NEBRASKA NATURAL RESOURCES COMMISSION

Water Sustainability Fund

Application for Funding

Section A.

ADMINISTRATIVE

PROJECT NAME: Lincoln Water System Drought Resiliency and Flood Protection

PRIMARY CONTACT INFORMATION

Entity Name: City of Lincoln, Public Works and Utilities, Lincoln Water System

Contact Name: Steve R. Owen

Address: 2021 N 27 St, Lincoln, NE, 68503

Phone: (402) 441-5925

Email: sowen@lincoln.ne.gov

Partners / Co-sponsors, if any: None

1. Dollar amounts requested: (Grant)

   Grant amount requested. $ 7,636,698

   Loan amount requested. $ 0

   If Loan, how many years repayment period? N/A

   If Loan, supply a complete year-by-year repayment schedule.
   N/A

2. Permits Needed - Attach copy for each obtained (N/A = not applicable)

Nebraska Game & Parks Commission (G&P) consultation on Threatened and Endangered Species and their Habitat N/A☐ Obtained: YES☒ NO☐

Nebraska Game and Parks Commission Letter (Attachment A.1)

Surface Water Right N/A☐ Obtained: YES☒ NO☐

Department of Natural Resources Permit A-17312 (Attachment A.2)

USACE (e.g., 404 Permit) N/A☐ Obtained: YES☐ NO☒

No USACE 404 permit is required for the well and piping, funding for permitting the bridge abutments is included in the grant application cost estimate.

Cultural Resources Evaluation N/A☐ Obtained: YES☒ NO☐

Nebraska Historical Society Letter (Attachment A.3)

Other (provide explanation below) N/A☐ Obtained: YES☒ NO☐

Floodplain Development Permit (Attachment A.4)

3. Are you applying for funding for a combined sewer over-flow project?

YES☐ NO☒

If yes, do you have a Long Term Control Plan that is currently approved by the Nebraska Department of Environmental Quality?

YES☐ NO☐

If yes attach a copy to your application. N/A

If yes what is the population served by your project? N/A

If yes provide a demonstration of need. N/A

If yes and you were approved for funding in the most recent funding cycle, then resubmit the above information updated annually but you need not complete the remainder of the application.

4. If you are or are representing an NRD, do you have an Integrated Management Plan in place, or have you initiated one?

N/A☒ YES☐ NO☐

5. Has this application previously been submitted for funding assistance from the Water Sustainability Fund and not been funded?

YES☐ NO☒

If yes, have any changes been made to the application in comparison to the previously submitted application? N/A

If yes, describe the changes that have been made since the last application. N/A

No, I certify the application is a true and exact copy of the previously submitted and scored application. (Signature required) N/A

6. Complete the following if your project has or will commence prior to next July 1st.

As of the date of submittal of this application, what is the Total Net Local Share of Expenses incurred for which you are asking cost share assistance from this fund? $ 0

Attach all substantiating documentation such as invoices, cancelled checks etc. along with an itemized statement for these expenses. N/A

Estimate the Total Net Local Share of Expenses and a description of each you will incur between the date of submittal of this application and next July 1st for which you are asking cost share assistance from this fund.

A detailed schedule and construction budget can be found attached (Attachment A.5). The construction budget for activities through July 1, 2017 is $5,209,638. The local share of these expenses would be $2,083,855.20.

Section B.

DNR DIRECTOR'S FINDINGS

Does your project include physical construction (defined as moving dirt, directing water, physically constructing something, or installing equipment)?

YES☒ NO☐

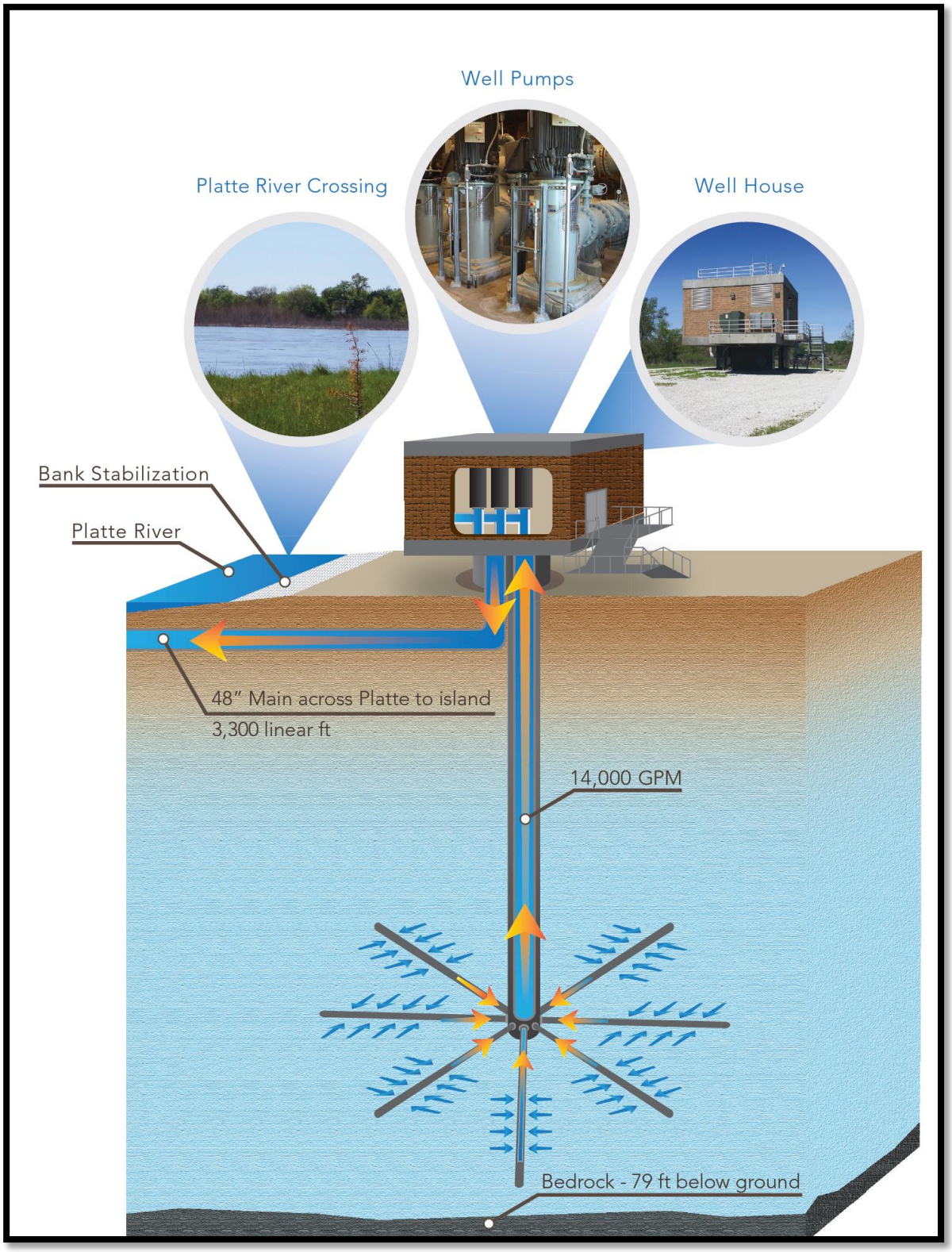
1(a). If yes (structural), submit a feasibility report (to comply with Title 261, CH 2) including engineering and technical data and the following information:

A discussion of the plan of development (004.01 A);

The droughts of 2002 and 2012 and the floods of 1993, 1997, 2001, and 2011 illustrated to the City of Lincoln two significant threats to the sustainability of its water supply. The Lincoln Water System (LWS) is supplied by a wellfield near Ashland, Nebraska with wells in the center and on the west side of the dynamic Platte River. The purpose of the Drought Resiliency and Flood Protection Project is to address both threats. For drought resiliency, the project includes completion of the fourth horizontal collector well and associated pipeline to provide for more efficient water supply operations, specifically during drought. The improvements are illustrated below in Figure 1. For flood protection, the project includes bank stabilization structures to protect the critical infrastructure from erosional damage during flood events. The project will provide a direct benefit to the citizens of Lincoln and upgradient water users by removing water from the aquifer more efficiently and thus allowing the LWS to operate its wellfield at lower Platte River flow conditions while also protecting critical infrastructure during high flows.

Three reports were prepared in support of the Lincoln Water System Drought Resiliency and Flood Protection Project (the "Project"). These are:
1. Lincoln Water System Facilities Master Plan, May 2014 (Attachment B.1)
2. LWS Platte River Wellfield Hydrogeological Investigation, June 2005, hereafter called the "Wellfield Investigation" (Attachment B.2)
3. Platte River Bank Stabilization, Assessment, Prioritization, and Recommendations: Final Report, April 2016 hereafter called the "Bank Stabilization Assessment" (Attachment B.3)

Figure 1. Summary of Drought Resiliency and Flood Protection Project



A summary of the two feasibility reports is provided as follows:

Summary of the Wellfield Investigation

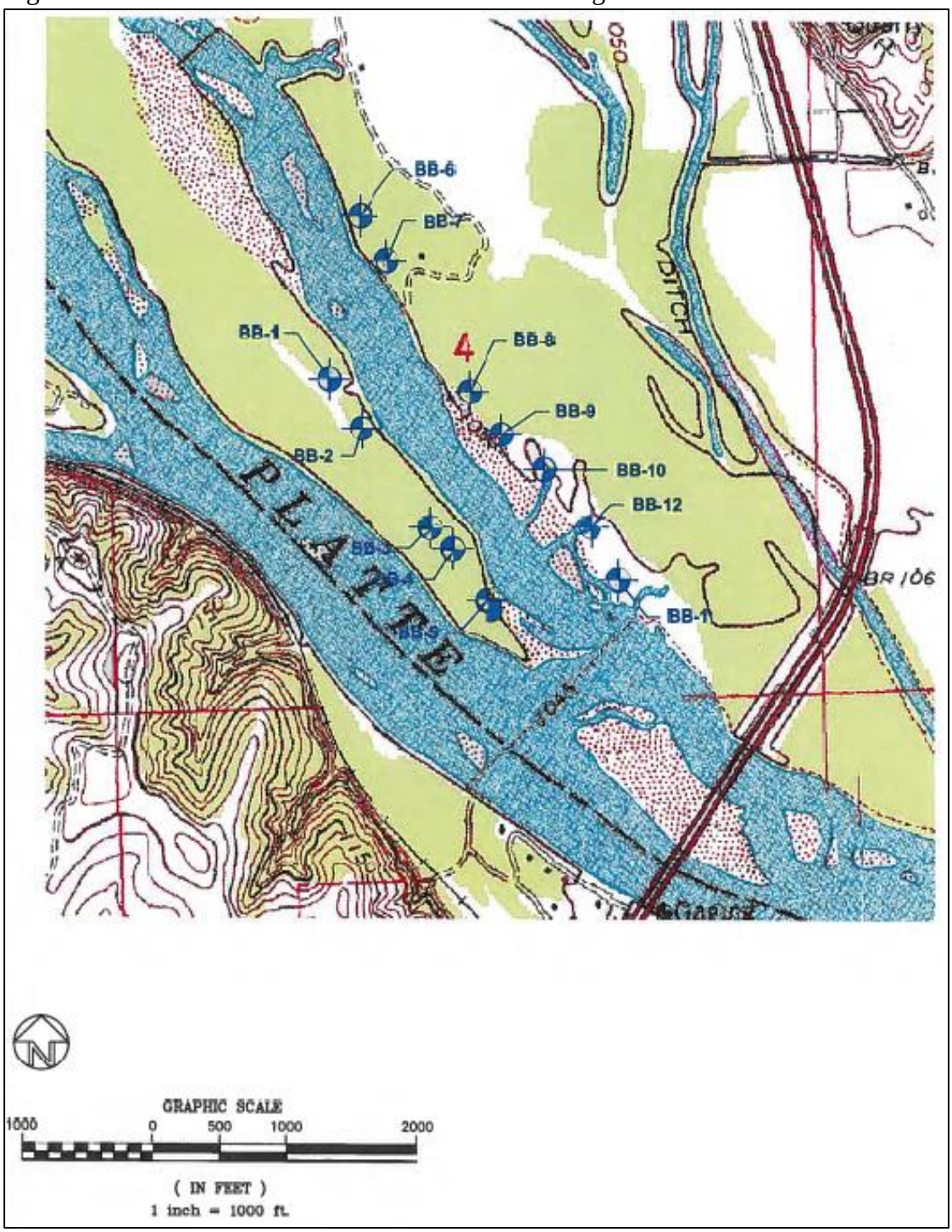
The goal of the Wellfield Investigation was to provide the city with recommendations for the best locations to install additional horizontal collector wells (HCWs) at the city's wellfield located near Ashland, NE. The city currently operates three HCWs at their wellfield. The first two were installed in the early 1990s based on recommendations from an earlier study completed in 1991. The third collector well was installed in 2013 based on the results of the Wellfield Investigation, which identified the location as the best option out of all the locations evaluated.

The Wellfield Investigation states:
Primary objectives of the hydrogeological evaluation were to:

- Assess the vertical and lateral extent of the aquifer in the study areas
- Characterize the hydraulic properties of the aquifer in the study areas
- Evaluate the communication (i.e., recharge) between the aquifer and the river, and
- Determine the projected yield of a potential collector well installed at each site. (Attachment B.2 page 9)

In order to complete this evaluation, consultants conducted a series of geologic and hydrologic field investigations, as described in greater detail below. In general, the Wellfield Investigation conducted an initial screening of 12 potential locations (Figure 2).

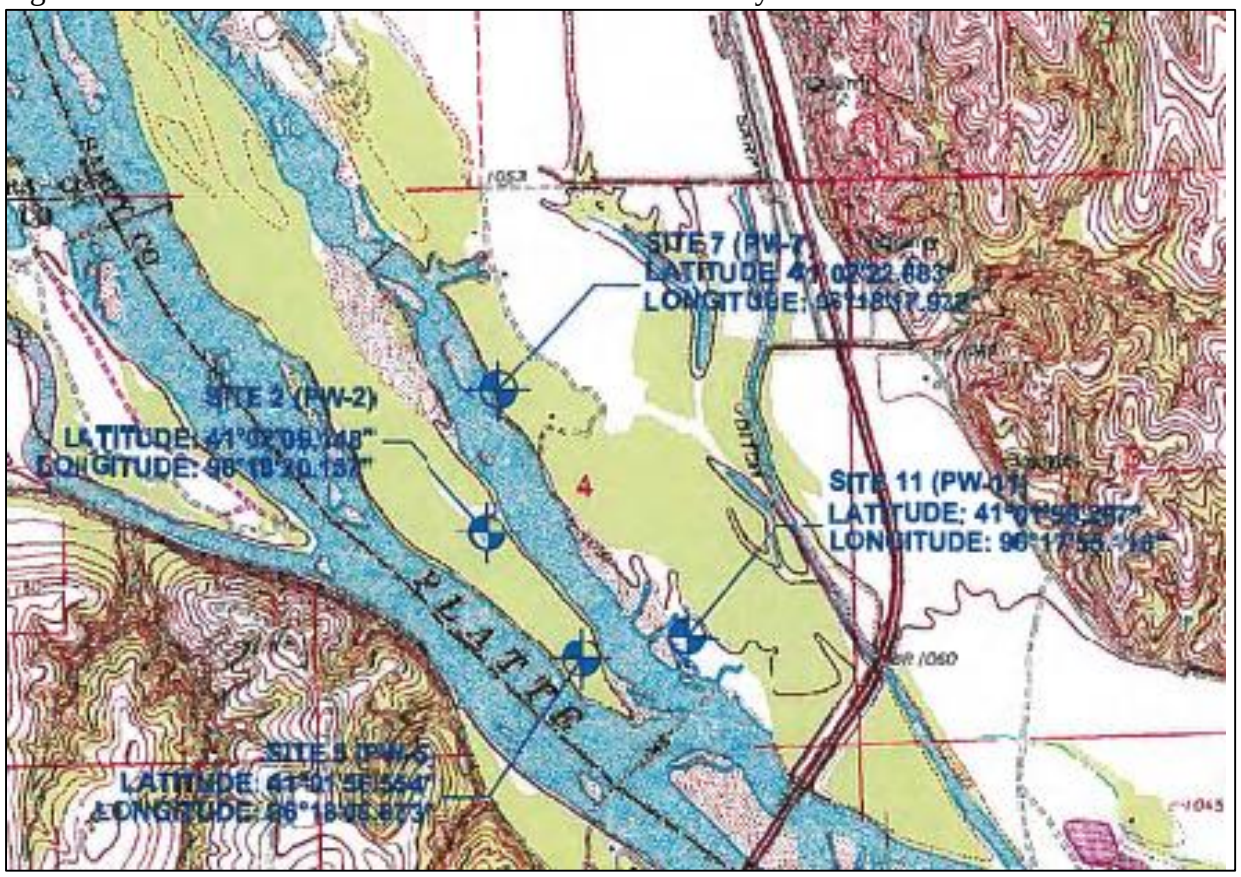
Figure 2. Location of 12 sites used for initial screening.



Based on this initial screening, four sites were chosen for additional, more in-depth study (Figure 3). The report concluded:

Results of the investigation appear favorable for the installation of high capacity radial collector wells at all four sites tested. The permeable nature of the aquifer encountered, as well as the favorable infiltration rates and recharge, make each site attractive for groundwater development (Attachment B.2 page 44).

Figure 3. Location of the four sites chosen for further study.



Based on these results, the city installed the caisson and lateral collectors at Site 2 and Site 11 in 2013. The first well was also outfitted with pumps and related equipment and put into service in 2014. This element of the Project seeks to finish the development of the two HCWs by outfitting the second caisson with pumps and connecting the well to the pipeline for the wellfield (which requires crossing the east channel of the Platte River with a connecting pipeline).

