US Army Corps of Engineers®

Papillion Creek and Tributaries Lakes, Nebraska

General Reevaluation Report

Appendix H
Environmental Assessment and Finding of No Significant Impact

June 2021

Omaha District
Northwestern Division

FINDING OF NO SIGNIFICANT IMPACT

Papillion Creek and Tributaries Lakes
General Reevaluation Report
Sarpy, Douglas and Washington Counties, Nebraska
June 2021

The U.S. Army Corps of Engineers, Omaha District (Corps) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The final Feasibility Report (FR) and separate Environmental Assessment (EA) dated **30 June 2021**, for the Papillion Creek and Tributaries Lakes General Reevaluation Report addresses flood risk and assesses opportunities and the feasibility to reduce flood and life safety risks in the Papillion Creek Basin in Sarpy, Douglas and Washington Counties, Nebraska. The final recommendation is contained in the report of the Chief of Engineers, dated **DATE OF CHIEF'S REPORT**.

The Final FR and EA, incorporated herein by reference, evaluated various alternatives that would reduce the likelihood and consequences of flooding on human life and safety, reduce the risk of flood damage to property, businesses, and infrastructure (including critical facilities), incorporate natural and nature-based systems, where possible, to preserve and increase the area and habitat function of the Papillion Creek and its tributaries, and where possible improve recreational opportunities through the 50-year period of analysis in the study area.

The Recommended Plan reduces equivalent annual damages from $14,434,470 under future without-project conditions to $7,026,580 with project. The difference between the future without project and with project condition represents total annual benefits of $7,407,890 resulting from the proposed structural and nonstructural flood risk management measures. When compared to total annual costs of $5,156,420 the resulting benefit-cost ratio is 1.44. The combined flood risk management plan measures, which are individually justified, generate a benefit-to-cost ratio above unity, and produce $2,251,470 in annual net benefits to the Nation. The Recommended Plan also includes recreation features. The annual benefits from these features total $805,801. Compared against $266,765 in the total annual costs required to add these features, the recreation component is also economically justified with $539,036 in net annual benefits and a benefit-cost ratio of 3.02. The final Recommended Plan, including recreation, produces $8,213,690 average annual benefits. With average annual costs totaling $5,423,190, the Recommended Plan has a benefit-cost ratio of 1.51 and would provide $2,790,510 in annual net benefits to the Nation. Therefore, it is considered economically justified. The recommended plan is the National Economic Development (NED) Plan and includes:

- A 74-acre wet dam on South Papillion (DS19)
- A dry dam on Little Papillion Creek (DS10)
- A new levee/floodwall on Little Papillion (3.67 miles on right bank & 2.98 miles on left bank)
- Elevation of 59 residential structures, dry floodproofing of 256 commercial structures, and filling of 71 residential basements along Big Papillion Creek, Cole Creek, Papillion Creek, Saddle Creek, South Papillion Creek and West Papillion Creek.

- Compensatory mitigation necessitates the replacement of 34.8 acres of riparian forest, 1.4 acres of palustrine emergent (PEM) wetlands and 10.1 acres of native prairie plantings. Monitoring will continue until required mitigation has been determined to be successful based on the identified criteria within the Monitoring and Adaptive Management Plan included in Appendix H5. Post-construction monitoring is expected to require a minimum of five years annual monitoring but last no more than 10 years.
- Recreation features

In addition to a "no action" plan, four thematic action alternatives were evaluated for each tributary. The alternatives included Dams/Reservoirs, Channel Modification/Levees/Floodwalls, Nonstructural, and Combination plans on West Papillion, South Papillion, Little Papillion, Big Papillion, Papillion Creek, Saddle Creek, Cole Creek, and Thomas Creek. Reference Section 5 of the EA and Section 4 of the Feasibility Report for detailed alternative formulation, tentative plan selection, optimization and final Recommended Plan.

For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the Recommended Plan are listed in Table 1.

Table 1: Summary of Potential Effects of the Recommended Plan

	Significant Effect to Resource	Insignificant Effects	Insignificant Effects as a Result of Mitigation	No Effect to Resource
Physiography/Topography	☐	☒	☐	☐
Climate	☐	☐	☐	☒
Soils	☐	☒	☐	☐
Land Use	☐	☒	☐	☐
Hazardous, Toxic & Radioactive Waste	☐	☐	☐	☒
Stream Habitat Function	☐	☐	☒	☐
Water Quality	☐	☒	☐	☐
Wetlands	☐	☐	☒	☐
Air Quality	☐	☐	☐	☒
Noise	☐	☐	☐	☒
Vegetation	☐	☐	☒	☐
Fish & Wildlife	☐	☒	☐	☐
Migratory Birds & Bald Eagle	☐	☒	☐	☐
Aquatic Macroinvertebrates	☐	☒	☐	☐
Threatened and Endangered Species	☐	☒	☐	☐
Species of Concern	☐	☐	☐	☒
Invasive Species	☐	☒	☐	☐
Socioeconomics and Environmental Justice*	☒	☐	☐	☐
Cultural Resources±	☐	☐	☒	☐
Recreation*	☒	☐	☐	☐

*Effect is beneficial
±Effect is insignificant with the implementation of the Programmatic Agreement

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs) as detailed in the FR and EA will be implemented, if appropriate, to minimize impacts.

The Recommend Plan will result in unavoidable adverse impacts to environmental resources, including removal of 23.5 acres of riparian forest habitat for dam construction, reservoir inundation and levee/floodwall construction, loss of 0.35 acres of palustrine emergent (PEM) wetlands that would be directly filled from embankment construction of DS19, and conversion of a stream to a lacustrine system. To mitigate for the impacts to forest resources the Corps will plant 31.8 acres of trees within the boundaries of the normal operating pool and maximum operating pool of DS19 and 3 acres at DS10. For mitigation of wetland impacts the Corps will restore of 1.4 acres of PEM wetlands through the excavation of shallow areas connected to the edge of the normal pool area of DS19. For mitigation of stream resources, the Corps will plant a 100-foot wide buffer of native prairie and wetland plants along each side of the Little Papillion creek for 1,000 feet and along both sides of South Papillion Creek for 1,200 feet. The estimated cost for mitigation of 34.8 acres of riparian forest habitat is estimated at approximately $405,264. The cost associated with PEM wetland mitigation is estimated at $54,147 for excavation and seeding. The estimated cost for restoration of stream impacts is estimated at $151,480. Mitigation requirements were determined through analysis utilizing the Nebraska Stream Condition Assessment Procedure and the Brown Thrasher Habitat Evaluation Procedure and may be found in Appendix H1.

Two public scoping meetings, three tribal coordination meetings, one partnership meeting and three public meetings held for report review or alternative discussion occurred during the feasibility phase of this project. The draft FR and EA were released for public review on November 21, 2019. The public review period ended on January 3, 2020. Comments submitted during public meetings and public review periods were responded to in the Final FR and EA and may be found in Appendix K.

Pursuant to Section 7 of the Endangered Species Act of 1973, as amended, the Corps determined that the recommended plan may affect but is not likely to adversely affect the northern long-eared bat and would have no effect on the pallid sturgeon and western prairie orchid. The US Fish and Wildlife Service concurred with the Corps' determination on 4 February 2021

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the Corps determined that historic properties may be adversely affected by the recommended plan. The Corps has been coordinating a Draft Programmatic Agreement (PA) which was sent to the Nebraska State Historic Preservation Office, Advisory Council of Historic Properties, Project Sponsor, Ponca Tribe of Nebraska, Omaha Tribe, Otoe-Missouria Tribe, Ponca Tribe of Indians of Oklahoma, Pawnee Nation of Oklahoma, Winnebago Tribe and Iowa Tribe of Nebraska and Kansas for comment prior to finalization on December 18, 2020. All terms and conditions resulting from the agreement shall be implemented in order to minimize adverse impacts to historic properties.

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with section 404(b)(1) Guidelines (40 CFR 230). The Clean Water Act Section 404(b)(1) Guidelines evaluation is found in Appendix H4.

A water quality certification pursuant to Section 401 of the Clean Water Act would be obtained from the Nebraska Department of Environment and Energy (NDEE) prior to construction. In a letter dated May 5, 2021, the NDEE stated they have reviewed the Papillion Creek and Tributaries Lakes General Reevaluation Report Section 404(b)(1) evaluation and have not identified any significant concerns with the project to this point. Water quality certification would be granted pending confirmation based on information to be developed during the pre-construction engineering and design phase. All conditions of the water quality certification will be implemented in order to minimize adverse impacts to water quality.

All applicable environmental laws, regulations, executive orders and policy guidance have been considered and coordination with appropriate agencies and officials has been completed.

Technical, environmental, economic criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on this report, the reviews by other Federal, State and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

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Date

Mark R. Himes, P.E., PMP
Colonel, Corps of Engineers
District Commander

Table of Contents

List of Figures

List of Appendices

Papillion Creek and Tributaries Lakes, Nebraska General Reevaluation Report Final Environmental Assessment

Sarpy, Douglas, and Washington Counties, Nebraska

June 2021

1. INTRODUCTION

The U.S. Army Corps of Engineers, Omaha District (Corps), in cooperation with the Papio-Missouri River Natural Resources District (NRD) has prepared this Environmental Assessment (EA) pursuant to the National Environmental Policy Act (42 U.S.C. § 4331 et seq.; NEPA) of 1969, as amended, for the proposed Papillion Creek General Reevaluation Report (GRR) for the Papillion Creek Watershed located in Douglas, Sarpy, and Washington Counties in Nebraska. The GRR and this EA are a reanalysis of previously completed flood risk management studies, using current planning criteria and policies, which is required due to changed conditions and/or assumptions. The results may affirm the previously selected plan; reformulate and modify it, as appropriate; or find that no plan is currently justified.

The existing Papillion Creek and Tributaries Lakes, Nebraska, Flood Risk Reduction Project was authorized for investigation under Section 203(b) of the Flood Control Act of 1962 (Public Law [P.L.] 87-874) and authorized for construction under Section 203 of the Flood Control Act of 1968 (P.L. 90-483) for $2.1M and $26.8M, respectively. The comprehensive plan to reduce flood risks within the Papillion Creek Basin in Sarpy, Douglas and Washington Counties included the construction of 21 dams for flood control, recreation and water quality. The Corps has constructed four dams; Glen Cunningham (completed December 1979), Standing Bear (completed December 1978), Zorinsky (completed September 1989) and Wehrspann (completed August 1988), of the 21 authorized. The federal dams are owned and operated by USACE and are leased to sponsors who operate and maintain the upstream lands for public recreation. In addition, six levee systems were constructed, and channel improvements, bank armoring and grade control structures have also been constructed on Big Papillion Creek and its tributaries throughout the basin. Non-federal sponsors have subsequently continued to implement additional flood risk management through construction of four additional dams, several detention basins, and nine additional non-federal levee systems.

Due to ongoing development in the Papillion Creek basin, which has resulted in channel instability, and increases in surface runoff and water velocities, significant flood risk to the community remains. There are approximately 4,700 structures in the 500-year floodplain with an approximate structure value of $1.9B. Within the 500-year floodplain, the population at risk is approximately 6,219 people and identified critical infrastructure includes 6 schools, 4 emergency medical services, 4 fire stations, 2 local emergency operation centers, 2 national shelter systems, 3 law enforcement facilities, and 2 prisons.

1.1. Project Authority

The GRR and accompanying EA are authorized under the Energy and Water Development Appropriation Act of 1982 (public law 97-88) House Report No. 97-177. The GRR Study began September 12, 2018, with the execution of a Feasibility Cost Sharing Agreement between the Corps and the NRD. The study is cost-shared 50% federal and 50% non-federal.

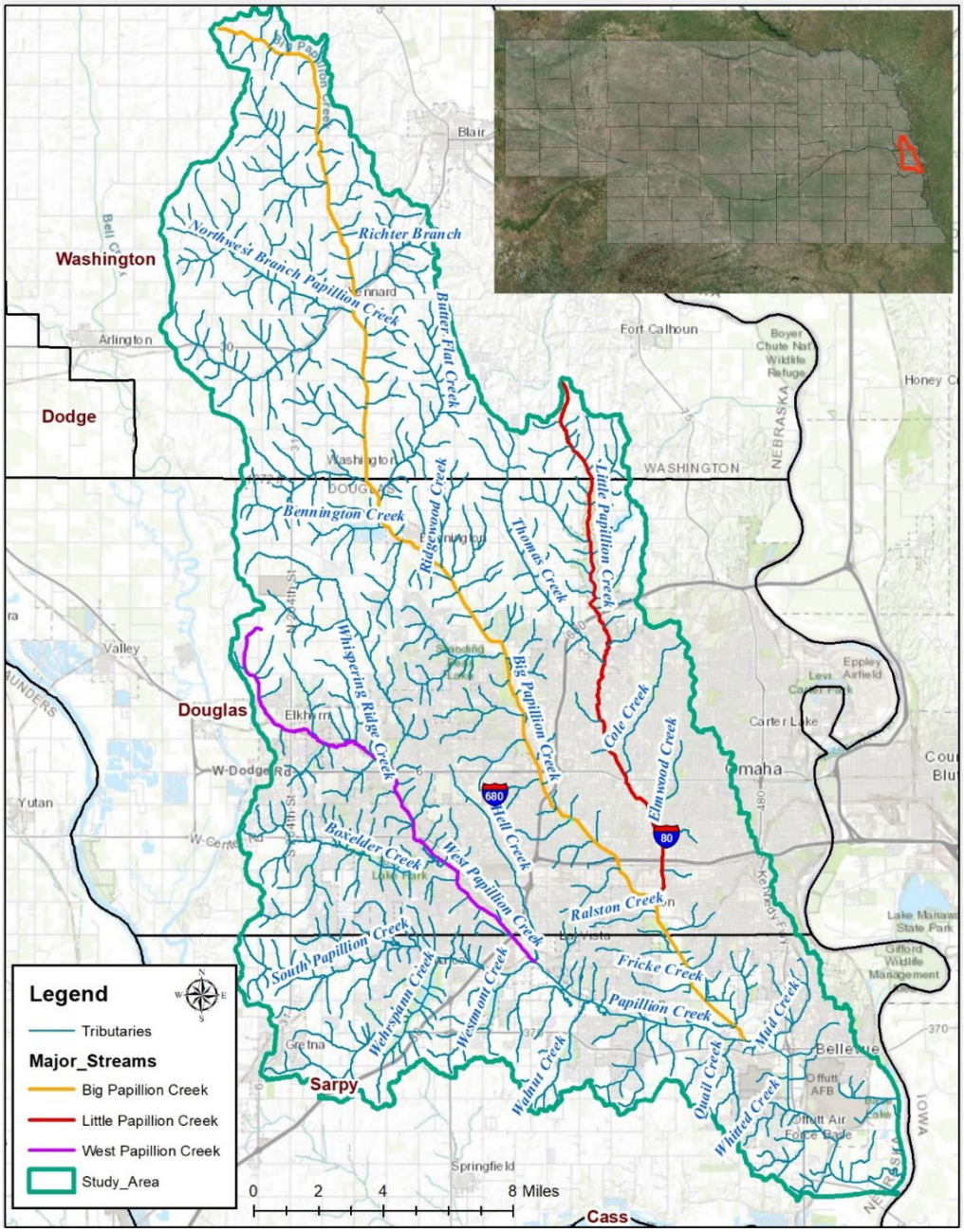

Figure 1. The three major streams in the Papillion Creek basin; West Papillion (purple), Big Papillion (orange) and Little Papillion (red).

1.2. Project Location

The Papillion Creek basin spans three counties; Washington, Douglas and Sarpy, and is about 41 miles long, has a maximum width of about 17 miles and drains approximately 402 square miles. The three major streams within the watershed are the Little Papillion Creek, Big Papillion Creek and West Papillion Creek (Figure 1).

2. PURPOSE AND NEED

The purpose of the proposed project is to address flood risk issues in order to reduce flood and life safety risks in the Papillion Creek Basin. The need for the project is to protect the population at risk, approximately 6,000 people as well as the critical infrastructure within the 0.2% APE floodplain.

3. ALTERNATIVES ANALYSIS

Review Section 4.6 and Section 5 of the feasibility report for detailed discussion on alternative formulation, alternative screening criteria and alternatives carried forward for further consideration. Initially, during alternative formulation, Problems and Opportunities were identified in addition to planning objectives and constraints. Two iterations of the planning process were conducted with the sponsor prior to the Alternatives Milestone Meeting (AMM). Measures originally considered included dams, levees, floodwalls, flood tunnels, off channel detention, water diversions, channel widening, nonstructural measures, bridge modifications, bridge removal, road modifications, and culvert modifications. These measures were evaluated for their ability to meet the completeness, effectiveness, efficiency, and acceptability criteria.

The plan formulation of the Papillion Creek Basin alternatives assumed that actions on each particular channel (i.e. Big Papillion Creek, Little Papillion Creek, etc.) have independent impacts and benefits. Therefore, alternatives were formulated on each channel individually and not compared against alternatives on other channels. Having passed review for engineering adequacy, environmental and public acceptability, and the other alternatives evaluation criteria as described in the GRR, the remaining alternative with the highest net benefits to the national economy was identified as the National Economic Development Plan (NED plan). The final NED plan includes the NED plan for each channel combined together; however, each channel could be implemented independent of the actions on the other channels. This allows for a more comprehensive flood risk reduction plan for the entire watershed.

Reference Section 5 of the feasibility report for discussion on initial screening, the tentatively selected plan (TSP), the optimized TSP and the Recommended Plan. This EA will bring forward analysis of the Recommend Plan. Table 1 below identifies the final array of alternatives carried forward for further consideration after initial measures were screened out.

3.1. No Action

Under the No Action Alternative, there would be no federally-funded construction actions taken or changes to the existing flood risk management system or its current operations, maintenance, or management practices in any of the channels in the Papillion Creek Basin. Because no flood risk reduction actions would occur, flood risk in the basin would persist and potentially worsen as the basin continues to develop. While it is possible that other non-federal Sponsors may continue to implement flood risk reduction management projects such as channel improvement or additional dam construction, it is likely adverse impacts from continued development in the basin and exacerbated average annual increases in runoff would occur prior to funding being secured from local sources.

The No Action Alternative does not meet the Purpose and Need identified in Section 2 nor does it successfully address the planning objectives. The No Action Alternative does not alleviate risk to flood-prone properties and the public health and safety of the affected community. While some local emergency preparedness plans can be updated and general awareness of flood risk may be increased, this measure is inadequate when taken alone.

Table 1. Final Array of Alternative Plans

Final Array	Alt 1 - No Action Alternative	Alt 2 – Dams/ Reservoirs	Alt 3 - Channel Modifications/ Levees/ Floodwalls	Alt 4 - Nonstructural	Alt 5 – Combined Plans
West Papillion	No Action		Floodwall	Elevation, Dry Floodproofing, Basement Fill	Alt 3 + Alt 4
South Papillion	No Action	Dam Site 19			
Little Papillion	No Action	Dam Site 10	- New Levee/ Floodwall	Elevation, Dry Floodproofing, Basement Fill	Alt 2 + Alt 3 + Alt 4
Big Papillion	No Action		- Channel Widening - Levee Raise/ Floodwall	Elevation, Dry Floodproofing, Basement Fill	Alt 3 + Alt 4
Papillion Creek	No Action			Dry Floodproofing	
Saddle Creek	No Action			Elevation, Dry Floodproofing, Basement Fill	

4. RECOMMENDED PLAN

Damage probability relationships for risk reduction reaches with the proposed alternatives in place were estimated. Construction, real estate, mitigation, operations, and maintenance cost estimates were prepared for each alternative. Alternatives were screened at risk reduction levels based on equivalent annual values of damages avoided over the period of analysis, as compared to the No Action alternative. From these assessments, net economic benefits and benefit-cost ratios were calculated.

Recommended Plan/NED Plan – Through several iterations of the planning process, the alternatives that maximize net benefits were selected. The Recommended Plan (RP) includes South Papillion Creek Dam Site 19 (wet dam), Little Papillion Creek Dam Site 10 (dry dam) and new levee/floodwall and 71 basement fills, 59 elevation of residential structures and 256 dry floodproofing of commercial structures along Big Papillion Creek, Cole Creek, Papillion Creek,

Saddle Creek, South Papillion Creek, and West Papillion Creek. While the nonstructural measures for approximately 386 structures reduce their flood risk, it does not, however, remove those structures from the regulatory floodplain. The recommended structural plan also includes removal of approximately 149 structures from the regulatory floodplain. The 1% AEP energy grade line plus three additional feet alternatives for the Little Papillion Creek will reduce life loss by 2 orders of magnitude.

Environmental Mitigation- The Recommend Plan necessitates the removal of 23.5 acres of riparian forest habitat for dam construction, reservoir inundation and levee/floodwall construction and would require replacement. A total of 31.8 acres of riparian forest mitigation plantings would occur within the boundaries of the normal operating pool and maximum operating pool of DS19, and 3 acres of riparian forest mitigation would be planted within the flood pool of the dry dam at DS10. Estimated costs for mitigation of riparian forest habitat were calculated to approximately $405,264 for the total 34.8 acres of riparian forest mitigation plantings. Additionally, 0.35 acres of palustrine emergent (PEM) wetlands would be directly filled from embankment construction of DS19, resulting in the restoration of 1.4 acres of PEM wetlands through the excavation of shallow areas connected to the edge of the normal pool area of DS19. Costs associated with PEM wetland mitigation are estimated at $54,147 for excavation and seeding. Impacts to stream habitat function would also require mitigation; this would be accomplished by planting a 100-foot wide buffer of native prairie and wetland plants along each side of the Thomas Creek for 1,000 feet at DS10, and planting a 100-foot wide buffer along both sides of an unnamed tributary to South Papillion Creek for 1,200 feet for DS19. This would result in 10.1 mitigation acres for stream impacts at an estimated cost of $151,480. Mitigation requirements were determined through analysis utilizing the Nebraska Stream Condition Assessment Procedure and the Brown Thrasher Habitat Suitability Index Model. Additional discussion on mitigation is available in Section 5.6, 5.8, 5.11, 7 of the EA and Appendix H1.

5. EXISTING CONDITIONS AND ENVIRONMENTAL CONSEQUENCES

The current environmental conditions and the resources listed below provide information where it exists and reference important information from previous documentation regarding current conditions. The affected environment in the proposed project area was assessed through site visits, aerial photographs, and literature searches.

Environmental consequences of the alternatives in the Recommended Plan have been integrated with the affected environment to show the degree of potential impacts to individual resources; these impacts may either be positive or negative in nature. The probable consequences (i.e., adverse and beneficial effects) of the proposed action and its alternatives on selected resource categories are described below for each resource category. An assessment of the environmental consequences provides the scientific and analytic basis for alternative comparison. Impacts are described in terms of duration and intensity:

Impact Duration:

1) **Short-term**: Temporary impacts caused by the construction and/or implementation of an alternative.
2) **Long-term**: Impact persists after the action has been completed and/or after the action is in full and complete operation.

Impact Intensity and Context:

1) **Negligible**: Impacts may occur, but the change would be localized and so small that it would not be of any measurable or perceptible consequence.
2) **Minor**: Impact could result in a change to a population or individuals of a species or to a portion of a habitat or resource. The change would be measurable but small, localized, and of little consequence to the resource.
3) **Moderate**: Impact could result in some change to a population or individuals of a species or habitat. The change would be measurable and of consequence, but would be of moderate scale and would occur over a limited area.
4) **Major**: Impact could result in a considerable change to a population or individuals of a species or resource or habitat. The change would be measurable, extensive, and would occur over a wide geographic area.

To enable quantifying and qualifying various impacts to the physical environment, existing ecological services were modeled with the Nebraska Stream Condition Assessment Procedure (NESCAP) to ensure no net loss of stream habitat function as a result of the Recommended Plan. As applicable, modeling analysis has been integrated within this EA to demonstrate adverse and beneficial impacts to assessed resource categories. For the complete NESCAP modeling results, reference Appendix A of the EA.

5.1. Physiography and Topography

The topography of the Papillion Creek watershed is generally moderate to steeply sloping hills, with overland slopes ranging from 0- to approximately 30-percent. Deep, narrow valleys with relatively steep valley slopes also characterize the study area. The Papillion Creek waterhsed is situated in the Missouri River basin and is generally distinguished by two major landform divisions; the uplands which formed in loess and glacial till and the floodplains which formed from alluvium along the Missouri River. The uplands include hills and bluffs adjacent to the Missouri River and rolling loess topography. Floodplains are flat and exist approximately 100 to 300 feet below the uplands. Elevations vary from 850 feet mean sea level (msl) to approximately 1400 ft msl near the Little Papillion Creek in Washington County (NDEQ, 2018).

5.1.1. No Action

Under the No Action alternative, no federally-funded construction activities related to flood risk management would occur within the Papillion Creek basin; there is minor potential for some flood reduction measures to continue to be implemented within the basin by non-federal sponsors, however there are currently no identified actions in any City or County Master Plans.

It is not anticipated that any impacts would directly occur to topography as a result of the No Action Alternative. The No Action Alternative will not address the purpose and need of the project. Indirect impacts as a result of the No Action Alternative may include localized changes to topography within the floodplain from continued bank sloughing and erosion that could continue to occur without stabilization and sediment management measures.

5.1.2. Recommended Plan

Under the Recommended Plan, some moderate, long-term localized changes to topography would occur as a result of dam, levee, and floodwall construction. These changes are described below.

5.1.2.1. South Papillion Creek

Along the South Papillion Creek, DS 19 would be constructed. This would involve the construction of a 1,450-foot earthen dam across the South Papillion Creek to create a 74-acre lake within the existing creek valley. Approximately 74 acres of terrestrial habitat and agrarian areas would be converted to an open water resource. A sediment retention structure would also be constructed just upstream of the lake pool.

5.1.2.2. Little Papillion Creek

To reduce flood risk along the Little Papillion Creek, Dam Site 10 would be constructed along Thomas Creek, which is a tributary to the Little Papillion Creek. A 1,450-foot long dam would be constructed across the creek to form a dry dam within the creek valley. Because it would be a dry dam, the only changes to topography would be associated with the dam itself and the spillway. New levees and/or floodwalls ranging in height from 2.6 to 9.8 feet would be constructed between Blondo Street and Saddle Creek.

5.2. Climate

The study area is marked by wide seasonal variations with hot summers and generally cold winters. Nebraska experiences a continental climate type; typical characteristics include large temperature variability with warm summers dominated by convective thunderstorms and cold winters influenced by snow and wind from mid-latitude cyclones. Moisture in the eastern portion of the state, where the study area is located, is received from southerly winds coming across the Gulf of Mexico (Shulski et al., 2013).

Table 2. 30-year average annual minimum and maximum temperatures and average annual precipitation from 1981-2010.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Max. Temperature (°F)*	33.4	38.1	50.9	63.7	73.8	83.2	87.3	85.1	77.6	64.7	48.9	35.3	61.8
Avg. Min. Temperature (°F)*	13.6	18.1	28.1	39.8	50.9	61.0	66.2	64.0	53.9	41.6	28.8	16.7	40.2
Avg. Total Precipitation (inches)*	0.72	0.85	1.99	2.96	4.76	4.18	3.83	3.82	2.68	2.15	1.64	1.04	30.62

Values are from the Eppley Airfield weather station, Source: National Climatic Data Center https://www.ncdc.noaa.gov/cdo-web/datatools/normals

Human activities have caused an approximate 1˚C (33.8˚F) increase in global temperatures above pre-industrial levels with a likelihood of increasing to 1.5˚C (34.7˚F) between 2030 and 2052 should no action be taken (IPCC, 2018). According to the National Climate Assessment, the Great Plains Region is susceptible to changes in crop growth cycles due to warming winters and alterations in the timing and magnitude of rainfall events. Rising temperatures will also lead to an increased demand for water and energy, this will continue to strain development, stress natural resources and increase competition for water among communities, agriculture, energy production and ecological needs (Shafer et al., 2014).

The Papillion Creek Basin falls within Region 10: Missouri River Basin. According to the *Climate Change Assessment for Water Resources Region 10* (USACE 2015), Mauget (2004) assessed 42 streamflow gages within the United States, 11 of which were located along the Missouri River. From 1939 to 1998, an increase in streamflow for the entire Missouri River basin was observed. The general consensus in recent literature indicates mild increases in temperature and streamflow within the entire Missouri River basin, with a clear consensus of a lengthening growing season (USACE 2015).

5.2.1. No Action

While the No Action alternative would have no direct effect on climate, the No Action Alternative would not address the project Purpose and Need to address flood risk to the local community. Some scientific evidence indicates continued increases in precipitation and surface runoff in this region. Should no action be taken to address flood risk, it is likely that flooding events will continue to increase in frequency and intensity threatening public health and safety and causing significant property damage.

5.2.2. Recommended Plan

The Recommended Plan would have no direct effect on climate; as discussed in the *Climate Change Assessment for Water Resources Region 10*, statistically significant evidence indicates mild increases in temperature, precipitation and surface runoff for the lower basin of Region 10 where the Papillion Creek Basin is located. As such, it is feasible to assume that continued and increasing flood risk is present; The Recommended Plan would assist in proactively addressing current and potential future flood risk to the surrounding community.

5.3. Soils

The soils in the upper portions of the basin are generally deep, well-drained silt loam to silty clay loam formed in loess. Permeability is moderate, and the available water capacity is high. Bottomland soils, or soils in the lower portions of the basin, generally consist of poorly drained silty clay to fine sand loam. Permeability is moderate and the available water capacity is low.

Generally, soil composition tends to be dominated by silty clays and silty clay loams. Parent materials generally consist of clayey alluvium or silty alluviums. Soils presented in Figure 4 have been grouped together by dominant soil type, however, most soils are complexes, meaning a combination of one or more major soil types. The soil type with the highest presence along the three streams are variations of Udorthents and Udarents Urban Land complexes. Kezan- and Calmo- dominated complexes have hydric soil ratings and are fairly present throughout the study area. Some areas of prime farmland are intermittently present throughout the study area as well as soils of statewide importance, and soils classified farmland if drained; however, a majority of soils within Douglas and Sarpy counties have been converted to urban, residential or open space land use and would likely already not be utilized for agriculture purposes (NRCS, 2019).

5.3.1. No Action

Under the no action alternative, there would be no construction activity, so there would be no impacts to soils.

5.3.2. Recommended Plan

Prime Farmland soils are present at DS19 on South Papillion Creek, and at DS10 on Thomas Creek. Prime Farmland Soils present include Kennebec Silty Loam, and Judson Silty Clay Loam. At Dam Site 19, there is also one soil type (Contrary-Marshall Silty Clay Loam) that is classified as having statewide importance. Approximately 79 acres of Prime Farmland soils that are currently farmed at Dam Site 19 on South Papillion Creek would be permanently converted into a dam and lakebed and would no longer be farmable. There are approximately 71 acres of Prime Farmland soils within the footprint of the floodpool at Dam Site 10 on Thomas Creek, however, because DS10 would be a dry dam, most of these acres would remain farmable. The footprint of the dam and the spillway at DS10 would permanently convert approximately 18 acres of prime farmland soils into the dam and spillway structures, so they would no longer be farmable. The United States Department of Agriculture Natural Resource Conservation Service (NRCS) in Nebraska was coordinated with on multiple occasions via email beginning in January

of 2020. Farmland Conversion Impact Rating Forms were prepared for DS10 and DS19 and submitted to the NRCS for review. An email was received from the NRCS on 21 January 2020 stating that the proposed projects at DS10 and DS19 were found to be cleared of Farmland Protection Policy Act Concerns. See Appendix H2 for the completed Farmland Conversion Protection Rating Forms, and the 21 January 2020 email from the NRCS.

Other minor and temporary impacts associated with Little Papillion Creek Alternative 5 include the excavation, hauling, and grading that would occur to construct the proposed levees and floodwalls. Typical earth-moving equipment would be used to dig, grade, trench and shape the soils during construction activities. Erosion control best management practices (BMPs), such as silt fencing and erosion control blankets would be utilized during construction. Immediately following construction activities, disturbed areas would be seeded with a native seed mixture or levees would be seeded a with stabilizing seed mixture and the newly seeded areas would be mulched to control erosion. Ground disturbing activities would be kept to a minimum.

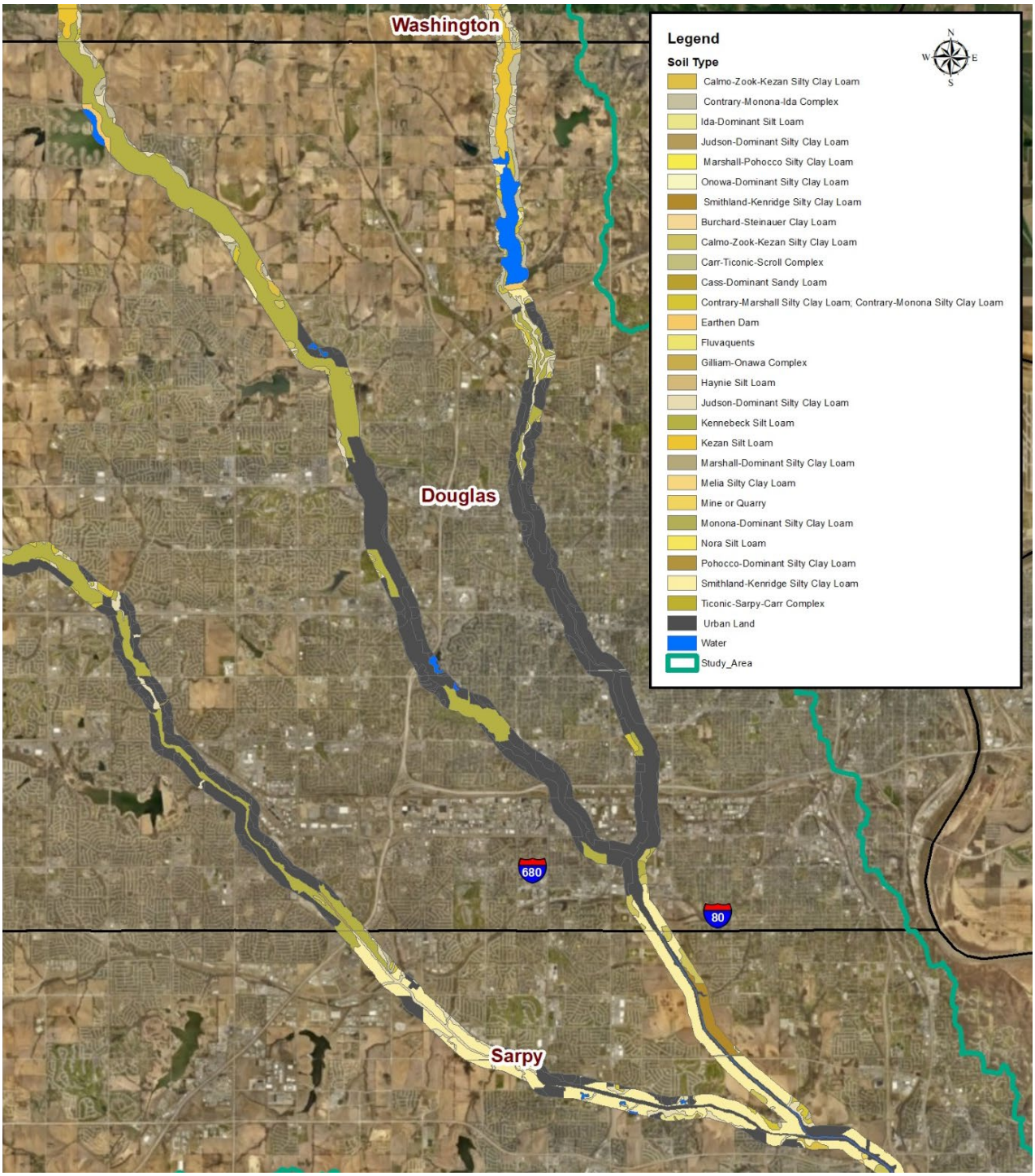

Figure 2. General soil types surrounding West Papillion Creek, Big Papillion Creek and Little Papillion Creek

5.4. Land Use

Land use within the study area is generally heavily urbanized in Sarpy and Douglas Counties and primarily agrarian in Washington County. Areas of herbaceous open-space are sporadically

present within the Papillion Creek basin in all three Counties while wooded/forested areas and wetlands are notably lacking throughout the entire basin (Figure 5). Land use at the two proposed dam sites (DS 19 in Sarpy County and DS 10 in Douglas and Washington counties) is primarily agricultural.

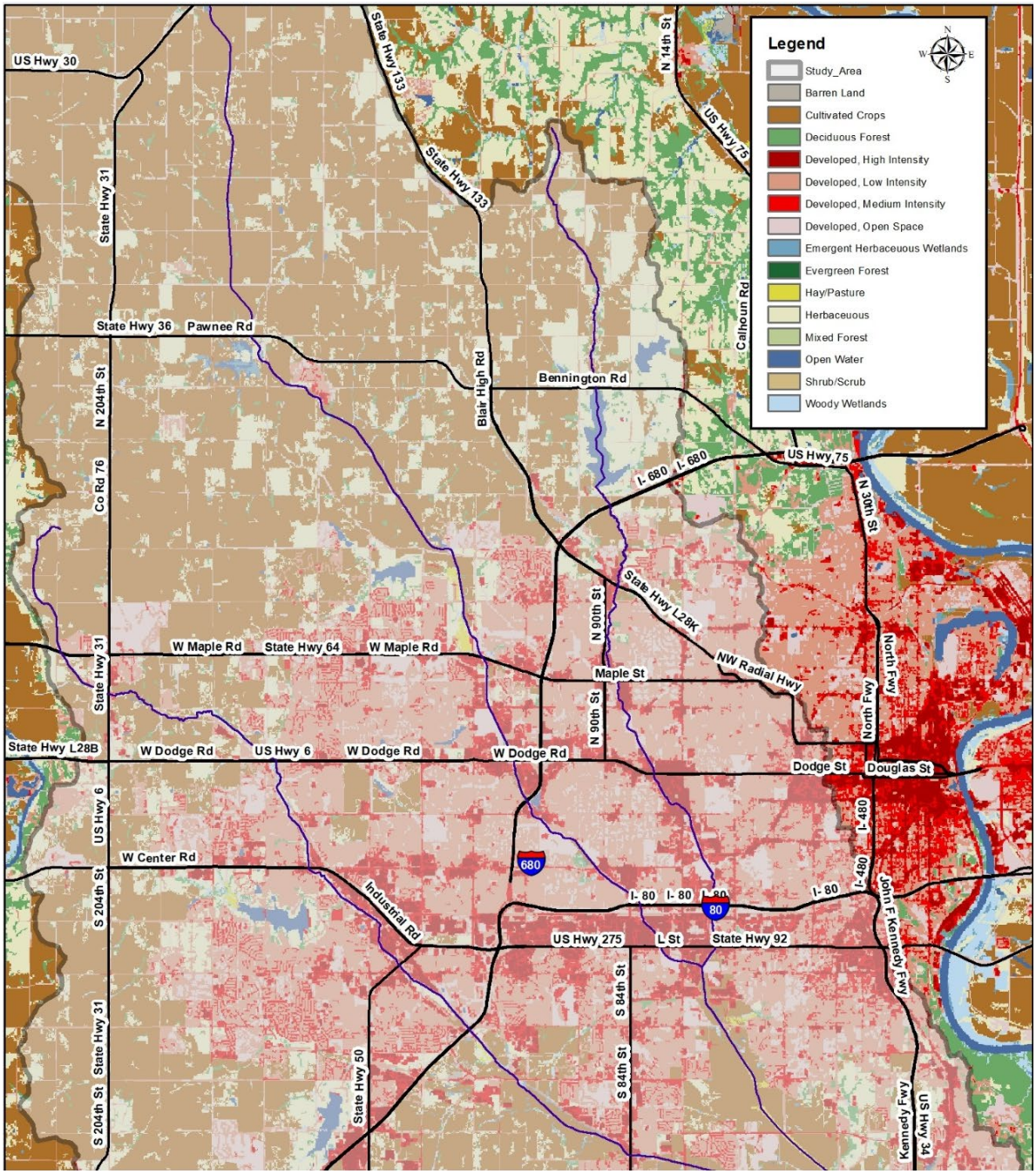

Figure 3. General land use classifications within the Papillion Creek watershed

5.4.1. No Action

Under the No Action alternative, there would be no federally funded construction. There is potential that non-federal sponsors may continue to implement flood risk reduction measures; however, it is likely that a non-federal project would take significantly longer as funding would be derived from the local community. Should no measures be taken to address flood risk within the Papillion Creek basin, residential, urban and agricultural land use categories may all be adversely impacted as a result of continued flooding.

5.4.2. Recommended Plan

Implementation of the Recommended Plan would result in a number of localized land use changes along the Little Papillion, South Papillion, and Thomas Creeks associated with levee and floodwall construction, and construction of the two proposed dam sites. These land use changes would occur along each of the included Papillion Creek tributaries as described below.

5.4.2.1. South Papillion Creek

The Recommended Plan would result in the construction of Dam Site 19 on the South Papillion Creek in Sarpy County. Real estate acquisition for dam site construction would result in a permanent land use change on over 214 acres of primarily agricultural land that would be located below the maximum flood pool elevation. Approximately 74 of the 214 acres would be located below the normal pool elevation and would likely be continuously flooded. The area between the normal pool elevation and the maximum flood pool elevation (approximately 100 acres) would be converted from agricultural land to recreation facilities and wildlife habitat. In addition, a proposed stream habitat mitigation site on an unnamed tributary to the South Papillion Creek would permanently convert approximately 5.5 acres of land that is currently farmed into wildlife habitat.

5.4.2.2. Little Papillion Creek

Under the Recommended Plan, Dam Site 10 would be constructed on Thomas Creek to provide flood risk management benefits along the Little Papillion Creek. Because DS10 is proposed to be a dry dam, the required level of real estate acquisition for the land within the floodpool would primarily consist of flowage easements. Under flowage easements, farming would be allowed to continue where feasible, however no habitable structures would be allowed within the easements. Also located within the floodpool footprint, approximately 7.6 acres of primarily farmland would be acquired in fee for habitat mitigation. Construction of the dam and spillway would convert approximately 18 acres of farmland into flood risk management structures. Construction of the levees and floodwalls along the Little Papillion Creek would require the removal of two houses along the Cole Creek levee tie off. These houses and their driveways and patios would be removed to construct the levee. The previously impervious surfaces would be replaced by grass cover on the levee and the 15-foot buffer next to the levee. There are several other locations along the proposed levee and floodwall where impervious surfaces like parking lots and portions of some buildings would be removed and replaced with grass covered levees. A total of approximately 2.53 acres of impervious surfaces would be replaced by pervious grass covered surfaces associated with levee construction.

5.4.2.3. Non-Structural

Typical non-structural measures that would be implemented under the Recommended Plan include elevating structures, dry floodproofing, and filling basements. These measures would not change the land use where the work would be performed. However, there are some structures located in the floodway. The only viable non-structural measure to address structures in the floodway is a buy-out. In a buy-out, the structure would be purchased from the owner and the structure would be removed from the floodway. This would change the land use where the structure was located from commercial or residential to open green space with no structures.

5.5. Hazardous, Toxic and Radioactive Waste

Phase I site investigations will be completed prior to any real estate transactions to ensure that no contaminated properties become part of the proposed project prior to being remediated.

5.5.1. No Action

Under the No Action alternative there would be no ground disturbing activities associated with construction, so there would be no impacts to buried hazardous, toxic, or radioactive waste.

5.5.2. Recommended Plan

Currently, there are no known hazardous, toxic, or radioactive waste sites within the proposed project area. The Recommended Plan would involve acquisition by the sponsor of all lands, easements, and rite of ways necessary to construct the proposed levees, floodwalls, and dam sites included in the plan. As part of the acquisition process, environmental condition of property surveys would be conducted on each parcel proposed for acquisition. The purpose of the environmental condition of property surveys is to screen each parcel for the potential presence of hazardous, toxic, or radioactive waste prior to purchasing the property. If a survey reveals the potential presence of hazardous, toxic, or radioactive waste, the property would not be acquired unless the owner cleans up the site. For these reasons, the Recommended Plan is not likely to disturb or otherwise adversely impact any hazardous, toxic, or radioactive waste sites.

5.6. Stream Habitat Function

The Recommended plan would modify portions of the beds and/or banks of the South Papillion Creek , Little Papillion Creek, and Thomas Creek, which is a tributary to the Little Papillion Creek. Impacts to stream habitat function resulting from construction within or along the banks of a stream or conversion of a stream into a lake or reservoir must be quantified and mitigated appropriately.

5.6.1. Nebraska Stream Condition Assessment Protocol (NeSCAP)

The Nebraska Stream Condition Assessment Procedure (NESCAP) was the selected habitat assessment tool to assess baseline environmental conditions for the Papillion Creek General

Reevaluation Report Feasibility Study. This model was reviewed by the U.S. Army Corps of Engineers (Corps) Ecosystem Planning Center of Expertise (ECOPCX) and received approval for regional use on July 11, 2019. Site visits were conducted on May 17, 22, and 29, 2019 to collect data for the model parameters described below. Reference Appendix H1 of this document for the full technical analysis.

NESCAP is a hydrogeomorphic assessment method that measures thematic variables for the major physical, ecological and anthropogenic factors that can strongly influence stream and adjacent riparian systems. The minimum assessment area used for this method includes the bankfull stream channel and active floodplain. The six variables utilized in this method are as follows:

V1- Hydraulic Conveyance and Sediment Dynamics
V2- In-stream Habitat/Available Cover
V3- Floodplain Interaction-Connectivity
V4-Riparian Vegetation Composition
V5- Riparian Buffer Continuity and Width
V6- Riparian Land Use

Each variable receives a Condition Index Rating (CIR) between 0.10 and 1.00 based on conditions observed or measured at the project site in conjunction with off-site information. The most degraded, culturally disturbed conditions are assigned a 0.10, and the reference standard condition is assigned a 1.00. Conditions not measured or observed may receive a CIR of 0.0. If a given variable is non-applicable, the variable may be completely omitted from scoring from a particular River Reach (RR), and thus receive a "NA". The RR is an aggregated assessment unit, which is defined laterally as a segment of a mainstem stream channel and adjacent riparian ecosystem that is relatively homogenous in terms of geomorphology, soils, hydrology, channel morphology, vegetation and cultural alteration. The RR includes the bankfull stream channel, active floodplain and the less frequently flooded, historical floodplains and terraces.

Once each RR has been assessed with applicable variables, a finalized Stream Condition Index (SCI) is calculated. The SCI is defined as the sum of the scores for the rated variables divided by the maximum sum of the scores for the variables rated, where: $SCI=\Sigma V/\Sigma Vmax$. The resultant SCI (habitat quality) for the given RR is then multiplied by stream lengths or area (habitat quantity) for a unit-less weighted score. Refer to Appendix H1 of the EA for a full explanation of the NeSCAP procedure.

5.6.2. NeSCAP Existing Conditions

One sampling location (data point) was established in each river reach where construction is proposed on each of the three streams. The extent of each river reach was determined primarily by the type of construction proposed for each reach, but they were further defined laterally as segments of stream channel and adjacent riparian ecosystem that are relatively

homogenous in terms of geomorphology, soils, hydrology, channel morphology, vegetation and cultural alteration. Each sampling location was visited during May of 2019. At each location, a hand diagram was drawn of the stream channel, photographs were taken, estimates of bankfull depth and floodprone depth were recorded, and the types of vegetation present were identified. Google Earth Pro was used to measure top of bank width and bankfull width, characterize adjacent land use, quantify land use within the 100-foot from top of bank assessment zone, and measure acreage of different land cover types. This information was then used to develop existing condition scores for each of the six NeSCAP variables for each sampling location. The scores for each variable were then entered into the NeSCAP spreadsheets to determine the existing conditions SCI score for each sampling location. The spreadsheets also calculate the SCI area for each sampling location and multiply it by the SCI score to produce project impact units.

5.6.3. NeSCAP Future With Project Conditions

Future with project stream condition index scores were developed for each river reach in the Recommended Plan and entered into the NeSCAP calculation spreadsheets. Future with project scores were developed by considering the footprint of the proposed work in each river reach and determining how vegetation, land use, stream morphology, and riparian buffers would be affected by the proposed construction. Aerial imagery from Google Earth Pro and real estate maps depicting the proposed project footprints were utilized to aid in developing scores.

5.6.4. NeSCAP Results

The NeSCAP calculation spreadsheets compare the existing condition SCI scores with those of the predicted Future With Project SCI scores to determine whether the proposed project would produce total positive (beneficial) or negative (adverse) impacts to the condition of the river reach being analyzed. The degree of positive or negative impacts to each river reach are presented as either a positive or negative project impacts unit score. The net positive or negative project impact units for each alternative in the recommended plan are presented in Table 3 below.

Table 3. Summary of stream condition index scores and total impact units

	Stream condition Index		Stream Condition Index * Area		
	Existing Conditions	Future With Project	Existing Conditions	Future With Project	Total Impact Units
Dam Site 10	0.34	0.28	137,558.93	114,144.64	-23,414.29
Dam Site 19	0.37	0.19	71,953.14	35,977	-35,976.57
Little Papio Levee/Floodwall					
L-2	0.35	0.35	144,522	151,515	6,993.00
L-3	0.29	0.29	118,490	118,490	0.00
L-1a	0.21	0.19	35,313.30	31,660.20	-3,653.10
L-1a (Cole Creek)	0.34	0.34	45,143.50	53,110.00	7,966.50
L-2a	0.14	0.14	174,586	174,585.71	0.00
L-3a	0.3	0.26	201,465	189,953	-11,512.29
Lp-8	0.28	0.28	157,323	166,763	9,439.40
Total					-50,157.35

Due to the relatively poor condition of the streams in this study area, the future with project condition only resulted in relatively minor negative project impact unit scores to some of the reaches of Little Papillion Creek during the NeSCAP analysis. Overall, the future with project condition resulted in 9,233.51 net positive project impact units when the results for all of the reaches in the Little Papillion Creek were combined. The beneficial impacts to some of the reaches of the Little Papillion Creek are primarily the result of converting concrete or otherwise un-vegetated areas to grass or other perennial cover due to the expansion of the project footprint resulting from construction of new levees. Floodwalls were used in areas where high value properties or other real estate constraints prevented the acquisition of sufficient property to provide enough space for levee construction. The floodwalls have a much smaller footprint than levees and require less real estate. This resulted in less conversion of concrete surfaces or buildings to grass cover or expansion of the vegetated buffers along the river reaches where floodwalls are proposed. As a result, project impact unit scores in river reaches where floodwalls are proposed either did not change between the without project and future with project condition, or they resulted in slightly negative scores. Negative scores for reaches that primarily included floodwalls were also related to the decrease in floodplain connectivity that would result from construction of floodwalls.

Conversion of over 4,843 feet of South Papillion Creek to lacustrine habitat at Dam Site 19 would result in -35,976.57 project impact units. Since the NeSCAP model assesses impacts to streams, converting a stream to a lake results in negative project impact units that will require mitigation. Construction of a dry dam at Dam Site 10 on Thomas Creek would not convert the creek to a lake, however, it would impact the function of the stream enough to require mitigation of 23,414.29 negative project impact units.

According to the results of the NeSCAP modeling for the Recommended Plan, construction of the two proposed dam sites would result in a combined total negative project impact unit score

of -59,390.86, while the total beneficial impacts of the remainder of the proposed actions (levees/floodwalls) along Little Papillion Creek would result in a total of 9,233.51 beneficial (positive) project impact units. Overall, this results in net negative impacts totaling 50,157.35 negative project impact units. The 59,390.86 negative project impact units that result from construction of Dam Sites 10 and 19 are partially compensated for by the 9,233.51 positive project impact units produced by the remainder of the proposed construction activities along Little Papillion Creek in the Recommended Plan. Therefore, based on the NeSCAP modeling results, the net negative impacts to stream condition (-50,157.35 project impact units) that would occur as a result of construction of the two dam sites under the Recommended Plan would need to be mitigated.

5.6.5. Mitigation of Stream Habitat Function

Negative impacts to Thomas Creek caused by the proposed project would be mitigated by acquiring a total of 4.6 acres of land straddling both sides of a 1,000-foot long segment of the creek just upstream of Pawnee Road. This segment is located within the floodpool of the proposed dry dam. However, because a dry dam with no permanent pool is being proposed, this segment would be suitable for mitigation. Stream mitigation would primarily consist of planting a 100-foot wide buffer of native prairie and wetland plants along each side of the creek for 1,000 feet. Stream impact mitigation at Dam Site 19 would be accomplished by acquiring 5.5 acres of land straddling both sides of a 1,200-foot long segment of an unnamed tributary to the South Papillion Creek located west of Highway 6. This segment of the tributary is located just outside the edge of the floodpool on the upstream end of the proposed reservoir. Similar to the mitigation proposed at Dam Site 10, a 100-foot wide buffer of native prairie and wetland plants would be planted along both sides of the creek channel for a distance of 1,200 feet. The type and amount of stream mitigation proposed was determined through use of the mitigation tool in the NeSCAP calculation book. This tool allows you to manipulate the expected CIR scores for each of the variables that would be affected by the proposed mitigation measures. It also allows you to manipulate the stream length and acreage proposed for mitigation to produce the amount of positive project impact units needed to be mitigate for the impacts of the proposed project Figures 7 and 8 below are NeSCAP mitigation tool worksheets that show how the proposed mitigation at the two dam sites would achieve the required total of at least 50,157.35 positive project impact units. As depicted on the two NeSCAP mitigation tool worksheets, the total amount of mitigation units that would be produced by the proposed mitigation at both dam sites is 52,971 units.

RR_m= Mitigation reach

	Baseline (Pre project)	RR_m1	RR_m2
1	Hydraulic Conveyance and Sediment Dynamics	0.50	0.00
2	In-stream Habitat/Available Cover	0.50	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.10	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	0.25	0.00
6	Land use adjacent to Active Flood plain zone	0.25	0.00
	Stream Condition Index	0.34	0.00
	Left descending bank -Length (ft)	1,000.00	0.00
	Right descending bank -Length (ft)	1,000.00	0.00
	width (ft)	60.00	0.00
	Area	60,000.00	0.00
	Stream condition Index * area	20,142.86	0.00

	Post Project (PROPOSED)	RRm1	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.50	0.00
2	In-stream Habitat/Available Cover	0.75	0.00
3	Floodplain Interaction-Connectivity	0.50	0.00
4a	Riparian Vegetation Composition	1.00	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	1.00	0.00
6	Land use adjacent to Active Flood plain zone	1.00	0.00
	Stream Condition Index	0.75	0.00
	Left descending bank -Length (ft)	1,000.00	0.00
	Right descending bank -Length (ft)	1,000.00	0.00
	width (ft)	60.00	0.00
	Area	60,000.00	0.00
	Stream condition Index * area	45,000.00	0.00

	Change from baseline to post project	RRm1	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.00	0.00
2	In-stream Habitat/Available Cover	0.25	0.00
3	Floodpalin Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.90	0.00
4b	Riparian Vegetation Composition	0.00	0.00
5	Riparian Buffer	0.75	0.00
6	Land use adjacent to Active Flood plain zone	0.75	0.00

PROPOSED - BASELINE	24,857
Stream Length Multiplier	1.0

MITIGATION UNITS	24,857

Figure 4. NeSCAP mitigation tool worksheet for Dam Site 10 on Thomas Creek.

RR_m= Mitigation reach

	Baseline (Pre project)	Unnamed Tributar	RR_m2
1	Hydraulic Conveyance and Sediment Dynamics	0.25	0.00
2	In-stream Habitat/Available Cover	0.25	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.10	0.00
4b	Riparian Vegetation Composition	0.10	0.00
5	Buffer continuity & Width	0.10	0.00
6	Land use adjacent to Active Flood plain zone	0.25	0.00
	Stream Condition Index	0.19	0.00
	Left descending bank -Length (ft)	1,200.00	0.00
	Right descending bank -Length (ft)	1,200.00	0.00
	width (ft)	20.00	0.00
	Area	24,000.00	0.00
	Stream condition Index * area	4,457.14	0.00

	Post Project (PROPOSED)	Unnamed Tributar	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.50	0.00
2	In-stream Habitat/Available Cover	0.50	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	1.00	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	1.00	0.00
6	Land use adjacent to Active Flood plain zone	1.00	0.00
	Stream Condition Index	0.68	0.00
	Left descending bank -Length (ft)	1,200.00	0.00
	Right descending bank -Length (ft)	1,200.00	0.00
	width (ft)	40.00	0.00
	Area	48,000.00	0.00
	Stream condition Index * area	32,571.43	0.00

	Change from baseline to post project	Unnamed Tributar	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.25	0.00
2	In-stream Habitat/Available Cover	0.25	0.00
3	Floodpalin Interaction-Connectivity	0.00	0.00
4a	Riparian Vegetation Composition	0.90	0.00
4b	Riparian Vegetation Composition	0.40	0.00
5	Riparian Buffer	0.90	0.00
6	Land use adjacent to Active Flood plain zone	0.75	0.00

PROPOSED - BASELINE	28,114
Stream Length Multiplier	1.0

MITIGATION UNITS	28,114

Figure 5. NeSCAP mitigation tool worksheet for Dam Site 19 on an unnamed tributary.

Stream mitigation costs at each dam site would include the cost of fee title real estate acquisition, purchase of native seed mixes, and planting the seed. A mix of native grasses, forbs, and wetland plants would be used. The seed mix is estimated to cost about $150/pound, and it would be applied at a rate of 12 pounds/acre for a total cost of $1,800/acre. The proposed mitigation site at Dam Site 10 is located along Thomas Creek within the floodpool area behind the dam. Because Dam Site 10 would be a dry dam, flowage easements would be obtained within the floodpool footprint rather than obtaining fee title to the land. Land used for mitigation in Corps' projects must be owned in fee. Therefore, the real estate cost attributable to mitigation would be the cost of acquiring the land in fee over and above the value of the flowage easement that would be needed to construct the dam. The proposed mitigation site for Dam Site 19 is located outside the fee acquisition boundary required for the proposed reservoir, so full value would have to be payed to acquire fee title to the land. Table 4 below provides a summary of estimated stream mitigation costs at each proposed dam site. See Appendices 1 and 5 for the full site mitigation plan and the Monitoring and Adaptive Management Plan.

Table 4. Stream Impact Mitigation Cost Summary.

Impact Location	*Habitat Type Impacted*	*Acres Impacted*	*Acres Replaced*	*Cost/Acre*	*Total RE Cost*	*Excavation Cost @ 9.09/CY*	*Seeding/Planting Cost/Acre*	*Total Implementation Cost*	*GRAND TOTAL MITIGATION COST*
DS10	Stream	4.6	4.6	$ 18,392	$ 84,603	$ -	$ 1,800	$ 8,280	$ 92,883
DS19	Stream	5.5	5.5	$ 8,854	$ 48,697	$ -	$ 1,800	$ 9,900	$ 58,597
Grand Total		**10.1**	**10.1**		**$ 133,300**			**$ 18,180**	**$ 151,480**

5.7. Water Quality

In accordance with the Clean Water Act (CWA) (33 U.S.C. §1251), states, Tribes, or the EPA must develop standards for their jurisdiction. Pursuant to the CWA, water quality consists of three components: 1) designated and existing uses, 2) water quality criteria necessary to protect these uses, and 3) an anti-degradation policy (40CFR Part 131.6; USACE 2008). Designated uses for waterbodies and streams within the Papillion Creek basin include primary contact recreation, water supply for agriculture, aquatic life, warmwater A and B classifications and aesthetics.

In accordance with Section 303(d) of the CWA, states must identify surface waters that do not meet EPA-approved water quality standards. These affected waters must be placed on a 303(d) list which requires these waters to have total maximum daily load (TMDL) developed. A TMDL is based on the maximum amount of a pollutant that a body of water can receive and still meet water quality standards set forth and on an allocation of that pollutant amount among various sources. Primary pollutants identified in the Papio-Missouri River Basin Water Quality Management Plan (2018) include nutrients, pesticides, sediment and bacteria. Streambank instability and bed degradation are prevalent throughout the system from channelization, armoring, damming and increased surface runoff. Waterbody impairments for the Papillion Creek basin are associated with primary contact recreation and aquatic life designated uses. Impairments and pollutants of concern include excessive chlorophyll, total phosphorus, total nitrogen, sediment, mercury, algal blooms, turbidity, pH, low dissolved oxygen, *E. coli* bacteria

and “unknown” which is likely associated with the loss of habitat for the aquatic community (NDEQ, 2018).

For the Papillion Creek segment (MT1-10100) which extends from the confluence of Big Papillion Creek downstream to its confluence with the Missouri River, TMDLs have been developed for *E. coli* in 2008 and approved in 2009 and the fish consumption advisory was lifted in 2012 however, according to the last reporting cycle in 2016, a TMDL was still needed for selenium (EPA, 2016). Big Papillion Creek (MT1-10120) and Little Papillion Creek (MT1-10111) have also been listed for *E. coil* and West Papillion Creek (MT1-10250) has been listed for Hazardous Index Compounds. As of 2016 Little Papillion and Big Papillion Creeks are classified as impairment-category 4A, meaning that these waterbodies have an EPA-approved TMDL plan in place and implemented while West Papillion Creek is categorized as a 5, meaning this waterbody has violated water quality standards and a TMDL is still needed (NDEQ, 2018).

In addition to the streams within the Papillion Creek basin, the Nebraska Department of Environmental Quality (NDEQ) conducted assessments on 15 of the 18 lakes present within this watershed, of those 11 were identified as impaired for fish consumption advisory, bacteria, nutrients, chlorophyll a and pH. Presently, the entire Papillion Creek watershed has been identified as a priority area by NDEQ (NDEQ, 2018). NDEQ has identified various practices that could help reduce the sedimentation, nutrient loading and *E. coli* present within the watershed; these priority identified measures include practices such as stream restoration, wetland restoration, grassed waterways, riparian buffers, riparian terracing, livestock exclusion fencing, cover crops and sediment control basins.

5.7.1. No Action

Under the No Action Alternative, no federal project would be constructed within the Papillion Creek Tributaries Basin. Potential minor adverse impacts to water quality may occur should the Papillion Creek system continue to flood out of bank. As floodwaters move across the urbanized and agrarian areas of the floodplain, contaminants such as pesticides, road treatment chemicals, sediment, refuse and debris may accumulate and be transported into the Papillion Creek system.

5.7.2. Recommended Plan

Should the Recommended Plan be implemented, spillage of contaminants from the construction site into waterways is a potential effect that would be minor and short term. The CWA requires preparation and submission of a general stormwater permit and preparation of a Stormwater Pollution Prevention Plan (SWPPP) before construction activities can begin. The SWPPP would be based on BMPs such as seeding and mulching bare slopes as soon as practicable and measures to contain spillage of any contaminants into waterways. In the long term there would essentially be no change to the water quality in these creeks from implementation of the Recommended Plan and none of the beneficial uses assigned to the Papillion Creek system would be degraded as a result of construction activities.

Under Section 401 of the CWA, an applicant for a federal license or permit (i.e. Section 404) must obtain a certification that the discharge and activity is consistent with State or Tribal effluent limitations (Section 301 of the CWA), water quality related effluent limitations (Section 302 of the CWA), water quality standards and implementation plans (Section 303 of the CWA), national standards of performance (Section 306 of the CWA), toxic and pretreatment effluent standards (Section 307 of the CWA) and "any other appropriate requirement of State or Tribal law set forth in such certification". An NDEQ 401 Water Quality Certification would be obtained prior to any construction activities. Any mitigation contained within this permit would become part of the proposed action. The Recommended Plan would have minor, temporary construction related adverse impacts to water quality resulting from site runoff and increased turbidity. These temporary impacts would be minimized to the greatest extent possible through the use of BMPs that would be required as a provision under the National Pollutant Discharge Elimination System (NPDES) permit and through permitting requirements from other local and state authorities.

BMPs would minimize any incidental fallback of material into the creek during construction and would minimize the introduction of fuel, petroleum products, or other deleterious material from entering into the waterway. Such practices and measures could include, but are not limited to: the use of erosion control fences; storing equipment, solid waste and petroleum products above the ordinary high water mark and away from areas prone to runoff and requiring that all equipment is clean and free of leaks. To prevent fill from reaching water sources by wind or runoff, fill would be covered, stabilized or mulched and silt fences used as required. With an expectation that BMPs would be required as a part of the NPDES permit and implemented during construction activities, no significant impacts to water quality are anticipated.

Section 404(b)(1) (Clean Water Act) consultations with the NDEQ are ongoing, and Section 401 Water Quality Certification for the Recommended Plan is expected subsequent to the public review of the draft general reevaluation report with integrated EA and Section 404(b)(1) evaluation. The draft Section 404(b)(1) evaluation can be found in Appendix 4.

5.8. Wetlands

At the time of statehood in 1867, Nebraska had approximately 2.9M acres of wetlands covering nearly 6% of the state. Draining wetlands for croplands and urban areas, filling and digging wetlands, channelization of stream systems and declining water tables have all contributed to a 35% reduction from historical conditions. Today, approximately 1.9M acres of wetlands exist within the entire state only covering approximately 3.5% of the land area (Dahl, 1990). Wetlands are the most productive biological systems known as they produce more plant and animal life per acre than any other habitat type. Approximately 990 plant species of the 2,000 found in the state of Nebraska are wetland dependent, all amphibian species in Nebraska are wetland dependent, 18 of 47 reptile species, 176 of 352 bird species and 29 of 80 mammal species found in Nebraska are also wetland dependent (LeGrange, 2005).

There are no major wetland complexes within the proposed project area due to the heavy urbanization, agrarian land uses and severe modification of the Papillion Creek basin. Some small wetland areas can be found on the landward side of some of the leveed sections of the creek. These wetlands are primarily sediment basins that allow storm water from interior drainage to settle prior to draining into the creek through a culvert that runs under the levee. Wetlands can also be found in some of the bays, along the fringes, and in the upstream delta areas of the reservoirs in the Papillion Creek tributaries basin. Small amounts of low-quality wetlands are also be present along the fringes of the streams and tributaries in the Papillion Creek basin. See Figure 9 below for a photo of the fringe wetlands typically found along the creek channels in the Papillion Creek Basin

Figure 6. Representative fringe wetland dominated by invasive reed canary grass typical of Papillion Creek Basin

5.8.1. No Action

Under the No Action Alternative, there would be no impacts to wetlands, as no construction activities associated with a federal project would occur. It is possible that non-federal sponsors may continue to implement flood risk reduction measures such as channel improvement and dam construction with local funding. Non-federal sponsors would have to comply Section 404 of the CWA.

5.8.2. Recommended Plan

Construction of the proposed measures in the Recommended Plan may have minor impacts to existing wetlands. As noted in Section 5.6, existing ecological services were assessed with

NESCAP to ensure no net loss of habitat function. The tributaries within the Papillion Creek basin are primarily managed as flood control channels and have been channelized and fixed in place; disallowing the natural formation of floodplain wetlands. Additionally, the area has been constricted with heavy urbanization. The Recommended Plan would continue to restrict the channels, precluding the streams from interacting with the ecological floodplain and thus the ability to form wetlands.

5.8.2.1. **South Papillion Creek**

Under the Recommended Plan, DS 19 would be constructed on the South Papillion Creek near 192nd and Giles Road in Sarpy County, Nebraska. Currently, over 90 percent of the land within the proposed floodpool is farmed (See Figure 10 below). The remainder of the land consists of the tree lined creek channel and some woody draws. The only wetlands that are present are located in a narrow band of low-quality riverine wetlands dominated by reed canary grass that line the edge of the low flow channel. The Creek channel is approximately 40-feet wide in the location where the dam would be constructed. Construction of the dam embankment would directly fill approximately 0.35 acres of palustrine emergent (PEM) wetlands within the creek channel. USACE requires a 4:1 mitigation ratio for changing the Nebraska Wetland Subclass of PEM wetlands from Riverine Channel to Lacustrine Fringe. The 0.35 acres of PEM wetlands lining the creek channel that would be lost at Dam Site 19 would be partially mitigated by the wetlands that develop along the shallow edges of the bays of the proposed reservoir. In addition, 1.4 acres of PEM wetlands would be created by excavating shallow areas or bays connected to the edge of the normal pool area and planting them with a native wetland seed mix. These areas would be located within the property acquisition limits of the project. The cost of constructing 1.4 acres of PEM mitigation wetlands would include the cost of excavating the depressions next to the normal pool of the reservoir and seeding the excavated areas. The native wetland seed mix is estimated to cost about $150/pound, and it would be applied at a rate of 12 pounds/acre for a total seed cost of $1,800/acre. The estimated cost to plant the seed is $867/acre. The total cost of purchasing the seed and planting it is $2,667/acre. Table 5 below shows a breakdown of the proposed wetland mitigation costs for DS19.

Table 5. Wetland mitigation cost summary.

Impact Location	*Habitat Type Impacted*	*Acres*	*Cost/Acre*	*Total RE Cost*	*Excavation Cost @ $9.09/CY*	*Seeding/Planting Cost/Acre*	*Total Implementation Cost*	*GRAND TOTAL MITIGATION COST*
DS19	PEM Wetland	1.4	$ -	$ -	$ 50,413	$ 2,667	$ 3,734	$ 54,147
Grand Total		**1.4**		**$ -**			**$ 3,734**	**$ 54,147**

Figure 7. DS 19, wetlands within the maximum pool boundary.

5.8.2.2. **Little Papillion Creek**

Under the Recommended Plan, a dry dam at DS10 would be constructed on Thomas Creek near 126th Street and Highway 36 in Douglas County to provide flood risk management benefits along the Little Papillion Creek. Currently, over 90 percent of the land within the boundaries of the proposed floodpool is farmed. The remainder of the land consists of the tree lined creek channel and some woody draws. The only wetlands that are present are PEM, forested/shrub, and riverine wetlands that line the banks, and the low flow channel within Thomas Creek (See

Figure 11 below). The creek channel is approximately 55 feet wide in the location where the dam embankment would be constructed. Construction of the dam embankment across the creek channel would directly fill approximately 0.25 acres of PEM wetlands. The 0.25 acres of PEM wetlands lost at Dam Site 10 would be mitigated by the wetlands that will develop adjacent to the creek bed along the 800-foot long backwater pool that would be created within the creek channel upstream of the dam face. Water in this 800-foot long segment of the creek will back up behind the dam and remain approximately 3 feet deeper than it currently is during normal flows. This deeper water would still be contained within the banks of the existing creek channel. The ground adjacent to the creek within the 800-foot long backwater area would remain wetter than it would have without the proposed project. Wetland vegetation is expected to develop in these areas with wetter soil. In addition, construction of the dam would cause the 2-year event to leave the banks of the creek and temporarily flood approximately 6 acres of land that is currently farmed. This more frequently flooded area is expected to no longer be farmable and much of the area will develop wetland characteristics over time.

