



**Summary Conceptual Planning Report for the Johnson
Park River Rehabilitation Project
Elkhorn River
Norfolk, Nebraska
March 2018**



Prepared For
The City of Norfolk

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Introduction

Dam mitigation projects are a growing way to provide river restoration, river recreation, and safe instream navigation near population centers. Their popularity has grown from greater understanding of negative environmental impacts resulting from dams and the country's desire to mitigate and remove this aging and often obsolete infrastructure. Concurrently, whitewater boating is a growing outdoor sport. Diverse communities varying in population and geographic characteristics are returning to their rivers for restoration, recreation, education, and local pride. Whitewater improvements cross the socio-economic lines of a community and attract citizens of a variety of ages (see Figure 1). The operation of these projects across the country has shown they provide several benefits including new opportunities for recreation and environmental education, economic stimulus, and enhanced aquatic habitat.

Flowing near Norfolk, Nebraska, the North Fork of the Elkhorn River has potential to host a multi-use park (See Appendix 1). Mitigation of the dam at the North First Street crossing near downtown Norfolk would create a navigational passage through the area and attract users to the river. Improvements to the bank and channel would help open the river to recreational use by paddlers, anglers, and other users within the community, as well as help enhance the habitat for aquatic and waterfowl species.

The North Fork of the Elkhorn River is particularly well suited for a dam mitigation project because of four main attributes (in no particular order). First, the North First Street Bridge dam is well located near the central business district. Second, the river discharge is controlled by a flood control channel upstream of Norfolk. Third, the ability to temporarily lower the discharge will simplify the construction process and any future maintenance. Fourth, the proposed Johnson Park improvements will create a valuable amenity directly adjacent to, and complementary to, the instream structures.

Riverwise Engineering, LLC (RWE) was contracted to complete a site feasibility study and conceptual planning rendering for modifications to the North Fork of the Elkhorn River. The conceptual rendering consists of fish habitat and recreational boating improvements, as well as related bank and access improvements. These fishing, whitewater, and bank improvements should be designed with Americans with Disabilities Act (ADA) access and opportunities in mind.

Design of the structures, including dimensions and structural elements, should be completed by a licensed Professional Engineer in the state of Nebraska.



Figure 1: The Travel Iowa Brochure highlighting the dam mitigation project in Manchester, Iowa

The improvements will help strengthen the tie between the community and the river, provide a whitewater paddling amenity for the community, and create an angling resource for the region.

Feasibility Report

RWE conducted a site visit on December 19, 2017. The site visit was conducted to determine site feasibility and manage collection of pertinent data for conceptual planning purposes. RWE visited sites on the North Fork of the Elkhorn River through the town of Norfolk. During the site visit, RWE connected with City staff, consulting teams, and local experts. RWE collected photos and field notes to be used during the permitting and planning process.



Figure 2: A whitewater park built at a former dam site in Charles City, Iowa

Based on the data collected during the site visit and subsequent analysis, RWE believes the areas by Johnson Park near North First Street and East Norfolk Avenue are feasible areas for navigational and whitewater improvements, and possesses characteristics that have supported some of the more successful whitewater parks (See Figure 2). Specifically, the site contains hydraulic gradient sufficient to develop whitewater and habitat enhancements. Parking is already available near the site at the existing Johnson Park providing site users with easy access. Parking and infrastructure could be improved to allow ADA access to the river pools and viewing areas. Finally, the area contains access points along the project reach that are conducive to river users wishing to have a “float through” experience. Based on these qualities, RWE recommends site improvements.

Multiple Objectives

This project will serve a variety of different user types (See Figure 3 and Figure 4). The reach is used for angling, and any changes will be made with a goal of maintaining and increasing angling opportunities. The proposed whitewater drops and pools create valuable angling habitat. Anglers will continue to frequent the area both during boating season and during the off-season.



Figure 3: ADA access point in Manchester, Iowa shown in the top right of the photo.

