CONSOLIDATION FEASIBILITY STUDY

SEPTEMBER 2016

SUMMERSET WEST WATER ASSOCIATON

WSDOH System ID No. 85080

VARELA & ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT
PLANNING • DESIGN • MANAGEMENT • INSPECTION

CONSOLIDATION FEASIBLITY STUDY

SUMMERSET WEST WATER ASSOCIATION
WSDOH System ID No. 85080

OPERATOR
Lorey Sielaff

SECRETARY
Elizabeth Keele

CITY OF OTHELLO
WSDOH System ID No. 64850

MAYOR
Shawn Logan

CITY ADMINISTRATOR
Wade Farris

COMMUNITY DEVELOPMENT DIRECTOR
Travis Goddard

PUBLIC WORKS DIRECTOR
Terry Clements

FINANCE OFFICER
Spencer Williams

CITY CLERK
Debbie Kudrna, CMC

CITY COUNCIL
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John Lallas, Position 2
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Angel Garza Position 7

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CONSOLIDATION FEASIBILITY STUDY

SUMMERSET WEST WATER ASSOCIATION

WSDOH WATER SYSTEM ID NO.85080

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1.0 INTRODUCTION

1.1 Background

In 2015 Drinking Water State Revolving Fund awarded the City of Othello several grants to study the feasibility of consolidating small water systems into Othello's water system. The goal of these consolidation feasibility studies is to provide the City of Othello and each small water system owner a basis for considering integration of the small water system into the City of Othello's water system. The analysis and alternatives for each system will vary depending on the specific locations, conditions, and situations within the small system and its potential impact on the City of Othello's water supply and infrastructure. The need for subsequent financial or technical investigations may become evident as a result of the consolidation studies.

1.2 Scope

The project scope of work includes the following:

- Inventory of the small water system existing facilities (supply, treatment, storage, distribution, water rights)
- Assessment of the condition of the small water system existing facilities
- Estimate existing small water system demands
    - ADD: Average Day Demand
    - MDD: Maximum Day Demand
    - PHD: Peak Hour Demand
- Develop criteria for small water system supply, treatment (disinfection or other water quality), storage, distribution system, and water rights
- Estimate capacity of small water system existing facilities and identify deficiencies
- Estimate ongoing operation and maintenance cost of small system if not consolidated
- Identify small water system components that do not meet Othello's standards and estimate cost of bringing the small water system facilities up to Othello standards.
- Identify likely system consolidation options
- Identify infrastructure needed to physically connect the small water system(s) to Othello's water system and estimate construction costs
- Estimate impacts to Othello's water system facilities and long term water supply; estimate need for and feasibility of additional water supply facilities.
- Compare ongoing operation and maintenance costs of unconsolidated system to the cost of consolidation
- Comment on possible barriers to consolidation that become evident during the evaluation
- Identify next steps if Othello and the small water system desires to pursue consolidation

DWSRF awarded Othello grants to evaluate the feasibility of consolidating with the following small water systems (see **Figure 1**):

- Adams County Water District No.1 WSDOH System ID No.22525
- Basin View Water Association WSDOH System ID No.04530
- Bird Dog Family LTD Partnership II WSDOH System ID No.52172

- Highland Estates Water System WSDOH System ID No.32736
- Meadow Lane Water Association WSDOH System ID No.53190
- Othello Manor Water System WSDOH System ID No.64845
- Rainier Tracts Water Association WSDOH System ID No.70910
- Summerset West Water Association WSDOH System ID No.85080

1.3 Contact Information

The contact information for the Summerset West Water Association (SWWA) is shown on the WFI is as follows:

Primary Contact
Lorey C. Sielaff, Operator
Certification No. 009835

Address
1057 S Hi Lo Dr
Othello, WA 99344

Phone
Daytime: 509.488.3976
Mobile: 509.989.0339

Owner Contact
Elizabeth Keele, Secretary

Address
2267 W Barbara Rd
Othello, WA 99344

Phone
Daytime: 509.488.5041
Mobile: 509.660.0299

2.0 EXISTING SYSTEM

2.1 System Information

SWWA is located on the north side of State Route 26 (SR26), approximately 1 mile west of the City of Othello city limits, in Adams County in the south half of Section 5, Township 15 N, Range 29 E. (see **Figure 2**).

According to the DOH Water System Inventory (WFI), SWWA provides domestic water service for 72 residential connections. There are currently 72 single family residences on single lots and 3 vacant lots. All connections are currently unmetered.

Irrigation water is provided by the East Columbia Basin Irrigation District (ECBID).

2.2 Service Area

The SWWA service area is shown on **Figure 2**.

Topography

The service area is generally flat and varies in elevation from approximately 935 to 966 amsl.

2.3 Inventory of Facilities

The SWWA water system is shown on **Figure 2**. The water system operates as a closed system with a single well pump, standpipe, booster pump, domestic distribution pipe, and fire hydrants.

The DOH Water Facilities Inventory (WFI) form lists the SWWA system as a Group A Community system serving a residential community and day care with a population of 240. The system is owned by an Association.

Supply

Supply is provided via one permanent well (S01). The system supply is summarized in the following table.

Table 2-1 Summerset West Water System Source Inventory [(1)]

Source Number	Source Name	Use	Metered	Treatment	Current Pumping Rate (gpm)
SO1	Well #1 – AFL225	Permanent	Yes	Chlorination	200

(1) *Information obtained from the Water Facilities Inventory (last updated 4/18/16 as of this writing)*

SWWA reported that the source meter had stopped working approximately one year ago.

Storage

The SWWA system operates as a closed system with a 7.5 hp booster pump pumping out of a 12-foot diameter, 50-foot tall welded steel standpipe. The standpipe has a nominal volume of 40,500 gallons.

The elevation of the standpipe is insufficient to provide adequate pressures throughout the system so a booster pump pumps out of the standpipe into the distribution system. In an emergency, the standpipe will provide minimal pressures and storage to maintain positive pressure in the distribution system.

Distribution System

Per SWWA the distribution system consists of 4-inch PVC and 2-inch PVC transmission mains with ¾-inch and 1-inch PVC, poly (HDPE) and galvanized service pipe. There are no reported issues with the distribution system and there are no reported pressure drops during peak demands. Services are not metered.

Fire Flow

SWWA contains 4 fire hydrants located along the 4-inch distribution main. Fire flow capacity will be analyzed base on the existing configuration.

The following table summarizes the major components of the SWWA.

Table 2-2 Summary of Summerset West Water Association System Components

System	Component	Description
Supply	Well Pump	ECY Well ID Tag: AFL225 Status: Online Log available: Yes Depth: 422' Casing: 8-inch to 104' Screen: None Date constructed: Approx. 1/1/1970 (effective date), 5/12/1995 (well pump replaced) SWL: Approx. 120' below wellhead elevation (~ Elev. 820) Approx. wellhead elev.: 940' Present pumping rate: 200 gpm per WFI Pump/motor: Submersible Turbine, 7.5 HP (constant speed, pressure switch operated) Enclosure: Pump enclosure (wood framed box with plywood siding and roof, individual insulation bags) Location: 696 Drury Ln., Othello, WA 99344
	Booster Pump	Pump/motor: Booster Pump, 7.5 HP (3-phase, continuous) Date installed: 2014 Present pumping rate: 120 gpm (reported by SWWA) Discharge pressure: 45-50 psi
Storage	Reservoir	Construction type: Steel, standpipe Approx. base elevation: 940' Height: ~50' Date constructed: 1978 Volume: 40,500 gallons Pressure zones served: One Location: 696 Drury Ln., Othello, WA 99344
Distribution System	2" 4" Total	2,500 LF 6,800 LF 9,300 LF
	Main materials	PVC
	Service Pressure	Approx. 45-50 psi

2.4 Assessment of the Condition of the Existing Facilities

A site visit of the Association facilities was conducted on February 9, 2016. The site visit included a tour of the Association's facilities. The following summarizes observations from the site visit regarding the condition of the existing facilities.

Supply

The well head was visible. There was no observable ECY tag present on the wellhead. The well head was capped, grouted and there were no observable defects. The well pump was replaced in the 1980's and since has reported to be operating trouble free with no recent problems. The condition of the supply appears to be good.

Storage

The storage consists of an estimated 40,500-gallon standpipe steel water reservoir which does not directly pressurize the distribution system. The booster pump supplies the distribution system from the reservoir. The standpipe will provide minimal system pressures in the event of a booster pump failure. All appeared to be in good visual condition.

Pump House

The well pump is located in a small wood framed enclosure with plywood roof and siding. The enclosure is insulated with loose bags of insulation. The piping within the enclosure is galvanized steel.

The well pump house with above ground system components is located adjacent to the well pump in two separate buildings.

The first building is a wood framed building with flat wood roof and siding and contains the electrical power, control panels, chlorine injection system, source meter and a 4.8-gallon pressure tank which is used to regulate pressure in line for the submersible well pump pressure switch up stream.

The second building is a wood framed building with a flat wood roof and siding and contains the 7.5 hp booster pump and interior piping. The booster pump was installed in 2014. The booster pump runs continuously with no pressure tanks installed on the distribution line.

Overall the facility appeared to be in good condition and well maintained.

Distribution

The condition of the distribution system could not be observed. SWWA provided a schematic of the existing system. Distribution mains are often located in customer's back yards. It was reported the mains are buried at between 24 - 30-inches.

Per SWWA, the distribution system was constructed in two separate phases. The first phase was constructed in 1970 and consists of the 21 lots west of Ryan Ln. The second phase was constructed in 1978 and consists of the 53 lots east of Ryan Ln.

Typical services for the first phase consist of a single domestic isolation valve located in an individual service box. Typical services for the second phase are located in large service boxes which

house both service valves and irrigation valves. Some service boxes contain several connections. Customer service meters and backflow preventers have not been installed at any of the locations. The SWWA is in the process of installing isolation valves at all service connections.

Domestic and irrigation water can be flushed at Thacker Street into the ditch.

Leaks have not been reported along the mainline and services. A leakage report could not be generated because service readings and water use efficiency reports for the system were not available.

2.5 Water Use, System Demands and Water Rights

2.5.1 Population/Connections

Existing

SWWA is a 75 lot subdivision and is DOH approved of up to 75 connections. The water system currently serves 72 active single family residential connections with 3 vacant lots.

- Existing Connections: 72 (residential)

The full-time residential population was provided by the DOH Sentry WFI which is represented below.

- Existing Population: 240

Projected

The development is fully built out and no growth is expected. Projected future water use will assume the remaining 3 vacant lots will be built on therefore the projected future connections are as follows:

- Projected Connections: 75 (residential)

The future population is projected based on the average current population/connection (3.33 persons per residential connection) extrapolated on the assumption the three non-active connections become active.

- Projected Population: 250

2.5.2 Water Use

Source meter data was provided by SWWA for one year of water readings. Legible readings were provided for January through February of the following year. It is unclear which years the source meter data represents. Water use is shown on the following tables and represents domestic use only. SWWA receives irrigation water from ECBID.

The source meter was reported to be broken about one year ago.

Table 2-3: Water Use Summary [1]

Description	Water Use	
	(gal.)	(gpd)
Annual Total	8,698,000	23,800
Maximum Month	971,600	32,000
Average Month	724,800	23,800
Minimum Month	214,500	7,100

(1) *Source meter data provided for one year, year not denoted. Reported that source meter is currently broken.*

2.5.3 ERUs

An ERU is a unit of measure used to equate non-residential or multi-family residential water usage to a specific number of single-family residences.

This study will use ERU's to equate the SWWA water use to the City of Othello water use.

Table 2-4: ERUs

Description	Estimated Water Use
Total annual water use (source meter) [1]	8,698,000
City of Othello gpd/ERU value [2]	453
City of Othello ERUs [3]	**53**

(1) *From Table 2-3*
(2) *Based on current water use data from 2013, 2014 and 2015*
(3) *Average daily water use (total annual divided by 365) divided by 453 gpd/ERU*

2.5.4 System Demands

Current

Water system demands were estimated based off the water use data and is as follows:

Table 2-5: Current Water System Demands

	ADD			MDD [1]			PHD [2]	Annual	
ERUs [3]	gpd/ERU [3]	(gpd)	(gpm)	gpd/ERU	(gpd)	(gpm)	(gpm)	(gal.) [3]	(ac-ft/yr)
53	453	23,800	17	791	41,600	29	104	8,698,000	26.7

(1) *MDD = MMAD(1.3); MMAD (maximum month average day) from Table 2-3*
(2) *PHD = (MDD/1440)(CN+F)+18, where C = 2.5, N = ERUs and F = 25, DOH WSDM Eq. 5-1*
(3) *From Table 2-4*

Future

Future water system demands are estimated assuming the remaining three vacant lots are built on per Section 2.5.1. Using the calculated ERUs from the highest water use year within the data period indicates there are approximately 1.42 connections per ERU. The three inactive connections are therefore equivalent to 2 ERU (rounded). Future system demands will add 2 ERUs to the peak water use with the resulting estimated future water demands shown on the following table.

Table 2-6: Future Water System Demands

	ADD			MDD			PHD [2]	Annual	
ERUs	gpd/ERU	(gpd)	(gpm)	gpd/ERU [1]	(gpd)	(gpm)	(gpm)	(gal.)	(ac-ft/yr)
55	453	24,900	17	791	43,500	30	107	9,089,000	27.9

(1) *MDD gpd/ERU from Table 2-5*
(2) *PHD = (MDD/1440)(CN+F)+18, where C = 2.5, N = ERUs and F = 25, DOH WSDM Eq. 5-1*
(3) *ADD (gpd) x 365 days*

2.5.5 Water Rights

The 1970 Permit to Appropriate Public Waters of the State of Washington allows the SWWA well to withdraw a Qi of 100 gpm and a Qa of 23.52 ac-ft/yr.

2.6 Evaluation Criteria

Each water utility must establish system design standards appropriate to meet its customers' needs and expectations. While a utility has some discretion in setting performance and design criteria, all criteria must meet the minimum standards set by the Washington State Department of Health (DOH) for public water supplies.

Washington Administrative Codes (WAC's) pertaining to public water systems administered by DOH and the Washington State Department of Ecology (ECY) comprise the regulatory criteria applicable to this water system (WAC 246-290).

The following standards will be used as the basis for facilities evaluation and design.

- Washington State DOH Water System Design Manual (WSDM)
- Industry practice
- Engineering judgement

The Sections following define the system design standards used for this evaluation.

2.6.1 Supply

The WSDM states supply must be able to meet the water system's maximum day demand (MDD). This is based on the assumption the system has equalizing storage to meet peak hour demands (PHD). The WSDM recommends supply is able to replenish depleted fire suppression storage (FSS) within 72 hours while supplying MDD.

Even though SWWA has a standpipe reservoir, SWWA operates a "closed" system meaning the system is closed to the atmosphere with a two-part supply system consisting of a well supplying a steel standpipe reservoir and a booster pump supplying the distribution system from the standpipe. SWWA was constructed out in two phases, the first was constructed in 1970 and the second phase was constructed in 1978. The first phase was not built to provide fire flow. The second phase was built to provide fire flow and contains four fire hydrants located along the 4" transmission main.

Since the SWWA is a closed system with a two-part supply system which has FSS capabilities, the criteria used to evaluate SWWA well supply will be based on the criteria above and the distribution

system supply will be based on the DOH WSDM criteria for closed system booster pump stations, therefore the supply criteria is as follows:

Well Supply (well pump)

- Supply MDD with equalizing storage sufficient to supply PHD

Distribution Supply (booster pump)

- Supply PHD at no less than 30 psi to all service connections

2.6.2 Treatment

Per the WSDM all sources used for water service must meet water quality standards set by EPA and the State (WAC 246-290-310) and must treat sources as required to meet water quality standards.

This evaluation will compare the available water quality records to the currently mandated water quality standards per WAC 246-290-310.

2.6.3 Storage

SWWA is a closed system will be evaluated for equalizing storage, standby storage and fire suppression storage.

Standpipe Reservoir

The steel standpipe reservoir provides equalizing storage, standby storage and fire suppression storage and will be evaluated based on the DOH WSDM Chapter 9 "Reservoir and Storage Volume".

- Equation 9-1: $ES = (PHD - Q_S)(150 \text{ min.})$, but in no case less than zero

Where:

ES	=	Equalizing storage component, in gallons
PHD	=	Peak hourly demand, in gpm, as defined in Chapter5 of the WSDM Manual
Q_S (1)	=	Sum of all active supply source capacities, except emergency supply, in gpm

(1) Q_S in this case is source of supply to the reservoir which is provided by the well pump

- Equation 9-2: $SB_{TSS} = (2 \text{ days})(ADD)(N)$

Where:

SB_{TSS}	=	Total standby storage for a single source water system, in gallons
ADD	=	Average day demand for the design year, in gpd/ERU

N = Number of ERUs

- Equation 9-4: $FSS = (FF)(t_m)$

Where:

FSS = Minimum fire suppression storage for a single a multiple source water system, in gallons

FF = Required fire flow rate, expressed in gpm, as specified by fire protection authority or under WAC 246-293-640, whichever is greater

t_m = Duration of FF rate, expressed in minutes, as specified by fire protection authority or under WAC 246-293-640, whichever is greater

2.6.4 Fire Flow

SWWA was constructed in two phases, the first was constructed in 1970 and the second phase was constructed in 1978. The first phase was not built to provide fire flow. The second phase was built to provide fire flow and contains four fire hydrants located along the 4" transmission main.

Fire Suppression Supply (booster pump)

- Supply MDD and fire flow at no less than 20 psi to all points along the distribution line at ground level with FSS and ES depleted

2.6.5 Distribution System

Per the WSDM the distribution system shall maintain a minimum 30 psi during PHD and 20 psi during fire flow conditions during MDD with a maximum 8 fps in the system pipes.

2.6.6 Water Rights

The adequacy of the SWWA water rights shall be evaluated by comparing the available water use data to the systems water right.

2.7 Evaluation/Deficiencies

2.7.1 Supply

The SWWA supply consists of two parts:

1. Well pump which pumps groundwater to supply the standpipe reservoir
2. Booster pump which pumps from the standpipe reservoir to supply the distribution system

2.7.1.1 Supply (well pump)

Criteria

Supply MDD with equalizing storage sufficient to supply PHD (see section 2.7.3)

Required Capacity

Current MDD = 29 gpm (Table 2-5)

Future MDD = 30 gpm (Table 2-6)

Current Capacity

Current capacity = 200 gpm (Table 2-2)

Evaluation

The current well capacity of 200 gpm is adequate to meet the current MDD.

The current well capacity of 200 gpm is adequate to provide the estimated future MDD.

Deficiencies

None.

2.7.1.2 Supply (booster pump)

Criteria

Supply PHD at no less than 30 psi to all service connections.

Required Capacity

Current PHD = 104 gpm (Table 2-5)

Future PHD = 107 gpm (Table 2-6)

Current Capacity

Current capacity = 120 gpm (Table 2-2)

Evaluation

Current booster pump capacity of 120 gpm is adequate to supply the current PHD.

Current booster pump capacity of 120 gpm is adequate to supply the future PHD.

Deficiencies

None.

2.7.2 Treatment

Criteria

Per the WSDM all sources used for water service must meet water quality standards set by EPA or the state (WAC 246-290-310) and must treat sources as required to meet water quality standards.

Evaluation

The most recent IOC analysis was performed on the system in 2007 and is shown on the following table. The most recent VOC analysis was performed on the system in 2016 and is shown in Table 2-8.