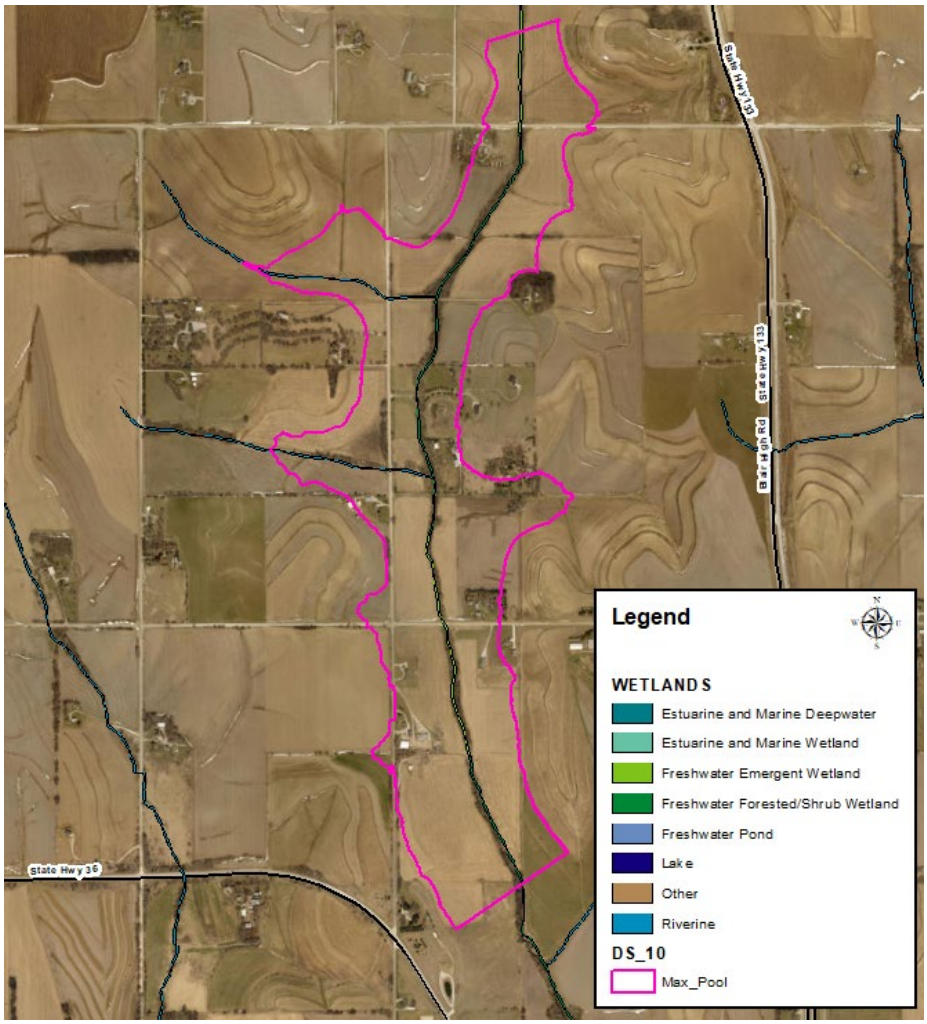

Figure 8. Wetlands within the maximum pool of DS 10.

New levees and/or floodwalls ranging in height from 2.6 to 9.8 feet in height would be constructed between Blondo Street and Saddle Creek. Examinations of aerial photography and on-site visits to the proposed levee/floodwall construction areas along the Little Papillion Creek were conducted during May of 2019. These investigations revealed no wetlands within the proposed levee/floodwall alignments. The only wetlands identified in the area were the riverine wetlands lining the banks of the low-flow channel of Little Papillion Creek (See figure 12 below). Levee and floodwall construction would only occur along the high banks of the creek channel, so no disturbance to the wetlands lining the low-flow channel would occur. Because there are no wetlands within the proposed construction footprints of the levees/floodwalls along the Little Papillion Creek, the proposed levee/floodwall work would not adversely impact wetlands along the Little Papillion Creek. No wetlands were identified with NWI mapping, but it is possible low-quality fringe wetlands may occur along Little Papillion Creek near the average annual water surface elevation. Should any fringe wetlands exist along the Little Papillion Creek, there is potential for placement of riprap to permanently fill these areas. Bank stabilization needs for Little Papillion Creek would be assessed during the design phase and are only anticipated to be utilized in sections where there is an expected increase in high velocities. It is not anticipated that significant bank armoring would be required on Little Papillion.

Figure 9. Wetlands within the proposed Little Papillion Creek levee/floodwall construction area.

5.8.2.3. Non-Structural

Typical non-structural measures that would be implemented under the Recommended Plan include elevating structures, dry floodproofing, and filling basements. These measures would occur in previously developed areas and often times within the footprint of existing structures, therefore these activities would not adversely impact wetlands.

5.9. Air Quality

The Clean Air Act (CAA) (42 U.S.C. § 7401 et seq.), of 1970 tasked the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and welfare and to regulate emissions of hazardous pollutants. A designation of non-attainment indicates that an area does not meet these standards. Air quality in the area is influenced by a combination of factors, which include climate, meteorology, and density and geographic distribution of local and regional air pollution sources. The dispersion of pollutants is influenced by the properties of the pollutants as well as the way air masses interact with the regional topography. Sources of suspended particulate matter and air pollutants in the proposed project area include industrial and commercial businesses, agricultural activities, residential areas and local and railway traffic.

Air quality in the Papillion Creek watershed and the State of Nebraska is monitored by the Nebraska Department of Environmental Quality (NDEQ). Additionally, the City of Omaha has a local agency named Omaha Air Quality Control (OAQC) as well as the Douglas County Health Department. These local agencies monitor air quality and plan, permit and enforce standards within their jurisdictions. Douglas County has multiple air quality monitoring stations that monitor particulate matter$_{2.5}$ (PM) and PM_{10}, carbon monoxide, ozone, sulfur dioxide, and a NCore site that monitors 9 pollutant parameters while Washington and Sarpy Counties each have a station that monitors $PM_{2.5}$ (NDEQ, 2018[2]).

AIRNow is an EPA-generated real time database that provides air quality index (AQI) information. As of February 2019, AQI within the general area of the Papillion Creek basin was considered "moderate" as a result of elevated $PM_{2.5}$ levels, while ozone, carbon monoxide and PM_{10} were considered "good" (EPA, 2019). It should be noted that AQI's fluctuate daily.

According to the EPA Green Book, as of February 2021, Douglas, Sarpy, and Washington Counties in Nebraska are all in attainment status for all priority pollutants (EPA, 2021).

5.9.1. No Action

Under the No Action Alternative, no construction activities utilizing federal funding would occur; however, non-federal sponsors may continue to implement flood risk reduction measures should they receive local fiscal assistance. Non-federal sponsors would have to comply with the CAA. Non-federal sponsors may be required to obtain air quality construction permits dependent upon the type and duration of construction and the potential pollutants emitted associated with construction activities. No adverse impacts are anticipated under the No Action Alternative.

5.9.2. Recommended Plan

The proposed construction activities associated with the Recommended Plan would be temporary, occurring on an intermittent basis during the construction season over a period of 5 to 10 years. Construction activities that would generate emissions include earthwork (i.e., land clearing, ground excavation, and cut-and-fill operations), aggregate/material handling, and construction of project structures. Construction activities would result in short-term emissions including fugitive dust from soil disruption and combustion emissions from the construction equipment and on-road vehicles. Emissions associated with construction equipment and on-road vehicles include criteria pollutants ($PM_{2.5,}$ PM_{10}, carbon monoxide, ozone, and sulfur dioxide), greenhouse gases, and small amounts of air toxics. These emissions are expected to be within acceptable air quality standards. In addition, the general actions below would help to avoid or minimize impacts to air quality during construction:

- Minimize clearing vegetation within all the construction work areas to minimize soil disturbance and keep dust down.
- Conduct construction activities in a manner to minimize the creation of dust. This may include measures such as limitations on equipment, speed, and/or travel routes.

- Implement measures to minimize the transfer of mud onto public roads.
- Maintain construction equipment in good working order.
- Implement a fugitive particulate emission control plan that specifies steps to minimize fugitive dust generation.
- Plan construction scheduling to minimize vehicle trips.

5.10. Noise

Under the Noise Control Act of 1972 and its amendments (Quiet Communities Act of 1978; U.S.C. Title 42, Parts 4901-4918), states have the authority to regulate environmental noise by which governmental agencies must comply with in addition to community noise policies and regulations.

Ambient noise levels within the Papillion Creek watershed vary. Primary sources of noise include vehicle traffic from the City of Omaha as well as air traffic generated from Eppley Airfield and Offutt Air Force Base. Additionally, the Union Pacific Railroad intersects with various locations within the watershed, contributing to the ambient noise level. In Washington County, primary sources of noise include agricultural activities, noise created from residential areas, and recreational activities such as boating and seasonal hunting.

5.10.1. No Action

Should the No Action Alternative be implemented, there would be no federally-funded construction activities. Non-federal sponsors may continue to implement flood risk reduction measures such as channel improvement and dam construction measures. Local entities would be required to comply with the Noise Control Act, therefore, no adverse impacts are anticipated to occur to ambient noise conditions under the No Action Alternative.

5.10.2. Recommended Plan

Increases in noise from construction activities are expected at each of the project sites during construction. The expected increases in noise would be minor, temporary, and similar to those already occurring in the area. The two dam site construction areas (DS10 and DS19) are located primarily in agricultural areas where construction noise would not be unlike the noise created by farm machinery at certain times of the year in these locations. The areas where levee and floodwall construction would occur are located in more urban areas where construction noise would not be as noticeable compared to ambient noise levels. Therefore, the expected increases in noise levels from project construction would be minor and short-term.

5.11. Vegetation

Vegetation in eastern Nebraska was historically a tallgrass prairie with a limited extent of woody vegetation found adjacent to rivers and streams. Prior to 1855 a distinct prairie-forest ecotone restricted to floodplains, terraces and other uplands bordering riparian areas existed. It is thought that lack of fire intensity and frequency allowed woody vegetation to colonize the region. Presently, cottonwood (*Populus deltoides*), bur oak (*Quercus macrocarpa*), American basswood (*Tilia americana*), and rough-leaved dogwood (*Cornus drummondii*) are more

common than they were prior to settlement of the region (Rothenberger, 1989). Within the immediate study area, habitat types were historically upland deciduous forests along the floodplain of the streams and tributaries of Papillion Creek basin and upland tallgrass prairie beyond the riparian corridors. Today, vegetation and habitat types have been severely altered from natural, historical conditions due to land use conversion. Most of the remaining riparian forest is confined to the banks within the stream channels of a few of the reaches. Most of the stream channels have been channelized, straightened, or modified in some other way. These reaches are dominated by smooth brome grass above the bankfull bench and reed canary grass on the bankfull bench and below. Other vegetation that can be found mixed in with the smooth brome grass includes bluegrass, fescue, smartweed, common milkweed, crown vetch, yellow sweet clover, white clover, and curly dock.

5.11.1. No Action

Should the No Action Alternative be implemented, no federally-funded construction activities would occur; however, non-federal sponsors may continue to implement flood risk reduction measures such as channel improvement and dam construction. Should the non-federal sponsor implement any measures that require woody vegetation removal, they would be required to comply with the City of Omaha Forestry Department's *Tree Mitigation Policy* for tree removal that occurs on public property. This generally would require a replacement ratio of 2:1. Additionally, non-federal sponsors would be required to utilize native, weed-free seed mixes; with the exception of seeding levees which require smooth brome, a non-native, rhizomatous cool season grass that provides levee stabilization. Under the No Action Alternative, no adverse impacts are anticipated to occur to vegetation as non-federal sponsors would be required to replace the vegetation that would have been removed.

5.11.2. Recommended Plan

All of the proposed construction actions that are part of the Recommended Plan would include disturbance of existing vegetation. As discussed, NESCAP was utilized to determine the impacts of the Recommended Plan on stream habitat function, and to ensure that no net loss of habitat function would result. The NeSCAP model assessment procedure utilizes thematic variables for the major physical, ecological, and anthropogenic factors that can strongly influence streams and the adjacent riparian systems. Riparian vegetation composition, riparian continuity and width, and riparian land use are all variables used in the NeSCAP model related to riparian vegetation. However, the NeSCAP model does not adequately address the loss of certain vegetation communities such as riparian forest that may be considered significant resources by the Corps or the partnering resource agencies. While the model may show a lower condition index rating for a particular variable if a resource such as native trees are replaced with a different type of non-native vegetation, the loss of the trees themselves may not hold enough weight in the model to result in mitigation of the trees. Construction of the Recommended Plan would result in the loss of 19.5 acres of riparian forest at DS19, 2 acres at DS10, and 2 acres from scattered locations along the Little Papillion Creek for a total loss of 23.5 acres of riparian forest. The trees are part of the existing riparian ecosystem in the basin, and they are considered by the PDT, the USFWS, and the Nebraska Natural Heritage Program to be a

significant resource that is steadily declining in the basin as development continues. For these reasons, 34.8 acres of riparian forest would be planted to mitigate for impacts from the Recommended Plan. Mitigation of the riparian forest habitat would support a recommendation made by the USFWS in an email dated May 28, 2019, in response to a request for Fish and Wildlife Coordination Act (FWCA) comments on the proposed project. The USFWS recommended incorporating riparian buffers along any proposed channel improvements or reservoirs to improve water quality. They also recommended the use of seed mixes that would produce pollinator habitat (see Appendix H2 for correspondence).

5.11.2.1. Habitat Evaluation Procedure (HEP)

The Habitat Evaluation Procedure (HEP) was used to determine the appropriate quality and quantity of riparian forest habitat to be replaced under the Recommended Plan. The HEP was developed by the USFWS in the 1970s. HEP is a well-known land management tool used to quantify (assign a value to) the suitability of habitat for selected species at baseline conditions and at different points in time. HEP can be used to compare the wildlife impacts of different project alternatives or mitigation techniques.

A HEP is comprised of one or more Habitat Suitability Index/Indices (HSI), which are models for calculating the habitat suitability for specific species based on habitat variables that are critical to their survival or successful reproduction. HSI models using existing USFWS-developed indicator species were certified by the Corps. A set of variables that represent the life requisites for the species (e.g. percent cover, water depth, tree height) are described for each species. The variables are measured using desktop methods and subsequently verified in the field and their value is assigned a corresponding index value. These values are then inserted into the HSI mathematical model to produce a score that describes existing habitat suitability. This score is a score between 0 (no value) and 1 (optimum value). Computation of the HSI model will result in an overall "suitability index" for each existing or planned habitat being evaluated. This HSI score is then multiplied by the number of acres affected by the project to produce a number referred to as a "Habitat Unit" or HU.

The Brown Thrasher Habitat Suitability Index (HSI) model was selected to measure the quality of the existing riparian forest habitat that would be impacted by the proposed project, and to predict the quality of the habitat that would be restored through mitigation. The model was developed to evaluate brown thrasher habitat in its entire breeding range during the breeding season (April – August). The variables that are assessed in the brown thrasher HSI model include the density of woody stems > 1.0 meter tall (in thousands of stems), the percent canopy cover of trees > 5.0 meters (16.5 feet) tall, and the percent of ground covered by leaf litter > 1 cm (0.4 inches) deep. Figures 16, 17, and 18 below are the suitability index scoring graphs for each of the three variables. To calculate the HSI score for each site, the suitability index score of each variable is multiplied by the suitability index scores of the other two variables. The following equation is used to calculate the HSI for each site: SIV1 x SIV2 x SIV3. See Section 8.3 in Appendix 1 for a more thorough explanation of the brown thrasher HSI model, and how it

was used to determine the appropriate quantity and quality of riparian forest mitigation for each of the proposed alternatives in the Recommended Plan.

5.11.2.1.1 Existing Conditions

Existing conditions HSI scores were developed for the three forested locations (DS10, DS19, and Little Papillion Creek) that would be adversely impacted (removed) under the Recommended Plan. Table 6 below lists the HSI scores for the existing conditions at the three impacted locations.

Table 6. Existing condition HSI scores for the three impacted sites.

Existing Conditions Brown Thrasher Habitat Suitability Index						
Location	**SIV1**	**SIV2**	**SIV3**	**Score**	**Acres**	**Habitat Units**
DS-19	0.56	0.5	0.7	0.196	19.5	3.82
DS-10	0.55	0.6	0.6	0.198	2	0.39
Little Papio	0.55	0.5	0.5	0.138	2	0.28

Existing conditions HSI scores were also developed for the two locations where the proposed mitigation plantings would be planted. The proposed mitigation locations for DS19 and Little Papillion Creek are located at DS19 in selected areas within the fee acquisition boundary in the band between the normal operating pool and the top of the flood pool. The 2 acres of riparian forest impacted along Little Papillion Creek would be mitigated at DS19 because the only available real estate for the mitigation plantings along Little Papillion creek is far more expensive at more than $100,000/acre than the real estate at DS19. The selected locations are all currently either pastureland or they are being farmed for corn or soybeans. There are no woody stems in these locations, and less than 20 percent of the ground is covered by leaf litter. The proposed mitigation location for DS10 is located along Thomas Creek within the flood pool of the dry dam. Similar to the mitigation site at DS19, the ground is currently being farmed for corn or soybeans, there are no woody stems, and less than 20 percent of the ground is covered by leaf litter. Table 7 below shows the existing conditions HSI scores and associated habitat units for the three proposed mitigation areas.

Table 7. Existing condition HSI scores for the mitigation sites.

Existing Conditions Brown Thrasher Habitat Suitability Index at Mitigation Sites						
Location	**SIV1**	**SIV2**	**SIV3**	**Score**	**Acres**	**Habitat Units**
DS-19 Mit/Little Papio	0.1	0.1	0.1	0.001	21.5	0.022
DS-10 Mit	0.1	0.1	0.1	0.001	2	0.002

5.11.2.1.2 Future With Project Conditions

A mitigation planting plan was developed to replace the quality and quantity of riparian forest habitat that would be lost at the three areas where trees would be cleared for construction or killed due to flooding. The proposed mitigation planting plan was developed through the use of an incremental cost analysis of a number of alternative riparian forest mitigation plans. The

incremental cost analysis considered a range of different combinations of planting rates and total acres of mitigation habitat. As a result of the incremental cost analysis, it was determined that the mitigation areas would be planted at a rate of 135 stems per acre. Within each acre, 10 percent of the stems would consist of native tree species with a minimum dbh of 2 inches, and 90 percent of the stems planted would consist of native shrub species. Trees are estimated to cost $200 per tree installed with 14/trees per acre being planted for a cost of $2,800/acre, and shrubs are estimated to cost $60 per potted plant installed with 121 shrubs/acre being planted for a cost of $7,260/acre; total cost for planting 125 woody stems/acre is estimated to be $10,060/acre. Table 8 below shows the estimated cost of the mitigation plantings for the three impacted riparian forest areas.

Table 8. Estimated mitigation planting costs for the three impacted riparian forest areas.

Impact Location	*Mitigation Location*	*Future With Project HSI Score*	*Acres of Mitigation*	*Total habitat Units*	*Planting Cost/Acre*	*Total Planting Cost*	*Real estate cost/Acre*	*Total Real Estate Cost*	*Total Mitigation Cost*
DS19	DS19	0.13	29.5	3.84	$10,060	$296,770	$0	$0	$296,770
DS10	DS10	0.13	3	0.39	$10,060	$30,180	$18,392	$55,176	$85,356
Little Papio	DS19	0.13	2.3	0.3	$10,060	$23,138	$0	$0	$23,138
Grand Total			**34.8**			**$350,088**		**$55,176**	**$405,264**

Future with project HSI scores were predicted for years 1, 10, 25, and 50 using the proposed mitigation planting plan with a planting rate of 135 stems per acre. The resulting future with project HSI scores and the associated habitat units are shown in Table 9 below.

Table 9. Future with project HSI scores for the proposed mitigation sites

Future With Project Scoring at Mitigation Sites							
Year	**Location**	**SIV1**	**SIV2**	**SIV3**	**HSI Score**	**Acres**	**Habitat Units**
1	DS-19 Mit	0.1	0.1	0.1	0.001	29.5	0.0295
1	DS-10 Mit	0.1	0.1	0.1	0.001	3	0.003
1	Little Papio Mit	0.1	0.1	0.1	0.001	2.3	0.0023
10	DS-19 Mit	0.13	1	1	0.13	29.5	3.84
10	DS-10 Mit	0.13	1	1	0.13	3	0.39
10	Little Papio Mit	0.13	1	1	0.13	2.3	0.3
25	DS-19 Mit	0.14	1	1	0.14	29.5	4.13
25	DS-10 Mit	0.14	1	1	0.14	3	0.42
25	Little Papio Mit	0.14	1	1	0.14	2.3	0.32
50	DS-19 Mit	0.15	1	1	0.15	29.5	4.43
50	DS-10 Mit	0.15	1	1	0.15	3	0.45
50	Little Papio Mit	0.15	1	1	0.15	2.3	0.35

5.11.2.1.3 Results of the HEP

The minimum target HSI scores at the proposed mitigation sites to achieve the equivalent number of habitat units using a planting rate of 135 stems/acre is 0.13. Based on the future with project scoring results in Table 9 above, the target HSI scores for all three impacted sites

would be achieved by year 10 with predicted scores of 0.13. The minimum target number of habitat units required to mitigate the lost habitat from each of the three impacted sites is 3.83 for DS-19, 0.39 for DS-10, and 0.28 for the Little Papillion Creek. Based on the future with project predicted habitat unit scores in Table 9, the target habitat unit scores would be exceeded for all three sites by year 10. At year 10 the habitat unit scores at the mitigation sites are predicted to be 3.84 for DS-19, 0.39 for DS-10, and 0.3 for the Little Papillion Creek. HSI scores, and habitat unit scores are expected to slowly increase out to year 50 as the stem count continues to increase over time.

5.11.2.2. South Papillion Creek

Under the Recommended Plan, DS 19 would be constructed along the South Papillion Creek. This would involve the construction of a 1,450-foot earthen dam across the South Papillion Creek to create a 74-acre lake within the existing creek valley. Currently, most of the land that would be inundated by the normal pool of the proposed reservoir is under cultivation to grow corn and soybeans. However, the creek channel and some attached drainage ditches are lined with trees consisting mostly of silver maple, green ash, box elder, mulberry, and cottonwood. In most areas, a narrow strip of smooth brome grass separates the edge of the creek channel from the planted crop fields (See Figure 13 below). It is estimated that approximately 19.5 acres of the riparian forest lining the creek channel would be impacted by construction of the dam embankment and the filling of the normal pool of the proposed reservoir. Utilizing the Brown Thrasher HSI Model, it was determined that appropriate mitigation of the lost riparian forest habitat would be achieved by planting 29.5 acres of trees and shrubs as described in Section 5.11.2.1.2 above. The trees and shrubs would be planted within the 100 acres of land surrounding the reservoir between the normal pool elevation and the maximum flood pool elevation. Some access roads and recreational features would also be constructed within this 100-acre band, but the remainder of this land that is currently in crop production would be converted to native grasses and shrubs for wildlife habitat.

Figure 10. Representative land use of DS 19; the agricultural areas and the mature trees would become entirely inundated as a result of the proposed project.

5.11.2.3. Little Papillion Creek

Under the Recommended Plan, a dry dam would be constructed at DS10 along Thomas Creek, which is a tributary to the Little Papillion Creek to reduce flood damages on the Little Papillion Creek. A 1,450-foot long dam would be constructed across the creek to form a dry dam within the creek valley. Currently, most of the land within the proposed floodpool is under cultivation to grow corn and soybeans. However, the creek channel and some attached drainage ditches are lined with riparian forest trees consisting mostly of silver maple, green ash, box elder, mulberry, and cottonwood. In most areas, a narrow strip of smooth brome grass separates the edge of the creek channel from the planted crop fields. It is estimated that approximately 2 acres of the riparian forest lining the creek channel would have to be cleared within the proposed dam footprint to construct the dam The loss of this riparian forest habitat would be mitigated by planting 3 acres of riparian forest habitat along Thomas Creek within the footprint of the proposed floodpool as described in Section 5.11.2.1.2 above. Because DS10 is proposed to be a dry dam, most of the land within the footprint of the proposed floodpool would continue to be farmed. However, a portion of the ground closer to the creek channel would be subject to more frequent flooding, and would likely become too wet to farm over time, and would eventually turn into wetlands.

Under the Recommended Plan, new levees and/or floodwalls ranging in height from 2.6 to 9.8 feet would be constructed along the Little Papillion Creek between Blondo Street and Saddle Creek. Construction of the levees and/or floodwalls in this reach would occur along the high bank directly adjacent to the creek channel. Approximately 2 acres of riparian forest habitat

spread out in in a few different areas would have to be cleared to construct the levees and/or floodwalls. Most of the vegetation along the high banks where the construction would occur consists primarily of smooth brome grass with some areas of blue grass mixed with or adjacent to the brome. A strip of vegetation up to 70-feet wide and running the entire length of the proposed levee/floodwall alignment on both sides of the creek where construction is proposed, would be removed or otherwise disturbed to construct the levees/floodwalls. Once construction is complete, the new levees and all areas disturbed by construction activities would be re-seeded. The two acres of riparian forest that would have to be cleared would be mitigated by planting 2.3 acres of replacement habitat as described in Section 5.11.2.1.2 above at DS19. It should also be noted that there are a few areas along the Little Papillion Creek where the new levee footprint could extend into areas that are currently concrete parking lots or sidewalks. Levee construction in these areas would result in more vegetated grassy areas than currently exist.

5.11.2.4. Non-Structural

Typical non-structural measures that would be implemented under the Recommended Plan include elevating structures, dry floodproofing, and filling basements. These measures would occur in previously developed areas and often within the footprint of existing structures, therefore these activities would not adversely impact vegetation.

5.12. Fish

A graduate thesis entitled Fishes of the Papillion Creek Tributaries Basin, Nebraska was completed in 2006. This document provided an inventory of the fish species in the Papillion Creek Basin, and an assessment of stream habitat quality within the basin by conducting an Index of Biotic Integrity (IBI). Results of the IBI determined that the fish population was dominated by generalist minnow species that are tolerant of lower quality habitat. As a result, the overall habitat quality of the streams within the basin was determined to be poor due to the high level of development along the creeks and the multiple modifications that have occurred within the streams for flood risk reduction and bank stabilization. Twenty-three species of fish were collected in the streams of the Papillion Creek Basin during the 2006 study. Over 95 percent of the fish collected were species from the minnow family (cyprinidae). Minnow species collected included the bigmouth shiner (*Notropis dorsalis*), sand shiner (*Notropis stramineus*), emerald shiner (*Notropis atherinoides*), river shiner (*Notropis blennius*), red shiner (*Cyprinella lutrensis*), fathead minnow (*Pimephales promelas*), brassy minnow (*Hybognathus hankinsoni*), creek chub (*Semotilus atromaculatus*), and common carp (*Cyprinus carpio*). Other species collected include the channel catfish (*Ictalurus punctatus*), black bullhead (*Ameiurus melas*), yellow bullhead (*Ameiurus natalis*), stonecat (*Noturus flavus*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), largemouth bass (*Micropterus salmoides*), shortnose gar (*Lepisosteus platostomas*), brook silverside (*Labidesthes sicculus*), brook stickleback (*Culaea inconstans*), gizzard shad (*Dorosoma cepedianum*), quillback (*Carpiodes cyprinus*), river carpsucker (*Carpiodes carpio*), and shorthead redhorse (*Moxostoma macrolepidotum*).

5.12.1. No Action

Under the No Action Alternative no construction of flood risk reduction measures would occur, so there would be no impacts to the fishes within the Papillion Creek Tributaries Basin. The quality of the fish habitat in the basin would remain poor, and the fish community would continue to be dominated by tolerant, generalist species reflective of the poor habitat conditions.

5.12.2. Recommended Plan

Construction of the various features of the Recommended Plan may cause minor impacts to the already impaired fish community in the Papillion Creek Tributaries Basin. The project area has been highly disturbed with industrial and commercial activities. The Recommended Plan would result in minor, temporary, construction-related adverse impacts to fish, and minor, long-term impacts to fish movement. The potential impacts to fish are described below by stream.

5.12.2.1. South Papillion Creek

Under this alternative, DS19 would be constructed along the South Papillion Creek. This would involve the construction of a 1,450-foot earthen dam across the South Papillion Creek to create a 74 acre lake within the existing creek valley. The proposed dam site would be constructed in the upstream portion of the creek's watershed where the channel is relatively small and the amount of available fish habitat is small, and of poor quality. Construction of the dam would convert over 4,800 feet of poor quality stream fish habitat into a lake. The lake would be stocked with game species that prefer lake habitat such as largemouth bass, crappie, bluegill, and channel catfish. The reservoir that is created by DS19 would support a diverse sport fish population that would differ from the riverine species composition historically found within the Papillion Creek basin prior to urbanization, channelization, dam construction and levee construction.

Additionally, the trees that become inundated during dam construction would remain in-place and provide physical structure that would be used by fish as feeding, shelter and breeding habitat. The additional surface area provided by the inundated woody vegetation would provide substrate for macro invertebrate colonization, which in turn would serve as a food source for fish and other aquatic organisms.

The construction of DS19 would also create a barrier to upstream movement by fish that would result in long term, minor impacts to the fish community in the upper reaches of South Papillion Creek. The impacts would be considered minor due to the poor quality of the existing fish habitat, and low diversity and abundance of the existing fish population in the South Papillion Creek within the proposed project area.

5.12.2.2. Little Papillion Creek

To reduce flood risk along the Little Papillion Creek, Dam Site 10 would be constructed along Thomas Creek, which is a tributary to the Little Papillion Creek. A 1,450-foot long dam would be constructed across the creek to create a dry dam with a 358-acre floodpool. Because DS10

would be a dry dam, most of the time the creek would remain within its banks and continue to flow as usual. The creek would only come out of its banks and begin to fill the flood pool during higher than normal runoff events. Construction of the dam would cause a small backwater to form within the creek channel for a distance of approximately 800 feet upstream from the face of the dam. This backwater would be contained within the banks of the creek, but it would create a pool that is approximately three feet deeper than the water in the creek would be without the proposed project. The structure within the dam that creates the backwater pool would likely serve as an impediment to upstream fish migration. DS10 would be constructed in the upstream portion of the Thomas Creek watershed where the channel is relatively small and the amount of available fish habitat is small, and of poor quality. The creek is surrounded by farm ground on both sides of the channel. The backwater pool that is formed by construction of the dam would provide some habitat diversity and potential refugia for fish in the reach upstream of the dam. However, the structure that creates the backwater pool would create an impediment to upstream migration by fish. In addition, approximately 1,500 feet of Thomas Creek would be lined on each side with a 100-foot buffer of native riparian forest and prairie plantings to mitigate impacts to riparian forest and stream function. These buffered areas would provide some benefits to fish by intercepting ag runoff and improving water quality. These buffered areas would also improve instream fish habitat diversity as leaf litter and branches fall or wash into the creek. The impacts of construction of DS10 to fish would be long term and minor. The impacts would be considered minor due to the location of the dam high up in the watershed, and the poor quality of the existing fish habitat and associated fish community.

Under the Recommended Plan, new levees and/or floodwalls ranging in height from 2.9 to 7.4 feet would be constructed along the Little Papillion Creek between Blondo Street and Saddle Creek. Construction of the levees and/or floodwalls in this reach would occur along the high bank and would not affect fish habitat within the channel. The channel in this reach is 150 to 180 feet wide and there are very few trees along the channel. Where there are trees, they are along the high bank and too far from the low flow channel to provide shade and organic matter input to the stream. A Section 402 permit would be obtained prior to construction and best management practices would be utilized to prevent sediment from flowing into the channel during construction. For these reasons, the construction of new levees and/or floodwalls along the Little Papillion Creek is not likely to adversely impact fish in the creek.

5.12.2.3. **Non-Structural**

Typical non-structural measures that would be implemented under the Recommended Plan include elevating structures, dry floodproofing, and filling basements. These measures would occur in previously developed areas, and often within the footprint of existing structures, therefore these activities would have no effect on fish or fish habitat.

5.13. Mammals

Mammals that may typically be found in the vicinity of waterways in eastern Nebraska, like that of the Papillion Creek basin, include whitetail deer (*Odocoilius virginianus*), Virginia opossum

(*Didelphis virginiana*), masked shrew (*Sorex cinereus*), least shrew (*Cryptotis parva*), eastern red bat (*Lasiurus borealis*), woodchuck (*Marmota monax*), white-footed mouse (*Peromysus leucopus*), northern grasshopper mouse (*Onychomys leucogaster*), southern bog lemming (*Synaptomys cooperi*), meadow vole (*Microtus pennsylvanicus*), and least weasel (*Mustela nivalis*), (Benedict et al., 2000). It is anticipated that generalist species prone to urbanized areas such as raccoon (*Procyon lotor*), Virginia opossum, skunk (*Mephitis mephitis*), fox squirrel (*Sciurus niger*), white-footed mouse and red fox (*Vulpes vulpes*) would likely be present throughout the study area.

5.13.1. No Action

Under the No Action Alternative, no federally-funded construction activities would take place within the Papillion Creek Basin; however, non-federal sponsors may continue to implement flood risk reduction measures should local funding become available. It is anticipated that under the No Action Alternative, no adverse impacts to mammals would occur.

5.13.2. Recommended Plan

None of the proposed construction areas under the Recommended Plan currently provide high quality habitat for mammals or other wildlife. The project area is highly urbanized or in agricultural production. Most of the areas where construction activities would take place are composed of smooth brome and reed canary grasses, neither of which provide habitat value to wildlife. In these grassed areas, common small mammal species such as cottontail rabbits, skunks, woodchucks, and various mouse species may be temporarily displaced to similar nearby habitat during construction activities. It is anticipated that small mammals would recolonize the project area after construction is complete and the areas have been replanted.

Approximately 2 acres of tree clearing would be required along the Little Papillion Creek for levee and floodwall construction, and 2 acres of trees would be cleared along Thomas creek to construct the dam at DS10. At DS19, approximately 19.5 acres of trees would either be cleared or inundated and killed by construction of the dam and filling of the reservoir pool. The loss of these trees would displace common mammal species typically found in forested areas or timber strips near water such as raccoons, fox squirrels, opossums, mink, and white tail deer. All trees lost to flooding or removal would be replaced as described in Section 6.10. The mitigation plantings for Little Papillion Creek would occur along the top of the banks of creek channels within the Papillion Creek basin that are currently owned by the NRD. The mitigation plantings for DS10 would occur along the banks of Thomas Creek within the footprint of the proposed floodpool. Mitigation plantings for DS19 would occur within the band of land surrounding the reservoir between the top of the normal pool elevation and the floodpool elevation. As the tree plantings mature over time, mammal species displaced by construction would begin to utilize the new habitat areas. The tree plantings around DS19 would provide higher quality habitat than currently exists because the land surrounding the South Papillion Creek in the proposed project area is currently in agricultural production, providing lower quality habitat to most resident mammal species within the area. Once DS19 is constructed, the project lands

surrounding the normal pool would be managed for recreation and wildlife habitat. This area would be planted with native grasses, shrubs, and trees; replacing the cropland.

5.14. Migratory Birds

As of 2017, Nebraska had an official state bird list that includes 461 species. Approximately 350 occur annually and 200 breed within the state. Many species of birds native to Nebraska have become extirpated due to human activities while several specialized species have considerably decreased due to wetland loss and loss and fragmentation of natural habitat and vegetation. Generalists, such as ravens (*Corvus corax*) and cowbirds (*Molothrus ater*) and nonnative species, such as European starlings (*Sturnus vulgaris*) have benefitted from these land changes and shift in composition of bird populations. Based on breeding bird surveys, breeding species that are increasing in Nebraska include the wild turkey (*Meleagris gallopavo*), Canada goose (*Branta canadensis*) and merlin (*Falco columbarius*), while many species of grassland-adapted birds such, as Henslow's sparrow (*Ammodramus henslowii*) and greater prairie chicken (*Tympanuchus cupido*), are precipitously declining. In fact, 75-percent of grassland species are undergoing population declines and according to USFWS, have nationally declined greater than any other ecological category (Johnsgard, 2013).

All federal agencies are subject to the provisions of the Migratory Bird Treaty Act (MBTA) (16 U.S.C. § 703-712, though §709 is omitted) which regulates the take of any migratory bird species. If a Corps project is expected to impact any migratory bird species, coordination with the USFWS is typically initiated in order to minimize impacts to these species. The Papillion Creek basin falls within the Central Flyway which merges easterly towards the Mississippi Flyway as it follows along the Missouri River. This route has been recognized as a collective north-south migratory pathway that houses 114 U.S and 21 Canadian localities of special importance to birds migrating. An estimated 400 species from 50 avian families utilize the Central Flyway to- and from- breeding and wintering grounds (Johnsgard, 2012).

Utilizing the USFWS IPaC online tool, 21 migratory birds of Conservation Concern were identified as having the potential to occur, or breed within the study area (Table 10).

Table 10. Birds of Conservation Concern potentially occurring within the study area.

Common Name	*Scientific Name*	Breeding Presence
American Bittern	*Botaurus lentiginosus*	1 Apr – 31 Aug
American Golden Plover	*Pluvialis dominica*	None
Bald Eagle	*Haliaeetus leucocephalus*	15 Oct – 31 Aug
Black-billed Cuckoo	*Coccyzus erythropthalmus*	15 May – 10 Oct
Bobolink	*Dolichonyx oryzivorus*	20 May – 31 July
Buff-breasted Sandpiper	*Calidris subruficollis*	None
Cerulean Warbler	*Dendroica cerulean*	21 Apr – 20 July
Dunlin	*Calidris alpine arcticola*	None
Eastern Whip-poor-will	*Antrostomus vociferous*	1 May – 20 Aug
Golden Eagle	*Aquila chrysaetos*	None
Hudsonian Godwit	*Limosa haemastica*	None
Kentucky Warbler	*Oporornis formosus*	20 Apr – 20 Aug
Least Bittern	*Ixobrychus exilis*	16 Aug – 31 Oct
Lesser Yellowlegs	*Tringa flavipes*	None
Prothonotary Warbler	*Protonotaria citrea*	1 Apr – 31 July
Red-headed Woodpecker	*Melanerpes erythrocephalus*	10 May – 10 Sep
Ruddy Turnstone	*Arenaria interpres morinella*	None
Rusty Blackbird	*Euphagus carolinus*	None
Semipalmated Sandpiper	*Calidris pusilla*	None
Short-billed Dowitcher	*Limnodromus griseus*	None
Wood Thrush	*Hylocichla mustelina*	10 May – 31 Aug

5.14.1. No Action

Under the No Action Alternative, there would be no construction of a federal project within the Papillion Creek Basin; however, non-federal sponsors may continue to implement flood risk reduction measures such as channel improvement and damming. Local entities must comply with the MBTA so there would be no anticipated impacts to migratory birds under the No Action Alternative.

5.14.2. Recommended Plan

Construction of the various features of the Recommended Plan would result in the removal or flooding and eventual mortality of over 23.5 acres of trees. Tree removal activities would be restricted to the time period between April 1st and October 31st to avoid impacts to nesting migratory birds. In addition, all trees removed or inundated would be replaced as described in Section 5.11. For these reasons, migratory birds are not likely to be adversely impacted by implementation of the Recommended Plan.

5.15. Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was federally listed as a threatened species under the ESA (7 U.S.C. § 136, 16 U.S.C § 1531) in 1973 though they were officially declared as endangered prior to the ESA in 1967. On August 9, 2007, the bald eagle was removed from the federal list of threatened and endangered species but continues to be protected under the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. § 668-668d), MBTA and the Lacey Act (16 U.S.C. § 701). Bald eagles are known to inhabit forested areas along waterways and near waterbodies. These birds tend to construct their nests in mature trees near aquatic habitats, especially in cottonwood trees. Bald eagle nests are typically easy to identify due to their large size and their height (they can be eight feet or more in diameter and 12 feet or more in height). They feed primarily on fish and crippled waterfowl, but may also feed on upland game birds and other birds, carrion, and small rodents. Over the past few years, a pair of bald eagles have nested in a cottonwood tree near the soccer fields at Wehrspann Lake, which is one of the existing dam sites along the South Papillion Creek. However, no bald eagle nests have been identified near any of the proposed project construction locations.

5.15.1. No Action

Under the No Action Alternative, there would be no construction of a federal project within the Papillion Creek Tributaries Basin, so there would be no impacts to bald eagles. Should non-federal sponsors continue to implement flood risk reduction measures such as channel improvement, levee construction, or dam construction, they would be required to comply with the BGEPA and MBTA. No adverse impacts are anticipated to occur to bald eagles under the No Action Alternative.

5.15.2. Recommended Plan

Bald eagles are known to pass through the proposed project area and likely occasionally roost on trees along the creek channels; however, the quality of the habitat for bald eagles in the proposed project area is relatively poor. No bald eagle nests or communal roost sites have been identified within the proposed project area, and bald eagle nest surveys would be conducted prior to commencement of construction activities. For these reasons, tree removal and other construction activities are not likely to adversely affect bald eagles. The construction of DS19 would provide new habitat that could be beneficial to bald eagles. The reservoir would be stocked with fish and the open water would attract waterfowl. Fish and waterfowl are both primary prey items for bald eagles, so the new reservoir at DS19 could provide productive foraging areas for bald eagles.

5.16. Reptiles and Amphibians

Presently, 13 species of amphibians and 47 species of reptiles are known to exist in the entire State of Nebraska. In Eastern Nebraska, the tiger salamander (*Ambystoma trigrinum*), cricket frog (*Acris crepitans*), woodhouse toad (*Bufo woodhousii*), western gray tree frog (*Hyla chrysoscelis*), plains leopard frog (*Rana blairi*), northern leopard frog (*Rana pipiens*) and western striped chorus frog (*Pseudacris triseriata*), are all amphibians that have a high probability of being found in and around the project area.

Reptiles expected to be found within the Papillion Creek basin include the blue racer (*Coluber constrictor*), prairie kingsnake (*Lampropeltis calligaster*), milk snake (*Lampropeltis triangulum*), common watersnake (*Nerodia sipedon*), bull snake (*Pituophis catenifer*), varying species of gartersnakes (*Thamnophis* spp.), the prairie skink (*Eumeces septentrionalis*), snapping turtle (*Chelydra serpentina*), and painted turtle (*Chrysemys picta*) (Lynch, 1985). During a site visit in May of 2019, a large spiny softshell turtle (*Apalone* spinifera) was observed basking on the bank of the low flow channel in Little Papillion Creek between Dodge Street and 72nd Street.

The quality of the habitat for reptiles and amphibians in most of the proposed construction areas is relatively poor because the creeks are flashy, so the water levels rise and fall rapidly. The vegetation is dominated by smooth brome grass and reed canary grass with a few areas of trees along the steep channel banks. Most of the frogs and turtles spend the majority of their time in the low flow channel, along the water's edge, or in the vegetation immediately next to the channel. Some snakes, toads and leopard frogs can be found using the grasses on the channel bench and along the channel side slopes above the bench.

5.16.1. No Action

Under the No Action Alternative, there would be no construction of a federal project within the Papillion Creek Tributaries Basin, so there would be no impacts to reptiles or amphibians.

5.16.2. Recommended Plan

Under the Recommended Plan, construction activities associated with the proposed construction of new levees and/or floodwalls along Little Papillion Creek would result in a significant amount of ground disturbance that could temporarily displace some reptiles and amphibians. Construction activities associated with the levee and floodwall work would be limited to areas along the top of the high bank where the habitat quality is relatively poor for reptiles and especially amphibians. Best management practices, such as the construction of silt fences would be used to prevent sediment from washing into the creek channel during construction. Once construction is complete, all disturbed areas would be replanted with grasses. Snakes, toads, and frogs would likely recolonize the levee construction areas. Construction of the proposed floodwalls would create a barrier for reptiles and amphibians as they attempt to move between the creek channel and the floodplain on the high bank. The impacts of levee construction to reptiles and amphibians would be considered temporary and minor. The impacts would only occur during construction, and the primarily brome grass and bluegrass habitat that would be disturbed, would be replaced after construction is complete. Construction of the floodwalls would have long term minor impacts to reptiles and amphibians. The floodwalls would be permanent structures that could inhibit movement of reptiles and amphibians between the banks of the low flow channel and the high banks. These impacts would be considered minor because the existing habitat on the high banks is of poor habitat value to reptiles and amphibians, and most of them utilize the habitat within the banks of the creek channel. Within the banks of the creek channel, most of the reptiles and amphibians utilize the banks of the low flow channel and the associated channel bench.

Construction of DS19 on South Papillion Creek would result in the conversion of stream channel into reservoir habitat. The current habitat along the South Papillion Creek channel is of relatively poor quality for reptiles and amphibians. The habitat consists of a narrow strip of trees growing out of the steep side slopes of the creek channel. On the high banks, there is a narrow, 25- to 50-foot wide buffer strip of smooth brome grass directly adjacent to either side of the creek channel. The areas beyond the buffer consists entirely as crop ground that has little value to most wildlife. Construction of DS19 would significantly improve habitat for reptiles and amphibians. The reservoir would provide much more usable shoreline for frogs, toads, and snakes, and the open water of the lake would provide significantly more habitat for turtles. In addition, the land between the normal pool elevation and the maximum flood pool elevation would be planted with native vegetation, providing significantly more usable habitat for reptiles and amphibians than is currently provided by the existing crop fields.

Construction of the proposed dry dam at DS10 on Thomas Creek would result in some benefits for reptiles and amphibians. Currently, the habitat within the portion of Thomas Creek located within the proposed project area consists of a narrow strip of trees growing out of the steep side slopes of the creek channel. On the high banks, there is a narrow, 25- to 50-foot wide buffer strip of smooth brome grass directly adjacent to either side of the creek channel. The areas beyond the buffer consists entirely as crop ground that has little value to most wildlife. Construction of the dam would result in the creation of an 800-foot long backwater pool within the creek channel upstream of the dam face. Water in this 800-foot long segment of the creek would back up behind the dam and remain approximately 3 feet deeper than it currently is during normal flows. This deeper water would still be contained within the banks of the existing creek channel. The ground adjacent to the creek within the 800-foot long backwater area would remain wetter than it would have without the proposed project, and wetland vegetation is expected to develop in these areas with wetter soil. In addition, construction of the dam would cause the 2-year event to leave the banks of the creek and temporarily flood approximately 6 acres of land that is currently farmed. This more frequently flooded area is expected to no longer be farmable and much of the area would develop wetland characteristics over time. The backwater pool that is created within the creek channel, and the wetlands that develop adjacent to the channel, and in a portion of the ground that is currently being farmed, would all provide improved habitat conditions for reptiles and amphibians when compared to the existing conditions.

5.17. Aquatic Macroinvertebrates

Macroinvertebrates are organisms that lack a spine and are large enough to be seen with the naked eye. Examples of aquatic macroinvertebrates that inhabit the Papillion Creek basin include aquatic insects, mussels, crustaceans, worms and other arthropods that are commonly found attached to rocks, vegetation or woody debris, or burrowed into the streambed. They directly reflect water quality and stream habitat quality as they are extremely sensitive to pollutants. The Stream Biological Monitoring Program (SBMP) provides statewide assessments of the biological conditions of Nebraska's streams. This SBMP began in 1983 where over 900

stream sites throughout the state were sampled for fish and macroinvertebrates. In 1997, NDEQ added additional randomly selected sites. Within the entire state, since 1997, NDEQ has collected over 600 species of macroinvertebrates (NDEQ, 2019).

Big Papillion Creek and Papillion Creek are both sampled as part of the SBMP and habitat scores were rated as "poor" for macroinvertebrates using an Invertebrate Community Index (ICI) (Bazata, 2005). Another field assessment conducted in 2002 for streams in Douglas County assessed the West Papillion, Big Papillion and Little Papillion creeks. Of the segments assessed on these three streams, on average, approximately 30-percent were classified as "poor" habitat and approximately 70-percent were considered "marginal" using the EPA rapid bioassessment protocol (CH2MHILL, 2008).

5.17.1. No Action

Under the No Action Alternative, no federally-funded construction would occur; however, non-federal sponsors may continue to implement flood risk reduction measures should local funding be sourced for such activities. The quality of habitat for aquatic macroinvertebrates in the basin would remain poor or marginal at best should the No Action Alternative be implemented; the invertebrate community would continue to be dominated by tolerant, generalist species reflective of the poor habitat conditions.

5.17.2. Recommended Plan

Construction of the various features of the Recommended Plan may cause minor impacts to the already impaired aquatic invertebrate community in the Papillion Creek Tributaries Basin. The potential impacts to invertebrates are described below by stream.

5.17.2.1. South Papillion Creek

Under this alternative, DS19 would be constructed along the South Papillion Creek. This would involve the construction of a 1,450-foot earthen dam across the South Papillion Creek to create a 74-acre lake within the existing creek valley. A sediment retention structure would also be constructed just upstream of the normal lake pool. The proposed dam site would be constructed in the upstream portion of the creek's watershed where the channel is relatively small and the amount of available macroinvertebrate habitat is small, and of poor to moderate quality. Construction of the dam would convert over 4,800 feet (4.4 acres) of poor to moderate quality stream habitat into a 74 acre lake. The lake would provide significantly more potential habitat for aquatic macroinvertebrates; inundated trees would remain in place providing increased habitat. It is expected the invertebrate community would likely shift to species that prefer the stiller waters of a lake rather than the flowing water conditions that currently exist in the creek. The reservoir that is created by DS 19 would support a larger and slightly different aquatic macroinvertebrate community than the creek currently supports. For these reasons, the construction of DS 19 is not likely to adversely affect aquatic macroinvertebrates in the South Papillion Creek. In fact, construction of DS 19 may result in some beneficial impacts by providing significantly more potential habitat.

5.17.2.2. **Little Papillion Creek**

To reduce flood risk along the Little Papillion Creek, a dry dam at DS10 is proposed for constructed along Thomas Creek, which is a tributary to the Little Papillion Creek. A 1,450-foot long dam would be constructed across the creek to create a dry dam. The proposed dam site would be constructed high up in the Thomas Creek watershed where the channel is relatively small and the amount of available aquatic habitat is small, and of poor quality. Because DS10 is proposed to be a dry dam, the creek would continue to flow and function as a stream most of the time except during precipitation events large enough to cause the water to back up behind the dam and spill out into the floodpool. Because the creek will continue to function as a creek most of the time, construction of the dry dam at DS10 is expected to result in long term minor impacts to the already poor to marginal macroinvertebrate community in the creek. These minor impacts would be the result of the more frequent flooding of the adjacent farmland that would occur once the dam is in place. This more frequent flooding could potentially introduce more ag chemicals, or sediment into the creek depending on the time of year and type of ground cover present when the flooding occurs. This potential increased frequency of exposure to ag chemicals and sediment could result in minor impacts to the macroinvertebrate community in the creek that consists primarily of generalist species that are more tolerant of changes to water quality.

Under the Recommended Plan, new levees and/or floodwalls ranging in height from 2.6 to 9.8 feet would be constructed along the Little Papillion Creek between Blondo Street and Saddle Creek. Construction of the levees and/or floodwalls in this reach would occur along the high bank and would not affect aquatic macroinvertebrate habitat within the channel. The channel in this reach is 150 to 180 feet wide and there are very few trees along the channel. Where there are trees, they are along the high bank and too far from the low flow channel to provide any shade to the stream. A Section 402 permit would be obtained prior to construction and BMPs would be utilized to prevent sediment from flowing into the channel during construction. For these reasons, the construction of new levees and/or floodwalls along the Little Papillion Creek is not likely to adversely impact aquatic macroinvertebrates in the creek.

5.17.2.3. **Non-Structural**

Typical non-structural measures that would be implemented under the Recommended Plan include elevating structures, dry floodproofing, and filling basements. These measures would occur in previously developed areas and often times within the footprint of existing structures, therefore these activities would have no effect on aquatic macroinvertebrates or their habitat.

5.18. Threatened and Endangered Species

In accordance with Section 7 of the Endangered Species Act (7 U.S.C. § 136, 16 U.S.C. § 1531), the USFWS was consulted to obtain information on federally listed threatened and endangered species that have the potential to occur within the proposed project area. A letter dated November 20, 2018 was submitted to the USFWS Region 6 Ecological Services Field Office requesting information on anticipated impacts that may be associated with proposed alternatives and a list of federally-listed threatened and endangered species that may be found

in the study area. The USFWS responded with a letter dated April 16, 2019 that provided a list of federally listed species that may occur within the proposed project area or be affected by the proposed project. Three federally listed threatened or endangered species were identified as having the potential to occur within the study area. They include the threatened northern long-eared bat (*Myotis septentrionalis*), and western prairie fringed orchid (*Platanthera praeclara*) and the endangered pallid sturgeon (*Scaphirhynchus albus*).

The analysis presented within Section 5.18 and its sub-sections are intended to serve as the Biological Assessment (BA) for the USFWS to assess potential impacts to listed species that may occur within the project area.

5.18.1. Northern Long-eared Bat

The northern long-eared bat was listed as federally threatened on May 2, 2015 and may be found within the project area. The northern long-eared bat is distributed along the eastern half of the United States, with a range that extends into and throughout the majority of the state of Nebraska, including Douglas, Sarpy, and Washington Counties. It is thought that habitat fragmentation, human disturbance and the emergence of white-nose syndrome (*Pseudogymnoascus destructans*) has decimated populations. As of October 2018, white nose syndrome has been confirmed present in four counties of Nebraska; one of those being Sarpy County.

During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. These bats are opportunistic and select roost tree species based on the tree's suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns and sheds. Northern long-eared bats spend the winter hibernating in caves and mines, referred to as hibernacula. They typically use large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents. Specific areas where they hibernate have very high humidity (USFWS, 2015).

Northern long-eared bats emerge at dusk to fly through the understory of forested hillsides and ridges feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation. Northern long-eared bats also feed by gleaning motionless insects from vegetation and water surfaces.

In Nebraska, breeding begins in late summer or early fall when males begin swarming near hibernacula. Fall swarming is the final stage before hibernation. Swarming starts in mid-August and lasts through the end of October. After copulation, northern long-eared bats hibernate in caves in southeastern Nebraska from October 15 to March 15 before beginning migration to summer-use areas. After hibernation, pregnant females migrate to summer areas where they roost in small colonies and give birth to a single pup in June or early July (USFWS, 2015).

Maternity colonies disperse toward hibernacula shortly after the young are able to fly. Northern long-eared bats can live up to 19 years (USFWS, 2015).

5.18.1.1. **No Action**

No federally-funded construction activities would occur within the Papillion Creek Basin under the No Action Alternative. There is potential that non-federal sponsors may choose to continue to implement flood risk reduction measures such as channel improvement and/or dam construction should local funding be provided. Should any non-federal sponsors determine to implement these measures, they would have to comply with Section 10 of the ESA which would require them to provide a Habitat Conservation Plan to the USFWS. Because there would be no federally-funded construction associated with this alternative, there would be no impacts to northern long-eared bats.

5.18.1.2. **Recommended Plan**

During an agency scoping meeting for the proposed project on December 10, 2018, the Nebraska Game and Parks Commission (NGPC) stated that there are no known hibernacula for northern long-eared bats within the Papillion Creek Basin. A total of approximately 2 acres of trees would have to be removed from the banks of the Little Papillion Creek to construct the levees and floodwalls, and 2 acres would have to be removed from Thomas Creek to construct the dam at DS10. Tree clearing would be restricted to the period between November 1st and March 31st to avoid the taking of potential maternity roost trees during the pup season (June 1 to July 31) and to avoid taking potential roost trees during the active season (April 1 to October 31) for the bats. In addition, the filling of the reservoir behind DS19 would inundate and eventually kill approximately 19.5 acres of mature trees. It is estimated it could take up to five years for the reservoir to fill to its normal pool level. The trees within the reservoir would be expected to slowly die as the pool level rises, and portions of the crowns of the trees would likely remain above the normal pool elevation. Because the trees would slowly be flooded and slowly die, northern long-eared bats would be able to find other suitable trees to roost in outside the reservoir pool if and when the trees within the reservoir pool are completely inundated or otherwise become unsuitable habitat for the bats. For these reasons, the Recommended Plan may affect, but is not likely to adversely affect northern long-eared bats.

5.18.2. Western Prairie Fringed Orchids

The western prairie fringed orchid is an herbaceous perennial that was listed as federally threatened on September 28, 1989. This member of the orchid family is native to the Midwest prairies, typically found in wet-mesic sedge meadows (Sharma et al., 2003). Loss of habitat through agrarian and urban encroachment have caused population declines.

The western prairie fringed orchid is reportedly long lived, provided adequate environmental factors exist. This plant is entirely propagated by seed and perpetuates through a perennating bud which forms on fusiform tubers. The initial shoot will emerge between April and May. A single bud is produced on the rhizome but will remain dormant over the winter after the plant senesces in September. In the following spring, the bud will develop into vegetative shoots.

Inflorescence typically occurs in July. Pollination is required, and is typically performed by various species of hawkmoths (USFWS, 1996). Mature seeds are released in the early fall and new progeny will form.

It is thought that a drought lasting longer than a year will severely increase mortality and reduce seed viability of remaining individuals. It is also sensitive to extensive periods of inundation. Habitat management practices such as grazing, mowing and burning may also affect survivorship.

The Papillion Creek basin does not provide adequate habitat to support western fringed prairie orchids due to the severe alteration of the watershed, urbanization and agricultural impacts.

5.18.2.1. **No Action**

No construction activities would occur in the Papillion Creek Basin under the No Action Alternative, so there would be no impacts to western prairie fringed orchids.

5.18.2.2. **Recommended Plan**

No unbroken, native prairie habitat exists within the proposed project area, and none of the proposed work areas under the Recommended Plan have suitable habitat for western prairie fringed orchids. The two proposed dam sites would be constructed within heavily disturbed agricultural land that is currently in crop production. The areas proposed levee and floodwall construction along Little Papillion Creek are all located in areas dominated by non-native smooth brome grass and turf forming bluegrass and fescue. For these reasons, the Recommended Plan would have no effect on western prairie fringed orchids as the species is not present.

5.18.3. Pallid Sturgeon

The pallid sturgeon is a large, long-lived bottom-dwelling fish that inhabits turbid, fast-flowing rivers within the Missouri and Mississippi River basin. Pallid sturgeon are often mistaken for their close relative, shovelnose sturgeon (*S. platorynchus*) and were not identified as a distinct species until 1905. Pallid sturgeon are not present within any of the streams of the Papillion Creek watershed; however, they are present immediately downstream in the Missouri River.

5.18.3.1. **No Action**

No construction activities would occur in the Papillion Creek Tributaries Basin under the No Action Alternative, so there would be no impacts to pallid sturgeon.

5.18.3.2. **Recommended Plan**

Pallid sturgeon are not present in any of the streams of the Papillion Creek Basin, so the proposed project would have no effect on pallid sturgeon.

5.19.State Listed Species of Concern

According to the Nebraska Natural Heritage Program, four species of State concern have the potential to occur in Douglas, Sarpy and Washington counties: lake sturgeon (*Acipenser*

fulvescens), sturgeon chub (*Macrhybopsis gelida*), river otter (*Lontra canadensis*), and American ginseng (*Panax quinquefolium*). Currently the Papillion Creek Basin does not provide adequate habitat to support any of these species.

5.19.1. No Action

No construction activities would occur in the Papillion Creek Tributaries Basin under the No Action Alternative, so there would be no impacts to the lake sturgeon, sturgeon chub, river otter, or American ginseng.

5.19.2. Recommended Plan

No suitable habitat for the lake sturgeon, sturgeon chub, river otter, or American ginseng exists within the proposed project area, therefore implementation of the Recommended Plan would have no effect on these state listed species.

5.20. Invasive Species

Several federal and state agency authorities, statutes, policies and procedures regulate floral and faunal invasive species. The National Invasive Species Act of 1996 (NISA; 16 U.S.C. § 4701 [PL 104-332]), which arose from the Non-indigenous Aquatic Nuisance Species Prevention and Control Act of 1990 (16 U.S.C. § 4701, as amended through PL 106-580 December 2000) is intended to prevent invasive species from entering inland waters. Executive Order (EO) 13112 seeks to prevent the introduction of invasive species and authorizes control of said species to minimize economic, ecological and human health impacts. This EO directs all federal agencies to address invasive species concerns and refrain from actions likely to increase invasive species problems. EO 13751 further amends 13112 to direct continuation of coordination for federal prevention and control efforts. This order also maintains and expands the National Invasive Species Council and further incorporates considerations of human and environmental health, climate change, technological innovation and other emerging priorities into federal efforts to address invasive species in a cost-efficient manner. EO 11987 Directs agencies to restrict the introduction of exotic species into the natural ecosystems on lands and waters which they own, lease or hold for purpose of administration and encourage state and local governments as well as private citizens to prevent the introduction of exotic species in natural ecosystems of the United States.

Additionally, the Corps has established a nationwide policy for the prevention, control and assessment of invasive species on all Corps managed and/or administered lands and waters proposed for Civil Works projects, and Corps land utilized for outgrants and permits as identified in the Corps' Invasive Species Policy Memorandum, dated June 2, 2009.

The State of Nebraska has identified Category 1 and 2 species, which are not known or prevalent species but would pose significant risk if introduced and are a top priority for eradication for new or existing populations, respectively. Category 3 species are established species; within the study area, established species include callery pear (*Pyrus calleryna*), reed

canary grass (*Phalaris arundinacea*), Chinese elm (*Ulmus parvifolia*), and crown vetch (*Securigera varia*).

In addition to invasive flora, faunal species known to be present within the Papillion Creek basin include zebra mussels (*Dreissena polymorpha*) and common carp (*Cyprinus carpio*). Both Lake Zorinsky and Glen Cunningham were infested with zebra mussels. In an effort to eliminate the mussels, both lakes were drained to expose the zebra mussels to cold temperatures over the winter causing them to freeze and desiccate. While the lakes were drained, they were also treated with Rotenone to target common carp.

5.20.1. No Action

Under the No Action Alternative, no federally-funded construction activities would occur within the Papillion Creek Basin; however, the non-federal sponsors may continue to implement flood risk reduction measures such as channel improvement and dam construction. Non-federal sponsors would be required to comply with NRD's and County Weed Management Plans. No adverse impacts are anticipated under the No Action Alternative.

5.20.2. Recommended Plan

Reed canary grass, an invasive species, dominates the banks of the low flow channels and on the riverward side of the channel benches within all of the creeks of the Papillion Creek Basin. Once construction is complete, the disturbed areas will be replanted with smooth brome or other sod forming grasses. While reed canary grass would not be planted in the disturbed areas following construction, it is so prevalent in the basin that it is likely recolonize the lower elevation, and wetter areas within the replanted areas and eventually become the dominant species in the years after construction is complete. Management of invasive species would be addressed following construction during adaptive management and monitoring as well as identified in the Operations and Maintenance Manual.

As previously mentioned above, both Lake Zorinsky and Glen Cunningham Lake have been previously infested with zebra mussels. In an effort to eliminate the mussels, both lakes were drained to expose the zebra mussels to cold temperatures over the winter causing them to freeze and desiccate. Currently, these measures seem to have killed off the zebra mussels. The proposed reservoir at DS19 would be at risk of infestation by zebra mussels that could be brought in by boats or bait that have previously been in zebra mussel infested waters. Efforts would be made to educate the public about how to prevent the introduction of zebra mussels into the proposed reservoir at DS19. Signage about the prevention of the spread of aquatic nuisance species would be prominently posted near boat ramps and other public use areas.

5.21. Socioeconomics and Environmental Justice

Socioeconomic and demographic information gathered for the Papillion Creek study relies heavily upon data obtained from the U.S. Census Bureau. The boundaries of the 0.2% (1/500) ACE floodplain extent are used as the basis for gathering socioeconomic and demographic conditions for Papillion Creek. The most recent Census data available is from the 2013-2017

American Community Survey (U.S. Census Bureau 2019). The American Community Survey includes data at the *block group* level. Block group level data provides a reasonable approximation of population and housing unit counts for the Papillion Creek study area (from the 2010 Census). There are 172 census block groups intersecting the Papillion Creek 0.2% ACE study area.

Table 11 below summarizes population and housing unit counts for Papillion Creek study area. Based on census block group data, the study area is home to approximately 207,000 residents, or about 51% of the City's total population. The population density of the study area (1,142 persons per square mile) is below that of city as a whole (2,800 persons per square mile).

Table 11. Study Area Population and Housing

Geography	Count of Census Block Groups	Area of Block Groups (sq mi)	2010 Population	Population Density (per sq mi)	2010 Total Households
Papillion Creek Census Block Groups	172	181	206,774	1,142	88,725
Omaha	-	142	408,958	2,880	162,627
Douglas County	-	339	517,110	1,525	202,411
Sarpy County	-	248	158,840	640	58,102
Nebraska	-	77,421	1,826,341	24	721,130
U.S	-	3,800,000	308,745,538	81	116,716,292

Source: U.S. Census Bureau, 2010

Table 12 below summarizes housing units by occupancy type. Based on block group data, the home ownership rate (61%) is slightly higher than citywide (53.6%) as well as Douglas County (56.8%), but lower than Sarpy County (66.4%). The vacancy rate is lower than all other geographic areas except Sarpy County, which has an equal vacancy rate at 4.6%.

Table 12. Study Area Housing Occupancy

Geography	Owner Occupied Percentage	Renter Occupied Percentage	Vacant Percentage
Papillion Creek Census Block Groups	61.0%	34.4%	4.6%
Omaha	53.6%	39.1%	7.3%
Douglas County	56.8%	36.2%	7.0%
Sarpy County	66.4%	29.0%	4.6%
Nebraska	60.0%	30.8%	9.2%
U.S	56.0%	31.8%	12.2%

Source: U.S. Census Bureau, 2019.

Table 13 below summarizes race in the Papillion Creek study area. Based on block group data, the study area is comprised primarily of those identified as White Alone (81.1%), Black or African American Alone (6.1%) or Hispanic or Latino (6.0%). For most minority populations, the Papillion Creek study area includes a lower proportion of minority populations than the City of Omaha as a whole.

Table 13. Summary of Race, Papillion Creek, 2017

Subject	Papillion Creek Census Block Groups	Omaha, Nebraska	Douglas County, Nebraska	Sarpy County, Nebraska	Nebraska	United States
Hispanic or Latino (of any race)	6.00%	13.7%	12.2%	8.7%	10.5%	17.6%
White alone	81.10%	67.4%	70.2%	81.8%	79.8%	61.5%
Black or African American alone	6.10%	12.1%	10.9%	3.7%	4.6%	12.3%
American Indian and Alaska Native alone	0.30%	0.4%	0.3%	0.3%	0.7%	0.7%
Asian alone	3.80%	3.5%	3.4%	2.5%	2.2%	5.3%
Native Hawaiian and Other Pacific Islander alone	0.00%	0.1%	0.0%	0.1%	0.1%	0.2%
Some other race alone	0.10%	0.2%	0.2%	0.1%	0.1%	0.2%
Two or more races	2.50%	2.7%	2.6%	2.8%	2.0%	2.3%

Source: U.S. Census Bureau, 2019.

5.21.1. No Action

Under the No Action Alternative, no federal project would be constructed, so the current level existing flood risk in the Papillion Creek Basin would not be reduced. As a result, the potential flood-related economic damages to individuals and businesses would remain high.

The No Action Alternative would not provide additional flood risk reduction beyond existing conditions to the residents living within the study area. There would be no direct impact on minority and/or low-income population groups under this alternative. However, since the No Action Alternative fails to provide additional flood risk reduction, the actual and perceived risks to minority and/or low-income population groups under this alternative would be higher than under the recommended plan.

5.21.2. Recommended Plan

The Recommended Plan would result in a long-term benefit to the socioeconomic condition of the study area. The Recommended Plan would reduce equivalent annual damages from $14,434,470 under future without-project conditions to $7,026,580 with project. The difference between the future without project and with project condition represents total annual benefits of $7,407,890 resulting from the proposed structural and nonstructural flood risk management measures. When compared to total annual costs of $4,939,850 the resulting benefit-cost ratio is 1.50. The combined flood risk management plan measures, which are individually justified,

generate a benefit-to-cost ratio above unity, and produce $2,468,040 in annual net benefits to the Nation. The Recommended Plan also includes recreation features. The annual benefits from these features total $805,801. Compared against $259,718 in the total annual costs required to add these features, the recreation component is also economically justified with $546,082 in net annual benefits and a benefit-cost ratio of 3.1. The final Recommended Plan, including recreation, produces $8,213,690 average annual benefits. With average annual costs totaling $5,199,570, the Recommended Plan has a benefit-cost ratio of 1.58 and would provide $3,014,120 in annual net benefits to the Nation.

The Corps is obligated under E.O. 12898 of 1994 and the Department of Defense's Strategy on Environmental Justice of 1995, which direct federal agencies to identify and address any disproportionately high adverse human health or environmental effects of federal actions to minority and/or low-income populations.

Minority populations are those persons who identify themselves as Black, Hispanic, Asian American, American Indian/Alaskan Native, Pacific Islander, or some other race or a combination of two or more races. A minority population exists where the percentage of minorities in an affected area either exceeds 50% or is meaningfully greater than in the general population. Low-income populations are those whose income is the Census Bureau's statistical poverty threshold for a family of four. The Census Bureau defines a "poverty area" as a census tract or block numbering area with 20% or more of its residents below the poverty threshold level and an "extreme poverty area" as one with 40% or more below the poverty threshold level.