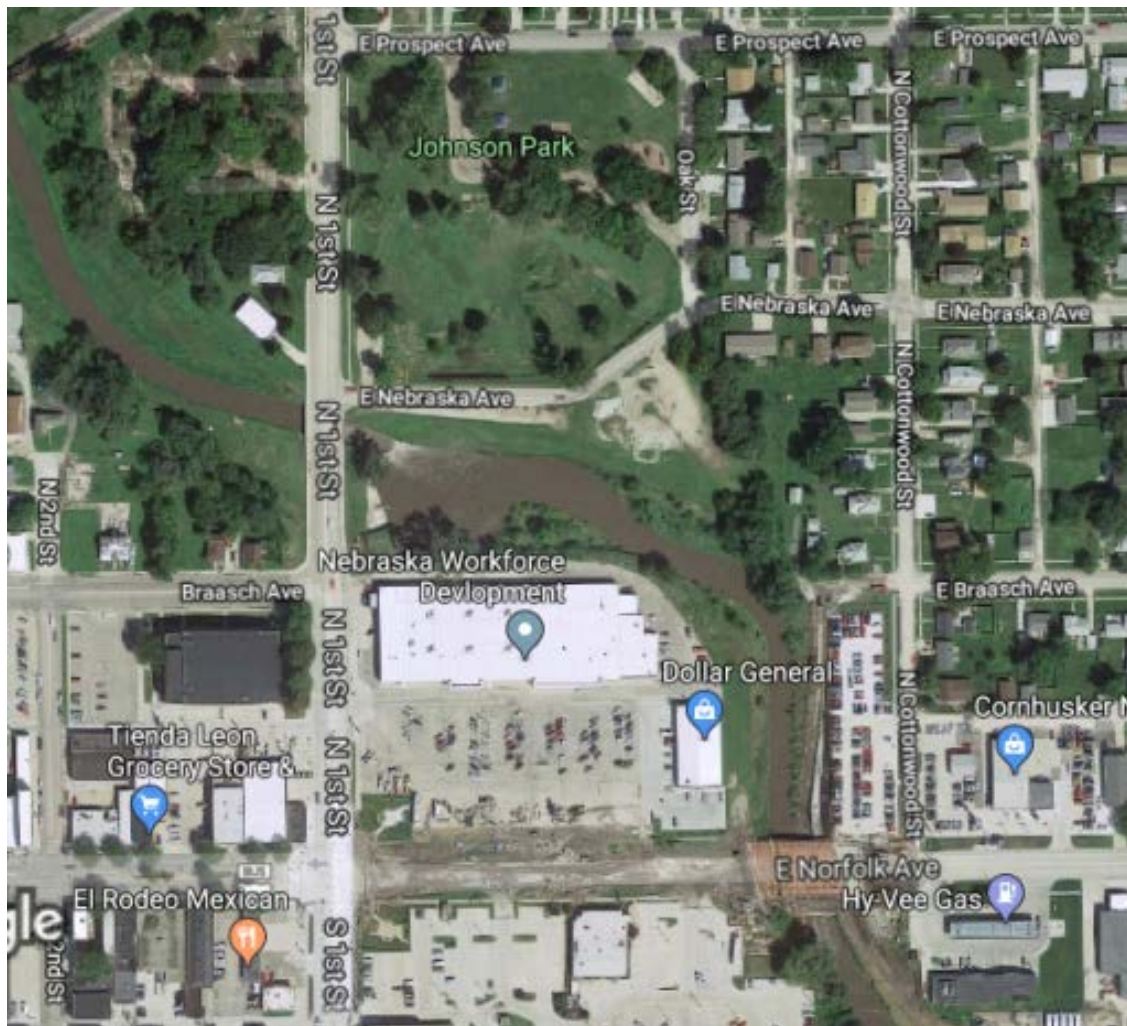


Figure 4: The public enjoying the Charles City Whitewater Park, Charles City, Iowa



Figure 5: ADA accessible access point in Siloam Springs, Arkansas

Selective accessible riverside play areas with natural boulders will be fun for kids and families. The area will be enhanced for walkers, joggers, and picnickers, and will provide opportunity for simply spending time by the river watching boaters and anglers. ADA access for whitewater and angling opportunities will also be included (See Figure 5). In addition, youth-oriented paddling and angling programs have sprung up around the development of whitewater parks to provide healthy, accessible recreation for young people.



Imagery ©2018 Google, Map data ©2018 Google 200 ft

Figure 6: Aerial image of the North Fork of the Elkhorn River in Norfolk, Nebraska showing the project area.



Project Description

The project area spans from the area near the North First Street Bridge to the area near the East Norfolk Avenue Bridge. An aerial image of the project site is shown in Figure 6. Modifications associated with this project include modifications to the channel, bank restoration and terracing, and the development and improvement of access points.

