CONSOLIDATION FEASIBILITY STUDY

SEPTEMBER 2016

BIRD DOG FAMILY LTD PARTNERSHIP II

Owned and operated by Pintail Properties LLC
WSDOH System ID No. 52172

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

CONSOLIDATION FEASIBLITY STUDY

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Owned and operated by Pintail Properties LLC
WSDOH System ID No. 52172

OWNER
Mark and Ashley E. Mollotte

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
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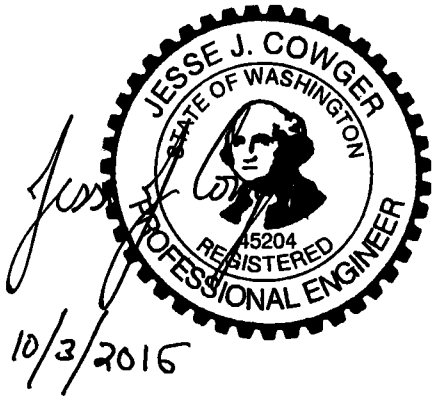

10/3/2016

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BIRD DOG FAMILY LTD PARTNERSHIP II

(OWNED BY PINTAIL PROPERTIES, LLC)

WSDOH WATER SYSTEM ID NO.52172

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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

Contact information for the Bird Dog Family LTD Partnership II water system:

Owner/Primary Contact
Mark & Ashley Mollotte

Address
Pintail Properties, LLC
P.O. Box 3041
864 S Taylor Road
Othello, WA 99344

Phone
509.331.3615

2.0 EXISTING SYSTEM

2.1 System Information

The Bird Dog Family LTD Partnership II water system was sold in late 2015 to Pintail Properties LLC.

The Bird Dog Family LTD Partnership II water system (hereinafter referred to as BDWS) is located on the south side of State Route 26 just west of the City of Othello City Limits, in Adams County in the north half of Section 9, Township 15 N, Range 29 E (see **Figure 2**).

At the time the data was gathered BDWS reported they have 51 domestic water services of which 45 are active connections and 6 are vacant (inactive).

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

2.2 Service Area

The BDWS service area is shown on **Figure 2**. The service area is approximately 16 acres.

The service area consists of one large parcel with a 44 unit residential housing complex and 7 single-family residential parcels.

Topography

The service area is generally flat and varies in elevation from approximately 1007 to 1017 amsl.

2.3 Inventory of Facilities

The BDWS is shown on **Figure 2**. The water system is a closed system (no gravity storage) with a well pump, underground cistern, booster pump, vertical steel pressure tank and distribution pipe.

The DOH Water Facilities Inventory (WFI) form lists the BDWS system as a Group A Community system serving a residential community. The system ownership is noted as "investor".

Supply

Supply is provided via one permanent well (S01). The only available source of information on supply is the DOH WFI and is summarized in the following table.

Table 2-1 Pintail Properties Water System Source Inventory [(1)]

Source Number	Source Name	Use	Metered	Depth	Treatment	Current Pumping Rate (gpm)
SO1	Well #1 – AFL228	Permanent	Yes	284 ft	None	33

[(1)] *Information obtained from the Water Facilities Inventory (last updated 6/1/2016 as of this writing)*

Storage

The BDWS is a closed system with a reported 8,000-gallon underground storage tank (which supplies the booster pump) and a vertical steel pressure tank with an estimated nominal volume of 845 gallons.

Distribution System

Per BDWS the distribution system consists of 3-inch PVC and 1-¼-inch HDPE mains with ¾-inch HDPE service pipe.

The owner/operator report the following issues with the distribution system:

- Distribution system piping too small
- Lack of service meters (only 6 of 51 connections metered)

Fire Flow

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

Table 2-2 Summary of Bird Dog Water System Components

System	Component	Description	
Supply	Well	ECY Well ID Tag:	AFL228
		Status:	Online
		Log available:	No
		Depth:	284
		Casing:	6" diameter casing
		Screen:	unknown
		Date constructed:	Approx. late 1950's
		SWL:	unknown
		Approx. wellhead elev.:	1014 amsl
		Present pumping rate:	35 gpm
		Pump/motor:	Submersible Turbine, 5 HP
		Discharge pressure:	unknown
		Enclosure:	Pump house (wood/cmu framed building with wood siding and metal roof)
		Location:	2241 W. Cunningham Rd., Othello, WA 99344
	Booster Pump	Pump/motor:	Centrifugal, 2 hp
		Present pumping rate:	Approx. 48 gpm (based on pump curve data researched from nameplate info)
Storage	Underground Reservoir	Construction Type:	Concrete
		Approx. base elevation:	1014'
		Date Constructed:	unknown
		Volume:	8,000 gallons (reported)
		Pressure zones served:	Supplies booster pump
		Location:	NW ½ of Section 7, Township 15N, Range 29E
	Pressure Tank	Construction type:	Steel
		Approx. base elevation:	1,014'
		Date constructed:	unknown
		Dimensions:	48" diameter x 108" height
		Volume:	845 gallons (nominal)
		Pressure zones served:	One
		Location:	NW ½ of Section 7, Township 15N, Range 29E
Distribution System	3"	~225 LF	
	1-1/4"	~720 LF	

System	Component	Description
	Main materials	PVC/HDPE
	Service Pressure	Approx.35 – 45 psi (reported by BDWS personnel)

2.4 Assessment of the Condition of the Existing Facilities

A site visit of the system facilities was conducted on December 3, 2015. The site visit included a tour of the system facilities. The following summarizes observations from the site visit regarding the condition of the existing facilities.

Supply

The well head is located inside the pump house. The well's 6-inch diameter steel casing was visible above ground and is capped by a steel flange, tapped for threaded galvanized steel pipe leading to the underground storage tank. The source meter is located on the piping between the well and the storage tank. 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 an underground 8,000 gallon concrete storage tank and an above ground 845 gallon vertical steel pressure tank.

The underground storage tank was not accessible and therefore not observable. BDWS reported the tank was inspected as part of the sales transaction in October of 2015 and was reported as in good condition.

The vertical steel tank appears from the outside to be in good condition with no observable defects.

BDWS reported adding storage as a medium priority improvement need.

Pump House

The pump house is a combination wood framed and CMU block building with metal roof and wood/CMU siding. The walls appear to be insulated and interior sheathed. All appeared to be in good condition.

The piping is galvanized steel with brass valves. The interior piping, booster pump, meter, 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. Few service meters exist.

Problems were reported by BDWS related to the distributions system which include inconvenient location of mains and inadequately sized mains.

BDWS reported replacing the distribution system as a medium priority need and installation of service meters as a high priority.

2.5 Water Use, System Demands and Water Rights

2.5.1 Population/Connections

Existing

The system is reported to provide service to 51 connections.

- Existing Connections: 51
    - 44 multi-family housing units on one large parcel
    - 7 single-family residential housing units on individual parcels

The current population is reported by BDWS as 200 persons.

- Existing population: 200
    - Approximately 3.9 persons per housing unit

Projected

As described in Section 2.2 the service area is comprised of a roughly 16 acre multi-family and single-family residential area.

There are 7 single-family private residential lots in the service area. All lots are built on and occupied. Growth cannot happen on these lots unless annexed and zoning changed.

The approximately 15 acre multi-family housing complex currently consists of 44 housing units. It is the desire of Pintail Properties LLC to expand this housing complex to a total of 100 units. The final expansion number will be dependent on many factors including adequate sewer and water service and annexation into the City of Othello.

The projected future connections are as follows:

- Projected Connections: 107
    - 100 multi-family housing units on single large lot
    - 7 single-family residential housing units on individual lots

The projected future population is as follows:

- Projected population: 417
    - Assuming 3.9 persons per housing unit

2.5.2 Water Use

The water system was recently purchased and the records provided by the previous owner were disorganized and incomplete. The available water use data used to estimate current water use consisted of the following:

- Sporadic source meter readings between November 14, 2001 and December 2, 2003
- Metered source readings for December 3, 2015 through February 8, 2016
- Metered water use records for the 6 individually metered parcels between March 2015 and January 2016
- Water Use Efficiency Annual Performance Reports (from DOH): 2010-2014

Meter Readings

Source Meter

Handwritten notepad records were provided which reportedly represent source meter readings between November 14, 2001 and December 2, 2003. The meter was read sporadically throughout the year ranging from readings 1 day apart to readings over 100 days apart. Readings were also not taken at the beginning and end of the data years. Annual water use estimates for 2002 and 2003 were extrapolated from this data.

