

FOA: BOR-DO-19-F006

WaterSMART: Water Marketing Strategy Grants for
Fiscal Year 2019



City of Garden City
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Technical Proposal

Executive Summary

The City of Garden City, Kansas is the county-seat of Finney County, Kansas and the economic hub of southwest Kansas. Historically, the area has been home to agricultural, animal feeding, and animal processing operations. Over the past decade, the City has experienced a major increase in the manufacturing and industry sectors. Recent growth includes the construction of a Dairy Farmers of America (DFA) milk drying facility and a Transload Facility. This development, and the opportunities it has created, has placed Garden City in the forefront of economic growth in the region. This growth has resulted in the need to increase the City's raw water supply.

In 2017, the City consumed approximately 6,000 acre-feet of water for municipal and industrial purposes; however, that is only a small fraction of the total water consumed in Finney County. Overall, Finney County is the highest water using county in Kansas with over 568,000 acre-feet authorized (over 93-percent of which is allocated for agricultural irrigation). Agriculture and ranching is big business in Finney County.

Garden City is a community that relies 100-percent on groundwater, and its source for water supply is the High Plains Aquifer (specifically the Ogallala Aquifer). The Ogallala Aquifer underlies all of Finney County and is the largest and most economically-important water source for western and south-central Kansas. The area surrounding the City has some of the highest-intensity groundwater use in the nation. This water use, combined with low natural recharge to the aquifer, has created large declines in groundwater levels throughout Finney County.

Groundwater levels in the Ogallala Aquifer have declined, on average, 70 feet from pre-development to 2007 due to extensive and unsustainable groundwater pumping. This presents a real threat to the continued economic health of western Kansas, and particularly Garden City. Near Garden City, the saturated thickness of the aquifer has declined by 30 to 45 percent of its original pre-development thickness.

In addition to reduced aquifer thickness, changes in groundwater quality have also begun to negatively impact the regional water supply. These water quality changes include increased salinity and increased levels of radionuclides and uranium. This decline in water quality is observed in the City and in other nearby communities with wells that are located near the Arkansas River and is correlated to infiltration of poor-quality river water into the aquifer. One of these communities, the City of Lakin, recently constructed a nanofiltration water treatment facility due to the presence of uranium in its groundwater.

The region is at a crossroads and remains in a precarious position when it comes to water supply. Aquifer levels are dropping, and quality is becoming worse. The water supply problem in Garden City and Finney County cannot be more immediate. Every day, citizens in Finney County live with the reality that future generations will look at Garden City and western Kansas as an afterthought unless something is done *now* to better manage water supplies. Every drop of water saved in the Ogallala Aquifer now can serve future generations and economic sustainability.

One immediate opportunity for implementing water savings for the region is the recent construction of the DFA milk drying facility in Garden City. This facility produces up to 1 million gallons per day (MGD) of wastewater effluent. In effect, this is a “new” source of water for Garden City. When combined with wastewater effluent from the City’s municipal wastewater treatment plant, the City has a substantial opportunity to save water in the Ogallala Aquifer for the future use by implementing a wastewater reuse program that utilizes the water from both the DFA facility and the City’s municipal wastewater treatment plant.

Recent planning efforts have led the City down the path of evaluating the beneficial use of wastewater effluent – both effluent from the DFA facility as well as expanded use of municipal WWTP effluent. The City recently completed a Reclamation Title XVI Feasibility Study that evaluated technical alternatives for use of wastewater effluent. This study, funded in part by the Bureau of Reclamation, made recommendations for both short-term and long-term wastewater reuse. Using wastewater for industrial purposes was deemed the most prudent and cost-effective option in the short-term; however, the concept of indirect potable reuse via aquifer storage and recovery (ASR) has incredible merit as a long-term goal.

Based on the results of the feasibility study, the next logical step is to develop a Water Marketing Strategy Plan. This plan will formally identify potential users of wastewater effluent and develop a rate structure for the purchase of this new supply. Actively marketing the City’s water resources could lead to economic growth and increased longevity of groundwater resources in the region. Further, exploring the viability and marketability of indirect potable reuse via ASR will bring the City and region one step closer to long-term water supply reliability.

The objective of the proposed work is to develop a Water Marketing Strategy Plan (Plan) that will be used by the City of Garden City. Water Marketing involves water right transactions and/or voluntary agreements governing water rights, water use, or water management. The proposed Plan will be developed as follows:

1. Conduct water marketing activities (actively market the City’s wastewater effluent resources to Stakeholders, and Stakeholders actively market their water resources)
 - a. Identify potential users of wastewater effluent, develop a rate structure for the purchased of treated wastewater effluent, and enter into memorandums of understanding (MOU) and/or agreements with users of wastewater effluent;
 - b. Identify opportunities for trading/purchase of Stakeholder owned water rights in exchange for wastewater effluent; and
 - c. Identify opportunities for trading/purchase of Stakeholder owned water rights in exchange for other Stakeholder owned water rights.
2. Explore the potential to develop and implement a new water market
 - a. Define the water marked for Indirect Potable Reuse via Aquifer Storage and Recovery (IPR via ASR) in Finney County, specifically in the vicinity of Garden City.

Background Data

Background

The City of Garden City, Kansas is a first-class city and the county-seat of Finney County, Kansas. The City has a population of approximately 31,000, requiring a peak water demand of 13

MGD, and serves as a regional hub for services, shopping, and healthcare services in Western Kansas. Historically, the area has been home to numerous animal feeding and processing operations. The City has experienced major growth in manufacturing and industry over the past decade, specifically in the energy and transportation sector including a 100 million gallon per year (MGY) ethanol plant and large facility that stages wind turbines and towers for rail to truck transfer. Recently, DFA constructed a large milk drying facility to create milk powder for domestic and export use in the food industry. The construction of this facility is driving efforts to find effective and beneficial effluent re-use methods. As part of the development agreement, the City has purchased exclusive access to the effluent water produced by the milk drying process. Further, the City was selected by the State of Kansas for a Transload Facility. This created an additional rail spur and set aside acreage for the development of Garden City Industrial Park (an area of future industrial growth with a more significant water demand).

In 2017, the City consumed approximately 6,000 acre-feet of water for municipal and industrial purposes; however, that is only a small fraction of the total water consumed in Finney County. Many local industries have their own wells and water rights outside of those owned by the City, and agricultural irrigation makes up the majority of water consumption in the county. Overall, Finney County is the highest water using county in Kansas, with over 568,000 acre-feet authorized (over 93-percent of that is authorized for agricultural irrigation).

In 2017, the total calculated economic output of the agricultural industry in Finney County was approximately \$2.7 billion and supported nearly 7,000 jobs (KDA, 2017). The largest of these agricultural industries include crop and livestock production, dairy, ethanol, beef and dairy processing. The economic viability of the entire state of Kansas, and specifically Finney County, is underpinned by water supplied by the Ogallala Aquifer.

Over the past ten (10) years, actual water use in Finney County is trending downward, and the City is leading the charge. The issue at hand is not solely related to water conservation – the citizens of Garden City and Finney County understand the importance of water. The long-term viability of the region will depend on improved management of existing water sources as well as stakeholders working together to develop a robust water market.

Water Supply

Garden City is a community that currently relies 100 percent on groundwater as its source for water supply. The City pumps groundwater from three well fields and a total of 17 wells. The total appropriated water rights for these wells is 9,878.8 acre-feet per year; however, the City is only permitted to use up to 7,010 acre-feet per year as determined by the Chief Engineer / Division of Water Resources. In recent years, the City has pumped approximately 6,000 acre-feet per year. The City water delivery system consists of 172 miles of water main serving 8,761 service connections. Total water delivery in 2018 was 5,919 acre feet. The City also purchased an additional 1,302.9 acre feet from Wheatland Electrical Cooperative, Inc.