Table 2-7: Water Quality Test Results - IOC (1)

ANALYTE	RESULT (2)	UNITS	SRL (3)	Trigger	MCL	Exceeds MCL (X if yes)
Arsenic	0.0030	mg/l	0.001	0.010	0.010	
Barium	<	mg/l	0.1	2	2	
Cadmium	<	mg/l	0.001	0.005	0.005	
Chromium	<	mg/l	0.007	0.1	0.1	
Mercury	<	mg/l	0.0002	0.002	0.002	
Selenium	<	mg/l	0.002	0.05	0.05	
Beryllium	<	mg/l	0.0003	0.004	0.004	
Antimony	<	mg/l	0.003	0.006	0.006	
Thalium	<	mg/l	0.001	0.002	0.002	
Cyanide	<	mg/l	0.05	0.2	0.2	
Fluoride	1.050	mg/l	0.2	2.0	4.0	
Nitrite – N	<	mg/l	0.1	0.5	1.0	
Nitrate – N	2.310	mg/l	0.5	5.0	10.0	
Total Nitrate/Nitrite-N	2.310	mg/l	0.5	5.0	10.0	
Iron	<	mg/l	0.1	--	0.31	
Manganese	<	mg/l	0.01	--	0.051	
Silver	<	mg/l	0.1	--	0.11	
Chloride	<	mg/l	20	--	2501	
Sulfate	51.0	mg/l	50	--	2501	
Zinc	<	mg/l	0.2	--	51	
Sodium	23.6	mg/l	5	--	--	
Hardness	159.0	mg/l	10	--	--	
Conductivity	465.0	µmhos/cm	70	--	7001	
Turbidity	0.150	NTU	0.1	--	--	
Color	<	CU	15	--	151	
Total Dissolved Solids	NA	mg/l	100	--	5001	
Nickel	<	mg/l	0.005	--	--	
Lead	<	mg/l	0.001	--	--	
Copper	<	mg/l	0.02	--	--	

(1) *Test results provided for September 9, 2007*
(2) *"NA" indicates "not analyzed", "<" indicates "less than state reporting level"*
(3) *State Reporting Level*

Table 2-8: Water Quality Test Results - VOC [1]

ANALYTE	RESULT [2]	UNITS	SRL [3]	Trigger	MCL	Exceeds MCL (X if yes)
Bromoform	2.600	ug/L	0.500	Y	-	
Total Trihalomethane	2.600	ug/L	0.500	Y	80.0	
Chloroform	<	ug/L	0.500	N	-	
Bromodichloromethane	<	ug/L	0.500	N	-	
Dibromochloromethane	<	ug/L	0.500	N	-	
Vinyl chloride	<	ug/L	0.500	N	2.0	
1,1 dichloroethylene	<	ug/L	0.500	N	7.0	
1,1,1 trichloroethane	<	ug/L	0.500	N	200.0	
Carbon tetrachloride	<	ug/L	0.500	N	5.0	
Benzene	<	ug/L	0.500	N	5.0	
1,2 dichloroethane	<	ug/L	0.500	N	5.0	
Trichloroethylene	<	ug/L	0.500	N	5.0	
1,4 dichlorobenzene	<	ug/L	0.500	N	75.0	
Chloromethane	<	ug/L	0.500	N	-	
Bromomethane	<	ug/L	0.500	N	-	
Chloroethane	<	ug/L	0.500	N	-	
Methylene chloride (dichloromethane)	<	ug/L	0.500	N	5.0	
Trans- 1,2 dichloroethylene	<	ug/L	0.500	N	100.0	
1,1 dichloroethane	<	ug/L	0.500	N	-	
2,2 Dichloropropane	<	ug/L	0.500	N	-	
CIS- 1,2 dichloroethylene	<	ug/L	0.500	N	70.0	
1,1 dichloropropene	<	ug/L	0.500	N	-	
1,2 dichloropropane	<	ug/L	0.500	N	5.0	
Dibromomethane	<	ug/L	0.500	N	-	
CIS- 1,3 dichloropropene	<	ug/L	0.500	N	-	
Toluene	<	ug/L	0.500	N	1000.0	
1,1,2 trichloroethane	<	ug/L	0.500	N	5.0	
Tetrachloroethylene	<	ug/L	0.500	N	5.0	
Trans- 1,3 Dichloropropene	<	ug/L	0.500	N	-	
1,3 dichloropropane	<	ug/L	0.500	N	-	
Chlorobenzene	<	ug/L	0.500	N	100.0	
1,1,1,2 tetrachloroethane	<	ug/L	0.500	N	-	
Ethylbenzene	<	ug/L	0.500	N	700.0	
M/P xylenes	<	ug/L	0.500	N	-	
O- xylene	<	ug/L	0.500	N	-	
Styrene	<	ug/L	0.500	N	100.0	
Bromobenzene	<	ug/L	0.500	N	-	
1,2,3 trichloropropane	<	ug/L	0.500	N	-	
1,1,2,2 tetrachloroethane	<	ug/L	0.500	N	-	
O- chlorotoluene	<	ug/L	0.500	N	-	
P- chlorotoluene	<	ug/L	0.500	N	-	

ANALYTE	RESULT (2)	UNITS	SRL (3)	Trigger	MCL	Exceeds MCL (X if yes)
M- dichlorobenzene	<	ug/L	0.500	N	-	
1,2 dichlorobenzene	<	ug/L	0.500	N	600.0	
Trichlorofluoromethane	<	ug/L	0.500	N	-	
Bromochloromethane	<	ug/L	0.500	N	-	
Isopropylbenzene	<	ug/L	0.500	N	-	
N- propylbenzene	<	ug/L	0.500	N	-	
1,3,5 trimethylbenzene	<	ug/L	0.500	N	-	
Tert- butylbenzene	<	ug/L	0.500	N	-	
1,2,4 trimethylbenzene	<	ug/L	0.500	N	70.0	
Sec- butylbenzene	<	ug/L	0.500	N	-	
P- isopropyltoluene	<	ug/L	0.500	N	-	
N- butylbenzene	<	ug/L	0.500	N	-	
1,2,4 trichlorobenzene	<	ug/L	0.500	N	-	
Naphthalene	<	ug/L	0.500	N	-	
Hexachlorobutadiene	<	ug/L	0.500	N	-	
1,2,3 trichlorobenzene	<	ug/L	0.500	N	-	
Dichlorodifluoromethane	<	ug/L	0.500	N	-	
Total xylenes	<	ug/L	0.500	N	10000	
EDB (screening)	<	ug/L	0.500	N	-	
DBCP (screening)	<	ug/L	0.500	N	-	

(1) *Test results provided for March 3, 2016*
(2) *"<" indicates "less than state reporting level"*
(3) *State Reporting Level*

A review of the DOH Sentry website indicates the system has no current water quality violations.

DOH has noted past issues with coliform and required the installation of a chlorination system. No reports of coliform since the chlorination system was installed.

Based on a review of the available data it does not appear the system has ongoing water quality issues.

Deficiencies

None.

2.7.3 Storage

2.7.3.1 Standpipe Storage Reservoir

Criteria

- Equation 9-1: ES = (PHD - Q_S)(150 min.), but in no case less than zero
- Equation 9-2: SB_{TSS} = (2 days)(ADD)(N)
- Equation 9-4: FSS = (FF)(t_m)

Required Capacity

From Table 2-5 the current PHD is 104 gpm and from Table 2-2 the Q_S is 200 gpm.

ES = (11-200)(150) = 0 gallons

From Table 2-6 the estimated future PHD is 107 gpm and from Table 2-2 the Q_S is 200 gpm.

ES = (120-200)(150) = 0 gallons

From Table 2-5 the current/future ADD is 453 gpd/ERU and from Table 2-5 the current N is 53.

SB_{TSS} = (2 days)(453)(53) = 48,018 gallons

From Table 2-6 the current/future ADD is 453 gpd/ERU and from Table 2-5 the future N is 55.

SB_{TSS} = (2 days)(453)(55) = 49,830 gallons

From WAC 246-293-640 the minimum fire suppression storage requirement for rural residential areas is 500 gpm for 30 minutes.

FSS = (500)(30 minutes) = 15,000 gallons

Current Capacity

Per Table 2-2 there is currently one steel standpipe reservoir with a total volume of 40,500 gallons.

Evaluation

DOH WSDM 9.3.3 states that standby and fire suppression storage may be nested with the larger of the two volumes being the minimum available, provided the local fire protection authority does not require them to be additive (WAC 246-290-235(4)). The nested standby and fire suppression storage is evaluated as equal to the larger of the two calculated storage volumes. For current and future scenarios the largest volume is associated with standby storage. The 40,500 gallons of current capacity is inadequate for the current and future standby and fire suppression storage needs.

Deficiencies

The reservoir capacity is deficient by 7,518 gallons to meet current estimated ERUs and FSS.

The reservoir capacity is deficient by 9,330 gallons to meet current estimated ERUs and FSS.

2.7.4 Fire Flow

Criteria

Supply MDD and fire flow at no less than 20 psi to all points along the distribution line at ground level with FSS and ES depleted

- DOH WSDM 9.2.1: Required Capacity = FF+MDD

Required Capacity

From WAC 246-293-640 the minimum fire flow requirement for rural residential areas is 500 gpm for 30 minutes.

From Table 2-5 the current MDD is 29 gpm and from Table 2-6 future MDD is 30 gpm.

Current Required Capacity = 500 + 29 = 529 gpm

Future Required Capacity = 500 + 30 = 530 gpm

Current Capacity

Supply to the distribution system of a 7.5 hp booster pump with a capacity of 120 gpm.

Evaluation

Current booster pump capacity of 120 gpm is inadequate to supply current FSS.

Current booster pump capacity of 120 gpm is inadequate to supply future FSS.

Deficiencies

The fire flow capacity for the system is deficient by 409 gpm to meet current estimated fire flow.

The fire flow capacity for the system is deficient by 410 gpm to meet current estimated fire flow.

2.7.5 Distribution System

Criteria

Per the WSDM the distribution system shall maintain a minimum 30 psi during PHD.

Per the WSDM the distribution system shall maintain a minimum 20 psi during MDD/FF.

Required Capacity

Based on the reported lowest pressure tank setting there is a maximum 15 psi pressure loss available (35.1 feet of head loss).

Current Capacity

It is reported the distribution system is comprised of 4-inch and 2-inch diameter PVC pipe with 1-inch and ¾-inch service pipe.

Evaluation

Based on the information provided by SWWA a hydraulic model of the distribution system was created in Bentley WaterCAD V8i (see **Figure 3**). The distribution system evaluation is limited to the estimated future system demands.

PHD

The future calculated PHD of 107 gpm (Table 2-6) was split equally (1.43 gpm/connection) between the 75 available connections (Section 2.5.1) and distributed regionally at nodes placed along the distribution pipes. Nodes were analyzed to determine system pressure under static and future PHD demand conditions under the lowest observed pressure condition of 45 psi at the booster pump.

The SWWA has reported no system pressure deficiencies.

Table 2-9: Distribution System Hydraulic Analysis

Location	Elevation	Static Pressure (psi)	Calculated Pressure Loss during PHD (psi)	PHD System Pressure (psi)
West dead end node	935	58.0	-3.0	55.0
Pump enclosure node	965	45.0	0.0	45.0
East loop node	966	44.0	-1.0	43.0

Based on the static pressures and calculated pressure losses during PHD the system pressure exceeds the minimum required pressure.

FF/MDD

The future calculated MDD of 30 gpm (Table 2-6) was split equally (0.40 gpm/connection) between the 75 available connection (2.5.1) and distributed regionally at nodes placed along the distribution pipes. Nodes were analyzed to determine system capacity under future MDD demand conditions while maintaining a residual minimum system pressure of 20 psi.

Note that the current booster pump (Section 2.7.1.2) does not currently have the capacity to deliver the estimated MDD+FF of 530 gpm. This section evaluates the distribution system capacity based on a booster pump operating at 530 gpm with a head of 100 feet.

Table 2-12a Hydraulic Analysis Pipe Summary

Label	Approximate Length (ft)	Diameter (in)	Material	Hazen-Williams C
P-5	999	4	PVC	150
P-6	126	4	PVC	150
P-14	497	4	PVC	150
P-16	743	4	PVC	150
P-18	43	4	PVC	150
P-19	699	4	PVC	150
P-21	90	4	PVC	150
P-27	158	4	PVC	150
P-28	429	4	PVC	150
P-29	287	4	PVC	150
P-30	221	4	PVC	150
P-31	166	4	PVC	150
P-32	264	4	PVC	150
P-33	278	4	PVC	150
P-34	242	4	PVC	150
P-35	181	4	PVC	150
P-36	71	4	PVC	150
P-37	192	4	PVC	150
P-38	196	4	PVC	150
P-39	279	4	PVC	150
P-41	106	2	PVC	150
P-42	105	2	PVC	150
P-45	511	2	PVC	150
P-46	442	2	PVC	150

Label	Approximate Length (ft)	Diameter (in)	Material	Hazen-Williams C
P-47	738	2	PVC	150
P-48	593	2	PVC	150
P-49	31	2	PVC	150
P-56	303	4	PVC	150
P-59	57	6	PVC	150
P-60	289	4	PVC	150
P-61	120	4	PVC	150

Table 2-12b Hydraulic Analysis Junction Report

Label	Flow (Total Needed) (gpm)	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Residual Lower Limit) (psi)
J-6	502	500	273	20
J-7	502	500	257	20
J-8	501	500	256	20
J-12	500	500	303	20
J-14	502	500	306	20
J-16	502	500	306	20
J-17	501	500	368	20
J-18	500	500	377	20
J-19	501	500	364	20
J-23	500	500	481	20
J-25	501	500	419	20
J-26	501	500	368	20
J-27	501	500	354	20
J-28	500	500	346	20
J-29	501	500	344	20
J-30	500	500	345	20
J-31	501	500	352	20
J-32	501	500	363	20
J-33	501	500	380	20
J-34	501	500	389	20
J-35	504	500	327	20
J-36	500	500	180	20
J-37	501	500	235	20
J-38	502	500	273	20
J-41	501	500	101	20
J-42	504	500	128	20
J-47	500	500	749	20

Deficiencies

PHD: None.

FF/MDD: The hydraulic analysis identified system capacity below the required fire flow (shaded). Increasing the diameter of all pipes within the distribution will correct these deficiencies as shown in the following tables.

Table 2-13a Hydraulic Analysis Pipe Summary w/Improvements

Label	Approximate Length (ft)	Diameter (in)	Material	Hazen-Williams C
P-5	999	6	PVC	150
P-6	126	6	PVC	150
P-14	497	6	PVC	150
P-16	743	6	PVC	150
P-18	43	6	PVC	150
P-19	699	6	PVC	150
P-21	90	6	PVC	150
P-27	158	6	PVC	150
P-28	429	6	PVC	150
P-29	287	6	PVC	150
P-30	221	6	PVC	150
P-31	166	6	PVC	150
P-32	264	6	PVC	150
P-33	278	6	PVC	150
P-34	242	6	PVC	150
P-35	181	6	PVC	150
P-36	71	6	PVC	150
P-37	192	6	PVC	150
P-38	196	6	PVC	150
P-39	279	6	PVC	150
P-41	106	4	PVC	150
P-42	105	6	PVC	150
P-45	511	6	PVC	150
P-46	442	6	PVC	150
P-47	738	4	PVC	150
P-48	593	4	PVC	150
P-49	31	4	PVC	150
P-56	303	6	PVC	150
P-59	57	6	PVC	150
P-60	289	6	PVC	150
P-61	120	6	PVC	150

Table 2-12b Hydraulic Analysis Junction Report w/Improvements

Label	Flow (Total Needed) (gpm)	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Residual Lower Limit) (psi)
J-6	502	500	777	20
J-7	502	500	819	20
J-8	501	500	822	20
J-12	500	500	832	20
J-14	502	500	809	20
J-16	502	500	782	20
J-17	501	500	858	20
J-18	500	500	870	20
J-19	501	500	855	20
J-23	500	500	988	20
J-25	501	500	918	20

Label	Flow (Total Needed) (gpm)	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Residual Lower Limit) (psi)
J-26	501	500	850	20
J-27	501	500	830	20
J-28	500	500	815	20
J-29	501	500	812	20
J-30	500	500	814	20
J-31	501	500	824	20
J-32	501	500	842	20
J-33	501	500	866	20
J-34	501	500	878	20
J-35	504	500	809	20
J-36	500	500	739	20
J-37	501	500	823	20
J-38	502	500	830	20
J-41	501	500	807	20
J-42	504	500	605	20
J-47	500	500	1,178	20

2.7.6 Water Rights

Criteria

The adequacy of the SWWA water rights shall be evaluated by comparing the available water use data to the systems water right.

Existing Water Right

From Section 2.5.5 HEWS withdraws water based on a permit to appropriate public waters of the State of Washington with a maximum instantaneous withdrawal rate of 100 gpm and an annual withdrawal amount of 7.664 MG (23.52 acre/ft).

Evaluation

The following table compares the annual water use and calculated maximum day water use for the past three years to the water right.

Table 2-10 Annual Water Use and Water Rights

Certifi-cate #	Name of Claimant	Priority Date	Source Name	Primar/ Supple-mental	Existing Water Rights		Future System Demand		Status excess/(deficiency)	
					(Qi) gpm	(Qa) MG	(Qi) (1)	(Qa) (2)	(Qi)	(Qa)
PERMITS / CERTIFICATES										
10734	Drury E. and Irma Mercer.	3/27/1970	SO1	Primary	100	23.5	200	27.9	(100)	(4.4)

(1) *Well pump capacity*
(2) *From Table 2-6*

Based on the above table it appears that SWWA exceeds its daily water right for instantaneous withdraw and for the projected annual withdraw.

Deficiencies

Qi deficient by of 100 gpm

Qa deficient by 4.4 ac-ft/year

2.7.7 Summary of Deficiencies

The following table summarized the deficiencies.

Table 2-11 Summary of Deficiencies

System Component	Current System Capacity	Current Needs	Current Deficiency	Future Needs	Future Deficiency
Supply (well pump)	200 gpm	33 gpm	none	35 gpm	none
Supply (booster pump)	120 gpm	116 gpm	none	120 gpm	none
Storage (standpipe reservoir)	40,500 gal	48,018 gal	7,518 gal	49,830 gal	9,330 gal
Treatment	No known issues		none		none
Fire Flow	120 gpm	533 gpm	413 gpm	535 gpm	415 gpm
Distribution (PHD) Distribution (FF/MDD)	Adequate inadequate	104 gpm @ 30 psi 529 gpm @ 20 psi	None inadequate	107 gpm @ 30 psi 530 gpm @ 20 psi	None inadequate
Water Rights (Qi)	100 gpm	200 gpm	100 gpm	200 gpm	100 gpm
Water Rights (Qa)	23.5 ac-ft/yr	26.7 ac-ft/yr	3.2 ac-ft/yr	27.9 ac-ft/yr	4.4 ac-ft/yr

2.8 System Finances

Current water rates are reported as follows:

Basic Fee: $35/mo.

Future water rates were given by SWWA and take effect in 2017:

Future Fee: $50/mo.

The projected financial data provided for the period 2016 – 2021 is shown on the following table.

Table 2-12 Current and Projected Annual Operation Budget [(1)]

Description	Current Year	2017	2018	2019	2020	2021
CASH BALANCE CARRIED FORWARD	$ 12,352	$ 11,370	$ 16,700	$ 21,772	$ 26,577	$ 31,114
INCOME AND REVENUE						
Rates Domestic[(2)]	$ 30,240	$ 43,200	$ 43,200	$ 43,200	$ 43,200	$ 43,200
Annual or special assessments irrigation	$ 8,682	$ 8,855	$ 9,032	$ 9,213	$ 9,397	$ 9,585
Property taxes (for taxing districts only)	$ -	$ -	$ -	$ -	$ -	$ -
Miscellaneous revenue	$ -	$ -	$ -	$ -	$ -	$ -
New connection fees	$ -	$ -	$ -	$ -	$ -	$ -
Interest earned on bank deposits	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2

Description	Current Year	2017	2018	2019	2020	2021
Total Income and Revenue	$ 38,922	$ 52,055	$ 52,232	$ 52,413	$ 52,597	$ 52,785
Total Income and Revenue and Balance	$ 51,275	$ 63,426	$ 68,934	$ 74,186	$ 79,176	$ 83,901
OPERATING EXPENSES AND PAYMENTS						
Employee salaries and benefits	$ 4,800	$ 4,800	$ 4,800	$ 4,800	$ 4,800	$ 4,800
Contract operator	$ 2,700	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000
Insurance	$ -	$ -	$ -	$ -	$ -	$ -
Water quality sampling	$ 488	$ 498	$ 508	$ 518	$ 528	$ 539
Short-lived asset replacement	$ 3,000	$ -	$ -	$ -	$ -	$ -
Chemicals	$ -	$ -	$ -	$ -	$ -	$ -
Electricity	$ 10,820	$ 11,036	$ 11,257	$ 11,482	$ 11,712	$ 11,946
Fuel	$ -	$ -	$ -	$ -	$ -	$ -
Vehicle maintenance	$ -	$ -	$ -	$ -	$ -	$ -
Property taxes (paid)	$ 46	$ 46	$ 46	$ 46	$ 46	$ 46
B & O (paid)	$ 1,399	$ 1,399	$ 1,399	$ 1,399	$ 1,399	$ 1,399
Income tax (for-profit utilities only)	$ -	$ -	$ -	$ -	$ -	$ -
Engineering services	$ -	$ -	$ -	$ -	$ -	$ -
Legal services	$ -	$ -	$ -	$ -	$ -	$ -
Accounting services	$ 1,905	$ 800	$ 800	$ 800	$ 800	$ 800
DOH fees	$ 322	$ 322	$ 322	$ 322	$ 322	$ 322
Office supplies, postage	$ 211	$ 211	$ 211	$ 215	$ 215	$ 215
Telecommunications (phone, internet)	$ -	$ -	$ -	$ -	$ -	$ -
Utilities (water, sewer, waste collection)	$ 9,062	$ 9,243	$ 9,428	$ 9,616	$ 9,809	$ 10,005
Travel and training	$ -	$ -	$ -	$ -	$ -	$ -
Other expenses	$ 952	$ 971	$ 991	$ 1,011	$ 1,031	$ 1,052
Debt payments (loan principle and interest)	$ 7,200	$ 14,400	$ 14,400	$ 14,400	$ 14,400	$ 7,200
Total operating expenses and payments	$ 39,905	$ 46,727	$ 47,162	$ 47,609	$ 48,062	$ 41,323

(1) *Projected values are based on 73 total service connections*
(2) *Water rates increase from $35/mo to $50/mo beginning in 2017*

The Annual Operation Budget is summarized below on a per user basis for the project years 2016 - 2018.

Table 2-13 Projected Annual Operation Budget – Summary per Connection

Description	2016	2017	2018	Average
Active Connections	73	73	73	73
Annual Revenue per Connection	$ 533.18	$ 713.08	$ 715.51	$ 653.92
Monthly Revenue per Connection	$ 44.43	$ 59.42	$ 59.63	$ 54.49
Annual Expenses per Connection	$ 546.64	$ 640.10	$ 646.05	$ 610.93
Monthly Expenses per Connection	$ 45.55	$ 53.34	$ 53.84	$ 50.91
Monthly net per connection (reserves)	$ -1.12	$ 6.08	$ 5.79	$ 3.58

Values shown in the above tables are based on a 73 total service connections. The increase in debt payment during the 2017 – 2020 financial period is a result of the Association's planned installation of service meters.

Based on the above tables it appears the water system finances are well managed, the current water rate structure is adequate to cover the daily operational expenses, ongoing maintenance and repairs and reserves appear adequate for equipment replacement as needed.

3.0 CONSOLIDATION

3.1 Improvements required to meet City Standards

The following sections evaluate the Associations components using the City of Othello "Public Works Design Standards", dated November 2014.

