Lincoln Water System Facilities Master Plan

CITY OF LINCOLN NEBRASKA

City of Lincoln Project No. 701353

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Executive Summary

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Abbreviations and Acronyms

ADD	Average Day Demand
AMD	Average Month Demand
AWWA	American Water Works Association
CIP	Capital Improvement Program
City	City of Lincoln
cfs	cubic feet per second
CMMS	Computerized Maintenance Management System
CPI	Consumer Price Index
Cr-6	hexavalent chromium
cVOC	carcinogenic Volatile Organic Compounds
DSC	Debt Service Coverage
EPA	U.S. Environmental Protection Agency
FY	Fiscal Year – September 1st to August 31st
GIS	Geographic Information System
HCW	Horizontal Collector Well
HDR	HDR Engineering, Inc.
IT	Information Technology
LWS	Lincoln Water System
2007 Master Plan	2007 Facilities Master Plan
Master Plan	2013 Facilities Master Plan
LPlan 2040	Lincoln/Lancaster County 2040 Comprehensive Plan
MDD	Maximum Day Demand
mgd	million gallons per day
MHD	Maximum Hour Demand
MMD	Minimum Month Demand
ng/L	nanograms per liter
NPDES	National Pollutant Discharge Elimination System
NPV	Net Present Value
SDWA	Safe Drinking Water Act

SP	Seasonal Peak
UCMR	Uncontaminated Monitoring Rule
UCMR3	Third Uncontaminated Monitoring Rule
VOC	Volatile Organic Compound

1.0 Introduction

Water utilities must continuously plan to address system needs and challenges, such as system growth, aging infrastructure, increasingly stringent regulatory requirements, and the need for a well-planned and efficient Capital Improvement Program (CIP). Recognizing this need, the City of Lincoln (City) has historically conducted master planning efforts at 5-year intervals: a comprehensive master planning effort every 10 years and updates to address system growth and distribution system needs every 5 years. The City last completed a comprehensive Facilities Master Plan in 2002 and an update in 2007.

The 2013 Facilities Master Plan (Master Plan) will provide a guide for the short-term and long-term improvements for the infrastructure of the Lincoln Water System (LWS) through the year 2060. The anticipated growth of the system through this time period was coordinated with the Lincoln/Lancaster County 2040 Comprehensive Plan (LPlan 2040). Figure ES-1 presents the study area and anticipated growth tiers for this planning effort.

The Master Plan presents recommended improvements for the City's water supply, treatment, transmission, and distribution facilities based on projected future water capacity requirements and the need for renewal and replacement in the system. The recommended improvements presented in the Master Plan will be the basis for financing, design, and construction of future water infrastructure needs. HDR Engineering, Inc. (HDR) and City staff have worked together extensively throughout this planning process to ensure all aspects of the City's water planning needs have been met.

2.0 Water Capacity Requirements

2.1 Population

Historical population data for the City was obtained from the LWS 2007 Facilities Master Plan (2007 Master Plan) and the U.S. Census Bureau. The 2012 base year population was estimated from the 2010 population based on an annual growth rate of 1.2 percent. Future population projections were based on the LPlan 2040. In addition to an overall population growth projection, the population projections were distributed geographically to provide more detail for future improvements. A summary of historical and projected population is presented in Figure ES-2.