In addition to groundwater resources, the City has two unique sources of water that have the potential to augment groundwater: wastewater effluent from the recently constructed Dairy Farmers of America (DFA) facility and wastewater from the City's wastewater treatment facility (WWTF). The DFA facility produces between 0.6 to 1.0 MGD of wastewater effluent of which the full amount is available to the City for reuse applications. The City's WWTF produces approximately 2.5 MGD of effluent.

The area surrounding the City has some of the highest-intensity groundwater use in the State and nation, as shown in *Figure 1 (Kansas Geological Survey (KGS), 2012)*. This water use, combined with low relative rate of recharge, has created large declines in groundwater levels within the primary regional water supply, the Ogallala Aquifer. The Ogallala Aquifer underlies the City and is the largest, most economically-important water source for western and south-central Kansas. As shown in *Figure 2*, groundwater levels in the Ogallala Aquifer have declined, on average, 70 feet from pre-development to 2007 due to extensive and unsustainable groundwater pumping. This presents a real threat to the continued economic health of western Kansas (*Kansas Water Office (KWO), 2014*), and particularly Garden City. Near Garden City, the saturated thickness of the aquifer has declined by 30 to 45 percent of its original pre-development thickness as shown in *Figure 3 (Buchanan, 2015)*.

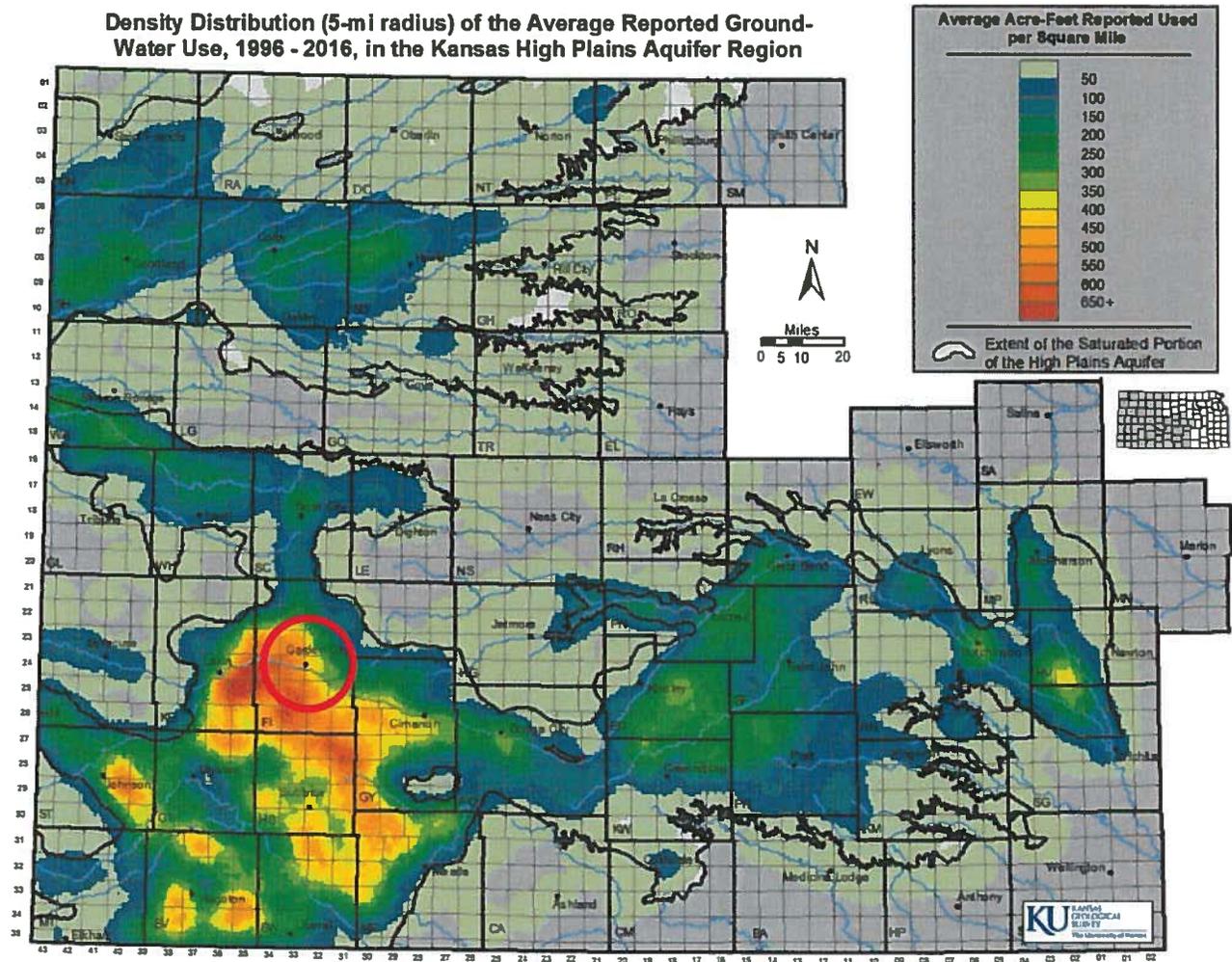


Figure 1: Groundwater use in the Kansas High Plains Aquifer Region (KGS, 2012)