Summary of the Bank Stabilization Assessment

The City of Lincoln has invested a significant level of financial resources in water supply infrastructure. In just the last few years, the city has expended over $11 million enhancing the reliability of its water supplies by installing two additional

HCW caissons and lateral collectors, a well house on one of those caissons, and a transmission main connecting that well house to the rest of its water supply infrastructure. While the Platte River alluvial aquifer is an excellent source of high quality drinking water, the dynamic nature of the river does present threats to both existing and planned infrastructure, due to gradual erosion and the impact of high water and ice events along its river banks.

Due to the vulnerability of this critical infrastructure, the City of Lincoln conducted a reconnaissance assessment of both the river banks and the mid-channel island and identified six priority areas for additional assessment and development of recommendations for protection of this infrastructure (Figure 4).

The study developed a comprehensive understanding of the geomorphology of the Platte River so that any recommendation would:

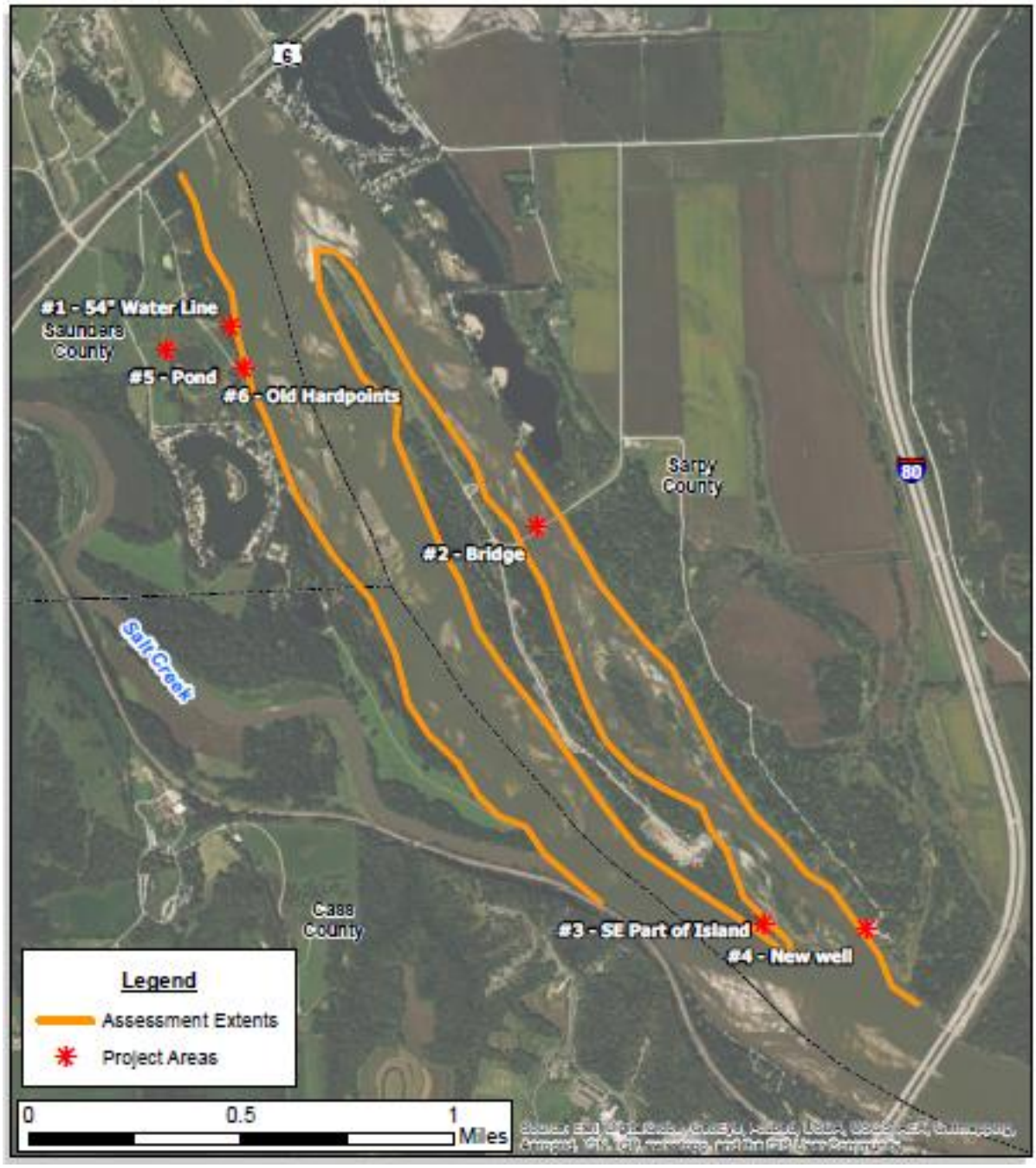
1. Ensure ecological integrity
2. Avoid and minimize environmental impacts
3. Mitigate other environmental impacts
4. Restore ecological services
5. Ensure engineering functionality

The Bank Stabilization Assessment produced conceptual design and cost estimates for measures that would protect the six priority areas with monitoring recommendations for ensuring protection of all shorelines and island banks. The Bank Stabilization Assessment then prioritized the recommended measures:

Prioritization was completed based primarily on the observed rate of erosion and the value of the infrastructure threatened. This gave a prioritized order based on the following needs/priorities:

1. Protecting the southern part of the Island (Site #3)
2. Protecting the existing water line (area around Site #1)
3. Protecting the new well 14-2 (Site #4)
4. Protecting the bridge (Site #2)
5. Protecting the pond area (Site #5)
6. Protecting existing hardpoints and surrounding area (Site #6)

Figure 4. Map of the bank stabilization area showing the six project areas.



Priorities 1-3 are considered the most critical and should be implemented as soon as funding allows. Priorities 3-6 are lower risk and could be implemented in the next three to five years. If funding allows, it would be ideal to design, permit, and construct all projects in one phase.

Plan of Development

The plan of development for the project is to have the well and pipeline complete and in service by 2018 and the flood protection measures initiated in 2018. A detailed construction schedule and budget is attached (Attachment A.5).

A description of all field investigations made to substantiate the feasibility report (004.01 B);

The field investigations conducted as part of the Wellfield Investigation and the Bank Stabilization Assessment are described in detail in those reports, which are attached to this application as (Attachment B.2) and (Attachment B.3). A general description of those investigations is provided below.

Wellfield Investigation field investigations

The field investigations conducted as part of the Wellfield Investigation included the following components:

1. Bedrock Determination
2. Test Borings/Interval Testing
3. Detailed Aquifer and Water Quality Testing

The bedrock determination was conducted by drilling 12 test borings for the sole purpose of determining the depth to bedrock at those locations. Four of these sites were selected for test borings and interval testing. This was done by drilling three observation wells. These "wells were installed in an effort to characterize the lithology and extent of the alluvial aquifer, as well as evaluate the apparent permeability of select horizons within the aquifer with depth" (Attachment B.2 page 11). The purpose of the interval testing was to "test intervals where the permeability was suspected to be reduced."

The final phase of the field investigation involved detailed aquifer testing at the four sites, including the collection of water samples to be tested for water quality. In this phase, three to four additional observation wells were installed at each of the four sites in order to create transects both parallel and perpendicular to the Platte River. Then, a pumping well was installed at each site at the point where these parallel and perpendicular transects intersected each other.

The aquifer testing conducted at each site consisted of both a four-hour multiple rate step test and an over 48 hour constant rate pumping test. During these pumping tests the water levels in the pumping well, the observation wells and the Platte River were continuously monitored. The results of these field activities are described below in the sections involving geologic investigations and hydrologic data.

Bank Stabilization Assessment Field Investigations

The field investigation conducted as part of the Bank Stabilization Assessment involved a reconnaissance level assessment which included walking and physically inspecting each of the sites illustrated above in Figure 4. During these site visits, "channel characteristics were recorded, any critical items such as infrastructure threatened by stream bank erosion were noted, design sketches created, and photographs were taken" (Attachment B.3, page 9).

Maps, drawings, charts, tables, etc., used as a basis for the feasibility report (004.01 C);

All relevant maps, drawings, charts, and tables that constitute the basis for conclusions and recommendations of the Wellfield Investigation and the Bank Stabilization Assessment are contained within those reports which are attached to this application (Attachment B.2 and Attachment B.3).

The maps, drawings and tables in the Wellfield Investigation are as follows:
FIGURE 1 – GENERAL LOCATION MAP
FIGURE 2 – LOCATION OF PHASE 1 BEDROCK BORINGS
FIGURE 3 – SITE BB-2 WELL LOCATION MAP
FIGURE 4 – SITE BB-2 LITHOLOGIC CROSS-SECTION, PARALLEL LINE
FIGURE 5 – SITE BB-2 LITHOLOGIC CROSS-SECTION, PERPENDICULAR LINE
FIGURE 6 – HYDROGRAPH OF MULTIPLE-RATE TEST, SITE BB-2
FIGURE 7 – HYDROGRAPH OF CONSTANT-RATE TEST, SITE BB-2
FIGURE 8 – POTENTIOMETRIC SURFACE MAP OF SITE BB-2, STATIC
FIGURE 9 – POTENTIOMETIRC SURFACE MAP OF SITE BB-2, PUMPING
FIGURE 10 – SITE BB-5 WELL LOCATION MAP
FIGURE 11 – SITE BB-5 LITHOLOGIC CROSS-SECTION, PARALLEL LINE
FIGURE 12 – SITE BB-5 LITHOLOGIC CROSS-SECTION, PERPENDICULAR LINE
FIGURE 13 – HYDROGRAPH OF MULTIPLE-RATE TEST, SITE BB-5
FIGURE 14 – HYDROGRAPH OF CONSTANT-RATE TEST, SITE BB-5
FIGURE 15 – POTENTIOMETRIC SURFACE MAP OF SITE BB-5, STATIC
FIGURE 16 – POTENTIOMETRIC SURFACE MAP OF SITE BB-5, PUMPING
FIGURE 17 – SITE BB-7 WELL LOCATION MAP
FIGURE 18 – SITE BB-7 LITHOLOGIC CROSS SECTION, PARALLEL LINE
FIGURE 19 – SITE BB-7 LITHOLOGIC CROSS-SECTION, PERPENDICULAR LINE
FIGURE 20 – HYDROGRAPH OF MULTIPLE-RATE TEST, SITE BB-7
FIGURE 21 – HYDROGRAPH OF CONSTANT-RATE TEST, SITE BB-7
FIGURE 22 – POTENTIOMETRIC SURFACE MAP OF SITE BB-7, STATIC
FIGURE 23 – POTENTIOMETRIC SURFACE MAP OF SITE BB-7. PUMPING
FIGURE 24 – SITE BB-11 WELL LOCATION MAP
FIGURE 25 – SITE BB-11 LITHOLOGIC CROSS-SECTION, PARALLEL LINE
FIGURE 26 – SITE B-11 LITHOLOGIC CROSS-SECTION, PERPENDICULAR LINE
FIGURE 27 – HYDROGRAPH OF MULTIPLE-RATE TEST, SITE BB-11
FIGURE 28 – HYDROGRAPH OF CONSTANT-RATE TEST, SITE BB-11
FIGURE 29 – POTENTIOMETRIC SURFACE MAP OF SITE BB-11, STATIC
FIGURE 30 – POTENTIOMETRIC SURFACE MAP OF SITE BB-11, PUMPING
FIGURE 31 – PROJECTED COLLECTOR WELL YIELD, SITE BB-2
FIGURE 32 – CONCEPTUAL DESIGN OF COLLECTOR WELL, SITE BB-2

The figures in the Bank Stabilization Assessment are as follows:

FIGURE 11 - CONCEPTUAL DRAWING FOR SITE 6, PAGE 25

A description of any necessary water and land rights and pertinent water supply and water quality information, if appropriate (004.01 D);

The City of Lincoln currently owns all land necessary to complete the project, as documented by the wellfield parcel data incorporated into this application (Attachment B.4). The city also has the necessary well permits from the Natural Resources District and an induced groundwater recharge permit (Number A-17312) from the Department of Natural Resources (Attachment A.2).

A discussion of each component of the final plan including, when applicable (004.01 E);

Required geologic investigation (004.01 E 1);

The Project includes geological investigations for both the Wellfield Investigation and the Bank Stabilization Assessment, which are described in detail in those reports. (Attachment B.2 and Attachment B.3). A general description of those investigations is provided below.

Wellfield Investigation Geologic Investigations

The first component of the geologic investigation conducted for the Wellfield Investigation involved an assessment of the depth to bedrock at 12 potential sites for enhanced groundwater development at the wellfield. The results indicated that the depth to bedrock ranged from as little as 67 feet to as much as 94 feet. Next, detailed well logs were developed and laboratory sieve analysis of samples obtained during drilling of observation wells were conducted for the observation wells drilled at the four sites selected for additional analysis. From this data, cross-sections of the lithology at each site were developed for both the parallel and perpendicular observation well transect.

The lithology across the study area could be generally characterized as consisting of a surficial layer that was about 60-65 feet thick consisting of coarse sands and gravels that constitute the primary aquifer in the area. Below that layer is a layer of variable thickness ranging from 10 to 30 feet that also contains coarse materials but which contains tightly packed silts, rendering this layer "unsuitable for large-scale water supply development."

Bank Stabilization Assessment Geologic Investigations

As part of the Bank Stabilization Assessment, a geomorphological assessment of the relative stability of channel banks was conducted in the vicinity of the six priority areas. This involved an assessment of historical aerial photography to determine river banks that are experiencing the most significant rates of erosion.

Using Google Earth, historic aerial photographs of the study area were examined in an attempt to locate areas of recent and ongoing bank erosion. The entire area has aerial photography in Google Earth dating from 1993 up to present day. As part of the aerial analysis, bank lines were roughly traced for multiple years, in an effort to make areas of erosion easier to identify. (Attachment B.3, pages 7-8)

Required hydrologic data (004.01 E 2);

The Project involved the collection and development of hydrologic data for both the Wellfield Investigation and the Bank Stabilization Assessment which are described in detail in those reports (Attachment B.2 and Attachment B.3). A general description of those investigations is provided below.

Wellfield Investigation Hydrologic Data

The Wellfield Investigation generated a suite of hydrologic data for the four sites where pumping and observation wells were installed and pumping tests conducted. This data is contained with the Wellfield Investigation report. This data was used to compute estimates of aquifer properties, including the transmissivity, hydraulic conductivity, and storativity of the aquifer. Other relevant parameters that were computed for each site are the distance to a line source of recharge (i.e., Platte River), the percent of the pumped water that is diverted from the Platte River (vs. percent derived from aquifer storage), and the infiltration rate (i.e., permeability of the Platte River streambed).

These results were then used to calculate predicted drawdown and potential yield of a radial well developed at each site. These data were also used to develop pertinent design parameters for a radial collector well at each site. A summary of these computations is included in the Wellfield Investigation report (Attachment B.2 Table 31).

Bank Stabilization Assessment hydrologic data

The hydrologic data utilized in the Bank Stabilization Assessment includes information developed from previous studies on the return interval for certain river discharge rates and related stream velocity data.

Design criteria for final design including, but not limited to, soil mechanics, hydraulic, hydrologic, structural, embankments and foundation criteria (004.01 E 3).

The design criteria for the projects are included in the Wellfield Investigation and the Bank Stabilization Assessment, which are attached to this application (Attachment B.2 and Attachment B.3). Specifically, for the HCW installation, the design parameters are summarized in Table 30 of the Wellfield Investigation (Attachment B.2). Installation of the caisson and radial laterals was conducted

according to these recommended design parameters. For the bank stabilization report, the recommended design parameters are found on pages 13-27 in the report which contains conceptual stabilization recommendations for each of the six sites along with recommendations for monitoring the remaining areas (Attachment B.3).

1(b). If no (non-structural), submit data necessary to establish technical feasibility including, but not limited to the following (004.02):

A discussion of the plan of development (004.02 A); **N/A**

A description of field or research investigations utilized to substantiate the project conception (004.02 B); **N/A**

A description of the necessary water and/or land rights, if applicable (004.02 C); **N/A**

A discussion of the anticipated effects, if any, of the project upon the development and/or operation of existing or envisioned structural measures including a brief description of any such measure (004.02 D).

N/A

2. Provide evidence that there are no known means of accomplishing the same purpose or purposes more economically, by describing the next best alternative.

The Project has two purposes, enhancing the drought resiliency of the city's water supply and providing flood protection for the city's critical infrastructure along the Platte River through bank stabilization projects. These will be discussed in turn below.

Drought Resiliency

The Lincoln Water Systems Master Facilities Plan contains an evaluation of the city's options to meet the city's short, medium, and long-term water supply needs. The options evaluated to meet the city's short term needs are listed below:

1. Expansion of existing wellfield with completion of the fourth HCW
2. New wellfield in the High Plains Aquifer
3. Aquifer storage and recovery (ASR)
4. Metropolitan Utilities District (MUD) interconnection
5. Water reuse

These were determined to be the only viable options due to the need to implement a short-term increase in the city's water supply before 2020. Two of these options were not fully evaluated. The New High Plains Aquifer well-field was determined to not be viable due to issues the city would have with water quality. Additional water reuse would not provide the required additional supply in the time horizon being evaluated. Therefore, cost estimates were not developed for these options.

Of the three remaining options, the expansion of the existing wellfield with completion of the fourth HCW was determined to be the least cost alternative, with an estimated cost of $10.3 million. The ASR alternative was determined to have a cost of $18.25 million. The MUD interconnections would cost $41.84 million for a finished water connection.

Flood Protection

The bank stabilization measures that will provide flood protection for the city's critical infrastructure do not have a lower cost alternative because they are essential to ensure the protection of this infrastructure. The only potential alternative, to do nothing, would likely end up being dramatically more expensive than the cost of implementing these measures, because the replacement costs the city would have to absorb when this infrastructure is compromised would be an order of magnitude larger than the cost of the bank stabilization projects.

