CONSOLIDATION FEASIBILITY STUDY

SEPTEMBER 2016

MEADOW LANE WATER ASSOCIATION

WSDOH System ID No. 53190

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

CONSOLIDATION FEASIBLITY STUDY

MEADOW LANE WATER ASSOCIATION

WSDOH System ID No. 53190

VICE-PRESIDENT
Daniel Hilmes

OPERATOR
Lorey C. Sielaff

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
Genna Dorow, Position 1
John Lallas, Position 2
Corey Everett, Position 3
Eugene Bain, Position 4
Kenneth Johnson, Position 5
Mark Snyder, Position 6
Angel Garza Position 7

JESSE J. COWGER
STATE OF WASHINGTON
46204
REGISTERED
PROFESSIONAL ENGINEER

10/3/2016

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PLANNING · DESIGN · MANAGEMENT · INSPECTION

CITY OF OTHELLO

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WSDOH WATER SYSTEM ID NO.53190

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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 Meadow Lane Water Association (MLWA) is shown on the WFI is as follows:

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

Address
(none given)

Phone
Daytime: 509.488.0219
Mobile: 509.989.0339

Owner Contact
Daniel Hilmes, Vice-president

Address
PO Box 6
Othello, WA 99344

Phone
Daytime: 509.989.6269

2.0 EXISTING SYSTEM

2.1 System Information

MLWA is located on the south side of Cunningham Road, approximately 1 mile west of the City of Othello City Limits, in Adams County in the north half of Section 5, Township 15 N, Range 29 E. (see **Figure 2**).

MLWA provides domestic water service to a 25 lot subdivision with 23 parcels (one parcel consists of two lots and two parcels consist of 1.5 lots each) and the Othello Gun Club club house. There are 25 metered connections, 23 are active with two being reported as inactive.

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

2.2 Service Area

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

2.3 Inventory of Facilities

The MLWA water system is shown on **Figure 2**. The water system is a closed system (no gravity storage) with a well pump, pressure tanks and distribution pipe.

The DOH Water Facilities Inventory (WFI) form lists the MLWA system as a Group A Community system serving a **residential** community with commercial/business and daycare. 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 Meadow Lane Water System Source Inventory [(1)]

Source Number	Source Name	Use	Metered	Treatment	Current Pumping Rate [(2)] (gpm)
SO1	Well #1 – ABR070	Permanent	Yes	None	75
				Total:	75

(1) *Information obtained from the Water Facilities Inventory (last updated 8/11/14 as of this writing)*
(2) *As reported by MLWA*

Storage

The MLWA system is a closed system with eight (8) individual 120-gallon steel bladder pressure tanks with a total nominal volume of 960 gallons.

Distribution System

Per MLWA the distribution system consists of 2" PVC transmission mains with ¾" and 1" PVC or Poly (HDPE) service pipe. There are no reported issues with the distribution system nor are there reported pressure drops during peak demands. All services are individually metered.

Fire Flow

The MLWA system currently does not contain fire hydrants and does not provide fire flow. Supply, storage, and distribution capacity are insufficient to provide fire flow.

The following table summarizes the major components of the MLWA.

Table 2-2 Summary of Meadow Lane Water Association System Components

System	Component	Description	
Supply	Well	ECY Well ID Tag: Status: Log available: Depth: Casing: Screen: Date constructed: SWL: Approx. wellhead elev.: Present pumping rate: Pump/motor: Discharge pressure: Enclosure: Location:	ABR070 Online No 307 8" diameter casing w/pitless adapter unknown Approx. 1966 Approx. 22' below wellhead elevation (~ Elev. 888) 910 75 gpm Submersible Turbine, 5 HP (constant speed, pressure switch operated) Approx. 60 psi Pump house (wood framed building with metal siding and roof) 2241 W. Cunningham Rd., Othello, WA 99344
Storage	Pressure Tank	Construction type: Approx. base elevation: Date constructed: Volume: Pressure zones served: Location:	Steel 910' varies 960 gallons (eight individual 120-gallon steel pressure tanks) Two 2241 W. Cunningham Rd., Othello, WA 99344
Distribution System	2"	2,700 LF	
	Total	2,700 LF	
	Main materials	PVC	
	Service Pressure	Approx. 40 – 60 psi	

2.4 Assessment of the Condition of the Existing Facilities

A site visit of the Association facilities was conducted on November 17, 2015. The site visit included a tour of the Associations facilities.

The following summarizes observations from the site visit regarding the condition of the existing facilities.

Supply

The well head was visible. The well head was capped, ECY tagged and there were no observable defects. The well pump was reported to be operating trouble free and has had no recent problems. The condition of the supply appears to be good.

Storage

The storage consists of eight individual 120-gallon steel pressure tanks. Seven of the tanks were observed to be of the older galvanized steel tanks and one a newer epoxy lined tank. All appeared to be in good visual condition.

Pump House

The pump house is a wood framed building with metal roof and siding. The walls are insulated and interior sheathed with a mix of plywood and OSB board.

The piping is primarily PVC with brass valves. Some pipe is galvanized steel. The interior piping, meter, PRV, electrical power and control panels all appear to be in good condition. Overall the facility appeared to be in good condition and well maintained.

Distribution

The condition of the distribution system could not be observed. Customer service meters were installed in the last couple years. One typical meter installation was inspected and consisted of a small, shallow meter box with metal lid. The meter and above ground portion of the setter was observed and appeared to be in relatively new condition and was readily accessible and easily read.

Leaks have been reported, both on the mainline and services. A review of the meter records indicates several service lines (property owner side) spring leaks every year as single monthly readings will quadruple or more over a single month. Many service lines (property owner side) have been replaced in the last 5-10 years.

Overall, based on the apparent frequency of leaks the distribution system appears to be nearing the end of its service life and while it will likely remain serviceable over the next decade an increased frequency of repairs should be expected until the distribution and service pipes can be replaced.

2.5 Water Use, System Demands and Water Rights

2.5.1 Population/Connections

Existing

Meadow Lane is a 25 lot subdivision with 23 parcels (one parcel consists of two lots and two parcels consist of 1.5 lots each). The water system serves 24 single family residential connections and the Othello Gun Club clubhouse (25 total connections). The water meter records indicate 2 residential connections are not active (0 water use).

- Existing Connections: 25 (24 residential + gun club)

Dan Hilmes, the water system vice-president, provided a population count for 2015 which is represented below.

- Existing Population: 63

Projected

The development is fully built out and no growth is expected. Projected future water use will assume the 2 non-active connections will be active therefore the projected future connections are as follows:

- Projected Connections: 25 (24 residential + gun club)

The future population is projected based on the average current population/connection (2.86 persons per residential connection) extrapolated on the assumption the two non-active connections become active.

- Projected Population: 69

2.5.2 Water Use

Water service and source meter data was provided by MLWA for 2013, 2014 and Jan-Oct of 2015. Water use is shown on the following tables. Water use represents domestic use only. The Association receives irrigation water from ECBID.

Table 2-3: Water Use Summary (1)

Description	Year					
	2013		2014		2015 (2)	
	(gal.)	(gpd)	(gal.)	(gpd)	(gal.)	(gpd)
Annual Total	1,686,000	4,600	1,516,000	4,200	1,318,000	3,600
Maximum Month	328,000	10,800	227,000	7,500	161,000	5,300
Average Month	141,000	4,600	126,000	4,100	110,000	3,600
Minimum Month	103,000	3,400	101,500	3,300	80,000	2,600

(1) *Source meter data*
(2) *Meter data provided for Jan - Oct. Annual total is projected by dividing the Jan-Oct total by 10 to get monthly average, then multiplying the monthly average by 12.*

Table 2-4: Annual Water Distribution Leakage (DSL)

Description	Year		
	2013	2014	2015
Source Meter Total	1,686,000	1,516,000	1,318,000
Service Meters Total	1,466,000	1,374,000	1,201,000
Difference	220,000	142,000	117,000
DSL %	13%	9%	9%

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 Association water use to the City of Othello water use.