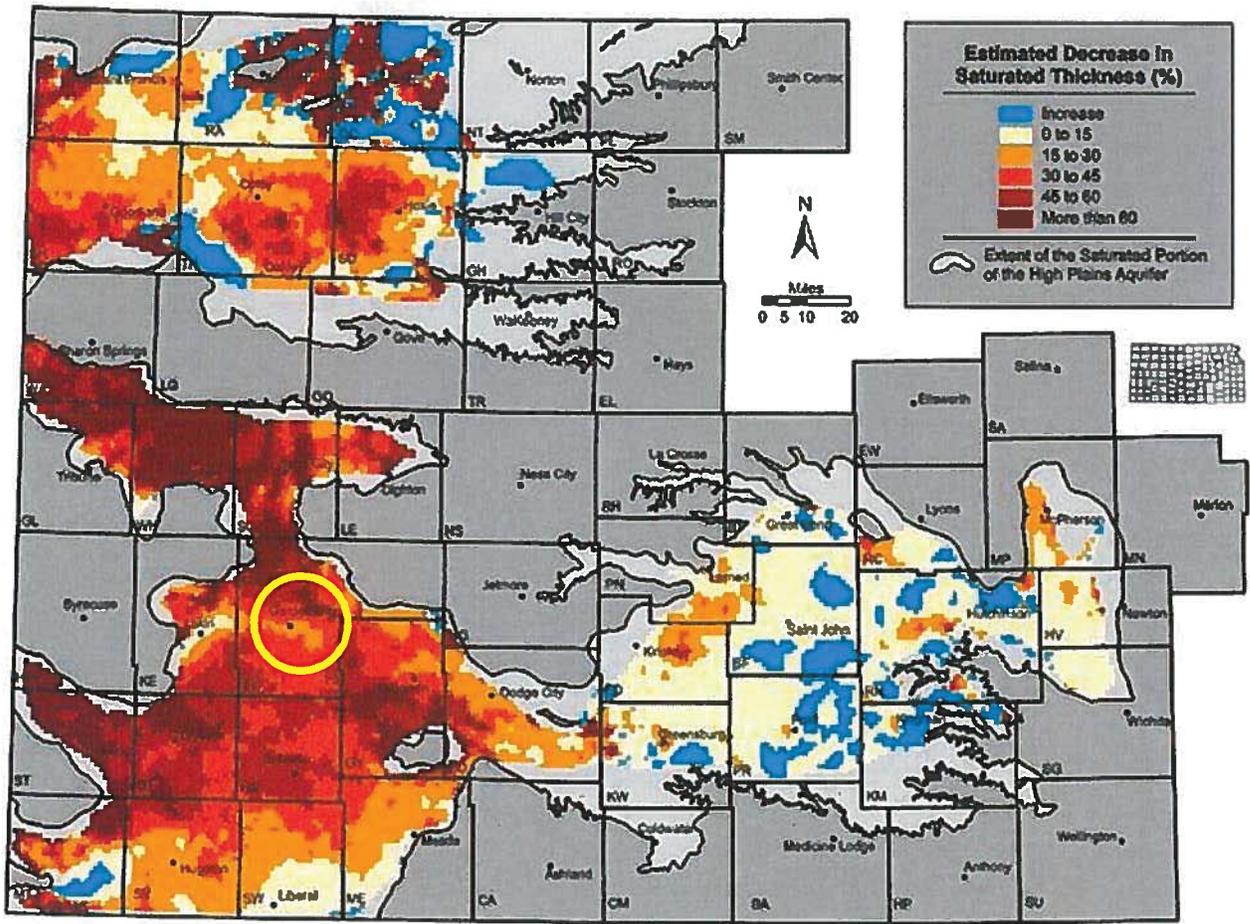


Figure 2: Percent Change in Saturated Thickness for the High Plains Aquifer

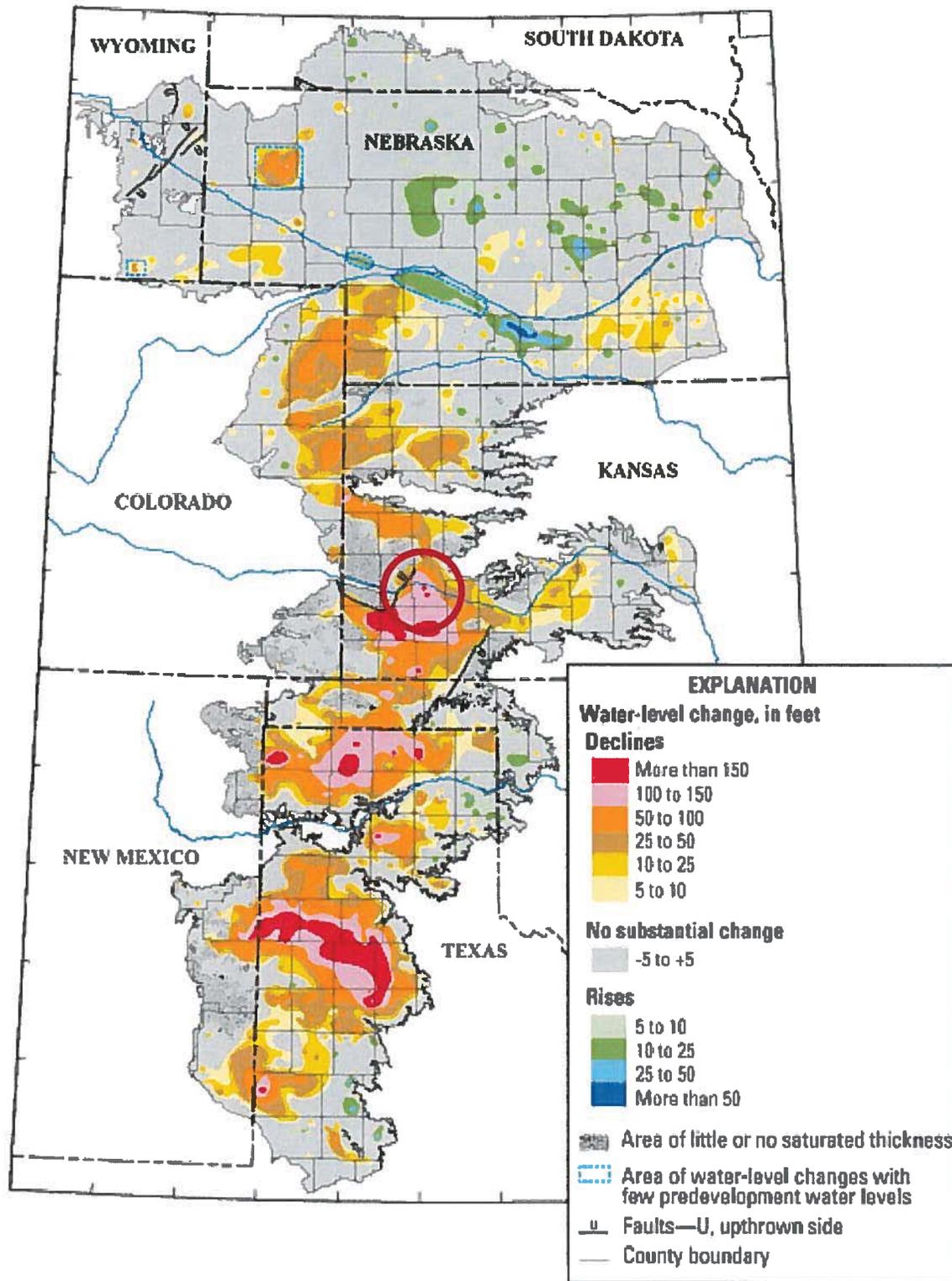


Figure 3: Water-level changes in the High Plains Aquifer (McGuire, 2017)

In addition to reduced aquifer thickness, changes in groundwater quality have also begun to negatively impact the regional water supply. These water quality changes include increased salinity and increased levels of radionuclides and uranium. This decline in water quality is observed in the City and in other nearby communities with wells that are located near the Arkansas River and is correlated to infiltration of poor-quality river water into the aquifer. One of these communities, the City of Lakin, recently constructed a nanofiltration water treatment facility due to the presence of uranium in its groundwater.

Water quality issues make the area sensitive to future growth and may interfere with meeting near-term demands. Quality issues include excessive levels of sulfates, selenium, and uranium (*Figure 5*). These quality issues may impact the ability of smaller, neighboring communities to provide water that meets Safe Drinking Water Act Standards, which will necessitate the need for wastewater reuse options for Garden City to provide a source of supply, if necessary.

Sulfate Concentration for the High Plains Aquifer in the Upper Arkansas River Corridor in Southwest Kansas

