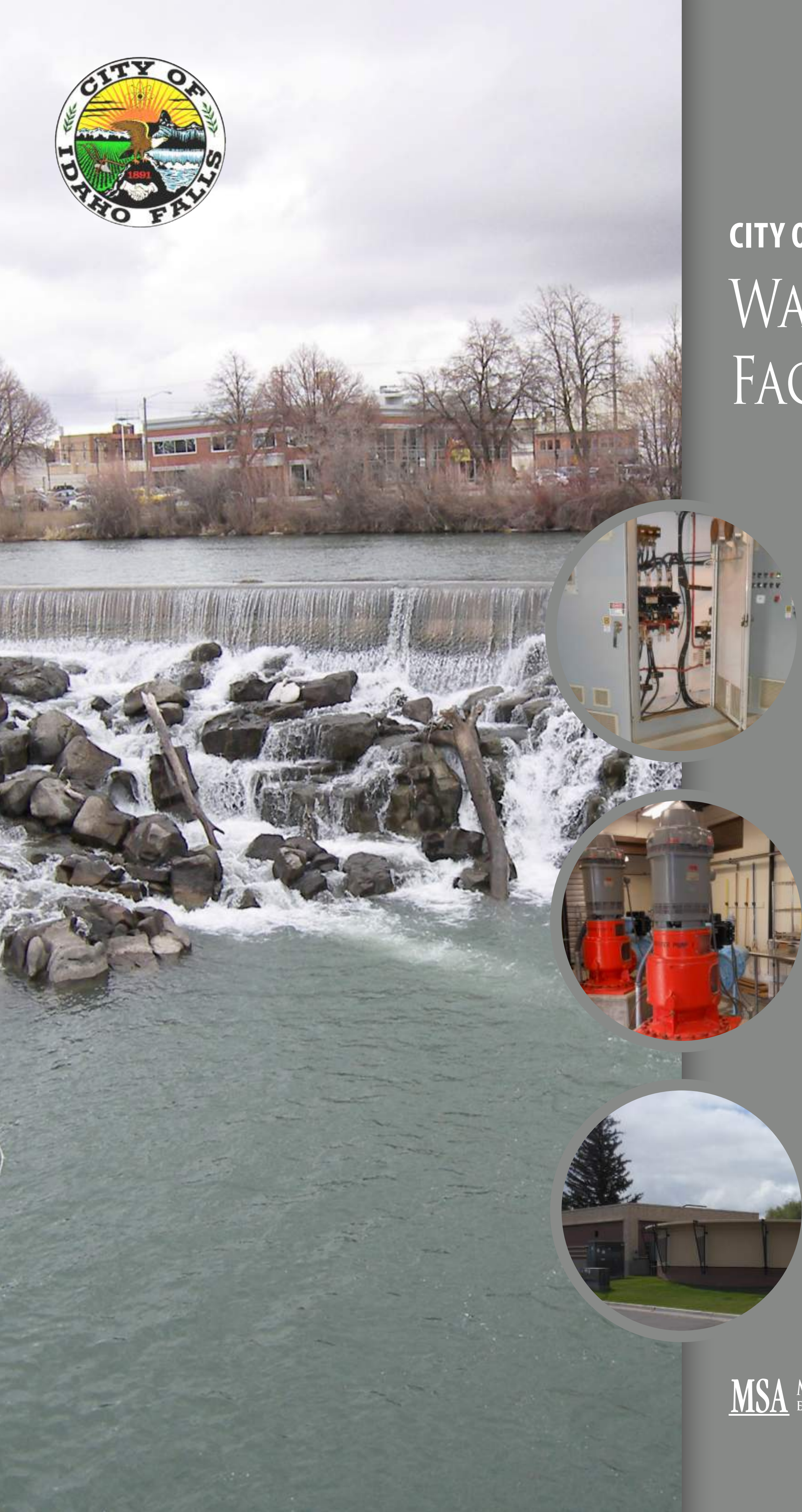


FINAL

CITY OF IDAHO FALLS

WATER FACILITY PLAN

MSA MURRAY, SMITH & ASSOCIATES, INC.
ENGINEERS | PLANNERS

JUNE 2015

WATER FACILITY PLAN

FOR

THE CITY OF IDAHO FALLS

JUNE 2015

PROFESSIONAL ENGINEER
REGISTERED
11112
STATE OF IDAHO
DAVID E. STANGEL
7/7/15

MURRAY, SMITH & ASSOCIATES, INC.
345 Bobwhite Court, Suite 230
Boise, ID 83706
208.947.9033

14-1550 MSA-ID 06/15

ACKNOWLEDGMENTS

Appreciation is expressed to all who contributed to the completion of this report.

City of Idaho Falls
Chris Fredericksen, P.E.
David Richards, P.E.
Rusty Gerdes

Murray, Smith & Associates, Inc.
David Stangel, P.E.
Dené Breakfield
Dennis Galinato, P.E.
Jennifer Fraser
LaDonne Harris, P.E.
Mark Cummings, P.E.
T. Clay Ellestad, P.E.

Galardi Rothstein Group
Cody Stanger

Control Engineers
Mike Johnson

ACRONYMS & ABBREVIATIONS

A

AACE	AACE International
ADD	average day demand
AMI	advanced metering infrastructure
ATS	automatic transfer switch
AWWA	American Water Works Association

B

BAT	backflow assembly tester
BMPO	Bonneville Metropolitan Planning Organization

C

CAGR	compounded annual growth rate
CCR	Consumer Confidence Report
CIP	capital improvement program
CL	chlorine

D

DEQ	Idaho Department of Environmental Quality
DSC	debt service coverage

E

ERP	Emergency Response Plan

F

fps	feet per second
ft	foot, feet
FTE	full-time equivalent
FY	fiscal year

G

GIS	geographical information system
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute

H

hp	horsepower
HVAC	heating, ventilating and air conditioning

I

IDAPA	Idaho Administrative Procedures Act
in	inch, inches
IWA	International Water Association

K

kgals	thousand gallons

M

MCC	motor control center
MDD	maximum day demand
MERF	Municipal Equipment Replacement Fund
MG	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
MSA	Murray, Smith & Associates, Inc.
MSL	mean sea level
MUA	multi-attribute utility analysis

N

NEC	National Electric Code

O

O&M	operations and maintenance
OIT	operator in training

P

%	percent (use with numerals – e.g., 13%)
PAYGO	Pay-As-You-Go
PER	Preliminary Engineering Report
PF	peaking factor
PHD	peak hour demand
PILOT	payments in lieu of taxes
PLC	programmable logic controllers
PRV	pressure reducing valve
psi	pounds per square inch
PUD	public utility district

S

SCADA	supervisory control and data acquisition
SCBA	self-contained breathing apparatus
SFR	single family residential
SRF	State Revolving Fund

T

TAZ	traffic analysis zone

U

UNK	unknown

V

VA	Vulnerability Assessment
VFD	variable frequency drive
VSP	variable speed pump

W

WFP	Water Facility Plan

TABLE OF CONTENTS

Page

1. EXECUTIVE SUMMARY

2. EXISTING SYSTEM DESCRIPTION

3. POPULATION AND DEMAND PROJECTIONS

4. DISTRIBUTION AND SUPPLY ANALYSIS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Murray, Smith & Associates, Inc.
Engineers/Planners

SECTION 1

Executive Summary

SECTION 1
EXECUTIVE SUMMARY

Introduction

The City of Idaho Falls (City) operates a public drinking water system through the Water Division (Division) of the Public Works Department. This Water Facility Plan (WFP) documents key water system information and provides analysis and recommendations that inform infrastructure development and operational decisions by City staff.

How This Plan Should Be Used

This WFP guides future water system improvements, and should:

- Be reviewed annually to prioritize and budget needed improvement projects.
- Be updated every 5 years to address current conditions.
- Have the system mapping updated regularly to reflect ongoing development and construction.
- Have its specific project recommendations regarded as conceptual. (The location, size, and timing of projects may change as additional site-specific details and potential alternatives are investigated and analyzed in the preliminary engineering phase of project design.).
- Have its cost estimates updated and refined with preliminary engineering and final project designs.

Scope of Work

The City selected Murray, Smith & Associates, Inc. (MSA) to create a Water Facility Plan (WFP) for its drinking water system. The scope of work for this WFP includes the following major tasks and deliverables:

- Describe the City's existing water system.
- Update the hydraulic model.
- Develop population and water demand projections.
- Develop water system performance criteria.
- Evaluate the water system's hydraulic capacity to identify deficiencies for existing and future planning horizons.
- Gather and summarize benchmarking data comparing the City's operations and maintenance (O&M) practices to similar municipalities, and provide improvement recommendations.
- Evaluate the existing condition of well and booster pump facilities and their compliance with State of Idaho drinking water rules and guidelines.

- Develop an ongoing repair and replacement program for system piping.
- Develop a capital improvement program (CIP) and cost estimates for recommended projects.
- Develop a water system financial plan that identifies a funding strategy that supports the implementation of the CIP and growth of the utility.
- Estimate the conceptual costs and analyze the financial impacts of a City-wide meter installation program.
- Review the City's existing rates, identify and evaluate feasible rate structure alternatives, and recommend changes congruous with available billing data.

Organization of the WFP

This WFP is organized into ten sections, as described in Table 1-1. Detailed technical information and support documents are included in the appendices.

Table 1-1
WFP Organization

Section	Description
1 – Executive Summary	Purpose and scope of the WFP and summary of key components of each part of the plan.
2 – Existing System Description	Description of the service area and overview of the existing system and facilities.
3 – Population and Demand Projections	Population projections and water demand estimates for existing and future service area boundaries.
4 – Distribution and Supply Analysis	Overview of system performance criteria. Discussion of supply, storage, and pumping capacity, and distribution system hydraulic analysis for existing and future planning horizons.
5 – Operations and Maintenance	Description of current O&M procedures, overview of benchmarking results comparing the City to similar municipalities, and a summary of recommendations.
6 – System Condition and Code Evaluation	Determination of the operational and code compliance for the pumping facilities in the water supply and distribution system.
7 – Capital Improvement Program	Improvement project recommendations including cost estimates and timeframe for implementation.
8 – Financial Plan	Strategy for funding water system improvements and projected financial performance of the system.
9 – Financial Impacts of City-wide Meter Implementation	The conceptual costs, funding plan, and estimated financial impacts of a meter installation program
10 – Alternative Rates	Proposed changes to billing methodologies, rate structures, and fee levels by customer class.

Existing System Description

The water system includes over 310 miles of City pipe and about 25 miles of privately owned pipe. The system serves approximately 24,000 accounts, about 250 of which are metered, and serves over 52,000 people according to Bonneville Metropolitan Planning Organization (BMPO) projections (census data indicates that the City has an approximate population of 58,000, but BMPO data was used to calculate population projections in this WFP). The entire system is on a single hydraulic gradient (pressure) zone set by the overflow of the elevated tank.

Most of the system's 19 groundwater wells pump into ground-level contact tanks. The water is then boosted from the tanks to system pressure through 13 booster stations located at the well sites. The 65th South Booster Station is currently the only pump station not served directly by a well, but there are plans to add one at this location.

The City has a 0.5 million gallon (MG) elevated storage tank at Well 3 and two large ground-level storage tanks at Well 15/15B and the 65th South Booster Station that are 3 MG and 2.25 MG, respectively. The remainder of the tanks are small and intended primarily for chlorine contact time rather than system storage.

System piping diameters range from 2 to 24 inches, with the majority of pipes measuring either 6 or 8 inches. Most pipes are made of ductile iron; other materials include cast iron, steel, and asbestos cement. The oldest pipe dates back to the early 1900s.

Population and Demand Projections

The City has little existing customer use data, because only 250 accounts are metered. Therefore, overall system production and BMPO projections were used to predict population and spatially allocate demand in the system.

Historical production records were evaluated to determine average day demand (ADD) and peaking factors for maximum day demand (MDD) and peak hour demand (PHD). Based on these records and the BMPO population estimate of 52,000 people in the service area, the ADD per capita demand in the system is 455 gallons per capita per day.

The per capita demand and existing peaking factors are used with the City's projected service area expansion and BMPO population growth projections to calculate anticipated demands for the 5-, 20-, and 40-year time horizons. Based on City input, additional demand was also placed at three locations to serve potential industrial customers. Two of these locations are in the southwest of the system and another in the northeast near future growth areas.

The resulting system-wide demand projections in million gallons per day (mgd) are shown in Table 1-2.

Table 1-2
Demand Projections

Year	Demand Type	ADD (mgd)	MDD (mgd)	PHD (mgd)
2014 (Existing)	Existing Production	24.5	58.5	80.4
	Industrial Point Loads[1]	2.2	2.2	2.2
	Total	**26.7**	**60.7**	**82.6**
2020 (5-Year)	Based on Per Capita Demand	27.1	67.7	92.1
	Industrial Point Loads[1]	4.6	4.6	4.6
	Total	**31.7**	**72.3**	**96.7**
2035 (20-Year)	Based on Per Capita Demand	35.0	87.4	118.9
	Industrial Point Loads[1]	4.6	4.6	4.6
	Total	**39.6**	**92.0**	**123.5**
2055 (40-Year)	Based on Per Capita Demand	49.2	123.1	167.4
	Industrial Point Loads[1]	4.6	4.6	4.6
	Total	**53.8**	**127.7**	**172.0**

[1] *Industrial point demands are assumed to be relatively constant throughout the day, so peaking factors are not applied.*

Although not used as the basis for the WFP analysis, a separate demand projection was developed based on the installation of meters at all customer locations. A literature review of demand reductions for other utilities converting to meters and with similar climates assumes that a 30% reduction in average demand and a 40% reduction in peak demands could occur. Assuming these reductions and a 10-year implementation schedule for City-wide meter installations, the 20-year peak demands fall below existing demands and the 20-year ADD is only 3 mgd above the existing ADD. The installation of meters and charging customers for actual water usage could have a significant reduction in the number of new supply and pumping improvements required in the 20-year horizon.

Distribution and Supply Analysis

The City provides a reliable water supply to its customers and was evaluated based on criteria for pressure, storage, pumping, and fire suppression capability shown in Table 1-3.

Table 1-3
Performance Criteria

System Attribute	Evaluation Criterion
Water Supply	Firm supply capacity under MDD[1]
Distribution Storage	Sum of operational, equalization, fire and dead storage is adequate
Pump Stations and Wells	Redundant pumps Capacity to meet PHD or MDD+fire flow (whichever is larger) Backup power adequate to serve ADD + largest fire flow
Service Pressure	20 pounds per square inch (psi) minimum during MDD + fire flow 40 psi minimum during PHD 40-80 psi standard operating range
Distribution Piping	8-inch minimum future pipe diameter (exception: 6-inch for short, dead-end mains without fire service)
Fire Suppression[2]	Residential: 1,500 gallons per minute (gpm) for 2 hours Commercial/Industrial: 2000-3,000 gpm for 2 hours Heavy Industrial: 4,500 gpm for 4 hours

[1] Firm capacity: the total production capacity with the largest-capacity well, Well 5, out of service.
[2] For all fire flow evaluations, it is assumed that flow for only one fire at a time must be available.

Due to high summertime demands, deficiencies in instantaneous water rights, peak supply, and pumping capacity have been identified. It should be noted that the demand projections are based on the assumption that existing per capita average and peak water use trends will continue (i.e. customer meters are not installed). If per capita water use trends decrease, fewer future supply and pumping improvements will be required. The hydraulic model was utilized to evaluate existing, 5 and 20 year conditions. Supply evaluations were also conducted using 40 year projections. The following lists describe each respective analysis section:

Storage Analysis Summary

- The City has adequate storage for existing and 5-year conditions.
- The City will have a system-wide future storage deficit of 1.6 MG by the 20-year horizon.

Supply Analysis Summary

- The City has adequate yearly average and instantaneous water rights to meet existing and 5-year demands.
- The yearly average water right is adequate through the 2055 projection; however, the instantaneous water right will have a 7.4 mgd deficiency by the 20-year horizon and another 35.7 mgd deficiency by the 40-year horizon (43.1 mgd total).
- The City has adequate total and firm supply capacity (with Well 5 out of service) to

meet existing MDD. However due to transmission limitations to convey the existing supply at adequate service pressures, as identified through the hydraulic model analysis, an additional 10.8 mgd of well capacity is recommended in the 5-year horizon, and another 11.7 mgd within 20 years (22.5 total). Increased well capacity is recommended over significant transmission piping improvements due to cost effectiveness.

- Based on a demand and supply mass balance, approximately 26 mgd more (totaling over 48 mgd) will be required to supply the 40-year projected MDD.
- Due to changes in state regulations since the City's last water facility plan, current backup power capacity is deficient by 11.1 mgd, and by the 20-year horizon will be short an additional 13 mgd (24.1 mgd total).

Peak Pumping Analysis Summary

- The current pumping capacity is adequate for existing demands.
- For the 5-year horizon, an additional 4.3 mgd of pumping capacity is needed to meet PHD. This booster pumping capacity is included as part of the facility to increase well supply. By the 20-year horizon, another 17.4 mgd will be required (21.7 mgd total). All but 5.8 mgd of this booster pumping capacity is recommend in combination with new well supply.

Distribution System Analysis Summary

- For existing demands, the system has generally adequate pressures under ADD, MDD and PHD conditions, with one area modeled slightly above 80 psi during ADD, and one area under 40 psi in the hydraulic model during PHD conditions.
- A significant number of locations do not provide adequate fire flow under existing conditions. Many of these deficiencies are due to undersized pipes.
- Future scenarios were modeled assuming adequate supply and that existing deficiencies had been resolved.
- Under the 5-year demand projection, no locations have pressures over 80 psi, and only one new location has PHD pressures under 40 psi.
- For the 5-year fire flow analysis, five new areas have deficiencies, although all are less than 200 gpm below the requirement.
- No new pressure deficiencies are anticipated for the 20-year ADD and MDD conditions. However, the 20-year PHD analysis indicated significant portions of the north and south ends of the system with pressures below 40 psi. Transmission piping improvements were added to resolve the 20-year PHD deficiencies.
- No new fire flow deficiencies were identified under the 20-year analysis.
- Specific projects to address these deficiencies are described in Section 7—Capital Improvement Program. Some piping projects are also included to improve transmission from new supply facilities and expanded booster pumping capacity.

System-Wide Summary

The storage, well supply, and booster pumping deficiencies and recommended solutions for each evaluation horizon are detailed in Table 1-4 (deficient numbers are inside parentheses).

Table 1-4
Storage, Supply, Pumping Summary Deficiencies

Timeframe	Deficiency			Recommended Solution[1]
	Storage (MG)	Well Pumping Capacity (mgd)	Booster Pumping Capacity (mgd)	
2014 (Existing)	No Deficiency	No Deficiency	No Deficiency	• N/A
2020 (5-year)	No Deficiency	(10.8)	(4.3)	• New facility with 4.3 mgd well capacity, 4.3 mgd booster capacity and 1.25 MG storage[2] • New 6.5 mgd well at 65th Street facility
2035 (20-year)	(1.6)	(22.5)	(21.7)	• New facility with 5.2 mgd well capacity, 5.2 mgd booster capacity, and 1.25 MG storage • New facility with 2.2 mgd well capacity, 2.2 mgd booster capacity, and 0.1 MG storage • New facility with 4.3 mgd well capacity, 4.3 mgd booster capacity, and 1 MG storage[3] • Additional 3.6 mgd in booster capacity at 65th Street facility • Additional 2.2 mgd in booster capacity

[1] To adequately address the storage, supply and pumping deficiencies, transmission piping improvements are also required. Recommended improvements are outlined in Section 7.
[2] Storage is not required until 2035, but is driven by the timing of supply and booster requirements.
[3] Storage is not required by 2035, but is driven by the timing of supply and booster requirements and lack of storage in the north of the system.

Operations and Maintenance

The City’s water system Operations and Maintenance (O&M) program was assessed to determine current deficiencies in its existing procedures and to identify areas of improvement. This assessment and its resulting program improvement recommendations are based on information supplied by City staff, pertinent regulatory requirements, and comparison of the City’s O&M practices to those of seven comparably sized utilities.

Currently, 14 full-time Water Division employees work under the direction of the Water Superintendent; all are involved in the operations or maintenance of the system in some capacity. Routine operations involve the analysis, formulation, and implementation of procedures to ensure that the facilities are functioning efficiently and meeting quality, quantity, and pressure requirements, as well as other system demands. Routine items include making daily rounds to visually check system facilities, visually monitoring flow and reservoir level recording devices on a regular basis during the day, and responding to customer inquiries and complaints.

Benchmark comparisons revealed that the City spends less per year on population served and total distribution system length than half of the surveyed utilities. The City ranks second in total length of distribution system operated per full-time equivalent (FTE) staff. The City provides the greatest average daily flow per both FTE and dollar spent in annual budget.

It should be noted that the three largest systems used for comparison (Meridian, Nampa, and Redmond) have all experienced rapid, recent growth. According to the 2010 U.S. Census, Meridian's population grew by 115%, Nampa's by 57%, and Redmond's by 94% between 2000 and 2010. (Idaho Falls grew 12% in the same timeframe.) It is reasonable to conclude that large portions of these systems' infrastructures will likely be newer, having been built to accommodate this recent growth, and will thus require fewer near-term O&M program improvements and structural replacements.

The following conclusions and recommendations for improving the City's O&M program include:

- Implement a water storage tank inspection and cleaning program to assess every storage tank within the system at least once every five years.
- Develop a pipeline replacement program to replace approximately 3.2 miles (16,800 ft) of publicly owned pipeline per year.
- Continue to develop the unidirectional flushing program.
- Establish a valve exercise program that locates, operates, and rates the condition of all distribution valves on a five-year basis.
- Develop a water meter testing program and construct a dedicated test facility.
- Continue to update and maintain the City's safety plan and safety equipment.
- Continue to evaluate different, safer, disinfection alternatives.
- Conduct ongoing record-keeping training for staff to maintain a disciplined documentation program.
- Maintain concrete and asphalt flatwork at each well facility.
- Implement asset management software to help manage the O&M staff's tasks.
- Add two FTEs and equipment to the water distribution section to implement the valve exercising, unidirectional flushing, and meter testing programs.

- Add one additional FTE and equipment to the water supply section to aid ongoing facility O&M work.

System Condition and Code Evaluation

To determine the status of the City's water supply system, MSA and City staff reviewed all wells, booster stations with regard to both the existing condition of the facility, and its compliance with 2014 Idaho Administrative Procedures Act (IDAPA) drinking water rules and applicable Idaho Department of Environmental Quality (DEQ) guidelines.

Multiple sources of information were synthesized to determine the status of the City's drinking water system, including interviews with system operators, site visits, and reviews of as-built design drawings and geographic information system (GIS) data. The two components comprising the system, production facilities (combined well and booster stations) and the distribution system (piping), were analyzed and ranked to identify where the City should begin rehabilitation and component replacement efforts.

The City's GIS records were analyzed to compare each buried pipeline's age, material, and break records with its expected life to determine which pipelines were in most need of repair. Results of this analysis suggest that the City needs to first focus its replacement efforts on cast iron piping installed between 1902 and 1959, and then on pipes with the highest number of breaks.

Specific improvements were identified for all well production facilities to ensure they meet the operators' needs and comply with current state and federal standards. Many of the recommended improvements apply to all except the three newest facilities (Wells 15, 16, and 17).

In general, wells that produce the most water and need the most updates are recommended to be improved first. Table 1-5 shows the improvement prioritization of all well facilities. No assessments were performed for Well 7 due to water quality problems; this well has not been used for some time and the City will likely abandon it. For detailed facility rankings and improvement recommendations, see Section 6—System Condition and Code Evaluation in this WFP.

Table 1-5
Well Facility Improvement Ranking

Ranking	Facility
1	Wells 9 & 10
2	Well 3
3	Well 1
4	Well 4
5	Well 8
6	Well 5
7	Well 12
8	Wells 11 & 14
9	Wells 13 & 13B
10	Well 6
11	Well 16
12	Well 17
13	Well 2
14	Wells 15 & 15B

Capital Improvement Program

The Capital Improvement Program (CIP) focuses on system improvements required in the existing, 5-year and 20-year planning horizons to provide reliable water supply and distribution throughout the City's service area; longer-term (21- to 40-year) supply needs are described in general terms.

The CIP generally consists of four improvement project categories:

New and Upgraded Pipelines

The system analysis includes 87 pipeline projects to address hydraulic capacity constraints over the next 20 years. Pipeline projects are generally prioritized within each planning horizon, based on the severity of the hydraulic deficiency, size of the impacted area, and pipe condition.

Pipeline Replacement

The City plans to replace all system piping over a 100-year period at about 1% per year. Due to budget constraints, full funding for this replacement program is not proposed in the next 20 years; however, the City intends to address capacity-related improvements first, with any pipe replacement contributing to the overall 100-year plan.

To help prioritize pipe replacement, the existing infrastructure was assessed based on age, material, and associated main breaks. Pipes were then assigned a condition rating of high, medium, or low; high-priority pipes are in the poorest condition and should be replaced first. The City will have the flexibility to use funds currently identified for capacity-related pipe improvements for high-priority replacements as needed over the 20 year planning period. Estimates for the yearly cost of replacing 3.2 miles of pipeline are approximately $3.14 million, depending on project specifics and actual bid prices. Discrete condition replacement projects are not identified in the pipeline CIP, because they will be conducted in conjunction with other utility or street work, or bundled into construction packages where a large area or neighborhood can be completed as a single project.

New and Upgraded Facilities

Facility projects are prioritized based on the severity of hydraulic deficiency, City preference, the facility's condition, and budget constraints. Improvement recommendations include 24 individual facility projects and 3 ongoing repair-and-replacement budget items for all facilities over the next 20 years.

Metering

Future regulations may mandate the City to meter all of its water accounts. In anticipation of this requirement, the CIP includes $250,000 annually to begin installing meters on the largest service accounts. The City has begun installing meter pits on all new residential construction as required by state regulations. The water metering analysis conducted as part of this WFP and documented in Section 9—Financial Impact of City-wide Meter Implementation, assumes that if the City begins metering all customers, it will implement advanced metering infrastructure (AMI), which will necessitate installing associated hardware and software to enable centralized collection of customer usage records. Full metering costs are not included in the CIP.

Backup Power

Backup power is included in many facility upgrade projects and with all new facilities. At the completion of the 20-year CIP, over half the wells and booster stations will have backup power.

As detailed in Table 1-6, the total project costs are approximately $23,000,000 for the 1- to 5-year planning horizon, and $60,000,000 for years 6 to 20. Funding and implementation of the 1- to 5-year projects outlined in Section 8—Financial Plan begins in fiscal year (FY) 2016 and runs through FY 2020. The priority of the improvement projects may vary somewhat from these recommendations as the City annually reviews system needs and budget constraints.

Table 1-6
CIP Summary

	Cost of Required 2020 Improvements (1 to 5 Year)	Cost of Required 2035 Improvements (6 to 20 Year)
New and Upgraded Pipelines[1]	$7,000,000	$28,014,000
New and Upgraded Facilities	$14,715,000	$28,328,000
Metering	$1,250,000	$3,750,000
Total	**$22,965,000**	**$60,092,000**
Annual Average	$4,593,000	$4,006,133

[1] *The City intends to use funding from this category to address capacity- or condition-related pipeline improvements*

Financial Plan

The projected financial performance of the system is impacted by capital improvement needs, increasing operation and maintenance requirements associated with existing and new infrastructure, and renewal and rehabilitation of system assets. Forecasts of financial performance were developed using a financial planning model designed to represent utility cash flows under alternative assumptions related to revenue generation, O&M expenses, and alternative funding plans for capital investment.

The City’s existing rates and charges for water service are among the lowest in southeastern Idaho, and low compared to cities of similar size in the greater intermountain region. The last water rate increase occurred on July 1, 2008. Despite static revenues, however, the Division is in a strong financial position, evidenced by substantial available reserves in the combined water and wastewater operating fund. The reserves enable financing of the Division’s capital program without reliance on future debt issues or implementation of more significant near-term rate increases.

The CIP reflects priority needs of the system and, after adjusting for inflation, is expected to require expenditures of $26.20 million between FY 2015 and FY 2020. As outlined in Table 1-7, these capital projects will be funded with current operating revenues ($18.68 million, 71.2%), connection fee revenues ($2.25 million, 8.6%), and operating reserves ($5.32 million, 20.3%).

Table 1-7
FY 2015 – FY 2020 CIP Funding Plan

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	TOTAL	Percent
Projected Capital Expenditures	**$ 2.12**	**$ 4.72**	**$ 5.09**	**$ 5.34**	**$ 4.43**	**$ 4.51**	**$ 26.20**	**100.0%**
Operating Revenues[2]	1.81	3.01	3.11	3.29	3.57	3.89	18.68	71.2%
Connection Fee Revenues[3]	-	0.45	0.45	0.45	0.45	0.45	2.25	8.6%
Existing Reserves[4]	0.39	1.19	1.59	1.61	0.33	0.21	5.32	20.3%
Used (Unused) Balance[5]	(0.08)	0.07	(0.06)	(0.01)	0.08	(0.04)	(0.05)	
Total Funds	**$ 2.12**	**$ 4.72**	**$ 5.09**	**$ 5.34**	**$ 4.43**	**$ 4.51**	**$ 26.20**	**100.0%**

1 All numbers in millions, slight calculation discrepancies may exist due to rounding
2 Includes increased rate revenues associated with proposed rate adjustments
3 Represents transfers from the Division's Fund 44 (Connection Fees) to pay for qualifying capital improvement projects
4 Represents existing operating reserves of the Division that may be used for ongoing and future CIP projects
5 After using funds from various sources for the CIP, approximately $50,000 will remain (unused balance) to fund future projects

Use of operating revenues to finance the capital program is made possible by a proposed five-year rate plan that specifies a 20% increase at the beginning of FY 2016 followed by annual 5% increases from FY 2017 through FY 2020.

Largely due to the proposed rate plan, total system revenues are forecasted to increase 49.8%, from $7.11 million to $10.65 million between FY 2015 and FY 2020. The Division's total operating expenditures—including O&M expense (both baseline and incremental costs), General Fund Transfers, Municipal Equipment Replacement Fund (MERF) Contributions, and Capital Outlay—will increase 27.4%, from $5.31 million to $6.77 million over the same time period. Net operating revenues will increase from $1.81 million in FY 2015 to $3.89 million in FY 2020, and will be used to fund a significant portion of the capital program as shown in Table 1-7.

Financial Impacts of City-Wide Meter Implementation

The financial feasibility of a City-wide meter installation program was analyzed, including demand reduction assumptions based on customers' response to volumetric pricing, the potential costs of installing meters across the existing customer base, and identification of capital projects within the 20-year forecast horizon that may be deferred as a result of decreased system production requirements.

Conservation education programs are beneficial, but will not yield the type of results associated with the financial incentives of metered water service. Customers that must pay for the amount of water they use naturally respond to such price signals by decreasing both indoor and outdoor water consumption to reduce their water bill. The actual demand reduction impact associated with meter installation is difficult to predict, and will vary based on how quickly the program is implemented and the proposed rate structure. This analysis assumes that customers will be subject to a simple, uniform volumetric rate one year after they receive a meter, that system average day and peak demand will be reduced 30 and 40 percent respectively, and that the meter program will require a ten-year implementation period.

The conceptual costs of a City-wide meter installation program are estimated to be $77.68 million in current dollars. The results of the financial impacts analysis rely heavily on the estimated cost of program implementation. To the extent that actual program costs differ from those estimated, the financial impacts outlined in this report could vary substantially.

Due to the time required to transition all customer accounts to meters, many near-term capital projects are still required. However, various facilities projects and other investments can either be deferred beyond FY 2035 or eliminated altogether, resulting in a reduction of $27.76 million in CIP requirements over the 20-year forecast period. When combined with the $87.03 million nominal cost estimate to install meters, the net cost of the program is projected to be $59.27 million. These costs represent capital project requirements *in addition to those* already outlined in the CIP.

Issuances of long-term debt are required to provide adequate funding amounts for the capital program. The funding analysis assumes that the Division will have access to low-interest State Revolving Fund (SRF) loans under terms similar to those recently secured for the City's wastewater system. As summarized in Table 1-8, projected capital expenditures under a metering scenario will be funded through four sources: rate revenues (34.5%), connection fee revenues (3.4%), long-term debt (60.8%), and existing reserves (1.3%). The addition of debt as a majority funding source is one of the primary differences compared to the financial plan without meter installation.

Table 1-8
FY 2015 – FY 2020 CIP Funding Plan with Metering

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	TOTAL	Percent
Projected Capital Expenditures	**$ 2.12**	**$ 12.23**	**$ 12.79**	**$ 13.24**	**$ 12.52**	**$ 12.81**	**$ 65.72**	**100.0%**
Operating Revenues[2]	1.81	-	-	-	9.00	11.85	22.65	34.5%
Connection Fee Revenues[3]	-	0.45	0.45	0.45	0.45	0.45	2.25	3.4%
Long-term Debt[4]	-	40.00	-	-	-	-	40.00	60.8%
Existing Reserves[5]	0.39	-	-	-	-	0.45	0.85	1.3%
Used (Unused) Balance[6]	(0.08)	(28.22)	12.34	12.79	3.07	0.06	(0.03)	
Total Funds	**$ 2.12**	**$ 12.23**	**$ 12.79**	**$ 13.24**	**$ 12.52**	**$ 12.81**	**$ 65.72**	**100.0%**

1 All numbers in millions, slight calculation discrepancies may exist due to rounding
2 Includes increased rate revenues associated with proposed rate adjustments
3 Represents transfers from the Division's Fund 44 (Connection Fees) to pay for qualifying capital improvement projects
4 Anticipated issuance of low-interest, State Revolving Fund (SRF) loan to support the meter installation program
5 Represents existing operating reserves of the Division that may be used for ongoing and future CIP projects
6 After using funds from various sources for the CIP, approximately $30,000 will remain (unused balance) to fund future projects

Annual rate increases of 20% percent are required from FY 2016 to FY 2020 in order to support the debt service payments associated with the Division's anticipated SRF loans and fund the CIP. The equivalent water bill for a residential customer will increase from $21.00 to $52.26 by FY 2020, an increase of 148.9%. Additional rate increases beyond FY 2020 are not necessary under the metering scenario.

In municipal credit markets, the affordability of long-term borrowing is established by calculating a financial performance ratio known as debt service coverage (DSC). Forecasted DSC on the Division's proposed SRF loans is estimated to range above the threshold established for subordinate financing instruments, but the Division will need to further investigate the availability of such loans.

The financial impact analysis for metering should not be interpreted as a recommendation to implement a City-wide metering program. Instead, an estimate of the potential rate impacts associated with such a scenario is offered as a single data point along an array of potential implementation options. Policymakers must ultimately identify feasible options, weigh the advantages and disadvantages of each, and determine the most beneficial course of action for the City of Idaho Falls.

Alternative Rates

The City requested an evaluation of the advantages and disadvantages of the Division's existing rate structure, along with recommendations to improve the rate structure while acknowledging the current limitations of available billing determinants.

In the absence of metered consumption data, several rate structure alternatives were developed for the following four customer categories: Residential Indoor; Residential Outdoor; Non-Residential Indoor, and Non-Residential Outdoor. A structured decision framework was created in order to weigh the qualitative benefit and cost tradeoffs associated with each of the rate structure alternatives. This process involved identification of various policy objectives (criteria) and an assessment of relative importance. The list of objectives reflects customer, administrator, and policymaker perspectives. Each of the rate alternatives was scored against the policy objectives, and the recommended rate structure alternatives for each major category are identified in Section 11.

Besides the recommended rate structure alternatives, the following modifications to current billing methodologies are recommended to improve rate transparency and reduce customer confusion:

- Incorporate one-time charges like the seasonal irrigation charge and DEQ fee into the monthly flat rate for all unmetered customers (residential and non-residential), thus ensuring customers receive the same monthly rate year-round.
- Increase the proportion of revenues that are attributed to outdoor water use by decreasing the monthly flat rate and increasing the seasonal irrigation charge. This

won't change the cost of water service (if one-time charges are annualized and included in the monthly bill), but better communicates the relative cost of outdoor water use.

- Simplify the rate structure for metered, non-residential customers by replacing the minimum bill concept with a monthly customer charge based on meter size, eliminating the volume allowance, and establishing a volumetric rate that would be applied to all water use.
- Improve equity through the rate design process by setting fees for outdoor use that are internally consistent among unmetered and metered non-residential customers.

A rate design model was constructed to summarize billing determinants and provide for an iterative analysis of potential fee levels for the recommended rate structures. The purpose of the model is to "calibrate" observed revenue levels with existing rates and to facilitate rate design by predicting rate revenues under various fee scenarios. The recommended rates are presented in Table 1-9 by customer type. The recommended rates are *revenue-neutral*; that is, they are expected to provide the same level of rate revenues received by the Division under existing rates.

Table 1-9
Recommended Rate Structure Alternatives by Major Category

Customer Class	Customer Segment	Billed Units	Proposed Rate	Proposed Revenues[1]	Percent by Type	Existing Revenues	Percent by Type
Residential	Single Family Residence	17,374	$ 23.50	$ 4,899,468	66.7%	$ 4,709,275	67.0%
	Apartment Units	4,137	$ 14.68	$ 728,774	9.9%	$ 819,465	11.7%
Non-Residential	Unmetered, indoor	2,079	varies	$ 1,043,256	14.2%	$ 1,050,722	14.9%
	Unmetered, outdoor	172,775	$ 1.23	$ 212,513	2.9%	$ 41,200	0.6%
	Metered, base charge	247	varies	$ 171,898	2.3%	$ 122,800	1.7%
	Metered, volume charge	422,028	$ 0.45	$ 189,913	2.6%	$ 184,143	2.6%
Outside City	All customers	185	$ 47.00	$ 104,340	1.4%	$ 103,793	1.5%
Subtotal, all customers				**$ 7,350,161**	**100.0%**	**$ 7,031,396**	**100.0%**

1 Recommended alternative rates presented in this table are revenue-neutral; that is, they are expected to provide the same level of rate revenues received by the Division under existing rates after accounting for the predicted-to-actual calibration ratio described in this report.

All unmetered customers will be transitioned to a single monthly flat rate that includes fee components for both indoor and outdoor use. The indoor rate for apartment units will be set at 80% of the single family residential (SFR) indoor rate, while the outdoor rate will be set at 25% of the SFR outdoor rate based on a sampling of the average landscaped area per apartment unit. Unmetered non-residential customers will be assigned to one of five general rate categories based on an analysis of indoor water usage patterns for metered customers. Based on measurements for individual customers, an annual charge per 100 square feet of landscaped area will be assessed to all non-residential customers for outdoor water use. Metered customers' bills will include a monthly customer charge based on meter size and a revised volumetric rate that will be applied to all water use. Metered customers will no longer be subject to a minimum bill. The monthly customer charge will be scaled up for larger meter sizes based on the American Water Works Association's (AWWA) hydraulic meter ratios.

The rate design process was based on the best available data at this time. Prior to implementation, the Division should carefully review the assumptions of this analysis with the benefit of improved customer data provided by the City's new billing platform. Also, the bill impacts for specific non-residential customers, both metered and unmetered, should be investigated to determine whether adjustments to the revised rate schedule are warranted.

Summary and Overall WFP Recommendations

This WFP constituted a major investment of time and resources for City staff, and the City is commended for initiating such a comprehensive scope of work in order to successfully operate, maintain, and improve the City's drinking water system. This WFP utilized industry-standard evaluation criteria and approaches by analyzing the City's GIS records, conducting site visits, interviewing City staff, reviewing as-built site drawings, applying weighted rankings to help determine improvement hierarchy, and utilizing a hydraulic model analysis to identify system deficiencies and refine recommended improvement projects.

Collecting and compiling system data presented an accurate, comprehensive look at the water system as a whole. Hydraulic modeling was used to evaluate existing, 5- and 20-year conditions, and supply and water right evaluations were also conducted using 40-year projections. The capital projects that have been identified provide a plan, phased over the next 20 years, which will enable the City to continue providing high quality water to its customers at a reasonable cost.

As a result of this WFP, the following recommendations are made:

- Update the WFP every 5 years to incorporate changes in the system related to growth, regulations and facility and piping condition.
- Continue improving the quality of available water system information, specifically:
    - Continue updating and utilizing the hydraulic model as a tool for testing the impact of future development and operational changes.
- Continue evaluating the feasibility of metering all water customers and implement use-based billing to help reduce overall water demand.
- Continue proactively managing the City's water rights portfolio to ensure adequate long term supply.
- Develop a 100 year pipeline replacement program to replace approximately 3.2 miles (16,800 feet) of publicly owned pipeline per year.

    - Focus these replacement efforts on cast iron piping installed between 1902 and 1959, and then on pipes with the highest number of breaks.
- O&M programs should continue to improve preventative maintenance procedures and documentation to enable the City to provide high quality water.
- Hire additional staff to perform identified programs and overall system maintenance.
- Make investments in existing facilities to address:
    - Existing condition issues
    - Code and safety compliance
- Implement the projects identified in the 5-year CIP and adopt a rate structure to fund them.
- Establish a new Capital Projects fund to consolidate project budgeting and capital expenditures, facilitate funding from multiple sources, and improve transparency of the capital program.
- Evaluate the existing connection fee methodology and determine whether an increase to the fee is justified given the magnitude of planned capital expenditures outlined in this report.
- Review and revise the CIP and CIP funding plan annually based on updated information, including comparisons of actual to projected costs and financial performance.
- After the new billing software is implemented, make recommended changes to the City's existing rate structure to improve rate transparency and reduce customer confusion.

Murray, Smith & Associates, Inc.
Engineers/Planners

SECTION 2

Existing System Description

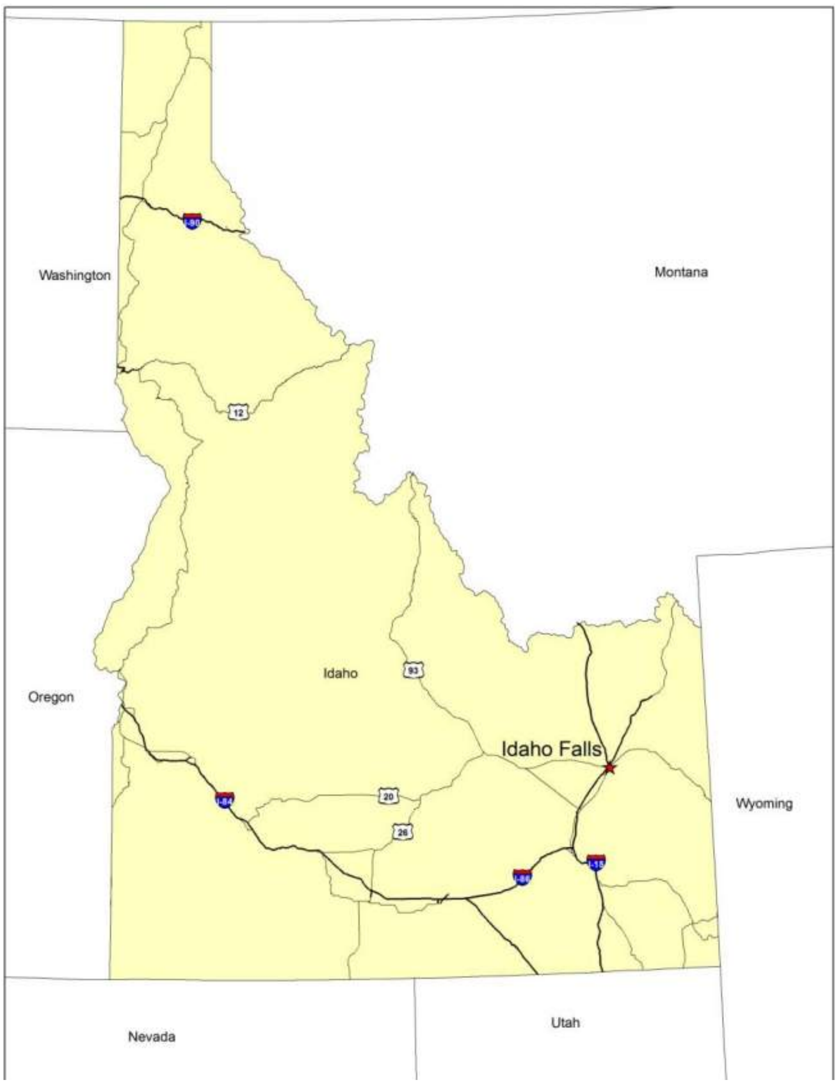
SECTION 2
EXISTING SYSTEM DESCRIPTION

Introduction

This section provides an overview of the existing water system and descriptions of the major facilities.

