Environmental Assessment - Appendices

City of Kingman, KS
City of Kingman Parks Repair and Flood Hazard Mitigation
Public Assistance Program
Project Number PA-07-KS-4449-PW-00760(0)-GM-137376

September 2022

U.S. Department of Homeland Security
Federal Emergency Management Agency, Region VII
11224 Holmes Rd, Kansas City, Missouri 64131

Wilson & Company
FEMA
LIST OF APPENDICES

FEMA has worked to ensure that this EA document is accessible to persons with disabilities, in compliance with Section 508 of the Rehabilitation Act of 1973. Regarding the EA’s Appendices, which are provided in a separate document, this EA has reported what was done and how those results affect the decision that will be made based on the totality of the EA findings. In case any of these appendices poses a challenge to be read electronically by persons with disabilities, each appendix is briefly described and summarized below, rather than being simply listed.

Appendix A. Wetland Documentation. This report is a compilation prepared by Wilson & Company of wetland documentation prepared by Mr. Bert Wilson of Marshland Environmental Consulting. His fieldwork was completed in June 2022. The document includes text, aerial photos, ground-level photos of potential wetlands, and USACE wetland determination forms.

Appendix B. Ninnescah River Mitigation Study – Mitigation Hydrologic & Hydraulic Report. This 65-page memorandum is dated March 26, 2022. It was prepared by Charles Loughman, P.E., of Wilson & Company, Inc. Engineers and Architects, and was addressed to FEMA Region VII – Resilience and Infrastructure Branch. It bears an inked impression of Mr. Loughman’s Professional Engineer seal, indicating that it is accurate and complete in his professional opinion. This document is comprised of 16 pages of memorandum supplemented by Appendices A through G, including results of a technical model called HEC RAS 2D. HEC RAS stands for Hydrologic Engineering Center's River Analysis System, developed by the U.S. Army Corps of Engineers.

Appendix C. Section 7 Informal Consultation between FEMA and the U.S. Fish and Wildlife Service. This letter is 11 pages long and dated May 24, 2022. It was written by Lois H. Coulter Environmental and Historic Preservation Advisor, Readiness Branch, Office of Environmental Planning and Historic Preservation, Washington, DC, who is currently deployed to FEMA Region 7. It was addressed to Jason Luginbill, Kansas Field Supervisor, U.S. Fish and Wildlife Service, Kansas Ecological Services Field Office, in Manhattan, Kansas. It describes the Action Area, the Proposed Action, justification for the action, and the anticipated effects and proposed mitigation regarding the Peppered Chub, Northern Long Eared Bat, and Monarch Butterfly.

Appendix D: USFWS Concurrence Letter. This letter is two pages long and is dated June 21, 2022. It was signed by Gibran Suleiman on behalf of Jason Luginbill, Kansas Field Supervisor, U.S. Fish and Wildlife Service, Kansas Ecological Services Field Office, in Manhattan, Kansas. It was addressed to Jason Luginbill, Kansas Field Supervisor, U.S. Fish and Wildlife Service, Kansas Ecological Services Field Office, in Manhattan, Kansas. The letter concluded: “Our office has reviewed the action area and the scope and nature of the proposed work to be completed as well as the avoidance and minimization measures to be implemented, that you provided. We concur with your determination of No Effect for the Whooping Crane and May Effect, Not Likely to Adversely Affect for the Peppered Chub and Northern Long-eared Bat.”

Appendix E: Kansas Department of Wildlife and Parks Letter regarding State-Listed Threatened and Endangered Species. This letter is two pages long and dated May 5, 2022. It was written by Mark Van Scoyoc, Biodiversity Survey Coordinator/Ecologist, Ecological Services Section, KDWP, in Pratt, Kansas. It was addressed to Bert Wilson, Marshlands Environmental Consulting, in Topeka, Kansas. It identifies four fish species of concern and provides eight mitigation recommendations. The letter states that an Action Permit will be required from KDWP. Permit conditions will primarily consist of work date restrictions to avoid the spawning seasons for
protected species of fish in the Ninnescah River. Project activity should not begin until application for the Action Permit has been received and signed by both parties.

**Appendix F: Section 106 Consultation between FEMA and the Kansas State Historic Preservation Officer.** This letter is 11 pages long and dated May 23, 2022. It was signed by Lois H. Coulter Environmental & Historic Preservation Advisor, Readiness Branch, Office of Environmental Planning and Historic Preservation, Washington, DC, who is currently deployed to FEMA Region 7. It was addressed to Patrick Zollner, Director, Cultural Resources Division, Deputy State Historic Preservation Officer, Kansas Historical Society, in Topeka, Kansas. The letter discusses a Finding of No Adverse Effect to Historic Properties for the project. It describes the Undertaking, the Area of Potential Effect (APE), Identification and Evaluation of Resources (including four standing structures), Tribal Involvement, and Determination of Effect. Its Conclusion requests SHPO concurrence with the finding.

**Appendix G. National Register Eligibility Determination.** This is a 21-page document prepared by FEMA that was an attachment to the Section 106 Consultation letter which is Appendix B. The paper presents Determinations of NRHP eligibility, including current photos and in some cases historic photos or maps, for the following sites:

- Kingman Fairgrounds
- Kingman Riverside Park
- Storage Shed, Riverside Park
- Kingman City Mechanic Shop
- Kingman Mill Race
- Two bridges along KS Highway-14 accessing Kingman Fairgrounds/Riverside Park

**Appendix H. SHPO Letter of Concurrence with FEMA Section 106 Findings.** This is a one-page letter signed by Patrick Zollner, Director, Cultural Resources Division, Deputy State Historic Preservation Officer, Kansas Historical Society, in Topeka, Kansas. It is addressed to Claudia Vines, FEMA Environmental Specialist, via email. The letter states: “The SHPO has determined that the proposed project will not adversely affect any property listed or determined eligible for listing in the National Register. As far as this office is concerned, the project may proceed.”

**Appendix I: Example of FEMA Tribal Consultation Letter.** This 10-page letter is one of three tribal consultation letters that was sent by FEMA to Native American Tribes with a known interest in the Kingman, Kansas, area. It was signed by Kate Stojsavljevic, Regional Environmental Officer, FEMA Region VII, in Kansas City, MO. This example was addressed to Dr. Andrea Hunter, Director and Tribal Historic Preservation Officer of the Osage Nation, in Pawhuska, Oklahoma. It describes the Undertaking, the Area of Potential Effects (APE), and Identification and Evaluation of Resources (including four standing structures). The letter requested input from the Tribe regarding the Undertaking and reported a proposed Finding of Effect as follows: “Based on FEMA’s identification and evaluation efforts, unless any of the Tribes contacted have concerns or object, FEMA will conclude the Section 106 review with a finding of No Adverse Effect to Historic Properties.”

**Appendix J: Phase 1 Environmental Site Assessment for Kingman, Kansas.** This 32-page July 2022 technical report was prepared by ppB enviro-solutions of Topeka, Kansas. It reports the
results of its research regarding hazardous material sites with the potential to be a Recognized Environmental Condition affecting the Ninnescah River island flood mitigation project. The major sections of this report are titled: Executive Summary; Introduction; User Supplied Information; Records Review; Site Reconnaissance; Interviews; Evaluation and Conclusions; Non-Scope Services; and References. An additional 599 pages of database search results are available but have been excluded from this appendix for public accessibility, as they are adequately summarized in the first 32 pages of the report.
Appendix A. Wetland Documentation

This report is a compilation of work prepared by Mr. Bert Wilson of Marshland Environmental Consulting. His fieldwork was completed in June 2022. The document includes text, aerial photos, ground-level photos of potential wetlands, and USACE wetland determination forms.
KINGMAN (KS) NINNESCAH RIVER ISLAND WETLANDS

The USFWS’s National Wetlands Inventory (NWI) Mapper (USFWS 2020b) indicates that the Kingman City Parks project area overlaps with two narrow linear wetlands associated with the stream bank of the Ninnescah River. Based on aerial imagery (Figure 1), the linear wetlands are largely congruent with existing stream channel. These wetlands exist at or slightly above the ordinary high-water mark of the river, as determined by qualified biologist Bert Wilson of Marshlands Environmental Consulting, who conducted a site visit in June 2022 to assess potential wetlands in the project area.

West End of the Island

The wetland located at the Kingman Fairgrounds West End has a 10-inch layer of river sand over an under layer of dark clay soil. This supports several species of obligate wetland plants (Figure 2). Preliminary construction plans indicate this wetland may not be within the construction limits and not disturbed by the activity. It exists at the edge of the river approximately 75 feet from the bank at the sidewalk (Figure 3).
Biologist Bert Wilson examined the soil. Vegetation and hydrology at this west-end site and documenting the results that confirm this sampling site to be located within a wetland.