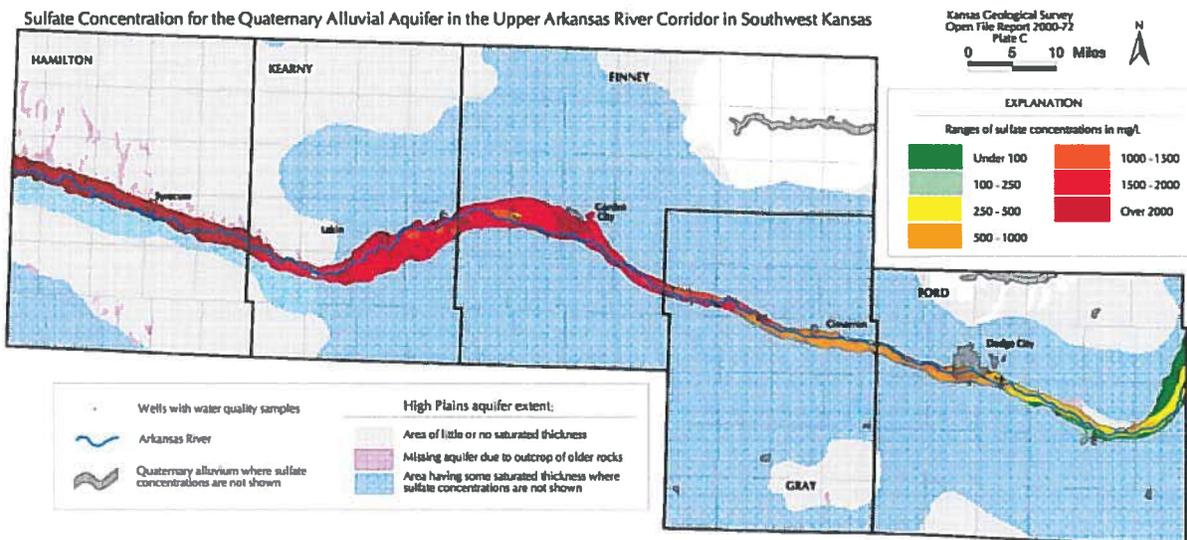
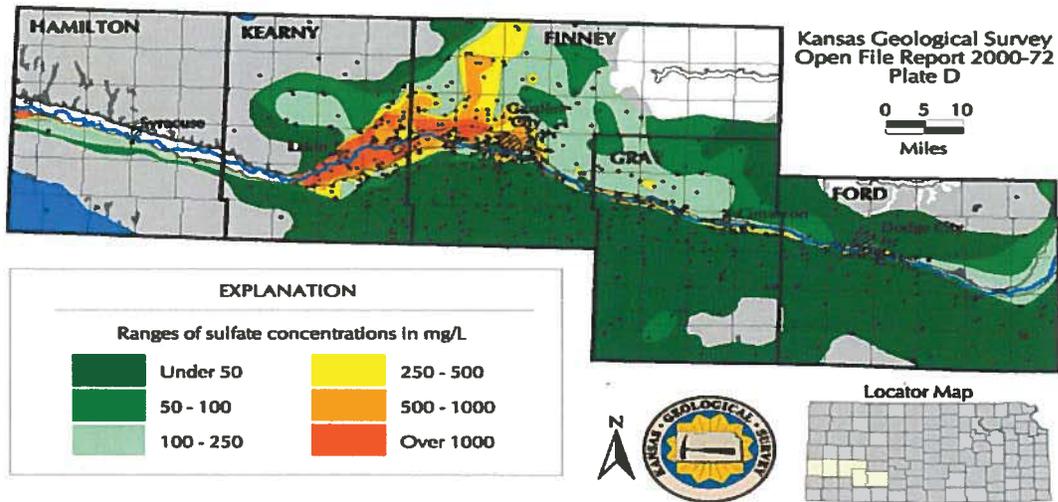


Figure 5: Water quality issues in western Kansas.

“The Arkansas River in western Kansas is among the most saline in the country.....Data from the U.S. Geological Survey and the Kansas Geological Survey (KGS) show uranium concentrations in the river during saline low flows generally exceeding the Environmental Protection Agency (EPA) drinking water standards. The dissolved concentrations of uranium are well correlated with sodium, sulfate, and chloride concentrations. In general, selenium and uranium concentrations increase with increasing salinity of the surface and ground waters. Just as the primary source of the sulfate in the waters is natural (leaching of rocks and soils), the primary source of the uranium is natural. However, the high concentrations of both sulfate and uranium in the Arkansas River surface water and ground water affected by the river are not natural but the result of the evapotranspiration consumption of water in Colorado, leaving the residual salts dissolved in a much smaller volume of water. The saline water from the Arkansas River seeps into the subsurface alluvial aquifer and then the Ogallala-High Plains aquifer in Kansas, thereby contaminating the ground water with high sulfate and uranium concentrations.” – 2009 Kansas State Water Plan.

Regional Planning

Garden City is centered in the heart of the Upper Arkansas (River) Regional Planning Area. This significant resource area is one of the 14 regional planning areas in the State that were established in 2014 by the Kansas Water Authority, in conjunction with the Long-Term Vision for the Future of Water Supply in Kansas. In 2015, Regional Advisory Committee (RAC) members were approved for each of these 14 planning areas and began to establish priority goals for each region. The City of Garden City is represented on this committee, which has established its priority regional goals as well as completed the development of [Regional Goal Action Plans \(Figure 4\)](#). These goals and action plans are representative of the collaborative effort of diverse stakeholders along the Arkansas River and within the surrounding watershed on water quality and quantity issues.

- 1. Extend the usable lifetime of the Ogallala Aquifer for at least 25 years in the planning region through the promotion of multiple Local Enhanced Management Areas (LEMAs), Water Conservation Areas (WCAs) and other incentive-based programs. Slow the depletion of the Ogallala Aquifer by 25% in 10 years in the planning region maximizing the opportunity to make use of emerging technologies. Encourage conservation through added flexibility. Find additional sources of water and a place to store water for irrigation and recharge. Increase the opportunity to use wastewater for other beneficial uses. Increase education of aquifer conditions.**
- 2. By 2020, continue to re-establish and maintain flows along the Upper Arkansas River in the amount of one cubic feet per second at the USGS gage located at Dodge City for 100% of Kansas’ share of compact water and a quantified share of high flows that is currently stored in Colorado that is over and above the compact amount through management of river flows and maintenance of open channel conveyance through 100% of tamarisk control. Ensure we maintain compact compliance and enforce the compact when necessary.**
- 3. Maximize available water and promote conservation of municipal use through incentives, education and outreach, reduced water loss, and increased data availability to reduce gallons per capita per day usage.**
- 4. Maximize available water and promote conservation of industrial use through incentives, education and outreach, benchmarking efforts, and increased data availability to reduce gallons per production unit usage.**

Figure 4: The Upper Arkansas RAC goals and action plans were developed collaboratively with watershed interests representing public water supply, agriculture, dairy, surface water irrigation, groundwater irrigation, industry/commerce, conservation and environment, groundwater management, and the public at large.

Garden City recognizes the need for a watershed-based approach that not only manages existing resources but outlines long-term solutions as well. Water reuse opportunities will help expand the water supply portfolio for the City and will aid in achieving the regional goals of decreasing overall dependency on declining groundwater resources. This is a watershed-wide, regional-wide piece of the solution for the declining aquifer.

According to the Bureau of Reclamation Study, *Upper Arkansas River Basin Public Water Supply Alternatives Viability Analysis: Water Supply Alternatives for Hamilton, Kearny, and Finney Counties, Kansas*, regional water supply opportunities may exist for Garden City to supply water to neighboring communities for future sustainability related to water quality and quantity.

Listed as some of the top 150 water users of the Ogallala Aquifer in Kansas in a report published by the Kansas Leadership Center, these stakeholders are committed to identifying opportunities to collectively commit to a sustainable and resilient Finney County.

Figure 5. Cumulative Reported Water Use in Acre-Feet (2005-2017) for Finney County Research Community Members. Rank indicates the quantity of reported water use compared to all reporting users in the High Plains – Ogallala Aquifer in Kansas (Dillon, 2018).

Rank	Entity	Cumulative Reported Water Use in Acre-Feet (2005-2017)
1	Wheatland Electric Cooperative, Inc	384,136
2	The Garden City Company	244,879
5	Tyson Fresh Meats, Inc	164,669
23	Brookover Land Enterprises	73,778
31	City of Garden City	64,596

A collaborative, innovative, and sustainable approach to using water resources in Finney County is paramount to the long-term viability of the region. The City of Garden City, and the rest of the regional stakeholders, are firmly dependent on the Ogallala Aquifer; however, Garden City has two available wastewater effluent resources for beneficial use: DFA effluent and City WWTP effluent.

