# EXECUTIVE SUMMARY

## PURPOSE OF THE WSP

The City of Richland's (City) water system is a major infrastructure, much of which is invisible to the customers that receive its water. The water system requires qualified staff to operate and maintain an ongoing capital improvement program (CIP) to replace old components to meet the requirements mandated by federal and state laws. The primary purpose of the City's Comprehensive Water System Plan (WSP) is to identify and schedule water system improvements that correct existing system deficiencies and ensure a safe and reliable supply of water to current and future customers. This WSP complies with Washington State Department of Health (DOH) regulations under Chapter 246-290 Washington Administrative Code, which requires water purveyors to update their water system plans every 6 years. In anticipation of proposed changes to the water system planning requirements to extend the planning horizon to 10 years, this WSP was prepared to serve as a 6-year and 10-year document. The WSP is anticipated to be approved by DOH in early 2017. Therefore, the last year of the planning period of this WSP is 2027, which is 10 years beyond the anticipated approval date of the WSP.

## CHANGES SINCE THE LAST WSP UPDATE

The City's previous WSP was approved by DOH in December 2010. The following changes have occurred since the last update that affect water system planning for the City.

- The Benton County *Comprehensive Plan* was updated in 2013. The update projected future growth for the City through 2034.
- Drinking water regulations are continually evolving to ensure that water purveyors are providing a safe and reliable water supply to their customers. Additional water quality monitoring requirements and revisions to existing regulations, such as the Groundwater Rule, Stages 1 and 2 Disinfectants/Disinfection Byproducts Rules, and the revised Coliform Rule have been implemented.

## SUMMARY OF KEY ELEMENTS

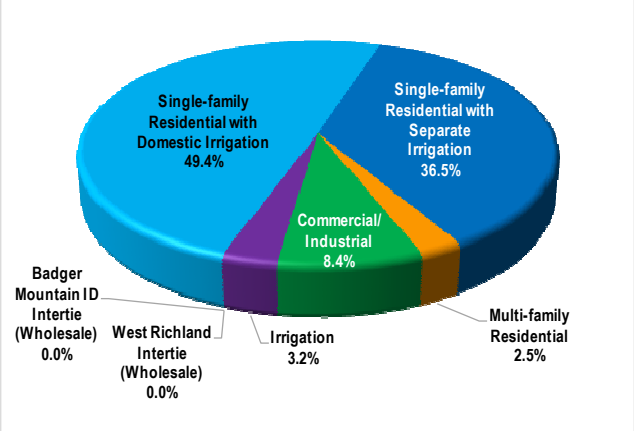
This WSP presents a description of the existing water system and service area, a forecast of future water demands, policies and design criteria for water system operation and improvements, the operations and maintenance program, staffing requirements, a schedule of improvements, and a financial plan to accomplish the improvements. The WSP also includes several ancillary elements that include a water use efficiency plan, a water quality monitoring plan, a wellhead protection plan, a watershed control plan, and a cross-connection control program. A summary of the key issues related to these elements is provided in the following sections.

### WATER SERVICE AREA

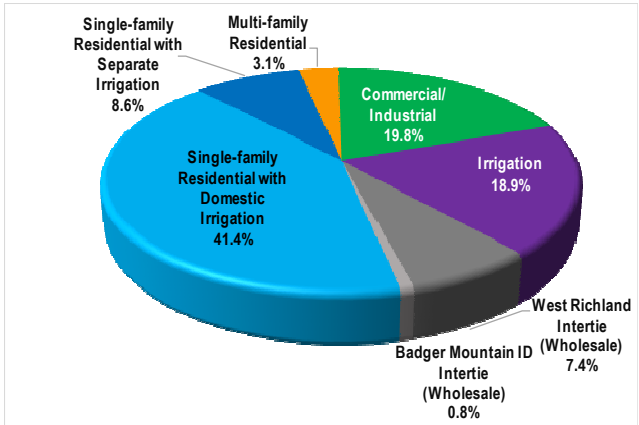
The City provides water service to approximately 54,466 people throughout its water service area boundary, which extends beyond the City's corporate limits. The City is responsible for providing public water service, utility management, and water system development within this area. The City

will provide new water service within the City limits and where there are existing water mains (i.e., the retail water service area). Requests for new water service outside of the City limits but within the Urban Growth Area, where there are no existing water mains fronting the property, will only be granted after the area is annexed to the City or upon completion of an annexation agreement.