3.1.1 Supply

The existing SWWA 8-inch diameter well, with a 200 gpm capacity, is likely too low for the City to utilize cost-effectively. The well is located on a small parcel with inadequate space for the City to operate and maintain effectively. Therefore, this well would likely be required to be abandoned by the Association as part of a consolidation.

3.1.2 Distribution

To be in compliance with the City of Othello "Public Works Design Standards", dated November 2014, the following distribution system improvements are required:

- Replace the existing 2-inch and 4-inch diameter water main with a minimum 8-inch diameter DI/PVC water main, change alignments from backyards to rights-of-way
- Replace the existing ¾-inch and 1-inch diameter PVC service pipes with new 1-inch diameter K copper pipe
- Install service meters per City standards
- Install a sampling station
- Install a 2-inch blow-off at temporary dead ends
- Replace fire hydrants at the spacing required per City standards

3.1.3 Storage

The existing standpipe reservoir and booster pump is incompatible with the City gravity storage and provides no benefit to the City, therefore the reservoir will likely be required to be abandoned by the Association as part of the consolidation.

3.1.4 Estimated Cost of Improvements

The table below contains a unit length cost breakdown for distribution system costs used in estimating SWWA improvements

Table 3-1 Estimated Improvements Unit Cost – Water Mains, Services and Surface Restoration

Diameter (in.)	Estimated Cost per LF							
	Main & Install (1)	Valves, Fittings, Restraints		Fire Hydrants (4)	Service Connections		Surface Replacement	
		T-Main (2)	Dist. Main (3)		T-Main (5)	Dist. Main (6)	T-Main (7)	Dist. Main (8)
8	$28	$7	$13	$9	$2	$36	$2	$10
10	$32	$8	$15	$9	$2	$36	$2	$10
12	$35	$10	$19	$9	$2	$36	$2	$10
14	$38	$15	$28	$9	$2	$36	$2	$10
16	$42	$20	$38	$9	$2	$36	$2	$10

(1) *Based on recent bid tabulations and pipe material costs – assumes PVC C900/905 mains*
(2) *Based on review of recent bid tabulations and one connection detail every 400 ft.*
(3) *Based on review of recent bid tabulations and one connection detail every 750 ft.*
(4) *Assume one hydrant every 500 ft.*
(5) *Assume one service every 1000 ft*
(6) *Assume one service every 50 ft*
(7) *Assume 6' wide restoration, 1 HMA patch for water/road crossing every 1,500 ft, cover crop hydroseed over remainder of ditch*
(8) *Assume 6' wide restoration, 1 HMA patch for water/road crossing every 100 ft, cover crop hydroseed over remainder of ditch*

Table 3-2 Estimated Improvements Unit Cost – Highway, Railroad and Canal Crossings

RAILROAD CROSSINGS / HIGHWAY CROSSINGS Bore and Jack					IRRIGATION CANAL CROSSINGS Horizontal Directional Drill				
Casing		Carrier Pipe		Est. Cost	Casing		Carrier Pipe		Est. Cost
Dia.	Material	Dia.	Material	$/lf	Dia.	Material	Dia.	Material	$/lf
36"	steel	14"/16"	DI	$ 900	36"	HDPE	14"/16"	PVC	$ 700
24"	steel	10"/12"	DI	$ 600	24"	HDPE	10"/12"	PVC	$ 500
16"	steel	8"	DI	$ 500	16"	HDPE	8"	PVC	$ 350

The cost to improve the SWWA water system to meet current City standards is estimated on the following table. Costs are estimated assuming public works bidding and state prevailing wage rates are required.

Table 3-3 Estimated Improvements Cost

Description	Est. Quan.	Units	Unit Price	Amount
Main & install (8-inch PVC)	7400	LF	$ 28	$ 207,200
Valves, fittings, restraints	7400	LF	$ 13	$ 92,500
Fire hydrants	7400	LF	$ 9	$ 66,600
Service connections	7400	LF	$ 36	$ 266,400
Surface Replacement	7400	LF	$ 10	$ 74,000
Sampling Station	2	EA	$ 2,000	$ 4,000
2" Blow-off	5	EA	$ 2,000	$ 10,000
			Subtotal	$ 721,000
			Mobilization 10%	$ 72,000

Description	Est. Quan.	Units	Unit Price	Amount
Contingency 20%				$ 144,000
Estimated construction cost				$ 937,000
Environmental approvals allowance (assuming must meet DWSRF loan requirements)				$ 14,000
Engineering 25% (design, construction management/inspection)				$ 234,000
ESTIMATED PROJECT COST				$ 1,185,000
ESTIMATED PROJECT COST/LF				$ 160

3.2 Infrastructure Required to Physically Connect to the City of Othello Water System

3.2.1 Transmission Main Routing

The nearest City water main is on Moon St., approximately 300 feet east of State Route 24 at Roosevelt Ave. City water service can be extended to SWWA by constructing a transmission main from Moon St./Roosevelt Ave. west on Moon St. approximately 2,000 feet and west on SR-26 approximately 5,500 feet to connect to the Summerset West water system.

The connection will allow for Bird Dog Water System (BDWS) to connect the City system and will also provide a nearer connection point for the Rainier Tracts Water Association (RTWA). Both water systems could provide a cost sharing partner to SWWA for the water main extension. SWWA should also consider discussing late comer fees with the City as another way to offset the long term cost of the extension.

See **Figure 5** for the proposed transmission main extension.

3.2.2 Transmission Main Sizing

Hydraulic Analysis Model

The transmission main was sized using a hydraulic model of the City of Othello water system created in Bentley WaterCAD V8i. The model was based on the hydraulic model used in the 2011 City of Othello Water System Plan. The hydraulic model was updated based on information provided by the City regarding water mains which have been either added or replaced after 2011.

Water system demands were updated using water use data provided by the City for the years 2013, 2014 and 2015.

Water reservoir levels used for the various demand scenarios were taken from the 2011 City of Othello Water System Plan.

Service to the City of Othello UGA

The SWWA is within the City of Othello UGA and it is presumed at some point in the future the City of Othello's water system will be extended to serve the UGA. Therefore the transmission main sizing will also be evaluated using growth figures and fire flows provided by the City.

Existing ERUs were determined via a count of existing houses as shown on the most recent aerial maps. Future ERUs within the UGA were provided by the City planner based on the recently completed City of Othello's 2015 Comprehensive Plan.

See **Appendix C** which contains the ERUs counts (existing and future) used to determine system demands and evaluate the transmission main size to serve the UGA along with the proposed transmission main routing.

Criteria

The WSDOH Water System Design Manual (WSDM) Chapter 5 states "Engineers must consider at least two demand scenarios when using a hydraulic analysis to size mains (WAC 246-290-230(5) and (6)).

- **PHD:** First, the water system must be able to deliver the peak hourly demand (PHD) at the required pressure of 30 psi at every existing and proposed service connection.
- **MDD/FF:** Second, if the water system provides fire flow, the distribution pipelines must be able to deliver the maximum day demand (MDD) rate, in addition to the fire flow, at the required pressure of 20 psi throughout the distribution system."

Fire flows as follows:

- Residential fire flow = 1,000 gpm (per the City of Othello 2011 Water System Plan)

In addition, the City of Othello water system design standards include the following standards for distribution system extensions:

- Minimum size for water lines shall be 8-inch diameter except for hydrant leads less than 60 feet long
- Permanent dead-end lines are not allowed
- Residential service pipe shall be one-inch copper
- Water services shall end within road right-of-way or easement
- One sampling station is required per 50 lots (no less than one per development)
- 2-inch blow off valves shall be installed on all dead-end water mains

Evaluation/Conclusion

The transmission main sizing was evaluated under both scenarios required in the WSDOH WSDM for both SWWA and City of Othello needs. The demand scenarios and resulting transmission main size are shown on the following table:

Table 3-4 Transmission Main Sizing

Description	ERUs	System Demands			Scenario	Scenario Demand	Pipe Size
		MDD (gpm)	PHD (gpm)	FF (gpm)		(gpm)	T-Main [3] Dia. (in.)
SWWA [1]	55	35	120	1000	PHD	120	8
City of Othello Growth Area 2 [2]	453	188	305	1000	PHD	305	8

Description	ERUs	System Demands MDD (gpm)	PHD (gpm)	FF (gpm)	Scenario	Scenario Demand (gpm)	Pipe Size T-Main [3] Dia. (in.)
SWWA [1]	55	35	120	1000	MDD/FF	1035	8
City of Othello Growth Area 2 [2]	453	188	305	3000	MDD/FF	3188	12 / 14

(1) *From Table 2-6*
(2) *See Appendix C*
(3) *From SWWA, east along SR-26, East on Moon St. (see Figure 5)*

3.2.3 Estimated Cost to Connect to City of Othello Water System

The cost to physically connect to the City of Othello Water System is estimated on the following table.

Table 3-5 Estimated Cost to Connect to City of Othello Water System

Description	Estimated Quantity	Unit	Unit Price	Amount (SWWA) (8-inch T-Main)	Amount (City of Othello) (upsize to 14-inch)
Main (8-inch PVC)	7,900	LF	$28	$221,200	
Main & install (upsize to 12-inch, see Figure 5)	2,400	LF	$7		$16,800
Main & install (upsize to 14-inch, see Figure 5)	5,500	LF	$10		$55,000
Valves, fittings, restraints (8-inch)	7,900	LF	$7	$52,667	
Valves, fittings, restraints (upsize to 12-inch, see Figure 5)	2,400	LF	$3		$8,000
Valves, fittings, restraints (upsize to 14-inch, see Figure 5)	5,500	LF	$8		$44,000
Fire hydrants	7,900	LF	$9	$71,100	
Service connections	7,900	LF	$2	$15,800	
Surface Replacement	7,900	LF	$2	$15,800	
RR Crossing Bore (T-Main, 16" casing, 8" carrier pipe)	60	LF	$500	$30,000	
RR Crossing Bore (T-Main, 24" casing, 12" carrier pipe)	60	LF	$100		$6,000
Irrigation Canal Crossing (T-Main, 16" casing, 8" carrier pipe)	200	LF	$350	$70,000	
Irrigation Canal Crossing (upsize to 24" casing, 14" carrier pipe)	200	LF	$150		$30,000
PRV Vault	1	EA	$15,000	$15,000	
			Subtotal	$492,000	$160,000
			Mobilization 10%	$49,000	$16,000
			Contingency 20%	$98,000	$32,000
			Estimated construction cost	$639,000	$208,000
			Environmental approvals allowance (assuming must meet DWSRF loan requirements)	$16,000	$0

Description	Estimated Quantity	Unit	Unit Price	Amount (SWWA) (8-inch T-Main)	Amount (City of Othello) (upsize to 14-inch)
Engineering 25% (design, construction management/inspection)				$160,000	$52,000
ESTIMATED PROJECT COST				$815,000	$260,000
ESTIMATED PROJECT COST/LF				$103	

3.3 Estimated Impact to City System

The impact of consolidating the SWWA into the City of Othello water system is evaluated below by system component including supply, distribution and storage. The evaluation will be based on the current City of Othello water system demands as shown on the following table and estimated existing and future SWWA system demands from Table 2-5 and 2-6.

Table 3-6 Current City of Othello Water System Demands

Year	ERUs (1)	ADD (gpm)	MDD (gpm)	PHD (gpm)	Annual (MG)	Annual (acre/ft)
2013		3,340	4,570	7,410	1,757	5,390
2014		3,420	5,070	8,250	1,796	5,510
2015		3,100	4,460	7,250	1,628	5,000
Average	10,490	3,300	4,700 (2)	7,600 (3)	1,700	5,300

(1) *Calculated based on ADD using 453 gpd/ERU*
(2) *Resulting ADD:MDD peaking factor 1.43*
(3) *Resulting MDD:PHD peaking factor 1.62*

3.3.1 Supply

Criteria

The WSDOH WSDM provides the following criteria for public water supply:

- Supply must meet MDD
- Supply should meet MDD and replenish Fire Suppression Storage within 72 hours while supplying MDD

Current Capacity

The City's water is supplied via eight groundwater wells. The current supply capacity of the City's wells is shown on the following table.

Table 3-7 Current City Supply

Well No.	WSDOH ID No.	Current Capacity (gpm)
2	01	-
3	02	800
4	06	430

Well No.	WSDOH ID No.	Current Capacity (gpm)
5	07	900
6	05	2,500
7	08	630
8	09	395
9	10	1,500
Total Supply Capacity		7,155

Evaluation

The impact of consolidating the SWWA into the City of Othello water supply is evaluated in the following table.

Table 3-8 Supply Capacity Evaluation

Description	Scenario	MDD (gpm)	Replenish FSS [1] (gpm)	Total (gpm)	Current Supply Capacity [2] (gpm)	Excess / (Deficiency) (gpm)
City of Othello	Current [3]	4,700				
SWWA	Current [4]	29				
Total		4,729	347	5,076	7,155	2,079
City of Othello	Current [3]	4,700				
SWWA	Future [5]	30				
Total		4,730	347	5,077	7,155	2,078

(1) *Per City of Othello 2011 WSP Fire Suppression Storage = 6,250 gpm for 4 hours (1,500,000 gallons), Replenish FFS = 1,500,000/72 hrs/60 min*
(2) *From Table 3-7*
(3) *From Table 3-6*
(4) *From Table 2-5*
(5) *From Table 2-6*

Conclusion

The City has adequate supply capacity to serve SWWA with no improvements required.

See **Appendix D** for discussion related to long-term effects on City supply.

3.3.2 Distribution

Criteria

Per the WSDM the distribution system shall maintain a minimum 30 psi during PHD and 20 psi during FF/MDD.

Hydraulic Analysis Model

As described in Section 3.2.2.

Evaluation

The hydraulic model of the City of Othello's water system was run after adding the SWWA system demands. No deficiencies within the existing City of Othello water system were found.

The hydraulic model was then run adding the SWWA system demands and the demands estimated for the future UGA area. No deficiencies within the existing City of Othello water system were found.

Conclusion

The City has adequate distribution system capacity to serve SWWA and the future UGA with no improvements required.

3.3.3 Storage

Criteria

The WSDOH WSDM provides the following criteria for public water storage:

Operational Storage (OS): Storage volume devoted to supplying the water system when sources of supply are in the "off" status (volume between pump "on" and pump "off")

Equalizing Storage (ES): Storage volume required to meet peak system demands which exceed source capacity (min. system pressure 30 psi)

- ES = (PHD-Qs)(150 min.)

Where:

- PHD = peak hour demand in gpm
- Qs = sum of all source capacities in gpm

Standby Storage (SB): Storage volume to provide system reliability in cases where sources fail or during periods of unusually high demands (min. system pressure 20 psi)

- SB = (2 days)[(ADD)(ERUs) – t_M (Q_S-Q_L)]

Where:

- ADD = gpd/ERU
- t_M = 1,440 minutes
- Q_S = Sum of all source capacity in gpm
- Q_L = Largest source capacity in gpm

Alternatively, the WSDM recommends the standby storage volume be no less than 200 gal/ERU

Fire Suppression Storage (FSS): Storage volume required to provide the maximum fire flow rate and duration (min. system pressure 20 psi)

- FSS = (FF)(duration)

Where:

- FF = 6,250 gpm (largest fire flow demand)
- Duration = 4 hours (longest fire flow duration)

Dead Storage (DS): Storage volume below the minimum required system pressure (unusable storage)

Current Capacity

The City of Othello has three reservoirs with a total nominal storage capacity of approximately 6,000,000 gallons. The useable volume available to the system varies from 1.3 MG to 2.8 MG depending on the residual system pressure for the storage component being analyzed, i.e. 20 psi for FF and SB; 30 psi for ES. The remaining volume is referred to as "dead storage".

Evaluation

Operational Storage

Extending service to SWWA will not change the pump setting or OS volume.

Equalizing Storage

Description	PHD (gpm)	Qs [1] (gpm)	Duration (min.)	ES (gal.)
Othello	7,600 [2]	7,155	150	66,750
SWWA	107 [3]	7,155	150	0
Combined	7,707	7,155	150	82,840

(1) *From Table 3-7*
(2) *From Table 3-6*
(3) *From Table 2-6*

Standby Storage

Description	Duration (days)	ADD (gpd/ERU)	ERUs	t_M	Q_S (gpm)	Q_L (gpm)	SB (Eq.9-3) (gal.)	SB (200 gal./ERU) (gal.)
Othello	2	453	10,490	1440	7155	2500	<0	2,098,000
SWWA	2	453	55	1440	7155	2500	<0	11,000
Combined	2	453	10,545	1440	7155	2500	<0	2,109,000

Fire Suppression Storage

Description	Largest FF Demand (gpm)	Longest FF Duration (hrs)	FF Volume (gal.)
Othello	6,250	4	1,500,000
SWWA	1,000	2	120,000

Dead Storage

All service elevations in SWWA are at or below existing City of Othello service elevations so extending City of Othello water service to SWWA will not increase dead storage.

Storage Comparison

The City of Othello storage volumes with and without SWWA is shown in the following table:

Table 3-9 Storage Comparison

Description	CITY OF OTHELLO		OTHELLO/SWWA	
	Elevation (amsl)	Volume (gal.)	Elevation (amsl)	Volume (gal.)
Overflow (1)	1209.0		1209.0	
OS		239,825		239,825
Bottom of OS (1)	1205.0		1205.0	
ES		65,952		82,840
Bottom of ES (2)	1203.9		1203.6	
SB		2,098,013		2,109,000
Bottom of SB (3)	1168.9		1168.4	
FSS		1,500,000		1,500,000
Bottom of FSS (4)	1178.9		1178.6	
Base Elevation	1119.6		1119.6	

(1) *From 2011 Water System Plan*
(2) *Minimum elevation required to maintain 30 psi service pressure = 1195*
(3) *Minimum elevation required to maintain 20 psi service pressure = 1167*
(4) *Minimum elevation required to maintain 20 psi service pressure = 1170*
(5) *SB and FSS are nested per 2011 Water System Plan*

Conclusion

The City has adequate distribution system capacity to extend water service to SWWA with no improvements required.

3.3.4 Water Rights

Criteria

The criteria used to evaluate the adequacy of the City's water rights are as follows:

Maximum instantaneous flow (based on total source capacity) < Maximum instantaneous withdrawal (Qi)

Maximum annual water use (based on current water use data) < Maximum annual withdrawal (Qa)

Current Water Right

The City's water rights were consolidated into a unified water allocation. This unified allocation is as follows:

Qi = 9,550 gpm

Qa = 7,100 acre-ft/yr

Evaluation

The impact on the City's water rights of consolidating the SWWA into the City of Othello water system is evaluated in the following table.

Table 3-10 Water Rights Evaluation

Description	Qi Capacity of all sources (gpm)	Qa Annual water use (acre-ft/yr)
City of Othello	7,155	5,300 (1)
SWWA	0	27.9 (2)
Total	7,155	5,328
Water Right	9,550	7,100
Excess/(deficiency)	2,395	1,772
SWWA Water Rights Transfer	100 (3)	23.5 (3)
City of Othello Water Rights post Consolidation (4)	9,650	7,123.5

(1) *From Table 3-6*
(2) *From Table 2-6*
(3) *From Table 2-10*
(4) *Adds current SWWA water right amounts, actual amount would be determined by ECY. ECY may limit Qi to current pump rate (35 gpm)*

Conclusion

The City of Othello has adequate water rights to provide service to SWWA.

Based on estimated future water use from Table 2-10, extending water service to SWWA will not affect Qi and will use 27.9 acre-ft/yr of the City's Qa. Consolidating with SWWA and acquiring the water right associated with SWWA's well could potentially add 100 gpm (current SWWA Qi) to the City's Qi and 23.5 acre-ft/yr (maximum convertible Qa for well) to the City's Qa which would partially offset the SWWA annual water use impact to the City's Qa.

Actual Qi/Qa amounts would be determined by ECY. ECY may limit Qi to current pump rate (35 gpm).

3.3.5 Summary of Impacts of Consolidation on City Water System

The following table summarizes the impacts to the City of Othello's water system components:

Table 3-11 Summary of Impacts to City of Othello Water System Components

Component	Deficiencies Identified	Impacts to City System (required improvements)
Supply	none	none
Distribution	none	none
Storage	none	none
Water Rights	none	none

3.4 Comparison of Costs – Unconsolidated vs Consolidated

3.4.1 Unconsolidated System

The capital cost for the improvements needed to correct the system deficiencies identified in Table 2-11 are estimated as follows.

FUNDING

The estimates assume the project will be funding using public agency funding. Available funding sources include:

DWSRF: Drinking Water State Revolving Fund

This funding source provides funds for drinking water infrastructure projects aimed at increasing public health protection. This funding source prioritizes water quality projects which primarily focus on eliminating water quality issues such as microbial, primary inorganic chemical, other primary chemical and secondary chemical contaminations before infrastructure replacement or other distributions improvements projects.

In general, DWSRF provides funding at 1% interest for 20 year term.

CDBG-GP: Community Development Block Grant

This funding source funds drinking water projects which principally benefit low- to moderate-income people. This is a highly competitive funding source with a maximum grant amount of $750,000.

This funding source is grant and repayment is not required.

USDA-RD: United States Department of Agriculture Rural Development

This is a Federal funding source which will fund rural water utility projects. This is an easy source to qualify for but has a difficult and lengthy application/award and funding process.

Interest rates for this source vary with market rates with terms up to 40 years but the term should not exceed the expected life of the improvements.

