1 | DESCRIPTION OF WATER SYSTEMS

WATER SYSTEM OWNERSHIP AND MANAGEMENT

The City of Richland (City) is a Washington State municipal corporation that owns and operates a Group A community water system within the boundaries of the City. Water system data on file at the Washington State Department of Health (DOH) for the City is shown in **Table 1-1**.

Table 1-1
Water System Ownership Information

Information Type	Description
System Name	Richland, City of
System Type	Group A, Community
DOH System ID Number	72250
Primary Operator ID	06666
County	Benton
Address	P.O. Box 190, Richland, WA, 99352
Contact Name	John Finch, City of Richland Water Manager
Contact Phone Number	(509) 942-7476

SYSTEM HISTORY AND BACKGROUND

HISTORY

The City's history is intertwined with the development of the Hanford Nuclear Reservation. The City was incorporated in 1906 as a small, growing farming community. The original Richland town site, with a population of under 300 people, was later condemned by the federal government in early 1943 for a secret war effort. Hanford was the primary site in the secret development and production of weapons-grade plutonium for the atomic bomb. The government developed much of the core residential and commercial areas of the City to support employees working at Camp Hanford. The government-run community grew to as many as 16,000 people in a few short years.

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. The condemnation process also yielded water supplies from the local Richland Irrigation District (RID). Historically, the RID surface waters had been diverted from the Horn Rapids Dam and transported through the Horn Rapids Canal to agricultural lands around the old Richland town site. The government used the series of canals and created another set of recharge basins to accept and naturally treat the former irrigation surface waters. The artificially stored groundwaters were then pumped into the water system for the expanding domestic water needs. By 1948, three north Richland well fields, called the North Richland, Columbia, and Duke Well Fields, as well as the Wellsian Way Well Field, had been developed as the primary supplies for the potable water system. A 5-million-gallon (MG) reservoir was constructed on the south side of the Yakima River on elevated ground to provide water storage for the system.

The City was incorporated again in 1958 to take over the general governance and provide municipal services in the local community. The water system and water rights were conveyed to the City on or about October 1959. It was studied and determined that the recharge efforts in three of the four major basins were not efficient; only the North Richland Well Field 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, along with a 10 MG reservoir south of the Yakima River to meet storage requirements. The high cost of maintaining the Horn Rapids Canal led to abandoning the diversion of Yakima River water. 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 Well Fields were converted to pump naturally occurring groundwater. The Yakima River pump station stopped pumping water to the Wellsian recharge area and was used instead to irrigate the adjoining shelterbelt. Studies had shown that the irrigation practices around the shelterbelt provided similar groundwater recharge benefits to the Wellsian Way Well Field as the abandoned recharge area.

Growth in the City south of the Yakima River required development of an extensive system of booster pumps and reservoirs to serve the five pressure zones. By 1979, the City had grown to the point where it was required to upgrade the WTP pumping capacity to 30 MGD.

Sometime in the early 1990s, the Wellsian Way system shut down for a period of time due to high levels of volatile organic compounds (VOCs). The reduced pumping created problems with perched local groundwaters, motivating the City to reactivate the Wellsian Way system by using an air stripping facility to treat the VOCs.

In the mid-1990s four filter basins were added to the original four at the WTP. In addition, effluent pumping capacity was increased and treatment process improvements were made to meet surface water treatment rule requirements.

In the early 2000s, the City redeveloped the North Richland Well Field (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 well field similar to a slow sand filter. The well supply is routed to an ultraviolet (UV) plant where the water is disinfected, chlorinated for residual purposes, and conveyed into the distribution system.

TOPOGRAPHY

The topography of the City's water system varies greatly. The City's core north of the Yakima River has a high elevation of approximately 425 feet, a low elevation of approximately 340 feet, and lies generally north of the Yakima River and within 3 miles of the Columbia River. The ground elevation steadily increases from State Route (SR) 240 west to a plateau on which the Horn Rapids Golf Course and planned unit development are located. Ground elevations in the Horn Rapids pressure zone are approximately 400 to 500 feet. The City's water service south of the Yakima River rises sharply to Badger Mountain, forming five pressure zones above the City core. A large portion of this part of the service area is in a single pressure zone known as Tapteal I, which has ground elevations of approximately 555 feet to 425 feet above mean sea level. Steep slopes rise from the Tapteal I Zone to Badger Mountain, with the southeasterly portion of Badger Mountain located within the City's service area, with a maximum ground elevation of approximately 1,485 feet.

