EXECUTIVE SUMMARY

INTRODUCTION

The purpose of this study is to provide a comprehensive evaluation of the City's water system with respect to its existing and future needs, identify improvements and associated costs necessary to meet those needs, and provide the City with a framework for the provision of water service through the year 2030.

This executive summary has been prepared to provide a concise overview of the evaluations and analyses performed in each chapter of the study. A summary of the capital improvement program costs appears at the end of this chapter.

PROJECT OBJECTIVES

This master plan has been developed to provide the City with a guide for short term and long term water system improvements and has been prepared as a reference document to assist the City as it evaluates the impacts of proposed development and land use on the water system.

This master plan accomplishes the following specific objectives:

- Establishes water system design and planning criteria
- Provides an inventory of the existing water system infrastructure
- Identifies current and future water system deficiencies on a prioritized basis
- Provides specific recommendations to the community and City Council for action
- Provides the City with a water system master plan that addresses the needs of both the City and regulating agencies

BASIS FOR MASTER PLANNING

The City's previous water master plan was completed in 1999. One year later, the Oregon State Department of Corrections (DOC) announced its decision to site a correctional facility with the City's urban growth boundary and in 2007 the Oregon Legislature authorized the Department of Human Services (DHS) to build a new state-operated psychiatric facility co-sited with the DOC project. The combined population influence from these two facilities comprises roughly 58 percent of the 2008 municipal population and will require a significant expansion to the City's water system. Accordingly a new master plan was needed to address the impacts of these new facilities.

STUDY AREA AND PLANNING CONSIDERATIONS

The City's Comprehensive Plan was developed in the 1980's and established a large urban growth boundary (UGB) encompassing 2,188 acres, approximately 1,254 of which are outside the

present City limits. Eventually all areas inside the UGB will be part of the City and will be served by the City's utility systems.

The study period for this investigation is from year 2010 to 2030 and utilizes the UGB as the boundary for municipal development across this period. The City currently provides water service to a population of 5,700. It is anticipated that municipal growth across the planning period will more than double, resulting in a 2030 population of roughly 13,000.

The improvements recommended in this plan are based on the development of land within the UGB in its present location, and the current zoning designations for these areas. This report evaluates the anticipated water supply, treatment, pumping, and storage needs for the 20 year planning period. Implementation of the improvements will provide an adequate and dependable water system for the City's existing and future customers. Significant expansions of the UGB, or changes to the existing zoning areas could change the recommendations of this plan. An update or reevaluation of key planning assumptions should be performed should such changes occur.

REGULATORY REQUIREMENTS

The US Environmental Protection Agency (EPA) and the State of Oregon Department of Human Services, Drinking Water Program (ODWP) currently enforce drinking water standards for 91 primary contaminants and 15 secondary contaminants. Primary standards regulate contaminants that pose a serious risk to public health, whereas secondary standards cover aesthetic considerations. Public water systems must sample for primary contaminants routinely to ensure that standards are met and must report the results of such sampling to the regulating agency.

The City's water system operates in compliance with the current regulatory requirements. Regulatory compliance is achieved as a function of the basic water system design, the operational modes selected by the City's licensed operators, as well as the current regulatory structure. Future compliance in light of near-term regulatory changes combined with increasing water demands will require modifications to the design and operation of the City's water system.

The City has had a history of elevated nitrate levels in two of its wells. This finding is supported by numerous studies that have documented rising nitrate levels in the groundwater of the southern Willamette Valley. The City has achieved compliance by taking these wells off-line; however, a growing municipal population and the demands of the new DOC and DHS facilities will require the full use of these sources.

Beginning on January 1, 2010, all public water systems will be regulated by the Ground Water Rule (GWR). This rule will require new monitoring standards and will potentially require additional treatment of groundwater sources. The GWR was promulgated to address bacterial and viral contamination at groundwater sources, as a complimentary approach to the distribution system monitoring currently required by the Total Coliform Rule.

In summary, the long-term success of the City's water system requires an expansion plan that suitably addresses anticipated regulatory needs over the planning period.

EXISTING WATER SYSTEM INVENTORY

The City operates and maintains the existing water system and delivers water to its consumer base utilizing four active groundwater wells, a single elevated storage reservoir, one ground storage reservoir, and a network of distribution pipes. Fire protection is provided by the 1.25 million-gallon (MG) ground storage reservoir and three fire pumps that have a combined capacity of 2,000 gpm.

Combined production from the wells is 2,050 gpm and water is delivered directly into the distribution grid after chlorination at each facility. Maximum day demand exceeds the current pumping capacity and requires the use of one fire pump to keep pace with demand during this period. Only one of the wells is equipped with emergency backup power, a condition that would reduce net water production to 550 gpm should the City experience an area-wide power outage.