The City of Idaho Falls (City) is located in southeastern Idaho, approximately 50 miles west of the Idaho-Wyoming border and approximately 100 miles north of the Idaho-Utah border. The City is located in Bonneville County. Elevation within the City ranges from approximately 4,600 to 4,800 feet above mean sea level (MSL). The City covers an area of approximately 23 square miles and based on the 2010 census has a population of approximately 58,000.

Figure 2-1
Location of Idaho Falls



The Idaho Falls water system is operated through the Water Division of the Public Works Department. The City's Water Division is directed by a water superintendent, supply foreman and distribution foreman. The water superintendent, along with the office assistant, handles most administrative duties. Operation and maintenance of the City's wells is handled by the supply foreman, with operation and maintenance of the distribution system, including water mains, water services, valves and hydrants, overseen by the distribution foreman. The system (PWS #7100039) provides service to approximately 24,000 accounts and over 52,000 people according to the Bonneville Metropolitan Planning Organization projections.

The system contains over 310 miles of City pipe and approximately 2,100 fire hydrants. The City's system operates on a single hydraulic gradient (pressure) zone with the hydraulic grade set by the overflow of the elevated tank at 4,879 feet above MSL. Supply is provided by 19 groundwater wells located throughout the system. Most of the wells pump into a contact tank to allow sufficient chlorine contact time, and the water is then boosted from the tanks into the distribution system. Each of the major hydraulic elements is summarized below and the locations of the facilities throughout the service boundary are illustrated in Figure 2-2.

Supply

Supply Wells

The potable water for the City system is supplied solely by groundwater sources derived from 19 water wells distributed across the City's service boundary. The City's water supply comes from the lower zone of the East Snake River Plain Aquifer, which stretches from St. Anthony, Idaho to Thousand Springs near Twin Falls, Idaho. The groundwater level is typically 130 to 170 feet below ground surface and the upper zones of the aquifer, which may be more susceptible to contamination, are sealed by layers of dense basalt. The City wells are typically drilled below this upper zone to at least 400 feet below ground surface.

City wells are named chronologically, with Well 1 the first well constructed and originally drilled in 1927 and Well 17 the most recently drilled. Those well sites with a "B" following the well number, such as Well 13B and Well 15B, do not follow this naming convention and are instead associated with the well where they share a location. The majority of well sites (Wells 1-8, 12, 16 and 17) contain a single well. Wells 9 and 10 share a common site, but have separate well houses. Wells 11 and 14, 13 and 13B, and 15 and 15B each have a similar configuration with a common site, but separate well house facilities. Wells 12 and 16 were designed with space to accommodate a second well to be drilled when needed.

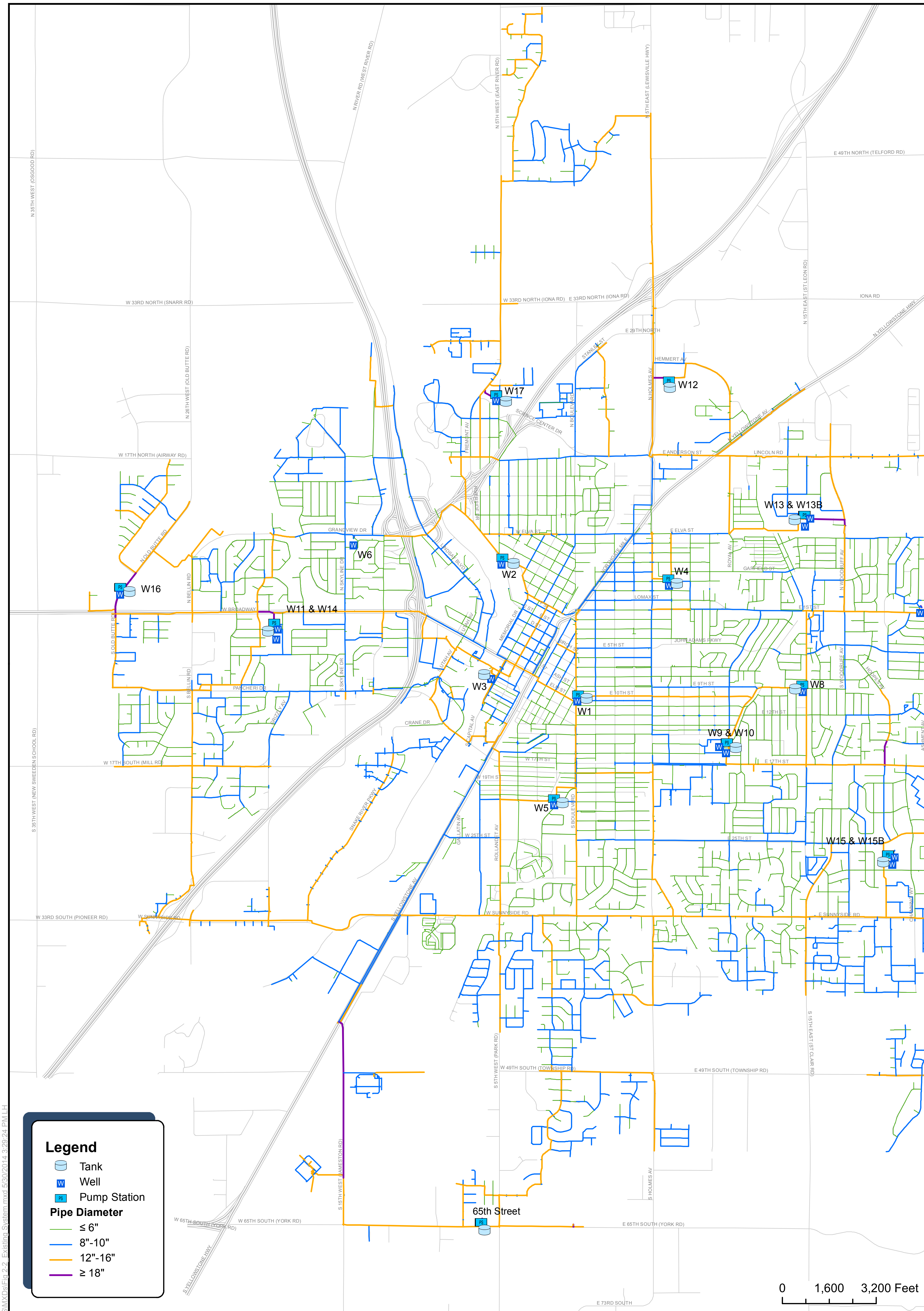
Well 3 pumps directly into the elevated tank. Well 6 pumps into underground pressurized tanks and then directly to system pressure; most other wells pump first to a ground-level contact tank and are then boosted to system pressure. Most of the wells produce high-quality water; however, Well 7 can have air entrainment issues and is no longer used. Well 8 produces sand, primarily during startup. The total capacity of all active wells in the City's water system is 61,150 gpm (88.1 mgd). During a power outage, facilities with backup power generation on site can provide a total well pumping capacity of 13,700 gpm (19.7 mgd) and total booster pumping capacity of 22,900 gpm (33.0 mgd).

Using the limiting capacity (well pump or booster pump) at each active facility with backup power, the system can pump 15,300 gpm (22.0 mgd) under emergency power conditions. Table 2-1 presents basic information for each well. The locations of the wells are shown in Figure 2-2.

Table 2-1
Well Summary

Well	Location	Pumping Capacity (gpm)	Status	Contact Tank	Backup Power
1	S Boulevard & 10th Street	4,000	Active	Yes	No
2	Riverside Drive & I Street	3,150	Active	Yes	No
3	S Capital Avenue & Cliff Street	4,000	Active	No	No
4	Cleveland Street & N Freeman Avenue	4,500	Active	Yes	No
5	W 21st Street & Calkins Avenue	5,500	Active	Yes	No
6	N Skyline Drive & Grandview Drive	1,150	Active	No	No
7	1st Street & Eastview Drive	-	Inactive	No	No
8	9th Street & St Clair Road	1,650	Active	Yes	No
9	E 15th Street & SE Bonneville Drive	3,600	Active	Yes (shared with 10)	Yes[1]
10	E 15th Street & SE Bonneville Drive	4,400	Active	Yes (shared with 9)	Yes[1]
11	Dale Drive & W Broadway Street	4,000	Active	Yes (shared with 14)	Yes[2]
12	Pop Kroll Way & N Holmes Avenue	4,000	Active	Yes	No
13	Between N Woodruff Avenue & Hollipark Drive	3,100	Active	Yes (shared with 13B)	Yes[3]
13B	Between N Woodruff Avenue & Hollipark Drive	2,500	Active	Yes (shared with 13)	Yes[3]
14	Dale Drive & W Broadway Street	3,300	Active	Yes (shared with 11)	Yes[2]
15	Barbara Avenue & E 25th Street	2,200	Active	Yes (shared with 15B)	Yes
15B	Barbara Avenue & E 25th Street	2,000	Active	Yes (shared with 15)	No
16	N Old Butte Road & W Broadway Street	3,600	Active	Yes	No
17	Fremont Avenue & Energy Drive	4,500	Active	Yes	No
Total		**61,150**			

[1] *Backup power at well 9/10 can supply either well 9 and booster 9 or well 10 and booster 10, but not both.*
[2] *Backup power at well 11/14 can supply either well 11 and booster 11 or well 14 and booster 14, but not both.*
[3] *Backup power at well 13/13B can supply either well 13 and boosters 13-1 and 13-2 or well 13B and booster 13-3, but not both.*



MSA Murray, Smith & Associates, Inc.

Idaho Falls Water Facility Plan

Figure 2-2 Existing System

N W E S

CITY OF IDAHO FALLS

Treatment

Disinfection is the only process applied to source water in the system. All of the well locations are equipped with chlorine gas injection systems. The chlorine is dosed to provide a target chlorine residual concentration of 0.3 mg/L in the distribution system.

Booster Stations

Each supply facility, except Wells 3, 6, and 7, has booster stations that pump water from the contact tanks into the distribution system. Booster Stations 1-12 and 14 contain a single pump designed at a similar capacity as the well pump. Booster Stations 13, 15, 16 and 17 have multiple pumps designed for redundancy and to provide operational flexibility. Currently, the booster pump at Well 12 is the only variable speed pump (VSP) in the City. However, the City is in the process of designing other VSPs, starting with Booster Station 15/15B, to provide additional operational flexibility. All other booster pumps are constant speed and utilize electric valve actuators to control flow by matching booster pump flow with the deep well flow. A summary of booster stations is shown in Table 2-2.

Table 2-2
Booster Station Summary

Booster Station	Location	Number of Pumps	Total Pumping Capacity (gpm)	Backup Power
1	S Boulevard & 10th Street	1	4,000	No
2	Riverside Drive & I Street	1	3,500	No
4	Cleveland Street & N Freeman Avenue	1	4,500	No
5	W 21st Street & Calkins Avenue	1	5,500	No
8	9th Street & St. Clair Road	1	1,600	No
9/10	E 15th Street & SE Bonneville Drive	2	8,000	Yes[1]
11/14	Dale Drive & W Broadway Street	2	7,250	Yes[1]
12	Pop Kroll Way & N Holmes Avenue	1	4,000	No
13/13B	Between N Woodruff Avenue & Hollipark Drive	3	6,500	Yes[2]
15/15B	Barbara Avenue & E 25th Street	3	6,000	Yes[3]
16	N Old Butte Road & W Broadway Street	2	3,600	No
17	Fremont Avenue & Energy Drive	2	4,000	No
18	S 5th West (Park Road) & W 65th South (York Road)	3	4,900	Yes[3]
Total			**63,350**	

[1] Backup power is sufficient for only one of the booster pumps at a time.
[2] Backup power is sufficient for booster pumps 13-1 and 13-2 with well 13 or booster pump 13-3 with well 13B, but not all booster pumps simultaneously.
[3] Backup power is sufficient for all booster pumps.

Tanks

The water system contains 14 tanks and two pressurized vessels. Most reservoirs are ground-level concrete tanks designed solely to provide adequate chlorine contact time, rather than as system storage. The tanks range in type and size, and most are less than 0.5 million gallons (MG). Well 3 pumps into the only elevated tank in the City. The elevated tank stores 0.5 MG and is used primarily to regulate the City's system pressure. Wells 6 and 7 each pump into underground pressurized vessels. Wells 9 and 10 share a common contact tank, as do Wells 11 and 14, 13 and 13B, and 15 and 15B. The contact tank at Wells 15 and 15B is sized to provide system storage and has a capacity of 3 MG. A 2.25 MG tank was recently built on W 65th S Street that is not currently associated with a well, but is designed for a future well and is intended to provide system storage under peak demand or emergency conditions. An overview of the tanks in the system is provided in Table 2-3.

Table 2-3
Tank Summary

Tank	Location	Volume (MG)	Tank Type
1	S Boulevard & 10th Street	0.1	Ground
2	Riverside Drive & I Street	0.1	Ground
3	S Capital Avenue & Cliff Street	0.5	Elevated
4	Cleveland Street & N Freeman Avenue	0.15	Ground
5	W 21st Street & Calkins Avenue	0.15	Ground
6	N Skyline Drive & Grandview Drive	0.03	Underground Pressure
7	1st Street & Eastview Drive	0.03	Underground Pressure
8	9th Street & St. Clair Road	0.1	Ground
9/10	E 15th Street & SE Bonneville Drive	0.24	Ground
11/14	Dale Drive & W Broadway Street	0.275	Ground
12	Pop Kroll Way & N Holmes Avenue	0.275	Ground
13/13B	Between N Woodruff Avenue & Hollipark Drive	0.315	Ground
15/15B	Barbara Avenue & E 25th Street	3	Ground
16	N Old Butte Road & W Broadway Street	0.315	Ground
17	Fremont Avenue & Energy Drive	0.22	Ground
18	S 5th West (Park Road) & W 65th South (York Road)	2.25	Ground
Total		**7.99**	

System Controls

The status of the water system is primarily monitored and controlled through a supervisory control and data acquisition (SCADA) system. The SCADA system monitors flow, pressure, and various status conditions at each well through programmable logic controllers (PLCs). Information is transferred by wireless and fiber connections from the PLCs to the City's Water Division shop, allowing the City to control the functionality of the wells remotely. Well pumps with contact tanks are triggered to turn off and on by tank levels.

The wells that pump directly to the system and the booster pumps are triggered by pressure points located throughout the system. Based on set pressure values, these pumps turn on and off as needed to maintain system pressure at these points. Pressure readings at these points are transmitted to the Water Division via a dedicated phone line. Flow at the booster pumps is regulated by electric valve actuators that monitor tank levels and manipulate a valve to adjust flow through the boosters to match the flow of the well pumps, aiming to keep the water level in the contact tanks constant.

Distribution

Pipe

The City's water distribution piping includes over 310 miles of pipe, ranging in size from 2 to 24 inches in diameter. The oldest pipe in the system dates back to the early 1900s, with large quantities of pipe installed in the 1920s, 1950s, 1980s and 2000s. These pipes are made of cast iron, ductile iron, steel and asbestos cement. A large portion of the system is cast iron, but since the mid-1970s, City standards have required the use of ductile iron pipe. A summary of the length of City-owned pipe by diameter and age is in Table 2-4. An additional 25 miles of privately owned and maintained pipe connect to the City system and are not included in Table 2-4. A map showing the existing distribution piping is provided above in Figure 2-2.

Table 2-4
Pipeline Length by Age

Year of Installation - Length (1,000 ft)										
Diameter (in)	**Before 1950**	**1950-1959**	**1960-1969**	**1970-1979**	**1980-1989**	**1990-1999**	**2000-2013**	**Unk**	**Total**	**Percent**
< 6	109	55	6	4	3	1	2	12	192	11.6%
6-8	37	149	145	182	126	166	240	23	1,068	64.5%
10-16	10	17	53	62	46	62	126	7	383	23.1%
18-24	0	0	1	4	0	8	1	0	14	0.8%
Total	**156**	**221**	**205**	**252**	**175**	**237**	**369**	**42**	**1,657**	**—**
Percent	9.4%	13.4%	12.4%	15.2%	10.5%	14.3%	22.3%	2.5%	—	100%

Services

There are currently over 24,000 service connections to the City's system. Just over 2,300 of these are commercial/industrial connections. With the exception of approximately 250 commercial/industrial services, none of the services are metered; however, in compliance with state regulations, all new construction is required to install provisions for meters, with all new commercial construction adding meters.

Hydrants

Approximately 2,100 fire hydrants are located throughout the City's system. The Fire Department determines hydrant spacing and location during construction drawing review. After installation, the Water Division is responsible for the operation and maintenance of the hydrants. However, the Fire Department does an annual check to verify that all hydrants are operational. Any issues identified during the Fire Department's annual check are reported to the Water Division, which then makes any necessary repairs.

Murray, Smith & Associates, Inc.
Engineers/Planners

SECTION 3

Population and Demand Projections

SECTION 3
POPULATION AND DEMAND PROJECTIONS

Introduction

Water infrastructure planning calculates future water demands to identify anticipated water supply requirements and to size piping and related water facilities. The method used to determine future demands depends on available forecasting information. The City of Idaho Falls (City) has very limited existing customer use data, because most customers in the City are not metered. However, overall system production and population projections provide valuable tools for performing the calculations. Existing water demand can be described on a per capita usage rate by dividing the total existing production by the number of people served. Assuming per customer usage rates remain the same, future population projections can be multiplied by the per capita water usage, yielding future water demand.

The populations developed by the Bonneville Metropolitan Planning Organization (BMPO) were used for projection purposes. The BMPO data are useful in allocating population throughout the system because the population data is spatially distributed using Traffic Analysis Zone (TAZ) boundaries. The TAZ boundaries do not align exactly with the census boundaries so the base population used for projections in this section differ from the population reflected in other sections of this plan, which are based on census data. The TAZ data provides location-specific population growth information and thus is useful in projecting the locations of growth throughout the system, which was used to determine future water demand and size infrastructure within specific areas of the system. This section presents current population and water production information and uses it in conjunction with future population to calculate future water system demands.

Definition of Terms

<u>Demand</u>: the total system production, which is the quantity of water provided by the supply source(s) during a given time period. This information, which is typically reported on a yearly, daily and hourly basis, is required to meet the needs of domestic, commercial, industrial, and institutional use; this includes firefighting, system losses, and other miscellaneous applications. Demands are normally discussed and quantified in terms of flow rates, such as million gallons per day (mgd) or gallons per minute (gpm).

<u>Flow rate</u>: a volume of water delivered during a specific period. Flow rates used in this plan are as follows:

- Average Day Demand (ADD): the total volume of water delivered to the system in a year, divided by 365 days.
- Maximum Day Demand (MDD): the maximum volume of water delivered to the system during any single day.

- Peak Hour Demand (PHD): the maximum volume of water delivered to the system during any single hour.

Peaking factor (PF): the relationship between the ADD and other demand parameters, such as the MDD and PHD.

Per capita demand: the total system demand divided by the total population served expressed in gallons per capita per day (gpcd).

Water Production

Table 3-1 provides a summary of monthly water production records for the years 2009 through 2013. The volume of water produced is the amount pumped from the aquifer, chlorinated, and put into the distribution system. Table 3-2 shows the ADD, MDD, PHD and the associated peaking factors for each year. The average peaking factors for the five-year period are used in the report to calculate future MDD and PHD from ADD values.

Table 3-1
Historical Water Production (Millions of Gallons)

Month	2009	2010	2011	2012	2013
January	353	322	322	295	314
February	324	299	285	279	303
March	351	328	298	304	301
April	399	389	311	498	431
May	956	672	554	1,112	1,073
June	753	990	1,049	1,370	1,406
July	1,517	1,578	1,685	1,583	1,665
August	1,470	1,479	1,460	1,667	1,607
September	1,142	1,043	1,196	1,177	789
October	415	652	527	605	428
November	317	307	300	280	279
December	353	321	303	292	338
Total	**8,350**	**8,380**	**8,290**	**9,462**	**8,934**

Table 3-2
Historical Demands and Peaking Factors

Year	ADD (mgd)	MDD (mgd)	PHD (mgd)	PF_{MDD} (MDD/ADD)	PF_{PHD} (PHD/ADD)
2009	22.9	57.1	84.0	2.5	3.7
2010	23.0	54.2	76.1	2.4	3.3
2011	22.7	58.5	79.4	2.6	3.5
2012	25.9	66.0	82.1	2.5	3.2
2013	24.5	56.8	80.4	2.3	3.3
Averages	23.8	58.5	80.4	2.5	3.4

Per Capita Demand

Per capita demand is a convenient method of comparing the water use of different water systems or areas served by the system. Differences in climate, type of development, cost of water and usage trends influence the per capita demand for different water systems. Because there is a portion of the population within the City limits not served by the water system and some customers outside of the City limits served by the City water system, the service area population differs from the City population. To increase the accuracy of per capita demand calculations and be more conservative in future demand projections, the service area population (as calculated from BMPO TAZ data) was used instead of the City limit population. Using the BMPO data to estimate the service population, results in a lower population served than the Census City limit populations. Consequently, this results in a more conservative per capita demand and future demand projection values. However, BMPO does not have population estimates for each year, so the 2014 population estimate distribution was used, resulting in a service area population estimate of 52,300 people.

The City meters less than 1% of its water customers, making it difficult to develop a demand estimate any more refined than an average per capita demand based on system-wide production, which includes all uses and system losses. Using an average of the demands from the past five-years and the BMPO population estimate of 52,000 people in the service area, results in an ADD of 455 gpcd, and a MDD of 1,119 gpcd.

Non-Revenue Water

The International Water Association (IWA) and the American Water Works Association (AWWA) have published and promoted a water audit methodology that has been widely recognized and adopted throughout the water industry. This method provides definitions and classifications for annual water production and consumption, shown in Table 3-3. Column E identifies “non-revenue” water as the unbilled component of production; this is the difference between the volume of water produced and the volume of water sold to customers. Since only a small percentage of City customers are metered, there is no accurate way to estimate non-revenue water in the system. Existing per capita usage rates include non-revenue water and as part of the projections are assumed to continue to constitute the same percentage of overall water production as the system expands in the future.

Table 3-3
Components of the IWA/AWWA Water Balance

A	B	C	D	E
System Input Volume = Production = System Demand	Authorized Consumption	Billed Authorized Consumption	Billed metered consumption (including water exported to another system) Billed unmetered consumption	Revenue Water
		Unbilled Authorized Consumption	Unbilled metered consumption Unbilled unmetered consumption	Non-Revenue Water
	Water Losses	Apparent Losses	Unauthorized consumption Data handling error Metering Inaccuracies	
		Real Losses	Leakage from transmission and/or distribution mains Storage leakage and overflows Leakage from service connections up to a point of customer metering	

From AWWA. Manual M36, Water Supply Practices. Water Audits and Loss Control Programs (3rd edition, 2009).

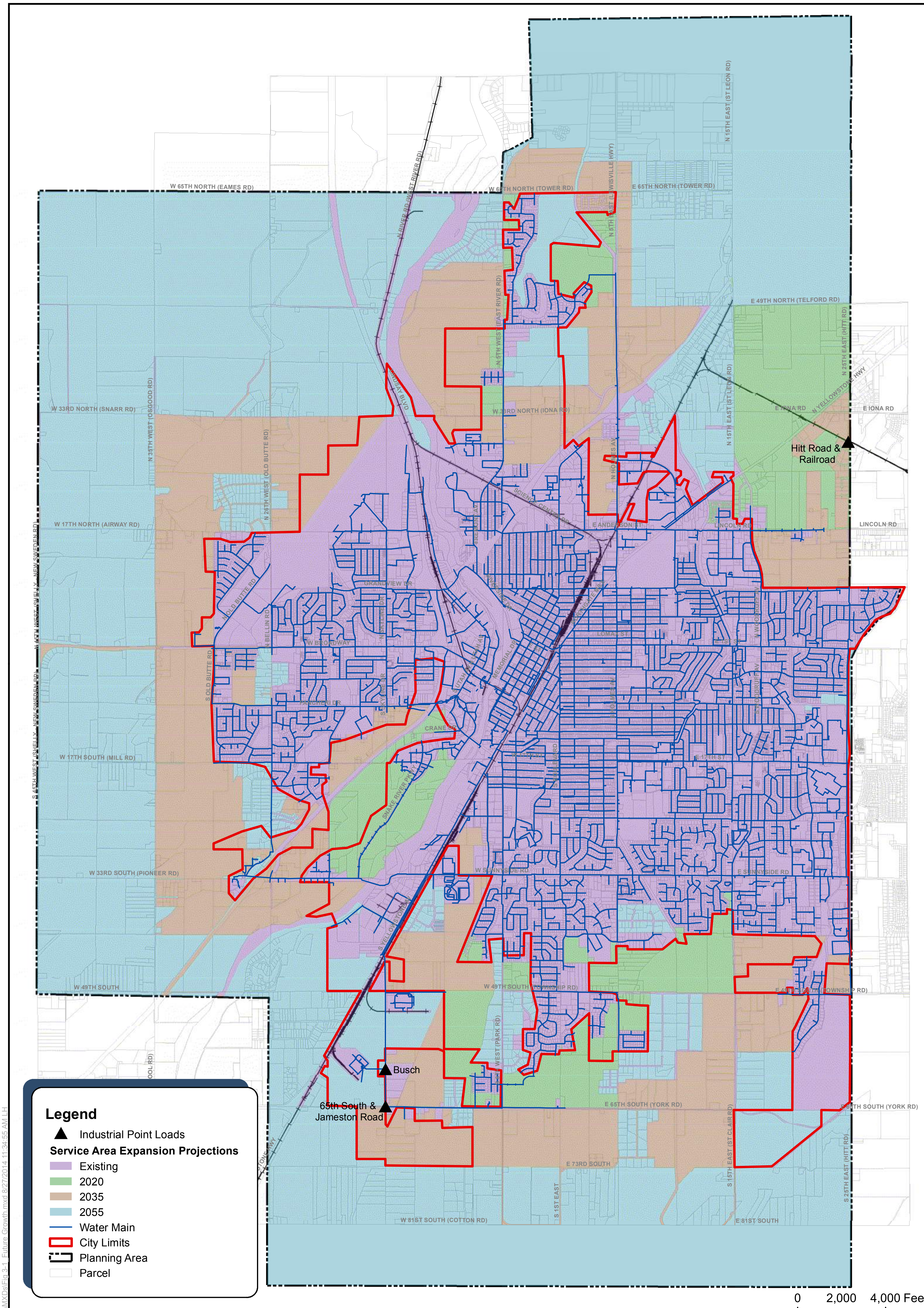
Future Service Area Boundaries & Population Served

City staff developed an estimated geographic boundary and associated timeline for the expansion of the City's current service area to its full planning boundary at build-out. This service boundary expansion is illustrated in Figure 3-1. BMPO population estimates for 2014 and 2035 associated with these geographic service boundaries were used to predict the service area populations for the existing and 20-year horizons. Census data show that the City has grown, on average, over 1% each year for the past few decades. Using BMPO estimates, the growth rate for the service population over the next 20-years is approximately 1.75% per year, which was used to calculate the intermediate 5-year (2020) and future 40-year (2055) service populations, as shown in Table 3-4.

Table 3-4
Service Area Population Projections

Year	Service Area Population Estimate[1]
2014 (Existing)	52,300
2020 (5-year)	58,000
2035 (20-year)	75,300
2055 (40-year)	106,600

[1] Service area population differs from city limit population. Populations have been rounded to nearest 100.



MSA Murray, Smith & Associates, Inc.	**Idaho Falls Water Facility Plan**	**Figure 3-1 Growth Projections & Industrial Point Loads**	N / W / E / S	City of Idaho Falls

June 2015 14-1550

Future Water Demand Projections

Industrial Demand Reserve

Since less than 1% of City water customers are metered and there is no accurate way to distinguish between unmetered residential and non-residential demand, the per capita demand reflects an average for all uses and non-revenue water across the system. However, because the City is committed to meeting the existing and future demands of large industrial customers in particular areas of the system, three locations have been identified for future large localized demands. These locations are shown in Figure 3-1 and summarized in Table 3-5. Currently, the City has a contractual obligation to provide up to 2.16 mgd on an as-needed basis to the Busch malting plant. Busch has not utilized this amount of water recently, however it is included in the 2014 and future demands since the City could be required to provide it at any time. Two other large demand locations on Hitt Road and York Road have been identified for potential future water intensive industrial developments. The City also has an agreement with the Grupo Modelo malting facility. Since the agreement was made, the facility has taken measures to reduce its water use so the potential for this demand is assumed to be within the demand loading at York & Jameston Roads.

Table 3-5
Service Area Demand Projections

Location	Demand Loading (mgd)	Timeline[1]
Busch	2.16	2014
York & Jameston Roads	1.0	2020
Hitt Road near Railroad Crossing	1.5	2020

[1] *Also assumed to be included in all subsequent future analysis horizons*.

System Demand

As described earlier, an average per capita demand of 455 gpcd is used as the primary demand forecasting value. In addition, the specific industrial loads from Table 3-5 are added to calculate a system-wide demand. System projections for ADD, MDD and PHD water demands are shown in Table 3-6. The starting demand was determined from the historic production using the most recent (2013) or five-year average demand, whichever was greater. The projected values were calculated using population projections, average per capita demand, average peaking factors, and the specific industrial demands.

Table 3-6
Demand Projections

Year	Demand Type	ADD (mgd)	MDD (mgd)	PHD (mgd)
2014 (Existing)	Existing Production	24.5	58.5	80.4
	Industrial Point Load[1]	2.2	2.2	2.2
	Total	**26.7**	**60.7**	**82.6**
2020 (5-Year)	Based on Per Capita Demand	27.1	67.7	92.1
	Industrial Point Loads[1]	4.6	4.6	4.6
	Total	**31.7**	**72.3**	**96.7**
2035 (20-Year)	Based on Per Capita Demand	35.0	87.4	118.9
	Industrial Point Loads[1]	4.6	4.6	4.6
	Total	**39.6**	**92.0**	**123.5**
2055 (40-Year)	Based on Per Capita Demand	49.2	123.1	167.4
	Industrial Point Loads[1]	4.6	4.6	4.6
	Total	**53.8**	**127.7**	**172.0**

[1] *Industrial point demands are assumed to be relatively constant throughout the day so peaking factors are not applied.*

Impact of Metering on Future Water Demands

If the City began metering and charged based on customer use, a significant decline in per capita water usage would likely occur. A reduction could have a significant impact on the future water supply needs of the system. A second calculation was completed assuming the amount of water required if average per capita demand was reduced by 30% to 319 gpcd. This 30% reduction in average demand and an estimated 40% reduction in peak demands was based upon a literature review of demand reductions other utilities in similar climates have observed when metering is implemented. The actual reduction due to metering could vary from these estimates based upon many factors including the implementation and rate structure. Further explanation of these values is provided in Section 9—Financial Plan. Additionally the City could see reductions from conservation measures, as outlined in the City's recently developed Conservation Plan (Appendix A). However, metering is assumed to provide the greatest potential for demand reductions.

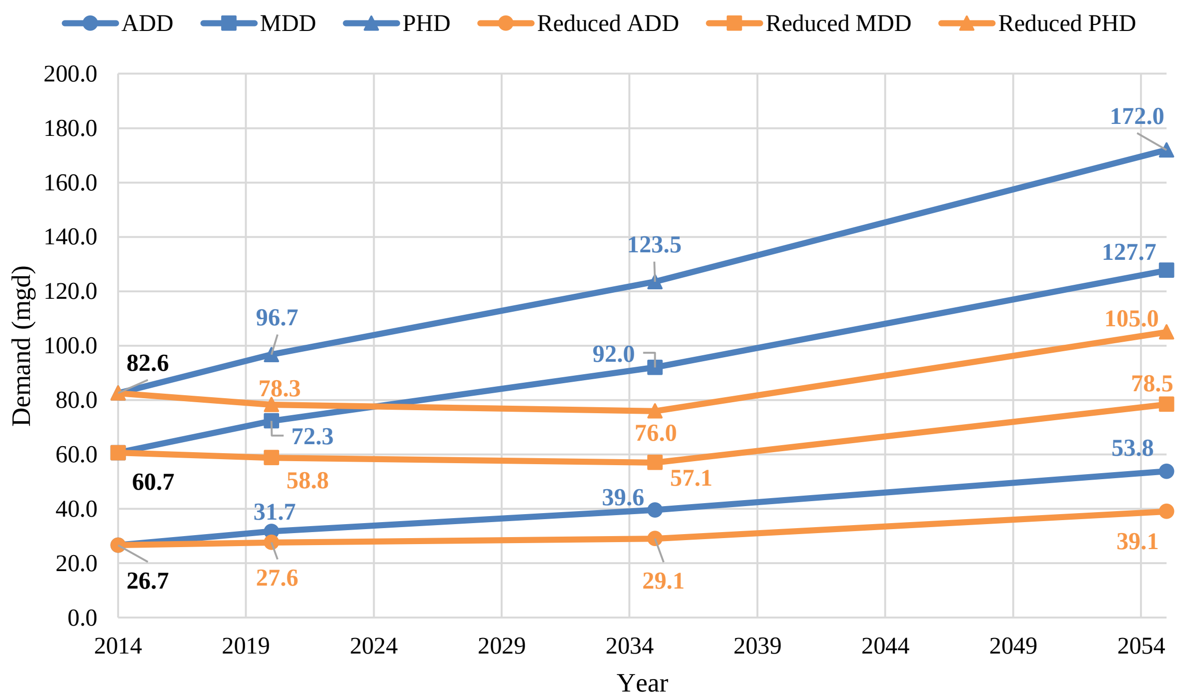
Since the possible conversion to metering would occur over a number of years, an assumption was made that half of the 30% and 40% reduction (15% and 20%) would be realized by 2020. It was assumed that all customers would be metered by 2035. The resulting demand values are in Table 3-7. Figure 3-2 shows the resulting demands at the 5-, 20- and 40-year horizons with and without a reduction due to metering.

Table 3-7
Demand Projections Assuming Metering

Year	Demand Type	ADD (mgd)	Reduction in Average Demand From Non-Metered Projections	MDD (mgd)	PHD (mgd)	Reduction in Peak Demand From Non-Metered Projections
2014 (Existing)	Existing Production	24.5	-	58.5	80.4	-
	Industrial Point Load[1]	2.2	-	2.2	2.2	-
	Total	**26.7**	**-**	**60.7**	**82.6**	**-**
2020 (5-Year)	Based on Per Capita Demand	23.0	15%	54.2	73.7	20%
	Industrial Point Loads[1]	4.6	0%	4.6	4.6	0%
	Total	**27.6**	**13%**	**58.8**	**78.3**	**19%**
2035 (20-Year)	Based on Per Capita Demand	24.5	30%	52.5	71.4	40%
	Industrial Point Loads[1]	4.6	0%	4.6	4.6	0%
	Total	**29.1**	**27%**	**57.1**	**76.0**	**38%**
2055 (40-Year)	Based on Per Capita Demand	34.5	30%	73.9	100.4	40%
	Industrial Point Loads[1]	4.6	0%	4.6	4.6	0%
	Total	**39.1**	**27%**	**78.5**	**105.0**	**39%**

[1] *Industrial point loads are assumed to be relatively constant so peaking factors are not applied.*

Figure 3-2
Demand Projections Comparison



Conclusions

As described in Table 3-7 and Figure 3-2, the City's overall water demand could be reduced if the system is metered and use based billing is implemented. This could result in a significant reduction related to the requirement for future water rights and supply infrastructure. The viability of metering will be evaluated further in Section 9.

While the projected demands over the next 5 and 20 years will be used to evaluate the hydraulic capacity of the system and identify improvements, the actual timing of those improvements should be scrutinized and based on when system demands reach certain thresholds.

SECTION 4

Distribution and Supply Analysis

SECTION 4
DISTRIBUTION AND SUPPLY ANALYSIS

This section documents the overall water supply and distribution system analysis for the City of Idaho Falls (City) for existing and future conditions. The water demand forecast summarized in Section 3—Population and Demand Projections was used in conjunction with performance criteria to assess water system characteristics, including supply capacity, service pressures, system storage, pumping capacity, and emergency fire flow availability. A 20-year horizon was used to evaluate the distribution system. For water supply needs, a longer, 40-year horizon was evaluated to facilitate long-term planning. This section provides the basis for recommended system improvements presented in Section 7—Capital Improvement Program.

Performance Criteria

The water distribution system should be capable of operating within certain performance limits under varying customer demand and operational conditions. The recommendations of this plan are based on the performance criteria summarized in Table 4-1. The criteria are based on the requirements within the Idaho Department of Environmental Quality administrative rules (IDAPA 58.01.08), many of which come directly from the federal Safe Drinking Water Act requirements. Other standards that have been referenced include the American Water Works Association (AWWA) acceptable practice guidelines, Ten States Standards and the Washington State *Water System Design Manual*.

Table 4-1
Performance Criteria

System Attribute	Evaluation Criterion	Value
Water Supply	Firm Supply Capacity[1]	MDD[2]
Distribution Storage	Total Distribution Storage Capacity	Sum of operational, equalization, fire & dead storage
Pump Stations and Wells	Minimum No. of Pumps	2
	Capacity	PHD[3] or MDD+ fire flow (whichever is larger)
	Emergency Power	At least two independent sources, system-wide adequate to serve ADD[4] + largest fire flow
Service Pressure	Minimum during MDD + fire flow	20 pounds/square inch (psi) at service junctions
	Minimum, during PHD	40 psi
	Standard Range	40-80 psi
	Maximum	80 psi preferred[5]
Distribution Piping	Maximum Velocity during MDD	5 feet/second (fps)
	Velocity during PHD or Fire Flow	Not to exceed 10 fps
	Minimum Future Pipe Diameter	8-inch (exception: 6-inch for short, dead-end mains without fire service)
Fire Suppression	Available Fire Flow Requirements[6]	Residential: 1,500 gpm[7] for 2 hours Commercial/Industrial: 2000-3,000 gpm for 2 hours Heavy Industrial: 4,500 gpm for 4 hours

[1] *Firm capacity: the total production capacity with the largest-capacity well, Well 5, out of service.*
[2] *MDD: Maximum day demand: the maximum volume of water delivered to the system during any single day.*
[3] *PHD: Peak hour demand: the maximum volume of water delivered to the system during any single hour of the maximum demand day.*
[4] *ADD: Average day demand: the total volume of water delivered to the system throughout the year averaged over 365 days.*
[5] *For pressures greater than 80 psi, installation of individual pressure reducing valves (PRVs) is recommended.*
[6] *For all fire flow evaluations, it is assumed that flow for only one fire at a time must be available.*
[7] *gpm: Gallons per minute.*

Storage Analysis

Storage Criteria

Reservoirs intended to store water and meet demand in the system serve four purposes: operational storage, equalization storage, fire storage, and standby or emergency storage (if adequate standby power is not provided). The total distribution storage required is the sum of these four components plus dead storage that is not available for use or provides substandard flows and pressures. The system is evaluated and will be recommended to provide adequate standby power so storage is not intended to provide emergency/standby volume.

Required storage volumes in millions of gallons were calculated according to the following criteria:

- *Dead Storage* – storage not available for use in the system.
- *Operational Storage* – storage that supplies water under normal conditions when the sources are off.
- *Equalization Storage* – the difference between a system's maximum pumping capacity and PHD provided for 150 minutes.
- *Fire Storage* – largest fire flow requirement within the system, multiplied by the duration of that flow (see Table 4-1 for fire flow requirements).

Storage Findings

Most of the reservoirs in the City's water system are intended to provide chlorine contact time for the groundwater supply and are not sized to provide storage to meet peak or emergency demand within the system. However, the 0.5-million-gallon (MG) elevated tank at Well 3, the 2.25-MG tank at the 65th Street facility and the 3-MG tank at Well 15/15B, resulting in 5.75 MG of existing storage are intended to meet peak demands in the system. The results of the storage analysis are shown in Table 4-2 and indicates that the existing storage is just adequate through the 5-year horizon with another 1.6 MG needed within 20 years.

Table 4-2
Storage Analysis

<table>
<tr><th rowspan="2">Timeframe</th><th colspan="2">Well 15/15B (MG)[1]</th><th colspan="2">Well 3/ Elevated (MG)[1]</th><th colspan="2">65th Street (MG)[1]</th><th colspan="2">System-wide (MG)[1]</th><th rowspan="2">Total Effective Storage Needed (MG)[1]</th><th rowspan="2">Surplus/ Deficiency (MG)[1]</th></tr>
<tr><th>Dead[2]</th><th>Operational</th><th>Dead[2]</th><th>Operational</th><th>Dead[2]</th><th>Operational</th><th>Fire</th><th>Equalization</th></tr>
<tr><td>2014 (Existing)</td><td rowspan="3">0.3</td><td rowspan="3">0.5</td><td rowspan="3">0.04</td><td rowspan="3">0.2</td><td rowspan="3">0.2</td><td rowspan="3">0.4</td><td rowspan="3">1.1</td><td>0.4</td><td>3.1</td><td>2.7</td></tr>
<tr><td>2020 (5-Year)</td><td>1.8</td><td>4.5</td><td>1.2</td></tr>
<tr><td>2035 (20-Year)</td><td>4.6</td><td>7.3</td><td>(1.6)</td></tr>
</table>

[1] *MG: million gallons.*
[2] *Assumes 2.5 feet of unusable storage in each tank.*

Supply Analysis

Water Rights and Long-Term Supply

The City has a varied portfolio of water rights, including hydropower rights and municipal groundwater rights, along with surface water irrigation shares and storage water shares. The municipal groundwater rights provide the supply to the City's potable distribution system and are summarized in Table 4-3.

Table 4-3
Municipal Groundwater Rights

Right # or Permit #	Wells	Priority Date	Instantaneous Flow (cfs[1]; gpm)	Annual Volume (Acre-Feet)
25-02095	#1	02/25/1927	5.20; 2,340	3,758
25-02142 & 35-03020	#2, #3, #4, #5, #7, #8 & #6	04/08/1963	50.20; 22,590	20,200
25-02143	#9, #10	11/22/1963	17.10; 8,019	12,358
35-07001	#11	07/13/1967	8.90; 4,005	6,432
25-07022	#12	01/18/1972	7.35; 3,308	5,312
25-07058	#13, #13-B	08/22/1974	6.14; 2,763	4,437
35-07841	#14	02/07/1979	7.35; 3,308	5,312
25-07298 & 25-07398	#15	12/23/1982 01/11/1985	3.35; 1,503 1.55; 696	2,421 1,120
25-07654 (Permit)	#15-B	09/03/1997	6.70; 3,015	4,842
35-08682	#16	02/10/1988	8.02; 3,609	5,796
25-07467	#17	09/09/1988	8.02; 3,609	5,796
Total			**129.88; 58,765**	**77,784**

[1] *cfs: Cubic feet per second.*

As indicated in Table 4-1, the firm supply is required to meet or exceed maximum day demand (MDD). The City currently has adequate water rights to meet demand, although peak irrigation season demands have in the past approached instantaneous flow allowance. As shown in Table 4-4, the City's existing average yearly water rights are adequate to meet demand projections through the next 40 years. However, the instantaneous demand, represented by MDD, will surpass the City's instantaneous water rights flow rate prior to the 20-year timeframe. The City has recently developed a Water Rights Plan to assess the options to best utilize existing rights and adequately provide for future demands. A copy of the Water Rights Plan, which addresses the adequacy of water rights and options for addressing future shortfalls, is included in Appendix B. A separate assessment below evaluates the adequacy of the system's pumping capacity to convey the water into the system and meet demand.