INVENTORY OF EXISTING FACILITIES

PRESSURE ZONES

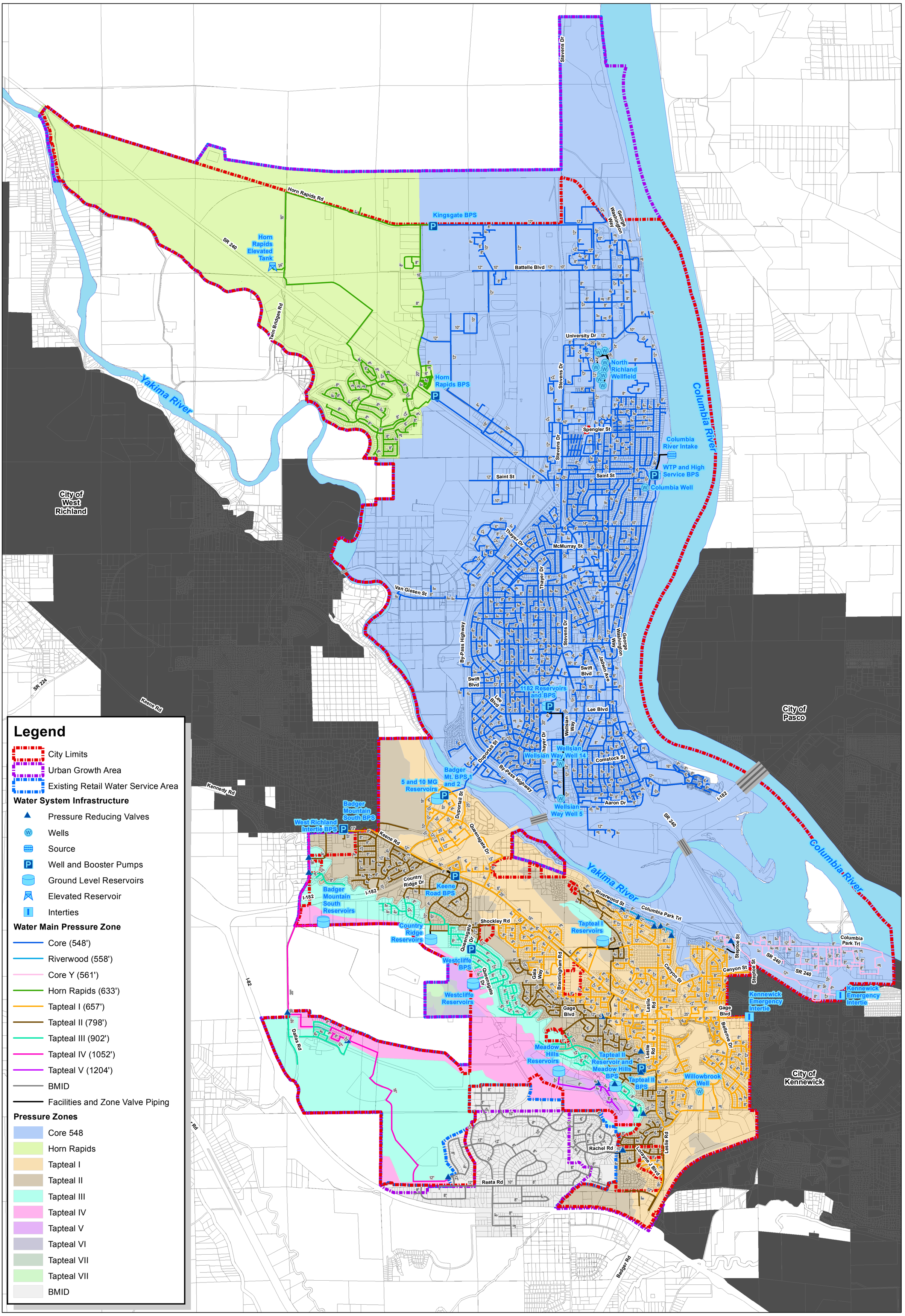
The City's water system consists of seven pressure zones served by reservoirs and two served by pressure reducing stations (PRVs). The City does not have any closed pressure zones (i.e., a pressure zone without a storage facility, where the only supply to the pressure zone is pumped). The City's largest zone, both in terms of area and number of customers, is the Core 548 Zone. The City's pressure zones and existing system facilities are shown on **Figure 1-1**. The pressure in each pressure zone is regulated by reservoir levels, pressure reducing station settings, pump station settings or a combination of these, as illustrated in the hydraulic profile, **Figure 1-2**.

SUPPLY FACILITIES

The City's Columbia River WTP is currently the primary source of supply, with three other well fields providing additional regular supply to the water system. A summary of the supply sources and their capacities is shown in **Table 1-2**, and a brief description of each supply source is provided in the following sections.

Table 1-2
Supply Facilities Summary

Name	Discharge Pressure Zone	Total Pumping Capacity (gpm)	Total Treatment Capacity (gpm)
WTP Intake	Core 548	62,000	0
Columbia - 1100B	Core 548	730	730
WTP	Core 548	25,000	25,000
Wellsian Way - 5	392	1,500	1,500
Wellsian Way - 14	392	600	
N. Richland Wellfield - A	Core 548	1,500	10,400
N. Richland Wellfield - B	Core 548	1,000	
N. Richland Wellfield - C	Core 548	1,000	
N. Richland Wellfield - D	Core 548	1,500	
N. Richland Wellfield - E	Core 548	2,200	
N. Richland Wellfield - H	Core 548	1,500	
N. Richland Wellfield - J	Core 548	1,500	
N. Richland Wellfield - L	Core 548	1,000	
Total		**101,030**	**37,630**



Legend

- City Limits
- Urban Growth Area
- Existing Retail Water Service Area

Water System Infrastructure

- Pressure Reducing Valves
- Wells
- Source
- Well and Booster Pumps
- Ground Level Reservoirs
- Elevated Reservoir
- Interties

Water Main Pressure Zone

- Core (548')
- Riverwood (558')
- Core Y (561')
- Horn Rapids (633')
- Tapteal I (657')
- Tapteal II (798')
- Tapteal III (902')
- Tapteal IV (1052')
- Tapteal V (1204')
- BMID
- Facilities and Zone Valve Piping

Pressure Zones

- Core 548
- Horn Rapids
- Tapteal I
- Tapteal II
- Tapteal III
- Tapteal IV
- Tapteal V
- Tapteal VI
- Tapteal VII
- Tapteal VII
- BMID

\\RH2\DFS\RICHLAND\DATA\RIC\715-107\GIS\MAPS\FIG1-1.MXD BY: RWITHERS PLOT DATE: MAR 20, 2017 COORDINATE SYSTEM: NAD 1983 STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

RH2 ENGINEERS, INC. NORTH

1 inch = 2,500 feet

0 1,250 2,500 5,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2”

Richland Washington

Figure 1-1
Existing Water System

City of Richland
2017 Comprehensive Water System Plan

Vicinity Map

City of Richland
Domestic Water System

Figure 1-2
2017 Hydraulic Profile

09/13/2016

RIC 714-039
RIC-F-HPRO-2014.DWG

TAPTEAL 5
1204

Meadow Hills
0.22 Mg

Meadow Hills
0.22 Mg

TAPTEAL 3.5
973

TAPTEAL 3
902

Meadow Hills

350

350

1 2

TAPTEAL 2
798

Tapteal 2A
0.18 Mg

Tapteal 2B
0.7 Mg

Tapteal 2

950

950

1 2

2

Tap 1.5, 718
Caliente Sands

TAPTEAL 1
657

Badger Mt.1
(Tapteal 1)

1700

900

1700

1 2 3

Badger Mt.2
(City View)

2000

2000

2000

1 2 3

CORE
548

Tapteal 1A
0.75 Mg

Tapteal 1B
2.6 Mg

5 Mg

10 Mg

WTP High Service

3300

5400

6500

6500

6500

3 4 5 6 7vfd 8 future

WTP Clearwell
2.2 Mg

372

343

River Intake
Structure

9500

10500

5500

5500

9000

10500

9000

7 6 5vfd 4 3 2 1

WTP Intake

Westcliffe A
0.20 Mg

Westcliffe B
0.20 Mg

WestCliffe

710

710

1 2

4" Relief

Keene Rd.