Existing Conditions

The existing conditions of the project reach can be characterized as “highly disturbed” with extensive impact. The river corridor includes floodwalls, concrete trails and retention walls, access points (See Figure 7), roads, bridges, a historic hydro plant, and an existing spillway (See Figure 8). In addition, bridge piers are located within the riverbed to provide support for two bridges.

The riparian zone through the project area is generally low quality. Plant life is minimal or exists in controlled municipal park areas except for an area on the south bank downstream of the North First Street Bridge. The likelihood of wetlands within this area is high and they will need to be protected, or mitigation will be required for impacts.

Access to the river throughout the project reach is currently available at one primary location. Just upstream from the spillway under the North First Street Bridge (See Figure 7) on the south side of the river is a dirt access indicating a portage area for the dangerous spillway just downstream. It is RWE’s opinion this access point provides marginal access for the proposed improvements, and the construction of additional access points from riverside trails on the other side of the river (north side) would enhance recreational opportunities on the river. Between the existing and proposed access locations it is possible to provide river access for park-and-play, float through, and handicapped users.



Figure 7: Existing access point on river right just upstream from the spillway on the North Fork of the Elkhorn River



Figure 8: Existing Spillway under North First Street Bridge

Hydrology

The mean monthly streamflow at the North Fork of the Elkhorn River near Pierce, Nebraska is illustrated below in Figure 9.

High flows on the North Fork of the Elkhorn River near Pierce, NE generally occur in the months of March through June and drop in the fall and winter. Mean monthly flows range from 50 cubic feet per second (cfs) in January to approximately 200 cfs in March (Figure 9). However, in rare cases, peak flow has historically reached over 1,100 cfs (Figure 10). Although the weather in the area may not be hospitable during all months, the flow conditions support whitewater recreation all year long.

