NEBRASKA NATURAL RESOURCES COMMISSION

Water Sustainability Fund

Application for Funding

Section A.

ADMINISTRATIVE

PROJECT NAME: Aquifer Storage and Restoration (ASR) Nitrate and Uranium Control Project, Hastings Nebraska

PRIMARY CONTACT INFORMATION

Entity Name: City of Hastings (Hastings Utilities)

Contact Name: Steve Cogley

Address: P.O. Box 289, Hastings, Nebraska 68902

Phone: 402-462-3693

Email: scogley@hastingsutilities.com

Partners / Co-sponsors, if any: Little Blue Natural Resources District, Upper Big Blue Natural Resources District

1. Dollar amounts requested: (Grant, Loan, or Combination)

Grant amount requested. 60% of $7.35 million, or, $4,410,000 from the Water Sustainability Fund. $2,940,000 of the $7.35 million will be provided by the City of Hastings. The $7.35 million amount is a portion of the entire nitrate and uranium reduction project which totals approximately $46 million. This portion of the overall project (the $7.35 million) is representative of the cost associated with providing for the installation of reverse osmosis treatment equipment and the installation of four injection wells. The four injection wells will return the lower concentration water (provided by reverse osmosis treatment) to the underground aquifer. The aquifer provides drinking water to users of the water distribution system and those entities connected to the City of Hastings water distribution system.

See attached Executive Summary for further project overview.

Grant amount requested. $ 4,410,000

Loan amount requested. $ N/A

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☐
Surface Water Right	N/A☒	Obtained: YES☐	NO☐
USACE (e.g., 404 Permit)	N/A☐	Obtained: YES☒	NO☐
Cultural Resources Evaluation	N/A☒	Obtained: YES☐	NO☐
Other (provide explanation below)	N/A☐	Obtained: YES☒	NO☐

As noted above the only permit that is required is a USACE 404 permit. This permit is required to complete the installation of a sewer main which crosses the adjacent streambed. This stream segment is South Branch of the West Fork of the Big Blue River. See attached permit titled USACE 404 Permit for ASR Sewer Crossing authorizing the sewer main construction.

No other environmental permits are required to complete this project. No other construction is proposed within the riparian zone along the South Branch of the West Fork of the Big Blue River. The project construction will occur on existing farm ground.

The lands where construction will occur have been reviewed to determine the presence of wetlands. No wetlands were found. Please see attached report titled HU ASR Storage Lagoon Wetland Audit for more details.

The NDEQ requires an Underground Injection Control (UIC) Permit for the construction and operation of the ASR injection wells. This permit has been approved pending completion of the ASR 5 injection Well Pilot Study. The intent of this study is to verify the injection well design criteria. See attached file title ASR NDEQ UIC Permit for more details.

During construction the Federal Aviation Administration will be notified when drilling or other elevation construction equipment is utilized. This is required to provide air traffic information on potential flight hazards.

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. Click here to enter text.

If yes what is the population served by your project? Click here to enter text.

If yes provide a demonstration of need. Click here to enter text.

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? Click here to enter text.

If yes, describe the changes that have been made since the last application. Click here to enter text.

No, I certify the application is a true and exact copy of the previously submitted and scored application. (Signature required) Click here to enter text.

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? *$274,030.60*

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

See attached file titled ASR Project Design Invoices

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.

The total estimated cost is $ 2,025,000:

Triplex Pump	$ 25,000
Vadose Zone Study	$ 50,000
ASR Pilot Study	$ 50,000
N. Baltimore Water Storage	$ 700,000
N. Baltimore RO Unit	$ 1,200,000
TOTALS	$ 2,025,000

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☐

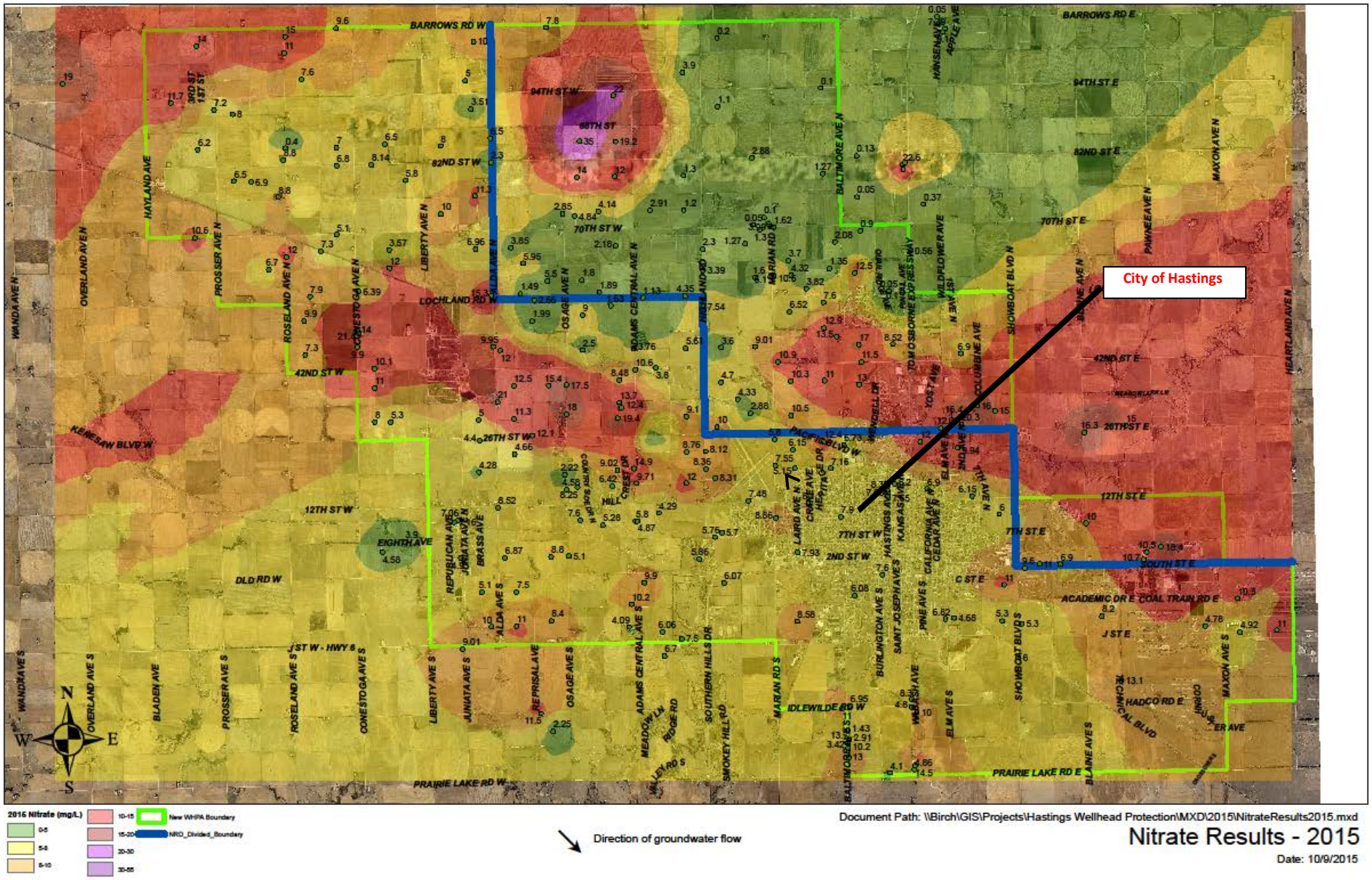
1(a). If yes (structural), submit a feasibility report (to comply with Title 261, CH 2) including engineering and technical data and the following information:

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

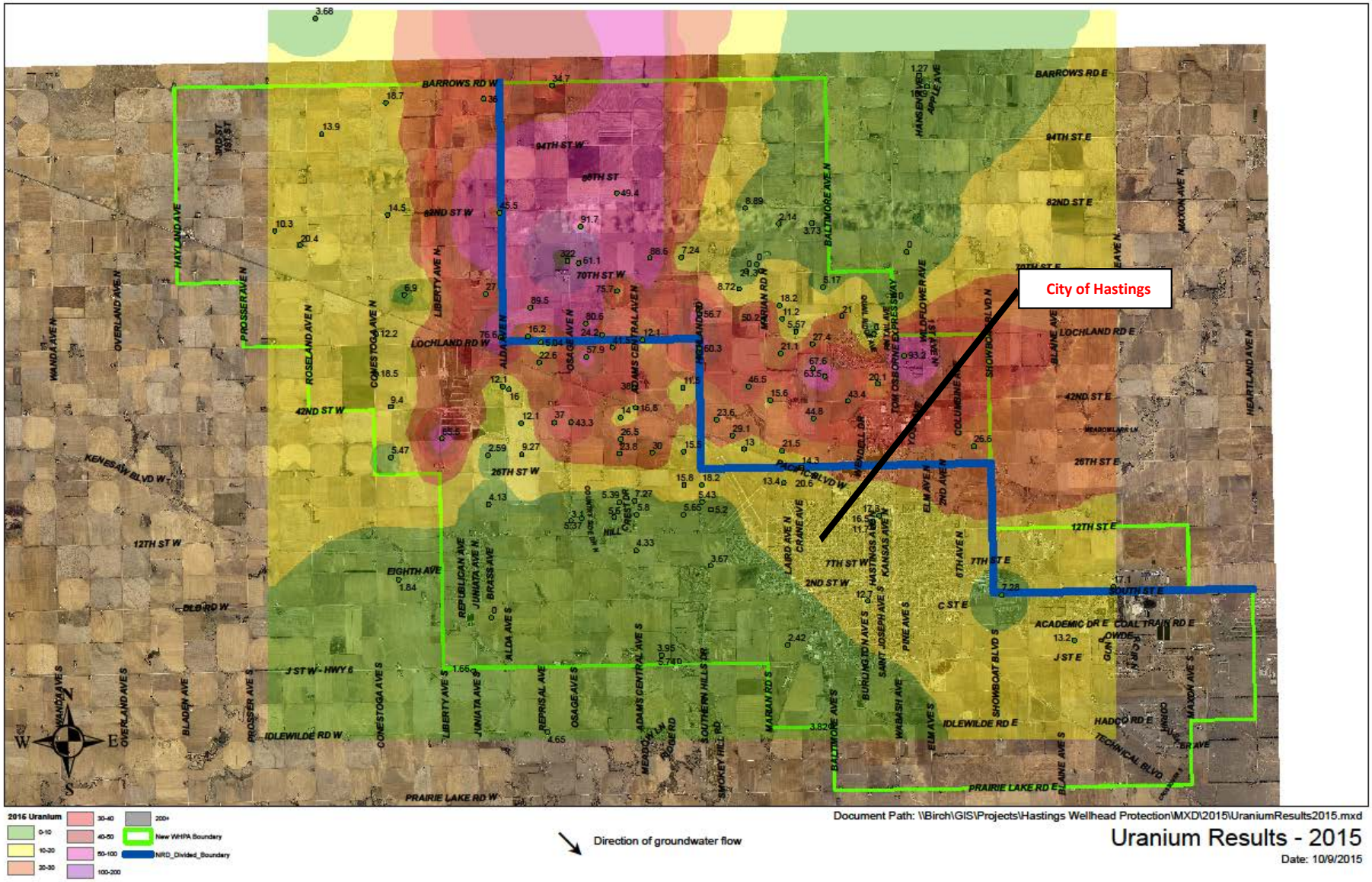
The Hastings Aquifer Storage and Restoration (ASR) Project along with the implementation of the Hastings Wellhead Nitrogen Management Plan is being developed to provide a sustainable supply of potable water for the City of Hastings and its wholesale customers. This includes the Village of Trumbull and Clay County SID #1. The City of Hastings is in a position to become a rural water supplier for nearby water systems as the need arises, due to regulatory or capacity issues.

The issues facing the City of Hastings and the surrounding communities are nitrates and uranium. Groundwater contamination is extensive as many areas are above the Safe Drinking Water Act (SDWA) Maximum Contaminate Level (MCL) of 10 mg/l (ppm) for Nitrates and 30 ug/l (ppb) for Uranium. This contamination is shown in the maps as noted below titled 2015 Nitrate Map and 2015 Uranium Map. See attached maps for larger view. Some areas have nitrates levels 7.5 times the MCL and Uranium levels 10 times the MCL. The SDWA is a federal mandate passed by Congress in 1974.

2015 Nitrate Map



2015 Uranium Map



The City of Hastings currently has nitrate levels above 8 mg/l (ppM) in 89.5% of its municipal water supply wells of which 31.6% are above 9 mg/l. The nitrate levels continue to increase. It is predicted that by 2016 the City of Hastings may not be able to meet peak hour demands and will be required to implement water conservation measures.

The nitrate contamination has been found in the regional aquifer extending from the City of Hastings upgradient to the Platte River. The Platte River provides approximately 50% of the groundwater recharge for the Hastings aquifer. The nitrate contamination is due primarily to the use of anhydrous ammonia. This has been confirmed with the use of nitrate and oxygen isotope testing completed by the University of Nebraska – Lincoln (UNL). However, it is well understood that all sources of nitrogen including animal wastes, urban landscape, and septic system contribute to the nitrate problem.

To better assess the source of nitrates, a vadose zone study was completed in 2010 by Dr. Roy Spalding of UNL. (See attached 2011 Vadose Zone Nitrate Study.) The vadose zone sampling found that 500 to 2000 pounds of nitrogen per acre is found in the vadose zone. Due to recharge from over irrigation and rainfall events this nitrogen is moving into the aquifer. Currently another vadose zone study is being completed by UNL to assess the movement and fate of the nitrates. It is planned to conduct an additional vadose zone study every 5 years to monitor the effectiveness of the Hastings Wellhead Nitrogen Management Plan.

To complicate the groundwater contamination issues facing the City of Hastings it has been found that nitrates that pass below the root zone into the vadose zone and then into the aquifer are contributing to the mobilization of uranium. This understanding is being developed by UNL-Dr. Karrie Weber. (See attached Geogenic Aqueous Uranium in an Alluvial Aquifer and the UNL Uranium Study by Dr. Weber.) Nitrates are a nutrient for the naturally occurring soil bacteria. The nitrates allow the bacteria to become more prolific. The uranium is found in the clay sediments found in and overlaying the aquifer. The bacteria through respiration reduce the uranium, allowing it to become mobile.

The City of Hastings has been working with UNL, the Little Blue NRD, the Upper Big Blue NRD, the NDEQ, the DHHS, and UNL- Extension Service to define the problem and develop a solution. A Wellhead Protection Plan was developed with public participation. The Wellhead Protection Committee defined the solution to the nitrate problem as a long term solution to address the nitrate legacy issue and the short term solution to provide potable water for the City of Hastings.

Given that nitrate contamination has already occurred and substantial contamination exists in the vadose zone, it was concluded that nitrates will be an issue for many years to come (nitrate legacy). The long term response that was recommended by the Wellhead Protection Committee

was to implement Best Management Practice to reduce future contamination. The Hastings Wellhead Nitrogen Management Plan has been enacted in cooperation with the City of Hastings, the Little Blue NRD, and the Upper Big Blue NRD. The Hastings Wellhead Nitrogen Management Plan requires Best Management Practice, water conservation, and reporting of nitrogen use by both urban and rural uses.

The short term issue facing the City of Hastings (pop. 25,000) is to secure a sustainable supply of potable water. To secure a source of sustainable potable water the Hastings Aquifer Storage and Restoration (ASR) Project is being developed. This is estimated to cost of $45,911,000 (2013$) as compared to conventional water treatment at an estimated cost of $72,300,000 (2010$)

The Hastings ASR Project consists of 5 components that provide cost savings as compared to conventional treatment. These components are more specifically described as follows:

1. Aquifer Injection: Clean water generated by the extraction well and produced by the water treatment plant will be injected upgradient of the existing municipal water supply wells to provide a supply of potable water. By design, some high nitrate water will enter this injection zone. The amount of low nitrate water will be regulated to insure the water captured by the municipal wells is potable.

2. Dual Pumping: It has been shown through various testing and pilot studies that nitrates tend to float on top of the aquifer. This is consistent with the understanding that water recharge from the Platte River (approximately 50% of total recharge) is typically low in nitrates but the groundwater recharge that occurs between the Platte River and the Hastings Municipal Well Field is the mechanism by which nitrates enter the aquifer. The Dual Pumping component is the installation of two or more pumps in one well casing. The pumps are set at different levels to capture the higher nitrates found at the top of the well as compared to the bottom of the well. This separation reduces the amount of water to be treated. Containment wells will be constructed to reduce the amount of high nitrate water entering the capture zone of the existing municipal water supply wells.

3. Focused Water Treatment: Water treatment will utilize Reverse Osmosis Technology. The goal is to provide a supply of water lower in nitrates and uranium that can be injected back into the aquifer. This water will still retain some of the hardness and alkalinity which will provide a stable water that does not promote the release of metals found in the aquifer geology. Uranium will be removed using absorptive medium, as needed. No wastewater is generated by this process except for periodic cleaning and maintenance. This focused treatment reduces generation of wastewater. Much of the wastewater generated will be sent to irrigation for beneficial use.

4. Irrigation Management: The land lying over the injection zone is used for agricultural production. The existing irrigation wells would utilize the potable water. In an effort to protect the use of the water for potable use, the high nitrate wastewater generated by the containment wells and treatment plant will be used for irrigation in lieu of pumping more groundwater. The treatment system will run continuously, and thus, a water storage facility will be built to store water until it is needed for irrigation. Plans are to expand this irrigation potential to the adjacent city parks. This has benefit of reducing the potable water demand and beneficially using the high nitrate water.

5. Water Storage and Blending: The water distribution system has been constructed to allow water to be collected from several municipal wells and transported to the treatment plant site. This then allows for the blending of waters from the various wells to maintain potable levels of contaminates. Water storage will be provided to meet maximum day demands as needed. This component of the ASR Project is the final phase and will not be installed until needed. The expectation is that the ASR system and water treatment will be sufficient to provide a sustainable potable water supply.

The City of Hastings response to the threat of nitrate and uranium contamination impacting the Hastings Aquifer has been addressed in several engineering studies and investigations completed since 1995. These include the following attached documents:

1. 1996 Water Supply Study
2. 1997 Groundwater Modeling Study
3. Water Treatment Plant Reject Water Disposal Investigation, Issued December 2007
4. Hastings Wellhead Protection Plan, Adopted June 17, 2010
5. Well 33 Spinner Flow Study, 2009
6. Hastings Utilities Water System Master Plan Phase I, Issued December 2010
7. Hastings Utilities Municipal Well 33 Particle Tracking and Localized Groundwater Model, Issued August 9, 2011
8. Hastings Wellhead Protection Area 2010 Water and Soil Sampling Report, completed February 2011
9. 2011 Vadose Zone Nitrate Study
10. Hastings Utilities Water System Master Plan Phase II, Issued February 2012
11. Hastings Utilities Well Based Nitrate and Uranium Management Plan, Issued January 2013
12. BV Review of Groundwater Quality Management Plan, January 7, 2014

1. 1996 Water Supply Study

In 1995 the water system was experiencing loss of water pumping capacity due to volatile organic contamination. This was due to various industrial releases including Trichloroethylene from industrial solvents, Carbon Tetrachloride from storage of grain, and release of these chemicals disposed of in local landfills. A Water Supply Study was commissioned in 1995 (completed in 1996) which developed a plan to address the lost production wells. (See attached 1996 Water Supply Study for details.)

This plan was developed utilizing a technical team represented by the Little Blue NRD, the Upper Big Blue NRD, Adams County, City of Hastings and Hastings Utilities. The study recommended development of new wells in the northwest portions of the city, near the airport. Nitrate contamination was evaluated and recommendations were made to monitor the concentrations. At that time, limited testing was done outside of the City of Hastings. Data from the local NRDs was used to monitor these areas. In the period of 1995 to 2005 nitrate levels in the production wells were increasing. Additional water monitoring was conducted outside the City of Hastings during this time. Areas of nitrates exceeding the Maximum Contaminate Level (MCL) for potable water of 10 mg/l (ppM) were found. (See attached 1996 Water Supply Study for details.)

2. 1997 Groundwater Modeling Study and Wellhead Protection Area Delineation for Hastings Utilities Municipal Well Field, Issued October 1997

In 1997, a groundwater model was developed to ascertain the source of recharge and flow of groundwater. The development of the model used the same technical team as was utilized for the 1996 Water Supply Study. Based upon the modeling, a Wellhead Protection Area was established. The area includes 76 square miles extending to lands northwest of the City of Hastings. With review and coordination with the Nebraska Department of Environmental Quality the City of Hastings in 2005 adopted the Hastings Wellhead Protection Area. (See attached 1997 Groundwater Model Study for more details.)

3. Water Treatment Plant Reject Water Disposal Investigation, Issued December 2007

In 2007, a Water Treatment Plant Reject Water Disposal Investigation was completed to determine how best to dispose of wastewater generated by a water treatment plant. At that time it was obvious that wastewater disposal would be a major issue to resolve if water treatment was required. (See attached Water Treatment Plant Reject Water Disposal Investigation, Issued December 2007 for more details.)

4. Hastings Wellhead Protection Plan, adopted June 17, 2010

In February 2009, the City of Hastings held its first public meeting to discuss the nitrate issues. The meeting focused on the need to unite the urban and rural views so that a workable solution could be developed. At that time, it was determined a Wellhead Protection Committee would be developed to address the nitrate issues.

The Hastings Wellhead Committee met several times in 2009 and 2010. They developed recommendations to address short term and long issues related to the nitrate contamination. The recommendations included additional monitoring of the nitrates, development of best management practice for fertilizer use (both urban and rural) and to move forward with water treatment as needed. (See attached Hastings Wellhead Protection Plan.)

5. Well 33 Spinner Flow Study, Completed in 2009

In 2009 a spinner flow test was completed on Municipal Well 33 which indicated that nitrates were concentrated at the top of the aquifer. From this work, a Dual Pump Project was developed. (See attached Well 33 Spinner Flow Study for more details.)

