is contingent on approval of the application for certification under Section 401.

When construction occurs within a floodplain regulated under the National Flood Insurance Program (NFIP), a formal application to FEMA must be submitted to document the impacts associated with



construction. Furthermore, construction within a regulated floodway must demonstrate that no increase will result to the base flood elevations associated with the 100-year flood event. Following the completion of design details or plans associated with the proposed improvements and prior to construction, an application for a Conditional Letter of Map Revision (CLOMR) must be submitted to FEMA for review and approval. Construction cannot be initiated until approval of the CLOMR is received. Following construction, an application for a Letter of Map Revision (LOMR) must be submitted to document that the construction was completed in accordance with the design details and plans. The development and review of each CLOMR and LOMR application may range from 4 to 6 months.

During this feasibility assessment, a preliminary evaluation of the floodplain impacts related to the Recommended Construction Alternative was completed. The limits of the 100-year floodplain evaluation are presented in Figure 6 and the results summarized in Table 3. The results identify a decrease in the base flood elevation data ranging in magnitude from 0.1 to 0.9 feet. Decreases in base flood elevation correspond to the increased conveyance provided by the dredging and channel widening within the reach.

Implementation Schedule

Several items must be considered during the development of an implementation schedule for each alternative. The majority of these items pertain to the Recommended Construction Alternative rather than the Property Acquisition Alternative.

For the Recommended Construction Alternative, the following items were considered along with the estimated duration for completion of each item.

Easement and Management Agreements: 3 to 6 months, should be initiated immediately upon notice to proceed.

Permitting

Section 404:	2 to 3 years, initiated upon notice to proceed
Section 401:	3 months, concurrent with Section 404
FEMA (CLOMR):	4 months, initiated upon completion of design details
FEMA (LOMR):	4 months, initiated following completion of construction

Design:	3 months
Construction:	6 to 8 months

Assuming that the design and acquisition of easement and management agreements can be completed concurrent with the permitting (Section 404/Section 401/FEMA CLOMR), it is anticipated that these initial items will extend as long as three (3) years after notice to proceed with the Recommended Construction Alternative. The duration associated with permitting is the item that drives the schedule and may extend the implementation schedule well beyond 3 years prior to initiation of construction activities. Construction activities along with permitting (FEMA LOMR) will extend the project an additional year. In summary, assuming initial permitting activities can be completed within 3 years, the scheduled duration for implementation of the Recommended Construction Alternative becomes 4 years as a minimum.

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**Table 3. Comparison of Existing and Proposed Construction Alternative
100-Year Water Surface Elevations**

Model Cross Section	Existing Conditions	Proposed Construction Alternative	Difference in Water Surface Elevation (feet)
	100-Year Water Surface Elevation (Q = 14,700 cfs)		
881352.8	2825.33	2825.33	0.0
879774.8	2823.55	2823.52	0.0
878955.8	2822.65	2822.52	-0.1
878229.8	2821.83	2821.65	-0.2
877549.8	2820.89	2820.62	-0.3
876992.8	2820.09	2819.64	-0.5
876651.8	2819.75	2819.36	-0.4
875207	2818.14	2817.36	-0.8
873651.8	2816.01	2815.63	-0.4
872175.8	2814.3	2814.04	-0.3
871230.8	2813.11	2812.83	-0.3
870627.8	2812.26	2812.07	-0.2
868867	2810.51	2810.09	-0.4
867193.8	2808.96	2808.66	-0.3
866413.8	2807.99	2807.09	-0.9
865541.8	2807.2	2806.37	-0.8
864789	2806.61	2806.06	-0.6
863865.8	2806.25	2805.83	-0.4
862379.8	2805.58	2805.19	-0.4
861578.4	2805.38	2804.92	-0.5
861321.8	2804.77	2804.37	-0.4
861241.8	2804.48	2804.22	-0.3
861072.2	2804.33	2804.1	-0.2
860690.8	2804.13	2803.92	-0.2
860390.8	2803.34	2803.26	-0.1
860315.9	HWY 83 Bridge		
860268.8	2801.88	2801.44	-0.4
860173.8	2802.18	2801.69	-0.5
859767.8	2801.71	2801.54	-0.2
858771.8	2800.43	2800.36	-0.1
857869.8	2799.06	2798.68	-0.4
857526.8	2798.66	2798.4	-0.3
855960.8	2795.94	2795.73	-0.2
854241.8	2794.31	2794.1	-0.2
853365.8	2793.45	2793.18	-0.3
852679	2793.02	2792.82	-0.2
851072.8	2790.48	2790.43	-0.1
850378.8	2790.49	2790.45	0.0
849624.8	2790.22	2790.22	0.0
848912.8	2789.93	2789.93	0.0
848799.9	Railroad Bridge		

*Analysis conducted using Permit Review Model developed by Tetra Tech. Cross section locations are provided on Figure 6.



Figure 6 - HEC-RAS Model Cross Section Location Map



Alternatively, the implementation schedule for the Property Inundation Compensation Alternative considers the negotiation process related to inundation of parcels and structures. While it is acknowledged that this process may involve several iterations with multiple landowners, it is assumed that the scheduled duration of completion of this process is 1 year as a minimum. Furthermore, this schedule assumes that all landowners/parcels impacted by inundation associated with SDHFs will participate in the development of an inundation agreement.

Summary and Recommendations

Based on the information and results provided above, the following summary is provided with respect to the feasibility assessment of the Recommended Construction Alternative and the Property Acquisition Alternative.

- The implementation Costs associated with the Recommended Construction Alternative were estimated to be \$3,334,016 versus \$373,790 for the Property Inundation Compensation Alternative. The implementation costs for the Property Inundation Compensation Alternative represents a one-time inundation impact fee associated with land and structures.
- Long-term operation and maintenance costs were estimated to be \$30,500 for the Recommended Construction Alternative. No long-term operation and maintenance costs were identified for the Property Inundation Compensation Alternative.
- Potential permitting requirements are more extensive with the Recommended Construction Alternative. It is likely that an Individual Permit/Environmental Assessment, 401 Certification and floodplain permits will be required.
- The proposed design and configuration of the Recommended Construction Alternative tends to decrease the base flood elevations associated with the regulatory floodplain.
- The implementation schedule associated with the Recommended Construction Alternative is largely impacted by the duration of the permitting process which is estimated to take as much as 2 to 3 years to complete. Consequently, the implementation schedule for the Recommended Construction Alternative is estimated to be a minimum of 4 years (in consideration of permitting) versus 1 year for the Property Inundation Compensation Alternative.

The information in this summary indicates that the Property Inundation Compensation Alternative achieves the objectives of the PRRIP more cost effectively and timely than the Recommended Construction Alternative. Consequently, it is recommended that the Property Inundation Compensation Alternative be further investigated as a means to achieve the SDHF goals of the PRRIP. Should this alternative be selected, site-specific information related to each parcel will be required to better describe the inundation impacts, costs associated with the inundation, or alternatives to minimize the inundation (such as retaining walls, berms, etc.).