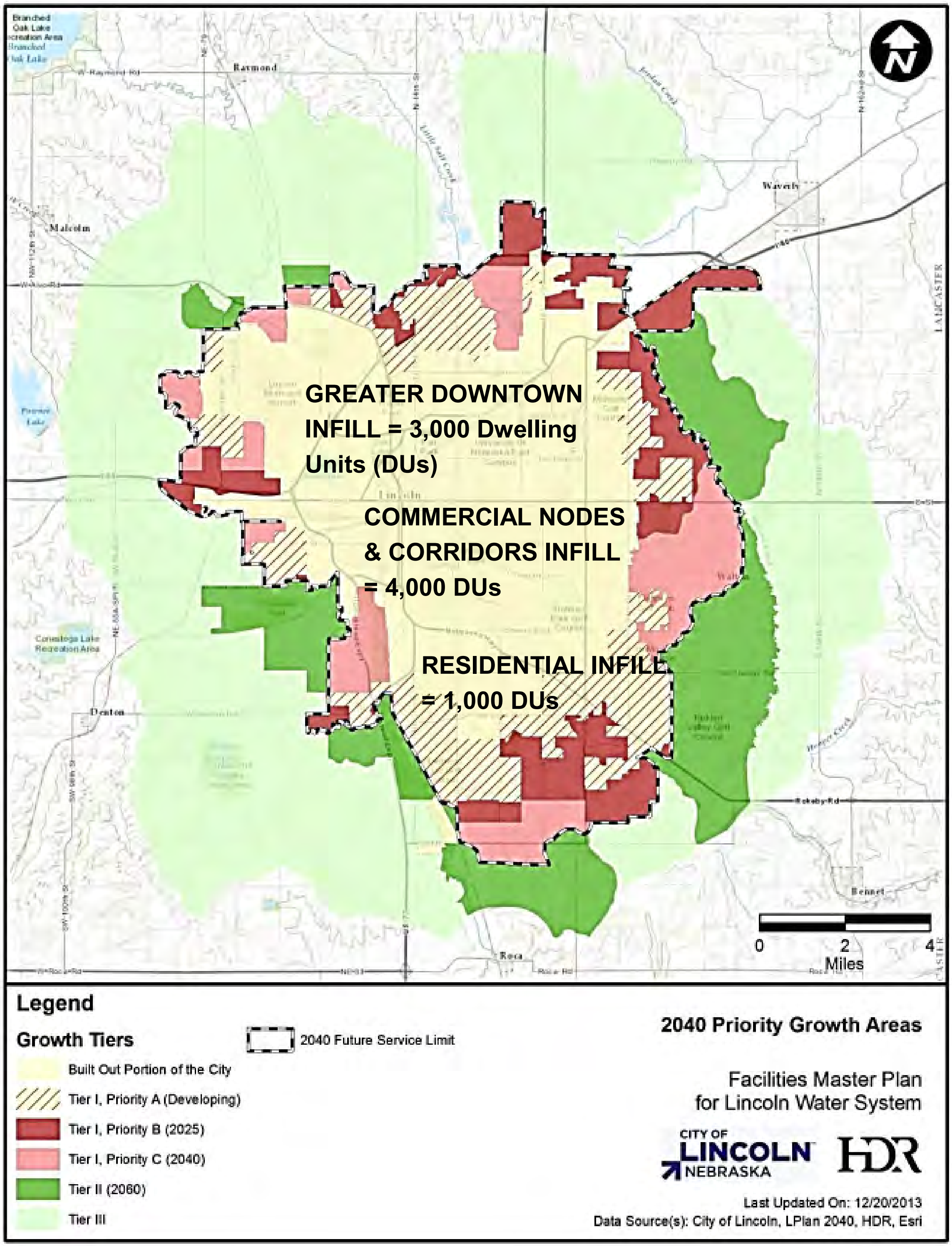

Figure ES-1 Study Area

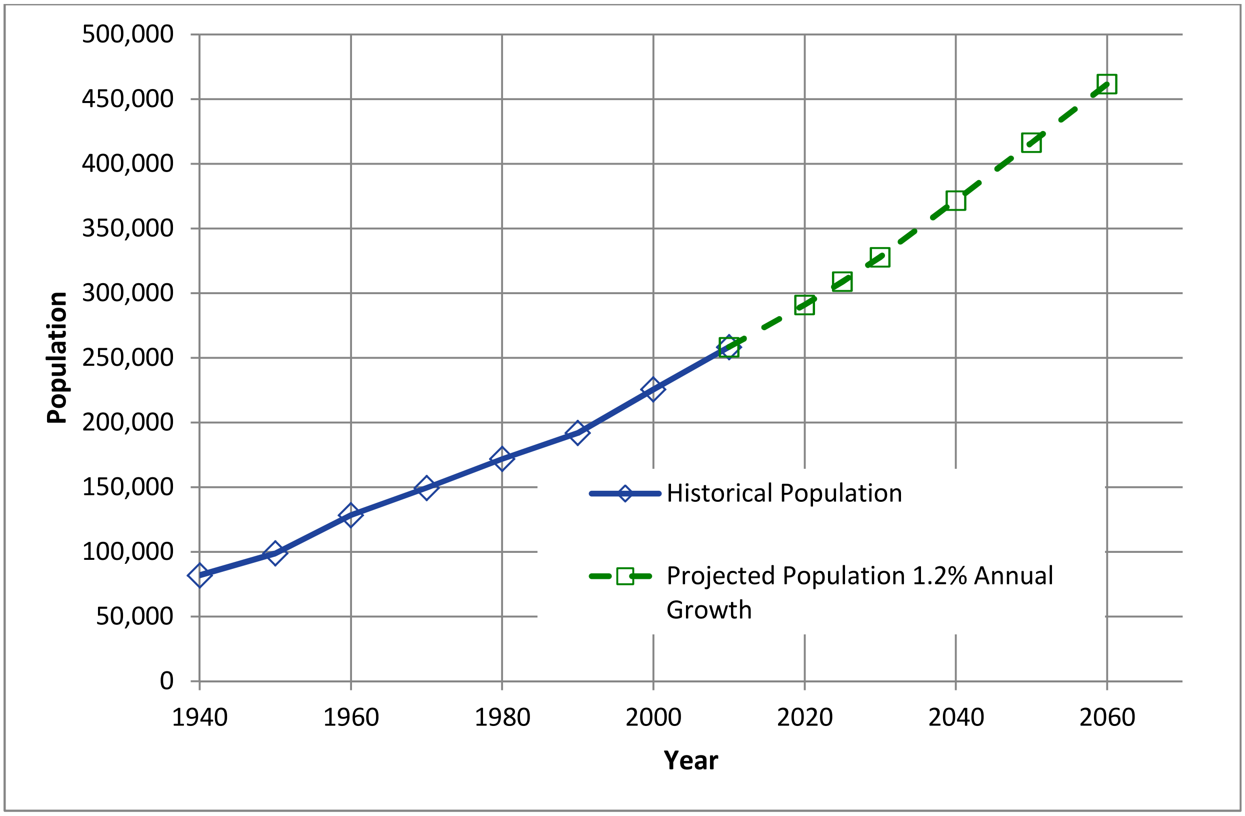

Figure ES-2 Historical and Projected City of Lincoln Population

2.2 Water Capacity

Future water capacity requirements were determined based on projected population and per capita water usage. Due to the City's promotion of water conservation, the per capita water usage rates have declined since the 2007 Master Plan, and this decline is reflected in the future capacity projections. Over the past 20 years, the per capita water usage rates have declined by approximately 23 percent. A summary of the future water capacity requirements is presented in Figure ES-3. Some of the key terms used in the capacity and supply analysis are defined as follows:

- Well field pumpage is the amount of water delivered to the Platte River Water Treatment Facility from the well field.
- Lincoln usage is the amount of water transmitted to the distribution system from the Platte River Water Treatment Facility.
- Average Day Demand (ADD) is the total water used during the year divided by 365 days per year.

- Maximum Day Demand (MDD) is the total daily demand during the day with the greatest amount of demand in a given year.
- Maximum Hour Demand (MHD) is the water demand during the hour with the highest system demands in a given year.
- Seasonal Peak (SP) is the average demand over the highest consecutive 3 months of raw water supply.

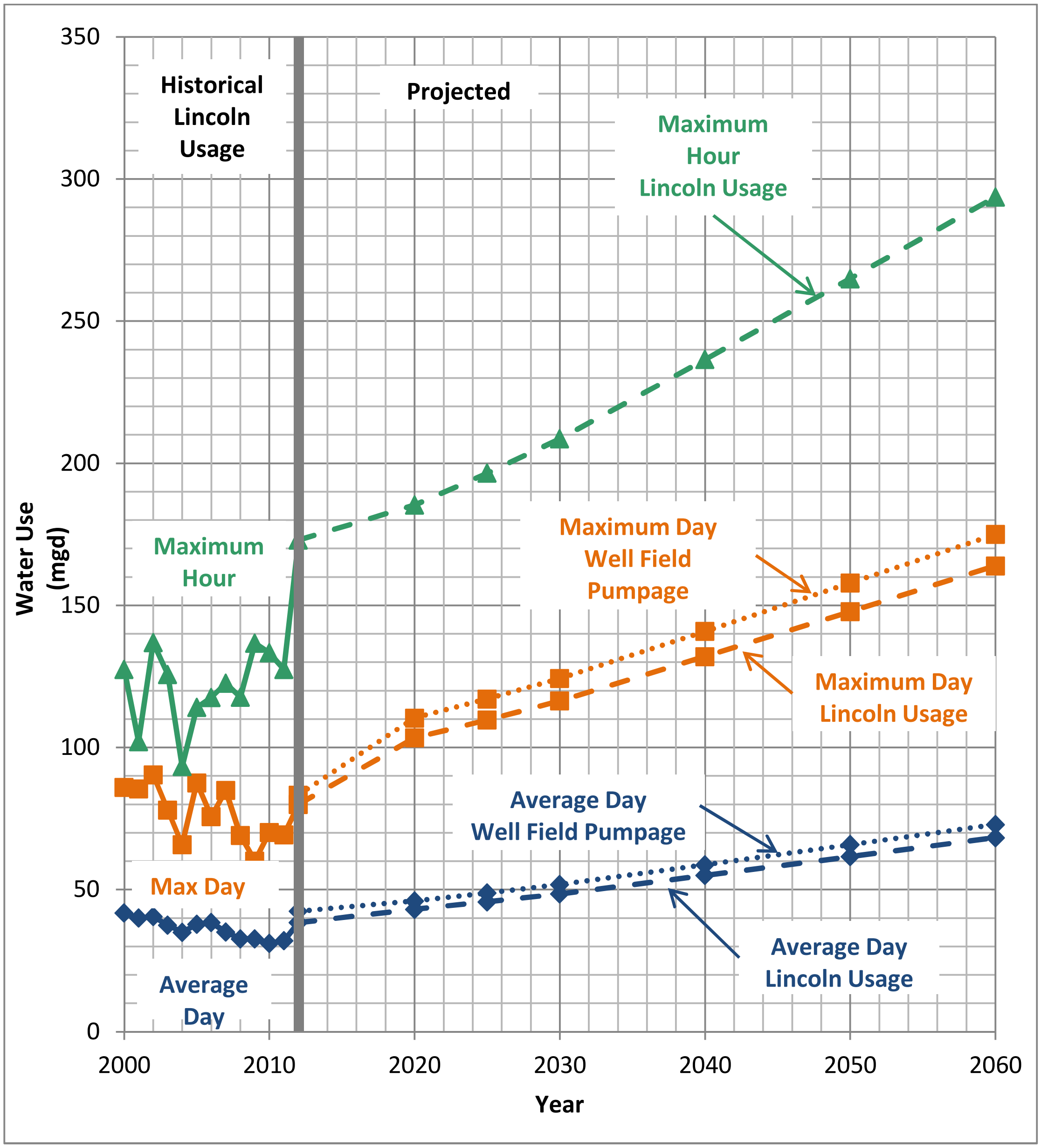

Figure ES-3 Future Demand Projections

3.0 Water Supply

The Master Plan establishes the current capacity of the City's water supply and identifies alternatives to expand those supplies through the year 2060. The planning effort includes a review of hydrologic data to determine the reoccurrence interval of prolonged drought events, an evaluation of current well performance data to determine the seasonal firm capacity of the well field, a comparison of the firm capacity of the well field to projected future water demands, and an evaluation of alternatives to add sufficient supply to account for any projected water deficit. The firm capacity of the well field is the capacity of the well field with the largest well out of service. The seasonal firm capacity is the capacity of the well field with the largest well out of service during the summer months.