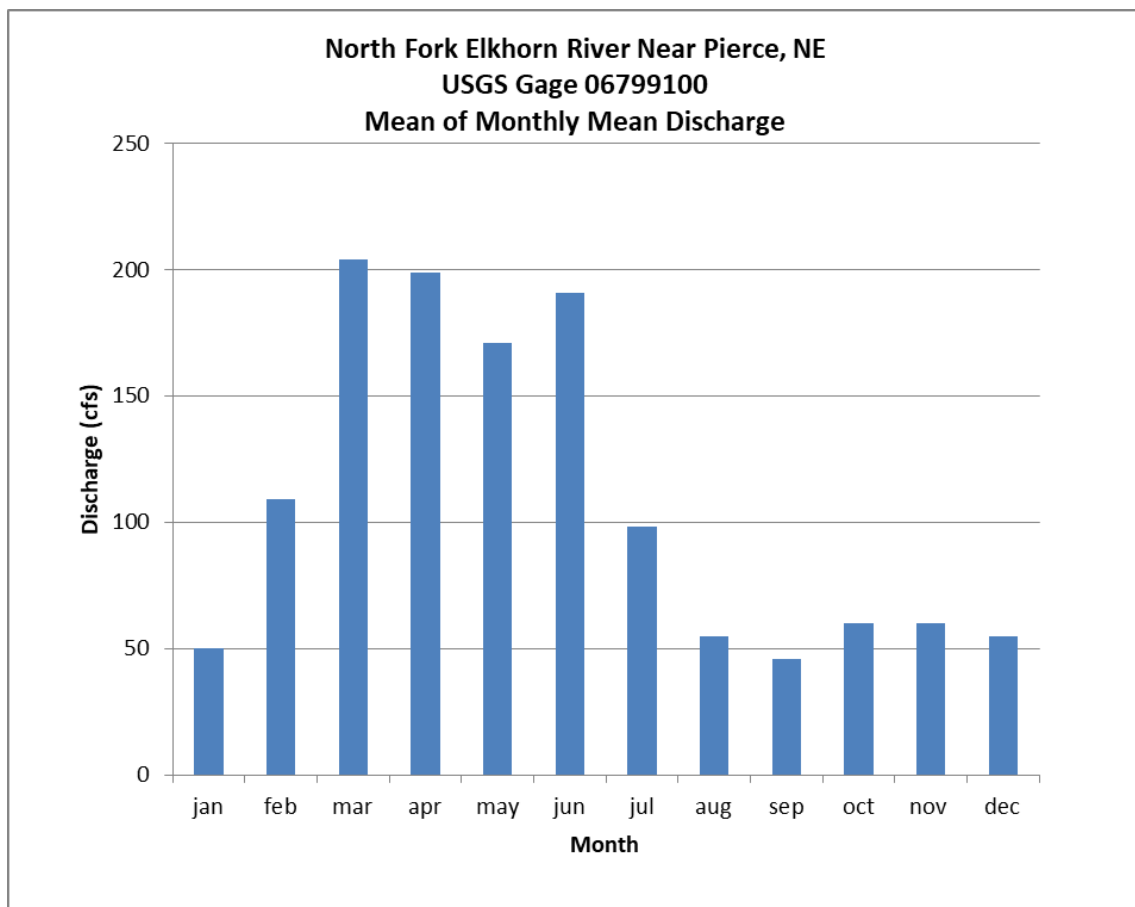


Figure 9: Mean monthly stream flow at USGS Gauge 06799100 located near Pierce, NE (Source waterdata.usgs.gov, period of record 1960-2018)

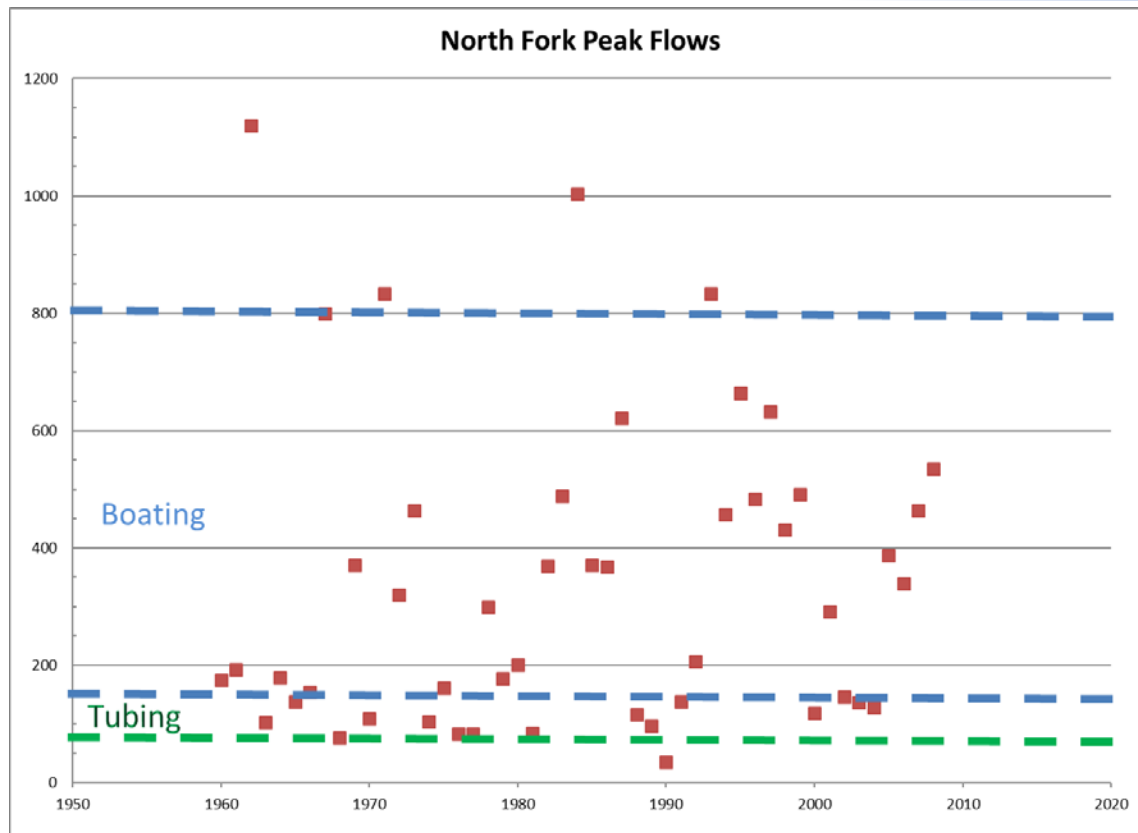


Figure 10: Peak flows at USGS Gauge 06799100 North Fork Elkhorn River near Pierce, NE (source: waterdata.usgs.gov)

RWE anticipate the discharge in the North Fork of the Elkhorn River could be managed to maximize recreational potential and minimize flooding. We consulted with U.S. Army Corps of Engineers, City of Norfolk staff, and local civil engineers familiar with the area. RWE also reviewed the existing operations manual and believes this type of management protocol could be implemented. Implementation of the project would require consultation and coordination between all these entities to create a new Operations Manual. The manual should include specific directions for City of Norfolk staff on how to manage the gates supplying water, and what protocol should be followed when altering the discharge. It should include a documentation process for any changes to the gates, a maintenance schedule, and the protocol to be followed by anyone wishing to modify the gates for such things as floods, river events, adjacent land construction projects, and instream structure maintenance projects.