6. Hastings Utilities Water System Master Plan Phase I, Issued December 2010

In 2010, the Hastings Utilities Water System Master Plan Phase I was prepared to address the development of water treatment. It recommended development of Reverse Osmosis Water Treatment at a cost of $72,300,000 (2010$). Due to the high cost of water treatment, the Board of Public Works directed staff to "think outside the box" and find a cheaper solution. (See attached Hastings Utilities Water System Master Plan Phase I for details.)

7. **Hastings Utilities Municipal Well 33 Particle Tracking and Localized Groundwater Model, Issued August 9, 2011**

In 2011, Well 33 was fitted with a second pump located near the top of the screen. This pump has successfully "skimmed" nitrates away from the production well. It is currently operating and has extended the life of the well. The Hastings Utilities Municipal Well 33 Particle Tracking and Localized Groundwater Model was developed to help better understand the operation of the dual pumps as to the skimming effect. (See Hastings Utilities Municipal Well 33 Particle Tracking and Localized Groundwater Model for details.)

8. Hastings Wellhead Protection Area 2010 Water and Soil Sampling Report, completed February 2011

In 2010/2011, extensive groundwater sampling was conducted to ascertain the extent of the nitrate contamination. The area of sampling included over 200 square miles and over 800 water samples. Nitrates were found to be as high as 75 mg/l (ppm). At that time the uranium contamination problem was found. In some areas, water samples exceeded 300 ug/l (ppb) of uranium. This exceeds the Maximum Contaminate Level for potable water of 30 ug/l (ppb). (See attached; Hastings Wellhead Protection Area 2010 Water and Soil Sampling Report for results of this sampling.)

9. 2011 Vadose Zone Nitrate Study

To better ascertain the movement of nitrates below the root zone, a Vadose Zone Study was completed by the University of NE – Lincoln. This study showed significant concentrations of nitrates below the root zone. It was determined that 500 to 2000 pounds of nitrogen per acre is found below the root zone. (See attached 2011 Vadose Zone Nitrate Study for more details.)

10. Hastings Utilities Water System Master Plan Phase II, Issued February 2012

In 2012 the Hastings Utilities Water System Master Plan Phase II was prepared. This study developed the groundwater model that is currently being used to evaluate aquifer management and movement of the nitrate and uranium contamination. This groundwater model updated the model developed in 1997 and included information from the Nebraska Cooperative Hydrology Study (COHYST). The study recommended a well management approach to address the nitrates. It recommended a Pump, Treat, and Recharge option. This option has evolved into the Hastings Aquifer Storage and Restoration Project. (See attached Hastings Utilities Water System Master Plan Phase II for more details and recommendations.)

11. Hastings Utilities Well Based Nitrate and Uranium Management Plan, Issued January 2013

In 2013, the Hastings Utilities Well Based Nitrate and Uranium Management Plan was prepared. It recommended a five prong approach to addressing the nitrate and uranium contamination. This included, Dual Pumping, Focused Water Treatment, Irrigation Management, Blending and Storage. This plan is known as the Hastings Aquifer Storage and Restoration (ASR) Project. This plan is estimated to cost $45,911,000 (2013$). (See attached Hastings Utilities Well Based Nitrate and Uranium Management Plan for more details.)

12. Black & Veatch Review of Groundwater Quality Management Plan, Issued January 7, 2014

In 2014 the Board of Public Works commissioned the Black and Veatch Peer Review of the Hastings ASR Project. This was done to obtain a “second opinion” on the project since the approach is an innovative and unique concept. The Hastings ASR Project proposes to use technically feasible activities that have been successfully used in Hastings, but not as a planned group to address nitrates and uranium. For example, groundwater containment and injection is successfully being conducted at the Hastings Blaine Avenue Naval Ammunition Depot Groundwater Remediation Project, by the United States Army Corp of Engineers.

The Board of Public Works has adopted the ASR concept and is moving forward with its permitting and design. See attached BV Review of Groundwater Quality Management Plan for complete details of the review.

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

To address and to better define the nitrate and uranium issues facing the City of Hastings several field investigations have been completed. These include but are not limited to the following attached documents:

1. Hastings Wellhead Protection Area 2010 Water and Soil Sampling Report, completed February 2010
2. 2011 Nitrate Map (additional 2012 water sampling)
3. 2012 Uranium Map (additional 2012 water sampling)
4. 2011 Vadose Zone Nitrate Study, Issued August 6, 2011
5. 2015 UNL Vadose Zone Sampling Agreement, Approved March 4, 2015
6. 1998 Pawnee Creek Sampling
7. 2010 Nitrate Isotope Sampling
8. 2011 Nitrate Isotope Sampling
9. Municipal Well Nitrate Graphs and Summaries
10. Well 33 Spinner Flow Test
11. Well 33 Dual Pump Study
12. Well 16 Dual Pump Study

1. Hastings Wellhead Protection Area 2010 Water and Soil Sampling Report, completed February 2010

The issue of nitrate contamination was noted as early as 1995 when a Water Supply Study was commissioned. The 1996 Water Study recommended monitoring of the aquifer and areas upgradient of the municipal water supply wells.

In 2010, a plan was prepared to sample all wells within the 76 square miles of the Hastings Wellhead Protection Area. The sampling plan adopted the Little Blue and Upper Big Blue NRD Quality Assurance / Quality Control Plans (QA/QC). The intent of adopting these QA/QC procedures was to ensure the data could be placed in the Clearinghouse Database. All wells were to be sampled for nitrates. Sampling for inorganics, metals, and pesticides was also conducted. The sampling effort was a cooperative effort between Little Blue NRD, Upper Big Blue NRD, and Hastings Utilities. The sampling included 282 domestic wells, 245 irrigation wells, 30 municipal wells (City of Hastings and Village of Juniata), 15 industrial wells, and 2 stock wells. This was a total of 574 wells sampled and represented 89.5% of all the wells located in the Hastings Wellhead Protection Area. The sampling had an extraordinary high percentage of participation and demonstrates the cooperative efforts by the rural community to address the problems facing the Hastings municipal water system. (See attached Hastings Wellhead Protection Area Water and Soil Sampling Report for details.)

2. 2011/2012 Nitrate and Uranium Concentration Maps

The data generated by the 2010 sampling indicated that areas upgradient of the Hastings Municipal water supply wells have significant levels of nitrates. In 2011 and 2012, additional sampling was completed to expand the area of study to include more than 200 square miles including the area between the City of Hastings and the Platte River. That effort included another 300 water samples. Some duplication of previous sample sites was conducted to help verify the data being collected. With over 800 wells sampled it was clear there are significant areas of nitrate contamination upgradient of the Hastings municipal water supply wells. See attached 2011 Nitrate Map and 2012 Uranium Maps that were generated to illustrate the extent of contamination.

3. 2011 Vadose Zone Nitrate Study, Issued August 6, 2011

To better define the potential for future contamination of the aquifer a vadose zone sampling study was commissioned in 2010 and completed in 2011. The University of Nebraska - Lincoln (Dr. Roy Spalding) was commissioned to complete this study. The 2011 Vadose Zone Nitrate Study provided results of 20 sampling sites consisting of dry-land farms, gravity irrigated farms, pivot irrigation, livestock facilities, urban residential, and urban parks. The results indicated that 500 to 2000 pounds of nitrogen per acre existing in the vadose zone. This study along with the extent of groundwater contamination indicated that a significant legacy of nitrates exist in the groundwater and vadose zone. (See attached 2011 Vadose Zone Nitrate Study for details.)

4. 2015 UNL Vadose Zone Sampling Agreement, Approved March 4, 2015

Based upon the legacy of nitrates, the Little Blue NRD, Upper Big Blue NRD, Hastings Water Quality Committee (Task force representing the Wellhead Protection Committee), Hastings Utilities, and City of Hastings, developed the Hastings Wellhead Nitrogen Management Plan. Within the plan it called for additional vadose zone sampling (5-year frequency), limited annual groundwater sampling (40 per year), and the entire water sampling of all wells within the Wellhead Protection Area on a 5-year frequency. Currently the entire Wellhead Protection Area is being resampled. This work will be completed in 2016. In 2015 more than 250 water samples were collected.

The vadose zone sampling is being conducted by the University of Nebraska – Lincoln by Dr. Dan Snow. Field work has begun. The study will be completed after the second round of fall sampling in 2016. (See attached 2015 UNL Vadose Zone Sampling Agreement for details.)

5. Nitrate Isotope Sampling and Storm Water Runoff sampling

To help determine the source of the nitrates, nitrogen and oxygen radioactive isotope tests have been collected. This includes groundwater and surface water sampling. This data indicates that anhydrous ammonia is the predominate source of the nitrate contamination. (See attached 1998 Pawnee Creek Sampling, 2010 Nitrate Isotope Sampling, and 2011 Nitrate Isotope Sampling.)

6. Municipal Well Nitrate Graphs and Summaries

To help forecast the viability of the municipal wells as related to nitrate contamination individual nitrate concentration graphs have been prepared. These graphs are used to monitor nitrate concentrations. Additional water sampling is conducted to ascertain changes due to operations, weather and annual use. Various summaries have been developed to help educate the public and various agencies on the extent of the nitrate contamination. They have indicated that by 2016 Hastings may need to limit water uses. As noted in the 2015 Municipal Well Nitrate Summary 89.5 % of the wells exceed 8 mg/l (ppm) of which 31.6% are above 9 mg/l (ppm). In 2015, Well 1 has been shut down due to nitrates and joins a growing list of wells that have had to be shut down. (See attached Municipal Well Nitrate Graphs and Summaries for more information.)

7. Well 33 Spinner Flow Test

Well 33 was the first attempt to better define the extent of the contamination within the saturated zone. A Spinner Flow Test was commissioned in 2010. Well 33 is a large well with a capacity of 2500 gpm. The study placed the pump suction at the top of the screen. The velocity along the entire length of the screen was measured. This effort was repeated with the pump suction placed at the bottom of the screen. The data showed that much of the water entering the well screen was coming from the upper portions of the screen and this water had significantly higher levels of nitrates. (See attached Well 33 Spinner Flow Test for more information.)

8. Well 33 Dual Pump Study

Following the Well 33 Spinner Flow Test, a Dual Pump Study was set up. Within the existing casing and screen of Well 33, a small pump was installed along-side the existing 12 inch pump. The 12 inch pump suction is placed near the bottom of the screen. The smaller pump has a capacity of 60 gpm and is placed at the top of the screen. Nitrate results are recorded in the Well 33 Dual Pump Study, see attached. The results indicate that high nitrates can be successfully removed (skimmed) from the top of the screen. This pilot testing has remained operational and has extended the life of Well 33.

9. Well 16 Dual Pump Study

To further evaluate the Dual Pump concept it was decided to evaluate the impact of increasing the amount of water pumped from the top of the screen in lieu of the 60 gpm pump used in Well 33. Well 16 was chosen, as it provided a larger diameter casing and had nitrate levels that would allow mixing of the top and bottom water that would allow the water to be injected into the water distribution system. Two 450 gpm submersible pumps were installed in 2012. The upper and lower water has successfully been separated. The top water has had nitrates in the 10 to 11 mg/l (ppm) range whereas the bottom water has been in the 5.5 to 6.5 range. The pilot testing has remained operational. (See Well 16 Dual Pump Study for more details.)

Future Tri-Plex Pump Study
The data collected by the Well 33 and Well 16 Dual Pump Studies indicate that water with higher nitrate levels can be separated (skimmed) from within the well thus reducing the amount of water to be treated. This has the potential to substantially reduce capital construction costs and ultimately operating costs. It also has the potential to conserve water withdraws.

To further develop the dual pump concept, a Tri-plex Pump System has been successfully installed in Well 27. The Tri-plex pump has 3 each 400 gpm submersible pumps installed in a single 18 inch diameter casing and screen. Testing of the pumps has been successfully completed. Currently the pilot testing for this well is pending the construction of the Water Storage Facility so that uranium exceeding the Maximum Contaminate Level of 30 ug/l (ppb) can be properly managed.

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

Maps
Significant mapping has been completed to show the extent of the nitrate and uranium contamination facing the City of Hastings. These maps are typically included in the various feasibility and engineering studies. The following are several of the key maps that have been prepared and are attached:

1. Hastings Wellhead Protection Area Map
2. Hastings Wellhead Protection 20-year Travel Time Map
3. Hastings Nitrate Action Plan Map
4. 2011 Nitrate Map
5. 2011 Nitrate Uranium Iron Composite Map
6. 2015 Nitrate Map
7. 2015 Nitrate Level Change
8. 2012 Uranium Map
9. 2015 Uranium Map
10. 2015 Uranium Level Change

Drawings
The noted drawings (as attached) represent the construction and planning drawings that have been prepared for the Hastings project.

1. Hastings Utilities Aquifer Storage and Restoration at North Baltimore Site, September 2014

2. Uranium and Nitrate Removal Water Treatment Plant, August 2013
3. Irrigation Water Storage Facility
4. ASR Water Main Project
5. ASR Waste Water Main
6. ASR Irrigation Water Main
7. Well 27 Triplex Pump Pilot Study
8. ASR 5 Injection Well and Monitoring Well Plans

Charts

See applicable tables for graphs and charts associated with data.

Tables

Several tables have been prepared to support the various feasibility studies. These tables are typically included in the various feasibility and engineering studies. The following are several of the key tables that have been prepared and are attached.

1. 1998 Pawnee Creek Sampling
2. 2008 Nitrate Isotope Testing
3. 2010 Nitrate Isotope Testing
4. 2011 Nitrate Isotope Testing
5. Final _Intake 197_Well 33
6. Final _Intake 237_Well 33
7. Hastings Utilities Well Nitrate Graph and Summaries
8. Well 16 Dual Pump Study
9. Well 33 Dual Pump Study
10. ASR Budget Summary

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

Water Rights

The Hastings Aquifer Storage and Restoration (ASR) Project does not require any specific water rights other than that associated with the construction of replacement wells and the required permitting by the NRD and DNR.

Land Rights

All land rights have been secured (purchased) for all major facilities. Easements have also been secured for all pipeline activities that lie within private property. Railroad and street crossing permits are pending final approval.

The following summarizes the City of Hastings major properties which will be used for the Hastings ASR Project:

1. North Baltimore Water Treatment Plant Site, part of the north half of the Northeast Quarter, Section 2, Township 7 North, Range 10 West, Adams County
2. ASR Water Storage Facility part of the Northeast Quarter, Section 2, Township 7 North, Range 10 West, Adams County
3. Phase III Injection Well Sites will be located on existing City of Hastings Airport Property located in part of Section 3, Township 7 North, Range 10 West, Adams County
4. Phase III Injection Well Sites are also included in the Well Field Addition 1 and 2 located in the Southwest Quarter of Section 3, Township 7 North, Range 10 West, Adams County

Water Supply

Water Supply capacity was addressed in the 1996 Water Supply Study, see attached. The study evaluated the impact of growth by the City of Hastings and the development of center pivot irrigation. It was assumed the remaining dry land farms would be put into center pivot irrigation. The assumption was also a doubling of Hastings municipal water use. When existing gravity irrigation was converted to center pivot irrigation the impact to the local aquifer was sufficient to offset any increase in municipal use or conversion of additional dry land to irrigation.

Water Quality

Various studies and field surveys have been completed to ascertain the local groundwater quality. That data can be found in the following reports and studies which are attached:

1. Hastings Wellhead Protection Area Water and Soil Sampling Report, Issued February 2011
2. 2011 Nitrate Map
3. 2012 Uranium Map
4. Nitrate Isotope Sampling and Storm Water Runoff sampling
5. Municipal Well Nitrate Graphs and Summaries

1. Hastings Wellhead Protection Area Water and Soil Sampling Report, Issued February 2011

The issue of nitrate contamination was noted as early as 1995 when a Water Supply Study was commissioned. The 1996 Water Study recommended monitoring of the aquifer and areas upgradient of the municipal water supply wells.

In 2010 a plan was prepared to sample all wells within the 76 square miles of the Hastings Wellhead Protection Area. The wells were to be sampled for nitrates. Sampling for inorganics, metals, and pesticides was also conducted. The sampling effort was a cooperative effort between Little Blue NRD, Upper Big Blue NRD, and Hastings Utilities. The sampling include 282 domestic wells, 245 irrigation wells, 30 municipal wells (City of Hastings and Village of Juniata), 15 industrial wells, and 2 stock wells. This was a total of 574 wells sampled and represented 89.5% of all the wells located in the Hastings Wellhead Protection Area. (See attached Hastings Wellhead Protection Water Sampling Report for details.)

2. 2011 Nitrate and 2012 Uranium Concentration Maps

The data generated by the 2010 sampling indicated that areas upgradient of the Hastings Municipal water supply wells have significant levels of nitrates. In 2011 and 2012, additional sampling was completed to expand the area of study to include more than 200 square miles including the area between the City of Hastings and the Platte River. This sampling included another 300 water samples. Some duplication of previous sample sites was conducted to help verify the data being collected. With over 800 wells sampled it was clear there are significant areas of nitrate contamination upgradient of the Hastings municipal water supply wells. (See attached a copy of the 2011 Nitrate Map and 2012 Uranium Map that were generated to illustrate the extent of contamination.)

3. Nitrate Isotope Sampling and Storm Water Runoff sampling

To help determine the source of the nitrates, nitrogen and oxygen radioactive isotope tests have been collected. This includes groundwater and surface water sampling. This data indicates that anhydrous ammonia is the predominate source of the nitrate contamination. See attached files titled 1998 Pawnee Creek Sampling, 2008 Nitrate Isotope Testing, 2010 Nitrate Isotope Sampling, and 2011 Nitrate Isotope Sampling.

4. Municipal Well Nitrate Graphs and Summaries

To help forecast the viability of the municipal wells as related to nitrate contamination, individual nitrate concentration graphs have been prepared. Various summaries have been developed to help educate the public and various agencies on the extent of the nitrate contamination. They have indicated that by 2016 Hastings may need to limit water uses. As noted in the 2015 Municipal Well Nitrate Summary 89.5 % of the wells exceed 8 mg/l (ppm) of which 31.6% are above 9 mg/l (ppm). In 2015 Well 1 has been shut down due to nitrates and joins a growing list of wells that have had to be shut down. See attached Municipal Well Nitrate Graphs and Summaries for more information.

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

The Hastings Aquifer Storage Restoration Project has five major components to the plan. This includes the following:

1. Aquifer Storage and Restoration (Groundwater Injection)
2. Dual Pumping – Skimming of high nitrate water from within a production well.
3. Focused Water Treatment – Remove nitrates and uranium yet return water to the aquifer which is stable (sufficient amounts of hardness and alkalinity)
4. Irrigation Management
5. Potable Water Storage and Blending

1. Aquifer Injection: Clean water generated by the extraction well and produced by the water treatment plant will be injected upgradient of the existing municipal water supply wells to provide a supply of potable water. By design, some high nitrate water will enter this injection zone. The amount of low nitrate water will be regulated to insure the water captured by the municipal wells is potable.

2. Dual Pumping: It has been shown through various testing and pilot studies that nitrates tend to float on top of the aquifer. This is consistent with the understanding that water recharge from the Platte River (approximately 50% of total recharge) is typically low in nitrates but the groundwater recharge that occurs between the Platte River and the Hastings Municipal Well Field is the mechanism by which nitrates enter the aquifer. The Dual Pumping component is the installation of two or more pumps in one well casing. The pumps are set at different levels to capture the higher nitrates found at the top of the well as compared to the bottom of the well. This separation reduces the amount of water to be treated. Containment wells will be constructed to reduce the amount of high nitrate water entering the capture zone of the existing wells municipal water supply wells.

3. Focused Water Treatment: Water treatment will utilize Reverse Osmosis Technology. The goal is to provide a supply of water lower in nitrates and uranium that can be injected back into the aquifer. This water will still retain some of the hardness and alkalinity which will provide stable water that does not promote the release of metals found in the aquifer geology. Uranium will be removed using absorptive medium as needed. No wastewater is generated by this process except for periodic cleaning and maintenance. This focused treatment reduces generation of wastewater. Much of the wastewater generated will be sent to irrigation for beneficial use.

4. Irrigation Management: The land lying over the injection zone is used for agricultural production. The existing irrigation wells would utilize the potable water. In an effort to protect the use of the water for potable use, the high nitrate wastewater generated by the containment wells and treatment plant will be used for irrigation, in lieu of pumping more groundwater. The

treatment system will run continuously, and thus, a water storage facility will be built to store water until it is needed for irrigation. Plans are to expand this irrigation potential to the adjacent city parks. This has benefit of reducing the potable water demand and beneficially using the high nitrate water.

5. Water Storage and Blending: The water distribution system has been constructed to allow water to be collected from several municipal wells and transported to the treatment plant site. This then allows for the blending of waters from the various wells to maintain potable levels of contaminates. Water storage will be provided to meet maximum day demands, as needed. This component of the ASR Project is the final phase and will not be installed until needed. The expectation is that the ASR system and water treatment will be sufficient to provide a sustainable potable water supply.

Required geologic investigation (004.01 E 1);

Construction Site

Geologic information has been collected and analyzed with regards to the construction of the water treatment facilities. This includes the GSI report titled Geotechnical Exploration High Nitrate Storage and Pump Station. (See attached.)

Injection Test Wells

The injection well design calls for monitoring and injection wells to be installed prior to initial design of ASR5 Injection Well. This well will have a pump test and injection test completed prior to the design and construction of ASR1 through ASR4. (Please find attached Monitoring Network and ASR Pilot Well Test Drilling Plan attached for more information.)

The Phase I drilling included construction of ASR5 Monitoring Wells and the ASR5 Injection Well. ASR monitoring well MW5A and MW5B were drilled using sonic drilling. See ASR MW5A and MW5B Sonic Drilling Report for more information. Sonic drilling was completed to better understand the local geology. In addition, sonic drilling allowed for the collection of undisturbed soil samples. These samples and the geological information was provided to the University of Nebraska – Lincoln (Dr. Karrie Weber) to support the uranium research as it relates to nitrate contamination of the vadose zone and aquifer.