Nexus with Reclamation

The City is continuing discussions and planning efforts related to the reuse of wastewater effluent with the goal to realize a water reuse and reclamation project to reduce groundwater pumping demand on the Ogallala Aquifer. Through a Bureau of Reclamation (BOR) grant titled *WaterSMART: Development of Feasibility Studies under the Title XVI Water Reclamation and Reuse Program for Fiscal Year 2017 (Title XVI)*, the City (the non-Federal project sponsor) was able to identify and commit to the success of the most plausible water reuse project.

The Title XVI Feasibility Study evaluated four water reuse alternatives in which the combined effluent from the City’s WWTP and the DFA facility is used to supply water to meet anticipated shortages. Water reuse at this scale can reduce groundwater pumping up to 6,000 acre-feet per year (AFY) and provide a reliable augmented water source as seasonal fluctuations of WWTP effluent are typically minimal. The beneficial impact to the aquifer in the form of leaving groundwater in storage and the associated rise in groundwater elevation is quantified by studying aquifer properties and

hydrogeological data. The feasibility study also reviewed existing water rights information and assessed the regulatory feasibility of projects such as reuse of wastewater for industrial reuse, irrigation, indirect potable reuse (IPR) system, or Direct Potable Reuse (DPR).

Based on the results of the BOR funded Feasibility Study, the City has determined that it has two options for the use of their wastewater effluent resources:

- Short-term: Sell the effluent for industrial, commercial, or agricultural reuse
- Long-term: IPR system consisting of aquifer storage and recovery (ASR).

Project Location

The project will be located in Finney County, Kansas. Garden City, Kansas is the county seat and population center for the county. The project latitude and longitude is approximately 37°58'31"N, 100°51'51"W.



Figure 6. Location of Garden City, Kansas

Project Description and Milestones

The City of Garden City has placed itself on the forefront of water resource planning in the State of Kansas. It is well understood that water resources play a critical role in the long-term viability of the community and region, especially in an area with limited surface water and ground water.

Recent planning efforts have led the City down the path of evaluating the beneficial use of wastewater effluent – both effluent from the DFA facility as well as expanded use of municipal WWTP effluent. The City recently completed a feasibility study that evaluated technical alternatives for use of wastewater effluent. This study, funded in part by the Bureau of Reclamation, made recommendations for both short-term and long-term wastewater reuse. Using wastewater for industrial purposes was deemed the most prudent and cost-effective option in the short-term; however, the concept of indirect potable reuse via aquifer storage and recovery (ASR) has incredible merit as a long-term goal.

Based on the results of the feasibility study, the next logical step is to develop a Water Marketing Strategy Plan. This plan will formally identify potential users of wastewater effluent and develop a rate structure for the purchase of this new supply. Actively marketing the City's water resources could lead to economic growth and increased longevity of groundwater resources in the region. Further, exploring the viability and marketability of indirect potable reuse via ASR will bring the City and region one step closer to long-term water supply reliability.

Objective

The objective of the proposed work is to develop a Water Marketing Strategy Plan (Plan) that will be used by the City of Garden City. Water Marketing involves water right transactions and/or voluntary agreements governing water rights, water use, or water management. The proposed Plan will be developed as follows:

1. Conduct water marketing activities (actively market the City's wastewater effluent resources to Stakeholders, and Stakeholders actively market their water resources)
 - a. Identify potential users of wastewater effluent, develop a rate structure for the purchased of treated wastewater effluent, and enter into memorandums of understanding (MOU) and/or agreements with users of wastewater effluent;
 - b. Identify opportunities for trading/purchase of Stakeholder owned water rights in exchange for wastewater effluent; and
 - c. Identify opportunities for trading/purchase of Stakeholder owned water rights in exchange for other Stakeholder owned water rights.
2. Explore the potential to develop and implement a new water market
 - a. Define the water marked for Indirect Potable Reuse via Aquifer Storage and Recovery (IPR via ASR) in Finney County, specifically in the vicinity of Garden City.

Scope of Work

The proposed Scope of Work that will be performed to develop the Plan will include the following elements. For ease of review, the detailed Scope of Work is represented in bullet form. Key Milestones are indicated in **bold**.

This proposal is for Funding Group I.

1. Stakeholder Engagement
 - a. **Coordinate and facilitate multiple Stakeholder Meetings.** The following stakeholders will be included in the development of the Plan:
 - i. Potential Industrial Customers
 1. Bonanza Bioenergy
 2. Wheatland Electric
 3. Dairy Farmers of America (DFA)
 4. International Paper
 5. Garden City Industrial Park
 6. Other potential customers as identified by the City
 - ii. Economic, Social, Community, and Environmental Interests
 1. Finney County Economic Development Corporation
 2. Garden City Area Chamber of Commerce

3. Finney County Convention and Visitors Bureau
 4. Garden City Parks
 5. Garden City Recreation Commission
 6. Garden City Neighborhood and Development Services
 7. Garden City Public Utilities
- iii. Regulatory
1. Kansas Department of Health and Environment (KDHE)
 2. Groundwater Management District #3
 3. Kansas Department of Agriculture / Division of Water Resources (DWR)
 4. Kansas Water Office
2. Planning Activities
- a. **Formalize the consumptive use of the City's Wastewater Resources** (DFA and municipal Wastewater Treatment Plant (WWTP) effluent) with DWR. Develop a Memorandum of Understanding between the City and DWR.
 - b. Conduct water marketing activities associated with Industrial Reuse of the City's Wastewater Resources.
 - i. Evaluate Stakeholder interest, water quality needs, and projected water demands;
 - ii. Update conceptual design for treatment and conveyance of City's Wastewater Resources for use by Stakeholders;
 - iii. Update conceptual level opinions of probable construction cost;
 - iv. Develop conceptual level opinions of probable operation and maintenance costs;
 - v. Cash Flow and Rate Development
 1. Evaluate rate structure for reuse of City's Wastewater Resources for industrial purposes.
 - a. Identify level of revenue needed to adequately fund reuse costs (capital, operational, and maintenance) and meet key financial performance indicators such as reserve levels and debt service coverage.
 - b. Develop 5- to 10-year cash flow reflecting proposed revenues and revenue requirements.
 - c. Propose rates that reflect anticipated demand and funding needs.
 2. Evaluate the impact to the water utility based on decreased demand associated with reuse of City's Wastewater Resources for industrial purposes.
 - vi. **Develop example MOU (or similar document) for City to execute with users of City's Wastewater Resources.**
 - c. Explore the potential to develop a new water market associated with Indirect Potable Reuse via Aquifer Storage and Recovery (IPR via ASR) with City's Wastewater Resources.
 - i. Determine the quantity of wastewater effluent available for treatment and aquifer storage. Quantity will be based on effluent discharge rates and usage for industrial purposes.
 - ii. Determine which aquifer will provide the greatest benefit to the City for storage – Arkansas River Alluvium or High Plains Aquifer. This determination will be based on an evaluation of the geology and hydrogeology of each aquifer and how that impacts the infrastructure needed to implement

ASR. An additional consideration for this recommendation will be water rights and how the aquifer selected for recharge impacts the ability of the City to extract that recharge water.