Soil Pit West River Wetland
In Bert’s figure, at left, north is not “up”.
**WETLAND DETERMINATION DATA SHEET** – Great Plains Region

<table>
<thead>
<tr>
<th>Project/See Cty of Kingsman-Minnesota River Project</th>
<th>City/County</th>
<th>Kingsman</th>
<th>Sampling Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicant/Owner</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Landform (Hills, terraces, etc.) River**

<table>
<thead>
<tr>
<th>Landform</th>
<th>Local relief</th>
<th>Convex, concave, none</th>
<th>Slope (%)</th>
</tr>
</thead>
</table>

**Subregion (URN) | UMR, MLRA, Lat, Lon | 37°54'48" | -98°12'07" | Datum | NAD93 |

**Soil Map Unit Name**

| Soil/Map Unit Name | Moderate, fine sandy loam, occasionally flooded | NWS classification | Freshwater Forested |

**Vegetation**

Are climatic/hydrological conditions on the site typical for this time of year? Yes __ No __

Are vegetation __, soil __, or hydrology significantly disturbed? Yes: "Normal Circumstances" present? Yes __ No __

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features.

<table>
<thead>
<tr>
<th>Hydrophyte Vegetation Present?</th>
<th>Yes __ No __</th>
<th>Is the Sampled Area within a Wetland?</th>
<th>Yes __ No __</th>
</tr>
</thead>
</table>

**VEGETATION** – Use scientific names of plants.

<table>
<thead>
<tr>
<th>Tree Stratum (Plot size: _______ )</th>
<th>Abundance % Cover</th>
<th>Dominant Species?</th>
<th>Indicator Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
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<tr>
<td>2.</td>
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<tr>
<td>3.</td>
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<td></td>
<td></td>
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<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shrub/Grass Stratum (Plot size: 20x1 )</th>
<th>1</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
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<tr>
<td>3.</td>
<td></td>
<td></td>
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<tr>
<td>4.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Herb Stratum (Plot size: 4000 sq ft )</th>
<th>10</th>
<th>No</th>
<th>OBL</th>
<th>FACW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2.</td>
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<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hayfield/Grass Stratum (Plot size: _______ )</th>
<th>Total Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bare Ground in Herb Stratum</th>
<th>Total Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Dominance Test Worksheet**

<table>
<thead>
<tr>
<th>Number of Dominant Species</th>
<th>OBL, FACW, or FAC: 1 (A)</th>
</tr>
</thead>
</table>

| Total Number of Dominant Species Across All Strata | 1 (B) |

| Percent of Dominant Species | OBL, FACW, or FAC: 100.0% (AB) |

**Prevalence Index Worksheet**

<table>
<thead>
<tr>
<th>Total % Cover</th>
<th>OBL species</th>
<th>FACW species</th>
<th>FAC species</th>
<th>FACU species</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20</td>
<td>80</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>20</td>
<td>80</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Column Totals</th>
<th>OBL species</th>
<th>FACW species</th>
<th>FAC species</th>
<th>FACU species</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>20</td>
<td>80</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prevalence Index</th>
<th>EVA</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Hydrophyte Vegetation Indicators**

1. Rapid Test for Hydrophyte Vegetation
2. Dominance Test > 50%
3. Prevalence Index > 50%

4. Morphological Characteristics (Provide supporting evidence in Remarks or on a separate sheet)

**Problematic Hydrophyte Vegetation**

Indicators of hydrology: water and wetland hydrology must be present, unless disturbed or problematic.

**Vegetation Present?** Yes __ No __
WEST ISLAND LOW WATER CROSSING SITES

Mr. Wilson next examined two locations on the western end of the island where water crossed from south to north during the 2019 flood event. Both sampling sites were determined to not have wetlands.

In Bert’s figure, at left, north is not “up”.

[Image of West Island Low Water Crossing Sites]
At both sampling sites for the low water crossing, all three factors needed for a wetland (vegetation, soils and hydrology) were not present.
**HYDROLOGIC CONDITIONS**

Are climate/hydrologic conditions on the site typical for this time of year? **Yes** □  **No** □ (If no, explain in Remarks.)

Are Vegetation, Soil, or Hydrology significantly disturbed? Are "Normal Circumstances" present? **Yes** □  **No** □

Are Vegetation, Soil, or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

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**SUMMARY OF FINDINGS** – Attach site map showing sampling point locations, transects, important features.

<table>
<thead>
<tr>
<th>Hydrophytic Vegetation Present?</th>
<th>Yes □  No X □</th>
<th>Wetland Hydrology Present?</th>
<th>Yes □  No □</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the Sampled Area within a Wetland?</td>
<td>Yes □  No X □</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VEGETATION** – Use scientific names of plants.

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Plot size:</th>
<th>% Cover</th>
<th>Dominant Species?</th>
<th>Indicator Status</th>
<th>Dominance Test worksheet:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Number of Dominant Species That Are OBL, FACV, or FAC: 0 (A)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total Number of Dominant Species Across All Strata: 2 (B)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Percent of Dominant Species That Are OBL, FACV, or FAC: 0.0% (A/B)</td>
</tr>
</tbody>
</table>

**Prevalence Index worksheet:**

<table>
<thead>
<tr>
<th>Total % Cover of:</th>
<th>Multiply by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBL species: 0</td>
<td>x1=0</td>
</tr>
<tr>
<td>FACV species: 0</td>
<td>x2=0</td>
</tr>
<tr>
<td>FAC species: 0</td>
<td>x3=0</td>
</tr>
<tr>
<td>FACU species: 50</td>
<td>x4=200</td>
</tr>
<tr>
<td>LPL species: 60</td>
<td>x5=200</td>
</tr>
<tr>
<td>Column Totals: 30</td>
<td>(A) 400 (B)</td>
</tr>
<tr>
<td>Prevalence Index = B/A = 4.44</td>
<td></td>
</tr>
</tbody>
</table>

**Hydrophytic Vegetation Indicators:**

1. Rapid Test for Hydrophytic Vegetation
2. Dominance Test: >50%
3. Prevalence Index: ≥3.0
4. Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)

Problems with Hydrophytic Vegetation (Explain)

Indicators of hydro soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes □  No X □

REMARKS:

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Marshlands Environmental Consulting
## Profile Description:

(Describe to the depth needed to document the indicator or confirm the absence of indicators.)

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>Color (moist)</th>
<th>%</th>
<th>Color (moist)</th>
<th>%</th>
<th>Type</th>
<th>Loc*</th>
<th>Texture</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-12</td>
<td>Red 85</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
<td></td>
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</tbody>
</table>

*Type: C=Concentration, D=Deposition, RM=Reduced Matrix, CS=Covered or Coated Sand Grains

### Hydric Soil Indicators:

(Applicable to all LLRs, unless otherwise noted.)

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Humus Substratum (A4)

### Indicators for Problematic Hydric Soil

- Tannic Muck (A9)
- Coast Prairie Redoxon (A16)
- Loamy Mucky Mineral (F1)
- Dark Surface (F7)
- High Plains Depressions (F15)
- LRRH outside of MLRA 72 & 73 of LRRH

### Restrictive Layer (if observed):

- Type: 
- Depth (inches): 
- Hydric Soil Present: Yes [ ] No [X]

### Hydrology

#### Wetland Hydrology Indicators:

**Primary Indicators (Minimum of one is required; check all that apply):**

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Clust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Water-Stained Leaves (B9)

**Secondary Indicators (Minimum of two required):**

- Salt Crust (B11)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Dry Season Water Table (C2)
- Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)
- FAC-Neat Test (C5)
- Frost-House Hummocks (D7)

**Field Observations:**

- Surface Water Present? Yes [ ] No [X] Depth (inches): 
- Water Table Present? Yes [ ] No [X] Depth (inches): 
- Saturation Present? Yes [ ] No [X] Depth (inches): 

**Wetland Hydrology Present?** Yes [ ] No [X]

### Remarks:

The site is a river sand bar which is slightly above ordinary high water.
LOW WATER CROSSING SAMPLE SITE #2

<table>
<thead>
<tr>
<th>U.S. Army Corps of Engineers</th>
<th>OMB Control # 0710-0024 Exp. 11/30/2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>WETLAND DETERMINATION DATA SHEET – Great Plains Region</td>
<td>Requirement Control Symbol EXEMPT. (Authority: AR 350-5, paragraph 5-7a)</td>
</tr>
</tbody>
</table>

Project: Site of Kingman/Nimnassah River Project
City/County: Kingman/Kingman
Sampling Date: 06/01/2022
Applicant/Owner: Wilson Company for City of Kingman
State: KS
Sampling Point 0
Investigator(s): Bert Wilson
Section, Township, Range: 06 T33S R009E W

Landform (shelf, terrace, etc.) River Bank: concave
Local relief (concave, convex, none): concave
Slope (%): 0
Subregion/LLR: PAR MURAT Lat 37°40'46" Long -96°21'47" Datum W3984
Soil Map Unit Name: Water
NW classification: Freshwater Forested

| Are climatic/hydrologic conditions on the wetland typical for this time of year? | Yes ☑ | No ☑ |
| Are vegetation, soil, or hydrology significantly disturbed? | Yes ☑ | No ☑ |
| Are vegetation, soil, or hydrology naturally problematic? | Yes ☑ | No ☑ |

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features

| Hydrophytic Vegetation Present? | Yes ☑ | No ☑ |
| Halophytic Soil Present? | Yes ☑ | No ☑ |
| Wetland Hydrology Present? | Yes ☑ | No ☑ |

Is the Sampled Area within a Wetland? Yes ☑ No ☑

Remater:

VEGETATION – Use scientific names of plants.