The City's original water distribution system was installed in 1938 and underwent a major expansion in 1963. The system is predominantly a looped network and is constructed largely in the public road rights-of-way. The distribution system consists of 37 miles of pipe and is dominated by a large installed base of small diameter pipe with roughly 56 percent of the total pipe length consisting of pipe 6-inches in diameter or smaller. The lack of larger diameter distribution pipes is notable compared to conventional benchmarks.

Water storage totals 1.35 MG, and is significantly undersized for a municipality of Junction City's size. The City has traditionally developed wells in lieu of storage facilities and is critically dependent on the pumping provided by the wells. The existing storage reservoirs do not meet current seismic code.

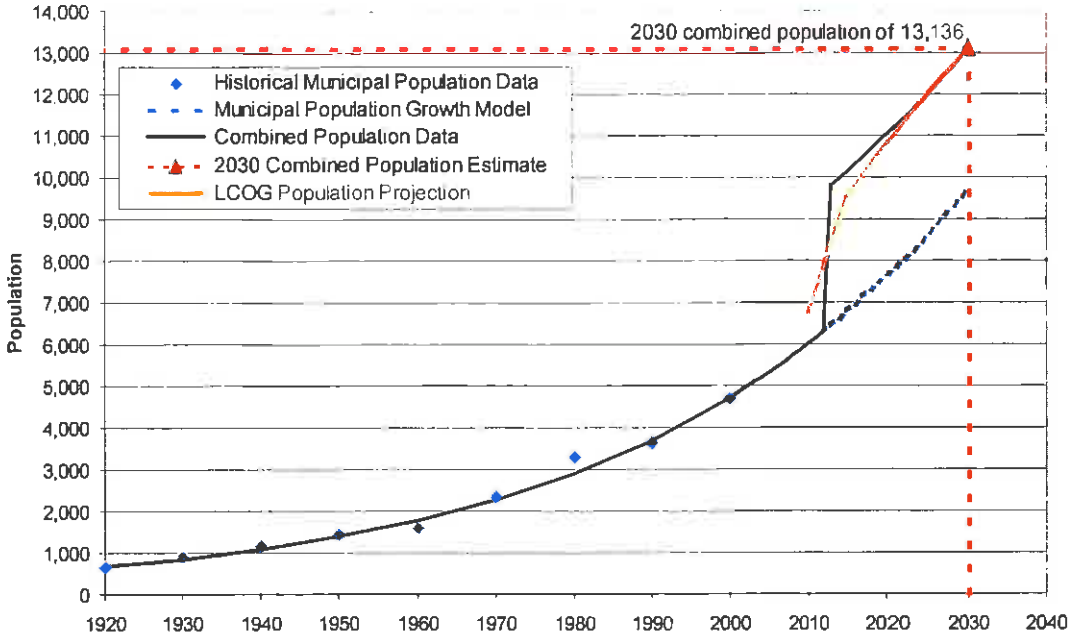
The City's telemetry system was constructed in 1962 and is not capable of notifying the system operators of alarm conditions at the well facilities. The City is currently operating on an interim telemetry system installed after the failure of the original system in December of 2008.

PRESENT AND FUTURE WATER DEMANDS

At the most fundamental level, future water demands are a product of per capita water use patterns applied over the anticipated population growth. The per capita use factors utilized in this report are historical use rates and do not consider the effects of future conservation programs. The development of a conservation program is encouraged and will provide additional operating margins with regard to supply and capacity.

Historical populations were reviewed and future populations were projected based on conventional municipal growth patterns and the near-term development of the DOC and DHS facilities. The combination of slower long-term municipal growth and rapid short-term prison/hospital growth rates form the basis for the combined population growth curve of this report. This report assumes a 2030 population of 13,136—a number that is equivalent to the coordinated population estimates provided by Lane Council of Governments. Figure ES-1 on the following page depicts the historical and projected populations based on this analysis.

Figure ES-1 | Combined Population Projection



The average day demand utilized in this report is 160 gpcd. Maximum day demand (MDD) is defined as the highest production day within the highest production month. MDD is conventionally utilized to determine the adequacy of water supply sources, the size of water treatment plants, and factors into the sizing of reservoirs. MDD occurs almost exclusively in July and occasionally in August and averages 430 gpcd. Peak hour demand (PHD), as the name implies, is the greatest flow occurring in any one-hour period. Demand factors for the municipal population, and the DOC and DHS facilities were developed independently, as water use differs across these population groups. Table ES-1 summarizes the peaking factors used in this report.

Table ES-1 | Peaking Factor Summary

Population Group	ADD (gpcd)	ADD:MDD Peaking Factor	ADD:PHD Peaking Factor
Municipal	160	2.70	5.00
DOC	110	1.75	5.00
DHS	178	1.75	5.00

Water demands for each population group were combined to create a composite demand curve that can be extrapolated across the planning period. Table ES-2 lists the MDD in million gallons per day (mgd) for key years of the planning period.