In 2015, the City provided water service to an average of 18,689 connections, which were mainly comprised of single-family connections. The City categorizes the single-family residential connections based on the water source used for irrigation at each connection. Single-family residential connections using domestic water for irrigation represent approximately 49 percent of all accounts, and single-family residential connections using non-potable water for irrigation (from a separate irrigation system connection) represent approximately 37 percent of all accounts. The single-family residential connections using domestic water for irrigation consumed approximately 41 percent of all water supplied to the system in 2015, compared to the single-family residential connections with a separate irrigation connection consuming less than 9 percent of all water supplied to the system in 2015.




**2015 Water Connections**




**2015 Water Consumption**

## EXISTING WATER SYSTEM

As early as 1943, water supplies were diverted from the Yakima River, near the confluence with the Columbia River, and pumped into a recharge basin along Wellsian Way. Recharged groundwater was then pumped into the water system for the new and expanded Richland town site. By 1948, three north Richland wellfields, called the North Richland, Columbia, and Duke Wellfields, as well as the Wellsian Way Wellfield, had been developed as the primary supplies for the potable water system. In the early 1960s, it was studied and determined that the recharge efforts in three of the four major basins were not efficient; only the North Richland Wellfield (NRW) was yielding the anticipated production of water. By 1964, the City had built a 22 million gallon per day (MGD) water treatment plant (WTP) to supply potable water directly from the Columbia River, and the Yakima River diversion was abandoned due to high maintenance costs. The City instead added the capability to pump Columbia River water from the raw water intake at the WTP to the North Richland Recharge Basin. The Columbia, Duke, and Wellsian Wellfields were converted to pump naturally occurring groundwater. In the early 2000s, the City redeveloped the NRW by retrofitting the recharge basins

to provide a higher level of treatment. Washed sand was imported to the site that met filtration requirements and covered the two infiltration basins. Operations were modified to run the wellfield similar to a slow sand filter. The City's Columbia River WTP is currently the primary source of supply, with three other wellfields providing additional regular supply to the water system. A summary of the City's existing sources and their capacities is shown in **Table ES-1**.

**Table ES-1**
**Supply Facilities Summary**

| Name | Discharge Pressure Zone | Total Pumping Capacity (gpm) | Total Treatment Capacity (gpm) | Year Installed | Well Depth (feet BGS) | Casing Diameter (inches) | Top of Screen (feet BGS) | Bottom of Screen (feet BGS) | Pump Motor Size (hp) |
|---|---|---|---|---|---|---|---|---|---|
| WTP Intake | Core 548 | 62,000 | 0 | 1963 & 2001 | --- | --- | --- | --- | (3) 100, (2) 200, (2) 300 |
| Columbia - 1100B | Core 548 | 730 | 730 | 1948 | 77 | Unknown | 37 | 73 | 75 |
| WTP | Core 548 | 25,000 | 25,000 | 1963 & 1995 | --- | --- | --- | --- | (1) 350, (4) 500 |
| Wellsian Way - 5 | 392 | 1,500 | 1,500 | 1943 | 72 | Unknown | 46 | 68 | 60 |
| Wellsian Way - 14 | 392 | 600 | | 2001 | 56 | Unknown | 33 | 56 | 40 |
| N. Richland Wellfield - A | Core 548 | 1,500 | 10,400 | 1948 | 88 | 20 | 47 | 82 | 125 |
| N. Richland Wellfield - B | Core 548 | 1,000 | | 1948 | 89 | 20 | 45 | 82 | 75 |
| N. Richland Wellfield - C | Core 548 | 1,000 | | 2004 | 65 | 20 | 30 | 60 | 75 |
| N. Richland Wellfield - D | Core 548 | 1,500 | | 2004 | 75 | 20 | 40 | 70 | 125 |
| N. Richland Wellfield - E | Core 548 | 2,200 | | 1948 | 80 | 24 | 30 | 60 | 200 |
| N. Richland Wellfield - H | Core 548 | 1,500 | | 2004 | 56 | 20 | 26 | 50 | 125 |
| N. Richland Wellfield - J | Core 548 | 1,500 | | 2004 | 71 | 20 | 45 | 69 | 125 |
| N. Richland Wellfield - L | Core 548 | 1,000 | | 2004 | 83 | 20 | 55 | 80 | 75 |
| **Total** | | **101,030** | **37,630** | | | | | | |