Table 2-5: ERUs

Description	Year		
	2013	2014	2015 (1)
Total annual water use (source meter)	1,686,000	1,516,000	1,318,000
City of Othello gpd/ERU value (2)	453	453	453
City of Othello ERUs (3)	**10**	**9**	**8**

(1) *Annual water use is projected, see 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 2-6: Current Water System Demands

Description	ERUs (3)	ADD			MDD (1)			PHD (2)
		gpd/ERU (3)	(gpd)	(gpm)	gpd/ERU	(gpd)	(gpm)	(gpm)
2013	10	453	4,600	3	1,373	14,000	10	47
2014	9	453	4,200	3	1,069	9,800	7	38
2015	8	453	3,600	3	866	6,900	5	32

(1) *MDD = MMAD(1.3); MMAD from Table 2-3*
(2) *PHD = (MDD/1440)(CN+F)+18, where C = 3.0, N = ERUs and F = 0*
(3) *From Table 2-5*

Future

Future water system demands are estimated assuming the two inactive connections become active per Section 2.5.1. Using the calculated ERU's from the highest water use year within the data period indicates there are approximately 2.3 connections per ERU. The two inactive connections are therefore equivalent to 1 ERU (rounded). Future system demands will add 1 ERU to the peak 2013 water use with the resulting estimated future water demands shown on the following table.

Table 2-7: Estimated Future Water System Demands

ERUs	ADD			MDD (1)			PHD (2)	Annual (3)	
	gpd/ERU	(gpd)	(gpm)	gpd/ERU	(gpd)	(gpm)	(gpm)	(gal.)	(acre-ft/yr)
11	453	5,000	3	1,373	15,100	10	49	1,825,000	5.6

(1) *Peak MDD from Table 2-6*
(2) *PHD = (MDD/1440)(CN+F)+18, where C = 3.0, N = ERUs and F = 0*
(3) *ADD (gpd) x 365 days*

2.5.5 Water Rights

MLWA was unable to provide a water right certificate or claim. A search of the ECY records was unable to locate a water right certificate of claim. It is assumed MLWA is operating a permit exempt

well as described in RCW 90.44.050 with an allowed groundwater withdrawal rate not to exceed 5,000 gallons per day.

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.

The MLWA operates a "closed" system meaning the system is closed to the atmosphere (i.e. pressure storage tanks) and therefore does not have equalizing storage. MLWA also does not provide FSS.

Since the MLWA is a closed system and does not have equalizing storage or provide FSS, the criteria used to evaluate the MLWA supply is based on the DOH WSDM criteria for closed system booster pump station and is as follows:

- Supply PHD at no less than 30 psi to all service connections (this is more stringent than the WSDM supply criteria for meeting MDD)

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

Since the MLWA is a closed system and does have an atmospheric storage tank but individual vertical steel pressure tanks the criteria used to evaluate the MLWA supply is based on the DOH WSDM Chapter 11 "Hydropneumatic (pressure) Tanks".

- Equation 11-2: $$V_t = \frac{[(P1+14.7)]}{[P1-P2]} \text{ x } \frac{15\,Qp}{Nc} + 0.0204\,D^2$$

Where:

Vt	=	Total tank volume in gallons
P1, P2	=	P1 corresponds to the pump-off pressure and P2 to the pump-on pressure.
Nc	=	Number of pump operating cycles per hour (6 cycles per hour)
Qp	=	Pump delivery capacity in gpm at the midpoint of the selected pressure range
D	=	Diameter in inches

2.6.4 Fire Flow

MLWA does not provide fire flow or FSS and therefore will not be evaluated for fire flow. Consolidation options with the City of Othello will include an evaluation for fire flow.

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 MLWA 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

Criteria

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

Required Capacity

From Table 2-6 current PHD is 47 gpm. From Table 2-7 future PHD is estimated at 49 gpm.

Current Capacity

From Table 2-2 the current well pump capacity is 75 gpm.

Evaluation

The current well pump capacity of 75 gpm exceeds the required future capacity of 49 gpm.

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 latest IOC test data was provided and is shown on the following table.

Table 2-8: Water Quality Test Results - IOC (1)

ANALYTE	RESULT (2)	UNITS	SRL (3)	Trigger	MCL	Exceeds MCL (X if yes)
Arsenic	<	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	0.006	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	0.720	mg/l	0.2	2.0	4.0	
Nitrite – N	<	mg/l	0.1	0.5	1.0	
Nitrate – N	3.060	mg/l	0.5	5.0	10.0	
Total Nitrate/Nitrite-N	3.060	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	25.0	mg/l	20	--	2501	
Sulfate	81.0	mg/l	50	--	2501	
Zinc	<	mg/l	0.2	--	51	
Sodium	64.4	mg/l	5	--	--	
Hardness	151.0	mg/l	10	--	--	
Conductivity	614.0	µmhos/cm	70	--	7001	
Turbidity	<	NTU	0.1	--	--	
Color	<	CU	15	--	151	
Total Dissolved Solids	NA	mg/l	100	--	5001	
Nickel	<	mg/l	0.005	--	--	

ANALYTE	RESULT (2)	UNITS	SRL (3)	Trigger	MCL	Exceeds MCL (X if yes)
Lead	0.003	mg/l	0.001	--	--	
Copper	<	mg/l	0.02	--	--	

(1) *Test results provided for May 14, 2014 (most recent at time of writing this report)*
(2) *"NA" indicates "not analyzed", "<" indicates "less than state reporting level"*
(3) *State Reporting Level*

The system does not chlorinate. There appears to be a past history of total coliform hits (none since 2010). A review of the DOH Sentry website indicates the system has no current water quality violations.

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

Criteria

- Equation 11-2: $$V_t = \frac{[(P1+14.7)]}{[P1-P2]} \text{ x } \frac{15\,Qp}{Nc} + 0.0204\,D^2$$

Where:

Vt	=	Total tank volume in gallons
P1, P2	=	P1 corresponds to the pump-off pressure and P2 to the pump-on pressure.
Nc	=	Number of pump operating cycles per hour (6 cycles per hour)
Qp	=	Pump delivery capacity in gpm at the midpoint of the selected pressure range
D	=	Diameter in inches

Required Capacity

- Equation 11-2: $$V_t = \frac{[(P1+14.7)]}{[P1-P2]} \text{ x } \frac{15\,Qp}{Nc} + 0.0204\,D^2$$

Where:

Vt	=	712 gallons
P1	=	40 psi
P2	=	60 psi
Nc	=	6 cycles per hour
Qp	=	75 gpm

$D = 24"$

Based on the above values the total required tank volume in gallons equal 712 gallons.

Current Capacity

Per Table 2-2 there are currently eight 120-gallon vertical steel pressure tanks with a total volume of 960 gallons.

Evaluation

The 960 gallons of current capacity exceeds the calculated required capacity of 712 gallons.

Deficiencies

None.

2.7.4 Fire Flow

The MLWA does not provide fire flow therefore fire flow is not evaluated.

2.7.5 Distribution System

Criteria

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

Required Capacity

Based on the reported lowest pressure tank setting there is a maximum 10 psi pressure loss available (23.4 feet of head loss).