800

800

1 2

Riverwood
553

6

North Richland Well Field

1500

1000

1000

1500

2200

1500

1500

1000

A B C D E H J L

1100B
Columbia
Well

Country Ridge "A"
0.24 Mg

Country Ridge
"B" 0.14 Mg

1000

1660

8 D
Duke Wells

Richland Y
563

Kennewick
Intertie

Tri-City
Intertie

Kennewick
Intertie

TAPTEAL 4
1052

Badger Mt
2 x 0.45 Mg

BMID
Intertie

TAPTEAL 3.5
953

2

White Bluffs PRV
(Cowlitz Blvd)

TAPTEAL 2.5
850

Rau Lane

1

W.Richland
Intertie

KID
Intertie

900

Harrison
Well

Badger Mt
South

750

750

W.Richland
BPS

HORN RAPIDS 633

Horn Rapids
1.0 Mg

Kingsgate

1500

Horn Rapids

340

340

1600

1600

1 2 3 4

1182 BPS

600

600

1000

1000

1400

1400

1 2 3 4 5 6

1182 South
1 Mg

1182 North
1 Mg

392

1200

400

5 14

Wellsian Way

NOTE: Elevations shown based on NAVD 88

Pump
123
FLOW in GPM

Tank

PRV
2
# of STATIONS

Pressure Zone

Standby Pump

Intertie

PRV in BPS

Columbia River Intake

Columbia River water is pumped by two vertical turbine pumps at the City's intake structure to the NRW infiltration basins, and by four other vertical turbine pumps at the intake structure to the WTP. A seventh vertical turbine pump can be valved to pump either to the NRW or the WTP. The total pumping capacity at the intake is approximately 62,000 gallons per minute (gpm) (90 MGD).

Columbia River Water Treatment Plant

The Columbia River WTP is the City primary supply facility, located at Saint Street and Harris Street along the Columbia River. 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 (PACL) 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 backwashes into the primary inverted cone basin that is float controlled. The backwash criteria is one of three: 1) 3 MG flow; 2) 10 feet of headloss; or 3) 36 hours of runtime. The primary holding basin contains the backwash of two filters. The pumps send water to two settling basins where the water can be decanted to the Columbia River and the drying beds. The backwash water and sludge is typically pumped back to the drying beds.

The original plant was constructed in 1963 with a capacity of 15 MGD and upgraded in 1980 and 1995. The current maximum production capacity is 36 MGD (25,000 gpm), but much of the piping was sized to facilitate an upgrade to 45 MGD.

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.

North Richland Wellfield

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 westernmost basin serves as a settling basin and is connected to the north and south infiltration basins. Two pumps supply the settling basin from the Columbia River intake. The infiltration basin is maintained at a surface elevation of 391 to 393 feet. The north and south basins are connected by two culverts that operate between 380 and 381.5 feet. The City's operating policy stipulates that infiltration inflow should be twice the volume as the extracted well field flow on an annual basis. The water is disinfected by a UV system and chlorine.

The NRW is considered groundwater under the influence of surface water, but the DOH has granted the City a 2-log slow sand credit due to the method of operation of the infiltration basins. The treatment capacity at the NRW is 10,400 gpm (15 MGD).

1182 Treatment Facility

The Wellsian Way Wells pump to the 1182 Treatment Facility, which includes an air stripper with polyphosphate sequesterant reagent. Capacity is limited by the air stripper to 1,500 gpm (2.2 MGD). Of the four original Wellsian Way wells, two remain in domestic service to supply the 1182 Treatment Facility. Water treated at the 1182 facility is repumped to the City's Core pressure zone.

Columbia Wellfield

Of the three original Columbia Wellfield wells, only well 1100-B is still in service. This well is located near the intersection of Wallace Street and Harris Avenue. Water quality is good and is pumped directly to the Core zone. All water from this facility is disinfected with a liquid chlorine system. The pumping capacity of the Columbia Well (1100-B) is 730 gpm (1.1 MGD).

PUMP STATION FACILITIES

The City's water system has ten booster pump station facilities that provide supply throughout the water system. A summary of these pumping facilities is shown in **Table 1-3**.

Table 1-3
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

STORAGE FACILITIES

The City's water system has ten storage facility sites that provide 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 Booster Pump Station (BPS), and the 1182 BPS pump water from these reservoirs into the Core 548 Zone. A summary of the City's storage facilities is shown in **Table 1-4**.

Table 1-4
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

DISTRIBUTION AND TRANSMISSION SYSTEM

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 1-5**, most of the water main (approximately 56 percent) within the service area is 8 inches in diameter.