3. Document all sources and report all costs and benefit data using current data, (commodity prices, recreation benefit prices, and wildlife prices as prescribed by the Director) using both dollar values and other units of measurement when appropriate (environmental, social, cultural, data improvement, etc.). The period of analysis for economic feasibility studies shall be fifty (50) years or with prior approval of the Director, up to one hundred (100) years [T261 CH 2 (005)].

- Describe any relevant cost information including, but not limited to the engineering and inspection costs, capital construction costs, annual operation and maintenance costs, and replacement costs. Cost information shall also include the estimated construction period as well as the estimated project life (005.01).

Capital Improvement Costs

The sources for all cost and benefit data come from the Lincoln Water System Facilities Master Plan - May 2014 (Attachment B.1), the Platte River Bank Stabilization Assessment, Prioritization, and Recommendations Final Report -April 2016 (Attachment B.3), and information from the City of Lincoln – Lincoln Water System.

The cost and benefit data from the above-referenced reports is summarized below.

For the Fourth Horizontal Collector Well

Table 1 is a summary of the cost of the fourth HCW and the pipeline crossing the river. The total construction costs are estimated to be $11,325,300.

Table 1. Summary of cost for the HCW installation and River Crossing

Description	Cost
General Requirements (10%)	$852,000
Access Road & Transmission Main	$2,072,000
River Crossing (48")	$3,908,300
Sitework	$441,000
Well House	$1,970,000
Contingency (5%)	$469,000
Electrical & Instrumentation	$910,000
Disinfection Facility	$703,000
Total	**$11,325,300**

For the Flood Protection Measures

Table 2 is a summary of the cost of the recommended flood control measures. The total construction costs are estimated to be $1,210,000. Engineering fees to cover design, permitting, bidding, and construction are estimated to be $192,530. The total project cost is estimated to be $1,402,530.

Table 2. Summary of the cost of all the flood protection projects.

SUMMARY OF PROJECT CONSTRUCTION COSTS		
Item #	Description	Total
1.	NW - Protect 54" Water Line	$60,000
2.	Protect Bridge (both sides)	$170,000
3.	Protect Southern Part of Island with West Protection	$630,000
4.	SE- Protect New Well (14-2)	$220,000
5.	NW-Pond and Adjacent Area	$40,000
6.	Existing Hardpoints	$90,000
	Subtotal of Construction	$1,210,000
Estimated Engineering Fees (Design, Permitting, Bidding, Construction)		$192,530
	Total Project Cost	**$1,402,530**

The estimated engineering costs assume that the all six projects are pursued in one phase. Engineering fee estimates for design, permitting, bidding and construction were prepared based on the recommendation that all six projects be pursued together. If individual cost estimates for engineering were prepared, they are likely to sum up to a value that would be greater than this single one-time costs.

The detailed cost estimates for each of the bank stabilization projects can be found in Table 3 through Table 8.

Table 3. Summary of costs for protection of the 54" water line.

ESTIMATE OF QUANTITIES					
Item #	Description	Unit	Quantity	Unit Price	Total
1.	Mobilization	LS	1	$10,000.00	$10,000
2.	Clearing and Grubbing	LS	1	$5,000.00	$5,000
3.	Riprap	TON	450	$50.00	$22,500
4.	Live Pol Harvesting and Planting Willow	EA	100	$7.00	$700
5.	Earthwork	CY	50	$16.00	$800
6.	Seeding and Mulching	AC	1.00	$3,500.00	$3,500
				Subtotal of Construction	$42,500
				25% Contingency	$10,625
				Total Construction	**$60,000**

Table 4. Summary of costs for protection of the access bridge**.**

ESTIMATE OF QUANTITIES					
Item #	Description	Unit	Quantity	Unit Price	Total
1.	Mobilization	LS	1	$10,000.00	$10,000
2.	Clearing and Grubbing	LS	1	$10,000.00	$10,000
3.	Riprap	TON	2000	$50.00	$100,000
4.	Live Pol Harvesting and Planting Willow	EA	1,200	$7.00	$8,400
5.	Earthwork	CY	0	$16.00	$0
6.	Seeding and Mulching	AC	2.00	$3,500.00	$7,000
				Subtotal of Construction	$135,400
				25% Contingency	$33,850
				Total Construction	**$170,000**

Table 5. Summary of costs for protection of southern part of island.

ESTIMATE OF QUANTITIES					
Item #	Description	Unit	Quantity	Unit Price	Total
1.	Mobilization	LS	1	$30,000.00	$30,000
2.	Clearing and Grubbing	LS	1	$15,000.00	$15,000
3.	Riprap-Bank Stabilization	TON	3,850	$50.00	$192,500
4.	Riprap- Bendway Weirs	TON	480	$50.00	$24,000
5.	Riprap-Trenchfill on West	TON	4000	$50.00	$200,000
6.	Live Pool Harvesting and Planting Willow	EA	3,140	$7.00	$21,980
7.	Locked Logs	EA	4	$1,500.00	$6,000
8.	Seeding and Mulching	AC	2.00	$3,500.00	$7,000
				Subtotal of Construction	$496,480
				25% Contingency	$124,120
				Total Construction	**$630,000**

Table 6. Summary of project costs to protect new horizontal collector well.

ESTIMATE OF QUANTITIES					
Item #	Description	Unit	Quantity	Unit Price	Total
1.	Mobilization	LS	1	$20,000.00	$20,000
2.	Clearing and Grubbing	LS	1	$10,000.00	$10,000
3.	Riprap	TON	2,500	$50.00	$125,000
4.	Live Pool Harvesting and Planting Willow	EA	1,500	$7.00	$10,500
5.	Locked Logs	EA	0	$1,500.00	$0
6.	Seeding and Mulching	AC	2.00	$3,500.00	$7,000
				Subtotal of Construction	$172,500
				25% Contingency	$43,125
				Total Construction	**$220,000**

Table 7. Summary of costs to refurbish pond and adjacent areas.

ESTIMATE OF QUANTITIES					
Item #	Description	Unit	Quantity	Unit Price	Total
1.	Mobilization	LS	1	$2,500.00	$2,500
2.	Earthwork	CY	100	$16.00	$1,600
3.	Crushed Rock Road Surfacing	TON	25	$50.00	$1,250
4.	Excavator Machine Time	HR	20	$350.00	$7,000
5.	Plantings-Shrubs and Bushes	LS	1	$4,000.00	$4,000
6.	Seeding and Mulching	AC	2.00	$4,000.00	$8,000
				Subtotal of Construction	$24,350
				25% Contingency	$6,088
				Total Construction	**$40,000**

Table 8. Summary of costs to refurbish existing hardpoints.

ESTIMATE OF QUANTITIES					
Item #	Description	Unit	Quantity	Unit Price	Total
1.	Mobilization	LS	1	$5,000.00	$5,000
2.	Clearing and Grubbing	LS	1	$5,000.00	$5,000
3.	Riprap	TON	915	$50.00	$45,750
4.	Live Pol Harvesting and Planting, Willow	EA	225	$7.00	$1,575
5.	Earthwork	CY	150	$16.00	$2,400
6.	Seeding and Mulching	AC	2.00	$4,000.00	$8,000
				Subtotal of Construction	$67,725
				25% Contingency	$16,931
				Total Construction	**$90,000**

Operation and Maintenance Costs

The city estimates that the annual operational and maintenance costs are $125,000. This includes well operations, staff time, and replacement of equipment.

Construction Schedule

The estimated construction period for this project will be 2.5 years with start of construction commencing in November 2016. A detailed project schedule is attached (Attachment A.5).

The estimated project life for this project is 50 years.

- Only primary tangible benefits may be counted in providing the monetary benefit information and shall be displayed by year for the project life. In a multi-purpose project, estimate benefits for each purpose, by year, for the life of the project. Describe any intangible or secondary benefits separately. In a case where there is no generally accepted method for calculation of primary tangible benefits describe how the project will increase water sustainability, such that the economic feasibility of the project can be approved by the Director and the Commission (005.02).

A meeting was held on June 9, 2016, with NDNR staff members Kris Reed and Kent Zimmerman to discuss using a "least-cost analysis" to document Economic Feasibility for the Lincoln Water System Drought Resiliency and Flood Protection Project. This analysis would be similar to what the City of Hastings used in their application (Water Sustainability Fund Grant Application – Aquifer Storage and Restoration (ASR) Nitrate and Uranium Control Project, Hastings Nebraska) that was approved in the last grant cycle. It was agreed that this would be an appropriate method and will be used.

A least-cost analysis involves comparing the costs of various mutually exclusive, technically feasible project options and selecting the one with the lowest cost. Mutually exclusive project options must be alternative ways of producing the same output of a specified service quality. The alternative with lowest present value of costs is the least-cost alternative. (Guidelines for the Economic Analysis of Projects – Economics and Development Resource Center, February 1997).

The analysis contained in the Lincoln Water System Facilities Master Plan (Attachment B.1 pages 37-52) compared six options to address the short-term (2014 to 2025) water supply deficits and these alternatives and costs are summarized below:

It was determined that during prolonged low streamflow in the Platte River, the projected water demand could exceed the 60- to 90-day pumping capacity as early as 2018 depending on the magnitude and duration of a drought. In 2018, a supply deficit would be anticipated to occur only during extreme drought conditions that correlate to the 50- to 100-year reoccurrence interval event. By 2025, a supply deficit would be anticipated to occur during more frequent drought events, such as the 20-year reoccurrence interval event. There is also a projected supply deficit with the

instantaneous and short-term pumping capacity of the wellfield, where it is projected that the wellfield may not be able to meet the maximum day demand as early as 2022 during times when the 1-day streamflow is less than the 50- to 100-year reoccurrence interval drought.

In order to address the short-term water supply deficits, an addition of 20 million gallons per day (mgd) of instantaneous and short-term water supply and 10 mgd of water supply that can be sustained for 60 to 90 days would meet the projected water supply needs of the city through approximately 2030. Six potential projects that would expand the existing source of supply to these levels and that can be implemented in the near term were evaluated. The options evaluated are listed below:

1. Expansion of existing wellfield with completion of the fourth HCW (which is the Lincoln Water System Drought Resiliency and Flood Protection Project)
2. New wellfield in the High Plains Aquifer
3. Aquifer storage and recovery (ASR) as peak shaving
4. Metropolitan Utilities District (MUD) interconnection
5. Water reuse

Due to the numerous issues regarding groundwater quality in the sand and gravel deposits of the High Plains Aquifer, Option 2 was not considered as a viable alternative for the city, and therefore no cost estimate was developed. Although a cost estimate was developed for Option 4, the use of the raw water as a source of supply for the city could potentially impact the Environmental Impact Statement (EIS) that was prepared as part of the planning and design of the MUD Platte West wellfield and therefore, would have to be further evaluated (and not implementable in the near term) prior to fully developing this supply option. It was determined that the water reuse option (Option 5) is not viable as there would not be sufficient capacity to meet the short-term supply option needs.

The costs for the remaining options are:

Option 1.
Expansion of the existing wellfield with completion of the fourth HCW = $10,300,000 (in 2013 dollars) and $1,402,530 for Bank Stabilization.

Option 3.
Aquifer Storage and Recovery (ASR) as peak shaving = $18,250,000 (in 2013 dollars)

Option 4
Connection to the Metropolitan Utilities District (modified to supply a finished water interconnection) = $41,836,000 (in 2013 dollars)

Table 9. Summary of the cost of all options in 2016 dollars

Option Number	Title	Cost in 2016 Dollars
Option 1	Expansion of Existing Well field	$12,727,830
Option 3	Aquifer Storage and Recovery	$19,942,270
Option 4 modified	Connection to MUD	$45,715,330

The Lincoln Water System Drought Resiliency and Flood Protection Project (Option 1), is the least-cost alternative by more than $7,214,440 over the next, lowest-cost option and is therefore, economically feasible.

Secondary Benefits

Table 10 provides values for the existing infrastructure that will be protected by the bank stabilization portion of the project, which totals $21,462,813. This does not include the additional $11,325,300 that will be invested in expanding the wellfield through the fourth HCW. Therefore, the bank stabilization efforts will protect over $32 million worth of infrastructure.

Table 10. Value of existing infrastructure that will be protected by bank stabilization.

Asset on Island	Protected Asset Value
Caisson for HCW 14-1	$2,144,000
Well House for HCW 14-1	$2,481,500
Transmission Main & Roadway for HCW 14-1	$4,017,802
1991 HCW's and Well Houses - 2016 Dollar Value	$9,597,011
1991 42" Transmission Main 650 LF at $400 per LF	$260,000
1991 54" Transmission Main 2,400 LF at $500 per LF	$1,200,000
Original Roadway 3,500 LF at $75 per LF	$262,500
Bridge	$1,500,000
Total Protected Asset Value	**$21,462,813**

An additional benefit of the project is a reduction in turbidity along the project corridor. The benefits to water quality are described separately for each of the two parts of the project.

For the Drought Resiliency aspect of the project, a disinfection facility will be installed on the fourth collector well. The water quality issue to be improved is the reduction of particulate iron bacteria which can greatly reduce filter times and require a significant increase in filter backwashing, risk of exceeding turbidity standards and wasting treated water. Specifically, this element of the project reduces iron bacteria accumulation within the pipelines thus reducing impacts on the treatment plant filters. In turn this reduces potential turbidity issues and non-compliance resulting from filter washing. Therefore, the disinfection facility provides a water quality benefit to the Platte River at the discharge point.

For the Flood Protection aspect of the project, there is also a benefit to stream turbidity. As stated in the Bank Stabilization Assessment Report (Attachment B.3), "while this project is focused solely on a short segment of the overall river… the goal of this stabilization and protection plan is to mitigate the effects of both anthropogenic actions and natural processes by implementing measures to:

- Eliminate the current threat to infrastructure
- Prevent future damage to infrastructure
- Minimize any environmental impact, including in-stream impact to sand bar formation
- Improve ecological diversity – in the stream and on land
- Improve water quality

The improvement to water quality refers to the reduction in turbidity in the stream in the areas identified for bank stabilization.

Other benefits of this project include the protection of upstream junior irrigators for nearly 50% of the state. With the addition of fourth HCW, the LWS will be able to operate at lower Platte River flow conditions, which minimizes adverse impacts to upstream existing water users. For example, during the 2012 drought, at a critical time in August the Platte River was barely flowing. At that time, the city had the right to "make a call on the river" due to its induced groundwater recharge permit. The city could have asked the NDNR to restrict upstream withdrawals by junior surface water users any time the Platte River flow fell below 704 cfs. Although the city could have exercised its right in 2012, it chose not to. The intent of this project is to provide a means to more efficiently withdraw water from the aquifer. It is another important tool in reducing the potential to exercise the LWS water right. Exercising the LWS water right would require many upstream surface water users to discontinue water use. The potential economic impact of suspending the withdrawals for upstream junior surface water users during the critical period of late summer corn and soybean production would be devastating to this State of Nebraska's economy.

- All benefit and cost data shall be presented in a table form to indicate the annual cash flow for the life of the proposal, not to exceed 100 years (005.03).

  An attached chart (Attachment B.7) presents the annual cash flow for the fifty-year life of the project. The annual cash flow table includes a comparison of Option 1, which is the current project expanding the existing wellfield and providing flood protection, to Option 3 which is the Aquifer Storage and Recovery project. Over the 50-year period, including operation and maintenance costs, Option 1 is still the least cost option by $10,786,743.

- In the case of projects for which there is no generally accepted method for calculation of primary tangible benefits and if the project will increase water sustainability, the economic feasibility of such proposal shall be demonstrated by such method as the Director and the Commission deem appropriate (005.04). **N/A**

4. Provide evidence that sufficient funds are available to complete the proposal.

The Lincoln City Council reviews of necessary rates to be charged to cover capital and operations and maintenance costs for the water system on an annual basis. The council can implement changes to the rates charged or consider bonding certain costs of providing water service. Cited below is the state statute that allows the city to issue bonds and set rates for providing water services.

Authority to Issue Bonds - Neb. Rev. Stat. § 16-693

When any bonds shall have been issued by the city for the purpose of constructing or aiding in the construction of a system of waterworks, power plant, sewerage, heating, lighting or drainage, there shall thereafter be levied annually upon all taxable property of said city a tax not exceeding seven cents on each one hundred dollars for every twenty thousand dollars of bonds so issued, which shall be known as the waterworks tax, power tax, sewerage tax, heat tax, light tax or drainage tax, as the case may be, and shall be payable only in money. The proceeds of such tax, together with all income received by the city from the payment and collection of water, power, heat or light, rent, taxes, and rates of assessments, shall first be applied to the payment of the current expenses of waterworks, power plant, heating or lighting, to improvements, extensions, and additions thereto, and interest on money borrowed and bonds issued for their construction. The surplus, if any, shall be retained for a sinking fund for the payment of such loan or bonds at maturity.

Rate Making Authority - Neb. Rev. Stat. § 16-679

The mayor and council shall have power to require every individual or private corporation operating such works or plants, subject to reasonable rules and regulations, to furnish any person applying therefor, along the line of its pipes, mains, wires or other conduits, with gas, water, power, light or heat, and to supply said city with water for fire protection, and with gas, water, power, light or heat, for other necessary public or private purposes; to regulate and fix the rents or rates of water, power, gas, electric light or heat; and to regulate and fix the charges for water meters, power meters, gas meters, electric light or heat meters, or other device or means necessary for determining the consumption of water, power, gas, electric light or heat. These powers shall not be abridged by ordinance, resolution or contract.

Neb. Rev. Stat. § 16-681

Such city owning, operating or maintaining its own gas, water, power, light or heat system, shall furnish any person applying therefor, along the line of its pipes, mains, wires or other conduits, subject to reasonable rules and regulations, with gas, water, power, light or heat. It shall regulate and fix the rental or rate for gas, water, power, light or heat, and regulate and fix the charges for water meters, power meters, gas meters, light meters or heat meters or other device or means necessary for

determining the consumption of gas, water, power, light or heat. It shall require water meters, gas meters, light meters, power meters, or heat meters to be used, or other device or means necessary for determining the consumption of gas, water, power, light or heat.