<table>
<thead>
<tr>
<th>Vascular/Grass Status (Plot size: 7200 sq)</th>
<th>Absolute % Cover</th>
<th>Dominant Species?</th>
<th>Indicator Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>20</td>
<td>Yes</td>
<td>FAC</td>
</tr>
<tr>
<td>2.</td>
<td>30</td>
<td>Yes</td>
<td>FAC</td>
</tr>
<tr>
<td>3.</td>
<td>40</td>
<td>Yes</td>
<td>FACU</td>
</tr>
<tr>
<td>4.</td>
<td>50</td>
<td>Yes</td>
<td>FACU</td>
</tr>
<tr>
<td>5.</td>
<td>60</td>
<td>Yes</td>
<td>FACU</td>
</tr>
<tr>
<td>6.</td>
<td>70</td>
<td>Total Cover</td>
<td></td>
</tr>
</tbody>
</table>

Vegetation Indicators:

1. Rapid Test for Hydrophytic Vegetation
2. Dominance Tool (50%)
3. Prevalence Index (50%)
4. Morphological Adaptations (Provide supporting data in Remarks or on separate sheet)

<table>
<thead>
<tr>
<th>Woody Vene Status (Plot size: )</th>
<th>Absolute % Cover</th>
<th>Dominant Species?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>20</td>
<td>Total Cover</td>
</tr>
</tbody>
</table>

Vegetation Present? Yes ☑ No ☑

Remater:

This is a river sand bar or slightly above ordinary high water.

ENG FORM 6160-5, JUL 2010 Great Plains – Version 2.0

Marshlands Environmental Consulting
SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>Matrix</th>
<th>Redox Features</th>
<th>Color (moist)</th>
<th>%</th>
<th>Color (moist)</th>
<th>%</th>
<th>Type</th>
<th>Loc</th>
<th>Texture</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td></td>
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</tbody>
</table>

Type: C=Concentration, D=Deposition, RN=Reduced Matrix, CS=Covered or Coated Sand Grains

Hydraulic Soil Indicators: (Applicable to all LLRs, unless otherwise noted.)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Histosol (A1)</td>
<td>Sandy Clayey Matrix (S4)</td>
</tr>
<tr>
<td>Eutric Epipedon (A2)</td>
<td>sandy reddish matrix (S5)</td>
</tr>
<tr>
<td>Black Histic (A3)</td>
<td>Stripped Matrix (S5)</td>
</tr>
<tr>
<td>Hydrogen Sulfate (A4)</td>
<td>Loamy Mucky Mineral (F1)</td>
</tr>
<tr>
<td>Stratified Layers (A5) (LLR F)</td>
<td>Loamy Clayey Matrix (F2)</td>
</tr>
<tr>
<td>1 cm Mulch (3) (LLR F, G, H)</td>
<td>Depleted Matrix (F3)</td>
</tr>
<tr>
<td>Depleted Below Dark Surface (A11)</td>
<td>Redox Dark Surface (F6)</td>
</tr>
<tr>
<td>Thick Dark Surface (A12)</td>
<td>Depleted Dark Surface (F7)</td>
</tr>
<tr>
<td>Sandy Mucky Mineral (E1)</td>
<td>Redox Depressions (F8)</td>
</tr>
<tr>
<td>2.5 cm Mucky Peat or Peat (32) (LLR G, H)</td>
<td>High Plains Depressions (F16)</td>
</tr>
<tr>
<td>5 cm Mucky Peat or Peat (53) (LLR F)</td>
<td>(MLRA 72 &amp; 73 of LLR H)</td>
</tr>
</tbody>
</table>

Restrictive Layer (if observed):

<table>
<thead>
<tr>
<th>Type</th>
<th>Depth (inches)</th>
<th>Hydric Soil Present?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes [X] No [X]</td>
</tr>
</tbody>
</table>

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

<table>
<thead>
<tr>
<th>Prime Indicators (minimum of one is required: check all that apply)</th>
<th>Secondary Indicator (minimum of one is required: check all that apply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Water (A1)</td>
<td>Surface Soil Cracks (B3)</td>
</tr>
<tr>
<td>High Water Table (A2)</td>
<td>Aquatic Invertebrates (B13)</td>
</tr>
<tr>
<td>Saturation (A9)</td>
<td>Dry Season Water Table (C2)</td>
</tr>
<tr>
<td>Water Marks (E1)</td>
<td>Sediment Deposits (B2)</td>
</tr>
<tr>
<td>Sediment Deposits (B2)</td>
<td>(where not filled)</td>
</tr>
<tr>
<td>Ditch Deposits (B3)</td>
<td>Geomorphology (B2)</td>
</tr>
<tr>
<td>Algal Mats or Crust (B4)</td>
<td>Presence of Reduced Iron (C4)</td>
</tr>
<tr>
<td>Iron Deposits (B5)</td>
<td>Sediment Deposits (B2)</td>
</tr>
<tr>
<td>Inundation Visible on Aerial Imagery (E71)</td>
<td>Other (Explain in Remarks)</td>
</tr>
<tr>
<td>Water-Stained Lea (E9)</td>
<td>Hydrologic Transient (E71)</td>
</tr>
</tbody>
</table>

Field Observations:

<table>
<thead>
<tr>
<th>Surface Water Present?</th>
<th>Yes [X] No [X]</th>
<th>Depth (inches):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Table Present?</td>
<td>Yes [X] No [X]</td>
<td>Depth (inches):</td>
</tr>
<tr>
<td>Saturation Present?</td>
<td>Yes [X] No [X]</td>
<td>Depth (inches):</td>
</tr>
</tbody>
</table>

Vetland Hydrology Present? \[X\]

Remarks:

Marshlands Environmental Consulting
MILL RACE SAMPLE SITE

The NWI map shows no emergent wetlands in the Mill Race portion of the project. Field investigation has identified a wetland of less than 100 square feet at the west end of the construction site (Figure 5). Most of this wetland is below the ordinary high-water of the Race but has dry periods long enough to support the growth of hydrophytic vegetation. The soil is silty clay loam capable of supporting a wetland hydrology. This wetland may be outside the construction limits of the project. Field survey found no other wetlands in this portion of the project.

In Bert’s figure, at left, north is not “up”.

Marshlands Environmental Consulting
VEGETATION – Use scientific names of plants.

<table>
<thead>
<tr>
<th>Stratum</th>
<th>(Plot size: 100 ft²)</th>
<th>% Cover</th>
<th>Abs. Dominant Species?</th>
<th>Indicator Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree Stratum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
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<td>4</td>
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<tr>
<td>Total Cover</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sapling/Shrub Stratum</td>
<td>(Plot size: 100 ft²)</td>
<td>25</td>
<td>Yes</td>
<td>FACW</td>
</tr>
<tr>
<td>1</td>
<td></td>
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<tr>
<td>Total Cover</td>
<td></td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herb Stratum</td>
<td>(Plot size: 100 ft²)</td>
<td>40</td>
<td>Yes</td>
<td>OBL</td>
</tr>
<tr>
<td>1</td>
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<td>5</td>
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<tr>
<td>Total Cover</td>
<td></td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woody/Vine Stratum</td>
<td>(Plot size: 100 ft²)</td>
<td>70</td>
<td>Total Cover</td>
<td></td>
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<tr>
<td>1</td>
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<tr>
<td>2</td>
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<td></td>
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</tr>
<tr>
<td>% Bare Ground in Herb Stratum</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remarks:

Hydrophytic Vegetation Indicators:
- [ ] I. Rapid Test for Hydrophytic Vegetation
- [x] II. Dominance Test is >50%
- [x] III. Prevalence Index is <3.9
- [ ] IV. Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation (Explain)

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

<table>
<thead>
<tr>
<th>Hydrophytic Vegetation Present?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of bare ground in herb stratum</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Dominance Test worksheet:
- Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
- Total Number of Dominant Species Across All Strata: 3 (B)
- Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:
- Total % Cover of OBL species: 70 \( \times 1 = 70 \)
- Total % Cover of FACW species: 25 \( \times 2 = 50 \)
- Total % Cover of FAC species: 0 \( \times 3 = 0 \)
- Total % Cover of FACU species: 0 \( \times 4 = 0 \)
- Total % Cover of UPL species: 0 \( \times 5 = 0 \)
- Column Totals: 95 (A) 120 (B)
- Prevalence Index = EIA = 1.26
## SOIL

**Profile Description:** Describe the depth needed to document the indicator or confirm the absence of indicators.

<table>
<thead>
<tr>
<th>Depth</th>
<th>Color Index</th>
<th>%</th>
<th>Color Index</th>
<th>%</th>
<th>Type</th>
<th>Texture</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1.2</td>
<td>2.5</td>
<td>32</td>
<td>30</td>
<td>10</td>
<td></td>
<td>Muck</td>
<td></td>
</tr>
</tbody>
</table>

**Hydric Soil Indicators:** (Applicable to all LRRs, unless otherwise noted.)

- Histosol (A1)
- Black Horizon (A2)
- Black Horizon (A3)
- Hydric Silt Loam (A4)
- Deepened Below Dark Surface (A5)
- Deepened Below Dark Surface (A6)
- Sand Mucky Mineral (A7)
- Sand Mucky Mineral at 2.5 ft (A8)
- Sand Mucky Mineral at 3.2 ft (A9)

**Indicators for Problematic Hydric Soil:**

- Tom Muck (A10)
- Mucky silt Loam (A11)
- Mucky silt Loam (A12)
- Mucky silt Loam (A13)

**Restrictive Layer (if observed):**

<table>
<thead>
<tr>
<th>Type</th>
<th>Depth (inches)</th>
<th>Hydric Soil Present?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

**HYDROLOGY**

**Wetland Hydrology Indicators:**

- Surface Water (A1)
- High Water Table (A2)
- Saturated (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Salt Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Foundation Visible on Aerial Imagery (B6)
- Water-Shaded Lakes (B7)

**Field Observations:**

- Surface Water Present? Yes: 0.01
- Water Table Present? Yes: 0.01
- Saturated Present? Yes: 0.01

**Wetland Hydrology Present?** Yes: 0.01

**Remarks:**

### Marshlands Environmental Consulting

ENG FORM 016-5. JUL. 2019

Great Plains - Version 2.0
EAST END OF THE ISLAND

The other wetland identified on the NWI map located in the Riverside Park in the east construction area. The soils are well drained river sand over 12 inches deep - not capable of supporting a wetland hydrology (Figure 4). The USACE Wetland Determination Data Sheet for the East River sand bar concludes that there is no presence of hydrophytic vegetation, hydric soil, or wetland hydrology at the location. Therefore, it is concluded that no wetland was observed at this location.