Table 4-4
Municipal Water Rights Analysis

Timeframe	Average Yearly Demand (acre-feet)	Existing Yearly Water Rights (acre-feet)	Yearly Water Rights Surplus (acre-feet)
2014 (Existing)	29,909	77,784	47,875
2020 (5-Year)	35,510	77,784	42,274
2035 (20-Year)	44,359	77,784	33,425
2055 (40-Year)	60,266	77,784	17,518
Timeframe	**Instantaneous Peak Demand (MDD) (mgd)[1]**	**Existing Instantaneous Water Rights (mgd)**	**Instantaneous Surplus/Deficiency (mgd)**
2014 (Existing)	60.7	84.6	23.9
2020 (5-Year)	72.3	84.6	12.3
2035 (20-Year)	92.0	84.6	(7.4)
2055 (40-Year)	127.7	84.6	(43.1)

[1] mgd: Million gallons per day.

Supply Criteria

To adequately meet system demands, supply facilities must be capable of providing MDD with the largest pump out of service. This state requirement assumes that all demands above MDD, such as peak hour demand (PHD) and fire flows, must be provided by storage. The City could choose to provide for demands that exceed MDD directly from supply; however, this analysis assumes that supply will equal MDD.

Supply Findings

Since the City is comprised of a single hydraulic grade line (pressure zone), the supply evaluation is determined on a system-wide basis with the single largest capacity well pump, Well 5, out of service. Since most of the wells pump water to a contact tank where it is then boosted into the system through a booster station, the limiting pumping capacity (well or pump station) was used to evaluate each facility's contribution to the system capacity. As shown in Table 4-5, the system has sufficient supply over the 5-year horizon and requires an additional 12.7 million gallons per day (mgd) in pumping capacity to serve the 20-year projected demands. By the 40-year horizon, another 35.7 mgd (48.4 mgd total) of additional supply will be required.

Table 4-5
Supply Capacity Analysis

Timeframe	MDD (mgd)	Existing Supply Firm Capacity (mgd)	Surplus/Deficiency (mgd)[1]
2014 (Existing)	60.7	79.3	18.6
2020 (5-Year)	72.3	79.3	7.0
2035 (20-Year)	92.0	79.3	(12.7)
2055 (40-Year)	127.7	79.3	(48.4)

[1] Based on supply and conveyance capacity evaluated using the hydraulic model, the actual 2020 supply deficiency is 10.8 mgd and the 2035 supply deficiency is an additional 11.7 mgd (22.5 mgd total).

No additional supply capacity is required according to the mass balance analysis, which simply compares system-wide supply to system-wide demand. However, a hydraulic model analysis (described in detail later in this section) is done to determine if the distribution system can adequately convey the water from the supply locations to the areas of demand. The model analysis indicates the need for additional supply in areas of the system where conveyance limitations exist. The model analysis indicates an additional 10.8 mgd of well capacity is needed in the 5-year horizon and another 11.7 mgd (22.5 mgd total) of well capacity is necessary for the 20-year timeframe. To remain consistent with current City operations, recommendations for well capacity will be accompanied by storage and booster pumping capacity.

Backup Power Criteria

In the event of a power outage, the system should have adequate backup power to meet average day demand (ADD) plus the largest fire flow requirement in the system.

Backup Power Findings

The largest fire flow requirement in the system is 4,500 gallons per minute (gpm). It is assumed that fire flow requirements do not change over the 20-year analysis period. As described in Section 2—Existing System Description, some facilities only have adequate backup power to serve some combination of the well and booster pumps at the facility, not all pumps. For these facilities, the largest viable combination of pumps was used to determine available backup power supply to the system. As Table 4-6 indicates, the City is currently 11.1 mgd short of having adequate backup power, with this amount increasing as future demand grows.

Table 4-6
Backup Power Analysis

Timeframe	Fire Flow Requirement (mgd)	ADD (mgd)	Existing Backup Power (mgd)	Surplus/Deficiency (mgd)
2014 (Existing)	6.5	26.7	22.0	(11.1)
2020 (5-Year)	6.5	31.7	22.0	(16.1)
2035 (20-Year)	6.5	39.6	22.0	(24.1)

Pumping Analysis

Pumping Criteria

The majority of storage in the City system is pumped from ground level so the pumping capacity must have sufficient firm booster capacity to supply PHD or MDD plus the highest fire flow requirement in the system, whichever is largest. For each timeframe, the PHD is the largest requirement.

Pumping Findings

The firm pumping capacity is the total production capacity of the system with its largest pump, the Well 5 booster pump, removed. For Well 3 and Well 6, which do not pump through a booster station, the facility capacity was determined by the well capacity. For each of the other facilities, the capacity was calculated as the booster station capacity. A summary of the system pumping capacity and projected demand conditions is in Table 4-7. Based only on a mass balance analysis, there is a pumping deficiency of 6 mgd by the 5-year horizon and another 26.8 mgd (32.8 mgd total) by the 20-year horizon.

Table 4-7
Pumping Capacity Analysis

Timeframe	MDD (mgd)	Fire Flow Requirement (mgd)	MDD + fire flow (mgd)	PHD (mgd)	Existing Pumping Firm Capacity [1] (mgd)	Surplus/ Deficiency [2] (mgd)
2014 (Existing)	60.7	6.5	67.2	82.6	90.7	8.1
2020 (5-year)	72.3	6.5	78.8	96.7	90.7	(6.0)
2035 (20-year)	92.0	6.5	98.5	123.5	90.7	(32.8)

[1] *Pumping capacity is based on the design point for each pump. Under peak hour operating conditions, regulations allow the system minimum pressure to drop to 40 psi, so pump capacity will increase as the head requirement decreases. As a result the hydraulic model was used to validate the actual system capacity under peak conditions.*

[2] *Based on peak pumping capacity evaluated using the hydraulic model, the actual 2020 pumping deficiency is reduced to 4.3 mgd and the 2035 pumping deficiency is reduced to an additional 17.4 mgd (21.7 mgd total).*

The system is designed to provide 40 to 80 psi under standard operating conditions, with the pump design capacity providing a head at the upper end of this range. This standard design point capacity was used for the evaluation in Table 4-7. As demand increases to flows required above MDD, system pressures drop and pumps produce more flow as they operate farther out on their pump curves. As long as the pumps maintain system pressures above 40 psi, acceptable service is provided. As a result, to determine the actual peak pumping deficiency the pumping capacity was evaluated using the hydraulic model.

The results of the model analysis indicate that the actual booster pumping deficiency in the 5-year horizon is 4.3 mgd, with another 17.4 mgd (21.7 mgd total) booster pumping deficiency for the 20-year horizon under PHD conditions. See Table 4-7 for details related to the peak pumping requirements. The detailed hydraulic model analysis and results are discussed in the next section. Described further in Section 7, the needed pumping capacity is recommended through a combination of additional well and booster capacity, with 15.9 mgd of the increased pumping capacity recommended through facilities that include adding new well supply along with booster station capacity and only 5.8 mgd of booster pumping upgrade improvements at already existing or previously recommended well sites.

Distribution System Analysis

Distribution System Criteria

Service Pressure

Distribution system performance was assessed based on the following service pressure criteria discussed earlier and summarized in Table 4-1. A distribution system should:

- Provide approximately 40 to 80 psi at service connections under ADD, MDD, or PHD conditions.
- Maintain minimum pressure of 40 psi at service connections under PHD conditions.
- Maintain a minimum service pressure of 20 psi under MDD plus fire flow conditions.
- Keep static pressure within the distribution system below 100 psi and, where possible, below 80 psi.

Pipe Flow Velocity

Pipe flow velocity criteria were also used during distribution system analysis to indicate areas of undersized piping. These criteria alone did not dictate system improvements, but helped guide system analysis and the prioritization of system improvements. Distribution piping was assessed based on the following criteria:

- Velocity below 5 feet per second (fps) under MDD conditions.
- Velocity below 10 fps under PHD or fire flow conditions.

Hydraulic Model

A steady-state hydraulic network analysis model was used to evaluate the performance of the existing distribution system, and identify deficiencies and subsequently proposed piping improvements. The purpose of the model is to determine pressure and flow relationships throughout the distribution system for a variety of demand, supply and emergency conditions. The model is EPANet-based and was previously developed in InfoWater software and updated as part of previous projects from geographic information system (GIS) water piping and facility data provided by the City.

Field testing was conducted to evaluate the relationship between model results and field data. City water customers' usage is unmetered, making it difficult to accurately allocate demand within the model and thus presenting challenges in the validation process. A summary of the calibration process and results is presented in Appendix C. The model remains useful in predicting general areas with pressure and capacity constraints, and was analyzed to identify hydraulic deficiencies under current and future demand conditions. Where necessary, the model was expanded to include proposed improvements required to correct existing deficiencies and provide for future development.

Modeling Conditions

System analysis was performed under existing, 5-year and 20-year demand conditions for ADD, MDD, PHD and MDD plus fire flow conditions. Fire flow scenarios test the distribution system's ability to provide required fire flows at a given location while simultaneously supplying MDD and maintaining a minimum residual pressure of 20 psi at all services. Pressure criteria deficiencies were identified and used to develop the improvement projects outlined in Section 7.

Demand

Existing demand was allocated throughout the system based on the location of occupied parcels, identified through previous projects, and was updated to match current production records. As described in Section 3, future water demands were estimated using Bonneville Metropolitan Planning Organization (BMPO) data, along with production information and City-identified areas of growth. Future demand was allocated and scaled in the current hydraulic model to match projections.

Fire Flow

Fire flows are illustrated in Figure 4-1 and were assigned based on general zoning classifications, with some specific location fire flows identified by City staff.

Facilities

For distribution system modeling, which wells were operated was based on the amount of demand required and the typical order of operation. System storage tanks were modeled half full for the fire flow analysis. During non-fire flow conditions, system tanks were operated at the bottom of the operational band (when well pumps would turn on to fill them).

Distribution System Findings

A detailed system analysis was performed to assess the ability of the City's current distribution system to provide water for existing and projected future demands and emergency fire suppression. As previously indicated, the model was also utilized to validate the supply and pumping evaluations in conjunction with system distribution and transmission capabilities.

Existing Condition Analyses

The current system was modeled under existing demands and for ADD, MDD and PHD conditions. Adequate pressures between 40 and 80 psi exist throughout the system, with very few exceptions. There is one location that has pressure under 40 psi during PHD conditions, and a small area with pressures just over 80 psi during ADD conditions as shown in Figure 4-2. There are also some pipes that exceed the recommended criteria of 5 fps during MDD and 10 fps during PHD conditions. Although deviation from velocity criteria alone does not trigger improvements, it does indicate potential limiting points in the system.

Under MDD plus fire flow conditions, there are a number of locations with hydrants that do not currently maintain 20 psi under the required fire flow, including the location that also had inadequate pressure under PHD conditions. Many of these locations are on old, undersized pipes. These locations are identified in Figure 4-2.

Future System Analysis

Similar demand scenarios (ADD, MDD, PHD and MDD plus fire flow) were modeled for the 5-year and 20-year horizon. For ADD, MDD, and PHD, the 5-year demand conditions were modeled with existing supply and piping to identify areas needing improvements. The analysis also assumed full use of the 65th Street storage facility, which has no direct well supply and could have difficulty filling under peak demand conditions, resulting in the recommendation to continue with City plans to add a well source to directly fill the storage tank.

Under the future scenarios, no locations have pressures above 80 psi and only one new area, located in the far northeast portion of the system in the vicinity of the Well 7 site, has pressures just under 40 psi during PHD conditions. The locations are shown in Figure 4-3. There are some additional pipes exceeding the recommended velocity during the 5-year MDD and PHD evaluations. These pipe locations are also shown in Figure 4-3.

The 5-year MDD plus fire flow analysis was analyzed assuming improvements are in place to address the existing fire flow deficiencies. This was done to identify any new locations with inadequate fire flow due to future demand conditions. Only five hydrant locations become deficient in the 5-year horizon that were not already deficient under existing conditions. All locations were deficient by 200 gpm or less from the required fire flow. These locations are identified in Figure 4-3.

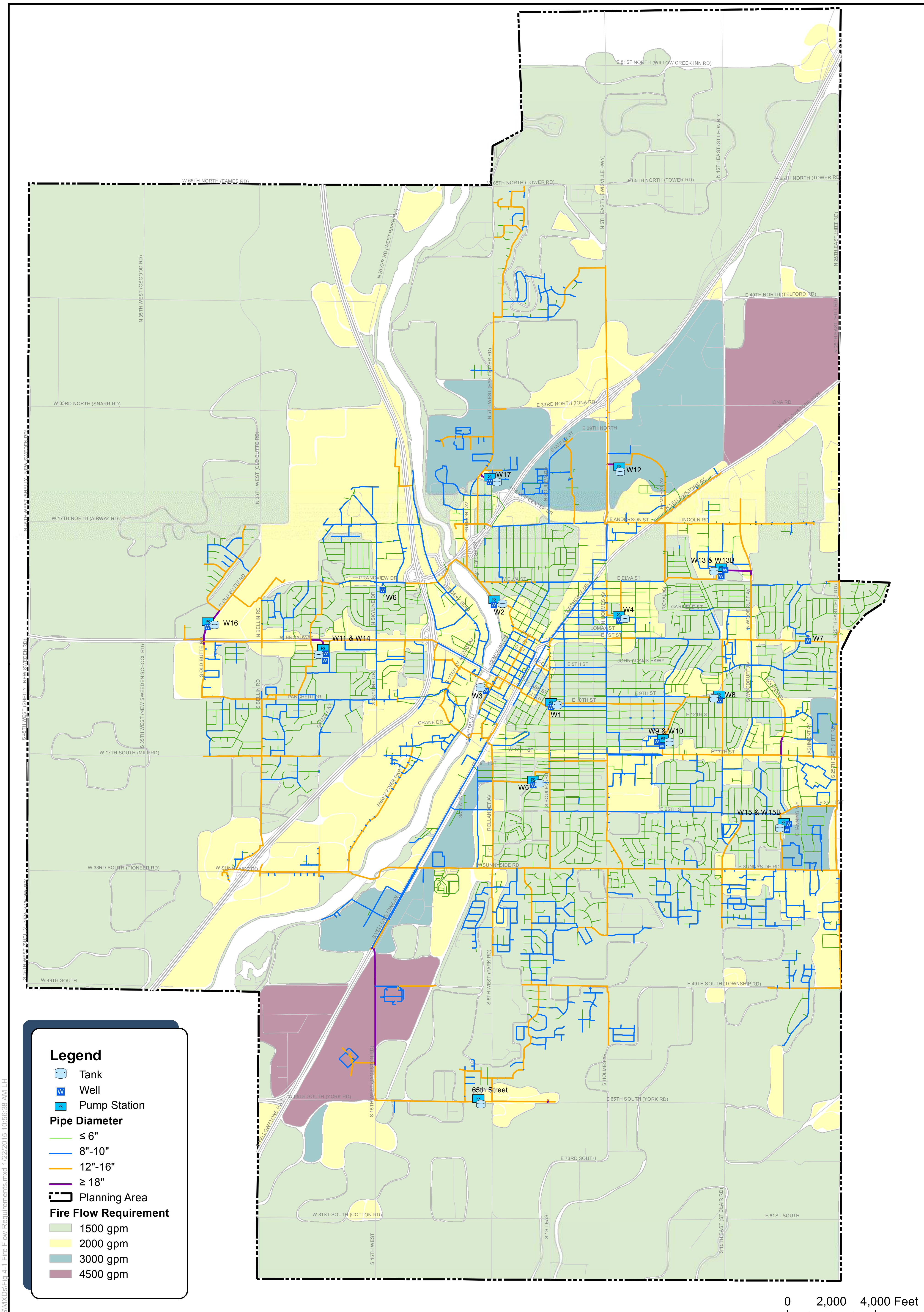
For all of the 20-year conditions, the system was evaluated with pipe improvements required to address existing or 5-year deficiencies in place. Due to the significant expected increase in MDD and analysis from Table 4-4, along with transmission constraints of existing supply to growth areas, 18 mgd in additional well pumping capacity was added where required. The locations of the new supply were determined based on projected growth patterns, areas identified to have low pressure under the 5-year demand conditions, and City input. New supply locations are shown in Figure 4-4. These assumptions allowed any new deficiencies to be determined, distinct from previously identified deficiencies or those due only to inadequate system-wide supply. Assumed improvements are explained further in Section 7.

Under the 20-year ADD and MDD, there are no new pressure deficiencies. For the 20-year PHD condition, areas of low pressure exist, particularly in the far south and north of the system, as seen in Figure 4-4. There are some additional pipes exceeding the recommended velocity during the 20-year MDD and PHD. These pipe locations are also shown in Figure 4-4.

The pressure deficiencies identified in the PHD analysis are due to a lack of transmission capacity to serve growth areas in the system and the pumping deficiency under PHD identified in Table 4-6. New transmission pipe and an additional 3.2 mgd in additional well pumping capacity (in addition to the 18 mgd in previously added supply) and 2.2 mgd in additional booster pumping capacity was added to specifically address the areas of low pressure identified during the 20-year PHD analysis and pumping deficiency identified in Table 4-6. The proposed piping and new pump locations are shown in Figure 4-5.

New pump locations were selected over adding pumping capacity to existing booster stations based on the projected growth in the north of the system, lack of existing supply in the area, and hydraulic and/or space restrictions at many of the existing facilities. The new piping and pumping capacity was added prior to the fire flow analysis to discern distinct fire flow inadequacies from low domestic pressure issues due to pumping and transmission capacity issues under 20-year demand conditions.

As mentioned, the MDD plus fire flow analysis for the 20-year horizon was done with piping improvements in place to address the existing and 5-year fire flow deficiencies, as well as supply, pumping and storage improvements to address those deficiencies. No new fire flow locations at hydrants are deficient under the 20-year demand conditions that were not previously identified under existing or 5-year conditions.



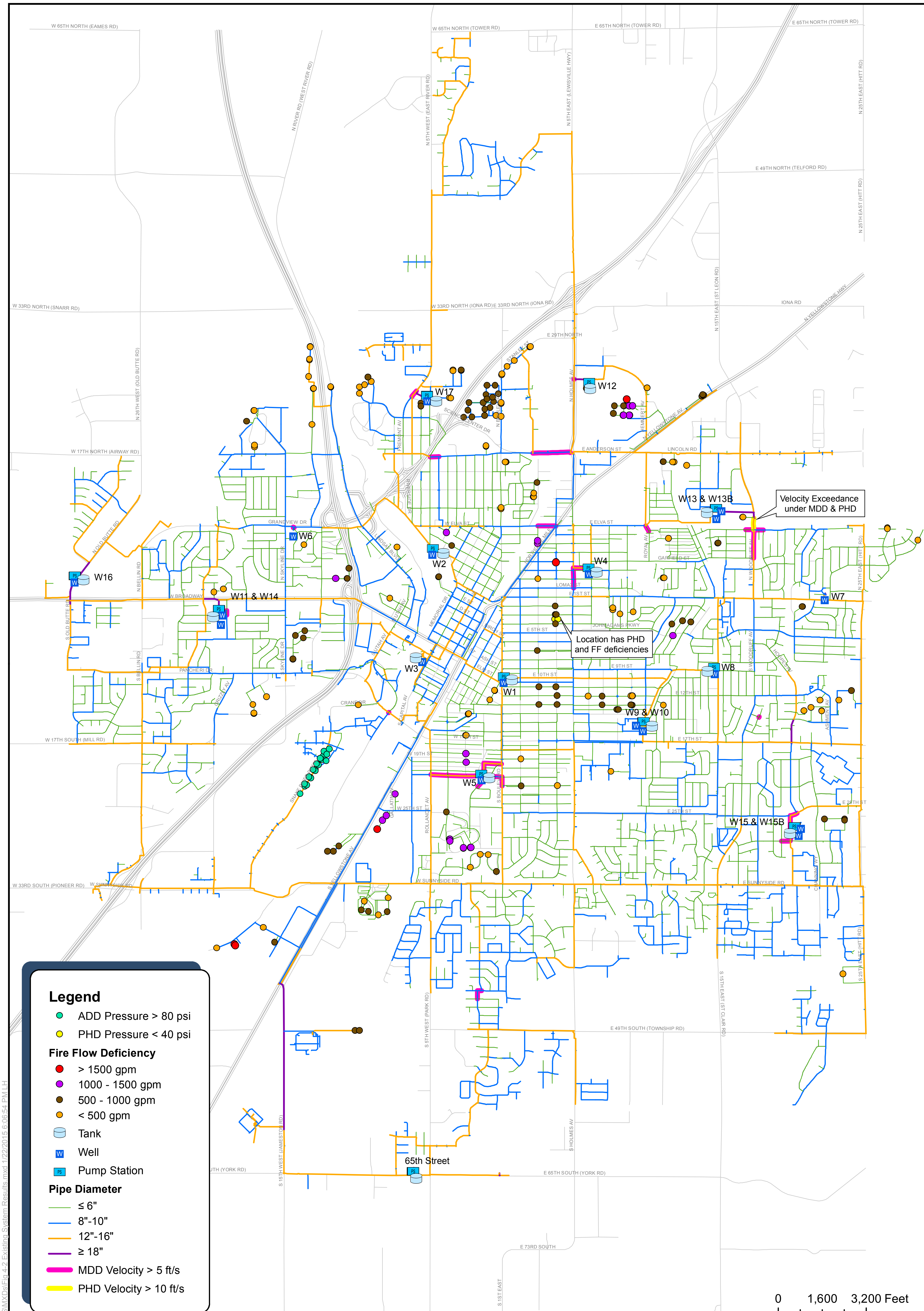
Idaho Falls
Water Facility Plan

Figure 4-1
Fire Flow Requirements

MSA Murray, Smith & Associates, Inc.

N W E S

CITY OF IDAHO FALLS

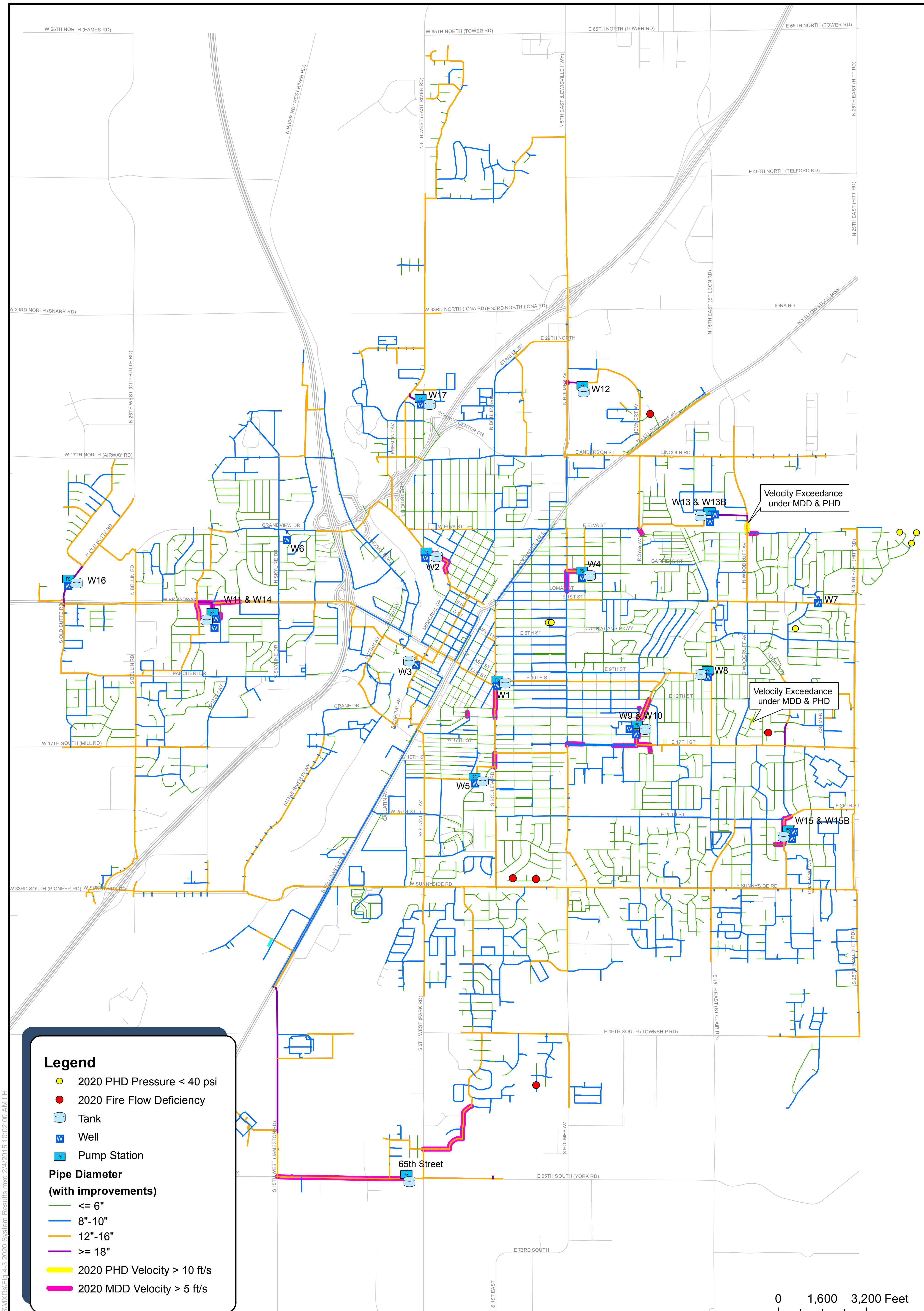


MSA
Murray, Smith & Associates, Inc.

Idaho Falls
Water Facility Plan

Figure 4-2
Existing System Results

June 2015 14-1550



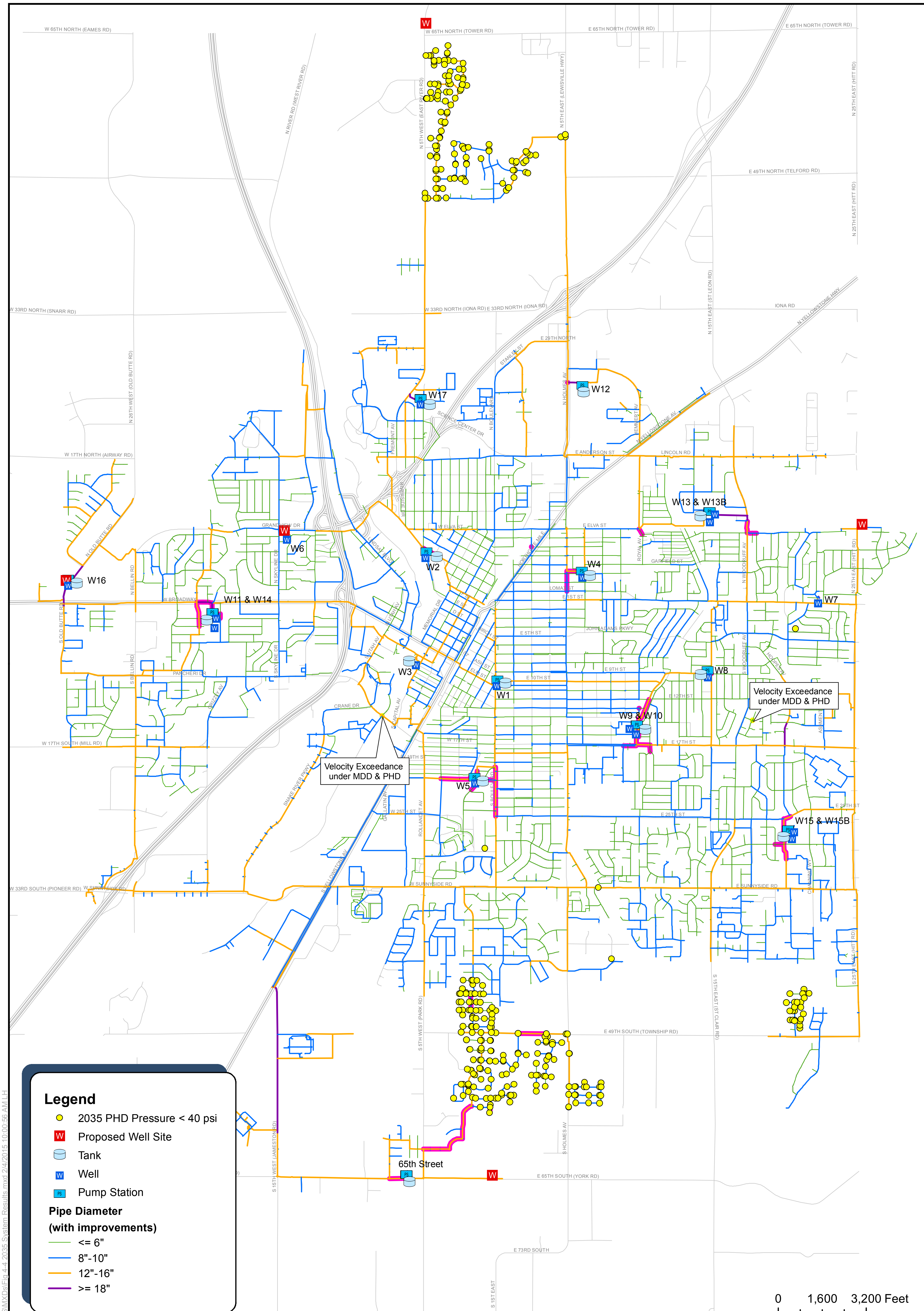
Murray, Smith & Associates, Inc.

Idaho Falls
Water Facility Plan

Figure 4-3
2020 Analysis Results

June 2015 14-1550

I:\BOI_Projects\14\14-1550\GIS\MXD\Fig 4-3 2020 System Results.mxd 2/4/2015 10:02:00 AM LH



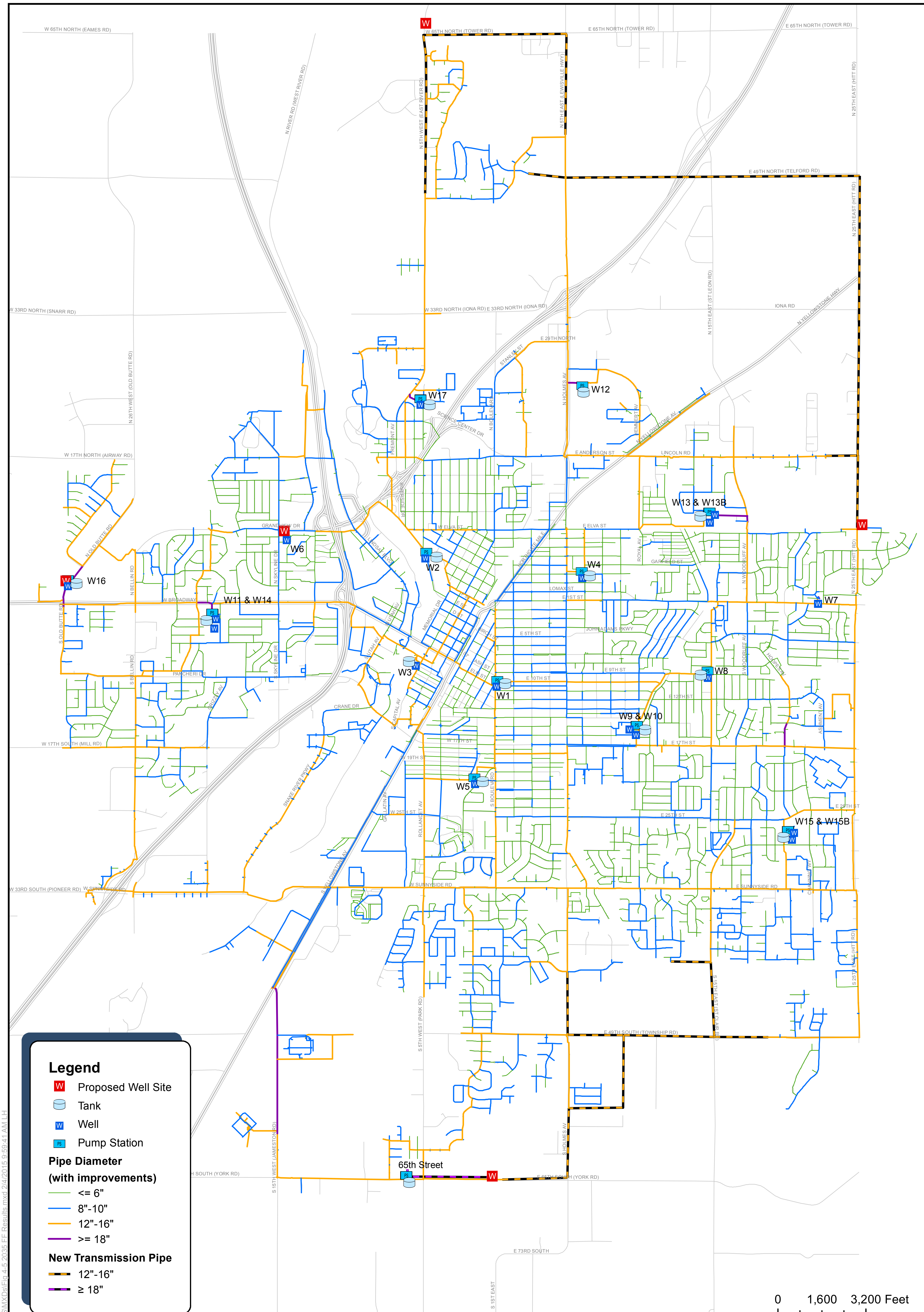
Murray, Smith & Associates, Inc.

Idaho Falls Water Facility Plan

Figure 4-4 2035 ADD, MDD & PHD Results

June 2015 14-1550

I:\BOI_Projects\14\14-1550\GIS\MXDs\Fig 4-4 2035 System Results.mxd 2/4/2015 10:00:56 AM LH



Murray, Smith & Associates, Inc.

Idaho Falls
Water Facility Plan

Figure 4-5
2035 Fire Flow
Analysis Results

June 2015 14-1550

Summary

The City provides reliable water supply to its customers and was evaluated on criteria for pressure, storage, pumping and fire suppression capability for existing, 5 and 20-year conditions. Supply evaluations were also conducted using 40-year projections. Due to high summertime demands, deficiencies in instantaneous water rights, peak supply, and pumping capacity have been identified. It should be noted that the demand projections are based on per capita average and peak water use trends continuing into the future. If per capita water use trends decrease, fewer future supply and pumping improvements will be required. The following lists describe the high-level takeaways from each of the respective analysis sections:

Storage Analysis Summary

- The City has adequate storage for existing and 5-year conditions.
- The City will have a system-wide future storage deficit of 1.6 MG by the 20-year horizon.

Supply Analysis Summary

- The City has adequate yearly average and instantaneous water rights to meet existing and 5-year demands.
- The yearly average water right is adequate through the 2055 projection; however, the instantaneous water right will have a 7.4 mgd-deficiency by the 20-year horizon and another 35.7 mgd deficiency by the 40-year horizon (43.1 mgd total).
- The City has adequate total and firm supply capacity (with Well 5 out of service) to meet existing MDD. However, due to transmission limitations to convey the existing supply at adequate service pressures as identified through the hydraulic model analysis, an additional 10.8 mgd of well capacity is recommended in the 5-year horizon. Increased well capacity is recommended over significant transmission piping improvements due to cost effectiveness.
- From the hydraulic analysis of existing supply, another 11.7 mgd (22.5 total) of firm supply capacity will be required within 20 years
- Based on a demand and supply mass balance, approximately 26 mgd more (total of over 48 mgd) will be required to supply the 40-year projected MDD.
- Due to changes in state regulations since the City's last water facility plan, backup power capacity is currently deficient by 11.1 mgd, and by the 20-year horizon will be short an additional 13 mgd (24.1 mgd total).

Peak Pumping Analysis Summary

- The current pumping capacity is adequate for existing demands. Although the mass balance in Table 4-7 shows a substantial pumping deficiency for 5-year and 20-year conditions, the hydraulic analysis indicates smaller actual deficiencies.
- For the 5-year horizon an additional 4.3 mgd of pumping capacity is needed to meet PHD. This additional booster pumping capacity is included as part of the facility to increase well supply.
- For the 20-year horizon, another 17.4 mgd (21.7 mgd total) in pumping capacity is required. All but 5.8 mgd of this booster pumping capacity is recommend in combination with new well supply.

Distribution System Analysis Summary

- For existing demands, the system has generally adequate pressures under ADD, MDD and PHD conditions, with one area slightly over 80 psi under ADD in the model, and one area under 40 psi in the hydraulic model during PHD conditions.
- There are a significant number of locations that do not provide adequate fire flow under existing conditions. Many of the deficiencies are due to undersized mains.
- Future scenarios were modeled assuming adequate supply, and that existing deficiencies were resolved.
- Under the 5-year demand projection, no locations have pressures over 80 psi and only one new location has PHD pressures under 40 psi.
- For the 5-year fire flow analysis, five new areas have fire flow deficiencies, although all are less than 200 gpm below the requirement.
- No new pressure deficiencies are anticipated for the 20-year ADD and MDD conditions. However, the 20-year PHD analysis indicated significant portions of the north and south ends of the system with pressures below 40 psi. Transmission piping improvements were added to resolve these deficiencies prior to the fire flow analysis.
- No new fire flow deficiencies were identified under the 20-year analysis.
- Specific projects to address these deficiencies are discussed in Section 7. Some piping projects are also included to improve transmission from new supply facilities and expanded booster pumping capacity.

System-wide Summary

A list of the storage, well supply, and booster pumping deficiencies and recommended solutions is in Table 4-8 for each evaluation horizon (deficient numbers are inside parentheses).

Table 4-8
Storage, Supply, Pumping Summary

Timeframe	Deficiency			Recommended Solution[1]
	Storage (MG)	Well Pumping Capacity (mgd)	Booster Pumping Capacity (mgd)	
2014 (Existing)	No Deficiency	No Deficiency	No Deficiency	• N/A
2020 (5-year)	No Deficiency	(10.8)	(4.3)	• New facility with 4.3 mgd well capacity, 4.3 mgd booster capacity, and 1.25 MG storage[2] • New 6.5 mgd well at 65th Street facility
2035 (20-year)	(1.6)	(22.5)	(21.7)	• New facility with 5.2 mgd well capacity, 5.2 mgd booster capacity, 1.25 MG storage • New facility with 2.2 mgd well capacity, 2.2 mgd booster capacity, and 0.1 MG storage • New facility with 4.3 mgd well capacity, 4.3 mgd booster capacity, and 1 MG storage[3] • Additional 3.6 mgd in booster capacity at 65th Street facility • Additional 2.2 mgd in booster capacity

[1] To adequately address the storage, supply and pumping deficiencies, transmission piping improvements are also required. Recommended improvements are outlined in Section 7.
[2] Storage is not required until 2035, but is driven by the timing of supply and booster requirements.
[3] Storage is not required by 2035, but is driven by the timing of supply and booster requirements and lack of storage in the north of the system.

Murray, Smith & Associates, Inc.
Engineers/Planners

SECTION 5

Operations and Maintenance

SECTION 5
OPERATIONS AND MAINTENANCE

This section assesses the City of Idaho Falls' (City's) Operations and Maintenance (O&M) program for its water system based on information supplied by City staff, comparison of the City's O&M practices to those of comparably sized utilities, and pertinent regulatory requirements. The resulting program improvement recommendations are detailed at the end of this section.

O&M Regulations and Guidelines

The Idaho Department of Environmental Quality (DEQ) promulgates the rules governing drinking water systems as set forth in Idaho Administrative Procedures Act (IDAPA) 58.01.08 – Idaho Rules for Public Drinking Water Systems, as follows:

- *58.01.08.501.07 – Reliability and Emergency Operation.* New community water systems constructed [or substantially modified] after April 15, 2007 are required to have sufficient dedicated on-site standby power, with automatic switch-over capability, or standby storage so that water may be treated and supplied to pressurize the entire distribution system during power outages. During a power outage, the water system shall be able to meet the operating pressure requirements of Subsection 552.01.b. for a minimum of eight (8) hours at average day demand plus fire flow where provided. A minimum of eight (8) hours of fuel storage shall be located on site unless an equivalent plan is authorized by the Department. Standby power provided in a public drinking water system shall be coordinated with the standby power that is provided in the wastewater collection and treatment system.
- *58.01.08.501.12 – Operation and Maintenance Manual.* A new or updated operation and maintenance manual that addresses all water system facilities shall be submitted to the Department for review and approval prior to start-up of the new or materially modified public water system unless the same system components are already covered in an existing operation and maintenance manual. For existing systems with continual operational problems, the Department may require that an operation and maintenance manual be submitted for review and approval. The operator shall ensure that the system is operated in accordance with the approved operation and maintenance manual.
- *58.01.08.554.01 – Licensed Operator Required.* Owners of all community and non-transient, non-community public drinking water systems must place the direct supervision of their drinking water system, including each treatment facility and/or distribution system, under the responsible charge of a properly licensed operator.

Pursuant to the authority of Idaho's Board of Drinking Water and Wastewater Professionals, IDAPA 24.05.01.250.01 describes two types of operator licenses: one for distribution systems and one for treatment systems. Both require operators to receive certification relevant to the classification of the system being operated. System classifications range from

Very Small to Class IV, depending upon size of population served; they are classified as follows:

- Very Small Public Drinking Water System – population of 500 or fewer and
    - no treatment other than disinfection, or
    - treatment that does not require chemical usage, process adjustments, backwashing, or media regeneration by an operator.
- Class I – 501 to 1,500.
- Class II – 1,501 to 15,000.
- Class III – 15,001 to 50,000.
- Class IV – 50,001 or more.

In addition to state regulations, the 10 States Standards *(Recommended Standards for Water Works*, 2007 Edition), recommends the following regarding water system O&M:

- An operation and maintenance manual including a parts list and parts order form, operator safety procedures and an operational troubleshooting section shall be supplied to the water works as part of any proprietary unit installed in the facility.

In addition to state regulations and recommended standards, the City has established basic drawings and specifications regarding connection, design, and construction of the water distribution and service connection system. These City documents provide design guidelines not covered the previously mentioned references.

System Overview, O&M Staff, and Licensure Status

The following list provides an overview of the City's water distribution system:

- System serves approximately 58,000 people and is classified as Class IV.
- Service Area: 23.0 square miles.
- Volume of water produced (2013 values).
    - Average Daily Demand (ADD): 24.5 million gallons per day (mgd).
    - Maximum Daily Demand (MDD): 56.8 mgd.
    - Peak Hourly Demand (PHD): 80.4 mgd.
- Unmetered service connections: 24,000.
- Metered service connections: 250.
- Total length of water line: 310 miles.
- Number of wells: 19.
- Number of booster pumping stations: 15.
- Number of chlorine contact tanks: 14.
- Number of pressure zones: 1.

- Average residential customer consumption: 455 gallons per capita per day (gpcd).
- Standard residential customer service line size: 1 inch.

The City's Water Division staff are responsible for the maintenance and operation of the distribution and treatment systems. Based on the system size, the state requires a Water Distribution Level IV operator license for the individual directly in charge of the system. A licensed treatment operator is not required, because only chlorination occurs and IDAPA rules consider chlorination a function of distribution. Table 5-1 lists current City state-licensed personnel.