5. Provide evidence that sufficient annual revenue is available to repay the reimbursable costs and to cover OM&R (operate, maintain, and replace).

The Lincoln City Council reviews of necessary rates to be charged to cover capital and operations and maintenance costs for the water system on an annual basis. The council can implement changes to the rates charged or consider bonding certain costs of providing water service. Cited below is the state statute that allows the city to issue bonds and set rates for providing water services.

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6. If a loan is involved, provide sufficient documentation to prove that the loan can be repaid during the repayment life of the proposal. **N/A**

7. Describe how the plan of development minimizes impacts on the natural environment.

The Project has two purposes, enhancing the drought resiliency of the city's water supply and providing flood protection for the city's critical infrastructure along the Platte River through bank stabilization projects. These will be discussed in turn below.

Drought Resiliency

The Project sponsor has determined that the drought resiliency component of the Project minimizes environmental impacts in several ways. The city conducted an evaluation of five potential options for the short-term expansion of their water supply:

1. Expansion of existing wellfield with completion of the fourth HCW
2. New wellfield in the High Plains Aquifer
3. Aquifer storage and recovery (ASR) as peak shaving
4. Metropolitan Utilities District (MUD) interconnection
5. Water reuse

This city evaluated ten criteria in assessing these options and selected the most desirable option. One of the criteria included was "minimizes environmental impacts" (Attachment B.1 page 60).

Additionally, the Nebraska Game and Parks Commission was consulted with to ensure the Project would not impact any threatened or endangered species. The following statement summarizes their findings: "We have determined that the proposed project would have no adverse impacts from river depletions on state-listed threatened and endangered species, and we would have no objection to the project as proposed" (Attachment A.1).

Flood Protection

The flood protection portion of the Project was developed based on the Bank Stabilization Assessment completed for the city, which developed its recommendations based on consideration of the following factors:

1. Ensure ecological integrity
2. Avoid and minimize environmental impacts
3. Mitigate other environmental impacts
4. Restore ecological services
5. Ensure engineering functionality

Therefore, the plan of development for the flood protection portion of the Project will clearly minimize impacts on the natural environment.

8. Explain how you are qualified, responsible and legally capable of carrying out the project for which you are seeking funds.

The City of Lincoln / Lincoln Water System has the authority to operate a water system as per the Nebraska Department of Health and Human Services, license number NE3110926 (Attachment B.5). The City of Lincoln has authority through its codes to regulate the use and construction of the water system. It also has the authority to set applicable water use rates to satisfy the cost of operating a water system. The City of Lincoln has the right to issue revenue bonds and to recover these costs through water use rates.

Authority to Issue Bonds - Neb. Rev. Stat. § 16-693

When any bonds shall have been issued by the city for the purpose of constructing or aiding in the construction of a system of waterworks, power plant, sewerage, heating, lighting or drainage, there shall thereafter be levied annually upon all taxable property of said city a tax not exceeding seven cents on each one hundred dollars for every twenty thousand dollars of bonds so issued, which shall be known as the waterworks tax, power tax, sewerage tax, heat tax, light tax or drainage tax, as the case may be, and shall be payable only in money. The proceeds of such tax, together with all income received by the city from the payment and collection of water, power, heat or light, rent, taxes, and rates of assessments, shall first be applied to the payment of the current expenses of waterworks, power plant, heating or lighting, to improvements, extensions, and additions thereto, and interest on money borrowed and bonds issued for their construction. The surplus, if any, shall be retained for a sinking fund for the payment of such loan or bonds at maturity.

Rate Making Authority - Neb. Rev. Stat. § 16-679

The mayor and council shall have power to require every individual or private corporation operating such works or plants, subject to reasonable rules and regulations, to furnish any person applying therefor, along the line of its pipes, mains, wires or other conduits, with gas, water, power, light or heat, and to supply

said city with water for fire protection, and with gas, water, power, light or heat, for other necessary public or private purposes; to regulate and fix the rents or rates of water, power, gas, electric light or heat; and to regulate and fix the charges for water meters, power meters, gas meters, electric light or heat meters, or other device or means necessary for determining the consumption of water, power, gas, electric light or heat. These powers shall not be abridged by ordinance, resolution or contract.

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9. Explain how your project considers plans and programs of the state and resources development plans of the political subdivisions of the state.

The Project considers three specific plans or programs of the state or resources development plans of the political subdivisions of the state. The first two are the Integrated Management Plans (IMPs) jointly adopted by the Nebraska Department of Natural Resources and the Lower Platte South Natural Resources District (LPSNRD) and the Papio-Missouri River Natural Resources District (P-MRNRD). The Project would assist these entities with several goals and related objectives of those plans.

For the LPSNRD IMP, the goals and objectives that the project benefits are as follows:

- Goal Area: Water supply management

Ensure a sustainable water supply is available in the amounts and location of the demands through management actions to meet the District's short and long term needs

- Goal Area: Water Use Management

Manage the expansion of new water uses in the District so as to not adversely affect current water users.

For the P-MRNRD IMP, the goals and objectives that the project benefits are as follows:

- Goal 1 – Develop and implement water use policies and practices that contribute to the protection of existing surface and groundwater uses while allowing for future water development.
- Objective 1.1 – Utilize existing policies and authorities of P-MRNRD and NDNR to address water quantity issues.
- Objective 1.3 – Identify and evaluate potential conjunctive management projects and activities within the IMP area.

Third, the Project considers the Public Water System Program of the Division of Public Health of the Nebraska Department of Health and Human Services. The mission of this program, as stated in the 2013 annual report (Attachment B.6), is to protect the health and welfare of Nebraskans by assuring safe, adequate, and reliable drinking water. The Project will assist the City of Lincoln in assuring a safe, adequate and reliable drinking water supply for the residents of the City of Lincoln.

10. Are land rights necessary to complete your project?

YES☒ NO☐

If yes, provide a complete listing of all lands involved in the project.

Parcel ID	County	Legal Address
130114499	Cass County	04-12-10 MOSS ISLAND IN PLATTE RIVER
130114588	Cass County	04-12-10 PT CASS CO IN RAASCH ISLAND SEC 4 & 5
010398619	Sarpy County	E1/2 W1/2 & E1/2 OF I-80 33-13-10
010420924	Sarpy County	TAX LOT A 5-12-10
010420894	Sarpy County	N1/2 NE1/4 & TAX LOTS a-D & GOV LOTS 4-7 4-12-10
010403000	Sarpy County	TAX LOTS 2A, A1B & C 32-13-10
010398597	Sarpy County	TAXLOTS 1A, 2A, A & B & GOV LOTS 1 & 2 33-13-10
003239000	Saunders County	RAASCH ISLAND 32-13-10

If yes, attach proof of ownership for each easement, rights-of-way and fee title currently held.

See Attachment B.4 for wellfield parcel data and ownership documentation.

If yes, provide assurance that you can hold or can acquire title to all lands not currently held.

As shown in the documentation included in Attachment B.4, the City of Lincoln holds title to the land impacted by the project.

11. Identify how you possess all necessary authority to undertake or participate in the project.

The City of Lincoln has the authority and obligation to provide its citizens with basic drinking water and sanitation services. This includes the development and operation of the public water supply and wastewater system. The first city-owned water well designated for public use was drilled in 1857. The City of Lincoln has authority through its ordinances to require connection to the water system and assess user fees and rates.

The City of Lincoln has eminent domain authority to acquire easements and land rights for the construction of a water system. The City of Lincoln / Lincoln Water Systems have the authority to operate a water system as per the Nebraska Department of Health and Human Services, license number NE3110926 (Attachment B.5.).

The City of Lincoln has the right to issue bonds and to recover these costs through water use rates.

Rate Making Authority - Neb. Rev. Stat. § 16-679

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12. Identify the probable environmental and ecological consequences that may result as the result of the project.

No negative environmental or ecological consequences are anticipated to result as a result of the project. The Project has two purposes, enhancing the drought resiliency of the city's water supply and providing flood protection for the city's critical infrastructure along the Platte River through bank stabilization projects. These will be discussed in turn below.

Drought Resiliency

The Project sponsor has determined that the drought resiliency component of the Project minimizes environmental impacts in several ways. The city conducted an evaluation of five potential options for the short-term expansion of their water supply:

1. Expansion of existing wellfield with completion of the fourth HCW
2. New wellfield in the High Plains Aquifer
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4. Metropolitan Utilities District (MUD) interconnection
5. Water reuse

The city evaluated ten criteria in assessing these options and selected the most desirable option. One of the criteria included was "minimizes environmental impacts" (Attachment B.1 page 60).

Additionally, the Nebraska Game and Parks Commission was consulted with to ensure the Project would not impact any threatened or endangered species. The following statement summarizes their findings: "We have determined that the proposed project would have no adverse impacts from river depletions on state-listed

threatened and endangered species, and we would have no objection to the project as proposed" (Attachment A.1).

Flood Protection

The flood protection portion of the Project was developed based on the Bank Stabilization Assessment completed for the city, which developed its recommendations based on consideration of the following factors:

1. Ensure ecological integrity
2. Avoid and minimize environmental impacts
3. Mitigate other environmental impacts
4. Restore ecological services
5. Ensure engineering functionality

Therefore, the plan of development for the flood protection portion of the Project will clearly minimize impacts on the natural environment (Attachment B.3).

Section C.

NRC SCORING

In the NRC's scoring process, points will be given to each project in ranking the projects, with the total number of points determining the final project ranking list.

The following 15 criteria constitute the items for which points will be assigned. Point assignments will be 0, 2, 4, or 6 for items 1 through 8; and 0, 1, 2, or 3 for items 9 through 15. Two additional points will be awarded to projects which address issues determined by the NRC to be the result of a federal mandate.

Notes:

- The responses to one criterion *will not* be considered in the scoring of other criteria. Repeat references as needed to support documentation in each criterion as appropriate. The 15 categories are specified by statute and will be used to create scoring matrixes which will ultimately determine which projects receive funding.

- There is a total of 69 possible points, plus two bonus points. The potential number of points awarded for each criteria are noted in parenthesis. Once points are assigned, they will be added to determine a final score. The scores will determine ranking.

- The Commission recommends providing the requested information and the requests are not intended to limit the information an applicant may provide. An applicant should include additional information that is believed will assist the Commission in understanding a proposal so that it can be awarded the points to which it is entitled.

Complete any of the following (15) criteria which apply to your project. Your response will be reviewed and scored by the NRC. Place an N/A (not applicable) in any that do not apply, an N/A will automatically be placed in any response fields left blank.

1. Remediates or mitigates threats to drinking water;

- Describe the specific threats to drinking water the project will address.
- Identify whose drinking water, how many people are affected, how will project remediate or mitigate.
- Provide a history of issues and tried solutions.
- Provide detail regarding long range impacts if issues are not resolved.

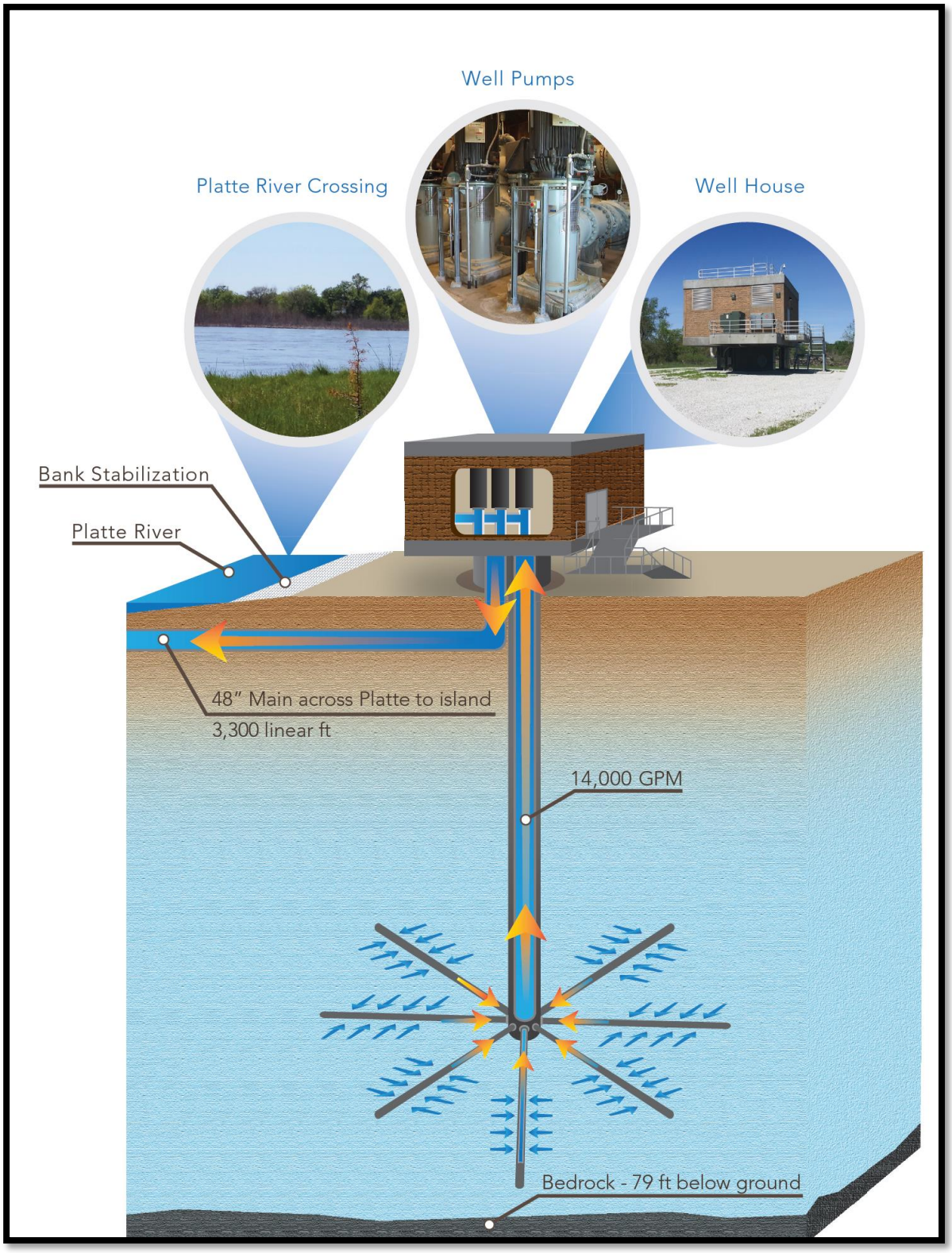
In 2013, it was reported by a national news organization that the City of Lincoln ranked as one of the top eleven most vulnerable water supplies in the nation (Attachment C.1). The report pointed out that the local water supply for the City of

Lincoln was not sustainable and cannot supply sufficient water to meet the needs of the community. While the report was not an entirely accurate representation of Lincoln's vulnerability, it does point to the fundamental fact that Lincoln relies solely on the Platte River and underlying aquifer for its water supply. This project is designed to mitigate two threats to Lincoln's water supply and is key in maintaining a reliable water supply for its citizens, especially during drought conditions.

The City of Lincoln relies on a wellfield nearly 20 miles away near Ashland, NE to supply clean drinking water to its citizens. The Ashland wellfield, located along the west bank and in the center of the dynamic Platte River system, has two significant vulnerabilities, drought and flood. The Drought Resiliency and Flood Protection Project for the Lincoln Water System (LWS) was developed to address these two threats.

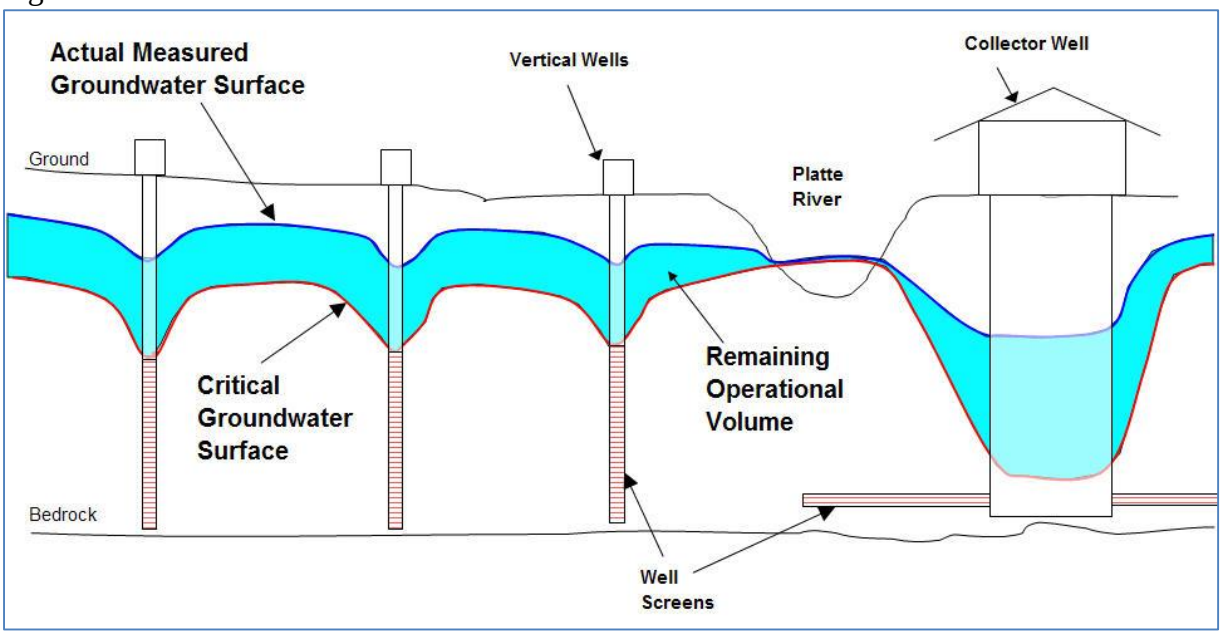
The project includes two separate components that will be completed over the next two years. The first threat is addressed through installation of a new well and associated pipeline as shown in Figure 5. As demonstrated in 2012, drought is a significant threat to Lincoln's drinking water supply since the long-term yield of LWS's raw water supply is directly correlated to streamflow in the Platte River.