The geological data for the remaining ASR5 monitoring wells (C,D,E) and the construction of the injection well ASR5 is found attached as the file labeled ASR5 Injection Well and Monitoring Well Plans.

Phase II injection well sites have had test wells drilled. This consists of ASR Injection Wells 1 through 4. This information is found in the ASR Phase 1 – 4 Test Well Report. (See attached.)

Phase III injection test wells located on the Hastings Airport property and Well Field Addition 1 and 2 will be completed when this project phase is authorized.

Agricultural Land Application

Chemical testing of vadose zone for the lands to receive high nitrate water for irrigation has been completed. This high nitrate water will be derived from the water storage facility. This information can be found attached at HNSL Water Reuse Sampling Summary.

Required hydrologic data (004.01 E 2);

Hydrologic model has been a keystone for the development of the Hastings Aquifer Storage and Restoration Project. This includes the following and are attached:

1. 1997 Groundwater Modeling Study (Groundwater Modeling Study and Well Head Protection Area Delineation for Hastings Utilities Municipal Well Field prepared by Layne GeoSciences, 1997)
2. Hastings Utilities Municipal Well 33 Particle Tracking and Localized Groundwater Model prepared by HDR Engineering, 2011
3. Hastings Utilities Water System Master Plan Phase II (Groundwater Modeling Study) prepared by HDR Engineering, 2012

1. Groundwater Modeling Study and Well Head Protection Area Delineation for Hastings Utilities Municipal Well Field

The attached 1997 Groundwater Modeling Study was developed to identify the source of groundwater for the Hastings Municipal Wells. The study provided a map indicating the 20-year travel time. It also provided a good description of the water recharge for the aquifer.

An analysis was completed to ascertain the sustainability of the current water use. This model was developed in concert with a technical review team consisting of representatives from the Little Blue NRD, Upper Big Blue NRD, Adams County, City of Hastings, and Hastings Utilities.

This model was developed referencing various groundwater studies completed in and around the City of Hastings. These studies included extensive groundwater investigations completed in association with the various superfund studies. In addition the Boyle Engineering Study was referenced as it reflected a regional study closely matching the study area.

2. Hastings Utilities Municipal Well 33 Particle Tracking and Localized Groundwater Model

The attached Hastings Utilities Municipal Well 33 Particle Tracking and Localized Groundwater Model is a localized model to better understand the flow of water into Municipal Well 33. This model confirmed that groundwater flows into the well screen in a laminar condition. Whereas the upper portions of the aquifer enters the top of the screen and the bottom of the aquifer enters the bottom of the screen. Though this condition would appear to be an obvious condition some concern was held with regard to short circuiting and poor well development and connectivity with the aquifer.

3. Hastings Utilities Water System Master Plan Phase II (Groundwater Modeling Study)

The Hastings Utilities Water System Master Plan Phase II (Groundwater Modeling Study) built upon the 1997 Groundwater Modeling Study and incorporated applicable data from the Groundwater Flow Model of the Eastern Model Unit of the Nebraska Cooperative Hydrology Study (COHYST) Area. This modeling was used to evaluate the potential benefits to develop the concept of Aquifer Storage and Restoration (ASR). This model is currently being used to evaluate the design and placement of the ASR Injection Wells. A copy of the 1997 Groundwater Modeling Study is attached. As additional data is developed the model will be updated as deemed appropriate.

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

Water Storage Facility

The design manual titled "JEO Design Technical Memorandum", (see attached), provides the design basis for the water storage facility and pump stations. It also provides design conditions for the water reuse associated with irrigation of the adjacent agricultural lands and city parks.

Injection Well Design

The design of the injection wells have been completed using the design standard as outlined in the submittal to NDEQ for an injection well permit. This information can be found in the attached report titled Monitoring Network and ASR Pilot Well Test Drilling Plan.

Based upon the geological information collected from the installation of Monitoring Well 5A and Monitoring Well 5B, a design injection rate of 450 gpm for the screen sizing and placement was used. The size and placement of the screen was supported by the design standard outlined in the "Groundwater and Wells, Second Edition as published by Johnson Filtration Systems Inc."

Reverse Osmosis Unit

The Reverse Osmosis Treatment Unit is being designed. The Reverse Osmosis layout and piping schematic can be found in the attached document titled North Baltimore Reverse Osmosis PI&D.

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

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.

Hastings Utilities has commissioned several feasibility studies to determine the most cost effective and reliable means to secure an adequate and sustainable supply of potable water for the City of Hastings and its wholesale customers. The Hastings Utilities Water System Master Plan Phase I (February 2010) estimated the cost of installing water treatment to be $72,300,000 (2010$). This was based upon the use of Reverse Osmosis (RO) water treatment. The cost to use RO is higher than the use of Ion Exchange estimated at $56,600,000 (2010$). However, Ion Exchange has limitations on the treatability of future contaminates. Ion Exchange wastewater is more difficult to properly dispose of. Please note the Aquifer Storage and Restoration project as proposed is estimated to cost $45,911,000 (2013$).

The use of conventional water treatment has many benefits as it is a proven and reliable technology. However, the development of conventional water treatment at a centralized location means the water system is less reliable as compared to the existing Hastings Municipal Water System. The current layout of the water system is basically 25 or more wells located throughout the city. This is known locally as “neighborhood wells”. The configuration of having the wells located across the city (i.e. water system) reduces vulnerability due to mechanical and power failure, as the loss of any one well can be backed up by other wells in the system. In the event that groundwater contamination would affect a well, the well can be shut down and then replaced

by operating a well in another part of the city until the capacity is replaced. This allows time to budget and construct replacement wells in lieu of it being an emergency.

The distribution system has developed over the last 100 plus years using these "neighborhood wells" which means the water system mains have **not** been developed to move large amounts of water across the entire system. Water is supplied by the wells near the demand, i.e. "neighborhood wells". The use of conventional water treatment would need to consider the costs to improve the water distribution system to meet fire flow and pressure demands. These costs are not included in the $72,300,000 (2013$) cost estimate.

The use of conventional water treatment does not protect the existing infrastructure (water supply wells) as it does not stop the encroachment of the nitrate and uranium contamination into the local supply aquifer. Conventional water treatment only treats the problem whereas the ASR Project coupled with the Hastings Wellhead Nitrogen Management Plan provides for long term control of nitrates and uranium which is expected to significantly reduce future treatment costs and future replacement of capital improvements (water treatment facilities).

Hastings Utilities also considered the use of Point of Use (POU) devices. POU devices would be installed at each location where potable water is used within the Hastings Water System. This option has significant compliance and enforcement issues. The Nebraska Department of Health and Human Services Standard Operating Procedure (PWS-029, see attached) governs the use installation and use of these devices. The key criteria for the authorized use of POU devices are summarized as follows:

1. Owned, controlled, and maintained by public water system utility (PWS)
2. Achieve 100% participation for each service connection
3. Monitor at least annually and sample for target contaminants
4. Responsible for all equipment maintenance per approved maintenance plan
5. Provide bottled water if inoperable
6. Extensive public notification
7. Extensive record keeping and reporting requirements

The POU device must be placed on all potable use locations including water used for food processing and manufacturing as they require potable water. Additionally it is required to install POU devices for the hospital, medical clinics, schools, restaurants, motels, and other public locations. These locations provide a significant challenge to the successful implementation. The estimated capital cost is $18,350,000 (2013$). The capital cost is much lower than conventional water treatment however the operating and maintenance costs were high. The present worth value for this option was estimated at $66,229,000 to $71,837,000 (2013$). Additionally the Nebraska Department of Health and Human Services does not support the use of POU devices for a community the size of Hastings. Additional costs would be incurred to implement POU

for wholesale customers including the Village of Trumbull and Clay County Sanitary Sewer Improvement District No. 1.

The use of conventional water treatment and POU plans were deemed too costly and unacceptable to Hastings Utilities. The Board of Public Works then authorized Hastings Utilities staff and HDR Engineering to "Think outside the box" and develop another solution.

The Aquifer Storage and Restoration Project as noted in the attached Hastings Utilities Well Based Nitrate and Uranium Management Plan was developed to address the issue of cost, loss of infrastructure, implementation phasing (development of improvements only as needed), and flexibility in wastewater disposal as it relates to uranium and nitrates. The proposed cost for this plan is estimated at $45,911,000 (2013$).

Hastings Utilities commissioned a peer review of this proposal as it proposes several innovative concepts to be utilized. Hastings Utilities commissioned Black and Veatch to provide this peer review (B&V Peer Review Study). A copy of this study is attached and titled BV Review of Groundwater Quality Management Plan. The results of this peer review summarized the risks verses benefits of the Aquifer Storage and Restoration (ASR) Project. Because of the nearly $30,000,000 cost savings as compared to conventional water treatment, the Hastings Utilities Board of Public Works believes the risks are minimal and are best managed by conducting the appropriate pilot studies. The ASR project is being developed in a meticulous and thoughtful manner to capture as much data as possible to ensure an adequate design. The design provides various "pressure relief values" in its development. For example, if the amount of water that can be skimmed by the Dual and Tri-plex Pumps is insufficient to meet the ASR Injection demands, then more water treatment will be provided. These "pressure relief valves" allow the system to evolve as data is developed and to only spend monies for capital improvements until they are needed.

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 Hastings Aquifer Storage and Restoration (ASR) Project 2013 cost estimate is as follows:

Phase	Description	Base Estimated Construction Cost
Pilot	ASR and Dual Pumping System Pilots	$ 2,132,000
I	North Baltimore ASR System	$ 20,636,000
II	Westbrook ASR System	$ 16,415,000
III	Storage and Blending at North Baltimore Site	$ 6,728,000
	Total Estimated Construction Cost	**$ 45,911,000**

The estimation for the costs is documented in the attached study titled Hastings Utilities Well Based Nitrate and Uranium Management Plan, see page 28. These costs include all engineering and legal, permitting, fees, and appropriate contingencies.

The project is being designed and built in phases. This phased approach is planned to allow for the necessary pilot testing to be completed. The results of the pilot testing will be used to direct the design and construction. Currently ASR Injection Well 5 pilot testing is being set up. The results of this test will guide the design of the remaining ASR Injection Wells 1 thru 4.

Pilot testing of Well 27 tri-plex pump system is anticipated to be conducted in the fall of 2016 once the water storage facility can receive water. The results of this pilot test will be used to guide the design of the dual pump system for Well 26 and Well 30. A uranium pilot test will begin in early spring of 2017 once the pilot testing for the Well 27 tri-plex pump system is completed. The results of this pilot test will be used to guide the design of the uranium treatment system.

The first phase of major construction is to construct the ASR injection wells, site piping, Reverse Osmosis Treatment System, Water Storage Facility, and Irrigation Pump System. This work is expected to be completed in 2017. Construction of a uranium treatment system would begin in 2018 if required. The following is a summary of the 2016 to 2022 construction budget:

Item	Plant Addition	2016	2017	2018	2019	2020	2021	2022	TOTAL
	CAPITAL COSTS								
1	Well 27 Tri-Plex Pump Pilot Study Complete with Uranium Treatment Study	$ 50,000	$ 25,000						$ 75,000
2	Vadose Zone Study	$ 50,000	$ 50,000						$ 100,000
3	ASR5 Pilot Study Completed. Phase 2 ASR Injection Well (4 injection wells) and Monitoring Well System Phase 2 (2 each)	$ 450,000	$ 400,000						$ 850,000
4	North Baltimore Avenue Water Storage Facility including distribution mains and sewers, irrigation pump station and north cell.	$ 3,500,000	$ 3,000,000						$ 6,500,000
5	North Baltimore Avenue Reverse Osmosis Treatment - Equipment	$ 2,401,250							$ 2,401,250
	North Baltimore Avenue Reverse Osmosis Treatment - Building	$ 3,465,000	$ 1,155,000						$ 4,620,000
6	Future UV at Baltimore WTP - Equipment, piping, electrical					$ 455,000			$ 455,000
7	New Well 36 (12th and N. Baltimore)	$ 300,000	$ 350,000						$ 650,000
8	Repair and complete grout study Well 11 (3rd and N. Baltimore)	$ 220,000							$ 220,000
9	Repair and complete grout study Well 5 (14th and N. St. Joesph)	$ 250,000							$ 250,000
9	Well 26 Tri-plex Pump System		$ 50,000	$ 250,000					$ 300,000
10	Well 30 Complete with Tri-plex Pump System		$ 200,000	$ 500,000					$ 700,000
11	Well 37		$ 30,000	$ 400,000	$ 300,000				$ 730,000
12	North Baltimore Avenue Uranium Treatment - Equipment and Building		$ 250,000	$ 4,000,000	$ 2,500,000				$ 6,750,000
13	Rehab and Upgrade Well 5 (14th and N. St. Joesph)			$ 100,000	$ 1,000,000	$ 500,000			$ 1,600,000
14	Well 34 and 35 Water Collection System			$ 300,000	$ 1,000,000	$ 500,000			$ 1,800,000
15	Well 34 and 35 Dual Pump System			$ 100,000	$ 400,000	$ 200,000			$ 700,000
16	Well 33 Dual Pump and Disposal System			$ 250,000	$ 1,300,000	$ 250,000			$ 1,800,000
17	Westbrook Treatment			$ 850,000	$ 5,030,000	$ 1,200,000			$ 7,080,000
18	Westbrook Storage and Irrigation			$ 600,000	$ 4,890,000				$ 5,490,000
19	ASR injection wells west of Marian Road (Phase 3)			$ 630,000	$ 2,190,000	$ 2,400,000			$ 5,220,000
20	Potable Water Storage and Pump System.					$ 550,000	$ 4,000,000	$ 2,500,000	$ 7,050,000
21	(Contingency) Land purchase for water line installation	$ 50,000							$ 50,000
22									
	Total	**$ 10,736,250**	**$ 5,510,000**	**$ 7,980,000**	**$ 18,610,000**	**$ 6,055,000**	**$ 4,000,000**	**$ 2,500,000**	**$ 55,391,250**

The 2016 – 2022 has a total of $55,391,250 (2015$) which includes capital improvements related to the ASR Project and other necessary water system improvements needed to support the portion of the municipal water system. For example Well 36 and Well 37 are needed to replace the lost capacity of Well 26 and 27 as they will be used as containment wells.

Operating and Maintenance Costs

The annual operating and maintenance (O&M) costs are summarized in the following table:

Item	Description	Annual Cost	Operational Date	Cost w/ Inflation	2016	2017	2018	2019	2020	2021	2022	Total
	O&M COSTS - NORTH BALTIMORE 4 MGD PRODUCTION											
1	Uranium Treatment	$ 445,000	2019	$500,800				$ 500,800	$ 515,824	$ 531,299	$ 547,238	$ 2,095,160
2	RO Labor (Including Fringes)	$ 70,000	2017	$74,263		$ 74,263	$ 76,491	$ 78,786	$ 81,149	$ 83,584	$ 86,091	$ 480,364
3	RO System Power	$ 110,000	2017	$116,699		$ 116,699	$ 120,200	$ 123,806	$ 127,520	$ 131,346	$ 135,286	$ 754,857
4	RO System Chemicals	$ 115,000	2017	$122,004		$ 122,004	$ 125,664	$ 129,434	$ 133,317	$ 137,316	$ 141,435	$ 789,169
5	RO System Maintenance and Replacement	$ 74,000	2017	$78,507		$ 78,507	$ 80,862	$ 83,288	$ 85,786	$ 88,360	$ 91,011	$ 507,813
6	Maintenance	$ 25,000	2017	$26,523		$ 26,523	$ 27,318	$ 28,138	$ 28,982	$ 29,851	$ 30,747	$ 171,558
	Total without Uranium treatment	**$ 394,000**	**2017**	**$418,000**		**$ 418,000**	**$ 430,540**	**$ 443,456**	**$ 456,760**	**$ 470,463**	**$ 484,577**	**$ 2,703,795**
	Total with Uranium Treatment	**$ 839,000**	**2019**	**$944,300**	**$ -**	**$ 418,000**	**$ 430,500**	**$ 944,250**	**$ 972,578**	**$ 1,001,755**	**$ 1,031,808**	**$ 4,798,892**

Item	Description	Annual Cost	Operational Date	Cost with Inflation	2016	2017	2018	2019	2020	2021	2022	Total
	O&M COSTS - WESTBROOK 4 MGD PRODUCTION											
1	Labor (Including Fringes)	$ 50,000	2020	$ 57,964					$ 57,964	$ 59,703	$ 61,494	$ 179,160
2	System Power	$ 112,100	2020	$129,955					$ 129,955	$ 133,853	$ 137,869	$ 401,677
3	RO System Chemicals	$ 115,000	2020	$133,317					$ 133,317	$ 137,316	$ 141,435	$ 412,068
4	RO System Maintenance and Replacement	$ 74,000	2020	$ 85,786					$ 85,786	$ 88,360	$ 91,011	$ 265,157
6	Maintenance	$ 25,000	2020	$ 28,982					$ 28,982	$ 29,851	$ 30,747	$ 89,580
		$ -										
	Total	**$ 376,100**	**2020**	**$436,003**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 436,003**	**$ 449,083**	**$ 462,556**	**$ 1,347,642**

Item	Description	Annual Cost	Operational Date	Cost with Inflation	2016	2017	2018	2019	2020	2021	2022	Total
	&M COSTS - EXISTING WELLS & INJECTION WELL											
1	Labor (Including Fringes)											
2	System Power	$ 61,000	2016	$ 62,830	$ 62,830	$ 64,715	$ 66,656	$ 68,656	$ 70,716	$ 72,837	$ 75,022	$ 481,432
3	Maintenance	$ 15,500	2016	$ 15,965	$ 15,965	$ 16,444	$ 16,937	$ 17,445	$ 17,969	$ 18,508	$ 19,063	$ 122,331
		$ -										
	Total	**$ 76,500**	**2016**		**$ 78,795**	**$ 81,159**	**$ 83,594**	**$ 86,101**	**$ 88,684**	**$ 91,345**	**$ 94,085**	**$ 603,764**

Item	Description	Annual Cost	Operational Date	Cost with Inflation	2016	2017	2018	2019	2020	2021	2022	Total
	O&M COSTS - IRRIGATION WELLS											
1	Labor (Including Fringes)	$ 35,000	2018	$ 38,245			$ 38,245	$ 39,393	$ 40,575	$ 41,792	$ 43,046	$ 44,337
2	System Power	$ 3,750	2018	$ 4,098			$ 4,098	$ 4,221	$ 4,347	$ 4,478	$ 4,612	$ 4,750
3	Maintenance	$ 5,000	2018	$ 5,464			$ 5,464	$ 5,628	$ 5,796	$ 5,970	$ 6,149	$ 6,334
		$ -										
	Total	**$ 43,750**	**2018**	**$ 47,807**	**$ -**	**$ -**	**$ 47,807**	**$ 49,241**	**$ 50,718**	**$ 52,240**	**$ 53,807**	**$ 55,421**

Item	Description		Midpoint of Construction		2016	2017	2018	2019	2020	2021	2022	2022
	ANNUAL TOTALS - Capital	**$21,522,700**			**$1,703,800**	**$ 1,237,200**	**$2,402,200**	**$3,608,100**	**$4,085,800**	**$4,243,200**	**$4,242,400**	**$21,522,700**
	ANNUAL TOTALS - O&M	**$ 1,335,400**			**$ 78,800**	**$ 499,200**	**$ 561,900**	**$1,079,600**	**$1,548,000**	**$1,594,400**	**$1,642,300**	**$ 7,004,200**
	ANNUAL TOTALS - Capital + O&M	**$22,858,100**			**$1,782,600**	**$ 1,736,400**	**$2,964,100**	**$4,687,700**	**$5,633,800**	**$5,837,600**	**$5,884,700**	**$28,526,900**

Once all the construction is completed, the O&M costs are expected to be $1,335,400 per year. The estimated costs for O&M includes labor, power, replacement parts, maintenance, cleaning, chemical use, inspections, and testing. For more details, see attached file titled ASR Budget Summary.

Construction Schedule

Construction of the project has begun with the construction of ASR injection Well 5, Well 27 Tri-plex pump system, and ASR sanitary flow meter. Design is nearing completion on the ASR Water Storage Facility and site piping. The design of the Reverse Osmosis Treatment unit has begun. The purchase of the treatment units are expected in early 2016. Final flood plain permit and conditional use permits are expected to be completed in early 2016 at which time bids will

be requested for the ASR Water Storage Facility and site piping. The following table provides a timeline for the different construction projects:

Item	Plant Addition	2016				2017				2018				2019				2020				2021				2022			
	CAPITAL COSTS																												
1	Well 27 Tri-Plex Pump Pilot Study Complete with Uranium Treatment Study																												
2	Vadose Zone Study																												
3	ASR5 Pilot Study Completed. Phase 2 ASR Injection Well (4 injection wells) and Monitoring Well System Phase 2 (2 each)																												
4	North Baltimore Avenue Water Storage Facility including distribution mains and sewers, irrigation pump station and north cell.																												
5	North Baltimore Avenue Reverse Osmosis Treatment - Equipment																												
	North Baltimore Avenue Reverse Osmosis Treatment - Building																												
6	Future UV at Baltimore WTP - Equipment, piping, electrical																												
7	New Well 36 (12th and N. Baltimore)																												
8	Repair and complete grout study Well 11 (3rd and N. Baltimore)																												
9	Repair and complete grout study Well 5 (14th and N. St. Joesph)																												
9	Well 26 Tri-plex Pump System																												
10	Well 30 Complete with Tri-plex Pump System																												
11	Well 37																												
12	North Baltimore Avenue Uranium Treatment - Equipment and Building																												
13	Rehab and Upgrade Well 5 (14th and N. St. Joesph)																												
14	Well 34 and 35 Water Collection System																												
15	Well 34 and 35 Dual Pump System																												
16	Well 33 Dual Pump and Disposal System																												
17	Westbrook Treatment																												
18	Westbrook Storage and Irrigation																												
19	ASR injection wells west of Marian Road (Phase 3)																												
20	Potable Water Storage and Pump System.																												
21	(Contingency) Land purchase for water line installation																												

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).