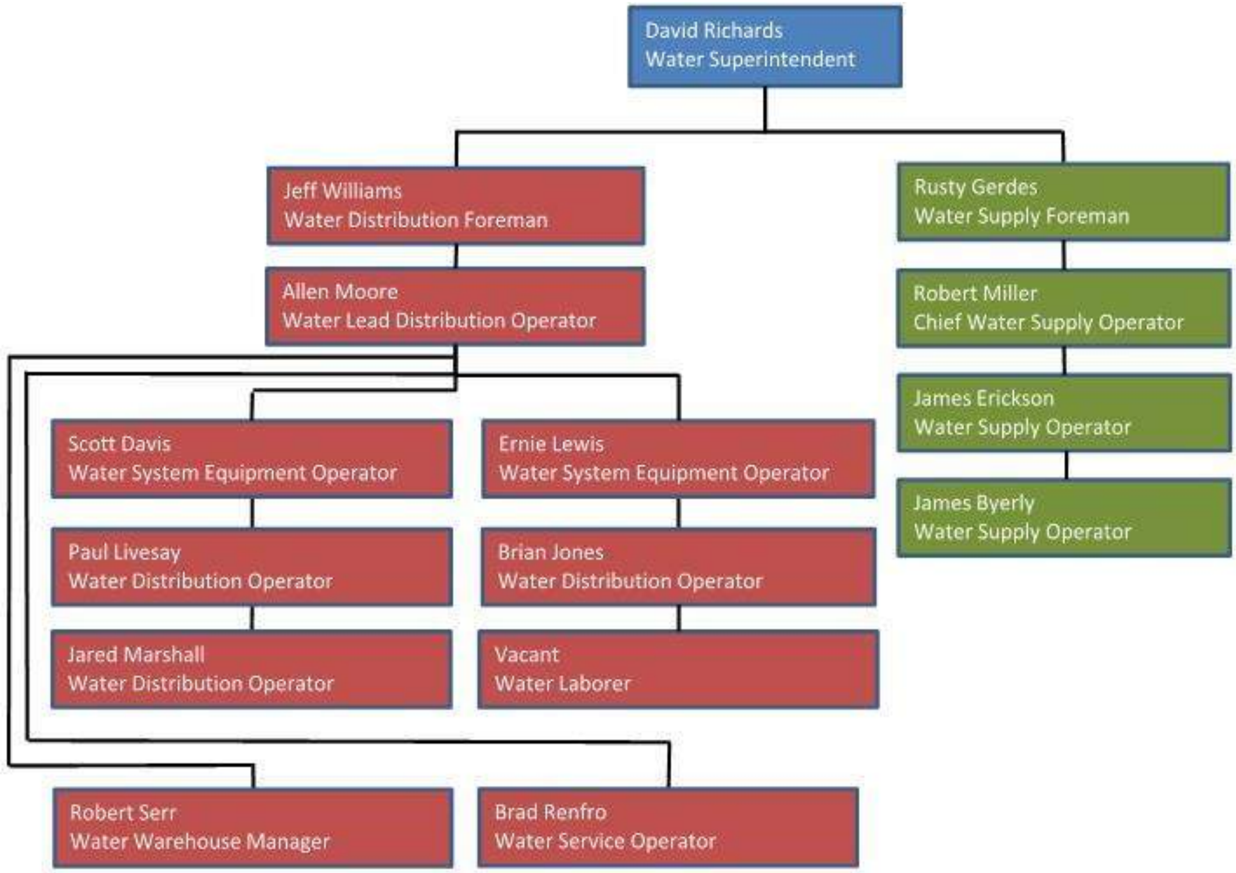
Table 5-1
Certification Status of Personnel

Operator Name		Position	Licensure[1]
Last	First		
Byerly	James	Water Supply Operator	Distribution III
		Water Supply Operator	BAT
Davis	Scott	Water System Equipment Operator	Distribution I
Erickson	James	Water Supply Operator	Distribution I
Gerdes	Rusty	Water Supply Foreman	Distribution IV
		Water Supply Foreman	BAT
Lewis	Ernie	Water System Equipment Operator	Distribution II
		Water System Equipment Operator	BAT
Livesay	Paul	Water Distribution Operator	Distribution I
Marshall	Jared	Water Distribution Operator	Distribution OIT
Miller	Robert	Water Supply Operator, Chief	Distribution IV
Moore	Allen	Water Lead Distribution Operator	Distribution III
		Water Lead Distribution Operator	BAT
Jones	Brian	Water Distribution Operator	Distribution I
		Water Distribution Operator	BAT
Renfro	Brad	Water Service Operator	Distribution II
Richards	David	Water Superintendent	Distribution IV
		Water Superintendent	BAT
Serr	Robert	Water Warehouse Manager	Distribution I
Williams	Jeff	Water Distribution Foreman	Distribution IV
		Water Distribution Foreman	BAT

[1] *Licensure acronym definitions: BAT = Backflow Assembly Tester; OIT = Operator in Training.*

The water system O&M operates under the direction of the Water Superintendent, who reports to the Director of Public Works. There are currently 14 full-time employees working in the Water Division under the direction of the Water Superintendent, all of whom are involved in the operation or maintenance of the system in some capacity. The organizational structure of the Water Division is outlined in Figure 5-1.

Figure 5-1
Water Division Organizational Chart



Current O&M Practices

Standard operations involve analyzing, formulating, and implementing procedures to ensure that the facilities function efficiently and meet quality, quantity, and pressure requirements, as well as other system demands. Routine tasks include daily rounds to visually check system facilities, visually monitoring flow and reservoir level recording devices on a regular basis during the day, and responding to customer inquiries and complaints.

General System Operation

The City's drinking water is supplied solely by groundwater from 19 wells distributed across the City's service boundary via an underground pipeline network. These wells are located at 15 pumping facilities, some of which house two wells. The facilities include the well pump, chlorine contact chamber, and booster pumps identified by well number (e.g., Well #1). Wells are numbered chronologically: Well 1 is the oldest, constructed in 1927, and Well 17, the newest, was built in 1994

All wells are equipped with chlorine gas injection systems. With the exception of Wells 3 and 6, wells pump directly into chlorine contact tanks, and then booster pumps deliver water from the chlorine contact tanks into the distribution system. Well 3 pumps into an elevated storage tank and Well 6 pumps directly into the system. Well 7 is currently not in use. Each facility is referred to as a numbered well (e.g., Well 1), and each well in this report refers to the entire facility, including the well pump, chlorine contact chamber, and booster pumps.

Water customers are responsible for service lines on their property, and the City maintains and operates all facilities and appurtenances within the water system up to the property line. All field personnel evaluate the system's performance daily, and with the exception of a few outsourced tasks such as meter pit installation or major water main and facility repairs, City staff handle the majority of O&M duties.

To check for any issues in the water system, staff make daily visits to each in-use pumping facility to record well production readings, chlorine usage, and building temperature, and they also perform a visual site inspection. Typically, all of the well facilities are in use during the summer and only a select group of facilities are used in the winter, when the demand is low.

The City has supervisory control and data acquisition (SCADA) equipment installed at each of the well facilities. The SCADA equipment records pertinent system information for review by the Water Division staff. The following system information is monitored:

- Reservoir water levels.
- Water pressure at the well facility discharge into the system.
- Water pressure at ten remote locations throughout the distribution network, used to determine the need for more water from the well/booster facilities.
- Flow rates as the water enters the distribution system from the well facility
- Pump power usage.
- Well water level measurements. (Currently Well #12 does not have well water level measurement abilities due to an obstructed stilling well.)

City staff read customer water meters monthly.

The City has a Geographic Information System (GIS) geodatabase that maintains detailed information about the system. The geodatabase provides extensive information about facilities, pipelines, and appurtenances throughout the system. It spatially locates each part of the system and includes attributes relevant to each feature, such as material, diameter, pressure settings, elevations, and other relevant characteristics. The GIS can be leveraged in the office and in the field via laptop.

Well Site Preventive Maintenance

Currently there is no formal documentation for well site preventative maintenance procedures. However, the water supply foreman submitted the following list of preventative maintenance activities and how often they are performed by the supply operators:

Daily

- Write down readings at each well.
- Check building temperatures.
- Check property.

Weekly

- Sweep floors and remove cobwebs.
- Run/exercise generator sets.

Monthly

- Check/test chlorine sniffer/sensor units.

Semiannually

- Test heater operation.

Annually

- Change oil in motors.
- Paint floors, pipes, pumps, and walls.
- Repack bearings where packing glands are all the way down.
- Grease pumps and motors.
- Change oil and filters in emergency generators.
- Calibrate flow meters.
- Calibrate pressure transmitters.
- Inspect tanks.
- Replace or repair chlorine tubing.
- Reload reading sheets into clipboards.
- Reload generator run sheets into clipboards.
- Change air filters in motor control center (MCC) cabinets.

As-Needed

- Dust and wipe down motors.
- Tighten packing gland.

Water Quality Monitoring

The City currently has a sampling plan that follows federal and state requirements for water quality monitoring. This plan describes the contaminant, point locations, and sampling frequency.

The water system is sampled for eighty-seven different regulated contaminants as required by federal and state standards. All samples are collected according to regulating agency timelines and laboratory instructions, and are evaluated by third-party laboratories.

The City monitors the following contaminant groups:

- Disinfectants.
- Inorganic chemicals.
- Organic chemicals.
- Radionuclides.
- Disinfection byproducts.
- Microorganisms.

The City also has a written Total Coliform Rule which describes the population based sampling plan for bacteriological contaminants.

Historical water quality monitoring indicates that the City's water meets federal and state requirements. The most current water quality reports are available as part of the City's annual consumer confidence report and can be found on the City's website.

Emergency Response Plan

The Water Division has a current Emergency Response Plan (ERP) and Vulnerability Assessment (VA). The ERP provides the City with a standardized response and recovery protocol to prevent, minimize, and mitigate injury and damage resulting from natural or manmade emergencies or disasters.

The VA describes how the Water Division will respond to potential threats, actual terrorist scenarios, and other emergency response situations.

Customer Complaints

The Water Division uses work order software that logs every customer request and complaint. Once dispatched, crews complete the work order, and data is entered into the software program and saved. The current software was created by a programmer who is no longer employed with the City; consequently, software capability is very limited and is not integrated with the GIS or associated mapping capability.

Cross-Connection Control

Aside from a pertinent section in the City code, there are currently no official guidelines for cross-connection control procedures. However, the Water Division recently purchased a software package for tracking backflow assemblies and is in the process of producing an outline for the City's cross-connection control program.

Source Water Protection

There is currently no formal documentation for source water protection. The DEQ supplied the City with a Source Water Assessment Report in February 2002, which is updated by the state when new sources are brought online by the City. The City's source water delineations from the EPA extend beyond city and county limits, and therefore a regional approach to source water protection makes the most sense. No organization has yet attempted to bring all stakeholders together.

Public Information

The City's Public Information Officer assists City divisions and departments with disseminating public information through a variety of sources (print and broadcast media, the web, social networking, etc.). The City's website also has an online Q&A program where the public can ask questions and have them answered by City staff. Other information is communicated in the Water Division's web page and through utility bill stuffers, which include brochures for the Consumer Confidence Report (CCR), Conservation, and Freeze Protection. Water Division personnel also interact with the public by participating in Earth Day and Water Week events.

Water Meter Calibration and Replacement Program

Due to the small number (250) of metered connections billed by the City, meters are only replaced when reading abnormalities are identified. There is currently no formal calibration maintenance program.

System Flushing Program

The City's Fire Department annually exercises all public fire hydrants within the system. They do not, however, measure flow, nor do they leave the hydrants flowing long enough to adequately flush the mains. The City is in the early stages of developing a unidirectional flushing program. Currently the Water Division flushes additional mains on an as-needed basis to address water quality complaints.

Valve Exercising Program

Currently there is no formal documentation for valve exercising procedures. However, the Water Division distribution operators perform the following main line valve exercises:

- in advance of City water distribution projects to ensure functionality.
- on an as-needed basis for emergency repairs.

System Leak Detection Program

No official guidelines exist for system leak detection. However, the City does perform an annual leak-detection project that tests approximately 10% of the system. The distribution foreman keeps a City map updated with sections that have been tested each year.

Safety Procedures

The Water Division currently has no formal safety manual, but conducts monthly safety training meetings. The supply and distribution operators meet separately each day as needed to conduct pertinent safety table-top discussions. They have also recently purchased an air quality tester and a confined-space tripod with man lift and harness, and anticipate producing a formalized procedure for permit-required confined space entry.

Benchmarking

Seven other comparably sized regional utilities were surveyed to compare their O&M practices to the City's current program. These utilities and the populations they serve are listed below:

1. Asotin County Public Utility District (PUD), Washington = 19,750
2. City of Lewiston, Idaho = 16,000
3. City of Meridian, Idaho = 66,000
4. City of Nampa, Idaho = 81,000
5. City of Pendleton, Oregon = 17,611
6. City of Redmond, Oregon = 27,000
7. City of Walla Walla, Washington = 35,000

Because each surveyed system has unique attributes, a number of the system characteristics were calculated on a unit basis for means of comparison. The results of these performance indicators are summarized in Table 5-2. Tables 5-3 to 5-12 highlight the responses to specific survey questions.

The City ranks third in population served and first in average flow rates in comparison to the other utilities surveyed. The City ranks second in the length of lines maintained and number of well and booster pump stations maintained. The City is fourth in the number of water system O&M staff and is ranked third in O&M budget. It should be noted that the three largest systems used for comparison (Meridian, Nampa, and Redmond) have all experienced rapid, recent growth since 2000. According to the 2010 U.S. Census, Meridian's population grew by 115%, Nampa's by 57%, and Redmond's by 94% between 2000 and 2010. In comparison, Idaho Falls grew 12% in the same timeframe. It is logical to conclude that large portions of these systems' infrastructures will be newer, having been built to accommodate this recent growth, and will thus require fewer near-term O&M program improvements and structural replacements.

Benchmark comparisons revealed that the City spends less per year on population served and total distribution system length than half of the surveyed utilities. The City ranks second in total length of distribution system operated per full-time equivalent (FTE) staff. The City provides the greatest average daily flow per both FTE and dollar spent in annual budget.

The performance indicators show that each City FTE is responsible for more daily average water supply and there are fewer FTEs per 10,000 population than the other utilities. The City ranks second to Meridian for total length of the distribution system operated per FTE. The previous comparisons shows that the City operates with fewer staff than the rest of the survey group. Additionally, national data from the *2012 Benchmarking, Performance Indicators for Water and Wastewater Utilities: Survey Data and Analyses Report* reveals that the national median is 210,000 gpd per FTE. The City's 1,633,000 gpd per FTE indicates that it is understaffed.

Similar to other utilities, the City receives almost all of its funding from water rates, with a small percentage of funds coming from connection fees. The City's connection fee and monthly water rates are low compared to some of the other utilities surveyed.

Table 5-2
Benchmarking – Performance Indicators[1]

Utility Name	Annual Budget/ Population Served ($/person)	Annual Budget/ Average Day Flow ($/mgd)	Annual Budget/ System Pipe Length ($/lf)	Average Day Flow/ FTEs (gal/FTE)	Feet of Pipe/ FTEs (lf/FTE)	Annual Budget/ FTEs ($/FTE)	FTEs/ 10,000 Population (FTE/ 10k persons)
Asotin PUD	111	542,000	3.5	507,000	79,000	275,000	4.1
Idaho Falls	**63**	**149,000**	**2.2**	**1,633,000**	**109,000**	**244,000**	**2.6**
Lewiston	225	878,000	5.9	293,000	44,000	257,000	8.8
Meridian	58	442,000	1.6	430,000	119,000	190,000	3.0
Nampa	14	176,000	0.9	236,000	47,000	41,000	3.5
Pendleton	142	676,000	4.4	617,000	94,000	417,000	3.4
Redmond	178	956,000	5.6	500,000	86,000	478,000	3.7
Walla Walla	55	201,000	2.0	592,000	60,000	119,000	4.6

[1] *Large numbers have been rounded for ease of comparison.*

Table 5-3
Benchmarking – Service Areas[1]

Utility Name	Rank (population served)	Population Served	Number of Service Connections	Service Area (sq. miles)
Asotin PUD	6	19,800	7,000	20.0
Idaho Falls	**3**	**58,000**	**24,000**	**23**
Lewiston	8	16,000	6,000	17
Meridian	2	66,000	27,300	30
Nampa	1	81,000	28,000	35
Pendleton	7	17,600	6,200	13.4
Redmond	5	26,900	10,000	10.2
Walla Walla	4	34,900	10,900	13.0

[1] *Large numbers have been rounded for ease of comparison.*

Table 5-4
Benchmarking – Flow Rates

Utility Name	Rank (ADD)	Volume of Water Produced (mgd)			Non-Revenue Water (%)
		ADD	MDD	PHD	
Asotin PUD	7	4.1	12.1	18.0	5
Idaho Falls	**1**	**24.5**	**56.8**	**80.4**	**Unknown**
Lewiston	6	4.1	10.5	NA[1]	6
Meridian	3	8.6	17.2	25.7	3
Nampa	4	6.6	7.5	13.0	18
Pendleton	8	3.7	9.4	14.3	7
Redmond	5	5.0	13.2	NA[1]	2
Walla Walla	2	9.5	20.0	26.8	31

[1] *NA = No answer.*

Table 5-5
Benchmarking – Distribution Pipe

Utility Name	Rank (Length of Distribution Pipe)	Total Length of Distribution Pipe (Miles)	Number of Hydrants
Asotin PUD	6	120	1,010
Idaho Falls	**2**	**310**	**2,100**
Lewiston	7	116	864
Meridian	1	450	4,380
Nampa	3	250	4,457
Pendleton	8	107	700
Redmond	5	163	1,700
Walla Walla	4	183	2,300

Table 5-6
Benchmarking – PRVs

Utility Name	Rank (Number of PRVs)	Number of PRVs	Number of Pressure Zones
Asotin PUD	2	25	9
Idaho Falls	**8**	**0**	**1**
Lewiston	1	28	8
Meridian	4	21	4
Nampa	6	6	2
Pendleton	5	9	13
Redmond	7	4	4
Walla Walla	2	25	4

Table 5-7
Benchmarking – Wells

Utility Name	Rank (Number of Wells)	Number of Wells	Largest Well Pump (hp)	Smallest Well Pump (hp)	Number of Wells with Backup Power
Asotin County PUD	5	7	900	200	1
Idaho Falls	**2**	**19**	**450**	**125**	**4**
Lewiston	8	6	350	75	0
Meridian	1	20	200	50	13
Nampa	3	14	250	30	14
Pendleton	4	8	450	100	0
Redmond	5	7	600	150	6
Walla Walla	5	7	500	200	0

Table 5-8
Benchmarking – Booster Stations

Utility Name	Rank (Number of Booster Stations)	Number of Booster Stations	Largest Pump (hp)	Smallest Pump (hp)	Number of Booster Stations with Backup Power
Asotin PUD	5	3	500	50	2
Idaho Falls	**1**	**15**	**350**	**50**	**3**
Lewiston	3	9	400	1.5	6
Meridian	7	2	100	25	2
Nampa	5	3	1100	60	3
Pendleton	2	13	100	1.5	1
Redmond	4	4	150	15	4
Walla Walla	8	1	25	15	0

Table 5-9
Benchmarking – Reservoirs

Utility Name	Rank (Number of Reservoirs)	Total Number	Tank Types				
			Pre-Stressed Concrete	Cast-In-Place Concrete	Welded Steel	Bolted Steel	Other
Asotin PUD	6	5	x		x	x	
Idaho Falls	**1**	**14**	**x**	**x**	**x**[1]		
Lewiston	4	7		x	x		x
Meridian	8	2	x		x		
Nampa	4	7	x		x		
Pendleton	2	8		x	x		x
Redmond	2	8	x		x		
Walla Walla	7	3	x		x		

[1] *The only welded steel tank is the elevated storage tank.*

Table 5-10
Benchmarking – Staff

Utility Name	Rank	Number of FTEs on Staff	Number of Licensed Distribution Operators			
			Class I	Class II	Class III	Class IV
Asotin PUD	7	8	1	5	2	0
Idaho Falls	**4**	**15**	**5**	**3**	**2**	**3**
Lewiston	5	14	2	3	2	1
Meridian	2	20	3	8	2	5
Nampa	1	28	7	8	5	2
Pendleton	8	6	5	0	1	0
Redmond	6	10	0	3	6	0
Walla Walla	3	16	0	4	1	0

Table 5-11
Benchmarking – Budget

Utility Name	Rank	Total O&M Budget
Asotin PUD	6	$2,200,000
Idaho Falls	**3**	**$3,660,000**
Lewiston	4	$3,600,000
Meridian	2	$3,800,000
Nampa	8	$1,160,000
Pendleton	5	$2,500,000
Redmond	1	$4,780,000
Walla Walla	7	$1,900,000

Table 5-12
Benchmarking – Financing

Utility Name	Residential Water Fees		Source of Budget (%)			
	Connection Fee	Average Monthly Water Rate	Connection Fee	Water Rates	General Fund	Loans
Asotin PUD	$1,650	$30.00	1	99	0	0
Idaho Falls	**$1,312**	**$21.00**	**4**	**96**	**0**	**0**
Lewiston	$1,500	$70.00	5	95	0	0
Meridian	$1,794	$24.24	0[1]	100	0	0
Nampa	$3,696	$16.08	18	82	0	0
Pendleton	$0	$20.00	0	100	0	0
Redmond	$400	$35.00	14	86	0	0
Walla Walla	$2,408	$54.00	3	97	0	0

[1] Meridian connection fees are used to subsidize capital improvements, but do not fund O&M.

The following summarizes information gathered from other questions in the benchmarking survey. Not all questions were answered by all surveyed utilities.

- *System Age*: The oldest part of the City's system is approximately 110 years old with the majority of the system less than 50. It should be noted that the three largest systems used for comparison (Meridian, Nampa, and Redmond) have all experienced rapid, recent growth, and much of their systems are newer, having been constructed to serve the increased growth.
- *Surface Water Sources*: Three utilities (Lewiston, Pendleton and Walla Walla) have a surface water source.
- *Budget Allocation*: The City's per-unit spending was comparable to other utilities; however, its O&M budget was the third largest of the group.
- *System Flushing:* The City and Pendleton lack a flushing program.
- *Valve Exercising:* The City is one of four utilities (Nampa, Lewiston and Pendleton) without a valve exercising program.
- *Cathodic Protection:* Approximately half of the utilities surveyed employ cathodic protection. (Idaho Falls, Meridian, Lewiston, Nampa, Walla Walla, and Redmond do not.)
- *Cross-Connection Control Program:* All utilities report having a cross-connection control program or are developing one.
- *Leak Detection:* The City is one of four utilities (along with Walla Walla, Asotin, and Lewiston) with some type of leak detection practice.
- *Well Head Protection Plan*: Idaho Falls and Redmond are the only utilities surveyed that do not have a well head protection plan.

Conclusions and Recommendations

The following conclusions and recommendations are based on the review of the City's current O&M practices and benchmarking of other water system O&M programs, as presented above.

General

O&M programs that effectively address issues with customer interaction, water quality, and infrastructure maintenance rely on timely, relevant information. This requires successfully transferring information from staff in the field to managers, which is achieved by meticulous record-keeping practices. To become more efficient overall and ensure compliance with state and industry recommendations, the City's water system O&M program should:

- Adopt formal procedures and documentation regarding the City's existing O&M programs as described in the *Current O&M Practices* section above.

- Expand existing forms to record and document each activity performed. These forms should track equipment, maintenance records, and staff hours.
- Invest in ongoing record-keeping training for staff to maintain a disciplined documentation program.
- Track and compare annual maintenance costs for each piece of equipment to help ensure informed repair or replacement decisions.
- Continue to log customer complaints and issues. Include date, time, location, cause of the issue, and measures taken to mitigate it.
- Implement an asset-management software to assist in performing the recommendations described above.

Wells and Booster Pumps

In addition to the existing well and booster pump station maintenance activities, the City should develop a program that closely follows the equipment manufacturers' recommendations for activities such as lubrication of bearings, oil changes and parts replacement to avoid invalidating equipment warranties. Specific requirements of individual pump stations should also be closely followed. In addition, operation manuals should be required from each manufacturer of proprietary units installed in the system.

The following recommendations will help improve the City's pump station operations and maintenance program:

- Continue to develop an O&M manual for each well and booster pump station to provide consistent maintenance practices over the life of the station. This will also encourage the transfer of the City field crew's knowledge and experience to new staff. The O&M manual should include a recommended inventory of critical components, supplier and manufacturer's contact information, and a list of local contractors for emergency repairs, including after-hours contacts. See Appendix D for a proposed schedule of pump inspection tasks that can be used by the City to create a pump station checklist.
- Pump station electrical equipment has a typical of life of 20 to 30 years. See Section 7—Capital Improvements Program for defined repair-and-replacement program costs.
- Develop annual maintenance program to repair, improve, or maintain concrete and asphalt flatwork at each well facility and the Water Division shop.

Water Storage Tanks

To ensure long tank life and high-quality water, storage tanks should be inspected and cleaned at least every five to ten years, depending on the structure and the wells' sand production. Routine inspections also provide benchmarks for assessing the coating system and helping to identify repairs.

The following recommendations will allow the City to improve its water storage tank operations and maintenance program:

- Implement a water storage tank inspection and cleaning program to assess every storage tank within the system at least once every five years.
- Set up an annual maintenance contract with an independent certified inspection company.
- Repaint, re-coat and re-roof the interior and exterior of the tanks when inspection reveals deficiencies.
- Well 3's elevated steel storage tank needs of major repairs, including foundation assessment and stripping of the lead paint and recoating. Section 6— System Conditions and Code Evaluation recommends demolishing the existing 0.5-MG tank and replacing it with a new, elevated 1-MG tank. See Section 7 for defined costs.

Distribution System

Water distribution systems O&M practices typically include the following maintenance programs:

- Water meter calibration and replacement.
- Pipeline replacement.
- System flushing.
- Valve exercising.
- System leak detection.

The City should continue to develop and formalize these programs and evaluate staffing needs to ensure these services.

The following recommendations have been defined for improving water distribution system O&M:

- Implement a pipe replacement plan. Analysis of the system's pipeline condition performed in Section 6 concludes that the City's pipeline replacement schedule should include replacing approximately 3.2 miles (16,800 ft) of pipeline per year starting with cast iron piping installed between 1902 and 1959.
- Continue systematic pipeline cleaning through the developing the unidirectional pipe flushing program. The Fire Department should begin to measure flow, and to flush for the appropriate amount of time.
- Create a valve exercise program that locates, operates, and rates the condition of all distribution valves on a five-year basis. The program will maintain the reliability of the valve service and help identify whether replacement is necessary. The City should focus on critical isolation valves within the distribution system.

- Develop a water meter testing program and construct a dedicated facility. The very small number of existing installed water meters can all be tested in a single year. Idaho currently has no regulations for frequency of water meter testing, but both Wyoming and Montana indicate that meters should be tested every four to ten years, depending on their size.

Most meters are equipped with touch-pad reading devices. At some point, the Water Division wishes to equip existing meters with radios supported by the fixed-base mesh network meter reading system recently installed by Idaho Falls Power. As Idaho Falls Power converts their meters to this new system, it will open the window for the Water Division to do the same.

Safety Plan

The City's drinking water disinfection program uses chlorine gas to provide primary and residual disinfection. Although chlorine gas is a simple, effective, and economical choice for disinfection, it is a highly hazardous substance, and handling it requires strict adherence to safety procedures. To provide a safe working environment, all chlorine gas feed and storage room facilities should be designed and operated to meet at least minimum state and federal safety standards.

The following list provides examples of the minimum required operator safety standards when working with chlorine gas. The first four items are already included in the City's safety plan; however, a more-complete procedure should be developed to include all of the following:

- Wear chemical goggles and a face shield.
- Use an approved, canister type respirator for use when making or breaking connections.
- Wear impervious (rubber) gloves.
- Use an approved self-contained breathing apparatus (SCBA) when making repairs on leaks or emergencies.
- Have access to an emergency eye-wash station.
- Work in pairs or teams.

Section 7 includes defined costs for equipment needed in each facility to provide a safe working environment.

It should be noted that the City plans to evaluate alternatives to its existing chlorine disinfection process. Should another process be implemented, it could potentially affect the current safety plan.

Staffing

As noted earlier in this section, the water system has 14 FTEs, not including the Water Superintendent. There are four staff assigned to operate and maintain the water supply and facilities, and ten responsible for the distribution system.

As shown in Table 5-2, the City maintains its water system with fewer staff than most cities, which indicates that there may not be adequate staff to perform O&M tasks for the system. The need for additional staff will grow as the system expands, water flows increase, and regulatory requirements become more stringent throughout the planning horizon. It is recommended that the City review its staffing needs in detail to determine the need for additional staff.

The City would potentially require two additional staff to implement the flushing, valve exercising, meter testing, and leak detection programs. The initial implementation of the program can be expected to proceed slowly, with only a few valves exercised per day. As the program advances and the old valve boxes have been vacuumed-out, broken valves replaced, and lost valves found and mapped, the number of staff could be reduced due to improved program efficacy.

For proper continued O&M of the existing well production facilities, it is recommended the City add one FTE staff and implement the new position with the proper equipment (truck, tools) to perform the work.

Summary of Recommendations

Based on the analyses detailed throughout this section, it is advised that the City consider the following recommendations:

- Develop and adopt formal procedures and documentation regarding the City's current O&M programs to include:
  - Implementing a water storage tank inspection and cleaning program to assess every storage tank within the system at least once every five years.
  - Developing a pipeline replacement program replacing approximately 3.2 miles (16,800 ft) of pipeline per year. (Costs to implement the pipe replacement program is included in Section 7.)
  - Continuing to develop the unidirectional flushing program.
  - Establishing a valve exercise program that locates, operates and rates the condition of all distribution valves on a five-year basis.
  - Developing a water meter testing program and facility for the City to perform meter testing.
  - Continuing to update and maintain the City's safety plan and safety equipment.

- The City's O&M investment areas should include:
    - Ongoing record-keeping training for staff to maintain a disciplined documentation program.
    - Budgeting annual costs for maintaining concrete and asphalt flatwork at each well facility. Costs for annual flatwork maintenance are included in Section 7.
    - Implementing asset management software to help manage the O&M tasks to be done by the operation staff.
    - Adding two FTE staff and equipment to the water distribution team for the implementation of the valve exercising, unidirectional flushing, and meter testing programs.
    - Adding one additional FTE staff and equipment to the water supply section to aid ongoing facility O&M work.

MSA
Murray, Smith & Associates, Inc.
Engineers/Planners

SECTION 6

System Condition and Code Evaluation

SECTION 6
SYSTEM CONDITION AND CODE EVALUATION

Introduction

As part of the water supply system planning effort, the City of Idaho Falls (City) has chosen to develop a long-term plan for the rehabilitation and replacement of the drinking water system facility components. These components include the water production facilities, and the distribution system. The water production facilities are comprised of wells, reservoirs, and booster pumps. The distribution system is comprised of buried pipelines and service connections.

To determine the status of the water supply system, a review of all wells, booster stations, and distribution system piping was performed with regard to both the existing condition of the facility and compliance with 2014 Idaho Administrative Procedures Act (IDAPA) drinking water rules, and applicable Idaho Department of Environmental Quality (DEQ) guidelines.

This section summarizes the evaluation and review of the City's existing water supply facilities, and provides recommendations for the rehabilitation and replacement of the system facility components for use in the City's long-term plan. Ultimately, the replacement plan will be utilized to identify long-term budgeting levels to ensure that system components are repaired or replaced prior to failure.

The overall system evaluation was performed through desktop review of the 2013 DEQ Enhanced Sanitary Survey, as-built engineering drawings of each system facility, interviews and questionnaires with the City's operation staff, an onsite review of each facility on August 5, 2014, and geographic information system (GIS) system review.

The onsite well facility review included a visual facility inspection by Murray, Smith & Associates, Inc. (MSA), Control Engineers (subconsultant to MSA), and City operators in an effort to identify issues and improvements.

The distribution system assessment was done primarily through a desktop review of GIS data.

Background

The City's drinking water system is supplied solely by groundwater derived from 19 wells distributed across the City's service boundary by an underground pipeline network. These wells are located at 15 pumping facilities, some of which house two wells. The facilities include the well pump, chlorine contact chamber, and booster pumps, and are identified by a well number (e.g., Well 1). These numbers are assigned chronologically by age (for example, Well 1 was constructed first, and Well 17 the most recently constructed).

All wells are equipped with chlorine gas injection systems. With the exception of Wells 3, 6, and 7, wells pump directly into chlorine contact tanks, and then booster pumps deliver water from the chlorine contact tanks into the distribution system. Well 3 pumps into an elevated storage tank, and Wells 6 & 7 pump through a buried, pressurized tank directly into the system. Well 7 is currently not in use due to water quality concerns resulting from air entrainment. The 19 wells are located at 15 pumping facilities, with some facilities housing two wells.

The distribution system consists of over 300 miles of underground pipeline ranging in size from 2 to 24 inches in diameter. The pipeline diameter, size, age, and material vary through the system. The oldest pipeline on record is a 4-inch steel pipe installed in 1902, serving residences around 16th St. and Lee Ave. The most recent sections of pipeline are 8-inch ductile iron installed in 2014, serving the South Bel Aire subdivision.

Facility Evaluation Process

Each facility was evaluated using input from multiple sources to help identify problems and areas of concerns. Process problems relating to well water pumping, treatment, and storage were noted, along with operator safety, equipment operation, and facility construction concerns.

As mentioned earlier, facility evaluation sources included a desktop review of the 2013 DEQ Enhanced Sanitary Surveys to gain an understanding of items the state has catalogued as deficient or not meeting the current IDAPA regulations.

A desktop review of the well facility as-built drawing was performed to identify site layout and buried piping sizes, and to determine general dimensions. Several of the facility as-builts were not current, particularly with respect to the electrical system and equipment.

MSA prepared and sent an Operator Survey so operations staff could document their general assessment of each well facility. Staff assessments were reviewed to help gain an understanding of each facility that may not be apparent through review of the as-built plans. The survey results (included in Appendix E) were combined with a similar survey chronicled by the operation staff in 2012 for the variable frequency drive (VFD) Conversion Study (see Appendix F).

The survey questions in Appendix E cover the condition, safety concerns, and operational deficiencies for the pump house, pump equipment, electrical equipment and chlorination system. The survey also assesses the condition of site access and security, and well water quality or quantity problems.

The final evaluation process included an onsite review of each facility to further identify issues and catalogue needed improvements. Each facility inspection reviewed its layout, overall condition and state of its equipment, and identified potential improvement options. No testing or structural evaluations (e.g., equipment testing, destructive load) were performed during the onsite review. The evaluation process was used to develop the Facility Condition and Facility Code Compliance ranking assessment scenarios, described below.

Facility Condition Assessment

Facility conditions were ranked based on responses to the operator survey questions mentioned earlier. Each facility was given a score of 1 (good or not applicable), 2 (average) or 3 (poor) for each survey question.

The score for each question response was then multiplied by a weighting factor between 1 and 3 to obtain the weighted ranking. The weighting factors are shown in Table 6-1 and were applied to help increase the effects of facility safety deficiencies; the higher the number, the more the deficiency was weighted.

The weighted rankings for each facility were then added, and their total scores compared. The highest score was given the highest rank (i.e., the highest score of 140 was given the rank of 1), indicating that it is the facility in greatest need of improvement based on the criteria listed.

The facility ranking is summarized in Table 6-1 below. It should be noted that Well 7 was not ranked because it has water quality problems and has not been used for some time; it is understood the City is planning to abandon this well.

Facility Code Compliance Assessment

Each facility was reviewed to determine compliance with current IDAPA 58.01.08 rules for public drinking water systems, which are enforced by regulating agencies including the DEQ and Idaho Department of Water Resources.

The IDAPA rules that apply to drinking water systems and well construction set minimum design, construction, operations, and maintenance standards to help ensure that the drinking water system is protected from contamination that might harm the health of its consumers.

IDAPA's updated construction and design standards have become increasingly stringent. Therefore, well facilities built to meet the previous regulations might not comply with current requirements. Facilities constructed prior to existing regulations are generally allowed to continue operation until major upgrades or modifications are performed, at which time the entire facility must be upgraded.

Further compliance assessment included MSA's review of the 2013 Enhanced Sanitary Survey, as well as data from record drawings and onsite visits for each well facility. The as-built and site-visit reviews consisted of visually observing facility design and construction relative to IDAPA 58.01.08 – Idaho Rules for Public Drinking Water Systems, and relevant National Electric Code (NEC) rules. Detailed equipment performance, subsurface construction, and structural testing were not performed.

A list of each facility deficiency discovered in the code compliance assessment task is shown in Table 6-2. (The IDAPA rules applicable to each violation are cited to facilitate further research and investigation.) If a facility is in violation of a particular code, it is given a score; otherwise, it is not scored. Similar to the facility condition assessment, weighting factors were applied to help increase the effects of facility safety deficiencies as defined in IDAPA Section 303.03 and operator safety (IDAPA Section 531.05). These received a high weighting of 4; items with a lower impact on health and safety were weighted between 1 and 3.

The Facility Code Compliance ranking is summarized in Table 6-2. To achieve this summary, weighed rankings for each facility were added and their total scores compared. A low total score means that a facility is generally more compliant with the IDAPA rules than a facility with a higher score. The highest score equaled the highest rank: the facility least compliant with IDAPA rules received a total score of 29 and was ranked 1.

It should be noted that no code compliance investigation or rankings were performed for Well 7, because it violates IDAPA Code 58.01.08.510.09, which requires any water supply no longer used to be properly abandoned.

Table 6-1 shows that Well 3 is most in need of improvement, followed by Well 1. The rankings indicate that older wells are generally in greater need of improvement that the newer ones. This finding is expected, because older buildings and equipment are nearer to the end their intended design life. Well 2 is an exception, due primarily to the extensive equipment and electrical upgrades performed in 2010 and 2011.

Table 6-2 shows that Well 12 has the greatest number of code violations and is ranked highest in need of improvements. However, the spread between the top five ranked facilities (Wells 12, 5, 1, 9, and 13) is narrow, indicating they are all very similarly positioned. Many of the improvements listed in Table 6-2 can be done fairly easily (safety equipment and automatic chlorine gas tank switchover devices), but some improvements will require major facility construction efforts (second reservoir access hatch and ladder). Similar to the facility assessment ratings, many older facilities require more improvements than the newer facilities.

Table 6-1
Facility Condition Assessment Rankings

				Weighted Rankings [1]													
Assessment Criteria	**Facility Element**	Question Number	Weighting Value	Well 1	Well 2	Well 3	Well 4	Well 5	Well 6	Well 8	Wells 9 & 10	Wells 11 & 14	Well 12	Wells 13 & 13B	Wells 15 & 15B[2]	Well 16	Well 17
Condition of facility ventilation	**Pump House General**	1	2	6	2	6	6	6	4	6	6	6	6	2	2	2	2
Condition of facility lighting		2	1	2	1	3	3	3	1	2	3	2	3	1	1	1	1
Condition of facility plumbing		3	1	2	1	2	3	2	1	2	2	2	2	1	1	1	1
Structural deficiencies		4	2	4	2	6	4	6	6	6	4	4	2	4	2	2	2
Pipe chase flooded? Is ponding water an issue?		5	2	4	2	6	4	6	4	6	4	2	4	2	2	2	2
Does pump house have any safety concerns?		6	3	9	3	9	6	3	6	6	6	6	9	6	6	3	6
Condition of site and site accessibility.	**Site**	7	2	6	2	2	4	4	2	2	2	4	2	2	2	2	4
Protection from vandals and trespassers.		8	3	9	3	9	6	9	9	9	6	6	9	6	6	3	6
Condition of the pumps.	**Equipment**	9	2	2	2	6	6	4	2	4	2	2	2	2	2	2	2
Conditions of pipes, valving, pressure gauges, meters		10	2	4	2	4	4	4	2	4	4	4	4	2	2	2	2
Condition of motor.		11	2	2	4	4	2	4	2	2	6	2	2	2	2	2	2
Are components maintained at recommended schedules?		12	2	2	4	4	2	2	2	2	2	2	2	2	2	2	2
Concerns regarding operation of pumps, valves & piping.		13	2	4	4	2	4	4	2	4	2	2	6	2	2	2	2
Equipment access and maintenance concerns.		14	2	4	2	2	4	4	4	6	6	2	6	2	2	2	2
Is CL in separate room w/ ventilation & alarms?	**Chlorination System**	15	3	3	3	3	3	6	3	3	3	3	3	3	3	3	3
Does gas CL feed have automatic switchover?		16	3	9	9	9	9	9	9	9	9	9	9	9	9	9	3
Water quality issues	**Water**	17	3	3	3	9	3	3	3	6	3	3	3	3	3	3	3
Water quantity issues		18	2	2	2	6	2	2	4	4	2	2	6	2	4	2	2
MCC condition	**Electrical**	19	3	9	3	9	3	3	3	3	9	3	3	3	3	3	3
Electrical system condition		20	3	9	3	9	6	3	3	3	9	3	3	3	3	3	3
Is open door control cabinet venting required?		21	2	4	2	6	2	4	2	2	6	6	6	2	2	2	2
CL room gas detection sensors, alarms?		22	3	3	3	6	3	3	3	3	3	3	3	3	3	3	3
Generator backed facility?		23	2	6	6	6	6	6	6	6	2	2	6	2	2	6	6
If generator backed, can ATS power all wells & booster pumps?		24	2	6	6	6	6	6	6	6	6	6	6	6	2	6	6
Well water depth, discharge pressure & flow sensors?		25	3	6	3	6	3	3	3	3	3	3	6	3	3	3	3
Condition of existing generator.		26	3	3	3	3	3	3	3	3	9	9	3	9	3	3	3
Sum of weighted ratings				120	77	140	104	109	92	115	110	89	113	75	71	71	73
Facility Condition Ranking (highest ranking facility is in the greatest condition deficiency)				**2**	**10**	**1**	**7**	**6**	**8**	**3**	**5**	**9**	**4**	**11**	**13**	**13**	**12**

[1] *Weighted ranking values are the result of multiplying the raw operator score by the weighting values.*
[2] *Assessment analysis assumes current Well 15 VFD Conversion Project has been completed.*

Table 6-2
Facility Code Compliance Ranking

Code Description	IDAPA Code	Weighted Score	Well 1	Well 2	Well 3	Well #4	Well #4	Well 6	Well 8	Wells 9 & 10	Wells 11 & 14	Well 12	Wells 13 & 13B	Wells 15 & 15B	Well 16	Well 17
Well annular seal needed.	510.03.b	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-
Well needs to be properly abandoned.	510.09	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Need Pump to waste piping.	511.02	2	2	-	2	2	2	2	2	2	2	2	2	-	-	-
Well casing needs to extend 12in above floor.	511.06.a	2	2	2	2	2	2	2	2	2	-	2	-	-	-	-
Well water level measurement needed.	511.06.c	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Need standby chlorination with automatic switchover.	530.01.a.ii	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-
Two chlorination contact tanks, unless one can be bypassed.	530.01.b.ii	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pump house needs ventilation.	541.01.e	2	2	-	2	2	2	2	2	2	2	2	2	-	-	-
Site security fencing.	544.04	2	2	2	-	2	2	2	-	-	-	2	-	-	-	-
Tank overflow pipe is small.	544.06	1	1	1	-	1	1	-	1	1	-	1	1	-	-	1
Storage tank overflow needed	544.06	2	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Overflow needs air gap between 12-24in	544.06	2	2	-	-	2	-	2	2	2	2	2	2	-	2	2
Overflow needs to be screened with mesh.	544.06.b.i	2	-	-	-	2	-	-	-	2	-	2	-	-	-	-
Storage tank needs 2nd hatch & ladder	544.07	2	2	2	-	2	2	-	2	2	2	2	2	2	2	2
Separate chlorine room with ventilation needed.	530.04	4	-	-	-	-	4	-	-	-	-	-	-	-	-	-
Chlorine gas safety equipment. (respirator, SCBA, gloves)	531.05	4	4	4	4	4	4	4	4	4	-	4	4	-	4	-
Chlorination room floor drain is connected to common drain.	541.01.i	4	-	-	-	-	-	-	-	-	4	-	-	-	-	-
Spaces about electrical equipment, 3.5ft minimum.	NEC 110.26	4	-	-	-	-	-	-	-	-	-	-	4	4	-	-
Arc flash warning, field marking & labels.	NEC 110.16	4	4	4	4	-	4	4	4	4	-	4	4	4	4	4
Sum of weighted ratings			25	19	21	23	27	22	23	25	18	29	25	14	13	10
Facility Code Compliance Ranking (highest ranking facility is the least compliant)			**3**	**10**	**9**	**6**	**2**	**8**	**6**	**3**	**11**	**1**	**3**	**12**	**13**	**14**

Risk and Failure Rankings

The facility condition and code compliance show similar ranking values for the facilities. Table 6-3 summarizes the rankings for each assessment and an average ranking between the two. The highest ranked facility is the most deficient.