Current Capacity

It is reported the distribution system is comprised of 2-inch diameter PVC pipe. Assuming a maximum distribution system pipe velocity of 3 fps this pipe has an approximate capacity of 30 gpm.

Evaluation

The future calculated PHD of 50 gpm (Table 2-7) was split equally (2.08 gpm/connection) between the 24 projected connections (Section 2.4.1) and distributed evenly along the distribution pipe with 7 connections east of the pump station and 17 connections west of the pump station.

Table 2-9: Distribution System Hydraulic Analysis

Location	Elevation	Static Pressure (psi)	Calculated Pressure Loss during PHD (psi)	PHD System Pressure (psi)
East End	928	31.8	-0.4	31.3
Pump House	909	40.0	0.0	40.0
Gun Club meter	873	55.6	-5.8	49.8

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

Deficiencies

None.

2.7.6 Water Rights

Criteria

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

Existing Water Right

From Section 2.4.5 MLWA appears to be withdrawing water based on a permit exempt well with a maximum legal withdrawal rate of 5,000 gpd which equates to an annual withdrawal amount of 1.825 MG (5.6 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

Year	ADD (1) (gpd)	Exceed Daily (gal.)	MDD (1) (gpd)	Exceed Daily (gal.)	Annual (1) (gal.)	Annual (acre/ft)	Exceed Annual (acre/ft)
2013	4,600	0	14,000	9,000	1,686,000	5.2	0
2014	4,200	0	9,800	4,800	1,516,000	4.7	0
2015	3,600	0	6,900	1,900	1,318,000	4.0	0
Projected Future	5,000	0	15,300	10,300	1,825,000	5.6	0

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

Based on the above table it appears the Association exceeds its daily water right during maximum day demand conditions and is projected to be equal to the daily water right under average day demand conditions. Annual water rights are currently within the available water right with projected future water use equal to the available water right.

Deficiencies

The projected water use indicates a daily water right deficiency of 10,300 gpd under MDD.

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)	75 gpm	47 gpm	none	49 gpm	none
Treatment	No known issues		none		none
Storage (pressure)	960 gal.	712 gal.	none	712 gal.	none
Fire Flow	n/a	n/a	n/a	n/a	n/a
Distribution	adequate	adequate	none	adequate	none
Water Rights (daily) Water Rights (Qi) Water Rights (Qa)	5,000 gpd ~4 gpm (1) 5.6 ac-ft/yr	14,000 gpd 75 gpm (2) 5.2 ac-ft/yr	9,000 gpd 71 gpm none	15,100 gpd 75 gpm (2) 5.6 ac-ft/yr	10,100 gpd 71 gpm none

(1) *The permit exemption specifies a maximum allowable daily withdrawal expressed in gpd. Qi is generally expressed in gpm. Qi calculated average allowable withdrawal rate by dividing the daily rate (gpd) by 1,440 min/day to result in gpm.*

(2) *Minimum Qi = minimum well pump capacity*

2.8 System Finances

Current Water Rates are reported as follows:

Basic Fee: $50/mo.

Usage Rates:

0 – 7,500 gallons	$0 (included in basic fee)
7,501 – 12,500 gallons	$5
12,501 up	$5 per thousand gallons

Financial data was provided for the period 2009 – 2014. The latest 3-years data (2012-2014) is shown on the following table.

Table 2-12 Annual Operation Budget

Description	2012	2013	2014
INCOME			
Water Fees	$ 13,293.00	$ 12,132.49	$ 15,035.00
Interest	$ -	$ -	$ -
Total Income Received	$ 13,293.00	$ 12,132.49	$ 15,035.00
Outstanding Balance Due	$ 595.00	$ 870.00	$ 1,060.00
EXPENSES			
Annual Meeting Expenses	$ 172.59	$ 123.00	$ 115.00
Avista	$ 300.87	$ 373.15	$ 425.48
Bookkeeping	$ -	$ -	$ 550.00
East Columbia Irrigation	$ 2,416.08	$ 2,470.01	$ 2,716.09
IRS	$ -	$ -	$ 100.00
Kuo Testing Lab (WQ Testing)	$ 477.00	$ 249.00	$ 348.00
Lad Irrigation (repairs)	$ 835.22	$ 19.78	$ 1,246.63
Misc.	$ -	$ 46.77	$ 73.67
Office supplies	$ -	$ 96.84	$ 655.10

Description	2012	2013	2014
PO Box rental	$ 120.00	$ 192.00	$ 187.22
Rainier Tracts (electricity)	$ 2,828.26	$ 2,422.97	$ 2,824.25
Lorey Sieloff (certified operator)	$ 2,700.00	$ 2,700.00	$ 2,725.00
State DOH Fees	$ 247.75	$ 255.50	$ 863.25
State Filing Fee	$ 10.00	$ 10.00	$ 10.00
Total Expenses	$ 10,107.77	$ 8,959.02	$ 12,839.69
BALANCE (assume transfer to reserves)	$ 3,185.23	$ 3,173.47	$ 2,195.31
ACCUMULATED FUNDS			
Money Market	$ 11,504.55	$ 16,456.05	$ 16,964.72
Time Deposit Savings	$ 12,210.78	$ 12,240.54	$ 12,268.57
Checking Account	$ 1,222.37	$ 734.35	$ 647.46
Total Reserves	$ 24,937.70	$ 29,430.94	$ 29,880.75

The Annual Operation Budget is summarized below on a per user basis.

Table 2-13 Annual Operation Budget – Summary per Connection

Description	2012	2013	2014	Average
Active Connections	24	23	23	23
Annual Revenue per Connection	$ 553.88	$ 527.50	$ 653.70	$ 578.36
Monthly Revenue per Connection	$ 46.16	$ 43.96	$ 54.47	$ 48.20
Annual Expenses per Connection	$ 421.16	$ 389.52	$ 558.25	$ 456.31
Monthly Expenses per Connection	$ 35.10	$ 32.46	$ 46.52	$ 38.03
Monthly net per connection (reserves)	$ 11.06	$ 11.50	$ 7.95	$ 10.17

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. See **Figure 3**.

3.1.1 Supply

The existing MLWA 8-inch diameter well, with a 75 gpm capacity, is likely too low for the City to utilize cost-effectively. The well is also located on a portion of a residential lot 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 diameter PVC water main with a minimum 8-inch diameter DI/PVC water main
- Replace the existing 1-inch diameter pvc/poly service pipes with new 1-inch diameter K copper pipe
- Install a sampling station
- Install a 2-inch blow-off at the west end of the 8-inch main
- Replace the service meters with service meters per City standards
- Install fire hydrants at the spacing required per City standards

3.1.3 Storage

The existing pressure storage tanks are incompatible with the City gravity storage and provide no benefit to the City, therefore the storage tanks 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 MLWA improvements.

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

Diam. (in.)	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 trench*
(8) *Assume 6' wide restoration, 1 HMA patch for water/road crossing every 100 ft, cover crop hydroseed over remainder of trench*

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

RAILROAD CROSSINGS / HIGHWAY CROSSINGS					IRRIGATION CANAL CROSSINGS				
Bore and Jack					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 Association water system to meet current City standards is estimated on the following table. Costs are estimated assuming public works bidding and state prevailing wage rate are required.