3.1 Source Water Availability

A hydrologic analysis was performed to evaluate streamflow conditions in the Platte River. The long-term yield of the City's raw water supply is correlated to the streamflow in the Platte River; therefore, understanding the flow regime of the river is an important part of the Master Plan effort. The objective of this analysis is to determine reoccurrence intervals (or frequency) of prolonged droughts and to understand the duration of these events.

The drought experienced by the City during summer 2012 was a 50- to 100-year reoccurrence interval event for the 7- and 30-day duration events, and a 50-year reoccurrence interval event for the 60-day duration event. With a 50-year planning horizon and the reoccurrence interval of the 2012 event being approximately 50 years, there is a strong probability (64 percent) that the City will experience at least one drought event similar to the 2012 event during the planning horizon.

Based on the results of the analysis, it is recommended that the availability of the water supply be evaluated over a range of streamflow values bracketed by the 50-year, 60-day and 100-year, 30-day events. This equates to Platte River flows at Ashland, Nebraska, of 466 cubic feet per second (cfs) and 311 cfs, respectively.

3.2 Supply Analysis

3.2.1 Well Field Pumping Capacity

The City's well field consists of 40 vertical wells, 2 existing horizontal collector wells (HCWs), and a third HCW that is currently under construction. When construction of the third HCW is complete, the City's well field will have a total pumping capacity of 192 million gallons per day (mgd) and a firm pumping capacity of approximately 149 mgd.

The analysis of the supply capacity of the existing well field indicated that once construction of the third HCW is complete, the well field will have a maximum instantaneous capacity of between 110 and 130 mgd, depending on streamflow conditions. The summer seasonal capacity of the well field for 60- to 90-day production capacity ranges from 75 to 80 mgd when streamflow is less than 1,000 cfs and from 71 to 77 mgd during a streamflow event that correlates to a 100-year reoccurrence interval drought for the same duration. Table ES-1 presents a summary of these capacities, and Figure ES-4 presents well field capacities relative to projected demands.

Table ES-1 City's Well Field Seasonal Firm Capacity with the third HCW

Season	Streamflow (cfs)	Water Level Conditions	Maximum Instantaneous Pumping (mgd)	Maximum Pumping for 2 Months (mgd)	Maximum Pumping for 3 Months (mgd)
Spring	3,000 or greater	High	130	110	105
Summer low flow	1,000 to 500	Low	120	80	75
Summer drought	<500 cfs 100-Year Reoccurrence Interval	Low	110	77	71

Note:

The 100–year, 60-day average streamflow during drought at Ashland is 351 cfs, and the 100-year, 90-day average streamflow during drought at Ashland is 465 cfs.

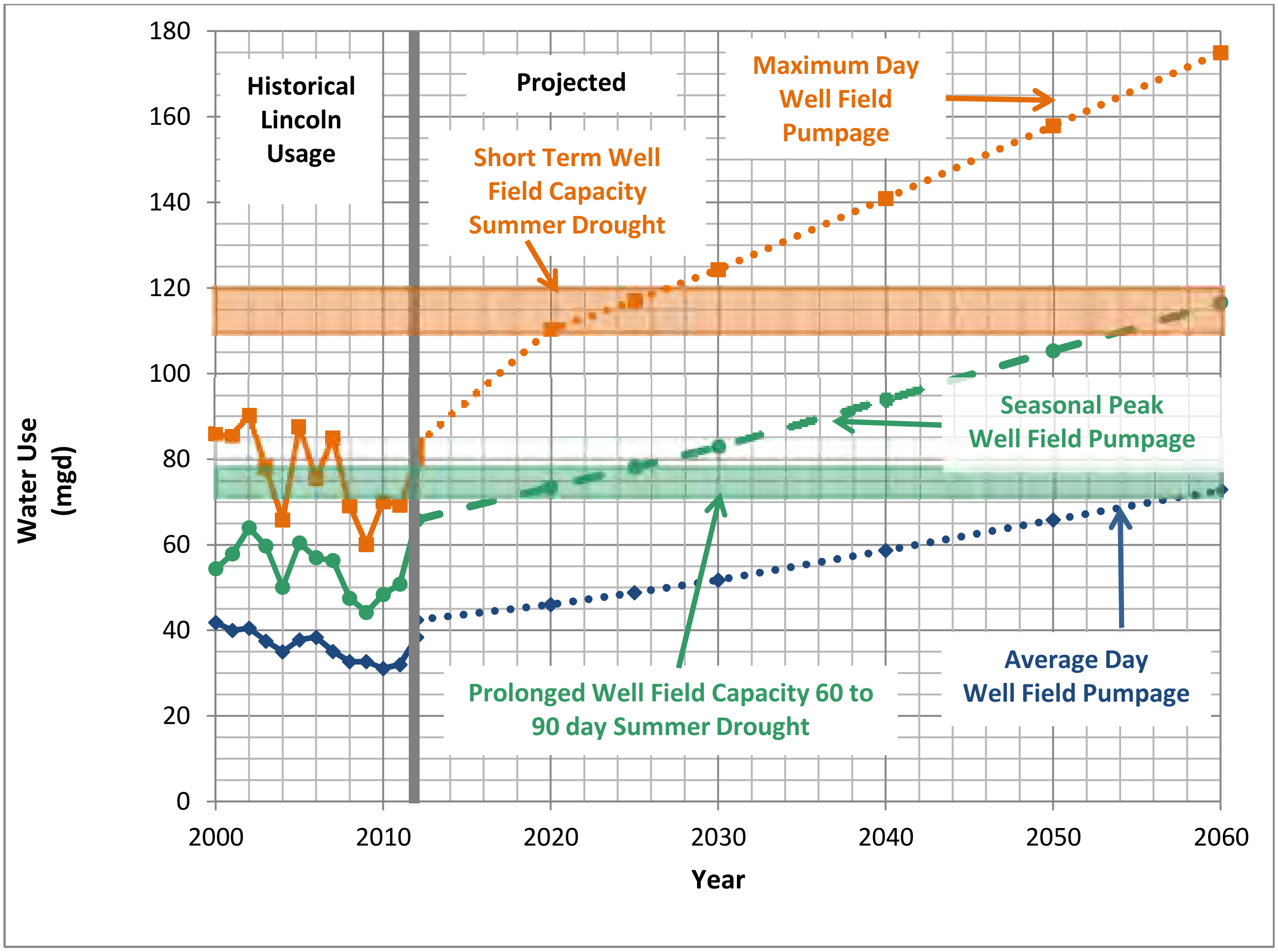

Figure ES-4 Raw Water Supply Deficits over Planning Horizon (with the third HCW)

3.2.2 Alternative Supply Analysis

The City's well field, in its current configuration, will not be able to meet projected demands through the planning horizon of 2060. Therefore, an evaluation was conducted of raw water supply alternatives that would increase the raw water capacity of the City to meet both the short-term and long-term demands. This analysis also considered increasing the reliability of the raw water supply by diversifying the raw water source. Three planning horizons were identified for this evaluation, as defined below.