The source meter was read during the site visit on 12/3/15 and source meter readings were provided for 12/8/15, 1/13/16 and 2/8/16. Annual water use was estimated for 2016 based on these readings.

Table 2-3 Source Meter Water Use Data

Year	Estimated Annual Water Use (gal)	Average Daily Water Use (gpd)	Estimated Units (total/occupied)	Est. Water Use per Unit (gpd)
2002 (1)	4,809,000	13,176	51/51 (4)	258
2003 (1)	5,025,000	13,766	51/51 (4)	270
Current (2)	4,137,000 (3)	11,355	51/42 (5)	270

(1) *Information provided by previous owner*
(2) *Information provided by current owner for period 12/3/15 – 2/8/16*
(3) *Calculated based on annualizing the 11,355 gpd from the data period 12/3/15 – 2/8/16*
(4) *Assumed fully occupied*
(5) *Current occupancy as provided by current owner*

Service Meter

Service meter readings were provided for the 6 individually metered single-family lots for the period 3/4/15 to 1/5/16.

Table 2-4 Service Meter Water Use Data

Description	Units
Period	271 days
Total Water Use (gal.)	474,600
Households	6
Average Water Use per household (gal.)	79,100
Average Water Use per household (gpd)	292
Estimated persons per household (1)	3.13
Estimated gpcd	93

(1) *The 3.9 persons per household figure from Section 2.5.1 was not used to represent the single family residences as these residences are not part of the migrant worker housing and are not expected to have the same values. These residences are better represented by the US Census Bureau estimates which were 3.13 the persons per household in Othello between 2009 and 2013.*

Water Use Efficiency Annual Performance Reports

The Water Use Efficiency Annual Performance Reports were available for the period 2010-2014. These reports were downloaded from the DOH website and are shown below. The source data and accuracy of these reports is unknown.

Table 2-5 Water Use Efficiency Report Water Use Data

Year	Estimated Annual Water Use (gal)	Average Daily Water Use (gpd)	Estimated Units (total)	Est. Water Use per Unit (gpd)
2010	132,000	362	51	7
2011	3,660,000	10,027	51	197
2012	3,650,000	10,000	51	196
2013	5,459,128	14,957	51	293
2014	6,331,775	17,347	51	340

Analysis

The Washington State DOH Water System Design Manual (WSDM) Chapter 5 states "When reliable water demand information is available for a given water system, the engineer **must** use it for the water system design." Since there was no source data provided to support the Water Use Efficiency Annual Performance Report numbers the source meter data from Tables 2-3 and 2-4 will be used to estimate current and projected water use.

The estimated current water use used to evaluate the capacity of the existing system will be based on full occupancy of the 51 existing residential units.

The 270 gpd/unit from Table 2-3 will be used to estimate the current water use. The 292 gpd/unit estimated in Table 2-4 was not used as this value is related to the single-family residences and the smaller rental units are expected to use less water. Therefore the overall system per unit value of 270 gpd/unit from Table 2-3 will be used. Current water use is shown on the following table.

Table 2-6: Current Estimated Annual Water Use

Year	Estimated Annual Water Use (1) (gal)	Average Daily Water Use (gpd)	Estimated Units (1) (total)	Water Use per Unit (gpd)
Current	5,026,000	13,770	51	270

(1) *From Table 2-6*

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 BDWS water use to the City of Othello water use.

Table 2-7: ERUs

Description	Values	
Total estimated annual water use (1)	5,026,000	gpd
Number of residential units (2)	51	each
Average daily water use per residential unit	**270**	**gal**
City of Othello gpd/ERU value (3)	453	gpd/ERU
City of Othello ERUs (4)	**30**	**ERUs**

(1) *From Table 2-6*
(2) *From Section 2.5.1*
(3) *Based on current water use data from 2013, 2014 and 2015*
(4) *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 2-8: Current Water System Demands

	ADD			MDD (2)			PHD (3)	Annual	
ERUs (1)	gpd/ERU (1)	(gpd)	(gpm)	gpd/ERU	(gpd)	(gpm)	(gpm)	(gal.)	(acre-ft/yr)
30	453	13,800	10	957	29,100	20	79	5,037,000	15.5

(1) *From Table 2-7*
(2) *MDD = ADD x 2.11; based on MLWA, ACWD#1, BVWA, HEWS and SWWA average ADD:MDD*
(3) *PHD = (MDD/1440)(CN+F)+18, where C = 3.0, N = ERUs and F = 0; WSDOH WSDM Equation 5-1*

Future

Future water use will be based on the projected connections from Section 2.5.1 and the most recent "average daily water use per residential unit" from Table 2-7.

Table 2-9: Estimated Future Water Use and ERUs

Description	Values	
Average daily water use per residential unit (1)	270	gpd
Projected Residential Units (2)	107	each
Estimated Annual Water Use	**10,545,000**	**gal**
City of Othello gpd/ERU value (3)	453	gpd/ERU
City of Othello ERUs (4)	**64**	**ERUs**

(1) *From Table 2-6*
(2) *From Section 2.5.1*
(3) *Based on current water use data from 2013, 2014 and 2015*
(4) *Average daily water use (total annual divided by 365) divided by 453 gpd/ERU*

Future water system demands are estimated on the following table:

Table 2-10: Estimated Future Water System Demands

	ADD			MDD [3]			PHD [4]	Annual	
ERUs [1]	gpd/ERU [2]	(gpd)	(gpm)	gpd/ERU	(gpd)	(gpm)	(gpm)	(gal.)	(ac-ft/yr)
64	453	29,000	20	957	61,300	43	141	10,585,000	32.5

(1) *From Table 2-9*
(2) *From June 2011 City of Othello Water System Plan (WSP) by Gray & Osborne, Inc.*
(3) *MDD = ADD x 2.11; based on MLWA, ACWD#1, BVWA, HEWS and SWWA average ADD:MDD*
(4) *PHD = (MDD/1440)(CN+F)+18, where C = 2.5, N = ERUs and F = 25; WSDOH WSDM Equation 5-1*

2.5.5 Water Rights

BDWS does not have a water right claim or certificate and appears to be currently 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 (gpd).

On March 11, 2015 the system received a letter from the Washington State Department of Ecology (ECY) stating the system was exceeding the water use allowed under the permit exempt well and was ordered to stop providing water in excess of 5,000 gpd.

On March 17, 2015 the City of Othello wrote a letter on behalf of the water system expressing their concern that immediate cessation of water service to the approximate 200 persons served by the water system would create difficulties for these persons. The City requested ECY allow the system to continue to operate until the Consolidation Feasibility Study was completed and a plan to remedy the water rights situation was identified. See the **Appendix B** for a copy of these letters.

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 are used as the basis for BDWS 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.

BDWS operates a "closed" system meaning the system is closed to the atmosphere (i.e. pressure storage tank) with a two part supply system consisting of a well supplying an underground storage tank and a booster pump supplying the distribution system from the storage tank. BDWS does not provide FSS. Each part of the supply system will be evaluated individually based on its own criteria.

Since the BDWS is a closed system with a two part supply system and does not provide FSS, the criteria used to evaluate the BDWS well supply will be based on the criteria above and the distribution system supply will be based on the DOH WSDM criteria for closed system booster pump station, therefore the supply criteria is as follows:

Well Supply (well pump)

- Supply MDD with equalizing storage sufficient to supply PHD

Distribution Supply (booster pump)

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

2.6.2 Treatment

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

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

2.6.3 Storage

BDWS is a closed system with equalizing storage, standby storage and a single vertical steel pressure tank.