Table 1-5
Water Main Diameter Inventory

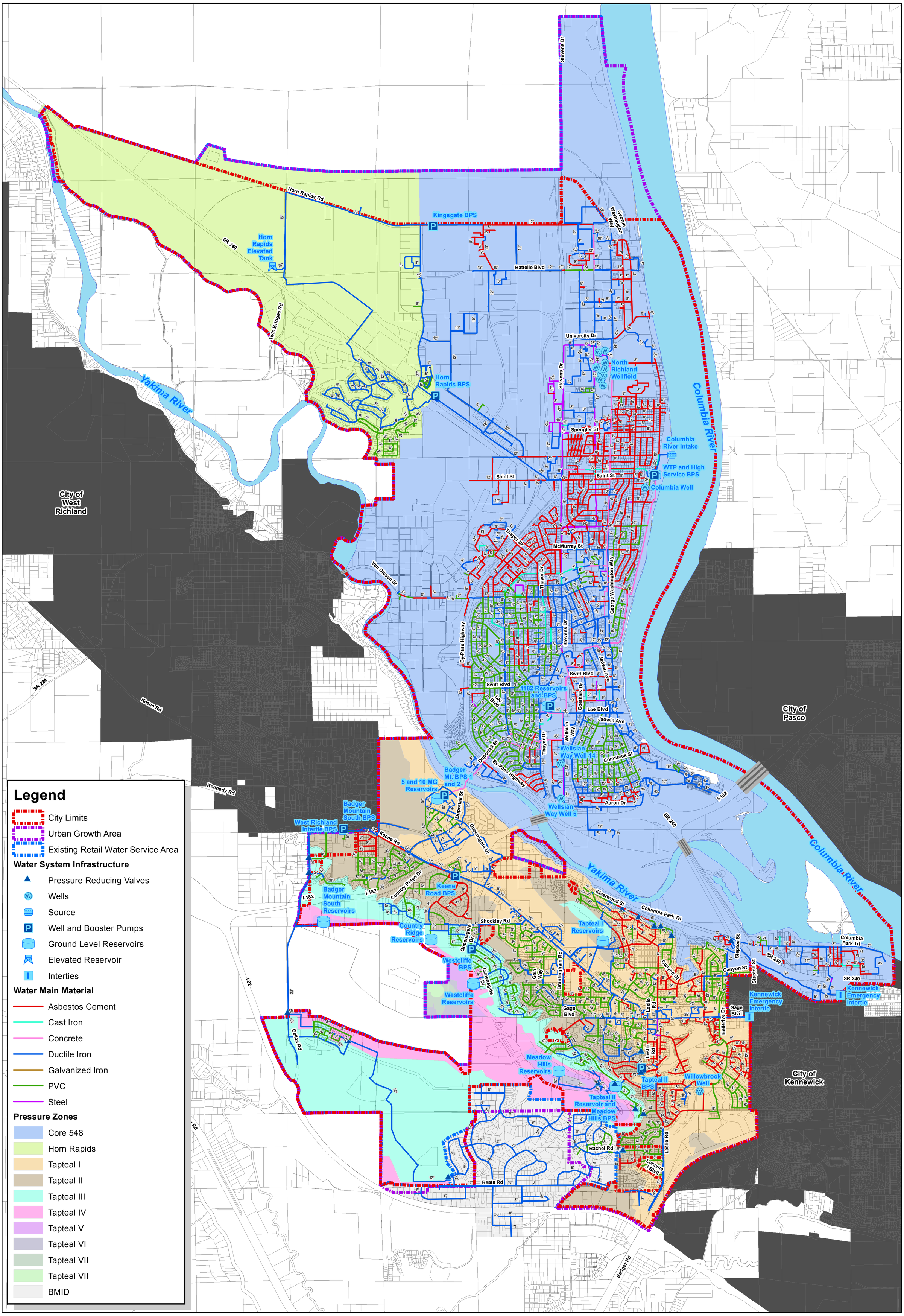
Diameter (inches)	Length (feet)	Percentage of Total
4 or smaller	25,165	1.4%
6	134,149	7.4%
8	1,015,653	56.4%
10	79,477	4.4%
12	235,881	13.1%
14	17,392	1.0%
16	118,665	6.6%
18	8,321	0.5%
20	69,610	3.9%
24	49,654	2.8%
30	17,668	1.0%
36	29,889	1.7%
Totals	**1,801,524**	**100.0%**

The water main in the City's system is constructed of either asbestos cement, cast iron, concrete, ductile iron, galvanized iron, polyvinyl chloride (PVC), or steel. Approximately 29 percent of the system is constructed of PVC; approximately 28 percent is constructed of asbestos cement; and approximately 37 percent is constructed of ductile iron. All new water main installations are required to use ductile iron or PVC pipe in accordance with the City's development and construction standards. **Table 1-6** and **Figure 1-3** show the City's existing water main inventory by material.

Table 1-6
Water Main Material Inventory

Water Main Material	Length (feet)	Percentage of Total
Asbestos Cement	496,010	27.5%
Cast Iron	21,879	1.2%
Concrete	58,346	3.2%
Ductile Iron	661,667	36.7%
Galvanized Iron	52	0.0%
PVC	518,746	28.8%
Steel	44,824	2.5%
Totals	**1,801,524**	**100.0%**

Per industry standard, the life expectancy of water main is generally 50 years. At least 42 percent of the system's water main is approximately 40 years old or older, and may be reaching or has reached



\\RH2\DFS\RICHLAND\DATA\RIC\715-107\GIS\MAPS\FIG1-3.MXD BY: RWITHERS PLOT DATE: MAR 20, 2017 COORDINATE SYSTEM: NAD 1983 STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

RH2 ENGINEERS, INC.

NORTH

1 inch = 2,500 feet

0 1,250 2,500 5,000 Feet

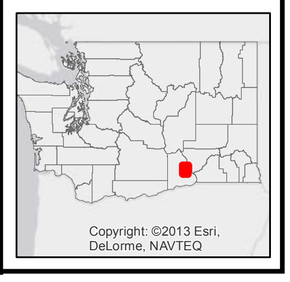
DRAWING IS FULL SCALE WHEN BAR MEASURES 2”

Richland Washington

Figure 1-3
Water Main Material

City of Richland
2017 Comprehensive Water System Plan

Vicinity Map



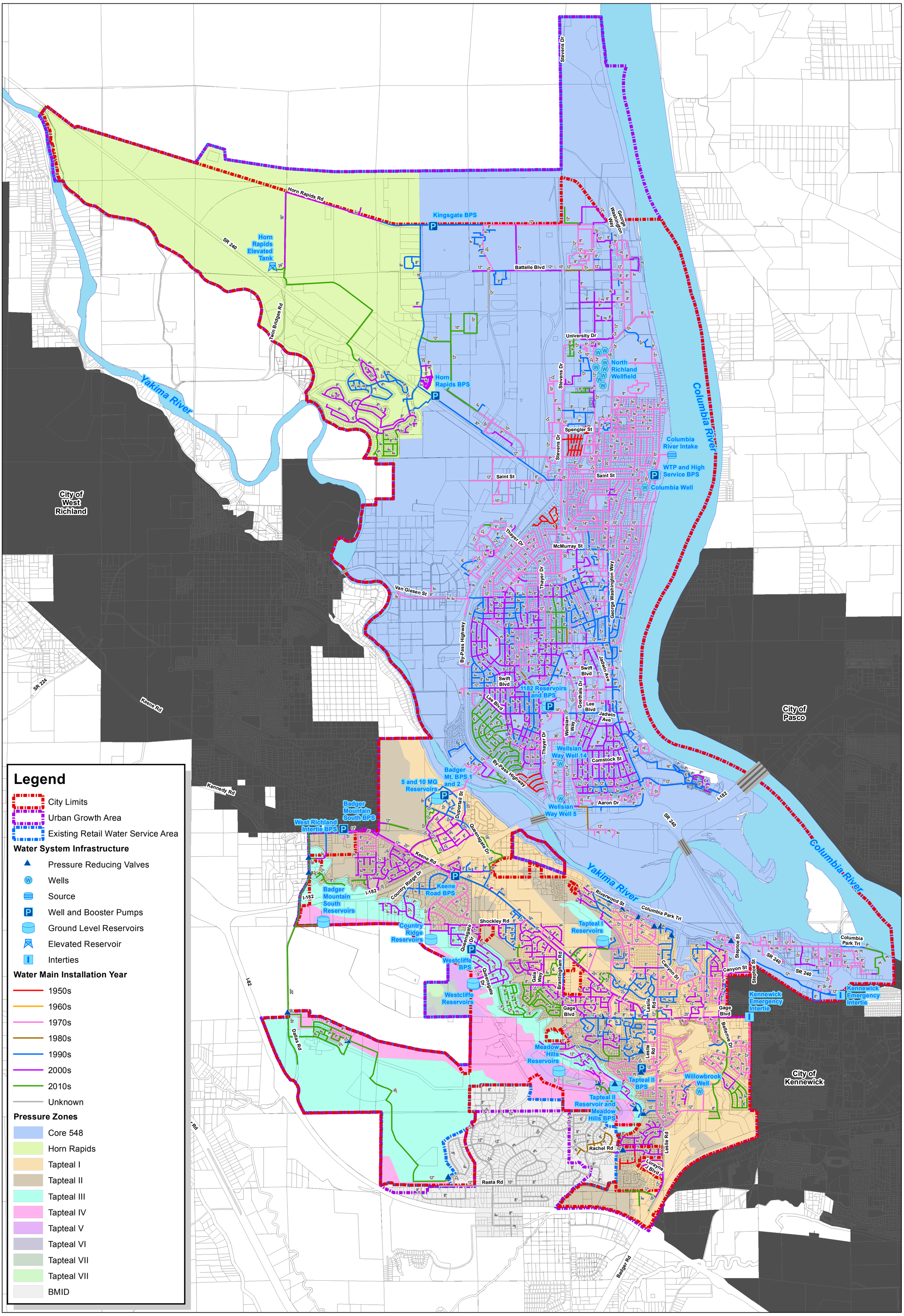
its projected life expectancy. The majority of this older water main is asbestos cement. The remainder of the water main in the City's water system is primarily 25 years old or less, and is generally in good condition. A detailed breakdown of the City's water main installation per year is shown in **Table 1-7**, and graphically in **Figure 1-4**.