An environmental justice (EJ) analysis was conducted by first determining whether EJ populations are present and second by determining whether the proposed action would result in a disproportionately high and/or adverse effect on these populations.
For purposes of the EJ analysis, the area of effect (or study area) includes Douglas and Sarpy counties. Using the EPA's EJSCREEN Tool, the average percentages for minority and low-income populations were compared for the study area, state of Nebraska, EPA Region 7, and the United States. Based on the data pulled from the EJScreen Tool and presented in Table 14, the Douglas County portion of the study area qualifies as an EJ community for low income populations.

Table 14. Summary of Race, Papillion Creek, 2017

County	Study Area	Nebraska	EPA Region 7	United States
Douglas County				
Minority Population	30%	20%	19%	39%
Low-Income Population	31%	30%	32%	33%
Sarpy County				
Minority Population	18%	20%	19%	39%
Low-Income Population	18%	30%	32%	33%

There is a potential adverse direct impact to EJ communities from implementation of the recommended plan. Direct impacts occur within the footprint of the structural alternative,

which for this project includes two dam sites and a levee/floodwall. The recommended plan will directly impact 131 private residences. The adverse impact of relocation is potentially disproportionate to low-income homeowners if they comprise a majority of homes being acquired.

Indirect impacts are those felt by the community that occur outside of the footprint of the actual structural alternative construction. Positive, indirect impacts related to construction of the structural alignments include reducing the likelihood of flooding and/or damages to housing in EJ and non-EJ communities that would normally flood under a 1% AEP flood event. Additionally, the amount of flooding from the 1% AEP flood event on the community would be reduced under the with-project condition. Adverse, indirect impacts from construction of the recommended plan include noise, dust, transportation impacts, and possibly induced flooding. A few reaches in the study area are identified as potentially having flooding induced from construction of the levee/floodwall. Modeling indicates the induced stages would primarily occur on structures in these reaches at events less frequent than the 1 percent AEP event. A handful of structures experience induced stages at the 1 percent AEP event, however these stage increases are less than 0.5 feet and remain below the first floor of structures. The damages from potential induced flooding are minimal and are not considered high adverse impacts.

The Recommended Plan will not cause any significant impacts, nor will it cause either disproportionately high and adverse human health or environmental effects. The recommended plan is expected to provide long-term benefits to the EJ communities by reducing flood risk. Individuals included in any relocation would be provided the necessary relocation assistance and equitable housing provided to displaced persons per the Uniform Relocation Assistance Act (URA). Therefore, disproportionate impacts to EJ communities would not be expected.

5.22. Cultural Resources

Under the authority of the National Historic Preservation Act (NHPA) of 1966, as amended; the Archeological Resources Protection Act of 1979, as amended (ARPA); the Antiquities Act of 1906; the Native American Graves Protection and Repatriation Act of 1990, as amended (NAGPRA); NEPA; and ER 1130-2-1; the USACE is authorized to preserve eligible cultural resources that may be affected by the operation and management of its projects.

Many cultural resource sites are located within the Papillion Creek watershed. Cultural resources can be defined as physical evidence or place of past human activity: site, object, landscape, structure; or a site, structure, landscape, object or natural feature of significance to a group of people traditionally associated with it.

Consultation with the Nebraska State Historic Preservation Office (SHPO), Tribes, and other interested parties was initiated in November 2018. The Tribes included in this effort are the Ponca Tribe of Nebraska, the Omaha Tribe, the Otoe-Missouria Tribe, the Ponca Tribe of Indians

of Oklahoma, the Pawnee Nation of Oklahoma, the Winnebago Tribe and the Iowa Tribe of Nebraska and Kansas.

The Omaha Tribe indicated that they wanted to participate in consultation. They also expressed concern over a major village site known to exist within the study area. The Corps met with Tribal Council representatives at the location of this site on December 7, 2018. At the meeting it was discussed how any of the potential alternatives would not cause an impact to this particular area, and the Tribe did not express any significant concerns regarding other locations.

Interest was also expressed by the Iowa Tribe of Kansas and Nebraska and the Pawnee Nation of Oklahoma.

An Agency Scoping Meeting was held at Wehrspann Lake on December 10, 2018, which included the participation of the SHPO. A further letter was sent to the Tribes on December 21, 2018.

Meetings with the Omaha Tribe were also held on July 15, 2019 and January 7, 2020, to discuss project updates. During the latter meeting it was agreed that the Tribe would be invited to participate in the Programmatic Agreement outlining any subsequent field work which may take place prior to initiation of any structural or nonstructural flood risk management measures.

A file search with History Nebraska was completed by a USACE archaeologist on June 4, 2019. The file search identified numerous surveys located within the Papillion Creek watershed. There are 26 sites within the one-mile radius of the considered alternatives, but only one site has been recorded within the Areas of Potential Effect (APE) shown in Table 22 below.

Table 15. Recorded Sites and Surveys Within the Study Areas of Potential Effect

Alternative	Location	Survey	Recorded Sites	Site Numbers
Levee Raise	Big and Little Papio between L St. and Harrison St.	A small amount surveyed just below L St. on the Big Papio	0	N/A
Levee Extension	Little Papio below I-80	0	0	N/A
Levee/Floodwall	Center St. to Cass St.	One survey on Little Papio from Howard St. to Dodge St.	0	N/A
Channel Widening	Big Papio Pacific St. to Blondo St.	Incidental adjacent surveys	0	N/A
Floodwall	Millard Ave to 144th St.	Incidental adjacent surveys	3 Not within APE	25SY501, 25SY54, 25SY78
Dam site #10	Thomas Creek north of Bennington Rd.	One very small survey at Pawnee Rd.	0	N/A
Dam Site #19	South Papio approximately 192nd St to "210th along Giles Rd.	Complete survey	1	25SY417

Based upon the results of the file search, and the fact that a majority of potential construction areas have been previously impacted, there is a low likelihood of adverse effects on historic properties. As the process of plan formulation took time and the study area is so large, survey contract(s) were not suggested until after the plan formulation phase is final. A Programmatic Agreement (PA) in consultation with the Nebraska SHPO, the Advisory Council on Historic Preservation, and Interested Parties is being finalized to address potential impacts to unrecorded historic properties that may be discovered prior to, or during, the construction of

levees, floodwalls, and reservoirs on undeveloped land. This includes both structural and nonstructural alternatives.

The draft PA was sent to the SHPO, the ACHP, the Papio NRD, the Ponca Tribe of Nebraska, the Omaha Tribe, the Otoe-Missouria Tribe, the Ponca Tribe of Indians of Oklahoma, the Pawnee Nation of Oklahoma, the Winnebago Tribe and the Iowa Tribe of Nebraska and Kansas for comment prior to finalization on December 18. 2020. There is an informational webinar scheduled for January 26. 2021 to address any questions. The Corps hopes to have the PA signed and completed by the end of February 2021.

5.22.1. No Action

Under the No Action Alternative, no federally-funded construction activities would occur within the Papillion Creek Basin; however, the non-federal sponsors may continue to implement flood risk reduction measures such as channel improvement and dam construction. Federal permits would be required to complete this work, so the non-federal sponsors would be required to comply with all applicable state and federal laws for the protection of cultural resources. For this reason, the No Action alternative is not likely to adversely impact cultural resources.

5.22.2. Recommended Plan

5.22.2.1. South Papillion Creek

The proposed construction of DS19on the South Papillion Creek is not likely to have an effect on historic properties, as the footprint of the inundation area has been completely surveyed. One site, 25SY417, was recorded. If eligible historic properties are discovered during construction, construction activities would cease and appropriate mitigation would be determined through a PA being developed in consultation with the Nebraska SHPO, the Advisory Council on Historic Preservation, and Interested Parties.

5.22.2.2. Little Papillion Creek

The construction of the dry dam at DS10 currently has the potential to have an effect on historic properties, as only one small survey within the APE for DS10 has been conducted. Additional surveys would be required before construction could commence. Construction of the proposed levees and floodwalls along the Little Papillion Creek also currently have the potential to effect historic properties, as only one survey of the proposed levee and floodwall alignments has been conducted. Additional surveys would be required before construction of the levees and floodwalls would be allowed to commence. If eligible historic properties are discovered during construction, construction activities would cease and appropriate mitigation would be determined through the PA being developed in consultation with the Nebraska SHPO, the Advisory Council on Historic Preservation, and Interested Parties.

5.22.2.3. Non-Structural Measures

Non-structural measures may be recommended as a result of this study. The owners of thousands of structures may be eligible to apply for such protections for their property, which would be on a voluntary basis. It is also unknown how many of said structures may be eligible for listing on the NRHP. In advance of implementing such a program, the Corps will continue to pursue the development of a Programmatic Agreement (Appendix C) with the Nebraska SHPO, the Advisory Council on Historic Preservation, and other interested parties, regarding mitigation of any effects to such properties.

5.23. Recreation

The Papillion Creek basin provides over 730 acres of recreational benefits to the citizens of Omaha. Ample recreational opportunities are present throughout the study area, primarily at the dam sites where Papio-NRD manages the reservoirs for fishing, swimming, boating and kayaking/canoeing. Surrounding the reservoirs is a network of pedestrian and biking trails in addition to the trails associated with the levee system. Passive recreational opportunities such as bird watching and wildlife viewing are also available at the existing dam sites.

5.23.1. No Action

Under the No Action Alternative, there would be no construction of a federal project within the Papillion Creek Tributaries Basin, so there would be no impacts to recreation.

5.23.2. Recommended Plan

Construction of the new levees and/or floodwalls along the Little Papillion Creek would cause temporary disruptions to recreational activities along the bike trails that parallel these streams. During construction, the bike trails in the proposed construction areas would have to be closed to the public and demolished to facilitate the levee or floodwall construction. Once levee and/or floodwall construction is complete, the bike trails would be rebuilt on top of the new or raised levees or on the landward side of the proposed floodwalls. The recreation impacts associated with bike trail closures would be considered temporary and minor.

Construction of the dry dam at DS10 would not provide any new recreational opportunities for the public because flowage easements would be acquired for the required lands within the footprint of the proposed floodpool instead of acquiring the land in fee. All of the acquired easement land would remain in private ownership and would not be accessible to the public. In addition, the land within the footprint of the dam and the proposed floodpool is currently privately owned and there are no public recreational opportunities that would be adversely impacted by the proposed project.

Construction of DS19 would provide a significant amount of new recreational opportunities in Sarpy County. Construction of DS19 would result in the creation of a 74-acre lake at normal pool with an additional 135 acres of land between the normal pool elevation and the elevation of the maximum floodpool. The new lake would provide opportunities for fishing, boating, and

kayaking/canoeing. The project lands surrounding the lakes would be used for hiking, biking, picnicking, and wildlife viewing.

6. MITIGATION

Based on the analysis of potential impacts to the environment of the Papillion Creek basin utilizing NESCAP, and HEP, it was determined that the impacts of the proposed construction included in the Recommended Plan to stream condition and function, riparian forest habitat, and wetlands would require mitigation. Total mitigation acreages and costs by location are shown in Table 16 below. Detailed analysis of the Mitigation Plan as well as Adaptive Management and Monitoring for the mitigation areas is available in Appendix H1 and H5. A "Green Sheet" outlining the environmental commitments of the project to ensure all required environmental compliance and mitigation requirements are carried forward through design and construction is available in Appendix H6.

Table 16. Total mitigation acreages and costs for the Recommended Plan

Impact Location	*Habitat Type Impacted*	*Acres Impacted*	*Acres Replaced*	*Mitigation Location*	*Cost/Acre*	*Total RE Cost*	*Excavation Cost @9.09/CY*	*Seeding/Planting Cost/Acre*	*Total Implementation Cost*	*GRAND TOTAL MITIGATION COST*
DS10	Stream	4.6	4.6	DS10	$ 18,392	$ 84,603	$ -	$ 1,800	$ 8,280	$ 92,883
DS10	Riparian Forest	2	3	DS10	$ 18,392	$ 55,176	$ -	$ 10,060	$ 30,180	$ 85,356
DS19	Stream	5.5	5.5	DS19	$ 8,854	$ 48,697	$ -	$ 1,800	$ 9,900	$ 58,597
DS19	Riparian Forest	19.5	29.5	DS19	$ -	$ -	$ -	$ 10,060	$ 296,770	$ 296,770
DS19	PEM Wetland	0.35	1.4	DS19	$ -	$ -	$ 50,413	$ 2,667	$ 3,734	$ 54,147
Little Papio	Riparian Forest	2	2.3	DS19	$ -	$ -	$ -	$ 10,060	$ 23,138	$ 23,138
Grand Total		**33.95**	**46.3**			**$ 188,476**			**$ 372,002**	**$ 610,891**

7. CUMULATIVE IMPACTS

The combined incremental effects of human activity are referred to as cumulative impacts (40CFR 1508.7). While these incremental effects may be insignificant on their own, accumulated over time and from various sources, they can result in serious degradation to the environment. The cumulative impact analysis must consider past, present and reasonably foreseeable actions in the study area. The analysis also must include consideration of actions outside of the Corps, to include other state and federal agencies. As required by NEPA, the Corps has prepared the following assessment of cumulative impacts related to the alternatives being considered in this EA.

Extensive alteration within the Papillion Creek Basin has been occurring since the early 1900's. To protect Omaha from flooding, drainage districts were formed between 1910 and 1928 and significant channelization of the Big Papillion Creek and its contributing tributaries began. Additionally, the Nebraska Department of Roads and Irrigation have historical accounts that indicate the majority of Papillion Creek, Big Papillion Creek and West Papillion Creek were straightened between 1910 and 1913 (Rus et al., 2003). Since 1913, alterations within the basin have continued. Along Little Papillion Creek, a 6.5-mile channel straightening project was completed in 1970, and in 1976, DS 11, Glenn Cunningham Lake, was completed. Along Big Papillion Creek, the Papio-Missouri River NRD constructed and has maintenance responsibilities for approximately 21 miles of levees and channel improvements from 72nd Street downstream to Capehart Road and a section of channel improvement from L Street downstream to 72nd

Street. DS 16, Standing Bear Lake, is located on a tributary of Big Papillion Creek and was completed in 1974. Lake Candlewood (DS 17), was constructed by a private developer on a tributary to the Big Papillion Creek. Newport Landing (DS 6) was built on a tributary to the Big Papillion Creek by the Papio-Missouri River NRD and a private developer in 2002. The West Papillion Creek basin currently has three flood control structures. Lake Zorinsky (DS 18) controls about 16.5 square miles of Box Elder Creek, Wehrspann Lake (DS 20) controls slightly over 13 square miles of a right bank tributary to the South Branch, and Walnut Creek Lake (DS 21) controls 3.4 square miles of Walnut Creek. Both Zorinsky and Wehrspann were built by the Corps under the originally authorized project. Walnut Creek (DS 21) was built in 1999 by the Papio-Missouri River NRD in cooperation with Nebraska Game and Parks Commission and Nebraska Natural Resource Conservation and Development. Dam Site WP 1, located west of Lake Flanagan (DS 15A) on a tributary to West Papillion Creek has been designed and funding has been secured. It is expected to be constructed in the next five years and is therefore included in both the existing and future without-project scenarios. In addition to these reservoirs, the Papio-Missouri River NRD has constructed a levee/channelization project along West Papillion Creek from the confluence of Walnut Creek to 36th Street.

Because the Papillion Creek Basin has been heavily modified, channelized and dammed, ecological resources within the basin have been significantly degraded compared to the natural, historic condition. Of the reasonably foreseeable projects and associated impacts, it is anticipated the City of Omaha will continue to sprawl. It is likely that the upstream portions of the watershed will convert from agricultural land use to residential/urban land use. The floodplain will continue to develop, placing a greater population at risk of a flood threat. The Recommended Plan would incrementally contribute to reducing flood risk to current and potential future communities. The Recommended Plan is not anticipated to cumulatively degrade the habitat or current resources within the basin due to its present, altered condition. Adverse effects associated with the Recommended Plan are short-term and minor, primarily limited to construction activities.

8. COMPLIANCE WITH OTHER ENVIRONMENTAL LAWS

American Indian Religious Freedom Act (AIRFA) of 1978, 42 U.S.C. 1996. *In compliance*. AIRFA protects the rights of Native Americans to exercise their traditional religions by ensuring access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites. The Papillion Creek Basin Project would not adversely affect the protections offered by this act. Access to sacred sites by Tribal members would not be affected.

Bald and Golden Eagle Protection Act, 16 U.S.C. Sec. 668, 668 note, 669a-668d. *In compliance*. This act prohibits the taking or possession of and commerce in bald and golden eagles, with limited exceptions for the scientific or exhibition purposes, for religious purposes of Indian Tribes, or for the protection of wildlife, agriculture or preservation of the species. The proposed project would have no adverse effects on the bald eagle.

Clean Air Act, as amended, 42 U.S.C. 185711-7., et seq. *In compliance*. The purpose of this act is to protect public health and welfare by the control of air pollution at its source and to set forth primary and secondary National Ambient Air Quality Standards to establish criteria for states to attain, or maintain. The proposed construction activities associated with the Recommended Plan would be temporary, occurring on an intermittent basis during the construction season over a period of 5 to 10 years. Emissions associated with construction equipment and on-road vehicles include criteria pollutants ($PM_{2.5,}$ PM_{10}, carbon monoxide, ozone, and sulfur dioxide), greenhouse gases, and small amounts of air toxics. These emissions are expected to be within acceptable air quality standards. In addition, the general actions below would help to avoid or minimize impacts to air quality during construction:

- Minimize clearing vegetation within all the construction work areas.
- Conduct construction activities in a manner to minimize the creation of dust. This may include measures such as limitations on equipment, speed, and/or travel routes.
- Implement measures to minimize the transfer of mud onto public roads.
- Maintain construction equipment in good working order.
- Implement a fugitive particulate emission control plan that specifies steps to minimize fugitive dust generation.

Clean Water Act, as amended, (Federal Water Pollution Control Act) 33 U.S.C. 1251., et seq. *In compliance*. The objective of this act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (33 U.S.C. 1251). Section 404(b)(1) (Clean Water Act) consultations with the Nebraska Department of Environmental Quality (NDEQ) are ongoing, and Section 401 Water Quality Certification for the Recommended Plan is expected during Design and Implementation.

Comprehensive Environmental Response Compensation and Liability Act (CERCLA). *In compliance*. Typically CERCLA is triggered by (1) the release or substantial threat of a release of a hazardous substance into the environment; or (2) the release or substantial threat of a release of any pollutant or contaminant into the environment which presents an imminent threat to the public health and welfare. To the extent such knowledge is available, 40 CFR Part 373 requires notification of CERCLA hazardous substances in a land transfer. The Recommended Plan would involve acquisition by the sponsor of all lands, easements, and rite of ways necessary to construct the proposed levees, levee raises, floodwalls, and reservoirs included in the plan. As part of the acquisition process, environmental condition of property surveys would be conducted on each parcel proposed for acquisition. The purpose of the environmental condition of property surveys is to screen each parcel for the potential presence of hazardous, toxic, or radioactive waste prior to purchasing the property. If the survey determines that CERCLA hazardous substances may be present, the land would not be acquired unless the owner cleaned it up.

Endangered Species Act, as amended, 16 U.S.C. 1531, et seq. *In compliance*. Section 7 (16 U.S.C. 1536) states that all federal departments and agencies shall, in consultation with and with the assistance of the Secretary of the Interior, ensure that any actions authorized, funded, or carried out by them do not jeopardize the continued existence of any threatened or endangered (T&E) species, or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary to be critical. This project has been coordinated with the USFWS. A letter dated November 20, 2018 was submitted to the USFWS Region 6 Ecological Services Field Office requesting information on anticipated impacts that may be associated with proposed alternatives and a list of federally-listed threatened and endangered species that may be found in the study area. The USFWS responded with a letter dated April 16, 2019 that provided a list of federally listed species that may occur within the proposed project area or be affected by the proposed project. It has been determined, through this document that the proposed project may effect, but is not likely to adversely affect northern long-eared bats, and the proposed project would have no effect on western prairie fringed orchids or pallid sturgeon. Concurrence with the Corps' may effect, but not likely to adversely affect determination for the northern long-eared bat was received from the USFWS on 4 February 2021. See Appendix H2 for a copy of the concurrence letter from the USFWS.

Environmental Justice (E.O. 12898). *In compliance*. Federal agencies shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States. The project does not disproportionately impact minority or low-income populations. The Recommended Plan will not cause any significant impacts, nor will it cause either disproportionately high and adverse human health or environmental effects. The recommended plan is expected to provide long-term benefits to the EJ communities by reducing flood risk. Individuals included in any relocation would be provided the necessary relocation assistance and equitable housing provided to displaced persons per the Uniform Relocation Assistance Act (URA). Therefore, disproportionate impacts to EJ communities would not be expected.

Farmland Protection Policy Act (Subtitle I of Title XV of the Agriculture and Food Act of 1981), effective August 6, 1984. *In compliance*. This act instructs the Department of Agriculture, in cooperation with other departments, agencies, independent commissions, and other units of the federal government, to develop criteria for identifying the effects of federal programs on the conversion of farmland to nonagricultural uses. The United States Department of Agriculture Natural Resource Conservation Service in Nebraska was coordinated with on multiple occasions via email beginning in January of 2020. Farmland Conversion Impact Rating Forms were prepared for DS10 and DS19 and submitted to the NRCS for review. An email was received from the NRCS on 21 January 2020 stating that the proposed projects at DS10 and DS19 were found to be cleared of Farmland Protection Policy Act Concerns. See Appendix B for

the completed Farmland Conversion Protection Rating Forms, and the 21 January 2020 email from the NRCS.

Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1(12), et seq. *In compliance*. The act establishes the policy that consideration be given to the opportunities for outdoor recreation and fish and wildlife enhancement in the investigating and planning of any Federal navigation, flood control, reclamation, hydroelectric or multi-purpose water resource project, whenever any such project can reasonably serve either or both purposes consistently. The Recommended Plan provides opportunities for outdoor recreation in the form of bike trails along the creek channels, and fishing, hiking, biking, kayaking/canoeing, and wildlife viewing opportunities at DS19.

Fish and Wildlife Coordination Act, 16 U.S.C. 661, et seq. *In compliance*. A letter dated November 30, 2018 was prepared by the Corps and sent to the USFWS. This letter requested a list of federally listed threatened and endangered species that could potentially be impacted by the proposed project. The letter also requested a Planning Aid Letter in compliance with the Fish and Wildlife Coordination Act. A similar letter was sent to the Nebraska Game and Parks Commission on November 7, 2018. These letters solicited fish and wildlife related comments on the proposed project. The USFWS responded in a letter dated April 16, 2019 regarding potential threatened and endangered species that may occur within the Papillion Creek Tributaries Basin. A biologist from the Corps met with USFWS staff in Grand Island, NE on May 15, 2019 to discuss endangered species and Fish and Wildlife Coordination Act compliance for the project. A follow up email was sent to the Corps by the USFWS on May 28, 2019 that provided additional comments and guidance related to fish and wildlife habitat considerations for the proposed project. Specifically, USFWS focused their FWCA recommendations on conservation of pollinator habitat and preservation or improvement of water quality. USFWS suggested the Corps consider wetland complexes as an alternative to traditional flood control reservoirs as these complexes could be designed to retain sediment from run-off and wetland plant species would assimilate nutrients and containments from run-off. The reservoir pool could be reduced should wetland complexes be considered. Additionally, USFWS recommended the riparian buffer is maintained or replaced along channel improvement locations and reservoirs. In regards to pollinator habitat conservation, USFWS recommended the Corps consider a seed mix that supports native pollinators. Seed mixes should be applied along buffer sites as appropriate. This would support the NGPC Nebraska Monarch and Pollinator Conservation Plan.

Floodplain Management (E.O. 11988). *In compliance*. Executive Order 11988 is applicable to all planning, design, and construction civil works projects program (ER 1165-2-26). The proposed project construction on the flood risk reduction project is to reduce the risk of flooding for the community, increase the protection of life safety, and will be developed with recognition of the state and local floodplain regulations. The study area includes streams within the Papillion Creek Basin: Big Papillion Creek, Little Papillion Creek, Thomas Creek, Papillion Creek, Saddle

Creek, South Papillion Creek, and West Papillion Creek. Corps of Engineers ER 1165-2-26, Implementation of Executive Order 11988 provides guidance on compliance with EO11988. The following comments are provided in reference to ER 1165-2-26 Section 8 General Procedures.

The project is located in Douglas, Sarpy, and Washington Counties within Nebraska. The proposed project is located in or adjacent to the NFIP floodway and/or the regulatory floodplain effective 2 December, 2005; 19 January 1995; and 3 May 2010 respectively (See FIRM Panel list in Appendix G) and is identified as within the 1% AEP floodplain in project analysis. As a flood risk reduction project, the proposed project's construction purpose is to reduce the flood risk and increase the protection of life safety, as such the project is functionally dependent on its location. The project will result in updated NFIP mapping, reducing the extent of the Special Flood Hazard Area. This will promote development in the areas with reduced risk. The project is being developed in accordance with local permitting criteria and communicated to the public through standard procedures

Land and Water Conservation Fund Act (LWCFA), as amended, 16 U.S.C. 4601-4601-11, et seq. *Not applicable.* Planning for recreation development at Corps projects is coordinated with the appropriate states so that the plans are consistent with public needs as identified in the State Comprehensive Outdoor Recreation Plan (SCORP). The Corps must coordinate with the National Parks Service (NPS) to ensure that no property acquired or developed with the assistance from this act will be converted to other than outdoor recreation uses. If conversion is necessary, approval of NPS is required, and plans are developed to relocate or re-create affected recreational opportunities. No lands involved in the proposed project were acquired or developed with LWCFA funds.

Migratory Bird Treaty Act of 1918 as amended, 16 U.S.C. 703-711, et seq. *In compliance*. The Migratory Bird Treaty Act of 1918 (MBTA) is the domestic law that affirms, or implements, the United States' commitment to four international conventions with Canada, Japan, Mexico and Russia for the protection of shared migratory bird resources. The MBTA governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts and nests. The take of all migratory birds is governed by the MBTA's regulation of taking migratory birds for educational, scientific, and recreational purposes and requiring harvest to be limited to levels that prevent over utilization. E.O. 13186 (2001) directs executive agencies to take certain actions to implement the act. Tree removal activities would be restricted to the time period between April 1st and October 31st to avoid impacts to nesting migratory birds and impacts to the northern long-eared bat. In addition, all trees removed or killed by flooding would be replaced as described in Section 6.10.

National Environmental Policy Act (NEPA), as amended, 42 U.S.C. 4321, et seq. *In compliance*. This EA has been prepared for the proposed action and to satisfy the NEPA requirement. An Environmental Impact Statement is not required.

National Historic Preservation Act, as amended, 16 U.S.C. 470a, et seq. *In compliance*. Consultation with the Nebraska State Historic Preservation Office (SHPO), Tribes, and other interested parties was initiated in November 2018. Many cultural resource sites are located within the Papillion Creek watershed. A file search with History Nebraska was completed by a USACE archaeologist on June 4, 2019. The file search identified numerous surveys located within the Papillion Creek watershed. There are 26 sites within the one mile radius of the considered alternatives, but only one site has been recorded within the Areas of Potential Effect (APE). Additional surveys would be required before implementation of the proposed project. If eligible historic properties are discovered, appropriate mitigation would be developed in consultation with the Nebraska SHPO prior to commencing any construction activities.

A Programmatic Agreement is being developed to address potential impacts to unrecorded historic properties that may be discovered during the construction of reservoirs on undeveloped land. It is also unknown how many of the 138 structures identified for potential non-structural measures may be eligible for listing on the NRHP. In advance of implementing such a program, the USACE will continue to pursue the development of a Programmatic Agreement with the Nebraska SHPO, the Advisory Council on Historic Preservation, and other interested parties, regarding mitigation of any effects to such properties.

Noise Control Act of 1972, 42 U.S.C. 4901, et seq. *In compliance*. While there will be minor, short-term noise increases during construction, there would be no long-term noise disturbances associated with this project.

Protection of Wetlands (E.O. 11990). *In compliance*. Federal agencies shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agencies' responsibilities. A small amount of poor-quality wetlands would be impacted by the proposed project at proposed Dam Sites 10 and 19. The impacts to these wetlands would be mitigated as described in Sections 6.8.2.1 and 6.8.2.2 above.

Rivers and Harbors Act, 33 U.S.C. 401, et seq. *In compliance*. This act prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This section provides that the construction of any structure in or over any navigable water of the United States, or the accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. A Section 10 permit is not required for Corps projects.

Watershed Protection and Flood Prevention Act, 16 U.S.C. 1101, et seq. *In compliance*. This act authorizes the Secretary of Agriculture to cooperate with states and other public agencies in works for flood prevention and soil conservation, as well as the conservation, development,

utilization and disposal of water. This act imposes no requirements on Corps Civil Works projects.

Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, et seq. *Not applicable.* This act establishes that certain rivers of the Nation, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The area in which the proposed activity would occur is not designated as a wild or scenic river, nor is it on the National Inventory of Rivers potentially eligible for inclusion.

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10. PREPARER

This EA and the associated Finding of No Significant Impact (FONSI) was prepared by Mr. Luke Wallace, Environmental Resource Specialist. The address of the preparer is: U.S. Army Corps of Engineers, Omaha District; PM-AC, 1616 Capitol Avenue, Omaha, Nebraska 68102.

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Papillion Creek and Tributaries Lakes, Nebraska

General Reevaluation Report

Appendix 1 – Modeling Report with Mitigation Recommendations

June 2021

Omaha District
Northwestern Division

Contents

FIGURES

TABLES

1 Introduction

The Nebraska Stream Condition Assessment Procedure (NESCAP) was the selected habitat assessment tool to assess baseline environmental conditions for the Papillion Creek General Reevaluation Study. This model was reviewed by the U.S. Army Corps of Engineers (Corps) Ecosystem Planning Center of Expertise (ECOPCX) and received approval for regional use on July 11, 2019. Site visits were conducted on May 17, 22, and 29, 2019 to collect data for the model parameters described in the sections below.

2 Procedure Overview

NESCAP is a hydrogeomorphic assessment method that measures thematic variables for the major physical, ecological and anthropogenic factors that can strongly influence stream and adjacent riparian systems. The minimum assessment area used for this method includes the bankfull stream channel and active floodplain. The six variables utilized in this method are as follows:

- V_1- Hydraulic Conveyance and Sediment Dynamics
- V_2- In-stream Habitat/Available Cover
- V_3- Floodplain Interaction-Connectivity
- V_4-Riparian Vegetation Composition
- V_5- Riparian Buffer Continuity and Width
- V_6- Riparian Land Use

Each variable receives a Condition Index Rating (CIR) between 0.10 and 1.00 based on conditions observed or measured at the project site in conjunction with off-site information. The most degraded, culturally disturbed conditions are assigned a 0.10, and the reference standard condition is assigned a 1.00. Conditions not measured or observed may receive a CIR of 0.0. If a given variable is non-applicable, the variable may be completely omitted from scoring from a particular River Reach (RR), and thus receive a "NA". The RR is an aggregated assessment unit, which is defined laterally as a segment of a mainstem stream channel and adjacent riparian ecosystem that is relatively homogenous in terms of geomorphology, soils, hydrology, channel morphology, vegetation and cultural alteration. The RR includes the bankfull stream channel, active floodplain and the less frequently flooded, historical floodplains and terraces.

Once each RR has been assessed with applicable variables, a finalized Stream Condition Index (SCI) is calculated. The SCI is defined as the sum of the scores for the rated variables divided by the maximum sum of the scores for the variables rated, where: $SCI = \frac{\Sigma V}{\Sigma V max}$. The resultant SCI

(habitat quality) for the given RR is then multiplied by stream lengths or area (habitat quantity) for a unit-less weighted score.

2.1 Variables

Below is a description of variable parameters. V_1 and V_2 assess channel and bankfull width, with emphasis being on channel stability, sediment transport and the interface of the channel with the immediate overbank area and morphological conditions that influence habitat diversity. The remaining four variables (V_3 thru V_6) assess the interaction of fluvial processes as they affect riparian system dynamics.

2.1.1 V_1 Hydraulic Conveyance and Sediment Dynamics

Hydraulic conveyance and sediment dynamics address fluvial processes for the active channel within the RR. Altered hydraulic conveyance (AHC) is used in the description of this variable to indicate the degree to which engineered techniques have been utilized to "improve" the capacity of channels to convey surface water. Engineered techniques which lend to AHC reduce frictional resistance (roughness) which is caused by channel substrate, vegetation, woody debris and other objects in the channel, thus limiting the wetted perimeter. Specific techniques include straightening, hardening/lining and removal of vegetation. All of these techniques have been utilized extensively throughout Papillion Creek basin lending to overall habitat degradation, long-term environmental impacts and perpetually impacted channel morphology which in turn disrupts the equilibrium and sediment dynamics. When the continuity of sediment transport is interrupted by activities such as the techniques listed above, the flow may become "sediment-starved," which enhances erosion of the channel bed and banks.

For this variable to receive a favorable reference standard condition rating of 1.00, movement of sediment in the channel must be considered in equilibrium in terms of supply, erosion, deposition and accretion. The channel is stable, no active down-cutting is observed or less than 5% of the channel within the RR is considered AHC. The majority of the data collected within the Papillion Creek basin indicates a CIR of 0.10, this metric depicts highly disrupted hydrology and corresponding sediment dynamics. The channel is deeply incised, with little to no riparian habitat occurring, excessive bed incision, down-cutting and greater than 50% of the RR with AHC.

2.1.2 V_2 In-stream Habitat/Available Cover

The biological components of riparian ecosystems have adapted to episodic cycles of disturbance and developed a variety of mechanisms to survive and flourish where other species cannot. The type, amount and temporal availability of in-stream habitat influence a variety of life history requirements for aquatic species, such as shelter, food and reproductive areas. Natural structures in streams, such as large rocks or cobble which cause riffles and pools, fallen trees, persistent leaf packs and undercut banks provide refugia or function as feeding and spawning sites as well as contributing to niches which leads to overall habitat diversity.

For this variable to receive a 1.00 rating, the floodprone area must be designated by greater than 50% coverage of diverse habitat features favorable for stream faunal colonization and maintenance of vegetative dynamics for recruitment. These features may include snags, submerged logs, undercut banks, roots, cobble and rocks, leaf packs, pools or other stable habitat at a stage which allow colonization. A significantly degraded rating of 0.25 is mostly applicable to Papillion Creek basin where lack of habitat is obvious, substrate is unstable or lacking, the channel bottom is flat, and many of the habitat features mentioned above are not present or are of poor quality.

2.1.3 V_3 Floodplain Interaction-Connectivity

Floodplain interaction-connectivity indicates the degree to which the hydrologic interaction between the bankfull channel and active floodplain remains intact. Connectivity is the degree to which water, organisms and suspended elements and compounds move across the fluvial system landscape and is based on the presence/absence of barriers. The assessment area is the floodprone area and abandoned floodplain/terraces. Figure 1 below depicts stream condition classes during the six stages of channel evolution and is used as a resource to determine CIR for this variable. All data points within the Papillion Creek basin had a Class IV condition.

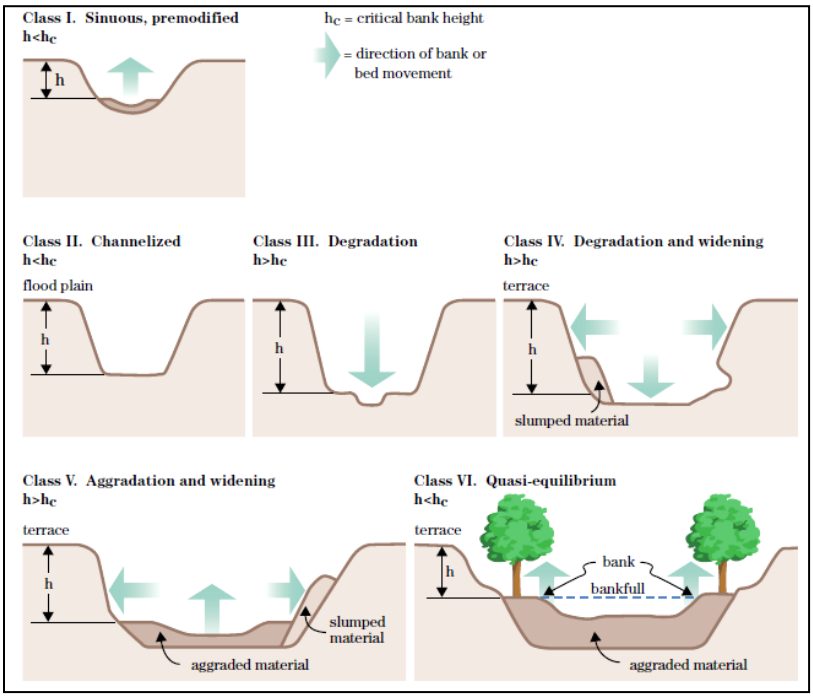


Figure 1. The six stages of channel evolution, derived from Simon 1989 and Natural Resource Conservation Service 2010.

When assigning this variable a CIR, V_1 and V_2 should be taken into account as well as observable indicators. To receive a 1.00, the floodplain must not be physically manipulated, no surface alterations such as dams, dikes, diversions or concrete lining may be present. A severely degraded CIR is indicative of complete geomorphic modification to the floodprone area which

restricts channel movement and prevents overbank flow. Dams, concrete lining, bank stabilization structures, grade control structures and levee systems are prevalent throughout the watershed, disconnecting the ecological floodplain and severely altering the available in-stream habitat. Most of Papillion Creek basin is considered to be severely degraded for this variable and received a CIR of 0.25.

2.1.4 V_4 Riparian Vegetation Composition

This variable is a response to both natural and anthropogenic disturbance. Plant communities are identified and diagnostic species are used to classify composition. Assessment of vegetation is conducted by determining dominance from field observation and follows the rapid test and dominance test described in the Regional Supplement to the Corps' 1987 Delineation Manual (USACE, 2010a; 2010b). Vegetation characterizations are stratified by observations above the floodprone area (V_{4a}) and below the floodprone area (V_{4b}).

For this variable to receive a 1.00 CIR, diagnostic species dominance is greater than 95%, minimal management would be required to preserve natural processes and no chronic anthropogenic disturbances are evident. At the most degraded vegetative communities, dominant plants observed with diagnostic species is between 5% and 25%, native vegetation is largely absent and the area is hardened (urbanized) or graded. The majority of streams within the Papillion Creek Basin are comprised of invasive or non-native plant species. This is especially true below the floodprone area (V_{4b}) where almost every sampling location was dominated by smooth brome and reed canary grass.

2.1.5 V_5 Riparian Buffer Continuity and Width

Riparian ecosystems typically form a relatively continuous corridor along the stream channel and floodplain. Continuity, for the purposes of this assessment variable, is the estimated percentage of the perimeter which is bordered by permanent vegetation. Average width is estimated based on areas where a buffer of permanent vegetation is present and is measured perpendicular from the top of the bank laterally out to 100 feet. Aerial photography was used to estimate the boundary and the results were field verified. The following table is used to determine the CIR:

Table 1. V_5 Buffer and continuity width with associated variable score

V_5 Riparian Buffer Continuity and Width								
	Continuity (%)	100	80-99	60-79	40-59	20-39	5-19	<5
Width(ft)	≥100	1.00	0.90	0.70	0.50	0.30	0.15	0.00
	75-99	0.80	0.75	0.60	0.40	0.25	0.10	0.00
	50-74	0.60	0.50	0.50	0.30	0.20	0.10	0.00
	25-49	0.40	0.30	0.30	0.20	0.15	0.05	0.00
	10-24	0.20	0.20	0.15	0.10	0.10	0.05	0.00
	5-9	0.10	0.10	0.10	0.05	0.05	0.01	0.00
	<5	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Corresponding Summary Rating with Variable score:

If summary rating is between :	Assign the following Condition Index Score:
0.80 - 1.00	1.00
0.60 - 0.79	0.75
0.40 - 0.59	0.50
0.20 - 0.39	0.25
0.01 - 0.19	0.10
0.00 - OR No buffer of permanent vegetation is present = 0	

As depicted in the table above, to receive a reference standard CIR of 1.00, the summary rating must be ≥80. The summary rating increases as the continuity and/or width of the buffer increase. This variable may receive a value of 0.00 if no vegetative buffer is present.

2.1.6 V_6 Riparian Land Use

Land use refers to how a tract of land is utilized, has been developed or the type of vegetation that is present. As is true for V_5, the assessment area is defined laterally as a distance of 100 feet from the top of the bank. General land use classes and associated weights are depicted in Table 2 below. Land use adjacent to each bank is categorized and quantified. The acreages of each category are then weighted according to the table below. The weighted scores are summed and divided by the total area to give the RR a weighted average. The RR is assigned a CIR based on the corresponding weighted average in Table 3 below

Table 2. V_6 Land use category and corresponding weight.

Land Use Category	Land Use Weight
Impermeable Surface	1
Feed Lot	1
Row Crop or Small Grain	3
Farmstead	6
Woodlot/Shelterbelt	6
Perennial Cover (of any type)	8
Managed for Native Vegetation Cover/Diversity	10

Table 3. V_6 Weighted average and Corresponding CIR

If the Land Use Weighted Average is:	Assign the following Condition Index Score:
≥ 8	1.00
7-8	0.75
5-6	0.50
2-4	0.25
< 1	0.10

It is important to note that for V_6 land use categories range from most intensely managed (impermeable surface) to least intensely managed (managed for native cover/diversity). Land use within the 100-foot buffer zone varies greatly by reach within the Papillion Creek Basin. During the assessment, all of the land use categories were observed except the Feed Lot, and Managed for Native Vegetation Cover/Diversity categories.

2.2 Stream Assessment Area

The overall stream area for each river reach assessed is measured in square feet. The area of each river reach is determined by multiplying the width of the stream measured at top of bank by the length of the river reach. The resulting square footage is then multiplied by the calculated SCI for each river reach analyzed. This quantifies the stream quality for comparison of baseline existing conditions to expected future conditions that would be achieved as a result of implementation of the alternatives being considered. The different features of the stream channel assessment area that was assessed for each variable at each data point is shown in Figure 2 Below.

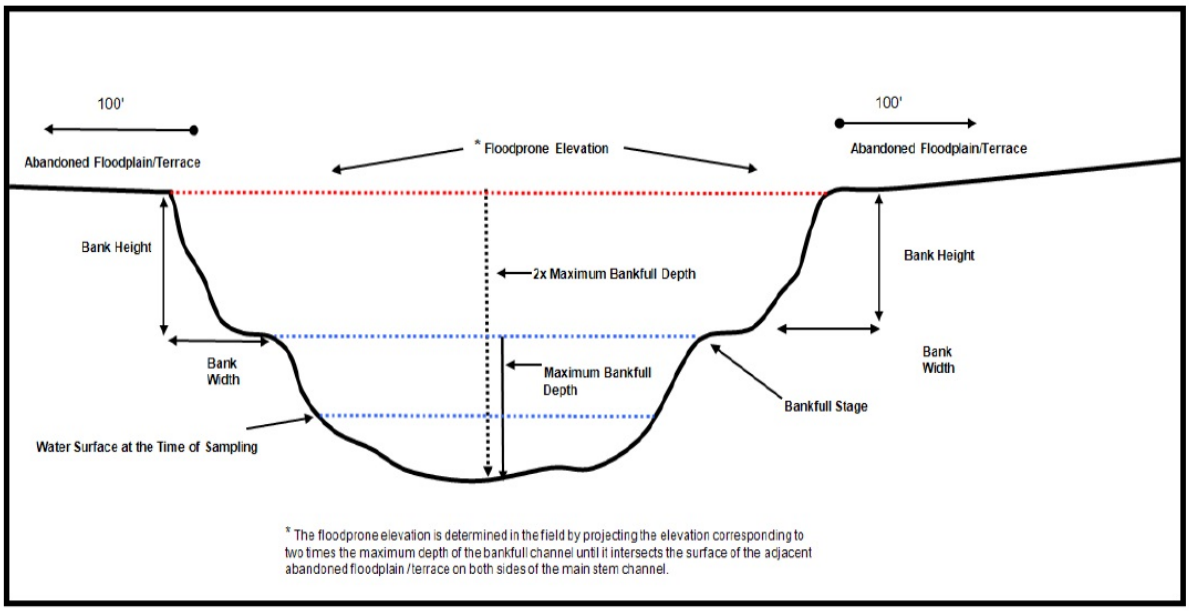


Figure 2. Diagram of the features of the stream assessment area.

2.3 Assumptions and Limitations

To complete the assessment utilizing the NeSCAP model, a number of assumptions were developed to assure consistency in the scoring of variables and defining the areas to be assessed.

For river reaches assessed within the Papillion Creek Basin where there are currently no levees, top of bank was assumed to be the point where the stream bank daylights with the adjacent ground on either side of the channel. Top of bank width was assumed to be the measured distance between these two points on either side of the stream. In reaches with levees, the top of bank was assumed to be the point where the stream channel daylights at the riverward side of the levee crest on either side of the stream channel. Top of bank width in reaches with levees was assumed to be the distance between these two points on either side of the stream.

The floodprone area was assumed to be the entire stream channel below the top of bank.

Bankfull stage for all of the river reaches assessed was assumed to be the points where the banks of the low flow channel daylight with the first bench in the channel. It is assumed that this bench represents the 2- to 3- year event elevation in all reaches analyzed. Width at bankfull was assumed to be the measured distance between these two points on either side of the low flow channel. Bankfull depths ranged from 8 to 15 feet within the study area.

For this assessment, the abandoned floodplain/terrace was assumed to be the area landward of the top of bank for a lateral distance of 100 feet.

3 Methods

The four major streams, South Papillion, West Papillion, Big Papillion and Little Papillion were divided into RRs utilizing ArcGIS. Through the use of aerial imagery, general land use surrounding the streams was assessed. RRs are generally categorized as the streams move through residential, industrial/commercial or green space/parkway areas. RRs are also based on the preliminary geographic scope which defined general areas where specific alternatives may be considered.

A wide array of alternative measures were considered for the different river reaches on each of the four streams. A majority of these alternative measures were screened out by river reach based on the cost of the alternative compared against the value of the flood damages prevented. Alternatives that did not result in a cost benefit ratio greater than 1 were screened out from further consideration. The combination of alternatives with positive cost benefit ratios for individual reaches on each of the four streams was determined to be the Tentatively Selected Plan. The Tentatively Selected Plan includes the following alternative measures for each of the four main streams considered in this study; reservoir construction at Dam Site (DS) 19 on South Papillion Creek, and DS10 on Thomas Creek; channel widening on the Big Papillion Creek

between Blondo Street and Pacific Street; raising the levees along the Big Papillion Creek between L Street and Harrison Street; raising the levees along the Little Papillion Creek between L Street and the Confluence with the Big Papillion Creek; construction of tie back levees along the Little Papillion Creek from L Street upstream to the railroad bridge; construction of floodwalls between 144th Street and Millard Avenue; construction of a tie back levee between 144th Street and 149th Street; and construction of new levees/floodwalls on the Little Papillion Creek between Cass Street and Saddle Creek. After the TSP was selected, further optimization analysis of the alternatives in the TSP was conducted. As a result of the optimization analysis, several more alternatives were eliminated from further consideration due to a negative cost benefit ratio. Alternatives eliminated after optimization include; channel widening on the Big Papillion Creek between Blondo Street and Pacific Street; raising the levees along the Big Papillion Creek between L Street and Harrison Street; raising the levees along the Little Papillion Creek between L Street and the Confluence with the Big Papillion Creek; construction of tie back levees along the Little Papillion Creek from L Street upstream to the railroad bridge; construction of floodwalls between 144th Street and Millard Avenue; and construction of a tie back levee between 144th Street and 149th Street. Alternatives carried forward after optimization include reservoir construction at DS 19 on South Papillion Creek, construction of a dry dam instead of the reservoir that was proposed at DS10 on Thomas Creek in the TSP, and new levee and floodwall construction along the Little Papillion Creek between Blondo Street and the confluence with Saddle Creek. More information regarding alternative development, plan formulation and screening of alternatives may be found in the main General Reevaluation Feasibility Report. NeSCAP modeling results in this report are only presented for the three alternatives carried forward after optimization. These alternatives include proposed projects on three different streams including South Papillion Creek, Thomas Creek, and Little Papillion Creek.

One sampling location (data point) was established in each river reach where construction is proposed on each of the three streams. The extent of each river reach was determined primarily by the type of construction proposed for each reach, but they were further defined laterally as segments of stream channel and adjacent riparian ecosystem that are relatively homogenous in terms of geomorphology, soils, hydrology, channel morphology, vegetation and cultural alteration. Each sampling location was visited during May of 2019. At each location, a hand diagram was drawn of the stream channel, photographs were taken, estimates of bankfull depth and floodprone depth were recorded, and the types of vegetation present were identified. Google Earth Pro was used to measure top of bank width and bankfull width, characterize adjacent land use, quantify land use within the 100-foot from top of bank assessment zone, and measure acreage of different habitat types. This information was then used to develop scores for each of the six NeSCAP variables for each sampling location. The scores for each variable were then entered into the NeSCAP spreadsheets to determine the SCI score for each sampling location. The spreadsheets also calculate the SCI area for each sampling location.

4 Existing Conditions

The data below in Table 4 represent the existing, baseline conditions of the Papillion Creek basin in the river reaches where construction is proposed. Baseline conditions are established to provide a reference for comparison of formulated alternatives for flood risk management reduction measures. SCI scores for each RR can vary between 0.1 and 1.0. The least culturally altered condition is assigned a 1.0, and is considered the "reference standard condition". Intermediate scores between 0.1 and 1.0 represent the range of variation between the most disturbed and least disturbed condition. Existing condition SCI scores for the RRs assessed in the Papillion Creek Basin ranged between 0.14 and 0.37 with a mean score of 0.29. The mean score of 0.29 indicates that the majority of the streams within the Papillion Creek Basin are highly disturbed and they are in relatively poor condition. The lowest score (0.14) was recorded along the Little Papillion Creek between Dodge Street and Pacific Street. The highest score (0.37) was recorded along the South Papillion Creek at the location of Proposed DS19.

Table 4. Existing Condition SCI Scores

RR_i= Impact reach

	Baseline (Pre project)	DS-10	DS-19	L-2	L-3	L-1a	L-1a/Cole Cr	L-2a	L-3a	LP-8
1	Hydraulic Conveyance and Sediment Dynamics	0.50	0.25	0.25	0.10	0.10	0.10	0.10	0.25	0.25
2	In-stream Habitat/Available Cover	0.50	0.75	0.50	0.50	0.25	0.50	0.25	0.50	0.25
3	Floodplain Interaction-Connectivity	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
4a	Riparian Vegetation Composition	0.10	0.10	0.10	0.10	0.25	0.50	0.10	0.25	0.10
4b	Riparian Vegetation Composition	0.50	0.50	0.10	0.10	0.10	0.50	0.10	0.10	0.10
5	Buffer continuity & Width	0.25	0.25	0.75	0.50	0.25	0.25	0.10	0.50	0.50
6	Land use adjacent to Active Flood plain zone	0.25	0.50	0.50	0.50	0.25	0.25	0.10	0.25	0.50
	Stream Condition Index	0.34	0.37	0.35	0.29	0.21	0.34	0.14	0.30	0.28
	Left descending bank -Length (ft)	7,450.00	4,843.00	3,330.00	2,890.00	1,353.00	1,582.00	**5,555.00**	**4,477.00**	**2,259.00**
	Right descending bank -Length (ft)	7,450.00	4,843.00	3,330.00	2,890.00	1,353.00	1,582.00	**5,555.00**	**4,477.00**	**2,259.00**
	width (ft)	55.00	40.00	124.00	140.00	126.00	85.00	**220.00**	**150.00**	**250.00**
	Area	409,750	193,720	412,920	404,600	170,478	134,470	1,222,100	671,550	564,750
	Stream condition Index * area	137,558.93	71,953.14	144,522.00	118,490.00	35,313.30	45,143.50	174,585.71	201,465.00	157,323.21

5 Future Without Project Results

For this analysis, it was assumed that the future without project condition would be the same as the existing conditions. All of the RRs within the study area are already degraded and considered to be in relatively poor condition. The sponsor may choose to implement its own flood risk management measures without the assistance of the Corps, but it is difficult to speculate what these measures would be. For these reasons the future without project conditions were assumed to be the same as the existing conditions.

6 Future With Project Results

Future with project stream condition index scores were developed for each river reach carried forward after optimization. Scores were developed by considering the footprint of the proposed work in each river reach and determining how vegetation, land use, stream morphology, and riparian buffers would be affected by the proposed construction. Aerial imagery from Google Earth Pro and real estate maps depicting the proposed project footprints were utilized to aid in developing scores.

Under the future with project condition, in the reaches where new levees and floodwalls are proposed, it was assumed that smooth brome grass would be planted on the levee slopes due to concerns raised by the Corps' levee safety officer about potential erosion issues if native grasses were used. When scoring the future with project condition for the proposed dam at DS19, the NeSCAP model requires that variables V1 (hydraulic conveyance and sediment dynamics) and V2 (in-stream habitat/available cover) are assigned a CIR of 0 when converting a stream to a lacustrine system. Similarly, V3 (floodplain interaction-connectivity) has an alternative scoring method when converting a stream to a lacustrine system. In this situation, a connectivity ratio is calculated by dividing the shoreline length of the normal reservoir pool by two times the length of the river reaches inundated. For variables V4, V5, and V6, the top of the reservoir floodpool was considered to be the top of bank, and the area below the top of the floodpool was considered to be the floodprone area. Because DS10 is proposed to be a dry dam, it was not scored like a reservoir project. The reach of Thomas Creek that is in the proposed floodpool of DS10, will essentially still function as a stream. The creek would still flow within its banks most of the time except during high water events. Under normal conditions, there would be about an 800-foot long reach of the creek running upstream from the face of the dam that would pool water about three feet higher than it would without the dam, however, this pool would still be contained within the banks of the creek. When the reservoir behind the dry dam fills during high water events, it would take a maximum of 24 hours for the water to drain back to its normal level

within the creek channel. For these reasons, DS10 was scored as a stream the same way the reaches of the Little Papillion Creek were scored.

The figures on the following pages are real estate maps of each RR that includes overlays of the proposed project footprint. Each set of real estate maps is immediately followed by the NeSCAP data sheets showing the existing conditions scores, future with project scores, and resulting project impact units for each of the river reaches depicted in the preceding real estate map.

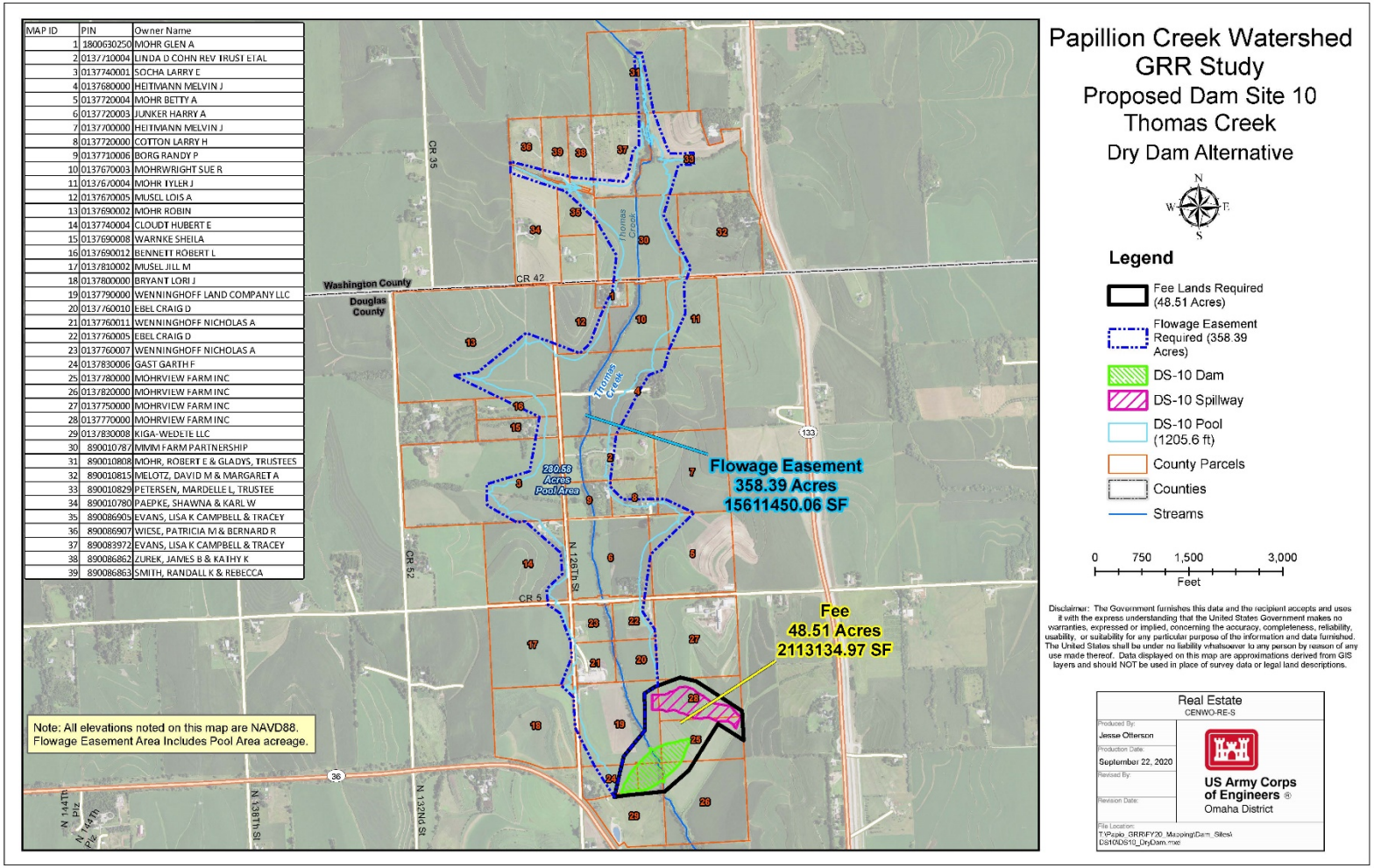


Figure 3. Real estate map of proposed Dam Site 10 on Thomas Creek.

RR_i= Impact reach

	Baseline (Pre project)	DS-10 Dry	RR_i2
1	Hydraulic Conveyance and Sediment Dynamics	0.50	0.00
2	In-stream Habitat/Available Cover	0.50	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.10	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	0.25	0.00
6	Land use adjacent to Active Flood plain zone	0.25	0.00
	Stream Condition Index	0.34	0.00
	Left descending bank -Length (ft)	7,450.00	0.00
	Right descending bank -Length (ft)	7,450.00	0.00
	width (ft)	55.00	0.00
	Area	409,750	0
	Stream condition Index * area	137,558.93	0.00

	Post Project (PROPOSED)	DS-10 Dry	RRi2
1	Hydraulic Conveyance and Sediment Dynamics	0.10	0.00
2	In-stream Habitat/Available Cover	0.25	0.00
3	Floodplain Interaction-Connectivity	0.50	0.00
4a	Riparian Vegetation Composition	0.10	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	0.25	0.00
6	Land use adjacent to Active Flood plain zone	0.25	0.00
	Stream Condition Index	0.28	0.00
	Left descending bank -Length (ft)	7,450.00	0.00
	Right descending bank -Length (ft)	7,450.00	0.00
	width (ft)	55.00	0.00
	Area	409,750	0
	Stream condition Index * area	114,144.64	0.00

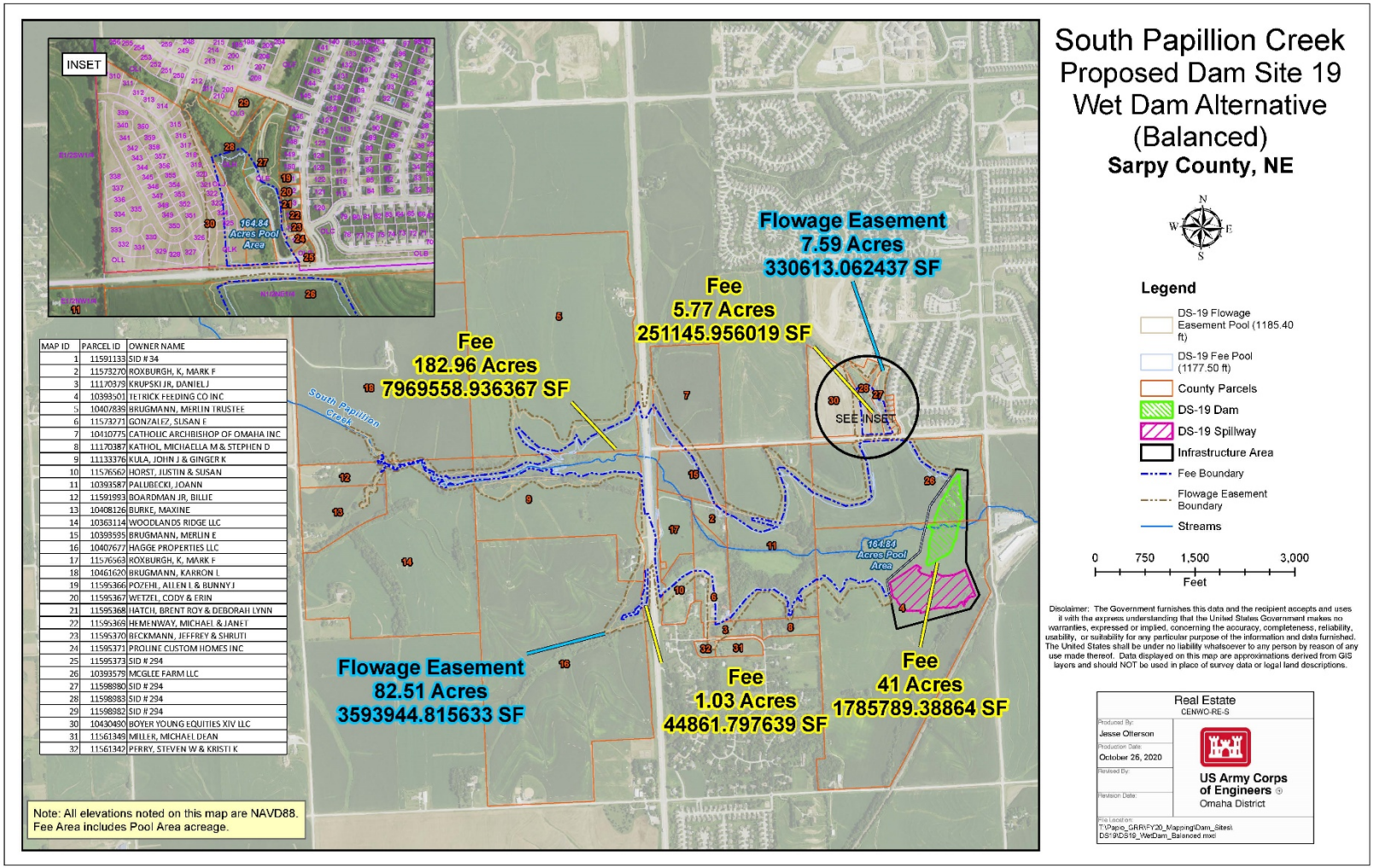
	Change from baseline to post project	DS-10 Dry	RRi2
1	Hydraulic Conveyance and Sediment Dynamics	-0.40	0.00
2	In-stream Habitat/Available Cover	-0.25	0.00
3	Floodpalin Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.00	0.00
4b	Riparian Vegetation Composition	0.00	0.00
5	Riparian Buffer	0.00	0.00
6	Land use adjacent to Active Flood plain zone	0.00	0.00

PROPOSED - BASELINE	-23,414.29
Stream Length Multiplier	1.0

Impact Units	-23,414.29

PROJECT IMPACT UNITS	-23,414.29

Figure 4. NeSCAP scoring results for Dam Site 10 on Thomas Creek.



MAP ID	PARCEL ID	OWNER NAME
1	11591133	SID # 34
2	11573270	ROXBURGH, K, MARK F
3	11170379	KRUPSKI JR, DANIEL J
4	10393501	TETRICK FEEDING CO INC
5	10407839	BRUGMANN, MERLIN TRUSTEE
6	11573271	GONZALEZ, SUSAN F
7	10410775	CATHOLIC ARCHBISHOP OF OMAHA INC
8	11170387	KATHOL, MICHAELLA M & STEPHEN D
9	11133376	KULA, JOHN J & GINGER K
10	11576562	HORST, JUSTIN & SUSAN
11	10393587	PALUBECKI, JOANN
12	11591993	BOARDMAN JR, BILLIE
13	10408126	BURKE, MAXINE
14	10363114	WOODLANDS RIDGE LLC
15	10393595	BRUGMANN, MERLIN E
16	10407677	HAGGE PROPERTIES LLC
17	11576563	ROXBURGH, K, MARK F
18	10461620	BRUGMANN, KARRON L
19	11595366	POZEHL, ALLEN L & BUNNY J
20	11595367	WETZEL, CODY & ERIN
21	11595368	HATCH, BRENT ROY & DEBORAH LYNN
22	11595369	HEMENWAY, MICHAEL & JANET
23	11595370	BECKMANN, JEFFREY & SHRUTI
24	11595371	PROLINE CUSTOM HOMES INC
25	11595373	SID # 294
26	10393579	MCGLEE FARM LLC
27	11598980	SID # 294
28	11598983	SID # 294
29	11598982	SID # 294
30	10430490	BOYER YOUNG EQUITIES XIV LLC
31	11561349	MILLER, MICHAEL DEAN
32	11561342	PERRY, STEVEN W & KRISTI K

Figure 5. Real estate map of proposed Dam Site 19 on South Papillion Creek.

RR_i= Impact reach

	Baseline (Pre project)	DS-19	RR_i2
1	Hydraulic Conveyance and Sediment Dynamics	0.25	0.00
2	In-stream Habitat/Available Cover	0.75	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.10	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	0.25	0.00
6	Land use adjacent to Active Flood plain zone	0.50	0.00
	Stream Condition Index	0.37	0.00
	Left descending bank -Length (ft)	4,843.00	0.00
	Right descending bank -Length (ft)	4,843.00	0.00
	width (ft)	40.00	0.00
	Area	193,720	0
	Stream condition Index * area	71,953.14	0.00

	Post Project (PROPOSED)	DS-19	RRi2
1	Hydraulic Conveyance and Sediment Dynamics	0.00	0.00
2	In-stream Habitat/Available Cover	0.00	0.00
3	Floodplain Interaction-Connectivity	0.10	0.00
4a	Riparian Vegetation Composition	0.10	0.00
4b	Riparian Vegetation Composition	0.75	0.00
5	Buffer continuity & Width	0.10	0.00
6	Land use adjacent to Active Flood plain zone	0.25	0.00
	Stream Condition Index	0.19	0.00
	Left descending bank -Length (ft)	4,843.00	0.00
	Right descending bank -Length (ft)	4,843.00	0.00
	width (ft)	40.00	0.00
	Area	193,720	0
	Stream condition Index * area	35,976.57	0.00

	Change from baseline to post project	DS-19	RRi2
1	Hydraulic Conveyance and Sediment Dynamics	-0.25	0.00
2	In-stream Habitat/Available Cover	-0.75	0.00
3	Floodpalin Interaction-Connectivity	-0.15	0.00
4a	Riparian Vegetation Composition	0.00	0.00
4b	Riparian Vegetation Composition	0.25	0.00
5	Riparian Buffer	-0.15	0.00
6	Land use adjacent to Active Flood plain zone	-0.25	0.00

PROPOSED - BASELINE	-35,976.57
Stream Length Multiplier	1.0

Impact Units	-35,976.57

PROJECT IMPACT UNITS	-35,976.57

Figure 6. NeSCAP Scoring results for Dam Site 19 on the South Papillion Creek.

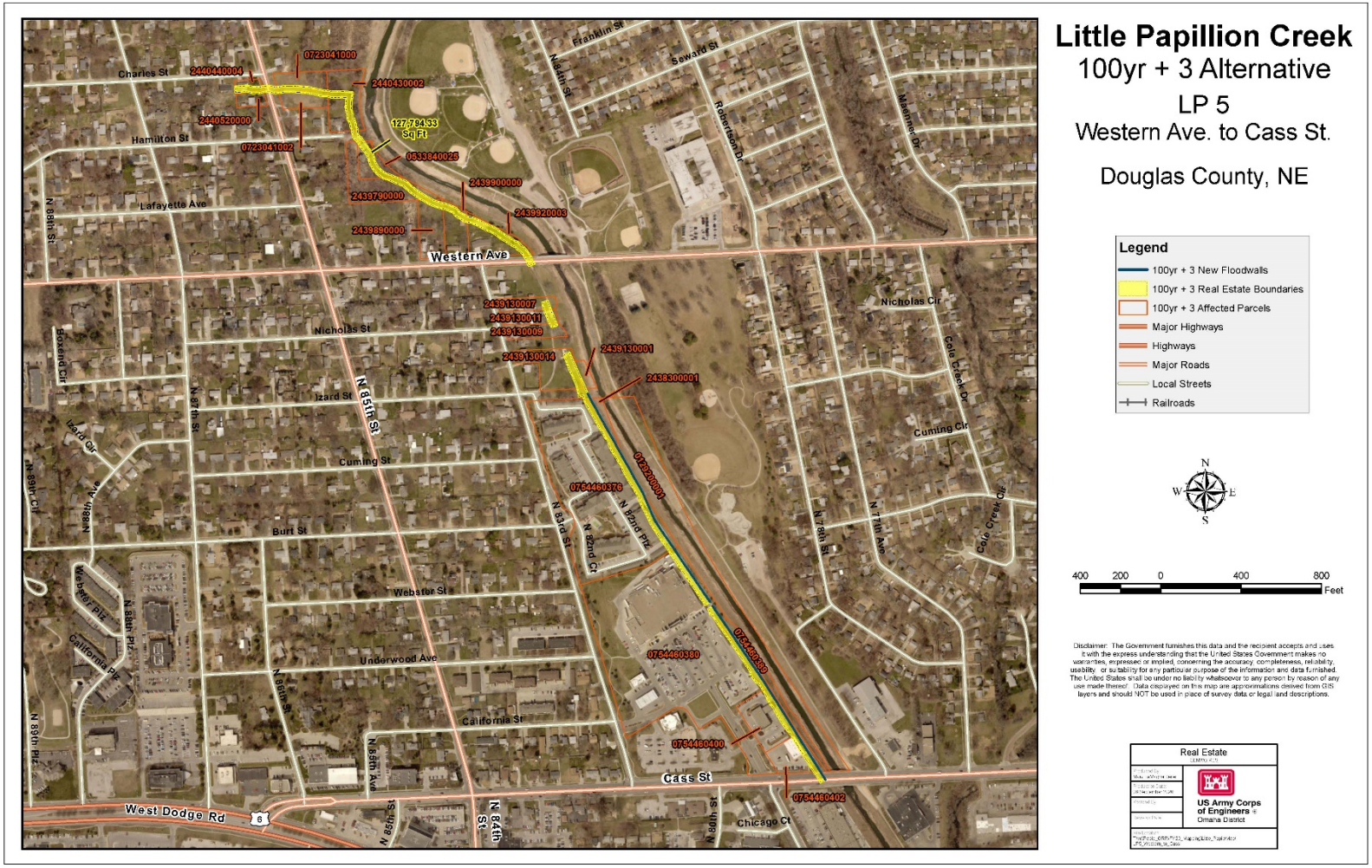


Figure 7. Real Estate Map of Little Papillion Creek Blondo Street to Western Avenue, and Western Avenue to Cass Street.