Hastings ASR Project provides benefits in retaining use of the existing infrastructure

The concept of the Aquifer Storage and Restoration (ASR) Project that is being developed for the City of Hastings is similar to other ASR projects developed across the nation. The Hastings ASR Project may seem innovative and untested, however, it is not new technology. It combines concepts and technologies that have been successfully utilized. However, the noted innovation is the concept of Dual and Tri-plex pumping to separate nitrate contaminated water within the production well.

The Hastings ASR Project differs from other ASR projects in the aspect that clean water injected into the well will not be pumped back out of the same well. Typically, ASR projects are known as Aquifer Storage and Recovery. The Hastings ASR project is Aquifer Storage and Restoration. The clean water that is injected into the aquifer will be allowed to be captured by existing municipal wells located down gradient of the injection well, instead of being recovered by the injection well. The clean water will be mixed with the higher nitrate and uranium water found in the aquifer. Mixing is accomplished by the capture zone of the existing municipal well intercepting both clean water and contaminated water. This concept then allows the continued use of the existing water system infrastructure (municipal wells) delaying the need for water storage. This also allows the continued use of the municipal wells to provide the necessary water pressure and flow within in the city without needing significant water main improvements. A key to this development is groundwater monitoring and modeling to insure sufficient amounts of clean water are placed strategically in the upgradient capture zone of the municipal wells.

The dual and tri-plex pumping aspect of the ASR Project allows for focused water treatment of only the contaminated water. This significantly reduces water treatment capital construction, operation, and maintenance costs.

The entire ASR Project does not have to operate continuously, as a short duration due to power outages and/or equipment maintenance, does not prohibit the operation of the existing municipal wells. The system is being developed to provide enough water on an annual basis. The aquifer is being used as it has always been a large “reservoir” of water. The costs associated with redundant equipment and emergency power supplies are not required with the ASR Project.

Hastings ASR Project has less economic impact as compared to conventional water treatment

The ASR Project will allow Hastings Utilities to better manage the cost of nitrate and uranium treatment. The cost of water is critical to the economic viability of the City of Hastings. Without maintaining a reasonable cost for potable water, existing businesses may not be able to continue operating in Hastings. The development of new businesses will be greatly inhibited if the cost of potable water is also not controlled.

The following is quoted from a letter of support, found later in Section D of this application, from Mr. Dave Rippe the Executive Director of the Hastings Economic Development Corporation:

"Water quality along with water rates can directly impact a community's ability to recruit and retain local employers. Moreover, assuring local water quality remains compliant with all Federal and State standards are important to all current and potential future residents of our community."

Hastings ASR Project promotes Water Sustainability and Conservation

Water conservation is addressed by the use of irrigation management and focused water treatment. By using the high nitrate water for irrigation, it reduces the amount of water to be wasted to the stream. The use of irrigation for wastewater disposal reduces the release of nitrates into the surface waters, thus protecting the environment and aquatic environment. The lands to which the high nitrate wastewater will be used will also be monitored via soil borings, water sampling, and irrigation management. The intent is to work with the NRDs to provide public education of the results of this water management practice which will assist the agricultural community in using best management practice.

With the help of the Little Blue NRD, Upper Big Blue NRD, and University of Nebraska – Lincoln Extension Service, the public education goal of this project is to provide information that could assist in the development of water management projects for other Nebraska communities. The concepts could be used to incorporate agriculture production into the proper disposal of nitrate wastewater which would reduce operating costs for treatment, protect use of existing water system infrastructure, and promote water and energy conservation. Though no costs can be directly calculated for this potential, the amount of monies that are expected to be spent by Nebraska communities will be a strain on the economic viability of our state. The economic management of the nitrate and uranium issues facing the State of Nebraska will benefit from the work being proposed with the Hastings ASR Project.

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).

The following table provides for a cost comparison of treating for nitrates and uranium using conventional water treatment as compared to the planned Hastings Aquifer Storage and Restoration Project. The total cost for conventional water treatment including capital costs and operation and maintenance cost is estimated to be $424,382,000 for the first 50 years of operation. The total cost for the Hastings ASR Project including capital costs and operation and maintenance costs, is estimated to be $295,490,000 for the first 50 years of operation. The Hastings ASR Project provides a $129,892,000 cost savings over the next 50 years.

						ANNUAL COST (3)							
Item	PROJECT CONCEPT	Comments	Estimated Cost-2015	Midpoint of Construction	Escalated Cost (2)	2017	2020	2025	2035	2045 (4)	2055	2065	TOTAL (5)
	CAPITAL COSTS												
1	ASR Project	The 2013 report cost was $45.9 million.The updated cost includes additional wells and facilities due to increasing nitrate and uranium concentrations.	$ 55,449,000	2017	61,132,000	$4,109,000	$4,109,000	$4,109,000	$ 4,109,000				$120,880,000
	ASR Upgrade-Approximately 2040	For the ASR project RO, UV, Uranium removal, HVAC, Electrical and I&C require an upgrade at a 2015 estimated cost of $13,800,000 for both North Baltimore and Westbrook WTP's. Forward priced at 3% per year results in a $29 million dollar upgrade. An amoritized payment is $1,935,000 per year								$1,935,000	$1,935,000		
2	Conventional Treatment	The 2010 Phase 1 report estimated cost was $72.3 million. The cost is updated using ENR index of 8799 for 2010 and 10092 for Nov 2015.	$ 82,924,000	2017	91,423,000	$6,145,000	$6,145,000	$6,145,000	$ 6,145,000				$176,680,000
	Conventional Treatment-Upgrade in approximately 2040	For the Conventioal Treatment project RO, UV, Uranium removal, HVAC, Electrical and I&C require an upgrade at a 2015 estimated cost of $19,200,000 for both North Baltimore and Westbrook WTP's. Forward priced at 3% per year results in a $40 million dollar upgrade. An amoritized payment is $1,935,000	$ 5,378,000							$2,689,000	$2,689,000		
	Net Savings		**$ 27,475,000**	**$ -**	**$ 30,291,000**	**$ 2,036,000**	**$ 2,036,000**	**$ 2,036,000**	**$ 2,036,000**	**$ 754,000**	**$ 754,000**	**$ -**	**$ 55,800,000**

						ANNUAL COST (6)							
Item	Description	Comments	O&M 2015	Full operation	Escalated Cost at full operation (5)	2017	2020	2025	2035	2045	2055	2065	TOTAL (7)
	O&M COSTS												
1	ASR Project	Portions of the project will be operational in 2017 but full operation will occur in approximately 2020	$ 1,335,400	2020	1,548,000	$ 700,000	$1,548,000	$1,794,000	$ 2,411,000	$3,240,000	$4,354,000	$5,852,000	$174,610,000
2	Conventional Treatment	O&M estimated in 2010 Phase 1 report. Cost was increased to 2015 at nominal inflation. Portions of the project will be operational in 2017 but full operation will occur in approximately 2020	$ 2,196,000	2020	2,545,000	$1,000,000	$2,545,000	$2,950,000	$ 3,964,000	$5,328,000	$7,160,000	$9,623,000	$247,702,000
	Net Savings		**$ 860,600**		**$ 997,000**	**$ 300,000**	**$ 997,000**	**$ 1,156,000**	**$ 1,553,000**	**$ 2,088,000**	**$ 2,806,000**	**$ 3,771,000**	**$ 73,092,000**

Item	Description	Comments				2016	2020	2025	2035	2045	2055	2065	TOTAL
ANNUAL TOTALS - ASR PROJECT						$4,809,000	$5,657,000	$5,903,000	$ 6,520,000	$5,175,000	$6,289,000	$5,852,000	$295,490,000
ANNUAL TOTALS - CONVENTIONAL						$7,145,000	$8,690,000	$9,095,000	$10,109,000	$8,017,000	$9,849,000	$9,623,000	$424,382,000
ANNUAL TOTALS - NET SAVINGS						$2,336,000	$3,033,000	$3,192,000	$ 3,589,000	$2,842,000	$3,560,000	$3,771,000	**$128,892,000**

NOTES:

Estimated cost are in 2015

1 **dollars**

2 **Capital costs are escalated at 5% per year for the short term. Long term costs (greater than 5 years) are escalated at the assumed rate of inflation of 3%/year**

3 **Annual Payments for construction are based on 3% and 20 years**

4 **At year 25-30 major equipment rehabilation is required.**

5 **Total cost is 20 year bond payment for 2017 to 2036 and bond payment from approximately 2040 to 2059.**

6 **O&M cost are escalated at 3% per year.**

7 **Total O & M expenditure is Compound amount Factor F/A at 3% for 50 Years which is 112.797**

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).

The Hastings Aquifer Storage and Restoration (ASR) Project is being undertaken because of groundwater contamination occurring upgradient of the Hastings Municipal Water Supply Wells. This project allows the City of Hastings to meet its obligation to provide potable water, fire

protection, sanitary service and treatment, irrigation, and water use for commercial and industrial operations. Though no direct primary tangible benefits can be defined a cost comparison as noted above was completed. This cost comparison evaluated the cost of conventional water treatment to the Hastings ASR Project. The net savings is estimated to be $129,892,000 for the next 50 years of operation.

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

As part of the annual budget discussions held by the city council, they include the review of necessary rates to be charged to cover capital and O&M costs for the water system. 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.

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.

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

Due to the City of Hastings' obligation to provide safe drinking water to all consumers connected to the public drinking water system (both within the community and also any other entities connected to that system), the City is obligated to see this project to its conclusion. Other avenues for funding beyond the grant request being made for Water Sustainability Fund monies, are increasing water rates and/or bonding portions of the project costs. Below are both the state statutes and local city codes that establish the ability to charge rates or to bond certain costs.

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.

Hastings City Code Section 32-111. Duties as to rates.

The Board of Public Works shall apply the rates as fixed by ordinance for the use of the services and facilities of the various Public Works. It shall be the duty of the Board to collect all receivables on account of such Public Works and to account for and pay the same over to the City Treasurer, taking receipt therefor in duplicate and filing one (1) of the same with the City Clerk; make a detailed report to the City once each month of the condition of the Public Works under the control of the Board, showing the receipts and expenditures thereof for the preceding month; and make such other reports as may be required by the Mayor and Council. The duties of the Water Commissioner as provided by statute of the State will devolve upon the Board.
(Code 1973, 29-22; Ord. No. 1683)

Neb. Rev. Stat. § 16-246

A city of the first class may make all such ordinances, bylaws, rules, regulations, and resolutions not inconsistent with the general laws of the state as may be necessary or expedient, in addition to the special powers otherwise granted by law, for maintaining the peace, good government, and welfare of the city and its trade, commerce, and manufactures, for preserving order and securing persons or property from violence, danger, and destruction, for protecting public and private property, and for promoting the public health, safety, convenience, comfort, and morals and the general interests and welfare of the inhabitants of the city. It may impose fines, forfeitures, penalties, and imprisonment at hard labor for the violation of any ordinance; provide for the

recovery, collection, and enforcement of such fines, forfeitures, or penalties; and, in default of payment, provide for confinement in the city or county prison, workhouse, or other place of confinement with or without hard labor as may be provided by ordinance. The jurisdiction of the city to enforce such ordinances, bylaws, rules, regulations, and resolutions shall extend over the city and over all places within two miles of the corporate limits of the city.

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 - This request does not involve a loan, it involves a grant.

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

The Hastings Aquifer Storage and Restoration (ASR) Project benefits the natural environment and the natural resources by minimizing the disposal of wastewater, minimizing groundwater withdraws and reduces energy consumption.

The Irrigation Management portion of the Hastings ASR Project is built upon the foundation of beneficially using non-potable water for non-potable uses in lieu of potable water for non-potable use. Much of a community's water is used for irrigation, waste transport (sewage), fire protection, and industrial cooling. These uses do not need a potable water supply. Since 1886, the Hastings water system has been developed to provide all of these activities including potable water use, via one water system. The historical development of the Hastings Water system is similar to all other water systems in Nebraska and of the region. The development of a gray water (non-potable water) system is one way a community can manage its water resources. More communities are beginning to develop gray water systems especially in areas with water shortages.

The Irrigation Management as provided by the Hastings ASR Project will be the foundation for a gray water system to reduce the use of potable water for non-potable purposes (irrigation). Initially, the plan is to irrigate the adjacent farm land lying over the injection zone site. Future plans are to extend this concept to the adjacent city parks. High nitrate wastewater would be used for irrigation and thus remove this demand from the use of potable water. Depending on the effectiveness of the Dual Pump systems, the amount of available water is not definitely known at this time. Pilot testing is planned for the Well 27 Tri-plex pump system once the water storage facility is operational. It is however, anticipated the ASR Project will have enough high nitrate water available to serve one full pivot and one, half pivot. The ASR Project is designed to

conserve the potable water located upgradient of the municipal wells for potable use in lieu of being pumped by the existing irrigation wells (non-potable use).

The Dual Pump and Focused Water Treatment portion of the Hastings ASR Project reduces the amount of water that needs to be treated and thus reduces energy consumption by only treating enough of the high nitrate water to meet the water demands for injection. It also reduces the amount of water to be released to the surface water via the Hastings Sanitary Sewer System. This is accomplished by sending most of the high nitrate wastewater to the ASR Water Storage Facility for reuse via irrigation.

The water treatment operation will be tuned to recover as much high nitrate water as possible for irrigation. The tuning will be based upon the uranium content of the water to be treated. Uranium will be removed from the water along with the nitrates. A self-imposed limit of 30 ug/l (ppb) has been set for any water used for irrigation. This has been done to protect the lands receiving the wastewater and to ensure the public is not unduly exposed to the uranium. The self-imposed limit of 30 ug/l (ppb) will protect the public from incidental ingestion of the irrigation water as it is used in public service.

The self-imposed limit for uranium disposal is based upon the Maximum Contaminate Level (MCL) for drinking water of 30 ug/l (ppb). The concentration of uranium used by the upgradient irrigators is as high as 300 ug/l (ppb). This is 10 times the MCL. The current EPA and NDEQ regulations allow much higher levels of uranium for land application. Currently it is limited to 0.05% for naturally occurring uranium. This is a uranium concentration of 500,000 ug/l (ppb). The application of uranium to agricultural lands is not well studied. A review of the available literature indicates that food crops uptake the uranium, the presence of the uranium in the soil will impact the plants ability to uptake nutrients. With these uncertainties, the ASR Project will be operated very conservatively with regards to uranium disposal. The plans call for the construction of a uranium removal facility to control the disposal of uranium as needed. The treatment process will only remove the uranium, no additional wastewater is produced other than periodic cleaning associated with the maintenance of the equipment. The uranium is removed in a solid phase and sent to a receiving facility for reprocessing or disposal.

In addition to focused water treatment and irrigation reuse to meet the short term requirements to provide potable water for the City of Hastings, the ASR project is being developed jointly with the implementation of the Hastings Wellhead Nitrogen Management Plan. The Hastings Wellhead Nitrogen Management Plan is based upon proper use of nitrogen based fertilizer (Best Management Practice) and water conservation. The water conservation component is essential to the control of nitrogen. By reducing the amount of irrigation applied, the potential for carrying nitrates through the root zone into the vadose zone is reduced. Water conservation

reduces groundwater withdraw. The water conservation also allows for more rainfall to be captured during a rain event thus reducing runoff and loss of nitrogen.

Please note that approximately 50% of the water recharged in the Hastings aquifer travels through the root zone. The other 50% comes from the Platte River. The water traveling through the root zone carries the mobilized nitrogen and the legacy nitrogen found in the vadose zone into the aquifer. Water conservation will reduce the release of nitrogen from the root zone and also reduce the rate at which the nitrogen is entering the aquifer. The ASR Project will provide opportunities to manage the fertilizer use and water conservation by the groundwater monitoring that will be conducted in the wellhead protection area. Hastings Utilities, Little Blue NRD, and Upper Big Blue NRD are committed to this monitoring as shown by the recent actions to fund the 2015 Vadose Zone Study currently be conducted by the University of Nebraska – Lincoln. The intent is to conduct this study once every five years until control of the nitrates can be shown. Water sampling is conducted on the irrigation wells found in the wellhead protection area annually with all wells sampled every five years. Currently the five-year testing is underway. More than 250 water samples were collected in the 2015 irrigation season. In 2016 the remaining production wells will be sampled. Domestic wells will be sampled this winter.

More study is needed in regard to the mobilization of uranium however it is anticipated that water conservation and the reduction in nitrate mobilization will also reduce the amount of uranium entering the aquifer. The implementation of the Hastings Wellhead Nitrogen Management Plan is essential in limiting future water treatment costs for both nitrate and uranium contamination.

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

Hastings Utilities / City of Hastings, NE have the authority to operate a water system as per the Nebraska Department of Health and Human Services, license number NE3100101. See attached file titled City of Hastings Water System Permit for more information. The City of Hastings 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 Hastings has the right to issue revenue bonds and to recover these costs through water use rates.

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.

Hastings City Code Section 32-111. Duties as to rates.

The Board of Public Works shall apply the rates as fixed by ordinance for the use of the services and facilities of the various Public Works. It shall be the duty of the Board to collect all receivables on account of such Public Works and to account for and pay the same over to the City Treasurer, taking receipt therefor in duplicate and filing one (1) of the same with the City Clerk; make a detailed report to the City once each month of the condition of the Public Works under the control of the Board, showing the receipts and expenditures thereof for the preceding month; and make such other reports as may be required by the Mayor and Council. The duties of the Water Commissioner as provided by statute of the State will devolve upon the Board.
(Code 1973, 29-22; Ord. No. 1683)

Neb. Rev. Stat. § 16-246

A city of the first class may make all such ordinances, bylaws, rules, regulations, and resolutions not inconsistent with the general laws of the state as may be necessary or expedient, in addition to the special powers otherwise granted by law, for maintaining the peace, good government, and welfare of the city and its trade, commerce, and manufactures, for preserving order and securing persons or property from violence, danger, and destruction, for protecting public and private property, and for promoting the public health, safety, convenience, comfort, and morals and the general interests and welfare of the inhabitants of the city. It may impose fines, forfeitures, penalties, and imprisonment at hard labor for the violation of any ordinance; provide for the recovery, collection, and enforcement of such fines, forfeitures, or penalties; and, in default of payment, provide for confinement in the city or county prison, workhouse, or other place of confinement with or without hard labor as may be provided by ordinance. The jurisdiction of the

city to enforce such ordinances, bylaws, rules, regulations, and resolutions shall extend over the city and over all places within two miles of the corporate limits of the city.

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.

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

Historically, Hastings Utilities (the City of Hastings) has been proactive in utilizing the resources of the various state programs. This has been evident starting with the development of the 1996 Water Supply Study and continuing with various plan updates and ongoing monitoring. The 1996 Water Supply Study included a technical team to provide review and input on the local issues. The technical team included representatives from Adams County, Village of Juniata, Little Blue NRD, Upper Big Blue NRD, and City of Hastings. By using the technical team approach to augment the study, it was a great opportunity for all parties to exchange information on the water resources and planning programs they are charged to enact. Additionally, the team members provided knowledge of the aquifer and water use.

From this study, information was utilized in the drafting of the Hastings Comprehensive Plan and the Adams County Zoning Map. (See attached files titled Hastings Comprehensive Plan and Adams County Zoning map for more information.) By having the respective planning committees represented on the technical team it provided an efficient means to address the water issues raised by the 1996 Water Supply Study.

By including the NRDs it began a communication on the nitrate issues facing their individual districts. During this time the extent of the nitrate problem was not well understood.

The Hastings Wellhead Protection Plan was prepared in accordance with NDEQ guidelines. The team approach was also used in the development of the Wellhead Protection Plan. This included the Natural Resource Conservation Service, University of Nebraska (UNL) Extension, Little Blue NRD, Upper Big Blue NRD, and City of Hastings. The intent of this technical team was to provide data and program information to the Wellhead Protection Committee. This provided an avenue for the Wellhead Protection Committee to get credible information to make an informed decision. The issue of rural verses urban was a concern. The large confined feeding operation located in the wellhead protection area was also suspected as the problem. By providing sound data by the technical team the Wellhead Protection Committee was able to determine that all nitrogen sources have a potential to cause groundwater contamination. As the committee agreed "Protecting Drinking Water is Everyone's Responsibility".

Logo used by the Hastings Wellhead Protection Committee to promote a partnership between the urban and rural stakeholders.

As a response to the recommendations presented in the Hastings Wellhead Protection Plan a Water Quality Executive Committee was set up to draft the Hastings Wellhead Nitrogen Management Plan. This plan was developed utilizing technical input from the Natural Resource Conservation Service, Little Blue NRD, Upper Big Blue NRD and Hastings Utilities. The plan was developed using the common goals and enforcement mechanisms the NRDs had to implement Best Management Practice. The Nitrate Management Plan was enforceable because of the rules and regulations the NRD have, which give them authorization to impose such management requirements. The City of Hastings also imposed Best Management Practice of nitrogen based fertilizer on its citizens. Public education for lawn and garden projects were developed by UNL Extension Service utilizing their existing outreach programs.

To help promote Best Management Practice, Hastings Utilities provided additional incentives for programs that were funded by the Little Blue NRD and Upper Big Blue NRD. These included well abandonment, soil sampling, Evaporation -Transpiration Gauges, soil moisture monitors and soil moisture monitor readers. (See attached Hastings Wellhead Protection Incentives.) Hastings Utilities also provided incentives for rain sensors, mulching mower blades, mulching mowers and septic tank abandonment.

Hastings Utilities encouraged and supported the USDA grants for the conversion of gravity irrigation to pivot irrigation.

Hastings Utilities has participated in the development of the Little Blue River Basin Water Management Plan. Hastings Utilities was represented on the Technical Advisory Team.