Table 3-3 Estimated Improvements Cost

Description	Est. Quantity	Units	Unit Price	Amount
Main & install (8-inch PVC)	3100	LF	$ 28	$ 86,800
Valves, fittings, restraints	3100	LF	$ 13	$ 38,750
Fire hydrants	3100	LF	$ 9	$ 27,900
Service connections (1)	3100	LF	$ 18	$ 55,800
Surface Replacement	3100	LF	$ 10	$ 31,000
Sampling Station	1	EA	$ 2,000	$ 2,000
2-inch blow-off	1	EA	$ 2,000	$ 2,000
			Subtotal	$ 244,000
			Mobilization 10%	$ 24,000
			Contingency 20%	$ 49,000
			Estimated construction cost	$ 317,000
			Environmental approvals allowance (assuming must meet DWSRF loan requirements)	$ 14,000
			Engineering 25% (design, construction management/inspection)	$ 79,000
			ESTIMATED PROJECT COST	$ 410,000

(1) *Used half the Table 3-1 value due to services on only one side of the street (half the no. of services)*

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 Cunningham Rd. just east of Danielle Rd. City water service can be extended to MLWA by constructing a transmission main from this location west on Cunningham Rd. approximately 3,300 feet to connect to MLWA water system.

See **Figure 4** for the proposed transmission main extension. The connection to the City system would be made by tying into the existing City of Othello system between the PRV and ACWD#1 meter vaults. This will avoid installing an additional PRV.

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 MLWA 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 B** 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 Washington State DOH 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
- 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 MLWA 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 MDD (gpm)	PHD (gpm)	FF (gpm)	Scenario	Scenario Demand (gpm)	Pipe Size T-Main [3] Dia. (in.)
MLWA [1]	11	11	50	1000	PHD	50	8
City of Othello UGA Area 2 [2]	453	188	305	3000	PHD	305	8
MLWA [1]	11	11	50	1000	MDD/FF	1011	8
City of Othello UGA Area 1 [2]	453	188	305	1000	MDD/FF	1188	8

(1) *From Table 2-7*
(2) *See **Appendix B***
(3) *Cunningham Rd. from Danielle Rd. to MLWA*

3.2.3 Estimated Cost

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	Est. Quantity	Units	Unit Price	Amount
Main (8-inch PVC)	3300	LF	$ 28	$ 92,400
Valves, fittings, restraints	3300	LF	$ 7	$ 22,000
Fire hydrants	3300	LF	$ 9	$ 29,700
Service connections	3300	LF	$ 2	$ 5,940
Surface Replacement	3300	LF	$ 2	$ 6,600
			Subtotal	$ 157,000
			Mobilization 10%	$ 16,000
			Contingency 20%	$ 31,000
			Estimated construction cost	$ 204,000
			Environmental approvals allowance (assuming must meet DWSRF loan requirements)	$ 15,000
			Engineering 25% (design, construction management/inspection)	$ 51,000
			ESTIMATED PROJECT COST	$ 270,000

IMPORTANT NOTE

If ACWD#1 consolidated with the City of Othello water system MLWA could then connect to the ACWD#1 distribution system (see **Figure 4**) approximately 250 feet to the east which would dramatically lower the cost to connect to the City of Othello water system (since the ACWD#1 system would then be the City of Othello system). The estimated cost to connect under this scenario is estimated below:

Description	Est. Quan.	Units	Unit Price	Amount
Main (8-inch PVC)	250	LF	$ 28	$ 7,000
Valves, fittings, restraints	250	LF	$ 7	$ 1,667
Fire hydrants	250	LF	$ 9	$ 2,250
Service connections	250	LF	$ 2	$ 450
Surface Replacement	250	LF	$ 2	$ 500
			Subtotal	$ 12,000
			Mobilization 10%	$ 1,000
			Contingency 20%	$ 2,000
			Estimated construction cost	$ 15,000
			Environmental approvals allowance (assuming must meet DWSRF loan requirements)	$ 5,000
			Engineering 25% (design, construction management/inspection)	$ 4,000
			ESTIMATED PROJECT COST	$ 24,000

3.3 Estimated Impact to City System

The impact of consolidating the MLWA 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 MLWA system demands from Table 2-6 and 2-7.

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.	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 MLWA 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				
MLWA	Current (4)	10				
Total		4,710	347	5,057	7,155	2,098
City of Othello	Current (3)	4,700				
MLWA	Future (5)	10				
Total		4,710	347	5,057	7,155	2,098

(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 2-6*
(5) *From Table 2-7*

See **Appendix C** 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 MLWA system demands. No deficiencies within the existing City of Othello water system were found.

The hydraulic model was then run adding the MLWA 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 MLWA 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) (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 MLWA will not change the pump setting or OS volume.

Equalizing Storage

Description	PHD (gpm)	Qs (1) (gpm)	Duration (min.)	ES (gal.)
Othello (2)	7,600	7,155	150	66,750
MLWA (3)	49	7,155	150	0
Combined	7,649	7,155	150	74,200

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

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
MLWA	2	453	11	1440	7155	2500	<0	2,200
Combined	2	453	10,501	1440	7155	2500	<0	2,100,200

Fire Suppression Storage

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

Dead Storage

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

Storage Comparison

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

Table 3-9 Storage Comparison

Description	CITY OF OTHELLO		OTHELLO/MLWA	
	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		74,200
Bottom of ES (2)	1203.9		1203.8	
SB		2,098,013		2,100,200
Bottom of SB (3)	1168.9		1168.8	
FSS		1,500,000		1,500,000
Bottom of FSS (4)	1178.9		1178.8	
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 storage capacity to extend water service to MLWA 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 MLWA 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)
MLWA	0	5.6 (2)
Total	7,155	5,305.6
Water Right	9,550	7,100
Excess/(deficiency)	2,395	1,794.4
MLWA Water Rights Transfer	39 (3)	5.6 (4)
City of Othello Water Rights post Consolidation (5)	9,589	7105.6

(1) *From Table 3-6*
(2) *From Table 2-7*
(3) *Estimated based on current* MLWA *PHD*
(4) *5,000 gpd x 365 days*
(5) *Estimated amounts, actual amount would be determined by ECY*

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

Based on estimated future water use from Table 2-7, extending water service to MLWA will not affect Qi and will use 5.6 acre-ft/yr of the City's Qa. Consolidating with MLWA and acquiring the water right associated with MLWA's exempt well could potentially add 39 gpm (current MLWA PHD) to the City's Qi and 5.6 acre-ft/yr (maximum convertible Qa for exempt well) to the City's Qa which would offset the MLWA annual water use impact to the City's Qa. Actual Qi/Qa amounts would be determined by ECY.

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

Table 2-11 summarizes identified system deficiencies. System deficiencies are limited to exceeding daily maximum water rights during MDD. The water system, on average, is estimated to stay within its 5,000 gpd water right. It is assumed ECY is more concerned with average day overages and therefore will not require MLWA to purchase additional water rights.

Estimated cost to continue to operate as an unconsolidated system will be based on costs contained in Table 2-12.

A review of the annual operating budget from 2012-2014 indicates MLWA is financially well run with monthly fees not only coving expenses but also providing reserve contributions averaging 21% of the income over the 3-year period. Substantial reserves are also available (233% of annual expenses for 2014). Based on this review the current rate structure appears to be adequate to operate and maintain the existing system.

The

Table 3-12 Estimated Annual Cost to maintain Unconsolidated System

Description	Amount	
Total Annual Cost (1)	$	15,000
Current Connections (1)		23
Cost per connection/month	$	54

(1) *Annual revenue from Table 2-12 for 2014; this includes all annual operating/maintenance expenses plus reserve funds for long-term capital expenses (i.e. replace well pump, pressure tanks, distribution system replacement, etc.)*

3.4.2 Consolidated System

The capital cost and estimated annual debt service for the improvements needed to extend City of Othello water service to serve MLWA is estimated in the following table.