In Bert’s figure, at left, north is not “up”.
U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Great Plains Region
See ERDC/EL TR-10-1; the proponent agency is CECW-C0-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Gite: City of Kingman Niinnesia River Project
City/County: Kingman/ Kingman
Applicant/Owner: Wilson Company for City of Kingman
State: KS
Sampling Date: 6/20/2022
Investigator(s): Bert Wilson
Section, Township, Range: 05 T029 R066W
Landform (hillsid'e, terrace, etc.): River Bank
Local relief (concave, convex, none): concave
Subregion (LRR): LRR H, MLRA 79
Lat: 37 38 24N
Long: -96 06 37W
Datum: WGS84
Soil Map Unit Name: Water
NWI classification: Freshwater Forested

Are climatic / hydrologic conditions on the site typical for this time of year? Yes \(\square\) No \(\square\)
(If no, explain in Remarks.)
Are Vegetation, Soil, or Hydrology significantly disturbed? Yes \(\square\) No \(\square\)
In “Normal Circumstances” present? Yes \(\square\) No \(\square\)
Are Vegetation, Soil, or Hydrology naturally problematic? Yes \(\square\) No \(\square\)
(If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes \(\square\) No \(\square\)
Hycric Soil Present? Yes \(\square\) No \(\square\)
Wetland Hydrology Present? Yes \(\square\) No \(\square\)
Is the Sampled Area within a Wetland? Yes \(\square\) No \(\square\)

Remarks:

VEGETATION – Use scientific names of plants.

<table>
<thead>
<tr>
<th>Tree Stratum</th>
<th>Plot size:</th>
<th>% Cover</th>
<th>Dominant Species?</th>
<th>Indicator Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<tr>
<td>=Total Cover</td>
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</table>

<table>
<thead>
<tr>
<th>Sapling/Shrub Stratum</th>
<th>Plot size: 1200</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Populus deltoides</td>
<td>5 Yes FACW</td>
</tr>
<tr>
<td>2. Salix exigua</td>
<td>5 Yes FACW</td>
</tr>
<tr>
<td>=Total Cover</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Herb Stratum</th>
<th>Plot size: 1200</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sorghum halepense</td>
<td>20 Yes FACU</td>
</tr>
<tr>
<td>2. Rudbeckia hirta</td>
<td>10 No FACU</td>
</tr>
<tr>
<td>3. Verbena stricta</td>
<td>25 Yes UPL</td>
</tr>
<tr>
<td>=Total Cover</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Woody/ Vine Stratum</th>
<th>Plot size:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
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<tr>
<td>2.</td>
<td></td>
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<tr>
<td>=Total Cover</td>
<td></td>
</tr>
</tbody>
</table>

% Bare Ground in Herb Stratum 30

Remarks:

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 \(\text{(A)}\)
Total Number of Dominant Species Across All Strata: 4 \(\text{(B)}\)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 \% \(\text{(AVB)}\)

Prevalence Index worksheet:
Total % Cover of: Multiply by:
OBL species 0 \(\times \) 1 = 0
FACW species 5 \(\times \) 2 = 10
FAC species 5 \(\times \) 3 = 15
FACU species 30 \(\times \) 4 = 120
UPL species 25 \(\times \) 5 = 125
Column Totals: 65 \(\text{(A)}\)
Prevalence Index = B/A = 4.15 \(\text{(B)}\)

Hydrophytic Vegetation Indicators:
1. Rapid Test for Hydrophytic Vegetation
2. Dominance Test is \(>5\%\)
3. Prevalence Index is 33 \% \(^1\)
4. Morphological Adaptations \(^3\) (Provide supporting data in Remarks or on a separate sheet)

\(^1\) Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes \(\square\) No \(\square\)
### SOIL

**Profile Description:** (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>Matrix</th>
<th>Redox Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-12</td>
<td>10yr 8/3</td>
<td>100</td>
</tr>
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</tr>
</tbody>
</table>

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, GS=Covered or Coated Sand Grains.*

**Hydric Soil Indicators:** (Applicable to all LRRs, unless otherwise noted.)

- Histosol (A1)
- Histic Epipedon (A2)
- Black Humic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5) (LRR F)
- 1 cm Muck (A9) (LRR F, G, H)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- 2.5 cm Mucky Peat or Peat (S2) (LRR G, H)
- 5 cm Mucky Peat or Peat (S3) (LRR F) (MLRA 72 & 73 of LRR H)

**Indicators for Problematic Hydric Soils:**

- 1 cm Muck (A9) (LRR I, J)
- Coast Prairie Redox (A16) (LRR F, G, H)
- Dark Surface (B7) (LRR G)
- High Plains Depressions (F16)
- Reduced Vertic (F18)
- Red Parent Material (F21)
- Very Shallow Dark Surface (F22)
- Other (Explain in Remarks)

**Restricted Layer (if observed):**

- Type: 
- Depth (inches): 
- Hydric Soil Present? Yes __ No X

**Remarks:**

Area is a river sand bar at slightly above ordinary high water

---

### HYDROLOGY

**Wetland Hydrology Indicators:**

**Primary indicators (minimum of one is required; check all that apply):**

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Incision Visible on Aerial Imagery (B7)
- Water-Stained Leaves (B6)

**Secondary Indicators (minimum of two required):**

- Salt Crust (B11)
- Aquatic invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Dry-Season Water Table (C2)
- Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

**Field Observations:**

- Surface Water Present? Yes __ No X Depth (inches): 
- Water Table Present? Yes __ No X Depth (inches): 
- Saturation Present? Yes __ No X Depth (inches): 
- (Includes capillary fringe)

**Wetland Hydrology Present? Yes __ No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

**Remarks:**
Summary of Findings
Field investigation was conducted in the vicinity of all areas expected to be disturbed, including both areas where the National Wetlands Inventory indicated possible presence of wetlands and areas where the NWI did not suggest wetland presence.

- West River site – wetland exists as indicated by NWI, but is expected to be outside the construction limits, so not affected.
- West Island Low Water Crossing Site #1 – no wetland suggested by NWI, but evaluated for due diligence, and no wetland found
- West Island Low Water Crossing Site #2 – no wetland suggested by NWI, but evaluated for due diligence, and no wetland found
- Mill Race site - no wetland suggested by NWI, but a small wetland (under 100 square feet) was found; most of this wetland is below the ordinary high-water of the Mill Race but has dry periods long enough to support the growth of hydrophytic vegetation. This wetland may be outside the construction disturbance limits of the project.
- East Island sand bar site - wetland potential suggested by NWI, but field evaluation determined that no wetland is present.

No Action Alternative
Under the No Action Alternative, the damage of the previous flood would go unrepaired. The wetlands which have developed since the last flood would remain intact until the next flood. Wetlands of this nature are subject to being destroyed by floods and reestablishing during the dry periods. The construction does not alter the flooding regime of the river. Since the construction does not change the stream flow the factors which created the wetlands after the last flood will reestablish the after the flood. The No Action Alternative does create an opportunity for future flood events to alter the river area landscape by destroying more of the existing structures and creating new river high water flow patterns between the Ninnescah River and the Mill Race. The effect on the future of wetlands here is unknown.

Proposed Action
No permanent impacts to wetlands are anticipated. Because existing wetlands within the project areas are restricted to areas within or immediately adjacent to existing stream channels, the proposed action could have short-term minor effects on wetlands. The impacts would occur when construction activities might move outside the construction limits. Any construction impacts to wetlands would be mitigated during the next high-water event. The wetlands would reestablish when the river water level recedes.

Additionally, the proposed action would reduce the risk that a major flood event would alter the river channel enough to damage wetland vegetation within and surrounding the project areas; hence, there would be minor, long-term beneficial effects on wetlands.
Appendix B. Ninnescah River Mitigation Study – Mitigation Hydrologic & Hydraulic Report.