Underground Storage Reservoir

The underground storage reservoir provides equalizing storage and standby storage will be evaluated based on the DOH WSDM Chapter 9 "Reservoir and Storage Volume".

- Equation 9-1: $ES = (PHD - Q_S)\ (150\ min.)$

Where:

ES = Equalizing storage component, in gallons

PHD = Peak hourly demand, in gpm

Q_S[(1)] = Sum of all active supply source capacities, except emergency supply, in gpm

(1) Q_S in this case is source of supply to the distribution system which is provided by the booster pump

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

Where:

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

Vertical Pressure Tank

The vertical pressure tank maintains system pressure when the booster pump is off. The criteria used to evaluate the vertical pressure tank are 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

BDWS does not provide fire flow or FSS and therefore will not be evaluated for fire flow. Provision of Fire Flow is a requirement of the City of Othello so consolidation options 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 (feet per second) in the system pipes.

2.6.6 Water Rights

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

2.7 Evaluation/Deficiencies

2.7.1 Supply

The BDWS supply consists of two parts:

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

2.7.1.1 Supply (well pump)

Criteria

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

Required Capacity

Current MDD = 20 gpm (Table 2-8)

Future MDD = 43 gpm (Table 2-10)

Current Capacity

Current capacity = 35 gpm (Table 2-2)

Evaluation

The current well capacity of 35 gpm is adequate to meet the current MDD of 20 gpm.

The current well capacity of 35 gpm is inadequate to provide the estimated future MDD of 43 gpm.

Deficiencies

The supply is deficient 8 gpm to supply to future estimated MDD.

2.7.1.2 Supply (booster pump)

Criteria

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

Required Capacity

Current PHD = 79 gpm (Table 2-8)

Future PHD = 141 gpm (Table 2-10)

Current Capacity

Current capacity = 48 gpm (Table 2-2)

Evaluation

Current booster pump capacity is inadequate to supply current PHD.

Current booster pump capacity is inadequate to supply future PHD.

Deficiencies

Current booster pump capacity is deficient 31 gpm to supply current PHD.

Current booster pump capacity is deficient 93 gpm to supply future PHD.

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

IOC test data was downloaded from the DOH Sentry website and is shown on the following table.

Table 2-11: Water Quality Test Results - IOC [(1)]

ANALYTE	RESULT (3/25/2011)	RESULT (4/6/2010)	RESULT (9/5/2007)	UNITS	SRL [(2)]	Trigger	MCL	Exceeds MCL (X if yes)
Arsenic	<	0.003	0.004	mg/l	0.001	0.010	0.010	
Barium	0.0343	0.33	<	mg/l	0.1	2	2	
Cadmium	<	<	<	mg/l	0.001	0.005	0.005	
Chromium	0.0001	<	<	mg/l	0.007	0.1	0.1	
Mercury	<	<	<	mg/l	0.0002	0.002	0.002	
Selenium	<	0.007	0.008	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	
Thallium	<	<	<	mg/l	0.001	0.002	0.002	
Cyanide	<	<	<	mg/l	0.05	0.2	0.2	
Fluoride	0.9100	0.7500	0.6600	mg/l	0.2	2.0	4.0	
Nitrite – N	<	<	<	mg/l	0.1	0.5	1.0	
Nitrate – N	2.390	2.340	2.480	mg/l	0.5	5.0	10.0	
Total Nitrate/Nitrite-N	2.390	2.340	2.480	mg/l	0.5	5.0	10.0	
Iron	0.0060	<	<	mg/l	0.1	--	0.31	
Manganese	<	0.0002	<	mg/l	0.01	--	0.051	
Silver	<	<	<	mg/l	0.1	--	0.11	
Chloride	15.0	16.2	<	mg/l	20	--	2501	
Sulfate	50.0	50.2	53.0	mg/l	50	--	2501	
Zinc	0.007	0.005	<	mg/l	0.2	--	51	
Sodium	47.9	48.4	48.8	mg/l	5	--	--	
Hardness	120.0	118.0	124.0	mg/l	10	--	--	
Conductivity	489.0	435.0	484.0	µmhos/cm	70	--	7001	
Turbidity	0.02	<	0.08	NTU	0.1	--	--	

ANALYTE	RESULT (3/25/2011)	RESULT (4/6/2010)	RESULT (9/5/2007)	UNITS	SRL (2)	Trigger	MCL	Exceeds MCL (X if yes)
Color	2.0	3.0	<	CU	15	--	151	
Total Dissolved Solids	NA	NA	NA	mg/l	100	--	5001	
Nickel	<	0.0004	<	mg/l	0.005	--	--	
Lead	<	<	<	mg/l	0.001	--	--	
Copper	0.003	0.0099	<	mg/l	0.02	--	--	

(1) *"NA" indicates "not analyzed", "<" indicates "less than state reporting level"*
(2) *State Reporting Level*

The system does not chlorinate. There appears to be a past history of total coliform hits (none since 2012). A review of the DOH Sentry website indicates the system has no current water quality violations. Past coliform issues may have been due to poor sampling technique rather than a contamination issue with the source or the distribution system.

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

Deficiencies

None.

2.7.3 Storage

2.7.3.1 Underground Storage Reservoir

Criteria

- Equation 9-1: $ES = (PHD - Q_S)$ (150 min.)
- Equation 9-2: $SB_{TSS} = (2 \text{ days})(ADD)(N)$

Required Capacity

From Table 2-8 the current PHD is 79 gpm and from Table 2-2 the Q_S is 35 gpm.

$ES = (79-35)(150) = 6{,}600$ gallons

From Table 2-10 the estimated future PHD is 141 gpm and from Table 2-2 the Q_S is 35 gpm. The required capacity analysis will assume the Q_S is increased to meet the future MDD (see Section 2.7.1), therefore the assumed future Q_S is 43 gpm and the required future equalizing storage is:

$ES = (141-43)(150) = 14{,}700$ gallons

From Table 2-8 the current/future ADD is 453 gpd/ERU and from Table 2-8 the current N (ERUs) is 30 (rounded to nearest 100 gallons).

$SB_{TSS} = (2 \text{ days})(453)(30) = 27{,}200$ gallons

From Table 2-10 the current/future ADD is 453 gpd/ERU and from Table 2-5 the future N (ERUs) is 64 (rounded to nearest 100 gallons).

SB_{TSS} = (2 days)(453)(64) = 58,000 gallons

Total Storage Required:

Current = 33,800 gallons

Future = 72,700 gallons

Current Capacity

Per Table 2-2 the current storage capacity is 8,000 gallons.

Evaluation

The current storage capacity of 8,000 gallons is inadequate for current or future equalizing and standby storage needs.

Deficiencies

Current storage is deficient by 25,800 gallons for current equalizing/standby storage.

Current storage is deficient by 64,700 gallons for future equalizing/standby storage.

2.7.3.2 Pressure Tank

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:

Item	Existing	Estimated Current System Demands	Estimated Future System Demands
Vt	**763 gallons**	**1,220 gallons**	**2,151 gallons**
P1	45 psi	45 psi	45 psi
P2	35 psi	35 psi	35 psi
Nc	6 cycles per hour	6 cycles per hour	6 cycles per hour
Q_P	48 gpm (1)	79 gpm (2)	141 gpm (3)
D	48"	48"	48"

(1) *Existing Booster Pump Capacity (from Table 2-2)*
(2) *Estimated required pump capacity to meet current PHD based on DOH criteria that booster pump must provide PHD. PHD from Table 2-8*
(3) *Estimated required pump capacity to meet future PHD based on DOH criteria that booster pump must provide PHD. PHD from Table 2-10*

Current Capacity

Per Table 2-2 the current pressure tank capacity is 845 gallons.

Evaluation

The current pressure tank capacity of 845 gallons is inadequate for current and future needs, assuming existing booster pump is replaced with booster pump with the capacity to meet the estimated PHD.

If the pump is to be replaced to meet current PHD a pump could be selected that can provide the capacity at a higher pressure and using a 20 psi pressure range (40 psi – 60 psi) the existing pressure tank would be sufficient. This setup would be insufficient for future system demands.