10. Are land rights necessary to complete your project?

YES☒ NO☐

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

The following properties are owned by the City of Hastings:

1. Water Treatment Plant Site including Well 27 and proposed Well 30 – Part of the north half of the Northeast Quarter, Section 2, Township 7 North, Range 10 West.
2. Water Storage Site – Part of the East Half of the Northeast Quarter, Section 2, Township 7 North, Range 10 West
3. Easements for Injection wells and water mains – North West Quarter, Section 2, Township 7 North, Range 10 West
4. Well 26 is located on the Lake Hastings City Park - Part of the Northwest Quarter of Section 2, Township 7 North, Range 10 West
5. Future Phase III Injection Well construction will be located on the Hastings Municipal Airport – East Half and part of the Southeast Quarter of Section 3, Township 7 North, Range 10 West
6. Future injection wells will be located on Airport West Well Field – Part of the Southeast Quarter of Section 3, Township 7 North, Range 10 West

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

The following properties are owned by the City of Hastings:

1. Water Treatment Plant Site including Well 27 and proposed well 30 – See Warranty Deed Johnson Imperial Home Company
2. Water Storage Site including easements for Injection wells – See Warranty Deed Gottsch Land Purchase
3. Easements for Injection wells and water mains– See Warranty Deed Gottsch Easement
4. Well 26 is located on the Lake Hastings City Park - See Assessor Data Sheet Lake Hastings Ball Field

5. Future Phase III Injection Well construction will be located on the Hastings Municipal Airport – See Assessor Data Sheet Airport Authority
6. Future injection wells will be located on Airport West Well Field – See Warranty Deed Mankin Land Purchase

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

The City of Hastings has the right to impose eminent domain if properties are required. At this time no additional properties are needed to complete this project. Please note the Hastings Utilities 2016 Budget does recommend a small land purchase. This land is located adjacent to the ASR Project site. This budget item was included to allow for the purchase of a small piece of property in the event the property owner would rather sell than provide an easement. The water main project intended for this land can be constructed without additional easement or land purchase. The easement or land purchase is being sought to ease construction of future utilities. To date, the acquisition of property has proceeded well as the affected property owners have been supportive of this project. This has occurred as the project incorporates water reuse and thus the sellers of the water storage facility lands have become willing partners in this project. However, should certain lands not already acquired become necessary, the City has the ability to use eminent domain proceedings to acquire those properties, as cited below:

Eminent Domain - Neb. Rev. Stat. § 16-684

When the system of waterworks or sewerage, power, heating, lighting, or drainage shall have been adopted, and the people shall have voted to borrow money to aid in the construction as aforesaid, the mayor and council may erect and construct and maintain such system of waterworks or sewerage or power plant, lighting, heating, or drainage, either within or without the corporate limits of the city, make all needful rules and regulations concerning their use, and do all acts necessary for the construction, completion, and management and control of same not inconsistent with law, including the taking of private property for the public use for the construction and operation of the same. The procedure to condemn property shall be exercised in the manner set forth in sections 76-704 to 76-724, except as to property specifically excluded by section 76-703 and as to which sections 19-701 to 19-707 are applicable.

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

The City of Hastings has the authority and obligation to provide its citizen with basic drinking water and sanitation services. This includes the development and operation of the public water supply and wastewater system. The first water mains were installed in Hastings in 1886. The

City of Hastings has authority through its ordinances to require connection to the water system and assess user fees and rates. The City of Hastings has eminent domain authority to acquire easements and land rights for the construction of a water system.

Hastings Utilities / City of Hastings, NE have the authority to operate a water system as per the Nebraska Department of Health and Human Services, license number NE3100101. (See attached file titled City of Hastings Water System Permit for more information.)

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

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.

Hastings City Code Section 32-111. Duties as to rates.

The Board of Public Works shall apply the rates as fixed by ordinance for the use of the services and facilities of the various Public Works. It shall be the duty of the Board to collect all receivables on account of such Public Works and to account for and pay the same over to the City Treasurer, taking receipt therefor in duplicate and filing one (1) of the same with the City Clerk; make a detailed report to the City once each month of the condition of the Public Works under the control of the Board, showing the receipts and expenditures thereof for the preceding

month; and make such other reports as may be required by the Mayor and Council. The duties of the Water Commissioner as provided by statute of the State will devolve upon the Board. (Code 1973, 29-22; Ord. No. 1683)

Neb. Rev. Stat. § 16-246

A city of the first class may make all such ordinances, bylaws, rules, regulations, and resolutions not inconsistent with the general laws of the state as may be necessary or expedient, in addition to the special powers otherwise granted by law, for maintaining the peace, good government, and welfare of the city and its trade, commerce, and manufactures, for preserving order and securing persons or property from violence, danger, and destruction, for protecting public and private property, and for promoting the public health, safety, convenience, comfort, and morals and the general interests and welfare of the inhabitants of the city. It may impose fines, forfeitures, penalties, and imprisonment at hard labor for the violation of any ordinance; provide for the recovery, collection, and enforcement of such fines, forfeitures, or penalties; and, in default of payment, provide for confinement in the city or county prison, workhouse, or other place of confinement with or without hard labor as may be provided by ordinance. The jurisdiction of the city to enforce such ordinances, bylaws, rules, regulations, and resolutions shall extend over the city and over all places within two miles of the corporate limits of the city.

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.

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

As recommended in the attached Hastings Utilities Well Based Nitrate and Uranium Management Plan the Hastings ASR Project will benefit the environment and ecology in the following manner:

1. **Reduces withdraw of groundwater using Focused Water Treatment and Dual Pumping as compared to using conventional water treatment.**

The reduction in groundwater use is accomplished by the use of the Dual or Tri-plex Pumping Systems which will separate the high nitrate water within the containment well. This reduces the amount of water that is treated (Focused Water Treatment) and thus the amount of water that is wasted. The amount of wastewater that can be reused for irrigation will depend on the uranium concentration. The Focused Water Treatment will use secondary pass of reverse osmosis treatment to further concentrate the wastewater prior to disposal to the sanitary sewer system. The reduction of wastewater sent to the sanitary sewer also reduces energy consumption by the wastewater treatment plant.

2. **Reduction of groundwater use is realized with the use of irrigation to dispose of high nitrate wastewater.**

As noted above the use of Focus Water Treatment coupled with the Dual Pumping of the high nitrate wastewater can be used to manage the amount of wastewater generated. The wastewater that is produced will be used for future irrigation use.

Initially the project will use the high nitrate water for the adjacent agriculture lands lying over the potable water injection zone. This displaces the use of the existing irrigation wells from using the potable water. This is consistent with the goal of using water for its best beneficial use. It protects low nitrate water for potable use whereas the water contaminated with nitrates should be used for irrigation. As the project develops the use of high nitrate water as irrigation water will be extended the adjacent city parks.

The beneficial use of high nitrate wastewater reduces the need for more energy to pump groundwater for irrigation.

3. **Reduces the demand for electrical energy by using Focused Water Treatment and Dual Pumping as compared to using conventional water treatment.**

Focused Water Treatment coupled with Dual Pumping limits the amount of water to be treated and thus directly limits the amount of electricity to be used. By limiting the amount of water to be treated it also significantly reduces the needed capital investment.

4. **The monitoring of wastewater disposal via irrigation will provide data on water conservation and management of nitrogen based fertilizers which will support the implementation of Best Management Practice that should reduce contamination of the aquifer.**

The soil monitoring that will be conducted on the agricultural lands receiving the high nitrate water will include the root zone and up to 15 feet below the soil surface. Monitoring is being done to assess the movement of nitrogen and heavy metals. Initial sampling was completed in November 2014 and will be conducted again after the first full year of irrigation using high nitrate wastewater. This is expected to occur again in 2017. Future soil sampling will occur at least every 5 years or more often as needed. Root zone sampling will occur each year to determine applicable nitrogen application rates.

Data collected from this study will be provided to the Little Blue NRD, Upper Big Blue NRD, University of Nebraska – Lincoln Extension Service, and the public as requested. This data will provide information which can assist agencies and producers in developing Best Management Practice activities. This information has the potential to reduce nitrogen contamination of groundwater and surface runoff thus protecting the environment and ecology.

5. **The continuing monitoring of nitrates and uranium in the Wellhead Protection Area will provide valuable information and data for the University of Nebraska – Lincoln conducting research on uranium mobilization. With a better understanding of the mobilization potential programs and methods can be developed to reduce the risk to uranium exposure.**

Based upon the current research being conducted by the University of Nebraska – Lincoln (UNL) the introduction of nitrates into the vadose zone is promoting biological activity. The bacteria found in the vadose zone are mobilizing uranium, selenium, chromium, and other heavy metals. The research is currently focusing on uranium. The uranium is naturally occurring and is found in the soil.

The mobilization of uranium especially in areas utilizing irrigation has the potential to introduce uranium into the corn and soybean production via irrigation. Uranium can also be introduced into fruits and vegetable produced in home and truck gardens. The use of irrigation water that contains uranium will effectively transport the naturally occurring uranium to the soil surface allowing exposure to humans, plants and animals. The uranium, once on the soil surface, can then be transported into the watershed due to runoff.

Studies have shown that uranium can accumulate in the root zone via evaporation of the irrigation water. This accumulation of uranium has the potential to negatively impact the ability of the roots to take up nutrients like nitrogen. This can reduce production rates, which some producers will react to the yield reduction by adding more nitrogen. This unintended action has a potential to increase uranium mobilization as more nitrogen is used.

The Hastings Wellhead Nitrogen Management Plan and Hastings ASR Project include the continuation of the data collection and studies that will support future research. The goal is to limit the uranium mobilization and thus protect the public and the environment.

By conducting the extensive water sampling effort in 2010 – 2015 it has brought to light that uranium is found in the drinking water supply for the rural communities. This information has been helpful for owners of domestic wells that do not have regular testing of their water.

6. The project's primary goal is to provide a safe source of potable water for the citizens of Hastings its wholesale customers.

The goal of this project is to provide a sustainable source of potable water. By limiting the amount of water used to provide potable water (reduce wastewater generation) and the reduction of energy usage to treat the water, this supports the goal of developing sustainable projects.

7. The land on which the project is to be constructed is currently cultivated.

No designated wildlife areas will be used for the construction of this project. Open space not used for facility operations will be converted to native grass or other low maintenance – low water use landscaping. The intent is to develop the project such that it will augment the hike and bike trail connecting Libs Park and Lake Hastings. This native grass landscaping will give the users an opportunity to interact with the native prairie ecosystem.

8. The Water Storage Facility will provide open surface water for migratory water fowl.

The Water Storage Facility will be fenced to keep animals from damaging the facility. As a result, this will provide a protected area for water fowl. The facility will be located next to Lake Hastings which currently attracts water fowl.

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.

Describe the specific threats to drinking water the project will address

The Hastings Aquifer Storage and Restoration (ASR) Project and the Hastings Wellhead Nitrogen Management Plan have primary goals of securing a sustainable supply of potable water for the City of Hastings and its wholesale water customers.

The City of Hastings has only one source of water, that being the local groundwater supply. The primary threat to groundwater consists of nitrate contamination due to nitrogen based fertilizers. In addition the groundwater is being contaminated with uranium and other heavy metals. Currently the University of Nebraska – Lincoln (Dr. Weber, et al) has determined that nitrates are contributing to the mobilization of the uranium and other heavy metals. See attached article titled "Natural Uranium Contamination in Major US Aquifers Linked to Nitrates". The mobilization is due in part to microbial action that releases the uranium found in the vadose zone and aquifer substrate. Nitrates are a nutrient that promotes microbial activity.

Identify whose drinking water, how many people are affected, how will project remediate or mitigate

The City of Hastings Municipal Water System provides water for 25,000 persons including residential, food processing, recreational, industrial, hospital, college, and other potable water needs. The Municipal Water System serves the Central Community College (1,000 equivalent full time students and 190 faculty), Hastings East Industrial Park (40 Industrial Businesses), Clay County Sanitary Improvement District No. 1 (39 Industrial Businesses), and the Village of Trumbull (205 Population).

This project will provide for a sustainable supply of potable water. This project is being developed in concert with the implementation of the Hastings Wellhead Nitrogen Management Plan. The Hastings Wellhead Nitrogen Management Plan and the Hastings ASR Project collectively address the long term and short term issues regarding nitrates and uranium contamination in the Hastings aquifer.

The Hastings Wellhead Nitrogen Management Plan requires training and reporting related to nitrogen fertilizer application. The training and reporting is required for all rural users and urban users applying fertilizer to more than one acre. The Management Plan promotes "Best Management Practice" to reduce fertilizer applications. Water conservation is promoted as well to reduce the loss of nitrogen via over irrigation. Water conservation has the added benefit of also reduce the rate at which nitrates move from the vadose zone into the aquifer. These efforts are intended to manage the nitrate legacy found in the vadose zone. With proper management the intent is to reduce the need for future capital improvements related to water treatment.

The Hastings ASR Project will provide for the containment of high nitrate water from entering the capture zone of the municipal wells. This will be done with the use of Dual or Tri-plex pump

system. These pumps "skim" high nitrate water off the top of the aquifer. This high nitrate water is sent to a Reverse Osmosis (RO) Treatment plant where the nitrates are removed. This is known as "focused water treatment". The clean water from the RO System is sent to a series of injection wells to dilute the nitrates found in the capture zone of the municipal wells.

The high nitrate wastewater generated by the system is sent to a water storage facility. The stored water is used of irrigation. The existing irrigation wells located in the capture zone will be shut off to conserve the low nitrate water for potable use. This system provides control of the amount of nitrates moving into the Hastings wellfield and provides water treatment to meet the annual demand for potable water.

Uranium will be removed as needed prior to treatment by the RO system. Similar to nitrates, the uranium has been shown to be concentrated at the top of the aquifer and enters the top of the well screen.

Provide a history of issues and tried solutions

The issue of nitrates has been a concern for the Hastings Utilities / City of Hastings prior to 1995. It was evident the nitrate levels were rising in the municipal wells. It was generally believed the source of the nitrates was due to the use of nitrogen fertilizers for urban lawns and gardens. At that time testing by the NRDs did not show a significant problem in the area upgradient of the municipal wells. A Water Supply Study was completed in 1996 to address the planned replacement of the wells lost due to nitrate and other contamination. In 1997 a Groundwater Model was developed and a Wellhead Protection Area determined. The recommendation was to replace wells lost due to contamination to new locations near the Hastings Airport. The Hastings Airport is located near the northwest side of the city and upgradient of the municipal wells. This plan would allow for centralization of the water system. Centralization would support future water treatment or blending as needed.

As the new wells were constructed near the Hastings Airport they were found to be clean sources of groundwater. Nitrate levels were in the 2 mg/l (ppm or less) range. However, as those wells were used, the nitrate levels began to rise quickly. This prompted sampling of upgradient irrigation and domestic wells. Results were mixed. Domestic wells that were older tended to be higher in nitrates. It was suspected this was due to septic tanks and fertilization of lawn and gardens associated with suburban land use. Nitrate and Oxygen Isotope testing indicated that anhydrous ammonia was the main source of nitrates. Vadose Zone sampling by the University of Nebraska – Lincoln confirmed a legacy supply of 500 to 2000 pounds of nitrogen per acre is found below the root zone.

The mixed results of the domestic wells led to our understanding of the variation of nitrates in the aquifer. It appears the older domestic wells are typically not as deep as the newer domestic

wells. We found the public "learned" that one driller got better nitrate results because he would drill the well deeper and set the pump near the bottom of the aquifer. Most people did not know why this would be the case but they knew he could get a good clean well. Obviously it was good for the driller's business.

In 2010, the wells located in the Wellhead Protection Area (76 Square miles) were sampled and vast areas of nitrate contamination were found. In 2011 and 2012 irrigation and domestic well sampling expanded to include 200 square miles. More than 800 water samples were collected.

Based upon the extent of the regional groundwater contamination it was apparent that relocating wells away from wells with known nitrate contamination was a futile effort.

The water testing that occurred in 2010 – 2012 also indicated the uranium being found in the municipal wells was due to upgradient sources.

A dual pump project was developed on Well 33 to "skim" nitrate water from the top of the well screen. This effort has been successful and has allowed the continued use of Well 33 for several years. This dual pumping technique has been further developed on Well 16 and has also worked well.

The concept of using dual pumping on each municipal well has been considered. The issue is wastewater disposal. The amount of water that would need to be captured cannot be sent to the sanitary sewer system. This water needs to be managed in order to promote water conservation.

The dual pump concept is one of the five components being developed for the implementation of the Hastings Aquifer Storage and Restoration Project.

Provide detail regarding long range impacts if issues are not resolved

If the nitrates are not controlled then it is highly likely they will continue to impact the groundwater supply for the City of Hastings. This will require water treatment. The uranium mobilization would continue to occur potentially increasing due to increased release of nitrates into the vadose zone. More agricultural lands will be contaminated with uranium as the groundwater is pumped for irrigation. With more uranium placed on the soil surface this could increase uranium found in surface water runoff impacting down gradient water users.

It is imperative that nitrate management be implemented and monitored as required by the Hastings Wellhead Nitrogen Management Plan. The impact of nitrogen on uranium mobilization needs to be studied to determine if any control measures could be implemented that would abate the mobilization that is occurring. The Hastings Wellhead Nitrogen Management Plan and the

Hastings Aquifer Storage and Restoration Project work together to provide the necessary management of the nitrates and uranium.

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.

Identify the specific plan that is being referenced including date, who issued it and whether it is an IMP or GW management Plan

The Little Blue NRD is currently developing a Integrated Management Plan titled Little Blue River Basin Water Management Plan. Final approval of the plan is expected by the end of 2015 or early in 2016. The Little Blue River Basin Water Management Plan has identified the control of groundwater contamination by nitrates as a high priority. Nitrates contamination is impacting a significant portion of the Little Blue NRD population. (See attached draft copy of the Little Blue River Basin Water Management Plan.)

Provide a history of work completed to achieve the goals of this plan

The Little Blue River Basin Water Management Plan is in the process of being approved hence no specific activities associated with the plan implementation have yet been undertaken. Notwithstanding, the Little Blue NRD has been aware of the nitrate contamination impacting the groundwater resources. The Little Blue NRD has implemented several public and operator training programs to promote Best Management Practice with regards to the use of Nitrogen based fertilizers. The Little Blue NRD has provided incentives for producers to use soil moisture monitoring, soil sampling, and evapotranspiration (ET) gauges.

List which goals and objectives of the management plan the project provides benefits for and how the project provides those benefits

The Hastings Aquifer Storage and Restoration (ASR) Project and the Hastings Wellhead Nitrogen Management Plan will support the goals and objectives of the Groundwater Policy Recommendations as noted in the Little Blue River Basin Water Management Plan.

Agronomic Soil Sampling and Reporting Requirement

The Little Blue Natural Resource District's Management Plan recommends soil sampling and reporting by the agricultural producers to help them on the use of best management practice for fertilizer application. The information will be used to assess nitrogen use and to allow the NRD to focus its efforts.

With regards to the Hastings Wellhead Nitrogen Management Plan, Hastings Utilities continues to fund soil sampling, soil moisture monitoring and ET gauge incentives for those producers located in the Plan Area.

Expand Groundwater Monitoring Program

Due to the efforts to better define the nitrate contamination in the Hastings area it was clear that previous water sampling by the NRDs had not collected enough water samples to show the extent of the nitrate contamination. Control on how and where the samples were taken needed to be modified. The Hastings Wellhead Nitrogen Management Plan requires a significant increase in water sampling by the NRDs and Hastings Utilities. To support this program and as per the inter-local agreement established with the Little Blue NRD and Upper Big Blue NRD sampling by Hastings Utilities of domestic, irrigation, industrial and municipal wells is expected to continue. To date more than 800 wells have been identified and are tested on a regular basis. This data is provided to the NRDs to support their programs.

Vadose Zone Monitoring Program

The Little Blue Natural Resource District's Management Plan recommends Vadose Zone Monitoring in areas with elevated nitrate concentration. (See attached Little Blue River Basin Water Management Plan). It is expected the vadose zone monitoring that is being conducted in the Hastings Wellhead Protection Area will continue to be performed every five years or as determined in consultation with the Little Blue and Upper Big Blue NRDs. The goal of the vadose zone sampling is to determine the rate at which nitrates flow through the vadose zone. It's also designed to study the rate at which nitrates may be reduced by biological action. This information is critical to the continued implementation of the Hastings Wellhead Nitrogen Management Plan. This information will be used to modify the plan as needed to protect the aquifer.

The Hastings Aquifer Storage and Restoration (ASR) Project and the Hastings Wellhead Nitrogen Management Plan will also support the goals and objectives of the Municipal Water System Assistance as noted in the Little Blue River Basin Water Management Plan.

Public Relations Campaign

The Little Blue River Basin Water Management Plan recommends increased communication with basin communities on nitrate issues. Hastings Utilities (HU) and its staff continue to provide public relation support to the NRDs. When requested, staff provides technical information to support training. HU staff will continue to provide the NRD boards updates on the information that is generated by the various sampling activities.

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.

The location, area and amount of recharge

The Hastings Aquifer Storage and Restoration (ASR) Project will provide for the recharge of groundwater containing lower levels of nitrates and uranium. The project will not increase the total quantity of recharge. The project provides for treatment and returns most of the extracted groundwater to the aquifer.

The location, area and amount that aquifer depletion will be reduced

The implementation of the Hastings Wellhead Nitrogen Management Plan will be instrumental in promoting water conservation and thereby significantly reduce groundwater withdraw. The Hastings Wellhead Nitrogen Management Plan recognizes that water conservation is imperative to control the release of nitrates below the root zone which move into the vadose zone. By promoting pivot irrigation and subsurface irrigation in lieu of gravity irrigation, ground water will be conserved. The Hastings Nitrate Management Area Plan covers 106 square miles. (See attached map for Hastings Nitrate Management Area Map.) This area includes all of the Hastings Wellhead Protection Area.

At this time, no specific irrigation application limits have been required, however, the reduction in gravity pivot use and the conversion to center pivot or sub surface irrigation will reduce groundwater depletion. The Little Blue NRD and Upper Big Blue NRD are requiring water meters to be installed. This will provide monitoring of groundwater use and thus promote water conservation.