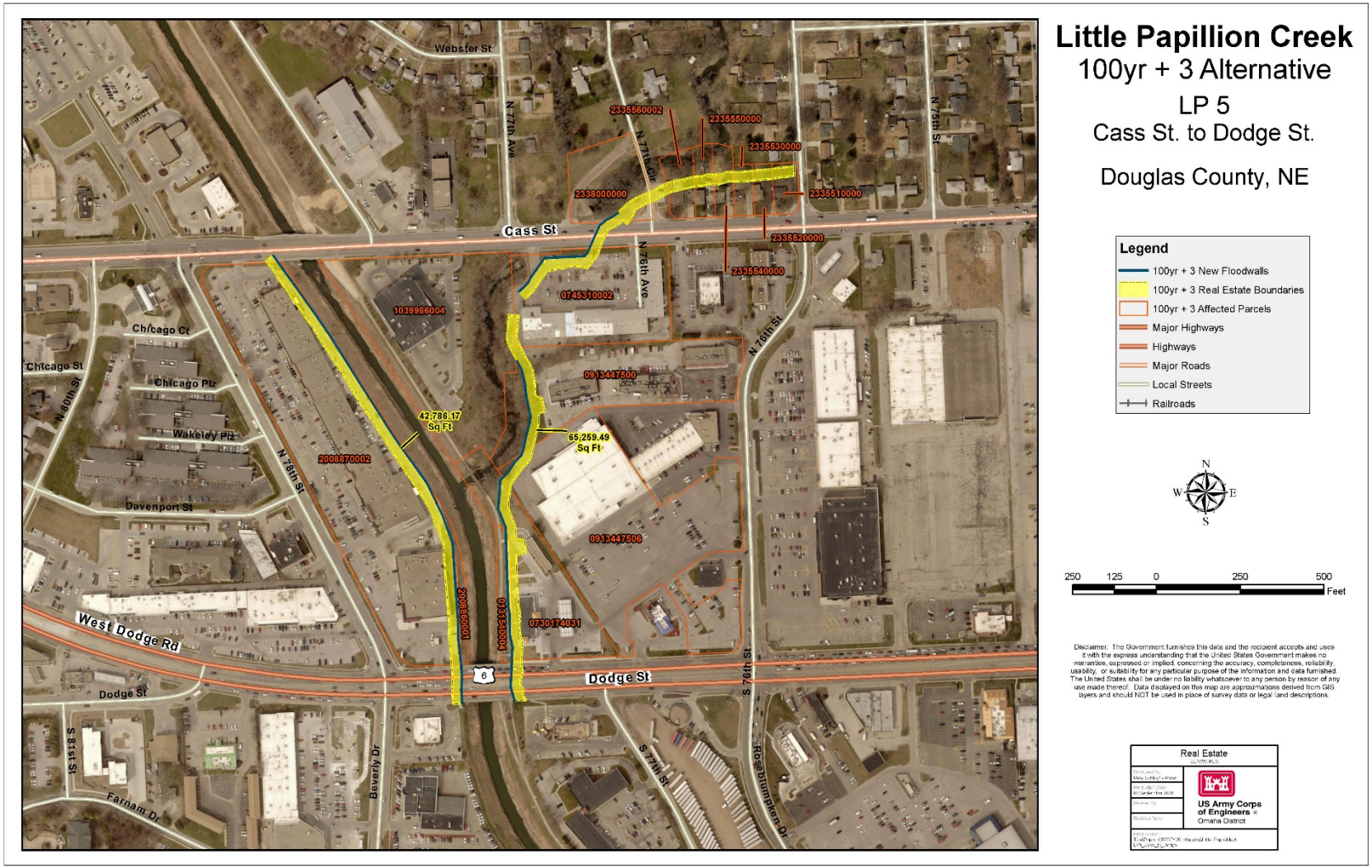


Figure 8. Real Estate Map of Little Papillion Creek and Cole Creek Confluence Cass Street to Dodge Street.

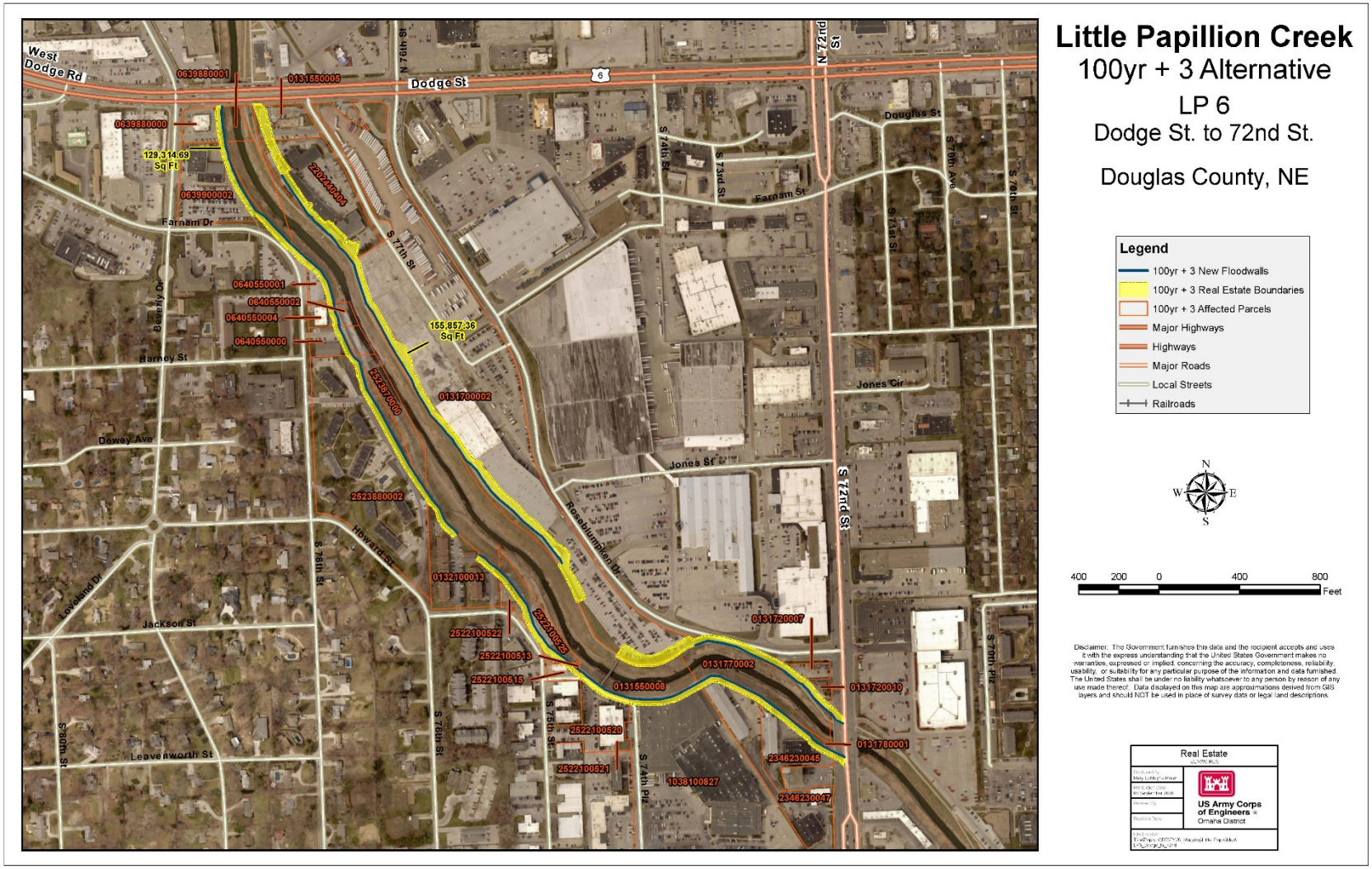


Figure 9. Real Estate Map of Little Papillion Creek Dodge Street to 72nd Street.

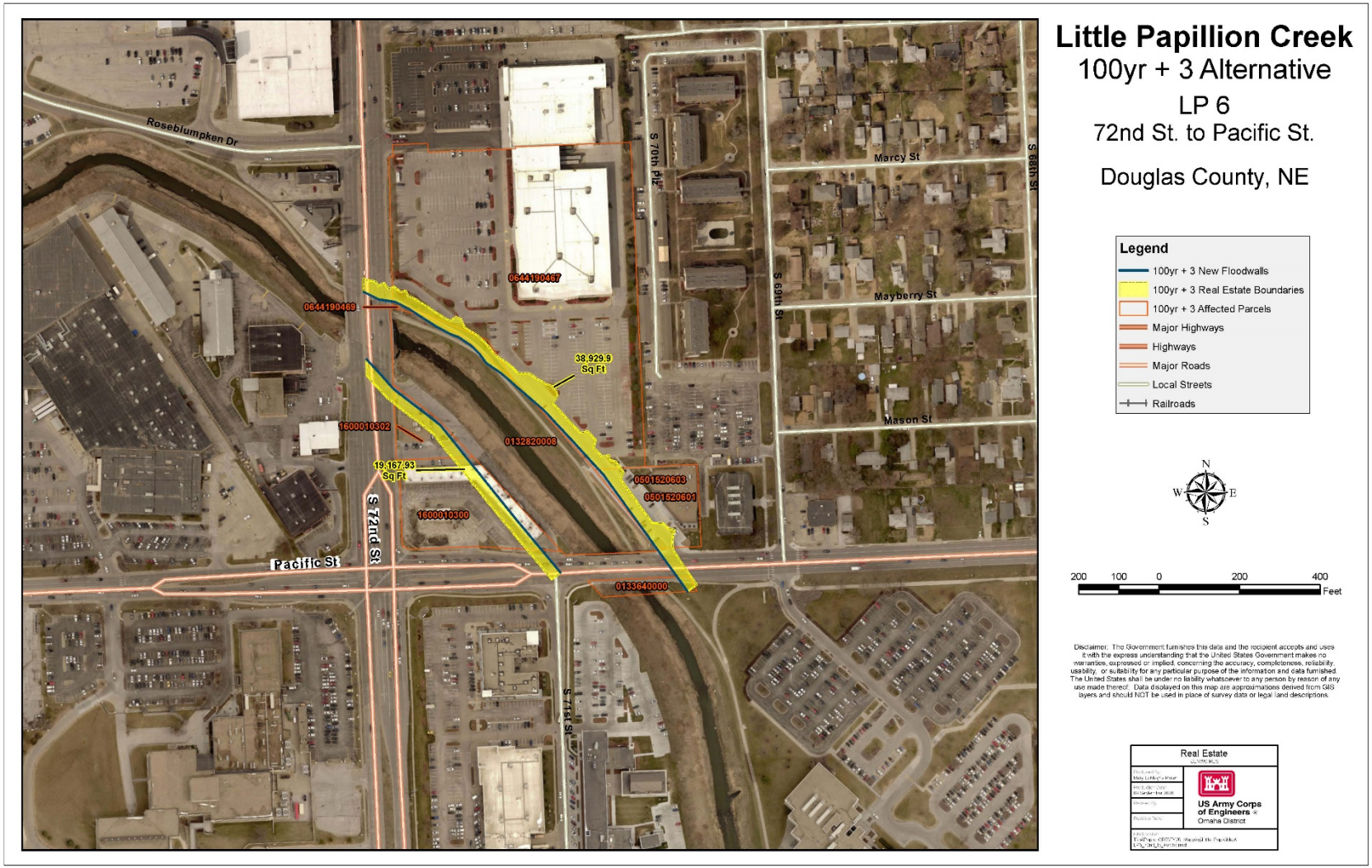


Figure 10. Real Estate Map of Little Papillion Creek 72nd Street to Pacific Street.

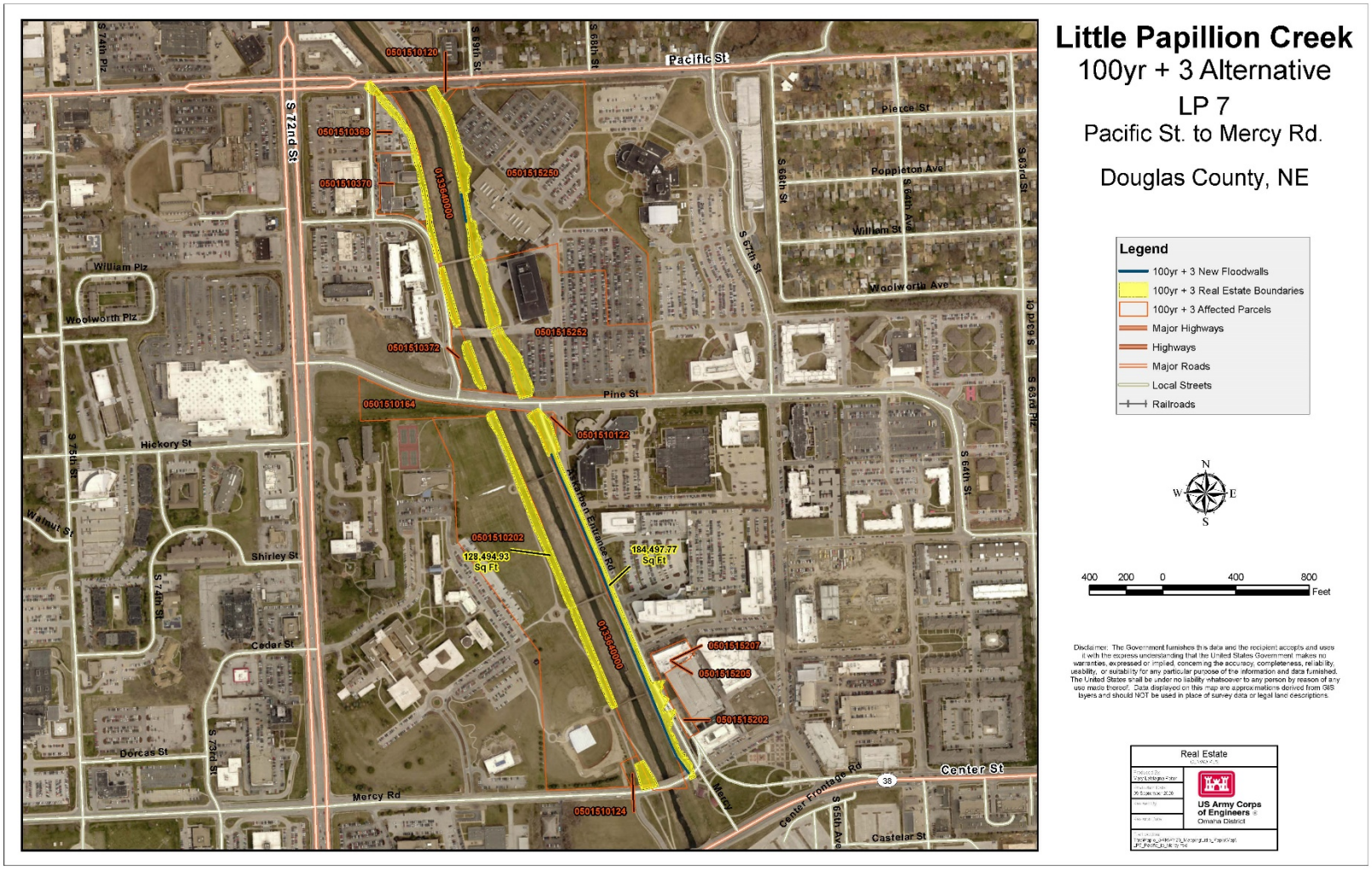


Figure 11. Real Estate Map of Little Papillion Creek Pacific Street to Mercy Road.

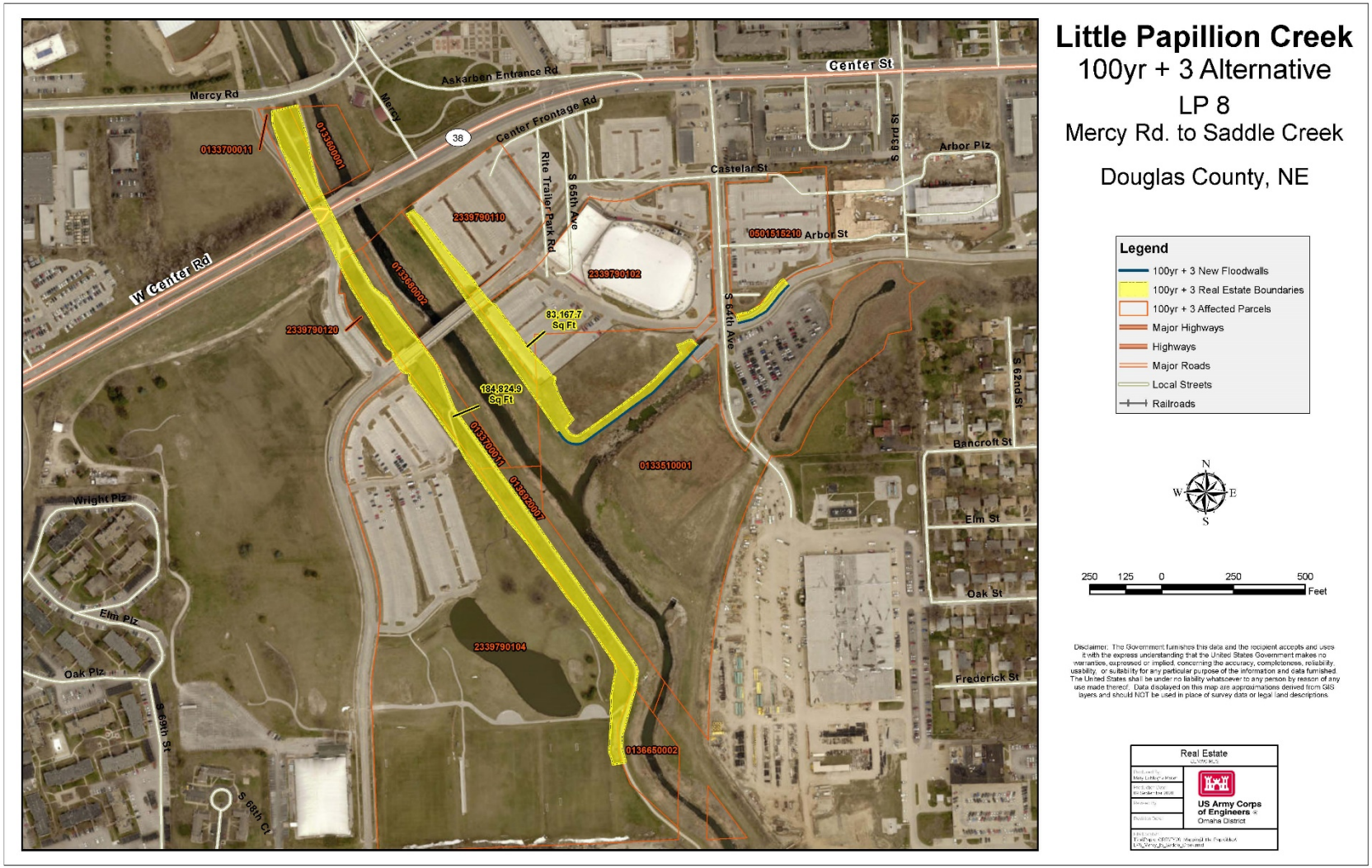


Figure 12. Real Estate Map of Little Papillion Creek Mercy Road to the confluence with Saddle Creek.

RR_i= Impact reach

	Baseline (Pre project)	L-2	L-3	L-1a	Cole Creek Tie	L-2a	L-3a	Lp-8
1	Hydraulic Conveyance and Sediment Dynamics	0.25	0.10	0.10	0.10	0.10	0.25	0.25
2	In-stream Habitat/Available Cover	0.50	0.50	0.25	0.50	0.25	0.50	0.25
3	Floodplain Interaction-Connectivity	0.25	0.25	0.25	0.25	0.25	0.25	0.25
4a	Riparian Vegetation Composition	0.10	0.10	0.25	0.50	0.10	0.25	0.10
4b	Riparian Vegetation Composition	0.10	0.10	0.10	0.50	0.10	0.10	0.10
5	Buffer continuity & Width	0.75	0.50	0.25	0.25	0.10	0.50	0.50
6	Land use adjacent to Active Flood plain zone	0.50	0.50	0.25	0.25	0.10	0.25	0.50
	Stream Condition Index	0.35	0.29	0.21	0.34	0.14	0.30	0.28
	Left descending bank -Length (ft)	3,330.00	2,890.00	1,353.00	1,582.00	5,555.00	4,477.00	**2,259.00**
	Right descending bank -Length (ft)	3,330.00	2,890.00	1,353.00	1,582.00	5,555.00	4,477.00	**2,259.00**
	width (ft)	124.00	140.00	126.00	85.00	220.00	150.00	**250.00**
	Area	412,920	404,600	170,478	134,470	1,222,100	671,550	564,750
	Stream condition Index * area	144,522.00	118,490.00	35,313.30	45,143.50	174,585.71	201,465.00	157,323.21

	Post Project (PROPOSED)	L-2	L-3	L-1a	Cole Creek Tie	L-2a	L-3a	Lp-8
1	Hydraulic Conveyance and Sediment Dynamics	0.25	0.10	0.10	0.10	0.10	0.25	0.25
2	In-stream Habitat/Available Cover	0.50	0.50	0.25	0.50	0.25	0.50	0.25
3	Floodplain Interaction-Connectivity	0.25	0.25	0.10	0.25	0.10	0.10	0.25
4a	Riparian Vegetation Composition	0.10	0.10	0.25	0.50	0.10	0.10	0.10
4b	Riparian Vegetation Composition	0.10	0.10	0.10	0.50	0.10	0.10	0.10
5	Buffer continuity & Width	0.75	0.50	0.25	0.25	0.10	0.50	0.50
6	Land use adjacent to Active Flood plain zone	0.50	0.50	0.25	0.25	0.25	0.25	0.50
	Stream Condition Index	0.35	0.29	0.19	0.34	0.14	0.26	0.28
	Left descending bank -Length (ft)	3,330.00	2,890.00	1,353.00	1,582.00	5,555.00	4,477.00	2,259.00
	Right descending bank -Length (ft)	3,330.00	2,890.00	1,353.00	1,582.00	5,555.00	4,477.00	2,259.00
	width (ft)	130.00	140.00	126.00	100.00	220.00	165.00	265.00
	Area	432,900	404,600	170,478	158,200	1,222,100	738,705	598,635
	Stream condition Index * area	151,515.00	118,490.00	31,660.20	53,110.00	174,585.71	189,952.71	166,762.61

	Change from baseline to post project	L-2	L-3	L-1a	Cole Creek Tie	L-2a	L-3a	Lp-8
1	Hydraulic Conveyance and Sediment Dynamics	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	In-stream Habitat/Available Cover	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Floodpalin Interaction-Connectivity	0.00	0.00	**-0.15**	0.00	**-0.15**	**-0.15**	0.00
4a	Riparian Vegetation Composition	0.00	0.00	0.00	0.00	0.00	**-0.15**	0.00
4b	Riparian Vegetation Composition	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Riparian Buffer	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Land use adjacent to Active Flood plain zone	0.00	0.00	0.00	0.00	0.15	0.00	0.00

PROPOSED - BASELINE	9,233.51
Stream Length Multiplier	1.0
Impact Units	9,233.51
PROJECT IMPACT UNITS	**9,233.51**

Stream Order Multiplier	0

Figure 13. NeSCAP scoring results for Little Papillion Creek new levees and floodwalls Blondo Street to the confluence with Saddle Creek.

SCI scores for future with project conditions along the three streams that were assessed ranged from 0.14 to 0.35. The lowest score (0.14) and the highest score (0.35) were both recorded along different reaches of the Little Papillion Creek. Because the NeSCAP model measures impacts to streams, converting the stream (South Papillion Creek) at Dam Site 19 to lacustrine habitat resulted in negative total impact units. The future with project condition for DS19 resulted in -35,976.57 total negative impact units. The dry dam at DS10 will not convert the impacted reach of Thomas creek to lacustrine habitat, so the future with project condition was scored the same as the rest of the flowing stream reaches. The proposed construction of the dry dam does, however, impact the condition of the stream enough that the modeling resulted in a total of -23,414.29 total negative impact units. The future with project conditions for the proposed levees and floodwalls along all of the assessed reaches of the Little Papillion Creek resulted in a total of 9,233.51 beneficial (positive) project impact units. The total negative impacts for both proposed dam sites combined is -59,390.86 total impact units, while the total beneficial impacts of the proposed levees and floodwalls along the Little Papillion Creek would result in a total of 9,233.51 beneficial (positive) total impact units. Overall, this results in net negative impacts totaling 50,157.35 total impact units. Table 5 below provides a summary of the stream condition impact scores and the total impact units by reach for each proposed construction alternative carried forward after optimization.

Table 5. Summary of stream condition index scores and total impact units

	Stream condition Index		Stream Condition Index * Area		
	Existing Conditions	Future With Project	Existing Conditions	Future With Project	Total Impact Units
Dam Site 10	0.34	0.28	137,558.93	114,144.64	-23,414.29
Dam Site 19	0.37	0.19	71,953.14	35,977	-35,976.57
Little Papio Levee/Floodwall					
L-2	0.35	0.35	144,522	151,515	6,993.00
L-3	0.29	0.29	118,490	118,490	0.00
L-1a	0.21	0.19	35,313.30	31,660.20	-3,653.10
L-1a (Cole Creek)	0.34	0.34	45,143.50	53,110.00	7,966.50
L-2a	0.14	0.14	174,586	174,585.71	0.00
L-3a	0.3	0.26	201,465	189,953	-11,512.29
Lp-8	0.28	0.28	157,323	166,763	9,439.40
Total					-50,157.35

7 Discussion

The streams within Papillion Creek Tributaries Basin have been extensively modified over the last 100 years to reduce flood risk and accommodate development within the basin. Most of the streams have been straightened, levees and channel improvement projects have been constructed, multiple flood control reservoirs have been constructed, and a majority of the land within the basin has been urbanized or placed in crop production. Stream reaches in rural areas have been severely impacted by agricultural practices that often eliminate vegetation buffers and result in removal of trees right up to the edge of the stream bank. Due to the relatively poor condition of the streams in this study area, the future with project condition only resulted in relatively minor negative project impact unit scores to some of the reaches of Little Papillion Creek during the NeSCAP analysis. Overall, the future with project condition resulted in 9,233.51 net positive project impact units when the results for all of the reaches in the Little Papillion Creek were combined. The beneficial impacts to some of the reaches of the Little Papillion Creek are primarily the result of converting concrete or otherwise un-vegetated areas to grass or other perennial cover due to the expansion of the project footprint resulting from construction of new levees. Floodwalls were used in areas where high value properties or other real estate constraints prevented the acquisition of sufficient property to provide enough space for levee construction. The floodwalls have a much smaller footprint than levees and require less real estate. This resulted in less conversion of concrete surfaces or buildings to grass cover or expansion of the vegetated buffers along the river reaches where floodwalls are proposed. As a result, project impact unit scores in river reaches where floodwalls are proposed either did not change between the without project and future with project condition, or they resulted in slightly negative scores. Negative scores for reaches that primarily included floodwalls were also related to the decrease in floodplain connectivity that would result from construction of floodwalls.

Conversion of over 4,843 feet of South Papillion Creek to lacustrine habitat at DS19 would result in -35,976.57 project impact units. Since the NeSCAP model assesses impacts to streams, converting a stream to a lake results in negative project impact units that will require mitigation. Construction of a dry dam at DS10 on Thomas Creek would not convert the creek to a lake, however, it would impact the function of the stream enough to require mitigation of 23,414.29 negative project impact units.

7.1 Significance of Resources Impacted

The significance of ecological resources shall be based upon both their monetary (NED) and non-monetary (EQ) values. Appropriate coordination, studies and analyses throughout the planning process have been conducted to determine the significance of ecological resources likely to be affected by alternative plans and the significance of these effects.

Most of the river reaches where potential construction projects are proposed as part of the optimized plan are located in highly urbanized areas with limited ecological resources along the stream corridor. Most of the sites are surrounded by residential and industrial areas with most of the vegetation in the riparian area being comprised of smooth brome grass, turf grasses and other invasive species. Three locations within the proposed project footprint contain pockets of trees with vegetation reminiscent of the historic conditions (Eastern Riparian Forest community). This community has a state rank in Nebraska of S3. This rank, as defined by the Natural Heritage Program, is "State Vulnerable", due to a restricted range and relatively few populations, recent and widespread declines and other factors make this community vulnerable to extirpation (Rolfsmeier and Steinauer, 2010). These areas include Dam Sites 10 and 19, and scattered areas along Little Papillion Creek. Approximately 19.5 acres of silver maple, green ash, box elder, mulberry, Chinese elm, and cottonwood trees lining the creek channel at DS 19 would require mitigation. These trees would either be inundated and killed by the filling of the normal pool of the proposed reservoir, or they would have to be removed to construct the dam embankment. DS10 is proposed to be a dry dam, so there would be no permanent pool to kill the trees lining the creek channel. Also, when the reservoir is filled during flood events, the flood water would draw down to its normal level within the banks of the creek in a relatively short period of time. For example, the 500-year event would draw down in approximately 27 hours, and the 200-year event would draw down in approximately 24 hours. Flood events smaller than the 200-year event would drain in less than 24 hours. Native riparian tree species have adapted to survive these short duration flood events. A total of approximately 2 acres of trees would have to be cleared from along the creek channel within the footprint of the dam at DS10. Finally, approximately 2 acres of trees would need to be cleared along the Little Papillion Creek to construct the levees and floodwalls. The trees that would be removed along Little Papillion Creek are primarily green ash, cottonwood, and silver maple. In total, construction of the optimized plan would result in the removal and/or death of approximately 23.5 acres of trees.

8 Recommendations

As defined in ER-1105-200-1 and in accordance with 40 CFR 1580.20, protection of the Nation's environment from adverse effects of each alternative plan, in missions other than ecosystem restoration, such as the proposed flood risk reduction projects along the Papillion Creek and tributary streams, is to be provided by mitigation of those effects. Each alternative plan shall include mitigation as determined appropriate. Mitigation should be addressed in consultation with the federal and state fish and wildlife agencies and in accordance with the Fish and Wildlife Coordination Act and other applicable laws, regulations and Executive Orders.

When practical, mitigation measures determined appropriate should be planned for concurrent implementation with other major project features. Cost of mitigation measures are part of total

project costs and are included in the benefit-cost analysis of alternative plans. For mitigation, "benefits" are interpreted as being the same as "losses prevented or replaced".

Mitigation includes, 1) avoid, 2) minimize and 3) rectify. Mitigation planning objectives are clearly written statements that prescribe specific actions to be taken to avoid and minimize adverse impacts as well as identify specific amounts of compensation required.

District commanders shall ensure that project-caused adverse impacts to ecological resources have been avoided or minimized to the extent practicable and that remaining, unavoidable impacts have been compensated to the extent justified. The Tentatively Selected Plan and the NED plan, if not the same, shall contain sufficient mitigation to ensure that either plan selected will not have more than negligible adverse impacts on ecological resources, as defined in WRDA 86, Section 906 (d).

8.1 Stream Impact Mitigation

According to the results of the NeSCAP modeling for the optimized plan, construction of the two proposed dam sites would result in a combined total negative project impact unit score of -59,390.86, while the total beneficial impacts of the remainder of the proposed actions (levees/floodwalls) along Little Papillion Creek would result in a total of 9,233.51 beneficial (positive) project impact units. Overall, this results in net negative impacts totaling 50,157.35 negative project impact units. The 59,390.86 negative project impact units that result from construction of dam sites 10 and 19 are partially compensated for by the 9,233.51 positive project impact units produced by the remainder of the proposed construction activities along Little Papillion Creek in the optimized plan. Therefore, based on the NeSCAP modeling results, the net negative impacts to stream condition (-50,157.35 project impact units) that would occur as a result of construction of the two dam sites under the optimized Plan would need to be mitigated. Negative impacts to Thomas Creek caused by the proposed project would be mitigated by acquiring a total of 4.6 acres of land straddling both sides of a 1,000-foot long segment of the creek just upstream of Pawnee Road. This segment is located within the floodpool of the proposed dry dam. However, because a dry dam with no permanent pool is being proposed, this segment would be suitable for mitigation. Stream mitigation would primarily consist of planting a 100-foot wide buffer of native prairie and wetland plants along each side of the creek for 1,000 feet. Stream impact mitigation at DS 19 would be accomplished by acquiring 5.5 acres of land straddling both sides of a 1,200-foot long segment of an unnamed tributary to the South Papillion Creek located west of Highway 6. This segment of the tributary is located just outside the edge of the floodpool on the upstream end of the proposed reservoir. Similar to the mitigation proposed at DS10, a 100-foot wide buffer of native prairie and wetland plants would be planted along both sides of the creek channel for a distance of 1,200 feet. The type and amount of stream mitigation proposed was determined through use of the mitigation tool in the NeSCAP calculation book. This tool allows you to manipulate the expected CIR

scores for each of the variables that would be affected by the proposed mitigation measures. It also allows you to manipulate the stream length and acreage proposed for mitigation to produce the amount of positive project impact units needed to be mitigate for the impacts of the proposed project Figures 14 and 15 below are NeSCAP mitigation tool worksheets that show how the proposed mitigation at the two dam sites would achieve the required total of at least 50,157.35 positive project impact units. As depicted on the two NeSCAP mitigation tool worksheets, the total amount of mitigation units that would be produced by the proposed mitigation at both dam sites is 52,971 units.

Stream mitigation costs at each dam site would include the cost of fee title real estate acquisition, purchase of native seed mixes, and planting the seed. A mix of native grasses, forbs, and wetland plants would be used. The seed mix is estimated to cost about $150/pound, and it would be applied at a rate of 12 pounds/acre for a total cost of $1,800/acre. The proposed mitigation site at DS10 is located along Thomas Creek within the floodpool area behind the dam. Because DS10 would be a dry dam, flowage easements would be obtained within the floodpool footprint rather than obtaining fee title to the land. Land used for mitigation in Corps' projects must be owned in fee. Therefore, the real estate cost attributable to mitigation would be the cost of acquiring the land in fee over and above the value of the flowage easement that would be needed to construct the dam. The proposed mitigation site for DS19 is located outside the fee acquisition boundary required for the proposed reservoir, so full value would have to be payed to acquire fee title to the land. Land in the proposed mitigation area at DS10 has been appraised at approximately $84,603 for the required 4.6 acres. The land for the proposed mitigation of 5.5 acres at DS19 has been appraised at approximately $48,967. Table 6 below provides a summary of estimated stream mitigation costs at each proposed dam site.

Table 6. Stream Mitigation Cost Summary

Impact Location	*Habitat Type Impacted*	*Acres Impacted*	*Acres Replaced*	*Cost/Acre*	*Total RE Cost*	*Excavation Cost @ 9.09/CY*	*Seeding/Planting Cost/Acre*	*Total Implementation Cost*	*GRAND TOTAL MITIGATION COST*
DS10	Stream	4.6	4.6	$ 18,392	$ 84,603	$ -	$ 1,800	$ 8,280	$ 92,883
DS19	Stream	5.5	5.5	$ 8,854	$ 48,697	$ -	$ 1,800	$ 9,900	$ 58,597
Grand Total		**10.1**	**10.1**		**$ 133,300**			**$ 18,180**	**$ 151,480**

RR_m= Mitigation reach

	Baseline (Pre project)	RR_m1	RR_m2
1	Hydraulic Conveyance and Sediment Dynamics	0.50	0.00
2	In-stream Habitat/Available Cover	0.50	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.10	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	0.25	0.00
6	Land use adjacent to Active Flood plain zone	0.25	0.00
	Stream Condition Index	0.34	0.00
	Left descending bank -Length (ft)	1,000.00	0.00
	Right descending bank -Length (ft)	1,000.00	0.00
	width (ft)	60.00	0.00
	Area	60,000.00	0.00
	Stream condition Index * area	20,142.86	0.00

	Post Project (PROPOSED)	RRm1	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.50	0.00
2	In-stream Habitat/Available Cover	0.75	0.00
3	Floodplain Interaction-Connectivity	0.50	0.00
4a	Riparian Vegetation Composition	1.00	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	1.00	0.00
6	Land use adjacent to Active Flood plain zone	1.00	0.00
	Stream Condition Index	0.75	0.00
	Left descending bank -Length (ft)	1,000.00	0.00
	Right descending bank -Length (ft)	1,000.00	0.00
	width (ft)	60.00	0.00
	Area	60,000.00	0.00
	Stream condition Index * area	45,000.00	0.00

	Change from baseline to post project	RRm1	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.00	0.00
2	In-stream Habitat/Available Cover	0.25	0.00
3	Floodpalin Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.90	0.00
4b	Riparian Vegetation Composition	0.00	0.00
5	Riparian Buffer	0.75	0.00
6	Land use adjacent to Active Flood plain zone	0.75	0.00

PROPOSED - BASELINE	24,857
Stream Length Multiplier	1.0
MITIGATION UNITS	24,857

Figure 14. NeSCAP mitigation tool worksheet for Dam Site 10 on Thomas Creek.

RR_m= Mitigation reach

	Baseline (Pre project)	Unnamed Tributar	RR_m2
1	Hydraulic Conveyance and Sediment Dynamics	0.25	0.00
2	In-stream Habitat/Available Cover	0.25	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.10	0.00
4b	Riparian Vegetation Composition	0.10	0.00
5	Buffer continuity & Width	0.10	0.00
6	Land use adjacent to Active Flood plain zone	0.25	0.00
	Stream Condition Index	0.19	0.00
	Left descending bank -Length (ft)	1,200.00	0.00
	Right descending bank -Length (ft)	1,200.00	0.00
	width (ft)	20.00	0.00
	Area	24,000.00	0.00
	Stream condition Index * area	4,457.14	0.00

	Post Project (PROPOSED)	Unnamed Tributar	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.50	0.00
2	In-stream Habitat/Available Cover	0.50	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	1.00	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	1.00	0.00
6	Land use adjacent to Active Flood plain zone	1.00	0.00
	Stream Condition Index	0.68	0.00
	Left descending bank -Length (ft)	1,200.00	0.00
	Right descending bank -Length (ft)	1,200.00	0.00
	width (ft)	40.00	0.00
	Area	48,000.00	0.00
	Stream condition Index * area	32,571.43	0.00

	Change from baseline to post project	Unnamed Tributar	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.25	0.00
2	In-stream Habitat/Available Cover	0.25	0.00
3	Floodpalin Interaction-Connectivity	0.00	0.00
4a	Riparian Vegetation Composition	0.90	0.00
4b	Riparian Vegetation Composition	0.40	0.00
5	Riparian Buffer	0.90	0.00
6	Land use adjacent to Active Flood plain zone	0.75	0.00

PROPOSED - BASELINE	28,114
Stream Length Multiplier	1.0

MITIGATION UNITS	28,114

Figure 15. NeSCAP mitigation tool worksheet for Dam Site 19 on an unnamed tributary.

8.2 Wetland Mitigation

A total of 0.25 acres of palustrine emergent (PEM) wetlands along Thomas Creek would be directly filled as a result of dam construction at DS10, and 0.35 acres of PEM wetlands would be filled along South Papillion Creek by construction of the dam at DS19. The 0.25 acres of PEM wetlands lost at DS10 would be mitigated by the wetlands that will develop adjacent to the creek bed along the 800-foot long backwater pool that would be created within the creek channel upstream of the dam face. Water in this 800-foot long segment of the creek will back up behind the dam and remain approximately 3 feet deeper than it currently is during normal flows. This will cause the ground along the banks of the creek to remain wetter than they would be without the proposed project. Wetland vegetation is expected to develop in these areas with wetter soil. In addition, construction of the dam would cause the 2-year event to leave the banks of the creek and temporarily flood approximately 6 acres of land that is currently farmed. This more frequently flooded area is expected to no longer be farmable and much of the area will develop wetland characteristics over time. The 0.35 acres of PEM wetlands that would be lost at DS19 would be mitigated by the wetlands that develop along the shallow edges of the bays of the proposed reservoir. In addition, 1.4 acres of PEM wetlands would be created by excavating shallow areas or bays connected to the edge of the normal pool area and planting them with a native wetland seed mix. These areas would be located within property acquisition limits of the project. The cost of constructing 1.4 acres of PEM mitigation wetlands would include the cost of excavating the depressions next to the normal pool of the reservoir and seeding the excavated areas. The native wetland seed mix is estimated to cost about $150/pound, and it would be applied at a rate of 12 pounds/acre for a total seed cost of $1,800/acre. The estimated cost to plant the seed is $867/acre. The total cost of purchasing the seed and planting it is $2,667/acre.

Table 7. Wetland mitigation cost summary.

Impact Location	*Habitat Type Impacted*	*Acres*	*Acres Replaced*	*Cost/Acre*	*Total RE Cost*	*Excavation Cost @ 9.09/CY*	*Seeding/Planting Cost/Acre*	*Total Implementation Cost*	*GRAND TOTAL MITIGATION COST*
DS19	PEM Wetland	1.4	1.4	$ -	$ -	$ 50,413	$ 2,667	$ 3,734	$ 54,147
Grand Total		**1.4**	**1.4**		**$ -**			**$ 3,734**	**$ 54,147**

8.3 Riparian Forest Mitigation

The NeSCAP model assessment procedure utilizes thematic variables for the major physical, ecological, and anthropogenic factors that can strongly influence streams and the adjacent riparian systems. Riparian vegetation composition, riparian continuity and width, and riparian land use are all variables used in the NeSCAP model related to riparian vegetation. However, the NeSCAP model does not adequately address the loss of certain vegetation communities such as riparian forest that may be considered significant resources by the Corps or the partnering resource agencies. While the model may show a lower condition index rating for a particular variable if a resource such as native trees are replaced with a different type of non-native vegetation, the loss of the trees themselves may not hold enough weight in the model to result in

mitigation of the trees. Construction of the optimized plan would result in the loss of a total 23.5 acres of riparian forest. Scattered groups of trees along the banks of the Little Papillion Creek totaling approximately 2 acres would have to be cleared to construct the levees and floodwalls. The trees are primarily broadleaf trees consisting of green ash, box elder, silver maple, and cottonwood. At DS10, construction of the dam would result in the clearing of approximately 2 acres of riparian forest within the proposed dam footprint along Thomas Creek. At DS19, construction of the dam would result in the removal, and/or death of approximately 19.5 acres of riparian forest due to clearing within the dam footprint and flooding by the proposed reservoir behind the dam along South Papillion Creek. The trees impacted at the two proposed dam sites are primarily broadleaf trees consisting of box elder, silver maple, cottonwood, green ash, Chinese elm, and mulberry.

All practicable means to avoid and reduce impacts to this habitat type was employed. The trees are part of the existing riparian ecosystem in the basin, and they are considered by the PDT, the USFWS, and the Nebraska Natural Heritage Program to be a significant resource that is steadily declining in the basin as development continues. For these reasons, replacement of 34.8 acres of riparian forest is required to mitigate impacts that would be lost from the removal of 23.5 acres. Section 8.3.4 details the mitigation analysis for the riparian forest habitat that would be impacted as a result of the Recommended Plan.

8.3.1 Habitat Evaluation Procedure

The Habitat Evaluation Procedure (HEP) was used to determine the appropriate quality and quantity of tree and shrub habitat to be replaced. The HEP was developed by the U.S. Fish and Wildlife Service (USFWS) in the 1970s. HEP is a well-known land management tool used to quantify (assign a value to) the suitability of habitat for selected species at baseline conditions and at different points in time. HEP can be used to compare the wildlife impacts of different project alternatives or mitigation techniques.

A HEP is comprised of one or more Habitat Suitability Index/Indices (HSI), which are models for calculating the habitat suitability for specific species based on habitat variables that are critical to their survival or successful reproduction. HSI models using existing USFWS-developed indicator species were certified by the USACE. A set of variables that represent the life requisites for the species (e.g. percent cover, water depth, tree height) are described for each species. The variables are measured using desktop methods and subsequently verified in the field and their value is assigned a corresponding index value. These values are then inserted into the HSI mathematical model to produce a score that describes existing habitat suitability. This score is a score between 0 (no value) and 1 (optimum value).

Selection of species to use in the HEP model is based on several criteria. First, the species' geographic range must include the project vicinity. The species selected must also utilize the habitat type or types that are present or proposed. Species with existing HSI models are

preferred. Using the previously developed and verified USFWS designed models provides a greater level of scoring certainty and significantly reduces the time necessary to prepare an appropriate HEP. Suitable HSI models must include habitat variables for which data collection is possible, given the availability of time and resources. In addition, the variables in the HSI models should be representative of the ecological functions that are being targeted for improvement or mitigation. This is important because, the use of an HSI model for a specific species is not solely based on providing a measure of potential benefit or impact to the species itself, but it more importantly serves as a surrogate for ecological function of the site being analyzed. Finally, variables must be sensitive enough to show a change in score for proposed restoration measures so that these measures can be compared to each other.

Computation of the HEP model will result in an overall "suitability index" for each existing or planned habitat being evaluated. This HSI score is then multiplied by the number of acres affected by the project to produce a number referred to as a "Habitat Unit" or HU. The HU represents the non-monetary value that the Corps utilizes to measure the improvement to the ecological function of a site. For example, if the existing condition for a habitat site of 100 acres is of low quality, it might have a suitability index of 0.1. The Habitat Units represented at that site would equal 10 HU's (100 acres x 0.1). By comparison, if that site was improved, its suitability index might increase to 0.8. This would equate to approximately 80 HU's at the site, for an overall improvement of 70 HU's.

The Brown Thrasher Habitat Suitability Index (HSI) model was selected to measure the quality of the existing riparian forest habitat that would be impacted by the proposed project, and to predict the quality of the habitat that would be restored through mitigation. The model was developed to evaluate brown thrasher habitat in its entire breeding range during the breeding season (April – August). The variables that are assessed in the brown thrasher HSI model include the density of woody stems $\geq$ 1.0 meter tall (in thousands of stems), the percent canopy cover of trees $\geq$ 5.0 meters (16.5 feet) tall, and the percent of ground covered by leaf litter $\geq$ 1 cm (0.4 inches) deep. Figures 16, 17, and 18 below are the suitability index scoring graphs for each of the three variables. To calculate the HSI score for each site, the suitability index score of each variable is multiplied by the suitability index scores of the other two variables. The following equation is used to calculate the HSI for each site: SIV1 x SIV2 x SIV3.

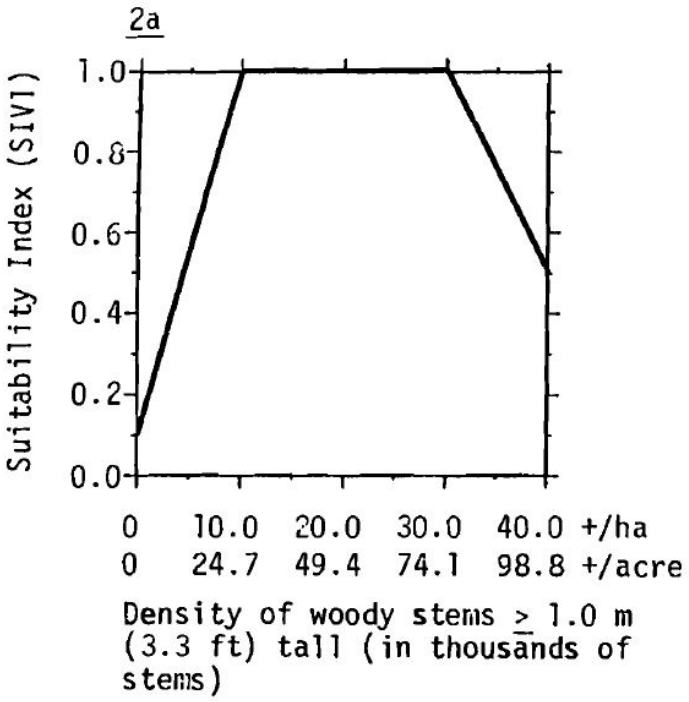


Figure 16. Suitability Index graph for variable 1

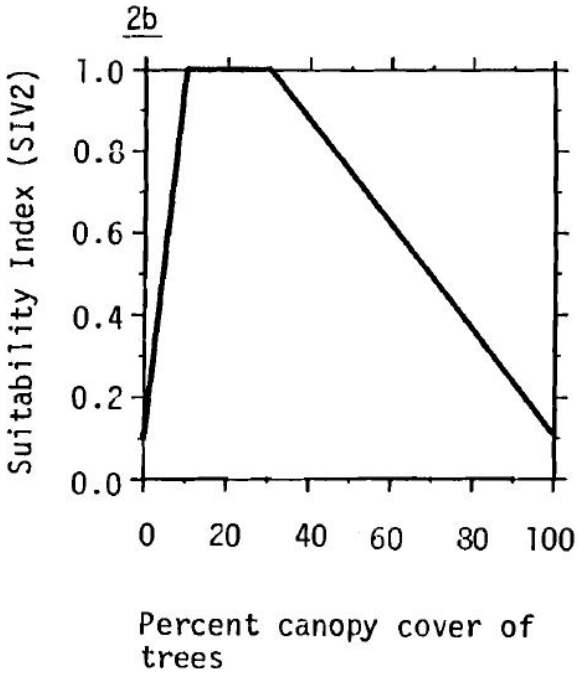


Figure 17. Suitability Index graph for variable 2

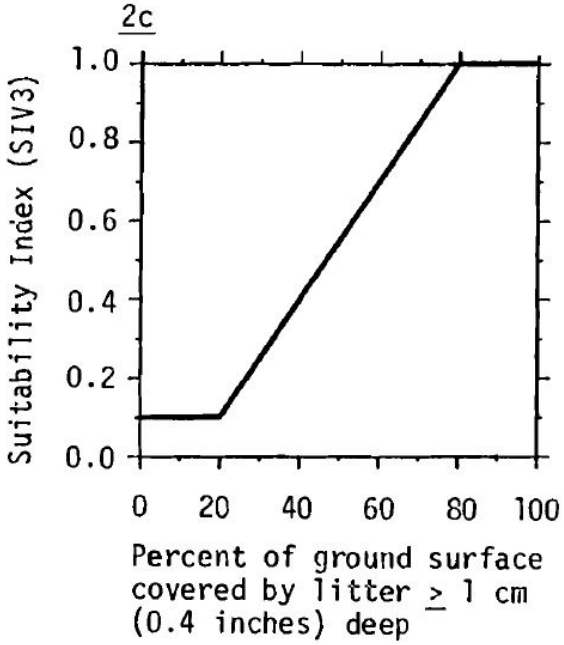


Figure 18. Suitability Index graph for variable 3

Food and cover associated with reproduction are the limiting requisites for brown thrashers on the breeding range. Breeding habitat for brown thrashers must provide nesting cover, territorial song perches, and food. Invertebrates are the limiting food source on the breeding range. Field work for the model was conducted by an Omaha District biologist in June of 2020. The forested areas at both proposed dam sites are located entirely on private ground, so field observations and measurements could only be made from road crossings. Similarly, the larger treed areas along the Little Papillion Creek that would be impacted by the proposed project were also located on private land on the side of the creek where there is no public trail. Observations and measurements along the Little Papillion Creek were also made from areas where public roads ran next to the treed areas.

8.3.2 Existing Conditions

Existing conditions HSI scores were developed for the three forested locations (DS-10, DS-19, and Little Papillion Creek) that would be adversely impacted (removed) under the optimized plan. Table 8 below lists the HSI scores for the existing conditions at the three impacted locations.

Table 8. Existing condition HSI scores for the three impacted sites.

Existing Conditions Brown Thrasher Habitat Suitability Index						
Location	SIV1	SIV2	SIV3	Score	Acres	Habitat Units
DS-19	0.56	0.5	0.7	0.196	19.5	3.82
DS-10	0.55	0.6	0.6	0.198	2	0.39
Little Papio	0.55	0.5	0.5	0.138	2	0.28

Existing conditions HSI scores were also developed for the two locations where the proposed mitigation plantings would be planted. The proposed mitigation locations for DS19 and Little Papillion Creek are located at DS19 in selected areas within the fee acquisition boundary in the band between the normal operating pool and the top of the flood pool. The 2 acres of riparian forest impacted along Little Papillion Creek would be mitigated at DS19, because the only available real estate for the mitigation plantings along the Little Papillion Creek is far more expensive at more than $100,000/acre than the real estate at DS19. The selected locations are all currently pastureland or they are being farmed for corn or soybeans, there are no woody stems, and less than 20 percent of the ground is covered by leaf litter. Figure 19 below is a map showing the proposed riparian forest mitigation areas at DS19. The proposed mitigation location for DS10 is located along Thomas Creek within the flood pool of the dry dam. Similar to the mitigation site at DS19, the ground is currently being farmed for corn or soybeans, there are no woody stems, and less than 20 percent of the ground is covered by leaf litter. Figure 20 below is a map of DS10 that shows the proposed tree mitigation area along Thomas Creek. Table 9 below shows the existing conditions HSI scores and associated habitat units for the two proposed mitigation areas.

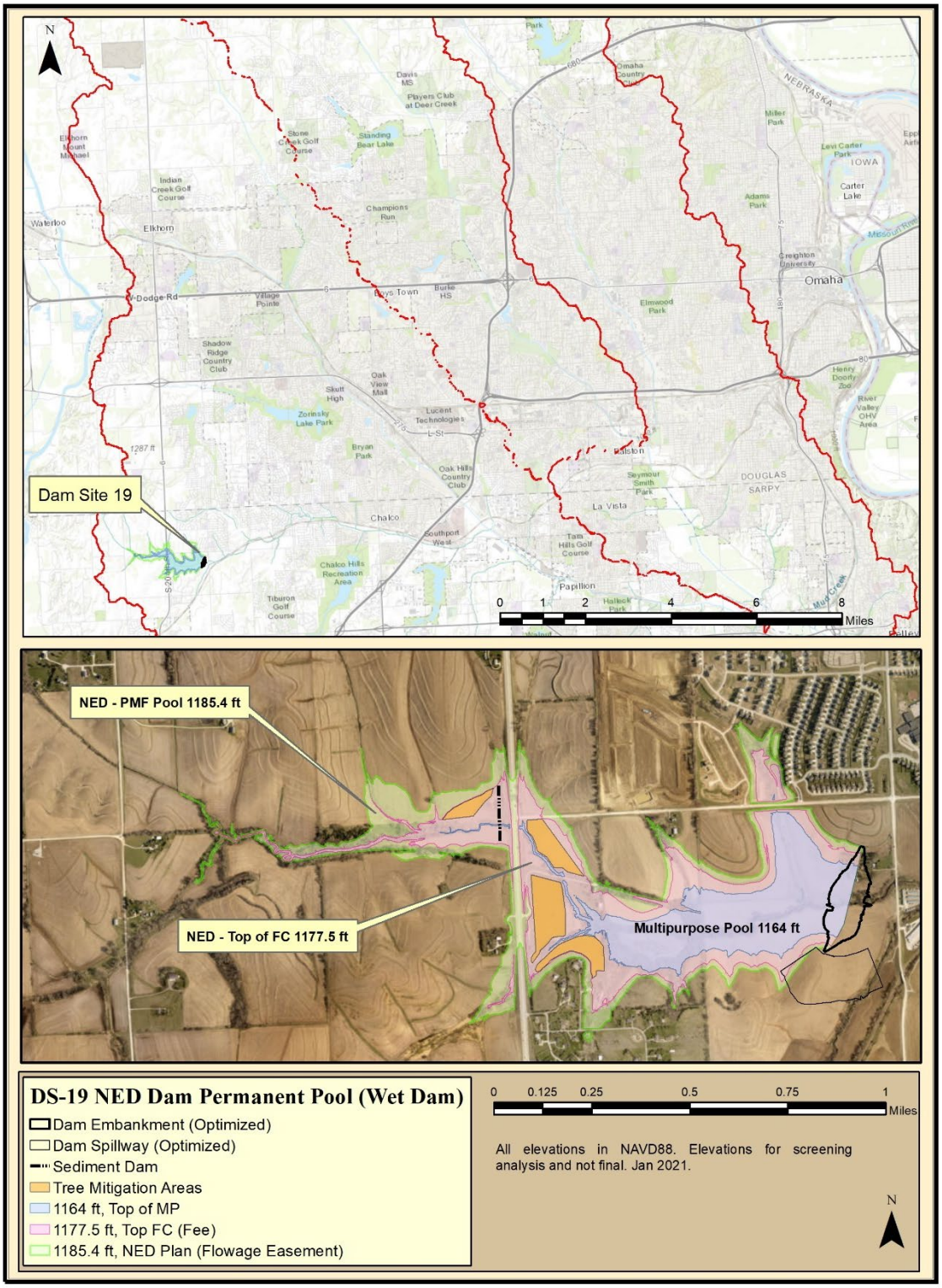


Figure 19. Map of DS19 showing proposed riparian forest mitigation areas.

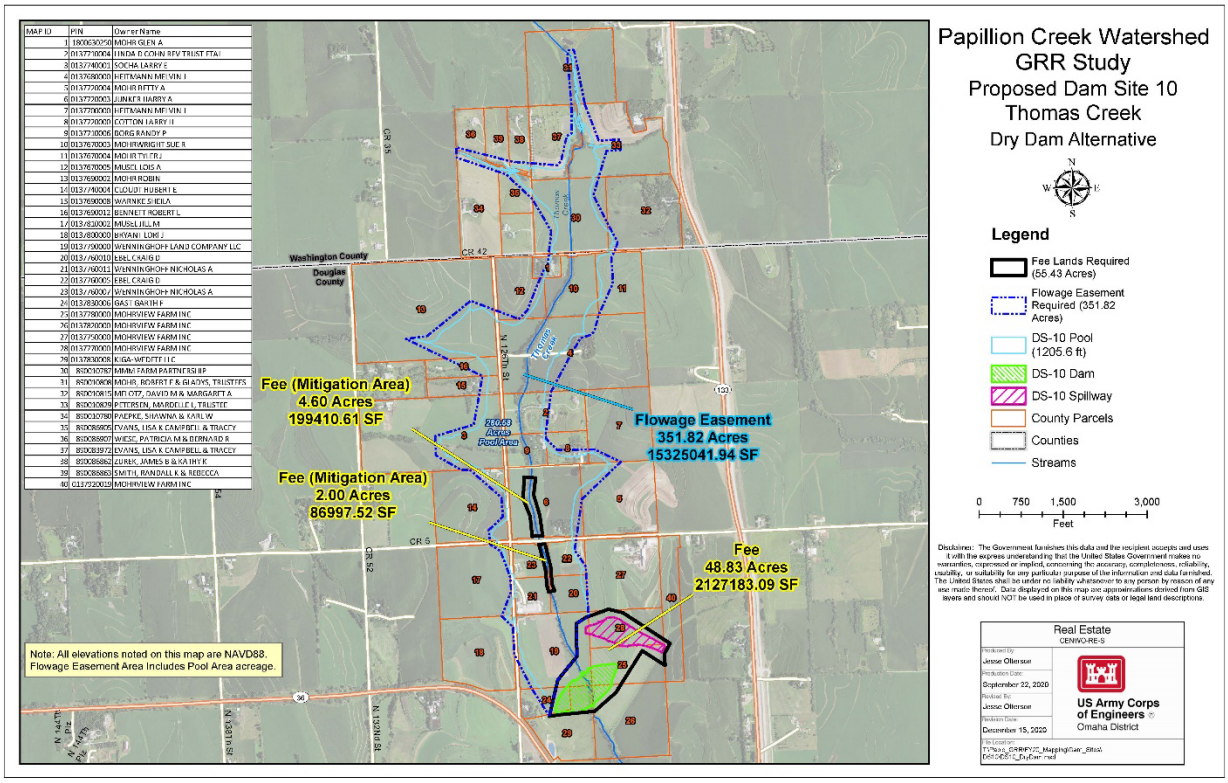


Figure 20. Map of DS10 showing proposed riparian forest mitigation area.

Table 9. Existing condition HSI scores for the mitigation sites.

Existing Conditions Brown Thrasher Habitat Suitability Index at Mitigation Sites

Location	SIV1	SIV2	SIV3	Score	Acres	Habitat Units
DS-19 Mit/Little Papio	0.1	0.1	0.1	0.001	21.5	0.022
DS-10 Mit	0.1	0.1	0.1	0.001	2	0.002

8.3.3 Future Without Project Conditions

Future without project HSI scores were calculated for years 1, 10, 25, and 50 for the three areas where riparian forest habitat would be impacted. A number of assumptions were made in scoring the future without project variables for the brown thrasher HSI model. These assumptions are listed below.

- Density of woody stems ≥ 1 meter tall would slowly decrease over time as the existing forest continues to mature.
- The percent canopy cover of trees ≥ 5 meters tall would slowly increase over time as the existing forest continues to mature.
- The percent of ground covered by leaf litter ≥ 1cm would slowly increase over time.

The resulting future without project HSI scores and the associated habitat units for the three impacted sites are shown in Table 10 below.

Table 10. Future without project HSI scores for impacted sites.

Future Without Project Scoring at Impacted Sites

Year	Location	SIV1	SIV2	SIV3	HSI Score	Acres	Habitat Units
1	DS-19	0.56	0.5	0.7	0.196	19.5	3.82
1	DS-10	0.55	0.6	0.6	0.198	2	0.39
1	Little Papio	0.55	0.5	0.5	0.138	2	0.28
10	DS-19	0.53	0.48	0.72	0.183	19.5	3.57
10	DS-10	0.53	0.58	0.62	0.187	2	0.374
10	Little Papio	0.52	0.48	0.52	0.13	2	0.26
25	DS-19	0.51	0.46	0.74	0.174	19.5	3.39
25	DS-10	0.5	0.56	0.64	0.179	2	0.358
25	Little Papio	0.51	0.46	0.54	0.127	2	0.254
50	DS-19	0.49	0.44	0.76	0.164	19.5	3.198
50	DS-10	0.48	0.54	0.66	0.171	2	0.342
50	Little Papio	0.49	0.44	0.56	0.121	2	0.242

8.3.4 Future With Project Conditions

A mitigation planting plan was developed to replace the quality and quantity of riparian forest habitat that would be lost at the three areas where trees would be cleared for construction or killed due to flooding. The proposed mitigation planting plan was developed through the use of an incremental cost analysis of a number of alternative riparian forest mitigation plans. The incremental cost analysis considered a range of different combinations of planting density and total acres of mitigation habitat. Planting with different stem count densities affected the quality of habitat produced as reflected in the HSI scores and the associated number of acres of habitat

that needed to be planted to achieve the number of habitat units lost at each of the three impacted forest areas (3.83 for DS19, 0.39 for DS10, and 0.28 for Little Papio). Table 11 below is the incremental cost analysis table for the riparian forest mitigation alternatives.

Table 11. Incremental cost analysis of proposed riparian forest mitigation alternatives.

135 Stems/Acre

Impact Location	*Mitigation Location*	*Future With Project HSI Score*	*Acres of Mitigation*	*Total habitat Units*	*Planting Cost/Acre*	*Total Planting Cost*	*Real estate cost/Acre*	*Total Real Estate Cost*	*Total Mitigation Cost*
DS19	DS19	0.13	29.5	3.84	$10,060	$296,770	$0	$0	$296,770
DS10	DS10	0.13	3	0.39	$10,060	$30,180	$18,392	$55,176	$85,356
Little Papio	DS19	0.13	2.3	0.3	$10,060	$23,138	$0	$0	$23,138
Grand Total			**34.8**			**$350,088**		**$55,176**	**$405,264**

225 Stems/Acre

Impact Location	*Mitigation Location*	*Future With Project HSI Score*	*Acres of Mitigation*	*Total habitat Units*	*Planting Cost/Acre*	*Total Planting Cost*	*Real estate cost/Acre*	*Total Real Estate Cost*	*Total Mitigation Cost*
DS19	DS19	0.15	25.6	3.84	$16,720	$428,032	$0	$0	$428,032
DS10	DS10	0.15	2.6	0.39	$16,720	$43,472	$18,392	$47,819	$91,291
Little Papio	DS19	0.15	2	0.3	$16,720	$33,440	$0	$0	$33,400
Grand Total			**30.2**			**$504,944**		**$47,819**	**$552,723**

450 stems/Acre

Impact Location	*Mitigation Location*	*Future With Project HSI Score*	*Acres of Mitigation*	*Total habitat Units*	*Planting Cost/Acre*	*Total Planting Cost*	*Real estate cost/Acre*	*Total Real Estate Cost*	*Total Mitigation Cost*
DS19	DS19	0.2	19.5	3.9	$33,300	$649,350	$0	$0	$649,350
DS10	DS10	0.2	2	0.4	$33,300	$66,600	$18,392	$36,784	$103,384
Little Papio	DS19	0.2	1.5	0.3	$33,300	$49,950	$0	$0	$49,950
Grand Total			**23**			**$765,900**		**$36,784**	**$802,684**

Based on the incremental cost analysis, it was determined that the proposed mitigation areas would be planted at a rate of 135 stems per acre. Planting at this rate would require more acres of mitigation to achieve the required number of habitat units at each site, but the cost would be significantly lower than replacing the habitat at a 1:1 ratio with equivalent habitat quality per acre as depicted in the 450 stems/acre alternative in the table above. Within each acre, 10 percent of the stems would consist of native tree species with a minimum dbh of 2 inches, and 90 percent of the stems planted would consist of native shrub species. Trees are estimated to cost $200 per tree installed with 14/trees per acre being planted for a cost of $2,800/acre and shrubs are estimated to cost $60 per potted plant installed with 121 shrubs/acre being planted for $7,260/acre; total cost for planting 135 woody stems/acre is estimated to be $10,060/acre. Table 12 below shows the estimated cost of the mitigation plantings for the three impacted areas of riparian forest.

Table 12. Estimated mitigation planting costs for the three impacted areas of riparian forest.

Impact Location	*Mitigation Location*	*Future With Project HSI Score*	*Acres of Mitigation*	*Total habitat Units*	*Planting Cost/Acre*	*Total Planting Cost*	*Real estate cost/Acre*	*Total Real Estate Cost*	*Total Mitigation Cost*
DS19	DS19	0.13	29.5	3.84	$10,060	$296,770	$0	$0	$296,770
DS10	DS10	0.13	3	0.39	$10,060	$30,180	$18,392	$55,176	$85,356
Little Papio	DS19	0.13	2.3	0.3	$10,060	$23,138	$0	$0	$23,138
Grand Total			**34.8**			**$350,088**		**$55,176**	**$405,264**

Future with project HSI scores were predicted for years 1, 10, 25, and 50 using the proposed mitigation planting plan with a planting rate of 135 stems per acre. A number of assumptions were made in scoring the future with project variables for the brown thrasher HSI model. These assumptions are listed below.

- All tree species planted will grow at a rate of at least 2 feet per year.
- All trees planted will be 2 inches diameter at breast height (dbh) and approximately 5 feet tall.
- All planted shrubs would grow to be $\geq$ 1.0 meter in 5 years.
- The woody stem density of planted trees and shrubs will continue to increase throughout the 50-year planning horizon.

The resulting future with project HSI scores and the associated habitat units are shown in Table 13 below.

Table 13. Future with project HSI scores for the proposed mitigation sites.

Future With Project Scoring at Mitigation Sites							
Year	Location	SIV1	SIV2	SIV3	HSI Score	Acres	Habitat Units
1	DS-19 Mit	0.1	0.1	0.1	0.001	29.5	0.0295
1	DS-10 Mit	0.1	0.1	0.1	0.001	3	0.003
1	Little Papio Mit	0.1	0.1	0.1	0.001	2.3	0.0023
10	DS-19 Mit	0.13	1	1	0.13	29.5	3.84
10	DS-10 Mit	0.13	1	1	0.13	3	0.39
10	Little Papio Mit	0.13	1	1	0.13	2.3	0.3
25	DS-19 Mit	0.14	1	1	0.14	29.5	4.13
25	DS-10 Mit	0.14	1	1	0.14	3	0.42
25	Little Papio Mit	0.14	1	1	0.14	2.3	0.32
50	DS-19 Mit	0.15	1	1	0.15	29.5	4.43
50	DS-10 Mit	0.15	1	1	0.15	3	0.45
50	Little Papio Mit	0.15	1	1	0.15	2.3	0.35

The minimum target HSI score at the proposed mitigation sites to achieve the equivalent number of habitat units using a planting rate of 135 stems/acre is 0.13. Based on the future with project scoring results in Table 12 above, the target HSI scores for all three impacted sites would be achieved by year 10 with predicted scores of 0.13. The minimum target number of habitat units required to mitigate the lost habitat from each of the three impacted sites is 3.83 for DS19, 0.39 for DS10, and 0.28 for the Little Papillion Creek. Based on the future with project predicted habitat unit scores in Table 13, the target habitat unit scores would be exceeded for all three sites by year 10. At year 10 the habitat unit scores at the mitigation sites are predicted to be 3.84 for DS19, 0.39 for DS10, and 0.3 for the Little Papillion Creek. HSI scores, and habitat unit scores are expected to slowly increase out to year 50 as the stem count continues to increase over time. The average annual habitat units for the future with project HSI scores at the mitigation sites, and the future without project HSI scores for the three impacted riparian forest sites are shown in Table 14 below.