Table 1-7
Water Main Installation Year Inventory

Water Main Installation Year	Length (feet)	Percentage of Total
1950s	20,477	1.1%
1960s	0	0.0%
1970s	728,829	40.5%
1980s	6,068	0.3%
1990s	317,115	17.6%
2000s	521,251	28.9%
2010s	195,323	10.8%
Unknown	12,461	0.7%
Totals	**1,801,524**	**100.0%**

EXISTING RETAIL WATER SERVICE AREA

The City is located on the right bank of the Columbia River and downstream of the Hanford Nuclear Reservation. An overview of the existing water system configuration and the existing retail water service area is shown in **Figure 1-1**. Within and adjacent to the City's existing retail water service area are other public and private domestic water systems. These include the City of Kennewick's water system, the City of West Richland water system, Tri-Cities Estates Water District, Badger Mountain Irrigation District (BMID), and Kennewick Irrigation District's Lorayne J water system. The Badger Canyon Water Association is located south of Interstate 82 (I-82) and south of the City's UGA and water service area. BMID, Columbia Irrigation District, and Kennewick Irrigation District also provide irrigation service within the City's existing retail water service area, as shown in **Figure 1-5**. A summary of the City's current water system data is shown in **Table 1-8**.



Legend

- City Limits
- Urban Growth Area
- Existing Retail Water Service Area

Water System Infrastructure

- Pressure Reducing Valves
- Wells
- Source
- Well and Booster Pumps
- Ground Level Reservoirs
- Elevated Reservoir
- Interties

Water Main Installation Year

- 1950s
- 1960s
- 1970s
- 1980s
- 1990s
- 2000s
- 2010s
- Unknown

Pressure Zones

- Core 548
- Horn Rapids
- Tapteal I
- Tapteal II
- Tapteal III
- Tapteal IV
- Tapteal V
- Tapteal VI
- Tapteal VII
- Tapteal VII
- BMID

\\RH2\DFS\RICHLAND\DATA\RIC\715-107\GIS\MAPS\FIG1-4.MXD BY: RWITHERS PLOT DATE: MAR 20, 2017 COORDINATE SYSTEM: NAD 1983 STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

RH2 ENGINEERS, INC. NORTH

1 inch = 2,500 feet

0 1,250 2,500 5,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2”

Richland Washington

Figure 1-4
Water Main Installation Year

City of Richland
2017 Comprehensive Water System Plan

Vicinity Map

Yakima River

Columbia River

City of West Richland

City of Pasco

City of Kennewick

Legend

- City Limits
- Urban Growth Area
- Existing Retail Water Service Area
- Neighboring City Limits

Irrigation Districts

- Badger Mountain Irrigation District
- Columbia Irrigation District
- Kennewick Irrigation District

Potable Water Purveyors

- Badger Mountain Irrigation District
- Lorayne J (KID)
- Tri-Cities Estates

\\RH2\DFS\RICHLAND\DATA\RIC\715-107\GIS\MAPS\FIG1-5.MXD BY: RWITHERS PLOT DATE: MAR 20, 2017 COORDINATE SYSTEM: NAD 1983 STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

RH2 ENGINEERING

NORTH

1 inch = 2,500 feet

0 1,250 2,500 5,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2”

Richland Washington

Figure 1-5
Adjacent Purveyors and Irrigation Districts

City of Richland
2017 Comprehensive Water System Plan

Vicinity Map

Table 1-8
Richland Water System Data

Information Type	Description
Water Service Area Population	54,466
Retail Water Service Area	47.30 square miles
Total Connections	18,689
Total ERUs	15,199
Demand per ERU	1,118 gallons per day
Demand per Capita	286 gallons per day
Average Annual Supply	6.20 billion gallons
MDD/ADD Factor	2.33
PHD/MDD Factor	1.32
Supply Capacity	37,630 gallons per minute
Storage Capacity	21.83 million gallons
Length of Water Piping	1,801,524 feet

ADD = average day demand
ERU = equivalent residential unit
MDD = maximum day demand

The City's water system has 18,689 connections and serves a population of 54,466. The existing retail water service area comprises approximately 47.30 square miles. Potable water supply is provided by 11 wells and the Columbia River. It is stored in 15 reservoirs with a total available capacity of 21.83 MG. Water supply from all sources is chlorinated.

FUTURE RETAIL SERVICE AREA

The future retail water service area includes a land transfer area at the northern extents of the existing City boundaries. The future retail water service area encompasses an area of approximately 48.48 square miles, and is shown in **Figure 1-6**.