This 65-page memorandum is dated March 26, 2022. It was prepared by Charles Loughman, P.E., of Wilson & Company, Inc. Engineers and Architects, and was addressed to FEMA Region VII – Resilience and Infrastructure Branch. It bears an inked impression of Mr. Loughman’s Professional Engineer seal, indicating that it is accurate and complete in his professional opinion. This document is comprised of 16 pages of memorandum supplemented by Appendices A through G, including results of a technical model called HEC RAS 2D. HEC RAS stands for Hydrologic Engineering Center's River Analysis System, developed by the U.S. Army Corps of Engineers.
Memorandum

To: FEMA Region VII – Resilience and Infrastructure Branch
From: City of Kingman, Kansas; Wilson & Company, Inc., Engineers & Architects
Date: 3/26/2022
Re: Ninnescah River Mitigation Study – Mitigation Hydrologic & Hydraulic Report

Wilson File Number: 19-600-505-02

Project Site Description

The City of Kingman, Kansas tasked Wilson & Company with the investigation of the Ninnescah River flood disaster conditions for the Kingman County Fairgrounds for FEMA disaster DR4449 from the Spring 2019 storm events. Before this current disaster the facility has been subject to 3 other disasters:

- DR4287 (2016)
- DR4403 (2018)
- DR4417 (2018)

The basic limits of the project facility / site is from the west end to the east end of the Kingman Mill Race on the south side of Kingman in the Kingman County Activity Center (See Figure 1). Here are the general site location conditions for the facility:

- Approximate Address: 121 South Main Street, Kingman, Kansas 67068
- Location: 0.5-miles south on K-14 from the US-400 / K-14 junction
- Latitude / Longitude: 37°38’24” N 98°06’58” W

Project Location Map

Figure 1: Project Location Map
Generally, the site is the location of the County Fairgrounds and City Park, which primarily contain large areas of flat land with generally uninhabitable structures associated with fair or park activities. The facility is located within a FEMA regulated Zone A6 floodplain for the North Fork Ninnescah River. A FEMA Zone A6 floodplain See Appendix A for the FEMA Federal Insurance Rate Map (FIRM) for the location.

The drainage area for the Ninnescah River at Main Street has a drainage area of approximately 440.0 square miles per both the FEMA Flood Insurance Study (FIS) from December 1979 and the current USGS StreamStats measurements. The drainage area closely follows the US-400 corridor and primarily consists of agricultural farmland along with Pratt, KS and other small municipalities. See Figure 2 for a

Figure 2: South Fork Ninnescah River Drainage Basin at Kingman, Kansas
Existing Condition Observations – West Site

The Kingman County Fairgrounds, Kingman Park, the Mill Race, and the Ninnescah River are owned and/or maintained by the City of Kingman, Kansas and furthermore will be considered as the Facility. The Facility experienced a major flooding event in spring of 2019, declared by FEMA as a Major Disaster. This disaster caused significant damage to the west 950 feet of the Kingman Park and Fairgrounds. Large amounts of sediment were deposited on the park grounds, sections of sidewalk were damaged, two multi-unit culverts were damaged, and the north bank of the Mill Race was eroded to within 5-feet of the sidewalk in some locations. A previous project was conducted to remove sediment and damaged tree from the facility. As a result, no sediment or tree debris removal will be included in this project.

Wilson & Company staff performed a survey of the existing facility and rivers. 2012 Elevation and LiDAR data was collected from Kansas Data Access & Support Center (KDASC) and used as Pre-Disaster Conditions for comparison. Based on ground surface or aerial image comparisons and site observations/measurement, the following repairs are required to return the site to pre-disaster conditions (graphical representation of the repairs are shown in the exhibit in Appendix B):

- Station 6+00.00 to Station 8+00.00 – Replace 35 cubic yards of Sidewalk Embankment, which was washed away during the flood events. Replacement will consist of 3-feet of sidewalk shoulder at 6” and then slope down at a 3:1 side slope to existing ground.
- Station 7+06.60 to Station 7+87.31 – Replace 45 cubic yards of Mill Race North Bank, which washed back approximately 5-feet during to flood events. Replacement will consist of a 2:1 slope to existing bank toe at 6.5-feet high.
- Station 8+67.38 to Station 9+94.19 – Replace 155 cubic yards of Mill Race North Bank, which washed back approximately 5-feet during to flood events. Replacement will consist of a 2:1 slope to existing bank toe at 6-feet high.
- Station 11+31.17 to Station 12+01.23 – Replace 80 cubic yards of Mill Race North Bank, which washed back approximately 5-feet during to flood events. Replacement will consist of a 2:1 slope to existing bank toe at 6-feet high.
- Station 12+50.00 to Station 12+69.08 – Replace 50 square feet of 6” Concrete Sidewalk, which cracked at several locations due to removal of gravel base by storm events. Replacement will consist of 5-feet wide 6” standard KDOT sidewalk concrete.
- Station 12+54.89 to Station 13+30.06 – Replace 145 cubic yards of Mill Race North Bank, which washed back approximately 10-feet during to flood events. Replacement will consist of a 2:1 slope to existing bank toe at 7-feet high.
- Station 12+96.98 to Station 13+29.19 – Replace 2 cubic yards of Sidewalk Embankment, which was washed away behind the park bench foundation during the flood events. Replacement will consist of 3-feet of sidewalk shoulder at 6” and then slope down at a 3:1 side slope to existing ground.
- Station 13+43.16 to Station 13+64.71 – Replace 2 cubic yards of Sidewalk Embankment, which was washed away behind the park bench foundation during the flood events. Replacement will consist of 3-feet of sidewalk shoulder at 6” and then slope down at a 3:1 side slope to existing ground.
- Station 13+75.15 to Station 14+00.00 – Replace 125 square feet of 6” Concrete Sidewalk, which was completed undermined and displaced through the entire length due to removal of gravel base by storm events. Replacement will consist of 5-feet wide 6” standard KDOT sidewalk concrete.
- Station 15+90.00 to Station 16+50.00 – Replace 300 square feet of 6” Concrete Sidewalk, which was completed undermined and displaced through the entire length due to removal of gravel base by storm events. Replacement will consist of 5-feet wide 6” standard KDOT sidewalk concrete.
- Station 20+85.64 to Station 21+08.01 – Replace 3 cubic yards of Sidewalk Embankment, which was washed away during the flood events. Replacement will consist of 3-feet of sidewalk shoulder at 6” and then slope down at a 3:1 side slope to existing ground.
• Station 21+03.97 to Station 21+50.00 – Replace 670 square feet of 6" Concrete Slope Protection, which was cracked and foundation was undermined during the storm events to the point where the concrete needs to be removed and the base reset to maintain the structural integrity of the concrete. Replacement will consist of 6" standard KDOT sidewalk concrete reinforcing and installation methodology for this slope protection. The slope protection shall also connect with existing culvert end sections.
• Station 21+50.00 to Station 21+95.00 – Replace 90 cubic yards of Sidewalk Embankment, which was washed away during the flood events. Replacement will consist of 3-feet of sidewalk shoulder at 5-feet high and then slope down at a 3:1 side slope to existing ground.
• Station 20+85.64 to Station 21+95.00 – Replace 550 square feet of 6" Concrete Sidewalk, which was completed undermined and displaced through the entire length due to removal of gravel base by storm events. Replacement will consist of 5-feet wide 6" standard KDOT sidewalk concrete.
• Station 25+35.00 – Replace 120 linear feet of 24" Corrugated Metal Pipe, which was removed during flood events. Replace with 24" Corrugated Metal Pipe and upstream concrete headwall.
• Station 25+65.00 – Replace 20 linear feet of 24" Corrugated Metal Pipe, which was removed during flood events. Replace with 24" Corrugated Metal Pipe and Flared End Section on the upstream and downstream side of the culverts.
• Station 25+00.00 to Station 25+95.14 – Replace 120 cubic yards of Sidewalk Embankment, which was washed away during the flood events. Replacement will consist of 3-feet of sidewalk shoulder at 4-feet high and then slope down at a 3:1 side slope to existing ground.
• Station 20+85.64 to Station 21+95.00 – Replace 475 square feet of 6" Concrete Sidewalk, which was completed undermined and displaced through the entire length due to removal of gravel base by storm events. Replacement will consist of 5-feet wide 6" standard KDOT sidewalk concrete.

Appendix A provides ground levels photos that depict the existing facility and bank conditions after the 2019 event. Appendix B provides an aerial image of the site layout for improvements to bring the site back to pre-disaster conditions. As shown in the photos, the extent of damage described above is portrayed.

Provide below is a cost estimate for the restoration activities outlined in the above bullet list. The unit prices were obtained from the KDOT statewide bid tab estimates for 2020.