Table ES-2 | Projected Maximum Day Water Demand

Year	2010	2015	2020	2030
MDD	3.0 mgd	4.5 mgd	5.0 mgd	6.0 mgd

WATER SUPPLY EVALUATION

In Oregon, all water is publicly owned. The Oregon Water Resources Department (OWRD) regulates the use of both surface and groundwater throughout the state. Over the years as greater demands have been placed on limited water resources, OWRD has exercised increasing control over water use. Water rights establish a hierarchy utilized by OWRD to adjudicate water in times of water shortages. Accordingly, it is paramount that the City secure and maintain suitable water rights to meet long term municipal needs.

Groundwater rights are generally categorized into three levels of increasing certainty comprised of registrations, permits, and certificates. Groundwater registrations are vested uses that were established prior to August 3, 1955, the date that Oregon began regulating groundwater. Under the law, OWRD is directed to undertake a process of reviewing and approving groundwater registrations filed after 1955. To date, however, the State has not had the resources to begin such efforts, and it is unlikely that adjudication will occur at anytime in the foreseeable future. Even without formal adjudication, and especially for municipalities, a groundwater registration has historically been viewed as equivalent to a state-issued water right, and the holder is entitled to continue using water up to the maximum amounts declared in the registration. Water rights issued after the adoption of the 1955 groundwater code, are issued in two stages; the issuance of an initial water right *permit*, and upon full development, the issuance of a final water right *certificate*. The permit serves as the initial authorization for a water user to develop the source and begin making beneficial use of the water and the certificate serves as evidence of a fully vested water right.

Only 32 percent of the City's potential water rights exist as certificates. The remainder is a combination of registrations, permits that are awaiting certification, or recoverable fractions that are created in the certification process as a result of capacity limitations in the City's well pumps. The City needs to begin a formalized process of securing certificates for all their water rights. Doing so will provide the City with roughly 7.84 mgd of water rights, a level that is sufficient to meet maximum day demands through the planning year 2046. Table ES-3 summarizes the City's water rights.

Table ES-3 | Water Rights Summary

	Authorized Use Rate		
Category	cfs	gpm	mgd
Groundwater Registrations	2.17	970	1.39
Permitted Rights (pending certification)	5.64	2,532	3.65
Permitted Remainder [1]	0.49	220	0.31
Certificated Rights	3.86	1,732	2.49
TOTAL	12.16	5,454	7.84

cfs = cubic feet per second gpm = gallons per minute mgd = million gallons per day

[1] Excludes the 11th & Elm Street well. Water rights at this well remain to be confirmed.

Entirely separate from the discussion of water rights is the evaluation of total pump capacity available at the City's wells. The City's well pump system was examined from the standpoint of net capacity and reliability. Unlike many municipalities that utilize topographic relief and gravity-fed water sources, all of the water in Junction City must be pumped. The City relies heavily on the capacity and mechanical reliability of the well pumps to deliver water into the distribution grid and storage reservoirs for consumption. It was determined that required water supply over the planning period is constrained not by water rights, but by a lack of pumping capacity and redundancy. The City lacks the required pumping capacity to replenish depleted fire flow storage within a 72-hour period while supplying MDD, and does not have the capacity to supply MDD with the largest well pump out of service. Additionally, emergency power generation is lacking at all the facilities except one.

Lastly, in 2005 the ODWP issued two letters to the City identifying the 11th & Elm and 8th & Deal Street wells as potentially groundwater sources under the direct influence of surface water (GWUDI). Water systems that use groundwater sources are governed by a less stringent set of water quality regulations than those that use surface water sources or GWUDI. Further study will be required to conclusively resolve this issue; however, it should be noted that the reclassification of the City's groundwater sources to GWUDI will require a water treatment approach that differs significantly from that of groundwater.

Key recommendations resulting from the water supply evaluation require the City to:

- Begin investigative efforts and work with ODWP to resolve the potential issue of GWUDI in the City's water source. The City should make a careful evaluation of previous and on-going studies that may point to a future reclassification of the City's groundwater sources. It is unlikely that an investigation of this issue can be definitively resolved within the design and construction deadlines for the proposed treatment plant as defined in the intergovernmental agreement (IGA) between the City, and the State of Oregon. There will accordingly be some ownership of risk on the part of the City with regard to additional treatment levels that may be required should this classification change within the design life of the plant.
- Consolidate the various levels of water rights into certificates and reexamine the allocation and assignment of these rights to the City's active wells.
- Reconstruct the existing well at 11th & Elm. This well should be deepened with the goal of mitigating nitrate levels and improving yield.
- Construct the necessary piping to connect the 8th & Front, 8th & Deal, 13th & Elm and 11th & Elm wells to the proposed WTP. This will allow these sources to contribute their full pumping capacity once the future treatment plant comes on-line.
- Provide auxiliary power sources for each of the wells. Providing auxiliary power at all existing well facilities is viewed as an essential step in maintaining current pumping levels during times of emergency.
- Begin planning for two additional new wells. One to be constructed prior to 2013, and a second to be constructed in 2020.