- iii. Identify potential locations for IPR via ASR project. Evaluate up to five (5) potential project locations and develop a ranking system that will identify a preferred ASR site. The ranking system will include technical, permitting, and financial considerations.
 - iv. Identify potential conflicts/beneficiaries with other water users in the area.
 - 1. Identify permitted water users within a 2-mile radius of the preferred ASR site.
 - v. Evaluate methods for aquifer storage – injection wells or infiltration basins. Evaluation shall consist of a comparison of the number of injection wells needed versus the number of infiltration basins needed to recharge the full volume of reuse water from the IPR system. The evaluation will include technical, permitting, and financial considerations. Financial considerations will include estimated O&M over a 20-year operating period.
 - vi. Determine quantity and locations for aquifer storage infrastructure.
 - 1. Develop planning level estimate of basin size, number of injection wells, and number of extraction wells needed to recharge the volume of effluent not used for industrial purposes.
 - vii. Refine existing Kansas Geological Survey regional-scale groundwater model to estimate recharge rates, extraction rates, capture zones, and recovery percentages for a conceptual ASR system.
 - viii. Advance discussions with regulatory agencies regarding treatment technology and water right implications.
 - ix. Estimate quantities of recovered water available for beneficial use by City and other stakeholders.
 - x. Develop a conceptual design for treatment, conveyance, aquifer storage, and recovery of CLIENT’s Wastewater Resources.
 - xi. Develop order-of-magnitude level opinions of probable construction cost.
 - xii. Develop order-of-magnitude level opinions of probable operation and maintenance costs.
 - xiii. **Engage Stakeholders in discussions regarding the viability and marketability of ASR.**
- d. **Develop a recommendation for how the City and Stakeholders can best manage their wastewater resources.**
- i. Based on discussions with stakeholders, evaluate the opportunity for additional water markets associated with wastewater effluent, groundwater rights, and surface water rights.
 - ii. Evaluate the potential for trading/purchase of water amongst stakeholders.
 - iii. Evaluate the potential for the development of Water Conservation Areas (WCAs) or Local Enhanced Management Areas (LEMAs) within the framework of the water market.
- e. Analyze the economic, social, community, and environmental impacts of the new water markets.
- i. Based on input from stakeholders, identify the economic, social, community, and environmental impacts.

3. Develop a Water Marketing Strategy Document.

- a. The Document shall include the following:
 - i. Rate structure for utilizing City’s wastewater resources;
 - ii. Formal documents detailing stakeholder commitment to utilizing marketed wastewater resources;
 - iii. Additional water marketing opportunities; and
 - iv. Additional requirements set forth by the Bureau of Reclamation in Section C.4, Table 1 of Funding Opportunity Announcement No. BOR-DO-19-F006.

Evaluation Criteria

Evaluation Criterion A – Water Marketing Benefits

Will the water marketing strategy project address a specific water supply shortfall? What is the nature and severity of the shortfall, and which sectors are affected?

The High Plains Aquifer (specifically the Ogallala Aquifer) underlies the City and is the largest, most economically-important water source for western and south-central Kansas. As shown in *Figure 2*, groundwater levels in the Ogallala Aquifer have declined, on average, 70 feet from pre-development to 2007 due to extensive and unsustainable groundwater pumping. This presents a real threat to the continued economic health of western Kansas (*Kansas Water Office (KWO), 2014*), and particularly Garden City. Near Garden City, the saturated thickness of the aquifer has declined by 30 to 45 percent of its original pre-development thickness.

The water supply prognosis in western Kansas is precarious. The Denver Post found that the Ogallala Aquifer shrank twice as fast from 2011 to 2017 as it had over the previous 60 years. This reduction is caused by overpumping, poor resource management, drought, and climate change. The entire region, and specifically Garden City and Finney County, currently depends solely on the Ogallala for water supply. All sectors in the region are impacted by this rapidly depleting resource include municipal, industrial, agricultural, crop and livestock production, dairy, ethanol, beef and dairy processing, and associated industries.

How, and to what extent, will the market strategy activities address the shortfall?

While the aquifer is depleting, and water quality impacts related to this depletion are becoming evident, these impacts are not the same across the entirety of Finney County. Further, individual users of water have varying requirements when it comes to water quality.

The water market strategy activities will pair together Stakeholders with available supply based on seasonal availability and water quality. Water resources available are not solely groundwater. The City of Garden City has two additional sources of water that are untapped: wastewater effluent from the recently constructed Dairy Farmers of America facility as well as wastewater effluent from the City’s Wastewater Treatment Facility.

Developing a water market strategy that brings together Stakeholders and available water supplies will improve management of the Ogallala, reduce dependency on groundwater, extend the life of the Ogallala, and allow for continued economic viability of the entire region.

Will the market strategy activities benefit multiple sectors and/or types of water use?

The water market/water marketing strategy will benefit multiple economic sectors including municipal, industrial, agricultural, crop and livestock production, dairy, ethanol, beef and dairy processing, and associated industries. All of these sectors are active in Garden City and Finney County, and all of these sectors depend on the Ogallala Aquifer.

Per the Kansas Department of Agriculture, there are 499 farms accounting for 815,905 acres. There are 25 agriculture, food, and food processing sectors including oilseed farming, grain farming, vegetable and melon farming, beef cattle ranching and farming, dairy cattle and milk production, poultry and egg production, commercial logging, canned fruits and vegetable manufacturing, meat processing, breweries, fertilizer mixing, and many more. With the sole source of water being the Ogallala, each is impacted by the water marketing strategy.

How, and to what extent, will the proposed water market strategy activities improve water supply reliability in general in the area?

Reducing the likelihood of conflicts over water – by bringing multiple Stakeholders together to actively develop a water market for not only groundwater but surface water (Arkansas River) and wastewater effluent reuse (DFA facility and municipal wastewater effluent), conflicts associated with both short-term and long-term utilization of water resources will be significantly reduced. The only way to sustain the viability of Garden City, Finney County, and western Kansas is to work together to develop a water marketing solution that benefits all Stakeholders.

Increasing resiliency to drought – drought impacts Garden City and Finney County in multiple ways. In dry years, the dependence on groundwater for agriculture, ranching, and municipal uses increases significantly. Drought also reduces (or eliminates) flow in the Arkansas River which negatively impact natural aquifer recharge. By sharing resources, particularly wastewater reuse, dependency on groundwater will be significantly reduced.

Sustaining agricultural communities – the economy of Garden City and Finney County is directly tied to agriculture. Per the Kansas Department of Agriculture, agriculture, food, and food processing sectors sustain over 8,200 jobs in Finney County accounting for over \$3 billion in economic output. By improving water reliability as a result of water marketing, the economic driver of Garden City will be maintained.

Demonstrating a water marketing approach that is innovative and which may be applied by others – the concept of actively marketing both wastewater effluent and existing groundwater rights to benefit multiple Stakeholders will be a model for communities throughout the United States, particularly in the west. As existing water resources become scarcer, and as technology improves to a point that previously unusable water resources are now viable, more communities will actively explore regional marketing of wastewater effluent. As indicated in the numerous letters of support received for this grant application, this project has the ability to be a model of sustainability for the entire country.

Will implementation of water market strategy activities be ready to proceed upon completion of the strategy?

Describe plans and timeline for implementing the strategy upon its completion – the Water Marketing Strategy will be implemented immediately upon its completion. By bringing Stakeholders to the table to

help frame the development of the Plan, buy-in will be achieved throughout development of the Plan; therefore, recommendations will be supported and implemented.

Are there complex issues that would need to be resolved before the strategy could be implemented – there are complex issues that need to be vetted, and we proposed to resolve those issues during development of the strategy; however, the results of the vetting process will directly impact how water will be marketed. For instance, the Kansas Department of Water Resources (DWR) has indicated that the use of wastewater effluent is not an increase of the City’s consumptive use. This would indicate the City could utilize 100-percent of wastewater effluent for reuse purposes. While preliminary discussions have been held with DWR, it is our intent to formalize the consumptive use; however, should there be a change in DWR’s interpretation of statute, we will vet that during development of the water marketing strategy, and the resulting recommendations would reflect any determination by DWR.