Table 3-13 Estimated Improvements Cost and Annual Debt Service

Description	Amount (MLWS Only)	Amount (MLWS and ACWD#1)
Estimated Cost to Improve MLWA (1)	$410,000	$410,000
Estimated Cost to extend service to MLWA (2) / (6)	$270,000	$24,000
Total Estimated Capital Cost	$680,000	$434,000
Annual Debt Service (3)	Amount	Amount
DWSRF Loan (1% interest for 20 yrs) (4)	$37,700	$24,100
DWSRF Loan w/50% Loan Forgiveness (1% interest for 24 yrs) (5)	$18,800	$10,200

(1) *From Table 3-3*
(2) *From Table 3-5*
(3) *Assume consolidation funded by City via. City application to WSDOH for DWSRF construction loan funds*
(4) *Assumes a not economically disadvantaged system with project completed within 24 months of contract execution.*
(5) *DWSRF will provide 50% principal forgiveness for eligible consolidation projects. Eligibility will be determined by WSDOH and DWSRF.*
(6) *From Section 3.2.3*

3.4.3 Comparison of Costs

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 3-14 Comparison of Costs

Description	MLWA remain separate system		MLWA to Consolidate with the City of Othello		MLWA and ACWD#1 to Consolidate with the City of Othello	
			DWSRF Loan	DWSRF Loan (w/50% Loan forgiveness)	DWSRF Loan	DWSRF Loan (w/50% Loan forgiveness)
Annual O&M	$15,000		$0	$0	$0	$0
Estimated Debt Service on Improvements	$0		$37,700	$16,000	$24,100	$10,200
Estimated Annual Cost	$15,000		$37,700	$16,000	$24,100	$10,200
Connections (2016)	23		23	23	23	23
Est. Cost Per Connection/month	$54		$137	$58	$87	$37
City of Othello base water rate (3) (outside city)	$0		$51	$51	$51	$51
Total Estimated cost per connection/month	$54		$188	$109	$138	$88

(1) From Table 2-12 for 2014
(2) From Table 3-13
(3) Does not include overage charges.
(4) 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. It is recommended MLWS perform their own estimates for privately funded construction to compare with the estimated improvement costs contained herein.

- The cost table above does not include intangible benefits from consolidation which include fire flow capacity (1,000 gpm/2 hrs) and increased reliability through standby storage 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 MLWA make contact with Adams County Water District No.1 to discuss cost sharing opportunities which would likely reduce MLWS share of the above estimated costs as well as others who may benefit from extending the City of Othello water mains

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 without additional subsidies or cost sharing
- Significance of ACWD#1’s decision to consolidate and effect on consolidation costs to MLWA
- Financing of improvements (USDA-RD, DWSRF, other)
- Eligibility of system consolidation for DWSRF 50% loan forgiveness
- Coordination between the City and MLWA for funding and construction of the improvements

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

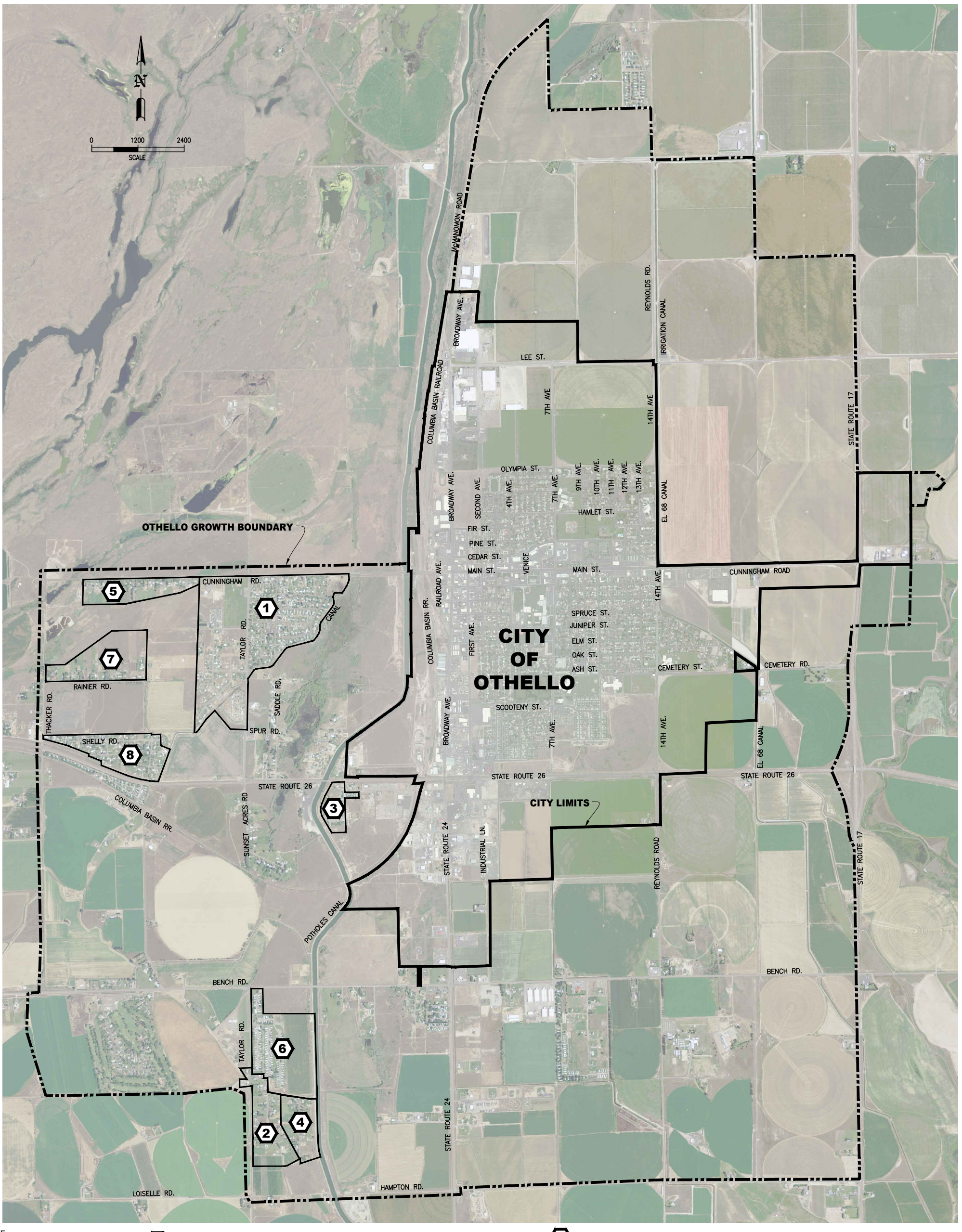
At this time there is inadequate time remaining by the September 30, 2016 DWSRF application deadline to amend the existing WSP, per above, to include the consolidation project(s) and get WSDOH approval.