BGS = Below Ground Surface

The City's water system has ten booster pump station (BPS) facilities that provide supply throughout the water system. A summary of these pumping facilities is shown in **Table ES-2**.

**Table ES-2**
**Booster Pump Station Facilities Summary**

| Name | Suction Pressure Zone | Discharge Pressure Zone | Year Constructed | Total Pumping Capacity (gpm) | Number of Pumps | Pump Motor Size (horsepower) |
|---|---|---|---|---|---|---|
| WTP High Service Pumps | 372 | Core 548 | | 28,200 | 5 | (1) 250, (4) 500 |
| 1182 BPS | 392 | Core 548 | | 6,000 | 6 | (2) 40, (2) 60, (2) 75 |
| Horn Rapids BPS | Core 548 | Horn Rapids 633 | | 3,880 | 4 | (2) 20, (2) 75 |
| Badger Mt. 1 BPS | Core 548 | Tapteal I 657 | | 4,300 | 3 | (1) 50, (2) 100 |
| Badger Mt. 2 BPS | Core 548 | Tapteal I 657 | | 6,000 | 3 | (3) 100 |
| Badger Mt. South BPS | Tapteal I 657 | Tapteal IV 1052 | 2013 | 1,500 | 2 | (2) 125 |
| Tapteal II BPS | Tapteal I 657 | Tapteal II 798 | | 1,900 | 2 | (2) 60 |
| Keene Rd. BPS | Tapteal I 657 | Tapteal II 798 | | 1,600 | 2 | (2) 40 |
| Westcliffe BPS | Tapteal II 798 | Tapteal III 902 | | 1,400 | 2 | (2) 50 |
| Meadow Hills BPS | Tapteal II 798 | Tapteal V 1204 | 2003 | 700 | 2 | (2) 50 |

The City's water system has ten storage facility sites that provide direct water storage to seven pressure zones. Two of these storage facilities, the WTP Clearwell and 1182 Reservoirs, provide storage for the water system but are not directly connected to pressure zones with customers. The WTP High Service BPS and the 1182 BPS pump water from these reservoirs into the Core 545 Zone. A summary of the City's storage facilities is shown in **Table ES-3**.