Figure 10 shows the peak flows at the noted gauge and the range of flows that may be used by instream users. The figure suggests that most peak flows are usable. It's important to note the gauge is located upstream of the project area and upstream of the flood diversion, and should not be used for a direct estimate of discharge in the North Fork of the Elkhorn River in Norfolk. A flow regime should be established to maximize environmental and recreational use through Norfolk.

Proposed Improvements

Instream, bank stabilization, river access, and trail improvements are proposed along the reach of the North Fork of the Elkhorn River shown in the attached Conceptual Rendering (See Appendix 1). The improvements complement each other and provide a recreational facility for users from advanced freestyle paddlers, to anglers, to streamside picnickers.

Planning Elements

This project will serve three main user-types: in-stream users, on-bank users and anglers. The primary in-stream users will be whitewater enthusiasts including kayakers, canoeists, stand up paddleboarders, rafters, tubers, swimmers and boogie board/surfers. On-bank users include anglers, pedestrians, joggers, picnickers, bird watchers, and people wishing to visit the historic hydro plant site. The planning elements include angling habitat enhancements and will accommodate anglers with improved river access to these enhancements.

Typically, whitewater features create popular angling areas due to the deep-water habitat and aerated water. The whitewater structures create drops and pools providing angling habitat in the summer and overwinter habitat in the colder months.

The project should be ADA-friendly. This will include (but is not limited to) additional features at the put-in areas that provide handicapped access. RWE has worked closely with disabled river users to incorporate specific elements into the access points and those elements should be included in this project.

In-stream users may enjoy a project that provides both float through and park-and-play type whitewater features. The features provide recreation for a variety of skill levels. At higher flows the course will become more challenging and the structures will become more dynamic and powerful. At lower flows these same structures will accommodate beginner and intermediate boaters who seek to develop their skills. Many other

whitewater features have been used extensively for instruction and accommodate beginners and children. Figure 11 shows children enjoying a whitewater feature in Charles City, Iowa.

On-bank users will be able to take advantage of easy riverside access, as well as new terraced areas for lounging and spectating.

Signage

Appropriate signage is necessary both on the banks and within the river to direct river users to the access locations for portages, and alert users to the existence of whitewater features. Signage at the site should suggest that all users, inflatable or hard boat, wear a life-jacket and helmet. The signage should be clear, brief, and appropriately placed to assist instream users avoid dangerous decisions.



Figure 11: Children enjoying the Charles City, Iowa park

Grade Control Structure

The primary whitewater features include a series of eight grade control structures, which are typical RWE whitewater structures that create waves or holes catering to recreational boaters and anglers while elevating the river as desired. These structures are constructed using large, grouted rock anchored into the bed and bank of the river. The structures would also have a gradual slope within a separate channel to allow for fish passage. In addition, the deep pools downstream of the structures provide habitat for aquatic species, especially during spring and summer runs. Figure 12 shows an example of a grade control structure in Durango, CO.



Figure 12. Grade Control Structure on the Animas River, Durango, CO.

Bank and River Access Improvements

Several bank stability and river access improvements are included within the conceptual rendering. The improvements should be designed to integrate with, and complement, work completed by JEO. Access points are important for providing safe access to the water. Additional access points will be constructed on both sides of the river by

Johnson Park and potentially upstream of the North First Street Bridge. These access points will funnel users to safe, accessible areas along the river's edge ideal for angling, entering the water to boat, sitting near the falls, or viewing the historic hydro plant.

A trail extending upstream and downstream from the North First Street Bridge will run along the river's north edge providing extended river access from Johnson Park. This trail will incorporate a street crossing across North First Street. Additional trails would be constructed in Johnson Park to develop the park as multi-use asset to the community. Joggers, picnickers, walkers, and birdwatchers will have developed paths for enjoying the river, riparian zone, and historical attributes this reach of river provides.