WATER TREATMENT EVALUATION

As overall municipal demand increases, the City will be required to either develop a significant number of new wells and begin utilizing existing developed wells that are currently off-line due to the presence of nitrate. As water treatment needs and regulatory requirements become more complex, the case can increasingly be made for a centralized water treatment plant. The construction of a new water treatment plant is viewed as the most economical and reliable method of meeting the City's water supply needs. Four of the City's wells are loosely centralized in an area with a 1,000 foot radius. This grouping of relatively high yield wells—13th & Elm, 8th & Deal, 8th & Front and 11th & Elm—comprises roughly 70 percent of the City's pumping capacity and presents an opportunity to centralize water treatment. Primary treatment objectives for the new plant include:

- Nitrate removal
- Inactivation and/or removal of Microbial Contaminants
- Corrosion Control
- Taste and Odor Improvements

Several technologies were evaluated for the removal of nitrate. This plan recommends the construction of an ion exchange process sized to treat water production from the 11th & Elm and 8th & Front Street wells. This component of the treatment process will be designed for future expansion should the City begin experiencing nitrate levels in its other wells. From a treatment standpoint, the removal of nitrate will require a pre-treatment process to reduce the elevated levels of iron found in the City's groundwater to prevent the fouling of the nitrate removal media. It is anticipated that this process will consist of a conventional granular media filter, or a membrane filtration unit installed upstream of the nitrate removal equipment. The selection of a specific pre-treatment filter will be made in the preliminary design phase.

It is recommended that the pre-treatment filtration process be sized to filter **all** production from the four wells that will be integrated into the new treatment plant. This is viewed as a necessary step that provides the City current benefit as well as an operating margin that will allow the City to successfully treat their well water should any of the sources be reclassified as groundwater under the direct influence of surface water.

A centralized treatment plant will also allow the City to meet the disinfection requirements of the Ground Water Rule. The current practice of chlorinating at each well will be consolidated to the treatment plant where additional disinfection contact time can be achieved with the use of the existing ground storage reservoir. A complete evaluation of the City's current corrosion control program will also be conducted to ensure that this program is optimized for the chemical feed changes that will likely be required as part of the new filtration and nitrate removal processes.

This report recommends that the initial phase of the water treatment plant be sized to produce 5.0 million gallons per day (MGD). Although a full 6.0 MGD is required to satisfy treatment needs over the full planning period, this additional capacity will not be required until 2020 and can be

reasonably deferred to allow for the near term construction of other more pressing water system upgrades.

As previously stated, this plan does not consider the effects of future water conservation programs. Growing demands and limited resources will play an increasingly important role in managing water resources. The development of a long-term water conservation program is encouraged, as conserved water becomes a relatively inexpensive source of water for the City. The timing and size of the future water treatment plant expansion should consider the development and efficacy of conservation measures. In light of a successful program, it may be possible to defer, or scale back the current upgrade plan.

The water treatment plant will deliver water into the City's existing and proposed ground storage reservoirs. A finished water pump station will be required to transfer this water into the new elevated storage reservoir.

Key recommendations resulting from the water treatment evaluation require the City to:

- Confirm the water treatment objectives and begin preparations for the design and construction of a 5.0 MGD water treatment plant to provide with nitrate removal for the 11th & Elm and 8th & Deal well facilities and complete filtration of the City's well production.
- Begin planning for a 1.0 MGD plant expansion in the year 2020.
- Begin the design process for a finished water pump station.
- Make fiscal preparations for the hiring or development of a full time water treatment plant operator with Level 3 certification and a filtration endorsement.

DISTRIBUTION SYSTEM EVALUATION

The primary purpose of a water distribution system is to deliver the full range of consumer demands and fire flows at pressures suited for the particular use. To accomplish this, the distribution system utilizes a combination of large transmission mains and networks of smaller distribution mains. Evaluations of the distribution system were derived from the study of a computerized hydraulic model created to replicate the City's pumps, reservoirs, and distribution network. This model was used to simulate various operational modes, fire flow scenarios, and failure states in order to develop improvement recommendations.

The City's existing distribution system was evaluated based on the design and performance criteria summarized in Table ES-4 on the following page.

Service pressures in the existing system were found to be adequate during average day demand periods but failed to deliver the minimum 30 psi during peak day demand in select central areas of town. Fire flows were deficient in a number of key areas across town. The proposed solution to this problem requires the improvement of a large set of distribution system pipes combined with an increase in the City's water system operating pressure. Distribution system piping improvements are presented in this section and the increase to system pressure is discussed in the following section under water storage improvements.