Table 6-3
Summary of Facility Condition and Code Compliance Rankings

Facility	Facility Condition Assessment Ranking	Facility Code Compliance Ranking	Average Rank
Well 12	4	1	2.5
Well 1	2	3	2.5
Well 5	6	2	4
Wells 9 & 10	5	3	4
Well 8	3	6	4.5
Well 3	1	9	5
Well 4	7	6	6.5
Wells 13 & 13B	11	3	7
Well 6	8	8	8
Wells 11 & 4	9	11	10
Well 2	10	10	10
Wells 15 & 15B	13	12	12.5
Well 16	13	13	13
Well 17	12	14	13

Table 6-3 shows that Wells 12 and 1 are tied for the highest average rank and are the most deficient when comparing both facility condition and code compliance; however, this ranking does not necessarily mean that they should be the highest on the City's improvement priority list. Further evaluation was performed using the wells' water production values to provide a metric for understanding how important each facility is to the City. This analysis assumes that wells producing more water are of greater importance than wells that produce less. Table 6-4 summarizes the firm and average daily production at each facility.

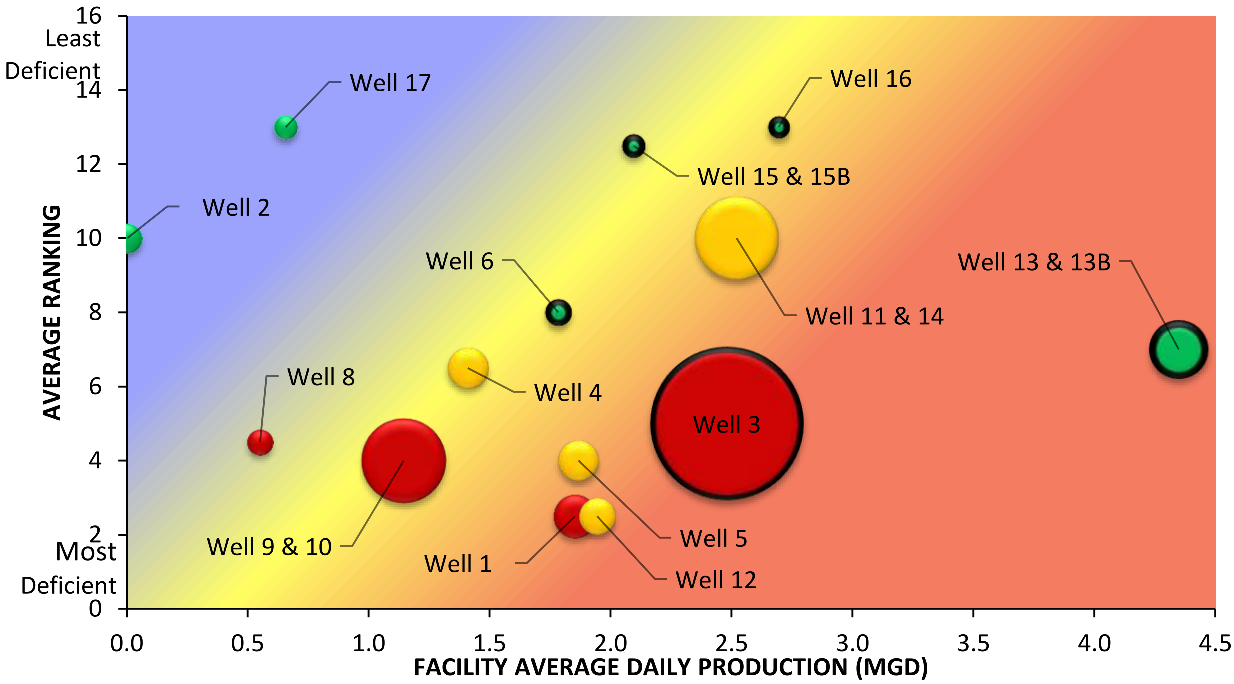
Table 6-4
Facility Production

Facility	Firm Supply Capacity (MGD)[1]	Average Daily Production (MGD)[2]	Year-Round Operation
Well 1	5.76	1.85	No
Well 2	4.53	0.00	No
Well 3	5.76	2.48	Yes
Well 4	6.48	1.41	No
Well 5	7.92	1.87	No
Well 6	1.65	1.78	Yes
Well 8	2.30	0.55	No
Wells 9 & 10	11.52	1.15	No
Wells 11 & 14	10.44	2.52	No
Well 12	5.76	1.94	No
Wells 13 & 13B	8.06	4.35	Yes
Wells 15 & 15B	6.04	2.09	Yes
Well 16	5.18	2.69	Yes
Well 17	5.76	0.66	No

[1] *Firm Supply Capacity to System from Section 5.*
[2] *Average production values recorded from August 2011 – July 2012.*

Facility average ranking was compared to both the average daily production and firm system capacity in order to prioritize the order for recommended facility improvements. The results of this analysis are shown in Figures 6-1 and 6-2, respectively. These figures illustrate additional facility details, including the relative cost for facility improvements (indicated by circle size) and risk of facility failure (indicated by circle color), and identify which facilities are used during the winter. Additional details and explanations are located after the figures, in Notes.

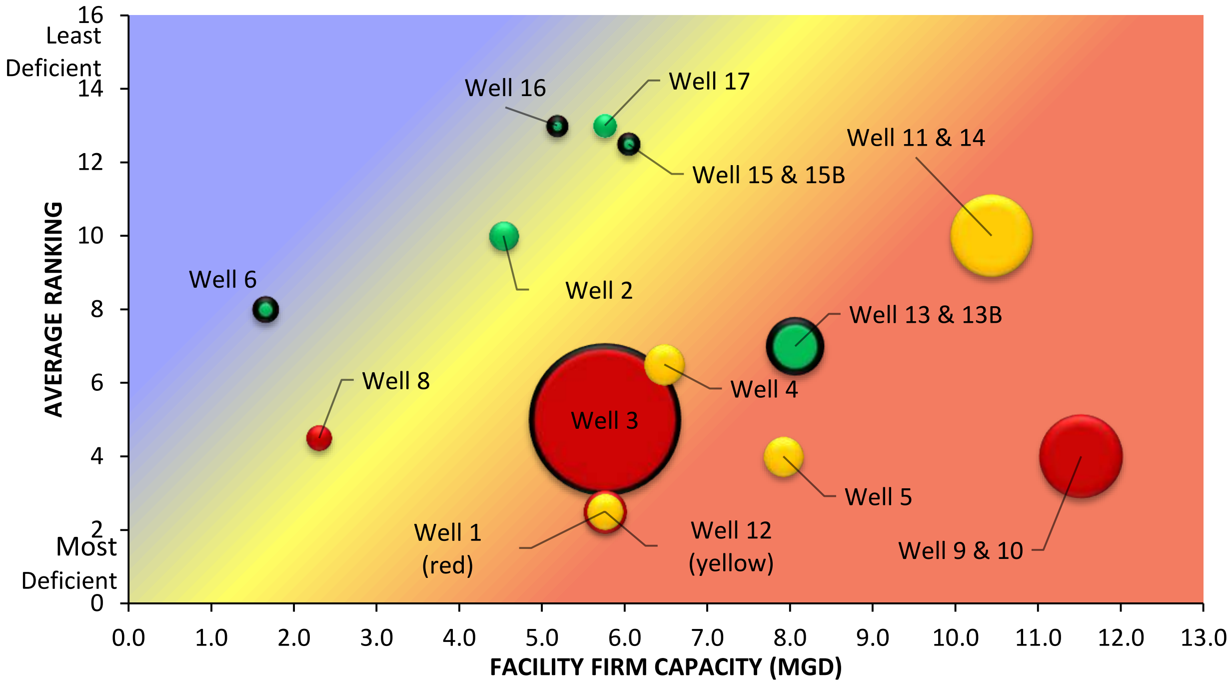
Figure 6-1
Well Ranking vs Average Daily Production



Notes:

1. Circle sizes indicate the relative costs for facility improvements: the larger the circle, the greater the costs.
    a. Improvements include new generator sets for Wells 9&10, 11&14 and 13&13B.
    b. Improvements include new 1MG elevated storage tank for Well 3.
2. Wells shown with black outer bands are used year round.
3. Color of symbol indicates well facility risk of failure. Risk of failure determined from Facility Assessment question numbers 5,9,10,11,12,13,14,19, 20, and 26:
    a. RED = High risk of failure.
    b. YELLOW = Moderate risk of failure.
    c. GREEN = Low risk of failure.
4. Well 15's risk of failure was calculated based on electrical improvements being performed in 2014.

Figure 6-2
Well Ranking vs Facility Firm Capacity



Notes:

1. Circle sizes indicate the relative costs for facility improvements: the larger the circle, the greater the costs.
    a. Improvements include new generator sets for Wells 9&10, 11&14 and 13&13B.
    b. Improvements include new 1MG elevated storage tank for Well 3.
2. Wells shown with black outer band are used year-round.
3. Color of symbol indicates well facility risk of failure. Risk of failure determined from Facility Assessment question numbers 5,9,10,11,12,13,14,19, 20 & 26:
    a. RED = High risk of failure.
    b. YELLOW = Moderate risk of failure.
    c. GREEN = Low risk of failure.
4. Well 15's risk of failure was calculated based on electrical improvements being performed in 2014.

Recommended facility improvement ranking orders are shown in Table 6-5. The initial order of the facility improvements is based on the highest risk of failure, highest production, and lowest average assessment ranking. Where the advantage of improving one facility over the other remained unclear, engineers' reasoned judgment and further input from City staff were used to select the order of the facilities.

Table 6-5
Well Facility Improvement Ranking

Order of Improvements	Facility
1	Wells 9 & 10
2	Well 3
3	Well 1
4	Well 4
5	Well 8
6	Well 5
7	Well 12
8	Wells 11 & 14
9	Wells 13 & 13B
10	Well 6
11	Well 16
12	Well 17
13	Well 2
14	Wells 15 & 15B

Recommended Improvements

The recommended facility improvements are shown in Table 6-6. Several facilities require additional improvements that are not completely represented in Table 6-6, and are further described in narratives following the table.

Table 6-6
Facility Improvements

	HVAC Improvements	Facility Security			Facility Safety		Piping Modifications			Facility Improvements	Well Improvements	Reservoir Improvements				Electrical Improvements		Additional Improvements
Well and Booster Facility Improvements	Upgrade or install new ventilation fans	Install motion sensors	Install door alarms	Site security fencing	Install eye wash station	Install SCBA	Pump to waste piping	Move piping out of pipe chase	New discharge flow meter	Replace pipe chase covers with grating	Extend well casing above finished floor	Add a second access hatch & ladder	Modify overflow air-gap	New level sensor	Replace membrane roofing	New MCCs	Upgrade generators to run all pumps & relocate	
Well 1	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•		Exterior CL room door, new building windows, replace submersible well with vertical turbine.
Well 2	•			•	•	•					•	•	•			•		Well level sensor.
Well 3	•	•	•		•	•	•									•		New building windows, well casing repair, well sanitary seal, well level sensor, new elevated storage tank
Well 4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		Lighting, construct new chlorine room, skylight replacement, replace 2300V submersible pump with a 480V vertical turbine pump, MCC and transformer.
Well 5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		Lighting, enclose chlorine room, new building heater, install floor drains, well level sensor, site grading for tank overflow.
Well 6	•			•	•	•	•	•		•	•					•		Interior & exterior lighting, building addition, well level sensor.
Well 7																		Abandon well.
Well 8	•				•	•		•	•	•	•	•	•			•		Building structural inspection, brick repair, booster pump inspection, lighting, new building windows, sump discharge piping.
Wells 9 & 10	•			•	•	•	•		•		•	•	•	•		•	•	Brick repair, heating system, Well 10 building expansion, replace Well 10 submersible with turbine.
Wells 11 & 14	•			•			•		•			•	•	•		•	•	Reservoir roof replacement to allow second access hatch.
Well 12	•	•	•	•	•	•	•		•				•	•		•		Lighting, well level sensor and stilling well repair, reservoir roof replacement to allow second access hatch.
Wells 13 & 13B	•					•	•		•			•	•		•	•	•	Lighting improvements. Reservoir roof replacement to allow second access hatch.
Wells 15 & 15B												•						
Well 16					•	•			•			•	•			•		Exterior lighting.
Well 17									•			•	•			•		Well level sensor.

Well 1 contains a 200-HP submersible well pump, 250-HP centrifugal booster pump, 150,000-gallon concrete reservoir, and a small brick pump house. Facility improvements include all of those indicated in Table 6-6, plus the following: install an exterior door in the chlorine room, replace the building windows, and replace the existing 200-HP submersible pump with a vertical turbine pump.

Well 2 contains a 200-HP vertical turbine well pump, 200-HP centrifugal booster pump, 100,000-gallon concrete reservoir, and a large brick pump house. Facility improvements include those indicated in Table 6-6; in addition, the well needs a well-water level measurement device.

Well 3 contains a 400-HP vertical turbine well pump and a 170-foot high, 500,000-gallon elevated steel storage reservoir. Facility improvements include those indicated in Table 6-6; the pump house also needs to have all of the building's windows replaced. The well needs a section of corroded well casing to be repaired, and a sanitary seal around the well casing and a level sensor should be installed. Due to the condition of the elevated storage tank, it is recommended that a new 1 MG elevated storage tank be constructed and the existing tank demolished.

Well 4 contains a 450-HP submersible well pump, 250-HP centrifugal booster pump, 150,000-gallon concrete reservoir and a large cement block pump house. Facility improvements include those indicated in Table 6-6; in addition, the pump house needs lighting improvements, construction of a new chlorine room to allow piping changes, and replacement of the building skylight. The existing 450-HP well pump motor is wound and operated at 2300 volts. Because replacement MCC parts and equipment for that voltage is difficult to find, it is recommended that the 2300V submersible pump be replaced with a 480V vertical turbine pump, and all associated 2300V equipment (transformer, MCC, wiring) be replaced with 480-volt equipment.

Well 5 contains a 450-HP vertical turbine well pump, 350-HP centrifugal booster pump, 150,000-gallon concrete reservoir, and a wooden residential-type pump house. Facility improvements include those indicated in Table 6-6; in addition, the pump house needs lighting improvements; construction of an enclosed chlorine room; installation of a new building heater, well water level measurement device, and floor drains; and site grading to ensure tank overflow drains to the appropriate location.

Well 6 contains a 150-HP vertical turbine well pump in a small brick pump house and a 30,000-gallon buried pressurized vessel. Facility improvements include those indicated in Table 6-6; in addition, the pump house needs interior and exterior lighting improvements, a small building expansion to facilitate elevating the discharge piping above the finish floor elevation, and a well-water level measurement device.

Well 7 has historically had poor water quality due to air entrainment, and the City has not used it in about a decade. The facility contains a 12-inch diameter production well with no pump, an 800-square foot wooden pump building, and a 30,000-gallon buried pressurized vessel. It is recommended that this well be abandoned by an approved well driller according to state standards.

Well 8 contains a 125-HP vertical turbine well pump, 100-HP centrifugal booster pump, 100,000-gallon concrete reservoir and a large brick pump house. Facility improvements include those indicated in Table 6-6; in addition, the pump house needs to have a structural inspection performed to determine if repairs are needed; cracking exterior bricks should be repaired, the booster pump needs to be inspected and balanced; interior and exterior lighting improvements need to be made, building windows replaced, and the discharge piping from the basement sump pump needs to be buried. It is recommended that the vertical turbine well pump be closely monitored, because its manufacturer is no longer in business and replacement parts could require long lead times to procure.

Wells 9 and 10 contain a 250-HP vertical turbine well pump, a 200-HP submersible pump, two 250-HP centrifugal booster pumps, a 240,000-gallon concrete reservoir, and two brick pump houses with a 750-KW diesel driven generator. The existing 750-KWgenerator is sufficient to power Well 9 (200 HP) and Booster 9 (250 HP) or Well 10 (200 HP) and Booster 10 (250 HP), but not all booster and well pumps simultaneously.

Facility improvements include those indicated in Table 6-6; in addition, the pump house's exterior brick structure needs to be repaired, the heating system needs to be upgraded, the existing generator should be replaced with a larger one that is sized to run all pumps and boosters, and the existing 200-HP submersible pump should be replaced with a vertical turbine pump, which will require a building addition to accommodate the appropriate electrical offsets.

Wells 11 and 14 contain two 250-HP vertical turbine well pumps, two 200-HP vertical turbine booster pumps, a 275,000-gallon concrete reservoir, and two brick pump houses with a 460-KW diesel driven generator. The existing 460-KW generator is sufficient to supply either well 11 (250 HP) and booster 11 (200 HP), or well 14 (250 HP) and booster 14 (200 HP), but not both sets simultaneously. Facility improvements include those indicated in Table 6-6; further recommended improvements include replacing the existing generator with a larger one sized to run all pumps and boosters, replacing the existing venturi meter with a new magnetic flow meter to the pump discharge piping, and installing pump-to-waste piping in both well pumps. The reservoir roof is post-tensioned concrete, and adding the required second access hatch cannot be done unless a new reservoir roof is installed with two access hatches and safety ladder to meet minimum standards.

Well 12 contains a 250-HP vertical turbine well pump, 250-HP vertical turbine booster pump, 275,000-gallon concrete reservoir and two brick pump houses. Facility improvements include those indicated in Table 6-6; in addition, the well needs its water level stilling well to be repaired, a new water level sensor to be installed, and lighting improvements to be made. The reservoir roof is post-tensioned concrete, and adding the required second access hatch cannot be done unless a new reservoir roof is installed with two access hatches and safety ladder to meet minimum standards.

Wells 13 and 13B contain two 200-HP vertical turbine well pumps, one 100-HP vertical turbine booster pump, one 50-HP vertical turbine booster pump, one 125-HP vertical turbine booster pump, a 310,000-gallon concrete reservoir, and two brick pump houses with a 475-KW diesel-driven generator. The existing generator is sufficient to power Well 13 (200 HP) and boosters 13-1 and 13-2 (100 HP and 50 HP), or well 13B (200 HP) and Booster 13-3 (125 HP), but not all booster and well pumps simultaneously.

Facility improvements include those indicated in Table 6-6; in addition, the pump house's exterior lighting needs to be improved and the existing generator should be replaced with a larger one sized to run all pumps and boosters. The reservoir roof is post-tensioned concrete, and adding the required second access hatch cannot be done unless a new reservoir roof is installed with two access hatches and a safety ladder to meet minimum standards. Electrical MCC improvements indicated in Table 6-6 include converting the motor controls to a VFD system. VFD upgrades will include replacing the two booster motor starters with VFD and upgrading the booster motors to handle the new service.

Wells 15 & 15B's improvement ranking analysis assumes the VFD Conversion Project is completed or is under construction during the writing of this analysis. The VFD Conversion project involves replacing all three booster motor starters with VFDs, providing new booster motors, rehabilitating the booster pumps, replacing the existing booster pump control valves, providing a new flow meter, and providing a pump to waste line for the Well 15 well pump. Recommended future projects include those indicated in Table 6-6.

Well 16 contains a 250-HP vertical turbine pump, a 150-HP vertical turbine booster pump, a 75-HP vertical turbine booster pump, a 315,000-gallon concrete reservoir, and a large brick pump house. Facility improvements include those indicated in Table 6-6; in addition, the pump house needs improved exterior lighting. Electrical MCC improvements indicated in Table 6-6 include converting the motor controls to a VFD system. VFD upgrades will require replacing the two booster motor starters with VFD and upgrading the booster motors to handle the new service.

Well 17 contains a 300-HP vertical turbine well pump, one 100-HP vertical turbine booster pump, one 150-HP vertical turbine booster pump, a 220,000-gallon concrete reservoir, and a large brick pump house. Facility improvements include those indicated in Table 6-6; in addition, the well needs a well-water-level measurement device. It is recommended that the three vertical turbine pumps be closely monitored, because their manufacturer is no longer in business and replacement parts may be unavailable or take longer to procure.

Pipe Replacement Program

MSA conducted a desktop analysis to identify a long-term replacement program for the City's water distribution piping. MSA used pipeline information from GIS, staff interviews and pipe break locations to identify the prospective useful life of the differing age and pipe materials within the system.

Table 6-7 below shows the public water pipeline material length and age in the City's distribution system. The table includes all active pipelines owned by the City or the Parks department. In addition, Table 6-8 shows privately owned pipeline sorted by material, length, and age. The combination of public and private pipelines comprise the total system length.

Analysis of Table 6-7 shows that the majority of the City's public distribution system piping material is ductile iron and was installed within regular intervals since the 1960s. Table 6-8 shows the majority of the private pipelines material is a slightly newer ductile iron installed since the 1980s.

Table 6-7
Public Pipeline Length by Material and Age

Material Type and Length (1,000 ft) (rounded to nearest 1,000 ft)											
Install Date	Asbestos Cement	Cast Iron	Ductile Iron	Galvanized Steel	Copper	Polyethylene	Steel	Cast in Place Pipe	UNK	Total	Percent
1902 - 1919	0	13	0	1	0	0	2	0	0	16	1.0%
1920 - 1939	1	63	1	1	0	0	11	0	0	76	4.6%
1940 - 1959	19	252	4	8	0	0	3	0	0	285	17.2%
1960 - 1979	2	300	152	2	0	0	1	0	0	456	27.5%
1980 - 1999	0	3	409	0	0	0	0	0	0	412	24.9%
2000 - 2013	0	3	362	0	0	0	3	0	0	369	22.3%
UNK	0	26	8	2	0	0	0	0	5	42	2.5%
Total	**22**	**661**	**936**	**13**	**1**	**0**	**19**	**0**	**6**	**1,657**	**100.0%**
Percent	1.3%	39.9%	56.5%	0.8%	0.1%	0.0%	1.1%	0.0%	0.4%	100.0%	

General note: No private pipelines included.

Table 6-8
Private Pipeline Length by Material and Age

Material Type and Length (1,000 ft) (rounded to nearest 1,000 ft)											
Install Date	Asbestos Cement	Cast Iron	Ductile Iron	Galvanized Steel	Copper	Polyethylene	Steel	Cast in Place Pipe	UNK	Total	Percent
1902 - 1919	0	0	0	0	0	0	0	0	0	0	0.0%
1920 - 1939	0	1	0	0	0	0	0	0	0	1	1.3%
1940 - 1959	0	0	1	0	0	0	0	0	0	1	13.0%
1960 - 1979	0	18	2	0	0	0	0	0	0	20	14.3%
1980 - 1999	0	0	40	0	0	0	0	0	0	40	26.0%
2000 - 2013	0	0	40	0	0	1	0	0	0	41	26.6%
UNK	0	2	12	0	0	0	0	0	15	29	19.5%
Total	**0**	**21**	**94**	**0**	**0**	**1**	**0**	**0**	**16**	**132**	**100.0%**
Percent	0.0%	15.9%	71.2%	0.0%	0.0%	0.8%	0.0%	0.0%	12.1%	100.0%	

General note: No public City or park pipelines included.

The City has recorded the location, date, and description of water main breaks and repairs since the mid-1980s. This information is invaluable for determining generally what type and age of pipe is breaking and should be scheduled for replacement. Table 6-9 summarizes the pipeline or joint break counts relative to age and material of the pipeline.

Table 6-9
Pipeline Break Count

Material Type and Break Count											
Install Date	Asbestos Cement	Cast Iron	Ductile Iron	Galvanized Steel	Copper	Polyethylene	Steel	Cast in Place Pipe	UNK	Total	Percent
1902 - 1919	0	18	0	0	0	0	3	0	0	21	3%
1920 - 1939	0	127	0	0	0	0	46	0	0	173	23%
1940 - 1959	12	324	2	6	0	0	12	0	0	356	48%
1960 - 1979	1	81	13	1	0	0	0	0	0	96	13%
1980 - 1999	0	2	8	0	0	0	0	0	0	10	1%
2000 - 2012	0	10	24	0	0	0	0	0	0	34	5%
UNK	0	44	3	4	0	0	0	0	6	57	8%
Total	**13**	**606**	**50**	**11**	**0**	**0**	**61**	**0**	**6**	**747**	**100%**
Percent	2%	81%	7%	1%	0%	0%	8%	0%	1%	100%	

General note: Includes City, park and private pipelines.

The break counts indicate that cast iron pipeline installed between 1920 and 1959 accounts for approximately 70% of the City’s breaks or repairs. Descriptions of the types of breaks and repairs performed on the 1950s-era cast iron pipe include many joint leak repairs and clamp-type repairs of rusting and cracked pipelines. These failure types indicate that the material is past its design life and is need of replacement.

The City’s proposed pipeline replacement schedule is based on water mains having a 100-year design life. As identified in Table 6-7, the City currently has 314 miles (1,657,000 feet) of public pipeline and 25 miles (132,000 feet) of private pipeline installed. Per the City’s recommendation, only the public pipelines will considered for replacement. The 100-year design life schedule replaces approximately 3.2 miles (16,800 feet) of public pipeline per year.

The pipeline replacement prioritization should be based on the following indicators:

- Known condition issues
- Capacity and condition issues
- Pipe material issues based on complaint and breakage records
- Pipeline age

Table 6-10 highlights the pipeline replacement priority based on break records, material, and age as shown in the previous two tables, and indicates the approximate number of years it will take to accomplish the replacement assuming the City replaces 3.2 miles (16,800 ft) of pipeline per year. See Figure 6-3 for a map showing the pipe location for each category in the table. The high priority replacement should focus on cast iron piping installed between 1902 and 1959. The replacement of both the public and private piping at 3.2 miles per year will take the City approximately 19.5 years to complete.

Table 6-10
Years for Pipeline Replacement and Prioritization

Years to Replace[1]											
Install Date	Asbestos Cement	Cast Iron	Ductile Iron	Galvanized Steel	Copper [2]	Polyethylene	Steel	Cast in Place Pipe	UNK	Total	Percent
1902 - 1919	-	0.77	-	0.06	-	-	0.12	-	-	0.95	0.9%
1920 - 1939	0.06	3.81	0.06	0.06	-	-	0.65	-	-	4.58	4.3%
1940 - 1959	1.13	15.00	0.30	0.48	-	-	0.18	-	-	17.02	16.0%
1960 - 1979	0.12	18.93	9.17	0.12	-	-	0.06	-	-	28.33	26.6%
1980 - 1999	-	0.18	26.73	-	-	-	-	-	-	26.90	25.3%
2000 - 2012	-	0.18	23.93	-	-	0.06	0.18	-	-	24.40	22.9%
UNK	-	1.67	1.19	0.12	-	-	-	-	1.19	4.23	4.0%
Total	**1.31**	**40.60**	**61.31**	**0.77**	**-**	**0.06**	**1.13**	**-**	**1.31**	**106.49**	
Percent	1.2%	38.1%	57.6%	0.7%	0.0%	0.1%	1.1%	0.0%	1.2%		

Replacement priority	
High	(red)
Medium	(yellow)
Low	(green)

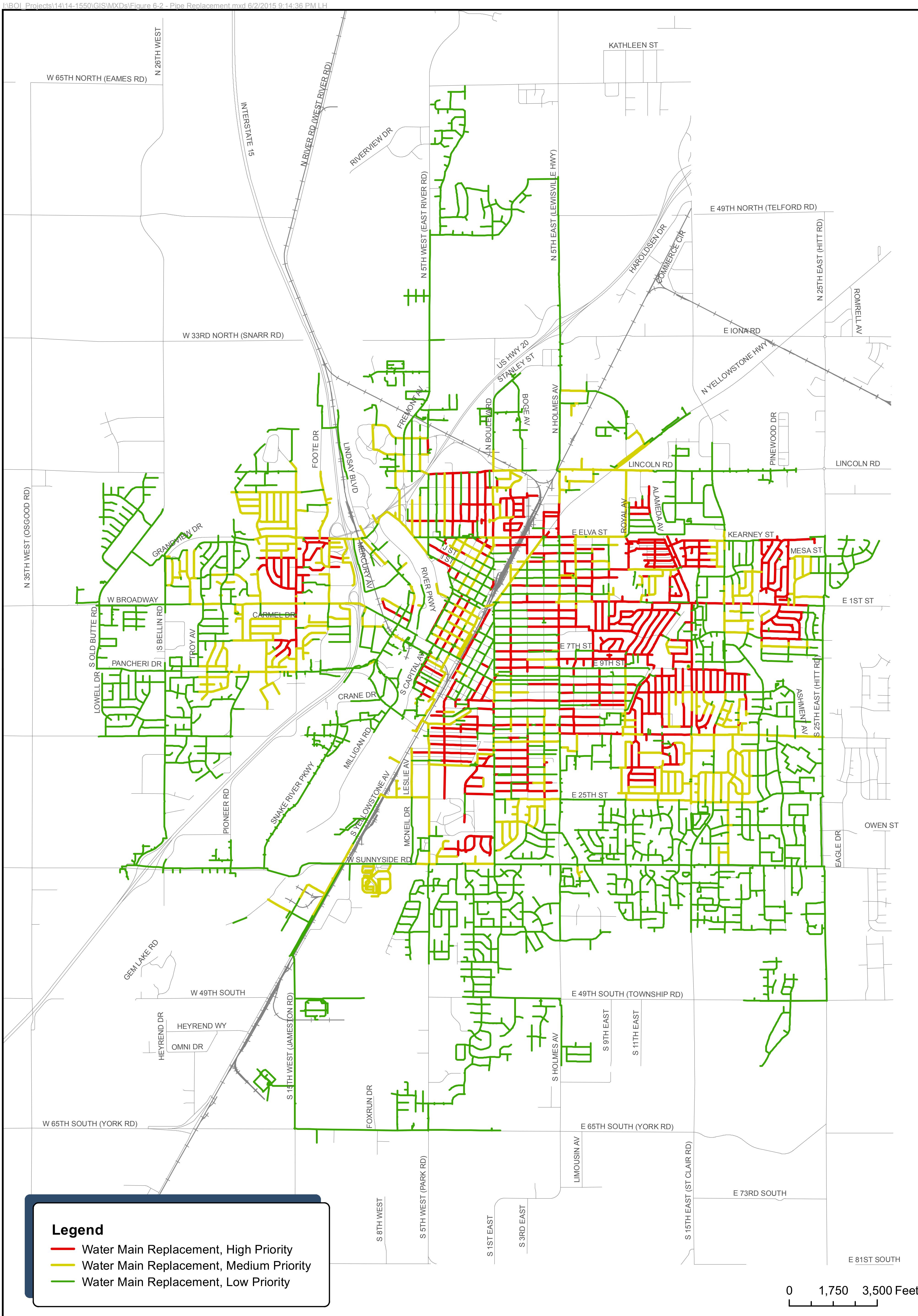
General note: Includes City, park and private pipelines.

[1] *Values shown as number of years to replace each type of pipeline assuming a replacement rate of 16,800 ft/yr.*

[2] *Values indicated as 0.00 were lost to rounding and truncation.*

In addition to water main pipeline replacement, service pipelines, including both laterals from the water main to meter pit (property line where no pit exists) and hydrant laterals, should be considered for replacement while the water mains are being replaced. City design criteria dictate the standard service material is 1-inch diameter, Type K copper for domestic connections. Larger hydrant lateral connections are typically ductile iron.

I:\BOI_Projects\14\14-1550\GIS\MXDs\Figure 6-2 - Pipe Replacement.mxd 6/2/2015 9:14:36 PM LH



MSA
Murray, Smith & Associates, Inc.

Idaho Falls
Water Facility Plan

Figure 6-3
Pipeline Replacement

June 2015 14-1550

Summary and Recommendations

Multiple sources of information were reviewed to evaluate the condition of the City's drinking water system. The two components comprising the system—production facilities (combined well and booster stations) and the distribution system (piping)—were analyzed and then ranked to identify where the City should begin rehabilitation and component replacement efforts.

The City's GIS records were analyzed to compare each buried pipeline's age, material, and break records with its expected life to determine which pipelines were most in need of repair. Results of this analysis suggest that the City needs to focus its replacement efforts on cast iron piping installed between 1902 and 1959.

Evaluation results were used to identify specific improvements for all well production facilities to ensure they meet the operators' needs and comply with current state and federal standards. Many of the recommended improvements appear to be recurring issues at all but the three newest facilities (Wells 15, 16, and 17).

The recommended order for well facility improvements is based on MSA and City staff evaluation of the facility condition assessment, the facility code compliance rankings, and the quantity of water produced at each facility. In general, wells that produce the most water and are in need of the most updates are recommended to be improved first.

Murray, Smith & Associates, Inc.
Engineers/Planners

SECTION 7

Capital Improvement Program

SECTION 7
CAPITAL IMPROVEMENT PROGRAM

This section describes the water system improvements required to serve Idaho Falls' (City's) service area under existing, 5- and 20-year planning horizons. Longer term 40-year (21- to 40-year) supply needs are also described in general terms; however, specific locations and costs have not been identified for those projects. The City is also undertaking a long-term program to replace all piping in the system on a 100-year cycle based on condition prioritization. The recommended improvement projects are shown in Figure 7-1 and summarized in Tables 7-1, 7-2, and 7-3. The total cost of projects within the 0- to 5-year timeframe is approximately $23,000,000 and within the 6- to 20-year timeframe is approximately $60,000,000.

Customer Metering

An analysis related to installing meters on all customer connections was conducted as part of this Water Facility Plan. It is believed that installing meters and charging customers based on actual water use would have a significant impact in reducing average and peak demands over time. The cost to implement metering is significant, estimated at between $40 million and $100 million. Metering would reduce or eliminate the need for future supply and pumping projects of approximately $15.8 million over the 20-year planning period, in addition to stretching existing water rights into the future.

The CIP included in this section is based on the assumption that metering is not implemented system-wide and that current water usage trends continue over the next 20 years. $250,000 per year has been included in the Capital Improvement Program (CIP) to begin installing meters on the City's largest service accounts. The City currently installs meter pits on all new residential construction as required by state regulations. The installed residential pits do not include water meters. However, new commercial construction is currently required to install water meters. Additional analysis related to the cost of metering is included in Appendix G.

Cost Estimating

All project descriptions and estimates represent planning-level accuracy and opinions of costs (+50%, -30%). During the design phase of each improvement project, recommended pipe lengths should be verified and an engineering evaluation should be performed.

Recommended pipeline diameters will vary based on final design requirements. Total project costs will depend on actual labor and material costs, site conditions, competitive market conditions, regulatory requirements, project schedule, and other factors. Therefore, project feasibility and risks should be carefully reviewed prior to making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. A Preliminary Engineering Report (PER) should be completed for each improvement project to identify the final sizing and location. A PER looks at a specific project in more detail than the analysis conducted within this WFP.

All project costs presented in this WFP are developed in 2014 dollars, using the 2014 RSMeans Heavy Construction Cost Data (RSMeans), recent City project bid tabs, City input, and local contractor and supplier rates. The project costs presented in this plan include estimated construction charges, and allow for contingency, permitting, legal, administrative, and engineering fees. Construction costs are based on the preliminary concepts and layouts of the water system components developed during the system modeling. The detailed cost methodology is presented in Appendix H.

Project Descriptions

The City has a reliable water system, but existing or projected deficiencies in supply, backup power and pumping capacity are anticipated because of high summertime demands. Much of this CIP is based on capacity deficiencies as identified in Section 4—Distribution and Supply Analysis. The remainder of needed improvements are identified in Section 5—System Condition and Code Evaluation, and Section 6—Operations and Maintenance.

Projects are recommended to maintain and improve the existing level of redundancy, flexibility, supply, and delivery of water in the system. Based on information in Section 4, these improvements are recommended to address hydraulic deficiencies:

- Existing well, booster, and storage facility upgrades.
- New well, booster and storage facilities.
- New and upgraded water transmission or distribution pipelines.

Due to the age of the system and facilities, there were several recurrent deficiencies identified in Section 5 that must be corrected to meet minimum IDEQ requirements. Recommended improvements related to the ongoing system operations and maintenance (O&M) are identified in Section 6. Additional projects recommended in Sections 5 and 6 include:

- Existing well and booster facility improvements to address condition and code compliance.
- Pipeline replacement.

All projects include identifiers (IDs) that designate them as either pipelines or facilities. Pipeline projects are labeled with a P, followed by a number: existing pipeline deficiencies are 100 numbers, 2020 deficiencies are 200 numbers, and 2035 deficiencies are labeled with 300 numbers. Within each timeframe, projects are also loosely prioritized, with 101 taking priority over 102, and so on. This prioritization order was based on the severity of the hydraulic deficiency, size of the area impacted, and pipe condition.

Facility projects are labeled with an F, and a number based on timeframe and priority, with 1 being prioritized over 2, and so on. This prioritization was based on the severity of the hydraulic deficiency, City preference, then on the condition of the facility, and finally, budget constraints.

Projects are depicted in Figure 7-1 and are described below. As the City annually reviews system needs and budget constraints, the list of projects to be constructed may vary from the recommendations in this section. It is also recommended that the City update this WFP and associated CIP every five years to ensure projects meet current system requirements.

Pipelines

Approximately 37.9 miles of pipeline improvements have been identified based on the hydraulic analysis (to address fire flows, low system pressures and create additional distribution capacity from new supply facilities) and are organized as distinct projects. These projects address deficiencies under existing, 2020, and 2035 conditions, and have been prioritized for implementation over the next five years (by 2020) and 6 to 20 years (by 2035). The existing projects address fire flow deficiencies, which consist of primarily undersized pipelines that should be replaced to provide adequate service. The projects required by 2020 are due to fire flow and pressure deficiencies. New piping is also required to distribute water from proposed supply facilities. The 2035 piping projects are required due to pressure and piping deficiencies associated with new supply. Tables 7-1, 7-2, and 7-3 summarize the pipeline projects due to existing deficiencies as Pipeline – 1A and Pipelines – 1B, 2020 deficiencies as Pipelines – 2, and 2035 deficiencies as Pipelines – 3. Due to budget constraints, some existing pipeline deficiencies will be addressed in the 6- to 20-year timeframe (Pipelines – 1B). The locations of pipeline improvements are depicted in Figure 7-1 and are summarized in Appendix I.

It is the City's intent to implement a program to replace all piping in the system over a period of 100 years (e.g. 1% per year). Due to budget constraints, it will not be possible to fully fund this program in the next 20 years. In general, the City intends to address capacity related improvements first, however any pipe replacement will also contribute to the overall 100 year replacement program. The City will also have the flexibility to utilize funds currently identified for capacity related pipe improvements for high priority condition replacements on an as-needed basis.

To help in prioritizing which pipes should be addressed first from a condition perspective, the existing pipeline infrastructure was rated either high, medium, or low, based on age, material and associated main breaks (e.g. pipes with higher priorities are in poorer condition than those pipes with medium or low priorities). Each of the pipeline projects has an associated replacement priority listed in Appendix I. In general, piping improvements to address hydraulic deficiencies are prioritized above those with condition issues in the CIP. Some hydraulic improvements may also address high priority condition issues.

As noted above the City intends to replace all piping in the system over a 100 year period. Many condition based pipe improvements will be completed in conjunction with street reconstruction, overlays or other underground utility projects.

Improvement projects to address deficiencies in privately owned piping, regardless of hydraulic deficiency or replacement priority, is scheduled for improvement beyond 20 years due to budget constraints as shown in Table 7-3 in Project ID Pipelines – 4. These pipelines also have a "P" added to the end of their Project ID number as shown in Figure 7-1 and Appendix I.

Facilities

Existing Well and Booster Facilities' Operation and Maintenance Projects

As described in previous sections of this WFP, the City currently operates 14 wells and booster stations. The City owns 15 supply facilities; however, the Well 7 facility is not used due to water quality issues. Each facility was analyzed in Section 5, and recommended improvements were described (Table 5-6). The results of system condition and code evaluations were ranked in Table 5-5, from most to least important. These facility analyses determined an overall 20-year project implementation, allowing approximately one facility improvement per year.

The facilities recommended for improvement over the next five years (by 2020) are Wells 9 and 10 (F-3), Well 3 (F-4.1), Well 1 (F-5), Well 4 (F-6), Well 8 (F-7), Wells 13 and 13B (F-8), and Well 16 (F-9).

The facilities recommended for improvement for years 6 to 20 (by 2035) are Well 12 (F-19), Wells 11 and 14 (F-20), Well 16 (F-21), Well 16 (F-22), Well 17 (F-23), Well 2 (F-24), Wells 15 and 15B (F-25), and Well 7 (F-26)

Each upgrade and its associated cost is summarized in Tables 7-1 and 7-2. The improvements identified in Section 5 focused on bringing each facility up to 2014 standards and to address recurring problems. Detailed costs associated with the improvements identified at each facility are included in Appendix J.

Three specific ongoing repair and replacement budget items have been identified by the City, and are included in this CIP. The first includes replacing the doors and locks for security at each well facility (F-10) over three years at $75,000 per year. The second provides funds for the transition from a radio supervisory control and data acquisition (SCADA) to a fiber SCADA system (F-11). This transition is scheduled to occur over three years at $40,000 per year. The third budget item will pay for maintaining concrete and asphalt flatwork at each well facility and the department shop (F-12) at approximately $10,000 annually over five years.

Water Supply Wells

As described in Section 4, the City's water distribution system was evaluated for deficiencies over the next 20 years, and its supply needs were identified over the next 40 years. Results from these analyses indicate additional supply requirements as shown in Tables 7-1, 7-2 and 7-3. The CIP includes 5 new wells in the 20-year horizon and another 8 new wells (13 total) by the 40-year timeframe.

To support projected growth in the northeast portion of the system and provide increased pressure to existing areas at higher elevations, additional supply is needed near Well 7, which, as previously mentioned, is no longer in service. Because Well 7 is close to the Well 13 and 13B facility and there is available space at this site, a new well and booster facility is recommended at that location (F-2). This facility is recommended in the 5-year timeframe.

The 65th South Facility does not have a dedicated supply, is far from existing wells, and is currently used only as a "peaking" source. A new well (F-1) is recommended near the existing facility in the 5-year timeframe to supply water under average day demand and maximum day demand conditions. The new well will be located at City-owned property about a half mile east of the booster and reservoir, and will require a dedicated pipeline to convey water from the well to directly fill the reservoir.

Two new wells are needed in the 20-year horizon, based on projected growth and limited supply on the west side of the system: one well located in the vicinity of Well 6 (F-14) and another at the existing Well 16 facility (F-13).

The far north portion of the system is relatively isolated from existing supplies and is projected to grow in the 20-year planning horizon. To better serve this area, a new well is recommended near the intersection of East River and Tower Roads (F-18).

Another eight well facilities (F-27), at least half including backup power, are recommended in the 40-year horizon to meet demand projections. The project cost and locations for these facilities has not been determined, and will need to be identified through subsequent planning.

Reservoirs and Storage

The City prefers to construct and operate well facilities that have well water conveyed directly to a reservoir and then boosted through a pump station to the system. Based upon existing supply capacity and projected demand growth, the City will require new or replacement reservoirs as summarized in Tables 7-1 and 7-2. Some of the reservoirs serve as storage for the system, and some serve as contact tanks for chlorination. Each of the recommended reservoirs corresponds to one of the new wells previously described.

In the 5-year horizon, a new storage reservoir is recommended to accompany the new well (F-2) at the existing Well 13 and 13B facility site; this will increase overall storage in the east portion of the system.

In the 20-year horizon, two new and two replacement reservoirs are recommended. The first is new reservoir is a small contact tank for chlorination to accompany the new well near the existing Well 6 (F-14) site. The second new reservoir is near the East River Road and Tower Road Well (F-18), and will provide storage for the system's north area. The first replacement is a larger reservoir at the current Well 16 (F-13) site to support the new and existing wells at this location. The elevated reservoir at Well 3 is also recommended for replacement (F-4.2, second project at the facility) in the 20-year horizon due to the condition assessment as summarized in Section 5.