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:	July 29, 2016
Submit final report to WSDOH/City of Othello for approval: *(revised per WSDOH comments)*	August 31, 2016
Submit to MLWA for review/consideration:	August 31, 2016
City/ MLWA 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

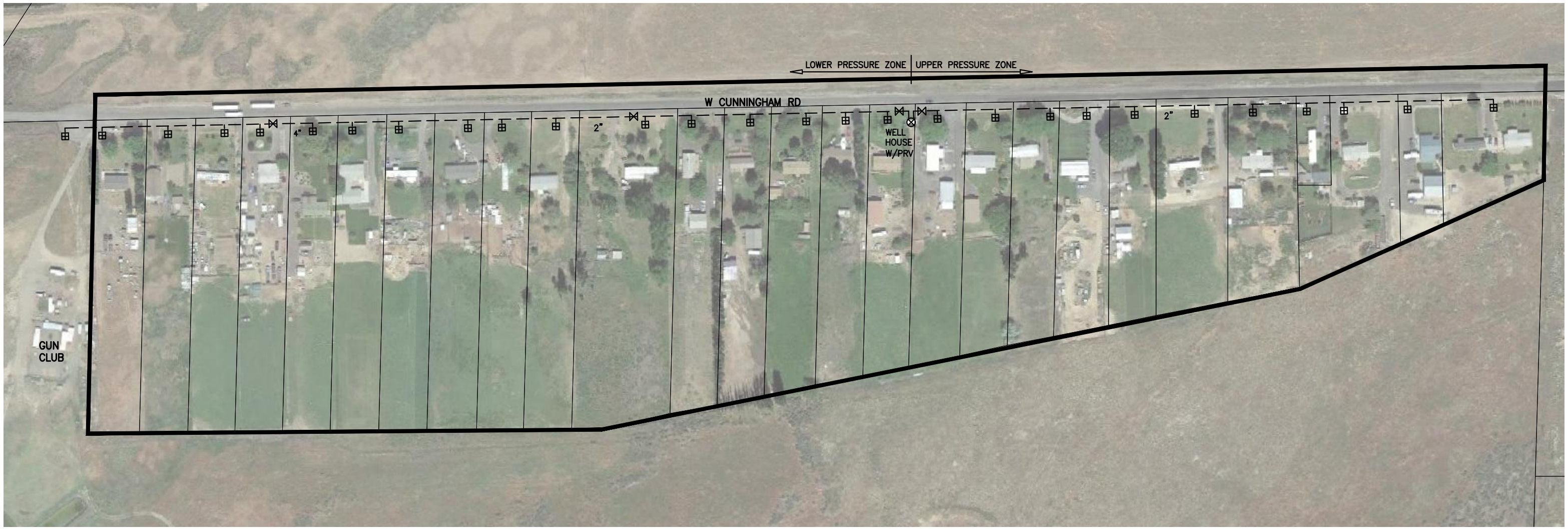
City to complete WSP update (and all DWSRF funding application tasks/requirements noted above)	August 1, 2017
City submit DWSRF grant/loan application:	September 30, 2017
City/ MLWA negotiate consolidation/water service agreement:	October 1, 2017 – December 31, 2017
City negotiate grant/loan agreement 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

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

SCALE: AS SHOWN DESIGNED: – DRAWN: TVP CHECKED: APPROVED: PROJ. NO.: 172-08 DATE: 8/26/16	VARELA AND ASSOCIATES, INC. ENGINEERING AND MANAGEMENT	**CITY OF OTHELLO, WASHINGTON** WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES CONSOLIDATION FEASIBILITY STUDY SYSTEM	FIGURE **1**



LEGEND

- MLWA BOUNDARY
- PARCEL LINE
- WATER LINE
- WELL
- METER
- VAVLE

0 100 200
SCALE

1720806 Meadow Lane Exhibit

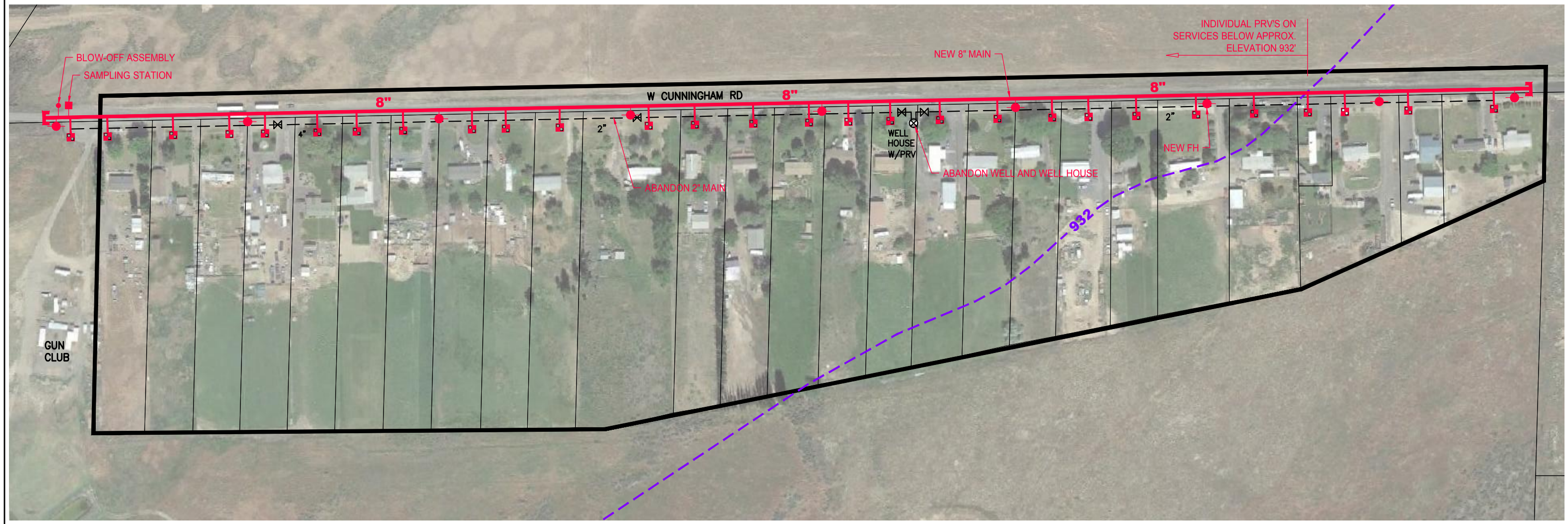
SCALE:	AS SHOWN
DESIGNED:	JSM
DRAWN:	TVS
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	7/20/16

VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

MLWA EXISTING WATER SYSTEM AND
WATER SYSTEM BOUNDARY

FIGURE
2



LEGEND

MLWA BOUNDARY	WELL	PROPOSED FIRE HYDRANT	SAMPLING STATION
PARCEL LINE	METER	8" PROPOSED WATER MAIN	BLOW-OFF ASSEMBLY
WATER LINE	VAVLE	1" SERVICE PIPE	PROPOSED WATER METER