Figure 5. Summary of Drought Resiliency and Flood Protection Project



The new horizontal collector well (HCW) and associated pipeline will provide for additional reliability, sustainability and resiliency in times of drought. Specifically, as illustrated in Figure 6, HCWs are installed deeper than vertical wells, are more efficient in water extraction and therefore they are not as vulnerable to water level declines.

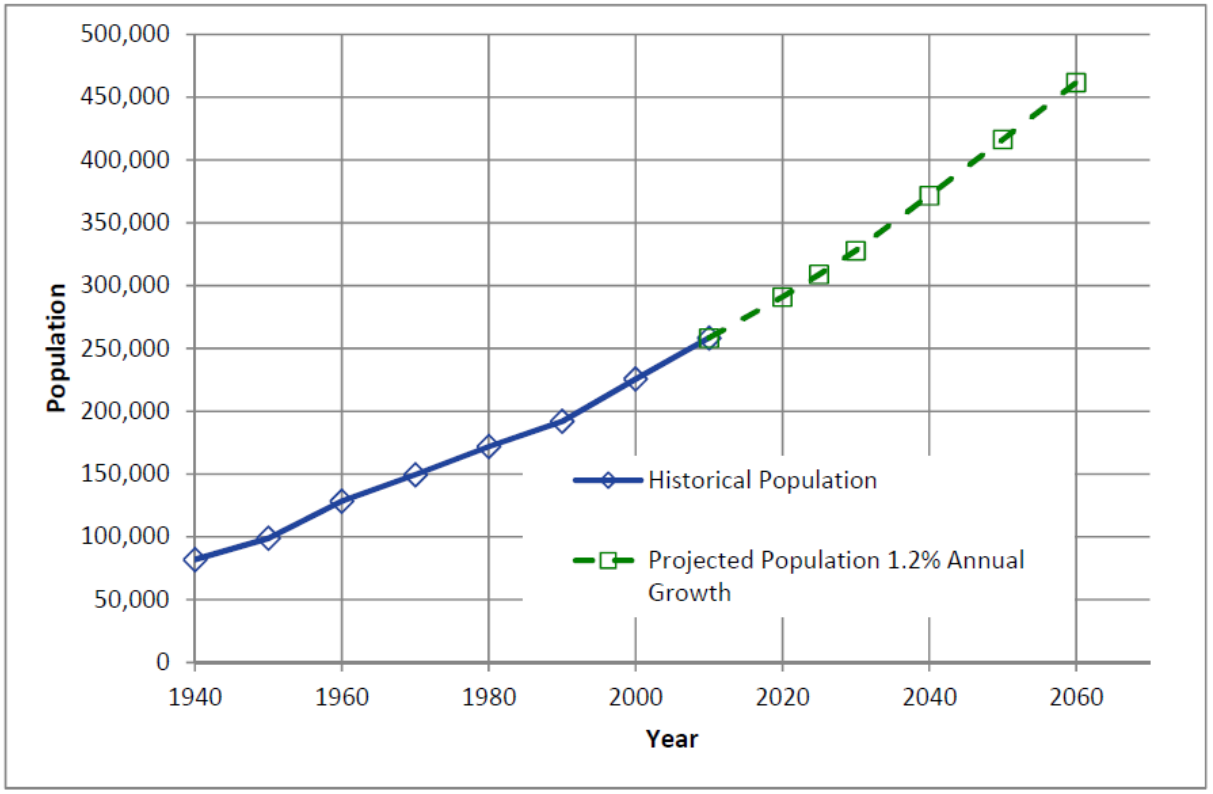
Figure 6. Cross Section of Horizontal Collector Well and Vertical Wells



The second component, also shown in Figure 5, includes six specific bank stabilization projects that will be implemented to protect the infrastructure that supplies clean drinking water to the citizens of Lincoln, the second largest community in Nebraska.

Lincoln's population in 2015 was estimated at 277,348 by the US Census Bureau. As described in the LWS Facilities Master Plan (Attachment B.1) and illustrated in Figure 6, Lincoln's projected population using a 1.2% growth will be over 450,000 in 2060.

Figure 7. Population projection for the City of Lincoln



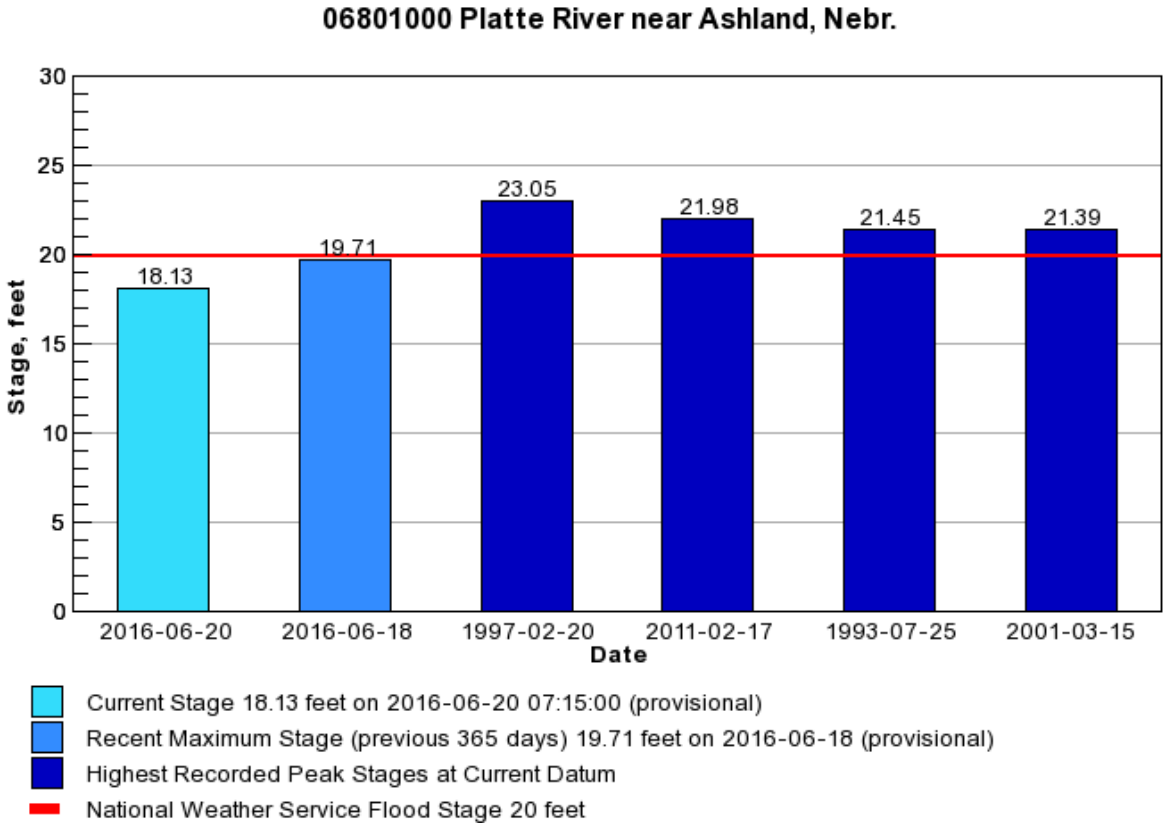
But population alone is not the only reason it is important to ensure a sustainable water supply is available to the community. The LWS provides water to the state and federal government offices that operate important functions such as fire protection and law enforcement, the main campus of the University of Nebraska, and the hospitals with critical care facilities that serve the majority of the state. The Drought Resiliency and Flood Protection Project will mitigate the threat of drought and flood to over a quarter million people whose drinking water is provided by LWS along with these critical operations for the Nebraskan's public security and public health and safety.

The droughts of 2002 and 2012 and the floods of 1993, 1997, 2001, and 2011 were strong reminders to the citizens of Lincoln and the LWS how vulnerable the wellfield is to these natural occurrences. Due to these events, the city has evaluated and implemented several interim solutions. To address the water shortage issues and be good stewards of a critical natural resource, the City of Lincoln has completed significant conservation efforts that have reduced the per capita water usage by 25% in the last 36 years. According to the LWS Water Management Plan (Attachment C.2), it is the policy of the City of Lincoln to promote water conservation. The water supply to the City of Lincoln is a limited resource, and everyone shares in the responsibility for appropriately using and preserving this resource. All customers of the Lincoln Water System are therefore encouraged to voluntarily reduce water usage by daily practicing water conservation, regardless of whether voluntary or

mandatory water restrictions are implemented or certain water shortage rates are applied. Other water conservation practices completed by the city include:

- Implementing an increasing block rate structure whereby the customer's water rate increases when more water is used
- Development of a Water Management Plan that specifies voluntary and mandatory restrictions
- Development of a Water Conservation Task Force in the 1980's

Figure 8. Highest recorded peak stages at the Platte River near Ashland, compared to more recent river stages.



Additionally, in the LWS Facilities Master Plan (Attachment B.1), the likelihood of another drought occurring like the one experienced in 2012 was gauged. The likelihood of a similar drought event, as defined by the amount of streamflow in the Platte River, is one in the 50-year master planning period. Along with the conservation efforts described in the LWS Water Management Plan, source water alternative solutions were proposed in the LWS Facilities Master Plan that included:

1. Expansion of existing wellfield with completion of a fourth HCW
2. New wellfield in the High Plains Aquifer
3. Aquifer storage and recovery as peak shaving
4. Metropolitan Utilities District (MUD) interconnection
5. Water reuse

The lowest cost alternative identified to mitigate for drought was the first alternative, which is the first component of this project.

Following the March 1993 flooding event that seriously crippled Lincoln's water supply caused by the failure of a large pipeline that was washed out, the LWS commissioned a Flood Damage Prevention Plan. From this plan several projects were completed including protection of exiting horizontal collection wells and the bridge abutment for the service road to the wells. Improvements were also made to the upstream end of the island to better protect against bank erosion near the first two HCWs.

There are both short- and long-term impacts for the LWS, if the issues associated with drought and flood are not resolved. The short- and long-term impacts include the potential risk that Lincoln's water supply is interrupted, putting Nebraska's public security, health, and safety in jeopardy.

2. Meets the goals and objectives of an approved integrated management plan or ground water management plan;

- Identify the specific plan that is being referenced including date, who issued it and whether it is an IMP or GW management plan.
- Provide the history of work completed to achieve the goals of this plan.
- List which goals and objectives of the management plan the project provides benefits for and how the project provides those benefits.

There are two specific Integrated Management Plans (IMPs) that this project will address. The IMP Jointly Developed by the Department of Natural Resources (NDNR) and the Lower Platte South Natural Resources District (LPSNRD) dated May 15, 2014 and the IMP jointly developed by the NDNR and the Papio-Missouri River Natural Resources District (P-MRNRD), August 31, 2014.

Both the Lower Platte South and the Papio-Missouri River NRDs and the NDNR have completed the first year of plan implementation, exchanged all available and relevant information collected during that first year, and prepared a report detailing this information and anticipated activities in the upcoming years.

The project has been endorsed by both the LPSNRD and the P-MRNRD because the project helps meet the goals and objectives of their IMPs (Attachment C.3 and Attachment C.4). For the LPSNRD IMP, the goals and objectives that the project benefits are as follows:

- Goal Area: Water supply management

Ensure a sustainable water supply is available in the amounts and location of the demands through management actions to meet the District's short and long term needs.

- Goal Area: Water Use Management

Manage the expansion of new water uses in the District so as to not adversely affect current water users.

For the P-MRNRD IMP, the goals and objectives that the project benefits are as follows:

- Goal 1 – Develop and implement water use policies and practices that contribute to the protection of existing surface and groundwater uses while allowing for future water development.
- Objective 1.1 – Utilize existing policies and authorities of P-MRNRD and NDNR to address water quantity issues.
- Objective 1.3 – Identify and evaluate potential conjunctive management projects and activities within the IMP Area.

The Drought Resiliency and Flood Protection project will assist the LPSNRD in achieving this water supply goal by supporting a project intended to address water quantity issues during the critical periods of drought as well as protecting the existing water supply infrastructure. The long-term yield of LWS raw water supply is directly correlated to streamflow in the Platte River. As shown in 2012, drought is one of the biggest threats to an adequate drinking water supply for Lincoln. The fourth HCW and associated pipeline project will provide for additional reliability, sustainability and resiliency in times of drought. Specifically, the HCWs are more efficient at extracting groundwater at a given rate of streamflow than vertical wells and therefore they are not as vulnerable to water level declines. Additionally, by adding the fourth collector well, the wellfield is able to withdraw water from a larger cross sectional area of the aquifer. This helps ensure that a sustainable water supply is available for the citizens of Lincoln in the amounts and location of the demand for both short and long term needs.

Another important aspect of this project is that with the addition of fourth HCW, the LWS will be able to operate at lower Platte River flow conditions, which minimizes adverse impacts to upstream existing water users. This will directly benefit the second LPSNRD goal area "to manage the expansion of new water uses in the District so as to not adversely affect current water users". Going back to the 2012 drought, at a critical time in August the Platte River was barely flowing. The city had the right to "make a call on the river" due to its induced groundwater recharge permit. The city could have asked the NDNR to restrict upstream withdrawals by junior surface water users any time the Platte River flow fell below 704 cfs. Although the city could have exercised its right in 2012, it chose not to. The intent of this project is to provide a means to more efficiently withdraw water from the aquifer. It is another important tool in reducing the potential to exercise the LWS water right. Exercising the LWS water right would require many upstream surface water users to discontinue water use. The potential economic impact of suspending the withdrawals for upstream junior surface water users during the critical period of

late summer corn and soybean production would be devastating to this State of Nebraska's economy.

As described in the Papio-Missouri NRD IMP, Goal 1 is designed to provide for additional water resources development opportunities while protecting the existing surface and groundwater uses. The LWS project will assist the P-MRNDR in achieving Goal 1 and Objectives 1.1 and 1.3 by supporting a project intended to address water quantity issues during the critical periods of drought as well as protecting the existing water supply infrastructure. The justification for this is as follows. The long-term yield of LWS raw water supply is directly correlated to streamflow in the Platte River. As shown in 2012, drought is one of the biggest threats to an adequate drinking water supply for Lincoln. The horizontal collector well (HCW) and associated pipeline project will provide for additional reliability, sustainability and resiliency in times of drought. Specifically, the HCWs are more efficient at extracting groundwater at a given rate of streamflow than vertical wells and therefore they are not as vulnerable to water level declines. This helps ensure that a sustainable water supply is available for the citizens of Lincoln in the amounts and location of the demand for both short and long term needs.

The fourth HCW is not initially intended to provide new capacity; it is to protect the existing use and the needed capacity in times of drought (Goal 1). As illustrated in Figure 5, with the additional development of the fourth HCW, the LWS will be able to operate at lower flow conditions without adverse impacts to upstream existing water users (Objective 1.1). The LWS wellfield in Ashland is a conjunctive use project in that it is utilizing induced groundwater recharge which by definition is a replenishment of groundwater storage from surface water supplies (Objective 1.3). Finally, the bank stabilization practices will contribute to flood protection of the wellfield facilities and infrastructure that will help ensure the availability of Lincoln's water supply (Goal 1). The LWS Drought Resiliency and Flood Protection Project will provide a direct benefit to the citizens of Lincoln by removing water from the aquifer more efficiently and protecting critical infrastructure, thus allowing the LWS to operate at lower Platte River flow conditions.

3. Contributes to water sustainability goals by increasing aquifer recharge, reducing aquifer depletion, or increasing streamflow;

List the following information that is applicable:

- The location, area and amount of recharge;
- The location, area and amount that aquifer depletion will be reduced;
- The reach, amount and timing of increased streamflow. Describe how the project will meet these objectives and what the source of the water is;
- Provide a detailed listing of cross basin benefits, if any.

By completing the fourth HCW, additional capacity is gained without affecting streamflows due to the efficiency of the collector well design and its spatial location relative to exiting wellfields and wells.