Previous planning, outreach and/or water marketing activities – the City of Garden City recently completed a Title XVI Feasibility Study for wastewater reuse. In that Study, technical alternatives were evaluated, and preliminary discussions were held with state regulatory agencies regarding the feasibility of identified alternatives. The previous work will be used as a jumping off point for development of the Water Marketing Strategy. Complex issues, such as the determination of consumptive use of wastewater effluent, have been preliminarily evaluated. This will allow for the immediate implementation of the Strategy.

Evaluation Criterion B – Level of Stakeholder Support and Involvement

The proposed planning process will be inclusive and incorporate input from a wide range of stakeholders. The following stakeholders will partake in this process:

1. Potential Industrial Customers
 - a. Bonanza Bioenergy
 - b. Wheatland Electric
 - c. Dairy Farmers of America (DFA)
 - d. International Paper
 - e. Garden City Industrial Park
 - f. Other potential customers as identified by the City
2. Economic, Social, Community, and Environmental Interests
 - a. Finney County Economic Development Corporation
 - b. Garden City Area Chamber of Commerce
 - c. Finney County Convention and Visitors Bureau
 - d. Garden City Parks
 - e. Garden City Recreation Commission
 - f. Garden City Neighborhood and Development Services
 - g. Garden City Public Utilities
3. Regulatory, Environmental, and Agricultural
 - a. Kansas Department of Health and Environment (KDHE)
 - b. Groundwater Management District #3
 - c. Kansas Department of Agriculture / Division of Water Resources (DWR)
 - d. Kansas Water Office

The planning effort will not duplicate any ongoing, or completed, planning efforts. This effort will be the first to bring together stakeholders from various sectors throughout Finney County to better manage and market water resources.

With over 16 stakeholders, and with interests ranging from municipal to agricultural to regulatory, all sectors with a reliance on water will be at the table during the development of the Plan.

Eight letters of support have been received thus far, with multiple other letters currently being developed. See Exhibit B. The support for this Plan is overwhelming, and the result will be a workable Plan that takes multiple stakeholder’s interests into mind.

There is no opposition to the Plan.

To ensure stakeholder participation, the City of Garden City, Kansas will contact each anticipated stakeholder individually to gauge interest in participation. In discussions with known stakeholders, additional stakeholders will be identified during the first few months after award. Any new stakeholders will be contacted directly by the City. Contact will be made via telephone and email until contact is made.

Key stakeholder interests in the planning area include municipal government, industrial, ethanol production, milk drying, agriculture, ranching, and other economic development.

The City has kept their congressional delegation apprised of this grant application. The City’s delegation will be reaching out to Reclamation to express their support.

Evaluation Criterion C – Ability to Meet Program Requirements

Describe how the three required project components will be addressed within the required timeframe – we are proposing for Funding Group I which requires project completion within 2 years. The schedule shown below represents all major tasks, milestones, and dates.

Should Garden City be awarded this project, our previous working relationship with Reclamation, including our ability to maintain schedule, should be strongly considered. Those tasks show below in blue represent milestones.

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Stakeholder Engagement																		
Stakeholder Meetings																		
Planning Activities																		
Formalize Consumptive Use																		
Conduct Water Marketing Activities																		
Develop MOU																		
Explore New Water Market																		
Recommendation for Management of Water Resources																		
Analyze Impacts of New Water Market																		
Develop Water Marketing Strategy Document																		
DRAFT Report Submission to Reclamation																		
FINAL Report Submission to Reclamation																		
Reclamation Coordination																		

Figure 7. Project Schedule.

Describe availability and quality of existing data and models applicable to the proposed water marketing strategy - Extensive groundwater datasets are available to complete the analyses required for the water marketing strategy presented in our proposals. The datasets are available primarily through the Kansas Geological Survey (KGS) and include information on both water quality and water quantity. Additionally, in 2012 the KGS developed a regional scale groundwater flow model for Southwest Kansas that includes all of Ground Water Management District No. 3, which includes Garden City. This regional scale model will be used as the parent model for development of a more localized groundwater model that will be used to support the proposed water marketing strategy.

Identify staff with appropriate technical expertise and describe their qualifications – The main point of contact between Reclamation and Garden City will be Fred Jones. Fred is the Water Resource Manager for the City of Garden City, Kansas. His duties include the overall management of the City's Water, Wastewater, and Water Reuse utilities; providing service to a residential community of 32,000 that is the regional trading hub of Southwest Kansas. Before his tenure in Garden City, Fred was the City Administrator for the City of Lakin, Kansas and coordinated to construct the first treatment plant in the State of Kansas designed for the specific removal of Uranium from groundwater. In addition to his duties with the City, he serves as the Vice-President of Southwest Kansas Groundwater Management District 3, Chairman of the Upper Arkansas Regional Advisory Committee, and serves on the KsAWWA Operator Training Committee. Fred is a Class IV Drinking Water Operator as certified by KDHE.

Garden City will be contracting with an A/E firm to facilitate Stakeholder engagement and perform the technical elements of the study. Brief biographies of key staff are included below.

Project Manager – Experience working with Reclamation, and on projects funded in part by Reclamation, will be an important selection criterion for the Project Manager. Further, experience in developing and implementing water supply solutions in Kansas will be stressed.

Stakeholder Engagement – The Stakeholder Engagement role will be filled by an individual(s) with significant experience with stakeholder engagement from nearly every sector across the State of Kansas.

Cash Flow and Rate Development – An individual(s) focusing on financial consulting for water, wastewater, and stormwater systems will be preferred. The breadth of engagement should include financial planning, cost of service, and rate design, system development charges, utility valuation, depreciation analysis, and economic modeling. Experience in understanding of business operations and economic modeling skills will be a plus. Also, the selected individual should have experience facilitating large and small workshops and presented study results effectively to decision makers and stakeholders.

Water Rights, Modeling, and Regulatory Coordination – Experience in the environmental and water supply industries, focusing on water rights consulting, development of groundwater resources, aquifer evaluations, and water resource planning will be required traits. Further, the development of regional scale groundwater models for state agencies and experience developing and using groundwater flow models to solve complex water problems will be required. Experiences shall also include planning and design of an Aquifer Storage and Recovery systems in the High Plains Aquifer.

Pilot activities – no piloting activities will be performed.

Evaluation Criterion D – Department of the Interior Priorities

Creating a conservation stewardship legacy second only to Teddy Roosevelt – the proposed project will be utilizing science (e.g. water modeling and water treatment) to better manage water resources. We will be finding ways to use the scarce water resources in the region for beneficial purposes. Further, by bringing multiple Stakeholders together to develop the Plan, relationships with conservation minded organizations (the City of Garden City, Reclamation, Groundwater Management District. 3, Kansas Water Office, and Kansas Department of Water Resources) will improve our collective ability to reach the goal of better water management.

Utilizing our natural resources – in southwest Kansas, and specifically Finney County, water plays a critical role in the economy. Local users of water include utilities, mining & quarrying, and ranching. In Finney County, the highest paying industries are Utilities (\$74,522) and Mining & Quarrying (\$69,219), per Data USA. Compared to other counties, Finney County has an unusually high number of residents working in Farming, Fishing, & Forestry Occupations (4.49 times higher than average), and Material Moving Occupations (2.05 times higher than average).