COST ESTIMATE

Table 3-12 Estimated Capital Improvements Cost

Description	Est. Amount
Install new 530 gpm fire flow booster pump (expand building; install new pump, piping, panel wiring, etc.)	$20,000
Main (4-inch PVC) (1,400 feet @ $22/LF for increased fire flow)	$30,800
Main (6-inch PVC) (7,900 feet @ $26/LF for increased fire flow capacity)	$205,400
Fire Hydrants (along proposed 6-inch main, 7,900 feet @ $9/LF)	$71,100

Description	Est. Amount
Install individual service meters (75 at $2,000 ea. including mainline saddle, corp stop, service pipe, curb stop, meter and meter box and surface restoration)	$150,000
Surface Restoration ($10/LF x 8,300 LF)	$83,000
Add pre-cast underground 10,000 gallon storage tank to supplement the existing 40,500 gallon standpipe (precast tank(s), piping, level controls, etc.)	$15,000
Increase water rights (purchase 4.4 acre-ft/yr @ $3,400/acre-ft) (1)(2)	$15,000
Subtotal	$590,000
Mobilization 10%	$59,000
Contingency 20%	$118,000
Estimated construction cost	$767,000
Environmental approvals allowance (assuming NEPA per USDA-RD loan requirements)	$25,000
USDA-RD Engineering Report Requirements, Funding Application, Interim Financing, etc.	$30,000
Engineering 25% (design, construction management/inspection)	$192,000
ESTIMATED PROJECT COST	$1,014,000
Estimated Annual Debt Service (assuming USDA-RD funding at 4.5% for 20 yrs)	$78,000

(1) *Based on "Trends in water market activity and price in the western United States" by Thomas C. Brown, published 2006; median price for sales for municipal uses ($2120 per ML, 2003 dollars) converted to acre-ft and 2016 dollars.*

(2) *This value is acknowledged to have a high probability for a large variability based on unknown availability a water rights holder willing to sell his/her water rights.*

The ongoing operation and maintenance costs are estimated in the following table.

Table 3-13 Estimated Operation and Maintenance Cost

Description	Amount
Annual O&M (1)	$47,000
Estimated annual debt service on capital improvements (2)	$78,000
Total Estimated Annual System Cost	$125,000

(1) *Based on Table 2-12 for 2017 rounded to nearest $1000*

(2) *From Table 3-12*

3.4.2 Consolidated System

Considered below is a consolidation scenario that affect the cost impacts of the consolidation on SWWA. This scenario includes Bird Dog Water System (BDWS) consolidating with City of Othello Water System and sharing the consolidation costs with SWWA. In this scenario the cost of connection may be shared based on the total length of transmission main required to connect each of the water systems to the City of Othello Water System (shared with BDWS).

Table 3-14 Estimated Cost Sharing with Bird Dog and Rainier Tracts (1) (2)

Description	Est. Quan.	Unit	Unit Price (3)	Amount		BDWS Share
Portion of shared consolidation transmission Main	2,800	LF	$103	$288,000		($144,000)
ESTIMATEDSHARED PROJECT COST				$288,000		($144,000)

(1) *This estimate does not include the estimated cost to the City of Othello to upsize to 12-inch and 14-inch main*
(2) *See Figure 7*
(3) *From Table 3-5*

The capital cost for the improvements needed to extend City of Othello water service to serve SWWA under the various consolidation scenarios are estimated in the following table.

Table 3-15 Estimated Improvements Cost and Annual Debt Service

Description	Consolidation Scenario	
	SWWA	SWWA and BDWS
Estimated Cost to Improve SWWA (1)	$1,185,000	$1,185,000
Estimated Cost to extend service to SWWA(2) (does not include City portion to upsize t-main)	$815,000	$815,000
Cost sharing reduction (3)		($144,000)
Total Capital Cost	$2,000,000	$1,856,000
Annual Debt Service (4)		
DWSRF Loan (1% interest for 20 yrs) (5)	$110,800	$102,900
DWSRF Loan w/50% Loan Forgiveness (1% interest for 24 yrs) (6)	$47,100	$43,700

(1) *From Table 3-3*
(2) *From Table 3-5*
(3) *From Table 3-14*
(4) *Assume consolidation funded by City via. City application to WSDOH for DWSRF construction loan funds*
(5) *Assumes a not economically disadvantaged system with project completed within 24 months of contract execution.*
(6) *DWSRF will provide 50% principal forgiveness for eligible consolidation projects and extend repayment to 24 yrs.*

The estimated cost to remain a separate water system is compared with the estimated cost to consolidate with the City of Othello on the following table.

Table 3-16 Comparison of Costs

Description	SWWA remain separate system	Consolidation Scenario			
		SWWA		SWWA and BDWS	
		DWSRF Loan	DWSRF Loan (w/50% forgiveness) (4)	DWSRF Loan	DWSRF Loan (w/50% forgiveness) (4)
Annual O&M (1)	$47,000				
Estimated Debt Service on Improvements (2)	$78,000	$110,800	$47,100	$102,900	$43,700
Estimated Annual Cost	$125,000	$110,800	$47,100	$102,900	$43,700
Connections (2016) (3)	75	75	75	75	75
Est. Debt Service Cost Per Connection/month	$139	$123	$52	$114	$49
City of Othello base water rate (5) (outside city)		$51	$51	$51	$51
Total Estimated cost per connection/month	$139	$174	$103	$165	$100

(1) *From Table 3-13*
(2) *From Table 3-13 / 3-15*
(3) *From Table 2-12*
(4) *DWSRF will provide 50% principal forgiveness for eligible consolidation projects. Eligibility will be determined by WSDOH and DWSRF.*
(5) *Does not include overage charges. Base rate is $34 with 50% surcharge ($17) outside the City. It is possible the City could count this $17 monthly surcharge amount toward the debt service lowering the Total Estimated cost per Connection/Month by $17*

Important notes about the above table:

- All estimated improvements costs are based on current regional costs for PUBLIC WORKS construction which require competitive bidding, prevailing wage rates, more restrictive environmental investigations and requirements, MBE/DBE requirements and generally higher overhead and administrative cost than comparable privately funding construction.

- The cost table above does not include intangible benefits from consolidation which include increased fire flow capacity (1,000 gpm/2 hrs vs 500 gpm/30 min) as well as elimination of volunteer time/effort needed to run the system (City of Othello would take over all water system administrative/maintenance tasks)

- Estimated costs are based on conceptual improvements with many potential variables and is intended to establish a “ball park” estimate of costs only

- It is recommended SWWA make contact with Bird Dog as well as others who may benefit from the City of Othello water main extension and discuss cost sharing opportunities which would likely reduce SWWA share of the above estimated costs.

3.5 Barriers to Consolidation

Potential barriers to consolidation are identified as follows:

- Overall estimated cost of the consolidation and significant impact to the monthly user rates
- Cost to improve existing system to City standards
- Cost of transmission main to extend City service to SWWA
- Financing of improvements (USDA-RD, DWSRF, other)
- Eligibility of system consolidation for DWSRF 50% loan forgiveness
- Coordination between the City and SWWA for funding and construction of the improvements
- Coordination between Bird Dog (and or other potential cost sharing partners) regarding their motivation for consolidation

4.0 NEXT STEPS/SCHEDULE

The project described in the feasibility study is not in the current Othello Water Department Water System Plan. For these projects to be eligible for DWSRF-funded construction the consolidation project(s) must be included by amendment into the existing WSP or included in the updated WSP which is scheduled to be completed in 2017. To be included by amendment the following tasks need to be completed along with the submission of a DWSRF construction funding application by the application deadline of September 30, 2016:

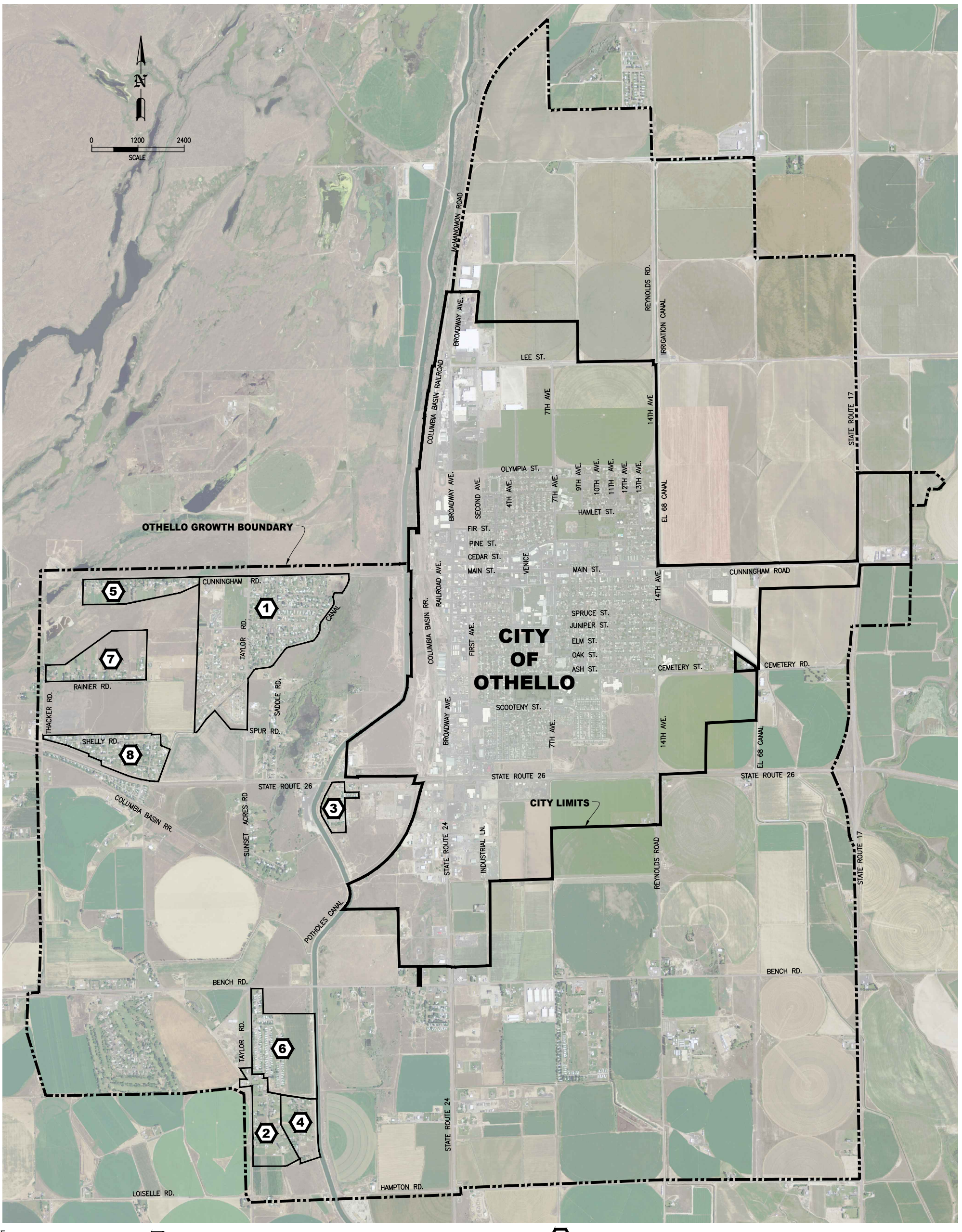
- The capital improvement program and projected budget must be updated to include the construction projects to be pursued in 2017.
- The systems contemplated for consolidation in 2017 must be included in the future service area.
- The amendment is subject to State Environmental Policy Act; the City is the lead agency.
- The amendment is also subject to the local government consistency requirement, with forms required from the City of Othello and Adams County Building and Planning.
- Amendment requires a public information meeting with appropriate public notice.
- The City must also make notice to adjacent water systems, in particular ones intended for consolidation. Their comments must be included in the WSP. (This would include the consent to be consolidated, which is required for the DWSRF application)
- The City Council must adopt the amendment
- WSDOH needs to review/approve the amendment prior to the submission of the application

At this time there is inadequate time remaining by the September 30, 2016 DWSRF application deadline to amend the existing WSP, per above, to include the consolidation project(s) and get WSDOH approval.

Therefore the following schedule reflects including system consolidation (if any) be included in the planned 2017 WSP update and submission of DWSRF application in the 2017 funding cycle.

The following steps and schedule are proposed:

Submit draft report to WSDOH for review/approval:	August 12, 2016
Submit final report to WSDOH/City of Othello for approval: *(revised per WSDOH comments)*	August 31, 2016
Submit to SWWA for review/consideration:	August 31, 2016
City/ SWWA schedule meeting to discuss report	September 2016
City schedule meeting with representatives from all 8 systems to discuss reports	October, 2016
Ongoing discussions/meetings between City and 8 systems to discuss report, negotiate consolidation options, etc.	November 2016 – February 2017
Deadline for City / 8 Systems to decide which (if any) systems are to be included for consolidation in the WSP update	March 1, 2017
City to complete WSP update (and all DWSRF funding application tasks/requirements noted above)	August 1, 2017
City submit DWSRF grant/loan application:	September 30, 2017
City/ SWWA negotiate consolidation/water service agreement:	October 1, 2017 – December 31, 2017
City negotiate grant/loan agreement with DWSRF:	January 1, 2018 – February 28, 2018
City sign grant/loan agreement with DWSRF:	March 1, 2018
City negotiate engineering agreement for design/construction management and inspection of improvements; environmental process and approval requirements:	March 1, 2018 – March 31, 2018
City execute engineering agreement:	April 1, 2018
Complete environmental approval process, design improvements	April 1, 2018 – June 30, 2018
WSDOH design review/approval DWSRF environmental review/approval	July 1, 2018 – July 31, 2018
Advertise for bids, bid period, award, process insurance/agreements, issue notice to proceed:	August 1, 2018 – September 15, 2018
Construct improvements:	September 15, 2018 – October 15, 2018
System(s) consolidation complete:	October 15, 2018



1. ADAMS COUNTY WATER DISTRICT #1 – SYSTEM ID: 22525 X
   - 341 CONNECTIONS
   - OTHELLO WATER SYSTEM INTERTIE – UNKNOWN CAPACITY
2. BASIN VIEW WATER ASSOCIATION – SYSTEM ID: 04530 N
   - 22 CONNECTIONS
   - OTHELLO MANOR WATER SYSTEM INTERTIE – 300 GPM
   - WELL #1 – 35 GPM
3. BIRD DOG FAMILY LTD PARTNERSHIP II – SYSTEM ID: 52172 8
   - 58 CONNECTIONS
   - WELL #1 – 33 GPM
4. HIGHLAND ESTATES WATER SYSTEM – SYSTEM ID: 32736 0
   - 16 CONNECTIONS
   - WELL #1 – 56 GPM
5. MEADOW LANE WATER ASSOCIATION – SYSTEM ID: 53190 T
   - 25 CONNECTIONS
   - WELL #1 – 70 GPM
6. OTHELLO MANOR WATER SYSTEM – SYSTEM ID: 64845 3
   - 152 CONNECTIONS
   - WELL #1 – 300 GPM
7. RAINIER TRACTS WATER ASSOCIATION – SYSTEM ID: 70910 M
   - 20 CONNECTIONS
   - WELL #1 – 45 GPM
8. SUMMERSET WEST WATER ASSOCIATION – SYSTEM ID: 85080 M
   - 72 CONNECTIONS
   - WELL #1 – 200 GPM

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SCALE:	AS SHOWN
DESIGNED:	–
DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08
DATE:	8/26/16

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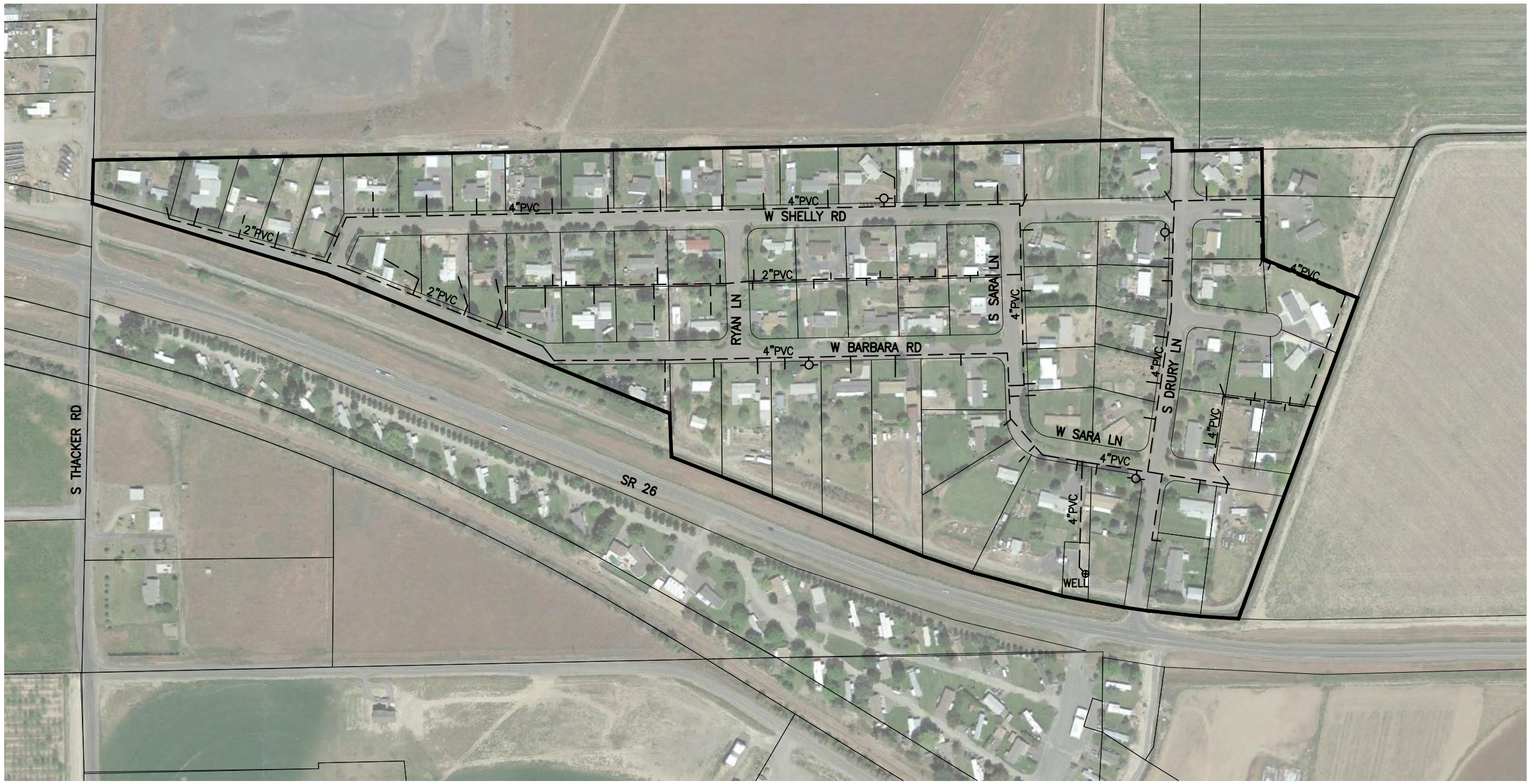
ENGINEERING AND MANAGEMENT

CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

CONSOLIDATION FEASIBILITY STUDY SYSTEM

FIGURE
1



LEGEND

- SWWA BOUNDARY
- PARCEL LINE
- WATER LINE
- WELL
- FIRE HYDRANT

N

0 150 300
SCALE

1720809 Summerset West Water Association Exhibit

SCALE:	AS SHOWN
DESIGNED:	JSM/NVH
DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	8/4/16