Table ES-4 | Distribution System Planning and Design Criteria Summary

Distribution and Transmission Pipe Sizing	
Transmission Pipe: Diameters 16-inch and larger	
Designed to Convey:	Large capacity flows across and through the City distribution system
Design Criteria:	Maximum Velocity = 5 feet per second
	Maximum Headloss = 3 feet per 1,000 feet of pipe
Distribution Pipe: Diameters smaller than 16-inch	
Designed to Convey:	Localized fire flow and consumer demand
Design Criteria:	Maximum Velocity = 10 feet per second
	Maximum Headloss = 5 feet per 1,000 feet of pipe
Service Pressures	
Maximum System Pressure: 80 psi	
Minimum Pressure during Average Day Demand: 40 psi	
Minimum Pressure during Peak Hour Demand: 30 psi	
Minimum System Pressure during Fire Flow: 20 psi	

Table ES-5 summarizes the fire flow standards adopted by the City. These standards were utilized to ensure that the distribution system is suitably sized and configured to reliably deliver these flows concurrent with maximum day demand.

Table ES-5 | Minimum Fire Flow Requirements

Location	Recommended Fire Flow (gpm)	Duration (hours)
Low Density Residential, R-1	1,000	2
Medium Density Residential, R-2	1,250	2
Residential Commercial, RC	2,500	3
Public (Schools & Institutions)	3,500	3
Commercial/Industrial, C-1, C-2, I		
Existing Facilities	Up to 4,000	4
New Facilities	6,000	4

The City's distribution system is comprised of a large percentage of aging and undersized pipe. Much of this pipe, particularly pipes with diameters 4-inches and smaller, has reached the end of its service life and should be replaced before failure occurs. This level of replacement translates to 8,500 feet of pipe and it is recommended that this pipe be replaced on an annual incremental basis over the next five years.

Key distribution improvement projects are summarized below. The full set of improvement project is numerous and exceeds the scope of this summary. The reader is encouraged to review

the full analysis presented in Chapter 8 and to utilize the figures of that chapter that detail the location of each improvement project.

- Transmission line improvements are required to provide fire flows to the DOC/DHS complex at the southern end of the UGB. These improvements will require 7,700 of 16-inch pipe installed around the west and south perimeter of the city limits and 16,000 feet 24-inch pipe installed along Highway 99 south to the prison site. The design of these facilities should be completed as soon as possible as the construction of these transmission mains will be an early work element in the implementation of this master plan.
- Fire flows to the elementary and high schools can be adequately delivered; however, improvements are necessary to supply the middle school with fire flows.
- A number of pipe improvements are required to ensure adequate fire flow to the core industrial area bordering Holly Street south of 10th Avenue and to residential areas comprised of Brentwood Homes, Norman Park, and Oak View Apartments.
- In 2020, the City will require 8,000 feet of 18-inch transmission line to be constructed from the intersection of 10th & Holly southward along Highway 99 then westward to connect at the intersection of Bailey Lane and Prairie Road. This line has been identified as the eastside transmission main and is viewed as the complement of the existing transmission main located on the west side of town in Oaklea Drive. This transmission line will need to be constructed to offset the reduction in reserve capacity in the existing 16-inch transmission line as water demands develop along the northern and western portions of the UGB.
- A new 16-inch transmission line loop will be required in the area west of Oaklea Drive as development begins within this portion of the UGB.

WATER STORAGE EVALUATION

In most municipal distribution systems, the water system service pressure is determined by the elevation of the free water surface in the storage reservoirs serving the system. Service pressures begin with available static pressure created by elevated reservoirs and are reduced en-route to the consumer by friction losses in the pipe network.

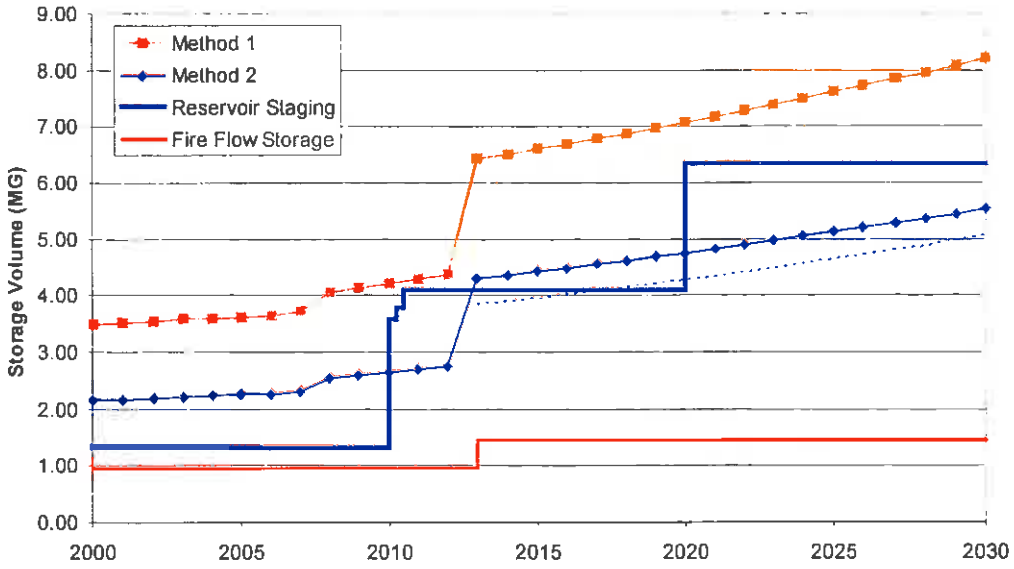
Due to the relatively flat topography, Junction City's distribution system is configured as a single pressure zone. Maximum static pressures in the zone are observed at the northwest corner of town and gradually decrease to the south as elevations increase. The increase in elevation across these two points of the distribution system is approximately 30 feet.