Item	Estimated Current System Demands	Estimated Future System Demands
Vt	**781 gallons**	**1,363 gallons**
P1	60 psi	60 psi
P2	40 psi	40 psi
Nc	6 cycles per hour	6 cycles per hour
Q_P	79 gpm	141 gpm
D	48"	48"

This setup, besides allowing the current pressure tank to remain in service, would increase the low pressure by 5 psi which would benefit the distribution system. The downside is a 20 psi difference in operational system pressures will be noticeable.

Deficiencies (assuming pressures remain unchanged)

The pressure tank capacity is deficient by 375 gallons to meet current estimated PHD.

The pressure tank capacity is deficient by 1,306 gallons to meet future estimated PHD.

2.7.4 Fire Flow

The BDWS 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.

Existing System

The existing water system is shown on **Figure 2**. Based on the reported lowest pressure tank setting there is a maximum 5 psi pressure loss available.

Current Capacity

The distribution is reported to consist of 3-inch and 1.25-inch diameter water mains.

Evaluation

Based on the information provided by BDWS a hydraulic model of the distribution system was created in Bentley WaterCAD V8i (see **Figure 3**). The distribution system evaluation is limited to the current distribution using current estimated system demands. Future conditions were not modeled as there are no current plans for the expansion beyond the target number of future units.

The current estimated PHD of 79 gpm (Table 2-8) was split equally (1.55 gpm/connection) between the 51 current connections and distributed regionally at nodes placed along the distribution pipes. Nodes were analyzed to determine system pressure under static and PHD demand conditions under the "low" pressure condition (when the pump is called to "on").

Note that the current booster pump capacity (Section 2.7.1.2) does not currently have the capacity to deliver the estimated PHD of 79 gpm. This section evaluates the distribution system under the estimated PHD demands without regard to the booster pump capacity.

Table 2-12a Hydraulic Analysis Pipe Report – Current PHD

Label	Approximate Length (ft.)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
P-1	20	3	PVC	150	54	2.47
P-2	202	3	PVC	150	9	0.40
P-3	84	1-1/4	PVC	150	46	11.91
P-4	66	1-1/4	PVC	150	38	9.99
P-5	55	1-1/4	PVC	150	31	8.07
P-6	76	1-1/4	PVC	150	19	5.00
P-7	75	1-1/4	PVC	150	10	2.69
P-8	84	1-1/4	PVC	150	6	1.54
P-9	43	1-1/4	PVC	150	6	1.54
P-10	44	1-1/4	PVC	150	6	1.54
P-11	41	1-1/4	PVC	150	21	5.38
P-12	89	1-1/4	PVC	150	13	3.46
P-13	59	1-1/4	PVC	150	1	0.38

Table 2-12b Hydraulic Analysis Junction Report – Current PHD

Label	Elevation (ft.)	Demand (gpm)	Static Pressure (psi)	Pressure under PHD Demands (psi)
J-1	1014	0.00	35	35
J-2	1014	8.82	35	35
J-3	1015	7.35	35	20
J-4	1015	7.35	35	12
J-5	1013	5.88	35	9
J-6	1011	2.94	36	7
J-7	1008	4.41	38	8
J-8	1007	5.88	38	8
J-9	1009	5.88	37	8
J-10	1012	5.88	36	9
J-11	1014	7.35	35	33
J-12	1011	11.76	36	33
J-13	1007	1.47	38	35

Deficiencies

The hydraulic analysis identified pipe runs with velocities in excess of 8 fps (shaded) and system pressures below 30 psi (shaded). Replacing pipes P-3, P-4 and P-5 with 3-inch diameter pipe will correct these deficiencies as shown in the following tables.

Table 2-13a Hydraulic Analysis Pipe Report – Current PHD w/Improvements

Label	Length (Scaled) (ft.)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
P-1	20	3	PVC	150	54	2.47
P-2	202	3	PVC	150	9	0.40
P-3	84	3	PVC	150	46	2.07
P-4	66	3	PVC	150	38	1.73
P-5	55	3	PVC	150	31	1.40
P-6	76	1-1/4	PVC	150	19	5.00
P-7	75	1-1/4	PVC	150	10	2.69
P-8	84	1-1/4	PVC	150	6	1.54
P-9	43	1-1/4	PVC	150	6	1.54
P-10	44	1-1/4	PVC	150	6	1.54
P-11	41	1-1/4	PVC	150	21	5.38
P-12	89	1-1/4	PVC	150	13	3.46
P-13	59	1-1/4	PVC	150	1	0.38

Table 2-13b Hydraulic Analysis Junction Report – Current PHD w/Improvements

Label	Elevation (ft.)	Demand (gpm)	Static Pressure (psi)	Pressure under PHD Demands (psi)
J-1	1014	0.00	35	35
J-2	1014	8.82	35	35
J-3	1015	7.35	35	34
J-4	1015	7.35	35	34
J-5	1013	5.88	35	35
J-6	1011	2.94	36	33
J-7	1008	4.41	38	34
J-8	1007	5.88	38	34
J-9	1009	5.88	37	34
J-10	1012	5.88	36	35
J-11	1014	7.35	35	33
J-12	1011	11.76	36	33
J-13	1007	1.47	38	35

2.7.6 Water Rights

Criteria

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

Existing Water Right

From Section 2.5.5 BDWS appears to be withdrawing water based on a permit exempt well per RCW 90.44.050 with a maximum legal withdrawal rate of 5,000 gpd which equates to a maximum annual withdrawal amount of 1.825 MG (5.6 acre/ft).

Evaluation

The following table compares the estimated annual water use and calculated maximum day water use to the water right.

Table 2-14 Annual Water Use and Water Rights

Description	MDD [1] (gpd)	(Deficiency) (gal.)	Annual [1] (gal.)	Annual (acre-ft/yr)	(Deficiency) (acre-ft/yr)
Current	29,100	(24,100)	5,037,000	15.5	(9.9)
Future	61,300	(56,300)	10,585,000	32.5	(26.9)

[1] *From Table 2-8 and Table 2-10*

Based on the above table the water system is exceeding its water right, both daily and annually, in both the current and future scenarios. This confirms the letter sent by ECY.

Deficiencies

Under current estimated water use the water right is deficient by 24,100 gpd (MDD) and 9.9 ac-ft/yr annually.

Under future estimated water use the water right is deficient by 56,300 gpd (MDD) and 26.9 acre-ft/yr annually.

2.7.7 Summary of Deficiencies

The following table summarized the deficiencies.

Table 2-15 Summary of Deficiencies

System Component	Current System Capacity	Current Needs	Current Deficiency	Future Needs	Future Deficiency
Supply (well pump)	35 gpm	20 gpm	none	43 gpm	8 gpm
Supply (booster pump)	48 gpm	79 gpm	31 gpm	141 gpm	93 gpm
Treatment	No known issues		none		none
Storage (atmospheric)	8,000 gal.	33,800 gal.	25,800 gal.	72,700 gal.	64,700 gal.
Storage (pressure)	845 gal.	1,220 gal.	375 gal.	2,151 gal.	1,306 gal.
Fire Flow	n/a	n/a	n/a	n/a	n/a
Distribution	inadequate		inadequate		inadequate
Water Rights (daily)	5,000 gpd	29,100 gpd	24,100 gpd	61,300 gpd	56,300 gpd
Water Rights (Qi)	~4 gpm	35 gpm	31 gpm	35 gpm	31 gpm
Water Rights (Qa)	5.6 ac-ft/yr	15.5 ac-ft/yr	9.9 ac-ft/yr	32.5 ac-ft/yr	26.9 ac-ft/yr

(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 required well pump capacity*

The deficiencies noted above relate to the existing system configuration. Changing the system configuration will change the individual component deficiencies. For example, the atmospheric storage and supply (booster pump) deficiencies can both be eliminated by increasing supply (well pump) capacity, but will increase the water right (Qi) deficiency. Another example, the Storage (pressure) deficiency can be addressed by increasing the supply (booster pump) and installing a VFD to provide better supply for low demand scenarios.

This report will base analysis and costs on the system remaining as currently configured and deficiencies noted above.