WHOLESALE WATER SERVICE AREA

The City currently provides wholesale water to the City of West Richland and BMID. The City's wholesale water service area includes the future retail water service area, as well as retail service areas of these other purveyors. The City's wholesale water service area is shown in **Figure 1-6**.

Columbia River
SR 240
Yakima River
City of West Richland
Van Giesen
By-Pass Highway
City of Richland
City of Pasco
SR 224
City of Benton City
I-182
Columbia River
City of Kennewick
I-82

Legend

- Wholesale Water Service Area
- Future Retail Water Service Area
- Existing Retail Water Service Area
- Neighboring City Limits

\\RH2\DFS\RICHLAND\DATA\RIC\715-107\GIS\MAPS\FIG1-6.MXD BY: RWITHERS PLOT DATE: MAR 20, 2017 COORDINATE SYSTEM: NAD 1983 STATEPLANE WASHINGTON SOUTH FIPS 4602 FEET

NORTH

1 inch = 4,000 feet

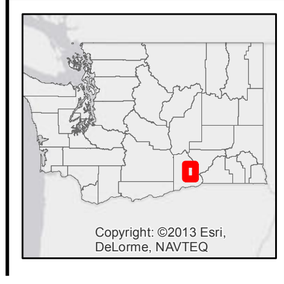
0 2,000 4,000 8,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2”

Figure 1-6
Water Service Areas

City of Richland
2017 Comprehensive Water System Plan

Vicinity Map



COMPATIBILITY WITH RELATED PLANS

To ensure that this Water System Plan (WSP) is consistent with other related plans, the following planning documents were examined.

- State of Washington Growth Management Act
- Benton County *Comprehensive Land Use Plan*
- City of Richland *Comprehensive Plan*
- *Regional Water Supply Feasibility Study*
- *Regional Water Forecast and Conservation Plan*

GROWTH MANAGEMENT ACT

The State of Washington Growth Management Act (GMA), was most recently updated in 2014. The GMA requires, among other things, consistency between land use and utility plans and their implementation. The State of Washington GMA of 1990 (and its multiple amendments) defined four goals relevant to this WSP:

1. Growth should be in urban areas;
2. There should be consistency between land use and utility plans and their implementation;
3. There should be concurrency of growth with public facilities and services; and
4. Critical areas should be designated and protected.

The GMA requires planning consistency from two perspectives. First, it requires consistency of plans among jurisdictions. This means that plans and policies of the City and Benton County (County) must be consistent (Revised Code of Washington (RCW) 36.70A.100). Second, the GMA requires the implementation of the WSP be consistent with local comprehensive plans (RCW 36.70A.120).

The 2003 Municipal Water Law also requires that water system plans are consistent with local plans and regulations. The signed Consistency Statement Checklists (included in **Appendix G**) from the City and County planning departments documents the determination for this WSP to be consistent with relevant plans and regulations.

The GMA also requires that critical areas be designated and protected. Critical areas include aquifer recharge areas, wetlands, streams, and geologically hazardous areas. The State Environmental Policy Act (SEPA) checklist in **Appendix Y** addresses other environmental concerns.

CITY OF RICHLAND COMPREHENSIVE PLAN

The Land Use Element of the City's *Comprehensive Plan* is the City's vision of how growth and development should occur over a 20-year horizon. While the Land Use Element goals and policies set forth general standards for locating land uses, the future land use map indicates geographically

where certain types of uses may be appropriate. The future land use map is a blueprint for development of an area, whereas the zoning map and zoning code are the regulatory means for implementing development.

The Land Use Element of the City's *Comprehensive Plan* considers the general location of land uses, as well as the appropriate intensity and density of land uses given the current development trends. The utilities, transportation, and capital facilities elements ensure that new development will be adequately serviced without compromising adopted levels of service, similar to the principal of concurrency as defined in the GMA. The City's *Comprehensive Plan* is reviewed and taken into consideration during the development and subsequent revisions to the WSP.

BENTON COUNTY COMPREHENSIVE LAND USE PLAN

The County originally adopted it's *Comprehensive Land Use Plan* on March 12, 2007. The plan has been amended several times since to incorporate urban growth area (UGA) changes, capital facility plan changes, and land use changes. The most recent amendments took effect in March 2013 to include data through 2012. The County's *Comprehensive Land Use Plan* guides development in rural, unincorporated Benton County, and designates land uses in unincorporated UGAs.

REGIONAL WATER SUPPLY FEASIBILITY STUDY

The *Regional Water Supply Feasibility Study* (RWSFS), originally prepared in 2003, and updated in the spring of 2016, provides a detailed analysis of how the Cities of Kennewick, Richland, and West Richland will obtain, treat, and distribute water south and west of the Columbia River. The RWSFS develops 50-year demand projections for each city, analyzes the hydraulics between the three cities, evaluates the feasibility of a regional treatment facility, and develops a detailed implementation plan for three future supply alternatives.

REGIONAL WATER FORECAST AND CONSERVATION PLAN

The *Regional Water Forecast and Conservation Plan* (RWFCP), originally prepared in September 2008, and updated in the spring of 2016, forecasts the long-term needs of the Cities of Kennewick, Pasco, Richland, and West Richland "to serve as a common demand forecast by the four cities when they update their water system plan." The RWFCP recommends a strategy to use the entire quad city water right of 178 cubic feet per second (cfs) under Application No. S4-30976 between the four cities. The intent of the RWFCP is to supplement the RWSFS and each city's individual WSP.

The RWFCP is required to be updated on a 6-year basis, as described in the Quad City water right permit (S4-30976). Although the anticipated approval period of this WSP is 10 years, the Cities of Kennewick, Pasco, Richland, and West Richland plan to continue updating the RWFCP every 6 years. In the event that the different approval periods of the RWFCP and WSP result in inconsistencies between the two documents, the City will prepare an amendment to the applicable document to ensure the consistency of these two documents in the future.

SERVICE AREA AGREEMENTS AND POLICIES

KENNEWICK SERVICE AREA AGREEMENTS

The City has a water service area agreement with the City of Kennewick that establishes each city's service area for providing water and sewer service along the cities' shared boundary line. The agreement, dated August 31, 1977, rescinds a 1967 agreement between the two cities that was established prior to each cities' corporate boundaries sharing a common boundary. The agreement expired on January 1, 1990, and was not renewed as a result of each cities' corporate boundaries having been expanded to this shared boundary line prior to this date. A copy of the original 1967 agreement and subsequent 1977 agreement are contained in **Appendix A**.