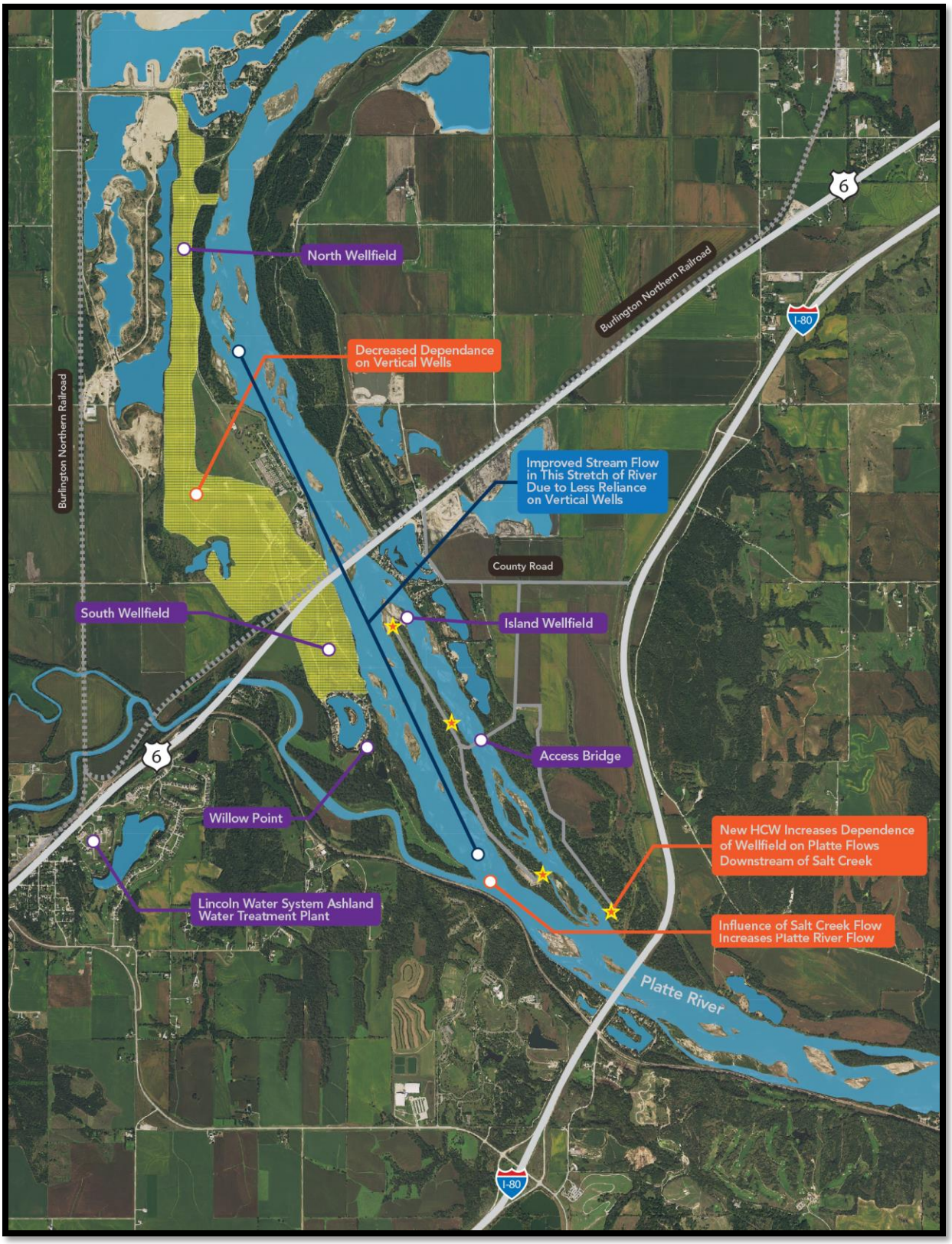
1. As shown in Figure 9, the fourth HCW is located just over five miles south of the north wellfield vertical wells, on the east bank of the Platte River and across from the confluence with Salt Creek. Improved stream flow should be realized along this five mile stretch of the Platte River because pumping from the fourth HCW will reduce the required pumping in the north wellfield vertical wells.
2. By design HCWs are more efficient than vertical wells and can recover more stored aquifer water for given streamflow. This is especially critical during low streamflow experienced during drought conditions.
3. The location of the fourth HCW takes advantage of Salt Creek flows as they enter the Platte River. The zone of influence of the fourth HCW intersects the area where Salt Creek flows enter the Platte, thus reducing the total withdrawal from the Platte River flow.

Collectively, the result is that the fourth HCW reduces the dependence on the Platte River flow along the five mile stretch of the Platte River between the north wellfield and the fourth HCW. Low flows in any stretch of the Platte River can result in the loss of aquatic life and aquatic habitat. The reduced dependence on Platte River flow in this stretch of river will provide increased streamflow and thus reduce impacts to aquatic life in drought conditions.

To illustrate how the HCWs will provide more sustainable operating conditions for the LWS, the following information is summarized from the Facilities Master Plan (Attachment B.1). In the year 2030, the required average day wellfield pumpage is projected to be 52 MGD while the maximum day wellfield pumpage is projected to be 124 MGD. When reviewing the data from the wellfield seasonal pumping capacity for the current conditions (with the third HCW) compared to the proposed conditions (with the fourth HCW), during summer low flow and summer drought conditions, the maximum pumping for 3 months is limited to 75 MGD for the current conditions (vertical wells and three HCW's) while with the fourth HCW in place the maximum pumping for 3 months is increased to 85 MGD, and overall increase of 10 MGD with the same stream flow conditions. This indicates that with operations from the fourth HCW, the LWS can pump more water with less stream flow or conversely, pump the same volume of water while maintaining a higher stream flow.

One reason for the projected increased pumping capacity is that the HCW's are more efficient in pumping than are the vertical wells due to the location of the screens within the water bearing formation. Increased pumping of the HCW's will reduce the required pumping in the vertical wells located at the north wellfield. A second reason for the projected increased capacity is attributed to the location of the fourth HCW which will be across the river of the confluence of Salt Creek flow entering the Platte River.

Figure 9. Lincoln Water System Wellfield pumping benefit detail



4. Contributes to multiple water supply goals, including, but not limited to, flood control, agricultural use, municipal and industrial uses, recreational benefits, wildlife habitat, conservation of water resources, and preservation of water resources;

- List the goals the project provides benefits.
- Describe how the project will provide these benefits
- Provide a long range forecast of the expected benefits this project could have versus continuing on current path.

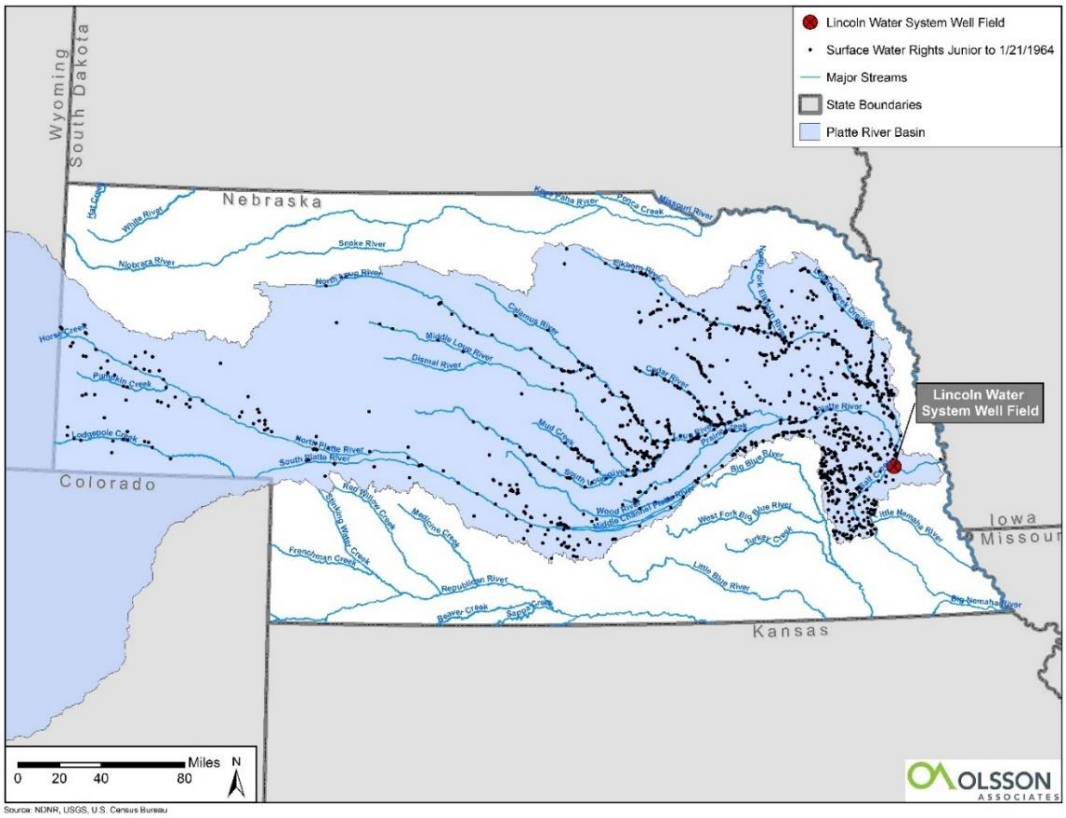
The multiple water supply goals this project will contribute to are:
1. Agricultural water use
2. Municipal and industrial use
3. Conservation of water resources
4. Preservation of water resources

These are discussed separately below.

Agricultural water use

This project will contribute to agricultural water supply goals by allowing the City of Lincoln to extract the water it needs to meet the demands of its water users at a lower streamflow level. This is important to agricultural water users because the vast majority of agricultural water users in Nebraska lie within the Platte River Basin upstream from the city, many of whom also rely on Platte River streamflow for their irrigation supply. In particular, surface water users that have a junior priority dates to the city's induced water supply permit, could be curtailed by a water right call from the city. Figure 10 shows the locations of surface water rights in the Platte River Basin upstream from the city's wellfield that could potentially be impacted by a water right call by the city.

Figure 10. Locations of water rights in the Platte Basin junior to the city's water right.



Municipal and industrial use

The Lincoln Water System provides the water supply for the municipal and industrial water users in the City of Lincoln. According to the LWS Master Plan (Attachment B.1 page 4 of Chapter 9), this project needs to be implemented by 2018 in order to mitigate the short term deficit currently projected during periods of extended drought. Failure to implement this short-term need will only intensify the longer-term projected water deficits. These longer-term deficits are predicted to increase. According to Dr. Don Wilhite, University of Nebraska professor emeritus and founder of the National Drought Mitigation Center, "Droughts are expected to become more frequent and severe in Nebraska…. there's a fundamental need to help communities improve their water supplies" (Omaha World Herald, July 18, 2016).

It was determined that during prolonged low streamflow in the Platte River, the projected water demand could exceed the 60- to 90-day pumping capacity as early as 2018 depending on the magnitude and duration of a drought. In 2018, a supply deficit would be anticipated to occur only during extreme drought conditions that correlate to the 50- to 100-year reoccurrence interval event. By 2025, a supply deficit would be anticipated to occur during more frequent drought events, such as the 20-year reoccurrence interval event. There is also a projected supply deficit with the

instantaneous and short-term pumping capacity of the wellfield, where it is projected that the wellfield may not be able to meet the maximum day demand as early as 2022 during times when the 1-day streamflow is less than the 50- to 100-year reoccurrence interval drought. It is important to note that the city has experienced drought conditions twice in the last 14 years.

This project will allow for more efficient extraction of water from the Platte River aquifer through the installation of the HCW, especially during drought and low flow conditions.

Conservation of water resources

Streamflow in the Platte River is one of the most important water resources in the State of Nebraska. After the North Platte River flows past Lake McConaughy and several reservoirs in the Loup River Basin, there is little to no ability to retain these streamflows in the state if they are not used at the time they occur. Due to the physical and hydrological conditions that exist at the Lincoln wellfield, the wells cannot extract streamflow from the Platte River at a high level of efficiency. This is particularly true of the city's vertical wells.

The horizontal collector wells are more efficient at extracting streamflow from the aquifer. Once water flows past the Lincoln wellfield, it is very unlikely to be consumptively used in Nebraska and simply flows into the Missouri River. While the City of Lincoln requires streamflows along the length of its wellfield, it is beneficial to conservation of water resources in Nebraska to keep these required flows at the lowest level possible necessary to meet the city's needs. And during dry and drought conditions, the LWS closely monitors the operational volume of the aquifer and makes adjustments in wellfield management. This is another step the LWS takes to use water as efficiently as possible during the low river flows.

Preservation of water resources

An additional benefit of the project is a reduction in turbidity along the project corridor. The benefits to water quality are described separately for each of the two parts of the project.

For the Drought Resiliency aspect of the project, a disinfection facility will be installed on the fourth collector well. The water quality issue to be improved is the reduction of particulate iron bacteria which can greatly reduce filter times and require a significant increase in filter backwashing, risk of exceeding turbidity standards and wasting treated water. Specifically, this element of the project reduces iron bacteria accumulation within the pipelines thus reducing impacts on the treatment plant filters. In turn this reduces potential turbidly issues and non-compliance resulting from filter washing. Therefore, the disinfection facility provides a water quality benefit to the Platte River at the discharge point.

For the Flood Protection aspect of the project, there is also a benefit to stream turbidity. As stated in the Bank Stabilization Assessment Report (Attachment B.3), "while this project is focused solely on a short segment of the overall river… the goal of this stabilization and protection plan is to mitigate the effects of both anthropogenic actions and natural processes by implementing measures to:

- Eliminate the current threat to infrastructure
- Prevent future damage to infrastructure
- Minimize any environmental impact, including in-stream impact to sand bar formation
- Improve ecological diversity – in the stream and on land
- Improve water quality

The improvement to water quality refers to the reduction in turbidity in the stream in the areas identified for bank stabilization.

5. Maximizes the beneficial use of Nebraska's water resources for the benefit of the state's residents;

- Describe how the project will maximize the increased beneficial use of Nebraska's water resources.
- Describe the beneficial uses that will be reduced, if any.
- Describe how the project provides a beneficial impact to the state's residents.

As stated in the Nebraska Constitution (Article XV Water), "those using the water for domestic purposes shall have preference over those claiming it for any other purpose". As stated in Nebraska State Statute 46-613, "Preference in the use of ground water shall be given to those using the water for domestic purposes. They shall have preference over those claiming it for any other purpose. Those using the water for agricultural purposes shall have the preference over those using the same for manufacturing or industrial purposes. As used in this section, (1) domestic use of ground water shall mean all uses of ground water required for human needs as it relates to health, fire control, and sanitation."

Thus, as defined by the state constitution and state statute, domestic water use is the highest beneficial use of waters of the state. The fourth HCW and associated pipeline for distribution, will maximize the beneficial use of the water by providing a more efficient extraction system to provide drinking water to the citizens of Lincoln.

The new HCW will reduce the LWS dependence on the vertical wells in the north wellfield. The new HCW is not as vulnerable to low water levels because water is extracted from a deeper portion of the aquifer. This will allow for continued operation of the LWS during times of lower river flow which will reduce the need for the LWS to make a call on the river. A call on the river by the LWS could negatively impact agricultural production across the entire Platte River Basin.

The bank stabilization plans will protect the LWS critical infrastructure and increase the beneficial use of Nebraska's water resources. As the second largest community in Nebraska, protecting the LWS infrastructure is of critical importance. The LWS provides water to the entire community including hospitals, fire departments, schools including the main campus of the University of Nebraska, and both state and federal government offices.

6. Is cost-effective;

- List the estimated construction costs, O/M costs, land and water acquisition costs, alternative options, value of benefits gained.
- Compare these costs to other methods of achieving the same benefits.
- List the costs of the project.
- Describe how it is a cost effective project or alternative.

An analysis contained in the Lincoln Water System Facilities Master Plan - May 2014 (Attachment B.1 pages 37-52) compared six options to address the short-term (2014 to 2025) water supply deficits. The alternatives and costs are summarized below:

It was determined that during prolonged low streamflow in the Platte River, the projected water demand could exceed the 60- to 90-day pumping capacity as early as 2018 depending on the magnitude and duration of a drought. In 2018, a supply deficit would be anticipated to occur only during extreme drought conditions that correlate to the 50- to 100-year reoccurrence interval event. By 2025, a supply deficit would be anticipated to occur during more frequent drought events, such as the 20-year reoccurrence interval event. There is also a projected supply deficit with the instantaneous and short-term pumping capacity of the wellfield, where it is projected that the wellfield may not be able to meet the maximum day demand as early as 2022 during times when the 1-day streamflow is less than the 50- to 100-year reoccurrence interval drought.

In order to address the short-term water supply deficits, an addition of 20 million gallons per day (mgd) of instantaneous and short-term water supply and 10 mgd of water supply that can be sustained for 60 to 90 days would meet the projected water supply needs of the city through approximately 2030. Six potential projects that would expand the existing source of supply to these levels and that can be implemented in the near term were evaluated. The options evaluated are listed below:

1. Expansion of existing wellfield with completion of the fourth HCW (which is the Lincoln Water System Drought Resiliency and Flood Protection Project)
2. New wellfield in the High Plains Aquifer
3. Aquifer storage and recovery (ASR) as peak shaving
4. Metropolitan Utilities District (MUD) interconnection
5. Water reuse

Due to the numerous issues regarding groundwater quality in the sand and gravel deposits of the High Plains Aquifer, Option 2 was not considered as a viable alternative for the city, and therefore no cost estimate was developed. Although a cost estimate was developed for Option 4, the use of the raw water as a source of supply for the city could potentially impact the Environmental Impact Statement (EIS) that was prepared as part of the planning and design of the MUD Platte West wellfield and therefore, would have to be further evaluated (and not implementable in the near term) prior to fully developing this supply option. It was determined that the water reuse option (Option 5) is not viable as there would not be sufficient capacity to meet the short-term supply option needs.

The costs for the remaining options are:

Option 1.
Expansion of the existing wellfield with completion of the fourth HCW = $10,300,000 (in 2013 dollars) and $1,402,530 for Bank Stabilization.

Option 3.
Aquifer Storage and Recovery (ASR) as peak shaving = $18,250,000 (in 2013 dollars)

Option 4
Connection to the Metropolitan Utilities District (modified to supply a finished water interconnection) = $41,836,000 (in 2013 dollars)

Table 9. Summary of the cost of all options in 2016 dollars

Option Number	Title	Cost in 2016 Dollars
Option 1	Expansion of Existing Well field	$12,727,830
Option 3	Aquifer Storage and Recovery	$19,942,270
Option 4 modified	Connection to MUD	$45,715,330

The Lincoln Water System Drought Resiliency and Flood Protection Project (Option 1), is the least-cost alternative by more than $7,214,440 over the next, lowest-cost option and is therefore, economically feasible.

Secondary Benefits

Table 10 provides values for the existing infrastructure that will be protected by the bank stabilization portion of the project, which totals $21,462,813. This does not include the additional $11,325,300 that will be invested in expanding the wellfield through the fourth HCW. Therefore, the bank stabilization efforts will protect over $32 million worth of infrastructure.

Table 10. Value of existing infrastructure that will be protected by bank stabilization.