**Table ES-3**
**Storage Facilities Summary**

| Name | Pressure Zone | Year Constructed | Material | Capacity (MG) | Diameter (feet) | Base Elevation (feet) | Overflow Elevation (feet) | Overall Height (feet) |
|---|---|---|---|---|---|---|---|---|
| WTP Clearwell A | 372 (WTP Clearwell) | 1944 | Concrete | 0.92 | 130.5 x 70.0 [1] | 358.9 | 372.9 | 14.0 |
| WTP Clearwell B | 372 (WTP Clearwell) | 1944 | Concrete | 0.92 | 130.5 x 70.0 [1] | 358.9 | 372.9 | 14.0 |
| 1182 North | 392 (1182 Reservoirs) | 1944 | Concrete | 0.87 | 97.0 x 144.5 [1] | 382.4 | 392.3 | 9.9 |
| 1182 South | 392 (1182 Reservoirs) | 1944 | Concrete | 0.89 | 77 x 186 [1] | 382.4 | 392.3 | 9.9 |
| Core 548 - 5 MG | Core 548 | 1952 | Concrete | 5.28 | 158 x 240 [1] | 528.4 | 548.0 | 19.6 |
| Core 548 - 10 MG | Core 548 | 1963 | Concrete | 9.42 | 240 | 516.9 | 548.2 | 31.3 |
| Horn Rapids | Horn Rapids 633 | 2010 | Elevated Steel | 0.87 | 65 | 597.4 | 633.4 | 36.0 |
| Tapteal IA | Tapteal I 657 | 1972 | Steel | 0.73 | 64 | 626.4 | 657.9 | 31.5 |
| Tapteal IB | Tapteal I 657 | 1981 | Concrete | 2.59 | 120 | 626.4 | 658.0 | 31.6 |
| Tapteal IIA | Tapteal II 798 | 1975 | Concrete | 0.17 | 40 x 40 [1] | 783.4 | 798.5 | 15.1 |
| Tapteal IIB | Tapteal II 798 | 1981 | Concrete | 0.66 | 80 | 779.9 | 798.3 | 18.4 |
| Country Ridge A | Tapteal II 798 | 1982 | Steel | 0.22 | 42 | 776.4 | 798.4 | 22.0 |
| Country Ridge B | Tapteal II 798 | 1985 | Steel | 0.13 | 32 | 776.4 | 798.2 | 21.8 |
| Westcliffe A | Tapteal III 902 | 2004 | Steel | 0.19 | 40 | 881.4 | 902.7 | 21.3 |
| Westcliffe B | Tapteal III 902 | 2004 | Steel | 0.19 | 40 | 881.4 | 902.7 | 21.3 |
| Badger South - North | Tapteal IV 1052 | 2013 | Concrete | 0.49 | 56.67 x 57.5 [1] | 1,031.4 | 1,052.7 | 21.3 |
| Badger South - South | Tapteal IV 1052 | 2013 | Concrete | 0.49 | 56.67 x 57.5 [1] | 1,031.4 | 1,052.7 | 21.3 |
| Meadow Hills A | Tapteal V 1204 | 1990 | Steel | 0.20 | 48 | 1,188.9 | 1,204.3 | 15.4 |
| Meadow Hills B | Tapteal V 1204 | 2013 | Steel | 0.20 | 48 | 1,188.9 | 1,204.3 | 15.4 |

(1) Rectangular dimensions

The City's water system contains more than 341 miles of water main ranging in size from 2 inches in the distribution system to 36 inches at the City's supply facilities. As shown in **Table ES-4**, most of the water main (approximately 56 percent) within the service area is 8 inches in diameter.

**Table ES-4**
**Water Main Diameter Inventory**

| Diameter (inches) | Length (feet) | Percentage of Total |
|---|---|---|
| 4 or smaller | 25,165 | 1.4% |
| 6 | 134,149 | 7.4% |
| 8 | 1,015,653 | 56.4% |
| 10 | 79,477 | 4.4% |
| 12 | 235,881 | 13.1% |
| 14 | 17,392 | 1.0% |
| 16 | 118,665 | 6.6% |
| 18 | 8,321 | 0.5% |
| 20 | 69,610 | 3.9% |
| 24 | 49,654 | 2.8% |
| 30 | 17,668 | 1.0% |
| 36 | 29,889 | 1.7% |
| **Totals** | **1,801,524** | **100.0%** |

## PAST WATER USAGE

The City has experienced a trend of decreasing annual supply volume and per capita water demand since 2000, which is most likely the result of water use efficiency practices, including replacement of aging water main. Between 2005 and 2015, the City's water service area population increased by more than 23 percent, but the volume of water supplied to the system only increased by approximately 13 percent. **Table ES-5** presents the City's annual net water supply, the average day demand (ADD), water service area population, and average demand per capita from 2000 through 2015.