Short-term horizon (2014-2025)

In the short-term horizon (2014-2025), the projected raw water demand could exceed the 60- to 90-day pumping capacity as early as 2018 depending on the magnitude and duration of a drought. The instantaneous and short-term pumping capacity could be exceeded by 2022. These short-term supply alternatives should be able to increase the instantaneous and short-term water supply capacity by 20 mgd and should be able to increase the summer seasonal yield by 10 mgd. Because this short-term supply alternative must be developed in the near future, the alternative must be considered relatively easy to permit and construct.

Short-term supply alternatives evaluated in the Master Plan include:

- Expansion of existing well field with completion of a fourth HCW
- New well field in the High Plains Aquifer
- Aquifer storage and recovery as peak shaving
- Metropolitan Utilities District (MUD) interconnection
- Water reuse

The recommended option is expansion of the existing well field with the construction of the fourth HCW. The opinion of cost for this option is $10.3 million in 2013 dollars. The caisson for the fourth HCW is expected to be completed in 2014. This alternative would include the completion of this well for production and the construction of the other related components required to connect the well to the system.

Mid-term horizon (2026-2040)

In the mid-term horizon (2026-2040), raw water demands are projected to exceed the supply capacity by 15 to 25 mgd by 2040 during periods of prolonged drought. The mid-term supply alternatives evaluated in the Master Plan include:

- Expansion of the existing well field
- Development of a surface water reservoir

The recommended option is expansion of the existing well field. Through a separate contract with the City, groundwater model simulations were performed that considered a well field consisting of 40 vertical wells and 6 HCWs. Under this well field configuration, the model estimated that the well field could produce 111 mgd for 60 days and 107 mgd for 90 days with a streamflow of 200 cfs. These modeled values compare favorably to the values estimated using conservative summer HCW pumping rates of 10 mgd for the new HCWs.

Assuming each new HCW will increase the summer seasonal well field yield by 10 mgd and the maximum instantaneous pumping rate by 15 mgd, a fifth HCW would increase the summer seasonal pumping capacity of the well field to between 91 and 97 mgd during drought conditions. This pumping capacity would meet projected seasonal demands through 2035. The addition of a sixth HCW on the East Bank of the well field would further increase the summer seasonal pumping capacity of the well field to between 101 and 107 mgd during drought conditions. This pumping capacity would meet projected seasonal demands until approximately 2045.

The opinion of cost for the fifth HCW is $12.6 million in 2013 dollars. The construction of the sixth HCW will require an additional 48-inch raw water transmission main to convey the water from the well to the Platte River Water Treatment Facility. The opinion of cost for the sixth HCW and the transmission main is $24.3 million in 2013 dollars.

Long-term (2041-2060) horizon

The long-term (2041-2060) supply alternatives evaluated included the Missouri River and the Platte River alluvial aquifers. The Missouri River was selected as the preferred alternative. The Missouri River is operated as a navigable channel, and the streamflow is regulated from upstream reservoirs. A well field constructed in the Missouri River alluvium would be less susceptible to low streamflow during the summer months when demands for water are highest.

For the purposes of the Master Plan, it was assumed that the long-term alternative would supply a maximum of 60 mgd, which is sufficient to meet the water supply needs of the City through 2060 if the mid-term supply alternative is not developed. The implementation of the mid-term supply option would reduce the initial capacity needs for the long-term alternative. However, development of a 60-mgd supply along the Missouri River would provide the City with a diversified source of supply that is more resistant to drought and could provide opportunities to develop this supply option as a regional water supply.

The opinion of cost for this alternative is approximately $500 million in 2013 dollars and includes the well field, a treatment facility, and transmission mains necessary to connect the Missouri River Project to the distribution system. It is recommended that field investigation for well field site selection be conducted in 2016 and that land acquisition for the well field facility occur in approximately 2018 in order to secure a site for future source development.

3.3 Water Conservation

It is the policy of the City to promote water conservation. Water conservation encourages responsible use and preservation of the City's water supply. While conservation has not been considered as a source of supply in this Master Plan, it could be used as a means to further delay the need for expanding the City's existing water supply.

The City has recently updated its Water Management Plan. When water use cannot be maintained within the system's capacity, the plan defines procedures and provides guidance for imposing water restrictions. The City also maintains the Mayor's Water Conservation Task Force, which is composed of community members appointed by the Mayor. The focus of the Mayor's Water Conservation Task Force is to promote voluntary cooperation to accomplish conservation goals.

In addition to the demand management, tiered rate structure, education, and public information efforts the City has already implemented, other potential water conservation practices may be feasible, including:

- Customer water survey and audit programs
- System water audits, leak detection, and leak repair
- Large landscaping conservation programs and incentives
- Incentive programs for water-efficient fixtures and appliances
- Conservation programs for commercial, industrial, and institutional accounts

4.0 Water Treatment

Water is treated at the Platte River Water Treatment Facility. There are two treatment trains at this site: the East Plant and the West Plant. The East Plant has a capacity of 60 mgd and primarily treats water from the HCWs. The East Plant consists of oxidation for iron and manganese removal, filtration, disinfection, and fluoridation. The East Plant has been designed for four future expansions in 30 mgd increments.

The West Plant has a capacity of 60 mgd and treats water from the vertical wells. The West Plant consists of aeration, chlorine oxidation of manganese, filtration, disinfection, and fluoridation.

4.1 Water Quality and Regulatory Requirements

Drinking water standards are regulated by the U.S. Environmental Protection Agency (EPA) under the Safe Drinking Water Act (SDWA). Public water supplies must follow the standards set forth by EPA. A review of raw water quality and finished water quality shows that LWS is in full compliance with the current drinking water standards.

A review of anticipated future regulations is included to assist in planning for future treatment improvement needs. Likely regulatory actions occurring in the 2014-2015 time frame will come from the preliminary Third Regulatory Determination, the proposed Long-Term Lead and Copper Rule, the proposed carcinogenic Volatile Organic Compounds Rule (cVOC), or the proposed Perchlorate Rule. Actions further out in time will arise from the third 6-year review process or from separate actions directed by legislation.

The following are the potential regulations and their impacts on LWS:

- Nitrosamines
    - Current international guidelines range from 40 to 100 nanograms per liter (ng/L)
    - Maximum found in LWS sampling was 2.8 ng/L (2008-2009)
    - Potential impacts on LWS are negligible
- Proposed Perchlorate Rule
    - Potential regulatory level ranges from 2 to 10 μg/L

  - LWS found no perchlorate during uncontaminated monitoring rule (UCMR) sampling
  - Potential impacts on LWS are negligible
- Proposed Long-Term Lead and Copper Rule
  - Partial lead service line replacement
  - Sample site modifications
  - Potential impact on LWS will be altered sampling procedures
- Proposed cVOC Rule
  - None of the proposed compounds have been detected in LWS samples
  - Potential impacts on LWS are negligible

The SDWA requires EPA to review all drinking water regulations every 6 years for possible revision. Expectations are that the following rules will be included for revision: the Stage 2 Disinfection Byproduct Rules, the Interim Enhanced Surface Water Treatment Rule, and the Long-Term 2 Enhanced Surface Water Treatment Rules. In addition, chromium is likely to be included as part of the 6-year review list because hexavalent chromium (Cr-6) is of concern.

The list of contaminants on the third uncontaminated monitoring rule (UCMR3) program provides insight into which compounds might be further regulated in the future. That list includes a few metals and some Volatile Organic Compounds (VOCs), several perfluorocarbons, 1,4-dioxane, two viruses, and seven hormones, along with total chromium and hexavalent chromium. LWS will be sampling for UCMR3 in March, June, September, and December 2015.

4.2 Water Treatment Plant Improvements

4.2.1 Future Capacity Expansions

Water treatment plant improvements and expansions will be required as system demands increase. Table ES-2 lists the projected improvements, the timing of implementation, and estimated costs of the recommended improvements.