Booster Stations

Tables 7-1 and 7-2 summarize the need for several additional or upgraded booster stations over the next 20 years, as determined in Section 4. Many of the required booster station improvements are associated with well and reservoir recommendations, and are a mix of new and upgrade projects.

In the 5-year timeframe, a new booster station needs to be built with the new well facility at Well 13 and 13B (F-2). Due to hydraulic limitations resulting from increasing the existing Well 13 and 13B booster station, a new facility (rather than an upgrade) is recommended to convey the increased water demand associated with the new facility. At the 20-year horizon, an additional pump (F-17) will be needed in this booster station to expand capacity and meet future peak demands.

In the 20-year horizon, new booster stations are needed at the new wells near Well 6 (F-14) and another at the new facility near the East River Road and Tower Road intersection (F-18). The additional new well and increased storage reservoir at the existing Well 16 location are needed to provide adequate supply and capacity to the west of the system, and will require a new booster station (F-13).

The existing Well 5 Facility is currently the largest capacity booster station in the system, but lacks a redundant pump. Replacing this facility's (F-16) booster station is recommended to increase the firm capacity to the system with a booster station with one that has at least two pumps.

The existing 65th South pumps do not meet the system hydraulic grade line, and as demand increases in the southern part of the system, these pumps will need to be replaced (F-15) with ones that can provide additional head. The capacity upgrade at 65th South booster stations will also require an additional pump and other upgrades in the 20-year timeframe to meet increased demands in the system, particularly during peak hour conditions.

Water Treatment Systems

As described in Section 2, disinfection is the only treatment process applied to well water. All of the well locations are equipped with chlorine gas injection systems to meet residual disinfection requirements.

The City is considering switching from chlorine gas, which poses a health and security hazards, to a safer sodium or calcium hypochlorite system. Although hypochlorite is somewhat more expensive, has less strength, and will require new control and feed systems, safety and security concerns have prompted the City to weigh the benefits of changing its disinfection system.

Because the City is still considering whether to convert from chlorine gas to another form of disinfection, no costs for this work are included in this CIP.

Automated Metering Infrastructure

The water metering analysis described above assumes that if the City begins metering all customers, advanced metering infrastructure (AMI) would be implemented. This involves installing the associated hardware and software to enable centralized collection of customer usage records. The costs of installing meters and AMI radio endpoints are further described in Section 9—Financial Impacts of City-Wide Meter Implementation. The City has elected to include $250,000 per year in its CIP for future water meter installation (projects Meter 1 and Meter 2). It should be noted that Idaho Falls Power system already utilizes data collectors and the Water Department is currently conducting a pilot project to test the capability of the existing data collectors for water meter reading.

Backup Power

Backup power has been included in many facility upgrade projects, and with all new facilities. Each new well (F-1, F-2, F-13, F-14, F-16, and F-18) and each new booster station (F-2, F-13, F-14, F-17, and F-18) includes backup power, as do many condition improvement projects (F-3, F-6, F-8, and F-20). At the completion of the 20-year CIP, over half the wells and booster stations will have backup power.

Pipeline Replacement Program

The desktop analysis of the system's pipeline condition concluded that the City should replace approximately 3.2 miles of public pipeline per year, starting with cast iron piping installed between 1902 and 1959. At a 1 percent per year rate, the water pipeline replacement program is estimated to cost approximately $3.14 million annually. Although it will not be fully funded in the first twenty years, the City intends to begin this program immediately, and after year 20, the requisite $3.14 million will be budgeted for this program annually. The 21 to 40 year CIP includes the $3.14 million budget per year for pipeline replacement. As the system continues to expand and new pipelines are installed, the yearly budget for pipeline replacement will need to increase to account for the larger system.

As described above, all existing piping has been assigned a pipeline condition priority. No discrete projects have been identified to address condition in the CIP as they will be conducted on an opportunistic basis in conjunction with other utility or street work or bundled into construction packages where a large section or neighborhood can be completed as a single project. The City will target approximately 3.2 miles of condition based replacement each year however the exact amount that will be constructed will be dependent on actual bid prices.

Improvements by Timeframe

Recommended pipeline and facility projects to be implemented by 2020 (years 0 to 5), 2035 (years 6 to 20), and by 2055 (years 21 to 40) are summarized in Tables 7-1, 7-2, and 7-3, respectively. These tables present each project's ID and name, the primary reason for the project, its type, a short description of each project, the project's recommended size, and its total cost.

Table 7-1
Summary of Required 2020 (0 to 5 Year) Improvements

Project ID	Project Name	Primary Reason for Project	Project Type	Description	Recommended Size	Total Cost[1]
Pipelines – 1A (See Appendix I)	Capacity Related Existing Pipeline Improvements	Capacity: Fire Flow	New Piping and Pipeline Replacement	Replacement and new pipelines for to address existing deficiencies (fire flow). Funding for the improvements is as follows: Year 1 = $1.2M, Year 2 = $1.3M, Year 3 = $1.4M, Year 4 = $1.5M, Year 5 = $1.6M. Projects that cannot fit within the funding are deferred beyond year 5 (year 6 to 20) as shown in Table 7-2.	6-, 8-, 10-, and 12-in diameter; 19.3 miles	$7,000,000
F-1	New 65th South Well (Project 1)	Capacity: Supply	New Well Dedicated Supply Pipeline to Reservoir	New well including backup power and dedicated supply piping to 65th South Reservoir. First of two projects in 20-year CIP at this location.	Well – 4,500 gpm Supply Pipeline – P-207: 24 in, 3,450 lf	$3,050,000
F-2	New Well Facility at Well 13 and 13B Facility (Project 1)	Capacity: Supply	New Well New Reservoir New Booster Station New Supply Pipeline	New well, booster station and storage reservoir including backup power and new supply piping to provide for new demand requirements and existing pressure requirements. First of two projects in 20 year CIP at this location.	Well – 3,000 gpm Reservoir – 1.25 MG Booster Station – 3,000 gpm Supply Pipeline – (P-208: 18 in 4,000 lf	$5,236,000
F-3	Wells 9 and 10 Upgrades	Condition	Facility Upgrade	Facility upgrade to security system, safety equipment, well pump change-out, piping, HVAC, well, reservoir, electrical system, generator and well pump.	-	$1,516,000
F-4.1	Well 3 Upgrades (Project 1)	Condition	Facility Upgrade	Facility upgrade to security system, safety equipment, piping, building, well and electrical system. First of 2 projects in 20 year CIP at this location.	-	$1,066,000
F-5	Well 1 Upgrades	Condition	Facility Upgrade	Facility upgrade to security system, safety equipment, piping, HVAC, building, well, reservoir and electrical system.	-	$703,000
F-6	Well 4 Upgrades	Condition	Facility Upgrade	Facility upgrade to security system, safety equipment, piping, HVAC, building, well, reservoir, electrical system, 2300v well pump change-out, and new generator.	-	$1,136,000
F-7	Well 8 Upgrades	Condition	Facility Upgrade	Facility upgrade to safety equipment, piping, HVAC, building, well, reservoir and electrical system.	-	$285,000
F-8	Well 13 and 13B VFD Installation (Project 1)	Condition	Facility Upgrade	Facility upgrade to replace well pump MCCs, upgrade boosters to VFD's, replace booster motor and pump 13-1 and 13-2, safety equipment and backup generator. First of two projects in 20 year CIP at this location.	-	$1,032,000
F-9	Well 16 VFD Installation (Project 1)	Condition	Facility Upgrade	Facility upgrade to replace well pump MCCs, upgrade boosters to VFD's, replace booster motor 16-1 and 16-2, and install safety equipment. First of two projects in 20 year CIP at this location.	-	$296,000
F-10	All Facilities: Door Replacement	Condition	Facility Upgrade	Facility upgrade to replace exterior doors: $75,000 budgeted annually for 3 years.	-	$225,000
F-11	All Facilities: SCADA Upgrade	Condition	Facility Upgrade	Conversion from radio SCADA to fiber SCADA: $40,000 budgetary annually for 3 years.	-	$120,000
F-12	All Facilities: Concrete Maintenance	Condition	Facility Upgrade	Concrete and asphalt maintenance and repair: $10,000 budgetary annually for 5 years.	-	$50,000
Meter 1	Water Meter Installation	-	-	Water Meter installation: $250,000 budgeted annually for 5 years.	-	$1,250,000
					Total	$22,965,000

[1] Total Cost: Project estimates are based on the type and size of projects identified in this WFP and were prepared in accordance with the guidelines of American Association of Cost Engineers (AACE) International Class 5 Estimate, with a typical accuracy of -30% to +50%. Project estimates are based on 2014 dollars and include design (unless noted otherwise), construction, and site-specific information as described in Appendix H.

General notes: The proposed locations of all water facilities in Section 7 (CIP) and this table are based on conceptual data available at the time this WFP was prepared. The actual location, routing, type, or size of any public water facility may vary from what is shown, because of actual physical conditions, the timing of development, the availability or cost of rights-of-way or easements, final engineering design considerations, or other similar reasons. To the extent any planned future water improvement is shown on private property, the location is only approximate and does not constrain or limit development on that property.

Table 7-2
Summary of Required 2035 (6 to 20 Year) Improvements

Project ID	Project Name	Primary Reason for Project	Project Type	Description	Recommended Size	Total Cost[1]
Pipelines – 1B (See Appendix I)[2]	Deferred existing capacity related pipeline improvements	Capacity: Fire Flow	Pipeline	Remainder of deferred existing pipeline improvements: New and replacement pipelines to address fire flow and operating pressure deficiencies.	Remainder of existing capacity-related existing pipelines. See Table 7-1	$11,454,000
Pipelines – 2 (See Appendix I)[2]	Capacity related 2020 pipeline improvements	Capacity: Fire Flow and Supply	Pipeline	New and replacement pipelines to address fire flow and operating pressure deficiencies by 2020.	8-, 12- and 16-in diameter; 5,400 lf	$1,312,000
F-4.2	Replacement of Well 3 Reservoir (Project 2)	Capacity: Storage and Condition	New Elevated Reservoir	Replacement of existing reservoir and construction of new elevated reservoir. Second project at this location in 20-year CIP.	1.0 MG	$6,334,000
F-13	Well 16 Upgrade (Project 2)	Capacity: Supply	New Well Replacement Reservoir Replacement Booster Station	New well, replacement reservoir and booster station including backup power and facility improvements due to new demand requirements and distribution limitations in this portion of system. Second project at this location in 20-year CIP.	Well – 3,600 gpm Reservoir – 1.25 MG Booster Station – 7,200 gpm	$5,026,000
F-14	New Well Facility Near Well 6	Capacity: Supply	New Well New Reservoir New Booster Station	New well, reservoir and booster station including backup power due to new demand requirements and distribution limitations in this portion of system.	Well – 1,500 gpm Reservoir – 0.1 MG Booster Station – 1,500 gpm	$1,840,000
F-15	65th South Booster Station Upgrades (Project 2)	Capacity: Pumping	Facility Upgrade	New booster pump and replacement of existing pumps due to demand and head requirements. Second project at this location in 20 year CIP.	Pump 1 – 2,000 gpm Pump 2 – 2,000 gpm Pump 3 – 900 gpm Pump 4 – 2,500 gpm	$790,000
F-16	Well 5 Booster Station Replacement	Capacity: Pumping and Condition	New Booster Station	New booster pump station to address condition issues and the addition of a second pump to address redundancy requirements.	6,000 gpm	$2,127,000
F-17	New Booster Pump at New Well Facility at Well 13 and 13B (Project 2)	Capacity: Pumping	Facility Upgrade	New booster pump at Project F-2 to increase pumping capacity. Second project at this location in 20-year CIP.	Additional Pump – 1,500 gpm	$180,000
F-18	New Well Facility near East River Road and Tower Road	Capacity: Supply	New Well New Reservoir New Booster Station New Supply Pipeline	New well, reservoir, and booster station including backup power, as well as new supply piping to connect to the distribution system.	Well – 3,000 gpm Reservoir – 1.0 MG Booster Station – 3,000 gpm Supply Pipeline – P-307: 16-in, 14,650 lf	$7,966,000
F-19	Well 12 Upgrades	Condition	Facility Upgrade	Facility upgrade to security system, safety equipment, piping, HVAC, reservoir and electrical system.	-	$874,000
F-20	Well 11 and 14 Upgrades	Condition	Facility Upgrade	Facility upgrade to security system, piping modifications, HVAC, reservoir, generator and electrical system.	-	$1,734,000

Table 7-2 Continued

Project ID	Project Name	Primary Reason for Project	Project Type	Description	Recommended Size	Total Cost[1]
F-21	Well 13 and 13B Upgrades (Project 2)	Condition	Facility Upgrade	Facility upgrade to piping, HVAC, and reservoir. Second project at this location in 20-year CIP.	-	$550,000
F-22	Well 6 Upgrades	Condition	Facility Upgrade	Facility upgrade to install safety equipment, piping modifications, HVAC, facility, well, reservoir and electrical system.	-	$203,000
F-23	Well 17 Upgrades	Condition	Facility Upgrade	Facility upgrade to piping, reservoir and electrical system.	-	$254,000
F-24	Well 2 Upgrades	Condition	Facility Upgrade	Facility upgrade to security system, safety equipment, piping, HVAC, well, reservoir and electrical system.	-	$337,000
F-25	Well 15 and 15B Reservoir Upgrades	Condition	Facility Upgrade	Facility upgrade to building lighting and reservoir (hatches and ladder).	-	$22,000
F-26	Abandon Well 7	Condition	Facility Upgrade	Abandon well and removal of 30,000 gallon tank.	-	$91,000
Meter 2	Meter Installation	-	-	Water Meter installation: $250,000 budgeted annually for 15 years.	-	$3,750,000
Pipelines – 3 (See Appendix I)	Capacity related 2035 pipeline improvements	Capacity: Fire Flow and Supply	Pipeline	Fire flow, operating pressure deficiencies and transmission piping.	6-, 8-, 12- and 16-in diameter; 11.1 miles	$15,248,000
					Total	$60,092,000

[1] *Total Cost: Project estimates are based on the type and size of projects identified in this WFP and were prepared in accordance with the guidelines of American Association of Cost Engineers (AACE) International Class 5 Estimate, with a typical accuracy of -30% to +50%. Project estimates are based on 2014 dollars and include design (unless noted otherwise), construction, and site-specific information as described in Appendix H.*

[2] *Pipeline projects have been delayed beyond the hydraulic deficiency timeframe due to budget limitations.*

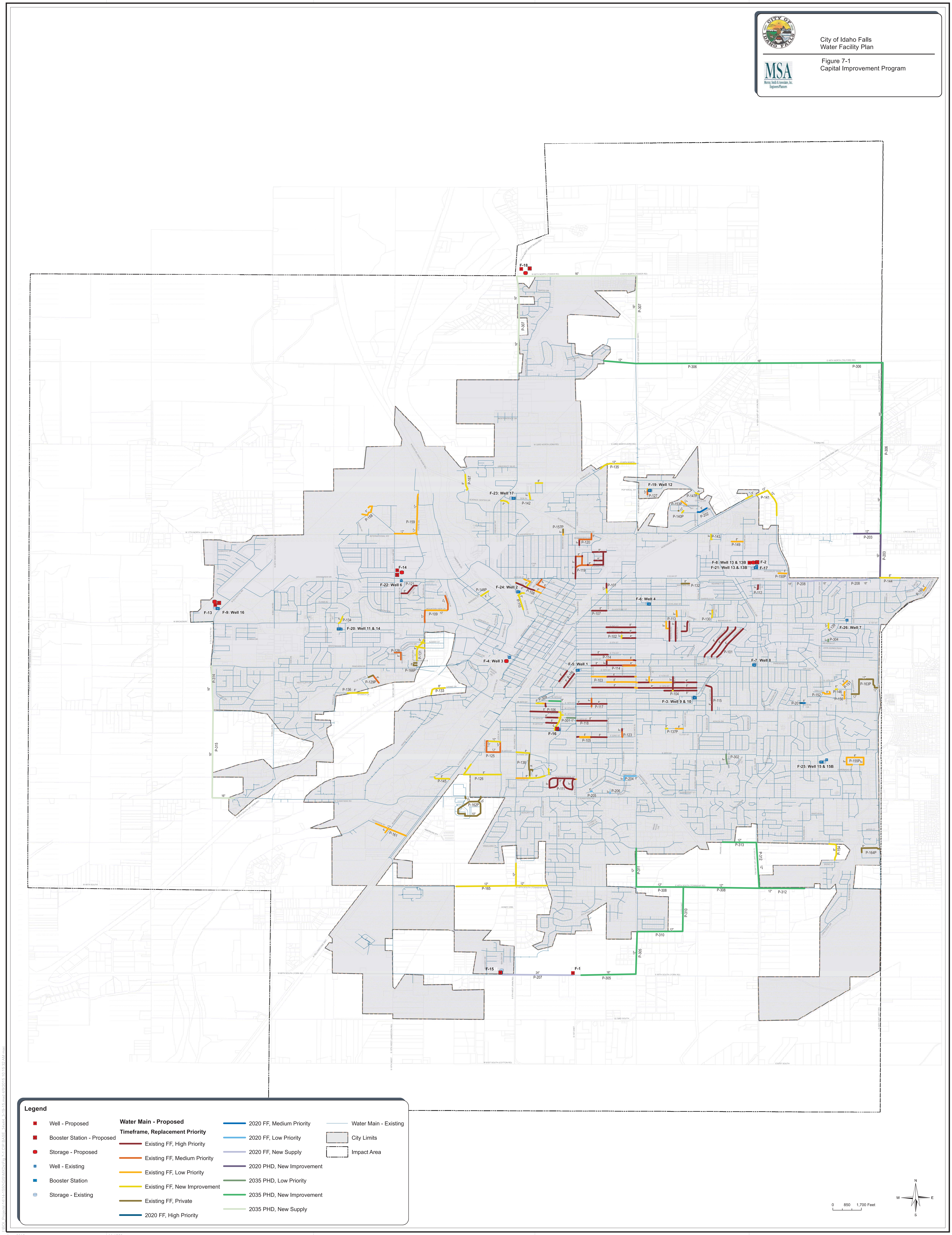
General notes: The proposed locations of all water facilities in Section 7 (CIP) and this table are based on conceptual data available at the time this WFP was prepared. The actual location, routing, type, or size of any public water facility may vary from what is shown, because of actual physical conditions, the timing of development, the availability or cost of rights-of-way or easements, final engineering design considerations, or other similar reasons. To the extent any planned future water improvement is shown on private property, the location is only approximate and does not constrain or limit development on that property.

Table 7-3
Summary of Required 2055 (21 to 40 Year) Improvements

Project ID	Project Name	Primary Reason for Project	Project Type	Description	Recommended Size	Total Cost
Pipelines - 4 (See Appendix I)	Capacity related pipeline improvements to Private Pipelines	Fire Flow and Capacity	Pipeline	Fire flow and operating pressure deficiencies on private pipelines.	6-, 8-, 10-, and 12-in diameter; 2.4 miles	$2,406,000
Pipeline Replacement	Pipeline Replacement Program	Condition	Pipeline	Replacement of the existing distribution system at $3,140,000 per year, approximately 1% of the system, as described in this section and Section 5.	-	$62,800,000
F-27	8 new supply facilities, at least half with backup power	Capacity and Condition	New Well	New demand requirements.	Not Defined	Not Defined

[1] Total Cost: Project estimates are based on the type and size of projects identified in this WFP and were prepared in accordance with the guidelines of American Association of Cost Engineers (AACE) International Class 5 Estimate, with a typical accuracy of -30% to +50%. Project estimates are based on 2014 dollars and include design (unless noted otherwise), construction, and site-specific information as described in Appendix H.

General notes: The proposed locations of all water facilities in Section 7 (CIP) and this table are based on conceptual data available at the time this WFP was prepared. The actual location, routing, type, or size of any public water facility may vary from what is shown, because of actual physical conditions, the timing of development, the availability or cost of rights-of-way or easements, final engineering design considerations, or other similar reasons. To the extent any planned future water improvement is shown on private property, the location is only approximate and does not constrain or limit development on that property.


City of Idaho Falls
Water Facility Plan
Figure 7-1
Capital Improvement Program
MSA
Legend
Well - Proposed
Booster Station - Proposed
Storage - Proposed
Well - Existing
Booster Station
Storage - Existing
Water Main - Proposed
Timeframe, Replacement Priority
Existing FF, High Priority
Existing FF, Medium Priority
Existing FF, Low Priority
Existing FF, New Improvement
Existing FF, Private
2020 FF, High Priority
2020 FF, Medium Priority
2020 FF, Low Priority
2020 FF, New Supply
2020 PHD, New Improvement
2035 PHD, Low Priority
2035 PHD, New Improvement
2035 PHD, New Supply
Water Main - Existing
City Limits
Impact Area
0 850 1,700 Feet
N
E
S
W

Murray, Smith & Associates, Inc.
Engineers/Planners

SECTION 8

Financial Plan

SECTION 8
FINANCIAL PLAN

Introduction

The projected financial performance of the City of Idaho Fall's (City's) water system is impacted by capital improvement needs, increasing operation and maintenance requirements associated with existing and new infrastructure, and renewal and rehabilitation of select system assets (including annual pipeline replacement). This section presents an overview of historical financial performance, a comprehensive funding plan for proposed capital projects, corresponding water rate adjustments and bill comparisons, and forecasts of future financial performance from fiscal year (FY) 2015 through FY 2020.[1]

Forecasts have been developed using a financial planning model designed to represent utility cash flows under alternative assumptions related to revenue generation, operations and maintenance (O&M) expenses, and financing structures for capital investment. The financial planning model incorporates projections of annual cash flow requirements developed through the City's budgeting process, as well as capital requirements identified in Section 7 – Capital Improvement Program (CIP). Forecasts also reflect discussions with City personnel in both the Water Division (Division) and Controller's Office.

Historical Performance

Table 8-1 presents a brief overview of the financial performance of the Division from FY 2011 through FY 2014 as reflected in various financial statements and other budget documents provided by the City.[2]

Water rates were last increased on July 1, 2008, from $15.00 per month for a single family dwelling to $21.00 (an increase of 40%). Water rate revenues have therefore remained fairly constant over the historical period, increasing slightly year over year as a result of customer growth. Water rate revenues were $6.86 million in FY 2011 and increased to $6.99 million in FY 2014, a compounded annual growth rate (CAGR) of 0.62%. Other sources of operating revenues include the sale of water meters and the Division's share of fees associated with delinquent payments. The sale of water meters has ranged from a low of roughly $2,800 in FY 2012 to a high of approximately $20,800 in FY 2014. Late fees for the combined water and wastewater systems have fluctuated between a low of $38,900 in FY 2011 to a high of $45,700 in FY 2013. Such fees are not tracked separately for each system. However, for reporting purposes, it is assumed that they accrue to the water system roughly in proportion to the overall ratio of water rate revenues to total rate revenues (40%).[3]

[1] The City's fiscal year runs from October 1 through September 30.
[2] The Water Division is not set up as a separate enterprise fund, and audited statements for that specific system are not available.
[3] On average, water rate revenues have historically represented approximately 40% of total rate revenues.

Table 8-1
Water System Historical Operating Results[1]

	FY 2011	FY 2012	FY 2013	FY 2014
Water Rate Revenue	$ 6,857.6	$ 6,912.9	$ 6,961.8	$ 6,986.9
Other Operating Revenues	23.4	19.3	27.9	37.1
Interest Revenues	48.1	61.9	45.9	37.4
Transfers from MERF[2]	19.3	50.0	69.4	-
Total Operating Revenue	**$ 6,948.5**	**$ 7,044.1**	**$ 7,104.9**	**$ 7,061.5**
Operations & Maintenance	2,614.5	3,087.8	3,366.9	3,334.0
General Fund Transfers	1,114.4	1,283.4	1,214.4	1,315.6
MERF Contributions[2]	76.4	78.9	99.4	94.7
Capital Outlay	44.7	96.6	103.6	65.5
Total Expense	**$ 3,850.0**	**$ 4,546.7**	**$ 4,784.3**	**$ 4,809.8**
Net Operating Revenues	**$ 3,098.5**	**$ 2,497.4**	**$ 2,320.6**	**$ 2,251.7**

1 All numbers in thousands, slight calculation discrepancies may exist due to rounding

2 City's Municipal Equipment Replacement Fund (MERF)

Interest revenues are earned on the combined (water and wastewater) operating fund balance, and have fluctuated between a low of $93,600 in FY 2014 to a high of $154,800 in FY 2012. Similar to late fees, the allocation of this revenue source to the Water Division is assumed to be 40%.

Other non-operating revenues available to the Division consist of revenue transfers from the City's Municipal Equipment Replacement Fund (MERF). As described below, the Division accesses this fund to offset the cost of new vehicle purchases. Transfers from MERF are highly variable, totaling between $0 in FY 2014 to as much as $69,400 in FY 2013 based on the vehicle replacement needs of the Division.

Total operating revenues of the system (excluding transfers from MERF) increased 1.9%, from $6.95 million in FY 2011 to $7.06 million in FY 2014.

Over the same time period, O&M expenses increased 27.5%, from $2.61 million to $3.33 million. Much of this increase can be attributed to more proactive efforts to enhance preventive maintenance activities. Additionally, two specific operational changes are significant contributing factors to the O&M cost increase. First, expenditures have increased with the installation of meter pits on new residential construction and on service line replacements as required by new state regulations. Second, policy changes requiring specialized backfill when patching street cuts from water line improvements has increased expenditures.

Transfers to the General Fund are based on the Division's share of direct costs for services from other City Divisions, including Engineering, Billings and Collections, and GIS. Transfers also include indirect cost allocations for the Division's share of Public Works Department administration costs and general City administration expense. The direct and indirect cost allocations are established by the City Controller's Office and applied to the City's cost estimates for the current budget year. General Fund transfers have increased from $1.11 million to $1.32 million, and represented approximately 25.4% to 28.9% of the Division's total expense over the historical period.

Other expenses of the Division include contributions to MERF and other capital expenses necessary for O&M of the system. Annual MERF contributions are based on the estimated useful lives and future replacement costs of existing Division-owned vehicles. Annual contributions accrue within the fund such that monies are available for replacement vehicle purchases. The program distributes the costs of vehicle acquisition across the life of the asset, effectively smoothing potential budget impacts associated with new automotive equipment. MERF contributions have varied between $76,400 and $99,400 per year over the historical period. The Capital Outlay cost category includes office equipment, software purchases, and other minor equipment. This category also includes the purchases of Division vehicles, although funds for such costs are paid for from the MERF as described earlier.[4] As a result, capital outlay expense has varied year over year, from $44,700 in FY 2011 to $103,600 in FY 2013.

Total expenses of the Division were $3.85 million in FY 2011 and $4.81 million in FY 2014, an increase of 24.9%. As a consequence of increasing operating costs and relatively stagnant revenue growth, net operating revenues of the system decreased from $3.10 million to $2.25 million over the historical period (a 27.3% reduction).

At this time, the Division does not carry any long-term debt. Annual net operating revenues of the system have been used to pay for capital improvement projects and augment the Division's operating reserve balances in order to strengthen the financial security of the utility.

Financial Management

A system of fund accounting is used to track revenues and expenses associated with the Division's various operating functions. These funds are separate accounts used to facilitate the accounting and reporting of operating and capital-related financial transactions.

[4] The MERF Contributions expense item represents the amount the Division contributes to MERF for replacement vehicle purchases, while the Capital Outlay budget category includes the purchases themselves. Table 8-1 shows the corresponding revenue offset line item (Transfers from MERF) which represents the use of previously contributed funds for vehicle replacement purchases in the Capital Outlay budget category.

Operating Fund

The Division records operating revenues and expenditures in its Operating Fund (Fund 61). The water system is not currently accounted for as a single enterprise fund, and this account is currently shared with the City's wastewater system. Although rate revenues from each enterprise are deposited into the same account, operating budgets are prepared and tracked separately for the water and wastewater systems. For the water system, appropriations are allocated and operating expenditures are accounted for in the Division's various operating categories for each budget year. The Division recently consolidated the number of categories tracked within the operating budget. Such categories now include Administration, Well Maintenance & Operations, Distribution System Maintenance & Operations, and New Construction.

Capital expenditures are budgeted within the New Construction category of the operating budget. Under current City policy, if actual capital expenditures are lower than budgeted capital expenditures, the remaining budgeted funds do not automatically become available for the subsequent budget year within the New Construction operating category. Instead, the excess funds become an addition to the reserve balance of Fund 61.

As of the beginning of FY 2015, the reserve balance of Fund 61 was $32.15 million. This balance includes pooled cash as well as investments the City has made to increase the operating reserves of the system. It also includes reserves associated with MERF ($3.01 million) and other assets restricted to equipment replacement for the wastewater system ($1.73 million). The unrestricted water and wastewater reserve operating balance was therefore approximately $27.41 million at the beginning of FY 2015.

Connection Fee Fund

The Division currently charges a water system connection fee for new customers requesting water service. Revenues from water system connection fees are placed into Fund 44 and tracked independent of wastewater connection fee revenues, which are deposited into Fund 40. Existing City ordinances require that connection fee revenues be used to pay for growth-related infrastructure such as new wells, new water mains, or additional service capacity within the system. The balance of Fund 44 was $1.72 million as of the beginning of FY 2015.

Water Rates & Charges

Existing Rate Structure

Because the majority of City customers receive unmetered water service, the existing rate structure is comprised mainly of fixed charges for both indoor and outdoor water use. Single family residential customers currently pay $21.00 per month for indoor water service, an annual $17.46 irrigation charge (for outdoor use), and a $3.00 per year charge associated with the Idaho Department of Environmental Quality's (DEQ) administration of the state's drinking water program. These charges are considered flat rates, since none vary based on the amount of actual water used by the customer. When factoring in the annual charges, the effective monthly flat rate for a single family residential customer is approximately $22.71.

Non-residential customers that are not metered pay a flat monthly rate for indoor use based on the type of business located at the property. Rates for restaurants, schools, laundromats, and various other customer types are identified within the City's rate schedule. Some of these, such as office buildings, pay a flat rate per 1,000 square feet of area. Others, such as hotels, pay a flat rate per room. Non-residential customers not specifically listed within the rate schedule pay the same rate as single family residential customers, $21.00 per month. The annual rate for outdoor use for unmetered non-residential customers is $97.59 per acre of lawn or cultivated area.[5] Non-residential customers also pay the annual $3.00 DEQ water quality program administration fee.

The City also provides service to a small number of residential and non-residential customers located outside the City limits. With the exception of the annual DEQ water quality program administration fee, these customers are charged twice the rates of similar customers located within the City. The effective rate for outside-City residential customers is therefore approximately $45.16.

Approximately 10% of the City's non-residential customers receive bills based on metered water use.[6] These customers pay a $21.00 monthly base charge and $0.55 for each thousand gallons of water used, after a 12,000 gallon minimum allowance. The determination of the monthly bill is subject to a minimum bill based on the size of the metered connection, with 1-inch (and smaller) customers paying at least $21.00 per month and 2-inch customers—the most common meter size of metered customers—paying $41.79 per month. As recommended in the American Water Works Association's (AWWA) M1 Manual of Practice: *Principles of Water Rates, Fees, and Charges*, the minimum bills for larger meter sizes are scaled up to recover fixed, capacity-related costs for those customers who have, based on meter size, reserved a higher allocation of capacity within the system.

Connection Fees

The City charges a connection fee to recover a part of the incremental costs associated with system expansion or capacity upgrades related to new development. This fee varies based on the demands the new customer will place on the system (as determined by service line size), but is currently $1,312 for a typical residential customer with a 1-inch connection. Consistent with AWWA's M1 Manual, connection fees are higher for new customers with larger diameter service lines. The fee for new customers with a 1.5-inch connection is $2,624, the fee for a 2-inch connection is $5,248 and the fee for a 4-inch connection is $20,992.

---

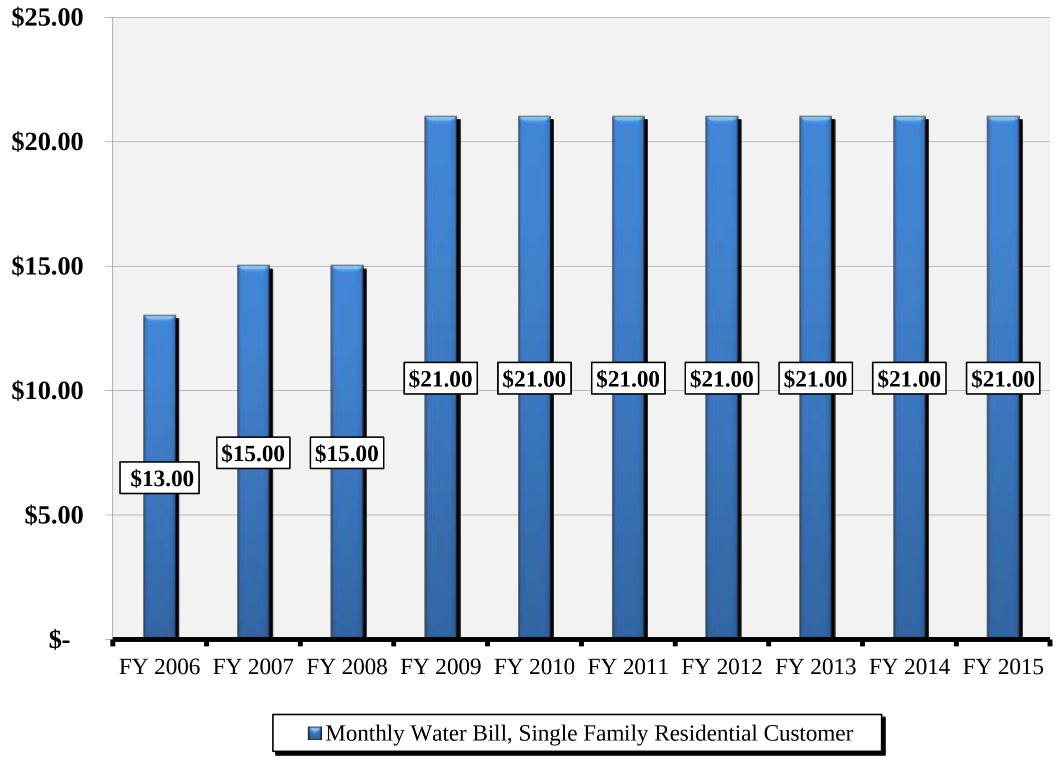
[5] Unmetered non-residential customers with less than 1/20th of an acre of cultivated area are not required to pay for outdoor water use.

[6] While some customers are metered for indoor and outdoor use, the majority of these existing customers receive a metered water bill for indoor consumption only.

Historical Rate Adjustments

The City last increased rates on July 1, 2008. At that time, all rate components were increased 40%, which represented an increase from $15.00 per month to $21.00 per month for single family residential customers. Prior to that, water rates were increased approximately 15% at the beginning of FY 2007 (October 1, 2006). Figure 8-1 presents the monthly bill for indoor water use for single family residential customers during the last ten fiscal years. The CAGR for water rates over this time period was approximately 5.5% per year.

Figure 8-1
Residential Water Rates, FY 2006 – FY 2015[1]



1 The rate comparison excludes annual charges for outdoor use and the DEQ water quality program administration fee.

Regional Water Rate Comparison

Local and regional communities were surveyed in early calendar year 2015 to determine how the City's existing rates compare to nearby water service providers or other communities of similar size within the intermountain west. Table 8-2 presents water rate information for these communities, including the monthly base charge and a description of the volumetric rate structure for single family residential users of each community. A comparison of the summer month water bill (assumed water use of 20,000 gallons) is presented for each community.

The rate comparison demonstrates that the City's existing water rates (highlighted in gray) are among the lowest in the region, especially when compared to communities of similar size. In fact, both the City's existing water bill and proposed FY 2016 water bill for residential users (highlighted in yellow and described later in this section) are lower than many smaller cities located in southeastern Idaho.

Table 8-2
Regional Water Rate Comparison, Single Family Residential Rates

Community	Monthly Charge	Volumetric Rate	Total Bill (20 kgals)
Butte, MT	$ 26.84	Varies per hundred cubic feet, declining block structure	**$ 83.53**
Bozeman, MT	$ 14.65	Varies, inclining block structure	**$ 68.82**
Malad, ID	$ 43.00	$0.60 / kgal after first 5 kgals	**$ 52.00**
Pocatello, ID	$ 7.55	$2.00 / kgal for first 25 kgals	**$ 47.55**
Boise, ID	$ 10.40	Varies, inclining block structure	**$ 46.20**
Meridian, ID	$ 5.49	$1.90 / kgal, no minimum	**$ 43.49**
Logan, UT	$ 16.00	$0.99 / kgal for first 10 kgal, $1.60 beyond that	**$ 41.90**
Twin Falls, ID	$ 10.74	$1.70 / kgal after first 2 kgals	**$ 41.34**
St. Anthony, ID	$ 27.13	$0.54 / kgal, no minimum	**$ 37.93**
Ammon, ID	$ 37.25	Flat rate (some residential customers charged $44.75/mo.)	**$ 37.25**
Nampa, ID	$ 34.90	Flat rate	**$ 34.90**
American Falls, ID	$ 24.15	$0.89 / kgal after first 15 kgals	**$ 30.50**
Blackfoot, ID	$ 21.90	$1.54 / kgal after first 15 kgals	**$ 29.60**
Burley, ID	$ 18.70	$0.573 / kgal after first 3 kgals	**$ 28.44**
Rexburg, ID	$ 15.87	$0.82 / kgal after first 6 kgals	**$ 27.35**
Idaho Falls, ID (proposed)*	$ 25.20	Flat rate (incorporates annualized irrigation charge and DEQ fee)	**$ 27.20**
Brigham City, UT	$ 9.31	$1.31 / kgal after first 7 kgals	**$ 26.34**
Idaho Falls, ID (existing)	$ 21.00	Flat rate (incorporates annualized irrigation charge and DEQ fee)	**$ 22.71**
Rigby, ID	$ 19.00	Flat rate	**$ 19.00**
Shelley, ID	$ 17.50	Flat rate	**$ 17.50**

** Monthly rate after proposed FY 2016 increase of 20% (described later in this section)*

Capital Financing

The Division's CIP contemplates expenditure requirements of $22.97 million in current dollars between FY 2016 and FY 2020 as outlined in Section 7. Combined with budgeted capital expenditures for the current fiscal year (FY 2015) of $2.12 million, projected capital expenditures over the forecast period are $25.08 million in current dollars. Capital projects include various facilities projects at the City's wells, boosters and reservoirs, along with annual pipeline work and concrete and asphalt maintenance. Budgeted expenditures also include exterior door replacement for existing facilities and conversion from radio to fiber SCADA. Capital project costs are scheduled across the forecast period based on priority needs of the system and are escalated at 2.5% per annum to account for cost inflation. In nominal dollars, the capital program is expected to require $26.20 million over the forecast period.

Table 8-3 identifies projected capital project expenditures and matching sources of funds. Projected capital expenditures will be funded through three sources: rate revenues (71.2%), connection fee revenues (8.6%), and existing reserves (20.3%).

Table 8-3
Capital Program Sources and Uses of Funds[1]

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	TOTAL	Percent
Projected Capital Expenditures	**$ 2.12**	**$ 4.72**	**$ 5.09**	**$ 5.34**	**$ 4.43**	**$ 4.51**	**$ 26.20**	**100.0%**
Operating Revenues[2]	1.81	3.01	3.11	3.29	3.57	3.89	18.68	71.2%
Connection Fee Revenues[3]	-	0.45	0.45	0.45	0.45	0.45	2.25	8.6%
Existing Reserves[4]	0.39	1.19	1.59	1.61	0.33	0.21	5.32	20.3%
Used (Unused) Balance[5]	(0.08)	0.07	(0.06)	(0.01)	0.08	(0.04)	(0.05)	
Total Funds	**$ 2.12**	**$ 4.72**	**$ 5.09**	**$ 5.34**	**$ 4.43**	**$ 4.51**	**$ 26.20**	**100.0%**

1 All numbers in millions, slight calculation discrepancies may exist due to rounding
2 Includes increased rate revenues associated with proposed rate adjustments
3 Represents transfers from the Division's Fund 44 (Connection Fees) to pay for qualifying capital improvement projects
4 Represents existing operating reserves of the Division that may be used for ongoing and future CIP projects
5 After using funds from various sources for the CIP, approximately $50,000 will remain (unused balance) to fund future projects

Rate revenues of the system will be the primary funding source for the capital program. This funding method is often referred to as current revenue financing or "Pay-As-You-Go" (PAYGO) funding because it leverages excess revenues of the system to pay for capital improvements on an annual basis. Excess revenues are those that remain after paying operating expenditures, debt service requirements, and all other costs of the utility (such as General Fund transfers). Revenues currently exceed operating expenses by approximately $1.81 million per year under existing rates.[7] This amount is used annually by the Division to pay for capital projects, and represents the current level of PAYGO funding. Proposed rate increases will be required to increase annual excess revenues of the Division and generate the $18.68 million of operating revenues proposed to fund the capital program.

Annual connection fee revenues have ranged between a low of $140,378 in FY 2011 to a high of $318,434 in FY 2013 over the last six fiscal years. Excluding the peak year, FY 2013, annual connection fee revenues have averaged $204,204 over a historical period that reflects periods of strong economic recession and slowed development activities. This financial plan conservatively assumes that annual connection fee revenues will be $200,000 per year over the forecast period. Furthermore, the financial plan assumes that the Division will use existing Fund 44 reserves in the amount of $250,000 per year to augment the annual amount available for the proposed capital program. In total, connection fee revenues are expected to contribute $0.45 million annually and $2.25 million over the forecast period. As stated earlier in this section, the City's water and wastewater operating fund has accrued an estimated unrestricted fund balance of approximately $27.41 million. These operating

[7] Based on forecasted or budgeted revenues and expenses of the Division for the current fiscal year.

reserves have accumulated over time as the Division has exercised fiscal restraint both in terms of operating expense and capital expenditures. After receiving input from City personnel, this financial plan assumes that approximately $8.25 million of the unrestricted fund balance is available for the Division. Of this amount, the Division expects to draw down $5.32 million of operating reserves to fund the capital program over the forecast period. A $2.90 million reserve balance will remain at the end of FY 2020.

The Division's capital improvement plan is subject to frequent review and modification based on evolving priorities and growth-related expansion of the system. To the extent that actual CIP costs vary from estimated expenditures in a given forecast year, the Division will adjust cash financing amounts of the capital program and/or reschedule previously identified capital projects to ensure the funding plan remains viable.

Forecasted Operating Results

Table 8-4 presents the cash flow forecasts for the Division's operating fund (Fund 61). Financial planning alternatives are developed to ensure compliance with City policy to maintain reserve balances equal to a minimum of three months of operating expense, to achieve minimum targeted debt service coverage where applicable, and to provide opportunities to cash-finance a significant portion of capital projects during the forecast period (thus avoiding interest payments on long-term debt).