Table 14. Average Annual Habitat Units (AAHU)

Location	*Future Without Project*	*Future With Project*
DS 19	3.394	3.684
DS 10	0.357	0.375
Little Papio	0.253	0.288

9 Conclusion

Based on the analysis of potential impacts to the environment of the Papillion Creek basin utilizing NESCAP, and HEP, it was determined that the impacts of the proposed construction included in the Optimized Plan to stream condition and function, riparian forest habitat, and wetlands would require mitigation. Total mitigation acreages and costs by location are shown in Table 15 below.

Table 15. Total mitigation acreages and costs for the Recommended Plan.

Impact Location	*Habitat Type Impacted*	*Acres Impacted*	*Acres Replaced*	*Mitigation Location*	*Cost/Acre*	*Total RE Cost*	*Excavation Cost @9.09/CY*	*Seeding/Planting Cost/Acre*	*Total Implementation Cost*	*GRAND TOTAL MITIGATION COST*
DS10	Stream	4.6	4.6	DS10	$ 18,392	$ 84,603	$ -	$ 1,800	$ 8,280	$ 92,883
DS10	Riparian Forest	2	3	DS10	$ 18,392	$ 55,176	$ -	$ 10,060	$ 30,180	$ 85,356
DS19	Stream	5.5	5.5	DS19	$ 8,854	$ 48,697	$ -	$ 1,800	$ 9,900	$ 58,597
DS19	Riparian Forest	19.5	29.5	DS19	$ -	$ -	$ -	$ 10,060	$ 296,770	$ 296,770
DS19	PEM Wetland	0.35	1.4	DS19	$ -	$ -	$ 50,413	$ 2,667	$ 3,734	$ 54,147
Little Papio	Riparian Forest	2	2.3	DS19	$ -	$ -	$ -	$ 10,060	$ 23,138	$ 23,138
Grand Total		**33.95**	**46.3**			**$ 188,476**			**$ 372,002**	**$ 610,891**

10 Literature Cited

Rolfsmeier, S.B. and G. Steinauer. 2010. Terrestrial Ecological Systems and Natural Communities of Nebraska (Version IV- March 9, 2010). Nebraska Natural Heritage Program and the Nebraska Game and Parks Commission, Lincoln, Nebraska.

US Fish and Wildlife. 1986. Habitat Suitability Models: Brown Thrasher. https://pubs.er.usgs.gov/publication/fwsobs82_10_118.

US Army Corps of Engineers®

Papillion Creek and Tributaries Lakes, Nebraska

General Reevaluation Report

Appendix 2 – Correspondence

June 2021

Omaha District
Northwestern Division

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NEBRASKA

Good Life. Great Journey.

DEPARTMENT OF TRANSPORTATION

Pete Ricketts, Governor

March 24, 2021

Rachel Shrader Williams, CFM
Project Manager/Plan Formulator
USACE - Omaha District

RE: Comments upon Papillion Creek General Reevaluation Report (GRR), Draft Final Feasibility Report and Environmental Assessment, January 2021

Dear Ms. Shrader Williams:

Thank you for hosting the Papillion Creek GRR Public Meeting on February 10, 2021. The Nebraska Department of Transportation (NDOT) appreciated the information and has further reviewed the Papillion Creek and Tributaries Lakes, Nebraska GRR – Draft Final Feasibility Report and Environmental Assessment. NDOT would like to discuss opportunities to work together based on the vicinity of the project with state highway facilities, more specifically Highway US-6 (Dodge Street) and US-6/N-31 (204th Street).

The first location of discussion is the proposed automated levee closure wall across Highway US-6, on either side of the Little Papillion Creek Bridge. The highway at this location is a 6-lane divided facility that carries over 47,000 vehicles a day. The stopping of traffic for the periodic testing of the automated system and during an actual event will potentially create user delays for the driving public and the potential for the interruption or termination of a transportation facility, which may be needed for emergency vehicles. Before advancing this concept with the potential of interrupting the mobility of the traveling public, NDOT requests that alternatives be considered. For example, one alternative being elevation of the highway and bridge in order to fully convey flows beneath the bridge.

The second location is the proposed Dam Site 19, which shows flood pools that would pool against and overtop US-6/N-31. In addition, the normal pool would extend through an existing highway box culvert. The highway at this location is currently a 4-lane divided facility that carries over 22,000 vehicles a day. In the future, NDOT plans to expand this section to a 6-lane divided highway. We propose a discussion to consider our future modifications to the highway, including an elevated and widened embankment and placing the highway travel lanes above the normal and maximum flood pools.

Moe Jamshidi, P.E., Interim Director
Department of Transportation

MAILING ADDRESS
PO Box 94759
Lincoln, NE 68509-4759

PHYSICAL ADDRESS
1500 Highway 2
Lincoln, NE 68502

PHONE 402-471-4567
EMAIL NDOT.ContactUs@nebraska.gov

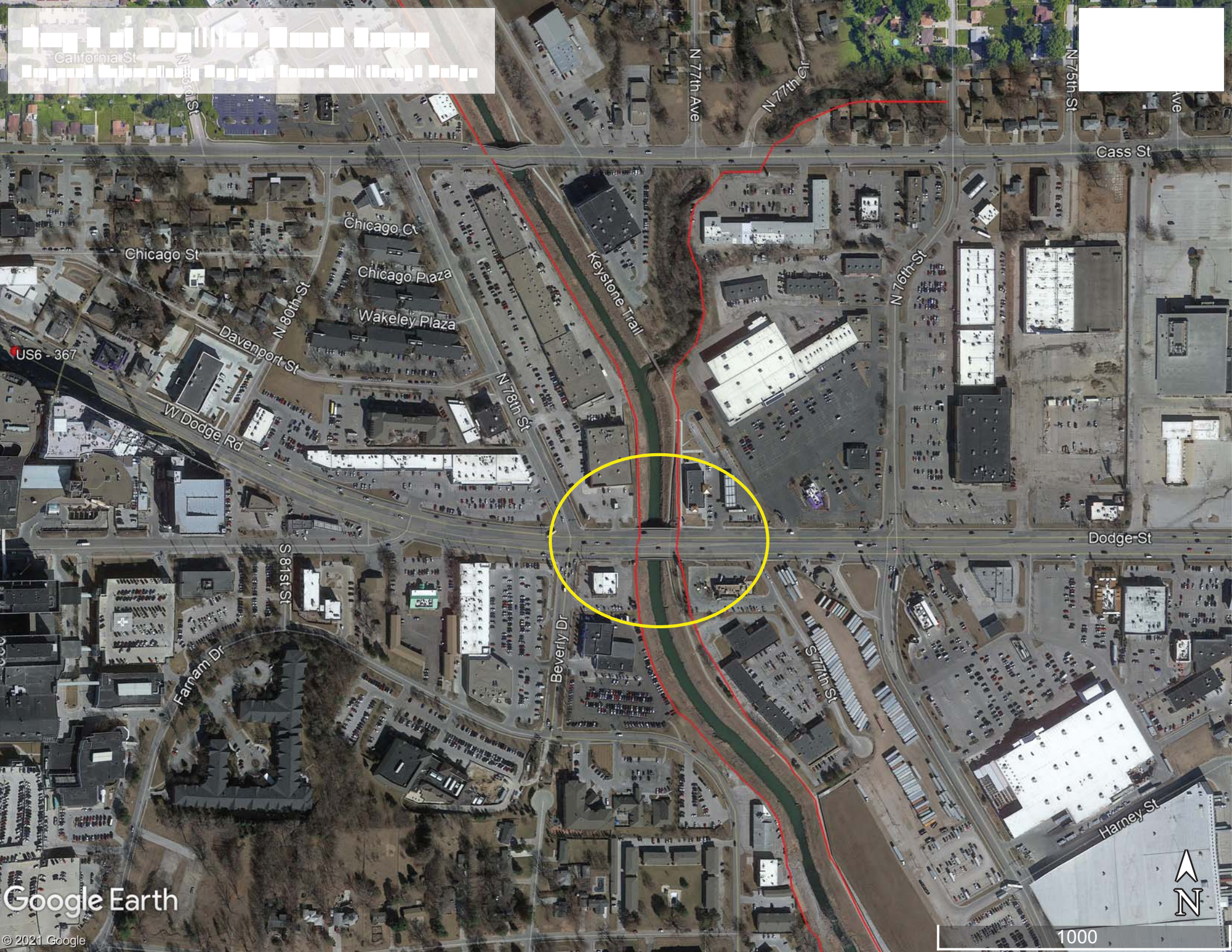
dot.nebraska.gov

We thank you for the opportunity to take part in the public meeting and provide comments on the draft final feasibility report, and project in general, and anticipate a working relationship as this project continues. We look forward to continuing discussions with the USACE regarding the proposed levee on US-6 and the reservoir near US-6/N-31.

Sincerely,

Khalil Jaber, PE
Deputy Director – Engineering

cc: Amanda Grint, Papio-Missouri River Natural Resource District
Tim Weander, NDOT District 2 Engineer
Robert G. Stubbe, City of Omaha Public Works Director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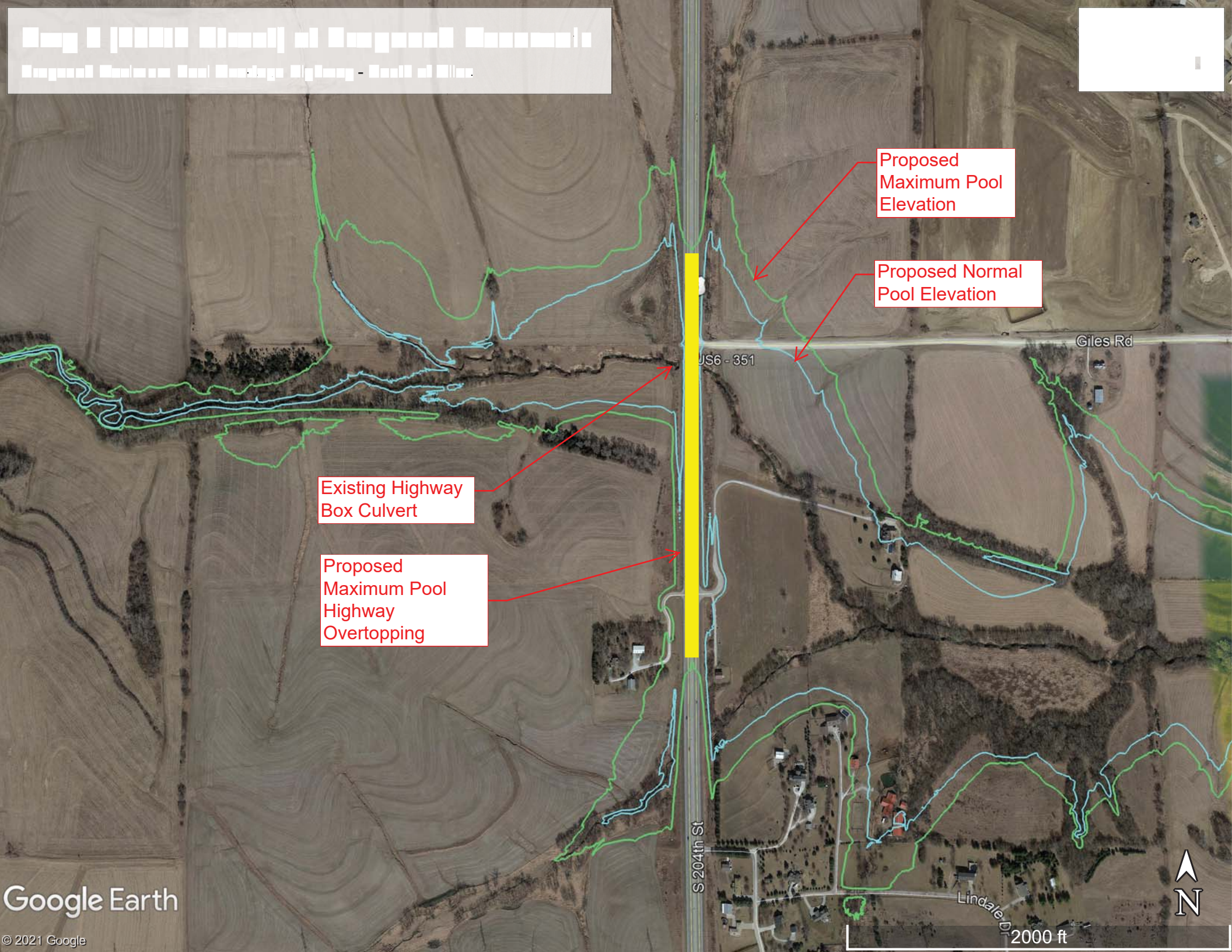
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2000 ft
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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Nebraska Field Office
9325 South Alda Road
Wood River, Nebraska 68883

April 16, 2019

FWS-NE: 2019-112

Eric Laux
U.S. Army Corps of Engineers, Omaha District
1616 Capitol Avenue
Omaha, Nebraska 68102-4901

RE: General Investigations Feasibility Study, Papillion Creek Basin, Douglas, Sarpy, and Washington Counties, Nebraska.

Dear Mr. Laux:

This responds to your November 30, 2018, letter regarding the Papillion Creek Basin General Investigations Feasibility Study. In a March 25, 2019, email, Mr. Luke Wallace of your office requested technical assistance from the U.S. Fish and Wildlife Service (Service) for the proposed project.

ENDANGERED SPECIES ACT

In accordance with section 7 of Endangered Species Act of 1973 (ESA), the Service has determined that the following federally listed species may occur or be affected by the proposed subject action:

Listed Species	Expected Occurrence
Northern long-eared bat (*Myotis septentrionalis*)	Breeding, migration
Pallid sturgeon (*Scaphirhynchus albus*)	Lower Platte River and Missouri River
Western prairie fringed orchid (*Platanthera praeclara*)	Tall-grass prairie and wet meadows

Northern Long-Eared Bat
The northern long-eared bat (NLEB) was listed as threatened with a 4(d) rule under ESA (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) in January 2016. No critical habitat has been

proposed for the NLEB and the state of Nebraska is within the known range of the species. During the summer, NLEBs typically roost singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically >3 inches dbh). Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on presence of cavities or crevices or presence of peeling bark. It has also been occasionally found roosting in structures like barns and sheds (particularly when suitable tree roosts are unavailable). They forage for insects in upland and lowland woodlots and tree lined corridors from the vegetation and from water surfaces. During the winter, NLEBs predominately hibernate in caves and abandoned mine portals. Additional habitat types may be identified as new information is obtained.

NLEBs are susceptible to white-nose syndrome (WNS), which poses a severe and immediate threat. Since symptoms were first observed in New York in 2006, WNS has spread rapidly from the Northeast to the Midwest and Southeast, an area that includes the core of the NLEB's range where it was most common before this disease. Numbers of NLEB (from hibernacula counts) have declined by up to 99 percent in the Northeast. The listing of the NLEB designated areas of the country impacted by WNS and then provided a buffer zone of 150 miles surrounding those areas to provide extra protection. For projects within the WNS buffer zone, measures provided in the 4(d) rule exempt take from the following activities:

(1) forest management practices;
(2) maintenance and limited expansion of transportation and utility rights-of-way;
(3) prairie habitat management; and
(4) limited tree removal projects, provided these activities protect know maternity roost and hibernacula.

The proposed project occurs in Douglas, Sarpy and Washington Counties, all counties included within the WNS buffer zone. As such, the guidance below, including conservation measures, would be applicable to the project. The below link provides additional NLEB information for federal projects and includes a map of the WNS buffer zone.
http://www.fws.gov/Midwest/endangered/mammals/nleb/KeyFinal4dNLEBFedProjects.html

Take is ONLY exempted within the WNS buffer zone if the following conservation measures are implemented:

(1) No tree clearing can occur within 150 feet of maternity trees from June 1-July 31.
(2) No tree clearing can occur within 0.25-mile of hibernacula at any time of the year.
(3) Hibernacula (e.g., mines caves) receive full protection under ESA throughout the year. No take exemption is provided for NLEBs that are present in the hibernacula—all take from any type of source (e.g., blasting, prescribed burns, mining, etc.) is prohibited at hibernacula.

While these conservation measures per the 4(d) rule satisfy federal requirements, additional coordination may be required with Nebraska Game and Parks Commission to ensure compliance with the Nebraska Nongame and Endangered Species Conservation Act.

Pallid Sturgeon

The pallid sturgeon was officially listed as an endangered species on September 6, 1990. In Nebraska, the pallid sturgeon is found in the Missouri and Lower Platte Rivers. Floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters formed the large-river ecosystem that provided macrohabitat requirements for the pallid sturgeon, a species that is associated with diverse aquatic habitats. These habitats historically were dynamic and in a constant state of change due to influences from the natural hydrograph, and sediment and runoff inputs from an enormous watershed spanning portions of ten states. Navigation, channelization and bank stabilization, and hydropower generation projects have caused the widespread loss of this diverse array of dynamic habitats once provided to pallid sturgeon on the Missouri River, resulting in a precipitous decline in populations of the species.

Western Prairie Fringed Orchid

The western prairie fringed orchid, federally listed as threatened, inhabits tall-grass calcareous silt loam or sub-irrigated sand prairies. Declines in western prairie fringed orchid populations have been caused by the drainage and conversion of its habitats to agricultural production, channelization, siltation, road and bridge construction, grazing, haying, and the application of herbicides. Populations are known to occur in Boone, Cherry, Dodge, Garfield, Grant, Greeley, Hall, Holt, Lancaster, Loup, Madison, Otoe, Pierce, Rock, Saline, Sarpy, Seward, and Wheeler counties, and may occur at other sites in Nebraska.

We appreciate the opportunity to review and comment on the proposed project. We also appreciate your interest in providing funds for use in the development of a Planning Aid Letter to addresses Fish and Wildlife Coordination Act (FWCA) requirements for the proposed project; however, we are unable to commit resources toward FWCA at this time due to staffing limitations. Should you have questions, please contact Mr. Jeff Runge within our office at jeff_runge@fws.gov or (308) 382-6468, extension 209.

Sincerely,

Eliza Hines
Nebraska Field Supervisor

cc: Nebraska Game and Parks Commission; Lincoln, NE (Attn: Carey Grell)
U.S. Army Corps of Engineers; Omaha, NE (Attn: Rebecca Podkowka, Luke Wallace)

[EXTERNAL] Papillion Creek and Tributaries General Reevaluation Report

Wallace, Arthur L Jr CIV USARMY CENWO (USA) <A.Luke.Wallace@usace.army.mil>

Thu 1/28/2021 2:02 PM

To: Runge, Jeff <jeff_runge@fws.gov>

1 attachments (6 MB)

20210124_AppH_EA_Papio.pdf;

The U.S. Fish and Wildlife Service concurs with your determinations that the described project will not adversely affect listed species or critical habitat. Contact this office if changes are made or new information becomes available.

Acting Field Supervisor, Nebraska Field Office

This email has been receivec **nks, ope**

Jeff,

The Papillion Creek and tributaries Lakes General Reevaluation Report is going out for the final public review. A lot of plan formulation has occurred since we last communicated and the draft report went out for public review the first time. We have eliminated several alternatives that we were still considering when the draft report went out last time. Our Recommended Plan now consists of a wet dam with a sediment retention structure at Dam Site 19 on the South Papillion Creek, a dry dam at Dam Site 10 on Thomas Creek that would reduce flood flows on Little Papillion Creek, and new levees and/or floodwalls ranging in height from 2.6 to 9.8 feet would be constructed between Blondo Street and saddle Creek.

The threatened northern long-eared bat and the western prairie-fringed orchid, and the endangered pallid sturgeon were all listed as species that may occur within the proposed project area. It was determined that the Recommended Plan would have no effect on the western prairie-fringed orchid or the pallid sturgeon, and it was determined that the Recommended Plan may affect, but is not likely to adversely effect the northern long-eared bat. The purpose of this email is to request concurrence from your office with the Corps' determination that the Recommended Plan may effect, but is not likely to adversely effect the northern long-eared bat. Because the potential impacts to threatened and endangered species were minimal, a separate Biological Assessment was not prepared. We are asking that you use the findings and analysis attached Environmental Assessment to decide whether the Service concurs with the Corps determination. Section 5.18 of the attached EA is the threatened and endangered species section.

An emailed response letter sent to the following address would be fine, if you do not wish to send a hard copy

Rebecca Podkowka
Section Chief, Environmental Section, Planning Branch
U.S. Army Corps of Engineers, Omaha District
1616 Capitol Avenue
Omaha, NE 68102-4901

Please do not hesitate to email me or give me a call if you have any questions.

Thank you,

Luke Wallace
Biologist
USACE, Omaha District
Planning Branch
(402)995-2692

From: Runge, Jeff
To: Wallace, Arthur L Jr CIV USARMY CENWO (US)
Subject: Re: [EXTERNAL] RE: [Non-DoD Source] General Investigations Feasibility Study - Papillion Creek Basin
Date: Tuesday, May 28, 2019 9:57:05 AM

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We appreciate you taking the time to travel to our office to discuss the proposed project. Please call or email if you have any questions or would want to discuss further.

Jeff

Jeff Runge
U.S. Fish and Wildlife Service
9325 South Alda Road
Wood River, Nebraska 68883
Office: (308) 218-0049
Cell: (308) 379-8553

On Thu, May 2, 2019 at 3:36 PM Wallace, Arthur L Jr CIV USARMY CENWO (US) <A.Luke.Wallace@usace.army.mil> wrote:

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> I look forward to hearing from you soon.
>
> Thanks,
>
> Luke Wallace
> Biologist
> USACE, Omaha District
> Planning Branch
> (402)995-2692
>
> -----Original Message-----
> From: Runge, Jeff [mailto:jeff_runge@fws.gov]
> Sent: Wednesday, April 17, 2019 4:58 PM
> To: Quinn, Aaron T CIV USARMY CENWO (US) <Aaron.T.Quinn@usace.army.mil>
> Cc: Laux, Eric A CIV USARMY CENWO (US) <Eric.A.Laux@usace.army.mil>; Wallace, Arthur L Jr CIV USARMY CENWO (US) <A.Luke.Wallace@usace.army.mil>
> Subject: Re: [EXTERNAL] RE: [Non-DoD Source] General Investigations Feasibility Study - Papillion Creek Basin
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>
> Aaron Quinn, PMP
> Environmental Resource Specialist
> US Army Corps of Engineers, Omaha District
> 1616 Capitol Avenue
> Omaha, NE 68102
> Office: 402-995-2669
>
> -----Original Message-----
> From: Laux, Eric A CIV USARMY CENWO (US)
> Sent: Wednesday, April 17, 2019 2:37 PM
> To: Runge, Jeff <jeff_runge@fws.gov <mailto:jeff_runge@fws.gov> >
> Cc: Wallace, Arthur L Jr CIV USARMY CENWO (US) <A.Luke.Wallace@usace.army.mil <mailto:A.Luke.Wallace@usace.army.mil> >; Quinn, Aaron T CIV USARMY CENWO (US) <Aaron.T.Quinn@usace.army.mil <mailto:Aaron.T.Quinn@usace.army.mil> >
> Subject: RE: [EXTERNAL] RE: [Non-DoD Source] General Investigations Feasibility Study - Papillion Creek Basin
>
> Thanks Jeff,
> Aaron works for me as well. I will have Luke discuss with Aaron and figure out the best time. Thanks.
> EL
>
> -----Original Message-----
> From: Runge, Jeff [mailto:jeff_runge@fws.gov <mailto:jeff_runge@fws.gov>]
> Sent: Wednesday, April 17, 2019 1:53 PM
> To: Laux, Eric A CIV USARMY CENWO (US) <Eric.A.Laux@usace.army.mil <mailto:Eric.A.Laux@usace.army.mil> >
> Cc: Wallace, Arthur L Jr CIV USARMY CENWO (US) <A.Luke.Wallace@usace.army.mil <mailto:A.Luke.Wallace@usace.army.mil> >; Podkowka, Rebecca L CIV USARMY CENWO (USA) <Rebecca.L.Podkowka@usace.army.mil <mailto:Rebecca.L.Podkowka@usace.army.mil> >; Eliza Hines <eliza_hines@fws.gov <mailto:eliza_hines@fws.gov> >
> Subject: Re: [EXTERNAL] RE: [Non-DoD Source] General Investigations Feasibility Study - Papillion Creek Basin
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> Eric,
>
> I had the opportunity to discuss with Eliza, and it would be beneficial to meet in person to efficiently address FWCA for the project. If possible, we would like to also use the time to discuss other projects in the queue. For example, Aaron Quinn submitted a request for project review pertaining to Cargill's proposed outfall and section 408 (I recognize that Aaron may serve in a different section). Days available include: April 23 (pm), 25, 30 (pm), and May 1 (pm), or 2.
>
> Jeff
>
> Jeff Runge
> U.S. Fish and Wildlife Service
> 9325 South Alda Road
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From: Runge, Jeff
To: Wallace, Arthur L Jr CIV USARMY CENWO (USA)
Cc: Shannon.sjolie@nebraska.gov
Subject: Re: [EXTERNAL] RE: [Non-DoD Source] General Investigations Feasibility Study - Papillion Creek Basin
Date: Tuesday, November 19, 2019 7:10:32 AM
Attachments: Re . Section 205 Flood Risk Management Study.pdf

---

Hello Luke,

In consideration of the project's location, stands of deciduous trees are typical for eastern Nebraska, so mitigation is appropriate for this project. Our standard recommendation for riparian tree mitigation is a ratio of 3:1 (see attached). The 3:1 ratio takes into consideration the many years (or decades) for planted trees to reach the same level of maturity of those impacted. Many of the species identified are on the list of pollinator plants (see below link to Pollinator Conservation Plan). Trees also provide habitat for migratory birds (a federal trust resource).

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Jeff Runge
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Wood River, Nebraska 68883
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Thank you,

Luke Wallace
Biologist
USACE, Omaha District
Planning Branch
(402)995-2692

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From: Runge, Jeff [mailto:jeff_runge@fws.gov]
Sent: Tuesday, May 28, 2019 9:54 AM
To: Wallace, Arthur L Jr CIV USARMY CENWO (US) <A.Luke.Wallace@usace.army.mil>
Subject: Re: [EXTERNAL] RE: [Non-DoD Source] General Investigations Feasibility Study - Papillion Creek Basin

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Aaron Quinn, PMP
Environmental Resource Specialist
US Army Corps of Engineers, Omaha District

From: Sjolie, Shannon
To: Wallace, Arthur L Jr CIV USARMY CENWO (USA)
Cc: Runge, Jeff
Subject: RE: [EXTERNAL] RE: [Non-DoD Source] General Investigations Feasibility Study - Papillion Creek Basin
Date: Tuesday, November 19, 2019 4:08:36 PM

Good afternoon Luke,

As described in the Nebraska Natural Legacy Project - State Wildlife Action Plan, native riparian woodlands were once abundant along the stream valleys and Missouri River tributaries of eastern Nebraska. NGPC staff supports the replacement of native trees and shrubs where appropriate, as this effort will replace habitat functions that will be lost during project construction and operation. Additionally, trees in eastern Nebraska provide habitat for nesting birds and roosting bats, including the state-listed threatened northern long-eared bat. We support replacement with native tree species and agree with USFWS ratio of 3:1 for the reasoning listed in Jeff Runge's email sent this morning (11/19/2019).

Thank you for consideration.

Shannon

Shannon Sjolie
Environmental Analyst Supervisor
Planning and Programming Division
Nebraska Game and Parks Commission
2200 N. 33rd Street
Lincoln, NE 68503
402-471-5423

From: Runge, Jeff <jeff_runge@fws.gov>
Sent: Tuesday, November 19, 2019 7:06 AM
To: Wallace, Arthur L Jr CIV USARMY CENWO (US) <A.Luke.Wallace@usace.army.mil>
Cc: Sjolie, Shannon <Shannon.sjolie@nebraska.gov>
Subject: Re: [EXTERNAL] RE: [Non-DoD Source] General Investigations Feasibility Study - Papillion Creek Basin

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From:	Vanek, Wayne (CTR) - NRCS, Lincoln, NE
To:	Wallace, Arthur L Jr CIV USARMY CENWO (USA)
Cc:	Bohnenkamp, Andrew - NRCS, Blair, NE; Dominy, Neil - NRCS, Lincoln, NE
Subject:	[Non-DoD Source] FFPA Response for: Papillion Creek GRR Dam Site 10 & Dam Site 19
Date:	Tuesday, January 21, 2020 9:31:23 AM
Attachments:	Papio_DS10_AD1006_Completed.pdf Papio_DS19_AD1006_Completed.pdf DAM_SITE_10.pdf DAM_SITE_19.pdf

USDA NRCS Natural Resources Conservation Service

Subject: FPPA response for: FFPA Response for: Papillion Creek GRR Dam Site 10 & Dam Site 19

Date: 01/21/2020

ATTENTION: Luke Wallace
Biologist
USACE, Omaha District
Planning Branch
(402)995-2692

I have reviewed the project information regarding the proposed Papillion Creek GRR Dam Sites 10 and 19 in Douglas, Sarpy, and Washington counties, in Nebraska for which you requested
review of impacts to prime and important farmlands as per the Farmland Protection Policy Act (FPPA). This review only covers FPPA concerns and does not include any other environmental concerns such as wetlands or endangered species. For general conservation concerns or questions relating to wetlands under the jurisdiction of the Food Security Act, contact your county Natural Resources Conservation Service office.

The AD-1006 which you submitted to our office shows that your Part VI section assessment point total is 104 for Sarpy County and 123 for Douglas/Washington Counties. The AD-1006 Farmland Conversion Impact

Rating form is based on a point system that has 160 points set as the minimum number of “Total Points” that triggers additional in-depth site reviews. The NRCS evaluation portion Part V is on a scale of 0 to 100 points. In the case with this project, the “Total Points” equate to 196 for Sarpy County and 213 for Douglas/Washington counties. Thus, NRCS has determined that your project was found to be cleared of FPPA significant concerns. We encourage you to continue to be aware of prime and important farmlands in general and the role they play in current and future projects. I am returning the AD-1006 form to you for your records.

Wayne Vanek
NRCS Contract Employee
402-730-4966
Wayne.vanek@usda.gov

From:	Vanek, Wayne (CTR) - NRCS, Lincoln, NE
To:	Wallace, Arthur L Jr CIV USARMY CENWO (USA)
Cc:	Bohnenkamp, Andrew - NRCS, Blair, NE; Dominy, Neil - NRCS, Lincoln, NE
Subject:	[Non-DoD Source] FFPA Response for: Papillion Creek GRR Dam Site 10 & Dam Site 19 (Re-Submittal)
Date:	Thursday, January 23, 2020 10:02:27 AM
Attachments:	Papio_DS10_AD1006 (004).pdf Papio_DS19_AD1006_Completed (002).pdf

---

USDA NRCS Natural Resources Conservation Service

Subject: FPPA response for: FFPA Response for: Papillion Creek GRR Dam Site 10 & Dam Site 19(Re-Submittal)

Date: 01/23/2020

ATTENTION: Luke Wallace
Biologist
USACE, Omaha District
Planning Branch
(402)995-2692

I have **re-evaluated** the project information regarding the proposed Papillion Creek GRR Dam Sites 10 and 19 in Douglas, Sarpy, and Washington counties, in Nebraska for which you requested
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The AD-1006 which you submitted to our office shows that your Part VI section assessment point total is 88 for Douglas/Washington and 69 for Sarpy County and Counties. The AD-1006 Farmland Conversion Impact Rating form is based

on a point system that has 160 points set as the minimum number of “Total Points” that triggers additional in-depth site reviews. The NRCS evaluation portion Part V is on a scale of 0 to 100 points. In the case with this project, the “Total Points” equate to 159 for Douglas/Washington and 155 for Sarpy County. Thus, NRCS has determined that your project was found to be cleared of FPPA significant concerns. We encourage you to continue to be aware of prime and important farmlands in general and the role they play in current and future projects. I am returning the AD-1006 form to you for your records.

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U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 1/21/20
Name Of Project Papillion Creek GRR Dam Site 10	Federal Agency Involved U.S. Army Corps of Engineers
Proposed Land Use Reservoir Construction	County And State Douglas and Washington in Nebraska
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☑	No ☐	Acres Irrigated 13,804	Average Farm Size 232
Major Crop(s) Corn/Soybeans	Farmable Land In Govt. Jurisdiction Acres: %		Amount Of Farmland As Defined in FPPA Acres: 286.9 %	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System		Date Land Evaluation Returned By NRCS 1/23/20	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	138.0			
B. Total Acres To Be Converted Indirectly	148.9			
C. Total Acres In Site	286.9	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	209.7			
B. Total Acres Statewide And Local Important Farmland	3.0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	71	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use	15	15			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	15			
4. Protection Provided By State And Local Government	20	0			
5. Distance From Urban Builtup Area	15	0			
6. Distance To Urban Support Services	15	0			
7. Size Of Present Farm Unit Compared To Average	10	8			
8. Creation Of Nonfarmable Farmland	10	10			
9. Availability Of Farm Support Services	5	5			
10. On-Farm Investments	20	15			
11. Effects Of Conversion On Farm Support Services	10	5			
12. Compatibility With Existing Agricultural Use	10	5			
TOTAL SITE ASSESSMENT POINTS	160	88	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	71	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	88	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	159	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

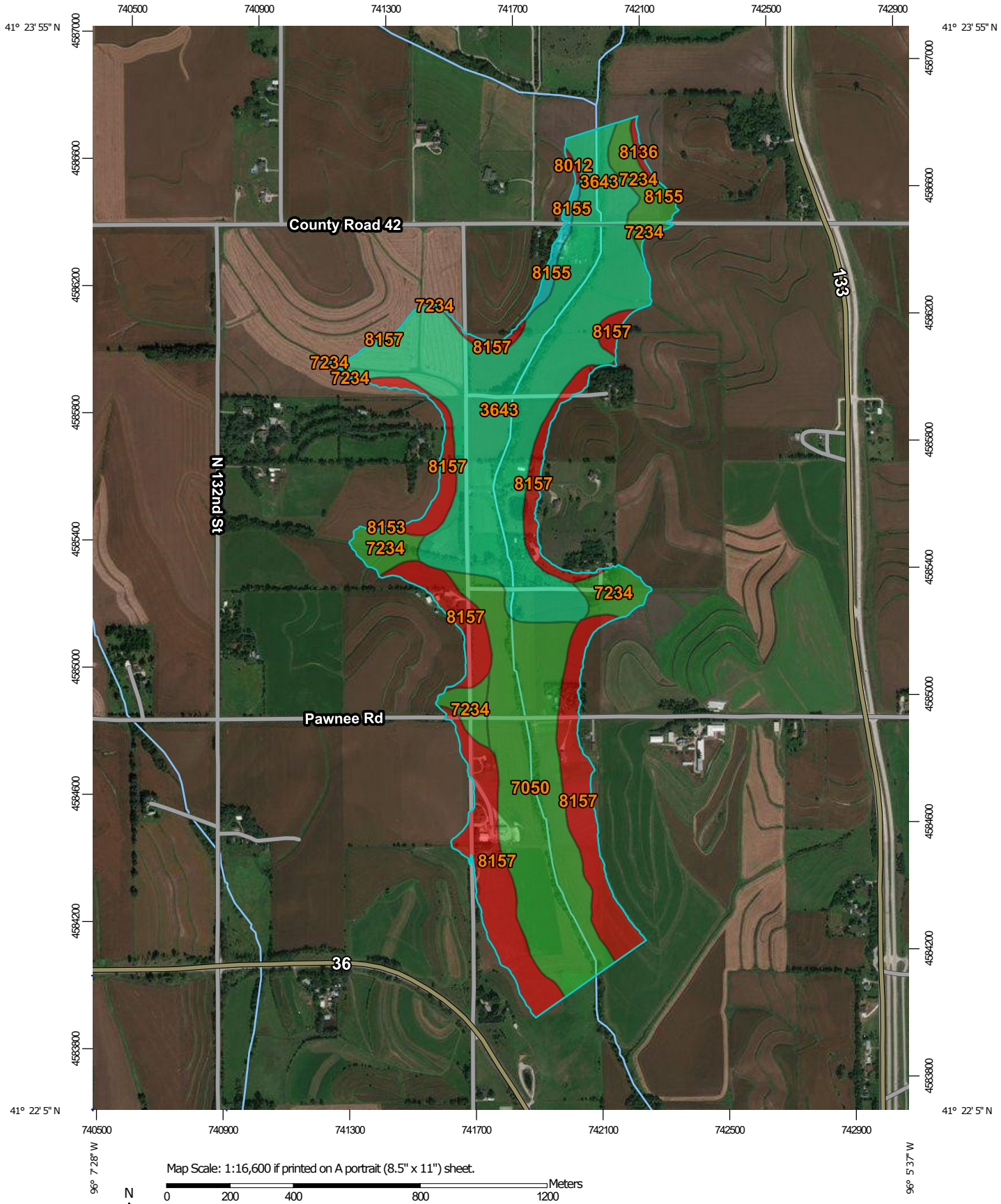
Reason For Selection:

(See Instructions on reverse side)

This form was electronically produced by National Production Services Staff

Clear Form

Form AD-1006 (10-83)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96° 5' 37" W
41° 23' 55" N
41° 22' 5" N
740500
740900
741300
741700
742100
742500
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4587000
4586600
4586200
4585800
4585400
4585000
4584600
4584200
4583800
County Road 42
Pawnee Rd
N 132nd St
133
36
8136
8012
3643
7234
8155
8157
8153
7050
Map Scale: 1:16,600 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 200 400 800 1200
Feet
0 500 1000 2000 3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

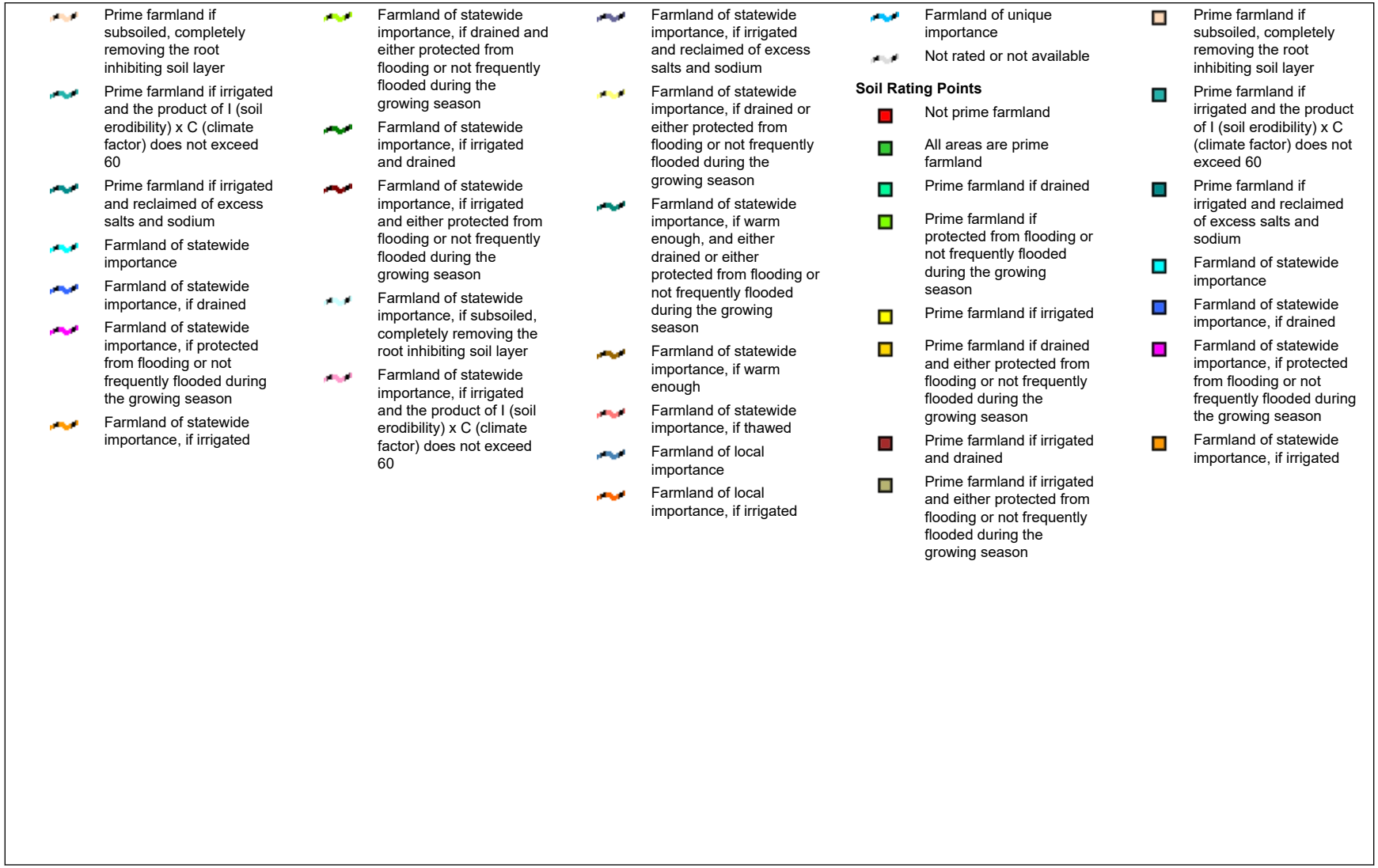
Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season


Prime farmland if subsoiled, completely removing the root inhibiting soil layer
Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Prime farmland if irrigated and reclaimed of excess salts and sodium
Farmland of statewide importance
Farmland of statewide importance, if drained
Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if irrigated
Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if irrigated and drained
Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if warm enough
Farmland of statewide importance, if thawed
Farmland of local importance
Farmland of local importance, if irrigated
Farmland of unique importance
Not rated or not available
Soil Rating Points
Not prime farmland
All areas are prime farmland
Prime farmland if drained
Prime farmland if protected from flooding or not frequently flooded during the growing season
Prime farmland if irrigated
Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
Prime farmland if irrigated and drained
Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
Prime farmland if subsoiled, completely removing the root inhibiting soil layer
Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Prime farmland if irrigated and reclaimed of excess salts and sodium
Farmland of statewide importance
Farmland of statewide importance, if drained
Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if irrigated

- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas County, Nebraska
Survey Area Data: Version 14, Sep 16, 2019

Soil Survey Area: Washington County, Nebraska
Survey Area Data: Version 18, Sep 16, 2019

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 1, 2014—Dec 1, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3643	Kezan-Kennebec silt loams, drained, occasionally flooded	Prime farmland if drained	104.1	36.3%
7050	Kennebec silt loam, occasionally flooded	All areas are prime farmland	69.0	24.0%
7234	Judson silty clay loam, 2 to 6 percent slopes	All areas are prime farmland	18.0	6.3%
8153	Contrary-Marshall silty clay loams, 6 to 11 percent slopes	Farmland of statewide importance	0.0	0.0%
8155	Contrary-Monona silty clay loams, 6 to 11 percent slopes	Farmland of statewide importance	2.1	0.7%
8157	Contrary-Monona-Ida complex, 6 to 17 percent slopes	Not prime farmland	72.7	25.3%
Subtotals for Soil Survey Area			**265.8**	**92.7%**
Totals for Area of Interest			**286.9**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3643	Kezan-Kennebec silt loams, drained, occasionally flooded	Prime farmland if drained	11.0	3.8%
7234	Judson silty clay loam, 2 to 6 percent slopes	All areas are prime farmland	7.7	2.7%
8012	Ida-Pohocco-Monona silt loams, 11 to 30 percent slopes	Not prime farmland	0.4	0.1%
8136	Pohocco-Ida complex, 11 to 17 percent slopes, eroded	Not prime farmland	1.1	0.4%
8155	Contrary-Monona silty clay loams, 6 to 11 percent slopes	Farmland of statewide importance	0.9	0.3%
Subtotals for Soil Survey Area			**21.1**	**7.3%**
Totals for Area of Interest			**286.9**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 1/21/20
Name Of Project Papillion Creek GRR Dam Site 10	Federal Agency Involved U.S. Army Corps of Engineers
Proposed Land Use Reservoir Construction	County And State Douglas and Washington in Nebraska
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☑	No ☐	Acres Irrigated 13,804	Average Farm Size 232
Major Crop(s) Corn/Soybeans	Farmable Land In Govt. Jurisdiction Acres: %		Amount Of Farmland As Defined in FPPA Acres: 286.9 %	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System		Date Land Evaluation Returned By NRCS 1/23/20	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	138.0			
B. Total Acres To Be Converted Indirectly	148.9			
C. Total Acres In Site	286.9	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	209.7			
B. Total Acres Statewide And Local Important Farmland	3.0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	71	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use	15	15			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	15			
4. Protection Provided By State And Local Government	20	0			
5. Distance From Urban Builtup Area	15	0			
6. Distance To Urban Support Services	15	0			
7. Size Of Present Farm Unit Compared To Average	10	8			
8. Creation Of Nonfarmable Farmland	10	10			
9. Availability Of Farm Support Services	5	5			
10. On-Farm Investments	20	15			
11. Effects Of Conversion On Farm Support Services	10	5			
12. Compatibility With Existing Agricultural Use	10	5			
TOTAL SITE ASSESSMENT POINTS	160	88	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	71	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	88	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	159	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

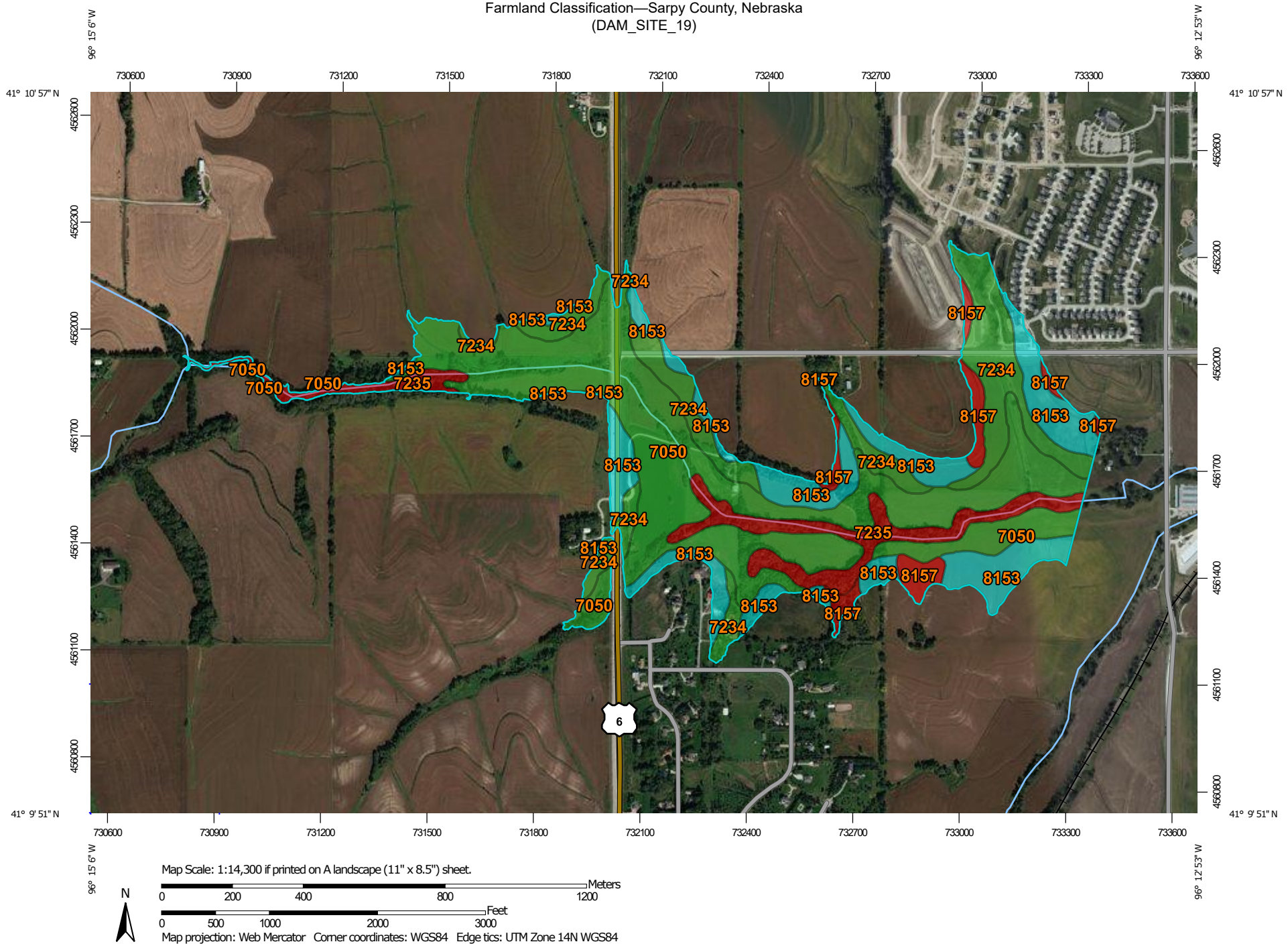
(See Instructions on reverse side)

This form was electronically produced by National Production Services Staff

Clear Form

Form AD-1006 (10-83)

Farmland Classification—Sarpy County, Nebraska
(DAM_SITE_19)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

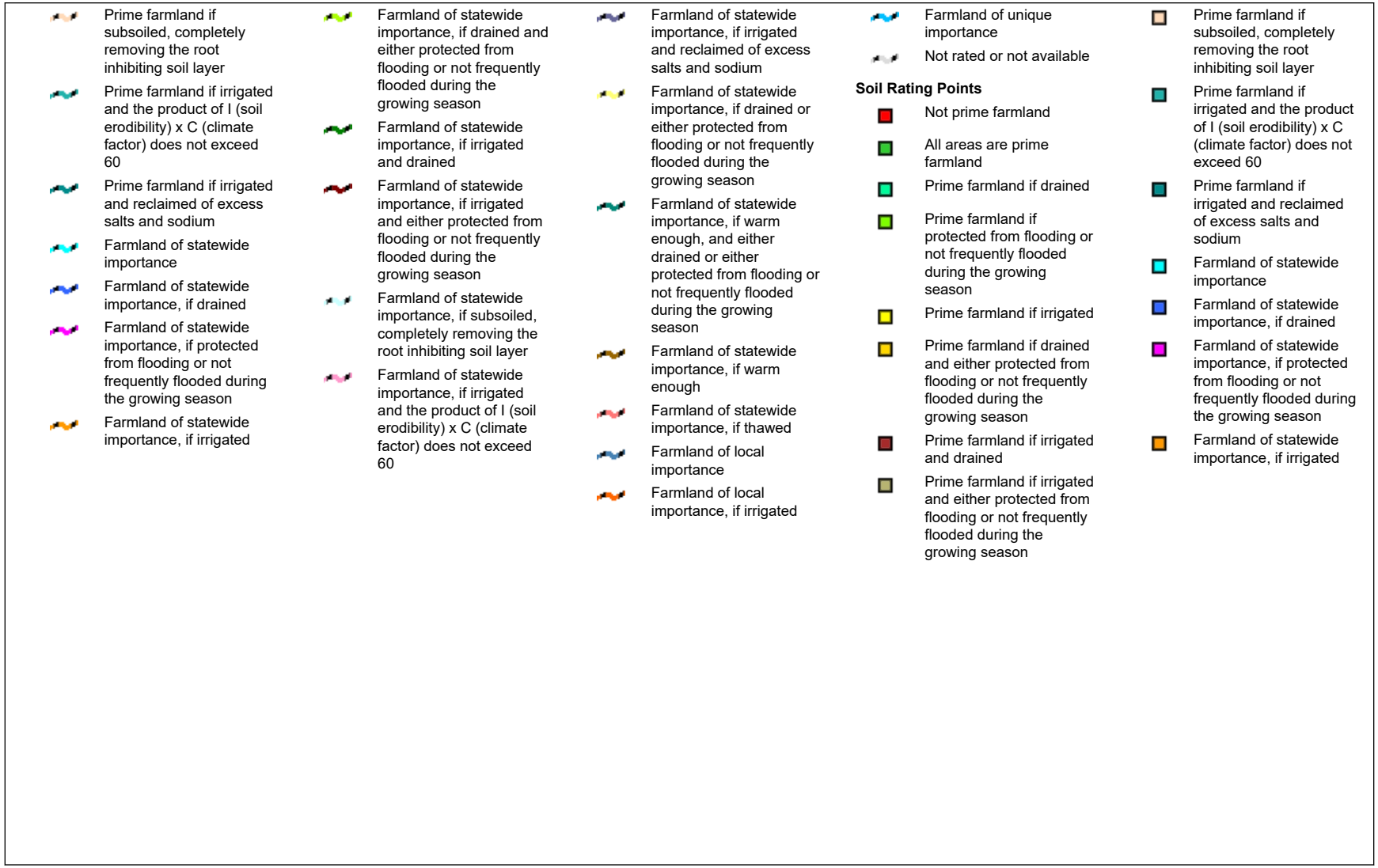
Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season


Prime farmland if subsoiled, completely removing the root inhibiting soil layer
Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Prime farmland if irrigated and reclaimed of excess salts and sodium
Farmland of statewide importance
Farmland of statewide importance, if drained
Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if irrigated
Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if irrigated and drained
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Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if warm enough
Farmland of statewide importance, if thawed
Farmland of local importance
Farmland of local importance, if irrigated
Farmland of unique importance
Not rated or not available
Soil Rating Points
Not prime farmland
All areas are prime farmland
Prime farmland if drained
Prime farmland if protected from flooding or not frequently flooded during the growing season
Prime farmland if irrigated
Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
Prime farmland if irrigated and drained
Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
Prime farmland if subsoiled, completely removing the root inhibiting soil layer
Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Prime farmland if irrigated and reclaimed of excess salts and sodium
Farmland of statewide importance
Farmland of statewide importance, if drained
Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if irrigated

- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
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- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sarpy County, Nebraska
Survey Area Data: Version 13, Sep 16, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 1, 2014—Sep 30, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
7050	Kennebec silt loam, occasionally flooded	All areas are prime farmland	99.7	45.6%
7234	Judson silty clay loam, 2 to 6 percent slopes	All areas are prime farmland	40.2	18.4%
7235	Judson-Nodaway channeled-Contrary complex, 3 to 10 percent slopes	Not prime farmland	23.7	10.8%
8153	Contrary-Marshall silty clay loams, 6 to 11 percent slopes	Farmland of statewide importance	45.5	20.8%
8157	Contrary-Monona-Ida complex, 6 to 17 percent slopes	Not prime farmland	9.7	4.4%
Totals for Area of Interest			**218.8**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

NEBRASKA
Good Life. Great Resources.
DEPT. OF ENVIRONMENT AND ENERGY

Pete Ricketts, Governor

Aaron Quinn
Section Chief, Environmental Section, Planning Branch
U.S. Army Corps of Engineers, Omaha District
1616 Capitol Avenue
Omaha, NE 68102-4901

May 5, 2021

RE: Papillion Creek and Tributaries Lakes General Reevaluation Report

Dear Mr. Quinn,

We have reviewed the Papillion Creek and Tributaries Lakes General Reevaluation Report Section 404(b)(1) evaluation and have not identified any significant concerns with the project up to this point. Upon receiving a formal request for a 401 water quality certification, we will review each project separately for Title 117 compliance. The Department developed a 401 WQC guidance document which outlines the new process for requesting certification under the 2020 401 Certification Rule. This guidance document can be found on our website or by following the link below.

http://dee.ne.gov/NDEQProg.nsf/OnWeb/S401

Sincerely,

Shelley Schneider
Permitting and Engineering Division Administrator

ECC: Luke Wallace, U.S. Army Corps of Engineers

Department of Environment and Energy
P.O. Box 98922
Lincoln, Nebraska 68509-8922

Jim Macy, Director
OFFICE 402-471-2186 FAX 402-471-2909
ndee.moreinfo@nebraska.gov

US Army Corps of Engineers®

Papillion Creek and Tributaries Lakes, Nebraska

General Reevaluation Report

Appendix 3 – Draft Programmatic Agreement

June 2021

Omaha District
Northwestern Division

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

WHEREAS, the US Army Corps of Engineers, Omaha District (District) is considering flood risk management alternatives in the Big Papillion Creek Basin, specifically West Papillion Creek, Big Papillion Creek, Little Papillion Creek, South Papillion Creek, Saddle Creek, Papillion Creek and Cole Creek. (Project); and

WHEREAS, the Papillion Creek and Tributaries Lakes, Nebraska Project was authorized by Public Law 90-483, the Flood Control Act of 1968, in accordance with the recommendations of the Chief of Engineers in House Document No. 349. The authorized Project consisted of a system of 21 dams and reservoirs, located on tributaries upstream from Metropolitan Omaha. In addition to flood control, the other purposes of the authorized Project are recreation, fish and wildlife enhancement, and water quality; and

WHEREAS, the Papio-Missouri River Natural Resources District (NRD) is the non-Federal sponsor; and

WHEREAS, the Project may consist of the dams/reservoirs, channel modifications and levees/floodwalls, and nonstructural measures; and

WHEREAS, the Areas of Potential Effect include borrow areas, dams/reservoirs, channel modifications and levees/floodwalls, and nonstructural measures within the Papillion Creek Watershed (Appendix A); and

WHEREAS, under the No Action Alternative, there would be no construction actions taken or changes to the existing flood risk management system or its current operations, maintenance, or management practices in any of the channels in the Papillion Creek Basin. Because no flood risk management actions would occur, flood risk in the basin would persist and worsen as the basin continues to develop, which may result in effects to historic properties; and

WHEREAS, a majority of the proposed construction measures under the Action Alternatives would take place in areas where no previous archaeological surveys have occurred; and

WHEREAS, As many of the proposed APEs have not been previously surveyed for cultural resources, there is the possibility that archaeological sites and approximately 550 buildings, structures and objects that are potentially eligible for the National Register may be located within the Areas of Potential Effect; and

WHEREAS, pursuant to 36 CFR Part 800, the regulations implementing Section 106 of the National Historic Preservation Act (NHPA) (54 U.S.C § 306108), the District has determined, in accordance with 36 CFR 800.6(c) that implementation of Project actions

will have the potential to have adverse effects on properties eligible for listing on the National Register of Historic Places (NRHP) and within the Areas of Potential Effect for dams/reservoirs, channel modifications and levees/floodwalls; and

WHEREAS, the District has notified the Advisory Council on Historic Preservation (ACHP) of the potential for the Project to affect historic properties and that a programmatic agreement will be prepared, and the ACHP does not wish to participate; and

WHEREAS, the District has consulted and will continue to consult with the Nebraska State Historic Preservation Office (NESHPO), Ponca Tribe of Nebraska, the Omaha Tribe, the Otoe-Missouria Tribe, the Ponca Tribe of Indians of Oklahoma, the Pawnee Nation of Oklahoma, the Winnebago Tribe and the Iowa Tribe of Nebraska and Kansas, and municipal and county historic societies, and the NRD to define and implement process for taking into consideration the effects of the Project on historic properties; and

WHEREAS, the District involved the general public beginning in November of 2018 through public scoping and review periods of the National Environmental Policy Act (NEPA) process, which affords all persons, organizations, and government agencies the right to review and comment on proposed major federal actions that are evaluated by a NEPA document and participate in public meetings during the review of the feasibility report; and

NOW, THEREFORE, the District and the SHPO agree that the undertakings shall be implemented in accordance with the following stipulations in order to take in to account the effects of the Project on historic properties:

STIPULATIONS

I. STRUCTURAL MEASURES

A. The District shall conduct a Class II survey(s) of all Areas of Potential Effect that were not previously surveyed or have not been previously disturbed for construction of any dams/reservoirs, channel modifications and levees/floodwalls which are considered for construction to identify areas with good or better potential for the presence of cultural resources. These areas will be submitted to the NESHPO for review.

B. The District shall evaluate any areas identified by this survey(s) to determine if any cultural resources are present. If any cultural resources are identified, an assessment of the integrity of the sites and their historic significance, in accordance with the eligibility criteria of the National Register of Historic Places, will be conducted. Following that evaluation, a determination will be made regarding the effect the Project will have on any sites determined to be eligible for the National Register and the need for further investigation.

C. The District will coordinate these investigations in accordance with the process identified in Stipulation III.B below.

II. NONSTRUCTURAL MEASURES

A. Nonstructural measures include floodproofing, elevation, basement fill, and acquisition/demolition which involve the alteration of buildings. The District will identify the properties to be acquired/demolished, elevated, basement filled, floodproofed and/or

relocated, and determine if these properties are listed or eligible for the National Register based on, but not limit to:

1. Review(s) of the National Register and/or the NESHPO cultural resources database; and/or

2. Additional field investigations; and

3. Consultation in accordance with Stipulation III.B below.

B. As part of these investigations, the District will also determine if archaeological survey(s) are required and carry out these investigations, if necessary.

1. All investigations will be coordinated in accordance with Stipulation III.B below.

2. Interested Tribe parties will be informed of any fieldwork to take place and be afforded the opportunity to monitor any ground disturbance related to such activities.

3. If a property is determined to be eligible for the National Register, in concurrence with the SHPO and in consultation with the interested parties, the District will determine in accordance with Stipulation III. B below if the historic property will be adversely affected by the proposed nonstructural measure and, if adversely affected, ways to resolve the adverse effect(s) in accordance with Stipulation III.

4. Archaeological investigations associated with nonstructural measures, if required, should be a part of any treatment plan identified as part of the resolution of adverse effects in accordance with Stipulation III.B.

5. The District will coordinate the results of investigations in accordance with the process identified in III.B below.

III. RESOLUTION OF ADVERSE EFFECTS

A. The District shall continue consultation with landowners in accordance with V.C below, as appropriate, pursuant to 36 CFR Part 800.6 to avoid, minimize or mitigate adverse effects to historic properties.

B. The District shall notify the NESHPO, Ponca Tribe of Nebraska, the Omaha Tribe, the Otoe-Missouria Tribe, the Ponca Tribe of Indians of Oklahoma, the Pawnee Nation of Oklahoma, the Winnebago Tribe and the Iowa Tribe of Nebraska and Kansas as necessary to provide documentation regarding the identification and evaluation of the historic properties. The District will work with the NESHPO, Ponca Tribe of Nebraska, the Omaha Tribe, the Otoe-Missouria Tribe, the Ponca Tribe of Indians of Oklahoma, the Pawnee Nation of Oklahoma, the Winnebago Tribe and the Iowa Tribe of Nebraska and Kansas, municipalities, and property owners and others as necessary to determine eligibility and how best to resolve any adverse effects and document the proposed resolution.

C. Once there is agreement on how the adverse effects will be resolved, the District shall prepare a treatment plan that will identify the activities to be implemented that will resolve the adverse effects. The treatment plan will be provided for review and comment prior to implementation.

D. If there are disputes and/or disagreements on the resolution of adverse effects, the District shall seek to resolve such objection through consultation in accordance with procedures outlined in Stipulation X.

IV. PUBLIC INVOLVEMENT AND OUTREACH

A. The District shall inform the public of the existence of this PA and the District's plan for meeting the stipulations of the PA. Copies of this agreement and relevant documentation prepared pursuant to the terms of this PA shall be made available for public inspection via the District's website. Information regarding the specific locations of terrestrial and submerged archaeological sites, including potential wreck areas, will be withheld in accordance with the Freedom of Information Act and National Register Bulletin No. 29 if it appears that this information could jeopardize archaeological sites. Any comments received from the public related to the activities identified by this PA shall be taken into account by the District.

B. The District shall develop publicly accessible information about the cultural resources and historic properties investigations for the Project in the form of brief publication(s), exhibit(s), or website.

V. CURATION

A. Any collection resulting from the investigations undertaken as part of the agreement are the property of the landowner at the time the collection was made. The District does not retain ownership of any collection removed from non-federal land(s).

B. The District shall ensure that all collections resulting from the identification and evaluation of surveys, data recovery operations, or other investigations pursuant to this PA are maintained in accordance with 36 CFR Part 79 until the collection is turned over to the landowner or other entity. Minimally, the District will ensure that analysis is complete and the final report(s) are produced and accepted by the NESHPO before the collection is provided to the landowner.

C. The District shall be responsible for consulting with landowners regarding the curation of collections resulting from archaeological surveys, data recovery operations, or other studies and activities pursuant to this agreement. The District shall coordinate the return of collections to non-Federal landowners. If landowners wish to donate the collection, the District, in coordination with the NESHPO, will determine an appropriate entity to take control of the collection.

D. The District shall be responsible for the preparation of any Federally owned collections and the associated records in accordance with the standards of the curation facility.

VI. UNANTICIPATED DISCOVERY

A. The following language shall be included in construction plans and specifications: "When a previously unidentified cultural resource is discovered during the execution of the Project, the individual(s) who made the discovery shall immediately secure the vicinity and make a reasonable effort to avoid or minimize harm to the resource, and notify the Project's Contracting Officer's Representative (COR) and the District cultural staff. All activities shall cease within a minimum of 50 feet from the inadvertent discovery (50-foot radius 'no work' buffer) until authorized by the District cultural staff and the Project COR."

B. If previously unidentified and unanticipated properties (unanticipated discovery) are discovered during Project activities, the District shall cease all work in the vicinity of the discovery until it can be evaluated in accordance with 36 CFR Part 800.13 "Post Review Discoveries". Upon notification of an unanticipated discovery, the District shall implement any additional reasonable measures to avoid or minimize effects to the resource. Any previously unidentified cultural resource will be treated as though it is eligible for the NRHP until such other determination may be made.

C. The District shall immediately notify the NESHPO, and other potentially interested parties within 48 hours of the identification of an unanticipated discovery and request consultation to determine the nature of the find, National Register eligibility and the assessment and resolution of adverse effects, if identified.

1. If it is determined the unanticipated discovery is not eligible for the National Register, then the suspension of work in the area of the discovery will end.

2. If it is determined that the cultural resource is eligible for the National Register, then the suspension of work will continue, and the District will determine the actions necessary to avoid, minimize, or mitigate adverse effects to the historic property and will ensure that the appropriate actions are carried out.

3. If there is a disagreement on the appropriate course of action to address an unanticipated discovery or effects to an unanticipated discovery, then the District shall initiate the dispute resolution process set forth in Stipulation X below.

VII. DISCOVERY OF HUMAN REMAINS

A. If any human remains and/or grave-associated artifacts are encountered during any of the investigations, including data recovery, the District shall follow the Unmarked Human Burial Sites and Skeletal Remains Protection Act (Nebraska State Statutes 12-1201 through 12-1212) [1989] and, as appropriate, develop a treatment plan for human remains that is responsive to the ACHP's Policy Statement on Human Remains" (September 27, 1988), the Native American Graves Protection and Repatriation Act (PL 101-601) and, US Army Corps of Engineers, Policy Guidance Letter No. 57 (1998) Indian Sovereignty and Government-to-Government Relations with Indian Tribes.

B. The following language shall be included in the construction plans and specifications:

"When human remains, suspected human remains, or indications of a burial are discovered during the execution of a Project, the individual(s) who made the discovery shall immediately notify the local law enforcement, coroner/medical examiner, and the Project COR and the District, and make a reasonable effort to protect the remains from any harm. The human remains shall not be touched, moved or further disturbed. All activities shall cease within a minimum of 50 feet from the area of the find (50-foot radius 'no work' buffer) until authorized by the District."

VIII. PROFESSIONAL QUALIFICATIONS AND STANDARDS

A. The District shall ensure that qualified professionals meeting the National Park Service professional qualifications for the appropriate discipline [National Park Service Professional Qualification Standards, Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44738-39)] are used to complete all identification and evaluation plans related to this undertaking, to include remote sensing surveys, underwater investigations, historic structure inventory and documentation.

B. All historic structures surveys carried out pursuant to this PA will be undertaken in accordance with the standards and guidelines of the NESHPO and the Secretary of the Interior *Standards for the Treatment of Historic Properties* (36 CFR Part 68).

C. All archaeological investigations carried out pursuant to this PA will be undertaken in accordance with the standards and guidelines of the NESHPO, and the Secretary of the Interior *Standards for the Treatment of Historic Properties* (36 CFR Part 68).

IX. ADMINISTRATIVE TERMS

A. REPORTING

1. Each year following the execution of this PA until it expires or is terminated, the District shall provide the NESHPO, Ponca Tribe of Nebraska, the Omaha Tribe, the Otoe-Missouria Tribe, the Ponca Tribe of Indians of Oklahoma, the Pawnee Nation of Oklahoma, the Winnebago Tribe and the Iowa Tribe of Nebraska and Kansas and municipal and county historic societies, and other appropriate consulting parties, a summary report detailing work undertaken pursuant to this PA. This report will include any scheduling changes, problems encountered, project work completed, PA activities completed, and any objections and/or disputes received by the District in its efforts to carry out the terms of this PA Copies of the summary report with be posted on the District project website.

2. The District shall coordinate a meeting or equivalent with the signatories to be held annually on a mutually agreed upon date to evaluate the effectiveness of this PA and discuss activities carried out pursuant to this PA during the preceding year and activities scheduled for the upcoming year.

B. COORDINATION, CONSULTATION, AND REVIEW PERIODS

1. Cultural Resource Surveys

2. For all activities involving properties and/or investigations on private property, the District will obtain the required Rights of Entry to complete investigations.

3. The District will provide the draft and final reports pertaining to such investigations to the NESHPO, Ponca Tribe of Nebraska, the Omaha Tribe, the Otoe-Missouria Tribe, the Ponca Tribe of Indians of Oklahoma, the Pawnee Nation of Oklahoma, the Winnebago Tribe and the Iowa Tribe of Nebraska and Kansas and municipal and county historic societies, and other appropriate consulting parties for review.

4. Coordination and consultation on eligibility determinations, or the need for additional investigations within the Project APEs based on results of completed investigations will include the NESHPO, Ponca Tribe of Nebraska, the Omaha Tribe, the Otoe-Missouria Tribe, the Ponca Tribe of Indians of Oklahoma, the Pawnee Nation of Oklahoma, the Winnebago Tribe and the Iowa Tribe of Nebraska and Kansas and municipal and county historic societies, and other appropriate consulting parties

C. Borrow Areas

1. All draft and final reports pertaining to investigations of Project borrow areas will be provided to the NESHPO, Ponca Tribe of Nebraska, the Omaha Tribe, the Otoe-Missouria Tribe, the Ponca Tribe of Indians of Oklahoma, the Pawnee Nation of Oklahoma, the Winnebago Tribe and the Iowa Tribe of Nebraska and Kansas and municipal and county historic societies, and other appropriate consulting parties for review.