Asset on Island	Protected Asset Value
Caisson for HCW 14-1	$2,144,000
Well House for HCW 14-1	$2,481,500
Transmission Main & Roadway for HCW 14-1	$4,017,802
1991 HCW's and Well Houses - 2016 Dollar Value	$9,597,011
1991 42" Transmission Main 650 LF at $400 per LF	$260,000
1991 54" Transmission Main 2,400 LF at $500 per LF	$1,200,000
Original Roadway 3,500 LF at $75 per LF	$262,500
Bridge	$1,500,000
Total Protected Asset Value	**$21,462,813**

An additional benefit of the project is a reduction in turbidity along the project corridor. The benefits to water quality are described separately for each of the two parts of the project.

For the Drought Resiliency aspect of the project, a disinfection facility will be installed on the fourth collector well. The water quality issue to be improved is the reduction of particulate iron bacteria which can greatly reduce filter times and require a significant increase in filter backwashing, risk of exceeding turbidity standards and wasting treated water. Specifically, this element of the project reduces iron bacteria accumulation within the pipelines thus reducing impacts on the treatment plant filters. In turn this reduces potential turbidly issues and non-compliance resulting from filter washing. Therefore, the disinfection facility provides a water quality benefit to the Platte River at the discharge point.

For the Flood Protection aspect of the project, there is also a benefit to stream turbidity. As stated in the Bank Stabilization Assessment Report (Attachment B.3), "while this project is focused solely on a short segment of the overall river… the goal of this stabilization and protection plan is to mitigate the effects of both anthropogenic actions and natural processes by implementing measures to:

- Eliminate the current threat to infrastructure
- Prevent future damage to infrastructure
- Minimize any environmental impact, including in-stream impact to sand bar formation
- Improve ecological diversity – in the stream and on land
- Improve water quality

The improvement to water quality refers to the reduction in turbidity in the stream in the areas identified for bank stabilization.

Other benefits of this project include the protection of upstream junior irrigators for nearly 50% of the state. With the addition of fourth HCW, the LWS will be able to operate at lower Platte River flow conditions, which minimizes adverse impacts to upstream existing water users. For example, during the 2012 drought, at a critical time in August the Platte River was barely flowing. At that time, the city had the right to "make a call on the river" due to its induced groundwater recharge permit. The city could have asked the NDNR to restrict upstream withdrawals by junior surface water users any time the Platte River flow fell below 704 cfs. Although the city could have exercised its right in 2012, it chose not to. The intent of this project is to provide a means to more efficiently withdraw water from the aquifer. It is another important tool in reducing the potential to exercise the LWS water right. Exercising the LWS water right would require many upstream surface water users to discontinue water use. The potential economic impact of suspending the withdrawals for upstream junior surface water users during the critical period of late summer corn and soybean production would be devastating to this State of Nebraska's economy.

7. Helps the state meet its obligations under interstate compacts, decrees, or other state contracts or agreements or federal law;

- Identify the interstate compact, decree, state contract or agreement or federal law.
- Describe how the project will help the state meet its obligations under compacts, decrees, state contracts or agreements or federal law.
- Describe current deficiencies and document how the project will reduce deficiencies.

The LWS project helps meet the obligations of two state agreements and one Federal law. The project has been endorsed by both the LPSNRD and the P-MRNRD because the project helps meet the goals and objectives of their IMPs (Attachment C.3 and Attachment C.4). IMPs are agreements that are required in certain parts of the state, however in the case of both the LPSNRD and the P-MRND, the state agreements were completed voluntarily to ensure long-term sustainability of the integrated groundwater and surface water supplies. The LWS project also helps the state meet the obligations of the Federal Law 93-523, otherwise known as the Safe Drinking Water Act (SDWA) United States Code 42 § 300f.

There are two specific Integrated Management Plans (IMPs) that this project will address. The IMP Jointly Developed by the Department of Natural Resources (NDNR) and the Lower Platte South Natural Resources District (LPSNRD) dated May 15, 2014 and the IMP jointly developed by the NDNR and the Papio-Missouri River Natural Resources District (P-MRNRD), August 31, 2014.

Both the Lower Platte South and the Papio-Missouri River NRDs and the NDNR have completed the first year of plan implementation, exchanged all available and relevant information collected during that first year, and prepared a report detailing this information and anticipated activities in the upcoming years.

For the LPSNRD IMP, the goals and objectives that the project benefits are as follows:

- Goal Area: Water supply management

Ensure a sustainable water supply is available in the amounts and location of the demands through management actions to meet the District's short and long term needs

- Goal Area: Water Use Management

Manage the expansion of new water uses in the District so as to not adversely affect current water users.

For the P-MRNRD IMP, the goals and objectives that the project benefits are as follows:

- Goal 1 – Develop and implement water use policies and practices that contribute to the protection of existing surface and groundwater uses while allowing for future water development.
- Objective 1.1 – Utilize existing policies and authorities of P-MRNRD and NDNR to address water quantity issues.
- Objective 1.3 – Identify and evaluate potential conjunctive management projects and activities within the IMP Area.

The Drought Resiliency and Flood Protection project will assist the LPSNRD in achieving this water supply goal by supporting a project intended to address water quantity issues during the critical periods of drought as well as protecting the existing water supply infrastructure. The long-term yield of LWS raw water supply is directly correlated to streamflow in the Platte River. As shown in 2012, drought is one of the biggest threats to an adequate drinking water supply for Lincoln. The fourth HCW and associated pipeline project will provide for additional reliability, sustainability and resiliency in times of drought. Specifically, the HCWs are more efficient at extracting groundwater at a given rate of streamflow than vertical wells and therefore they are not as vulnerable to water level declines. Additionally, by adding the fourth collector well, the wellfield is able to withdraw water from a larger cross sectional area of the aquifer. This helps ensure that a sustainable water supply is available for the citizens of Lincoln in the amounts and location of the demand for both short and long term needs.

Another important aspect of this project is that with the addition of fourth HCW, the LWS will be able to operate at lower Platte River flow conditions, which minimizes adverse impacts to upstream existing water users. This will directly benefit the second LPSNRD goal area "to manage the expansion of new water uses in the District so as to not adversely affect current water users". Going back to the 2012 drought, at a critical time in August the Platte River was barely flowing. The city had the right to "make a call on the river" due to its induced groundwater recharge permit. The city could have asked the NDNR to restrict upstream withdrawals by junior surface water users any time the Platte River flow fell below 704 cfs. Although the city could have exercised its right in 2012, it chose not to. The intent

of this project is to provide a means to more efficiently withdraw water from the aquifer. It is another important tool in reducing the potential to exercise the LWS water right. Exercising the LWS water right would require many upstream surface water users to discontinue water use. The potential economic impact of suspending the withdrawals for upstream junior surface water users during the critical period of late summer corn and soybean production would be devastating to this State of Nebraska's economy.

As described in the Papio-Missouri NRD IMP, Goal 1 is designed to provide for additional water resources development opportunities while protecting the existing surface and groundwater uses. The LWS project will assist the P-MRNDR in achieving Goal 1 and Objectives 1.1 and 1.3 by supporting a project intended to address water quantity issues during the critical periods of drought as well as protecting the existing water supply infrastructure. The justification for this is as follows. The long-term yield of LWS raw water supply is directly correlated to streamflow in the Platte River. As shown in 2012, drought is one of the biggest threats to an adequate drinking water supply for Lincoln. The horizontal collector well (HCW) and associated pipeline project will provide for additional reliability, sustainability and resiliency in times of drought. Specifically, the HCWs are more efficient at extracting groundwater at a given rate of streamflow than vertical wells and therefore they are not as vulnerable to water level declines. This helps ensure that a sustainable water supply is available for the citizens of Lincoln in the amounts and location of the demand for both short and long term needs.

The fourth HCW is not initially intended to provide new capacity; it is to protect the existing use and the needed capacity in times of drought (Goal 1). As illustrated in Figure 5, with the additional development of the fourth HCW, the LWS will be able to operate at lower flow conditions without adverse impacts to upstream existing water users (Objective 1.1). The LWS wellfield in Ashland is a conjunctive use project in that it is utilizing induced groundwater recharge which by definition is a replenishment of groundwater storage from surface water supplies (Objective 1.3). Finally, the bank stabilization practices will contribute to flood protection of the wellfield facilities and infrastructure that will help ensure the availability of Lincoln's water supply (Goal 1). The LWS Drought Resiliency and Flood Protection Project will provide a direct benefit to the citizens of Lincoln by removing water from the aquifer more efficiently and protecting critical infrastructure, thus allowing the LWS to operate at lower Platte River flow conditions.

The SDWA applies to every public water system in the United States. The LWS relies on the Platte River alluvial aquifer to supply clean water to the community. This project provides the necessary infrastructure improvements to efficiently and reliably supply safe drinking water to the citizens of Lincoln for public use. Without this project, the LWS has two deficiencies, it is vulnerable to drought and flood conditions on the Platte River. The new HCW will help mitigate the deficiencies during drought by providing a new highly efficient well that will be able to withdrawal water from deeper in the aquifer and provides for a greater cross

sectional area of the aquifer to be accessed as described in the LWS Facilities Master Plan (Attachment B.1). Both of these improvements will allow the LWS to operate the Ashland wellfield during lower flow conditions in the Platte River. The bank stabilization aspects of the project will protect the critical infrastructure from flood damage and erosion. Without these stabilization projects, the main 54" water line, the bridge connecting the Ashland wellfield on the island to the mainland, the southeast part of the island, the new HCW 14-2, the access road at the pond and the west bank of the river would be in jeopardy of erosion (As described in the Bank Stabilization Assessment, Attachment B.3). The loss of any of these structures would jeopardize Lincoln's compliance with the SDWA requirement that the LWS provide clean drinking water to the community.

8. Reduces threats to property damage or protects critical infrastructure that consists of the physical assets, systems, and networks vital to the state or the Untied States such that their incapacitation would have a debilitating effect on public security or public health and safety;

- Identify the property that the project is intended to reduce threats to.
- Describe and quantify reductions in threats to critical infrastructure provided by the project and how the infrastructure is vital to Nebraska or the United States.
- Identify the potential value of cost savings resulting from completion of the project.
- Describe the benefits for public security, public health and safety.

As illustrated in Figure 4, the bank stabilization aspects of this project include protection of the main 54" water line, the bridge connecting the Ashland wellfield on the island to the mainland, the southeast part of the island, the new HCW 14-2, the access road at the pond and the west bank of the river. As described in the Bank Stabilization Assessment (Attachment B.3), the Platte River is a braided stream, which is broad, shallow, and contains many islands and has never been used for major navigation. The sandy nature of the river causes the bed and banks to be relatively unstable, as sand bars will form and wash away seasonally. Additionally, the wide and shallow river bed creates ideal conditions for large ice jams to form in winter months, which can become mobilized during a short warming period and jam soon after causing flooding upstream. The stabilization structures included in the LWS project will protect the infrastructure from the dynamic nature of the Platte River that cause long term erosion of the banks of the Ashland wellfield.

The potential cost savings resulting from completion of the project can be estimated based on the construction costs of the individual parts of the system which amounts to $11,124,802 as shown in Table 11.

Table 11. Potential Cost Savings based on Individual System Components

Asset	Construction Value
Caisson for HCW 14-1	$2,144,000
Well House for HCW 14-1	$2,481,500
Transmission Main for HCW 14-1	$4,017,802
Caisson for HCW 14-2	$2,481,500
Total Construction Value (Construction Timeframe was the Fall 2013 to Fall 2014)	$11,124,802

The benefits to public security, public health and safety may initially appear more difficult to quantify. One way to evaluate the potential effect of flood damage to the LWS is to look at the critical operations that occur in Lincoln. The main offices for both State and Federal government agencies are operated out of Lincoln. As the second largest community in Nebraska, the LWS provides water to the entire community including hospitals, schools including the main campus of the University of Nebraska, and both state and federal government offices. Continued operation of the state and federal offices in Lincoln benefits the citizens of the state by providing security through operations of the local police force, state sheriffs, and National Guard. Public health and safety is provided through fire departments and hospitals with critical care facilities that serve the majority of the state. A fundamental purpose of a large public water supply such as Lincoln's is to provide fire suppression. Lincoln currently has a favorable fire protection rating from the Insurance Services Office (ISO) which specifically looks at adequate and reliable supply to the community. Any potential issues with supply can affect the ISO rating and cause significant insurance cost increases. Additionally, interstate rail and fiber networks run through the city. The rail center and fiber networks are critical infrastructure that would be in jeopardy of suspended service if an adequate water supply was not provided by the LWS. Interruption of service due to damage during flood events could potentially have a debilitating effect on public security or public health and safety of Lincoln's citizens. This project reduces threats to property damage and protects critical infrastructure that consists of the physical assets of the LWS.

9. Improves water quality;

- Describe what quality issue(s) is/are to be improved.
- Describe and quantify how the project improves water quality, what is the target area, what is the population or acreage receiving benefits, what is the usage of the water: residential, industrial, agriculture or recreational.
- Describe other possible solutions to remedy this issue.
- Describe the history of the water quality issue including previous attempts to remedy the problem and the results obtained.

For the Drought Resiliency aspect of the project, a disinfection facility will be installed on the fourth collector well. The water quality issue to be improved is the

reduction of particulate iron bacteria which can greatly reduce filter times and require a significant increase in filter backwashing, risk of exceeding turbidity standards and wasting treated water. Specifically, this element of the project reduces iron bacteria accumulation within the pipelines thus reducing impacts on the treatment plant filters. In turn this reduces potential turbidly issues and non-compliance resulting from filter washing. Therefore, the disinfection facility provides a water quality benefit to the Platte River at the discharge point.

For the Flood Protection aspect of the project, the water quality issue that is to be improved is also turbidity. As stated in the Bank Stabilization Assessment (Attachment B.3), "while this project is focused solely on a short segment of the overall river… the goal of this stabilization and protection plan is to mitigate the effects of both anthropogenic actions and natural processes by implementing measures to:

- Eliminate the current threat to infrastructure
- Prevent future damage to infrastructure
- Minimize any environmental impact, including in-stream impact to sand bar formation
- Improve ecological diversity – in the stream and on land
- Improve water quality

The improvement to water quality refers to the reduction in turbidity in the stream in the areas identified for bank stabilization (Figure 4). Other possible solutions to the increased turbidity due to bank erosion were discussed in the Bank Stabilization Assessment (Attachment B.3) and the proposed options were identified as meeting the goals of the plan as stated above.

10. Has utilized all available funding resources of the local jurisdiction to support the program, project, or activity;

- Identify the local jurisdiction that supports the project.
- List current property tax levy, valuations, or other sources of revenue for the sponsoring entity.
- List other funding sources for the project.

The local jurisdiction that supports this project is the Lincoln Water System within the Public Works and Utilities department of the City of Lincoln.

The property tax levy in the City of Lincoln is not relevant to this application since the source of local matching funds for this project is generated from the residents of Lincoln's utility bills. The City of Lincoln uses both an inclining block rate and water shortage rate structure to secure local sources of funding for the project while at the same time encouraging water conservation. The LWS designed and implemented the inclined block rate structure to reflect the increasing capital and O&M costs incurred to deliver adequate water supplies for outdoor water use such as turf irrigation that is over and above base use associated with health, sanitation, and

safety. For many years the City of Lincoln has used the multidimensional tiered rate structure that increases the individual's cost of water with the amount of water used to promote water conservation. Water shortage or drought rates are yet another step in reducing unnecessary water usage that the City of Lincoln has successfully implemented. The rate structures and other conservation measures implemented by the city have worked well as demonstrated by the 25% reduction in per capita water use since the 1980's.

The Drinking Water State Revolving Fund (DWSRF) was created to provide low cost financing for construction of publicly or privately owned public water systems. The DWSRF is created from a series of Environmental Protection Agency (EPA) capitalization grants, a required 20% state match from State general fund appropriations, the program's Administration Cash Fund, and Nebraska Investment Finance Authority (NIFA) public offered bond issues. In the last 5 years the City of Lincoln has utilized $14.9 million of DWSRF monies.

11. Has a local jurisdiction with plans in place that support sustainable water use;

- List the local jurisdiction and identify specific plans being referenced that are in place to support sustainable water use.
- Provide the history of work completed to achieve the goals of these plans.
- List which goals and objectives this project will provide benefits for and how this project supports or contributes to those plans.
- Describe and quantify how the project supports sustainable water use, what is the target area, what is the population or acreage receiving benefits, what is the usage of the water: residential, industrial, agriculture or recreational.
- List all stakeholders involved in project.
- Identify who benefits from this project.

The City of Lincoln has incorporated extensive water conservation measures into city ordinances and has demonstrated significant conservation efforts in past years. As written into the City of Lincoln Water Management Plan (Attachment B.9), "It is the policy of the City of Lincoln to promote water conservation. The water supply to the City of Lincoln is a limited resource, and everyone shares in the responsibility for appropriately using and preserving this resource. All customers of the Lincoln Water System are therefore encouraged to voluntarily reduce water usage by daily practicing water conservation, regardless of whether voluntary or mandatory water restrictions are implemented or certain water shortage rates are applied. There are many simple, cost-effective ways to lower water use and reduce strain on water resources and infrastructure without compromising Lincoln's quality of life. Customers of the Lincoln Water System are encouraged to follow at all times the water conservation measures found at lincoln.ne.gov, keyword: water conservation."

Lincoln's water conservation efforts date back many years and has been a fundamental part of effectively managing water supply. Efforts include:

1. A Water Conservation Task Force to advise policy and promote water conservation efforts.
2. Use of an inclining block rate fee structure where the price per unit of water is increased with high water use beyond normal health, sanitation, and safety.
3. Development of a Water Management Plan that has specific actions to taken during period of water shortages including voluntary and mandatory restrictions. The plan includes all the necessary ordinances required to implement enforcement of mandatory restrictions.
4. The use of incremental water shortage rates during both voluntary and mandatory restrictions to provide a financial incentive to customers for reduced water use.
5. Ordinance requiring all new irrigation systems to have a rain sensor installed.

The Mayor's Water Conservation Task Force, formed in the late summer of 1988, was created to develop positive approaches to water conservation. They determined voluntary cooperation was the best approach to accomplish conservation practices.