Evaluations of the City's exiting elevated reservoir determined that this facility is inadequately sized, requires significant seismic upgrades, and is not capable of providing adequate pressure to the DOC/DHS site. The recommendation of this report is to develop two new elevated reservoirs, one in town at the site of the proposed WTP and another at the DOC/DHS site with a matched and higher hydraulic grade. The new grade line was selected to maximize municipal pressures

without creating excessive pressures at the northwest corner of town. This selection produces a maximum system pressure of 63 psi at the DOC complex and 76 psi in town.

Total water storage capacity within the water system was also evaluated. Water storage is required to provide a reserve of water to equalize daily variations between supply and consumer demand, serve fire-fighting needs, and meet system demands during an emergency interruption of supply. Existing storage is the sum of volumes in the elevated reservoir and the ground storage reservoir and totals 1.35 MG. Two conventional methods were utilized to quantify the required storage volume from the present to the year 2030. By both benchmarks, net existing water storage was inadequate for the current year. Figure ES-2 depicts the required storage volumes, calculated by each method, for each year of the planning period. These curves are superimposed with another line depicting the recommended development sequence for future storage facilities.

Figure ES-2 | Projected Storage Volumes



As shown by the sequential steps on the reservoir staging curve, a number of storage tanks are recommended to resolve the city's current and future storage needs. Table ES-6 on the following page details these improvement projects by year, and by net storage volume. The cumulative storage volumes assume that the existing 1.25 MG ground storage reservoir will be rehabilitated and kept in service.

In summary, it is recommended that the City work to establish a reliable storage system and strengthen redundancy in that system by constructing the sequence of reservoirs shown in Table ES-6. It is important to note that the development of a second large 2.25 MG ground storage reservoir has been deferred from the near term to the year 2020. The City should begin making fiscal preparations for the construction of this facility, as it represents a key step to the recovery of operational margins that have been traditionally missing in the storage system.

Table ES-6 | Reservoir Staging

Year	Facility (MG)	Location	Cumulative Storage (MG)
2009	—	Existing Water Storage Facilities	1.35
2010	+ 0.30 EL	Water Treatment Plant in Town	1.65
2010	- 0.10 EL	Existing Elevated (removal)	1.55
2010	+ 0.30 EL	DOC/DHS Complex[1]	1.85
2011	+ 2.25 GS	Water Treatment Plant in Town	4.10
2020	+ 2.25 GS	Water Treatment Plant in Town	6.35

GS = Ground Storage EL = Elevated Storage

[1] Capital costs for this reservoir are funded by DOC

INSTRUMENTATION AND CONTROL EVALUATION

Daily, and sometimes hourly, observations of water system operating parameters are required to ensure that the system is performing within regulatory standards and meeting operational goals. Immediate notification of critical alarm conditions is paramount to ensuring a continuous supply of water to the public and is often necessary to protect the City's infrastructure.

The existing well control system was constructed in 1962 and consisted of a cam and lever control assembly driven by a pressure transducer installed at the existing elevated reservoir. Changes in water levels were transmitted to the cam system, the cams rotated, and triggered a series of relays. The activated relays generated a signal that was transmitted across a telephone line to a corresponding relay at each of the well facilities, and activated the required number of well pumps. This was an aging system that required frequent maintenance and repair. In December of 2008 the system failed. The cam and lever system and the pressure transducer were removed and replaced with a interim control system designed to function until the control system recommended by this study had been installed.

This report recommends the installation of a supervisory control and data acquisition (SCADA) system to record and transmit the collection of key operating parameters to a centralized location for use by the system operators. Data transmitted through a SCADA system is available immediately and is thus more useful than data that is stored at a remote pumping station or reservoir facility. Telemetered alarms provide immediate warning of malfunctions and low water levels, reducing the response time for emergency situations. The electronic collection of operational data in a centralized location improves operator efficiency and the reliability of collected data and enhances the operation of the water system.