The Hastings Aquifer Storage and Restoration (ASR) Project will also conserve groundwater use in the utilization of the Dual Pumping and Focused Water Treatment. These concepts will limit the amount of groundwater withdrawn as compared to that which would be needed for conventional water treatment. The impact on water resources will not be as significant as compared to the extensive use of groundwater for irrigation. It will however limit the disposal of wastewater as compared to conventional treatment.

The reach, amount and timing of increased stream flow. Describe how the project will meet these objectives and what the source of the water is;

The wastewater that will be sent to the sanitary sewer will be treated in the Hastings Pollution Control Facility. The effluent from this facility is discharged to the West Fork of the

Big Blue River. The goal of the Hastings ASR Project is to limit groundwater withdraw and use the wastewater for irrigation. Depending on the recovery of the nitrates and the uranium concentration the amount of wastewater sent to the West Fork of the Big Blue River is estimated to be in the range of 200 to 300 gpm (0.288 to 0.432 MGD). The effluent flow from the Pollution Control Facility is 2100 to 2400 gpm (3.0 to 3.5 MGD). The Hastings ASR Project is expected to represent a 10 to 15% flow increase in effluent discharge.

Provide a detailed listing of cross basin benefits, if any

No cross basin benefits are noted with this project

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.

List goals the project provides benefits

The goal of the Hastings Aquifer Storage and Restoration (ASR) Project is to provide a sustainable supply of potable water for the City of Hastings and its wholesale customers. In meeting this goal the ASR Project will also provide the following benefits:

1. Maximize the use of the groundwater resources for its highest beneficial use.
2. Limit wastewater disposal to conserve groundwater resources.
3. Limit future nitrate contamination of the aquifer.
4. Minimize energy consumption.
5. Limit future uranium contamination of the aquifer.

Describe how the project will provide these benefits

1. To maximize the use of the groundwater resources for its highest beneficial use the ASR Project will utilize the Dual Pump and Focused Water Treatment components. By separating the high nitrate water from the lower nitrate water, the high nitrate water can be used for irrigation. The low nitrate water (potable water) is then placed back into the aquifer for use by the existing municipal wells.
2. To limit wastewater disposal, the Focused Water Treatment component will utilize dual pass treatment to recover as much water as possible thus reducing brine generation (wastewater) that would be sent to the sanitary sewer for disposal. The Focused Water Treatment will also provide for the bypass of the water to retain water hardness and alkalinity. The hardness and alkalinity is needed to ensure the water to be injected into the aquifer is stabilized and doesn't promote uranium and metal mobilization.

3. The Hastings Wellhead Nitrogen Management Plan requires implementing Best Management Practice to properly apply nitrogen based fertilizers and to promote water conservation. The plan calls for periodic vadose zone sampling, water sampling, and reporting. This is essential to ensure compliance and to monitor the impact of the management plan. When necessary, the plan will be amended to ensure that nitrates contamination is reduced.
4. To minimize energy consumption, the Dual Pump and Focused Water Treatment components will reduce the amount of water to be pumped and treated. This will minimize the amount of electrical energy that is required. Irrigation management will ensure only high nitrate water is used for irrigation of the adjacent lands and city parks thereby reducing the need to pump potable water.
5. To limit future uranium contamination of the aquifer, it is essential that monitoring and additional studies be completed. The understanding today is that limiting the amount of nitrates entering the vadose zone will reduce the potential for mobilization of uranium and other metals. The amount and degree of control is yet to be determined.

Provide a long range forecast of the expected benefits this project could have versus continuing on current path

In the event the Hastings ASR Project is not implemented and the Hastings Nitrate Management Area Plan is not enforced the only solution the City of Hastings will have is to construct conventional water treatment at an estimated cost of $72,300,000 (2010$). This will be a significant financial burden for the City of Hastings and its wholesale customers. This would negatively impact the community's economic viability and vitality.

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.

Describe how the project will maximize the increased beneficial use of Nebraska's water resources

The goal of the Hastings Aquifer Storage and Restoration (ASR) Project is to maximize the use of the groundwater resources for its highest beneficial use. The Dual Pump and Focused Water Treatment component provides this function. By separating the high nitrate water from the lower nitrate water, the high nitrate water can be used for irrigation. The low nitrate water is then placed back into the aquifer for use by the existing municipal water supply wells. The goal is to maximize the groundwater use and limit the amount of water that is disposed into the sanitary sewer system.

Describe the beneficial uses that will be reduced if any

The disposal of wastewater will be sent to the West Fork of the Big Blue River via the Hastings Pollution Control Facility (sewer treatment plant). This water, if not for the nitrate and uranium contamination, could have been used for irrigation or potable use.

Describe how the project provides a beneficial impact to the state's residents

The ASR Project has the potential to serve as a model for other communities to consider for implementation. By using the nitrate contaminated groundwater resources for irrigation it is using agriculture (irrigation) to remove the nitrates that were released by agriculture.

Investment in this project will enable the state's residents an opportunity to support demonstration of this innovative project. It is anticipated that with proper nitrate management and implementation of the ASR concepts, the nitrate and uranium contamination can be managed for less cost, less energy consumption, and less wastewater disposal than conventional treatment. The information and lessons learned will be provided to the public, communities, NRD's, and other agencies.

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.

List estimated construction costs, O&M costs

The Hastings Aquifer Storage and Restoration (ASR) Project has been estimated to cost $45,911,000 (2013$) as per the following summary:

Phase	Description	Base Estimated Construction Cost
Pilot	ASR and Dual Pumping System Pilots	$ 2,132,000
I	North Baltimore ASR System	$ 20,636,000
II	Westbrook ASR System	$ 16,415,000
III	Storage and Blending at North Baltimore Site	$ 6,728,000
	Total Estimated Construction Cost	**$ 45,911,000**

The annual Operating and Maintenance (O&M) costs are estimated to be $1,335,400 per year (2015$).

Land acquisition costs

To date all lands necessary to construct the Hastings ASR Project have been purchased. This includes the North Baltimore Treatment Plant Site, Water Storage Facility Site, and the West Airport Site (Well 34 and 35). The total cost for these properties is $934,384. The cost of land is not included in the ASR Project or the cost of conventional water treatment as both options required the same land purchases.

Water acquisition costs

No water acquisition is required to implement the Hastings ASR Project. The source of water or this ASR Project is the local groundwater supply.

Alternative Options

The best alternative to the Hastings ASR Project is the implementation of conventional water treatment at a cost of $72,300,000 (2010$) and annual O&M cost of $2,090,000 (2010$). The cost associated with this option is summarized as follows:

Phase	Date	Project	Description	RO Only Treatment	IX Only Treatment	Annual O&M Costs [4]
1	2011	1a	Westbrook Water Treatment Plant Phase 1	$ 3,700,000	$ 3,700,000	$ 280,000
		1b	Westbrook Water Treatment Plant Phase 2	$ 1,700,000	$ 1,700,000	$ 280,000
2	2011-2014	2	Storage and Pump Station[2] at Future North Baltimore WTP	$ 14,300,000	$ 14,300,000	$ 230,000
		3	Chemical Treatment Building[3]			
		4	Piping Network Phase 1			
3	2013-2018	5	Piping Network Phase 2 and 3	$ 31,800,000	$ 23,800,000	$ 650,000
		6	North Baltimore Water Treatment Plant Phase 1			
			Treatment Facility[1]			
			Evaporation Pond (2 Cells)			
			Pipe to WPCC			
4	2019-2025	7	North Baltimore Water Treatment Plant Phase 2	$ 18,300,000	$ 10,600,000	$ 650,000
			Treatment Facility[1]			
			Evaporation Pond (2 Cells)			
			Pipe for Agricultural/Irrigation Blending			
5	2026-2030	8	Elevated Storage Tank at South Location	$2,500,000	$ 2,500,000	N/A
			Estimated Total:	**$ 72,300,000**	**$ 56,600,000**	

Please note the use of Ion Exchange (IX) does not provide sufficient removal of heavy metals and pesticides. The use of Ion Exchange has limited flexibility for unknown contamination that may be found or regulated in the future by the Environmental Protection Agency. This option was not considered viable due to the treatment limitations.

As compared to conventional water treatment the capital savings with the ASR Project is $26,389,000 (2013$). The annual O&M cost saving is $754,600.

Hastings Utilities' Board of Public Works also investigated the implementation of Point of Use devices. Point of Use devices (Reverse Osmosis units) would be installed on all potable

water connections (fixtures). The estimated capital cost is estimated to be $18,350,000 (2013$). Though the capital cost is much lower than the ASR Project, it has a significantly higher O&M cost. This is estimated to be $3,842,000 to $4,292,000 per year (2013$). The labor to service, test and conduct testing is a significant challenge. The present worth value for this option is estimated to be $66,229,000 to $71,837,000 (2013$) as summarized below:

Parameter	Description	Cost
Clerical Staff	2 @ $35,000 per Year + 1.5 Overhead	$105,000
Operation and Testing Staff	19-25 @ $50,000 per Year + 1.5 Overhead	$1,425,000 to $1,875,000
Replacement Parts	10% of Initial Equipment Cost	$1,835,000
Laboratory Testing	9,550 Services @ $50 per Year	$477,000
	Total	**$3,842,000 to $4,292,000**
	20-Year Present Worth @ 5%	**$47,879,000 to $53,487,000**
	Total 20-Year Present Worth	**$66,229,000 to $71,837,000**

Besides the high O&M costs the option to install Point of Use devices is not supported or recommended by the Nebraska Department of Health and Human Services for the Hastings community.

Bottled water was considered but was deemed not an appropriate option. Bottled water would not meet the needs (volume and pressure) of businesses that require significant amounts of potable water; such as in the preparation of food, food manufacturing and processing, hospital, clinics, packing plant, etc.

Value of benefits gained

The value of the City of Hastings to have a sustainable supply of potable water is essential to the City of Hastings' existence. Without potable water the city does not survive as an economic center. It may be a cliché but having a supply of potable water is "priceless". A supply of potable water is the "life blood" of a community and essential for maintaining public health. As stated by the Value of Water Coalition; "*The value of water is Essential. Reliable. Invaluable. Water—it's the thread that weaves together our daily lives. It keeps our communities healthy, our cities running, and our economies growing.*" The Hastings ASR project is required to maintain the existing level of service that is currently provided to the citizens of Hastings and its wholesale customers. The cost of water treatment for nitrates and uranium is an economic burden being placed on the water system.

The control of nitrates upgradient of the municipal wells was not within the control of the City of Hastings however the City of Hastings is faced with the costs to provide water treatment. It is understood nitrates are both an urban and rural problem. In the Hastings area, it has been determined the contamination found between the City of Hastings and the Platte River is due to agriculture activities and has left a significant legacy that will cost the citizens of Hastings millions of dollars for decades to come. (See attached 2015 Nitrate Map and 2015 Uranium Map which shows the extent of contamination.)

Compare costs to other methods of achieving the same benefit

The Hastings ASR Project has an estimated capital cost of $45,911,000 (2013$) with an O&M cost of $1,335,400 per year (2015$). The capital cost of conventional water treatment is $72,300,000 (2010$) with an annual O&M cost of $2,090,000 (2010$). As compared to conventional water treatment, the capital savings with the ASR Project is $26,389,000. The O&M cost saving is $754,600 per year.

List the costs of the project

The cost of the Hastings ASR Project is estimated to be $45,911,000 (2013$) and an annual O&M cost of $1,335,400 (2015$).

Phase	Description	Base Estimated Construction Cost
Pilot	ASR and Dual Pumping System Pilots	$ 2,132,000
I	North Baltimore ASR System	$ 20,636,000
II	Westbrook ASR System	$ 16,415,000
III	Storage and Blending at North Baltimore Site	$ 6,728,000
	Total Estimated Construction Cost	**$ 45,911,000**

Describe how it is a cost effective project or alternative

Currently, technology does not exist that would be a cost effective means to remove the nitrate and uranium found in the vadose zone and groundwater. As recommended by the Hastings Wellhead Protection Committee, the problem is a short term issue of ensuring potable water for the City of Hastings and its wholesale customers. The long term issue is the nitrate legacy. The Hastings Aquifer Storage and Restoration (ASR) Project coupled with the Hastings Wellhead Nitrogen Management Plan addresses both the short term and long term issues. The Hastings ASR Project will provide the short term need to provide potable water. The Hastings Wellhead Nitrogen Management Plan and the monitoring it

recommends is needed to reduce future treatment costs and reduce the addition of nitrates into the vadose zone and groundwater.

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.

Identify the interstate compact, decree, state contract or agreement or federal law

The Hastings Aquifer Storage and Restoration (ASR) Project addresses the federal law associated with the Safe Drinking Water Act, a federal mandate passed by Congress in 1974. According to the attached file, Federal Register 40 CFR 141.62, the Maximum Contaminate Level (MCL) for nitrates in drinking water is 10 mg/l (ppm) reported as Nitrogen. Also see the attached file titled Consumer Factsheet on Nitrates-Nitrates. In the attached file, Federal Register 40 CFR 141.66, the MCL for uranium in drinking water is 30 ug/l (ppb). See attached files Radionuclides Rule: A quick Reference Guide for more information on uranium in drinking water and also attached file Federal Register 40 CFR 141.66. To operate a municipal water system for the City of Hastings and its wholesale customers, federal law requires that all water provided must not exceed the appropriate MCL as established by the Safe Drinking Water Act.

Describe how the project will help the state meets its obligation under compacts, decrees, state contracts or agreements or federal law

The Hastings ASR Project will provide the necessary containment of the nitrate and uranium contamination from entering the capture zone of the existing municipal wells. This is accomplished by a system of containment wells, dual pumping to separate high nitrate water within the pumping well, focused water treatment, groundwater injection, irrigation management, water storage, and blending. The ASR Project will provide the City of Hastings and its wholesale customers a sustainable supply of potable water meeting the regulatory requirements of the Federal Safe Drinking Water Act.

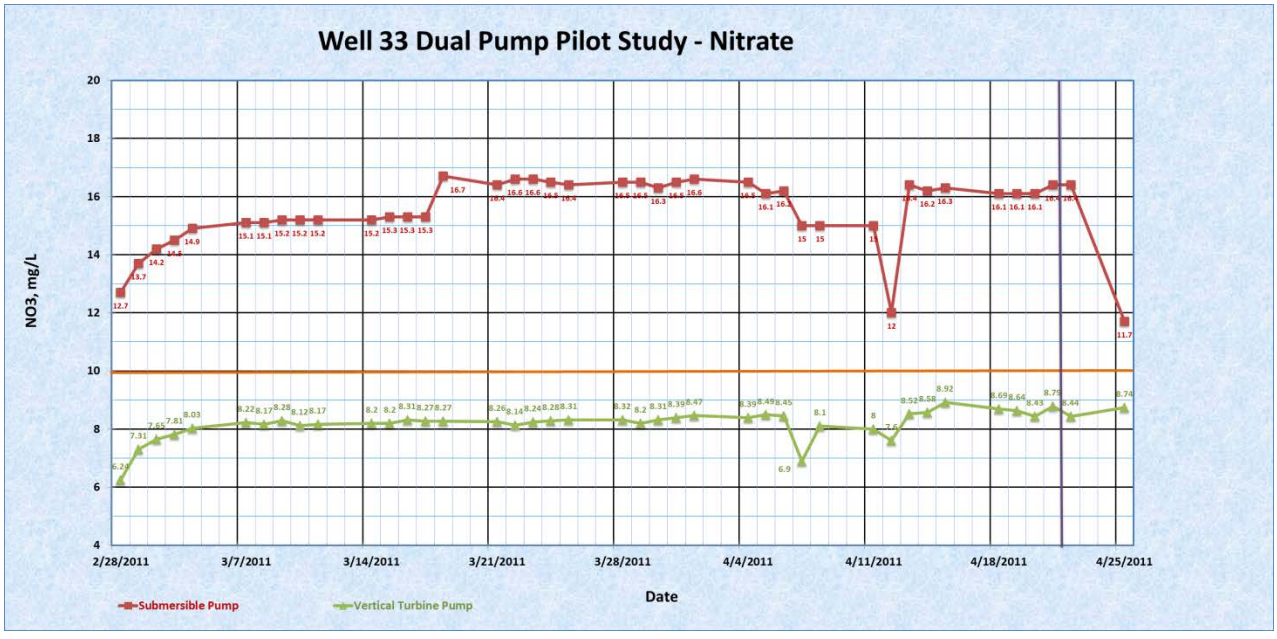
Describe current deficiencies and document how the project will reduce deficiencies

The Hastings groundwater supply has been and continues to be contaminated by nitrates. The presence of nitrates has also contributed to the mobilization of uranium. See attached 2015 Nitrate Map and 2015 Uranium Map. See also attached Grand Island Independent

uranium article titled UNL Uranium Study and informational poster titled Geogenic Aqueous Uranium in an Alluvial Aquifer.

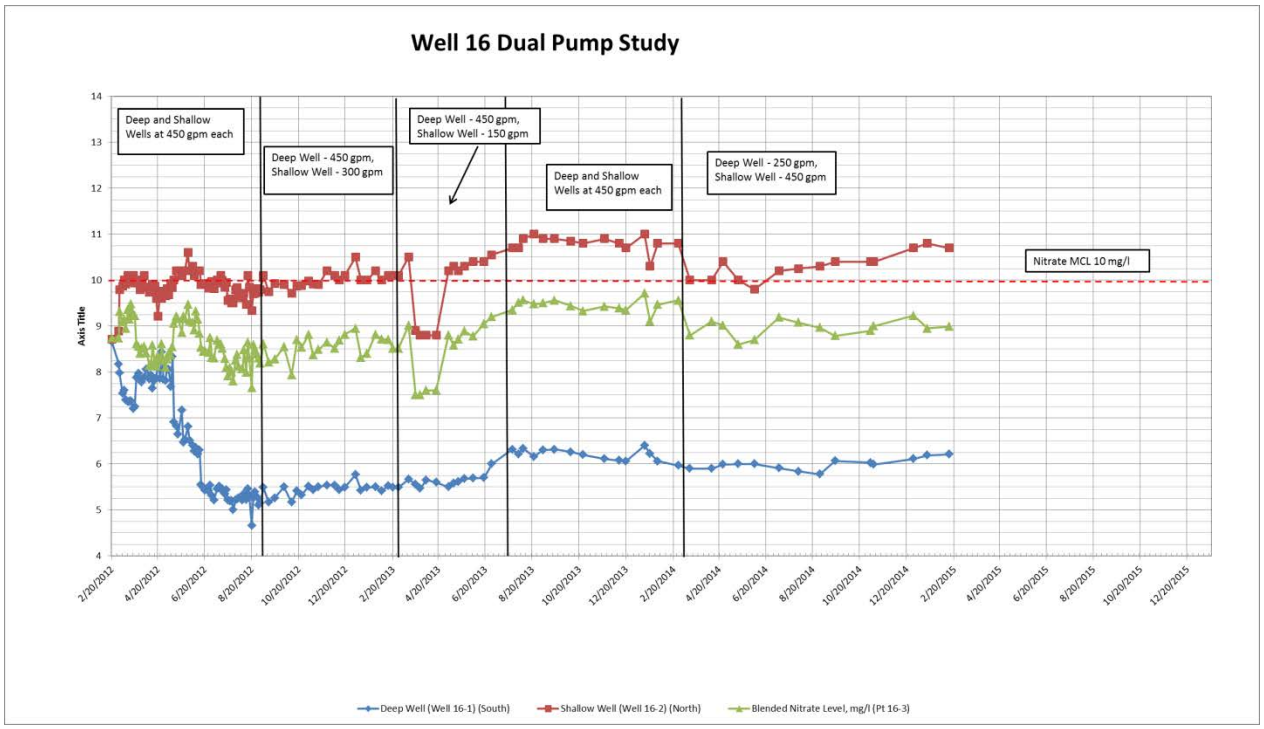
The Hastings ASR Project will provide the necessary control and water treatment to ensure a sustainable supply of potable water for the City of Hastings and its wholesale customers. The ASR Project will utilize Dual Pumping, Focused Water Treatment and Groundwater Injection. These concepts have been documented to provide the planned control and are described specifically as follows:

A. Dual Pumping has been pilot tested in two of the Hastings Municipal Wells. Well 33 has operated with a 60 gpm pump located at the top of the well screen and a 1250 gpm pump (Maximum of 2500 gpm and controlled with variable frequency drive) located near the bottom of the well screen. The results of the Well 33 Dual Pump Study test are attached and noted below. The Well 33 dual pump test has been operating since February of 2011. The upper pump has had nitrate levels at 16 to 17 mg/l (ppm) and the lower pump has had nitrate levels of 8 to 10 mg/l (ppm). The impact of the upper pump operating at 60 gpm has reduced the finished water nitrate level by 0.3 to 0.4 mg/l (ppm). This reduction has extended the life of the well by at least three years or more. Well 33 continues to operate and to provide potable water.



B. Well 16 dual pump has been operating since February of 2012. Both pumps operate at 450 gpm. The top pump is located near the top of the well screen and the bottom pump located near the bottom of the well screen. The results of the Well 16 Dual Pump Study are attached and noted below. The upper pump has had nitrate levels at 10 to 11 mg/l (ppm) and the lower pump has had nitrate levels of 5.5 to 6.5 mg/l (ppm). This test

provided evidence that better pumping distribution across the well screen will allow for different capture rates. As the lower pump increases in nitrates, control can be accomplished by increasing the upper pump flow rate. This supports the concept that nitrates tend to float on the groundwater surface. This also supports the concept that nitrates are entering the aquifer from the vadose zone.



C. Focused Water Treatment will utilize reverse osmosis technology. This technology has been proven and is used extensively for potable water treatment. As noted in the attached G08-1490 Drinking Water Treatment Reverse Osmosis, Reverse Osmosis (RO) will remove nitrates. The RO unit that is proposed for the Hastings ASR Project will be much larger and constructed on a commercial scale of approximately 500 to 600 gpm per skid. Up to four skids are proposed for the first phase of construction. See attached North Baltimore RO Treatment Unit PI&D.