Additional trees and native riparian vegetation will be planted along the river bank to provide shade as well as a more secluded and aesthetic atmosphere for park users.

Trails and access points extending upstream and downstream from the spillway will run along the river's south edge extending the length of the project. The access points provide locations for ingress and egress for instream and bank users. The area near Structure #4 includes an area that will be designed to attract bank users and potentially provide a finer substrate (i.e. a beach). The remnants of the historic mill are in this area and the consulting team has discussed creating project elements that showcase and highlight this amenity.

All these access points, trails, and park infrastructure are envisioned to be attractive, functional, permanent, and blend with, and improve, the natural environment. Figure 13 shows an example of bank terracing and trail work.



Figure 13. Before and after example of bank terracing and trail improvements in Salida, CO by REP



Floodplain Impacts

There will be potential floodplain impact due to this project. It is standard engineering protocol to create a calibrated flood model to study the rise in water surface elevations during 100-year flood events. RWE recommends this is completed during the first stage of design. The study should focus on creating a calibrated one-dimensional numerical model capable of modeling the water surface elevation associated with different discharges. The lowest floor of any adjacent buildings or infrastructure should be researched and documented for use in the model. Finally, the consulting team should work with the U.S. Army Corps of engineers to modify and update the Operations Manual associated with the North Fork of the Elkhorn flood relief channel north of town. The channel will need to be managed based on a set protocol and that protocol will be a combination of modeling results, City requirements, and the U.S. Army Corps of Engineers requirements.

Accessibility

The project, as mentioned, is located near downtown Norfolk on the North Fork of the Elkhorn River. Parking already exists at the location and there are nearby businesses with facilities, food, and drinks. The proposed improvements to Johnson Park will create significant attraction to the area and will further bolster the success of the instream features.

Maintenance

In-stream improvements are virtually maintenance-free assuming they are designed and built correctly. During the design phase careful attention should be paid toward anchoring these structures well into the banks and beds of the river so that there is no possibility of failure. Regular inspections should be scheduled to evaluate any significant erosion each year and following high discharge or peak flow events. Trees, ice and woody debris will be passed during normal flows but should be removed if suspended during high-use times as they represent an immediate in-stream hazard.

RWE recommends inclusion of budget to perform minor modifications and changes that result from the first significant hydrograph through the structures. Our experience has shown that problem areas resulting in excessive erosion and aggradation usually occur within this first hydrograph and it is prudent to address them early.



RWE recommends the creation of a maintenance plan during final design stages. The plan should include responsibilities and tasks associated with the maintenance of the park. The plan should include, but not be limited to:

- Entity responsible for regular maintenance such as trash and debris removal.
- Plans for maintenance and rehabilitation following flood damage.
- Protocol for future improvements or expansion of facilities.

The Maintenance Plan should include an operating cost estimate and may be used to secure a managing agency and set budgets.

Anticipated Use

Given the flow rates and weather at the site, it is expected that boaters and floaters will visit the park throughout the months of March through October. After the weather deteriorates, it is expected that in-stream use by boaters will decrease, but bank use will continue throughout the year. Anglers will likely gravitate towards the newly constructed pools and are expected to frequent the park on the shoulder seasons.

Costs

See the attached cost estimate in Appendix 2. The cost estimate includes mobilization, minor water control, and construction of the rendered structures. The estimate includes a 30% contingency, which is appropriate for planning. Project engineering and consulting is estimated at 12% and additional surveying will be necessary.

RWE recommends a budget is set aside (See Item #16) for minor changes that may be necessary following the first significant hydrograph through the site, as noted above. Experience has suggested most instream structures will reveal any longer-term problems, whether they are aggradation or erosion, after that hydrograph. The budget item accounts for a site visit where project engineers can identify and remediate those problems.

Many Cities have much of the required rock available at active work sites or in storage which could reduce material costs and can have a significant impact on the total cost of the project.

Project Phasing

Project proponents and consultants questioned whether the project could be done in phases. Phasing a project provides advantages if the funding needed to build a project



may only be available in stages, or if site conditions, political conditions, and other extenuating circumstances prevent the project from being done at one time.