The City and Kennewick also have two water service agreements identifying the water and sewer service boundaries and conditions of service near the I-82 Badger Canyon interchange, located at the southeasterly extent of the City's existing service area. The agreements provide for a supply intertie between the City and Kennewick, in which Kennewick provides up to 200 gpm of domestic water supply to a small portion of the City's water system that was originally unable to be supplied by the City. The agreements, dated January 27, 1994, and March 2, 1999, are contained in **Appendix B**. Since these agreements were established, the City has extended domestic water supply to this area, and presently serves this portion of its City limits. Kennewick does not currently provide water service to the City's water system near the I-82 Badger Canyon interchange, and no intertie currently exists.

WEST RICHLAND SERVICE AREA AGREEMENT

The City's has a wholesale water service agreement with the City of West Richland that states that the City would withdraw, treat, and pump water supply to West Richland's system. The City of West Richland operates the Intertie BPS to pump water from the City's Tapteal I Zone to West Richland's Zone 4. The official agreement can be found in **Appendix C**.

BADGER MOUNTAIN IRRIGATION DISTRICT

The City has a temporary agreement with BMID to provide potable supply to the BMID water service area to allow the City to have a looped transmission system on the southern side of Badger Mountain, eliminating a long dead-end near Dallas Road and I-82. Once development adjacent to Dallas Road reaches the point that stagnant water is not a concern, the temporary agreement between the City and BMID will be terminated. BMID consists of single-family residential customers located on the southern side of Badger Mountain. Supply to the BMID is currently provided through an intertie with the City's Tapteal IV Zone, on the western border of BMID's water service area. City water is wheeled through BMID, with excess water able to supply the City's Tapteal II Zone via a PRV on the eastern border of BMID's water service area. The City meters water into and out of the BMID. BMID has two wells that will be used to provide supply to the BMID water system following termination of the temporary agreement with the City. A copy of the interlocal agreement can be found in **Appendix D**.

EMERGENCY SUPPLY INTERTIES

The City has two emergency intertie agreements with the City of Kennewick; one located at the intersection of Gage Boulevard and Steptoe Street; and one located near the intersection of Columbia Center Boulevard and Tapteal Drive, as shown in **Figure 1-1**. The Gage Boulevard and Steptoe Street intertie connects the City's Tapteal I Pressure Zone (657-foot hydraulic grade) with Kennewick's Zone 2 (657-foot hydraulic grade). The emergency intertie consists of a 16-inch-diameter isolation valve that is normally closed and must be manually opened to flow water to either city during an emergency situation. An emergency situation may occur when one water system loses its main source of supply or a major transmission main, or during firefighting situations, and is unable to provide a sufficient quantity of water to its customers. The operation of the emergency intertie is contained in an agreement, dated March 5, 1975, a copy of which is included in **Appendix E**.

The Columbia Center Boulevard and Tapteal Drive intertie connects the City's Core Y Pressure Zone (561-foot hydraulic grade) with Kennewick's Zone 2 (657-foot hydraulic grade). The intertie consists of an isolation valve that is normally closed and must be manually opened to flow water to the City during an emergency situation. Because the hydraulic grade of Kennewick's adjacent pressure zone is 96 feet greater than the City's at this location, piping was installed at the intertie to facilitate installation of a temporary pump in the event that Kennewick requires emergency supply from the City. The operation of the emergency intertie is contained in an agreement, dated November 16, 2004, a copy of which is included in **Appendix F**.

The City also has emergency interties with Tri-Cities Estates Water District and Kennewick Irrigation District's Lorayne J water system. Copies of the City's intertie agreements with these two water systems are included in **Appendix T**.

CONDITION OF SERVICE

The City has the stability and authority to ensure water service and will continue to provide high quality water and service. Decisions about the water system governed by the elected City Council. City staff, including the Public Works Director, recommends decisions and policies to the City Council and the Council's appointed Utility Advisory Committee. The City has sufficient water rights such that water availability is a technical issue based upon the location of the property and available capacity in the specific pressure zone. The City's water system model can evaluate the supply capacity, while storage needs are tabulated and managed on an equivalent residential unit (ERU) basis.

SATELLITE SYSTEM MANAGEMENT AGENCY

A Satellite System Management Agency (SSMA) is defined as a person or entity that is certified by DOH to own or operate more than one public water system without the necessity for a physical connection between such systems. SSMAs were created to stop the proliferation of small water systems, many of which could not meet federal and state water quality and water system planning regulations. Based on the success of SSMAs, DOH made recommendations to the legislature to include rules for designating entities as qualified SSMAs.

In July 1995, Senate Bill 5448 became law, governing approval of new water systems and setting forth requirements for SSMAs. The goal of the law is to ensure that the people of Washington State will receive safe and reliable water supplies in the future from professionally managed or properly operated water systems. SSMAs can provide three different levels of service:

1. Ownership of the satellite system;
2. Operations and management of the satellite system; or
3. Contract services only.

Service can be provided to new systems, existing systems that are no longer viable, or existing systems placed into receivership status by DOH.

The City is responsible for providing water service to all customers in the City's water service area defined in this WSP. Currently, the aforementioned BMID water system and the Lorayne J Water System (owned and operated by the Kennewick Irrigation District) are located immediately adjacent to the southern portion of the City limits, and the Tri-Cities Estates water system is located within the City limits. All other areas surrounding the City's service area are currently served by large, stable water systems that are unlikely to be future satellite water systems operated by the City.

The City is not currently a qualified SSMA and is not actively seeking to be a SSMA. In the event that a neighboring water system needs the City's assistance, the City will evaluate providing the necessary satellite management services on a case-by-case basis.

DUTY TO SERVE

The City has a duty to service its community with safe, clean water. The four threshold factors for duty to serve are as follows.

1. Capacity: The capacity of the system to serve the anticipated future needs is addressed as part of the system analysis in **Chapter 3**.
2. Consistency: The Benton County *Land Use Plan* and development regulations for the retail service area allow for the development of residential, industrial, and commercial lands within the City's UGA. The annexation process between the City and the County ensures that the retail service area does not exceed the UGA.
3. Water Rights: Water rights self assessments are included in **Chapter 4** to demonstrate the available supplies are provided within the retail service area.
4. Timely and Reasonable: New buildings and facilities that are within the retail service area will be served. Service policies define how new service will be provided when the City infrastructure requires improvement.