Local programmable logic controllers (PLCs) installed at the various water system facilities will transmit collected data to a central PLC at the water treatment plant. These local PLCs will also be utilized to disseminate command information from the central PLC to the process equipment and devices as directed. The proposed communication system will utilize an Ethernet radio

system with unlicensed radios operating on a spread spectrum frequency. This system will allow the City to operate their system independent of a third party communication system. The relatively short communication distances and flat topography will require modest antenna structures throughout the system. A graphic based SCADA interface will be installed to allow system operators to access the PLC system through a desktop computer. Measured variables can be viewed, trended and saved on the computer. The computer-based interface will also provide centralized alarm management with stored alarm logs.

OPERATION AND MAINTENANCE EVALUATION

The maintenance of water systems is necessary to ensure the proper operation of the facilities and to obtain the full useful life of those facilities. Water systems represent a significant investment of public capital. If a water system is allowed to fall into disrepair because of the lack of maintenance, it will not operate efficiently or as designed. Health problems and property damage may result from leaking mains or services, mainline breaks, inoperable valves or fire hydrants. The repair of failed portions of a public water system is costly, quite often equaling or exceeding the original cost of construction. Because of this it is imperative that municipalities consistently provide adequate maintenance funding and staffing to protect their investment.

A review of the operation and maintenance programs in place, and the annual level of effort spent on each shows that the operations and Public Works staff are performing at a high level given the program funding and staff size. Staff members are knowledgeable and perform maintenance activities on regular basis. The recommendations of this chapter are therefore minor in nature.

The Public Works Department currently employs 14 full time employees. Of the current staff approximately 3.6 full-time equivalents (FTE) are dedicated to the water system. Based on existing and proposed operations and maintenance programs and the addition of the new water treatment facility, it is estimated that between 5.5 and 6.0 FTE are required to operate and maintain the water system. One FTE should be added concurrent with the startup of the new treatment plant and additional staff should be hired as additional operation and maintenance programs are developed.

CAPITAL IMPROVEMENT PLAN

As summarized in the previous sections, the water system has a number of deficiencies, which inhibit the City's ability to provide an adequate level of water service throughout the physical system, and across the years of the planning period. Some of these deficiencies are more critical than others. Some deficiencies present an immediate reduction to service level, while other deficiencies will manifest as the City expands and the existing system continues to age.

A prioritizing process was developed to rank the improvement projects since the scope of the proposed improvements is large. Factors utilized in the prioritizing process included several measures of criticality, as well as the cost/benefit ratio of each project. This process identified essential, high benefit to cost projects for early implementation, and the deferral of less critical,

lower value projects. Each of the projects identified in the plan were examined and assigned a priority for implementation and appear in Table ES-7 at the end of this summary.

Priority 1A and 1B are targeted to problem areas needing immediate attention. They have been developed to resolve existing or near term system deficiencies, resolve regulatory compliance issues or to serve known near term developments. With limited exceptions all of the priority 1A projects are required to provide adequate water service to the DOC/DHS facilities. The development of this improvement list is based on the fact that the City is obligated to provide water service to the State facilities and that these improvements are required in the near-term as defined by the IGA development schedule. A prioritized list for municipal needs alone would yield a different set of improvement projects with a longer development period and a reduced overall cost.

It is recommended that Priority 1 improvements are undertaken as soon as practical. Priority 2 projects will be needed beyond the near term of the Priority 1 projects to improve the quality of service throughout town. Although not critical at this time, they will likely be required at the midpoint of the planning period. Priority 3 projects are long term improvements designed to improve system reliability or to supply future demands if land develops to the zoned intensities. While important, they are not considered to be critical at the present time.

At a minimum, all of the Priority 1A, 1B, and Priority 2 improvements should be included in the CIP. The Priority 3 improvements are largely growth driven. It is envisioned that these improvements will be constructed as part of future development and that individual developers will construct and pay for the improvements on an incremental basis. Should the City desire to promote development in certain areas, selected Priority 3 improvements may also be included in the CIP.

It is recommended that the City implement the Priority 1A improvements under a single funding package. Work on the Priority 1A and 1B improvements should begin immediately after agency approval and City adoption of this master plan. It is anticipated that Priority 2 projects will be required beginning in 2020; however, these projects can begin following the Priority 1 improvements, as finances become available and as the need arises.

Junction City does not currently have the resources nor is the City's existing user fee structure sufficient to fund all of the recommended improvements; therefore, alternative funding sources must be pursued. Several potential funding sources are identified and discussed in Section 12 of the master plan. All funding options will likely require an increase of the user rate and SDCs.