Table ES-2 Future Plant Improvements

Year[1]	Description	Current Cost Basis[2]	Future Cost Basis - 3% Inflation[3]	Future Cost Basis - 5% Inflation[4]
2027	12 mgd West Plant Expansion[5]	$14,588,000	$22,043,000	$28,827,000
2034	First 30 mgd East Plant Expansion	$25,200,000	$46,872,000	$70,207,000
2052	Second 30 mgd East Plant Expansion[6]	$23,800,000	$75,589,000	$159,579,000

Notes:

1. *The year listed is when the additional capacity is operational.*
2. *Current cost based on HDR Project Cost Estimating software, 2013 dollars.*
3. *Inflated to projected year dollars at 3% per year inflation rate.*
4. *Inflated to projected year dollars at 5% per year inflation rate.*
5. *Testing for the West Plant Expansion is projected to be completed in 2022.*
6. *The need for the second East Plant expansion is dependent on the final timing of implementation of the Missouri River Project.*

4.2.2 Regulatory Improvements

Both East and West Plants are in compliance with all existing drinking water regulations. Rulemaking in the foreseeable future does not appear to adversely impact the plants. Only National Pollutant Discharge Elimination System (NPDES) discharge permit improvements are anticipated to possibly be required throughout the planning period.

5.0 Transmission and Distribution Systems

The transmission and distribution system analysis focused on maintaining and expanding service to customers as the City grows over the next 50 years. The planning periods were selected to coordinate with the LPlan 2040 and are as follows:

- 2025 (short-term, 2014-2025)
- 2040 (mid-term, 2026-2040)
- 2060 (long-term, 2041-2060)

5.1 Existing Facilities

LWS facilities are categorized into two major systems: transmission and distribution. The transmission system consists of transmission mains, reservoirs, and pumping stations that deliver water from the Platte River Water Treatment Facility near Ashland to the distribution system within the City. The distribution system consists of distribution mains, reservoirs, and pumping stations that deliver water from the transmission system to LWS's customers. The distribution system is divided into six pressure zones or service levels: Northwest, Belmont, Low, High, Southeast, and Cheney. The service levels are shown in Figure ES-5.

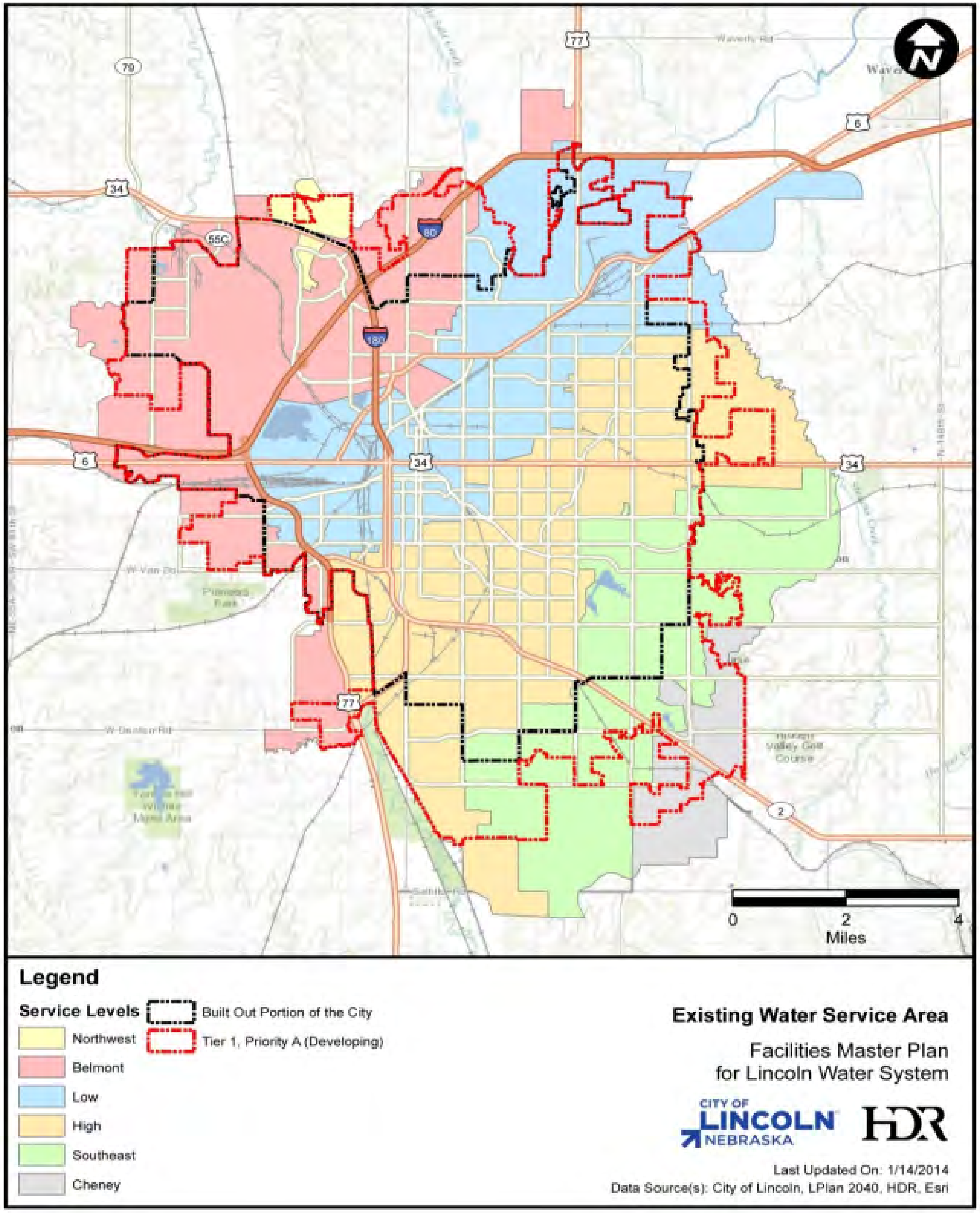

Figure ES-5 Existing Water Service Area

5.2 Analyses

A computer hydraulic model was used to analyze the transmission and distribution systems for each of the planning periods. Computer hydraulic analysis is a method of predicting hydraulic gradients, pressures, and flows across the water distribution network under a given set of conditions. The model software used is InfoWater by Innovyze, version 10.0 Update 7. Alternative improvements were investigated to identify those most effective in meeting future system needs. Criteria used to develop the improvement program include increasing system reliability, simplifying system operations, effectively utilizing system storage, and maintaining minimum pressures under maximum hour demand conditions.

5.2.1 Fire Flow Analyses

The base year maximum day demands were used to analyze potential fire flow deficiencies in the distribution system. Zoning-based fire flow requirements were established as a general indication of areas of potential deficiencies. Some deficiencies were found in areas of the system with 4-inch mains and 6-inch non-looped mains in older areas of the City, including the downtown area. The results of the analyses were incorporated into the development of the improvements program.

5.2.2 Water Age Analyses

Water age modeling was performed to identify areas in the distribution system with high residence times. It is acceptable industry practice to use distribution system water ages as a surrogate indicator for many water quality parameters, including disinfection by-product formation, disinfectant decay, corrosion control effectiveness, microbial re-growth, nitrification, and taste and odor issues. Water age should not be considered as the ultimate indicator of these aforementioned water quality characteristics, but in conjunction with other factors such as pipe characteristics, disinfection processes, distribution system operations, and water use habits. However, water age can be quite useful in identifying distribution system deficiencies in terms of water quality.

Each water age scenario was simulated for a duration of 30 days (720 hours). Areas of the system fed by the Air Park, Southeast, and Cheney tanks have the highest water age in the system. The overall system water age is 148 hours and 103 hours during minimum month demand (MMD) and average month demand (AMD), respectively.