2.8 System Finances

Pintail Properties LLC recently purchased the system and at this time has no historical operation and maintenance records. Their current operation budget does not itemize the water system expenses separate from the overall operation and maintenance expenses of the 44 unit complex. Therefore the annual water system operation budget was estimated on the following table.

Table 2-16 Estimated Annual Operation Budget

Description	
INCOME	
Water Fees (portion of rent to devote to water system to cover expenses/reserves) - 44 units @ $10 per unit/month	$ 5,280.00
Water Fees (6 metered private connections) (1)	$ 2,900.00
Water Fees (1 unmetered private connection) (2)	$ 480.00
Estimated Income from private connections	$ 8,660.00
EXPENSES	
Power (well pump, booster pump)	$ 750.00
Bookkeeping (assume 4 hrs/mo. @ $25/hr)	$ 1,200.00
Maintenance person (assume 4 hrs/mo. @ $30/hr)	$ 1,440.00
Testing Lab (WQ Testing)	$ 500.00
Certified Operator (assume $200/mo. to retain)	$ 2,400.00
Total Estimated Annual Expenses	$ 6,290.00
RESERVES	
Well pump replacement (assume $10,000/10 yrs)	$ 1,000.00
Booster Pump replacement (assume $1k/3 yrs)	$ 333.00
Leak repair (assume $500/yr)	$ 500.00
Other repairs (assume $500/yr)	$ 500.00
Total Estimated Annual Reserves	$ 2,333.00
Total Estimated Annual Expenses/Reserves	$ 8,623.00
BALANCE	$ 37

(1) *Based on service meter readings provided by* BDWS *for the period March 2015 – November 2015 extrapolated over a 12 month period*

(2) *Based on average water fee for metered residences of $40/mo. applied to a 12 month period.*

3.0 CONSOLIDATION

3.1 Improvements required to meet City Standards

3.1.1 Supply

The existing BDWS 6-inch diameter well, with a 35 gpm capacity, is likely inadequate for the City to utilize cost-effectively for supply. The well is also located on private property without public access for the City to operate and maintain effectively. Therefore this well would likely be required to be abandoned by the system 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, and to provide 1,000 gpm fire flows as required by the City for residential areas, the following distribution system improvements are required (see **Figure 4**):

- Replace the existing 3-inch diameter water mains within City right-of-ways with a minimum 8-inch diameter DI/PVC water main, relocated from alley to street, relocate meters to property line
- Install new meter, backflow assembly and connection to Pintail Properties development, meter large enough to serve the proposed expansion and provide fire flow
    - Pintail Properties LLC will be responsible for water mains/service connections on their property and will continue to own, operate and maintain the distribution system on their property
    - Pintail Properties LLC will no longer be responsible for providing water service or billing the 7 private residences currently served by the BDWS, water service and billing will be provided by the City of Othello post-consolidation
- Install a sampling station
- Replace the service meters with service meters per City standards
- Install new service lines between the main and new meter
- Relocate meters to edge of right-of-way
- Install fire hydrants at the spacing required per City standards

3.1.3 Storage

The existing underground reservoir and 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 a consolidation. The City storage reservoirs have sufficient capacity to provide the required 1,000 gpm/2 hrs FSS for BDWS.

3.1.4 Estimated Cost of Improvements to meet City of Othello's Water System Standards

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

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

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

(1) *Based on recent bid tabulations and pipe material costs – assumes PVC C900/905 mains*

(2) *Based on review of recent bid tabulations and one connection detail every 400 ft.*

(3) *Based on review of recent bid tabulations and one connection detail every 750 ft.*

(4) *Assume one hydrant every 500 ft.*

(5) *Assume one service every 1000 ft*

(6) *Assume one service every 50 ft*

(7) *Assume 6' wide restoration, 1 HMA patch for water/road crossing every 1,500 ft, cover crop hydroseed over remainder of ditch*

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 BDWS 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. Quan.	Units	Unit Price	Amount
Main & install (8-inch PVC)	350	LF	$ 28	$ 9,800
Valves, fittings, restraints	350	LF	$ 13	$ 4,550
Fire hydrants	350	LF	$ 9	$ 3,150
Service connections	350	LF	$ 36	$ 12,600
Surface replacement	350	LF	$ 10	$ 3,500
Sampling Station	1	EA	$ 2,000	$ 2,000
Meter vault (inc. 8-inch meter for fire flow, 4-inch meter for domestic use)	1	EA	$ 20,000	$ 20,000

Description	Est. Quan.	Units	Unit Price	Amount
Subtotal				$ 56,000
Mobilization 10%				$ 6,000
Contingency 20%				$ 11,000
Estimated construction cost				$ 73,000
Environmental approvals 10% (assuming must meet DWSRF loan requirements)				$ 7,000
Engineering 25% (design, construction management/inspection)				$ 18,000
ESTIMATED PROJECT COST				$ 98,000

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

3.2.1 Transmission Main Routing

The nearest City water main is on Moon St., approximately 300 feet west of State Route 24 at Roosevelt Ave. City water service can be extended to BDWS by constructing a transmission main from Moon St./Roosevelt Ave. west on Moon St. approximately 2,000 feet to connect to the Pintail Properties water system.

This proposed extension route was reviewed with the City of Othello Public Works and Water Department personnel. Per the City of Othello Public Works department, the City will require the system be looped back which requires crossing State Route 26 and reconnecting to the City system at Broadway Ave. north of State Route 26. This loop will also allow the business north of BDWS to connect to the City system also and provide a cost sharing partner to BDWS for the water main extension. BDWS should also consider discussing late comer fees with the City as another way to offset the long-term cost of the extension.

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

3.2.2 Transmission Main Sizing

Hydraulic Analysis Model

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

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

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

Service to the City of Othello UGA

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

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

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

Criteria

The 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)
- Commercial fire flow = 3,000 gpm (provided by City of Othello)
- Industrial fire flow = 2,500 gpm (provided by City of Othello)

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 BDWS 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.)	Loop Main [4] Dia. (in.)
BDWS [1]	64	43	141	1000	PHD	141	8	8
City of Othello UGA Area 2 [2]	453	188	305	3000	PHD	305	8	8
BDWS [1]	64	43	141	1000	MDD/FF	1043	8	8
City of Othello UGA Area 2 [2]	453	188	305	3000	MDD/FF	3188	12	8

(1) *From Table 2-10*
(2) *See **Appendix C***
(3) *Moon St. from Broadway Ave. to BDWS*
(4) *From* BDWS*, north across SR 26 and back to Broadway Ave.*

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. Quan.	Unit	Unit Price	Amount (8" T-Main) (8" Loop Main)	Amount (12" T-Main) (8" Loop Main)
Main & install (8-inch PVC Loop Main)	3200	LF	$ 28	$ 89,600	$ 89,600
Main & install (8-inch PVC T-Main)	2600	LF	$ 28	$ 72,800	
Main & install (12-inch PVC T-Main)	2600	LF	$ 35		$ 91,000
Valves, fittings, restraints (8-inch PVC Loop Main)	3200	LF	$ 7	$ 22,400	$ 22,400
Valves, fittings, restraints (8-inch PVC T-Main)	2600	LF	$ 7	$ 18,200	
Valves, fittings, restraints (12-inch PVC T-Main)	2600	LF	$ 10		$ 26,000
Fire hydrants (T-Main/Loop Main)	5800	LF	$ 9	$ 52,200	$ 52,200
Service connections (T-Main/Loop Main)	5800	LF	$ 2	$ 11,600	$ 11,600
Surface replacement	2800	LF	$ 2	$ 5,600	$ 5,600
RR Crossing Bore (Loop Main, 16" casing, 8" carrier pipe)	60	LF	$ 500	$ 30,000	
RR Crossing Bore (T-Main, 16" casing, 8" carrier pipe)	60	LF	$ 500	$ 30,000	$ 30,000
RR Crossing Bore (T-Main, 24" casing, 12" carrier pipe)	60	LF	$ 600		$ 36,000

Description	Est. Quan.	Unit	Unit Price	Amount (8" T-Main) (8" Loop Main)	Amount (12" T-Main) (8" Loop Main)
SR 26 Crossing Bore (T-Main, 16" casing, 8" carrier pipe)	75	EA	$ 500	$ 37,500	
SR 26 Crossing Bore (T-Main, 24" casing, 12" carrier pipe)	75	EA	$ 600		$ 45,000
Sampling Station	2	EA	$ 2,000	$ 4,000	$ 4,000
			Subtotal	$ 374,000	$ 413,000
			Mobilization 10%	$ 37,000	$ 41,000
			Contingency 20%	$ 75,000	$ 83,000
			Estimated construction cost	$ 486,000	$ 537,000
			Environmental approvals 10% (assuming must meet DWSRF loan requirements)	$ 49,000	$ 54,000
			Engineering 25% (design, construction management/inspection)	$ 122,000	$ 134,000
			ESTIMATED PROJECT COST	$ 657,000	$ 725,000

3.3 Estimated Impact to City System

The impact of consolidating the BDWS 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 BDWS system demands from Table 2-8 and 2-10.