In the event that uranium treatment is needed to control the use of the wastewater from the dual pumping and RO treatment, then an absorptive media will be constructed similar to treatment system currently used by the City of Grand Island. Their system is currently removing uranium. The plans call for a uranium pilot study to determine the effectiveness of the absorptive media. The uranium removal media and equipment will be sized to meet the project needs. Initial project development will be to control the uranium level in the irrigation reuse by disposing of some RO reject to the sanitary sewer system. When it becomes necessary, the uranium treatment process will be constructed.

D. Groundwater injection pilot testing is ongoing. The concept of groundwater injection to restore or augment groundwater supplies has been successfully completed throughout the United States. As noted in the AWWA Manual M63; Aquifer Storage and Recovery many of the ASR projects inject water into the aquifer via a production well. Water is recovered from the same well. The Hastings ASR Project is unique in that water is injected in the ASR well but removed by the existing municipal wells. This concept affords a significant cost savings. It protects the use of the existing water system infrastructure. The existing wells located throughout the city (neighborhood wells) will be allowed to operate. This provides critical pressure for fire protection as the water system has been developed with smaller mains relying on the pressure provided the neighborhood wells.

The ASR injection wells are located to augment the groundwater found in the capture zone of the municipal wells. This allows for mixing within the aquifer (via capture) to reduce uranium and nitrate levels. For example, if the nitrates in the capture zone are 12 mg/l (ppm) and the need for water is 6000 gpm, then 3000 gpm needs to be injected at 4 mg/l (ppm) to have a captured water nitrate level of 8 mg/l. This is a simplistic representation as the water in the upgradient aquifer is not uniform. However, the amount of water needed to provide a potable supply is that which is necessary to displace enough nitrate and uranium contaminated water that is withdrawn by the municipal wells.

Demand for water varies seasonally. The aquifer however acts like a very large storage tank and the amount of water needed is only enough to meet yearly demands, not day-to-day demands. The injection and treatment system can be stopped for short periods of time for maintenance and electrical outages. Short duration loss of water injection can be made up over an extended period of time. This concept removes the need for duplicate systems to maintain water production, as would be required for conventional water treatment. It also eliminates the need for backup power supplies.

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.

Identify the property that the project is intended to reduce threats to

The nitrate and uranium contamination found in the Hastings aquifer is threating the viability of the Hastings Public Water System which includes service to the City of Hastings and its wholesale customers. This includes the Village of Trumbull and Clay Count Sanitary Improvement District No. 1. Hastings is the economic center for northern Adams County and provides potable water for residential, retail commerce, Mary Lanning Hospitals, several medical clinics, Hastings College, Central Community College, public and private K-12 schools, industries and manufacturing, ethanol production, soybean processing, electric power production, and many other uses common to municipal operations. The extent of the nitrate contamination is impacting several smaller communities located near the City of Hastings. Hastings may be called upon to become a regional water supplier as contamination impacts these smaller communities.

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

The Hastings Aquifer Storage and Restoration (ASR) Project will provide for a sustainable supply of potable water for the City of Hastings and its wholesale customers.

The cost to the water system is not just the loss of the water supply wells but the replacement of lost water supply capacity and pressure. The ASR Project allows the continued use of the existing water supply wells. Currently the water system has tried to maintain a minimum of 25 municipal wells to meet the peak hour demands for water. Several wells recently have been shut down or put on emergency use only, due to nitrates.

To estimate the cost of replacing the municipal wells, a rough cost estimate was developed. This was based upon locating a new well field southwest of Hastings. A new well field was considered north of Hastings but the aquifer is much shallower and also has high levels of iron and manganese that would require removal and thus require water treatment.

A typical municipal well costs approximately $500,000 to replace. To replace 25 wells is a value of $12,500,000. The problem of replacing these wells is finding new locations that have low nitrates and that have sufficient separation between existing wells to be approved for siting. It was estimated that each well would have to have at least approximately 80 acres to meet the 1000 foot separation required by the Little Blue NRD and the Nebraska Department of Health and Human Services. Based upon a $10,000 per acre (value estimated on land not readily available and may require condemnation), land costs would be in excess of $20,000,000. The time to acquire these lands would not allow the water system to operate adequately and water shortages would likely occur.

The nearest location of a low nitrate water supply is 10 miles to the southwest of Hastings. The water main cost is based upon 10 miles of transmission mains and 15 miles of collection mains. The transmission mains required to move the water into Hastings are estimated to be $18,500,000. To transport the water through the mains a pumping station and reservoir would be also be required. This was estimated to $10,000,000. The total estimated cost is in excess of $61,000,000.

A critical factor in developing a new well field includes the viability of the area southwest of Hastings for sustaining the necessary water withdrawals. Sampling in the Hastings Wellhead Protection Area indicates the nitrates problem is widespread. The intensity of agricultural production is similar in the area southwest of Hastings. The aquifer is thicker and it is presumed the nitrates are lower because of more mixing of lower nitrate water within the irrigation well. No testing was conducted on the stratification of the nitrates however the Village of Juniata near this area continues to see increases of nitrates in their wells. It is reasonable to believe that nitrates will evidentially impact these areas and water treatment would still be required.

Considering the future need for water treatment, the cost to replace the lost municipal wells is estimated to be $72,300,000 (2010$), that being the cost for conventional water treatment.

By providing for a sustainable potable water supply the economic viability of the city is protected. Hastings is the main economic center is south central Nebraska employing 16,480 and serving the medical needs of an eight (8) county area. Hastings provides support for alcohol fuel production, soybean process, beef slaughter, food processing, support of industrial and agricultural commerce that are also vital to the economic viability of the State of Nebraska.

Identify the potential value of cost savings resulting from completion of the project

By implementing the Hastings ASR Project at a cost of $45,911,000 (2013$) it is a capital savings of $26,389,000 as compared the cost $72,300,000 (2010$) for conventional water treatment.

Describe the benefits for public security, public health and safety

The Hastings ASR Project will provide potable water which is essential for maintaining public health. The water system also provides fire protection for the City of Hastings and its wholesale customers. The Hastings ASR project allows for the continued use of the existing water system and decentralized design which utilizes neighborhood wells.

The advantage to having a water system that has wells located throughout the city (neighborhood wells) is that during an electric outage it does not typically affect all wells. This provides emergency service for potable water and fire protection. It also has the advantage that as contamination migrates into the city not all municipal wells are impacted at the same time. This

affords some protection from losing the entire water system due to one event. It is not "having all your eggs in one basket." Decentralization of the municipal wells allows for smaller main sizing and thus reduced infrastructure costs.

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.

Water quality issue(s) to be improved

The project is meant to keep nitrate and uranium concentrations within the standards of the Safe Drinking Water Act so that drinking water supplies provided by the municipal water system of the City of Hastings (and all connections there to) are safe for consumers to use and consume. The Safe Drinking Water Act is a federal mandate passed by Congress in 1974.

Describe how the project improves water quality/populations/usage of water

The quality of the water will be improved by removing higher concentrated supplies from the top of an underground aquifer that supplies the system's drinking water, storing those supplies in reservoirs that can then be used for a variety of purposes including farm ground irrigation and municipal park irrigation, pumping lower concentrations of nitrate contaminated water from the aquifer, removing nitrates and uranium from those lower concentrations and then reinjecting that "cleaned" water back into the aquifer where it will be mixed with higher concentrations of aquifer water that are migrating toward the water system from other geographical regions of the aquifer. By mixing those supplies, the levels of nitrates and uranium that will enter the water system for distribution to end users will remain within the levels required by the Safe Drinking Water Act.

The populations affected include the approximate 25,000 residents of Hastings, the approximate 205 residents of the Village of Trumbull (which is interconnected to the City of Hastings' system), 1,205 students enrolled at Hastings College, approximately 1,200 students and faculty at the Central Community College campus near Hastings, approximately 40 businesses and their associated employees in an industrial park southeast of Hastings and the residents and businesses connected to the Clay County SID #1, east of Hastings (which is also interconnected to the municipal water system of the City of Hastings).

Describe other possible solutions

If the Hastings ASR Project is not implemented then it would be necessary to construct, operate and maintain a conventional water treatment facility that is estimated to cost $72,300,000 (2010$). This approach is estimated to cost $ 45,911,000 (2013$).

Hastings Utilities also investigated the implementation of Point of Use devices. Point of Use devices (Reverse Osmosis units) would be installed on all potable water connections (fixtures). The estimated capital cost is estimated to be $18,350,000 (2013$). Though the capital cost is much lower than the ASR Project it has a significantly higher O&M cost. This is estimated to be $3,842,000 to $4,292,000 per year (2013$). The labor to service, test and conduct testing is a significant challenge. The present worth value for this option is estimated to be $66,229,000 to $71,837,000 (2013$). This cost does not include implementation Point of Use for the Village of Trumbull and Clay County Sanitary Improvement District No. 1. The Nebraska Department of Health and Human Services does not support the use of POU devices for a community the size of Hastings.

Describe the history of the problem and other attempts to remedy

The following narrative describes the history of these water quality issues and previous attempts and approaches that were tried prior to deciding on this approach to remedy the issues:

The issue of nitrates has been a concern for Hastings Utilities prior to 1995. It was evident the nitrate levels were rising in the municipal wells. It was generally believed the source of the nitrates was use of nitrogen fertilizers from urban lawns and gardens. Testing by the NRDs did not show a significant problem in the area upgradient of the municipal wells. A Water Supply Study was completed in 1996 to address the planned replacement of the wells lost due to nitrate and other contamination. In 1997 a Groundwater Model was developed and a wellhead protection area determined. The recommendation was to replace wells lost to contamination in the south half of the city to lands adjacent to the Hastings Airport. This would allow for centralization of the water system. Centralization would support future water treatment or blending as needed.
As the new wells were constructed near the Hastings Airport, the groundwater had nitrate levels in the 2 mg/l (ppM or lower) range. However, as those wells were used, the nitrate levels began to rise quickly. This prompted sampling of upgradient irrigation and domestic wells. Results were mixed. Domestic wells that were older tended to be higher in nitrates. It was suspected this was due to septic tanks and fertilization of lawns and gardens. Nitrate and Oxygen Isotope testing indicated that anhydrous ammonia was the main source of nitrates. Vadose Zone sampling by the University of Nebraska – Lincoln confirmed a legacy supply of 500 to 2000 pounds of nitrogen is found below the root zone.

The mixed results of the domestic wells led to our understanding of the variation of nitrates in the aquifer. It appears the older domestic wells are typically not as deep as the new domestic

wells. We found the public "learned" that one driller got better nitrate results because he would drill the well deeper and set the pump near the bottom of the aquifer. Most people did not know why this would be the case but the results were good for the driller's business.

In 2010, the wells located in the Wellhead Protection Area (76 square miles) were sampled and vast areas of nitrate contamination were found. In 2011 and 2012, irrigation and domestic well sampling expanded to include 200 square miles. More than 800 water samples were collected.

Based upon the extent of the regional groundwater contamination it was apparent that relocating wells away from wells with nitrate contamination was a futile effort.

The water testing that occurred in 2010 – 2012 also indicated the uranium contamination found in the municipal water supply wells was due to upgradient sources.

If the nitrates are not controlled then it is highly likely they will continue to impact the groundwater supply for the City of Hastings. This would require water treatment. The uranium mobilization would continue to occur, potentially increasing due to increased release of nitrates into the vadose zone. More agricultural lands will be contaminated with uranium as the groundwater water is pumped for irrigation. With more uranium placed on the soil surface, this will increase uranium in surface water runoff impacting down gradient water users.

It is imperative that nitrate management be implemented and monitored as required by the Hastings Wellhead Nitrogen Management Plan. Uranium mobilization needs to be studied to determine if possible control measures can abate the mobilization that is occurring.

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.

Identify the local jurisdiction that supports the project

The local jurisdictions involved are the City of Hastings, the Little Blue Natural Resources District and the Upper Big Blue Natural Resources District.

List current property tax levy, valuations, or other sources of revenue for the sponsoring entity

Hastings Utilities, which is the City of Hastings' utilities department, receives its revenues through the rates that it charges for a particular service (i.e. water) and *it does not receive any tax dollar support*. The utilities department is a standalone proprietary function. The Little Blue NRD and the Upper Big Blue NRD have taxing authority.

List other funding sources for the project

Currently, the other funding sources, beyond the City of Hastings water rates, are the Little Blue NRD and the Upper Big Blue NRDs financial support.

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.

List the local jurisdiction and identify specific plans being referenced that are in place to support sustainable water use

The City of Hastings, Little Blue NRD, and Upper Big Blue NRD have jurisdiction over the Hastings Wellhead Protection Area. Consistent with the Hastings Wellhead Protection Plan, a recommendation to develop best management practice with regards to the use of nitrogen based fertilizers in the Hastings Wellhead Nitrogen Management Plan was enacted and adopted by the City of Hastings, Little Blue NRD, and Upper Big Blue NRD.

The Little Blue NRD is currently adopting the Little Blue River Basin Water Management Plan. This plan has been drafted to address both water quality and quantity issues. The plan is expected to be fully adopted and approved in early 2016.

Provide the history of work completed to achieve the goals of these plans

The goal of the Hastings Wellhead Nitrogen Management Plan is to protect the Hastings groundwater so that it can be used for potable use. The goal is management of the nitrate legacy and to reduce the amount of nitrogen passing through the root zone. To accomplish this goal the Hastings Wellhead Nitrogen Management Plan requires Best Management Practice for nitrogen based fertilizers and water conservation.

The Hastings Wellhead Nitrogen Management Plan became effective July 1, 2012. The plan requires all agricultural producers that are responsible for the decision to apply fertilizer to be trained. Training is also required for any residential, urban facilities, and lawn care contractors applying fertilizer to more than one (1) acre. Training has been provided to all these individuals and groups. Agricultural producers are required to soil sample at least one farm. The training includes instruction on the requirements for annual reporting of fertilizer use. This information is collected by the NRDs and Hastings Utilities. Review of the plan compliance is conducted jointly by Hastings Utilities and the NRDs.

The Little Blue NRD is currently requiring water meters to be installed on all irrigation wells. This is a four year implementation plan that began in 2015. Reporting of annual water use is required. This information will be used to evaluate water conservation practices to support the control of nitrogen entering the vadose zone. Applying the correct amount of water for irrigation can reduce the downward migration of nitrates through the vadose zone.

Vadose zone sampling and analysis is completed every five years. Starting this fall (2015) and continuing into the fall of 2016 a Vadose Zone Study will be conducted to compare the results of a similar study completed in 2010.

To accomplish these goals it is necessary to monitor the nitrates found in the Hastings Wellhead Protection Area. This involves sampling of irrigation, domestic, industrial, and municipal wells annually and all wells every five years. Currently Hastings Utilities staff has begun the sampling of all wells with over 250 well samples collected in 2015 and the remaining 300 wells will be collected in the summer of 2016.

Data collection by all parties is shared and is jointly evaluated to ensure the objectives are being met and, if not, suggest changes to obtain the goals and objectives.

List which goals and objectives this project will provide benefits for and how this project supports or contributes to those plans

The Hastings Aquifer Storage and Restoration (ASR) Project is only part of the necessary action plan to secure a sustainable potable water supply for the City of Hastings and its wholesale customers. It requires enforcement of the Hastings Wellhead Nitrogen Management Plan. The Hastings ASR Project is addressing the short term problem of securing potable water for the City of Hastings and its wholesale customers. The Hastings Wellhead Nitrogen Management Plan addresses the long term problem (legacy) of the nitrates found in the vadose zone and aquifer upgradient of the Hastings municipal wells.

The goal is to then reduce the amount of nitrates moving into the aquifer by reducing the amount passing the root zone and then entering the vadose zone.

Water conservation is required to help reduce the movement of the nitrogen. This has the added benefit of keeping the nitrogen in the root zone to be used for plant growth.

The water quality data collected, vadose zone study results, annual report of nitrogen use, and annual irrigation application use will be used to educate the users of nitrogen based fertilizers and to modify the program to work towards a sustainable use and protection of the aquifer for potable use.

With regards to uranium contamination the mobilization of the uranium is directly linked to the presence of nitrates in the vadose zone and groundwater. The obvious response to controlling the uranium mobilization is to reduce the movement of nitrates into the vadose zone. More work is needed to better understand the uranium mobilization that is being experienced within the Hastings Aquifer. The monitoring of nitrates and uranium and providing the data to the NRD's and City of Hastings is essential to ensuring the Nitrate Management policy is enforced and modified as deemed necessary.

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

The Hastings ASR Project and the Hastings Wellhead Nitrogen Management Plan jointly address water conservation.

The Hastings Wellhead Nitrogen Management Plan does not set irrigation application limits but establishes a best management practice to reduce over irrigation that has been shown to contribute to the movement of the nitrogen below the root zone. The plan recommends and promotes the use of water meters, soil moisture monitor, and evapotranspiration gauges to reduce irrigation and thus conserve groundwater use. This plan covers 106 square miles.

Currently waters meters are being installed on the irrigation wells found in the Hastings Wellhead Protection Area. Through metering an inventory of water use can be more clearly defined. This information will then be used to assess water conservation measures to ensure a sustainable water supply.

The City of Hastings currently has a previous five year per capita water use of 273 gallons per day. This includes all water sold to the Village of Trumbull, Central Community College, Hastings East Industrial Park, and Clay County Sanitary Improvement District No.1 but no accounting of the additional population served. The Hastings water use includes potable use, industrial, recreational (pools, sports), park watering, and other uses typical of municipal water system.

List all stakeholders involved in project

The stakeholder in this project is the City of Hastings and its wholesale customers including the Village of Trumbull and Clay County Sanitary Improvement District No. 1, the Little Blue NRD and Upper Big Blue NRD.

The City of Hastings has primary control over the development of the Hastings ASR Project with technical input from other stakeholders (NRDs, NDEQ, DHHS) as they have the jurisdiction for groundwater use and quality in the Hastings area.

Identify who benefits from this project

The Hastings ASR Project will benefit the citizens of Hastings, citizens of Trumbull, and the public who uses services in these communities. This includes potable water service provided to the Mary Lanning Hospital, medical and dental clinics, Hastings College, Central Community College, retail commerce, alcohol fuel production, soybean processing, beef slaughter, food processing, support of industrial and agricultural commerce. Water is also provided to the Clay County Sanitary Improvement District No. 1 which provides water to its industrial and residential customers.

Investment in this project will enable the state's residents an opportunity to support demonstration of this innovative project. It is anticipated that with proper nitrate management and implementation of the ASR concepts, the nitrate and uranium contamination can be managed for less cost, less energy consumption, and less wastewater disposal than conventional treatment. The information and lessons learned will be provided to the public, communities, NRD's, and other agencies.

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.

List the issues or problems addressed by the project and why they should be considered statewide

The increasing levels of nitrates and uranium reaching groundwater is a statewide issue due in large part to the application of nitrogen based fertilizers which are primarily used for agricultural purposes. Rural communities that are surrounded by agriculture operations (and other influences such as feedlots etc.) are particularly susceptible to these influences. According to an environmental engineer at the University of Nebraska-Lincoln, 161 Nebraska communities are

currently conducting additional water quality tests because nitrate levels are at, or near, the allowable levels.

Describe how the project will address each issue and/or problem

The project is meant to keep nitrate and uranium concentrations within the standards of the Safe Drinking Water Act so drinking water supplies provided by the municipal water system of the City of Hastings (and all connections there to) are safe for consumers to use and consume.

The quality of the water will be improved by removing higher concentrated supplies from the top of an underground aquifer that supplies the system's drinking water, storing those supplies in reservoirs that can then be used for a variety of purposes including farm ground irrigation and municipal park irrigation, pumping lower concentrations of nitrate contaminated water from the aquifer, removing nitrates and uranium from those lower concentrations and then reinjecting that "cleaned" water back into the aquifer where it will be mixed with higher concentrations of aquifer water that are migrating toward the water system from other geographical regions of the aquifer. By mixing those supplies, the levels of nitrates and uranium that will enter the water system for distribution to end users will remain within the levels required by the Safe Drinking Water Act, a federal mandate passed by Congress in 1974.

Describe the total number of people and/or total number of acres that would receive benefits

The populations affected include the approximate 25,000 residents of Hastings, the approximate 205 residents of the Village of Trumbull (which is interconnected to the City of Hastings' system), 1,205 students enrolled at Hastings College, approximately 1,200 students and faculty at the Central Community College, campus near Hastings, approximately 40 businesses and their associated employees in an industrial park southeast of Hastings and the residents and businesses connected to the Clay County SID #1, east of Hastings (which is also interconnected to the municipal water system of the City of Hastings).

Identify the benefit, to the state, this project would provide

The benefit to the state that this project will provide is in the knowledge that will be gained. The knowledge will be shared with any and all interested parties. The ASR Project may allow communities and/or water suppliers a cost effective measure to keeping statewide drinking water supplies within the allowable limits as prescribed by the Safe Drinking Water Act, mandatory federal water quality legislation. The Safe Water Drinking Act must be followed by all water suppliers regulated by the Nebraska Department of Health and Human Services. Any information generated by the ASR Project will be shared with any requesting parties which potentially include municipalities, smaller communities and Natural Resource Districts located throughout the state.

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.

List other funding sources in a funding matrix

	Year					
Funding Source	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Capital Improvement, includes Debt Service and Operating Expense	$ 11,912,000.00	$13,440,000.00	$ 12,769,000.00	$ 14,939,000.00	$ 9,403,000.00	$ 11,354,000.00
Water Rates Adjustments	12%	12%	12%	12%	12%	12%
Water Revenue Funding	$ 5,288,000.00	$ 5,825,000.00	$ 6,502,000.00	$ 7,261,000.00	$ 8,111,000.00	$ 9,063,000.00
Bond Issuance / State Revolving Fund - Loan	$ -	$14,000,000.00	$ -	$ 12,000,000.00	$ -	$ 2,700,000.00
LBNRD Municipal Assistance Funding	$ 100,000.00	$ 100,000.00	$ 100,000.00	$ 100,000.00	$ -	$ -
Subtotal: Net Reserve or Deficit	$ (6,524,000.00)	$ 6,485,000.00	$ (6,167,000.00)	$ 4,422,000.00	$ (1,292,000.00)	$ 409,000.00
Cash Beginning of Year	$ 2,671,000.00	$ (3,853,000.00)	$ 2,632,000.00	$ (3,535,000.00)	$ 887,000.00	$ (405,000.00)
Cash End of Year	$ (3,853,000.00)	$ 2,632,000.00	$ (3,535,000.00)	$ 887,000.00	$ (405,000.00)	$ 4,000.00

Total 6 year Capital Expenditure	$ 73,817,000.00	Note this includes other obligations of the water system operation.
Total 6 Year Water Rate increase	97.38%	Note over the next 6 years the water rates will nearly double.