0 100 200
SCALE

1720806 Meadow Lane Exhibit

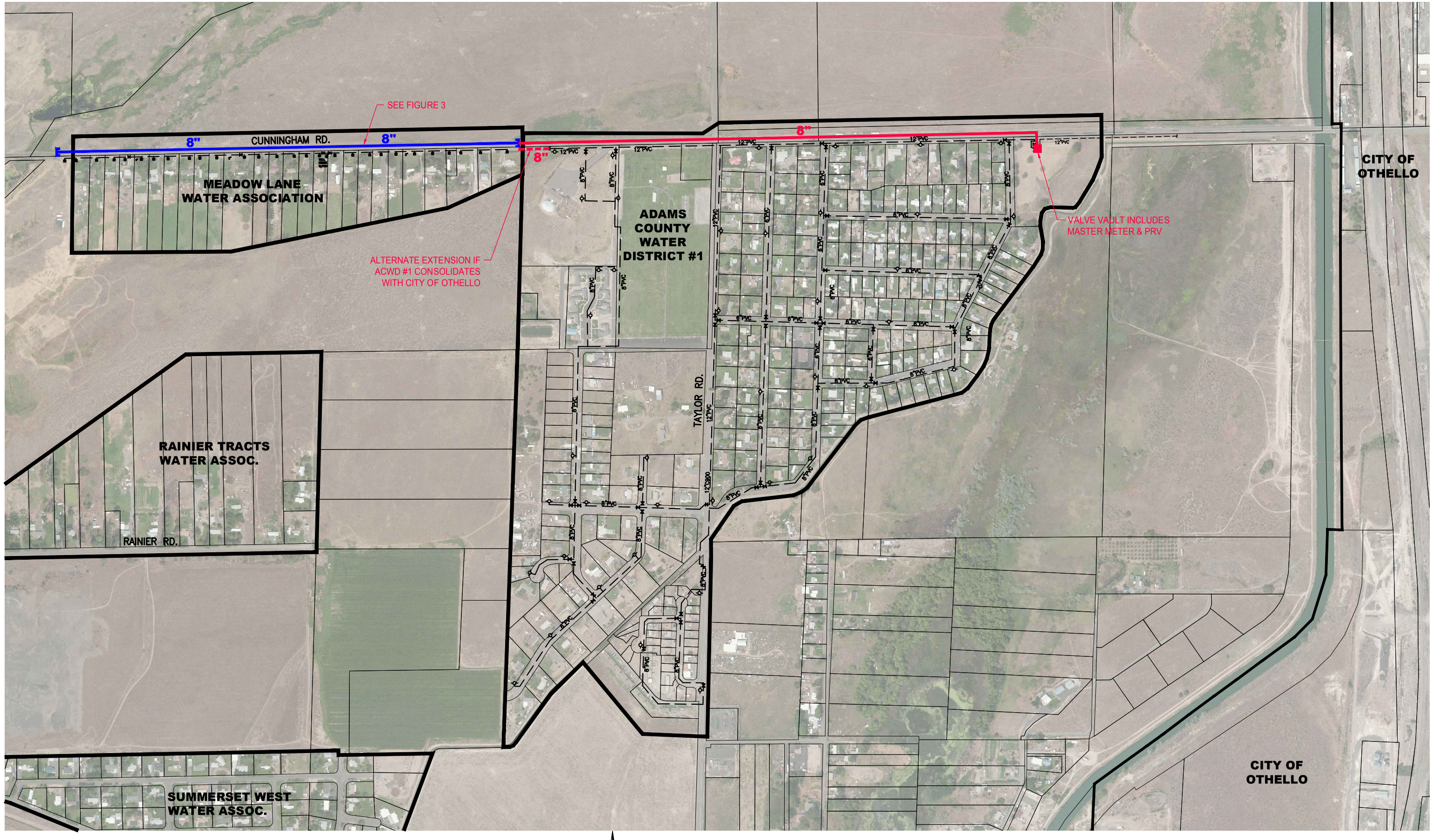
SCALE:	AS SHOWN
DESIGNED:	JSM
DRAWN:	TVS
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	7/20/16

VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

MLWA EXISTING WATER SYSTEM AND WATER SYSTEM BOUNDARY

FIGURE
3



1720806 Meadow Lane Exhibit

SCALE:	AS SHOWN
DESIGNED:	JSM
DRAWN:	TVS
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	7/20/16

LEGEND

- MLWA BOUNDARY
- PARCEL LINE
- EXISTING WATER LINE
- 8" PROPOSED TRANSMISSION MAIN (CONNECT TO CITY)

0 300 600
SCALE

N

VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

MLWA CONSOLIDATION IMPROVEMENTS

FIGURE
4

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: 08/11/2014
Printed: 7/20/2016
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
53190 T	MEADOW LANE WATER ASSN	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: 003711**

MEADOW LANE WATER ASSN
DARLA BARRETT — SECRETARY/ TREAS
PO BOX 6
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: xxxxxxxxxxxxxxxxxxxx

10. OWNER CONTACT INFORMATION

Owner Daytime Phone: (509) 770-6930
Owner Mobile/Cell Phone:
Owner Evening Phone: (xxx)-xxx-xxxx
Fax: E-mail: xxxxxxxxxxxxxxxxxxxx

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
- [x] 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)

15	16 SOURCE NAME	17 INTERTIE	18 SOURCE CATEGORY										19 USE			20	21 TREATMENT						22 DEPTH	23	24 SOURCE LOCATION			
Source Number	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 - ABR070		X										X			Y	X						307	70	NE NW	05	15N	29E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
53190 T	MEADOW LANE WATER ASSN	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?)		24	25
A. Full Time Single Family Residences (Occupied 180 days or more per year)	24		
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.	1	1	1
28. TOTAL SERVICE CONNECTIONS		25	26

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per year? 56

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?	6	6	60	10	10	10	10	60	6	6	6	6
B. How many days per month is water accessible to the public?	2	2	2	2	2	2	2	2	2	2	2	2
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?	12	12	12	12	12	12	12	12	12	12	12	12
B. How many days per month are they present?	20	20	20	20	20	20	20	20	20	20	20	20
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

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 <u>without</u> 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)

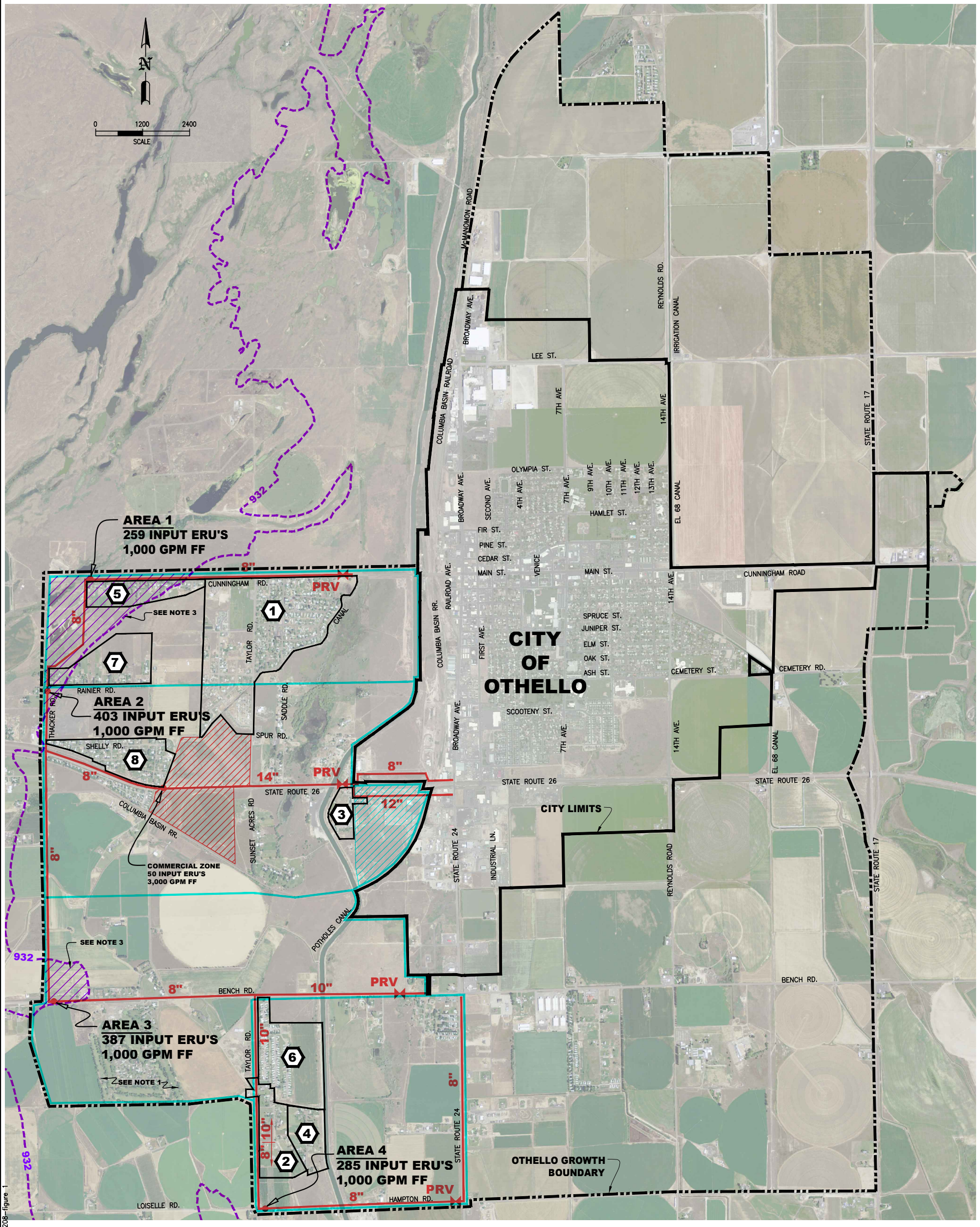
15. ADD, MDD, PHD and FF were evaluated based on the CFS UGA land area