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 BDWS 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				
BDWS	Current [4]	20				
Total		4,720	347	5,067	7,155	2,088
City of Othello	Current [3]	4,700				
BDWS	Future [5]	43				
Total		4,743	347	5,090	7,155	2,065

(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*
(1) *From Table 3-7*
(2) *From Table 3-6*
(3) *From Table 2-8*
(4) *From Table 2-10*

Conclusion

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

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

3.3.2 Distribution

Criteria

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

Hydraulic Analysis Model

As described in Section 3.2.2.

Evaluation

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

The hydraulic model was then run adding the BDWS 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 BDWS 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)

- $SB = (2 \text{ days})[(ADD)(ERUs) – t_M (Q_S-Q_L)]$

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 BDWS will not change the pump setting or OS volume.

Equalizing Storage

Description	PHD (gpm)	Qs [1] (gpm)	Duration (min.)	ES (gal.)
Othello	7,600	7,155	150	66,750
BDWS	141	7,155	150	0
Combined	7,741	7,155	150	87,900

(1) *From Table 3-7*
(2) *From Table 3-6*
(3) *From Table 2-10*

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
BDWS	2	453	64	1440	7155	2500	<0	12,800
Combined	2	453	10,554	1440	7155	2500	<0	2,110,800

Fire Suppression Storage

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

Dead Storage

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

Storage Comparison

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

Table 3-9 Storage Comparison

Description	CITY OF OTHELLO		OTHELLO/BDWS	
	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		87,900
Bottom of ES (2)	1203.9		1203.5	
SB		2,098,013		2,110,800
Bottom of SB (3)	1168.9		1168.5	
FSS		1,500,000		1,500,000
Bottom of FSS (4)	1178.9		1178.5	
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 BDWS 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	<	Maximum annual withdrawal (Qa)

(based on current water use data)

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 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)
BDWS	0	32.5 (2)
Total	7,155	5,332.5
Water Right	9,550	7,100
Excess/(deficiency)	2,395	1,767.5
BDWS Water Rights Transfer	75 (3)	5.6 (4)
City of Othello Water Rights post Consolidation (5)	9,625	7105.6

(1) *From Table 3-6*
(2) *From Table 2-10*
(3) *Estimated based on current* BDWS *PHD*
(4) *5,000 gpd x 365 days*
(5) *Estimated amounts, actual amount would be determined by ECY*

Conclusion

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

Based on estimated future water use from Table 2-10, extending water service to BDWS will not affect Qi and will use 32 acre-ft/yr of the City's Qa. Consolidating with BDWS and acquiring the water right associated with BDWS's exempt well could potentially add 75 gpm (current BDWS 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 partially offset the BDWS 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

The capital cost for the improvements needed to correct the system deficiencies identified in Table 2-15 are estimated in the following table.

Table 3-12 Estimated Capital Improvements Cost

Description	Est. Amount	
Replace existing 35 gpm well pump with 43 gpm well pump (new pump, column, panel, wiring, etc.)	$	15,000
Replace existing 48 gpm booster pump with new duplex 141 gpm booster pump system (packaged duplex pump system, power, control panel, piping, etc.)	$	20,000
Replace existing 8,000 gallon storage tank with new 73,000 gallon underground storage tank (precast tank(s), piping, level controls, etc.)	$	75,000
Replace existing 845 gallon pressure tank with 2100 gallon pressure tank	$	15,000
Increase water rights (purchase 27 acre-ft/yr @ $3,400 per acre-ft) (1)(2)	$	92,000
Distribution System Improvements (3)	$	8,000
Estimated Cost of Capital Improvements	$	225,000
Estimated Annual Debt Service (assuming 5% for 10 yrs) (4)	$	29,100

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

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

(3) *Estimate includes the recommendation from Section 2.7.5 to replace 205 LF of existing pipe with 3-inch pipe. Distribution system extension to serve future development is not estimated as the future layout and distribution system requirements are unknown.*

(4) *It is assumed private financing will be needed to expand the system for the primary benefit of a private development*

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

Table 3-13 Estimated Operation and Maintenance Cost

Description	Amount	
Annual O&M [1]	$	17,000
Income from 7 water system customers [2]	$	(3,400)
Estimated annual debt service on capital improvements [3]	$	29,100
Total Estimated Annual System Cost	$	42,700

(1) *Based on Table 2-16 multiplied by 2 (for future system) and rounded to nearest $1,000*
(2) *From Table 2-16 rounded to nearest $1,000*
(3) *From Table 3-12*

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 BDWS is estimated in the following table.

Table 3-14 Estimated Improvements Cost and Annual Debt Service

Description	Amount	
Estimated Cost to Improve BDWS [1]	$	98,000
Estimated Cost to extend service to BDWS [2] (does not include City portion to upsize t-main)	$	657,000
Total Estimated Capital Cost	$	755,000
Annual Debt Service [3]	**Amount**	
DWSRF Loan (1% interest for 20 yrs) [4]	$	42,000
DWSRF Loan w/50% Loan Forgiveness [5] (1% interest for 24 yrs) [5]	$	18,000

(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 with repayment extended to 24 yrs. Consolidation of these water systems may qualify due to the water rights issue with* BDWS *and the ECY letter stating* BDWS *is to cease operations until adequate water rights are secured. This will have to be discussed with DWSRF prior to applying for funding.*

Estimated cost for water service post-consolidation is estimated for Pintail Properties (not 7 individual residences) in the following table.

Table 3-15 Estimated Ongoing Water Service Cost

Scenario	Meter Size	Minimum Monthly Service Charge	Estimated Annual Water Use (gal.) [1]	Estimated Average Monthly Usage Charge	Total Estimated Monthly Water Charge	Total Estimated Annual Water Charge
Remain outside City Limits (50% surcharge)	4-inch	$853	9,892,500	$1,282	$2,135	$25,600

Annexed into City Limits (no 50% surcharge)	4-inch	$569	9,892,500	$854	$1,422	$17,100

(1) *Estimated Pintail Properties LLC water use only (Table 2-10 values excluding estimated water use for the 7 private residences currently on the system)*

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 3-16 Comparison of Costs

Description	BDWS remain separate system	BDWS to Consolidate with the City of Othello			
		Remain outside City Limits		Annexed into City Limits	
		DWSRF Loan	DWSRF Loan (w/50% Loan forgiveness)	DWSRF Loan	DWSRF Loan (w/50% Loan forgiveness)
Debt Service on Capital Improvements (1)		$42,000	$18,000	$42,000	$18,000
Estimated Annual Water Charge (2)		$25,600	$25,600	$17,100	$17,100
Estimated Annual Cost	$ 42,700 (3)	$67,600	$43,600	$59,100	$35,100
Est. Cost Per Unit/Mo. (based on 100 units)	$ 36	$56	$36	$49	$29

(1) *From Table 3-14*
(2) *From Table 3-15*
(3) *From Table 3-13*

Important notes about the above table:

- Estimated cost to operate and maintain the BDWS are rough estimates based on little existing data as BDWS does not separate water system maintenance cost from overall maintenance cost. It is recommended Pintail Properties LLC perform their own water system operation and maintenance estimates.