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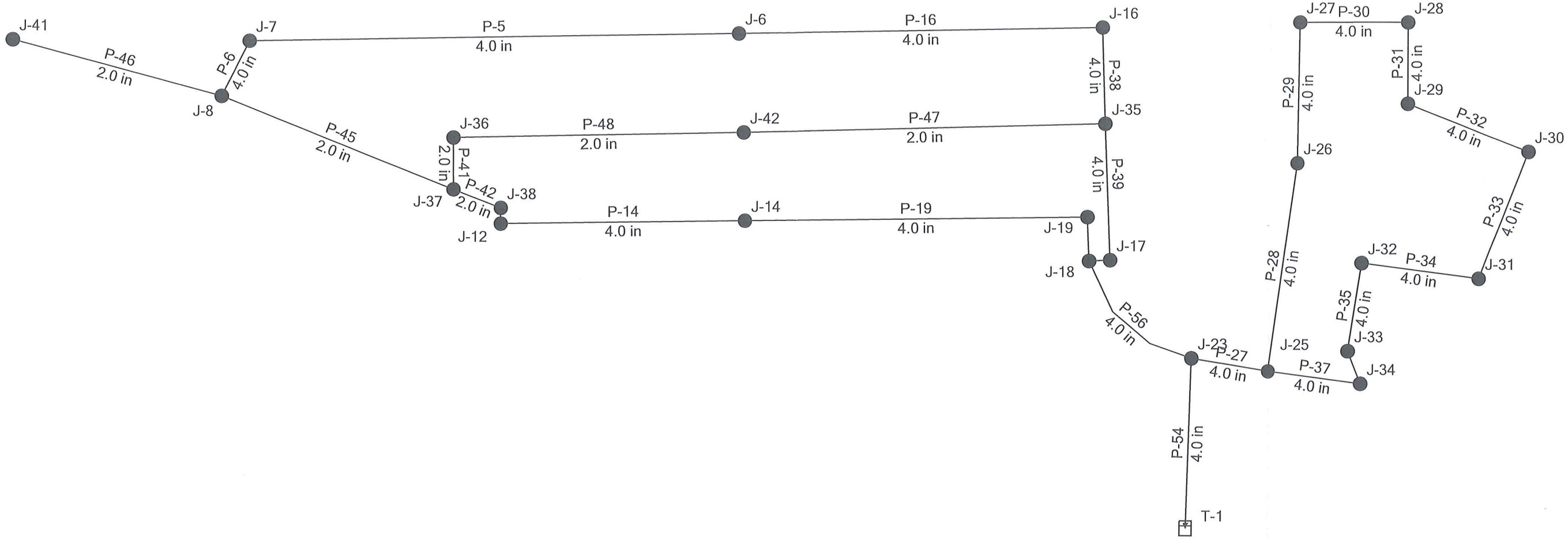
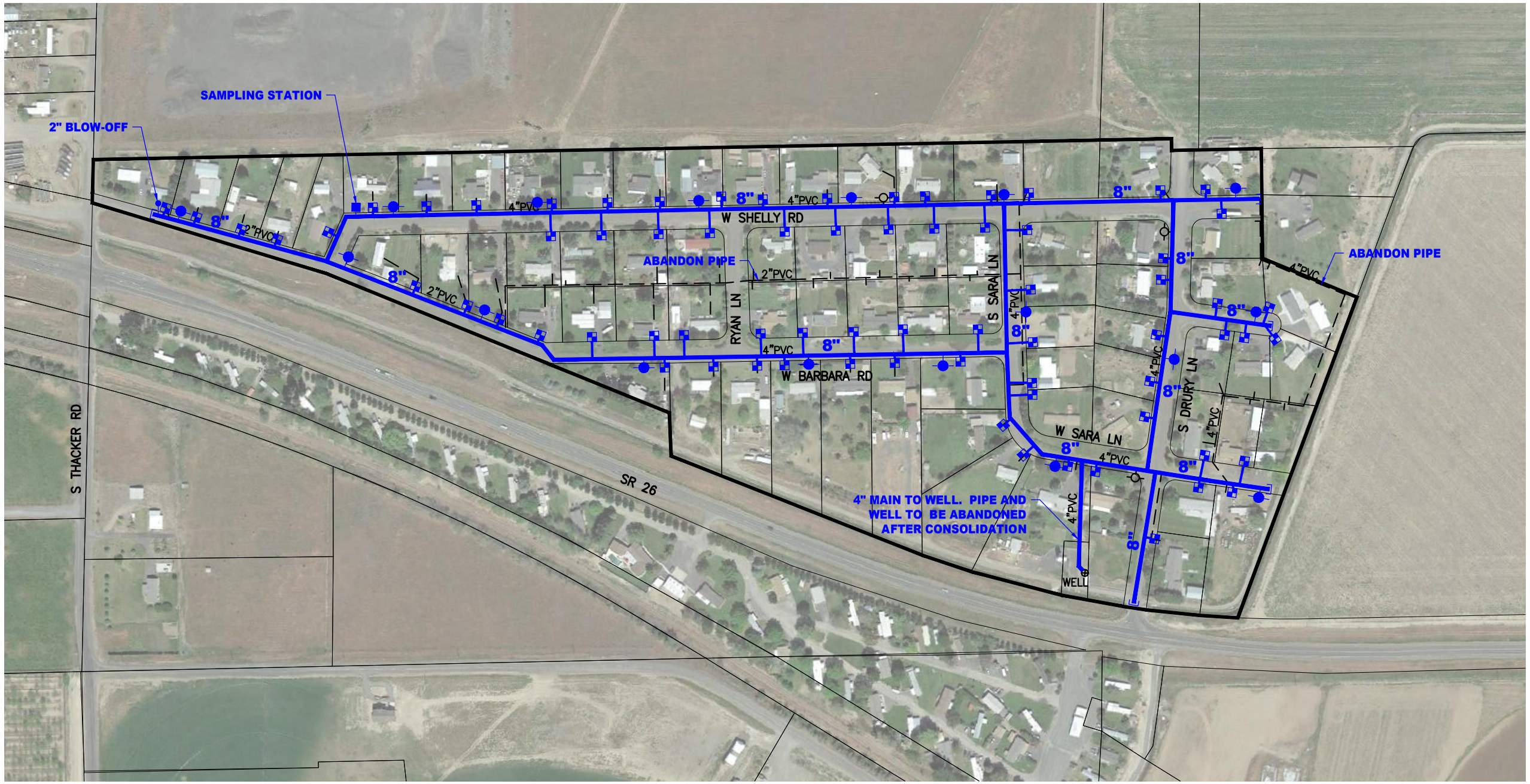
CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

SWWA EXISTING WATER SYSTEM AND
WATER SYSTEM BOUNDARY

FIGURE
2

Figure 3
SWWA Hydraulic Model Node Map





LEGEND

- SWWA BOUNDARY
- PARCEL LINE
- WATER LINE
- WELL
- FIRE HYDRANT
- PROPOSED WATER METER
- PROPOSED FIRE HYDRANT
- SAMPLING STATION
- BLOW-OFF ASSEMBLY
- 8" REPLACEMENT WATER MAIN
- REPLACE WATER SERVICE

N

0 150 300
SCALE

1720809 Summerset West Water Association Exhibit

SCALE:	AS SHOWN
DESIGNED:	JSM/NVH
DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	8/4/16

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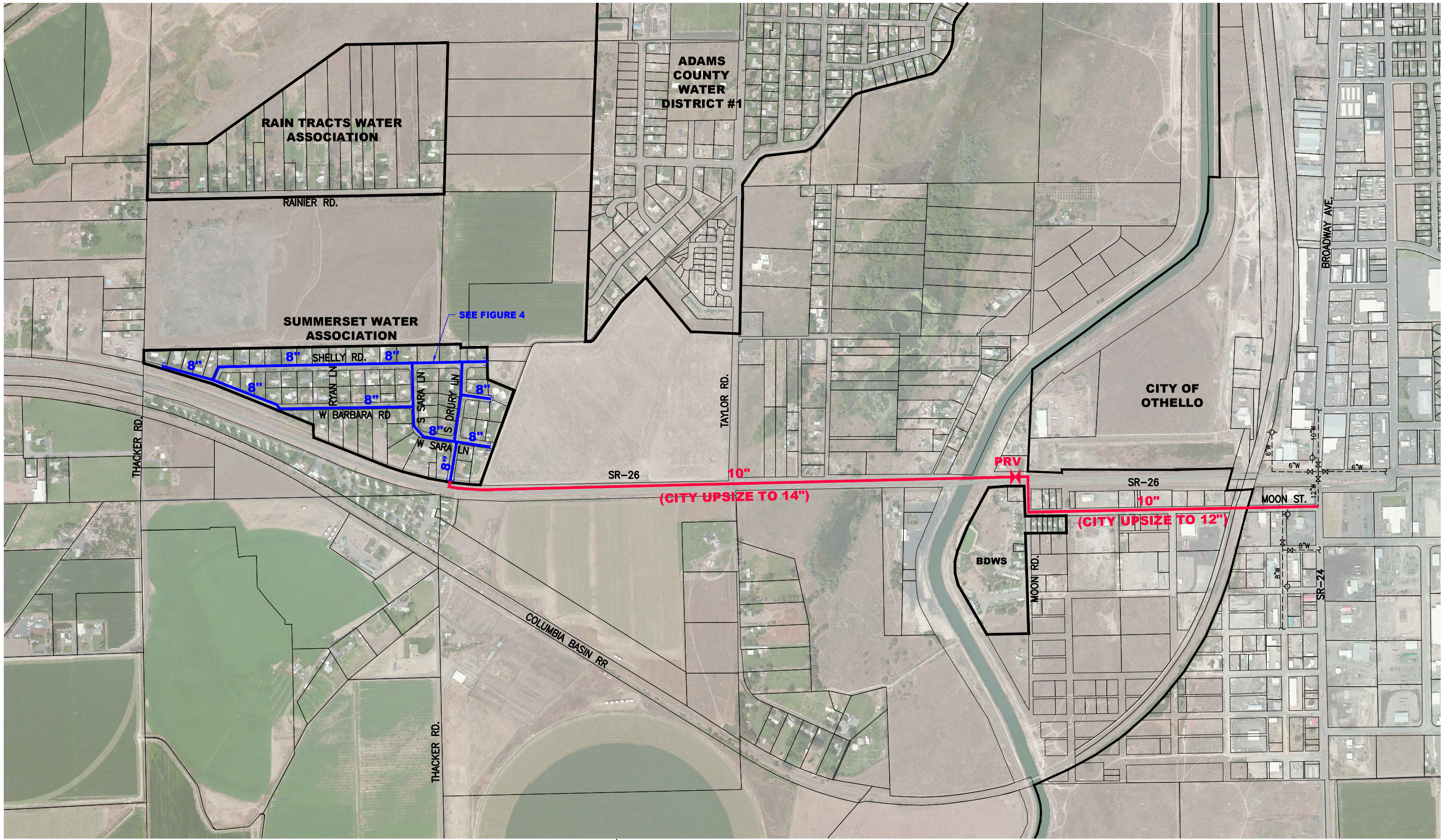
ENGINEERING AND MANAGEMENT

CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

SWWA PROPOSED IMPROVEMENTS REQUIRED TO MEET CITY STANDARDS

FIGURE
4



1720809 Summerset West Water Association Exhibit

SCALE:	AS SHOWN
DESIGNED:	JSM/NVH
DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	8/4/16

LEGEND

- WATER SYSTEM BOUNDARY
- PARCEL LINE
- EXISTING WATER LINE
- 8" PROPOSED WATER MAIN

0 400 800
SCALE

N

VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

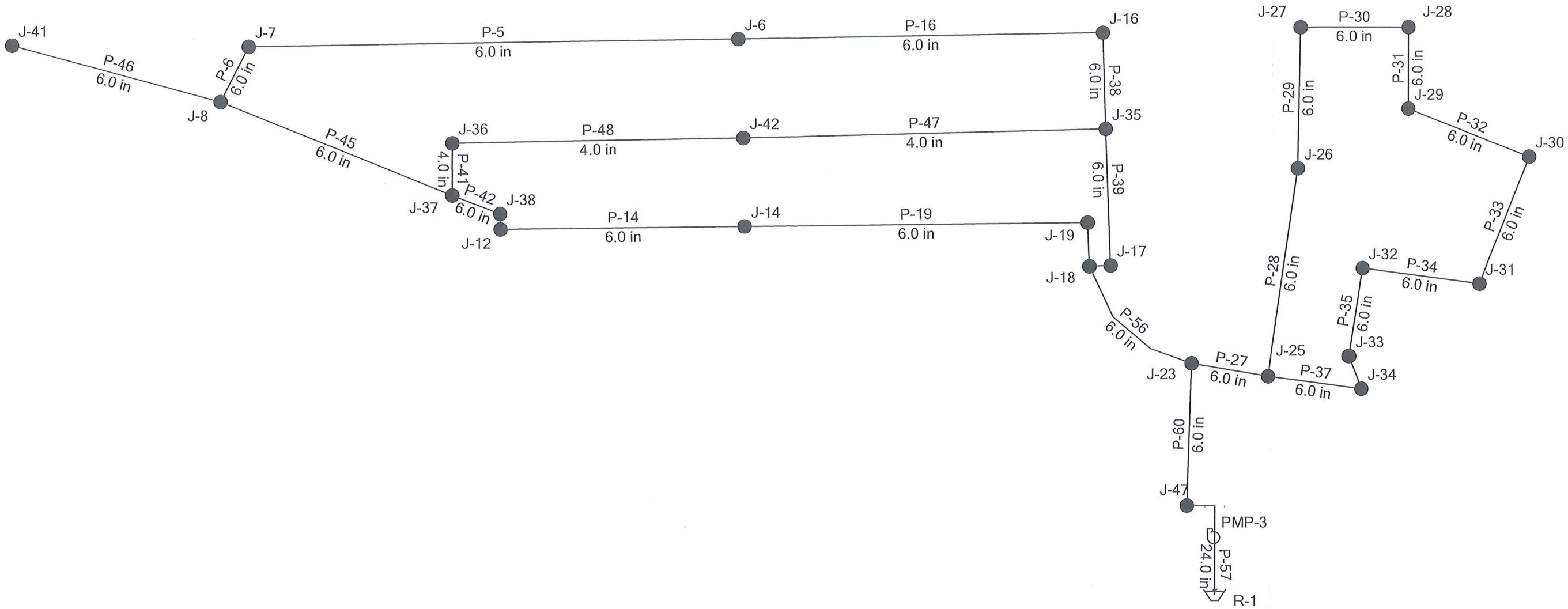
CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

SWWA CONSOLIDATION IMPROVEMENTS

FIGURE **5**

Figure 6

SWWA Fire Flow Hydraulic Model Node Map



RAIN TRACTS WATER ASSOCIATION

ADAMS COUNTY WATER DISTRICT #1

RAINIER RD.

SUMMERSET WATER ASSOCIATION

SEE FIGURE 4

8" SHELLY RD. 8"

8" 8"

RYAN LN

S SARA LN

S DRURY LN

8" 8"

W BARBARA RD

8" 8"

W SARA LN

8"

THACKER RD.

TAYLOR RD.

CITY OF OTHELLO

BROADWAY AVE.

6"W 10"W 6"W

PRV

SR-26

10"

(CITY UPSIZE TO 14")

SR-26

10"

(CITY UPSIZE TO 12")

MOON ST.

12"W

8"W

BDWS

MOON RD.

SR-24

COLUMBIA BASIN RR

THACKER RD.

1720809 Summerset West Water Association Exhibit

LEGEND

WATER SYSTEM BOUNDARY

PARCEL LINE

10" PROPOSED TRANSMISSION MAIN

COST SHARING WITH BDWS

N

0 400 800

SCALE

SCALE:	AS SHOWN
DESIGNED:	JSM/NVH
DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	8/31/16

VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

COST SHARING WITH BDWS

FIGURE
7

APPENDIX A

WFI

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

WATER FACILITIES INVENTORY (WFI) FORM

ONE FORM PER SYSTEM

Quarter: 2
Updated: 04/18/2016
Printed: 8/3/2016
WFI Printed For: On-Demand
Submission Reason: Contact Update

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
85080 M	SUMMERSET WEST WATER ASSOCIATION	ADAMS	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS

LOREY C. SIELAFF [OPERATOR]
1057 S HI LO DR
OTHELLO, WA 99344-9715

7. OWNER NAME & MAILING ADDRESS — **8. OWNER NUMBER: 005742**

SUMMERSET WEST WATER ASSN
ELIZABETH KEELE — SECRETARY
2267 W BARBARA RD
OTHELLO, WA 99344

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS
CITY STATE ZIP

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS
CITY STATE ZIP

9. 24 HOUR PRIMARY CONTACT INFORMATION

Primary Contact Daytime Phone: (509) 488-3976
Primary Contact Mobile/Cell Phone: (509) 989-0339
Primary Contact Evening Phone: (xxx)-xxx-xxxx
Fax: (509) 488-0219 E-mail: xxxxxxxxxxxxxxxxxxx

10. OWNER CONTACT INFORMATION

Owner Daytime Phone: (509) 488-5041
Owner Mobile/Cell Phone: (509) 660-0299
Owner Evening Phone:
Fax: E-mail: xxxxxxxxxxxxxxxxxxx

WAC 246-290-420(9) requires that water systems provide 24-hour contact information for emergencies.

11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)

- [x] Not applicable (Skip to #12)
- [ ] Owned and Managed
- [ ] Managed Only
- [ ] Owned Only

SMA NAME: _____ SMA Number:

12. WATER SYSTEM CHARACTERISTICS (mark all that apply)

- [ ] Agricultural
- [ ] Commercial / Business
- [x] Day Care
- [ ] Food Service/Food Permit
- [ ] 1,000 or more person event for 2 or more days per year
- [ ] Hospital/Clinic
- [ ] Industrial
- [ ] Licensed Residential Facility
- [ ] Lodging
- [ ] Recreational / RV Park
- [x] Residential
- [ ] School
- [ ] Temporary Farm Worker
- [ ] Other (church, fire station, etc.): _____

13. WATER SYSTEM OWNERSHIP (mark only one)

- [x] Association
- [ ] City / Town
- [ ] County
- [ ] Federal
- [ ] Investor
- [ ] Private
- [ ] Special District
- [ ] State

14. STORAGE CAPACITY (gallons)

40,500

15	16	17	18 SOURCE CATEGORY										19 USE			20	21 TREATMENT						22	23	24 SOURCE LOCATION			
Source Number	SOURCE NAME LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	Well #1 - AFL225		X										X			Y		X					422	200	SE SW	05	15N	29E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
85080 M	SUMMERSET WEST WATER ASSOCIATION	ADAMS	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		72	75
A. Full Time Single Family Residences (Occupied 180 days or more per year)	72		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	0	0	0
28. TOTAL SERVICE CONNECTIONS		72	75

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per year? 240

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?												
B. How many days per month is water accessible to the public?												

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?												
B. How many days per month are they present?												

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
* Requirement is exception from WAC 246-290	1	1	1	1	1	1	1	1	1	1	1	1

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

35. Reason for Submitting WFI:

☐ Update - Change ☐ Update - No Change ☐ Inactivate ☐ Re-Activate ☐ Name Change ☐ New System ☐ Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____ **DATE:** _____

PRINT NAME: _____ **TITLE:** _____

APPENDIX B

Water Rights, Well Log

S. F. No. 370-B—OS—6-67.

$10.00 examination fee should accompany each application.

STATE OF WASHINGTON
DEPARTMENT OF WATER RESOURCES
Division of Water Management

PRIORITY
Date 9-22-70
Time 11 AM
Accepted EAL

*

APPLICATION FOR A PERMIT

To Appropriate Public Ground Waters
OF THE STATE OF WASHINGTON

Application No. G. W. 10734

I, Drury E ~~Mercer~~ & Irma Mercer
(Name of applicant)

of 760 E Main St. Othello Wash. 99344
(Complete post office address)

do hereby make application for a permit to appropriate the following described public ground waters of the State of Washington, subject to existing rights. This application is made under the provisions of Chap. 263 of the Session Laws of 1945, and amendments thereto of the State of Washington and subject ***to the rules and regulations of the Department of Water Resources.***

1. *The proposed appropriation will be from* Well
(Well, tunnel, infiltration trench)

located 2 Miles West of Othello WASH.
(Give approximate distance and direction from nearest city or town)

Area ..... (Leave blank) *Sub-area* ..... (Leave blank)

Zone ..... (Leave blank)

Applicant's name or number of well or other works, if any * 3

2. *The quantity of water which applicant intends to withdraw for beneficial use is* 100 *gallons per minute;* ..... *acre feet per year.*

3. *The use or uses to which water is to be applied* ~~Domestic Use~~ COMMUNITY DOMESTIC SUPPLY
(Domestic supply, irrigation, municipal, manufacturing, industrial use, etc.)

4. *The time during which water will be required each year* ~~Continuous~~ CONTINUOUSLY

5. *Location of well or other works for withdrawal of water: In county of* ADAMS

(a) ~~230~~ 235' N & ~~40~~ 40' E/W OF S 1/4 CORNER OF SEC 5 20 West And 3 ft. North of Farm Unit line in South East Corner of Unit 31 Irrigation Block 49 C.B.P.
(Give distance and bearing from nearest corner of section or legal subdivision)

being within the ~~SW¼ of Section~~ (Give smallest legal subdivision) of Sec. 5, Twp. 15 N., Rge. 29 E (E. or W.) WM.

or (b) *If within limits of recorded platted property, town or city: Lot* ....., *Block* .....,

of FARM UNIT 31, IRRIGATION BLOCK 49, Columbia Basin Project
(Give name of plat or addition) (If within town or city, give name)

(c) *Show this location on accompanying section plat. Other adequate maps or drawings will be acceptable.*

* NO Cost till 1972
Send Notice to Bureau.
E.

Called Eagr Morlock, 4/8/70 (ROS-4451) 501
APPL. INTENDS TO PLAT ONLY THAT PART OF FU 31 LYING N'LY OF HWY 26, in increments: 1st part = Westerly; 2d is the easterly part thereof

6. DESCRIPTION OF WORKS:

(a) Well will be Drilled (Dug or drilled) and have a diameter of 8" inches and an estimated depth of 415 feet.

(b) Tunnels or trenches to be described: (Attach additional sheets if needed for full description.)

(c) Distribution system to be described: 7½ hrs. power pump 4 To 6 PARMA TANKS Distribution lines to be 2" N.S.F. Rigid 160# presure plastic pipe.

(d) If pumps are to be used, give size and type:
5 to 7½ hrs. Submersible

(e) Give capacity and type of motor or engine to be used:
70 GAL Per minute Submersible engine 5 to 7½ hrs.

(f) If the location of the well, tunnel, or other works is less than one-fourth mile from a natural stream or stream channel, give the distance to the nearest point on each of such channels and the difference in elevation between the stream bed and the ground surface at the source of development:

(g) Ownership of each existing well or other works from which ground water is withdrawn within a radius of one-quarter mile and the distance and direction from well or other works being reported herein:

Darrel Thacker (Name)	S.W. (Direction)	¼ mile (Distance)
Rainier Tracts (Name)	N.W. (Direction)	½ Mile (Distance)
Ed Read (Name)	S E (Direction)	¼ mile (Distance)

SUPPLY THE FOLLOWING INFORMATION ACCORDING TO USE PROPOSED:

7. For Municipal Supply: To supply the city, town, or community of Summerset West, in the county of ADAMS, having a present population of 0, and an estimated population of 150, in 19 75.

8. For Irrigation: Number of acres to be irrigated 0 acres.

9. *Legal Description of Property on which water is to be used for all purposes other than municipal supply:*

(Copy legal description from deed)
(If more space is required, attach separate sheet)

South East Corner of Farm Unit 31
Irrigation Block 49 C.B.P.
Also S W¼ of Section 5 T. 15 N. R 29
~~That portion of Farm Unit 31, Irrigation Block 49, Columbia Basin Project, Lying Northerly of State Hwy #26 and Being within Sec. 5, T 15 N, R 29 E W.M., Lots 1 through 21, within Plat of Summerset West.~~ within

(On accompanying plat show location of the existing wells or works)

Sec. 5, T 15 N, R 29 E W.M.

10. *What interest do you have in the above described property?* Owner

(Owner, lessee, contract buyer, etc.)