5.3 Recommended Improvements

Improvements are recommended to be completed in four phases: Immediate (2014-2019), Short-term (2020-2025), Mid-term, (2026-2040), and Long-term (2041-2060). The improvements are divided into two categories: transmission improvements and distribution improvements. A summary of the total cost for each phase of improvements is provided in Table ES-3.

Table ES-3 Summary of Transmission and Distribution Improvements

Description	Current Cost Basis[1]	Future Cost Basis (3%)[2]	Future Cost Basis (5%)[3]
Immediate (2014-2019)			
Transmission Improvements	$12,186,000	$14,141,000	$15,584,000
Distribution Improvements	$18,459,000	$20,233,000	$21,501,000
Short-term (2020 -2025)			
Transmission Improvements	$46,427,000	$60,759,000	$72,449,000
Distribution Improvements	$25,442,000	$33,731,000	$40,519,000
Mid-term (2026 -2040)			
Transmission Improvements	$106,041,000	$183,747,000	$264,180,000
Distribution Improvements	$31,570,000	$57,427,000	$84,772,000
Long-term (2041-2060)			
Transmission Improvements	$92,356,000	$239,688,000	$451,520,000
Distribution Improvements	$70,710,000	$211,086,000	$430,017,000

Notes:
1. *Engineering and Contingency estimates are included in each item at a value of Contingency 30% and Engineering 20% of the item cost.*
2. *Inflated to projected implementation year dollars at 3% per year inflation rate.*
3. *Inflated to projected implementation year dollars at 5% per year inflation rate.*

6.0 Water Main Replacement Program

The LWS distribution system consists of a wide range of pipe sizes, ages, and materials. As of the end of 2012, there were approximately 1,200 miles of water main ranging in size from 4 to 60 inches. The oldest pipes in the system were installed in the late 1800s. Over the past 29 years, LWS has added an average of 16 miles of water main per year.

Currently, LWS has budgeted $4.0 million for main replacements in fiscal year (FY) 2013. This will replace approximately 5 miles, or 0.4 percent, of the overall distribution system. This budgeted replacement rate is expected to continue over the next several years.

LWS uses an asset ranking form to prioritize potential projects based on several criteria, including:

- Level of service consequence
- Damage consequence

- Water main condition and failure risk

The score from this asset ranking is combined with other factors such as:

- Break history
- Capacity improvements
- Fire flow improvements
- Opportunity projects (replacing water mains coincident with roadway projects)

LWS has set a system goal to have a maximum break rate of 14 breaks per 100 miles of main per year. Overall, LWS has maintained break rates at or near the goal. LWS is currently performing better than the national average as reported by American Water Works Association (AWWA). Figure ES-6 presents main break rate history for LWS. It is estimated that the current replacement program has prevented nearly 1,400 additional breaks since 1991.

The break rates related to various pipe characteristics were compared to determine where trends exist in order to assist in prioritizing projects. The pipe traits that were used in the comparison are:

- Pipe material
- Pipe diameter
- Operating pressure
- Ground slope
- Soil corrosion potential

The break rates versus age for these criteria were compared to determine if there were significant differences in the break rate. It was found that diameter and material showed the most significant variation in break rates; 6-inch and smaller diameters and thin walled cast iron and unprotected ductile iron had higher break rates than other categories in the comparison.

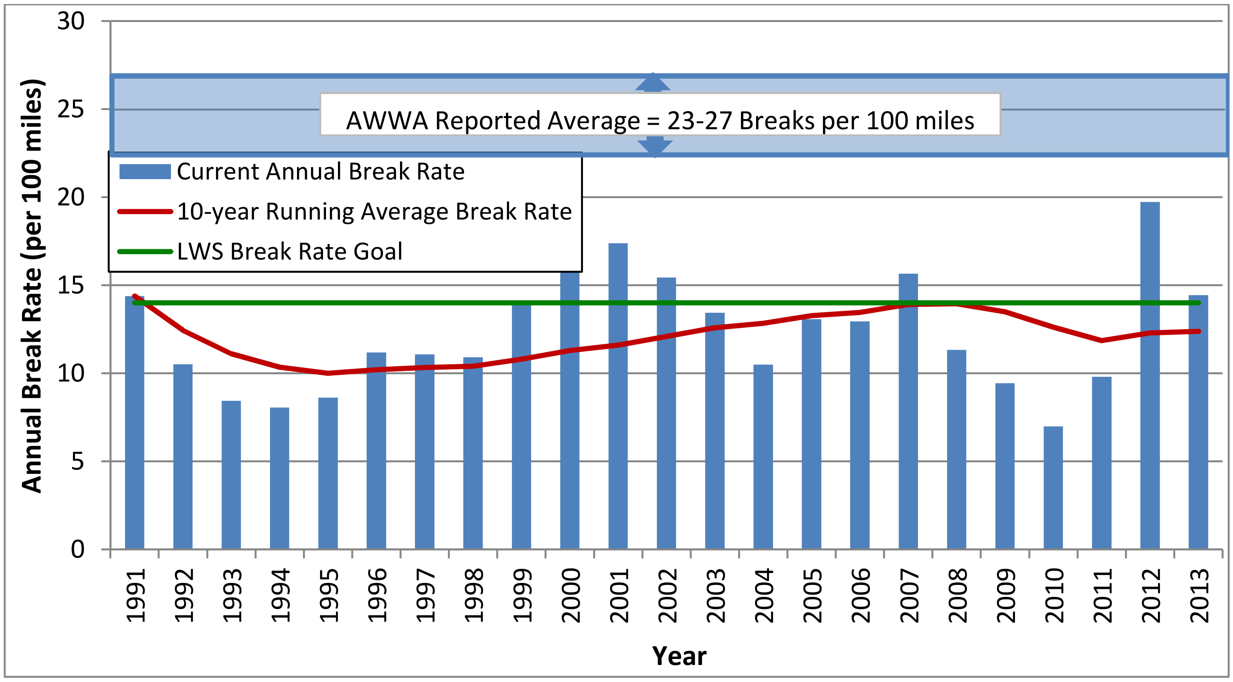

Figure ES-6 System Performance Relative to LWS Goal & AWWA Recommended Goal

Based on LWS's current performance, desired level of service, cost targets, backlog of pipe requiring replacement, and risk tolerance, an investment level of approximately 7 miles of pipe replacement per year is recommended. This would require approximately $6.3 million per year in 2013 dollars. This level of replacement would maintain the current level of backlog for water mains requiring replacement.

7.0 Asset Management

The City performed a formal asset management needs assessment with CH2M Hill in 2009. Through this effort, a comprehensive asset management program was identified as both a gap and a priority for continuing high performance operations and organizational sustainability at LWS.

The methodology used as a part of this Master Plan to conduct the asset management evaluation for LWS compared currently used business processes against industry best practices in the context of the Asset Management Framework, as depicted in Figure ES-7.

The framework items identified in the blue boxes in Figure ES-7 were the focus of this study:

- Asset knowledge is generally obtained and maintained in the computerized maintenance management system (CMMS).
- People and processes drive the asset management program.