- 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 and generally higher overhead and administrative cost. It is recommended Pintail Properties LLC perform their own estimates for privately funded construction to compare with the estimated improvement costs contained herein.

- It is recommended Pintail Properties LLC make contact with other potential land owners who may benefit from the City of Othello water main extension and discuss cost sharing opportunities which would likely reduce Pintail Properties LLC share of the above estimated costs.

- A critical element for BDWS to remain an independent water system is the ability to obtain additional water rights. No investigations were made as part of this report to identify viable water rights holders and sellers and determine the potential for obtaining additional water

rights. The inability to obtain additional water rights would severely restrict BDWS's options for remaining an independent water system.

3.5 Barriers to Consolidation

Potential barriers to consolidation are identified as follows:

- Cost to improve existing system to City standards
- Cost of transmission main to extend City service to BDWS
- Financing of improvements (private or City sponsored DWSRF application)
- Eligibility of system consolidation for DWSRF 50% loan forgiveness
- Timing of improvements to meet Pintail Properties timeline for expanding their development
- Guarantees of payment by Pintail Properties if funded via City sponsored DWSRF funding
- Coordination between the City and Pintail Properties 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.

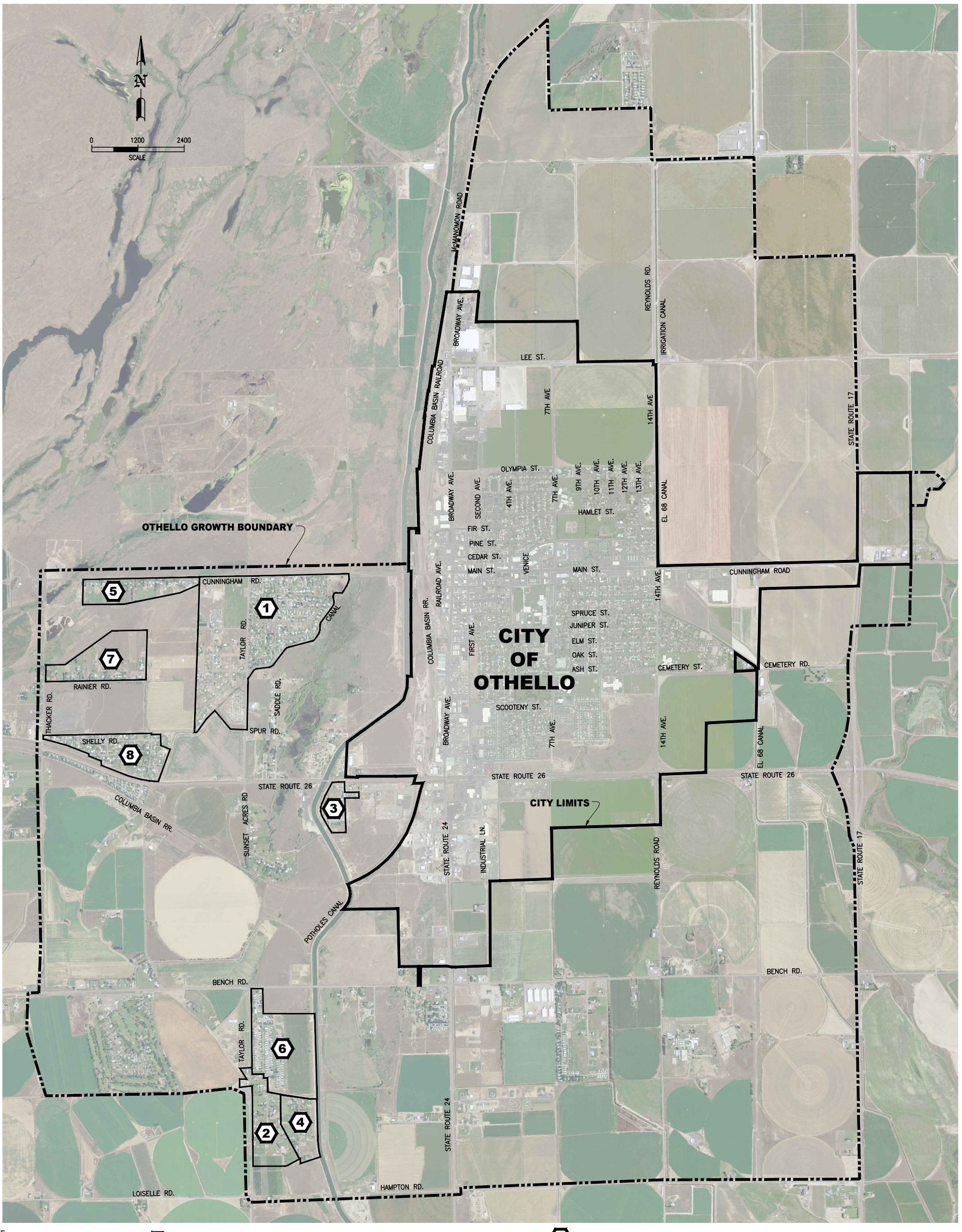
The following steps and schedule are proposed:

Submit draft report to WSDOH for review/approval:	July 8, 2016
Submit final report to WSDOH/City of Othello for approval: *(revised per WSDOH comments)*	August 31, 2016
Submit to BDWS for review/consideration:	August 31, 2016
City/ BDWS 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/ BDWS 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

Notes on above schedule:

- Either City or Bird Dog can back out of consolidation at any time prior to signing DWSRF grant/loan agreement
- There is no guarantee the consolidation will qualify for DWSRF 50% loan forgiveness
- Moving forward with above schedule does not preclude Bird Dog from funding and constructing the improvements using private resources (at any time prior to executing DWSRF agreement)
- Annexation will need to be discussed along with other non-water system related improvements that may be required as part of a potential annexation
- Applying for DWSRF funds does not preclude Bird Dog from moving forward with securing alternate private funding of improvements (at any time prior to executing DWSRF agreement)
- If private funds are used the above schedule can be accelerated with the potential of construction of improvements and consolidation completion prior to the end of the 2016 construction season



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

- BDWS BOUNDARY
- PARCEL LINE
- WATER LINE
- WATER METER
- WATER CONNECTION/ NO METER
- PR — PRIVATE RESIDENCE

N

0 60 120
SCALE

1720804 PTPLLC Exhibit

SCALE: AS SHOWN DESIGNED: JSM DRAWN: TVS CHECKED: APPROVED: PROJ. NO.: 172-08-04 DATE: 7/8/16	VARELA AND ASSOCIATES, INC. ENGINEERING AND MANAGEMENT	**CITY OF OTHELLO, WASHINGTON** WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES BDWS EXISTING WATER SYSTEM AND WATER SYSTEM BOUNDARY	FIGURE **2**

LEGEND

- BDWS BOUNDARY
- PARCEL LINE
- PR — PRIVATE RESIDENCE
- J-10 — JUNCTION NODE w/ LABEL
- J-10 / 1.25" / (3") — EXISTING PIPE w/ PIPE LABEL; EXISTING PIPE SIZE; PROPOSED PIPE SIZE

N

0 60 120
SCALE

1720804 PTPLLC Exhibit

SCALE: AS SHOWN DESIGNED: JSM DRAWN: TVS CHECKED: APPROVED: PROJ. NO.: 172-08-04 DATE: 7/8/16	**VARELA AND ASSOCIATES, INC.** ENGINEERING AND MANAGEMENT	**CITY OF OTHELLO, WASHINGTON** WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES BDWS DISTRIBUTION SYSTEM HYDRAULIC MODEL	FIGURE **3**