D. Measures for Residential and Non-Residential Structures

1. All draft and final reports pertaining to investigations of the measures for residential and non-residential structure Areas of Potential Effect will be provided to the NESHPO, the relevant municipality(ies) and local historical society(ies) or historic preservation group(s) for review (see Appendix E).

2. Coordination and consultation on eligibility determinations, the need for additional investigations, etc., resulting from the reviews completed in Stipulation VIII.B above will include the NESHPO, the relevant municipality(ies) and local historical society(ies) or historic preservation group(s) for review (see Appendix E).

3. Unless otherwise stated, all review periods will be 30 calendar days and any comments resulting from those reviews must be submitted to the District in writing (via electronic or regular mail).

4. With the submission of final reports, the District will respond to comments, identifying how comments were taken into account as part of report revisions or recommendation for additional action.

5. If a response is not received by the end of the review period, the District will assume concurrence with the subject determination, evaluation, plan, report or other document submitted.

X. DISPUTE RESOLUTION

1. Should any signatory object in writing to the District at any time to any actions proposed or the manner in which the terms of this PA are implemented, the District and the signatories shall attempt to resolve any disagreement arising from implementation of this PA.

2. If there is a determination that the disagreement cannot be resolved, the District shall forward all documentation relevant to the dispute to the ACHP and request the ACHP's recommendations or request the comments of the ACHP in accordance with 36 CFR Part 800.7.

3. The ACHP shall provide the District with its advice on the resolution of the objection within forty-five (45) days of receiving adequate documentation. Any ACHP recommendations or comments provided in response will be considered in accordance with 36 CFR Part 800.7, with reference only to the subject of the dispute. The District shall respond to ACHP recommendations or comments indicating how the District has taken the ACHP's recommendations or comments into account prior to proceeding with the Undertaking activities that are the subject to dispute. Responsibility to carry out all other actions under this PA that are not the subject of the dispute will remain unchanged.

4. If the ACHP does not provide its advice regarding the dispute within the thirty (45) calendar daytime period, the District may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the District shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories to the PA, and provide them and the ACHP with a copy of such written response.

XI. WITHDRAWAL AND TERMINATION

1. Any signatory may withdraw its participation in this PA by providing thirty (30) days advance written notification to all other signatories. In the event of withdrawal, any signatory to this PA may terminate it by providing 30 calendar days written notice to the signatories. In the event of withdrawal, this PA will remain in effect for the remaining signatories.

2. This agreement may be terminated in accordance with 36 CFR Part 800, provided that the signatories consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. Any signatory requesting termination of this PA will provide thirty (30) days advance written notification to all other signatories.

3. In the event of termination, the District will comply with 36 CFR 800.4 through 800.6 with regard to individual undertakings covered by this Agreement.

XII. DURATION AND SUNSET CLAUSE

1. This PA shall take effect upon execution by the District, the NESHPO, and the signatories with the date of the final signature.

2. This PA will continue in full force and effect until the construction of the Undertaking is complete and all terms of this PA are met, unless the Undertaking is terminated or authorization is rescinded or a period of five years from execution of the PA has passed, at which time the agreement may be extended as written provided all signatories concur.

XIII. AMENDMENT

1. This PA may be amended upon agreement in writing by all signatories. Within thirty (30) days of a written request to the District, the District will facilitate consultation between the signatories regarding the proposed amendment.

2. Any amendments will be in writing and will be in effect on the date the amended PA is filed with the ACHP.

XIV. ANTI-DEFICIENCY ACT

All requirements set forth in this PA requiring expenditure of funds by the District are expressly subject to the availability of appropriations and the requirements of the Anti-Deficiency Act (31 U.S.C. 1341). No obligation undertaken by the District under the terms of this PA shall require or be interpreted to require a commitment to extend funds not appropriated for a particular purpose. If the District cannot perform any obligation set forth in this PA because of unavailability of funds that obligation must be renegotiated among the District and the signatories as necessary.

Execution of the this Programmatic Agreement by the U.S. Army Corps of Engineers and the NESHPO, its subsequent acceptance by the Council, and implementation of its terms, evidence that the U.S. Army Corps of Engineers has afforded the Council an opportunity to comment on the Project and its effects on historic properties and that the U.S. Army Corps of Engineers has taken into account the effects of the undertaking on historic properties.

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

SIGNATORY:

U.S. Army Corps of Engineers, Omaha District

Date: 23 MAR 2021

Colonel Mark R. Himes, USACE Omaha District Commander

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

SIGNATORY:

Nebraska State Historic Preservation Officer

Trevor Jones, State Historic Preservation Officer

Date: 4/1/2021

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

INVITED SIGNATORY:

Papio-Missouri River Natural Resources District

Amanda Grint

Date: 4/22/2024

Amanda Grint, Water Resources Engineer

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

CONCURRING SIGNATORY:

Ponca Tribe of Nebraska

_____ Date: _____

Stacy Settje, Tribal Historic Preservation Officer

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

CONCURRING SIGNATORY:

Omaha Tribe

_____ Date: _____

Thomas Parker, Tribal Historic Preservation Officer

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

CONCURRING SIGNATORY:

Otoe-Missouria Tribe

_____ Date: _____

Elsie Whitehorn, Tribal Historic Preservation Officer

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

CONCURRING SIGNATORY:

Ponca Tribe of Indians of Oklahoma

_____ Date: _____

Halona Cabe, Tribal Historic Preservation Officer

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

CONCURRING SIGNATORY:

Pawnee Nation of Oklahoma

_____ Date: _____

Matt Reed, Tribal Historic Preservation Officer

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

CONCURRING SIGNATORY:

Winnebago Tribe

_____ Date: _____

Sunshine Thomas-Bear, Tribal Historic Preservation Officer

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

CONCURRING SIGNATORY:

Iowa Tribe of Nebraska and Kansas

_____ Date: _____

Lance Foster, Tribal Historic Preservation Officer

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
AND
THE NEBRASKA STATE HISTORIC PRESERVATION OFFICE
REGARDING
THE PAPILLION CREEK WATERSHED GENERAL INVESTIGATION STUDY

CONCURRING SIGNATORY:

ACCEPTED for the Advisory Council on Historic Preservation

_____ Date: _____

Christopher Daniel, Civil Works Case Officer

US Army Corps of Engineers®

Papillion Creek and Tributaries Lakes, Nebraska

General Reevaluation Report

Appendix 4 – Section 404(b)(1) Evaluation

June 2021

Omaha District
Northwestern Division

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Contents

Papillion Creek and Tributaries Lakes, Nebraska General Reevaluation Report

May 2021
Draft Section 404(b)(1) Evaluation (40 CFR 230)
Sarpy, Douglas, and Washington Counties, Nebraska

1.0 Introduction

This Section 404(b)(1) Evaluation is being conducted to assess the potential effects of construction of the Recommended Plan resulting from the Papillion Creek and Tributaries Lakes, Nebraska General Reevaluation Report Final Feasibility Report and Environmental Assessment on water quality and the aquatic environment in the effected streams within the proposed project area. The purpose of the Papillion Creek and Tributaries Lakes, Nebraska General Reevaluation Report (Papillion Creek Study) is to address flood risk issues in order to reduce flood and life safety risks in the Papillion Creek Basin. The feasibility report and environmental assessment document the existing conditions, evaluation of alternatives, and recommendations for Papillion Creek and its Tributaries Lakes. These recommendations are intended for authorization and implementation following the approval of the final report.

2.0 Study Authority

The Energy and Water Development Appropriation Act, 1982 (Public Law 97-88) House Report No. 97-177 authorized a General Reevaluation Study of the Papillion Creek and Tributaries Lakes, Nebraska Report. The Papillion Creek and Tributaries Lakes, Nebraska project was originally authorized by Public Law 90-483, the Flood Control Act of 1968 (FCA), in accordance with the recommendations of the Chief of Engineers in House Document No. 349. The authorized project consisted of a system of 21 dams and reservoirs, located on tributaries upstream from Metropolitan Omaha. In addition to flood control, the other purposes of the authorized project are recreation, fish and wildlife enhancement, and water quality. The current Papillion Creek and Tributaries Lakes, Nebraska General Reevaluation Report study began September 12, 2018, with the execution of a Feasibility Cost Sharing Agreement between the USACE and the Papio-Missouri River Natural Resource District, (Papio-NRD or NRD; local non-Federal levee sponsor).

3.0 Problem

There continues to be significant risk to public health, safety, and property in the Papillion Creek Basin due to seasonal rainfall events combined with undersized bridges, culverts, and channels and extensive development in the floodplain which cause residential and commercial flooding in the Papillion Creek Basin. Based on updated floodplain mapping there are approximately 4,700 structures in the 0.2% annual exceedance probability (AEP) floodplain with an approximate structure value of $1.9B and EAD of over $19M. In addition, there are several critical facilities

that lie within the floodplain, including three correctional facilities, 13 emergency services facilities, six schools and one airport. The population at risk is approximately 25,000 people at night and 59,000 people during the day within the 0.2% AEP floodplain.

4.0 Planning Objectives

The Federal objective of water and related land resources project planning is to contribute to National Economic Development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Planning objectives represent desired positive changes to the future without-project conditions. All of the planning objectives focus on activity within the study area and within the 50-year period of analysis. These planning objectives include:

I. Reduce the likelihood and consequences of flooding on human life and safety in the Papillion Creek Basin.

II. Reduce the risk of flood damage to property, businesses, and infrastructure (including critical facilities) in the Papillion Creek Basin due to flooding.

III. Improve recreational opportunities consistent with flood risk management objectives in the Papillion Creek watershed.

5.0 Project Location

This study is situated in a highly urbanized area prone to flash flooding. As a result, there is a threat to life safety in the communities of Omaha, Papillion, Ralston, Elkhorn, Bellevue, LaVista, Boystown, Bennington, and Gretna along with a high risk of economic flood damage to associated urban infrastructure. The study is being formulated to reduce the risk of flooding to commercial, residential and public infrastructure along the various Papillion Creek tributaries, consistent with protecting the nation's environment, pursuant to national environmental statutes, with applicable executive orders and with other Federal planning requirements.

The study considers flood risk management alternatives in the Papillion Creek Basin, specifically along West Papillion Creek, Big Papillion Creek, Little Papillion Creek, South Papillion Creek, Saddle Creek, Papillion Creek, Cole Creek, and Thomas Creek. Future with and without-project risks to life safety are considered in the study consistent with Planning Bulletin (PB) 2019-04. There are minimal risks to the environment expected from the project.

The study area encompasses the entire Papillion Creek watershed. The watershed covers most of Douglas County, and parts of Washington and Sarpy Counties in Nebraska. It drains an area of approximately 400 square miles. The three major streams draining the watershed are the Big Papillion Creek, Little Papillion Creek, and West Papillion Creek. A study area map is shown in Figure 1. Detention in the upper parts of the basin, structural measures, and nonstructural

measures in the lower part of the basin are all being considered in the alternatives analysis, therefore, the project area is consistent with the study area.

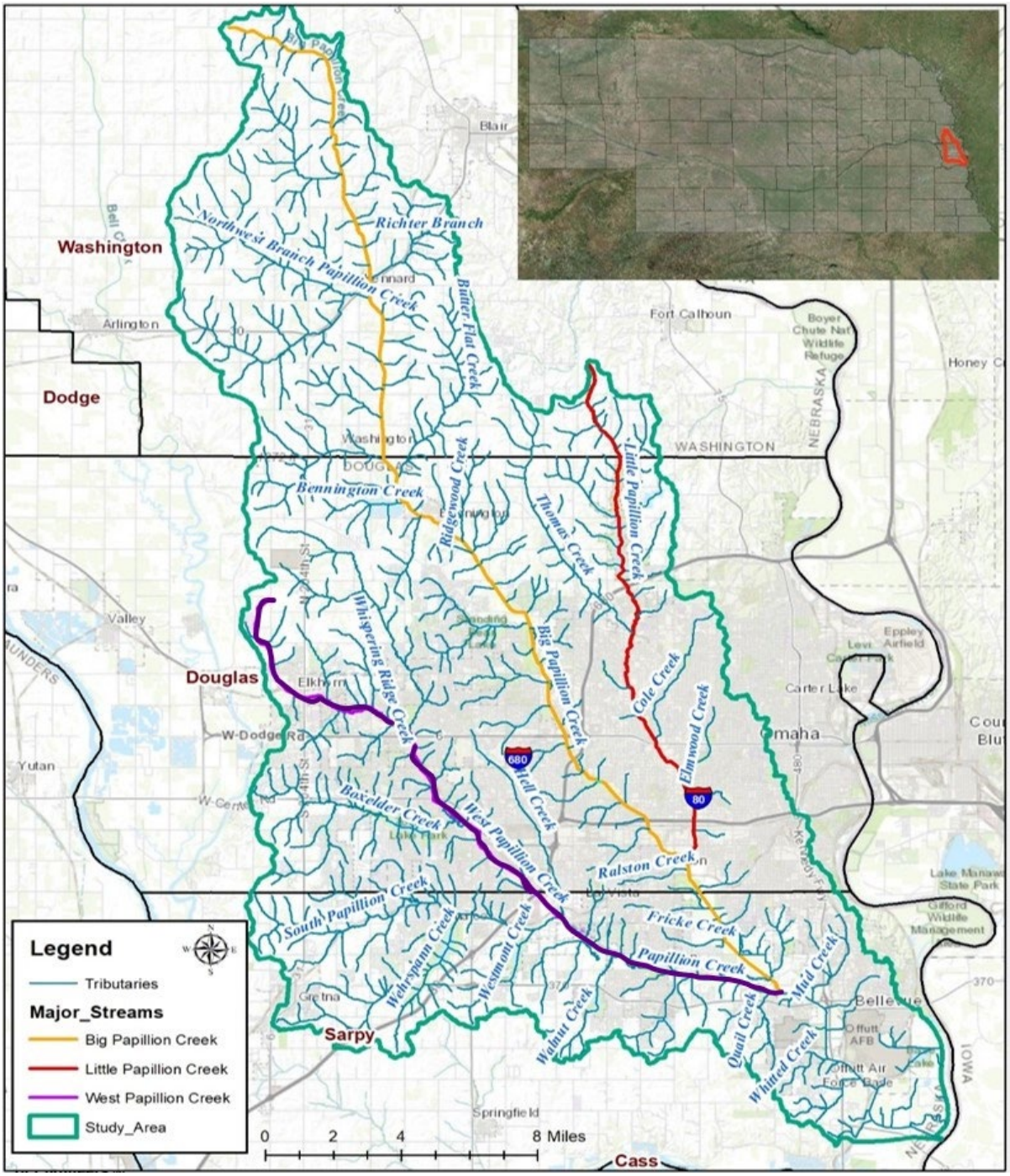

Figure 1. Map of Study Area

6.0 Plan Formulation

The USACE uses a six-step planning process to guide project studies, as detailed in ER 1105-2-100 “Planning Guidance Notebook”. This process is a structured approach to problem solving which provides a rational framework for sound decision making. The six steps are:

1) Specification of water and related land resources problems and opportunities (relevant to the planning setting) associated with the Federal objective and specific state and local concerns
2) Inventory, forecast, and analysis of water and related land resource conditions within the planning area relevant to the identified problems and opportunities
3) Formulation of alternative plans
4) Evaluation of the effects of the alternative plans
5) Comparison of alternative plans
6) Selection of a recommended plan based upon the comparison of alternative plans

Plan formulation is the process of evaluating existing conditions and building alternative plans that meet planning objectives and avoid planning constraints. This study examines and addresses the Federal criteria of completeness, efficiency, effectiveness, and acceptability. To adequately address these criteria, the development and early screening of potential alternatives considered a number of evaluation factors. Primary among those factors are the following:

- Engineering and flood risk management adequacy (effectiveness)
- Ability to contribute to meeting the planning objectives (effectiveness)
- Consistency with planning constraints and authorities
- Acceptability (includes law and policy, sponsor, environmental, cultural and public aspects)
- Early cost indicators (early efficiency indicators for screening purposes)
- Construction site constraints and real estate requirements (topography, location conflicts, adjacent development, etc.)

7.0 Alternatives Analysis

Refer to Section 4.6 and Section 5.0 of the Papillion Creek Study main report for detailed discussion on alternative formulation, alternative screening criteria and alternatives carried forward for further consideration. Initially, during alternative formulation, Problems and Opportunities were identified in addition to planning objectives and constraints. Two iterations of the planning process were conducted with the sponsor prior to the Alternatives Milestone Meeting (AMM). Measures originally considered included dams, levees, floodwalls, flood tunnels, off channel detention, water diversions, channel widening, nonstructural measures, bridge modifications, bridge removal, road modifications, and culvert modifications. These measures were evaluated for their ability to meet the completeness, effectiveness, efficiency, and acceptability criteria.

The plan formulation of the Papillion Creek Basin alternatives assumed that actions on each particular channel (i.e. Big Papillion Creek, Little Papillion Creek, etc.) have independent impacts and benefits. Therefore, alternatives were formulated on each channel individually and not compared against alternatives on other channels. Having passed review for engineering adequacy, environmental and public acceptability, and the other alternatives evaluation criteria as described in the GRR, the remaining alternative with the highest net benefits to the national economy was identified as the National Economic Development Plan (NED plan). The final NED plan includes the NED plan for each channel combined together; however, each channel

could be implemented independent of the actions on the other channels. This allows for a more comprehensive flood risk reduction plan for the entire watershed. Table 1 below identifies the final array of alternatives carried forward for further consideration after initial measures were screened out. Refer to Sections 3.1 through 3.9 of the EA for a description of the final array of alternatives

Table 1. Final Array of Alternative Plans.

Final Array	Alt 1 - No Action Alternative	Alt 2 – Dams/ Reservoirs	Alt 3 - Channel Modifications/ Levees/ Floodwalls	Alt 4 - Nonstructural	Alt 5 – Combined Plans
West Papillion	No Action		Floodwall	Elevation, Dry Floodproofing, Basement Fill	Alt 3 + Alt 4
South Papillion	No Action	Dam Site 19			
Little Papillion	No Action	Dam Site 10	- New Levee/ Floodwall	Elevation, Dry Floodproofing, Basement Fill	Alt 2 + Alt 3 + Alt 4
Big Papillion	No Action		- Channel Widening - Levee Raise/ Floodwall	Elevation, Dry Floodproofing, Basement Fill	Alt 3 + Alt 4
Papillion Creek	No Action			Dry Floodproofing	
Saddle Creek	No Action			Elevation, Dry Floodproofing, Basement Fill	

7.1 Tentatively Selected Plan (TSP)

In compliance with USACE policy the TSP is the plan that reasonably maximizes net NED benefits while fulfilling the other planning objectives and constraints. For multi-purpose reservoir plans the reservoir must be economically viable based on flood risk management NED benefits only (most efficiently achieved with a dry dam) and then recreation NED benefits can be used to justify the additional costs of creating a multi-purpose reservoir. If both steps can be fulfilled then the resulting multi-purpose dam can be included as part of the TSP. Table 2 presents the TSP based on the analysis completed to date. Alternatives included in the TSP are circled in the table.

Table 2. Tentatively Selected Plan

Final Array	Alt 2 - Dams	Alt 3 - Channel Improvements / Levees / Floodwalls	Alt 4 - Nonstructural	Alt 5 – Combined Plans
West Papillion		- Floodwall	Elevation, Dry Floodproofing, Basement Fill	Alt 3 + Alt 4
South Papillion	Dam Site 19			
Little Papillion	Dam Site 10	- New Levee/Floodwall	Elevation, Dry Floodproofing, Basement Fill	Alt 2 (DS 10 with Recreation) + Alt 3 + Alt 4
Big Papillion		- Channel Widening - Levee Raise/Floodwall	Elevation, Dry Floodproofing, Basement Fill	Alt 3 + Alt 4
Papillion Creek			Dry Floodproofing	
Saddle Creek			Elevation, Dry Floodproofing, Basement Fill	

7.2 Non-Economically Justified Plans Recommended for Optimization

Two alternatives that were not economically justified, and therefore, were not part of the NED Plan or the TSP, were carried forward for further analysis to see if they could be economically justified through optimization. They included the West Papillion Creek Alternative 3 – Channel Improvements / Levees / Floodwall, and South Papillion Creek Alternative 2 – Dam Site 19. The West Papillion Creek structural alternative produces a benefit-to-cost ratio slightly below 1.0 at 0.83. However, based on the uncertainty in the benefits and the distribution of the BCR, the median BCR is 0.99 and there is a 25% chance it could be as high as 1.34. USACE recommended carrying both the structural and nonstructural alternatives forward into optimization. The South Papillion Creek Dam Site 19 dry dam alternative produces a benefit-to-cost ratio slightly below 1.0 at 0.93 based solely on flood risk management NED costs and benefits. However, a significant percentage of the cost is associated with real estate ($12.66 million or 53.4%) and construction contingencies ($3.78 million or 15.9%). When the recreation costs and benefits are incorporated into the plan the BCR increases to 1.12. Based on the uncertainty in the costs and benefits and the changes which could come from incorporating the future condition hydrology and climate change, USACE recommended carrying both the dry dam and wet dam alternatives forward into optimization and refinement.

7.3 Optimization of the TSP

ER 1105-2-100 dictates that the USACE shall find the plan that maximizes the benefits associated with the NED account. Optimization was carried out on all alternatives included in the TSP and the two alternatives (West Papillion Creek Alternative 3 – Channel Improvements / Levees / Floodwall, and South Papillion Creek Alternative 2 – Dam Site 19) that were not

included in the TSP, but carried forward for further analysis. For each alternative, construction costs were quantified, real estate needs were determined, and flood damage reduction was evaluated to determine the optimal design. Cost Benefit Analysis was then conducted on each of the optimized plans.

8.0 Recommended Plan

Once modeling and the corresponding economic analysis was completed for each alternative considered, the final optimized alternatives were modeled as one final plan, which is now the Recommended Plan. The Recommended Plan includes the DS19 wet dam, the DS10 dry dam, and the levee/floodwall on the Little Papillion Creek at the optimized height of a top elevation equal to the 1% AEP energy grade line with an additional three feet. Optimization resulted in the elimination of West Papillion Creek Alternative 3 – Channel Improvements / Levees / Floodwall, and Big Papillion Creek Alternative 3 – Channel Widening / Levee Raise / Floodwall from further analysis because the costs of these alternatives exceeded the benefits. DS10 in Little Papillion Creek Alternative 2 was proposed as a wet dam in the TSP. During the time since the TSP was selected, public opposition has led the non-Federal sponsor to support changing DS10 to a dry dam instead of a wet dam. Optimization of DS10 as a dry dam has led to Little Papillion Creek Alternative 2 being carried forward into the Recommended Plan as a dry dam. Table 3 below shows the alternatives included in the Recommended Plan. Figure 2 below shows the locations of the structural alternatives included in the Recommended Plan.

Table 3. Recommended Plan

Final Array	Alt 2 - Dams	Alt 3 - Channel Improvements / Levees / Floodwalls	Alt 4 - Nonstructural	Alt 5 – Combined Plans
West Papillion				
South Papillion	Dam Site 19 (wet)		Elevation, Dry Floodproofing, Basement Fill	
Little Papillion	Dam Site 10 (dry)	- New Levee/Floodwall in Reaches LP-6 Through LP-8	Elevation, Dry Floodproofing, Basement Fill	Alt 2 DS10 (dry) + Alt 3 + Alt 4
Papillion Creek			Dry Floodproofing	
Saddle Creek			Elevation, Dry Floodproofing, Basement Fill	

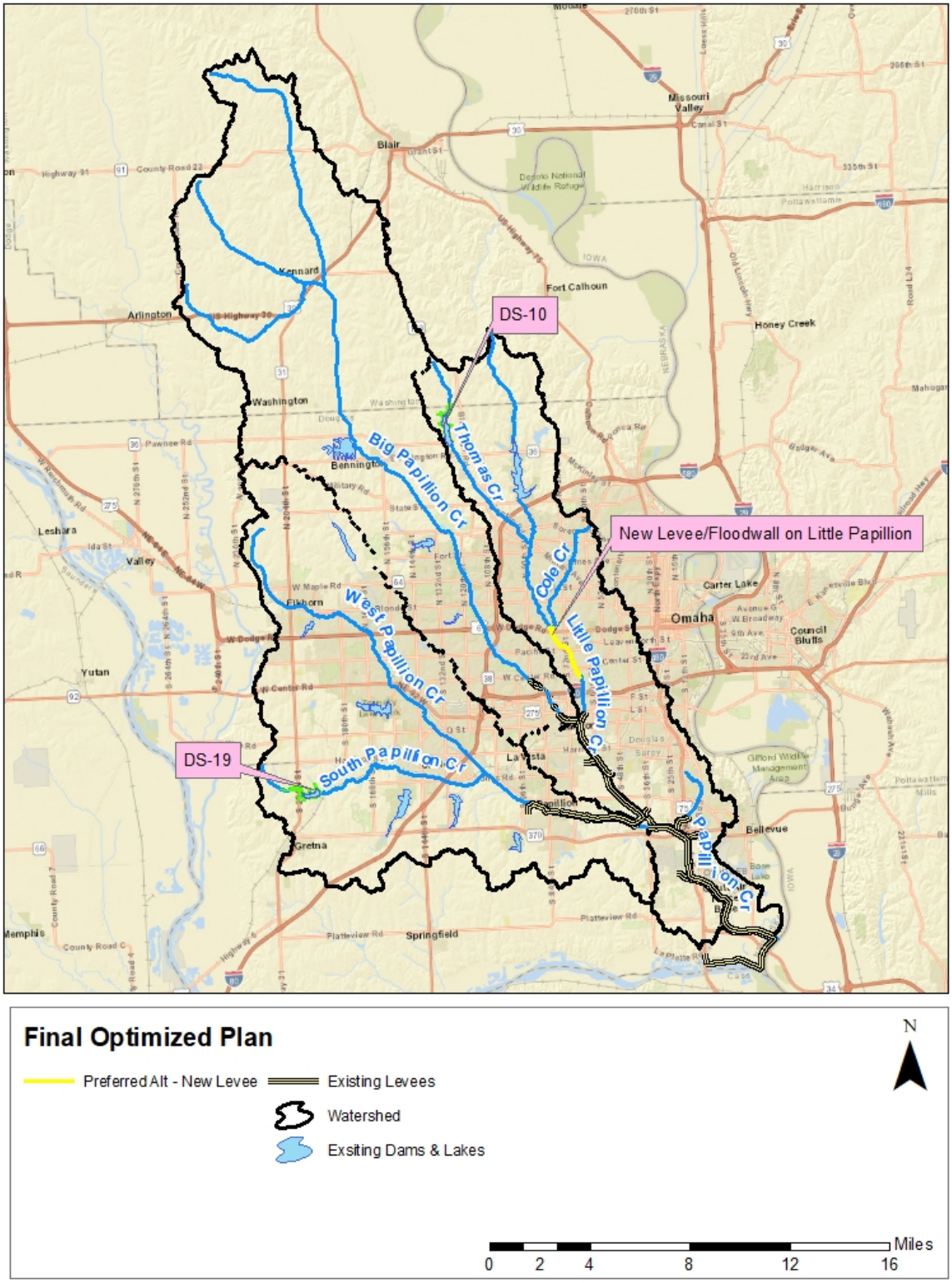

Figure 2. Papillion Creek GRR Final Structural Recommended Plan.

8.1 The Nebraska Stream Condition Assessment Procedure (NeSCAP).

NeSCAP was the selected habitat assessment tool to assess baseline environmental conditions for the Papillion Creek General Reevaluation Study. This model was reviewed by the U.S. Army Corps of Engineers (Corps) Ecosystem Planning Center of Expertise (ECOPCX) and received approval for regional use on July 11, 2019. Site visits were conducted on May 17, 22, and 29, 2019 to collect data for the model parameters described below. NESCAP is a hydrogeomorphic assessment method that measures thematic variables for the major physical, ecological and anthropogenic factors that can strongly influence stream and adjacent riparian systems. The minimum assessment area used for this method includes the bankfull stream channel and active floodplain. The six variables utilized in this method are as follows:

- V_1- Hydraulic Conveyance and Sediment Dynamics
- V_2- In-stream Habitat/Available Cover
- V_3- Floodplain Interaction-Connectivity
- V_4-Riparian Vegetation Composition
- V_5- Riparian Buffer Continuity and Width
- V_6- Riparian Land Use

Each variable receives a Condition Index Rating (CIR) between 0.10 and 1.00 based on conditions observed or measured at the project site in conjunction with off-site information. The most degraded, culturally disturbed conditions are assigned a 0.10, and the reference standard condition is assigned a 1.00. Conditions not measured or observed may receive a CIR of 0.0. If a given variable is non-applicable, the variable may be completely omitted from scoring from a particular River Reach (RR), and thus receive a "NA". The RR is an aggregated assessment unit, which is defined laterally as a segment of a mainstem stream channel and adjacent riparian ecosystem that is relatively homogenous in terms of geomorphology, soils, hydrology, channel morphology, vegetation and cultural alteration. The RR includes the bankfull stream channel, active floodplain and the less frequently flooded, historical floodplains and terraces.

Once each RR has been assessed with applicable variables, a finalized Stream Condition Index (SCI) is calculated. The SCI is defined as the sum of the scores for the rated variables divided by the maximum sum of the scores for the variables rated, where: $SCI = \frac{\Sigma V}{\Sigma V max}$. The resultant SCI (habitat quality) for the given RR is then multiplied by stream lengths or area (habitat quantity) for a unit-less weighted score. Refer to Sections 1 through 7 in Appendix 1 of the EA for a complete description of the NeSCAP evaluation conducted for the Recommended Plan.

8.1.1 NeSCAP Results.

The streams within Papillion Creek Tributaries Basin have been extensively modified over the last 100 years to reduce flood risk and accommodate development within the basin. Most of the streams have been straightened, levees and channel improvement projects have been constructed, multiple flood control reservoirs have been constructed, and a majority of the land within the basin has been urbanized or placed in crop production. Stream reaches in rural areas have been severely impacted by agricultural practices that often eliminate vegetation buffers and result in

removal of trees right up to the edge of the stream bank. Due to the relatively poor condition of the streams in this study area, the future with project condition only resulted in relatively minor negative project impact unit scores to some of the reaches of Little Papillion Creek during the NeSCAP analysis. Overall, the future with project condition resulted in 9,233.51 net positive project impact units when the results for all of the reaches in the Little Papillion Creek were combined. The beneficial impacts to some of the reaches of the Little Papillion Creek are primarily the result of converting concrete or otherwise un-vegetated areas to grass or other perennial cover due to the expansion of the project footprint resulting from construction of new levees. Floodwalls were used in areas where high value properties or other real estate constraints prevented the acquisition of sufficient property to provide enough space for levee construction. The floodwalls have a much smaller footprint than levees and require less real estate. This resulted in less conversion of concrete surfaces or buildings to grass cover or expansion of the vegetated buffers along the river reaches where floodwalls are proposed. As a result, project impact unit scores in river reaches where floodwalls are proposed either did not change between the without project and future with project condition, or they resulted in slightly negative scores. Negative scores for reaches that primarily included floodwalls were also related to the decrease in floodplain connectivity that would result from construction of floodwalls.

Conversion of over 4,843 feet of South Papillion Creek to lacustrine habitat at Dam Site 19 would result in -35,976.57 project impact units. Since the NeSCAP model assesses impacts to streams, converting a stream to a lake results in negative project impact units that will require mitigation. Construction of a dry dam at Dam Site 10 on Thomas Creek would not convert the creek to a lake, however, it would impact the function of the stream enough to require mitigation of 23,414.29 negative project impact units.

8.1.2 Stream Impact Mitigation.

According to the results of the NeSCAP modeling for the Recommended Plan, construction of the two proposed dam sites would result in a combined total negative project impact unit score of -59,390.86, while the total beneficial impacts of the remainder of the proposed actions (levees/floodwalls) along Little Papillion Creek would result in a total of 9,233.51 beneficial (positive) project impact units. Overall, this results in net negative impacts totaling 50,157.35 negative project impact units. The 59,390.86 negative project impact units that result from construction of Dam Sites 10 and 19 are partially compensated for by the 9,233.51 positive project impact units produced by the remainder of the proposed construction activities along Little Papillion Creek in the optimized plan. Therefore, based on the NeSCAP modeling results, the net negative impacts to stream condition (-50,157.35 project impact units) that would occur as a result of construction of the two dam sites under the optimized Plan would need to be mitigated. Negative impacts to Thomas Creek caused by the proposed project would be mitigated by acquiring a total of 4.6 acres of land straddling both sides of a 1,000-foot long segment of the creek just upstream of Pawnee Road. This segment is located within the floodpool of the proposed dry dam. However, because a dry dam with no permanent pool is being proposed, this segment would be suitable for mitigation. Stream mitigation would primarily consist of planting a 100-foot wide buffer of native prairie and wetland plants along

each side of the creek for 1,000 feet. Stream impact mitigation at Dam Site 19 would be accomplished by acquiring 5.5 acres of land straddling both sides of a 1,200-foot long segment of an unnamed tributary to the South Papillion Creek located west of Highway 6. This segment of the tributary is located just outside the edge of the floodpool on the upstream end of the proposed reservoir. Similar to the mitigation proposed at Dam Site 10, a 100-foot wide buffer of native prairie and wetland plants would be planted along both sides of the creek channel for a distance of 1,200 feet. The type and amount of stream mitigation proposed was determined through use of the mitigation tool in the NeSCAP calculation book. This tool allows you to manipulate the expected CIR scores for each of the variables that would be affected by the proposed mitigation measures. It also allows you to manipulate the stream length and acreage proposed for mitigation to produce the amount of positive project impact units needed to mitigate for the impacts of the proposed project. Figures 3 and 4 below are NeSCAP mitigation tool worksheets that show how the proposed mitigation at the two dam sites would achieve the required total of at least 50,157.35 positive project impact units. As depicted on the two NeSCAP mitigation tool worksheets, the total amount of mitigation units that would be produced by the proposed mitigation at both dam sites is 52,971 units.

Stream mitigation costs at each dam site would include the cost of fee title real estate acquisition, purchase of native seed mixes, and planting the seed. A mix of native grasses, forbs, and wetland plants would be used. The seed mix is estimated to cost about $150/pound, and it would be applied at a rate of 12 pounds/acre for a total cost of $1,800/acre. The proposed mitigation site at Dam Site 10 is located along Thomas Creek within the floodpool area behind the dam. Because Dam Site 10 would be a dry dam, flowage easements would be obtained within the floodpool footprint rather than obtaining fee title to the land. Land used for mitigation in Corps' projects must be owned in fee. Therefore, the real estate cost attributable to mitigation would be the cost of acquiring the land in fee over and above the value of the flowage easement that would be needed to construct the dam. The proposed mitigation site for Dam Site 19 is located outside the fee acquisition boundary required for the proposed reservoir, so full value would have to be payed to acquire fee title to the land. Land in the proposed mitigation area at DS10 has been appraised at approximately $18,392/acre. Land in the proposed mitigation area for DS19 has been appraised at approximately $8,854/acre. Table 4 below provides a summary of estimated stream mitigation costs at each proposed dam site.

Table 4. Stream Mitigation Cost Summary.

Impact Location	*Habitat Type Impacted*	*Acres Impacted*	*Acres Replaced*	*Cost/Acre*	*Total RE Cost*	*Excavation Cost @ 9.09/CY*	*Seeding/Planting Cost/Acre*	*Total Implementation Cost*	*GRAND TOTAL MITIGATION COST*
DS10	Stream	4.6	4.6	$ 18,392	$ 84,603	$ -	$ 1,800	$ 8,280	$ 92,883
DS19	Stream	5.5	5.5	$ 8,854	$ 48,697	$ -	$ 1,800	$ 9,900	$ 58,597
Grand Total		**10.1**	**10.1**		**$ 133,300**			**$ 18,180**	**$ 151,480**

RR_m= Mitigation reach

	Baseline (Pre project)	RR_m1	RR_m2
1	Hydraulic Conveyance and Sediment Dynamics	0.50	0.00
2	In-stream Habitat/Available Cover	0.50	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.10	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	0.25	0.00
6	Land use adjacent to Active Flood plain zone	0.25	0.00
	Stream Condition Index	0.34	0.00
	Left descending bank -Length (ft)	1,000.00	0.00
	Right descending bank -Length (ft)	1,000.00	0.00
	width (ft)	60.00	0.00
	Area	60,000.00	0.00
	Stream condition Index * area	20,142.86	0.00

	Post Project (PROPOSED)	RRm1	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.50	0.00
2	In-stream Habitat/Available Cover	0.75	0.00
3	Floodplain Interaction-Connectivity	0.50	0.00
4a	Riparian Vegetation Composition	1.00	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	1.00	0.00
6	Land use adjacent to Active Flood plain zone	1.00	0.00
	Stream Condition Index	0.75	0.00
	Left descending bank -Length (ft)	1,000.00	0.00
	Right descending bank -Length (ft)	1,000.00	0.00
	width (ft)	60.00	0.00
	Area	60,000.00	0.00
	Stream condition Index * area	45,000.00	0.00

	Change from baseline to post project	RRm1	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.00	0.00
2	In-stream Habitat/Available Cover	0.25	0.00
3	Floodpalin Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.90	0.00
4b	Riparian Vegetation Composition	0.00	0.00
5	Riparian Buffer	0.75	0.00
6	Land use adjacent to Active Flood plain zone	0.75	0.00

PROPOSED - BASELINE	24,857
Stream Length Multiplier	1.0

MITIGATION UNITS	24,857

Figure 3. NeSCAP mitigation tool worksheet for Dam Site 10 on Thomas Creek.

RR_m= Mitigation reach

	Baseline (Pre project)	Unnamed Tributar	RR_m2
1	Hydraulic Conveyance and Sediment Dynamics	0.25	0.00
2	In-stream Habitat/Available Cover	0.25	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	0.10	0.00
4b	Riparian Vegetation Composition	0.10	0.00
5	Buffer continuity & Width	0.10	0.00
6	Land use adjacent to Active Flood plain zone	0.25	0.00
	Stream Condition Index	0.19	0.00
	Left descending bank -Length (ft)	1,200.00	0.00
	Right descending bank -Length (ft)	1,200.00	0.00
	width (ft)	20.00	0.00
	Area	24,000.00	0.00
	Stream condition Index * area	4,457.14	0.00

	Post Project (PROPOSED)	Unnamed Tributar	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.50	0.00
2	In-stream Habitat/Available Cover	0.50	0.00
3	Floodplain Interaction-Connectivity	0.25	0.00
4a	Riparian Vegetation Composition	1.00	0.00
4b	Riparian Vegetation Composition	0.50	0.00
5	Buffer continuity & Width	1.00	0.00
6	Land use adjacent to Active Flood plain zone	1.00	0.00
	Stream Condition Index	0.68	0.00
	Left descending bank -Length (ft)	1,200.00	0.00
	Right descending bank -Length (ft)	1,200.00	0.00
	width (ft)	40.00	0.00
	Area	48,000.00	0.00
	Stream condition Index * area	32,571.43	0.00

	Change from baseline to post project	Unnamed Tributar	RRm2
1	Hydraulic Conveyance and Sediment Dynamics	0.25	0.00
2	In-stream Habitat/Available Cover	0.25	0.00
3	Floodpalin Interaction-Connectivity	0.00	0.00
4a	Riparian Vegetation Composition	0.90	0.00
4b	Riparian Vegetation Composition	0.40	0.00
5	Riparian Buffer	0.90	0.00
6	Land use adjacent to Active Flood plain zone	0.75	0.00

PROPOSED - BASELINE	28,114
Stream Length Multiplier	1.0

MITIGATION UNITS	28,114

Figure 4. NeSCAP mitigation tool worksheet for Dam Site 19 on an unnamed tributary.

8.2 Habitat Evaluation Procedure (HEP)

The NeSCAP model does not adequately address the loss of certain vegetation communities such as riparian forest that may be considered significant resources by the Corps or the partnering resource agencies. While the model may show a lower condition index rating for a particular variable if a resource such as native trees are replaced with a different type of non-native vegetation, the loss of the trees themselves may not hold enough weight in the model to result in mitigation of the trees. Construction of the Recommended Plan would result in the loss of 23.5 acres of riparian forest. Scattered groups of trees along the banks of the Little Papillion Creek totaling approximately 2 acres would have to be cleared to construct the levees and floodwalls. The trees are primarily broadleaf trees consisting of green ash, box elder, silver maple, and cottonwood. At DS10, construction of the dam would result in the clearing of approximately 2 acres of riparian forest within the proposed dam footprint along Thomas Creek. At DS19, construction of the dam would result in the removal, and/or death of approximately 19.5 acres of riparian forest due to clearing within the dam footprint and flooding by the proposed reservoir behind the dam along South Papillion Creek. The trees impacted at the two proposed dam sites are primarily broadleaf trees consisting of box elder, silver maple, cottonwood, green ash, Chinese elm, and mulberry.

The trees are part of the existing riparian ecosystem in the basin, and they are considered by the PDT, the USFWS, and the Nebraska Natural Heritage Program to be a significant resource that is steadily declining in the basin as development continues. For these reasons, mitigation of the 23.5 acres of riparian forest would be required.

The Habitat Evaluation Procedure (HEP) was used to determine the appropriate quality and quantity of riparian forest habitat to be replaced. The HEP was developed by the U.S. Fish and Wildlife Service (USFWS) in the 1970s. HEP is a well-known land management tool used to quantify (assign a value to) the suitability of habitat for selected species at baseline conditions and at different points in time. HEP can be used to compare the wildlife impacts of different project alternatives or mitigation techniques.

A HEP is comprised of one or more Habitat Suitability Index/Indices (HSI), which are models for calculating the habitat suitability for specific species based on habitat variables that are critical to their survival or successful reproduction. HSI models using existing USFWS-developed indicator species were certified by the USACE. A set of variables that represent the life requisites for the species (e.g. percent cover, water depth, tree height) are described for each species. The variables are measured using desktop methods and subsequently verified in the field and their value is assigned a corresponding index value. These values are then inserted into the HSI mathematical model to produce a score that describes existing habitat suitability. This score is a score between 0 (no value) and 1 (optimum value).

8.2.1 Brown Thrasher Habitat Suitability Index (HSI)

The Brown Thrasher Habitat Suitability Index (HSI) model was selected to measure the quality of the existing riparian forest habitat that would be impacted by the proposed project, and to predict the quality of the habitat that would be restored through mitigation. The model was developed to evaluate brown thrasher habitat in its entire breeding range during the breeding season (April – August). The variables that are assessed in the brown thrasher HSI model include the density of woody stems $\geq$ 1.0 meter tall (in thousands of stems), the percent canopy cover of trees $\geq$ 5.0 meters (16.5 feet) tall, and the percent of ground covered by leaf litter $\geq$ 1 cm (0.4 inches) deep. Figures 16, 17, and 18 below are the suitability index scoring graphs for each of the three variables. To calculate the HSI score for each site, the suitability index score of each variable is multiplied by the suitability index scores of the other two variables. The following equation is used to calculate the HSI for each site: SIV1 x SIV2 x SIV3.

8.2.2 Results of the HEP Analysis

The existing conditions of the riparian forest at each of the three proposed construction locations was analyzed using the brown thrasher HSI model. Existing conditions HSI scores were also developed for the three locations where the proposed mitigation plantings would be planted. A mitigation planting plan was developed to replace the quality and quantity of riparian forest habitat that would be lost at the three areas where trees would be cleared for construction or killed due to flooding. The proposed mitigation areas would be planted at a rate of 135 stems per acre. Within each acre, 10 percent of the stems would consist of native tree species with a minimum dbh of 2 inches, and 90 percent of the stems planted would consist of native shrub species. Based on the results of the HEP analysis, equivalent habitat units would be achieved in each of the proposed mitigation plantings by year 10 if 29.5 acres are planted for DS19, 3 acres are planted for DS10, and 2.3 acres are planted for the Little Papillion Creek using the mitigation planting plan described above. For a complete discussion of HEP and how it was used to determine appropriate mitigation for the loss of riparian forest habitat, refer to Section 8.3 in Appendix 1 of the EA.

8.3 Section 404(b)(1) Evaluation

This evaluation is based on the regulations found at 40 CFR 230, Section 404(b)(1): Guidelines for Specification of Disposal Sites for Dredged and Fill Material.

A thorough Environmental Assessment (EA) has been conducted to identify alternatives, compare effects of alternatives, and select the best alternative plans for flood risk management in the Papillion Creek Basin in Douglas, Sarpy, and Washington Counties in Nebraska. The Economic and Environmental Principals and Guidelines for Water and Related Land Resources Implementation Studies (P&Gs) (U.S. Water Resources Council 1983) establish the standards and procedures that the Corps and other Federal agencies use for planning and evaluating the merits of a water project. The EA evaluated, in detail, the environmental, social, and economic effects of the Proposed Action.

An important aspect of the Environmental Assessment is the evaluation of the recommended alternative consistent with Section 404(b)(1) guidelines. Section 404(b)(1) guidelines are the substantive criteria used in evaluating discharges of dredged or fill materials in waters of the United States under Section 404 of the Clean Water Act. Fundamental to these Guidelines is the precept that dredged or fill materials should not be discharged into an aquatic ecosystem unless it can be demonstrated that such discharges would not have unacceptable adverse impacts either individually or in combination with known or probable impacts of other activities affecting the ecosystem of concern.

The purpose of this analysis is to demonstrate that the Recommended Plan would not have unacceptable adverse impacts either individually or in combination with known or probable impacts of other activities affecting the aquatic resources in the project area, thus satisfying compliance with Section 404(b)(1) Guidelines. Each of the three structural alternatives in the Recommended Plan (DS19, DS10, and Little Papillion Creek Levees/Floodwalls) are evaluated independently in the sections below

9.0 Dam Site 19

Proposed Dam Site 19 would be located on the South Papillion Creek in Sarpy County, Nebraska near Highway 6 and Giles Road. Construction of DS 19 would include the construction of a 1,450-foot long earthen dam which would impound approximately 74 surface acres of water, and the construction of an auxiliary spillway that would be approximately 1,000 feet long with a bottom width of 550 feet. The design includes construction of an upstream sediment control basin to manage long-term sedimentation. Construction of the dam embankment would require approximately 322,250 cubic yards of earthen material excavated from the location of the auxiliary spillway. The top of the dam would be approximately 40 feet above the floodplain and 62 feet above the bottom of the creek channel. The intake structure would be a reinforced concrete box shaft with metal trash racks protecting the openings. The intake would also have two 6-feet wide by 5.5 feet tall low flow openings. The outlet conduit would be a reinforced concrete pipe with an inside diameter of 6 feet. The upstream face of the dam would be armored with 4,755 tons of riprap. The sediment control basin would be constructed within the boundaries of the floodpool just upstream of 204th street. The dam embankment for the sediment control basin would be approximately 860 feet long and the top of the dam would be about 9 feet above the floodplain. The normal pool control culvert would be a 36-inch reinforced concrete pipe. The pool behind the dam would cover approximately 12 acres.

The recreational features and opportunities associated with DS 19 would be similar to those at existing reservoir sites in the Papillion Creek watershed. Recreational opportunities would include fishing, canoeing, hiking, biking, and picnicking. Compensatory mitigation associated with the construction of DS19 would include 1.4 acres of palustrine emergent (PEM) wetlands, 29.5 acres of riparian forest mitigation, and 5.5 acres of mitigation for loss of stream habitat function. Figure 5 below shows the footprint of the proposed dam and reservoir at DS19. Figure

6 is a cross section of the proposed dam embankment. Figure 7 is a cross section of the proposed auxiliary spillway.

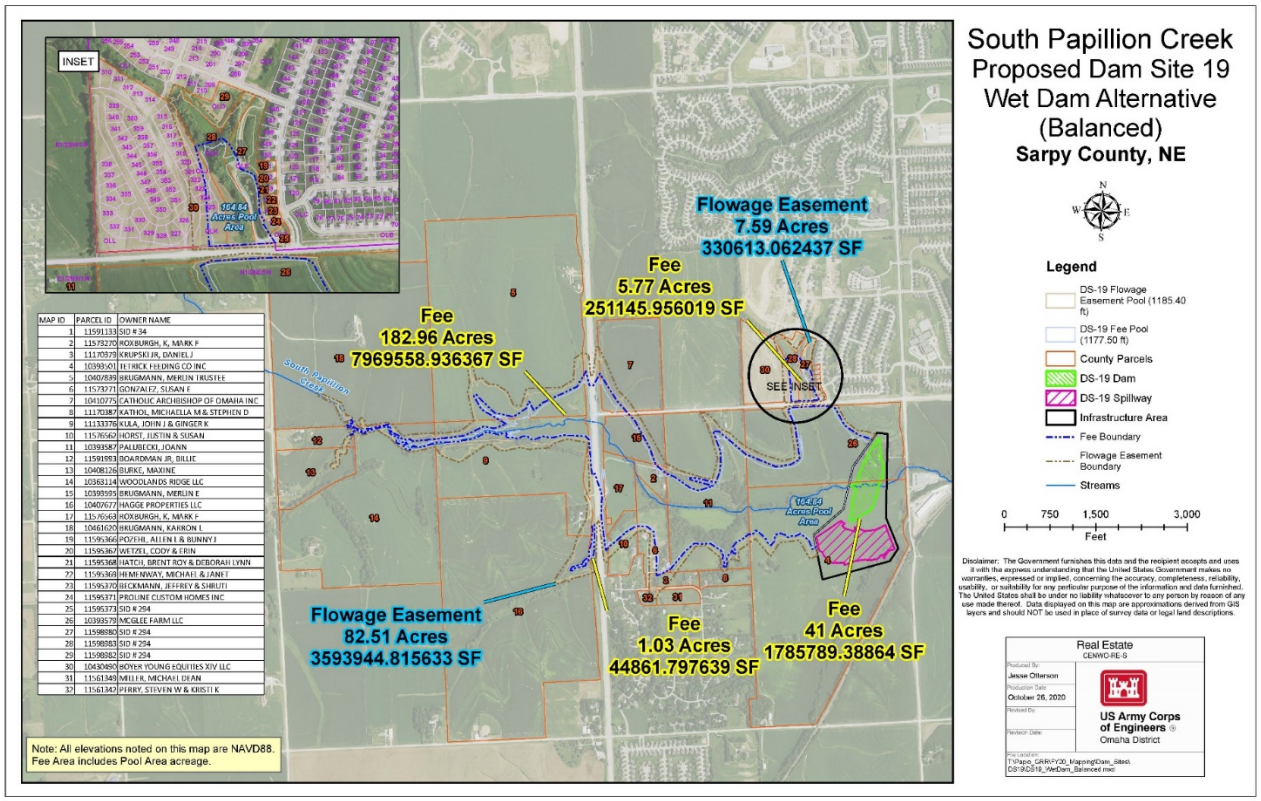

Figure 5. Map of proposed dam and reservoir at DS19.

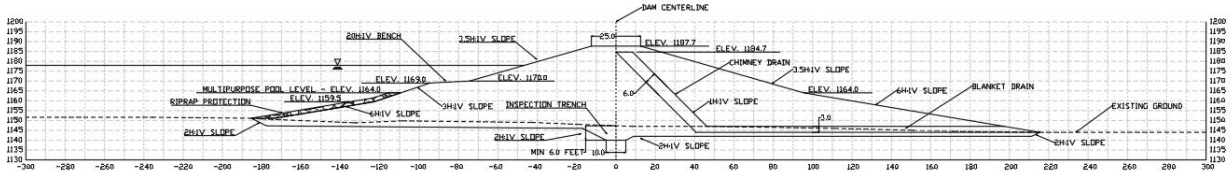

Figure 6. Cross-section of dam embankment for DS19

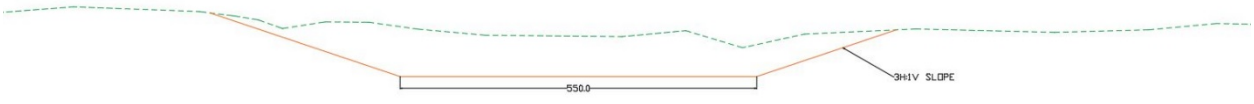

Figure 7. Spillway cross-section for DS19.

9.1 Physical and Chemical Characteristics (Subpart C)

9.1.1 Physical Substrate (230.20).

The soils in the upper portions of the basin where DS19 would be constructed are generally deep, well-drained silt loam to silty clay loam formed in loess. Substrate within the creek channel consists of these same soils that washed into the creek with the addition of crop residue and other organic matter from the vegetation lining the channel. Aquatic habitat within the creek channel is limited due to the small size of the stream and lack of habitat diversity within the channel. The habitat that does exist is of poor quality due to channelization and surrounding land use practices which primarily consist of row crop farming. The Creek channel is approximately 40-feet wide in the locations where the main dam and the sediment control basin would be constructed.

The Corps will take steps to minimize impacts to physical substrate that include implementation of project appropriate construction BMPs. Several measures would be implemented during construction to minimize water quality impacts that would include both structural and non-structural BMPs. Structural BMPs include perimeter controls such as straw bales and/or silt fencing and earthen berms. Non-structural BMPs would include keeping heavy construction equipment out of the waterway whenever possible, protecting construction materials from precipitation/flooding, and stabilizing bare soil by mulching and revegetation. Utilizing erosion control to prevent sediment from entering existing wetlands and preventing deleterious material from entering South Papillion Creek are examples of BMPs that would be used to reduce the amount of potential pollutants that reach the water resources adjacent to or downstream of the proposed project area.

Construction of the dam and sediment embankments would directly fill approximately 0.5 acres of the South Papillion Creek Channel with compacted fill material. The fill material used to construct the dam embankments would consist of silt loam to silty clay loam formed in loess that would be excavated from an area near the location of the dam to construct the auxiliary spillway for the dam. The dam embankment would be 1,450 feet long and would require approximately 322,250 cubic yards of earthen material to construct. Construction of the dam would block the creek channel and raise the substrate elevation within the dam embankment footprint to an elevation equal to the top of dam elevation. The top of the dam would be approximately 40 feet above the floodplain and 62 feet above the bottom of the creek channel. The intake structure would be a reinforced concrete box shaft with metal trash racks protecting the openings. The intake would also have two 6-feet wide by 5.5 feet tall low flow openings. The outlet conduit would be a reinforced concrete pipe with an inside diameter of 6 feet. The upstream face of the dam would be armored with 4,755 tons of clean riprap from a commercial quarry to protect it from wind wave erosion. The rip rap would be placed from the toe of the dam embankment up to the elevation of the multipurpose pool. The sediment control basin would be constructed within the boundaries of the floodpool of the reservoir just upstream of 204th street. The dam embankment for the sediment control basin would be approximately 860 feet long and the top of the dam would be about 9 feet above the floodplain. The fill material for this dam embankment would be excavated from the upstream pool area for the sediment control basin, so it would

consist of the same silt loam and silty clay loam formed in loess soils found in the bed of the creek channel. The normal pool control culvert would be a 36-inch reinforced concrete pipe. The pool behind the dam would cover approximately 12 acres.

The elevation of the substrate in the sediment control basin would increase over time as the heavier sediment from runoff events is trapped behind the dam and settles out in the basin. As portions of the pool become shallower due to sediment accumulation, wetland vegetation is expected to develop, and the open water areas would slowly transition into wetlands. A portion of the finer, suspended sediments associated with the surrounding loess soil types would pass through the sediment control basin and make it into the main reservoir. This suspended sediment would eventually settle out and raise the substrate elevation in the upstream portion of the lake. This change in substrate elevation would occur at a much slower rate than the accumulation of heavy sediments in the sediment control basin.

Physical effects on benthos may occur as a result of direct burial of less mobile organisms during construction of the dam embankments. However, these impacts are expected to be minor due to the small amount of habitat available in the narrow creek channel and the poor quality of the existing habitat. Construction of the reservoir may alter the makeup of the benthic community to species that prefer lake environments, however, the quantity and quality of available habitat for benthos would be greatly increased along the littoral zone of the lake. This would result in a more productive environment with a more abundant and diverse benthic community than currently exists within the South Papillion Creek in the proposed project area.

9.1.2 Suspended Particulates and Turbidity (230.21).

During normal to low flows in the South Papillion Creek, turbidity and suspended particulates are relatively low. However, during precipitation runoff events, the turbidity within the creek greatly increases primarily due to the fact that the majority of the land adjacent to the creek is actively farmed, so it does not have permanent vegetation to hold the soil in place. Project construction would result in short term, localized increases in turbidity within the creek channel. The Corps will take steps to minimize erosion and increases in turbidity during construction that include implementation of project appropriate construction BMPs as described in Section 9.1.1 above.

These measures would minimize increases in turbidity and sediment load, and limit damage to aquatic life outside the immediate area of operation during construction. Once the dam is constructed, and the reservoir is filled, the fine particles of the loess soils in the area are likely to cause temporary increases in turbidity in the lake during upstream runoff events, however the sediment retention basin is expected to significantly decrease the amount of bedload and suspended sediment that actually makes it into the reservoir. It is also likely that wind wave action in the shallow areas along the shoreline could cause localized increases in turbidity near the shore where the waves are stirring up the bottom sediments. These localized increases in turbidity would not significantly impact water quality in the lake. The water exiting the reservoir

downstream of the dam would likely remain less turbid than it would have prior to the dam being constructed due to the sediment trapping abilities of the sediment dam and the main dam.

9.1.3 Water (230.22).

As the reservoir behind DS19 fills, the creek will be converted from a lotic (flowing stream) to a lentic (lacustrine) environment. The water in the newly formed lake would be much more biologically productive than the flowing waters of the creek. This would be the result of a number of factors. First, the increased length of shoreline and shoreline habitat diversity would provide significantly more habitat for fish, macroinvertebrates, and other aquatic organisms. Second, the relatively more stable substrate in the shallower portions of the lake would facilitate the growth of aquatic submergent and emergent macrophytes that would not be able to grow in the flowing creek due to the unstable, moving substrate in the bed of the creek. These macrophytes provide substrate for colonization by aquatic macroinvertebrates, and food and cover for fish, reptiles and amphibians, aquatic and semi-aquatic mammals, shorebirds, and waterfowl. Third, the relatively still waters of the lake along with the greatly increased surface area compared to the existing creek, would support the growth of an abundance of phytoplankton, and zooplankton, which would be the drivers of the aquatic food chain in the lake.

Land use in the South Papillion Creek watershed upstream of the proposed dam site primarily consists of agriculture. Over time, the nutrient rich soil that washes into the creek from the farm fields will accumulate in the sediment retention basin, with smaller amounts making it into the upstream reaches of the reservoir. This accumulated sediment could eventually cause impacts to water quality due to the buildup of nutrients attached to the sediment. The nutrients could eventually contribute to algae blooms that increase turbidity and impact the dissolved oxygen content of the water. In areas where the accumulated sediment makes the water shallow, the bottom sediments would become more susceptible to being stirred up by wind wave action and increasing turbidity in these shallow water areas. These long-term effects of sedimentation in the reservoir would be slowed down and minimized by construction of the proposed sediment retention basin, and the implementation of programs or practices by the NRD or the Natural Resources Conservation Service (NRCS) in the watershed upstream of the proposed dam site, such as terracing, planting riparian buffer strips, grass waterways, livestock exclusion fencing, revegetation, and stream restoration. These practices would all help to prevent or slow degradation of the water quality within the lake over time by reducing the rate and amount of sediment and the attached nutrients and chemicals that flow into the lake after runoff events. The water exiting the reservoir downstream of the dam would likely remain less turbid than it would have prior to the dam being constructed due to the sediment trapping abilities of the sediment dam and the main dam. The water stored behind the dam would also provide more flow downstream of the dam during dry periods when the natural flows in the creek would be low. This increased flow during dry periods would have beneficial impacts to water quality in the creek downstream of the dam by diluting pollutants, lowering water temperature, and improving the dissolved oxygen content of the water.

9.1.4 Current Patterns and Water Circulation (230.23).

Construction of the dam at DS19 would alter the free-flowing characteristics of South Papillion Creek by causing the water behind the dam to back up and form a permanent 74-acre multipurpose pool. The habitat in the creek would be converted from a lotic (flowing stream) to a lentic (still-water lake) environment within the footprint of the multipurpose pool. Within the deepest portions of the multipurpose pool (near the dam) the water is likely to stratify as the water temperature changes with the seasons.

In the upstream portion of the creek between the edge of the multipurpose pool and the upstream edge of the floodpool, the creek would continue to function as a flowing stream during normal flows. However, during higher runoff events due to precipitation or snow melt, the water in this section of the creek would begin to back up and fill the floodpool. Once the precipitation event ends, and the floodpool drains back down to the elevation of the multipurpose pool, the creek would once again become a flowing stream.

Downstream of the dam, the creek would be less flashy, and the flood peaks would be reduced as a result of impoundment of the flood flows behind the dam.

9.1.5 Normal Water Fluctuations (230.24).

Construction of DS19 would alter normal water fluctuations within South Papillion Creek by capturing high flows within the reservoir pool and releasing them downstream in a more drawn out and controlled manner. This would reduce the flood peaks in the creek downstream of the dam. The elevation of the pool behind the dam would fluctuate with runoff events. The floodpool, which is the band between the elevation of the top of the multipurpose pool and the elevation of the top of the floodpool would fill to varying degrees after each runoff event. Once the runoff event has ended, the water in the floodpool would drain back down to the elevation of the top of the multipurpose pool.

9.1.6 Salinity Gradients (230.25).

The Papillion Creek Tributaries Basin is an inland, non-coastal waterway. No impacts to Salinity Gradients are expected.

9.2 Biological Characteristics (Subpart D)

NeSCAP was the selected habitat assessment tool to assess the potential impacts of the recommended plan on stream habitat function in the affected streams. Construction of DS19 would result in the conversion of over 4,843 feet of South Papillion Creek into lacustrine habitat. Based on the results of the NeSCAP analysis, this conversion would result in -35,976.57 project impact units. Since the NeSCAP model assesses impacts to streams, converting a stream to a lake results in negative project impact units that will require mitigation. Stream impact mitigation at DS19 would be accomplished by acquiring 5.5 acres of land straddling both sides of a 1,200-foot long segment of an unnamed tributary to the South Papillion Creek located west of Highway 6. This segment of the tributary is located just outside the edge of the floodpool on

the upstream end of the proposed reservoir. A 100-foot wide buffer of native prairie and wetland plants would be planted along both sides of the creek channel for a distance of 1,200 feet. Refer to Section 8.1 above for a more thorough discussion of the NeSCAP analysis and proposed mitigation for each alternative in the Recommended Plan.

9.2.1 Threatened and Endangered Species (230.30).

The northern long-eared bat is the only listed species that could potentially be found within the proposed project area. The northern long-eared bat was listed as federally threatened on May 2, 2015. The northern long-eared bat is distributed along the eastern half of the United States, with a range that extends into and throughout the majority of the state of Nebraska, including Douglas, Sarpy, and Washington Counties. During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. These bats are opportunistic and select roost tree species based on the tree's suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns and sheds. Northern long-eared bats spend the winter hibernating in caves and mines, referred to as hibernacula. They typically use large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents. Specific areas where they hibernate have very high humidity. During an agency scoping meeting for the proposed project on December 10, 2018, the Nebraska Game and Parks Commission (NGPC) stated that there are no known hibernacula for northern long-eared bats within the Papillion Creek Basin.

Tree clearing would be restricted to the period between November 1st and March 31st to avoid the taking of potential maternity roost trees during the pup season (June 1 to July 31) and to avoid taking potential roost trees during the active season (April 1 to October 31) for the bats. In addition, the filling of the reservoir behind DS19 would inundate and eventually kill approximately 19.5 acres of mature trees. It is estimated it could take up to five years for the reservoir to fill to its normal pool level. The trees within the reservoir would be expected to slowly die as the pool level rises, and portions of the crowns of the trees would likely remain above the normal pool elevation. Because the trees would slowly be flooded and slowly die, northern long-eared bats would be able to find other suitable trees to roost in outside the reservoir pool if and when the trees within the reservoir pool are completely inundated or otherwise become unsuitable habitat for the bats. For these reasons, the Recommended Plan may affect, but is not likely to adversely affect northern long-eared bats.

9.2.2 Fish and Other Aquatic Organisms (230.31)

A graduate thesis entitled Fishes of the Papillion Creek Tributaries Basin, Nebraska was completed in 2006. This document provided an inventory of the fish species in the Papillion Creek Basin, and an assessment of stream habitat quality within the basin by conducting an Index of Biotic Integrity (IBI). Results of the IBI determined that the fish population was dominated by generalist minnow species that are tolerant of lower quality habitat. As a result, the overall habitat quality of the streams within the basin was determined to be poor due to the high level of development along the creeks and the multiple modifications that have occurred

within the streams for flood risk reduction and bank stabilization. Twenty-three species of fish were collected in the streams of the Papillion Creek Basin during the 2006 study. Over 95 percent of the fish collected were species from the minnow family (cyprinidae). Three minnow species were collected from the South Papillion Creek. They included the bigmouth shiner, sand shiner, and fathead minnow. All three of these species are considered to be tolerant species. Tolerant species are adaptable to degradation of water quality, spawning and cover habitats, and food resources due to erosion and siltation, organic and inorganic pollution, channelization, and flow fluctuations.

Construction of DS19 would create a 74-acre lake within the existing creek valley. The proposed dam site would be constructed in the upstream portion of the creek's watershed where the channel is relatively small and the amount of available fish habitat is small, and of poor quality. The dam would create a barrier to upstream fish movement, however, there are no unique or important habitat areas located upstream of the dam that the fish would be blocked from accessing. Construction of the dam would convert over 4,800 feet of poor-quality stream fish habitat into a lake. The lake would be stocked with game species that prefer lake habitat such as largemouth bass, crappie, bluegill, and channel catfish. The reservoir that is created by DS19 would support a more diverse sport fish population that would differ from the riverine species composition historically found within the Papillion Creek basin prior to urbanization, channelization, dam construction and levee construction. Additionally, the trees that become inundated during dam construction would remain in-place and provide physical structure that would be used by fish as feeding, shelter and breeding habitat. The additional surface area provided by the inundated woody vegetation would provide substrate for macro invertebrate colonization, which in turn would serve as a food source for fish and other aquatic organisms. The construction of DS19 would result in long term, minor impacts to the fish community in the upper reaches of South Papillion Creek. The impacts would be considered minor due to the poor quality of the existing fish habitat, and low diversity and abundance of the existing fish population in the South Papillion Creek within the proposed project area.

9.2.3 Other Wildlife (230.32).

Land use within the proposed construction area for DS19 consists almost entirely of agriculture, so suitable wildlife habitat is currently limited to the forested banks of the creek channel and a narrow band (approximately 50 feet) of smooth brome grass located along the high banks on either side of the creek. Common mammals likely to use the habitat along the creek channel include the whitetail deer, Virginia opossum, raccoon, skunk, fox squirrel, red fox, and coyote. Various species of reptiles and amphibians, and migratory birds can also be found within the proposed project location. Construction of the dam would result in the removal and or death of approximately 19.5 acres of trees that currently line the creek channel. Approximately 2 acres of trees would have to be cleared to construct the dam, and 17.5 would be inundated by the permanent flooding of the multipurpose pool. Construction of the dam and flooding of the multipurpose pool would displace the wildlife currently using the forested habitat along the creek. The 19.5 acres of trees lost as a result of construction of DS19 would be mitigated by replanting 29.5 acres of native trees and shrubs within the band of land between the elevation of

the multipurpose pool and the elevation of the top of the floodpool. Refer to Section 8.2 above for an explanation of how appropriate mitigation of riparian forest habitat was determined. As the tree plantings mature over time, wildlife species displaced by construction would begin to utilize the new habitat areas. The tree plantings around DS19 would provide higher quality habitat than currently exists because the land surrounding the South Papillion Creek in the proposed project area is currently in agricultural production, providing lower quality habitat to most resident wildlife species within the area. Once DS19 is constructed, the project lands surrounding the multipurpose pool would be managed for recreation and wildlife habitat. This area would be planted with native grasses, shrubs, and trees; replacing the cropland that currently exists. The shallow edges of the lake would provide improved habitat for many species of reptiles and amphibians. The open water of the lake is likely to be used by waterfowl, and the shallows along the edge of the lake pool would provide habitat for a variety of shorebirds.

9.3 Special Aquatic Sites (Subpart E)

9.3.1 Sanctuaries and Refuges (230.40).

None present.

9.3.2 Wetlands (230.41).

The only wetlands that are present are located in a narrow band of low-quality riverine wetlands dominated by reed canary grass that line the edge of the low flow channel. The Creek channel is approximately 40-feet wide in the location where the dam would be constructed. Construction of the dam embankment would directly fill approximately 0.35 acres of palustrine emergent (PEM) wetlands within the creek channel. USACE requires a 4:1 mitigation ratio for changing the Nebraska Wetland Subclass of PEM wetlands from Riverine Channel to Lacustrine Fringe. The 0.35 acres of PEM wetlands lining the creek channel that would be lost at DS 19 would be partially mitigated by the wetlands that develop along the shallow edges of the bays of the proposed reservoir. In addition, 1.4 acres of PEM wetlands would be created by excavating shallow areas or bays connected to the edge of the normal pool area and planting them with a native wetland seed mix. These areas would be located within the property acquisition limits of the project. The cost of constructing 1.4 acres of PEM mitigation wetlands would include the cost of excavating the depressions next to the normal pool of the reservoir and seeding the excavated areas. The native wetland seed mix is estimated to cost about $150/pound, and it would be applied at a rate of 12 pounds/acre for a total seed cost of $1,800/acre. The estimated cost to plant the seed is $867/acre. The total cost of purchasing the seed and planting it is $2,667/acre. Table 5 below shows a breakdown of the proposed wetland mitigation costs for DS19.

Table 5. Wetland mitigation cost summary.