The Water Sustainability Grant request of $4,410,000 will provide relief on bond debt and debt service. This then reduces the need for future water rate increases.

The ASR Project will be funded as noted above with the issuance of bonds and appropriate increase of water rates to provide the necessary monies to pay for debt service and operations of the water system.

Describe how each source of funding is made available if the project is funded

The issuance of general obligation bonds will provide the necessary monies to pay for the proposed capital improvements. A schedule will be prepared using the proposed construction schedule to determine when bonds need to be issued. State Revolving Fund will provide monies similar to general obligation bonds with the added criteria the monies will have to be spent prior to release of monies.

The LBNRD Municipal Assistance Funding is made available annually with documentation that capital expenditures have been issued.

Provide a copy or evidence of each commitment, for each separate source, of match dollars and funding partners

The bonding for this project has not been selected. Bonding may be a combination of general obligation bonds or loan from the State Revolving Fund. The application for assistance through the State Revolving Fund has been completed with the NDEQ (Clean Water) and NHHS (Drinking Water) as this project has both water and wastewater components. See attached file titled SRF 2016 Application for more details.

The Little Blue NRD is providing Municipal Assistance Funding to support the Hastings ASR Project. The assistance is for 5 years that began in 2015. The funding provides for $100,000 per year for assistance in capital projects as it relates to nitrates. For the period of 2016 through 2019 the monies will be used for the Hastings ASR Project. See attached file titled LBNRD Municipal Water Funding for more details.

Describe how you will proceed if other funding sources do not come through

In the event that outside funding sources are not secured, the city council will issue general obligation bonds to finance the Hastings ASR Project. These bonds will be secured with appropriate water rate fees to cover debt service.

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.

The Hastings Aquifer Storage and Restoration Project and the area regulated by the Hastings Wellhead Nitrogen Management Plan is located in the upper reaches of the West Fork of the Big Blue River and the upper reaches of the Little Blue River. The goal of the Hastings ASR Project is to protect the groundwater resources for the City of Hastings. To accomplish this goal it is essential to control nitrogen based fertilizers as required by the Hastings Wellhead Nitrogen Management Plan. The use of Best Management Practice will also provide benefits to the watershed by limiting the amount of fertilizer being applied to the agricultural and urban lands. This will have the benefit of significantly reducing the amount of fertilizer that is allowed to runoff into the receiving streams of both the Little Blue and Big Blue watersheds.

The monitoring of irrigation wells, periodic vadose sampling, and reporting of fertilizer application rates are key components in the control of nitrogen and for its potential to be released into the watershed and aquifer. The City of Hastings, Little Blue NRD, and Upper Big Blue NRD understand and continue to support the implementation of this plan. As new information is collected, it is used to further develop and promote Best Management Practice.

The Best Management Practice as it relates to the Hastings ASR Project basically requires proper application of nitrogen based fertilizers and includes water conservation. Specifically, water conservation is vital to the control of the nitrate so that the fertilizer that is applied stays in the root zone to be used by the crop and not allowed to move into the vadose zone.

In the development of the Hastings ASR Project, it has been found by the University of Nebraska – Lincoln, that nitrates found in the vadose zone are contributing to the mobilization of uranium. The uranium is naturally occurring in the soils lying above the aquifer. The nitrates are providing nutrients for the soil bacteria which will then mobilize uranium. This mobilization has significantly increased the uranium levels in the aquifer. In some areas, it is as much as ten times the safe drinking water limit of 30 ug/l (30 ppB). The contaminated groundwater is currently being used for irrigation, which then is bringing the uranium to the soil surface. Due to evaporation, uranium is being left on the soil surface. This has the potential for uranium to be transported into the watershed via storm water runoff.

The continuation of studies and data collection will be key to understanding the impact of nitrates on uranium mobilization. The Hastings ASR Project not only has the potential to provide viable information that can be used to protect the Little Blue and Big Blue watersheds, but could be helpful to other watersheds in the region.

15. 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.

Identify the date of the Annual Report utilized

September 2015

List any and all objectives of the Annual Report intended to be met by the project

The Hastings Aquifer Storage and Restoration (ASR) Project coupled with the Hastings Wellhead Nitrogen Management Plan will support the following objectives of the September 2015 DNR Annual Report:

Inter-local coordination with other agencies

The development of the Hastings ASR project has utilized the technical and staff resources of the Little Blue and Upper Big Blue NRD since 1995 when the Hastings Water Supply Study was initiated. This cooperation has continued to present day.

The use of inter-local agreements has worked well to memorialize intentions and understanding between the boards. (See attached Hastings Water Sampling Agreement.)

Data and information collection

The water sampling results collected to date has been supplied to the Quality- Assessed Agrichemical Contaminant Database for Nebraska Ground Water (Clearinghouse Database.) This information supports resource planning.

Monitoring of the vadose zone continues to provide valuable information on the protection of the water resources.

Support planning of resource projects

The Hastings ASR project has the potential to provide valuable information that will support efficient methods to manage the nitrate legacy and uranium mobilization. It is anticipated that with proper nitrate management and implementation of the ASR concepts the nitrate and uranium contamination can be managed for less cost, less energy consumption, and less wastewater disposal than conventional treatment.

Explain how the project meets each objective

Inter-local coordination with other agencies

The Hastings Wellhead Nitrogen Management Plan requires reporting to the Little Blue NRD, Upper Big Blue NRD and Hastings Utilities board so compliance with the management plan is being met and, if necessary, make corrections to achieve the goal of protecting the aquifer for potable use.

Data and information collection

The submission of data to the Clearinghouse Database is the responsibility of the agency that collects the data. The water sampling data when appropriate is presented in maps and tables to assist staff, boards, and the public in understanding the information that is collected. For example, the attached 2015 Nitrate Level Change represents the change in nitrate concentration

from data collected in 2010/2012 to the data collected in 2015. This map helps explain how the nitrates are moving into the aquifer.

Support planning of resource projects
By maintaining open communication between the NRDs and Hastings Utilities on both a staff (technical) and board (governance) level resource planning can be better developed with joint access to each agency's information and policies.

This cooperation among the City and NRDs provides a good foundation for the inter-agency cooperation as recommended in the Annual Report.

16. 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.

Describe the federal mandate
The Hastings Aquifer Storage and Restoration (ASR) Project addresses the federal law associated with the Safe Drinking Water Act, a federal mandate passed by Congress in 1974. According to the attached file, Federal Register 40 CFR 141.62, the Maximum Contaminate Level (MCL) for nitrates in drinking water is 10 mg/l (ppm) reported as Nitrogen. Also see the attached file titled Consumer Factsheet on Nitrates-Nitrates. In the attached file, Federal Register 40 CFR 141.66, the MCL for uranium in drinking water is 30 ug/l (ppb). See attached files Radionuclides Rule: A quick Reference Guide for more information on uranium in drinking water and also attached file Federal Register 40 CFR 141.66. To operate a municipal water system for the City of Hastings and its wholesale customers, federal law requires that all water provided must not exceed the appropriate MCL as established by the Safe Drinking Water Act.

Provide documentary evidence of the federal mandate
Below is a list of the regulated contaminants, including nitrates and uranium, covered by the Safe Drinking Water Act that the City of Hastings must comply with:

National Primary Drinking Water Regulations

National Primary Drinking Water Regulations (NPDWRs or primary standards) are legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water.

Inorganic Chemicals

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)	Sources of Contaminant in Drinking Water
Nitrate (measured as Nitrogen)	10	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaking from septic tanks, sewage; erosion of natural deposits
Uranium	zero	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits

Describe how the projects meets the requirements of the federal mandate

The Aquifer Storage and Restoration project meets the standards of the Safe Drinking Water Act because through the measures used within the project (removing high nitrate water from the top of the aquifer, removing nitrate and uranium concentrations through reverse osmosis, and then injecting the lower nitrate and uranium water back into the aquifer) the water provided to customers of the water system including within Hastings and other water system connected to the local distribution network, will keep both the levels of nitrate and uranium concentrations below the allowable limits of the SDWA.

Describe the relationship between the federal mandate and how the project furthers the goals of water sustainability

Due to the strict nature of water quality standards established by the Safe Drinking Water Act, it has become necessary for the community of Hastings to address concentrations of nitrates and uranium in the underground aquifer that supplies potable water to the community's residents and also to wholesale customers connected the Hastings system. Rather than draw high nitrate water from the top of the underground aquifer, and then disposing of that water with no beneficial use being gained, this project "cleans" the water, lowers the concentrations and then returns the water to the aquifer, thereby replenishing and sustaining the aquifer for further use. Additionally, the water with the highest levels of nitrates will be used to irrigate crops and/or city parks displacing potable water use for irrigation.

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 Hastings Aquifer Storage and Restoration (ASR) Project will provide a sustainable supply of potable water for the City of Hastings (pop. 25,000) and Village of Trumbull (pop. 205). The groundwater supply is contaminated with nitrates and uranium. Nitrates have been linked to the mobilization of naturally occurring uranium. Areas up gradient of the municipal wells have nitrates and uranium levels more than 7.5 times the safe drinking water level.

Hastings has been working with the LBNRD and UBBNRD to define the problem and develop a solution. A Nitrogen Management Plan has been implemented to reduce future nitrate contamination.

The Hastings (ASR) Project is estimated to cost $45,911,000 as compared to $72,300,000 for conventional water treatment. The ASR Project combines Groundwater Injection, Dual Pumping, Focused Water Treatment, Irrigation Management, and Water Storage. This innovative plan will minimize treatment costs and limit water and energy consumption.

2. Project Tasks and Timeline

> Identify what activities will be conducted by the project. For multiyear projects please list what activities are to be completed each year.

To date, all necessary feasibilities studies required have been completed. All necessary land rights and easements have been acquired. Soil investigations and test wells have been completed. (See attached Geotechnical Exploration High Nitrate Storage and Pump Station.) Currently the Reverse Osmosis Water Treatment Plant design is being completed. (See attached North Baltimore Reverse Osmosis PI&D.) Plans and specifications for the wastewater storage facility and site piping have been completed. (See attached file titled Irrigation Water Storage Facility.) Injection Well 5 has been constructed and pilot testing is ongoing. (See attached file titled ASR5 Injection Well and Monitoring Well Plans.) Well 27 Tri-Plex Pump Pilot Study has been installed and tested. (See attached file titled Well 27 Tri-Plex Pump Pilot Study.) Currently, the Well 27 pump test and uranium treatment pilot study is on hold until the wastewater storage facility is constructed and can receive water.

Future work is as follows:

2016

a.) Complete specification and bid Reverse Osmosis (RO) Treatment Equipment - May
b.) Bid and begin construction of the North Cell Water Storage facility – May
c.) Bid and begin water main construction – May
d.) Complete specification and plans for RO Building – July
e.) Bid and begin RO Building Construction - September
f.) Bid and begin construction of injection wells - September
g.) Begin filling Water Storage Facility with Well 27 - December

2017

a.) Install Reverse Osmosis (RO) Treatment Equipment – January
b.) Begin uranium treatment study - January
c.) Complete construction of injection wells - March
d.) Complete RO Building Construction - May
e.) Complete construction of the Water Storage facility – May
f.) Complete water main construction – May
g.) If necessary begin uranium treatment design – October
h.) Begin Well 26 dual pump design – October
i.) Begin Well 30 dual pump design - October

2018

a.) Bid and begin uranium treatment construction - January
b.) Bid and begin construction of Well 26 dual pump – January
c.) Bid and begin construction of Well 30 dual pump – January
d.) Modify design of South Cell Water Storage Facility – May
e.) Complete Well 26 dual pump – June
f.) Complete Well 30 dual pump - June
g.) Begin design of Well 34 and 35 water collection system – June
h.) Begin design of Well 34 and 35 dual pump system – June

2019

a.) Bid and begin construction of Well 34 and 35 water collection system - January
b.) Bid and begin construction of Well 34 and 35 dual pump system – January
c.) Bid and begin construction South Cell Water Storage Facility – March
d.) Complete water main construction – May
e.) If necessary begin uranium treatment design – October
f.) Begin Well 26 dual pump design – October
g.) Begin design of Phase III injection wells – October

2020

a.) Complete construction Phase III injection wells – March

b.) Complete construction of Well 34 and 35 water collection system - May

c.) Complete construction of Well 34 and 35 dual pump system – May

d.) Complete construction South Cell Water Storage Facility – May

Item	Plant Addition	2016				2017				2018				2019				2020				2021				2022			
	CAPITAL COSTS																												
1	Well 27 Tri-Plex Pump Pilot Study Complete with Uranium Treatment Study																												
2	Vadose Zone Study																												
3	ASR5 Pilot Study Completed. Phase 2 ASR Injection Well (4 injection wells) and Monitoring Well System Phase 2 (2 each)																												
4	North Baltimore Avenue Water Storage Facility including distribution mains and sewers, irrigation pump station and north cell.																												
5	North Baltimore Avenue Reverse Osmosis Treatment - Equipment																												
	North Baltimore Avenue Reverse Osmosis Treatment - Building																												
6	Future UV at Baltimore WTP - Equipment, piping, electrical																												
7	New Well 36 (12th and N. Baltimore)																												
8	Repair and complete grout study Well 11 (3rd and N. Baltimore)																												
9	Repair and complete grout study Well 5 (14th and N. St. Joesph)																												
9	Well 26 Tri-plex Pump System																												
10	Well 30 Complete with Tri-plex Pump System																												
11	Well 37																												
12	North Baltimore Avenue Uranium Treatment - Equipment and Building																												
13	Rehab and Upgrade Well 5 (14th and N. St. Joesph)																												
14	Well 34 and 35 Water Collection System																												
15	Well 34 and 35 Dual Pump System																												
16	Well 33 Dual Pump and Disposal System																												
17	Westbrook Treatment																												
18	Westbrook Storage and Irrigation																												
19	ASR injection wells west of Marian Road (Phase 3)																												
20	Potable Water Storage and Pump System.																												
21	(Contingency) Land purchase for water line installation																												

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.

The development of the Hastings Aquifer Storage and Restoration (ASR) Project has involved the public and various state and local agencies. Technical assistance has been provided by these agencies to help develop this innovative project. For example, the University of Nebraska – Lincoln Extension Service has provided assistance with public education on the necessity of Best Management Practice with the use of nitrogen based fertilizers and water conservation. County and City planning departments have included wellhead protection in their respective comprehensive plans. The South Central Heartland Health District provided leadership as the moderator and organizer for the public participation in the Hastings Wellhead Protection Committee meetings. Assistance has been provided by the University of Nebraska – Lincoln (UNL) to provide nitrate isotope testing to better define the source of nitrates. UNL has also provided technical assistance (education) on the relationship between nitrates and uranium mobilization. These activities were essential is the development of the Hastings ASR Project.

There individual roles with direct financial contributions are described as follows:

Little Blue NRD

1. The Little Blue NRD through its Municipal Water System Assistance Program is contributing $100,000 per year for five years ($500,000) to support the development of the Hastings ASR Project. In 2016, $50,000 will be used to support the Hastings Vadose Zone Study being completed by the University of Nebraska – Lincoln. The remaining monies ($450,000) will be used to support the Hastings ASR Project. See attached file titled LBNRD Municipal Water Funding.

2. The Little Blue NRD has contributed $50,000 for the development of the Hastings Utilities Well Based Nitrate and Uranium Management Plan. See attached file titled Interlocal Agreement with HU LBNRD UBBNRD Management Plan.

Upper Big Blue NRD

1. The Upper Big Blue NRD is contributing $50,000 to support the Hastings Vadose Zone Study being completed by the University of Nebraska – Lincoln (2016/2017). See attached file titled UBBNRD Vadose Study Interlocal Agreement.

2. The Upper Big Blue NRD has contributed $25,000 for the development of the Hastings Utilities Well Based Nitrate and Uranium Management Plan. See attached file titled Interlocal Agreement with HU LBNRD UBBNRD Management Plan.

3. The Upper Big Blue has provided drilling equipment and personnel for the subsoil monitoring associated with the beneficial use of high nitrate water for irrigation.

Both NRD's have provided many man-hours of technical support for the Hastings ASR Project. This relationship had begun prior to 1995 and has been a unifying partnership for this innovative project. It is expected the NRDs will continue to provide this support to ensure the project develops properly and in a fiscally responsible manner.

In 2010 a funding request was granted by the Nebraska Environmental Trust (NET) and Nebraska Department of Environmental Quality (319 Grant) to support the 2010 Vadose Studies and various water conservation and nitrogen monitoring. The NET grant provided $87,500 and the 319 Grant provided $87,500 in financial support.

In 2015 another NET grant application has been requested in the amount of $100,000 to support the 2015 Vadose Zone Study. The determination as to that possible funding has not yet been released.

At this time no request of financial support has been rejected.

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 costs for the entire project are estimated at approximately $46 million. The City of Hastings has received financial commitments from two Natural Resource Districts to help in offsetting some of the project costs. The Little Blue NRD is contributing $550,000 and the Upper Big Blue NRD is contributing $75,000 (as noted directly above in the #3, Partnerships response). A $100,000 grant request from the Nebraska Environmental Trust (NET) has been made to help offset the cost of the 2015 Vadose Zone Study. The determination as to that funding has not yet been released. Those monies are in addition to this application for a Water Sustainability Funding grant of $4.41 million (that amount represents the 60% provided from the fund). If the NET grant and/or the WSF grant are not attained, the funding for this project will be attained through a series of significant water rate increases and/or the possibility of bonding some of the associated costs.

Driven by the issues of rising nitrates and uranium concentrations, water rates to customers of Hastings Utilities (and those other entities that rely upon the Hastings municipal water supply)

have risen 5% in 2012, 10% in 2013, 12% in both 2014 and 2015 and will rise an additional 12% in 2016.

5. Support/Opposition

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

This project has not received any opposition.

It has received a great deal of support because of the pertinence to many communities throughout the state that are battling these same issues due to rising levels of nitrates and uranium in drinking water. Both the Little Blue Natural Resources District and the Upper Big Blue Natural Resource District are contributing financially and with technical expertise to the project. The information gained, and cost saving techniques developed by this project, will assist other communities faced with the same issues develop an action plan for their communities at the appropriate time. The information gathered by this project will be readily shared by the City of Hastings and its partners with any area, community or region within the State of Nebraska.

Additionally, the City of Hastings has been working with the University of Nebraska-Lincoln (UNL) on testing the various levels of nitrate and uranium concentrations (UNL has determined that as the nitrates travel through the soil to the underground aquifer that they support microbial activity which release uranium that are naturally present in the soil).

The City Council of Hastings, the Board of Public Works (a five-member group that establishes policies for Hastings Utilities, which is the City's utility department), and the local Planning and Zoning Commission all support this project going forward.

The Hastings Economic Development Corporation (HEDC), the local organization that coordinates recruiting new industrial clients and employers and also works at retaining the current manufacturing base in Hastings, strongly supports this project. HEDC has submitted a letter of support which is attached and titled HEDC Support Letter.

The development of the Hastings Aquifer Storage and Restoration (ASR) Project has been a very public and open process. This public process has provided the public many opportunities to express their support or opposition. The project development builds upon the study and understanding nitrate and uranium contamination. Work continues to be completed to better understand the sources of contamination and its fate.

The opposition that has been expressed to date has not been for the actual ASR Project but for the understanding of how the nitrates entered the aquifer. Substantial efforts have been made through water and soil sampling to provide factual information.

Once this information was presented the public has begun to accept the fact that nitrogen based fertilizers have contributed to the contamination of the aquifer and to mobilization of the uranium.

Starting with the Water Supply Study completed in 1996, the development of this feasibility study utilized a technical support team including the Little Blue NRD, Upper Big Blue NRD, Adams County, Village of Juniata, Hastings Planning and Zoning, Hastings Utilities, and other City offices. In 2010, the Wellhead Protection Committee was formed utilizing a similar technical team including representatives from the local colleges and University of Nebraska – Lincoln Extension Service to provide information on agricultural practices and environmental impacts.

During the development of the Wellhead Protection Plan and the Hastings Wellhead Nitrogen Management Plan, the public was invited to several public hearings. In addition, public training was organized on several occasions by the local NRDs to implement the Hastings Wellhead Nitrogen Management Plan and the Hastings ASR Project was presented and discussed.

The City Council, Board of Public Works, and City of Hastings Planning and Zoning Commission have had several opportunities to review and discuss the various feasibility studies and to address the costs associated with this project. The City Council and the Board of Public Works meetings are televised on the local public service channel.

In the design of the water storage facility, JEO Consulting Group conducted interviews with several members of the public representing various civic groups. (See attached Stakeholder Report.) To help educate the public on the Hastings ASR Project a brochure was developed to showcase the project. (See attached Hastings Fact Sheet.) In addition to contacting the various civic groups JEO contacted the adjacent property ownership to determine if they had any concerns. Issues of fencing, landscaping, and other issues were addressed in the design of the water storage facility.

The Little Blue and Upper Big Blue NRDs have not only provided technical assistance but have provided financial support. In discussions with the respective NRD Boards and their staff, in part, their support for the ASR Project is due to the potential for cost saving as compared to conventional treatment. Both the Little Blue and Upper Big Blue NRDs have several smaller communities that could benefit from the technology that is being developed by this project.

Discussions are ongoing with the NRDs to try and best manage the contamination and to protect those areas that groundwater is being used for potable supply. These activities will support the development of the Little Blue River Basin Water Management Plan.