**Table ES-5**
**Historical Water Supply and System Demand**

| Year | Net Supply (MG) | System-wide Average Day Demand[1] (gpm) | Domestic Average Day Demand[2] (gpm) | Water Service Area Population | Average Demand Per Capita[3] (gal/day/capita) |
|---|---|---|---|---|---|
| 2000 | 7,052.5 | 13,418.0 | 13,418.0 | 41,318 | 468 |
| 2001 | 6,659.2 | 12,669.7 | 12,669.7 | 41,992 | 434 |
| 2002 | 6,484.3 | 12,336.9 | 12,336.9 | 42,562 | 417 |
| 2003 | 6,250.7 | 11,892.5 | 11,892.5 | 43,131 | 397 |
| 2004 | 5,755.1 | 10,949.6 | 10,949.6 | 43,701 | 361 |
| 2005 | 5,507.1 | 10,477.7 | 10,477.7 | 44,270 | 341 |
| 2006 | 5,314.6 | 10,111.5 | 10,111.5 | 44,840 | 325 |
| 2007 | 5,374.7 | 10,225.8 | 10,225.8 | 45,409 | 324 |
| 2008 | 5,556.9 | 10,572.4 | 10,572.4 | 46,561 | 327 |
| 2009 | 5,778.6 | 10,994.2 | 10,994.2 | 47,714 | 332 |
| 2010 | 5,203.0 | 9,899.1 | 9,681.1 | 48,866 | 285 |
| 2011 | 5,259.0 | 10,005.6 | 9,741.3 | 50,019 | 280 |
| 2012 | 5,085.7 | 9,675.9 | 9,414.8 | 51,171 | 265 |
| 2013 | 5,594.8 | 10,644.7 | 10,206.0 | 52,324 | 281 |
| 2014 | 6,022.1 | 11,457.5 | 10,543.2 | 53,476 | 284 |
| 2015 | 6,201.2 | 11,798.3 | 10,825.4 | 54,466 | 286 |
| **Average 2013 to 2015** | | | | | **284** |

(1) System-wide ADD is based on the water system's net supply, and includes wholesale supply to Badger Mountain Irrigation District and West Richland.

(2) Domestic ADD is based on the water system's net supply, and does not include wholesale supply to Badger Mountain Irrigation District and West Richland.

(3) Average demand per capita is based on the domestic average day demand.