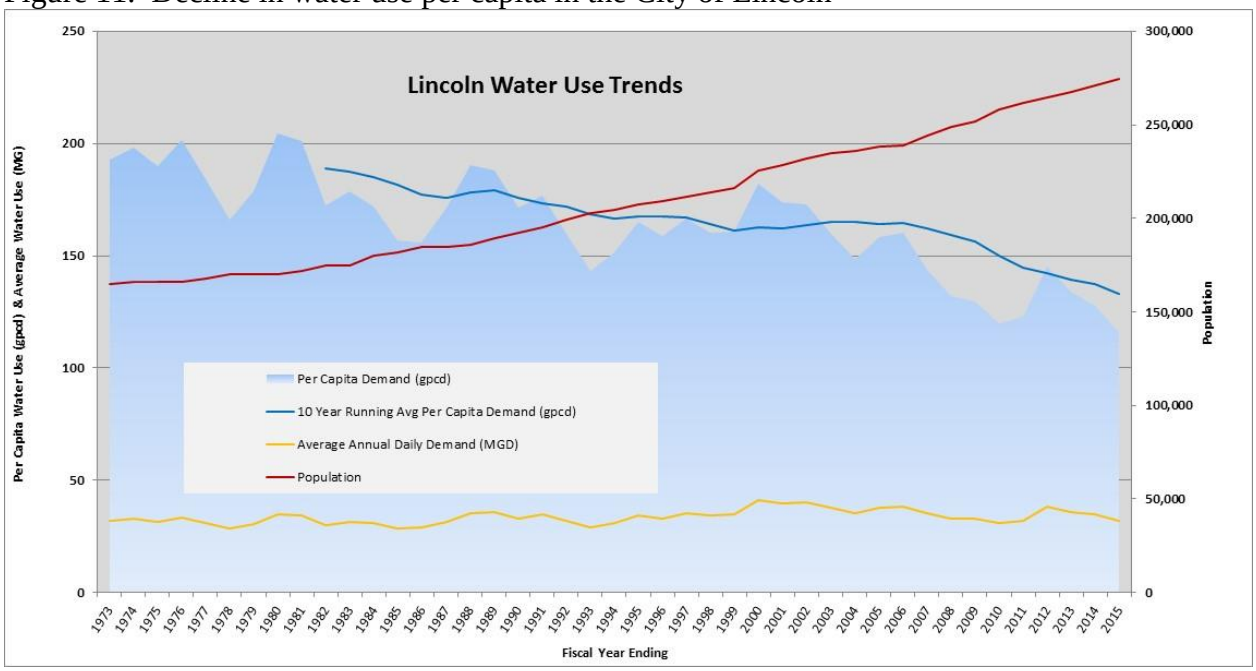
The goals of the task force were to maintain a public awareness program to keep peak day water use within the water system's ability to deliver; encourage participation and support for water conservation practices from business, industry and the community; and to identify and promote the adoption of water conserving plant materials and landscape practices.

The Task Force's purpose was:

- Inform and educate the citizens of Lincoln about the importance of conserving our water resources.
- Increase the acceptance of water conservation measures to reduce outdoor water consumption.
- Improve domestic in home water conservation.
- Improve water conservation and use efficiency of industrial, commercial and business water users.
- Inform customers regarding water quality issues.

Lincoln's history of sustainable water use is best illustrated by Figure 11. This figure illustrates the per capita water use and population over time. As shown in the graph, Lincoln's population has nearly doubled since the early 70's. Conversely, the per capita water use has decreased by 25% since the early 80's. The result is that the average daily demand has stayed the same.

Figure 11. Decline in water use per capita in the City of Lincoln



This is a remarkable record of water conservation that should be a model for many communities across the nation. There is always more that can be done and the City of Lincoln continues to implement water conservation policies that encourage the wise use of water. The citizens that benefit from these practices include over a quarter of million people that live within the City of Lincoln are receive water from the LWS. Additionally, the benefits of the project include the upstream water users that draw their water from the Lower Platte River watershed. The project will provide a direct benefit to the citizens of Lincoln and upgradient water users by removing water from the aquifer more efficiently and thus allowing the LWS to operate its wellfield at lower Platte River flow conditions. Upgradient users will therefore have the opportunity to utilize their water rights and maintain their agricultural operations for longer periods of time when it is most critical, during drought.

12. Addresses a statewide problem or issue;

- List the issues or problems addressed by the project and why they should be considered statewide.
- Describe how the project will address each issue and/or problem.
- Describe the total number of people and/or total number of acres that would receive benefits.
- Identify the benefit, to the state, this project would provide.

The issue addressed by the project is the balance of water supplies and water uses within the Platte River Basin, by far the largest river basin in Nebraska covering nearly 50% of the total land area of the state (or more than 24,700,000 acres). With anticipated conflicts between the largely agricultural water users upstream of Lincoln with the needs of the City of Lincoln, this project will enhance the reliability of the city's water supply without reducing the water available for agricultural use in the state.

In particular, surface water users that have a junior priority dates to the city's induced water supply permit, could be curtailed by a water right call from the city. Figure 9 shows the locations of surface water rights in the Platte River Basin upstream from the city's wellfield that could potentially be impacted by a water right call by the city.

Furthermore, as Lincoln is the state capitol and a majority of state government functions are located in Lincoln, the continued viability of the City of Lincoln's water supply is clearly a statewide issue.

13. Contributes to the state's ability to leverage state dollars with local or federal government partners or other partners to maximize the use of its resources;

- List other funding sources or other partners, and the amount each will contribute, in a funding matrix.
- Describe how each source of funding is made available if the project is funded.
- Provide a copy or evidence of each commitment, for each separate source, of match dollars and funding partners.
- Describe how you will proceed if other funding sources do not come through.

The local jurisdiction that supports this project is the Lincoln Water System within the Public Works and Utilities department of the City of Lincoln. There are no other funding sources or financial partners. The source of local matching funds for this project is generated from the residents of Lincoln's utility bills. The City of Lincoln uses both an inclining block rate and water shortage rate structure to secure local sources of funding for the project while at the same time encouraging water conservation. The LWS designed and implemented the inclined block rate structure to reflect the increasing capital and O&M costs incurred to deliver adequate water supplies for outdoor water use such as turf irrigation that is over and above base use associated with health, sanitation, and safety. For many years the City of Lincoln has used the multidimensional tiered rate structure that increases the individual's cost of water with the amount of water used to promote water conservation. Water shortage or drought rates are yet another step in reducing unnecessary water usage that the City of Lincoln has successfully implemented. The rate structures and other conservation measures implemented by the city have worked well as demonstrated by the 25% reduction in per capita water use since the 1980's.

Since there are no other sources of funding the last two bullet points for this question are not applicable.

14. Contributes to watershed health and function;

- Describe how the project will contribute to watershed health and function in detail and list all of the watersheds affected.

By completing the fourth HCW, additional capacity is gained without affecting streamflows due to the efficiency of the collector well design and its spatial location relative to exiting wellfields and wells.

1. The fourth HCW is located just over five miles south of the north wellfield vertical wells, on the east bank of the Platte River and across from the confluence with Salt Creek. Improved stream flow should be realized along this five mile stretch of the Platte River because pumping from the fourth HCW will reduce the required pumping in the north wellfield vertical wells.
2. By design HCWs are more efficient than vertical wells and can recover more stored aquifer water for given streamflow. This is especially critical during low streamflow experienced during drought conditions.
3. The location of the fourth HCW takes advantage of Salt Creek flows as they enter the Platte River. The zone of influence of the fourth HCW intersects the area where Salt Creek flows enter the Platte, thus reducing the total withdrawal from the Platte River flow.

Collectively, the result is that the fourth HCW reduces the dependence on the Platte River flow along the five mile stretch of the Platte River between the north wellfield and the fourth HCW. Low flows in any stretch of the Platte River can result in the loss of aquatic life and aquatic habitat. The reduced dependence on Platte River flow in this stretch of river will provide increased streamflow and thus reduce impacts to aquatic life in drought conditions in the Lower Platte River watershed.

Additionally, as stated in the Bank Stabilization Assessment (Attachment B.3), the goals of the stabilization project are:

- Eliminate the current threat to infrastructure
- Prevent future damage to infrastructure
- Minimize any environmental impact, including in-stream impact to sand bar formation
- Improve ecological diversity – in stream and on land
- Improve water quality

With funding to complete the LWS project, these goals for infrastructure protection and watershed health and function will be achieved.

4. Uses objectives described in the annual report and plan of work for the state water planning and review process issued by the department.

- Identify the date of the Annual Report utilized.
- List any and all objectives of the Annual Report intended to be met by the project
- Explain how the project meets each objective.

The most recent annual plan of work for the state water planning and review process was issued by the Department of Natural Resources on September 15, 2015. Two of the objectives in the report consist of continued implementation of the IMPs for the LPSNRD and the PMRNRD. This project will assist in achieving several of the goals and objectives of these IMPs, as described below.

There are two specific Integrated Management Plans (IMPs) that this project will address. The IMP Jointly Developed by the Department of Natural Resources (NDNR) and the Lower Platte South Natural Resources District (LPSNRD) dated May 15, 2014 and the IMP jointly developed by the NDNR and the Papio-Missouri River Natural Resources District (P-MRNRD), August 31, 2014.

Both the Lower Platte South and the Papio-Missouri River NRDs and the NDNR have completed the first year of plan implementation, exchanged all available and relevant information collected during that first year, and prepared a report detailing this information and anticipated activities in the upcoming years.

For the LPSNRD IMP, the goals and objectives that the project benefits are as follows:

- Goal Area: Water supply management

Ensure a sustainable water supply is available in the amounts and location of the demands through management actions to meet the District's short and long term needs

- Goal Area: Water Use Management

Manage the expansion of new water uses in the District so as to not adversely affect current water users.

For the P-MRNRD IMP, the goals and objectives that the project benefits are as follows:

- Goal 1 – Develop and implement water use policies and practices that contribute to the protection of existing surface and groundwater uses while allowing for future water development.
- Objective 1.1 – Utilize existing policies and authorities of P-MRNRD and NDNR to address water quantity issues.
- Objective 1.3 – Identify and evaluate potential conjunctive management projects and activities within the IMP Area.

The Drought Resiliency and Flood Protection project will assist the LPSNRD in achieving this water supply goal by supporting a project intended to address water quantity issues during the critical periods of drought as well as protecting the existing water supply infrastructure. The long-term yield of LWS raw water supply is directly correlated to streamflow in the Platte River. As shown in 2012, drought is one of the biggest threats to an adequate drinking water supply for Lincoln. The fourth HCW and associated pipeline project will provide for additional reliability, sustainability and resiliency in times of drought. Specifically, the HCWs are more efficient at extracting groundwater at a given rate of streamflow than vertical wells and therefore they are not as vulnerable to water level declines. Additionally, by adding the fourth collector well, the wellfield is able to withdraw water from a larger cross sectional area of the aquifer. This helps ensure that a sustainable water supply is available for the citizens of Lincoln in the amounts and location of the demand for both short and long term needs.

Another important aspect of this project is that with the addition of fourth HCW, the LWS will be able to operate at lower Platte River flow conditions, which minimizes adverse impacts to upstream existing water users. This will directly benefit the second LPSNRD goal area "to manage the expansion of new water uses in the District so as to not adversely affect current water users". Going back to the 2012 drought, at a critical time in August the Platte River was barely flowing. The city had the right to "make a call on the river" due to its induced groundwater recharge permit. The city could have asked the NDNR to restrict upstream withdrawals by junior surface water users any time the Platte River flow fell below 704 cfs. Although the city could have exercised its right in 2012, it chose not to. The intent of this project is to provide a means to more efficiently withdraw water from the aquifer. It is another important tool in reducing the potential to exercise the LWS water right. Exercising the LWS water right would require many upstream surface water users to discontinue water use. The potential economic impact of suspending the withdrawals for upstream junior surface water users during the critical period of late summer corn and soybean production would be devastating to this State of Nebraska's economy.

As described in the Papio-Missouri NRD IMP, Goal 1 is designed to provide for additional water resources development opportunities while protecting the existing surface and groundwater uses. The LWS project will assist the P-MRNDR in achieving Goal 1 and Objectives 1.1 and 1.3 by supporting a project intended to address water quantity issues during the critical periods of drought as well as protecting the existing water supply infrastructure. The justification for this is as follows. The long-term yield of LWS raw water supply is directly correlated to streamflow in the Platte River. As shown in 2012, drought is one of the biggest threats to an adequate drinking water supply for Lincoln. The horizontal collector well (HCW) and associated pipeline project will provide for additional reliability, sustainability and resiliency in times of drought. Specifically, the HCWs are more efficient at extracting groundwater at a given rate of streamflow than vertical wells and therefore they are not as vulnerable to water level declines. This helps ensure

that a sustainable water supply is available for the citizens of Lincoln in the amounts and location of the demand for both short and long term needs.

The fourth HCW is not initially intended to provide new capacity; it is to protect the existing use and the needed capacity in times of drought (Goal 1). As illustrated in Figure 5, with the additional development of the fourth HCW, the LWS will be able to operate at lower flow conditions without adverse impacts to upstream existing water users (Objective 1.1). The LWS wellfield in Ashland is a conjunctive use project in that it is utilizing induced groundwater recharge which by definition is a replenishment of groundwater storage from surface water supplies (Objective 1.3). Finally, the bank stabilization practices will contribute to flood protection of the wellfield facilities and infrastructure that will help ensure the availability of Lincoln's water supply (Goal 1). The LWS Drought Resiliency and Flood Protection Project will provide a direct benefit to the citizens of Lincoln by removing water from the aquifer more efficiently and protecting critical infrastructure, thus allowing the LWS to operate at lower Platte River flow conditions.

5. Federal Mandate Bonus. If you believe that your project is designed to meet the requirements of a federal mandate which furthers the goals of the WSF, then:

- Describe the federal mandate.
- Provide documentary evidence of the federal mandate.
- Describe how the project meets the requirements of the federal mandate.
- Describe the relationship between the federal mandate and how the project furthers the goals of water sustainability.

The LWS project also helps the state meet the obligations of the Federal Law 93-523, otherwise known as the Safe Drinking Water Act (SDWA) United States Code 42 § 300f. As a public water system, the LWS must comply with the SDWA. The LWS relies on the Platte River alluvial aquifer to supply clean water to the community. This project provides the necessary infrastructure improvements to efficiently and reliably supply safe drinking water to the citizens of Lincoln for public use in compliance with the SDWA.

This project is a perfect example of how the funds from the Water Sustainability fund furthers the goals of water sustainability in the state of Nebraska. As stated in the LWS Water Management Plan, water is a finite resource and must be managed accordingly. The new HCW will provide a new, highly efficient well that will be able to withdrawal water from deeper in the aquifer and across a greater cross sectional area of the aquifer. Both of these improvements will allow the LWS to operate the Ashland wellfield during lower flow conditions in the Platte River. The bank stabilization aspects of the project will protect the critical infrastructure from flood damage and erosion. Without these stabilization projects, the main 54" water line, the bridge connecting the Ashland wellfield on the island to the mainland, the southeast part of the island, the new HCW 14-2, the access road at the pond and the

west bank of the river would be in jeopardy from erosion. The loss of any of these structures would jeopardize Lincoln's compliance with the SDWA requirement that the LWS provide clean drinking water to the community.

Additionally, the chlorination facility that is a part of this project directly addresses the need for a public water supplier to provide clean drinking water to the community. Without chlorination, water quality issues would preclude distribution of clean water to the citizens of Lincoln.

Section D.

PROJECT DESCRIPTION

1. Overview

In 1,000 characters *or less*, provide a brief description of your project including the nature and purpose of the project and objectives of the project.

The drought of 2002 and 2012 and the floods of 1993, 1997, 2001, and 2011 illustrated to the City of Lincoln two significant threats to the sustainability of its water supply. The Lincoln Water System (LWS) is supplied by a wellfield near Ashland, Nebraska with wells in the center and on the west side of the dynamic Platte River. The purpose of the Drought Resiliency and Flood Protection Project is to address both threats. For drought resiliency, the project includes completion of the fourth horizontal collector well and associated pipeline to provide for more efficient water supply operations, specifically during drought. For flood protection, the project includes bank stabilization structures to protect the critical infrastructure from erosional damage during flood events. The project will provide a direct benefit to the citizens of Lincoln and upgradient water users by removing water from the aquifer more efficiently and thus allowing the LWS to operate its wellfield at lower Platte River flow conditions while also protecting critical infrastructure during high flows.

2. Project Tasks and Timeline

The project tasks and timeline are outlined in Attachment A.5.

3. Partnerships

Identify the roles and responsibilities of agencies and groups involved in the proposed project regardless of whether each is an additional funding source. List any other sources of funding that have been approached for project support and that have officially turned you down. Attach the rejection letter.

No other sources of funding have been applied for at this time and therefore none have been turned down.

4. Other Sources of Funding

Identify the costs of the entire project, what costs each other source of funding will be applied to, and whether each of these other sources of funding is confirmed. If not, please identify those entities and list the date when confirmation is expected. Explain how you will implement the project if these sources are not obtained.

The entire cost of the project is $12,727,830. As documented in the Mayor's Letter of Support (Attachment D.1) for this application, the City of Lincoln is committed to funding 40% of this project.

5. Support/Opposition

Discuss both support and opposition to the project, including the group or interest each represents.

Letters of Support from the Lower Platte South Natural Resources District and the Papio-Missouri River Natural Resources District are included in Attachments C.2 and C.3. The project has been endorsed by both the LPSNRD and the P-MRNRD because the project helps meet the goals and objectives of their Integrated Management Plans.

A letter of support for the project from the Mayor of Lincoln, Mr. Chris Beutler, is included in Attachment D.1. Additionally, a letter of support from the Mayor's Environmental Task Force is included in Attachment D.2. This task force advises the Mayor of the City of Lincoln on local environmental stewardship and sustainability policies and programs.