Table 8-4
Projected Sources and Uses of Cash, Fund 61[1]

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Beginning Cash Balance	*$ 8,223.7*	*$ 7,829.0*	*$ 6,638.8*	*$ 5,050.8*	*$ 3,440.0*	*$ 3,114.5*
Water Rate Revenue	$ 7,000.0	$ 7,026.3	$ 7,078.9	$ 7,132.0	$ 7,185.5	$ 7,239.4
Rate Revenue from Increases	-	1,405.3	1,840.5	2,303.6	2,796.2	3,320.1
Other Operating Revenues	25.0	25.2	25.4	25.6	25.8	26.0
Interest Revenues	48.0	47.0	39.8	30.3	20.6	18.7
Transfers from MERF	41.0	42.6	44.3	46.1	48.0	49.9
Total Sources	**$ 7,114.0**	**$ 8,546.3**	**$ 9,029.0**	**$ 9,537.7**	**$ 10,076.1**	**$ 10,654.0**
O&M Expense	$ 3,814.2	$ 3,966.8	$ 4,279.3	$ 4,539.6	$ 4,718.7	$ 4,904.9
General Fund Transfers	1,323.5	1,383.3	1,445.8	1,511.1	1,579.3	1,650.6
MERF Contributions	85.6	88.2	90.8	93.5	96.3	99.2
Capital Outlay	85.4	98.3	101.2	104.2	107.4	110.6
Debt Service	-	-	-	-	-	-
PAYGO Transfers	2,200.0	4,200.0	4,700.0	4,900.0	3,900.0	4,100.0
Total Uses	**$ 7,508.7**	**$ 9,736.5**	**$ 10,617.1**	**$ 11,148.4**	**$ 10,401.7**	**$ 10,865.3**
Ending Cash Balance	*$ 7,829.0*	*$ 6,638.8*	*$ 5,050.8*	*$ 3,440.0*	*$ 3,114.5*	*$ 2,903.2*

1 All numbers in thousands, slight calculation discrepancies may exist due to rounding

Revenues and Other Sources of Funds

The Division receives revenues predominantly from water rates. Less substantial sources of funds include revenues associated with operation of the system, such as late fees or the sale of water meters to new non-residential customers.

Because the majority of system customers are not metered, the Division forecasts rate revenues based on observed historical figures. Trends such as average water use by customer and volume of water billed by consumption increment (kgals) are not available without metered data. Because most customers pay the same monthly rate regardless of water use, total rate revenues do not vary significantly with changes in weather patterns or increases in rates (i.e. there is no price elasticity response).

The most recent 10-year CAGR for the Division's customer base was 1.18%. In the last three years, that same number has been 0.63%. This financial plan assumes that the system will grow at a rate of 0.75% over the forecast period, and the base rate revenue forecast reflects this assumption. To account for the fact that growth typically occurs over the course of a fiscal year, a mid-year forecasting convention is used to reduce the forecasted revenue base in FY 2016. Base rate revenues are therefore projected to grow from $7.00 million in FY 2015 to $7.24 million by FY 2020, an increase of 3.4%.

A five-year rate increase program is necessary to generate sufficient revenues to (1) keep pace with increasing operating costs, (2) fund additional operating and maintenance positions in the Division as outlined in Section 5—Operations and Maintenance, and (3) provide for the levels of PAYGO financing specified in the CIP funding plan. The proposed rate plan specifies an increase of 20% at the beginning of FY 2016, then 5% per annum increases for the next four fiscal years (FY 2017 through FY 2020).[8] With the exception of the DEQ water quality program administration fee and connection fee charges, all water rates and charges will be increased. The proposed rate plan balances the use of existing operating reserves with customer rate impacts, while ensuring the Division continues to meet financial performance targets such as minimum fund balance requirements. Figure 8-2 presents the monthly water bill for residential customers of the system from FY 2015 through FY 2020 based on the proposed rate plan.

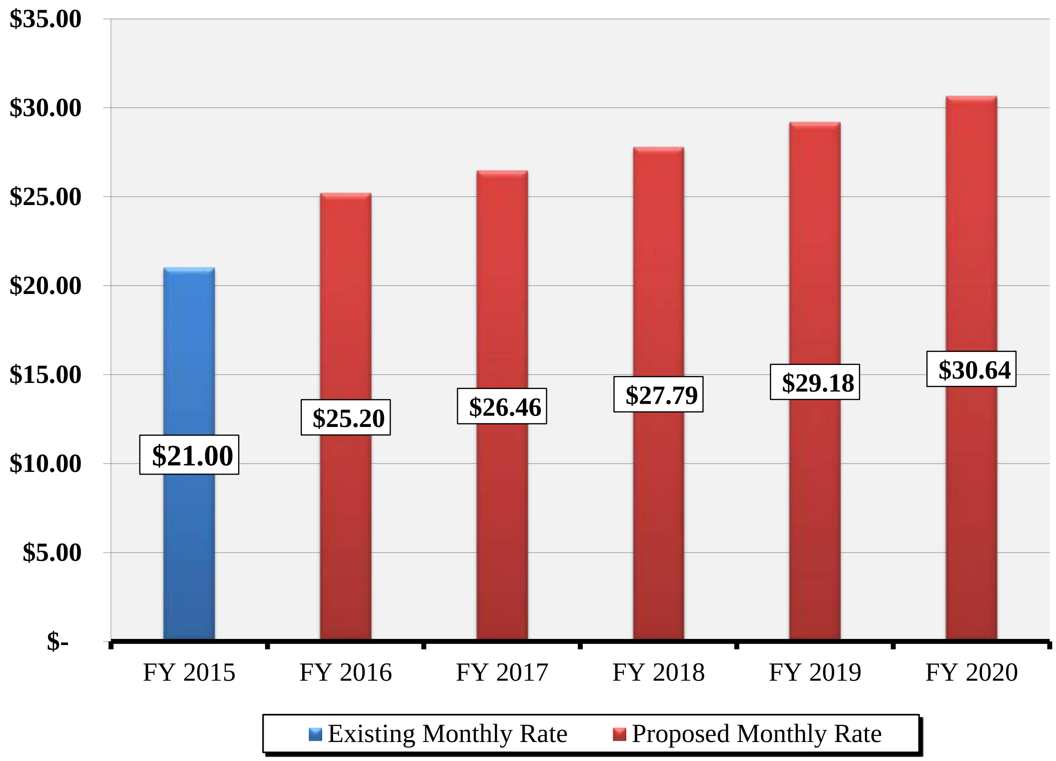
While the proposed rate plan will result in a 45.9% overall increase in the monthly flat rate paid by residential customers, the financial plan assumes that there will be no corresponding reduction in demand because only a small percentage of the Division's customers can influence the price they pay for water service.[9] The FY 2016 rate increase is therefore expected to result in an additional $1.41 million of water rate revenues in the first year of implementation. In total, the proposed rate plan should provide approximately $11.67 million

---

[8] The financial plan assumes rate increases will be implemented at the beginning of each fiscal year.
[9] Residential customers are not metered; only 10% of the Division's non-residential customers are metered and can respond to price increases by reducing consumption.

over the five-year forecast period, covering a significant portion of the capital improvement requirements.

Figure 8-2
Proposed Residential Water Rates, FY 2016 – FY 2020



Other operating revenues of the system are comprised of two different categories: sale of water meters and late fees. The sale of water meters represents revenues received from new non-residential customers that are required to have a metered connection. While these customers may purchase a meter from any retailer, the Division offers the convenience of purchasing a meter from them.[10] Customers who do not pay their water bill in a timely manner are assessed a late fee, which is the other source of operating income for the Division. Together, these two revenue items are expected to be $25,000 in the current budget year (FY 2015), a slightly lower total than the most recent 4-year historical average. Other operating revenues are expected to increase over time based on the rate of customer growth within the system assumed for financial projections (0.75%). Over the forecast period, this revenue source will provide approximately $0.15 million.[11]

[10] The Division does not profit from the sale of meters; meters are sold at the Division's cost and an offsetting expense line item is included in the O&M budget forecasts.
[11] The Division also receives a share of Miscellaneous Revenues, considered another component of Other Operating Revenues. However, this revenue source is purposely excluded from the analysis because of its highly unpredictable nature.

Fund 61, the combined water and wastewater operating fund, receives interest earnings each year based on the existing reserve balance within this fund. Interest revenues are assumed to accrue to the water and wastewater systems based on a 40/60 allocation as outlined earlier in this section. Because this revenue category can fluctuate based on market rates and other external economic forces, the base year forecast is established as the average interest earnings of the water system during the last four fiscal years, which equates to $48,000. Interest revenues are projected to vary over time based on the ending balance of the Division's unrestricted operating reserves. Because the CIP funding plan proposes to use a significant portion of the water system's reserves, the forecasted interest revenues decline over the forecast period from $48,000 in FY 2015 to $18,700 in FY 2020. This revenue source is expected to contribute a total of $0.20 million over the planning period.

The Division also receives transfers *from* the City's MERF to offset the cost of purchasing replacement vehicles. Because both the annual contribution to the MERF and the purchase costs of vehicles are included in the operating expense forecast, the flow of funds in Table 8-4 includes MERF transfers as an offsetting source of funds. The forecast of MERF transfers exactly mirrors the forecasted cost of vehicle purchases, and totals $0.27 million through FY 2020.

Largely as a result of the proposed five-year rate plan outlined above, annual water rate revenues are forecast to increase slightly more than 50%, from $7.00 million in FY 2015 to $10.56 million in FY 2020. Total operating revenues (excluding transfers from MERF) are forecasted to increase from $7.07 million to $10.60 million. In FY 2020, the Division's sources of funds will be comprised of rate revenues (99.11%), other operating revenues (0.24%), interest revenues (0.18%), and transfers from MERF (0.47%).

Expenses and Other Uses of Funds

The Division's total budgeted expenses are $5.31 million in FY 2015 and constitute the primary use of funds. Expenditures are grouped into various categories for forecasting purposes, including: O&M Expense, General Fund Transfers, MERF Contributions, and Capital Outlay.

O&M expenses are comprised of personnel costs (such as salaries and wages, overtime, and employee benefits), operational and administrative supplies, repair and maintenance costs, professional services, and office expenses, among others. O&M expense has increased significantly over the last four fiscal years, averaging a CAGR of more than 9.8%. Much of this increase can be attributed to more proactive efforts to enhance preventive maintenance activities, but two specific operational changes are also significant contributing factors to the cost increase. First, expenditures have increased to include the installation of meter pits on service line replacements as required by new state regulations. Second, policy changes requiring specialized backfill when patching street cuts from water line improvements has increased expenditures.

For forecasting purposes, the financial plan assumes that the O&M cost category will increase at 4.0% per year to account for the increasing cost of employee benefits as well as utility costs that often out-pace the inflation rate. The O&M expense forecast also includes incremental personnel costs that recognize additional Division staffing needs identified in Section 5. Fully loaded labor estimates (salary and fringe) for two O&M staff have been added to the forecast in FY 2017 ($153,800), and another $90,700 added to the forecast in FY 2018 to represent the hiring of a third Division employee.[12] As with other O&M expenses, incremental personnel expense is escalated at 4.0% per annum across the forecast period. Total O&M expense is projected to increase 28.6%, from $3.81 million in FY 2015 to $4.90 million in FY 2020.

Transfers to the General Fund are based on the Division's share of direct costs for services from other City Divisions, including Engineering, Billings and Collections, and GIS. Transfers also include indirect cost allocations for the Division's share of Public Works Department administration costs and general City administration expense. This expense category also includes payments in lieu of taxes (PILOT) and the Division's share of costs for projects implemented by other City Divisions. The majority of costs within the General Fund Transfers category are established as an allocated percentage of other City Divisions. As a result, these costs have remained relatively stable over the historical period, growing at an annual compounded rate of 4.5%. The financial plan assumes that these costs will grow over time at that same rate, increasing from $1.32 million in FY 2015 to $1.65 million in FY 2020 (24.7%).

Contributions to the MERF are expected to increase 3.0% per year, from a budgeted estimate for the current fiscal year of $85,600 to $99,200 by FY 2020. As explained earlier in this section, this cost category represents the annual contributions to the MERF for replacement vehicle purchases—the purchases themselves are budgeted within the Capital Outlay cost category.

The Capital Outlay expense category includes equipment purchases, software programs, and vehicle purchases. This category *does not* include major capital improvement expenditures like those outlined in Section 7. Historical cost levels of this category have fluctuated significantly as a result of the variable nature of vehicle purchases. The budget estimate for the current fiscal year is $85,400, and the average cost over the last four fiscal years has been $77,600. To reflect the Division's share of anticipated costs for the City's new billing software, the forecasting basis for this category was increased to $98,300 in FY 2016. Capital Outlay expense is escalated at 3.0% per year over the forecast period.

Total budgeted expenses of the system will increase 27.4% over the forecast period, from $5.31 million in FY 2015 to $6.77 million in FY 2020. The aggressive escalation of some cost categories represents a conservative approach to the forecasted financial performance of the Division. In FY 2020, the composition of forecasted expenses will include O&M

[12] Cost estimates were provided by the Division in current dollars, then converted to nominal dollars based on the timing of new hires and a 4.0% escalation rate for this cost category.

Expense (72.5%), General Fund Transfers (24.4%), MERF Contributions (1.5%), and Capital Outlay (1.6%).

Equity Financing of Capital (PAYGO)

As indicated in Table 8-3, the Division's five-year financing plan assumes that $24.00 million will be drawn from the Division's operating revenues ($18.68 million) and existing operating reserves ($5.32 million) to fund the capital program. The combined equity financing amounts vary based on the capital project requirements and the projected performance of the operating fund (Fund 61), but are expected to range between $2.20 million and $4.90 million over the forecast period as shown in Table 8-4. The specified PAYGO transfers are enabled by the proposed rate plan, which will significantly increase the net operating revenues of the system.[13] As a result of the proposed FY 2016 rate increase of 20%, net operating revenues of the system increase from $1.81 million in FY 2015 to $3.01 million in FY 2016. By the end of the forecast period, net operating revenues reach $3.89 million.

Fund Balances

The City's policy is to maintain at least enough cash reserves to equal approximately three months of budgeted expenditures (approximately $1.33 million) to provide adequate working capital for the Division's operations and to respond to any unforeseen emergencies. Despite a plan to equity finance $24.00 million of CIP over the forecast period, the projected ending cash balance for the Division's operating fund far exceeds the minimum requirement. As previously shown in Table 8-4, the projected ending balance for Fund 61 ranges from $7.83 million in FY 2015 to $2.90 million in FY 2020.

Table 8-5 presents the flow of funds for Fund 44, the fund used to track revenues from water connection fees assessed to new customers. As outlined earlier in this section, these revenues must be used to pay for growth-related infrastructure such as new wells, new water mains, or additional service capacity within the system. The balance of Fund 44 was $1.72 million as of the beginning of FY 2015. Annual connection fee revenues are projected to be $200,000 per year and increase at a rate of 3.0% per year. The proposed capital funding plan calls for annual transfers of $450,000 per year beginning in FY 2016, which will reduce the ending balance of Fund 44 to $0.69 million by FY 2020.

[13] Net operating revenues are defined as the operating revenues of the system minus total operating expenses (including any debt service payments). The annual MERF contribution is included because the offsetting expense is part of forecasted operating expenses. PAYGO is excluded from the calculation, since these transfers represent the use of net operating revenues to pay for the capital program.

Table 8-5
Projected Sources and Uses of Cash, Fund 44[1]

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Beginning Cash Balance	*$ 1,721.7*	*$ 1,921.7*	*$ 1,673.2*	*$ 1,426.2*	*$ 1,180.7*	*$ 936.8*
Annual Revenues	200.0	201.5	203.0	204.5	206.1	207.6
Transfers for Capital Projects	-	450.0	450.0	450.0	450.0	450.0
Ending Cash Balance	*$ 1,921.7*	*$ 1,673.2*	*$ 1,426.2*	*$ 1,180.7*	*$ 936.8*	*$ 694.4*

1 All numbers in thousands, slight calculation discrepancies may exist due to rounding

Drawing down of both Fund 61 and Fund 44 balances enables financing of the Division's capital program without issuance of long-term debt or implementation of more significant near-term rate increases. Despite the reliance on reserves from these funds to pay for the capital program, fund balances will continue to exceed established performance targets.

Funding Plan for the Extended Forecast Period

The financial analysis presented in this section has focused on a six-year forecast period—the current budget year plus a five-year planning horizon. However, Section 7 identifies a number of capital projects beyond FY 2020, including additional well, booster station and reservoir upgrades, fire-flow improvements, and other pipeline projects. Projects from FY 2021 through FY 2035 (the final year of the extended forecast period) total $60.09 million in current dollars, or just more than $4.0 million per year, on average, over the 15-year period.[14] After applying a 2.5% per annum escalation factor, the nominal dollar total is expected to be $81.28 million.

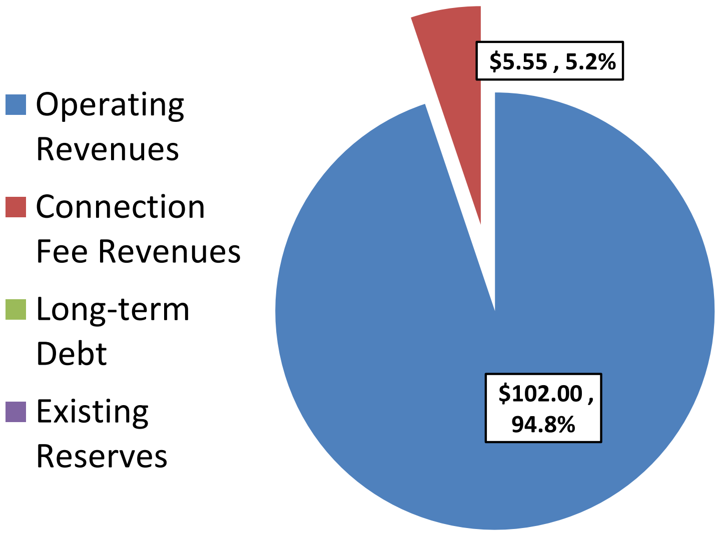
Developing detailed funding plans too far into the future isn't always practical, since changes to operating procedures, system development plans, and other economic factors can significantly affect the prospective capital plan. However, it is still a worthwhile exercise to estimate feasible amounts from potential CIP funding sources and gauge the corresponding rate impacts associated with a long-term funding plan.

Figure 8-3 presents a funding summary based on total CIP requirements of $107.48 million over the extended forecast horizon ($26.20 million from FY 2015 through FY 2020, and $81.28 million from FY 2021 through FY 20135). Under this financing plan, the Division continues to rely heavily on PAYGO transfers to fund the capital program ($102.00 million, 94.8%) and connection fee revenues ($5.55 million, 5.2%). While the Division expects to use existing operating reserves through the early part of the extended forecast period (as outlined

[14] This level of expenditures does not fully fund a 100-year useful life replacement schedule for the City's pipelines, as recommended in Section 7.

earlier), the funding plan anticipates rebuilding the Fund 61 balance over time and eventually restoring it to previous levels.[15]

Figure 8-3
Proposed Funding Plan, FY 2015 – FY 2035



Revenue and expense forecast assumptions for the extended forecast period do not vary from those presented earlier in this section. Customer growth, for financial purposes, is assumed to be 0.75% per year, while operating expenditures continue to grow between 3.0% and 4.5% per year depending on the nature of the expense.

In order to generate sufficient operating revenues for the PAYGO transfer requirements, rate increases beyond the proposed five-year rate plan are necessary. The prospective capital program will require 3.9% rate increases for the subsequent five-year period (FY 2021 through FY 2025) and 3.0% rate increases for the final ten-year period (FY 2026 through FY 2035). The additional rate increases will generate approximately $56.08 million over the extended forecast period[16], and PAYGO transfers will average $5.20 million per year and total $78.00 million between FY 2021 and FY 2035.

Annual transfers from Fund 44 (connection fee revenues) will increase slightly to $220,000, essentially the equivalent of the revenues the Division receives each year from this funding source. The ending balance of Fund 44 in FY 2035 is projected to be $0.70 million, only nominally higher than the balance at the end of the initial planning horizon. Connection fee revenues will provide $3.30 million for the capital funding plan from FY 2021 through FY 2035.

---

[15] The ending balance of Fund 61 in FY 2035 is projected to be $9.48 million, slightly higher than the $8.22 million beginning fund balance in FY 2015.
[16] This estimate represents incremental revenues expected from rate increases implemented in FY 2021 and beyond and is in addition to the incremental revenues generated from the proposed FY 2016 to FY 2020 rate plan.

Conclusions and Recommendations

This financial analysis has presented forecasts of revenues, expenses, and fund performance between FY 2015 and FY 2020 to indicate the financial feasibility of the Division's proposed capital improvement plan, including incremental operation and maintenance requirements and renewal and rehabilitation needs of select system assets (including annual pipeline replacement).

The historical and forecasted financial performance of the system is summarized as follows:

- In the absence of rate increases, net operating revenues of the system have steadily declined over the last five fiscal years as operating expenses continue to increase.
- The City's existing rates and charges for water service are among the lowest in southeastern Idaho, and low compared to cities of similar size in the greater intermountain region.
- Total system revenues, including transfers from MERF, are forecasted to increase 49.8%, from $7.11 million to $10.65 million between FY 2015 and FY 2020.
- The Division's total operating expenditures—including O&M expense (both baseline and incremental costs), General Fund Transfers, MERF Contributions, and Capital Outlay—will increase 27.4%, from $5.31 million in FY 2015 to $6.77 million in FY 2020.
- The Division's CIP reflects priority needs of the system and, after adjusting for inflation, is expected to require expenditures of $26.20 million between FY 2015 and FY 2020. These capital projects will be funded with current operating revenues ($18.68 million, 71.2%), connection fee revenues ($2.25 million, 8.6%), and system operating reserves ($5.32 million, 20.3%).
- Revenue growth and corresponding PAYGO financing of the capital program is made possible by a proposed five-year rate plan that specifies a 20% increase at the beginning of FY 2016 followed by annual 5% increases from FY 2017 through FY 2020.
- The strong financial position of the Division, evidenced by substantial available reserves in Fund 61 and Fund 44, enables financing of the Division's capital program without reliance on future debt issues or implementation of more significant near-term rate increases.
- The Division is able to fully restore the operating reserves of Fund 61 and fund an additional $81.28 million in capital projects over the extended forecast period (FY 2021 through FY 2035) with implementation of annual rate increases at or slightly above the anticipated rate of inflation.

As the Division prepares to implement the proposed capital improvement plan and corresponding FY 2016 rate increase, the following steps are recommended:

1. As summarized earlier in this section, the capital funding plan will require a combination of current operating revenues (PAYGO transfers), Fund 61 reserves, annual connection fee revenues, and Fund 44 reserves. Currently, the Division must budget projects within separate funds to take advantage of multiple funding sources in a single fiscal year. Also, budgeted capital spending must conclude before the end of the fiscal year or funds automatically revert back to the reserve balance. It is recommended that the Division establish a new Capital Projects fund to consolidate project budgeting and capital expenditures. This action will facilitate the integration and year-to-year rollover of available funds from multiple sources, enable spending over multiple fiscal years for larger, more complex projects, and increase transparency for the Division's capital program.

2. This financial plan assumes that connection fees charged to new customers remain at existing levels over the forecast period. However, the Division should evaluate the existing fee methodology and determine whether an increase to the connection fee is justified given the magnitude of planned capital expenditures outlined in this report. An increase to the water connection fee would necessarily reduce the funding requirements from PAYGO transfers, although the near-term impact may not be significant in light of the ratio of this funding source to total capital project requirements.

3. Following sound financial planning principles, the forecasts of financial performance in this report are presented with as much accuracy as possible but are generally conservative in nature (i.e., forecasted revenues err on the low side of potential results and estimates of future expenses tend to the high side). The financing plan incorporates the best available system information at this time, but the Division should review the plan on a regular basis to determine whether adjustments are necessary. In particular, actual financial performance should be compared to projected financial performance—and corresponding revenue and expense forecasts updated—to evaluate potential changes in the capital funding plan, including adjustments to the proposed five-year rate plan.

Murray, Smith & Associates, Inc.
Engineers/Planners

SECTION 9

Financial Impact of City-Wide Meter Implementation

SECTION 9
FINANCIAL IMPACTS OF CITY-WIDE METER IMPLEMENTATION

Introduction

As a separate component of the financial analysis of the water system, the City of Idaho Falls (City) requested that the project team evaluate the financial feasibility of City-wide meter installation. This section presents a summary of that analysis, including demand reduction assumptions based on customers' response to volumetric pricing, the potential costs of installing meters across the existing customer base, and potential capital projects within the 20-year forecast horizon that may be deferred as a result of decreased system production requirements. Other implementation assumptions, such as the timing and duration of the meter installation program, are also identified. Finally, the proposed funding plan and potential rate impacts of City-wide meter installation are summarized.

This analysis represents an attempt to estimate the potential financial impacts associated with meter installation throughout the City. The results of the analysis rely heavily on a single input—the estimated cost of program implementation. To the extent that actual program costs differ from those estimated for this analysis, the financial impacts outlined in this section could vary substantially.

The conceptual costs of meter installation represent capital project requirements in addition to those already outlined in Section 7—Capital Improvement Program (CIP). This analysis therefore presents the estimated financial impacts under a scenario in which the Water Division (Division) implements the recommended capital program and installs meters. The information presented in this section should not be interpreted as a recommendation to implement a City-wide metering program. Instead, an estimate of the potential rate impacts associated with such a scenario is offered as a single data point along an array of potential implementation options. Policymakers must ultimately identify feasible options, weigh the advantages and disadvantages of each, and determine the most beneficial course of action for the City.

Demand Impacts of Metering

As discussed in Appendix A, one of the conservation tools that can have the greatest impact on customer demand is the installation of meters and subsequent implementation of a volumetric rate. Conservation education programs are beneficial, but will not yield the type of results associated with established financial incentives. Customers that must pay for the amount of water they use naturally respond to such price signals by decreasing both indoor and outdoor water consumption to reduce their water bill. Implementation of a City-wide metering program would likely result in a significant decrease in water demand throughout the system.

The actual demand reduction impact associated with such a program is difficult to predict, and will vary based on many factors including how quickly the program is implemented and the proposed volumetric rate structure. For example, an inclining block rate structure—which charges higher volumetric rates for higher incremental levels of monthly water use—can result in substantially lower demand. A metering program implemented over a shorter time period will yield results sooner than one that is gradually implemented over time (such as converting neighborhoods or other sections of the City one at a time).

A review of water studies and other relevant literature was conducted to estimate the potential for demand reduction associated with metering. Examples of such studies include scholars or other water professionals that have attempted to quantify the demand impacts of meter implementation, comparisons of water use among metered and unmetered customers within the same geographic region, and analyses of demand data for previously unmetered communities that had converted to meters. The results of the literature review are summarized in Table 9-1.

The literature review acknowledges the wide variations in reduced water demand, with both estimated and actual average day demand (ADD) reduction ranging from 15% to 60%. Fewer studies make reference to peak day demands—an important input for the capital planning process. However, for those that did, reported peak or seasonal demand reduction numbers were estimated between 40% and 50%.

Studies of communities or other customer groups that have installed water meters also indicated that demand impacts occur soon after customers are subjected to any type of rate structure that requires payment per water increment used. The studies also observed that the initial decrease in customer demand was sustained over time, representing a permanent change in customers' water usage habits rather than a one-time reaction to higher water bills.

Based on the results of the literature review and subsequent discussions with the Division, it was decided that the City's metering analysis would assume a 30% reduction in ADD and a 40% reduction in peak day demand.

Table 9-1
Literature Search: Water Demand Impacts of Meter Installation

Author(s)	Title	Conclusion
Howe and Linaweaver	***The Impact of Price on Residential Water Demand and its Relation to System Design and Pricing Structure***	After controlling for income, climate, market value of dwelling, age of dwelling, price, quantity consumed, and marginal commodity charge, the average use per non-metered dwelling was 692 gallons per day and 458 gallons per day for a metered dwelling (reduction of 34%); authors studied various flat rate and metered customers across the country, but climate and other factors were controlled to produce the results;
Hanke	***Demand for Water Under Dynamic Conditions***	Time series data from Boulder, CO between 1956 to 1958; determined that initial demand reduction was 36% for the first year metering was deployed and remained stable thereafter;
Walters and Young	***Economic Factors Affecting Residential Water Demand in Colorado***	Study included Colorado communities presented in AWWA's Annual Utility Reporting Data, 1980; authors also mailed survey to utilties in 6 great basin and desert states; 18 of 66 data points (returned and completed surveys) were from non-metered utilities even though AWWA more utilities were non-metered; average use per non-metered household was 27,176, while metered household was 11,543 gallons-- reduction of 58%;
Alliance for Water Efficiency	***Metering Introduction (part of Resource Library shown on web)***	Unmetered water consumption is reduced 15 to 30% when metering and commodity rates are implemented, as measured recently by utilities (source data not provided);
Acres Consulting Services Ltd	***City of Calgary Water Conservation Study***	Provides range of 25-50% average demand reduction; average metered per capita (liters per day) across major metropolitan providers = 500, same number was 755 for unmetered customers (references several canadian service providers); max day demand is almost half (48% reduction), and max hour is 42% reduction for metered customers;
SPUR (San Francisco Planning and Urban Research)	***Bringing Water Consumption down as the Drought Heats Up (web)***	Communities without water meters use 39% more than the state-wide average;
Walski	***Advanced Water Distribution Modeling and Management***	Approximate 50% reduction (106 to 211 gallons per capita per day for unmetered use), cites a 1979 Metcalf and Eddy study
Bishop and Weber	***Impacts of Metering, A Case Study at Denver Water***	Cites average annual demand reduction of 28 percent, peak seasonal reduction of 38 percent

Conceptual Costs of Meter Installation

A conceptual cost estimate of City-wide meter installation was developed in order to estimate the potential financial impacts of the program. The cost estimate was prepared in accordance with the guidelines of AACE International (formerly the Association for the Advancement of Cost Engineering International) and is based on average costs from City input and information provided by local suppliers.[1]

[1] Appendix G provides additional detail related to the development of the conceptual cost estimate.

The cost estimate is categorized as Class 5 and represents planning-level accuracy and opinions of costs (+50%, -30%). Specifics of design including project scope and specific information (e.g., number and size of service meters) should be verified during a more detailed investigation of project requirements. The final cost will depend on actual labor and material costs, site conditions, competitive market conditions, regulatory requirements, project schedule, and other factors.

Construction Costs

Specific costs were identified based on the assumed service line diameter (and corresponding meter size) of various customer classes. Cost components include construction costs and a contingency factor to account for any unanticipated components of the project. For all meter installations, the construction cost is assumed to include excavation, backfill and related materials, costs related to the disposal of waste material, and surface restoration costs. Costs also include the insulation and construction of the meter pit, the meter itself, automated metering endpoint, and meter testing (among others). The cost estimate does not include costs to replace corroded service lines that will not allow a water-tight connection when the new meter is installed. In some cases, service line replacement will be necessary and construction costs of the program will increase.

Cost Allowances

Additional construction cost allowances, briefly summarized in Table 9-2, were also added to the cost estimates. These allowances include traffic control, erosion control, contractor overhead and profit, mobilization, and contingency.

Table 9-2
Additional Construction Costs

Additional Cost Factor	Percent
Traffic Control	0.1%
Erosion Control	1.0%
Contractor Overhead and Profit	10.0%
Mobilization	10.0%
Contingency	30.0%

Minor traffic control will be required from time to time while installing water meters. The cost and level of traffic control should be evaluated on a case-by-case basis for each meter installation. For planning purposes, the cost of traffic control is estimated at 0.1% for all installation. The traffic control mark-up accounts for the cost of signage, flagging and temporary barriers, pavement markings, lane delineators, and lighting at flagging locations.

While each water meter installation is small in area, the combined excavation area for all locations will be significant. Depending on the way the project is phased, Erosion and

Sediment Control Plans or Stormwater Pollution Prevention Plans may be necessary. For planning purposes, erosion control is estimated at 1% of the construction costs. Erosion control mark-up accounts for materials and practices to protect adjacent property, stormwater systems, and surface water in accordance with regulatory requirements.

Other allowances include a 10% mark-up for the contractor's indirect project costs and anticipated profit; a 10% mobilization mark-up for the cost of the contractor's administrative and direct expenses to mobilize equipment, materials and labor to the work site; and a 30% increase to account for uncertainties inherent in planning-level estimates.

Cost Summary

Based on the methodology described above, fully loaded cost estimates were developed for installation of 1-inch and 2-inch meters. The cost of each meter installation was applied to the number of unmetered customers within each class. The majority of residential customers, located both inside and outside the City, are serviced with a 1-inch line and will require installation of a 1-inch meter. The costs for meter pit development were tracked separately for this service line size, since a small number of residential customers already have a meter pit. The cost for those without meter pits is approximately $3,000, while the cost to install a meter if the customer already has a meter pit is $450.[2]

Most commercial customers, as well as residential apartments, will require a 2-inch meter.[3] The approximate cost for installation is $8,500. Table 9-3 summarizes the cost of meter installation by customer class, including a total conceptual cost estimate of $77.68 million in current dollars.

Table 9-3
Conceptual Cost Estimate for Meter Installation

Water Account	Number of Billed Accounts	Meters to be Installed	Service Size	Unit Cost	Total Construction Cost
Residential House	17,374				
(with meter pit already installed)	575	575	1-inch	$450	$258,750
(without meter pit)	16,799	16,799		$3,000	$50,397,000
Residential Apartments	4,137	1,035	2-inch	$8,500	$8,797,500
Commercial	2,079	2,079	2-inch	$8,500	$17,671,500
Outside City Limits	185	185	1-inch	$3,000	$555,000
Metered Accounts	247	0	2-inch	-	-
Total	**24,022**	**20,673**	**-**	**-**	**$77,680,000**

[2] This analysis assumes that the City would increase hook-up fees to recover the cost of meter installation directly from new customers that request water service, so the conceptual cost estimate only includes costs to convert existing customers.
[3] Based on feedback from the City, the analysis assumes that a 2-inch master meter will serve 4 apartment units.

Program Implementation Assumptions

To estimate the timing and magnitude of demand reduction over the forecast period and corresponding adjustments to the capital plan, various assumptions must be made regarding the start date and duration of program implementation. After discussions with Division staff, it was determined that the analysis should reflect a 10-year program implementation period beginning in fiscal year (FY) 2016.[4] Installing meters for customers of various types throughout the City will be a complex and time-consuming process. Under the assumed timeline, the City will spend $7.77 million per year for the program (in current dollars). After applying a 2.5% annual escalation factor, the meter program is expected to cost $87.03 million. A more aggressive implementation timeline was not considered feasible, given the scale of other high-priority capital expenditures.

The analysis also assumes that customers will be converted to a uniform volumetric rate one year after meters are installed at their home or place of business. A uniform volumetric rate structure means that customers pay the same rate for each thousand gallons (kgals) of water used. Under this scenario, the Division would anticipate developing a communication program that would educate customers about water use and deliver a "hypothetical water bill" that reflects the cost of service under the volumetric rate structure during the first year metered data is available. This process would allow customers to view the bill for metered service and anticipate the financial impacts before they begin paying the volumetric rate at the beginning of the second year.

Together, these assumptions dictate the pace and schedule of anticipated system demand reductions. Because of the one-year lag period for volumetric rate billing, it is assumed that the first demand reductions will be realized in FY 2017 (the second year of program implementation) as the first 10% of customers begin paying based on metered water use. In each corresponding year of implementation, system demand will be reduced as more customers are converted to meters. The resulting ADD and peak demand reduction schedule is summarized in Table 9-4.

Table 9-4
Estimated Demand Reduction

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
Program Implementation	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Customers Converted	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	
ADD Reduction		-3%	-6%	-9%	-12%	-15%	-18%	-21%	-24%	-27%	-30%
Peak Demand Reduction		-4%	-8%	-12%	-16%	-20%	-24%	-28%	-32%	-36%	-40%

[4] While the City will likely need more time to prepare for program execution (including implementation of new billing software selected in May 2015 to enable volumetric water pricing), this assumption facilitates an estimate of near-term financial impacts associated with metering (whenever it may begin).

Not only would existing customers receive a meter, but all new customers connecting to the system would be required to install a meter as well. By the end of FY 2020, ADD is expected to decrease by 12%, while peak demand will decrease 16%. Total demand reductions will be realized at the end of FY 2026, the eleventh year of the 20-year forecast horizon, when ADD is reduced by 30% and peak demand is reduced 40%. Under these assumptions, ADD increases from 26.7 mgd in FY 2015 to 29.1 mgd by FY 2035. Peak day and hour demand would actually be less in 20 years than current peak demands, as discussed in Section 3—Population and Demand Projections.

Capital Planning Adjustments

Due to the time required to transition all customer accounts to meters and realize reductions in system demand, capital projects between FY 2016 and FY 2020 to meet demand and other system requirements are still required. Moreover, projects that will improve the condition at existing facilities and pipeline projects needed to serve new areas of the system, convey supply throughout the system, and address fire flow are still needed through the 20-year horizon as described in Section 7. However, as the reduction in demand declines more significantly between FY 2021 and FY 2026, various projects designed to increase the capacity of the system—including new supply and pumping facilities—can be deferred.

Based on the reduced demand projections of a City-wide meter installation scenario, the existing 20-year instantaneous water rights, storage, and system pumping requirements described in Section 4—Distribution and Supply Analysis, would be sufficient over the 20-year timeframe. As a result, five facilities projects recommended as part of the capital program could be deferred beyond FY 2035. These projects include the construction of three new well facilities and associated reservoirs, booster stations, and requisite piping (Projects F-13, F-14, and F-18), as well as two projects that increase booster pumping capacity at already constructed facilities (Projects F-15 and F-17). Deferring these facility projects beyond the 20-year horizon reduces the cost of capital improvements for the FY 2021 to FY 2035 planning period by $15.80 million in current dollars ($21.37 million in nominal dollars).

The capital program outlined in Section 7 also specifies expenditures of $250,000 per year towards incremental water meter installation that would not be needed if a full-scale metering program was funded. Removal of this capital project results in current dollar savings of $5.00 million over the 20-year period ($6.39 million in nominal dollar savings).

Total capital expenditures either deferred beyond the 20-year forecast period or eliminated altogether is $20.80 million in current dollars ($27.76 million in nominal dollars).

Proposed Funding Plan and Rate Impacts of Metering

The financial impacts of the metering program have been estimated using a financial planning model designed to represent utility cash flows under alternative assumptions related to revenue generation, operations and maintenance expenses, and financing structures for capital investment. Assumptions related to revenue and operating expense forecasts do not vary from those presented in Section 8—Financial Plan, with the exception of the rate increases required to fund the additional capital requirements associated with meter installation.

The net impact of a City-wide metering program on projected capital expenditures is an increase of $59.27 million over the 20-year forecast period (a program cost of $87.03 million and project deferrals of $27.76 million).[5] Over the initial planning horizon, the metering program causes net capital project expenditures to increase to $65.72 million. Table 9-5 identifies the annual CIP and matching sources of funds for this time period—FY 2015 through FY 2020.

Table 9-5
Capital Program Sources and Uses of Funds with Metering[1]

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	TOTAL	Percent
Projected Capital Expenditures	**$ 2.12**	**$ 12.23**	**$ 12.79**	**$ 13.24**	**$ 12.52**	**$ 12.81**	**$ 65.72**	**100.0%**
Operating Revenues[2]	1.81	-	-	-	9.00	11.85	22.65	34.5%
Connection Fee Revenues[3]	-	0.45	0.45	0.45	0.45	0.45	2.25	3.4%
Long-term Debt[4]	-	40.00	-	-	-	-	40.00	60.8%
Existing Reserves[5]	0.39	-	-	-	-	0.45	0.85	1.3%
Used (Unused) Balance[6]	(0.08)	(28.22)	12.34	12.79	3.07	0.06	(0.03)	
Total Funds	**$ 2.12**	**$ 12.23**	**$ 12.79**	**$ 13.24**	**$ 12.52**	**$ 12.81**	**$ 65.72**	**100.0%**

1 All numbers in millions, slight calculation discrepancies may exist due to rounding
2 Includes increased rate revenues associated with proposed rate adjustments
3 Represents transfers from the Division's Fund 44 (Connection Fees) to pay for qualifying capital improvement projects
4 Anticipated issuance of low-interest, State Revolving Fund (SRF) loan to support the meter installation program
5 Represents existing operating reserves of the Division that may be used for ongoing and future CIP projects
6 After using funds from various sources for the CIP, approximately $30,000 will remain (unused balance) to fund future projects

Projected capital expenditures will be funded through four sources: rate revenues (34.5%), connection fee revenues (3.4%), long-term debt (60.8%), and existing reserves (1.3%). The addition of debt as a majority funding source is one of the primary differences compared to the financing plan without meter installation presented in Section 8. The addition of debt also allows the Division to minimize the use of existing reserves, which constitute less than $1.00 million of the combined funding total under this scenario.

Long-Term Debt

Without some form of borrowing, the City would not be able to finance the meter program *and* the capital improvement requirements identified in Section 7. This analysis assumes that the Division will have access to low-interest State Revolving Fund (SRF) loans to support

[5] All figures quoted in nominal dollars.

funding of the meter program. The terms of this financing instrument are assumed to be similar to the loan recently secured for the City's wastewater system: a 20 year term, 0.75% interest, and a 1.00% annual administrative fee.[6] Costs of issuance equal to 0.50% of proceeds, as well as a funded reserve equal to one year's payment, are added to establish the par amount of the loan.[7]

Debt issuances of $40.00 million in FY 2016 and $25.0 million in FY 2021 are required to provide adequate funding amounts for the capital program. Based on the financing assumptions outlined earlier, the corresponding par amounts of each loan are $42.59 million and $26.62 million, respectively. It is assumed that proceeds would be received at the beginning of each specified fiscal year, and that annual debt service payments would begin the year in which proceeds are received. The annual debt service payment is projected to be $2.54 million on the first debt issuance and $1.59 million on the second debt issuance.

Forecasted Operating Results

In order to demonstrate the full financial impact of the meter installation program, Table 9-6 presents the cash flow forecasts for the Division's operating fund (Fund 61) for a ten-year planning increment (through FY 2025). The financial plan was developed to ensure compliance with the City's financial policies and provide for funding of the CIP—including the conceptual costs of metering.

Annual rate increases of 20% are required from FY 2016 to FY 2020 in order to support the debt service payments associated with the Division's anticipated SRF loans and fund the capital program. These rate increases will provide $28.20 million in additional operating revenues through FY 2020, and $55.10 million from FY 2021 through FY 2025. The equivalent water bill for a residential customer will increase from $21.00 to $52.26 by FY 2020, an increase of 148.9%.[8,9] The proposed FY 2020 residential bill under this plan is similar to the projected $49.98 residential water bill in FY 2035 under the financing scenario outlined in Section 8. Under a metering scenario, however, customers would be subject to the higher bill 15 years earlier, thereby generating a significant amount of additional rate revenues much earlier in the forecast period. *Because of this, rate increases beyond FY 2020 are not necessary under the metering scenario*.

[6] Under the terms of the existing wastewater loan, the administrative fee is combined with the interest rate to create an effective 1.75% total annual cost of borrowing.
[7] The par amount is the total amount of the loan, and includes not only proceeds from the loan, but also issuance costs and the funded reserve.
[8] While the combined nominal increase is 100% over the five-year period, the compounding effects of a multi-year rate increase schedule result in the higher overall increase.
[9] The metering analysis described in this section assumes a revised rate structure (including a monthly base charge and volumetric rate) will be implemented as customers receive metered water service. Although monthly consumption data is not available, this analysis assumes that the new rates will be revenue-neutral; that is, structured to result in a similar monthly bill for the Division's customers and provide for existing levels of revenue recovery.

The revised rate plan provides for adequate revenues to support the debt service on both debt issuances and fund the remainder of capital project requirements after the meter installation program is complete (FY 2026 through FY 2035). In fact, the ending operating fund balance in the final year of the extended forecast period is projected to be $20.81 million, more than twice the current available reserve balance. If predicted financial performance is realized under this scenario, the Division may want to consider a reduction in rates after implementation of the metering program is complete.

With the exception of additional rate revenues from the revised five-year rate plan, all other revenue and expense forecasts summarized in Table 9-6 are the same as those presented in Section 8 of this report. Debt service payments begin in FY 2016 when the first SRF loan is secured, and increase again in FY 2021 when the second SRF loan is issued. PAYGO transfers, totaling $59.70 million between FY 2015 and FY 2025, are generally needed as proceeds from each loan issuance are depleted over the forecast period. The ending fund balance of Fund 61 is projected to be $5.32 million at the end of FY 2025, well above minimum balance targets established by the City.