**Pre-Disaster Engineer Cost Estimate – West Site**

<table>
<thead>
<tr>
<th>No.</th>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>TOTAL PRICE</th>
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</thead>
<tbody>
<tr>
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<td>Concrete Removal</td>
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<td>SY</td>
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<td>$4,900.00</td>
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<td>2</td>
<td>Embankment</td>
<td>677</td>
<td>CY</td>
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<tr>
<td>3</td>
<td>6&quot; Concrete Sidewalk</td>
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<td>SY</td>
<td>$65.00</td>
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<td>4</td>
<td>6&quot; Concrete Slope Protection</td>
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<td>5</td>
<td>Storm Sewer Pipe (24&quot; CMP)</td>
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<tr>
<td>6</td>
<td>6&quot; Concrete Headwall</td>
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<td>$4,000.00</td>
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<td>7</td>
<td>24&quot; Flared End Sections</td>
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<td>EA</td>
<td>$1,000.00</td>
<td>$2,000.00</td>
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<tr>
<td>8</td>
<td>Electrical Lighting Conduit</td>
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<td>LF</td>
<td>$8.00</td>
<td>$12,000.00</td>
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<tr>
<td>9</td>
<td>Seeding and Restoration</td>
<td>1</td>
<td>ACR</td>
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</table>

**Subtotal Probable Construction Cost** $55,241.00

**Construction Contingency (30%)** $16,572.30

**TOTAL PROBABLE CONSTRUCTION COST** $71,813.30
Existing Condition Observations – East Site

The Kingman County Fairgrounds, Kingman Park, the Mill Race, and the Ninnescah River are owned and/or maintained by the City of Kingman, Kansas and furthermore will be considered as the Facility. The Facility experienced a major flooding event in spring of 2019, declared by FEMA as a Major Disaster. This disaster caused significant damage to the west 950 feet of the Kingman Park and Fairgrounds and these damages are captured within the 3/1/2021 Pre-Disaster report for this site. During a site investigation on winter 2021, it was discovered that an additional area of damage had occurred on the eastern portion of the park. The portion of the park in question is location on the southern slope of the Ninnescah River, about 650 feet west of the Ninnescah River and Mill Race confluence.

Based on aerial images (See Figure 2) of the site prior to the disaster, it appears that the slope prior to 2019 has a large tree that is no longer on the slope. This removal of the tree has created a 30-ft hole on the slope that is within 3-feet of impacting the sidewalk and park pond embankment (See Figure 3). If this slope The City has indicated that this hole is continuing to grow along the embankment to impact other sections. The geographical limits of the damage is included in Figure 2 below.

Figure 3: Damage Location Map
Along with rebuilding the embankment, riprap will need to be replaced on the slope. The image below shows that riprap is located on the slope to protect against the Ninnescah River velocities. The Engineers estimate listed on the next page will outline the requirements to bring the slope back to pre-disaster conditions.
### Pre-Disaster Engineer Cost Estimate – East Site

<table>
<thead>
<tr>
<th>No.</th>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>TOTAL PRICE</th>
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<tr>
<td>1</td>
<td>Mobilization</td>
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<tr>
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<td>Clearing &amp; Grubbing</td>
<td>1</td>
<td>LS</td>
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<td>Embankment</td>
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<td>4</td>
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<td>70</td>
<td>SY</td>
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<td>$ 10,500.00</td>
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**Subtotal Probable Construction Cost** $20,400.00

**Construction Contingency (30%)** $6,120.00

**TOTAL PROBABLE CONSTRUCTION COST** $26,520.00

### Existing Condition Hydrologic Results

Peak discharges were found with both the FEMA FIS report and the USGS StreamStats program, which utilizes the State of Kansas USGS regression equations. Additional peak discharges were found at USGS Stream Gages at Murdock, KS, which is located approximately 22 miles downstream of the facility with approximately 150 additional square miles of drainage area. Converted to exceedance frequencies using the USGS PeakFQ program.

*Table 1: South Fork Ninnescah River Peak Discharges*

<table>
<thead>
<tr>
<th>Discharge Source</th>
<th>Drainage Area (sq miles)</th>
<th>10-year</th>
<th>Peak Discharge (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEMA Flood Insurance Study</td>
<td>440.0</td>
<td>15,600</td>
<td>28,200</td>
</tr>
<tr>
<td>USGS StreamStats</td>
<td>441.2</td>
<td>11,600</td>
<td>22,900</td>
</tr>
<tr>
<td>USGS Stream Gage near Murdock, KS</td>
<td>597.0</td>
<td>15,730</td>
<td>27,295</td>
</tr>
</tbody>
</table>

Based on direct discharge comparisons between the three calculations/methodologies, the peak discharge from the 1979 FEMA FIS report provides results that are significantly higher than either of the other two methodologies, which could most likely be attributed to using methodologies from over 40 years ago. Therefore, these values should not be used to develop the modeling for this location. When comparing the USGS StreamStats and Stream gage results, you can see that the values match very well on lower-level (10-year) storms when reducing the peak discharge for the Murdock gage based on the drainage area ratio. However, that same methodology does not hold true when looking at the large-level storms as the 500-year discharges are nearly the same for the two methodologies. After looking at other stream gages along the river, it was determined that calibrating the USGS Stream Gage at Murdock, KS to the facility location would result in the most realistic representation of the true Ninnescah River peak discharges. Those peak discharges used in the model are shown below in Table 2.

*Table 2: Facility Peak Discharges*

<table>
<thead>
<tr>
<th>Discharge Source</th>
<th>Drainage Area (sq miles)</th>
<th>10-year</th>
<th>Peak Discharge (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Fork Ninnescah River at Main Street in Kingman, Kansas</td>
<td>440.0</td>
<td>11,590</td>
<td>20,120</td>
</tr>
</tbody>
</table>

### DR4449 Event Hydrologic Analysis

FEMA disaster declaration DR-4449-KS began in April 28, 2019 and was officially declared a disaster on June 20, 2019. The peak discharge at the Murdock gage during that time was 8,900 cfs, which is significantly lower than the 10-year event discharge. When compared against lower-level storms...
frequencies at this location, the storm frequency for the event within the South Fork of the Ninnescah River more directly aligns with approximately a 5-year storm event from USGS Stream Stats and USGS PeakFQ for the Murdock gage calculations. It will be important to consider that the damage inflicted on this facility was from a 5-year storm and therefore it could be assumed that larger level storm could create significantly larger impacts on the facility.
Existing Condition Hydraulic Modeling

Based on a general overview of the ground surface elevations, it appears that the Mill Race bank quickly overtops at approximately the 2-year event and flows naturally flow across the west end of the park until it discharges into the Ninnescah River. Based on this observation, a HEC-RAS 2-dimensional model was determined to be the most appropriate modeling approach to establishing the existing conditions for the facility and determining the effectiveness of the proposed improvements on the site performance. Additionally, no FEMA digital hydraulic model has been developed for this community so there was not ability to utilize a FEMA product for this location.

The base of the model was a combination of LiDAR and ground surface information. LiDAR was obtained from the Kansas Data Access & Support Center (DASC) that is provided and maintained by the University of Kansas Geological Services. The extents of the LiDAR surface were extensive enough to contain the entire facility and the extents of the existing 100-year floodplain per the current effective FEMA FIRM. Ground surface and sonar survey was obtained for the South Fork Ninnescah River and the Mill Race from the western to the eastern end of the survey to ensure that the river corridor was accurately modeled after the 2019 storm event as the LiDAR surface doesn’t provide ground elevations below the water surface or show more recent channel migrations. The combination of these surfaces were used to establish a 20’x20 grid surface to navigate the water through.

In addition to the LiDAR and survey data, land cover data was gathered from the Natural Resource Conservation Services (NRCS) National Land Cover Database (NLCD) to use as the base for the manning’s n values for the model. These values were slightly modified within the channel and some overbank locations to represent the natural conditions of the land cover more accurately. Refinement regions were developed for the channel banks and Main Street to ensure that the embankment stream bottom and roadway overtopping elevations were accurately modeled. Bridges over the Ninnescah River and Mill Race were modeled as SA/2D Connectors using the best available bridge data and elevations.

100-year Model Results/Calibration

After the existing geometry was developed, the existing model geometry was ran using the 10-year, 50-year, and 100-year storm events for the South Fork Ninnescah River discharges that were established in the previous section. The 100-year storm event results were compared against the current effective floodplain elevations at Main Street and the extents as shown on FEMA FIRM. See Appendix A for the FEMA Federal Insurance Rate Map and Appendix D for the 100-year Existing Conditions Model map. The following calibration points were reviewed as part of this process.

- The extent of the current effective floodplain extends to Avenue A to the north and 3rd Street to the south at Main Street. The model floodplain was found to nearly match as the floodplain extends to Avenue A to the north and 3rd Street to the south. The approximate floodplain widths for the current effective and modeled extents are 2,000 feet and 2,200 feet, respectively.
- The elevations upstream and downstream of the Main Street embankment for the current effective floodplain are 1508 and 1505, respectively. The elevations upstream and downstream of the Main Street embankment for the modeled floodplain are approximately 1507.5 and 1505, respectively. While the upstream elevation does not match exactly with the current effective elevation, it was not anticipated that the difference in modeling techniques would be result in the same elevations. However, the close connection in water surface elevations would indicate that the floodplain on a macro scale is being modeled in nearly the same manner.
Proposed Mitigation Improvements

After witnessing 4 disaster events within a 4 year span and reviewing the existing hydraulic modeling for the facility, it became very clear that preventing flooding within the facility was not an option without raising the ground within the facility, providing robust slope protection on those new river banks and significantly impacting the floodplain. Therefore, the next step was to determine the locations that sustained the most damage over the several disasters and provide simple solutions in those locations that would allow flood flows to pass with little damage or future maintenance concerns. The following improvements were determined to provide the most long-term benefit and be the most cost effective for the community. All proposed improvements described in the next sections are shown in detail in Appendix E.