Impact Location	Habitat Type Impacted	Acres	Acres Replaced	Cost/Acre	Total RE Cost	Excavation Cost @ 9.09/CY	Seeding/Planting Cost/Acre	Total Implementation Cost	GRAND TOTAL MITIGATION COST
DS19	PEM Wetland	1.4	1.4	$ -	$ -	$ 50,413	$ 2,667	$ 3,734	$ 54,147
Grand Total		**1.4**	**1.4**		**$ -**			**$ 3,734**	**$ 54,147**

9.3.3 Mud Flats (230.42).

None present.

9.3.4 Vegetated Shallows (230.43).

None present.

9.3.5 Coral Reefs (230.44).

None present.

9.3.6 Riffle and Pool Complexes (230.45).

None present.

9.4 Human Use Characteristics (Subpart F)

9.4.1 Municipal and Private Water Supplies (230.50).

The South Papillion Creek is not known to be used as a source for municipal or private water supplies.

9.4.2 Recreational and Commercial Fisheries (230.51).

The portion of the South Papillion Creek in the proposed project area currently provides very few recreational fishing opportunities. The creek is very narrow, and shallow, and it is surrounded by private land with no public access. The fish population within the creek consists primarily of tolerant minnow species that have little value to recreational or commercial fishermen. Once DS19 is constructed, and the reservoir is filled, the new lake would provide excellent recreational fishing opportunities to the public. The lake is expected to be stocked with sport fish such as largemouth bass, bluegill, crappie, and channel catfish.

9.4.3 Water-Related Recreation (230.52).

The portion of South Papillion Creek located within the proposed project area is surrounded by private land with no public access. In addition, the creek is too narrow and shallow to provide any water related recreational activities. However, once the dam is constructed, and the reservoir is filled, a number of new water-related recreational activities, such as boating/kayaking, fishing, and wildlife viewing would become available around the new lake.

9.4.4 Aesthetics (230.53).

Construction of DS19 would convert approximately 74 acres of the narrow, vegetated creek bottom and the adjacent crop fields into an open water lake. In addition, the band of primarily agricultural land between the normal multipurpose pool elevation, and the elevation of the floodpool would be planted with native trees, shrubs, grasses, and forbs for wildlife habitat. Within this same band of land, recreation facilities such as hiking/biking trails, a boat ramp with a parking lot, and associated access roads and parking areas would be constructed. These changes would alter the visual characteristics of the project area. Aesthetics analyses are somewhat of a subjective realm of evaluation, and whether or not the visual impacts are seen as beneficial or adverse typically varies amongst individuals.

9.5 Contaminant Evaluation and Testing (Subpart G).

Primary pollutants identified in the Papio-Missouri River Basin Water Quality Management Plan (2018) include nutrients, pesticides, sediment and bacteria. Streambank instability and bed degradation are prevalent throughout the system from channelization, armoring, damming and increased surface runoff. Waterbody impairments for the Papillion Creek basin are associated with primary contact recreation and aquatic life designated uses. Impairments and pollutants of concern include excessive chlorophyll, total phosphorus, total nitrogen, sediment, mercury, algal blooms, turbidity, pH, low dissolved oxygen, *E. coli* bacteria and "unknown" which is likely associated with the loss of habitat for the aquatic community (NDEQ, 2018).

For the Papillion Creek segment (MT1-10100) which extends from the confluence of Big Papillion Creek downstream to its confluence with the Missouri River, TMDLs have been developed for E. coli in 2008 and approved in 2009 and the fish consumption advisory was lifted in 2012 however, according to the last reporting cycle in 2016, a TMDL was still needed for selenium (EPA, 2016). Big Papillion Creek (MT1-10120) and Little Papillion Creek (MT1-10111) have also been listed for E. coil and West Papillion Creek (MT1-10250) has been listed for Hazardous Index Compounds. As of 2016 Little Papillion and Big Papillion Creeks are classified as impairment-category 4A, meaning that these waterbodies have an EPA-approved TMDL plan in place and implemented while West Papillion Creek is categorized as a 5, meaning this waterbody has violated water quality standards and a TMDL is still needed (NDEQ, 2018).

In addition to the streams within the Papillion Creek basin, the Nebraska Department of Environmental Quality (NDEQ) conducted assessments on 15 of the 18 lakes present within this watershed, of those 11 were identified as impaired for fish consumption advisory, bacteria, nutrients, chlorophyll a and pH. Presently, the entire Papillion Creek watershed has been identified as a priority area by NDEQ (NDEQ, 2018). NDEQ has identified various practices that could help reduce the sedimentation, nutrient loading and E. coli present within the watershed; these priority identified measures include practices such as stream restoration, wetland restoration, grassed waterways, riparian buffers, riparian terracing, livestock exclusion fencing, cover crops and sediment control basins.

Only non-contaminated fill material would be used to construct the main dam and the sediment retention dam at DS19. The fill material would consist of local earthen material and clean rock obtained from commercial quarries. This material would not violate any water quality standards criteria for the state of Nebraska Title 117 Nebraska Surface Water Quality Standards.

9.6 Actions to Minimize Adverse Effects (Subpart H).

The planning process went through several iterations and evaluated a large range of structural and nonstructural measures. The range of study alternatives was refined based on preliminary analyses of effectiveness and cost. Several alternatives were screened from further consideration as they were found to be either economically unjustified or were less efficient at reducing flood damages than other alternatives.

Based on the analysis of potential impacts of the construction of DS19 to South Papillion Creek and its associated riparian forest and wetlands, it was determined that the impacts of the proposed construction included in the Recommended Plan to stream condition and function, riparian forest habitat, and wetlands would require mitigation. Total mitigation acreages and costs for DS19 are shown in Table 6 below.

Table 6. Total mitigation acreages and costs for Dam Site 19.

Impact Location	*Habitat Type Impacted*	*Acres Impacted*	*Acres Replaced*	*Cost/Acre*	*Total RE Cost*	*Excavation Cost @ 9.09/CY*	*Seeding/Planting Cost/Acre*	*Total Implementation Cost*	*GRAND TOTAL MITIGATION COST*
DS19	Stream	5.5	5.5	$ 8,854	$ 48,697	$ -	$ 1,800	$ 9,900	$ 58,597
DS19	Riparian Forest	19.5	29.5	$ -	$ -	$ -	$ 10,060	$ 296,770	$ 296,770
DS19	PEM Wetland	1.4	1.4	$ -	$ -	$ 50,413	$ 2,667	$ 3,734	$ 54,147
Grand Total		**26.4**	**36.4**		**$ 48,697**			**$ 310,404**	**$ 409,514**

In addition to screening of alternatives and compensatory mitigation, the Corps will take steps to minimize impacts that include implementation of project appropriate construction BMPs. Several measures would be implemented during construction to minimize water quality impacts that would include both structural and non-structural BMPs. Structural BMPs include perimeter controls such as straw bales and/or silt fencing and earthen berms. Non-structural BMPs would include keeping heavy construction equipment out of the waterway whenever possible, protecting construction materials from precipitation/flooding, and stabilizing bare soil by mulching and revegetation. Utilizing erosion control to prevent sediment from entering existing wetlands and preventing deleterious material from entering South Papillion Creek are examples of BMPs that would be used to reduce the amount of potential pollutants that reach the water resources adjacent to or downstream of the proposed project area.

Implementation of programs or practices by the NRD or the NRCS in the watershed upstream of the proposed dam site, such as terracing, planting riparian buffer strips, construction of sediment retention structures, revegetation, and stream restoration would all help to prevent degradation of the water within the lake over time as sediment and the attached nutrients and chemicals continue to flow into the lake.

9.7 Secondary and Cumulative Impacts.

9.7.1 Secondary Impacts

Secondary Impacts are the effects on an aquatic ecosystem that are associated with a discharge of dredged or fill material, but do not result from the actual placement of the dredged or fill material. Secondary effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Expected secondary effects are described below.

- The main secondary effect of placement of fill into South Papillion Creek to construct the proposed dam would be the formation of the 74-acre reservoir on the upstream side of the dam. The filling of the reservoir would convert 4,843 feet of stream channel into a 74-acre lake. The resulting loss of stream habitat function would be mitigated by the acquisition of 5.5 acres of land along both sides of a 1,200-foot long segment of an unnamed tributary to South Papillion Creek located upstream of the reservoir. A 100-foot wide buffer of native grasses, forbs, and wetland plants would be planted along both sides of the 1,200-foot long segment.

- The filling of the reservoir would also inundate and eventually kill approximately 19.5 acres of riparian forest habitat that currently lines the creek channel. The loss of this habitat would be mitigated by planting 29.5 acres of native trees and shrubs in designated locations within the band of land between the elevation of the multipurpose pool and the elevation of the top of the floodpool.

- The floodpool of the reservoir would capture higher runoff events and release them at a slower rate over a longer period of time than would have occurred without the dam. This would decrease the floodpeaks in the creek downstream of the dam.

- The existing aquatic habitat in South Papillion Creek is of limited quantity, and poor quality due to the small size of the creek, the surrounding land use (agriculture), and straightening and other manipulations that have been made to the creek channel over time. The more diverse and abundant aquatic habitat that develops in the lake would support a greater abundance and diversity of aquatic species than the creek currently supports. It would also support a recreational fishery that currently does not exist in the South Papillion Creek

- The conversion of land use surrounding the reservoir from agricultural to wildlife habitat and limited recreational facilities would increase the quality and abundance of wildlife habitat, and provide recreational opportunities to the public where none currently exist. Recreational opportunities would include hiking, biking, fishing, boating, kayaking, and wildlife viewing.

- Construction of the dam and reservoir may also result in improvement to downstream water quality by trapping sediment and attached nutrients in the reservoir and releasing the cleaner water through the dam. There may also be improvement to downstream water quality during low flow periods because the water stored behind the dam would be available for release downstream for a longer period of time than if the creek was not impounded.

9.7.2 Cumulative Impacts

Cumulative impacts are the changes in an aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material. Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous separate actions can result in major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems. Cumulative effects attributable to the discharge of dredged or fill material in waters of the United States should be predicted to the extent reasonable and practicable.

Extensive alteration within the Papillion Creek Basin has been occurring since the early 1900's. To protect Omaha from flooding, drainage districts were formed between 1910 and 1928 and significant channelization of the Big Papillion Creek and its contributing tributaries began. Additionally, the Nebraska Department of Roads and Irrigation have historical accounts that indicate the majority of Papillion Creek, Big Papillion Creek and West Papillion Creek were straightened between 1910 and 1913 (Rus et al., 2003). The upper portion of the South Papillion Creek Watershed is primarily surrounded by row crop agriculture with some livestock farming. The lower portion of the watershed is surrounded by residential developments, commercial businesses, roads, parking lots, and other impervious surfaces. In the agricultural areas, the land is often farmed to within 50 feet of the creek channel. The only riparian habitat available is usually confined to the banks of the creek channel, and a thin buffer of smooth brome grass. Other flood risk reduction projects have been constructed on tributaries to the South Papillion Creek over the years. Wehrspann Lake was constructed on a tributary to the South Papillion Creek downstream of proposed DS19. This 246-acre lake opened to the public in 1988, and it provides flood risk reduction and recreation benefits to the surrounding community. Prairie Queen Recreation Area, which is another lake that provides flood risk reduction and recreation benefits, opened to the public in 2015. Prairie Queen was constructed on another tributary to South Papillion Creek downstream of Wehrspann Lake.

Residential and commercial development is moving farther up into the watershed, and it is likely to replace the agriculture surrounding the proposed project lands within the next ten to twenty years. This would eventually decrease the amount of sediment and agricultural runoff entering South Papillion Creek, but it would increase the amount of impervious surfaces in the watershed resulting in more runoff and potential flood risk along the stream.

The added increment of constructing DS19 would not cause significant adverse cumulative impacts to south Papillion Creek or its associated watershed. The creek has been straightened

and modified multiple times since the early 1900s. The existing aquatic habitat in the creek is of poor quality, and the adjacent riparian habitat is sparse and degraded due to the adjacent land use practices which primarily consist of row crop agriculture. Although 4,800 feet of the creek would be converted to a lake. The habitat quantity, quality, and diversity provided by the lake would benefit a greater number of aquatic and terrestrial species than the current creek channel provides. In addition, impacts to wetlands, stream habitat function, and riparian forest would all be mitigated, so the proposed project would result in no significant adverse impacts.

9.8 Compliance With the Guidelines (Subpart B)

9.8.1 Factual Determinations (230.11).

9.8.1.1 Physical Substrate Determinations.

Physical and chemical substrate conditions and potential impacts to physical and chemical properties are discussed in Section 9.1.1. The proposed project would result in temporary impacts to the existing substrate during construction. Measures including structural and non-structural BMPs to reduce temporary effects during construction would be implemented as described in Section 9.1.1. Long-term minor impacts to substrate slope and elevation would occur as a result of dam construction and the formation of the reservoir behind the dam. These impacts would be minimized as described in Section 9.6.

9.8.1.2 Suspended Particulate/Turbidity Determinations.

Suspended particulates and turbidity existing conditions and potential impacts are described in Section 9.1.2. The proposed project would result in minor temporary and localized increases in suspended particulates during construction. The Corps will take steps to minimize erosion and the associated increases in turbidity during construction that include implementation of project appropriate construction BMPs as described in Section 9.1.1 above. These measures would minimize increases in turbidity and sediment load, and limit damage to aquatic life outside the immediate area of operation during construction. Once the reservoir behind the dam fills, episodic increases in turbidity would occur after runoff events. The proposed sediment retention basin would help to minimize the increases in turbidity tied to runoff events. Localized areas of minor increases in turbidity in shallow areas impacted by wind wave action would also occur. These episodic and localized increases in turbidity within the reservoir would not significantly impact the water quality within the reservoir, and they would be similar to what is experienced in other man-made reservoirs constructed within the Papillion Creek Basin.

9.8.1.3 Water.

Water quality existing conditions are described in Section 5.7 of the EA. Potential impacts of the proposed project to water quality are described in Section 9.1.3 above. Construction of the proposed project would result in minor increases in turbidity and the potential for spills or leaks from construction equipment. Long-term beneficial effects include improvements to beneficial uses for aquatic life through increases in habitat quantity and quality in the new lake compared to

what currently exists in the South Papillion Creek Channel. There would also be downstream water quality improvements as a result of increased minimum flows during dry periods. Long-term adverse impacts to water quality could occur over time as the reservoir ages and sediment accumulates. Measures to reduce these potential adverse effects are described in Section 9.6.

9.8.1.4 Current Patterns, Water Circulation, and Fluctuation Determinations.

Current patterns, water circulation, and fluctuation existing conditions and potential impacts are described in Sections 9.1.4 and 9.1.5. The proposed project would have long-term impacts to current patterns, water circulation, and fluctuation. These impacts would occur as a result of converting a portion of the free-flowing South Papillion Creek into an impounded reservoir. The impacts of these changes would be minimized as described in Section 9.6. Construction of the dam in conjunction with the proposed mitigation and implementation of BMPs would not violate Section 404(b)(1) guidelines.

9.8.1.5 Salinity Determinations.

Salinity determinations are not applicable to the South Papillion Creek.

9.8.1.6 Aquatic Ecosystem and Organism Determinations.

The aquatic ecosystem and organism existing conditions and potential impacts within the proposed project area are described in Section 9.2. The Nebraska Stream Condition Assessment Procedure (NeSCAP) was the selected habitat assessment model used to assess baseline environmental conditions for the study. Conversion of over 4,843 feet of South Papillion Creek to lacustrine habitat at Dam Site 19 would result in -35,976.57 project impact units. Since the NeSCAP model assesses impacts to streams, converting a stream to a lake results in negative project impact units that will require mitigation. Mitigation for stream habitat function would be accomplished along 1,200 feet of an unnamed tributary to the South Papillion Creek as described in Appendix 1 of the EA. The removal or death of 19.5 acres of trees as a result of dam construction may effect, but is not likely to adversely effect the northern long-eared bat. Construction of DS19 would create a fish passage barrier within the creek that would result in long-term minor impacts to fish. The impacts would be considered minor due to the poor quality of the existing fish habitat, and low diversity and abundance of the existing fish population in the South Papillion Creek within the proposed project area.

Short-term minor impacts to fish and other aquatic and benthic organisms would occur during construction. Impacts would include short-term increases in turbidity, direct burial of less mobile organisms during placement of fill, and temporary displacement during construction. Short-term minor impacts to terrestrial mammals and birds would occur as a result of tree removal, the movement of heavy construction equipment, and increased noise and other disturbances from construction activities. Measures to reduce adverse effects during construction would be implemented as described in Section 9.6. Long-term benefits to fish, other aquatic and semi-aquatic organisms, and terrestrial wildlife would occur as a result of the

increased quality and quantity of aquatic habitat that would develop in the new reservoir, and the conversion of farmland to wildlife habitat that would occur around the perimeter of the lake.

9.8.1.7 Special Aquatic Sites Determinations.

Existing wetlands and potential impacts to wetlands are described in Section 9.3.2. Approximately 0.35 acres of palustrine emergent (PEM) wetlands would be impacted by the proposed project. These impacts would be mitigated by construction 1.4 acres of PEM wetlands by excavating shallow areas or bays connected to the edge of the normal pool area and planting them with a native wetland seed mix. Wetlands are also expected to form within the pool of the upstream sediment retention basin as it becomes shallower due to deposition of sediment. For these reasons, impacts to wetlands are not considered to be significant.

9.8.1.8 Human Use Characteristics Determinations.

The fish population within South Papillion Creek primarily consists of tolerant minnow species that have little value to recreational or commercial fisherman. Once DS19 is constructed, and the reservoir is filled, the new lake would provide excellent recreational fishing opportunities to the public. The lake is expected to be stocked with sport fish such as largemouth bass, bluegill, crappie, and channel catfish.

The portion of South Papillion Creek located within the proposed project area is surrounded by private land with no public access. In addition, the creek is too narrow and shallow to provide any water related recreational activities. However, once the dam is constructed, and the reservoir is filled, a number of new water-related recreational activities, such as boating/kayaking, fishing, and wildlife viewing would become available around the new lake.

Construction of DS19 and the associated wildlife habitat development, and construction of recreational facilities would alter the visual characteristics of the project area. Whether or not these visual impacts are seen as beneficial or adverse would vary amongst individuals.

9.8.1.9 Contaminant Determinations.

Only non-contaminated fill material would be used to construct the main dam and the sediment retention dam at DS19. The fill material would consist of local earthen material and clean rock obtained from commercial quarries. This material would not violate any water quality standards criteria for the state of Nebraska Title 117 Nebraska Surface Water Quality Standards.

9.8.1.10 Determination of Cumulative Effects on Aquatic Ecosystem.

Cumulative impacts are impacts on the environment that result from the incremental impact of actions when added to other past, present, and reasonably foreseeable future actions. The added increment of constructing DS19 would not cause significant adverse cumulative impacts to south Papillion Creek or its associated watershed. The creek has been straightened and modified multiple times since the early 1900s. The existing aquatic habitat in the creek is of poor quality, and the adjacent riparian habitat is sparse and degraded due to the adjacent land use practices

which primarily consist of row crop agriculture. Although 4,800 feet of the creek would be converted to a lake. The habitat quantity, quality, and diversity provided by the lake would benefit a greater number of aquatic and terrestrial species than the current creek channel provides. In addition, impacts to wetlands, stream habitat function, and riparian forest would all be mitigated, so the proposed project would result in no significant adverse impacts.

9.8.1.11 Determination of Secondary Effects on the Aquatic Ecosystem.

Secondary Impacts are the effects on an aquatic ecosystem that are associated with a discharge of dredged or fill material, but do not result from the actual placement of the dredged or fill material. Adverse secondary effects of the proposed project include conversion of a stream into a lake, and the inundation and death of 19.5 acres of trees that would occur as the reservoir fills. These impacts would be mitigated as described in Section 9.6. Beneficial secondary effects include, decreased floodpeaks downstream of the dam, improved quantity of aquatic and terrestrial habitat, increased recreational opportunities, and potential downstream water quality benefits.

9.8.2 Findings of Compliance or Non-compliance with the Restrictions on Discharge (230.12).

a. Our Review of Water Quality Standards established by the State of Nebraska indicates that the proposed discharge would not violate any applicable state water quality standards.

b. The Proposed Action would not result in significant adverse impacts to human health and welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, shellfish, wildlife or special aquatic sites.

c. All appropriate steps to minimize adverse environmental impacts have been taken.

d. The Proposed Action would not jeopardize the existence of Federally listed endangered or threatened species or their habitat.

e. No significant adaptations of the guidelines were made relative to this evaluation.

9.8.3 Conclusions

Based on all of the above, the Proposed Action is determined to be in compliance with the Section 404(b)(1) Guidelines

10.0 Dam Site 10

To reduce flood risk along the Little Papillion Creek, Dam Site 10 would be constructed along Thomas Creek, which is a tributary to the Little Papillion Creek. The proposed dam site would

be constructed in Washington County, Nebraska near the intersection of North 126th Street and Highway 36. A 1,450-foot long dam would be constructed across the creek to form a dry dam within the creek valley. The auxiliary spillway would be 1,417 feet long with a 100-foot bottom width. Dry dams are catchment areas designed to hold excess water in times of flooding and drain to a largely dry pool with negligible water storage in normal conditions. These structures provide short term flood storage to reduce downstream flood risk. A dry dam does not maintain a permanent reservoir pool, so the entire potential volume of its reservoir is available for flood storage. Land acquisition within the floodpool would be in the form of flowage easements instead of fee title. No habitable structures would be allowed within the flowage easements, but land uses such as farming would still be permitted. Construction of the dam embankment would require the placement of 408,000 cubic yards of earthen material excavated from the location of the auxiliary spillway. The dam would have a concrete intake structure with a trash rack that would be connected to an 8-foot wide by 7 feet tall box culvert that would serve as the outlet pipe.

Compensatory mitigation associated with the construction of DS10 would include 3 acres of riparian forest habitat mitigation and 4.6 acres of mitigation for loss of stream habitat function. Figure 6 below shows the footprint of the proposed dam and spillway at DS10. Figure 7 is a cross section of the proposed dam embankment. Figure 8 is a cross section of the proposed auxiliary spillway.

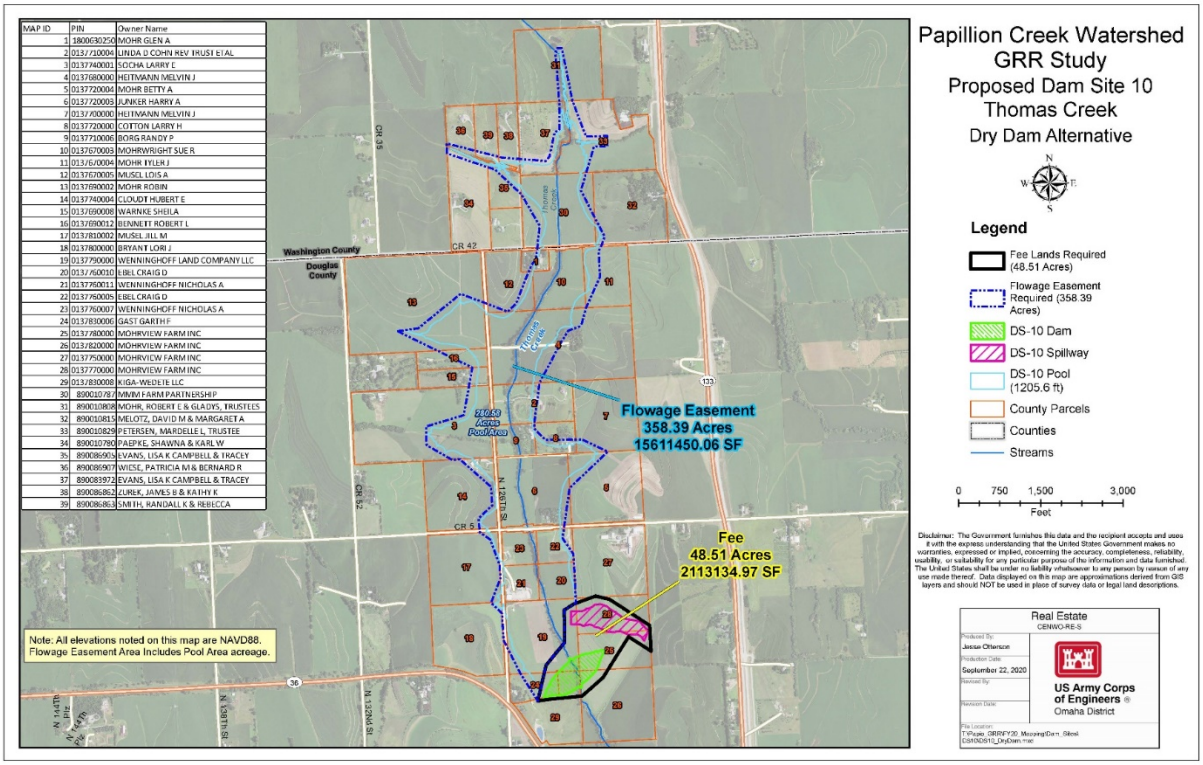

Figure 6. Footprint of the proposed dam embankment and auxiliary spillway at DS10.

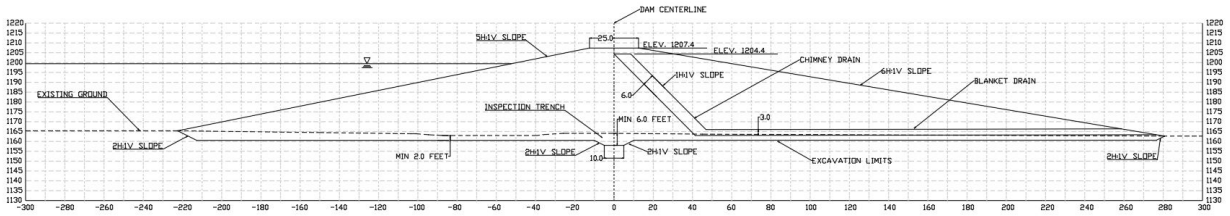

Figure 7. Cross section of the proposed dam embankment at DS10.

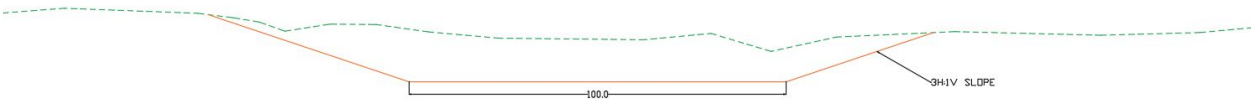

Figure 8. Cross section of the proposed auxiliary spillway at DS10.

10.1 Physical and Chemical Characteristics (Subpart C)

10.1.1 Physical Substrate (230.20).

The soils in the upper portions of the basin where DS10 would be constructed are generally deep, well-drained silt loam to silty clay loam formed in loess. Substrate within the creek channel consists of these same soils that washed into the creek with the addition of crop residue and other organic matter from the vegetation lining the channel. Aquatic habitat within the creek channel is limited due to the small size of the stream and lack of habitat diversity within the channel. The habitat that does exist is of poor quality due to channelization and surrounding land use practices which primarily consist of row crop farming. The Creek channel is approximately 30-feet wide in the location where the dam embankment would be constructed.

The Corps will take steps to minimize impacts to physical substrate that include implementation of project appropriate construction BMPs. Several measures would be implemented during construction to minimize water quality impacts that would include both structural and non-structural BMPs. Structural BMPs include perimeter controls such as straw bales and/or silt fencing and earthen berms. Non-structural BMPs would include keeping heavy construction equipment out of the waterway whenever possible, protecting construction materials from precipitation/flooding, and stabilizing bare soil by mulching and revegetation. Utilizing erosion control to prevent sediment from entering existing wetlands and preventing deleterious material from entering Thomas Creek are examples of BMPs that would be used to reduce the amount of potential pollutants that reach the water resources adjacent to or downstream of the proposed project area.

Construction of the dam embankment would directly fill approximately 0.4 acres of the Thomas Creek Channel with compacted fill material; of which 0.25 acres are PEM wetlands. The fill material used to construct the dam embankments would consist of silt loam to silty clay loam

formed in loess that would be excavated from an area near the location of the dam to construct the auxiliary spillway for the dam. The top of the dam embankment would be 1,385 feet long and would require approximately 408,000 cubic yards of earthen material to construct. Construction of the dam would block the creek channel and raise the substrate elevation within the dam embankment footprint to an elevation equal to the top of dam elevation. The dam would have a concrete intake structure with a trash rack that would be connected to an 8-foot wide by 7 feet tall box culvert that would serve as the outlet pipe. The upstream face of the dam would be armored with 4,755 tons of clean riprap from a commercial quarry to protect it from wind wave erosion.

Construction of DS10 would result in the formation of an 800-foot long backwater pool within the creek channel upstream of the dam face. Water in this 800-foot long segment of the creek will back up behind the dam and remain approximately 3 feet deeper than it currently is during normal flows. This deeper water would still be contained within the banks of the existing creek channel. The ground adjacent to the creek within the 800-foot long backwater area would remain wetter than it would have without the proposed project. Wetland vegetation is expected to develop in these areas with wetter soil. Sediment would be trapped over time within this backwater pool and the substrate elevation will increase as the sediment builds up. The elevation of the substrate in the sediment control basin would increase over time as the heavier sediment from runoff events is trapped behind the dam and settles out in the basin. As portions of the pool become shallower due to sediment accumulation, wetland vegetation is expected to develop, and the open water areas would slowly transition into wetlands.

Physical effects on benthos may occur as a result of direct burial of less mobile organisms during construction of the dam embankment. However, these impacts are expected to be minor due to the small amount of habitat available in the narrow creek channel and the poor quality of the existing habitat. Mobile organisms would be temporarily displaced due to disturbances caused during construction. The pool and wetland habitat that develops in the 800-foot long backwater would result in a more productive environment with a more diverse and abundant benthic community than currently exists within Thomas Creek in the proposed project area.

10.1.2 Suspended Particulates and Turbidity (230.21).

During normal to low flows in Thomas Creek, turbidity and suspended particulates are relatively low. However, during precipitation runoff events, the turbidity within the creek greatly increases primarily due to the fact that the majority of the land adjacent to the creek is actively farmed, so it does not have permanent vegetation to hold the soil in place. Project construction would result in short term, localized increases in turbidity within the creek channel. The Corps will take steps to minimize erosion and increases in turbidity during construction that include implementation of project appropriate construction BMPs as described in Section 10.1.1 above. These measures would minimize increases in turbidity and sediment load, and limit damage to aquatic life outside the immediate area of operation during construction. Once the dam is constructed, turbidity caused by the finer suspended sediment in the water column after runoff events would result in an increased duration of elevated turbidity downstream as the stored floodwater in the

dam drains back to its normal level. This minor increase in the duration of elevated turbidity within Thomas Creek would not significantly impact water quality in the creek.

10.1.3 Water (230.22).

Because DS10 would be a dry dam, only minor changes to environmental characteristics and values of the water within Thomas Creek would occur. Construction of the dam would create an 800-foot long backwater pool that would be contained within the banks of the existing creek channel. This pool would provide valuable habitat to fish, reptiles and amphibians, macroinvertebrates, and other aquatic and semi-aquatic organisms. The deeper water within the pool would also saturate the soil adjacent to the top of the creek channel and cause wetland plants to become established. During normal flows, the portions of the creek upstream and downstream of the backwater pool would continue to flow and function as a stream. During runoff events, the water in the creek upstream of the dam would back up and leave the banks of the creek and form a pool on the adjacent floodplain. The size and depth of the pool would be dependent on the magnitude of the runoff event. It would take approximately 24 hours for the maximum flood pool to drain. Because the creek would continue to flow during normal flows, and the flood pool would drain in 24 hours or less after runoff events, nutrients and other chemicals would not be able to build up and adversely impact the water quality in the creek to the same degree that they would if DS10 was a wet dam with a permanent pool. Short term, localized increases in turbidity within the creek channel would occur during construction. The Corps will take steps to minimize erosion and increases in turbidity during construction that include implementation of project appropriate construction BMPs as described in Section 10.1.1 above. Implementation of these measures during construction would ensure that impacts to water in Thomas Creek would be short-term and minor.

10.1.4 Current Patterns and Water Circulation (230.23).

Construction of the dam at DS10 would alter the free-flowing characteristics of Thomas Creek to a lesser degree than the wet dam at DS19. Construction of the dam would create an 800-foot long backwater pool that would be contained within the banks of the existing creek channel. During normal flows, the portions of the creek upstream and downstream of the backwater pool would continue to flow and function as a stream. During runoff events, the water in the creek upstream of the dam would back up and form a pool. The size and depth of the pool would be dependent on the magnitude of the runoff event. It would take approximately 24 hours for the maximum flood pool to drain. These impacts would be considered to be long-term and minor.

Downstream of the dam, the creek would be less flashy, and the flood peaks would be reduced as a result of temporary impoundment and slower release of the flood flows behind the dam.

10.1.5 Normal Water Fluctuations (230.24).

Construction of DS10 would alter normal water fluctuations within South Papillion Creek by capturing high flows within the flood pool and releasing them downstream in a more drawn out and controlled manner. This would reduce the flood peaks in the creek downstream of the dam.

During normal flows, the creek would remain within its banks and continue to flow. The land within the flood pool upstream of the dam would normally remain dry. The creek would only leave its banks and begin to fill the flood pool during runoff events. Once the runoff event has ended, the water in the flood pool would drain back down to within the banks of the creek.

10.1.6 Salinity Gradients (230.25).

The Papillion Creek Tributaries Basin is an inland, non-coastal waterway. No impacts to Salinity Gradients are expected.

10.2 Biological Characteristics (Subpart D)

NeSCAP was the selected habitat assessment tool to assess the potential impacts of the recommended plan on stream habitat function in the affected streams. Construction of a dry dam at Dam Site 10 on Thomas Creek would not convert the creek to a lake, however, it would impact the function of the stream enough to require mitigation of 23,414.29 negative project impact units. Negative impacts to Thomas Creek caused by the proposed project would be mitigated by acquiring a total of 4.6 acres of land straddling both sides of a 1,000-foot long segment of the creek just upstream of Pawnee Road. This segment is located within the floodpool of the proposed dry dam. However, because a dry dam with no permanent pool is being proposed, this segment would be suitable for mitigation. Stream mitigation would primarily consist of planting a 100-foot wide buffer of native prairie and wetland plants along each side of the creek for 1,000 feet. Refer to Section 8.1 above for a more thorough discussion of the NeSCAP analysis and proposed mitigation for each alternative in the Recommended Plan.

10.2.1 Threatened and Endangered Species (230.30).

The northern long-eared bat is the only listed species that could potentially be found within the proposed project area. The northern long-eared bat was listed as federally threatened on May 2, 2015. The northern long-eared bat is distributed along the eastern half of the United States, with a range that extends into and throughout the majority of the state of Nebraska, including Douglas, Sarpy, and Washington Counties. During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. These bats are opportunistic and select roost tree species based on the tree's suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns and sheds. Northern long-eared bats spend the winter hibernating in caves and mines, referred to as hibernacula. They typically use large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents. Specific areas where they hibernate have very high humidity. During an agency scoping meeting for the proposed project on December 10, 2018, the NGPC stated that there are no known hibernacula for northern long-eared bats within the Papillion Creek Basin.

Approximately 2 acres of trees would have to be cleared to construct the dam embankment. Tree clearing would be restricted to the period between November 1st and March 31st to avoid the

taking of potential maternity roost trees during the pup season (June 1 to July 31) and to avoid taking potential roost trees during the active season (April 1 to October 31) for the bats. For these reasons, the Recommended Plan may affect, but is not likely to adversely affect northern long-eared bats.

10.2.2 Fish and Other Aquatic Organisms (230.31).

A graduate thesis entitled Fishes of the Papillion Creek Tributaries Basin, Nebraska was completed in 2006. This document provided an inventory of the fish species in the Papillion Creek Basin, and an assessment of stream habitat quality within the basin by conducting an Index of Biotic Integrity (IBI). Results of the IBI determined that the fish population was dominated by generalist minnow species that are tolerant of lower quality habitat. As a result, the overall habitat quality of the streams within the basin was determined to be poor due to the high level of development along the creeks and the multiple modifications that have occurred within the streams for flood risk reduction and bank stabilization. Twenty-three species of fish were collected in the streams of the Papillion Creek Basin during the 2006 study. Over 95 percent of the fish collected were species from the minnow family (cyprinidae). Four minnow species were collected in Thomas Creek downstream from the proposed location of DS10. Species collected included the bigmouth shiner, sand shiner, fathead minnow, and creek chub. All four of these species are considered to be tolerant species. Tolerant species are adaptable to degradation of water quality, spawning and cover habitats, and food resources due to erosion and siltation, organic and inorganic pollution, channelization, and flow fluctuations.

Construction of the dam would create a barrier to upstream fish movement, however, there are no unique or important habitat areas located upstream of the dam that the fish would be blocked from accessing. Construction of the dam would create an 800-foot long backwater pool that would be contained within the banks of the existing creek channel. This pool would provide valuable habitat to fish, reptiles and amphibians, macroinvertebrates, and other aquatic and semi-aquatic organisms. The construction of DS10 would result in long term, minor impacts to the fish community in the upper reaches of Thomas Creek. The impacts would be considered minor due to the poor quality of the existing fish habitat, and low diversity and abundance of the existing fish population in the Thomas Creek within the proposed project area.

10.2.3 Other Wildlife (230.32).

Land use within the proposed construction area for DS10 consists almost entirely of agriculture, so suitable wildlife habitat is currently limited to the forested banks of the creek channel and a narrow band (approximately 50 feet) of smooth brome grass located along the high banks on either side of the creek. Common mammals likely to use the habitat along the creek channel include the whitetail deer, Virginia opossum, raccoon, skunk, fox squirrel, red fox, and coyote. Various species of reptiles and amphibians, and migratory birds can also be found within the proposed project location. Approximately 2 acres of trees would have to be cleared to construct the dam embankment. Removal of these trees would displace the wildlife currently using the forested habitat along the creek within these 2 acres. The 2 acres of trees lost as a result of construction of DS10 would be mitigated by replanting 3 acres of native trees and shrubs along

Thomas Creek upstream of the dam within the flood pool of the dry dam. Refer to Section 8.2 above for an explanation of how appropriate mitigation of riparian forest habitat was determined. As the tree plantings mature over time, wildlife species displaced by construction would begin to utilize the new habitat areas.

10.3 Special Aquatic Sites (Subpart E)

10.3.1 Sanctuaries and Refuges (230.40).

None present.

10.3.2 Wetlands (230.41).

The only wetlands that are present are located in a narrow band of low-quality riverine wetlands dominated by reed canary grass that line the edge of the low flow channel. The Creek channel is approximately 30-feet wide in the location where the dam would be constructed. Construction of the dam embankment would directly fill approximately 0.25 acres of palustrine emergent (PEM) wetlands within the creek channel. The 0.25 acres of PEM wetlands lost at Dam Site 10 would be mitigated by the wetlands that will develop adjacent to the creek bed along the 800-foot long backwater pool that would be created within the creek channel upstream of the dam face. Water in this 800-foot long segment of the creek will back up behind the dam and remain approximately 3 feet deeper than it currently is during normal flows. This will cause the ground along the banks of the creek to remain wetter than they would be without the proposed project. Wetland vegetation is expected to develop in these areas with wetter soil. In addition, construction of the dam would cause the 2-year event to leave the banks of the creek and temporarily flood approximately 6 acres of land that is currently farmed. This more frequently flooded area is expected to no longer be farmable and much of the area will develop wetland characteristics over time.

10.3.3 Mud Flats (230.42).

None present.

10.3.4 Vegetated Shallows (230.43).

None present.

10.3.5 Coral Reefs (230.44).

None present.

10.3.6 Riffle and Pool Complexes (230.45).

None present.

10.4 Human Use Characteristics (Subpart F)

10.4.1 Municipal and Private Water Supplies (230.50).

Thomas Creek is not known to be used as a source for municipal or private water supplies.

10.4.2 Recreational and Commercial Fisheries (230.51).

The portion of the Thomas Creek in the proposed project area currently provides very few recreational fishing opportunities. The creek is very narrow, and shallow, and it is surrounded by private land with no public access. The fish population within the creek consists primarily of tolerant minnow species that have little value to recreational or commercial fishermen.

10.4.3 Water-Related Recreation (230.52).

The portion of Thomas Creek located within the proposed project area is surrounded by private land with no public access. In addition, the creek is too narrow and shallow to provide any water related recreational activities.

10.4.4 Aesthetics (230.53).

Construction of the dam embankment at DS10 would alter the visual characteristics of the landscape in the proposed project area. The top of the dam embankment would be elevated high above the existing floodplain. In addition, the wetlands that develop along the 800-foot long backwater pool, the 3 acres of riparian forest mitigation plantings, and the 4.6 acres of stream mitigation plantings would all convert farm land to more natural habitat with permanent vegetative cover Aesthetics analyses are somewhat of a subjective realm of evaluation, and whether or not the visual impacts are seen as beneficial or adverse typically varies amongst individuals.

10.5 Contaminant Evaluation and Testing (Subpart G).

Primary pollutants identified in the Papio-Missouri River Basin Water Quality Management Plan (2018) include nutrients, pesticides, sediment and bacteria. Streambank instability and bed degradation are prevalent throughout the system from channelization, armoring, damming and increased surface runoff. Waterbody impairments for the Papillion Creek basin are associated with primary contact recreation and aquatic life designated uses. Impairments and pollutants of concern include excessive chlorophyll, total phosphorus, total nitrogen, sediment, mercury, algal blooms, turbidity, pH, low dissolved oxygen, *E. coli* bacteria and “unknown” which is likely associated with the loss of habitat for the aquatic community (NDEQ, 2018).

For the Papillion Creek segment (MT1-10100) which extends from the confluence of Big Papillion Creek downstream to its confluence with the Missouri River, TMDLs have been developed for E. coli in 2008 and approved in 2009 and the fish consumption advisory was lifted in 2012 however, according to the last reporting cycle in 2016, a TMDL was still needed for selenium (EPA, 2016). Big Papillion Creek (MT1-10120) and Little Papillion Creek (MT1-10111) have also been listed for E. coil and West Papillion Creek (MT1-10250) has been listed for Hazardous Index Compounds. As of 2016 Little Papillion and Big Papillion Creeks are classified as impairment-category 4A, meaning that these waterbodies have an EPA-approved

TMDL plan in place and implemented while West Papillion Creek is categorized as a 5, meaning this waterbody has violated water quality standards and a TMDL is still needed (NDEQ, 2018).

In addition to the streams within the Papillion Creek basin, the Nebraska Department of Environmental Quality (NDEQ) conducted assessments on 15 of the 18 lakes present within this watershed, of those 11 were identified as impaired for fish consumption advisory, bacteria, nutrients, chlorophyll a and pH. Presently, the entire Papillion Creek watershed has been identified as a priority area by NDEQ (NDEQ, 2018). NDEQ has identified various practices that could help reduce the sedimentation, nutrient loading and E. coli present within the watershed; these priority identified measures include practices such as stream restoration, wetland restoration, grassed waterways, riparian buffers, riparian terracing, livestock exclusion fencing, cover crops and sediment control basins.

Only non-contaminated fill material would be used to construct the dam at DS10. The fill material would consist of local earthen material and clean rock obtained from commercial quarries. This material would not violate any water quality standards criteria for the state of Nebraska Title 117 Nebraska Surface Water Quality Standards.

10.6 Actions to Minimize Adverse Effects (Subpart H).

The planning process went through several iterations and evaluated a large range of structural and nonstructural measures. The range of study alternatives was refined based on preliminary analyses of effectiveness and cost. Several alternatives were screened from further consideration as they were found to be either economically unjustified or were less efficient at reducing flood damages than other alternatives.

Based on the analysis of potential impacts of the construction of DS10 to Thomas Creek and its associated riparian forest and wetlands, it was determined that the impacts of the proposed construction included in the Recommended Plan to stream condition and function, and riparian forest habitat would require mitigation. Total mitigation acreages and costs for DS10 are shown in Table 7 below.

Table 7. Total mitigation acreages and costs for Dam Site 10.

Impact Location	*Habitat Type Impacted*	*Acres Impacted*	*Acres Replaced*	*Cost/Acre*	*Total RE Cost*	*Excavation Cost @ 9.09/CY*	*Seeding/Planting Cost/Acre*	*Total Implementation Cost*	*GRAND TOTAL MITIGATION COST*
DS10	Stream	4.6	4.6	$ 18,392	$ 84,603	$ -	$ 1,800	$ 8,280	$ 92,883
DS10	Riparian Forest	2	3	$ 18,392	$ 55,176	$ -	$ 10,060	$ 30,180	$ 85,356
Grand Total		**6.6**	**7.6**		**$ 139,779**			**$ 38,460**	**$ 178,239**

In addition to screening of alternatives and compensatory mitigation, the Corps will take steps to minimize impacts that include implementation of project appropriate construction BMPs. Several measures would be implemented during construction to minimize water quality impacts that would include both structural and non-structural BMPs. Structural BMPs include perimeter controls such as straw bales and/or silt fencing and earthen berms. Non-structural BMPs would

include keeping heavy construction equipment out of the waterway whenever possible, protecting construction materials from precipitation/flooding, and stabilizing bare soil by mulching and revegetation. Utilizing erosion control to prevent sediment from entering existing wetlands and preventing deleterious material from entering South Papillion Creek are examples of BMPs that would be used to reduce the amount of potential pollutants that reach the water resources adjacent to or downstream of the proposed project area.

Implementation of programs or practices by the NRD or the NRCS in the watershed upstream of the proposed dam site, such as terracing, planting riparian buffer strips, construction of sediment retention structures, revegetation, and stream restoration would all help to prevent degradation of the water within the creek and the temporary flood pool that develops during runoff events.

10.7 Secondary and Cumulative Impacts.

10.7.1 Secondary impacts

Secondary Impacts are the effects on an aquatic ecosystem that are associated with a discharge of dredged or fill material, but do not result from the actual placement of the dredged or fill material. Secondary effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Expected secondary effects are described below.

- Placement of fill into Thomas Creek to construct the proposed dam would result in the formation of an 800-foot long backwater pool within the creek channel upstream of the dam. In addition, construction of the dam would cause the creek to leave its banks and begin to fill the area that would become the flood pool more frequently than occurs naturally. This more frequent inundation of the land adjacent to the creek channel would make a portion of the land unfarmable. This land that is no longer suitable for farming is expected to naturally convert into wetlands over time. Construction of the dry dam would also impact stream habitat function in Thomas Creek by temporarily impounding flood flows behind the dam. The resulting loss of stream habitat function would be mitigated by the acquisition of 4.6 acres of land along both sides of a 1,000-foot long segment of Thomas Creek just upstream of Pawnee Road. A 100-foot wide buffer of native grasses, forbs, and wetland plants would be planted along both sides of the 1,000-foot long segment.

- The floodpool of the dry dam would capture higher runoff events and release them at a slower rate over a longer period of time than would have occurred without the dam. This would decrease the floodpeaks in the creek downstream of the dam.

- Construction of the dry dam may also result in improvement to downstream water quality by trapping sediment and attached nutrients after runoff events and releasing the cleaner water through the dam.

10.7.2 Cumulative impacts

Cumulative impacts are the changes in an aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material. Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous separate actions can result in major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems. Cumulative effects attributable to the discharge of dredged or fill material in waters of the United States should be predicted to the extent reasonable and practicable.

Extensive alteration within the Papillion Creek Basin has been occurring since the early 1900's. To protect Omaha from flooding, drainage districts were formed between 1910 and 1928 and significant channelization of the Big Papillion Creek and its contributing tributaries began. Additionally, the Nebraska Department of Roads and Irrigation have historical accounts that indicate the majority of Papillion Creek, Big Papillion Creek and West Papillion Creek were straightened between 1910 and 1913 (Rus et al., 2003). The upper portion of the Thomas Creek Watershed is primarily surrounded by row crop agriculture with some livestock farming. The lower portion of the watershed is surrounded by residential developments, commercial businesses, roads, parking lots, and other impervious surfaces. In the agricultural areas, the land is often farmed to within 50 feet of the creek channel. The only riparian habitat available is usually confined to the banks of the creek channel, and a thin buffer of smooth brome grass. Residential and commercial development is moving farther up into the watershed, and it is likely to replace the agriculture surrounding the proposed project lands within the next ten to twenty years. This would eventually decrease the amount of sediment and agricultural runoff entering Thomas Creek, but it would increase the area of impervious surfaces in the watershed resulting in more runoff and potential flood risk along Thomas Creek and further downstream along the little Papillion creek.

The added increment of constructing DS10 would not cause significant adverse cumulative impacts to Thomas Creek or its associated watershed. The creek has been straightened and modified multiple times since the early 1900s. The existing aquatic habitat in the creek is of poor quality, and the adjacent riparian habitat is sparse and degraded due to the adjacent land use practices which primarily consist of row crop agriculture. The impacts to stream habitat function, and riparian forest would be mitigated, so the proposed project would result in no significant adverse cumulative impacts.

10.8 Compliance With the Guidelines (Subpart B)

10.8.1 Factual Determinations (230.11).

10.8.1.1 Physical Substrate Determinations.

Physical and chemical substrate conditions and potential impacts to physical and chemical properties are discussed in Section 10.1.1. The proposed project would result in temporary

impacts to the existing substrate during construction. Measures including structural and non-structural BMPs to reduce temporary effects during construction would be implemented as described in Section 10.1.1. Long-term minor impacts to substrate slope and elevation would occur as a result of dam construction and the formation of the 800-foot long backwater pool created upstream of the dam. These impacts would be minimized as described in Section 10.6.

10.8.1.2 Suspended Particulate/Turbidity Determinations.

Suspended particulates and turbidity existing conditions and potential impacts are described in Section 10.1.2. The proposed project would result in minor temporary and localized increases in suspended particulates during construction. The Corps will take steps to minimize erosion and the associated increases in turbidity during construction that include implementation of project appropriate construction BMPs as described in Section 10.1.1 above. These measures would minimize increases in turbidity and sediment load, and limit damage to aquatic life outside the immediate area of operation during construction. Once the dam is constructed, turbidity caused by the finer suspended sediment in the water column after runoff events would result in an increased duration of elevated turbidity downstream as the stored floodwater in the dam drains back to its normal level. This minor increase in the duration of elevated turbidity within Thomas Creek would not significantly impact water quality in the creek.

10.8.1.3 Water

Water quality existing conditions are described in Section 5.7 of the EA. Potential impacts of the proposed project to water are described in Section 10.1.3 above. Because DS10 would be a dry dam, only minor changes to environmental characteristics and values of the water within Thomas Creek would occur. Construction of the dam would create an 800-foot long backwater pool that would be contained within the banks of the existing creek channel. This pool would provide valuable habitat to fish, reptiles and amphibians, macroinvertebrates, and other aquatic and semi-aquatic organisms. Construction of the proposed project would result in minor increases in turbidity and the potential for spills or leaks from construction equipment. The Corps will take steps to minimize spills, leaks, erosion and increases in turbidity during construction that include implementation of project appropriate construction BMPs as described in Section 10.6 above. Implementation of these measures during construction would ensure that impacts to water in Thomas Creek would be short-term and minor.

10.8.1.4 Current Patterns, Water Circulation, and Fluctuation Determinations.

Current patterns, water circulation, and fluctuation existing conditions and potential impacts are described in Sections 10.1.4 and 10.1.5. The proposed project would have long-term impacts to current patterns, water circulation, and fluctuation. These impacts would occur as a result of construction of a dry dam that would alter current patterns, water circulation, and fluctuations primarily during runoff events when flood waters would be temporarily held back behind the dam. In addition, flood peaks below the dam would be smaller and spread out over a slightly longer period of time than currently occurs without the dam in place. The impacts of these changes would be minimized as described in Section 10.6. Construction of the dry dam in

conjunction with the proposed mitigation and implementation of BMPs would not violate Section 404(b)(1) guidelines.

10.8.1.5 Salinity Determinations.

Salinity determinations are not applicable to Thomas Creek.

10.8.1.6 Aquatic Ecosystem and Organism Determinations.

The aquatic ecosystem and organism existing conditions and potential impacts within the proposed project area are described in Section 10.2. The Nebraska Stream Condition Assessment Procedure (NeSCAP) was the selected habitat assessment model used to assess baseline environmental conditions for the study. Construction of a dry dam at Dam Site 10 on Thomas Creek would not convert the creek to a lake, however, it would impact the stream habitat function enough to require mitigation of 23,414.29 negative project impact units. Negative impacts to Thomas Creek caused by the proposed project would be mitigated by acquiring a total of 4.6 acres of land straddling both sides of a 1,000-foot long segment of the creek just upstream of Pawnee Road. Stream mitigation would primarily consist of planting a 100-foot wide buffer of native prairie and wetland plants along each side of Thomas Creek for 1,000 feet. Refer to Appendix 1 of the EA for a more thorough discussion of the NeSCAP analysis and proposed mitigation for each alternative in the Recommended Plan. The removal of 2 acres of trees to construct the dam embankment may affect but is not likely to adversely affect the northern long-eared bat. Construction of DS10 would create a fish passage barrier within the creek that would result in long-term minor impacts to fish. The impacts would be considered minor due to the poor quality of the existing fish habitat, and low diversity and abundance of the existing fish population in Thomas Creek within the proposed project area.

Short-term minor impacts to fish and other aquatic and benthic organisms would occur during construction. Impacts would include short-term increases in turbidity, direct burial of less mobile organisms during placement of fill, and temporary displacement during construction. Short-term minor impacts to terrestrial mammals and birds would occur as a result of tree removal, the movement of heavy construction equipment, and increased noise and other disturbances from construction activities. Measures to reduce adverse effects during construction would be implemented as described in Section 10.6.

10.8.1.7 Special Aquatic Sites Determinations.

Existing wetlands and potential effects to wetlands are described in Section 10.3.2. Construction of the dam embankment would directly fill approximately 0.25 acres of palustrine emergent (PEM) wetlands within the creek channel. The 0.25 acres of PEM wetlands lost at Dam Site 10 would be mitigated by the wetlands that will develop adjacent to the creek bed along the 800-foot long backwater pool that would be created within the creek channel upstream of the dam face. Water in this 800-foot long segment of the creek will back up behind the dam and remain approximately 3 feet deeper than it currently is during normal flows. This will cause the ground along the banks of the creek to remain wetter than they would be without the proposed project. Wetland vegetation is expected to develop in these areas with wetter soil. In addition,

construction of the dam would cause the 2-year event to leave the banks of the creek and temporarily flood approximately 6 acres of land that is currently farmed. This more frequently flooded area is expected to no longer be farmable and much of the area will develop into wetlands over time. For these reasons, the impacts of the proposed project on wetlands are not considered to be significant.

10.8.1.8 Human Use Characteristics Determinations.

The portion of the Thomas Creek in the proposed project area currently provides very few recreational fishing opportunities. The creek is very narrow, and shallow, and it is surrounded by private land with no public access. The fish population within the creek consists primarily of tolerant minnow species that have little value to recreational or commercial fishermen.

The portion of Thomas Creek located within the proposed project area is surrounded by private land with no public access. In addition, the creek is too narrow and shallow to provide any water related recreational activities. Flowage easements would be obtained for the land within the flood pool, so this land would remain in private ownership. As a result, construction of a dry dam at DS10 would not provide any new public recreation opportunities.

Construction of the dam embankment at DS10 would alter the visual characteristics of the landscape in the proposed project area. The top of the dam embankment would be elevated high above the existing floodplain. In addition, the wetlands that develop along the 800-foot long backwater pool, the 3 acres of riparian forest mitigation plantings, and the 4.6 acres of stream mitigation plantings would all convert farm land to more natural habitat with permanent vegetative cover Whether or not the visual impacts are seen as beneficial or adverse would vary amongst individuals.

10.8.1.9 Contaminant Determinations.

Only non-contaminated fill material would be used to construct the dam embankment at DS10. The fill material would consist of local earthen material and clean rock obtained from commercial quarries. This material would not violate any water quality standards criteria for the state of Nebraska Title 117 Nebraska Surface Water Quality Standards.

10.8.1.10 Determination of Cumulative Effects on Aquatic Ecosystem

Cumulative impacts are impacts on the environment that result from the incremental impact of actions when added to other past, present, and reasonably foreseeable future actions. The added increment of constructing DS10 would not cause significant adverse cumulative impacts to Thomas Creek or its associated watershed. The creek has been straightened and modified multiple times since the early 1900s. The existing aquatic habitat in the creek is of poor quality, and the adjacent riparian habitat is sparse and degraded due to the adjacent land use practices which primarily consist of row crop agriculture. Impacts to stream habitat function, and riparian forest would be mitigated, so the proposed project would result in no significant adverse impacts.

10.8.1.11 Determination of Secondary Effects on the Aquatic Ecosystem

Secondary Impacts are the effects on an aquatic ecosystem that are associated with a discharge of dredged or fill material, but do not result from the actual placement of the dredged or fill material. Adverse secondary effects of the proposed project include impacts to stream habitat function as a result of construction of the dry dam. These impacts would be mitigated as described in Section 9.6. Beneficial secondary effects include, decreased floodpeaks downstream of the dam, the formation of a backwater pool within the creek channel, and the formation of wetlands in the floodplain adjacent to the creek channel.

10.8.2 10.8.2 Findings of Compliance or Non-compliance with the Restrictions on Discharge (230.12)

a. Our Review of Water Quality Standards established by the State of Nebraska indicates that the proposed discharge would not violate any applicable state water quality standards.

b. The Proposed Action would not result in significant adverse impacts to human health and welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, shellfish, wildlife or special aquatic sites.

c. All appropriate steps to minimize adverse environmental impacts have been taken.

d. The Proposed Action would not jeopardize the existence of Federally listed endangered or threatened species or their habitat.

e. No significant adaptations of the guidelines were made relative to this evaluation.

10.8.3 10.8.3 Conclusions

Based on all of the above, the Proposed Action is determined to be in compliance with the Section 404(b)(1) Guidelines

11.0 Little Papillion Creek Levees and Floodwalls

New levees and/or floodwalls ranging in height from 2.6 to 9.8 feet would be constructed along Little Papillion Creek between Blondo Street and Saddle Creek to reduce flood risk along Little Papillion Creek. These structures would work in conjunction with DS10 to reduce flood risk along Little Papillion Creek. Figures 9 through 14 below are aerial maps of each stream segment showing the location of the proposed levees and floodwalls.

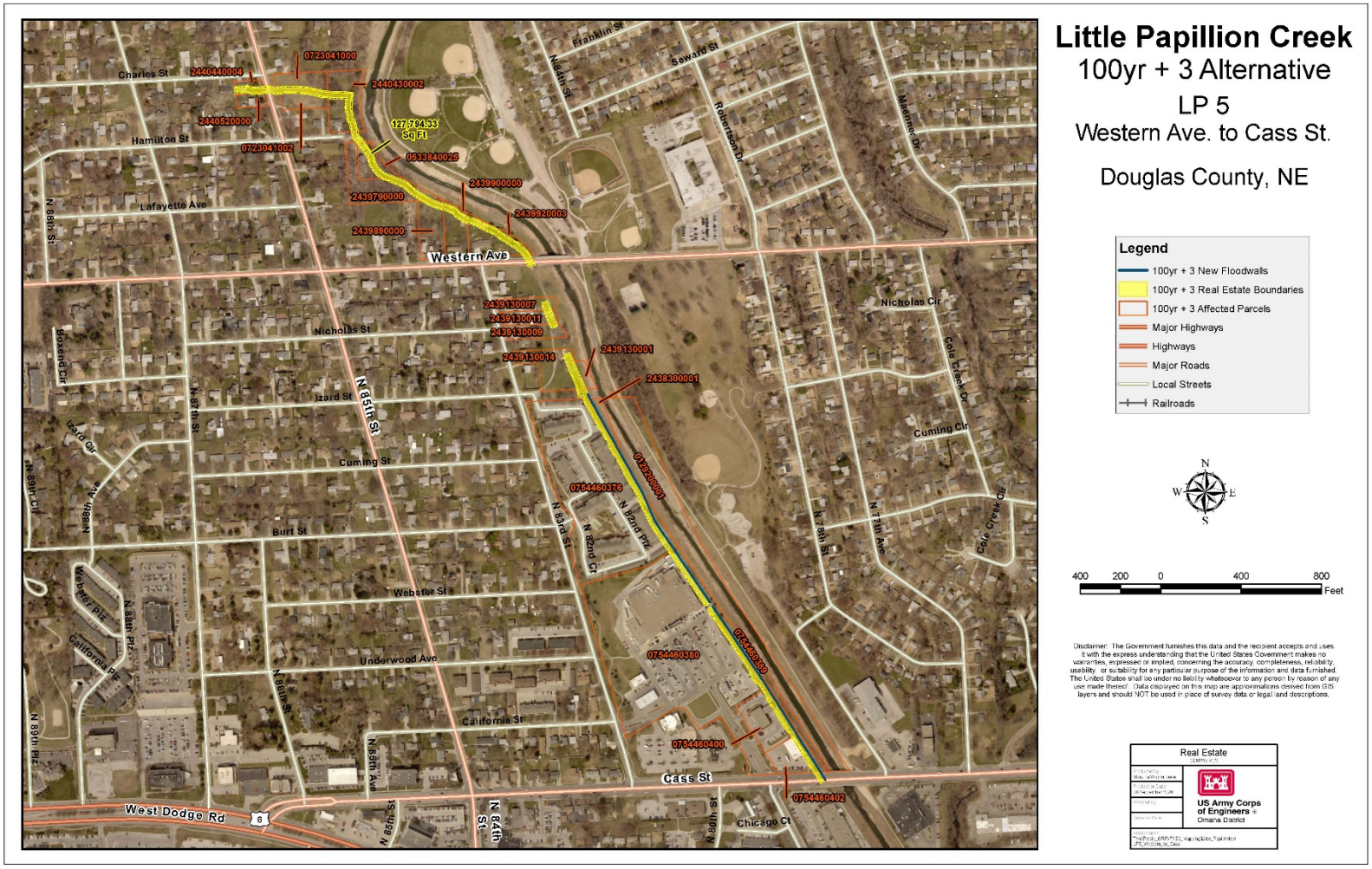

Figure 9. Little Papillion Creek. Blondo Street to Western Avenue, and Western Avenue to Cass Street.

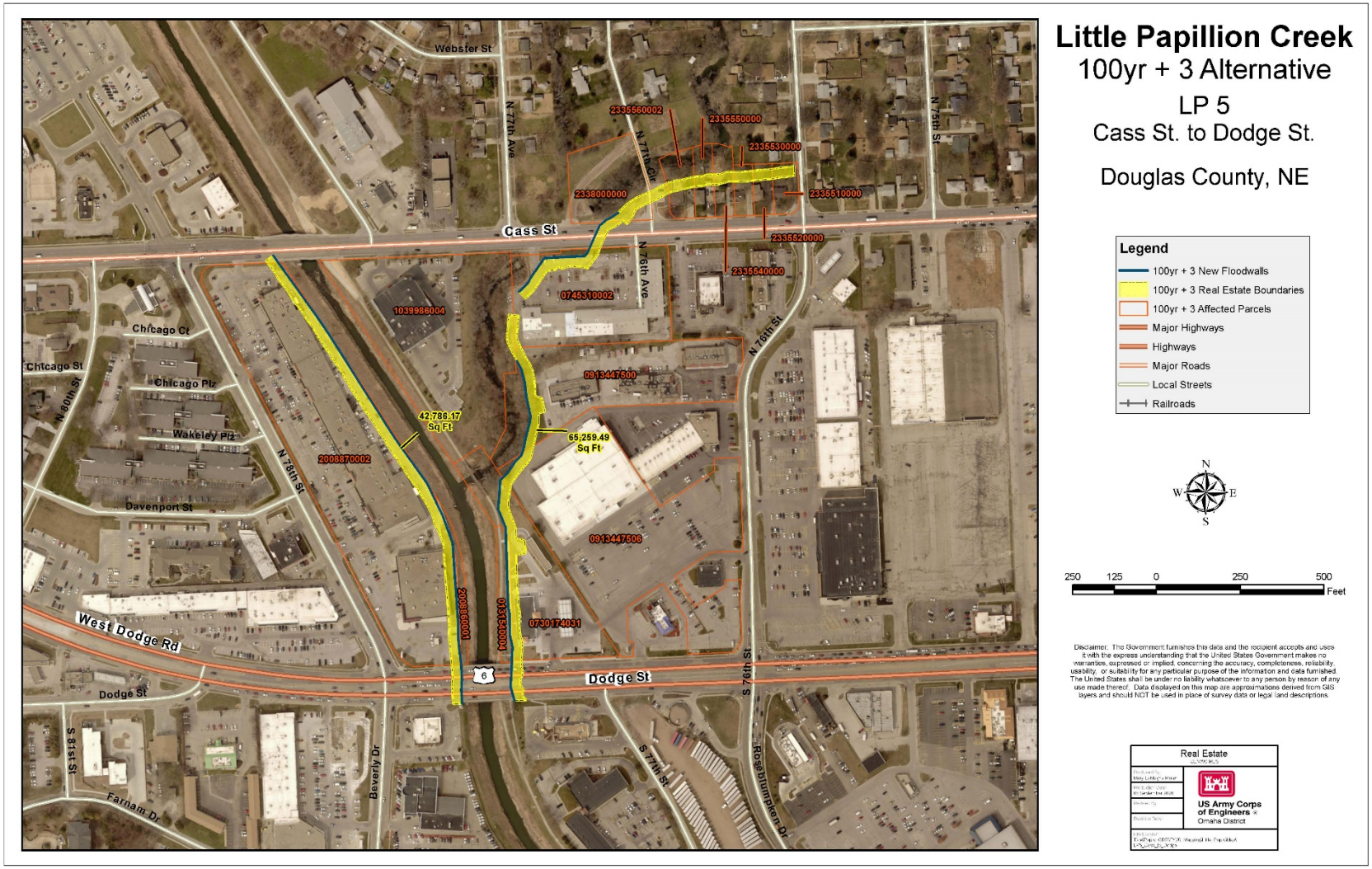

Figure 10. Little Papillion Creek and Cole Creek confluence Cass Street to Dodge Street.

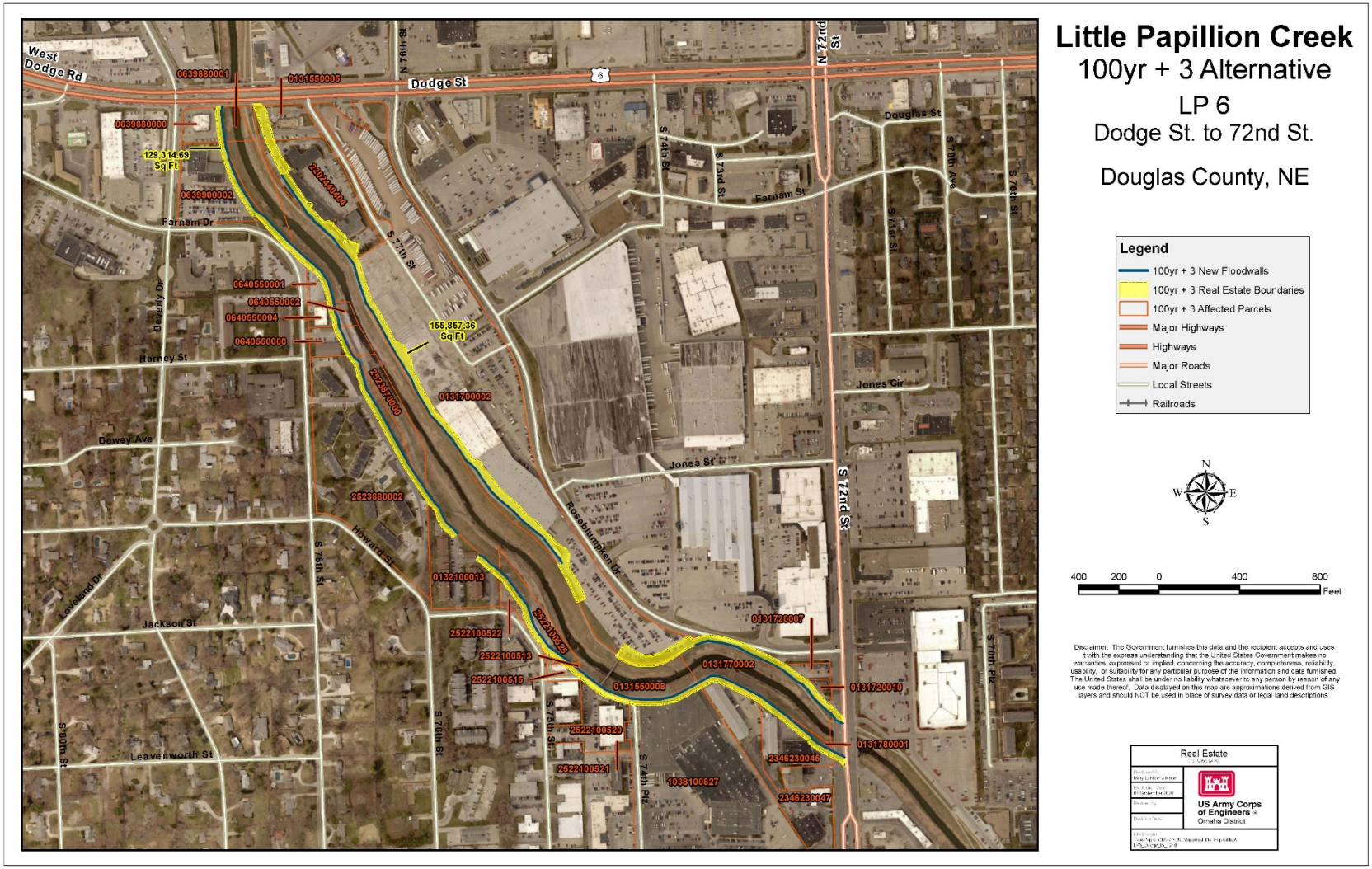

Figure 11. Little Papillion Creek Dodge Street to 72nd Street.