11. *Do you have any other water rights appurtenant to the above described property?* Yes
If so, from what source? ~~Owner~~ Bureau of Reclamation

12. *Construction work will begin on or before* 3-25-70

13. *Construction work will be completed on or before* 4-2-70

14. *Water will be put to complete beneficial use on or before* 5-25-70

Henry E. Mercer
(Signature of applicant)

15. *Name and address of owner of land on which well or works are located:*

Henry E. Mercer (Name) 760 E. Main (Address)

Henry E. Mercer
(Signature of legal landowner)

Signed in the presence of us as witnesses:

Robert J Law (Name) 381 E. Main, Othello, Wash. (Address of witness)

(Name) (Address of witness)

STATE OF WASHINGTON,
COUNTY OF ~~THURSTON~~. } ss.

This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for correction or completion as follows:

In order to retain its priority, this application must be returned to the Department of Water Resources, with corrections, on or before ....., 19.....

WITNESS my hand this .....*day of* ....., 19.....

Division of Water Management.
Department of Water Resources.

DIRECTIONS FOR PREPARING APPLICATIONS

1. Initial examination fee of $10.00 should accompany each application. If additional fee is required, you will be notified.

2. Write plainly in ink or use typewriter.

3. Read carefully all questions. Answer only those that apply to your project.

4. Under Question 2 estimate in gallons per minute and acre-feet per year the quantity of water that will be required for your proposed use.

5. A map showing the location of well or other works and place of use, must be made on the enclosed section plat. If for irrigation, show the approximate area to be irrigated. Show also location of other existing wells or other works for withdrawing ground water within a radius of one-quarter mile.

6. In answering Question 5, give the distance and direction of location of well or other construction works for withdrawal of water from the nearest 40-acre corner or other legal subdivision, as

"320 feet north and 1100 feet east from the southwest corner of Sec. 1, Twp. 13 N., Rge. 2 E.W.M.," or

"North 36° 20′ east 500 feet from the northeast corner of NW¼ of SW¼ of Sec. 33, Twp. 12 N., Rge. 3 E.W.M.," or

If within the limits of incorporated town or city:

"Lot 4, Block 6 of Churchill's Addition to the City of Spokane, Washington."

7. Be sure to give on the map brief directions for driving to the location of the well or other works from some town or easily located point on a state highway. This is for our convenience in making the examination.

8. If you have been using ground water since **before** June 7, 1945, it will not be necessary to secure a permit from the state for this purpose.

9. Sign application on the line indicated under Section 14.

SCHEDULE OF FEES DUE IN CONNECTION WITH OBTAINING GROUND WATER RIGHTS

Examination Fees: There is a minimum fee of $10.00 for each application received. This fee covers all withdrawals up to and including 2250 gallons per minute. There is an additional examination fee of $2.00 for each 450 gallons per minute, or fraction thereof, over 2250 gallons per minute.

Fees for Filing and Recording Permits: There is a minimum fee of $5.00 for filing and recording a permit.

For irrigation, permit fees are as follows:

40¢ per acre, up to and including 100 acres;

20¢ per acre over 100 acres to 1,000 acres, inclusive;

10¢ per acre over 1,000 acres.

Permit fee for other uses: Twice the examination fee.

Fee for filing and recording certificate: There is a minimum fee of $5.00.

Report of Examination on Ground Water

Received date March 27, 1970 Date of exam. February 11, 1971 Appli. No. 10734

Name Drury E. and Irma Mercer Address 760 Main Street, Othello, WA

Type of works a well Dimensions 8" x 415'

Progress of works Completed

Quantity applied for 100 g.p.m. acre-feet per year

Legal sub Farm Unit/Sec. 5 Twp. 15 N. Rge. 29 E. County Adams
31, irrigation block 49, Columbia Basin Project

Use Community domestic supply

Irrigation-acreage: Present 0 Planned 0 Feasible 0

Municipal: Population 150 as of 1975

Industrial -

Time pump will be operated Continuously

Other water rights appurtenant to this land Receives water from Columbia Basin Project for irrigation

Proximity to existing works, springs, wells, or streams Darrell Thaiker - southwest ¼ mile

Rainier Tracts - northwest ½ mile

Ed Rea - southeast ¼ mile

Area Sub-area Zone

RECOMMENDATIONS

Approved for 100 g.p.m. 23.52 acre-feet per year, subject to existing water rights. (1 acre-foot 325,850 gallons.)

With the development of the Columbia Basin Project, the ground water characteristics of the land within the Project have undergone considerable change, including a substantial commingling of natural and "artificially stored" ground waters. In view of the requirement for obtaining additional information concerning the quantities of natural and "artificially stored" ground water available for appropriation, it is considered in the public interest that permit should issue subject to the following provision: "This permit authorizes the withdrawal of public ground waters within the exterior boundaries of the Columbia Basin Irrigation Project based on a conditional determination that public waters are available for beneficial use, and is issued subject to review and final determination by the Department of Ecology as to the availability of public ground waters based upon conclusions to be derived from a comprehensive, quantitative ground water study now in progress and scheduled for completion on or before December 31, 1972. No Certificate of Water Right, as provided by RCW 90.44.080, will issue under this permit prior to the above scheduled completion date of the comprehensive water study nor

until a final determination is made by the Department of Ecology as to the availability of public ground waters. Further, this permit is issued subject to any prior right to artificially stored ground water which may be established by declaration as provided in RCW 90.44.130. By acceptance of this permit permittee expressly consents to this provision".

"The installation of an access port as described in attached Ground Water Bulletin Number 1 shall be required prior to issuance of final certificate of water right. The applicant may, for his own convenience, wish to install an airline and gage in addition to the access port".

The examination of this application was made by Watermaster Louis Hawkes. The water requirement is based on each home requiring 1.120 acre-feet per home per year or 23.52 acre-feet for 21 homes to be used continuously throughout the year.

The well has been completed and is equipped with a 7½ horsepower submersible pump.

Signed at Olympia, Washington
this 11 day of MAY, 1971.

Charles K. McDonald

Charles K. McDonald, Engineer
Department of Ecology

S. F. No. 7354—(Rev. 6-70).

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Permit to Appropriate Public Waters of the State of Washington

Book No. 21 of Ground Water Permits, on page 10318 under Application No. 10734.

DRURY E. AND IRMA MERCER

of Othello, Washington

is, pursuant to the Report of Examination which has been accepted by the applicant, hereby granted a permit to appropriate the following described public ground waters of the State of Washington, subject to existing rights and to the limitations and provisions set out herein.

Priority date of this permit is March 27, 1970

Source(s) of the proposed ground water appropriation is/~~are~~ a well

The quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 100 gallons per minute; 23.52 acre-feet per year, to be used for the following purposes: community domestic supply, as more definitely set out below.

Approximate location(~~s~~) of the point(~~s~~) of withdrawal is/~~are~~: 235 feet north and 40 feet west of south quarter corner of Sec. 5

being within Farm Unit 31, Irrigation Block 49, Columbia Basin Project

of Sec. 5, Twp. 15 N., Rge. 29 E. W.M., Adams County,

The use, or uses, to which water is to be applied:

Domestic/~~municipal~~ supply: 100 gallons per minute; 23.52 acre-feet per year, during entire year. Community

Irrigation: ..... gallons per minute; ..... acre-feet per year from ..... to ....., each year, for the irrigation of ..... acres.

Other use(s): ..... gallons per minute; ..... acre-feet per year, from ..... to ..... each year, for .....

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Lots 1 through 21, within Plat of Summer Set West, Sec. 5, T. 15 N., R. 29 E.W.M.

ADDITIONAL LIMITATIONS AND PROVISIONS: The installation and maintenance of an access port as described in Ground Water Bulletin No. ' shall be required prior to issuance of final Certificate of Water Right.

This permit authorizes the withdrawal of public ground waters within the exterior boundaries of the Columbia Basin Irrigation Project based on a conditional determination that public waters are available for beneficial use, and is issued subject to review and final determination by the Department of Ecology as to the availability of public ground waters based upon conclusions to be derived from a comprehensive, quantitative ground water study now in progress and scheduled for completion on or before December 31, 1972. No Certificate of Water right, as provided by RCW 90.44.080, will issue under this permit prior to the above scheduled completion date of the comprehensive water study nor until a final determination is made by the Department of Ecology as to the availability of public ground waters. Further, this permit is issued subject to any prior right to artifically stored ground water which may be established by declaration as provided by RCW 90.44.130. By acceptance of this permit permittee expressly consents to this provision.

Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations including those administered by local agencies under the Shoreline Management Act of 1971.

DESCRIPTION OF PROPOSED WORKS:

The well will be **drilled** (Dug or drilled) and have a diameter of **8** inches, and depth of **415** feet.

Description of tunnel or infiltration trench: .....

DEVELOPMENT SCHEDULE:

Construction work shall begin on or before **Started**

and shall thereafter be prosecuted with reasonable diligence and completed on or before

Completed

and complete application of water to proposed use shall be made on or before

July 1, 1972

This permit shall be subject to cancellation should the permittee fail to comply with the above development schedule and/or fail to give notice to the Department of Ecology on forms provided by that Department documenting such compliance.

Given under my hand and the seal of this office at Olympia, Washington, this **9th**

day of **July**, 19**71**

JOHN A. BIGGS, *Director*
Department of Ecology

by Glenn D. Fiedler

ENGINEERING DATA
OK D.F.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. 10318

(1) OWNER: Name John Mercer   Address Box 280 Othello, Wash 99334

(2) LOCATION OF WELL: County Adams   SW ¼ ..... ¼ Sec 5 T. 15 N., R. 29 W.M.
Bearing and distance from section or subdivision corner   SE¼ SW¼

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 422 ft. Depth of completed well 422 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: ....." Diam. from 0 ft. to 104 ft.
Threaded ☐ ....." Diam. from ..... ft. to ..... ft.
Welded ☒ ....." Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☒
Type of perforator used ....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Cased with drive shoe to 104' Yes ☐ No ☐ To what depth? ..... ft.
Material used in seal ....
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ..... Depth of strata .....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name Jacuzzi ~~[illegible]~~
Type: Submersible   H.P. 7½ HP

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 940 ft.
Static level 120 ft. below top of well Date .....
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by .... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level   Tested w/air
Was a pump test made? Yes ☐ No ☒ If yes, by whom? .....
Yield: 200 gal./min. with ..... ft. drawdown after 1 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Gravel + sand	0	33
Clay	33	104
Hard gray basalt	104	153
Black basalt rock	153	178
Hard gray basalt	178	195
Soft brown basalt	195	238
Hard gray basalt	238	250
Soft broken basalt (little water)	250	260
Hard gray basalt	260	263
Hard yellow shale	263	267
Gray basalt	267	320
Soft brown basalt	320	324
Hard gray basalt	324	412
Broken black water rock water	412	422

10 0 12
23.5
Not Dom
Col'd
Co

Work started May 16 1970. Completed May 23 1973

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Barnett Pump & Irrigation Inc (Person, firm, or corporation) (Type or print)

Address Box 104 Lind, Washington 99341

[Signed] John Barnett President (Well Driller)

License No. .... Date June 10, 1973

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

SOIL SAMPLING SERVICE, INC.

1415 MERIDIAN EAST, PUYALLUP, WA 98371-1399

FEDERAL ID #: 91-0762274 WA CONT. #SOIL SS*344LO

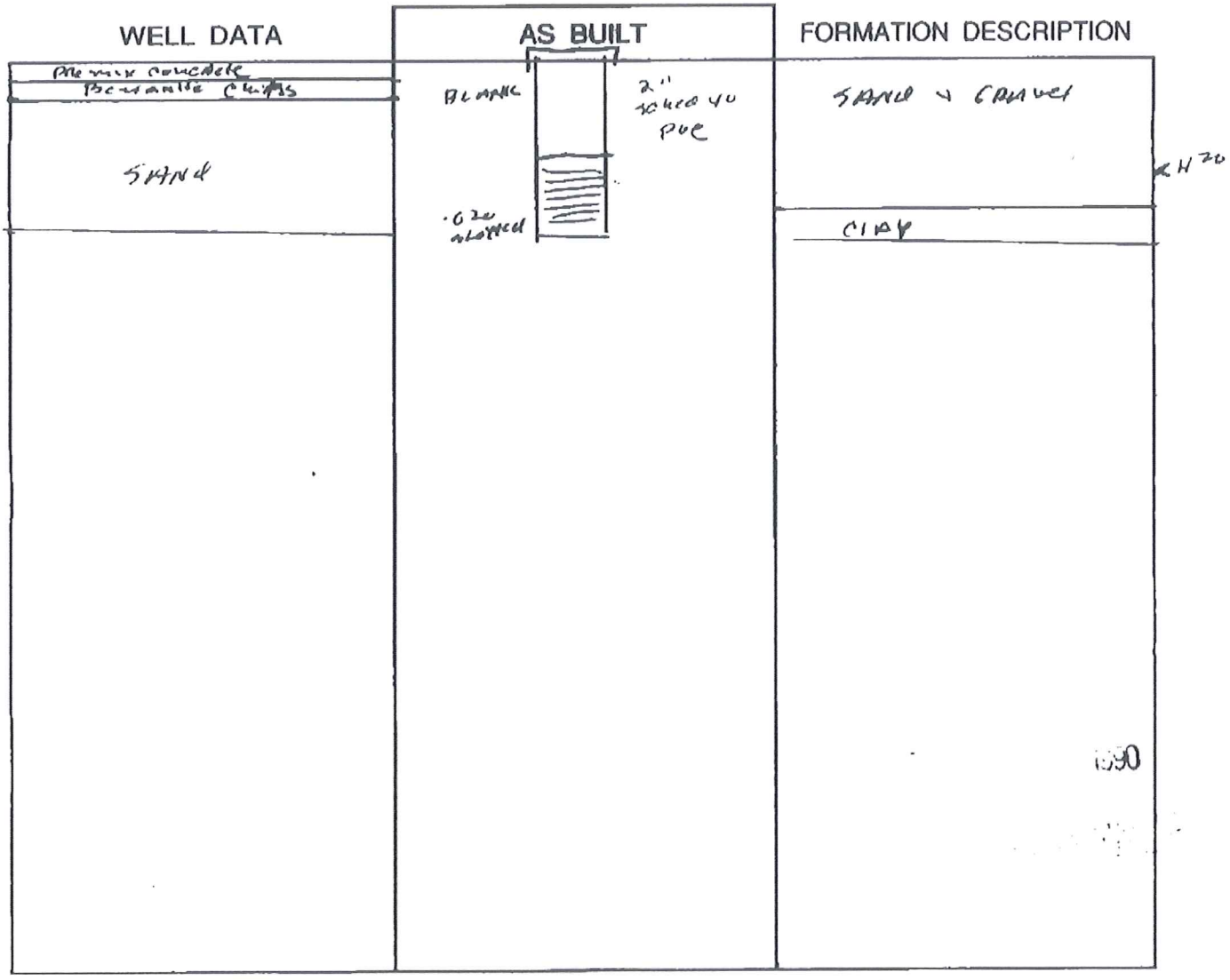
(206) 927-3173
TELEX: 466762
FAX: (206) 927-3478

Geotechnical, Engineering & Mineral Exploration Drilling • Instrumentation • Horizontal Drains
Ground Water Monitoring • Hazardous Waste Identification • Well Abandonments

RESOURCE PROTECTION WELL REPORT

PROJECT NAME: Applied Geotechnology
WELL IDENTIFICATION NO.: B1 B2 B4 B5
DRILLING METHOD: 7x6 Rope Thread Casing Air Rotary
DRILLER: Melvin Pederson
SIGNATURE: Melvin Peder
CONSULTING FIRM: Applied Geotechnology INC
REPRESENTATIVE: Tom Moser

JOB #: U-2230 START CARD NO.: 034784
COUNTY: Adams CITY: Othello
LOCATION: ____ 1/4 SE 1/4 SW 1/4
SEC.: 5 TOWN: 15N RANGE: 29E
DATUM: ____
WATER LEVEL ELEVATION: ____
INSTALLED: 8-29 & 10-2
DEVELOPED: ____



SCALE: 1" = 10'

PAGE 1 OF 1

APPENDIX C

City of Othello Hydraulic Model Information

Conceptual Future UGA Service Extension, ERUs and Transmission Main Sizing

I. Steps taken to set up the City of Othello demand distribution map:

1. The City of Othello hydraulic model was created in Bentley WaterCAD V8i based on pipe sizes and lengths provided within the 2011 City of Othello Water System Plan and information provided by the City regarding water mains which have been either added or replaced after 2011. Elevations were based on Google Earth elevations at nodes.
2. Demands were assigned to nodes based on the City of Othello parcel map. Unweighted values were used to assign a demand value of 1 for each parcel.
3. The Parcel Count alternative was generated in WaterCad by inputting the demand distribution evaluated during step 3.
4. The high water user spreadsheet was provided by the City and shows a high user ERU of 6,562.
5. Several of the provided high user ERUs were adjusted based on City input. The high user adjusted ERU count was determined to be 5,759 for the 15 customers listed on the high user list for 2015.
6. High user ERUs were subtracted from the total ERU count for 2015 to produce the non-high user ERUs. Non-high user ERUs = total system ERUs (10,443) – high user ERUs (5,759) = 4,684
7. Adams County Water District #1 (ACWD1) demand was applied at the location of the meter vault node.
8. Using known locations for local businesses, Google Earth and school district resources medium demands were assigned to the Parcel Count (w/ medium users) alternative. This involved assigning higher demand than the parcel count method assigned during Step 3.
9. The model was run for the Parcel Count (w/ medium users) alternative which returned a total demand of 2,291.
10. The ERUs (w/o high user) alternative was generated by scaling the Parcel Count (w/ medium users) alternative using the known non-high user ERUs for 2015 and the calculated demand from Step 10 which resulted in a factor of 2.04 (2.04 = 4684/2291)
11. The ERUs (w/ high users) alternative was generated by applying point demands at individual nodes consistent with the high use spreadsheet to obtain the total 2015 ERU count of 10,443.
12. The ADD alternative was generated by scaling the ERUs (w/ high users) alternative using the provided average ADD of 3,290 gpm for the City system. The scaling factor used was 0.32 = 3290/10443.
13. The MDD alternative was generated by scaling the ERUs (w/ high users) alternative using the provided average MDD of 4,700 gpm for the City system. The scaling factor used was 0.45 = 4700/10443
14. PHD was calculated using Equation 5-1 of the DOH WSDM and the peaking factor calculated from the meter readings provided by the City of Othello. The calculated PHD was 7,640 gpm for the City system.
15. The PHD alternative was generated by scaling the ERUs (w/ high users) alternative using the calculated PHD of 7,640 from Step 15. The scaling factor used was 0.73 = 7640/10443.
16. Production values were input into each of the Demand alternatives (ADD, MDD, PHD) at each node associated with a City well. Values were based on the most current well production values provided by the City.

17. Reservoir elevations were input into the model for the three existing standpipe reservoirs based on the 2011 City of Othello WSP Table 3-9 for values without McCain Foods online. Reservoirs serve one pressure zone. Reservoir elevation were input based upon the following conditions per the DOH WSDM:
    - ADD: Reservoir elevation are at the lower elevation of operation storage (OS). Initial elevation is 1,205 ft.
    - MDD: Reservoir elevation are at the lower elevation of fire suppression storage (FSS). Initial elevation is 1,174 ft. Because MDD was used to evaluate fire flow, the MDD Demand alternative does not include the highest producing well (Well 6).
    - PHD: Reservoir elevation are at the lower elevation of equalizing storage (ES). Initial elevation is 1,199 ft.
18. The Othello WSP Fire Flow alternative was created by applying a universal fire flow distribution of 1,000 gpm throughout the system per the Othello WSP. Nodes were then targeted to apply concentrated fire flow per the WSP.

II. Steps taken to size the City of Othello CFS distribution mains:

1. Transmission mains were extended from the City of Othello distribution system in order to consolidate the CFS candidates with the City system. Consolidation of the CFS candidates are discussed in each of the City of Othello Consolidation Feasibility Studies.
2. Available water system meter readings were analyzed for each CFS candidates to evaluate ERU, ADD, MDD and PHD demands. See City of Othello Consolidation Feasibility Studies for demands.
3. Individual water system demands were applied at the extended transmission mains at the connection node.
4. Distribution mains were sized to satisfy each demand scenario. See **Exhibit X**.
    - Pipe Material: PVC
    - Hazen Williams C: 150

III. Steps taken to size the City of Othello CFS UGA distribution mains:

1. The Urban Growth Area (UGA) was provided by the City and is shown on **Exhibit X**
    - Total UGA area: 5,688 acres
2. The total planned future ERU's were provided by the City for the UGA:
    - Total planned future ERUs: 1,252 ERUs
3. Transmission mains were extended from the CFS distribution (see above) mains within the City of Othello hydraulic model to serve the CFS UGA. Location of mains were based on input from the City, the full City of Othello UGA, and locations of transmission mains proposed in the Consolidation Feasibility Studies (CFS). The proposed CFS UGA is shown on **Exhibit X**.
    - UGA area served by T-mains: 3,012 acres
4. The planned future ERUs associated with the CFS UGA were calculated based on the total number of planned ERUs.
    - Planned future CFS ERUs: 663
5. A total count of existing connections not associated with the CFS candidates was performed based on the most recent aerial maps.