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
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   - 25 CONNECTIONS
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   - WELL #1 – 200 GPM

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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 C

Long-term water supply study excerpts

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

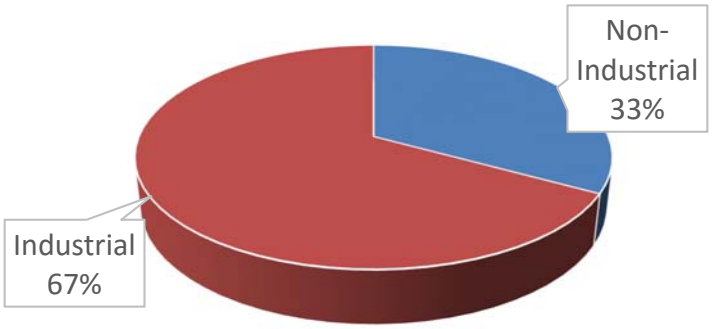
Option	Advantages	Disadvantages
5) Use Well 6 as ASR Injection Well	• May reduce concentration of fluoride in Well 6 to below MCL. • Would not require reducing the pumping rate of Well 6 • If ASR implemented, may slow the decline of the Wanapum aquifer • Supplemental source of supply would reduce the 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

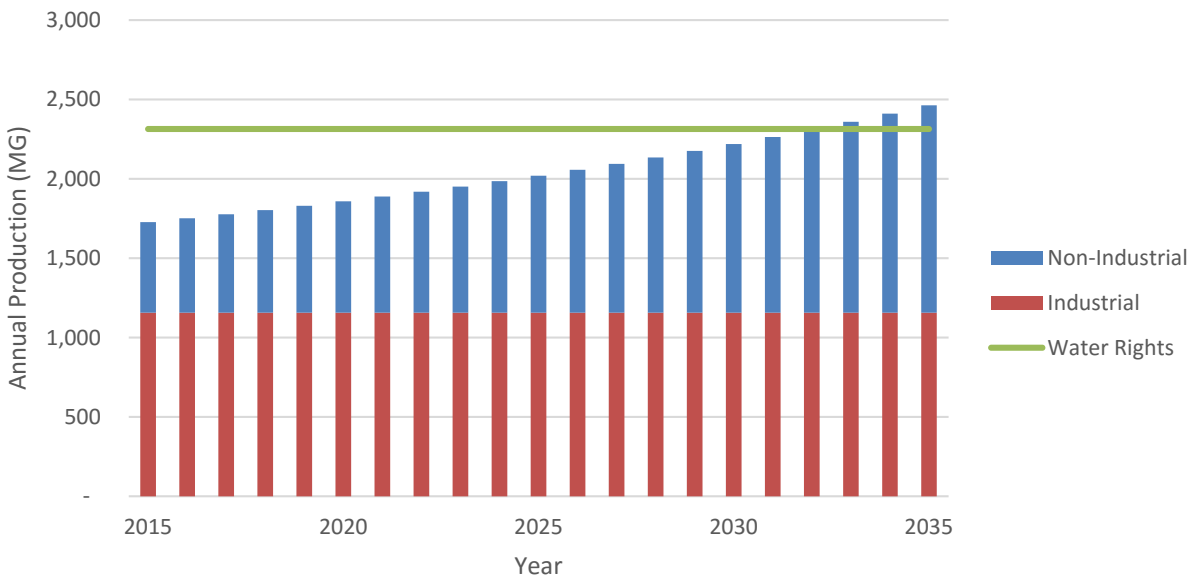
On March 28, 2016 Othello adopted its updated Comprehensive Plan (Comp Plan). The Comp Plan lays out an ambitious vision for growth in Othello which includes population growing from 7,780 in 2015 to 17,825 in 2035. The population growth projected in the Comp Plan equates to an annual rate of 4.23%. In 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



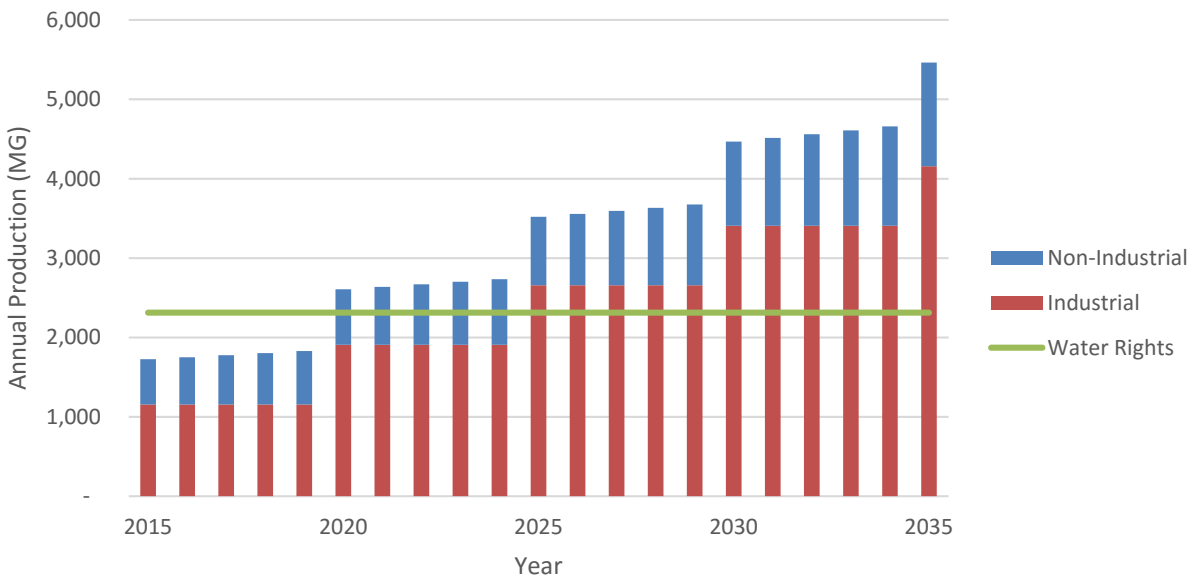
If non industrial water use increases proportionally with projected population growth and industrial demand remains static, the following demand curve results:

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 gpd/ERU (2)	ADD (gpd)	ADD (gpm)	MDD (3) gpd/ERU	MDD (3) (gpd)	MDD (3) (gpm)	PHD (4) (gpm)	Annual (5) (MG)	Annual (5) (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.*