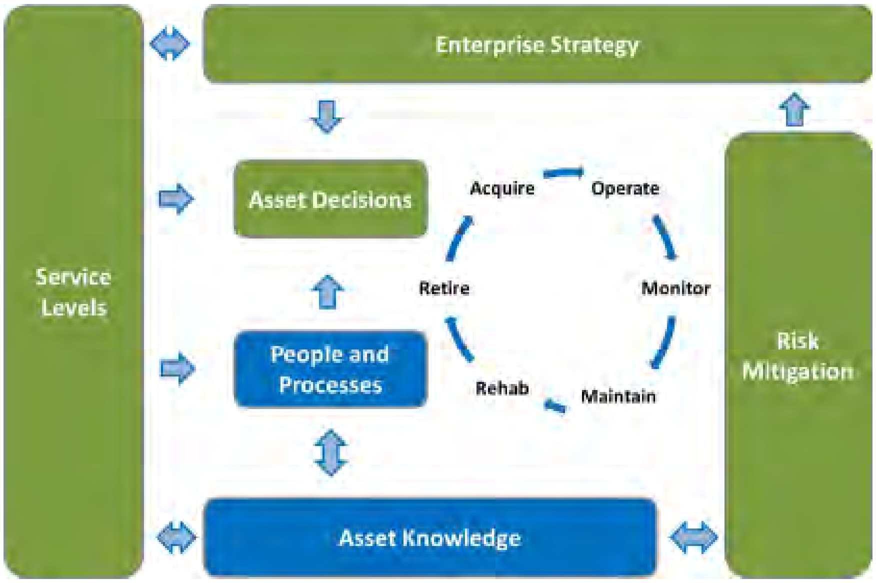

Figure ES-7 Asset Management Framework

The key tools currently used by LWS for asset knowledge include a CMMS program called Hansen and a geographic information system (GIS). LWS has made significant progress towards implementing these systems, but currently these systems operate independently of each other and are used inconsistently throughout the division.

LWS has an experienced staff, with much of the maintenance activities being conducted based on well developed schedules and system knowledge. While this knowledge and expertise is critical to the overall operation of the system, using the Asset Management Framework with the proper information technology (IT) systems and business processes will facilitate information transfer and will significantly reduce the potential of losing system knowledge as a result of staff changes.

A robust asset management program will provide LWS with the information and tools necessary to make critical decisions for the system. These decisions include maintenance scheduling and proactive prioritization of capital renewal and replacement projects.

LWS has made progress in the implementation of an asset management program with the further implementation and population of Hansen and GIS. To further advance this program, LWS should develop defined and consistent business processes throughout all sections within LWS. This includes consistent use of CMMS and GIS, establishment of an asset management hierarchy, and routine syncing of the CMMS and GIS. In addition, an asset management project leader should be identified to facilitate the implementation of the program.

Another critical element of a robust asset management program is the implementation of a condition assessment process. This process will allow LWS to further extend the useful life of assets, reduce the potential for failure, and identify those assets that have the highest potential for and consequence of failure in the system.

8.0 Financial Assessment

The objective of the financial assessment is to provide a conceptual review of the financial feasibility of the Master Plan. This financial assessment is not a comprehensive rate study, and it is not intended to be used for rate setting purposes. The financial assessment considers both the annual operating costs and capital needs of LWS. The financial assessment determines the financial feasibility of the Master Plan and what adjustments may be needed to the current water rates and revenues to adequately support the Master Plan. At the same time, the financial assessment considers other financial planning criteria, such as debt service coverage (DSC) covenants and maintenance of adequate reserve levels.

Two time periods were explored for the financial assessment: a 10-year projection and a 30-year projection. The 10-year projection is more critical for immediate financial planning purposes, but developing a financial forecast for a 30-year time period allows for a longer range look at the needed improvements and costs to the system. The financial feasibility of the Missouri River Project, which carries an additional and significant financial burden with it, was also explored.

8.1 10-Year Projection

Capital improvement projects during the first 10 years, from FY 2014 through FY 2023, total approximately $235 million. The capital projects in any particular year range from approximately $10 million to slightly over $40 million. Given that LWS is currently funding approximately $10 million per year for capital projects, the funding of the larger projects in the Master Plan will likely need to be debt funded. In the model developed as a part of the financial assessment, the overall annual debt service payments are projected to increase during this 10-year period from approximately $5.0 million per year to slightly over $9.0 million per year.

In addition to debt funding, the Master Plan capital projects during this period will be funded on a “pay-as-you-go” basis using rate revenues. This will require LWS to continually increase the level of funding of the CIP from rates over this 10-year period from the current level of approximately $10 million per year to about $15 million per year in FY 2023. The needed rate adjustments to support the Master Plan for FY 2014 through FY 2023 average 5 percent over this time period. Inflation alone accounts for approximately 3 percent per year in rate adjustments. During this time period, renewal and replacement projects for the existing LWS system account for over 50 percent of the CIP.

8.2 30-Year Projection with the Missouri River Project

During the 30-year time period, from FY 2014 through FY 2044, the CIP for LWS has approximately $1.0 billion in capital projects without the addition of a long-term water supply required to meet the needs of the system in the mid-2040s. The identified long-term supply project, the Missouri River Project, has a 2013 (estimated) cost of approximately $500 million, and when escalated to the end of the 30-year period, it approaches $1.2 billion. When placed in this context, the Missouri River Project essentially doubles LWS's capital plans over this 30-year time period.

A project of this magnitude raises a number of serious financial questions. Most importantly is whether this project is "affordable" and, if so, whether there is a financial strategy that LWS should consider for this particular project. There are no simple strategies to fund a project of this magnitude. However, it has concluded that LWS should consider the following strategy:

- As soon as possible, LWS should begin to set aside funds in a dedicated Missouri River Project reserve. The intent of this reserve is to begin to pre-fund the project such that it does not require 100 percent debt financing in 2040 or when built.
- The intent of funding this reserve is two-fold. First, it sets aside funds for the project, but more importantly, it begins to ramp up LWS's rates to a point at which LWS can support the eventual debt service payments associated with the project. Once the project is built, the financial strategy is that LWS will have gradually built into its rates, over the last 30 years, an amount that will pay a substantial portion of the annual debt service payment going forward. The key to this strategy is that it should minimize the need for a major rate adjustment (for example, a doubling of rates in a single year) at the time the debt is issued.
- A significant amount of funds will need to be collected annually and set aside in this dedicated reserve. Even with these funds set aside, LWS may be able to fund only 10 to 15 percent of the total expected project costs from this reserve.
- When the Missouri River Project is being built, LWS should deplete the dedicated reserve and apply those reserves against the project. The balance of any needed funds to construct the project will be obtained from the issuance of long-term debt.

While this strategy appears to be relatively sound on the surface, it will likely be more complicated in reality. In particular, asking today's customers to fund a project that is potentially 30 years into the future, and may or may not be built, creates a certain set of political challenges on its own. Though not impossible, it may be difficult for LWS to start the reserve in the near future; instead, LWS may need to wait until there is greater certainty around the Missouri River Project. However, that strategy has its own pitfalls in that the amount of funds collected in the dedicated project reserve may be minimal due to the shortened amount of time available to accumulate funds. Alternatively, the size of the rate adjustments needed over the shorter time period to ramp up to the anticipated level of debt service may be too large on an annual basis. The financial assessment developed in this Master Plan is intended only to answer the basic question of whether it is potentially feasible to be fund the Missouri River Project.

The scenario considered assumed that LWS would begin to fund the Missouri River Project reserve in FY 2018 at $1 million per year. Over time, the annual contribution would increase to $32 million by FY 2040. At that point, the Missouri River Project reserve would fund approximately $298 million of the project costs. Additional funds would be collected from rates during the construction period, and an additional $25 million is assumed to also be available in construction reserves. When taken together, this is approximately 28 percent of the anticipated project cost, meaning that the balance of approximately $882 million (72 percent) would need to be funded from long-term debt.

From the projection of revenues and expenses, along with a funding plan for CIP projects, a summary of the revenue requirements for LWS for the 30-year period from FY 2014 through FY 2044 was developed. This summary is provided in Figure ES-8.