- Existing connections: 314 connections (non-CFS candidates)

6. Based on the proposed distribution system the UGA was split into the 4 areas as shown on **Exhibit X**. The City indicated that 111 acres within Area 2 is proposed Commercial and will contain a new school facility
    - Area 1: ` 584 acres (residential)
    - Area 2: 1,022 acres (residential and commercial)
    - Area 3: 874 acres (residential)
    - Area 4: 643 acres (residential)
7. Existing CFS connections were combined with non-CFS connections. Existing Adams County Water District #1 (ACWD1) connections were not included in this total because ACWD1 demands were represented in the City of Othello Water System demands provided by the City.
    - Total existing connections: 671
8. Total existing and planned ERUs were combined. Each connection was considered a City ERU.
    - Total planned ERUs: 1,334
9. 50 ERUs were added to the total planned ERUs for the proposed school.
    - Total planned ERUs: 1,384
10. The total planned ERUs (existing and future) were distributed within Areas 1 – 4 equally based on residential area.
    - Area 1: 259 ERUs
    - Area 2: 403 ERUs
    - Area 3: 387 ERUs
    - Area 4: 285 ERUs
11. ADD was evaluated to be 453 gpd/ERU and is based on the most current City of Othello water demands.
    - CFS UGA ADD: 435 gpm
12. MDD was evaluated based on the City of Othello's observed peaking factor for MDD.
    - Peaking Factor: 1.43 (MDD)
    - CFS UGA MDD: 623 gpm
13. PHD was evaluated for the CFS UGA based on the City of Othello's observed peaking factor for PHD.
    - Peaking Factor: 1.62 (PHD)
    - CFS UGA PHD: 1,009 gpm
14. FF was applied for residential and commercial fire flows.
    - Residential FF: 1,000 gpm
    - Commercial FF: 3,000 gpm (school)

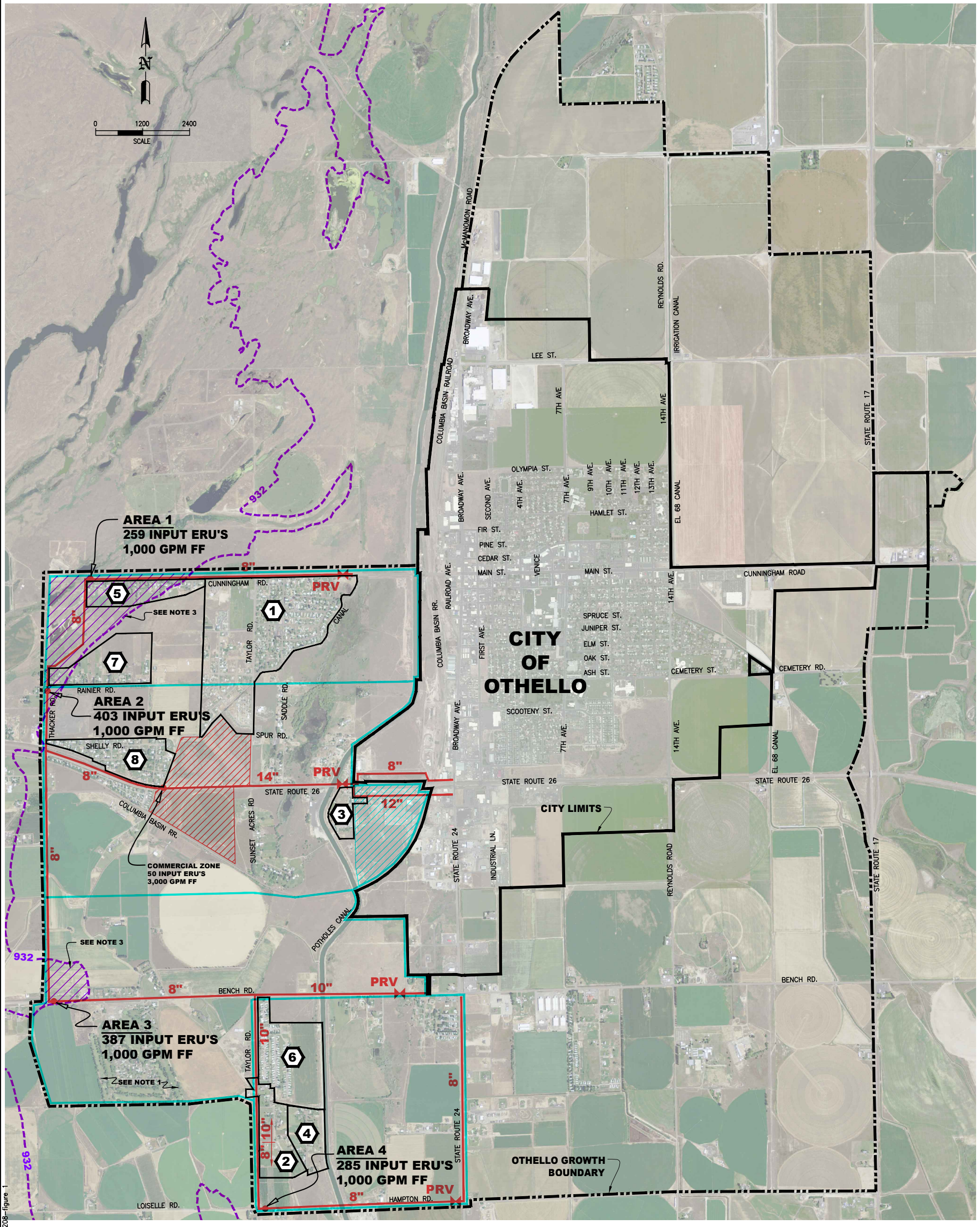
15. ADD, MDD, PHD and FF were evaluated based on the CFS UGA land area

CFS UGA	Residential Area	Total Conn.	ERUs	ERUs adj	ADD	MDD	PHD	MDD+FF
Area 1	584	259	259	259	84	121	196	1121
Area 2	911	403	403	453	132	188	305	3188
Area 3	874	387	387	387	126	181	293	1126
Area 4	643	285	285	285	93	133	215	1215
Total	3012	1334	1334	1384	435	623	1009	

16. Demands for each of the ADD, MDD and PHD scenarios were applied to the City of Othello UGA distribution model at the eastern most node within each of the 4 areas.
17. Distribution mains were sized to satisfy each of the demand scenarios. See **Exhibit X**.
    - Pipe Material: PVC
    - Hazen Williams C: 150

IV. Steps taken in order to establish pressure zones in the UGA

1. Once the City of Othello CFS UGA distribution mains were sized the "No Demand" scenario was run in the hydraulic model. High pressures associated with the elevation drop were observed to the south and west of the City.
2. 80 psi was determined to be highest desirable pressure in the UGA during the "No Demand" scenario (Reservoir levels = 1,209 ft)
3. The 80 psi elevation contour was found to be 1,024.2 ft. (1209 – [80*2.31])
4. PRVs were placed along Bench Rd and Hampton Rd at elevation = 1,024.2 ft and along State Route 26 at the intersection of the proposed 12-inch and 8-inch transmission mains (elevation = 1,005 ft).
5. The three proposed PRVs and existing ACWD#1 PRV were set to have a discharge pressure of 40 psi.
6. After the PRVs were input into the model, the "No Demand" scenario was run and pressures exceeding 80 psi were observed.
7. The 80 psi elevation contour for the new pressure zone was found to be 981.8 ft. (1024.2 – [40*2.31]). Services below this elevation require service PRVs to keep service pressures from exceeding 80 psi.
8. Demand scenarios were run to check that the addition of the PRVs in the hydraulic model did not affect supply. Main sizes were adjusted as necessary.



LEGEND

- CITY LIMITS
- OTHELLO GROWTH BOUNDARY
- WATER DISTRICT BOUNDARY
- AREA BOUNDARY
- 8" PROPOSED WATER MAIN
- PRV PRESSURE REDUCING VALVE
- COMMERCIAL ZONE
- LIGHT INDUSTRIAL ZONE
- 932 CONTOUR

NOTES

1. GOLF COURSE IRRIGATION TO BE PROVIDED BY IRRIGATION DISTRICT.
2. PRV TO BE SET AT 40 PSI.
3. SERVICE PRV'S REQUIRED AT ELEVATION LOWER THAN 932

1. ADAMS COUNTY WATER DISTRICT #1 – SYSTEM ID: 22525 X
   - 341 CONNECTIONS
   - OTHELLO WATER SYSTEM INTERTIE – UNKNOWN CAPACITY
2. BASIN VIEW WATER ASSOCIATION – SYSTEM ID: 04530 N
   - 22 CONNECTIONS
   - OTHELLO MANOR WATER SYSTEM INTERTIE – 300 GPM
   - WELL #1 – 35 GPM
3. BIRD DOG FAMILY LTD PARTNERSHIP II – SYSTEM ID: 52172 8
   - 58 CONNECTIONS
   - WELL #1 – 33 GPM
4. HIGHLAND ESTATES WATER SYSTEM – SYSTEM ID: 32736 0
   - 16 CONNECTIONS
   - WELL #1 – 56 GPM
5. MEADOW LANE WATER ASSOCIATION – SYSTEM ID: 53190 T
   - 25 CONNECTIONS
   - WELL #1 – 70 GPM
6. OTHELLO MANOR WATER SYSTEM – SYSTEM ID: 64845 3
   - 152 CONNECTIONS
   - WELL #1 – 300 GPM
7. RAINIER TRACTS WATER ASSOCIATION – SYSTEM ID: 70910 M
   - 20 CONNECTIONS
   - WELL #1 – 45 GPM
8. SUMMERSET WEST WATER ASSOCIATION – SYSTEM ID: 85080 M
   - 72 CONNECTIONS
   - WELL #1 – 200 GPM

s:\autocad drawings\172 othello\172-08 system consolidation\17208-figure 1

SCALE: AS SHOWN DESIGNED: NVH DRAWN: TVP CHECKED: APPROVED: PROJ. NO.: 172-08 DATE: 7/8/16	VARELA AND ASSOCIATES, INC. ENGINEERING AND MANAGEMENT	**CITY OF OTHELLO, WASHINGTON** WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES CONCEPTUAL FUTURE UGA SERVICE EXTENSION, ERUs AND TRANSMISSION MAIN SIZING	EXHIBIT **X**

APPENDIX D

Long-term water supply study excerpts

VARELA & ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

601-A W Mallon Avenue, Spokane, WA 99201 | P 509.328-6066 | F 509.328.1388 | www.varela-engr.com

TECHNICAL MEMO

TO: City of Othello, WA

FROM: Jesse Cowger, PE

DATE: August 24, 2016

RE: Water Supply Plan Summary

ATTACH: Water Supply Planning Recommendations – Aspect Consulting – Dec 10, 2014
Well Assessment – Aspect Consulting – Feb 12, 2016
Groundwater Supply Improvements – Aspect Consulting – Jun 21, 2016

Background

The City of Othello relies on wells drilled into the lower Wanapum Basalt aquifer as its sole source of drinking water. Over time the groundwater level in the lower Wanapum Basalt has declined and resulted in progressively lower pumping rates from existing wells. The Washington State Department of Ecology (Ecology) has identified and documented the regional decline of aquifer levels through a series of reports regarding the Columbia Basin Groundwater Management Area (GWMA). Othello recognized the looming threat to its water supply posed by declining aquifer levels and sought assistance from Varela & Associates and Aspect Consulting. The City tasked Varela and Aspect with developing a Water Supply Plan to secure the City's water supply for the future.

Othello received a Pre-Construction Grant from the Washington State Drinking Water State Revolving Fund (DWSRF) to partially fund the Water Supply Plan. The City utilized a combination of local funds and the grant from DWSRF to fund the Water Supply Plan.

Project Description and Scope

In addition to declining aquifer levels, interference between City and private wells exacerbates declining pumping rates in City wells. The City's Well 6 has fluoride (F) concentrations above the MCL and Well 7's capacity has declined possibly due to biofouling. The City also relies heavily on well pumping capacity to meet peak demands due to a lack of equalizing storage volume in reservoirs. Due to these factors, this Water Supply Plan scope includes the following:

- Systematic evaluation of existing wells
- Options for addressing fluoride level above MCL in Well 6
- Options for meeting present and future water demands

Systematic Evaluation of Existing Wells

Refer to attached Aspect Consulting memo dated February 12, 2016 for the full detailed analysis of City wells. The following summarizes the findings and recommendations related to the existing condition of the City's wells:

- The City is doing a good job of managing the effects of seasonal drawdown and well interference by selectively pumping certain wells to maximize yield.

- All City wells except Well 7 show stable well efficiency over time. Well 7 was constructed with a stainless steel screen (all other wells except Well 6 are completed primarily with open borehole in the water bearing zones. Rehabilitation of Well 7 might increase the existing pumping rate of 600 gpm to 900 gpm.

- The City operates a telemetry system collecting and recording water level and flow data from each of the active wells. Much of the historical telemetry data was reportedly corrupted and lost. Maintaining reliable, accurate water level and flow data is critical to managing and optimizing the City's pumping and limiting drawdown in the wells. We recommend that the City routinely archive telemetry data in a secure location to ensure data are available for future use.

- Wells 2, 6, and 8 may be subject to cascading water when pumping causes water levels to draw down below the elevation of uncased water bearing zones. Cascading water may entrain air and negatively affect pump performance. We recommend that the pump performance curves be compared to actual pump yields at operating total head to assess whether cascading water and air entrainment could be affecting pump performance.

- Water rights are not a constraint for the City in managing the well field. Withdrawals from recently constructed Well 9 are limited to 2,000 gpm, 3,000 ac-ft/year, as this well is only authorized under one City water right. We recommend that if and when future water changes are required that Well 9 be added to the right being changed.

- There is record in the files reviewed that proofs of appropriation or requests to extend the development schedules for City water rights were filed with Ecology. If this is the case, we recommend completing proofs of appropriation for five of the City's water rights that are ready for certification, while filing extensions to the development schedules for the remaining rights.

Options for Addressing Fluoride in Well 6

Well 6 has fluoride levels that generally exceed the MCL of 4.0 mg/L. The City attempted to modify the well in the past to decrease the fluoride concentration, but had little success. Due to the fluoride levels exceeding the MCL Othello currently designates Well 6 as an emergency well and only operates it if all other sources of supply cannot meet system demand. Well 6 is the City's largest producing source at 2,500 gpm. The City sees the following Options for future utilization of Well 6:

Option 1: Continue to Utilize Well 6 as an Emergency Source (Do Nothing)

The City can continue to utilize Well 6 on an emergency basis and rely on blending in the distribution system to dilute the fluoride level. The primary benefit of this alternative is no investment is required. This alternative has the disadvantage of lack of flexibility in when the City can utilize Well 6. It would also make it more likely the customers closest to Well 6 would consume water with fluoride levels that exceed the MCL. DOH may not allow the City to operate the well in the fashion indefinitely.

Option 2: Dedicate Well 6 to Supplying Industrial Users

More than half of the water pumped from Othello's wells goes to industrial users. The largest of these industrial users is Simplot, which utilizes roughly 70% of total industrial water supplied by Othello. If a significant portion of Othello's industrial users could utilize water from Well 6 without affecting their industrial processes, then devoting Well 6 to industrial use would effectively reduce the demand on Othello's other wells. The following considerations pertain to feasibility of implementing this option:

- DOH may have water quality requirements for the water used in the industrial processes that would preclude use of water with fluoride concentrations above 4.0 mg/L.
- Water produced from Well 6 has some aesthetic taste and odor issues that may make the water unappealing for some industrial customers.
- Dedicate use of Well 6 would require construction of a dedicated distribution system for industrial supply and would require industrial users to internally separate their potable uses from their industrial uses. This carries with it an increased risk of cross connection between the two systems.
- Well 6 does not currently have a VFD to allow modulation of pumping rate to match demand; however, the City has budgeted for purchase an installation of a VFD for Well 6.
- If the VFD does not provide sufficient range of flow for industrial users, then a dedicated reservoir would also be needed.
- Dedicating a single source to industrial use has potential for reliability issues if the single source breaks down. Installation of a one-way intertie with the City's potable water distribution system could potentially mitigate reliability concerns.

Additional discussions with the City's industrial users are needed to determine whether barriers exist that preclude implementation of this option. The City will investigate this option further and potentially combine discussions with industrial users while investigating the feasibility of industrial wastewater treatment and reuse.

Option 3: Construct Treatment System to Remove Fluoride from Well 6 Water

A Treatment system could remove fluoride from the water produced by Well 6. The following types of treatment methods could likely remove fluoride from Well 6 raw water to levels below the MCL:

- Granular Activated Alumina
- Reverse Osmosis (RO)
- Electrodialysis and Electrodialysis Reversal
- Bone Char

Additional investigation of the raw water properties and constituents is needed to determine which of the preceding treatment methods would make the most sense for Well 6 if implemented. A treatment system would require additional operator expertise and certification and would also have ongoing chemical and membrane/media expenses (depending on the treatment method).

Option 4: Blend Well 6 with other City Well(s)

Well 6 has the highest fluoride concentration of all Othello's wells. Most City wells have average fluoride concentrations around 2.0 mg/L; although some of the wells have occasional spikes up to 3.0 mg/L. Several factors affect the feasibility of blending Well 6 with another City well:

- Capacity: Well 6 is Othello's largest producing source with a current pumping rate of approximately 2,000 gpm. To reliably achieve a blended water fluoride concentration below the MCL the City may need to reduce the pumping rate of Well 6 to allow sufficient dilution of fluoride.
- Proximity of other wells to Well 6:
    - A dedicated main with no service connections is required to blend Well 6 with another well. The well closest to Well 6 is Well 2 which is approximately half a mile away. However, Well 2 has limited reliability; City Staff reports the well runs out of water after roughly 15 minutes of operation. The City has designated Well 2 "Emergency Only".
    - Due to Well 2's lack of capacity (historic pumping rate of approximately 300 gpm) compared to Well 6 and its lack of reliability for extended pumping, blending with Well 2 appears unfeasible.
    - Most City wells (other than Well 2) are 1-2 miles away from Well 6
- Reliability: in order to maintain blended fluoride concentration below the MCL operation of Well 6 becomes contingent upon the operability of the well(s) blended with it. If the blending well becomes inoperable due to mechanical failure, interference issues, capacity decline, or other issues then the City cannot operate Well 6 without supplying the system undiluted water with fluoride concentration likely exceeding the MCL.
- Monitoring: fluoride concentrations in City wells vary throughout the year so DOH would likely require routine monitoring (possibly daily) to demonstrate blended fluoride concentration meets regulatory requirements. The frequency and corresponding expense associated with monitoring blended water quality may affect the feasibility of this Option.

The cost associated with blending Well 6 with other City wells would be considerable due to the high capacity of Well 6 and its proximity to other wells. Blending also has the disadvantage of reduce reliability because Well 6 becomes dependent on the operation of other wells to achieve the desired blended fluoride concentration below the MCL.

Option 5: Use Well 6 as an Aquifer Storage and Recover (ASR) Injection Well

Othello has begun investigating the feasibility of developing a supplemental source of supply to augment its groundwater sources. The supplemental supply would likely include treatment of surface water and may utilize ASR (refer to later section of this memo for details pertaining to the City's plans for a future supplemental source of supply). If the City utilizes Well 6 as the injection well for ASR it may dilute the fluoride concentration in the vicinity of the well. If the City also continues to utilize Well 6 as a recovery well the fluoride concentration may drop below the MCL.

Well 6 is located near the western edge of Othello's system. Initial observations by the City's hydrogeology consultant indicate a well more centrally located betwixt Othello's other wells would be more ideal from an ASR standpoint. However, further analysis is needed to assess the options, combinations, advantages, and disadvantages associated with selecting the injection well(s) for an ASR system.

Utilizing Well 6 for ASR may have operational complexities that affect the well's availability for meeting system demand (e.g. when utilizing Well 6 as an injection well it cannot provide supply to the system). Some of the restrictions on availability could likely be overcome through operational coordination with the City's other wells and the new supplemental source (surface water or industrial). Presumably the City would not inject water during periods of high demand when the City might need Well 6 to meet peak demands.

Discussion of Options for Addressing Fluoride in Well 6

The following table summarizes advantages and disadvantages associated with the options for addressing fluoride in Well 6:

Option	Advantages	Disadvantages
1) Do Nothing	• Low cost	• Well 6 remains emergency source • Customers closest to Well 6 likely exposed to higher levels of fluoride when Well 6 operates
2) Dedicate Well 6 to Industrial Users	• Potentially puts capacity of Well 6 to use for existing industrial customers • Would likely reduce fluoride levels consumed by non-industrial customers	• Acceptability to regulators unknown • Would require dedicated distribution system and potentially storage facilities (significant cost to implement)
3) Treatment System to Remove Fluoride	• Reliable way to reduce fluoride from water produced by Well 6	• Likely significant first cost • Increased operational complexity • Ongoing chemical/media/membrane maintenance
4) Blend with other City Well(s)	• Could achieve blended fluoride levels that meet the MCL.	• Significant first cost associated with mains dedicated to blending • May required blending with multiple sources or reducing pumping rate of Well 6 • Reduces system reliability due to required functionality of blending wells to operate Well 6 • Increased monitoring to demonstrate blended water quality meets regulatory requirements

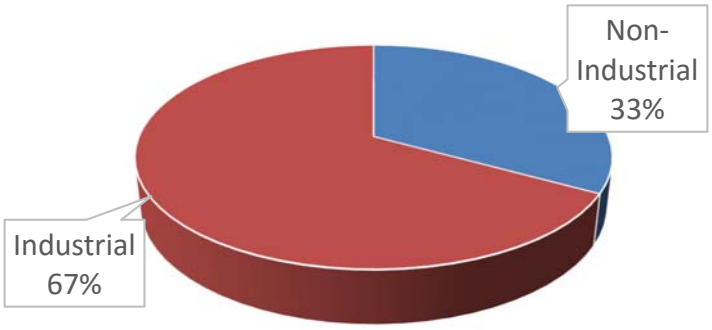
Option	Advantages	Disadvantages
5) Use Well 6 as ASR Injection Well	• May reduce concentration of fluoride in Well 6 to below MCL. • Would not require reducing the pumping rate of Well 6 • If ASR implemented, may slow the decline of the Wanapum aquifer • Supplemental source of supply would reduce the City's reliance on existing sole source aquifer	• Requires construction of supplemental source of supply (high first cost and ongoing operation and maintenance cost) • Non-central location of Well 6 in relation to Othello's other wells may not be ideal from an ASR standpoint • Greater operational complexity

As shown in the preceding table, each option has advantages and disadvantages. Additional investigation and cost estimates are needed to determine which option best serves the City's long-term interests. The results of the City's ASR feasibility study will affect the City's decision as will input from DOH on potentially devoting Well 6 to industrial use. Othello has begun the process of updating its Water System Plan and will further analyze the alternatives discussed herein when formulating the City's capital improvements plan.