gpm = gallons per minute

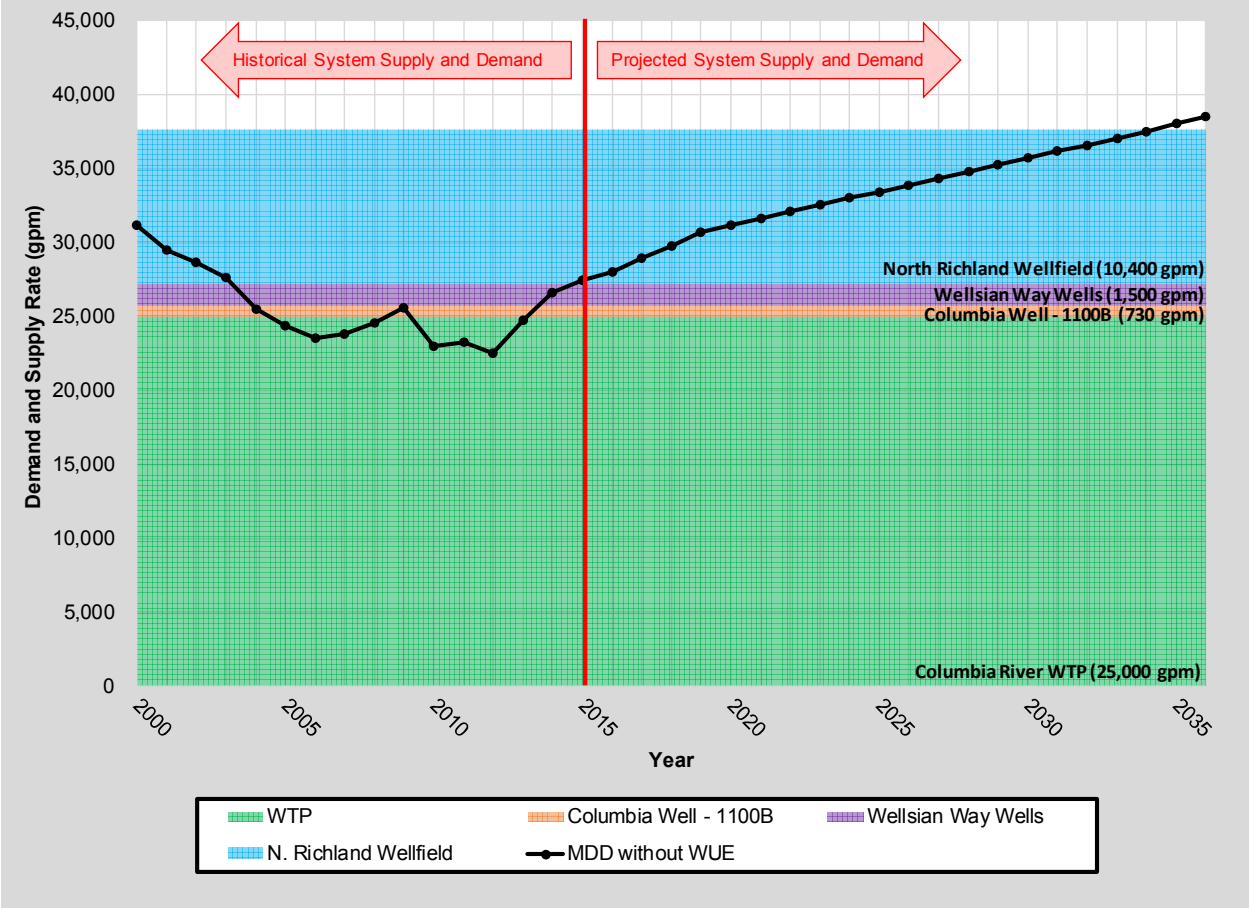
MG = million gallons

## FUTURE WATER DEMANDS AND WATER SUPPLY

Overall water demand within the City's system is estimated to increase by approximately 52 percent by the end of the 21-year planning period. The City's existing active sources are sufficient to meet the projected demands of the system through 2034, but additional source capacity is needed to meet the projected demands beyond 2034.

The City has a Washington State Department of Ecology groundwater well permit for a 1,500 gallon per minute (gpm) well in south Richland. The City drilled a pilot well in Summer 2016, and found that the water quality of the well is not suitable for use in the City's system. The City plans to evaluate other locations in south Richland that may have acceptable water quality throughout the 2027 planning period. Additional source capacity is not needed within the 12-year (2027) planning period of this WSP, as shown in **Chart ES-1**.

**Chart ES-1**
**Future Water Demands and Water Supply**



## WATER SOURCE AND QUALITY

The City's Columbia River WTP is currently the primary source of supply, with three other wellfields providing additional regular supply to the water system. Raw water from the Columbia River intake is treated at the WTP. The WTP is a direct filtration facility utilizing high-rate filtration through beds of coal and sand. Chlorine and polyaluminum chloride are added to the raw water ahead of the contact basins, and a secondary flocculent is added as needed ahead of filtration. Lime for pH control and activated carbon for taste and odor control are available if needed. The WTP is operated year-round and is only taken out of service for short periods in the winter to perform routine inspections and maintenance. During these periods, the wells are used as the primary source.

The NRW is operated as a slow sand filtration facility. The purpose of the infiltration basins is to provide a hydraulic barrier to the southward flow of potential contaminants from the Hanford site and supplement production capacity. These basins also provide water to the NRW. The City's operating policy stipulates that infiltration and inflow should be twice the volume as the extracted wellfield flow on an annual basis. The water is disinfected by an ultraviolet (UV) system and chlorine.