Restoring a trust with local communities – Reclamation and Garden City have forged a tremendous working relationship over the past 5 years, and discussions continue to this day. Reclamation staff has made a concerted effort towards discussing ideas and concepts with Garden City. Reclamation’s involvement in this water marketing effort will further solidify relationships with key Stakeholders including officials in the State of Kansas, the Kansas Water Office (led by a Governor appointee), the Kansas Department of Water Resources, Groundwater Management Districts, elected officials, and local communities.

Striking a regulatory balance – one of the objectives of developing the Water Market Plan is to optimize the regulatory framework (water rights and consumptive use of wastewater for beneficial purposes) surrounding the proposed water market. By doing this, the administrative and regulatory burden imposed on Garden City, and its local industries, will be reduced. The City of Garden City has also been actively engaged with the Kansas Department of Health and Environment to update wastewater reuse standards.

Modernizing our infrastructure – Executive Order 13834, titled “Efficient Federal Operations”, encourages public-private partnerships to advanced Federal energy and water efficiency. The proposed water market will bring together Stakeholders from various interests including private companies, public companies, and government organizations. The partnerships developed amongst these Stakeholder, both public and private, will benefit the entire region. By modernizing water marketing opportunities in southwest Kansas, infrastructure improvement will rapidly follow.

Project Budget

Funding Plan

All non-Federal funding will be provided directly by the City of Garden City, Kansas. No funding requests have been made, or will be received, from other Federal partners. Reclamation is the only source of Federal funding.

There are no pending funding requests.

The City’s contribution to the cost-share requirement will be monetary. The source of these funds will be from the City’s Operating Budget under the “Engineering” line item. There are adequate funds available.

Project expenditures have not, and will not, occur prior to the Award date.

Budget Proposal

Total Project Cost Table

SOURCE	AMOUNT
Costs to be reimbursed with the requested Federal funding	\$139,900
Costs to be paid by the applicant	\$139,900
Value of third-party contributions	\$0
TOTAL PROJECT COST	\$279,800

Budget Proposal Table

Budget Item Description	Computation		Quantity Type (hours/days)	Total Cost
	\$/Unit	Quantity		
Salaries and Wages				
N/A	-	-	-	-
Fringe Benefits				
N/A	-	-	-	-
Travel				
N/A	-	-	-	-
Equipment				
N/A	-	-	-	-
Materials/Supplies				
N/A	-	-	-	-
Contractual/Construction				
A/E Firm	\$279,800	1	Hourly not to exceed	\$279,800
Third-Party In-Kind Contributions				
N/A	-	-	-	-
Other				
N/A	-	-	-	-
Total Direct Costs				\$279,800
Indirect Costs				\$0
Total Project Costs				\$279,800

Budget Narrative

Salaries and Wages

No specific funds associated with the salary and wages of the Garden City program manager, Fred Jones, will be allocated to this project. His salary and wages will be paid directly to him separate from this agreement. Therefore, for the purpose of the Project Budget, these items are negligible.

Fringe Benefits

No specific funds associated with the fringe benefits of the Garden City program manager, Fred Jones, will be allocated to this project. His fringe benefits will be paid directly to him separate from this agreement. Therefore, for the purpose of the Project Budget, these items are negligible.

Travel

No travel is anticipated.

Equipment

No equipment is anticipated.

Materials and Supplies

No materials or supplies are anticipated.

Contractual

The City of Garden City, Kansas will be contracting with an Architectural/Engineering firm to perform the tasks outline in the table below. Procurement will follow 2 CFR 200.320(d) – Procurement by competitive proposals. Information provided below reflects the general project budget associated with development of the Water Marketing Plan as referenced in this application.

Expenses are associated with travel.

Task No.	Task Name	Task Cost	Estimated Hours	Avg. Contractual Billing Rate	Expenses
1	Project Meetings & Site Visits	\$18,300	68	\$238	\$2,150
2	Stakeholder Engagement	\$27,300	104	\$234	\$2,990
3	Planning Activities	\$179,700	854	\$210	\$260
4	Document Development	\$30,400	152	\$200	\$0
5	QA/QC	\$9,300	40	\$233	\$0
6	Project Management	\$14,800	64	\$231	\$0
TOTAL		\$279,800	1282	\$214	\$5,400

Third-Party In-Kind Contributions

No Third-Party In-Kind Contributions are anticipated.

Environmental and Regulatory Compliance Costs

Environmental and Regulatory Compliance Costs are not applicable.

Other Expenses

No Other Expenses are anticipated.

Indirect Costs

No Indirect Costs are anticipated.

Environmental and Cultural Resources Compliance

Will the proposed project impact the surrounding environment? Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.

Are you aware of any species listed or proposed to be listed as a Federal threatened or endangered species, or designated critical habitat in the project area?

No.

Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as "Waters of the United States?" If so, please describe and estimate any impacts the proposed project may have.

Yes. The Arkansas River is qualified as a Water of the United States. There will be no impact to the Arkansas River as a result of this project.

When was the water delivery system constructed?

Parts of the water conveyance system were constructed as far back as the 1930s; however, there will be no impact to the existing conveyance system as a result of this project.

Will the proposed project result in any modification of or effects to, individual features of an irrigation system?

No.

Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places?

Not applicable as there are no impacts to irrigation districts as a result of this project.

Are there any known archeological sites in the proposed project area?

No.

Will the proposed project have a disproportionately high and adverse effect on low income or minority populations?

No.

Will the proposed project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?

No.

Will the proposed project contribute to the introduction, continue existence, or spread of noxious weeds or non-native invasive species known to occur in the area?

No.

Required Permits or Approvals

No permits or approvals are required in order to complete the Water Marketing activities.

Existing Analysis Contributing to the Water Marketing Strategy

Extensive groundwater datasets are available to complete the analyses required for the water marketing strategy presented in our proposals. The datasets are available primarily through the Kansas Geological Survey (KGS) and include information on both water quality and water quantity. Additionally, in 2012 the KGS developed a regional scale groundwater flow model for Southwest Kansas that includes all of Ground Water Management District No. 3, which includes Garden City. This regional scale model will be used as the parent model for development of a more localized groundwater model that will be used to support the proposed water marketing strategy.

A link to the KGS groundwater model is here. It includes a link to the zip files for the model.

http://www.kgs.ku.edu/Hydro/Publications/2010/OFR10_18/index.html

KGS water level database:

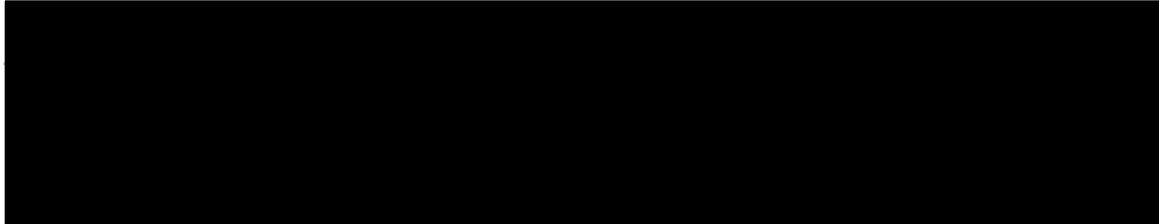
<http://www.kgs.ku.edu/Magellan/WaterLevels/index.html>

KGS well/boring logs:

<http://www.kgs.ku.edu/Magellan/WaterWell/index.html>

High Plains/Ogallala Aquifer database (KGS) for Finney County. This has links to several KGS database.

https://chasm.kgs.ku.edu/ords/pubcat.hpc2.SelectByCounty?f_cnty=55



Unique Entity Identifier and System for Award Management

The City is registered with SAMS effective 3/12/2019, and the account is active until the renewal date of 3/11/2020. The City's CAGE is 315M1.