Table ES-7 | Recommended Capital Improvement Priorities

Project Code [1]	Project	Priority	Total Estimated Project Cost [2]
I-1	Development of SCADA System Platform	1A	$ 70,000
D-1	South Transmission Line to DOC/DHS (24-inch line)	1A	$ 4,608,000
D-2	Westside Transmission Line (16-inch line in Oaklea Drive and Bailey Lane)	1A	$ 1,479,000
S-1	Finished Water Pump Station and yard piping improvements	1A	$ 2,100,000
D-30	Raw Water lines to WTP for 8th & Front + 11th & Elm Wells	1A	$ 308,000
D-31	Raw Water lines to WTP for 8th & Deal + 13th & Elm Wells	1A	$ 392,000
D-15	Elm Street Waterline Replacement (9th Avenue to 14th Avenue)	1A	$ 149,000
S-2	Reconstruction of 11th & Elm Street Well	1A	$ 1,400,000
R-1	Elevated Reservoir at WTP (0.3 MG)	1A	$ 2,100,000
R-2	Ground Storage Reservoir at WTP (2.25 MG)	1A	$ 4,900,000
S-3	Existing Well Facility Improvements (Auxiliary Power and I&C Improvements)	1A	$ 700,000
T-1	Water Treatment Plant, Phase I (5.0 MGD base capacity)	1A	$ 7,825,000
D-23	Rose Street Waterline Replacement	1A	$ 274,000
D-16	Prairie Meadows (Connect west end of Prairie Meadows to Pitney Village)	1A	$ 22,000
D-17	Hatton Lane, Phase I (Prairie Road to Oak View Apartments)	1A	$ 51,000
D-18	First Avenue (Kalmia Street to Highway 99)	1A	$ 84,000
D-19	River Road (From the alley between Cedar and Deal Streets to Boden Street)	1A	$ 98,000
D-20	Bryant Street (Prairie Road to Kalmia Street)	1A	$ 69,000
D-21	Hatton Lane, Phase II (Oak View Apartments to Hwy 99 then North on Hwy 99)	1A	$ 230,000
D-22	6th Avenue (Greenwood to Front Street & Elm to Cedar Street)	1A	$ 87,000
		Subtotal Priority 1A	**$ 26,946,000**
Galvanized Pipe Replacement Program (Program 1)			
D-4	Laurel Street (9th Street to 12th Street)	1B	$ 67,000
D-5	Laurel Street (6th Street to 9th Street)	1B	$ 68,000
D-6	Addison Avenue & SW Laurel Street	1B	$ 75,000
D-7	Laurel Street (3rd Avenue to 5th Avenue)	1B	$ 71,000
D-8	Kalmia Street (3rd Avenue to 5th Avenue)	1B	$ 71,000
D-9	Juniper Street (3rd Avenue to 5th Avenue)	1B	$ 71,000
D-10	3rd Avenue (Laurel Street to Juniper Street)	1B	$ 41,000
D-11	Alley between Ivy and Holly Street (4th Avenue to 7th Avenue)	1B	$ 69,000
D-12	Alley between Holly and Greenwood Streets (5th Avenue to 7th Avenue)	1B	$ 49,000
		Subtotal Priority 1B	$ 582,000

continued on the following page...

Table ES-7 | *Continued from previous page*

Project Code [1]	Project	Priority	Total Estimated Project Cost [2]
S-4	Development of New Well	2	$ 1,600,000
T-2	Water Treatment Plant, Phase II (1.0 MGD expansion)	2	$ 850,000
R-3	Second Ground Storage Reservoir at WTP	2	$ 5,100,000
D-24	Hydrant Infill along Front Street (Total of three new hydrants)	2	$ 15,000
D-25	5th Avenue (Greenwood to Front Street)	2	$ 40,000
D-26	2nd Avenue (Greenwood to Front Street)	2	$ 36,000
D-27	14th Avenue (Greenwood to Ivy Street)	2	$ 66,000
D-3	Eastside Transmission Line	2	$ 1,728,000
D-28	Commercial Corridor Hydrants (Constructed in conjunction with D-2)	2	$ 60,000
D-29	10th Avenue (Holly Street to Front Street)	2	$ 39,000
		Subtotal Priority 2	**$ 9,534,000**
D-30a	6th Avenue (Front Street to Elm Street)	3	$ 44,000
D-30b	6th Avenue and Birch Street (6th & Cedar then south along Birch Street)	3	$ 274,000
D-30c	River Road (Front Street to the alley between Cedar and Deal Streets)	3	$ 116,000
D-4	Future UGB Buildout Transmission Line	3	$ 2,211,000
D-5	Future Industrial Corridor Transmission Line	3	$ 1,536,000
		Subtotal Priority 3	**$ 4,181,000**
		TOTAL	**$ 41,243,000**

Recurring Annual Programs		
P-2	Perpetual Pipeline and Valve Replacement Program (Program 2)	$ 250,000
P-3	Hydrant Replacement and Infill Program (Program 3)	$ 15,000
	Subtotal Recurring Annual Programs	**$ 265,000**

[1] Project Code Legend:
D = Distribution
R = Reservoirs
S = Water Supply
T = Treatment
I = Instrumentation & Control
P = Improvement Program

[2] See Section 12.3 for basis of project cost estimates