LOCAL GOVERNMENT CONSISTENCY

The City's planning area is part of both the City's corporate boundary and the County. The Local Government Consistency Review Checklists from the City and County are included in **Appendix G**.

WATER RESOURCE INVENTORY AREA (WRIA) PLANNING

The City's planning area is part of WRIA 37, Lower Yakima Basin. There is Phase IV planning currently underway under Chapter 90.42 RCW within this watershed. A letter of consistency from the Yakima River Water Resources Agency is found in **Appendix H**.

SUMMARY OF PLAN CONTENTS

A brief summary of the content of the chapters in this WSP is as follows.

- **Executive Summary**: Provides a brief summary of the key elements of this WSP.
- **Chapter 1 – Description of Water Systems**: Introduces the reader to the City's water system, the objectives of the WSP, and the WSP organization. Presents the water service areas, and describes the existing water system.
- **Chapter 2 – Basic Planning Data**: Identifies current water use, projections, and production and consumption totals.
- **Chapter 3 – System Analysis**: Identifies system design standards, inventory, capacity, and water quality analysis, as well as system deficiencies.
- **Chapter 4 – Water Use Efficiency Program**: Identifies the City's Water Use Efficiency Program and the City's water right self-assessment forms.
- **Chapter 5 – Source Water Protection**: Presents the City's wellhead protection program.
- **Chapter 6 – Operations and Maintenance**: Discusses the City's operations and maintenance program.
- **Chapter 7 – Policies and Design Criteria Program**: Presents the City's design standards.
- **Chapter 8 – Capital Improvement Plan**: Presents the proposed water system improvements, their estimated costs, and implementation schedules.
- **Chapter 9 – Financial Plan**: Summarizes the financial status of the City and presents a program for funding the water system improvements.
- **Chapter 10 – Miscellaneous Documents**: Presents the City's emergency and supply interties with adjoining utilities.
- **Appendices**: Contains additional information and plans that supplement the main chapters of this WSP.

DEFINITION OF TERMS

The following terms are used throughout this WSP.

Consumption: The true volume of water used by the water system's customers. The volume is measured at each customer's connection to the distribution system.

Cross Connection: A physical arrangement that connects a public water system, directly or indirectly, with anything other than another potable water system and presents the potential for contaminating the public water system.

Demand: The quantity of water required from a water supply source over a period of time necessary to meet the needs of domestic, commercial, industrial, and public uses, as well as to provide enough water to supply firefighting, system losses, and miscellaneous water uses. Demands are normally discussed in terms of flow rate, such as million gallons per day (MGD) or gallons per minute (gpm), and are described in terms of a volume of water delivered during a certain time period. Flow rates pertinent to the analysis and design of water systems are as follows.

- **Average Day Demand (ADD):** The total amount of water delivered to the system in a year divided by the number of days in the year.
- **Maximum Day Demand (MDD):** The maximum amount of water delivered to the system during a 24-hour time period of a given year.
- **Peak Hour Demand (PHD):** The maximum amount of water delivered to the system, excluding fire flow, during a 1-hour time period of a given year. A system's PHD usually occurs during the same day as the MDD.

Distribution System Leakage (DSL): Water that is measured as going into the distribution system but not metered as going out of the system.

Equivalent Residential Units (ERUs): One ERU represents the amount of water used by one single-family residence for a specific water system. The demand of other customer classes can be expressed in terms of ERUs by dividing the demand of each of the other customer classes by the demand represented by one ERU.

Fire Flow: The rate of flow of water required during firefighting, which is usually expressed in terms of gpm.

Head: A measure of pressure or force exerted by water. Head is measured in feet and can be converted to pounds per square inch (psi) by dividing feet by 2.31.

Head Loss: Pressure reduction resulting from pipeline wall friction, bends, physical restrictions, or obstructions.

Hydraulic Elevation: The height of a free water surface above a defined datum; the height above the ground to which water in a pressure pipeline would rise in a vertical open-end pipe.

Maximum Contaminant Level (MCL): The maximum permissible level of contaminant in the water that the purveyor delivers to any public water system user, measured at the locations identified under Washington Administrative Code (WAC) 246-290-300, Table 3.

Potable Water: Water suitable for human consumption.

Pressure Zone: A portion of the water system that operates from sources at a common hydraulic elevation.

Purveyor: An agency, special purpose district, subdivision of the state, municipal corporation, firm, company, mutual or cooperative association, institution, partnership, or persons or other entity

owning or operating a public water system. Purveyor also means the authorized agents of such entities.

Supply: Water that is delivered to a water system by one or more supply facilities that may consist of supply stations, booster pump stations, and wells.

Storage: Water that is stored in a reservoir to supplement the supply facilities of a system and provides water supply for emergency conditions. Storage is broken down into the following five components, which are defined and discussed in more detail in **Chapter 3**: 1) operational storage; 2) equalizing storage; 3) standby storage; 4) fire flow storage; and 5) dead storage.

LIST OF ABBREVIATIONS

The abbreviations listed in **Table 1-9** are used throughout this WSP.

Table 1-9
Abbreviations

Abbreviation	Description
ADD	Average Day Demand
AWWA	American Water Works Association
BMID	Badger Mountain Irrigation District
BPS	Booster Pump Station
cfs	cubic feet per second
CIP	Capital Improvement Program
City	City of Richland
County	Benton County
DOH	Department of Health
DSL	Distribution System Leakage
EPA	Environmental Protection Agency
ERU	Equivalent Residential Unit
fps	feet per second
GMA	Growth Management Act
gpd	gallons per day
gpm	gallons per minute
MCL	Maximum Contaminant Level
MDD	Maximum Day Demand
MG	Million Gallons
MGD	Million Gallons per Day
mg/l	milligrams per liter
NRW	North Richland Wellfield
PDD	Peak Day Demand
PHD	Peak Hour Demand
PRV	Pressure Reducing Valve
psi	pounds per square inch
PVC	Polyvinyl Chloride
RCW	Revised Code of Washington
RWFCP	Regional Water Forecast and Conservation Plan
RWSFS	Regional Water Supply Feasibility Study
SDWA	Safe Drinking Water Act
UGA	Urban Growth Area
VOC	Volatile Organic Compound
WAC	Washington Administrative Code
WSP	Comprehensive Water System Plan
WTP	Water Treatment Plant
WUE	Water Use Efficiency