Meeting Present and Future Water Demand

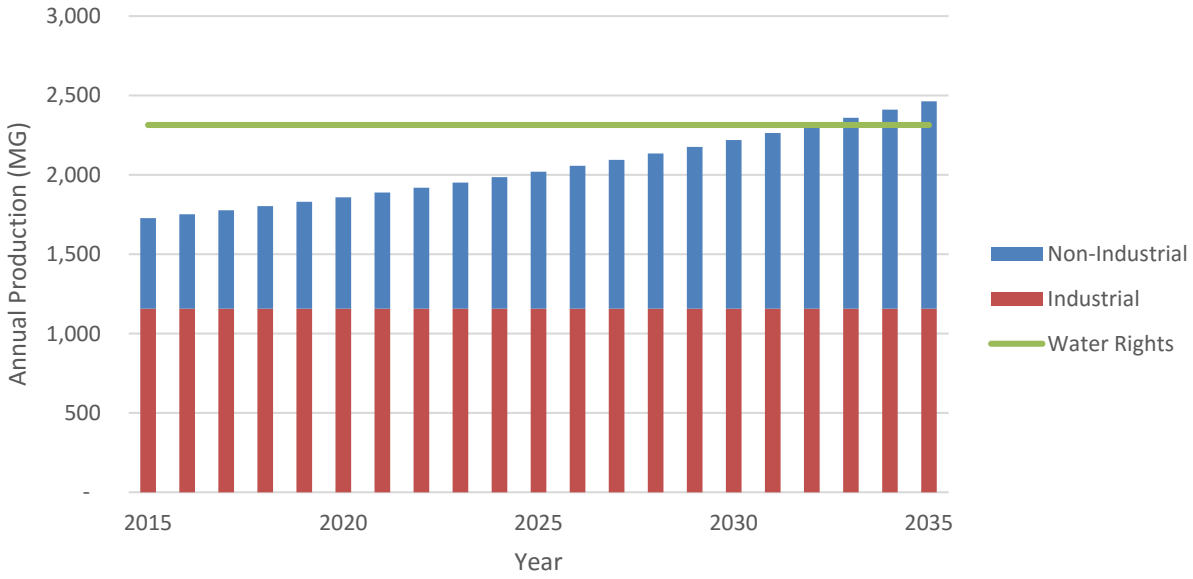
On March 28, 2016 Othello adopted its updated Comprehensive Plan (Comp Plan). The Comp Plan lays out an ambitious vision for growth in Othello which includes population growing from 7,780 in 2015 to 17,825 in 2035. The population growth projected in the Comp Plan equates to an annual rate of 4.23%. In many cases a water systems water demand will increase roughly proportionally to its population growth. However, Othello supplies several large industrial users which make up almost 2/3 of the City's annual demand. For this reason, projections for future demand can be broken into industrial and non-industrial segments.

Ratio of Industrial and Non-Industrial Water Use



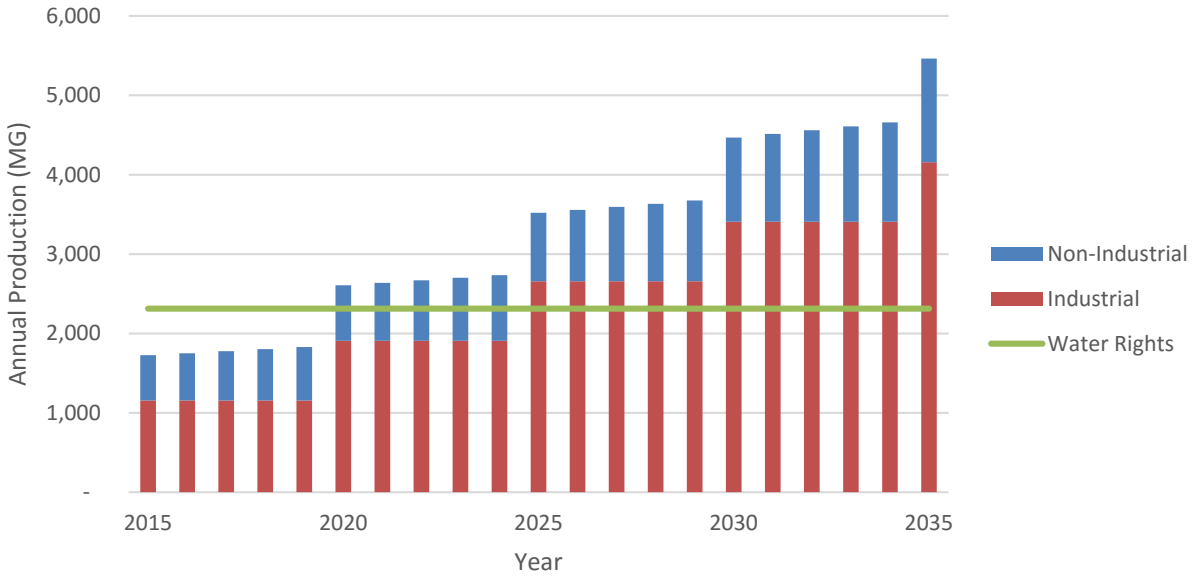
If non industrial water use increases proportionally with projected population growth and industrial demand remains static, the following demand curve results:

Projected Water Demand: No New Industrial Customers



Were Othello to attract additional industrial users to the City, water demand would experience incremental jumps as new industrial users come online. The City's largest industrial customer (Simplot) utilizes approximately 750 MG annually. If a new industrial user similar to Simplot located in Othello roughly every five years the following demand curve would result:

Projected Water Demand: New Industrial Customer Every Five Years



As shown in the preceding graphs, the time frame in which Othello has adequate water rights to meet system demand depends a great deal on whether the City attracts additional industrial users. If no new industrial users locate in the City then Othello's water rights could supply projected demand for the next 17-18 years. The City appears to have insufficient water rights to support addition of a new industrial user similar in size to Simplot at any point in the future. The City's

Comp Plan envisions growth of all sectors in Othello (residential, commercial, industrial, etc.); hence, the City plans the following steps to meet projected water demand and prevent availability of water supply from constraining growth in Othello:

Near Term: Continue to Maintain, Develop, and Rely on Groundwater

In the near term Othello must continue to rely on its groundwater sources and develop additional well(s) to keep up with regional declines in aquifer levels and corresponding declines in exiting well pumping rates. Refer to attached Aspect Consulting memo dated June 21, 2016 for the full detailed recommendations for improving Othello's groundwater supply. The following summarizes the findings and recommendations contained therein:

- Rehabilitate Well 7: it appears the efficiency of Well 7 has decreased over time. Rehabilitation of this well could recover 300 gpm of pumping capacity.
- Install new Wanapum Aquifer Well
- Explore Grande Ronde Aquifer

The City's existing wells tap the Wanapum basalt aquifer which has declined over time and decreased available drawdown and pumping rates of the City's wells. Rehabilitating Well 7 and developing a new Wanapum well will help the City maintain its existing supply capacity at least for the near term. Exploring the Grande Ronde basalt aquifer, which is deeper than the Wanapum basalt, will help the City determine the degree to which Othello may be able to rely on groundwater into the future. If the Grande Ronde has reasonable quality and quantity of water available it may extend the period of time Othello can continue to rely on groundwater supply.

Mid to Long-Term: Develop Supplemental Source of Supply

The available data and analyses to date document a regional decline in ground water levels in the Columbia Basin. The estimates vary on current rate of decline, but it appears Othello may not be able to continue to rely on groundwater indefinitely as its sole source of water supply. In recognition of the possibly finite nature of groundwater supply Othello plans to develop a supplemental source of supply. The City has identified the following possible components of a future supplemental source of supply:

- Surface water from bureau of reclamation irrigation canals treated to drinking water standards for potable use; this source could also be treated to the goundwater anti-degradation standard for injection and storage in the basalt aquifer for later recover via City wells.
- Industrial wastewater treated to anti-degradation standard for groundwater injection and storage in the basalt aquifer for later recovery via City wells. Currently industrial wastewater cannot be utilized for direct potable reuse; future changes in regulation may open doors for direct potable reuse of industrial wastewater.

The City has begun a study to investigate the feasibility of establishing a new source of supply which may employ aquifer storage and recovery (ASR) as a means to store treated water in the basalt aquifer. ASR may prove a useful tool for Othello due to several factors:

- Surface water from Bureau of Reclamation canals is not available for use during the winter. Treating water from the canals and storing it in the aquifer could allow Othello to treat and store the volume of water most useful to the City's situation.

- If the City pursued treatment and reuse of industrial wastewater the treated effluent would need to spend time in an environmental buffer such as a basalt aquifer before it could be utilized for drinking water.

- If the City utilizes Well 6 as the injection well for ASR it may dilute the fluoride concentration in the vicinity of the well (refer to previous discussion of options for Well 6). If the City also continues to utilize Well 6 as a recovery well the fluoride concentration may drop below the MCL.

Capacity of a supplemental source will depend on several factors including availability of raw water, construction and operation cost for treatment, and the City's desired ratio of groundwater Vs. supplement supply. Assuming availability of raw water is not the limiting factor, treatment could be designed for incremental expansion based on the City's needs over time.

The timing for implementation of a supplemental source of supply depends on many factors such as:

- Availability of raw water from Bureau of Reclamation canals, industrial users, or other sources not yet identified.

- Contaminants in raw water and treatment requirements to make raw water suitable for potable consumption or storage via ASR

- Permitting with Department of Ecology for reservoir permit and water rights implications

- Availability of funding

- Rate of aquifer decline and effect on Othello's ability to supply system demand

- Viability of Grande Ronde aquifer; if Grande Ronde is viable source of supply it may extend the timeframe Othello chooses to rely on groundwater

The results of Othello's ASR feasibility study will provide the City with some of the information needed to lay out a more specific timeline for implementation.

Appendix X

Cumulative effect of consolidation on the City of Othello water system components

1.1 Estimated Impact to City System

1.1.1 Estimated System Demands

The impact of consolidating all 8 small water systems into the City of Othello water system is evaluated below by system component including supply, distribution and storage. The evaluation will be based on the current City of Othello water system demands as shown on the following table.

Table 1: Current City of Othello Water System Demands

Year	ERUs (1)	ADD (gpm)	MDD (gpm)	PHD (gpm)	Annual (MG)	Annual (acre/ft)
2013		3,340	4,570	7,410	1,757	5,390
2014		3,420	5,070	8,250	1,796	5,510
2015		3,100	4,460	7,250	1,628	5,000
Average	10,490	3,300	4,700 (2)	7,600 (3)	1,700	5,300

(1) *Calculated based on ADD using 453 gpd/ERU*
(2) *Resulting ADD:MDD peaking factor 1.43*
(3) *Resulting MDD:PHD peaking factor 1.62*

Estimated current and future ERUs for the 8 individual systems are shown in the following table.

Table 2: Cumulative Estimated Current and Future Individual Water System ERUs

System	Current ERUs (1)	Future ERUs (2)
Adams County Water District No.1	0	36
Basin View Water Assoc.	15	21
Bird Dog Family Partnership II	30	64
Highland Estates Water System	13	13
Meadow Lane Water System	10	11
Othello Manor Water System	104	194
Rainier Tracts Water Assoc.	12	12
Summerset West Water Assoc.	53	55
Total	237	406

(1) *From individual water system reports (used highest ERU count for data period)*
(2) *From individual system reports*
(3) *ACWD#1 is currently connected and current ERUs are included in Table 1. The Future ERUs are the net increase in ERUs considering substantial reduction in DSL (See ACWD#1 report for more comprehensive explanation)*

Estimated current and future water use for the 8 individual water systems are shown in the following table.

Table 3: Estimated Cumulative Water System Demands (8 systems)

Description	ERUs (1)	ADD			MDD (3)			PHD (4)	Annual (5)	
		gpd/ERU (2)	(gpd)	(gpm)	gpd/ERU	(gpd)	(gpm)	(gpm)	(MG)	(ac-ft/yr)
Current	237	453	107,400	75	951	225,500	157	381	39.2	120.3
Future	406	453	183,900	128	951	386,100	268	583	67.1	206.0

(1) *From Table 2*
(2) *Based on current City of Othello water use for the period 2013 – 2015*
(3) *MDD = ADD(2.1); The ADD(2.1) factor was derived from comparing the average ADD to MMAD ratio from all the systems where this data was available and applying the MDD = MMAD(1.3) calculation per the WSDOH WSDM*
(4) *PHD = (MDD/1440)(CN+F)+18, where C =(varies), N = ERUs and F = (varies); WSDOH WSDM Equation 5-1*
(5) *ADD x 365 days/year*

1.1.2 Supply

Criteria

The WSDOH WSDM provides the following criteria for public water supply:

- Supply must meet MDD
- Supply should meet MDD and replenish Fire Suppression Storage within 72 hours while supplying MDD

Current Capacity

The City's water is supplied via eight groundwater wells. The current supply capacity of the City's wells is shown on the following table.

Table 4: Current City Supply

Well No.	DOH ID No.	Current Capacity (gpm)
2	01	-
3	02	800
4	06	430
5	07	900
6	05	2,500
7	08	630
8	09	395
9	10	1,500
Total Supply Capacity		7,155

Evaluation

The impact of consolidating the 8 water systems into the City of Othello water supply is evaluated in the following table.

Table 5: Supply Capacity Evaluation

Description	Scenario	MDD (gpm)	Replenish FSS [1] (gpm)	Total (gpm)	Current Supply Capacity [2] (gpm)	Excess / (Deficiency) (gpm)
City of Othello	Current [3]	4,700				
8 Water Systems	Current [4]	157				
Total		4,857	347	5,204	7,155	1,951
City of Othello	Current [3]	4,700				
8 Water Systems	Future [4]	268				
Total		4,968	347	5,315	7,155	1,840

(1) *Per City of Othello 2011 WSP Fire Suppression Storage = 6,250 gpm for 4 hours (1,500,000 gallons), Replenish FFS = 1,500,000/72 hrs/60 min*
(2) *From Table 4*
(3) *From Table 1*
(4) *From Table 3*

Conclusion

The City has adequate supply capacity to serve all 8 water systems with no improvements required.

See Appendix F for discussion related to long-term effects on City supply.

1.1.3 Distribution

Criteria

Per the WSDM the distribution system shall maintain a minimum 30 psi during PHD and 20 psi during FF/MDD.

Hydraulic Analysis Model

As described in Section 3.2.2 of each individual report.

Evaluation

The hydraulic model of the City of Othello's water system was run after adding the 8 water system demands. No deficiencies within the existing City of Othello water system were found.

The hydraulic model was then run adding the 8 water system demands and the demands estimated for the future UGA area. No deficiencies within the existing City of Othello water system were found.

Conclusion

The City has adequate distribution system capacity to serve the 8 water systems and the future UGA with no improvements required.

1.1.4 Storage

Criteria

The WSDOH WSDM provides the following criteria for public water storage:

Operational Storage (OS): Storage volume devoted to supplying the water system when sources of supply are in the "off" status (volume between pump "on" and pump "off")

Equalizing Storage (ES): Storage volume required to meet peak system demands which exceed source capacity (min. system pressure 30 psi)

- ES = (PHD-Qs)(150 min.)

Where:

- PHD = peak hour demand in gpm
- Qs = sum of all source capacities in gpm

Standby Storage (SB): Storage volume to provide system reliability in cases where sources fail or during periods of unusually high demands (min. system pressure 20 psi) (Equation 9-3)

- SB = (2 days)[(ADD)(ERUs) – t_M (Q_S-Q_L)]

Where:

- ADD = gpd/ERU
- t_M = 1,440 minutes
- Q_S = Sum of all source capacity in gpm
- Q_L = Largest source capacity in gpm

Alternatively, the WSDM recommends the standby storage volume be no less than 200 gal/ERU

Fire Suppression Storage (FSS): Storage volume required to provide the maximum fire flow rate and duration (min. system pressure 20 psi)

- FSS = (FF)(duration)

Where:

- FF = 6,250 gpm (largest fire flow demand)
- Duration = 4 hours (longest fire flow duration)

Dead Storage (DS): Storage volume below the minimum required system pressure (unusable storage)

Current Capacity

The City of Othello has three reservoirs with a total nominal storage capacity of approximately 6,000,000 gallons. The useable volume available to the system varies from 1.3 MG to 2.8 MG depending on the residual system pressure for the storage component being analyzed, i.e. 20 psi for FF and SB; 30 psi for ES. The remaining volume is referred to as "dead storage".

Evaluation

Operational Storage

Extending service to serve the 8 water systems will not change the pump setting or OS volume.

Equalizing Storage

Description	PHD (gpm)	Qs [1] (gpm)	Duration (min.)	ES (gal.)
Othello	7,600 [2]	7,155	150	66,750
8 water systems	583 [3]	7,155	150	0
Combined	8,183	7,155	150	154,200

(1) *From Table 4*
(2) *From Table 1*
(3) *From Table 3*

Standby Storage

Description	Duration (days)	ADD (gpd/ERU)	ERUs	t_M	Q_S (gpm)	Q_L (gpm)	SB (Eq.9-3) (gal.)	SB (200 gpd/ERU) (gal.)
Othello	2	453	10,490	1440	7155	2500	<0	2,098,000
8 water systems	2	453	406	1440	7155	2500	<0	81,200
Combined	2	453	10,896	1440	7155	2500	<0	2,179,200

Fire Suppression Storage

Description	Largest FF Demand (gpm)	Longest FF Duration (hrs)	FF Volume (gal.)
Othello	6,250	4	1,500,000
8 water systems	1,000	2	120,000

Dead Storage

All service elevations in the 8 water systems are at or below existing City of Othello service elevations so extending City of Othello water service to the 8 water systems will not increase dead storage.

Storage Comparison

The City of Othello storage volumes with and without the 8 water systems is shown in the following table:

Table 6: Storage Comparison

Description	CITY OF OTHELLO		OTHELLO/8 systems	
	Elevation (amsl)	Volume (gal.)	Elevation (amsl)	Volume (gal.)
Overflow (1)	1209.0		1209.0	
OS		239,825		239,825
Bottom of OS (1)	1205.0		1205.0	
ES		65,950		154,200
Bottom of ES (2)	1203.9		1202.4	
SB		2,098,000		2,179,200
Bottom of SB (3)	1168.9		1166.1	
FSS		1,500,000		1,500,000
Bottom of FSS (4)	1178.9		1177.4	
Base Elevation	1119.6		1119.6	

(1) *From 2011 Water System Plan*
(2) *Minimum elevation required to maintain 30 psi service pressure = 1195*
(3) *Minimum elevation required to maintain 20 psi service pressure = 1167*
(4) *Minimum elevation required to maintain 20 psi service pressure = 1170*
(5) *SB and FSS are nested per 2011 Water System Plan*

Conclusion

The City has adequate OS, ES and FSS storage capacity to extend water service to the 8 water systems with no improvements required.

Serving the 8 water systems will require additional SB storage capacity. The additional storage capacity is estimated to be deficient by approximately 54,000 gallons above the elevation 1167. This results in 195 gal/ERU SB storage instead of the 200 gal/ERU minimum recommendation in the WSDM.

It is noted the City has 8 operational wells and when SB is calculated per WSDM Equation 9-3 SB is zero. It would be a highly unusual circumstance with multiple source failures or extended power outage affecting all wells before the SB would be used.

1.1.5 Water Rights

Criteria

The criteria used to evaluate the adequacy of the City's water rights are as follows:

Maximum instantaneous flow (based on total source capacity)	<	Maximum instantaneous withdrawal (Qi)
Maximum annual water use (based on current water use data)	<	Maximum annual withdrawal (Qa)

Current Water Right

The City's water rights were consolidated into a unified water allocation. This unified allocation is as follows:

Qi = 9,550 gpm

Qa = 7,100 acre-ft/yr

Evaluation

The impact on the City's water rights of consolidating the BDWS into the City of Othello water system is evaluated in the following table.

Table 7: Water Rights Evaluation

Description	Qi Instantaneous water use (gpm)	Qa Annual water use (acre-ft/yr)
City of Othello	7,155	5,300 (1)
8 water systems	0 (2)	206 (3)
Total	7,155	5,506
Water Right	9,550	7,100
Excess/(deficiency) (4)	2,395	1,594

(1) *From Table 1*
(2) *The 8 water systems will not increase instantaneous withdrawal (no new sources of supply added to system)*
(3) *From Table 3*
(4) *Potential additional water rights obtained by transferring the individual system water rights to the City of Othello are not shown.*

Conclusion

The City of Othello has adequate water rights to provide service to the 8 water systems.

1.1.6 Summary of Impacts of Consolidation on City Water System

The following table summarizes the impacts to the City of Othello's water system components:

Table 8: Summary of Impacts to City of Othello Water System Components

Component	Deficiencies Identified	Impacts to City System
Supply	none	none
Distribution	none	none
Storage	SB is deficient by ~48,000 gal.	SB is reduced from the DOH recommended 200 gal/ERU to 195 gal/ERU
Water Rights	none	None (1)

(1) *The City will benefit from a net increase in water rights by transferring the individual system water rights to the City as part of the consolidation.*