West Park Facility Interior Conditions

The area west of the main Kingman County fairgrounds has sustained the most damage since 2016. Multiple sections of sidewalk, riverbank, and drainage structures have been damaged or removed since 2016. The existing conditions hydraulic model indicates that the water surface during the 100-year event is between 4 to 6 feet deep through the improvement area, which extend from the western point of the facility to nearly 1,000 feet west of the point. Improvements to prevent flooding of this facility where not environmentally or economically feasible for the community for the 100-year event. When looking at the 10-year event in this location, generally depth ranged between 1 foot and 2 feet deep with a portion of the area having depths less than 1 foot. This area of low water surface depth is down in Figure 3 below with a red polygon. At the 10-year event it also became clear that there were three distinct discharge point that help convey discharge from the Mill Race to South Fork Ninnescah River during events larger than the 2-year event. The western location has not drainage structures to convey flow to the river and the eastern 2 locations have a series of 24” corrugated metal pipes to convey the discharge. All these locations were damaged in the 2019 event as the sidewalk and/or culverts were swept away by the river. These areas of discharge to the South Fork Ninnescah River are shown in Figure 3 below with yellow pins.

Figure 5: West Park Facility Key Areas of Improvement

The area where the 10-year discharge is not very deep will be raised approximately 2-ft with a sidewalk on top to reduce the risk of storm events below the 10-year from entering the fairground area to damage
those assets. The improvement does not appear to cause any identifiable impact to the 100-year floodplain water surface elevations.

The three discharge areas identified will have either the sidewalk or culvert crossings replaced with low water crossings. The low water crossing is a 12-ft wide concrete paved section of the sidewalk with 3 foot toe walls on either end to reduce the risk of scour and 12 feet of riprap will be placed upstream and downstream of the structure to further reduce the scour risk of the crossing and embankment. The western location will have the sidewalk lowered approximately 2.5 feet to accommodate the low water crossing and the eastern 2 locations will remove the culvert embankment to install the crossings. The sidewalk will be installed ADA compliance to ensure that pedestrian safety is maintained. These low water crossing provide a relatively low maintenance option for the frequent flood conditions as the city staff can easily clean sediment off the path after a flood occurs and monitor the scour conditions to add more riprap as necessary.

**West Park Bank Conditions**

In addition to improving the interior park conditions on the western portion of the facility, nearly 100 feet of the Ninnescah River south bank and over 900 feet of the Mill Race north bank should be protected as erosion is continuing to encroach on the park facilities in these locations. Ground level photos in Figures 4 and 5 show the disaster conditions from 2019 at the Ninnescah River and Mill Race, respectively.

![Figure 6: 2019 South Fork Ninnescah River South Bank Damage Conditions](image)
Velocities within the western 100 feet of the Ninnescah River after splits with the Mill Race exceed 15 feet per second (fps) through the Rocky Dam location due to the slope of the dam at the split. After the western discharge location, the Ninnescah River southern bank moves over 100 feet away from the park sidewalk and the infrastructure is no longer at a high risk of failure from the main river channel velocities. Due to the high velocities through the Rock Dam location, the 100 feet after the split need to be protected with rock riprap to provide substantial reduced risk of future erosion along the embankment. Riprap placement would be similar to the riprap that was place at the point in 2017 as that design has held up well to the flow conditions of the Ninnescah River.

Velocities within the Mill Race after splits with the Ninnescah River are all less than 9 fps for the first 1,000 feet of the channel after the split. After the first 1,000 feet, the channel velocities reduce further to all being less than 8 fps, the sidewalk pulls further away from the river bank, and the erosion risk due to bank overtopping is significantly reduced. Due to the bank overtopping frequency of storm events larger than the 2-year event, the bank will be protected with a combination of a riprap stone protection at the toe of the slope to reduce the risk for future erosion from undermining the improvements and a vegetated geogrid slope with native slope plantings to stabilize the slope above the ordinary high water mark. The lower velocities within the Mill Race channel allows for this more environmentally advantageous bank protection. The goal for the overall bank slope would be to maintain the past slope conditions of approximately 1.5:1, which were obtained from the LiDAR before the disaster. No upstream water surface increases from these improvements are anticipated as the channel bank overtops at the 2-year event.

**East Overbank Grading**

The east overbank grading improvements is located on the South Fork Ninnescah River south bank in between 250 feet and 1,200 feet downstream of the Main Street bridge. Nearly 25% of this overbank has seen elevation increases of 0.5 feet to 4 feet from 2012 to 2019. Most all the increases are found on the eastern portion of the overbank as can be seen in Figure 6 below. In addition to the elevation increases, there has been an increase in heavy timber vegetation in the overbank that is changing the overbank manning’s n values. The overbank is proposed to be graded down approximately 1.5 feet across the overbank and seeded with native vegetation to assist with a consistent elevation and manning’s n value in the overbank to ensure that flow backups are not created in the future.
The overbank grading impacts to the Ninnescah River hydraulics a dependent on the size of the storm event. Floodplain impacts associated with the 100-year event show water surface decreases in the South Fork Ninnescah River between 0.05 feet than 0.15 feet between the downstream face of the Main Street bridge to approximately 1,000 feet downstream of the bridge. However, the floodplain impacts associated with the 10-year event show water surface decreases in the South Fork Ninnescah River between 0.05 feet and 0.20 feet between the 150 feet upstream of the Main Street bridge to approximately 1,200 feet downstream of the bridge. Additional water surface decreases are found on the South Fork Ninnescah River upstream of these limits throughout the project but these decreases are less than 0.05 feet. All floodplain impact comparisons can be found in Appendix G.

While the impacts are relatively localized to the section of the river between the bridge and 1,200 feet downstream for larger storm events (100-year and 50-year events), floodplain impacts associated with these improvements for lower-level events (similar to the DR4449 peak discharges) show that more efficient flow through this area of the channel would provide water surface decreases for the South Fork Ninnescah River from the western to eastern edge of the facility through sediment removal and appropriate vegetation cover.

These improvements are as much to ensure that overbank conditions do not get progressively worse over the years as it is to improve the current conditions. The improvements will allow the City to more easily and frequently monitor the overbank to ensure that conditions are maintained on a recurring basis. An inspection and maintenance schedule will be developed for post-grading to ensure that overbank conditions are maintained in the future.

**East River Bank Stabilization**

While not originally included in the damaged area for this disaster, it was discovered that this area of the South Ninnescah River bank was in danger of failure in the future. After walking the South Ninnescah River bank from western edge to eastern edge of the facility, it was observed that a nearly 300 foot portion of the South Ninnescah River bank is significantly encroaching on the embankment for the Riverside
Park pond on the eastern portion of the facility. Aerial images from 2016, shown in Figure 7, show that significant large trees were established on the bank with at least 6-ft of distance between the northern edge of the sidewalk and the top of bank. Ground level photos from 2021, shown in Figure 8, show that a large portion of the bank has either been removed by the removal of a tree with large roots or erosion and the top of bank is now within 3 feet of the edge of sidewalk. Outside of this being a pedestrian safety hazard, there is significant concern that the existing pond embankment would be breached is this embankment were to fail.

Figure 9: 2016 Aerial Image of the Eastern Bank Stabilization Conditions
The proposed improvement to stabilize this bank would be to use a combination of a longitudinal peaked stone toe protection (LPSTP) at the toe of the slope to reduce the risk for future erosion from undermining the improvements and a vegetated geogrid slope with native slope plantings to stabilize the slope above the ordinary high water mark. The velocities within the channel section are between 7 fps and 10 fps. The LPSTP improvements below the ordinary high water mark would help to reduce the risk for toe erosion in the future where the velocities would be the highest and the vegetate geogrid slope will be able to withstand the lower velocities along the upper bank. The goal for the overall bank slope would be to maintain the past slope conditions of approximately 1.5:1 to 2:1, which were obtained from the LiDAR before the disaster. Any potential upstream water surface increases from these improvements would be mitigated by the channel overbank grading immediately upstream of the location.
Future Facility Maintenance

Overall, the entire facility from western to eastern end along both the Ninnescah River and Mill Race banks need to be inspected and photo documents annually in January and May to ensure that all river bank erosion conditions are documented and addressed. The following future maintenance activities are anticipated to ensure the proposed improvements are properly maintained:

- **Sidewalk and Low Water Crossings** – Sidewalk embankments and low water crossings will require annual inspections in January and May at a minimum to assess and document current conditions. Additional inspections will also be required after every storm event that overtops the Mill Race bank. Anticipated maintenance activities include cleaning sediment off pavement annual or after every storm event over a 2-year frequency. Based on annual or storm inspections, additional rock riprap may be required where riprap is displaced, or additional scour has occurred in these locations.

- **Ninnescah River Western Bank Improvements** – The western Ninnescah River southern bank will require annual inspections in January and May at a minimum to assess and document current conditions. Additional inspections will also be required after every storm event at or above the 5-year event. Based on annual or storm inspections, additional rock riprap may be required where riprap is replaced or additional scour has occurred in these locations.

- **Mill Race Western Bank Improvements** – The western Mill Race northern bank will require annual inspections in January and May at a minimum to assess and document current conditions. Additional inspections will also be required after every storm event that overtops the Mill Race bank. Based on annual or storm inspections, additional rock riprap at the toe, vegetation reestablishment, or geogrid replacement may be required where bank is displaced, or additional scour has occurred in these locations.