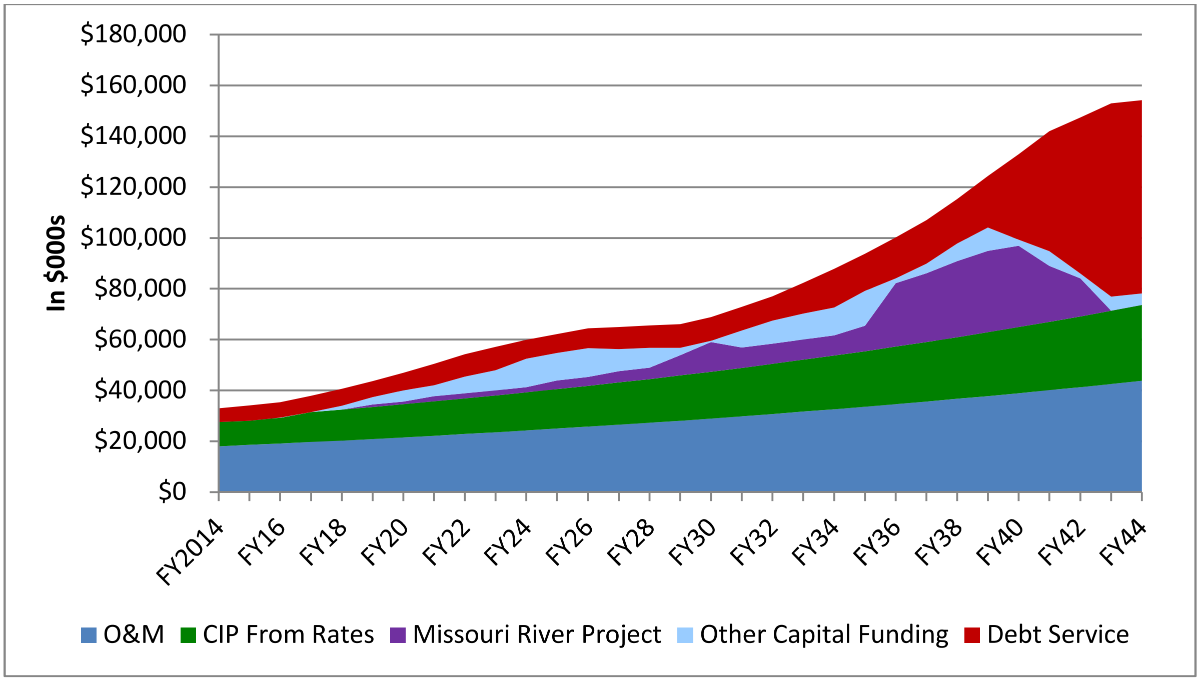

Figure ES-8 Summary of the 30-Year Financial Assessment ($000) Including the Missouri River Project

As shown in Figure ES-8, the purple area is the funding of the Missouri River Project reserve. In addition, the light blue funding of the "other capital funding" helps to position LWS for the eventual debt service that occurs, as shown in dark red. By FY 2044 and using the assumptions discussed above, the total revenue requirement is approximately $160 million.

While the magnitude of the dollars is exceptionally large in relation to today's costs, the needed rate adjustments, on their own, appear feasible and manageable. The financial assessment assumes needed rate adjustments on average of 4.5 to 5 percent over this time period.

While the level of the rate adjustments appears to be reasonable, the potential impact on a typical residential customer's bill was reviewed, as shown in Figure ES-9. This figure shows both nominal and real dollars in the form of net present value (NPV).

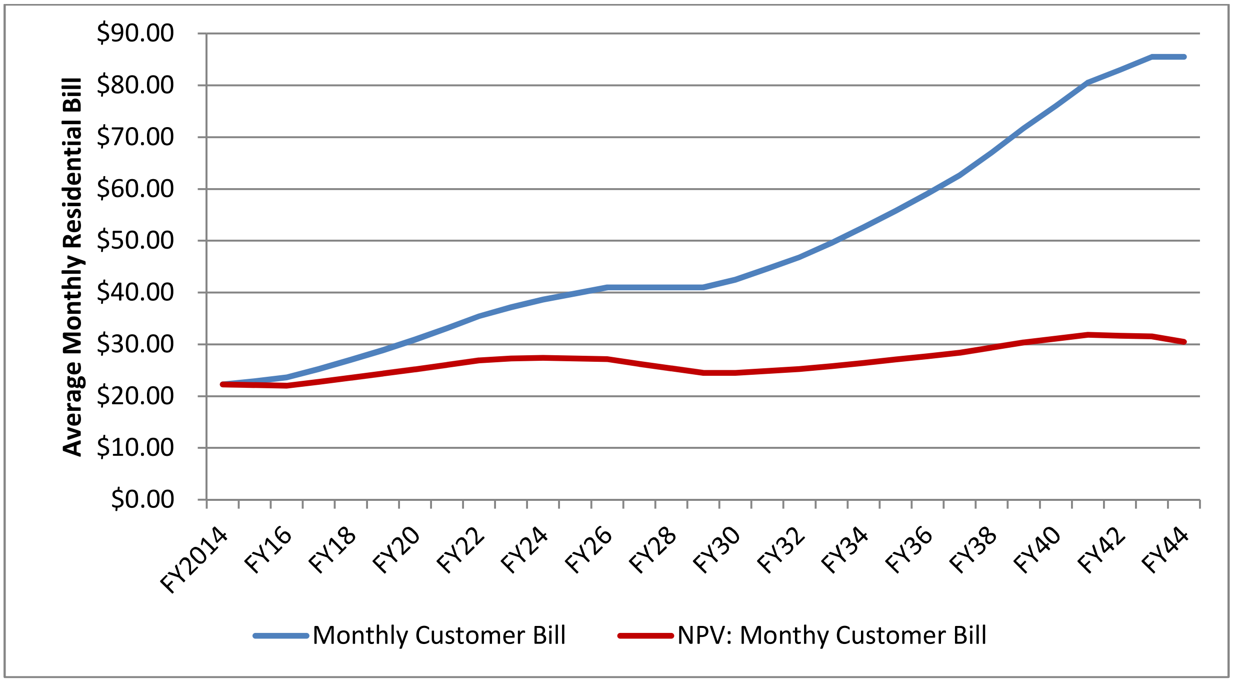

Figure ES-9 Projected Average Residential Monthly Bill – FY 2014 – FY 2044 Including the Missouri River Project

At the present time, the average monthly residential bill is approximately $22.24. Assuming the annual rate adjustments shown in Figure ES-9, the average monthly residential bill could increase to approximately $85.49 per month. If this value is adjusted (deflated) for the assumed time value of money, then, in net present value (NPV) dollars, the cost is approximately $30.46 per month. The assumed discount rate used for the present value analysis was 3.5 percent. This result is subject to the variability of the assumptions used over the 30-year period, and the result may vary significantly under different assumptions.

8.3 Affordability Issues

Affordability is a concern of all utilities given the fact that rates and charges for utility services have been increasing at a pace that exceeds the cost of living (CPI). Affordability has now come to the forefront of many discussions, particularly as it relates to major capital infrastructure funding and financing. Affordability for the community is defined as a percentage of the median household income (MHI). Average residential bills which exceed this threshold are considered "unaffordable". Typical measures used have ranged from 1.5% to 2.5% of a community's MHI.

In the case of the City, the median household income is approximately $46,600. Using a 2.0 percent measure, this means that the average residential bill would need to be $77.00 per month before the rate would be considered "unaffordable" on a community-wide basis. Stated another way, the current average residential bill of $22.24 is approximately 0.5 percent of the average MHI for Lincoln, which is in the low financial impact range. Given LWS's currently low rates, it would seem that nothing within this financial assessment that would indicate that the Master Plan is unaffordable on a community-wide basis. However, at an individual level, there may be affordability issues. As LWS's rates continue to increase over time, LWS and the City may consider different methods for addressing the needs of these specific customers.

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