In FY 2025, total sources of funds available to the system are projected to be $18.86 million, with water rate revenues accounting for more than 99.1 percent of this total. Total revenue requirements of $12.38 million are expected to be comprised of O&M expense (48.1%), General Fund Transfers (16.6%), other costs (1.9%), and annual debt service (33.4%). Annual net operating revenues of the system—excluding PAYGO transfers—are projected to be $6.47 million.

Table 9-6
Projected Sources and Uses of Cash, Fund 61, FY 2015-FY 2025[1]

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
Beginning Cash Balance	*$ 8,223.7*	*$ 7,829.0*	*$ 8,296.7*	*$ 10,150.7*	*$ 13,816.9*	*$ 10,829.7*	*$ 7,377.1*	*$ 14,478.0*	*$ 21,474.3*	*$ 17,554.8*	*$ 11,743.1*
Water Rate Revenue	$ 7,000.0	$ 7,026.3	$ 7,078.9	$ 7,132.0	$ 7,185.5	$ 7,239.4	$ 7,293.7	$ 7,348.4	$ 7,403.5	$ 7,459.1	$ 7,515.0
Rate Revenue from Increases	-	1,405.3	3,114.7	5,192.1	7,714.4	10,774.6	10,855.4	10,936.8	11,018.8	11,101.5	11,184.7
Other Operating Revenues	25.0	25.2	25.4	25.6	25.8	26.0	26.1	26.3	26.5	26.7	26.9
Interest Revenues	48.0	47.0	49.8	60.9	82.9	65.0	44.3	86.9	128.8	105.3	70.5
Transfers from MERF	41.0	42.6	44.3	46.1	48.0	49.9	51.9	54.0	56.1	58.4	60.7
Total Sources	**$ 7,114.0**	**$ 8,546.3**	**$ 10,313.2**	**$ 12,456.8**	**$ 15,056.5**	**$ 18,154.8**	**$ 18,271.4**	**$ 18,452.4**	**$ 18,633.9**	**$ 18,750.9**	**$ 18,857.8**
O&M Expense	$ 3,814.2	$ 3,966.8	$ 4,279.3	$ 4,539.6	$ 4,718.7	$ 4,904.9	$ 5,098.4	$ 5,299.6	$ 5,508.8	$ 5,726.3	$ 5,952.4
General Fund Transfers	1,323.5	1,383.3	1,445.8	1,511.1	1,579.3	1,650.6	1,725.1	1,802.9	1,884.3	1,969.3	2,058.1
MERF Contributions	85.6	88.2	90.8	93.5	96.3	99.2	102.2	105.3	108.4	111.7	115.0
Capital Outlay	85.4	98.3	101.2	104.2	107.4	110.6	113.9	117.3	120.9	124.5	128.2
Debt Service	-	2,542.1	2,542.1	2,542.1	2,542.1	2,542.1	4,130.9	4,130.9	4,130.9	4,130.9	4,130.9
PAYGO Transfers	2,200.0	-	-	-	9,000.0	12,300.0	-	-	10,800.0	12,500.0	12,900.0
Total Uses	**$ 7,508.7**	**$ 8,078.6**	**$ 8,459.2**	**$ 8,790.5**	**$ 18,043.8**	**$ 21,607.4**	**$ 11,170.5**	**$ 11,456.1**	**$ 22,553.3**	**$ 24,562.7**	**$ 25,284.7**
Ending Cash Balance	*$ 7,829.0*	*$ 8,296.7*	*$ 10,150.7*	*$ 13,816.9*	*$ 10,829.7*	*$ 7,377.1*	*$ 14,478.0*	*$ 21,474.3*	*$ 17,554.8*	*$ 11,743.1*	*$ 5,316.2*

1 All numbers in thousands, slight calculation discrepancies may exist due to rounding

Projected Debt Service Coverage

In municipal credit markets, the affordability of long-term borrowing is established by calculating a financial performance ratio known as debt service coverage (DSC). Debt service coverage compares the annual net operating revenues of the system (after meeting all operating expenses) to the combined annual debt service payments of all outstanding debt—including payments associated with prospective offerings. DSC is most often expressed as the ratio of annual net operating revenues to total annual debt service payments. In general, net operating revenues should exceed debt service payments by 20% to 30% for senior lien debt such as revenue bonds (an equivalent DSC greater than 1.20 or 1.30) and by 10% for subordinate debt (an equivalent DSC of 1.10 or greater).[10]

Repayment of the Division's proposed SRF loans is considered subordinate debt, and therefore subject to the lower 1.10x coverage requirements. To establish the affordability of the Division's proposed long-term borrowing outlined in this analysis, Table 9-7 presents forecasted net operating revenues, expenses, debt service, and debt service coverage from FY 2015 through FY 2025. As indicated in Section 8, revenues were forecasted on a conservative basis and expenses were estimated based on historical spending patterns, adjusted for anticipated inflation and incremental O&M costs associated with new Division staff.

Adjustments are made to both operating revenues and operating expenses to exclude items that should not be considered in the calculation of subordinate debt service coverage. Transfers from MERF do not represent current operating revenues of the system, and are therefore excluded from the calculation. Payments in lieu of taxes (PILOT) and other minor interfund transfers are also typically excluded from the DSC, and are removed from forecasted operating expenses.

Annual net operating revenues available to pay debt service vary between $2.11 million in FY 2015 and $11.77 million in FY 2020, the final year of the revised five-year rate package. In FY 2025, net operating revenues are expected to be $11.08 million, a compounded annual growth rate of 18.0% over the forecast period.

As shown in Table 9-7, forecasted subordinate debt service coverage is estimated to range from 1.30x in FY 2016 to 2.68x in FY 2025. As one would expect, the DSC ratio is lowest during the first year of the proposed rate plan, then peaks in FY 2020 as the proposed rate plan is fully implemented and before the second SRF loan is issued. However, even at the lowest forecasted levels, DSC remains above the 1.10x test required for issuance of subordinate debt. Based on the financial forecasts developed in this plan, forecasted coverage indicates that the proposed SRF loans necessary to fund the meter installation program would be financially feasible.

[10] The subordinate coverage calculation includes payment of senior lien obligations as part of total cost obligations.

Table 9-7
Projected Subordinate Debt Service Coverage, FY 2015-FY 2025[1]

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
Total Revenues & Transfers	$ 7,114.0	$ 8,546.3	$ 10,313.2	$ 12,456.8	$ 15,056.5	$ 18,154.8	$ 18,271.4	$ 18,452.4	$ 18,633.9	$ 18,750.9	$ 18,857.8
- Transfers from MERF[2]	(41.0)	(42.6)	(44.3)	(46.1)	(48.0)	(49.9)	(51.9)	(54.0)	(56.1)	(58.4)	(60.7)
Total Operating Revenues	$ 7,073.0	$ 8,503.7	$ 10,268.8	$ 12,410.6	$ 15,008.6	$ 18,104.9	$ 18,219.5	$ 18,398.4	$ 18,577.7	$ 18,692.6	$ 18,797.1
Operating Expenses	5,308.7	5,536.5	5,917.1	6,248.4	6,501.7	6,765.3	7,039.6	7,325.2	7,622.4	7,931.7	8,253.7
- Payment in Lieu of Taxes (PILOT)[3]	(350.0)	(365.8)	(382.2)	(399.4)	(417.4)	(436.2)	(455.8)	(476.3)	(497.7)	(520.1)	(543.5)
- Other Asset Transfers[4]	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Total Operating Expense	$ 4,963.7	$ 5,175.7	$ 5,539.9	$ 5,854.0	$ 6,089.3	$ 6,334.1	$ 6,588.8	$ 6,853.9	$ 7,129.6	$ 7,416.6	$ 7,715.2
Net Revenue Available for Debt Service	**$ 2,109.3**	**$ 3,327.9**	**$ 4,729.0**	**$ 6,556.6**	**$ 8,919.3**	**$11,770.8**	**$11,630.7**	**$11,544.6**	**$11,448.1**	**$11,276.0**	**$11,081.9**
Existing Subordinate Debt Service[4]	-	-	-	-	-	-	-	-	-	-	-
New Subordinate Debt Service[5]	-	2,542.1	2,542.1	2,542.1	2,542.1	2,542.1	4,130.9	4,130.9	4,130.9	4,130.9	4,130.9
Total Subordinate Debt Service	**$ -**	**$ 2,542.1**	**$ 2,542.1**	**$ 2,542.1**	**$ 2,542.1**	**$ 2,542.1**	**$ 4,130.9**	**$ 4,130.9**	**$ 4,130.9**	**$ 4,130.9**	**$ 4,130.9**
Projected Subordinate Coverage Ratio[6]	**NA**	**1.30**	**1.86**	**2.57**	**3.50**	**4.63**	**2.81**	**2.79**	**2.77**	**2.72**	**2.68**

1 Numbers in thousands, slight calculation discrepancies may exist due to rounding

2 Revenue transfers from MERF are not considered operating revenues for the purpose of calculating debt coverage

3 PILOT expense is typically excluded from the debt coverage calculation

4 Other Asset Transfers, which represent a small, positive offset to the Division's operating expense via Interfund Transfers, are not included in the coverage calculation

5 Forecasted debt service payments associated with anticipated FY 2016 and FY 2021 SRF loans

6 Debt service coverage metrics rounded to the second significant digit

Conclusions

The net cost impact of a meter installation program is estimated to be $59.27 million over a 20-year forecast period (FY 2015 through FY 2035). This estimate accounts for the conceptual costs of extending metered water service to the Division's existing customers and estimated project deferrals (cost savings) associated with reduced water demand. With the addition of metering, total capital requirements will exceed $166 million over the forecast period and require the support of some form of long-term borrowing.

Other key aspects of the metering analysis are summarized as follows:

- The estimated financial impacts of City-wide meter installation rely heavily on one key assumption: the conceptual cost estimate of the metering program. To the extent that actual program costs differ from those estimated for this analysis, the financial impacts outlined in this section could vary substantially.
- Many of the capital projects identified in Section 7—such as facility upgrades and pipeline improvements—are still necessary regardless of expected reductions in overall system demand.
- The financial plan assumes that the Division will be able to secure some form of long-term debt, at favorable terms, to finance the implementation of the meter program.
- After adjusting for inflation, capital improvement expenditures of $65.72 million will be required between FY 2015 and FY 2020 under a metering scenario. The CIP will be funded with current operating revenues ($22.65 million, 34.5%), connection fee revenues ($2.25 million, 3.4%), long-term debt ($40.00 million, 60.8%), and system operating reserves ($0.85 million, 1.3%).
- An ambitious rate plan is required to support debt service payments and meet PAYGO transfer obligations outlined in the financing plan. Annual rate increases of 20.0% are anticipated for a five-year period, from FY 2016 through FY 2020.
- Under the forecasting assumptions outlined in this report, net operating revenues of the system appear adequate to support long-term borrowing: a $40.00 million issuance in FY 2016 and a $25.00 million issuance in FY 2021. Subordinate debt service coverage is expected to range from 1.30x to 4.63x over the meter implementation timeframe.
- Beyond the initial five-year rate package, no other rate increases are necessary to fund the capital improvement requirements of the system and restore operating reserves (the FY 2035 ending balance is projected to be $20.81 million).
- Although financing the meter installation program must, by necessity, rely heavily on debt as a primary funding source, the Division's capital financing plan provides for achievement of subordinate debt service coverage and fund balances in excess of established performance targets.
- This section offers an estimate of the potential financial impacts associated with a meter installation scenario. The information presented in this section should not be

interpreted as a recommendation to implement a City-wide metering program. Policymakers must ultimately identify feasible metering options, weigh the advantages and disadvantages of each, and determine the most beneficial course of action for the City.

Murray, Smith & Associates, Inc.
Engineers/Planners

SECTION 10

Alternative Rates

SECTION 10
ALTERNATIVE RATES

Introduction

As part of this study, the City of Idaho Falls (City) requested that the project team (1) evaluate the advantages and disadvantages of the Water Division's (Division's) existing rate structure, and (2) recommend improvements to the rate structure while acknowledging the current limitations of available billing determinants (e.g. no metered water use data). Unlike Section 8—Financial Plan, which presents an analysis of the necessary rate impacts to fund the Capital Improvement Program (CIP)[1], this section presents a review of the Division's existing rate *structure*. The rate structure is the manner in which various base charges, volumetric rates, and flat rates are combined to represent the total cost of water service for various customers. Often times, the rate structure for each customer class (residential, apartments, commercial, industrial, etc) will vary based on the different cost-causing service characteristics that each of those classes place on the system.

This section also summarizes the number and type of accounts serviced by the system, identifies several feasible rate structure alternatives based on the quality and availability of billing data, and describes the process that was used to select the recommended rate structure alternative for each customer class. Additional data development activities are explained, and the rate design process (the act of setting the fees and charges for the chosen rate structure alternatives) is described in detail. Finally, the recommended rates are presented by customer class.

Existing Rate Structure

Because the majority of City customers receive unmetered water service, the existing rate structure is comprised mainly of fixed charges for both indoor and outdoor water use. Single family residential customers currently pay $21.00 per month for indoor water service, an annual $17.46 irrigation charge (for outdoor use), and a $3.00 per year charge associated with the state's water quality program administered by the Department of Environmental Quality (DEQ). These charges are considered flat rates, since none vary based on the amount of actual water used by the customer. When factoring in the annual charges, the effective monthly flat rate for a single family residential customer is approximately $22.71.

Non-residential customers that are not metered pay a flat monthly rate for indoor use based on the type of business located at the property. Rates for restaurants, schools, laundromats, and various other customer types are identified within the City's rate schedule. Some of these, such as office buildings, pay a flat rate per 1,000 square feet of area. Others, such as hotels, pay a flat rate per room. Non-residential customers not specifically listed within the rate schedule pay the same rate as single family residential customers, $21.00 per month. The

[1] Rate impacts specify an across-the-board increase for all rates and fees, but assume the rate structure remains the same.

annual rate for outdoor use for unmetered non-residential customers is $97.59 per acre of lawn or cultivated area.[2] Non-residential customers also pay the annual $3.00 DEQ water quality program administration fee.

The City also provides service to a small number of residential and non-residential customers located outside the City limits. With the exception of the annual DEQ water quality program administration fee, these customers are charged twice the rates of similar customers located within the City. The effective rate for outside-City residential customers is therefore approximately $45.16.

Approximately 10% of the City's non-residential customers receive bills based on metered water use.[3] These customers pay a $21.00 monthly base charge and $0.55 for each thousand gallons of water used, after a 12,000 gallon minimum allowance. The determination of the monthly bill is subject to a minimum bill based on the size of the metered connection, with 1-inch (and smaller) customers paying at least $21.00 per month and 2-inch customers—the most common meter size of metered customers—paying $41.79 per month. As recommended in the American Water Works Association's (AWWA) M1 Manual of Practice: *Principles of Water Rates, Fees, and Charges*, the minimum bills for larger meter sizes are scaled up to recover fixed, capacity-related costs for those customers who have, based on meter size, reserved a higher allocation of capacity within the system.

Based on the existing rate structure and the number and type of customers currently served by the Division (described later in this section), the Division will bill approximately $6.45 million for indoor water use (91.7%) and just $0.58 million for outdoor use (8.3%) in FY 2015. In contrast, the Division estimates—based on seasonal production data—that more than 60% of water is used for outdoor irrigation. This information is summarized in Table 10-1, and appears to suggest that seasonal irrigation charges are too low relative to the flat rates currently assessed for indoor use.

Table 10-1
Indoor versus Outdoor Billings and Production

Revenue Classification	Estimated FY15 Billing ($M)	Percent	Production (MG)	Percent
Indoor Revenues[1]	$6.448	91.7%	2,673	39.6%
Outdoor Revenues	$0.584	8.3%	4,082	60.4%
Total	**$7.031**	**100.0%**	**6,755**	**100.0%**

1 Includes revenues from DEQ water quality program administration fee

[2] Unmetered non-residential customers with less than 1/20th of an acre of cultivated area are not required to pay for outdoor water use.
[3] While some customers are metered for indoor and outdoor use, the majority of these existing customers receive a metered water bill for indoor consumption only.

Data Challenges

The current software used for billing water service is somewhat limited in the type of summary information it can provide. Customer accounts are not identified by customer class (e.g. residential, apartment, commercial, etc), although they can be categorized as residential and commercial through demand codes attributed to their Electric Department accounts. This makes it difficult to fully understand the existing composition of Water Division customers. Rates are also not associated with customers via billing codes, but are hard-coded within the software framework. Moreover, various non-residential customers receive rates based on different billing determinants (square footage, number of hotel rooms, etc) that are also not specifically tracked within the current software.[4] Taken together, these factors make it tough to determine the basis for the current rates assigned to each customer. The City selected a new utility billing software in May 2015 and is currently in the process of establishing a billing structure that will address these challenges.

From an administrative standpoint, the one-time nature of some of the Division's current charges also offers challenges. Division staff have cited the confusion that the DEQ water quality program administration fee can create among its customers, who do not understand the rationale for the fee. In addition, the annual billing of the seasonal irrigation charge can disrupt the monthly billing pattern and may represent a significant unexpected expenditure for some customers.

Since the Division doesn't assign customer classes within the software, rates are updated by applying an across-the-board increase to all customers. Also, because rate codes are not associated with each customer, it is difficult to understand how the Division might implement rate increases or changes to the rate structure for a particular class. In summary, the administrative burden of any proposed changes within the current system is quite high, and extracting and summarizing billing data by customer class required extensive data testing and manipulation.

Rate Structure Alternatives

Based on the known limitations of customer billing data, several rate structure alternatives were developed for the following four customer categories: Residential Indoor; Residential Outdoor; Non-Residential Indoor, and Non-Residential Outdoor. In the absence of metered water service (for most customers), chosen rate structure alternatives were, by necessity, congruous with available data. After discussions with Division staff, rate structure alternatives selected for evaluation for each major rate category included the following:

[4] For example, a non-residential customer may receive an indoor rate based on 4,000 square feet of building space and an outdoor rate based on 1.5 landscaped acres when they first receive water service, but this information is not tracked within the billing system to enable application of a different rate or fee structure in the future.

Residential Indoor

1. A uniform monthly flat rate would be applied to all residential categories, including single family residences (SFR), duplexes, triplexes, and apartment units.

2. A uniform monthly flat rate would be applied to all residential categories except apartments, which would be charged 75-80% of the residential flat rate (including landlord apartments).

3. A monthly flat rate would be charged per residential dwelling based on the number of plumbing fixtures in the residence.

Residential Outdoor

1. A uniform monthly irrigation rate for all residential customers, regardless of dwelling type or size.

2. A monthly irrigation rate based on 2 or 3 general lot size categories (small, medium, large); landscaped area will not be considered, only the size of the lot.

3. A monthly irrigation rate for each residential category (SFR, duplex, triplex, and apartment unit) based on a statistical sampling of measured landscape area for each category.

4. Individual irrigation rates per customer based on specific lot size combined with a statistical analysis to determine the ratio of landscaped area to lot size for a sample of residential customers of each residential category.

Non-Residential Indoor

1. Implement a uniform billing rate for all non-residential customers (either by account or by square footage).

2. A flat monthly rate based on broad customer designations (would rely on analysis of City's metered non-residential customers that can generally be grouped into low/average/high use categories).

3. Develop 3 to 6 customer classes (for most obvious classes such as Hotel/Motel, Restaurant/Food, Office/Retail, "High Use", etc) and determine the average use based on the City's metered data information; continue to charge customers based on different billing determinants (some square feet, others per unit or per room, etc).

4. Develop 8 to 10 general rate categories and assign non-residential customers to each category based on average water use data from similar metered customers. Notably,

customers in each rate would receive a flat monthly rate and non-residential customers would no longer receive rates based on different billing determinants.

5. Specify many different non-residential customer categories, and rely on national usage data (augmented by available City data) to set rates.

Non-Residential Outdoor

1. A uniform monthly outdoor rate per non-residential customer (under the logic that all non-residential customers would contribute to a 'green' City). Non-residential customers without landscaped area could request an exemption.

2. Develop three or four general categories based on the size of landscaped area (such as large landscaped area, medium landscaped area, small landscaped, and exemption).

3. Implement varied rates based on sampling of landscaped area for the chosen non-residential indoor rate categories.

4. A varied rate based on application of stormwater coefficients to average lot size of chosen non-residential indoor categories.

5. Individual monthly rates for every non-residential customer based on the landscaped square footage (City would charge a uniform rate per increment of landscaped area, but would need to develop the corresponding data set for all non-residential customers).

Additional data development would be required for many of these rate structure alternatives; others could be implemented with information already known to the Division. All acknowledge the reality of the current billing platform and are rate methodologies that do not require metered water data for individual customers. Each of the rate structure alternatives also offer tradeoffs between conflicting rate design objectives: some alternatives are more equitable than others, but not politically acceptable; some are more easily implemented and maintained than others, but not defensible; still others may be more readily accepted by the public, but more administratively burdensome. The next step of the evaluation process was to develop a decision framework to weigh the pros and cons of each potential solution.

Rate Structure Selection

A multi-attribute utility analysis (MUA) framework was created in order to weigh the qualitative benefit and cost tradeoffs associated with each of the rate structure alternatives. The first phase in such a process is the identification of various policy objectives (criteria) that will help determine the characteristics and attributes of a favorable rate structure alternative. The project team worked closely with the Division to establish the criteria against which each of the alternatives would be evaluated. The results of this exercise are summarized in Table 10-2.

The criteria should encompass all of the factors or objectives that the Division would consider when comparing rate structure alternatives. The list demonstrates that many factors are important, including customer, administrator, and policymaker perspectives.

Table 10-2
Policy Objectives and Weighting Factors

Policy Objective	Weight
Equitable - Rate structure reflects average cost of providing service to different groups based on area, function, customer class, and service characteristics-- to the extent data allows	14.7%
Understandable - Rates and fees are transparent and easy for general public to understand and calculate based on information provided	16.6%
Implementable - Rates can be implemented without significant resources to develop or assign characteristics (such as square footage or number of plumbing fixtures, for example) to each customer account	9.8%
Administrative Ease - Rate or fee structure can be updated and maintained for each customer with little effort	13.8%
Affordable - Rates are affordable to community, or if not affordable to a segment of the community, a program is in place to provide relief or assistance	11.5%
Defensible - Rate development process reflects attempt to identify water usage differences among various customer categories with limited data available	11.8%
Public Acceptance - Recommended alternative is perceived as fair and generally equitable by diverse customer groups	10.9%
Political Support - Rate development process and recommended alternative represents a solution that will be supported by Mayor and Council	11.0%

Table 10-2 also includes the corresponding weighting factors that each criterion receives within the evaluation process. Weighting factors recognize the fact that some criteria or objectives may be more significant than others, and establish the relative importance of the objectives. Administrators and staff within the Division, as well as other various City divisions (such as Billing & Collections), were asked to allocate 100 shares of weight to each of the policy objectives.[5] This process forces the person conducting the evaluation to take shares of weight from one or more objectives in order to give more weight (or importance) to other objectives. The average weighting factors that resulted from this exercise are shown in

[5] By definition, the weighting factors must sum to 100 across all policy objectives.

Table 10-2.[6] The policy objective that received the highest factor is "Understandable", which may reflect feedback the Division has received related to the existing rate structure. For the most part, each of the policy objectives received a significant share of the possible allocation, indicating that each criterion is moderately to strongly considered when choosing an appropriate rate structure alternative.

Scoring each rate structure alternative against the policy objectives is the next phase of the decision process. Similar to the process used to develop the weighting factors, Division and other City personnel were asked to score each alternative on a scale of 1 to 10 against the objectives shown in Table 10-2. A higher score (trending towards 10) indicates that the rate structure alternative is very consistent with the corresponding policy objective, while a lower score (trending towards 1) suggests that the rate structure alternative is not consistent with the objective. For example, a rate structure alternative that requires a significant amount of time and resources to update and maintain would score low against the "Administrative Ease" criterion.

A process was used to summarize the raw scores from City personnel for each policy objective, then the weighting factors were applied to develop a weighted score by policy objective for each of the rate structures evaluated. The weighted scores were then summed across the policy objectives to establish a total weighted score for each rate structure alternative. Appendix K presents the raw scores, the weighted scores by policy objective, and the total weighted score for each rate structure alternative for the four major rate categories: Residential Indoor; Residential Outdoor; Non-Residential Indoor, and Non-Residential Outdoor.

Based on the MUA process described above, Table 10-3 presents the recommended rate structure alternatives (i.e. those that received the highest weighted score among peer alternatives in the same major rate category).[7] After consulting with the Division, the project team decided to further develop each of the recommended rate structure alternatives, making only a slight change to the recommended alternative for indoor use of non-residential customers. Instead of creating 8-10 general rate categories for non-residential customers, the Division decided that five general rate categories would provide for sufficient data resolution and be easier to manage in the future.

Data Development

Several of the recommended rate structure alternatives include billing determinants that were not previously known or tracked by the Division. For example, the recommended outdoor rate alternative for non-residential customers dictates that each customer be charged based on the measured landscaped area of the property (as measured in increments of 100 square feet). This alternative assumes that the amount of outdoor water use will be strongly correlated

[6] Weight shares for a single policy objective were limited to no more than 25 percent.
[7] It is noteworthy that the recommended indoor and outdoor rate alternatives within the same customer category (residential and non-residential) are compatible with one another.

with the amount of landscaped area the customer is trying to water. Rate equity is improved as smaller billing units (square feet rather than number of acres) are used to assess outdoor water demand, but Division resources must be devoted to data development.

Moreover, the recommended outdoor rate structure for residential customers relies on a statistical sampling of average landscaped areas for each of the different customer types in this category: SFR, apartments, duplexes, and triplexes. The Division was instrumental in gathering or developing this information and other new data to support the rate design process. GIS maps and other property records were analyzed to establish the individual landscaped square footage for non-residential customers, residential customers were sampled to understand the relative differences between landscaped areas, and water use data for metered customers was arrayed in a manner that allowed the project team to evaluate consumption patterns for different types of customers (hotels, restaurants, car washes, etc).

Table 10-3
Recommended Rate Structure Alternatives by Major Category

Rate Category	Recommended Alternative
Residential Indoor	A uniform monthly flat rate would be applied to all residential categories except apartments, which would be charged 75-80% of the residential flat rate (including landlord apartments)
Residential Outdoor	A monthly irrigation rate for each residential category (SFR, duplex, triplex, apartment unit) based on a statistical sampling of measured landscape area for each category
Non-Residential Indoor	Develop 8 to 10 general rate categories and assign non-residential customers to each category based on average water use data from similar metered customers. Notably, customers in each rate would receive a flat monthly rate and non-residential customers would no longer receive rates based on different billing determinants
Non-Residential Outdoor	Individual monthly rates for every non-residential customer based on the landscaped square footage (City would charge a uniform rate per increment of landscaped area, but would need to develop the corresponding data set for all non-residential customers)

Significant work was also done to estimate—with as much accuracy as possible—the number and type of customers served by the system. Since customer class information is not tracked in the existing software, billing data outputs from the City's Electric Department were analyzed to estimate the number of residential and non-residential customers. Table 10-4 presents the results of the analysis, along with a summary of average landscaped area for sampled residential customers and total measured landscaped area for metered and unmetered non-residential customers.

There are roughly 17,374 single family residential customers and 4,137 apartment units served within the City. There are approximately 185 customers located outside the City boundaries, and most of these are also single family residences. In total, the Division provides water service to nearly 21,700 residential customers.[8] Statistical sampling and GIS records were used to measure the average landscaped area of single family residences, duplexes and triplexes, and apartment units.[9] The average landscaped area for a SFR is 6,440 square feet. In comparison, the average landscaped area for duplexes, triplexes, and apartments—which accounts for the number of units that share a common landscaped area—is 43%, 47%, and 23% of the SFR landscaped area, respectively.

Table 10-4
Number of Accounts and Estimated Landscaped Area by Customer Type

Customer Class	Customer Type	Number of Units	Landscape Area per Unit (sq ft)[1]	Total Landscape Area (sq ft)[2]	Percent by Class	Percent by Type
Residential	SFR	17,374	6,440	111,886,103	83.4%	78.2%
	Duplex[3]	-	2,796	-		0.0%
	Triplex[3]	-	3,003	-		0.0%
	Apartment Units	4,137	1,485	6,143,939		4.3%
	Outside City	185	6,440	1,191,374		0.8%
Non-Residential	Unmetered	2,079	8,310	17,277,500	16.6%	12.1%
	Metered	247	24,487	6,538,135		4.6%
Total				**143,037,050**	**100.0%**	**100.0%**

1 For residential customers, this represents the average of the sampled data for each customer type; for non-residential customers, this is the average landscaped area per customer unit based on the total measured landscaped area.

2 For residential customers, this represents an estimated total landscaped area based on the average per unit measurement from the sample and the total number of customer units.

3 The number of duplex and triplex units could not be determined from the billing data that was provided.

Of the more than 2,300 non-residential customers, approximately 247 receive metered service and the remaining 90% (2,079 customers) are unmetered accounts. After measuring individual lots of non-residential customers, the Division established a total estimated landscaped area of 23.8 million square feet for these customers. The average landscaped area for metered and unmetered non-residential customers is calculated by dividing the total measured area by the number of customers in each group. The average landscaped area for an unmetered non-residential customer is just more than 8,300 square feet, while the average area for a metered customer is just under 25,000 square feet. Clearly, the Division has chosen to meter the non-residential customers most likely to use large amounts of water for outdoor irrigation—at least as far as landscaped area is predictive of outdoor water use.

---

[8] The number of duplexes and triplexes could not be readily identified in the billing information, although the Division's sampling process did provide an estimate of landscaped area per unit for these customers.

[9] While a smaller number of duplexes and triplexes were sampled, almost 100 SFR customers and 25 apartment complexes were sampled.

Water use assumptions were used to confirm the total estimated landscaped area of system customers. Under an assumed application rate of 2 inches of water per week during the irrigation season,[10] estimated water use per 100 square feet of landscaped area over the course of a year is 2,743 gallons.[11] Multiplying that figure by the estimated number of 100 square feet of landscaped areas (1,430,371, as shown in Table 10-4) results in an estimated outdoor demand of 3,923 million gallons. This estimate compares very favorably to the Division's 4,082 million gallon water production estimate for outdoor demand (presented in Table 10-1), especially when water loss is considered.

After cross-checking the estimated number of accounts and landscaped area against other data sources, the Division concluded that the summary presented in Table 10-4 represented the best available information and instructed the project team to proceed with rate design using those billing determinants.

Rate Design Process

The rate design process involves assigning fees and charges to the new rate structure in order to achieve desired levels of revenue recovery. For example, the recommended rate *structure* for non-residential customers' outdoor water use is a charge based on the measured landscaped area of each customer. The previous section described how the billing determinants were developed, but the rate design process determines *how much* this customer group will pay per increment of landscaped area.

A rate design model was constructed to summarize billing determinants and provide for an iterative analysis of potential fee levels for the recommended rate structures. The purpose of the model is two-fold: first, it should be used to "calibrate" observed revenue levels with existing rates; and second, it should facilitate rate design by predicting rate revenues under various fee scenarios.

Model Calibration

The current rates and fee schedule was applied to the Division's existing billing determinants (mainly, number of accounts for unmetered customers; estimated water consumption and meter sizes for metered non-residential customers) to predict revenues using the rate design model. Indirectly, this calibration test also helps establish the veracity of the estimated billing determinants. The test resulted in estimated revenues of $7.16 million, a 2.2% increase over budgeted FY 2015 rate revenues of $7.00 million.

The fact that predicted revenues, under existing rates, are higher than actual revenues is not surprising. In most cases, the revenue calibration test will yield similar results because of various adjustments that occur to billed revenues. Such adjustments (negative amounts) may

[10] A commonly-used water demand assumption for Division planning based on climate and landscape type.
[11] Assumes an irrigation season of 22 weeks; source of conversion factors is USGS Water Science School, https://water.usgs.gov/edu/earthrain.html

occur as a result of after-meter billing adjustments, bill credits for overpayment, or other similar adjustments which are typical of the billing function of all water service providers.

It is also possible that the Division's billing data includes not only monthly bills, but also bill adjustments for a small number of customers. Although these adjusted bills have the potential to double-count some customers (or otherwise misrepresent the total number of customers that receive a water bill from the City), the very purpose of the revenue calibration test is to establish the ratio of predicted revenues to actual revenues. The difference in these two amounts—in this case, 2.2%—represents billing adjustments as well as other revenue or accounting adjustments made by the Division for bad debt (collections), increased receivables, or other factors.

The predicted to actual revenues ratio is a critical input in the rate design process. In most cases, it is assumed that the same billing and financial adjustments will continue in proportion to observed historical values after the new rates are implemented. The rate design process therefore uses a similar target ratio to ensure adequate revenue recovery. For example, if the ratio related to the revenue calibration test was 15%, then the rate design process might target a revenue level that is also 15% higher than total cost requirements.

In this case, the target ratio for the rate design process was set at 5.0%—higher than the observed historical ratio of 2.2%. A higher ratio provides for a greater margin of error when developing new rates and is appropriate given the uncertainties associated with the Division's existing billing determinants.

Recommended Changes to Rate Methodology

In addition to rate structure changes evaluated as part of this study, the Division has an opportunity to make additional modifications to current billing methodologies that may improve rate transparency and reduce customer confusion. The following revisions are recommended:

- Incorporate one-time charges like the seasonal irrigation charge and DEQ water quality program administration fee into the monthly flat rate for all unmetered customers (residential and non-residential), thus ensuring customers receive the same monthly rate year-round.
- Increase the proportion of revenues that are attributed to outdoor water use by decreasing the monthly flat rate and increasing the seasonal irrigation charge. Since it is proposed that the seasonal irrigation charge be annualized and integrated with the monthly flat rate, this won't change the cost of water service but may better prepare customers for migration to a metered water bill (if the City decides to pursue that option). At a minimum, it better communicates the relative cost of outdoor water use.
- Simplify the rate structure for metered, non-residential customers by replacing the minimum bill concept with a monthly customer charge based on meter size,

eliminating the volume allowance, and establishing a volumetric rate that would be applied to all water use.

- Improve equity through the rate design process by setting fees for outdoor use that are internally consistent among unmetered and metered non-residential customers. Using a purely hypothetical example to illustrate: if the volumetric rate is set at $3.00 per thousand gallons for metered customer, and the assumed water use for every 100 square feet of landscaped area is 2,743 gallons per year, then the outdoor rate per 100 square feet should be established at $8.23 per year (2,743/1,000 * 3.00).

Recommended Rates

Table 10-5 provides a summary of recommended rates, predicted revenues under the new rate structure, actual revenues under the existing rate structure, and the percentage revenue distribution by customer type under each scenario. Each rate is explained in greater detail following the table.

Table 10-5
Recommended Rates and Revenue Distribution by Customer Type

Customer Class	Customer Segment	Billed Units	Proposed Rate	Proposed Revenues[1]	Percent by Type	Existing Revenues	Percent by Type
Residential	Single Family Residence	17,374	$ 23.50	$ 4,899,468	66.7%	$ 4,709,275	67.0%
	Apartment Units	4,137	$ 14.68	$ 728,774	9.9%	$ 819,465	11.7%
Non-Residential	Unmetered, indoor	2,079	varies	$ 1,043,256	14.2%	$ 1,050,722	14.9%
	Unmetered, outdoor	172,775	$ 1.23	$ 212,513	2.9%	$ 41,200	0.6%
	Metered, base charge	247	varies	$ 171,898	2.3%	$ 122,800	1.7%
	Metered, volume charge	422,028	$ 0.45	$ 189,913	2.6%	$ 184,143	2.6%
Outside City	All customers	185	$ 47.00	$ 104,340	1.4%	$ 103,793	1.5%
Subtotal, all customers				**$ 7,350,161**	**100.0%**	**$ 7,031,396**	**100.0%**

1 Recommended alternative rates presented in this table are revenue-neutral; that is, they are expected to provide the same level of rate revenues received by the Division under existing rates after accounting for the predicted-to-actual calibration ratio described in this section.

Based on the recommendations outlined in this report, single family residential customers will pay a single flat rate each month of $23.50. This monthly rate is comprised of an indoor component ($16.00) and the monthly share ($7.50) of a seasonal irrigation charge ($90.00 per year). Based on total SFR units of 17,374, this customer type is expected to produce $4.90 million under the new rate design. The new monthly rate represents a 3.5% increase over the previous effective monthly rate of $22.71, which includes the annualized seasonal irrigation charge and DEQ water quality program administration fee.

All apartment units (including landlord units) will be billed a flat monthly rate of $14.68. This rate includes a $12.80 indoor component (80% of the SFR indoor rate) and a $1.88

outdoor component. The outdoor component is calculated as 25% of the SFR outdoor rate (or 0.25 * $7.50), since the sampling analysis presented in Table 10-4 indicates that the average landscaped area of an apartment unit is approximately 25% of the average landscaped area of SFR customers. The new rate represents a 16.1% decrease of the existing, annualized rate of $17.49 charged to apartment units. The Division provides water service to 4,137 apartment units, and revenues under the new rate design are expected to be $0.73 million per year.

The indoor rate for unmetered non-residential customers will vary based on the number and type of customers that fall into the five new rate categories. The recommended number of rate categories for this alternative was reduced from eight to five because the level of detail within the billing information did not support that level of granularity among unmetered rate categories. Based on an analysis of water usage patterns for various non-residential categories, Table 10-6 presents the assumed number of customers in each category and the corresponding rate. Rates were loosely established based on the relative difference of assumed average indoor water use for each rate category. Revenues from this rate component are expected to generate $1.04 million per year.

Table 10-6
Unmetered Customers Indoor Rates by Non-Residential Rate Category

Rate Category	Number of Customers	Rate	Proposed Revenues
Category 1	903	$ 16.00	$ 173,376
Category 2	962	$ 50.00	$ 577,200
Category 3	25	$ 75.00	$ 22,500
Category 4	166	$ 110.00	$ 219,120
Category 5	23	$ 185.00	$ 51,060
TOTAL	**2,079**		**$ 1,043,256**

The outdoor rate for unmetered non-residential customers will be assessed per 100 square feet of landscaped area.[12] The Division has measured this area for each customer, and this information is summarized in Table 10-4. This rate is set at $1.23 and will be assessed on an annual basis. However, it is anticipated that this rate will be annualized across a 12-month period to ensure non-residential customers pay a single flat rate each month. Revenues from this rate component are expected to total $0.21 million per year.

As described earlier in this section, it is recommended that the Division simplify the rate structure for metered non-residential customers. The proposed revisions are outlined in Table 10-7, and include a monthly customer charge based on meter size, elimination of the volume allowance and minimum bill, and a revised volumetric rate. Monthly customer charges for a

[12] Square footage will be rounded up to the nearest 100 square feet.

1-inch meter (and smaller) are set equal to the indoor rate for SFR customers of the system ($16.00). Charges for larger meter sizes are based on the American Water Works Association's (AWWA) hydraulic meter ratios, adjusted to reflect the 1-inch meter as the basis for all other ratios. The Division's 247 metered customers are expected to generate $0.17 million per year from monthly customer charges.

The volumetric rate for metered water use will be $0.45 per thousand gallons. This rate will be applied to all metered consumption, since the minimum volume allowance will be eliminated. This rate is consistent with the charge for outdoor use for unmetered non-residential customers. The assumed water use for 100 square feet of landscaped area is 2,743 gallons, or 2.743 kgals, as outlined earlier in this section. Since an unmetered customer pays $1.23 for this same amount of water (via the charge per 100 square feet of landscaped area), the effective rate for the unmetered customer is $0.45 per kgal ($1.23 / 2.743 kgals).

Table 10-7
Monthly Customer Charges by Meter Size for Metered Customers

Meter Size	Number of Customers	Scaling Factor[1]	Rate	Proposed Revenues
5/8"	4	1.00	$ 16.00	$ 768
3/4"	9	1.00	$ 16.00	$ 1,728
1"	34	1.00	$ 16.00	$ 6,528
1-1/4"	1	1.50	$ 24.00	$ 288
1-1/2"	37	2.00	$ 32.00	$ 14,208
2"	124	3.20	$ 51.20	$ 76,186
3"	15	6.40	$ 102.40	$ 18,432
4"	18	10.00	$ 160.00	$ 34,560
6"	5	20.00	$ 320.00	$ 19,200
TOTAL	**247**			**$ 171,898**

1 Revised scaling factors based on AWWA's hydraulic meter ratios, revised to reflect a 1-inch meter as the basis for the ratio of larger sizes.

An analysis of metered billing data indicates that billed consumption with the minimum allowance is approximately 334,806 kgals, and is expected to increase to 422,028 kgals if the minimum allowance is removed from the rate structure. The expected revenues from the volumetric rate are therefore $0.19 million.[13]

Consistent with the existing approach, outside-City customers will pay twice as much as customers of the same type located within the City. Since most of these customers are

[13] The analysis of this rate component assumes that all metered customers have metered outdoor use. In reality, those that do not receive metered outdoor service will be billed the rate based on measured landscape area and the predicted revenues from this customer type will increase.

assumed to be single family residences, Table 10-5 presents the new rate for outside-City customers as $47.00 per month (2 x $23.50). The 185 customers in this category are therefore expected to provide approximately $0.10 million per year.

The target revenue level for the rate design process is $7,350,000, equal to the budgeted revenue levels for the current fiscal year multiplied by the 5.0% target ratio discussed earlier in this section. Based on the revised rate structure and recommended fees and charges, predicted revenues are expected to just meet this target at $7,350,161 as shown in Table 10-5.

The recommended alternative rates presented in this section are *revenue-neutral*; that is, they are expected to provide the same level of rate revenues received by the Division under existing rates. Recommended rates would need to be increased based on the same five-year rate plan outlined in Section 8 in order to fund the CIP.

Revenue Distribution

The new rate design does not significantly alter the revenue contributions made by many of the Division's customers. As shown in Table 10-5, single family residential and metered customers contribute approximately the same percentage of revenues. Apartment units, however, will have a lower monthly rate and therefore contribute a lower percentage to total revenues. Unmetered non-residential customers, on the other hand, will pay significantly more for outdoor water use under the new rates.

The other major change under the new rate design is the proportion of indoor to outdoor revenue contributions, as illustrated in Table 10-8. The recommended revisions begin a process of shifting cost responsibilities to outdoor rates, moving from just 8.3% of total revenues under existing rates to 28.5% of total revenues under new rates. While still not consistent with estimated production for outdoor use (currently more than 60% of total water production based on Division estimates), the cost recovery associated with outdoor water use is moving in the right direction.

Table 10-8
Indoor and Outdoor Rate Revenues under New and Existing Rates

	Proposed Revenues	Percent	Existing Revenues	Percent
Indoor Revenues	$ 5,257,622	71.5%	$ 6,447,534	91.7%
Outdoor Revenues	$ 2,092,539	28.5%	$ 583,863	8.3%
Total	**$ 7,350,161**	**100.0%**	**$ 7,031,396**	**100.0%**

Conclusions and Recommendations

This section presents a review of the City's existing water rate structure and makes recommendations to address various challenges and achieve targeted revenue levels. Results of a MUA decision process were used to select preferred rate alternatives, and a rate design model was constructed to analyze iterative rate and fee scenarios across different types of customers. With implementation of these recommendations, rate equity among customer classes will be improved and the Division's administrative burden will be reduced.

While the rate design is expected to achieve full revenue recovery, the Division should consider the following before implementing revisions:

- The rate design process was based on the best available data at this time. Considerable resources were spent, including significant efforts by the Division, to develop or identify critical billing inputs. However, prior to implementation, the Division should carefully review the assumptions of this analysis with the benefit of improved customer data provided by the City's new billing platform. After the first year billing under the new rates, the Division should compare actual billed revenues to predicted revenues to determine if any adjustments to the rate structure are necessary.
- The bill impacts for non-residential customers, both metered and unmetered, should be investigated to determine whether adjustments to the revised rate schedule are warranted. A limited number of customer types (and even individual customers) were analyzed, but a more thorough study of the potential financial impacts would benefit the Division.

CITY OF IDAHO FALLS
1891

MSA
MURRAY, SMITH & ASSOCIATES, INC.
ENGINEERS | PLANNERS