- **East Overbank Grading** – The eastern overbank location will require inspections every 3 months to ensure that sediment accumulation and vegetation overgrowth are documented. Period surveys of the overbank may be required if it is determined that new sediment accumulation is developing within the overbank. After substantial native vegetation can be established in the overbank, monthly mowing from April through October will be required to eliminate the heavy tree and vegetation growth that would reduce the floodplain capacity.

- **Ninnescah River Eastern Bank Improvements** – The eastern Ninnescah River southern bank will require annual inspections in January and May at a minimum to assess and document current conditions. Additional inspections will also be required after every storm event at or above the 5-year event. Based on annual or storm inspections, additional rock riprap at the toe, vegetation reestablishment, or geogrid replacement may be required where bank is displaced, or additional scour has occurred in these locations.
Appendix A: FEMA Federal Insurance Rate Map
Appendix B: Existing Ground Level Photos
Appendix C: Site Layout Exhibit
Appendix D: Existing Condition HEC-RAS 2D Results
Appendix E: Proposed Improvement Plan
Appendix F: Proposed Condition HEC-RAS 2D Results
Appendix G: HEC-RAS 2D Results Comparison
Appendix A

FEMA Federal Insurance Rate Map
Appendix B

Existing Ground Level Photos
Photo 1
Station 6+00.00 to Station 8+00.00
Replace 35 cubic yards of Sidewalk Embankment
Photo 2
Station 7+06.60 to Station 7+87.31
Replace 45 cubic yards of Mill Race North Bank
Photo 3
Station 8+67.38 to Station 9+94.19
Replace 155 cubic yards of Mill Race North Bank
Photo 4
Station 11+31.17 to Station 12+01.23
Replace 80 cubic yards of Mill Race North Bank
Photo 5
Station 12+50.00 to Station 12+69.08
Replace 50 square feet of 6” Concrete Sidewalk
Photo 6
Station 12+54.89 to Station 13+30.06
Replace 145 cubic yards of Mill Race North Bank
Photo 7
Station 12+96.98 to Station 13+29.19
Replace 2 cubic yards of Sidewalk Embankment
Photo 8
Station 13+43.16 to Station 13+64.71
Replace 2 cubic yards of Sidewalk Embankment
Photo 9
Station 13+75.15 to Station 14+00.00
Replace 125 square feet of 6" Concrete Sidewalk
Photo 10

Station 15+90.00 to Station 16+50.00

Replace 300 square feet of 6" Concrete Sidewalk
Photo 11

Station 20+85.64 to Station 21+08.01
Replace 3 cubic yards of Sidewalk Embankment
Photo 12
Station 21+03.97 to Station 21+50.00
Replace 670 square feet of 6" Concrete Slope Protection
Replace 90 cubic yards of Sidewalk Embankment
Replace 550 square feet of 6" Concrete Sidewalk
Photo 13
Station 25+35.00
Replace 120 linear feet of 24" Corrugated Metal Pipe with Concrete Headwall
Photo 14

Station 25+65.00

Replace 20 linear feet of 24" Corrugated Metal Pipe with Flared End Sections
Photo 15

Station 25+00.00 to Station 25+95.14
Replace 120 cubic yards of Sidewalk Embankment
Replace 475 square feet of 6" Concrete Sidewalk
Appendix C
Pre-Disaster Site Layout Exhibit
Appendix D

Existing Conditions HEC-RAS 2D Results
Appendix E

Proposed Improvement Plan
Erosion and Sediment Control Notes

Temporary erosion and sediment control measures shall be implemented prior to the start of the project operations. These practices shall include:

1. **Trenching and Dewatering**
   - Trenching shall be performed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.
   - Trenches shall be kept at least 1.5 feet above the designated water line.
   - Trenches shall be lined with approved materials to prevent erosion.

2. **Silt Fence Installation**
   - Silt fences shall be installed at the entrances to the project site and at the ends of the project area.
   - Silt fences shall be at least 1.5 feet high and shall be maintained at all times.

3. **Site Preparation**
   - Site preparation shall be performed in a manner that does not increase the risk of erosion or flooding damage to adjacent facilities.
   - Site grading shall be performed in a manner that does not increase the risk of erosion or flooding damage to adjacent facilities.

4. **Soil Stabilization**
   - Soil stabilization shall be performed using approved materials to prevent erosion.
   - Soil stabilization shall be performed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

5. **Vegetated Slope Protection**
   - Vegetated slopes shall be protected using approved materials to prevent erosion.
   - Vegetated slopes shall be protected in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

6. **Temporary Water Control Structures**
   - Temporary water control structures shall be installed at the exits of the project site to prevent erosion.
   - Temporary water control structures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

7. **Temporary Erosion Control Measures**
   - Temporary erosion control measures shall be installed at the exits of the project site to prevent erosion.
   - Temporary erosion control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

8. **Temporary Sediment Control Measures**
   - Temporary sediment control measures shall be installed at the exits of the project site to prevent erosion.
   - Temporary sediment control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

9. **Temporary Erosion Control Measures**
   - Temporary erosion control measures shall be installed at the exits of the project site to prevent erosion.
   - Temporary erosion control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

10. **Temporary Sediment Control Measures**
    - Temporary sediment control measures shall be installed at the exits of the project site to prevent erosion.
    - Temporary sediment control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

11. **Temporary Erosion Control Measures**
    - Temporary erosion control measures shall be installed at the exits of the project site to prevent erosion.
    - Temporary erosion control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

12. **Temporary Sediment Control Measures**
    - Temporary sediment control measures shall be installed at the exits of the project site to prevent erosion.
    - Temporary sediment control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

13. **Temporary Erosion Control Measures**
    - Temporary erosion control measures shall be installed at the exits of the project site to prevent erosion.
    - Temporary erosion control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

14. **Temporary Sediment Control Measures**
    - Temporary sediment control measures shall be installed at the exits of the project site to prevent erosion.
    - Temporary sediment control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

15. **Temporary Erosion Control Measures**
    - Temporary erosion control measures shall be installed at the exits of the project site to prevent erosion.
    - Temporary erosion control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

16. **Temporary Sediment Control Measures**
    - Temporary sediment control measures shall be installed at the exits of the project site to prevent erosion.
    - Temporary sediment control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

17. **Temporary Erosion Control Measures**
    - Temporary erosion control measures shall be installed at the exits of the project site to prevent erosion.
    - Temporary erosion control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

18. **Temporary Sediment Control Measures**
    - Temporary sediment control measures shall be installed at the exits of the project site to prevent erosion.
    - Temporary sediment control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

19. **Temporary Erosion Control Measures**
    - Temporary erosion control measures shall be installed at the exits of the project site to prevent erosion.
    - Temporary erosion control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

20. **Temporary Sediment Control Measures**
    - Temporary sediment control measures shall be installed at the exits of the project site to prevent erosion.
    - Temporary sediment control measures shall be installed in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

Vegetated Slope Planting

Vegetated slope planting shall be propagated using approved materials to prevent erosion.

Vegetated slope planting shall be propagated in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.

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Vegetated slope planting shall be propagated using approved materials to prevent erosion.

Vegetated slope planting shall be propagated in a manner that does not increase the risk of flooding or erosion damage to adjacent facilities.
INSTALL 540 SF OF RIPRAP FOR SLOPE PROTECTION

INSTALL 650 SF OF CONCRETE LOW WATER CROSSING

INSTALL 690 SF OF CONCRETE LOW WATER CROSSING

INSTALL 980 LF OF SLOPE PROTECTION WITH VEGETATED GEOGRID

CITY OF KINGMAN, KS
NINNESCAH RIVER
MITIGATION STUDY
PRELIMINARY STUDY

INSTALL 1860 SF OF CONCRETE SIDEWALK

INSTALL 865 SF OF CONCRETE LOW WATER CROSSING

INSTALL LIGHT POLE

INSTALL 157 SY OF RIPRAP FOR SCOUR PROTECTION

INSTALL 133 SY OF RIPRAP FOR SCOUR PROTECTION

INSTALL 380 SF OF CONCRETE SIDEWALK

REMOVE 1370 SF OF CONCRETE SIDEWALK

INSTALL 3710 SF OF CONCRETE SIDEWALK

INSTALL LIGHT POLE

INSTALL LIGHT POLE

INSTALL LIGHT POLE

PROJECT NAME
PROJECT NO: 19-600-505-02
DESIGNED BY: CLP
DRAWN BY: CLP
CHECKED BY: CDL
DATE: 1/6/2020
SHEET TITLE
WEST SITE PLAN
SCALE: 1:50_XREF
INSTALL 385 LF OF SLOPE PROTECTION WITH VEGETATED GEOGRID
EXCAVATE 3360 CY OF SEDIMENT
CITY OF KINGMAN, KS
NINNESCAH RIVER
MITIGATION STUDY
PRELIMINARY STUDY
### ENGINEERS ESTIMATE OF PROBABLE CONSTRUCTION COST
#### NINNESCAH RIVER BANK STABILIZATION MITIGATION
#### CITY OF KINGMAN, KANSAS

**Estimators:** CDLoughman  
**Stage:** Preliminary  
**Date:** 4/5/2022

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**Total Probable Construction Cost** $648,150  
**Construction Contingency (20%)** $129,630  
**Environmental Assessment** $100,000  
**Engineering & Administration** $80,000  
**TOTAL PROJECT COST** $957,780
Appendix F

Proposed Conditions HEC-RAS 2D Results
Appendix G

HEC-RAS 2D Results Comparison