The Wellsian Way Wells pump to the 1182 Treatment Facility, which includes an air stripper with polyphosphate sequesterant reagent and UV disinfection. Capacity is limited by the air stripper to 1,500 gpm (2.2 MGD).

Of the three original Columbia Wellfield wells, only Well 1100-B is still in service. Water quality is good and is pumped directly to the Core Zone. All water from this facility is disinfected with a liquid chlorine system.

## OPERATIONS AND MAINTENANCE

The City's operations and maintenance organization is staffed by well-qualified, technically trained personnel. City staff regularly participate in safety and training programs to keep abreast of the latest changes in the water industry and to ensure smooth and safe operation of the water system. The current staff of supervisory and maintenance personnel have effectively operated and maintained the water system in the past.

The City has taken several steps to prepare for emergency situations. The City has had an Emergency Response Plan (ERP) prepared, which provides information to prepare and assist the City in responding to emergency events. The ERP includes a vulnerability assessment, contingency procedures, and emergency response procedures in accordance with the requirements of the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. Water system improvements completed by the City over the last several years, and proposed improvements identified in this WSP, will reduce the vulnerability of the water system during emergency situations.

## WATER SYSTEM EVALUATION

The existing water system was evaluated to determine its ability to meet the policies and design criteria of the City and those mandated by DOH. The results of the evaluation are summarized as follows.

- The City's existing active sources are sufficient to meet the projected demands of the system through 2034, but additional source capacity is needed to meet the projected demands beyond 2034.
- The City is projected to have a source capacity surplus beyond the 12-year planning period presented in this WSP, but a slight source capacity deficit in approximately 2035, based on the projected maximum day demand without reductions from water use efficiency efforts.
- The City's existing booster pump stations have adequate capacity at least through 2027, with the exception of the Tapteal I Zone BPS, which is projected to have a slight (165 gpm) deficiency by 2025, and a 412 gpm deficiency in 2027.
- The City's existing reservoirs have adequate capacity to meet the DOH minimum storage requirements for the next 21 years, with the exception of the Tapteal IV Zone as a result of the additional growth anticipated in the Badger Mountain South Subarea.
- Several residential areas are proposed to be converted from the Tapteal I to the Tapteal II Zone as a result of low pressures during existing peak hour demand conditions.
- Several pressure reducing valves are necessary to increase the level of service provided to customers within Tapteal I and Core Y Zones.
- Several water mains need to be replaced with new water mains to increase fire flows and resolve deficiencies related to undesirable pipe material and aging water main.

## PROPOSED WATER SYSTEM IMPROVEMENTS AND FINANCING PLAN

Improvements to the system are primarily necessary to resolve existing system deficiencies, but they will also improve operations, replace older aging infrastructure, and accommodate future water customers. Improvements identified for the first 6 years of the CIP (2016 to 2021) are estimated to cost approximately $25,105,000 (in 2016 dollars), which results in an average expenditure of approximately $4,184,000 per year (in 2016 dollars). Scheduled improvements in the following 6 years (2022 to 2027) are estimated to cost approximately $18,673,000 (in 2016 dollars). Scheduled City-funded improvements within the City's 21-year CIP (2016 to 2035) are estimated to cost approximately $90,049,000 (in 2016 dollars).

The financial analysis is intended to illustrate the feasibility of funding the operation, maintenance, and capital improvements planned for the water system through 2027. The financial forecast projects that rates can remain at existing levels and provide revenue sufficient to cover all utility financial obligations, including the addition of new debt and partial cash funding of the capital program. Holding rates at existing levels should provide for continued financial viability while maintaining generally affordable rates.

The City has established rates that are affordable to its customers and has earned a reputation for providing high-quality customer service and outstanding water quality. The City's proven financial strength will ensure that customers will continue to receive the same high-quality level of service they have come to expect.