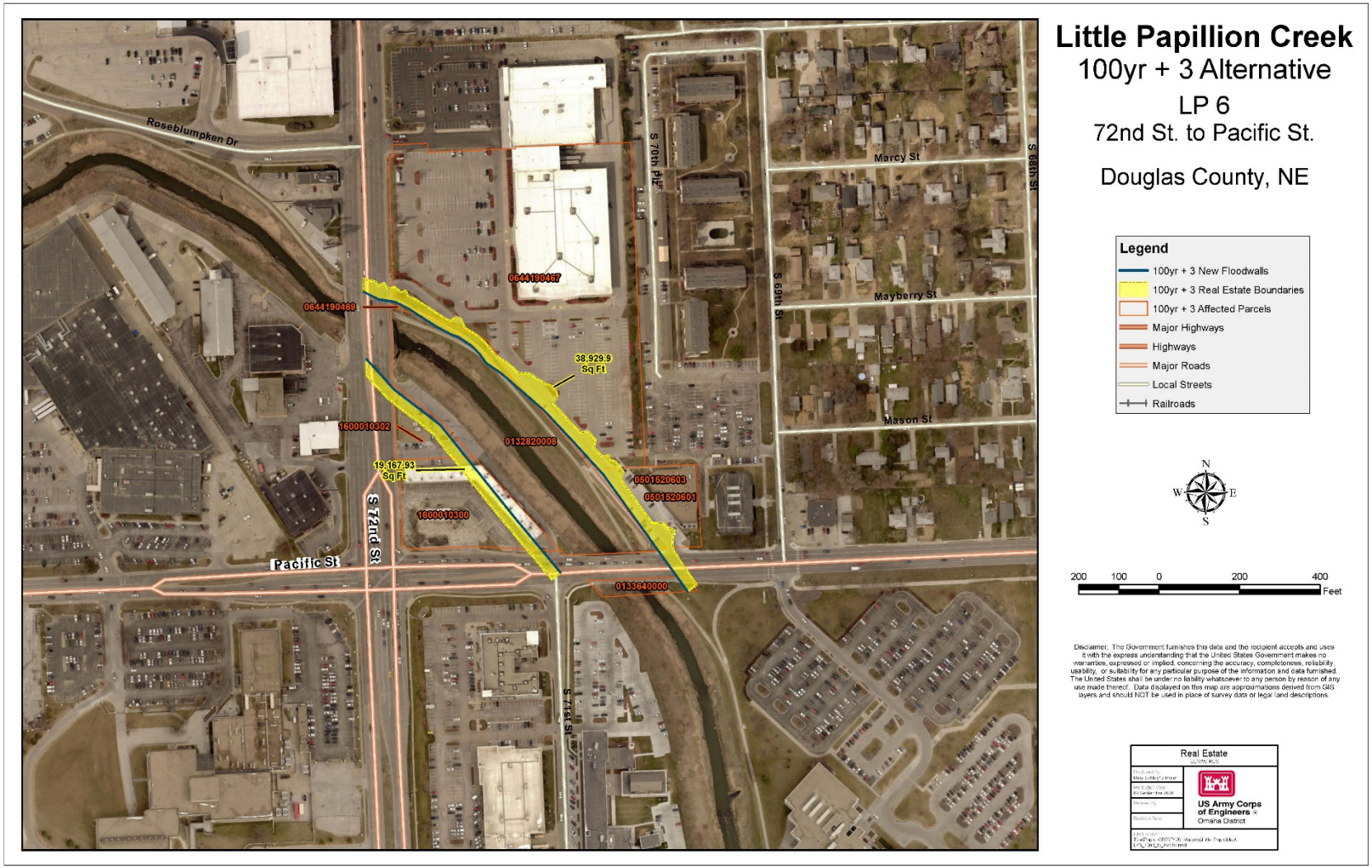

Figure 12. Little Papillion Creek 72nd Street to Pacific Street.

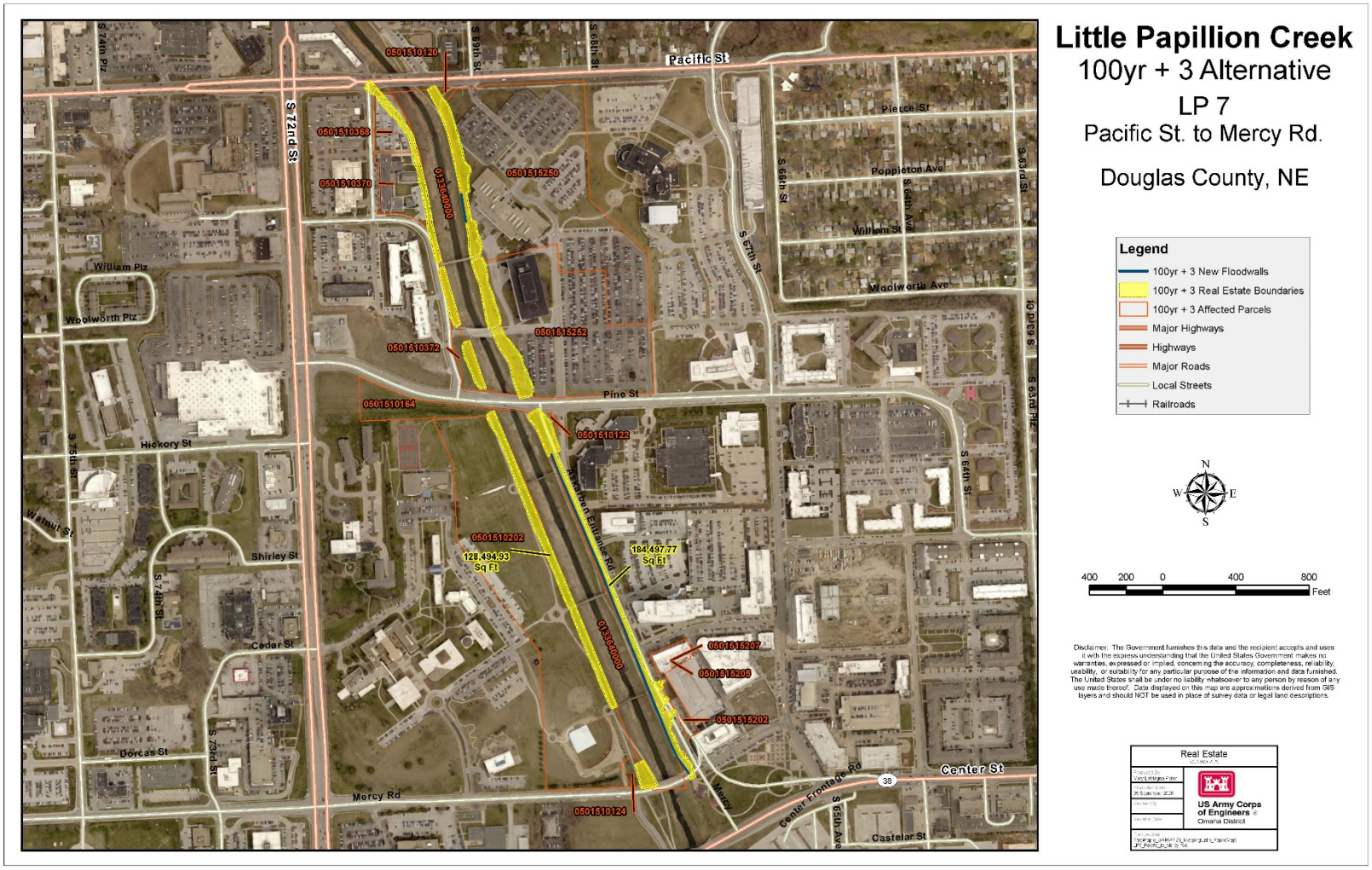

Figure 13. Little Papillion Creek Pacific Street to Mercy Road.

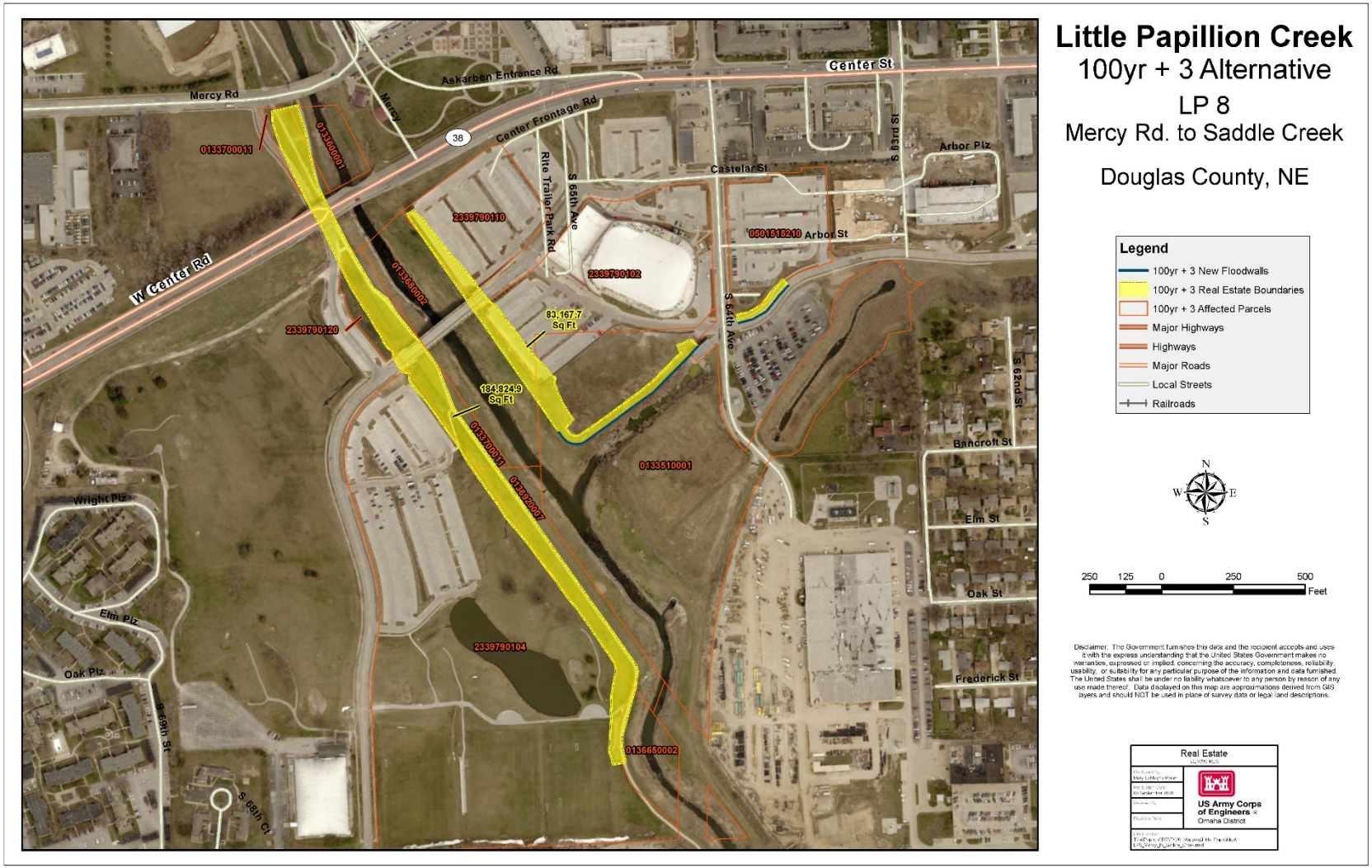

Figure 14. Little Papillion Creek Mercy Road to confluence with Saddle Creek.

New levees would have a minimum 12-foot-wide crown width and 3H:1V landside slopes, as shown in the typical cross-section in Figure 15. The new floodwalls would consist of inverted T walls with a 12-foot-wide levee crown on the landside of the floodwall, and a 3H:1V landside slope, as shown in the typical cross-section in Figure 16. The floodwalls would be constructed out of reinforced concrete.

In addition to the construction of levees and floodwalls, this alternative would also include construction of rip rap bank armoring along an 814-foot long section between cross sections 12732 and 11918 of Little Papillion Creek that contains a series of bridges. These bridges produce higher velocity flows that would likely result in bank erosion. Figure 17 below is an aerial view of the segment of stream where rip rap would be placed. There is already rock present in this reach to protect the bridges but there are gaps in protection between the bridges. The new rock is intended to fill in the gaps, so there are no breaks in the bank protection in this reach. Approximately 4,537 tons of rip rap and 887 tons of bedding material would be placed along the banks of the low flow channel to form a revetment. This would be the only placement of fill in waters of the United States associated with the Little Papillion Creek Levees and Floodwalls alternative. See Figure 18 for a typical cross section of the proposed revetment structures. The Section 404(b)(1) evaluation below for the Little Papillion Creek Levee/Floodwall Alternative primarily focuses on the construction of the revetment since that is the action that would include placement of fill in waters of the United States.

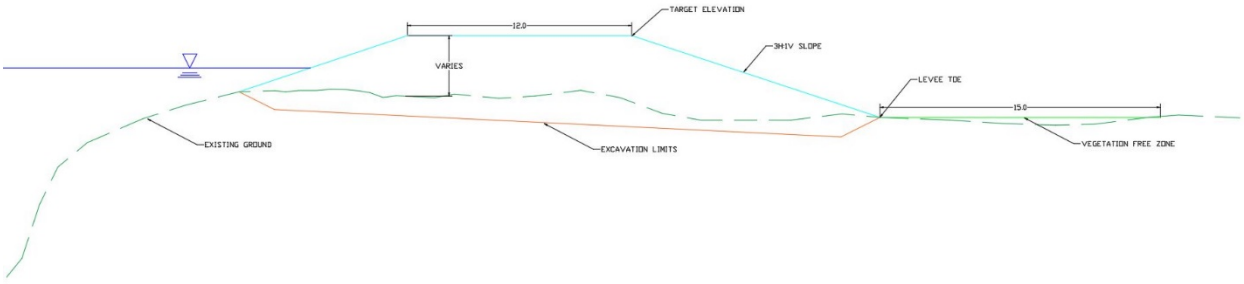

Figure 15. Typical cross section of proposed Levee.

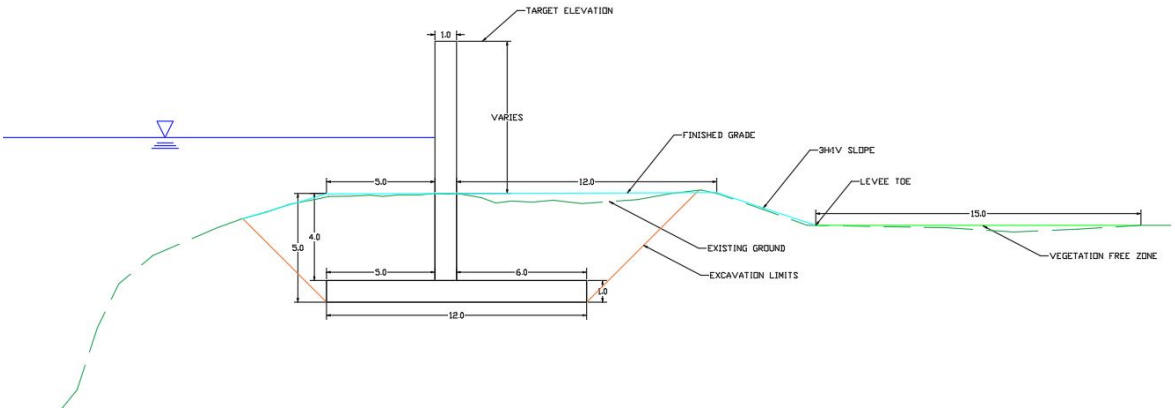

Figure 16. Typical cross section of the proposed floodwalls.

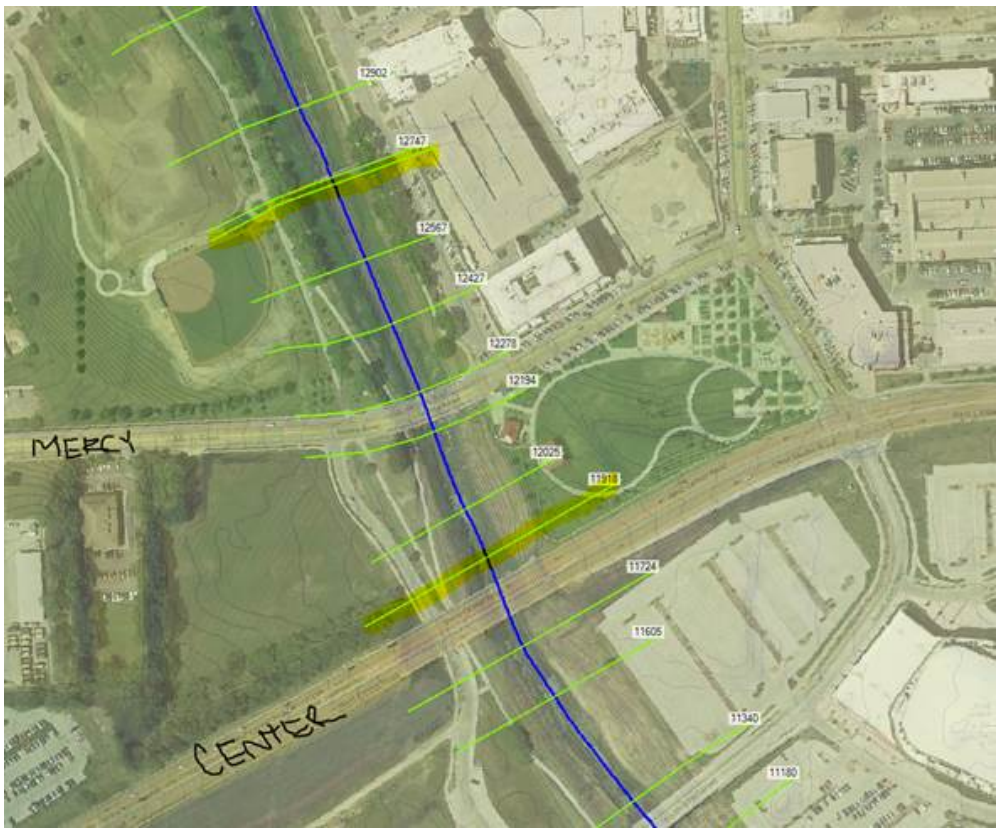

Figure 17. Aerial view of rip rap placement area between the two highlighted cross sections 12732 and 11918.

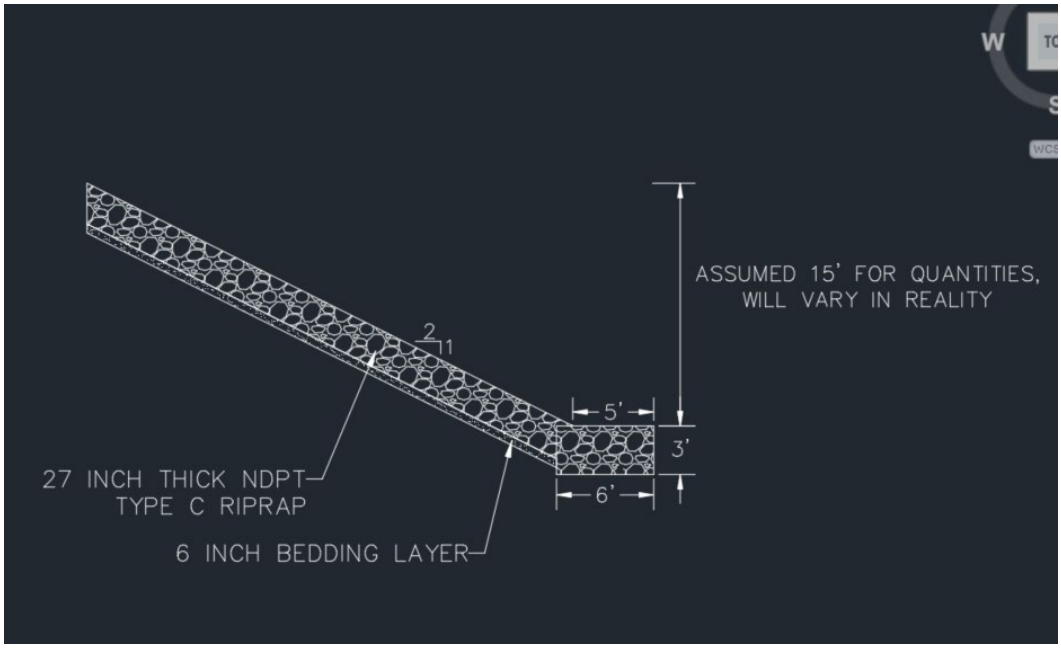

Figure 18. Typical cross section of proposed revetment structures.

11.1 Physical and Chemical Characteristics (Subpart C)

11.1.1 Physical Substrate (230.20).

Soil composition along Little Papillion Creek in the areas where levees and floodwalls would be constructed tends to be dominated by silty clays and silty clay loams. Parent materials generally consist of clayey alluvium or silty alluviums. The soil types with the highest presence along Little Papillion Creek are variations of Udorthents and Udarents Urban Land complexes. Kezan- and Calmo- dominated complexes have hydric soil ratings and are fairly present throughout the study area. Substrate within the creek channel consists of these same soils that washed into the creek with the addition of sand and gravel carried into the creek in runoff from roads and parking lots, and crop residue and other organic matter from the vegetation lining the channel. There are also scattered areas of rip rap bank protection within the creek channel to protect pipe outfalls, bridges, and the banks of the creek in areas with higher velocity flows. Aquatic habitat within the creek channel is limited due to the poor quality of the existing habitat and the lack of habitat diversity within the channel. The habitat that does exist is of poor quality due to channelization and surrounding land use which primarily consists of commercial and residential development.

Minor and temporary impacts associated with the Little Papillion Creek levee and floodwall construction alternative include the excavation, hauling, and grading that would occur to construct the proposed levees and floodwalls. Typical earth-moving equipment would be used to dig, grade, trench and shape the soils during construction activities. Erosion control best management practices (BMPs), such as silt fencing and erosion control blankets would be utilized during construction. Immediately following construction activities, disturbed areas would be seeded with a native seed mixture or levees would be seeded a with stabilizing seed mixture and the newly seeded areas would be mulched to control erosion. Ground disturbing activities would be kept to a minimum. The Corps will take steps to minimize impacts to physical substrate that include implementation of project appropriate construction BMPs. Several measures would be implemented during construction to minimize water quality impacts that would include both structural and non-structural BMPs. Structural BMPs include perimeter controls such as straw bales and/or silt fencing and earthen berms. Non-structural BMPs would include keeping heavy construction equipment out of the waterway whenever possible, protecting construction materials from precipitation/flooding, and stabilizing bare soil by mulching and revegetation. Utilizing erosion control to prevent sediment from entering existing wetlands and preventing deleterious material from entering Little Papillion Creek are examples of BMPs that would be used to reduce the amount of potential pollutants that reach the water resources adjacent to or downstream of the proposed project area.

Physical effects on benthos may occur as a result of direct burial of less mobile organisms during construction of the revetments. However, these impacts are expected to be minor due to the poor quality of the existing habitat. Mobile organisms would be temporarily displaced due to disturbances caused during construction. Placement of the new rock would also introduce more rock to the existing substrate. This would be a long-term minor impact to the stream, as the new rock would provide some habitat diversity that is currently lacking in Little Papillion Creek.

11.1.2 Suspended Particulates and Turbidity (230.21).

During normal to low flows in Little Papillion Creek, turbidity and suspended particulates are relatively low. However, during precipitation runoff events, the turbidity within the creek greatly increases primarily due to agricultural runoff higher in the basin, and runoff from construction areas, roads, yards, and parking lots in the urbanized area. Project construction would result in short term, localized increases in turbidity within the creek channel. The Corps will take steps to minimize erosion and increases in turbidity during construction that include implementation of project appropriate construction BMPs as described in Section 11.1.1 above. These measures would minimize increases in turbidity and sediment load, and limit damage to aquatic life outside the immediate area of operation during construction.

11.1.3 Water (230.22).

Construction of the levees, floodwalls, and revetments in Little Papillion Creek would result in minor changes to environmental characteristics and values of the water. During construction, there would be minor increases in turbidity and the potential for spills or leaks from construction equipment. The Corps will take steps to minimize spills, leaks, erosion and increases in turbidity during construction that include implementation of project appropriate construction BMPs as described in Section 11.1.1 above. Implementation of these measures during construction would ensure that impacts to water in Little Papillion Creek would be short-term and minor.

11.1.4 Current Patterns and Water Circulation (230.23).

Construction of the proposed revetments along the low flow channel, and the levees and floodwalls along the high bank would not impact the current patterns or water circulation within Little Papillion Creek.

11.1.5 Normal Water Fluctuations (230.24).

Construction of the proposed revetments along the low flow channel, and the levees and floodwalls along the high bank would not impact the normal water fluctuations in Little Papillion Creek.

11.1.6 Salinity Gradients (230.25)

The Papillion Creek Tributaries Basin is an inland, non-coastal waterway. No impacts to Salinity Gradients are expected.

11.2 Biological Characteristics (Subpart D)

NeSCAP was the selected habitat assessment tool to assess the potential impacts of the recommended plan on stream habitat function in the affected streams. Due to the relatively poor condition of the streams in this study area, the future with project condition only resulted in relatively minor negative project impact unit scores to some of the reaches of Little Papillion Creek during the NeSCAP analysis. Overall, the future with project condition resulted in 9,233.51 net positive project impact units when the results for all the reaches in the Little Papillion Creek were combined. The beneficial impacts to some of the reaches of the Little

Papillion Creek are primarily the result of converting concrete or otherwise un-vegetated areas to grass or other perennial cover due to the expansion of the project footprint resulting from construction of new levees. Floodwalls were used in areas where high value properties or other real estate constraints prevented the acquisition of sufficient property to provide enough space for levee construction. The floodwalls have a much smaller footprint than levees and require less real estate. This resulted in less conversion of concrete surfaces or buildings to grass cover or expansion of the vegetated buffers along the river reaches where floodwalls are proposed. As a result, project impact unit scores in river reaches where floodwalls are proposed either did not change between the without project and future with project condition, or they resulted in slightly negative scores. Negative scores for reaches that primarily included floodwalls were also related to the decrease in floodplain connectivity that would result from construction of floodwalls. Construction of the levees and floodwalls along Little Papillion Creek would result in a net total of 9,233.51 beneficial (positive) project impact units for all of the assessed reaches of the Little Papillion Creek. Refer to Section 8.1 above for a more thorough discussion of the NeSCAP analysis for each alternative in the Recommended Plan.

11.2.1 Threatened and Endangered Species (230.30).

The northern long-eared bat is the only listed species that could potentially be found within the proposed project area. The northern long-eared bat was listed as federally threatened on May 2, 2015. The northern long-eared bat is distributed along the eastern half of the United States, with a range that extends into and throughout the majority of the state of Nebraska, including Douglas, Sarpy, and Washington Counties. During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. These bats are opportunistic and select roost tree species based on the tree's suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns and sheds. Northern long-eared bats spend the winter hibernating in caves and mines, referred to as hibernacula. They typically use large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents. Specific areas where they hibernate have very high humidity. During an agency scoping meeting for the proposed project on December 10, 2018, the NGPC stated that there are no known hibernacula for northern long-eared bats within the Papillion Creek Basin.

Approximately 2 acres of trees from scattered locations would have to be cleared to construct the levees and floodwalls. Tree clearing would be restricted to the period between November 1st and March 31st to avoid the taking of potential maternity roost trees during the pup season (June 1 to July 31) and to avoid taking potential roost trees during the active season (April 1 to October 31) for the bats. For these reasons, the Recommended Plan may affect, but is not likely to adversely affect northern long-eared bats.

11.2.2 Fish and Other Aquatic Organisms (230.31).

A graduate thesis entitled Fishes of the Papillion Creek Tributaries Basin, Nebraska was completed in 2006. This document provided an inventory of the fish species in the Papillion

Creek Basin, and an assessment of stream habitat quality within the basin by conducting an Index of Biotic Integrity (IBI). Results of the IBI determined that the fish population was dominated by generalist minnow species that are tolerant of lower quality habitat. As a result, the overall habitat quality of the streams within the basin was determined to be poor due to the high level of development along the creeks and the multiple modifications that have occurred within the streams for flood risk reduction and bank stabilization. Twenty-three species of fish were collected in the streams of the Papillion Creek Basin during the 2006 study. Over 95 percent of the fish collected were species from the minnow family (cyprinidae). Nine different species of fish were collected in Little Papillion Creek near 78th and Cass Street, which is in the proposed project area for the levee and floodwall construction. Species collected included the largemouth bass, green sunfish, bluegill, bigmouth shiner, sand shiner, fathead minnow, creek chub, black bullhead, and yellow bullhead. Five of the nine species collected are considered to be tolerant species. Tolerant species are adaptable to degradation of water quality, spawning and cover habitats, and food resources due to erosion and siltation, organic and inorganic pollution, channelization, and flow fluctuations. The IBI score for this site was 36, which is indicative of poor habitat quality.

Construction of the proposed revetment sections along the banks of the low flow channel would cause short-term minor impacts to fish by temporarily increasing turbidity, and displacing fish during construction. Crayfish, aquatic insects, and other aquatic macroinvertebrates could be directly buried by placement of the rip rap during construction. Once construction is complete, young fish, crayfish, aquatic insects, and other aquatic macroinvertebrates are likely to use the void spaces in the rock for cover and utilize the increased surface area of the rock as substrate for colonization. The addition of rock to this highly altered stream with poor habitat quality and a lack of habitat diversity provides some of the only available structure or habitat diversity in many of the reaches of the Little Papillion Creek.

Construction of the levees and floodwalls along the top of the high bank would result in temporary disturbance to the existing vegetative cover. The Corps will take steps to minimize erosion and increases in turbidity during construction that include implementation of project appropriate construction BMPs as described in Section 11.1.1 above. This would minimize adverse impacts to fish and other aquatic organisms in Little Papillion Creek.

11.2.3 Other Wildlife (230.32).

Land use surrounding Little Papillion Creek in the proposed construction areas is heavily urbanized and consists of a mixture of commercial properties, roadways, and residential housing. Each side of the creek channel is lined with a relatively narrow strip of open space with a paved bike trail along one or both of the banks. Vegetation in these areas is primarily smooth brome grass with a few small Wooded/forested areas. Wetlands are notably lacking in these areas. Common mammals likely to use the habitat along the creek channel include the whitetail deer, Virginia opossum, raccoon, skunk, fox squirrel, red fox, and coyote. Various species of reptiles and amphibians, and migratory birds can also be found within the proposed project location. Approximately 2 acres of trees from scattered locations along Little Papillion creek would have

to be cleared to construct the levees and floodwalls. Removal of these trees would displace the wildlife currently using the forested habitat along the creek within these 2 acres. The 2 acres of trees lost as a result of construction of the levees and floodwalls along Little Papillion Creek would be mitigated by replanting 2.3 acres of native trees and shrubs in the band of land between the normal pool and the flood pool at DS19. Refer to Section 8.2 above for an explanation of how appropriate mitigation of riparian forest habitat was determined.

11.3 Special Aquatic Sites (Subpart E)

11.3.1 Sanctuaries and Refuges (230.40).

None present.

11.3.2 Wetlands (230.41).

No wetlands would be filled to construct the proposed flood risk reduction measures along Little Papillion Creek. The Corps will take steps to minimize erosion and increases in turbidity during construction that could impact wetlands or other aquatic habitats. These steps include implementation of project appropriate construction BMPs as described in Section 11.1.1 above.

11.3.3 Mud Flats (230.42).

None present.

11.3.4 Vegetated Shallows (230.43).

None present.

11.3.5 Coral Reefs (230.44).

None present.

11.3.6 Riffle and Pool Complexes (230.45).

None present.

11.4 Human Use Characteristics (Subpart F)

11.4.1 Municipal and Private Water Supplies (230.50).

Little Papillion Creek is not known to be used as a source for municipal or private water supplies.

11.4.2 Recreational and Commercial Fisheries (230.51).

The portion of Little Papillion Creek in the proposed project area currently provides very few recreational fishing opportunities. There is public access to the creek along the bike trails, but the banks of the creek are steep, and it is difficult to get down to the low flow channel. Limited numbers of people fish for carp or other game species that are primarily limited to the few,

scattered pool areas along the creek. The fish population within the creek is dominated by tolerant minnow species that have little value to recreational or commercial fishermen, and the numbers of fish that do have recreational or commercial value is too low to sufficiently support these activities.

11.4.3 Water-Related Recreation (230.52).

There is public access to Little Papillion Creek from the bike trails within the proposed project area, however, conditions in and around the creek are not conducive to water-related recreation other than limited amounts of recreational fishing. The channel is incised, the banks are steep, and the water in the creek is shallow with lots of rocks, trash, and other debris making it unsuitable for safe kayaking or canoeing. Construction of the proposed revetment would not impact the virtually non-existent water-related recreation in Little Papillion Creek.

11.4.4 Aesthetics (230.53).

New levees and/or floodwalls ranging in height from 2.6 to 9.8 feet would be constructed along Little Papillion Creek between Blondo Street and Saddle Creek to reduce flood risk along Little Papillion Creek. Construction of the levees and floodwalls would alter the visual characteristics of the landscape in the proposed project area. Construction of the levees would raise the ground surface along the banks of the creek, and construction of the floodwalls would create a visual and physical barrier on the floodplain. Construction of the revetments would occur along the low flow channel in an area where there is already a lot of rip rap bank protection. In addition, the 2 acres of riparian forest vegetation that would have to be cleared to construct the levees and floodwalls would also alter the visual characteristics of the proposed project area. All of these aesthetic changes would occur within a highly developed urban area, so these types of changes would be less noticeable. Aesthetics analyses are somewhat of a subjective realm of evaluation, and whether or not the visual impacts are seen as beneficial or adverse typically varies amongst individuals.

11.5 Contaminant Evaluation and Testing (Subpart G).

Primary pollutants identified in the Papio-Missouri River Basin Water Quality Management Plan (2018) include nutrients, pesticides, sediment and bacteria. Streambank instability and bed degradation are prevalent throughout the system from channelization, armoring, damming and increased surface runoff. Waterbody impairments for the Papillion Creek basin are associated with primary contact recreation and aquatic life designated uses. Impairments and pollutants of concern include excessive chlorophyll, total phosphorus, total nitrogen, sediment, mercury, algal blooms, turbidity, pH, low dissolved oxygen, *E. coli* bacteria and “unknown” which is likely associated with the loss of habitat for the aquatic community (NDEQ, 2018).

For the Papillion Creek segment (MT1-10100) which extends from the confluence of Big Papillion Creek downstream to its confluence with the Missouri River, TMDLs have been developed for E. coli in 2008 and approved in 2009 and the fish consumption advisory was lifted in 2012 however, according to the last reporting cycle in 2016, a TMDL was still needed for

selenium (EPA, 2016). Big Papillion Creek (MT1-10120) and Little Papillion Creek (MT1-10111) have also been listed for E. coil and West Papillion Creek (MT1-10250) has been listed for Hazardous Index Compounds. As of 2016 Little Papillion and Big Papillion Creeks are classified as impairment-category 4A, meaning that these waterbodies have an EPA-approved TMDL plan in place and implemented while West Papillion Creek is categorized as a 5, meaning this waterbody has violated water quality standards and a TMDL is still needed (NDEQ, 2018).

In addition to the streams within the Papillion Creek basin, the Nebraska Department of Environmental Quality (NDEQ) conducted assessments on 15 of the 18 lakes present within this watershed, of those 11 were identified as impaired for fish consumption advisory, bacteria, nutrients, chlorophyll a and pH. Presently, the entire Papillion Creek watershed has been identified as a priority area by NDEQ (NDEQ, 2018). NDEQ has identified various practices that could help reduce the sedimentation, nutrient loading and E. coli present within the watershed; these priority identified measures include practices such as stream restoration, wetland restoration, grassed waterways, riparian buffers, riparian terracing, livestock exclusion fencing, cover crops and sediment control basins.

Construction of the levees and floodwalls along Little Papillion Creek would not result in the placement of fill in waters of the United States. Construction of the revetments would involve the placement of fill. Only non-contaminated fill material would be used to construct the revetments along Little Papillion Creek. The fill material would consist of clean rock obtained from commercial quarries. This material would not violate any water quality standards criteria for the state of Nebraska Title 117 Nebraska Surface Water Quality Standards.

11.6 Actions to Minimize Adverse Effects (Subpart H).

The planning process went through several iterations and evaluated a large range of structural and nonstructural measures. The range of study alternatives was refined based on preliminary analyses of effectiveness and cost. Several alternatives were screened from further consideration as they were found to be either economically unjustified or were less efficient at reducing flood damages than other alternatives.

Based on the analysis of potential impacts of the construction of the new levees and floodwalls along Little Papillion Creek and its associated riparian forest and wetlands, it was determined that the impacts of the proposed construction included in the Recommended Plan to riparian forest habitat would require mitigation. Total mitigation acreages and costs for the Little Papillion Creek levees and floodwalls alternative are shown in Table 8 below.

Table 8. Total mitigation acreages and costs for Little Papillion Creek Levees/Floodwalls..

Impact Location	*Habitat Type Impacted*	*Acres Impacted*	*Acres Replaced*	*Cost/Acre*	*Total RE Cost*	*Excavation Cost @ 9.09/CY*	*Seeding/Planting Cost/Acre*	*Total Implementation Cost*	*GRAND TOTAL MITIGATION COST*
Little Papio	Riparian Forest	2	2.3	$ -	$ -	$ -	$ 10,060	$ 23,138	$ 23,138
Grand Total		**2**	**2.3**		**$ -**			**$ 23,138**	**$ 23,138**

In addition to screening of alternatives and compensatory mitigation, the Corps will take steps to minimize impacts that include implementation of project appropriate construction BMPs. Several measures would be implemented during construction to minimize water quality impacts that would include both structural and non-structural BMPs. Structural BMPs include perimeter controls such as straw bales and/or silt fencing and earthen berms. Non-structural BMPs would include keeping heavy construction equipment out of the waterway whenever possible, protecting construction materials from precipitation/flooding, and stabilizing bare soil by mulching and revegetation. Utilizing erosion control to prevent sediment from entering existing wetlands and preventing deleterious material from entering South Papillion Creek are examples of BMPs that would be used to reduce the amount of potential pollutants that reach the water resources adjacent to or downstream of the proposed project area.

11.7 Secondary and Cumulative Impacts.

11.7.1 Secondary impacts

Secondary impacts are the effects on an aquatic ecosystem that are associated with a discharge of dredged or fill material, but do not result from the actual placement of the dredged or fill material. Secondary effects are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable.

- Filling in the gaps in bank protection between the bridges by construction of revetments would completely armor both sides of the creek for a distance of approximately 814 feet. This would stabilize the banks in this section by preventing further bank erosion and slumping.

11.7.2 Cumulative impacts

Cumulative Impacts are the changes in an aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material. Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous separate actions can result in major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems. Cumulative effects attributable to the discharge of dredged or fill material in waters of the United States should be predicted to the extent reasonable and practicable.

Extensive alteration within the Papillion Creek Basin has been occurring since the early 1900's. To protect Omaha from flooding, drainage districts were formed between 1910 and 1928 and significant channelization of the Big Papillion Creek and its contributing tributaries began. Additionally, the Nebraska Department of Roads and Irrigation have historical accounts that indicate the majority of Papillion Creek, Big Papillion Creek and West Papillion Creek were straightened between 1910 and 1913 (Rus et al., 2003). Little Papillion Creek is surrounded by residential developments, commercial businesses, roads, parking lots, and other impervious surfaces.

Residential and commercial development is moving farther up into the watershed, and it is likely to replace the remaining agricultural land within the next ten to twenty years. This would eventually decrease the amount of sediment and agricultural runoff entering Little Papillion Creek through tributaries higher up in the watershed such as Thomas Creek, but it would increase the area of impervious surfaces in the watershed resulting in more runoff and potential flood risk along Thomas Creek and further downstream along the little Papillion creek.

The added increment of constructing the new levees and floodwalls along Little Papillion Creek would not cause significant adverse cumulative impacts to Little Papillion Creek or its associated watershed. In addition, the construction of the new levees and floodwalls in conjunction with the proposed construction of DS10 on Thomas Creek would reduce some of the existing and future flood risk along the Little Papillion Creek. The creek has been straightened and modified multiple times since the early 1900s. The existing aquatic habitat in the creek is of poor quality, and the adjacent riparian habitat is sparse and degraded due to the heavy urbanization along the creek which consist primarily of commercial and residential development. The impacts to riparian forest habitat would be mitigated, so the proposed project would result in no significant adverse cumulative impacts.

11.8 Compliance With the Guidelines (Subpart B)

11.8.1 Factual Determinations (230.11).

11.8.1.1 Physical Substrate Determinations.

Physical and chemical substrate conditions and potential impacts to physical and chemical properties are discussed in Section 11.1.1. The proposed levee and floodwall construction could result in temporary minor impacts to the existing substrate in the creek during construction as a result of runoff from areas disturbed by construction activities. Measures including structural and non-structural BMPs to reduce temporary effects during construction would be implemented as described in Section 11.1.1.

Physical effects on benthos may occur as a result of direct burial of less mobile organisms during construction of the revetments. However, these impacts are expected to be minor due to the poor quality of the existing habitat. Mobile organisms would be temporarily displaced due to disturbances caused during construction. Placement of the new rock would also introduce more rock to the existing substrate. This would be a long-term minor impact to the stream, as the new rock would provide some habitat diversity that is currently lacking in Little Papillion Creek.

11.8.1.2 Suspended Particulate/Turbidity Determinations.

Project construction would result in short term, localized increases in turbidity within the creek channel. The Corps will take steps to minimize erosion and increases in turbidity during construction that include implementation of project appropriate construction BMPs as described

in Section 11.1.1 above. These measures would minimize increases in turbidity and sediment load, and limit damage to aquatic life outside the immediate area of operation during construction. Therefore, the resulting impacts would be considered short-term and minor.

11.8.1.3 Water

Water quality existing conditions are described in Section 5.7 of the EA. Potential impacts of the proposed project to water are described in Section 11.1.3 above. Construction of the proposed project would result in minor increases in turbidity and the potential for spills or leaks from construction equipment. The Corps will take steps to minimize spills, leaks, erosion and increases in turbidity during construction that include implementation of project appropriate construction BMPs as described in Section 11.6 above. Implementation of these measures during construction would ensure that impacts to water in Little Papillion Creek would be short-term and minor.

11.8.1.4 Current Patterns, Water Circulation, and Fluctuation Determinations

Construction of the proposed revetments would not impact current patterns, water circulation, or normal water fluctuations in Little Papillion Creek.

11.8.1.5 Salinity Determinations

Salinity determinations are not applicable to Little Papillion Creek.

11.8.1.6 Aquatic Ecosystem and Organism Determinations

NeSCAP was the selected habitat assessment tool to assess the potential impacts of the recommended plan on stream habitat function in the affected streams. Due to the relatively poor condition of the streams in this study area, the future with project condition only resulted in relatively minor negative project impact unit scores to some of the reaches of Little Papillion Creek during the NeSCAP analysis. Overall, the future with project condition resulted in 9,233.51 net positive project impact units when the results for all the reaches in the Little Papillion Creek were combined. As a result, no mitigation for loss of stream habitat function is required along Little Papillion Creek.

The removal of 2 acres of trees to construct the new levees and floodwalls may affect but is not likely to adversely affect the northern long-eared bat.

Short-term minor impacts to fish and other aquatic and benthic organisms would occur during construction. Impacts would include short-term increases in turbidity, direct burial of less mobile organisms during placement of fill, and temporary displacement during construction. Short-term minor impacts to terrestrial mammals and birds would occur as a result of tree removal, the movement of heavy construction equipment, and increased noise and other disturbances from construction activities. Measures to reduce adverse effects during construction would be implemented as described in Section 11.6.

11.8.1.7 Special Aquatic Sites Determinations.

No wetlands would be filled to construct the proposed flood risk reduction measures along Little Papillion Creek. The Corps will take steps to minimize erosion and increases in turbidity during construction that could impact wetlands or other aquatic habitats. These steps include implementation of project appropriate construction BMPs as described in Section 11.1.1 above.

11.8.1.8 Human Use Characteristics Determinations.

The portion of Little Papillion Creek in the proposed project area currently provides very few recreational fishing opportunities. There is public access to the creek along the bike trails, but the banks of the creek are steep, and it is difficult to get down to the low flow channel. Limited numbers of people fish for carp or other game species that are primarily limited to the few, scattered pool areas along the creek. The fish population within the creek is dominated by tolerant minnow species that have little value to recreational or commercial fishermen, and the numbers of fish that do have recreational or commercial value is too low to sufficiently support these activities.

Conditions in and around Little Papillion Creek are not conducive to water-related recreation other than limited amounts of recreational fishing. The channel is incised, the banks are steep, and the water in the creek is shallow with lots of rocks, trash, and other debris making it unsuitable for safe kayaking or canoeing. Construction of the proposed revetment would not impact the virtually non-existent water-related recreation in Little Papillion Creek.

Impacts to Aesthetics associated with the proposed project are discussed in Section 11.4.4 above. The aesthetic changes associated with the project would occur within a highly developed urban area, so these types of changes would be less noticeable. Aesthetics analyses are somewhat of a subjective realm of evaluation, and whether or not the visual impacts are seen as beneficial or adverse typically varies amongst individuals.

11.8.1.9 Contaminant Determinations.

Construction of the levees and floodwalls along Little Papillion Creek would not result in the placement of fill in waters of the United States. Construction of the revetments would involve the placement of fill. Only non-contaminated fill material would be used to construct the revetments along Little Papillion Creek. The fill material would consist of clean rock obtained from commercial quarries. This material would not violate any water quality standards criteria for the state of Nebraska Title 117 Nebraska Surface Water Quality Standards.

11.8.1.10 Determination of Cumulative Effects on Aquatic Ecosystem.

The added increment of constructing the new levees and floodwalls along Little Papillion Creek would not cause significant adverse cumulative impacts to Little Papillion Creek or its associated watershed. In addition, the construction of the new levees and floodwalls in conjunction with the proposed construction of DS10 on Thomas Creek would reduce some of the existing and future flood risk along the Little Papillion Creek. The creek has been straightened and modified

multiple times since the early 1900s. The existing aquatic habitat in the creek is of poor quality, and the adjacent riparian habitat is sparse and degraded due to the heavy urbanization along the creek which consist primarily of commercial and residential development. The impacts to riparian forest habitat would be mitigated, so the proposed project would result in no significant adverse cumulative impacts.

11.8.1.11 Determination of Secondary Effects on the Aquatic Ecosystem.

Secondary Impacts are the effects on an aquatic ecosystem that are associated with a discharge of dredged or fill material, but do not result from the actual placement of the dredged or fill material. Filling in the gaps in bank protection between the bridges by construction of revetments would completely armor both sides of the creek for a distance of approximately 814 feet. This would stabilize the banks in this section by preventing further bank erosion and slumping.

11.8.2 Findings of Compliance or Non-compliance with the Restrictions on Discharge (230.12)

a. Our Review of Water Quality Standards established by the State of Nebraska indicates that the proposed discharge would not violate any applicable state water quality standards.

b. The Proposed Action would not result in significant adverse impacts to human health and welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, shellfish, wildlife or special aquatic sites.

c. All appropriate steps to minimize adverse environmental impacts have been taken.

d. The Proposed Action would not jeopardize the existence of Federally listed endangered or threatened species or their habitat.

e. No significant adaptations of the guidelines were made relative to this evaluation.

11.8.3 Conclusions

Based on all of the above, the Proposed Action is determined to be in compliance with the Section 404(b)(1) Guidelines.

12.0 Literature Cited

Nebraska Department of Environmental Quality (NDEQ). 2018. Papio-Missouri River Basin Water Quality Management Plan. Papio-Missouri River Natural Resources District in cooperation with NDEQ, the City of Omaha and the Papillion Creek Watershed Partnership.

Rus, D.L., B.J. Dietsch and A. Simon. 2003. Streambed Adjustment and Channel Widening in Eastern Nebraska. USGS. http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1040&context=usgspubs. Accessed January 30, 2019.

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US Army Corps of Engineers®

Papillion Creek and Tributaries Lakes, Nebraska

General Reevaluation Report

Appendix 5 – Monitoring and Adaptive Management Plan

June 2021

Omaha District
Northwestern Division

TABLE OF CONTENTS

FIGURES

TABLES

1 Introduction

The purpose of the proposed Project is to address flood risk issues in order to reduce flood and life safety risks in the Papillion Creek Basin. The need stems from the history of flooding which includes problems such as historical and future potential life loss, property damage, emergency response costs and transportation network disruptions.

The Recommended Plan includes South Papillion Creek Dam Site 19 (wet dam), Little Papillion Creek Dam Site 10 (dry dam) and new levee/floodwall and 71 basement fills, 59 elevation of residential structures and 256 dry floodproofing of commercial structures along Big Papillion Creek, Cole Creek, Papillion Creek, Saddle Creek, South Papillion Creek, and West Papillion Creek. Reference the main Feasibility Report for detailed discussion of the Recommended Plan.

The Recommend Plan necessitates the removal of 23.5 acres of riparian forest habitat for dam construction, reservoir inundation and levee/floodwall construction and would require replacement. Average annual habitat units (AAHU) were calculated for future with project (FWP) and future without project (FWOP) over the 50-year planning period using linear interpolation from the inputs of the habitat units (HU) from the Brown Thrasher Habitat Suitability Index (HSI) for riparian forest habitat. Table 1 provides the AAHUs for DS19, DS10 and Little Papillion to ensure that the mitigation plan adequately replaces lost habitat.

Table 1. 50-year AAHUs for DS19, DS10 and Little Papio for FWOP and FWP with mitigation.

Average Annual Habitat Units			
Location	**FWOP**	**FWP**	**NET GAIN**
DS 19	3.39	3.68	0.29
DS 10	0.36	0.38	0.02
Little Papio	0.25	0.29	0.04

31.8 acres of tree plantings would occur within the boundaries of the normal operating pool and maximum operating pool of DS19 and 3 acres of riparian forest would be restored at DS10. Estimated costs for mitigation of riparian forest habitat were calculated to approximately $379,512.

Furthermore, 0.35 acres of palustrine emergent (PEM) wetlands would be directly filled from embankment construction of DS19, resulting in the restoration of 1.4 acres of PEM wetlands through the excavation of shallow areas connected to the edge of the normal pool area of DS19. Costs associated with PEM wetland mitigation are estimated at $54,147 for excavation and seeding. Impacts from converting a stream to a lacustrine system would also require mitigation; this would be accomplished by planting a 100-foot wide buffer of native prairie and wetland plants along each side of the Little Papillion creek for 1,000 feet and planting a 100-foot wide

buffer along both sides of South Papillion Creek for 1,200 feet. This would result in 10.1 mitigation acres for stream impacts at an estimated cost of $151,480.

The Nebraska Stream Condition Assessment Procedure (NESCAP) was utilized to ensure no net loss of habitat function would occur as a result of the Recommended Plan. See Appendix H1 for modeling results. NESCAP analysis indicated the Recommended Project would be "self-mitigating" with the incorporation of native planting plans and tree replacement (see Section 1.1). It is important to note that NESCAP did not assess the impacts to terrestrial habitat/woody vegetation outside of the 100-foot buffer of the riparian corridor. As the Recommended Plan requires the construction of two dams/reservoirs, NESCAP was unable to account for the loss of approximately 42 acres of mature deciduous trees that would become inundated following construction of the earthen dams, causing complete mortality to this environmental resource. To ensure that environmental impacts associated with damming were accounted for, replacement of trees would opportunistically occur where possible. This effort would support a recommendation from the U.S. Fish and Wildlife Service (USFWS) in an email dated May 28, 2019, made under the Fish and Wildlife Coordination Act (FWCA). The USFWS recommended to maintain riparian buffers along channel improvements and reservoirs to improve water quality (see agency coordination in Appendix H) as well as to incorporate seed mixes that would support pollinator habitat. Review Appendix H1 for complete environmental analysis and the Recommended Mitigation Plan.

After initial construction activities are complete, adaptive management (AM) and monitoring are necessary to address uncertainties of the integrated environmental features and ensure project success. Success criteria were defined based on specific hypotheses, which were formulated based on the goals of the project. Monitoring activities were identified to determine whether the project met these success criteria and AM actions were designed to redirect the restoration effort in a positive way in the event that the restored areas do not perform as predicted.

The General Reevaluation Report and Environmental Assessment can be found here: http://www.nwo.usace.army.mil/Missions/Civil-Works/Planning/Project-Reports/.

1.1 Integrated Environmental Features

As defined in ER-1105-200-1 and in accordance with 40 CFR 1580.20, protection of the Nation's environment from adverse effects of each alternative plan, in missions other than ecosystem restoration, such as the flood risk reduction General Reevaluation study for the Papillion Creek Basin, is to be provided by mitigation of those effects. As stated in Appendix C of ER-1105-200-1, consideration to assess the extent to which beneficial ecosystem management features of alternative plans offset adverse impacts (losses) before consideration is given to separable mitigation features was conducted. In accordance with §1184 of the Water Resources Development Act of 2016, natural and nature-based features were assessed for incorporation with the flood risk reduction measures to minimize environmental impacts and result in a "self-

mitigating" project that would not require separable mitigation. Detailed analysis of mitigation may be referenced in Appendix H1.

The integrated environmental features incorporated into the flood risk reduction Recommended Plan include 23.5 acres of tree replacement between the boundaries of the normal operating pool and maximum operating pool for DS 19 (Figure 1). The specific footprint of mitigation plantings will be identified in the design and implementation phase.

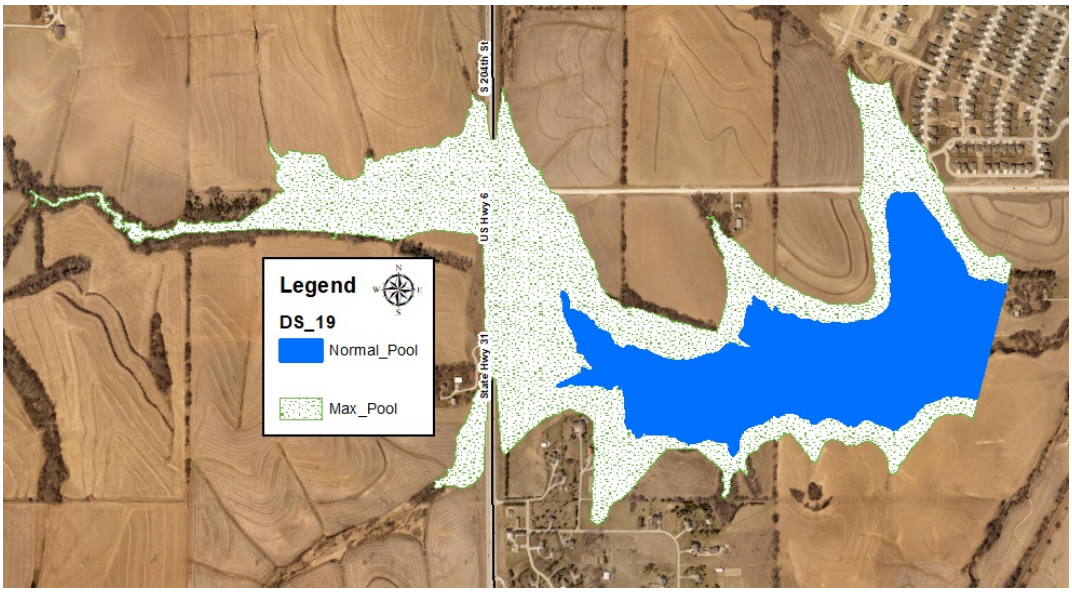

Figure 1. DS 19 normal operating pool and maximum boundary. Native vegetation, pollinator habitat and tree replacement would occur within the maximum pool area (139.6 acres).

Within the areas of inundation, trees consisting of silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), white mulberry (*Morus alba*), and cottonwood (*Populus deltoides*) comprise the general community composition. Species within the eastern riparian forest community that occur in facultative (FAC), facultative-upland (FACU) and upland (UPL) were selected for replacement of impacted trees. These species are recognized as occurring in both wetlands and uplands to varying degrees based on the hydrology of the site. No obligate (OBL) or facultative-wet (FACW) species were selected as water would not inundate these slopes on a frequent enough basis, nor would hydric soils be present, to support such hydrophytic communities. Ash species (*Fraxinus* spp.) were not selected for proposed plantings as emerald ash borer (*Agrilus planipennis*), an invasive insect detrimental to ash trees has been recently recorded in eastern Nebraska and is anticipated to continue to spread. As such, the Nebraska Forest Service does not recommend planting ash species.

Additionally, a total of 0.25 acres of palustrine emergent (PEM) wetlands along Thomas Creek from the construction of DS10 would be directly filled. The 0.25 acres of PEM wetlands lost at DS10 would be mitigated by the wetlands that will develop adjacent to the creek bed along the 800-foot long backwater pool that would be created within the creek channel upstream of the

dam face. Water in this 800-foot long segment of the creek will back up behind the dam and remain approximately 3 feet deeper than it currently is during normal flows. In addition, construction of the dam would cause the 2-year event to leave the banks of the creek and temporarily flood approximately 6 acres of land that is currently farmed. This more frequently flooded area is expected to no longer be farmable and much of the area will develop wetland characteristics over time.

Construction of DS19 and the sediment retention basin would directly fill approximately 0.5 acres of the South Papillion Creek Channel with compacted fill material; 0.35 acres of PEM wetlands that would be lost from embankment construction and would be mitigated by the wetlands that develop along the shallow edges of the bays of the proposed reservoir. Additionally, 1.4 acres of PEM wetlands would be created by excavating shallow areas or bays connected to the edge of the normal pool area and planting them with a native wetland seed mix. These areas would be located within property acquisition limits of the project. Specific footprints will be identified in the design and implementation phase.

Mitigation for stream impacts would require acquisition of 4.6 acres of land straddling both sides of a 1,000-foot long segment of the creek just upstream of Pawnee Road. This segment is located within the floodpool of the proposed dry dam. However, because a dry dam with no permanent pool is being proposed, this segment would be suitable for mitigation. Stream mitigation would primarily consist of planting a 100-foot wide buffer of native prairie and wetland plants along each side of the creek for 1,000 feet. Stream impact mitigation at DS19 would be accomplished by acquiring 5.5 acres of land straddling both sides of a 1,200-foot long segment of an unnamed tributary to the South Papillion Creek located west of Highway 6. This segment of the tributary is located just outside the edge of the floodpool on the upstream end of the proposed reservoir. Similar to the mitigation proposed at DS10, a 100-foot wide buffer of native prairie and wetland plants would be planted along both sides of the creek channel for a distance of 1,200 feet. Reference Appendix H1 for detailed mitigation analysis.

The table below represents the estimated total mitigation costs.

Table 2. Total Mitigation Roll-up.

Impact Location	*Habitat Type Impacted*	*Acres Impacted*	*Acres Replaced*	*Mitigation Location*	*Cost/Acre*	*Total RE Cost*	*Excavation Cost @9.09/CY*	*Seeding/Planting Cost/Acre*	*Total Implementation Cost*	*GRAND TOTAL MITIGATION COST*
DS10	Stream	4.6	4.6	DS10	$ 18,392	$ 84,603	$ -	$ 1,800	$ 8,280	$ 92,883
DS10	Riparian Forest	2	3	DS10	$ 18,392	$ 55,176	$ -	$ 10,060	$ 30,180	$ 85,356
DS19	Stream	5.5	5.5	DS19	$ 8,854	$ 48,697	$ -	$ 1,800	$ 9,900	$ 58,597
DS19	Riparian Forest	19.5	29.5	DS19	$ -	$ -	$ -	$ 10,060	$ 296,770	$ 296,770
DS19	PEM Wetland	0.35	1.4	DS19	$ -	$ -	$ 50,413	$ 2,667	$ 3,734	$ 54,147
Little Papio	Riparian Forest	2	2.3	DS19	$ -	$ -	$ -	$ 10,060	$ 23,138	$ 23,138
Grand Total		**33.95**	**46.3**			**$ 188,476**			**$ 372,002**	**$ 610,891**

2 Goals

The goal of monitoring is to assess the performance of the integrated environmental mitigation features described above in Section 1.1 and to determine if the constructed replacement habitat is appropriately establishing based on defined success criteria within a given timeframe. The overall goal of the integrated environmental features is to ensure a no net negative impact or habitat loss to the habitat of the project area from construction of the flood risk reduction features.

3 Objectives

The overall project goal is achieved by meeting the objectives. The metrics of the objectives used to measure progress for each habitat type and their success criteria are listed below. Section 4.1 provides additional detail regarding collected metrics and methodology.

Riparian Forest

- Adequate vegetation percent coverage (≥ 75% of total mitigation sites should be vegetated)
- Adjusted Floristic Quality Index ([FQI]; ≥ 4.0)
- Invasive and undesirable vegetation percent coverage (≤ 25%)
- Native vegetation presence (≥ 60% recorded species are native)
- Tree/shrub stem density (≥ 65%)

Native Prairie

- Adequate vegetation percent coverage (≥ 75% of total mitigation sites should be vegetated)
- Adjusted Floristic Quality Index ([FQI]; ≥ 4.0)
- Invasive and undesirable vegetation percent coverage (≤ 25%)
- Native vegetation presence (≥ 60% recorded species are native)

Palustrine Emergent Wetlands

- Adequate vegetation percent coverage (≥ 75% of site should be vegetated)
- FQI (≥ 4.0)
- Invasive and undesirable vegetation percent coverage (≤ 15%)
- Native vegetation presence (≥ 60% recorded species are native)
- Prevalence Index ([PI] ≤ 3.0)
- Percent native hydrophytes presence (≥ 50%)
- Percent native hydrophytes coverage (≥ 50%)

4 Monitoring

In accordance with ER-1105-2-100, monitoring is appropriate for all mitigation actions to insure those actions have achieved the objective. The level of monitoring should be consistent with the magnitude of the project and the degree of risk and uncertainty with the probable success of the mitigation. Following the first growing season after project construction, monitoring of the tree plantings and native grasses/mesic plantings would occur annually during the growing season (generally May 1 through October 31, optimally June 15 through August 1). Monitoring would occur not less than five subsequent years following the construction of the project on an annual basis. An evaluation of the condition of the constructed habitat features (notated as 25-foot mesic seed vegetative buffer, native stabilizing grasses and tree/shrub plantings) and subsequent Monitoring Reports would include at a minimum:

- General site condition observations
- A brief summary of climate conditions for the growing season
- Species composition (identified to species level)
- Percent vegetative cover of each species
- Identify observed species with Coefficient of Conservation (C) value in accordance with the Nebraska Natural Heritage Program (2006) or the Universal Floristic Quality Assessment (FQA) Calculator (http://universalFQA.org)
- Photographs from established photo stations
- Identification of factors, if any, limiting success of constructed features
- Stem count (tree/shrub plantings only)
- A list of all invasive, non-native and undesirable vegetation present and growing
- Discussion of plant loss
- Discussion of survivability of seedings and plantings
- Estimate of bare ground in planted areas
- Soil profile descriptions
- Species diversity (Shannon-Wiener index value ‘H)
- Species diversity (Shannon-Wiener index value E)

Monitoring reports will be due to the U.S. Army Corps of Engineers ([Corps]; 1616 Capitol Avenue, ATTN: CENWO-PM-AC, Omaha, NE 68102) by December 31 in any given year for at least five years after the initial growing season to determine the success of the constructed mitigation features. The local sponsor shall be responsible for monitoring the establishment of the mitigation areas and submitting annual mitigation monitoring reports to the Corps. Following the first year after planting, the upland vegetation mitigation site should be monitored once annually during the growing season for five years to document vegetation establishment, progress and to identify if any adaptive management measures are warranted. At that time success will be determined using the criteria listed above in Section 3.

If, after five years of monitoring and adaptively managing the site, the areas do not meet the above success criteria, more significant adaptive management measures may need to be implemented. It can often take three years for native species to begin to dominate. The site would be considered successful if after five years the sites are dominated by native, non-invasive species and with adequate vegetation establishment and stem density as measured by the performance metrics listed above in Section 3. No differentiation to distinguish between flora that are endemic to the site and native species that were planted as part of the mitigation process needs to occur.

4.1 Vegetation Coverage and Presence

Sample points along a transect can capture community composition and coverage and may be collected as relative percentages, or by utilizing the Daubenmire Method cover class categories. In addition to Daubenmire cover classes, total vegetation cover, regardless of species type, relative to the amount of space that contained leaf litter, dead vegetation, bare soils or any other cover should also be recorded. Helpful guidance for sampling methods may also be found in the *1987 Corps of Engineers Wetland Delineation Manual*. Typical plot sizes for vegetation observations of multi-layered communities is usually accomplished utilizing a series of plots for each stratum. An approximate 5-foot radius is used for the herbaceous layer, a 15-foot radius for saplings/shrubs and a 30-foot radius for trees and vines.

4.2 Floristic Quality Assessment

FQAs are measurements of a natural area's ecological integrity, based on their plant species composition. FQA's are based on C values assigned to the individual plant species based on their tolerance to degradation and the degree to which the species is faithful to natural remnant habitats (Swink and Wilhelm, 1994). C values range from 0 to 10, with the most highly conservative species, >7, that are typically found associated under long, unchanged conditions similar to those under which such species would evolve. The least conservative species, <3, are adapted to extreme anthropogenic or natural degradation of kinds that eliminate both high and mid conservatives.

FQA metrics generally reflect the degree to which the plot or site approximates the vegetative composition of a high quality natural area. Falling values would suggest that quality and biodiversity would be declining (Freyman et al., 2015). The C values for individual species in this region may be found using the Nebraska Natural Heritage Program (2006) plant list or Rolfsmeier and Steinauer (2003) updated list in 2013 (https://universalfqa.org). The C values are used to calculate metrics such as mean C, Floristic Quality Index (FQI) and Adjusted FQI. Mean C is the average C value for all species within the assessment area and FQI weights the mean C by species richness. The mean C and FQI are calculated with all non-native species omitted or assigned a C value of 0. The Adjusted FQI was developed to reduce sensitivity to species richness and include the contribution of nonnative species when assessing sites with high levels of human disturbance.

4.3 Sapling Measurements

Performance metrics for saplings were based off a Natural Resource Conservation Services (NRCS) Technical Note (Ogle et al., 2012) which recommend a 65% or more density planting plan when the objective is for habitat and wildlife. Density is simply the number of trees and shrubs per unit area. For plantings of the tree saplings and shrubs, it is recommended that a 15 foot radius, as suggest in Section 4.1 above, be used as the standardized sampling plot to derive the overall density of the constructed habitat. Therefore, the target performance metric of the tree and shrub plantings within the one acre of area in the upland zone of constructed flood risk reduction project will require a 65% density.

4.4 Shannon-Weiner Index

Shannon-Weiner diversity index is a mathematical measure of species diversity in a community. Diversity indices provide more information about community composition than just species richness (e.g. the total number of species present). The Shannon-Weiner index takes both the richness and the relative abundance of each of these species in a community into account to determine the uncertainty that an individual picked at random would be of a given species. $H' = -\Sigma (p_i)(\ln p_i)$, where pi = proportion of individuals of species **i** in community (= **ni** /**N**; where **n** is the number of individuals of a given species and **N** is the total number of individuals in a sample) and $E = H/H_{max}$ where $H_{max} = \ln S$ (S= number of species or species richness). E assumes a value between 0 and 1, with 1 being complete eveness.

4.5 Maintenance Activities

The sponsor would be responsible for operation and maintenance (O&M) of these mitigation features in perpetuity for the life of the project. There shall be no filling, excavating, mining or drilling; no removal of natural materials; no dumping of materials; and, no alteration of the topography in any manner except as shall be necessary to maintain the constructed habitat. There shall be no draining, dredging, damming or impounding; no changing the grade or elevation, impairing the flow or circulation of waters, reducing the reach of waters; and, no other discharge or activity requiring a permit under applicable clean water or water pollution control laws and regulations, as amended. There shall be no clearing, burning, cutting or destroying of trees or vegetation, except for undesirable, invasive species. There shall be no planting or introduction of non-native or exotic species of trees or vegetation. No agricultural, industrial, or commercial activity shall be undertaken or allowed which would interfere with or damage the mitigation habitat types. Furthermore, no placement of utilities or related facilities shall be constructed. There shall be no construction, erection, or placement of buildings, billboards, or any other structures, nor any additions to existing structures. There shall be no construction of new roads, trails or walkways within the constructed habitat areas.

5 Monitoring and Adaptive Management Summary

As noted in Section 4 above, it is a Corps requirement that monitoring occur for mitigation to assess performance and determine whether AM is need to attain project objectives. Monitoring

would be used by the Corps- Omaha District, in consultation with the sponsor, federal and state agencies, and the Corps' Division office to determine any changes that may be needed. Changes would need concurrence from the sponsor and would be cost shared with the sponsor. Monitoring and adaptive management are not the same as inspections or operation and maintenance, for which the sponsor would be responsible even during the monitoring period.

Monitoring sampling would occur annually for up to 5 years post-construction, and would include vegetation monitoring to collect data for the criteria identified in Section 3. Monitoring is estimated to cost $27,000 for the monitoring period ($5,400 per year). This is part of the total project cost shared between the Corps and the sponsor. These costs will be further refined in the Design and Implementation phase. Implementation responsibilities for the monitoring plan will be identified in the Project Partnership Agreement.

Table 3. Estimated monitoring costs for a qualified biologist.

Monitoring			
Activity	**Hours**	**Assumed Hourly Rate**	**Total**
Field Observation and Data Collection	12	100	$ 1,200.00
Monitoring Report	40	100	$ 4,000.00
Contingency	2	100	$ 200.00
Total Number of Monitoring Years		5	$ 5,400.00
Total Monitoring Costs		**$**	**27,000.00**

The adaptive management (contingency) plan assumes potential minor project adjustments, in accordance with the moderate scale of the project. The nature and cost of potential adjustment measures assumes replanting failed vegetation, approximately 5% of the total mitigation implementation costs ($372,000), at a cost of approximately $18,600. These costs will be further refined in the Design and Implementation phase. Adaptive management for mitigation for the Papillion GRR may anticipate potential re-planting costs in the event of failed establishment, or potentially the need to refine grading within the wetland areas. There is minimal concern for requiring significant adaptive management measures for plantings.

These adjustment measures would be dependent on appropriations from Congress and on the rules applicable at that time regarding funding of adjustment measures. Corps project closeout would occur 4 to 5 years after completion of construction, under the expected scenario that monitoring indicates that ecological success had been reasonably achieved.

6 Literature Cited

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