This project could be done in two or more phases. If the City is interested in phasing, RWE recommends the first phase focus on mitigation of the First Street Bridge dam. To mitigate this dam would require demolition of the dam and construction of Structures #4-8. The cost would be approximately 50% of the total cost of the project. This phase would complement the upland work proposed for Johnson Park and create a valuable amenity.

Completing the project as a whole creates economies of scale. If the project is done in phases, significant mobilization costs occur each time the contractor brings material to the site and creates staging and access locations. In addition, completion of phase one noted above would result in a drop in the water surface elevation upstream of the existing dam by approximately four feet. This could result in unsightly cut banks and channel erosion that may require mitigation and/or staged removal of the dam. Each of these challenges could result in delayed construction and/or additional costs.

Future Work

If the City decides to go forward with this project, future tasks include but are not necessarily limited to:

- Bathymetric Surveying
- Preliminary Design
- Detail Design
- Flood/Fluid Modeling
- Permit Applications
- Maintenance Plan
- Updated Operation Manual for the flood control project
- Construction and Bid Documents
- Construction and Construction Inspections
- First hydrograph maintenance



It is recommended that the project team open a dialogue with related planning and government agencies as soon as possible following the decision to proceed, since it is imperative that these stakeholders be included in the design process.

Permitting

Several permits will need to be obtained before the commencement of any construction of in-stream improvements. Permitting can be time-consuming and should be started as soon as possible during the preliminary design process. Necessary permits are expected to include (but not limited to) the US Army Corps of Engineers Section 404 and 401 Permits, and a conversation with the local floodplain administrator.

The project team will need to complete an update to the Operations Manual for the flood control project. This will require coordination and review with the U.S. Army Corp of Engineers Omaha District.

After the preliminary design phase, permits can be submitted to the various agencies and the City will get an indication on how extensive the permitting process will be.

Conclusion

Modifications to the North Fork of the Elkhorn River in Norfolk are feasible and recommended. The river is a valuable resource to the community and could become even more valuable with the implementation of proposed improvements. The modifications outlined in this conceptual report would open the river to increased recreation and improve angling habitat through the reach.

RWE has presented improvements at this site that include, but are not limited to, instream grade stabilization structures for whitewater and angling recreation, increased access and bank stabilization for park pedestrians and river users, and improvements to in-channel safety. These improvements provide a recreational amenity for instream and bank users alike.

Similar improvements have had enormous impacts on the quality of life and local economies of communities throughout the country. For example, the Manchester whitewater park in Manchester, Iowa saw a 4.4% retail sales increase following the opening of the park.

Appendices

1) Conceptual Rendering

See attached

North Fork of the Elkhorn River Improvement Project at Johnson Park





2) Cost Estimate

Planning Level - Opinion of Probable Cost

Johnson Park Master Plan

Design Firm: Riverwise Engineering, LLC

April 17, 2018

ITEM	DESCRIPTION	QTY.	UNIT	UNIT COST	ITEM TOTAL
1	Mobilization	1	unit	\$275,000	\$275,000
2	Water Control	10	unit	\$15,000	\$150,000
Instream Structures					
3	Structure #1	278	CY	\$325	\$90,278
4	Structure #2	278	CY	\$325	\$90,278
5	Structure #3 and Put-in	350	CY	\$325	\$113,750
6	Structure #4	231	CY	\$325	\$75,231
7	Structure #5	602	CY	\$325	\$195,602
8	Structure #6	231	CY	\$325	\$75,231
9	Structure #7	278	CY	\$325	\$90,278
10	Structure #8	278	CY	\$326	\$90,556
11	Bankside Terracing between Structures #4 and #6	611	CY	\$175	\$106,944
12	Deflectors between Structures #4 and #5 (two count)	167	CY	\$325	\$54,167
13	Re-Creation of floodplain terrace between Structures #4 and #5	9,375	CY	\$50	\$468,750
14	Miscellaneous Trackhoe Hours	250	hour	\$400	\$100,000
15	Miscellaneous Boulders (7-foot diameter or larger)	24	unit	\$2,400	\$57,600
16	First hydrograph maintenance	1	unit	\$100,000	\$100,000
17	Demolition of First Street Bridge Dam	1	unit	\$40,000	\$40,000
Subtotal Construction Costs					\$2,173,665
Project Contingency - 30%					\$652,099
Project Engineering - 12%					\$260,840
Topographic Survey Allowance					\$8,500
Total Construction Costs					3,095,104

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 4/17/2018