0 60 120
SCALE

LEGEND

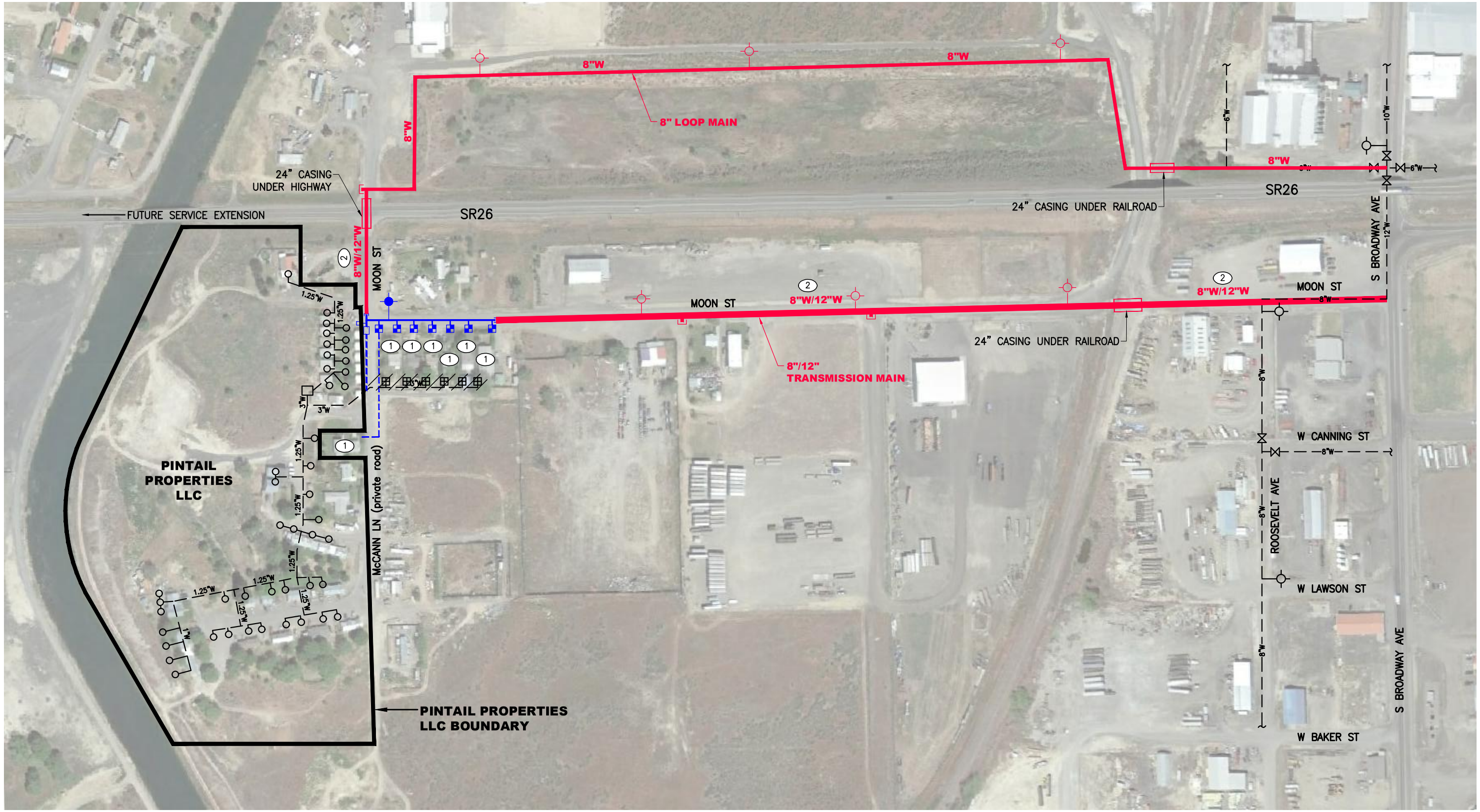
- BDWS BOUNDARY
- PARCEL LINE
- WATER LINE
- WATER METER
- WATER CONNECTION/ NO METER
- (PR) PRIVATE RESIDENCE
- PROPOSED FIRE HYDRANT
- PROPOSED WATER METER

NOTES

1. SAMPLING STATION
2. METER VAULT
3. MOVE SERVICE TO MOON ST., INSTALL NEW METER
4. NEW METER & SERVICE PIPE TO PRIVATE RESIDENCE
5. CONNECT TO PINTAIL PROPERTIES WATER MAIN
6. NEW 8" MAIN (12" MAIN FOR FUTURE CITY EXTENSION)
7. ABANDON WATER PIPE & METERS

1720804 PTPLLC Exhibit

SCALE: AS SHOWN DESIGNED: JSM DRAWN: TVS CHECKED: APPROVED: PROJ. NO.: 172-08-04 DATE: 7/8/16	VARELA AND ASSOCIATES, INC. ENGINEERING AND MANAGEMENT	**CITY OF OTHELLO, WASHINGTON** WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES BDWS PROPOSED IMPROVEMENTS REQUIRED TO MEET CITY STANDARDS	FIGURE **4**



1720804 PTPLLC Exhibit

LEGEND

- BDWS BOUNDARY
- PARCEL LINE
- EXISTING WATER LINE
- EXISTING WATER METER
- EXISTING WATER CONNECTION/ NO METER
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- PROPOSED WATER MAIN
- PROPOSED FIRE HYDRANT
- PROPOSED WATER METER (SINGLE FAMILY RESIDENCE)
- PROPOSED CONSOLIDATION FIRE HYDRANT

NOTES

1. BECOME CITY OF OTHELLO WATER CUSTOMER
2. 8" REQUIRED TO SERVE PINTAIL PROPERTIES, 12" REQUIRED FOR FUTURE CITY SERVICE EXTENSION

N

0 120 240
SCALE

SCALE:	AS SHOWN
DESIGNED:	JSM
DRAWN:	TVS
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	7/8/16

VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

BDWS CONSOLIDATION IMPROVEMENTS

FIGURE
5

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: 05/12/2016
Printed: 6/30/2016
WFI Printed For: On-Demand
Submission Reason: Owner 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
52172 8	BIRD DOG FAMILY LTD PARTNERSHIP II	ADAMS	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS	7. OWNER NAME & MAILING ADDRESS	8. OWNER NUMBER: 035671
MARK & ASHLEY E. MOLLOTTE [OWNER] PO BOX 3041 OTHELLO, WA 99344	PINTAIL PROPERTIES, LLC MARK & ASHLEY E. MOLLOTTE OWNER PO BOX 3041 OTHELLO, WA 99344	

STREET ADDRESS IF DIFFERENT FROM ABOVE	STREET ADDRESS IF DIFFERENT FROM ABOVE
ATTN	ATTN
ADDRESS 864 S TAYLOR RD.	ADDRESS 864 S TAYLOR RD.
CITY OTHELLO STATE WA ZIP 99344	CITY OTHELLO STATE WA ZIP 99344

9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION	
Primary Contact Daytime Phone: (509) 331-3615		Owner Daytime Phone: (509) 331-3615	
Primary Contact Mobile/Cell Phone: (509) 989-0034		Owner Mobile/Cell Phone: (509) 989-0034	
Primary Contact Evening Phone:		Owner Evening Phone:	
Fax:	E-mail: xxxxxxxxxxxxxxxxxxx	Fax:	E-mail: xxxxxxxxxxxxxxxxxxx

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

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

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

SMA NAME: _____ SMA Number:

12. WATER SYSTEM CHARACTERISTICS (mark all that apply)

- [ ] Agricultural
- [ ] Commercial / Business
- [ ] 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)

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

14. STORAGE CAPACITY (gallons)

2,600

15	16	17	18 SOURCE CATEGORY										19 USE			20	21 TREATMENT						22	23	24 SOURCE LOCATION			
Source Number	SOURCE NAME LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	Well #1 - AFL228		X										X			Y	X						284	33	NE NW	09	15N	29E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
52172 8	BIRD DOG FAMILY LTD PARTNERSHIP II	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?)		57	58
A. Full Time Single Family Residences (Occupied 180 days or more per year)	46		
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	4		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	11		
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	0
28. TOTAL SERVICE CONNECTIONS		58	58

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per year? 186

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

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

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

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

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

35. Reason for Submitting WFI:

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

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

SIGNATURE: _____ DATE: _____

PRINT NAME: _____ TITLE: _____

APPENDIX B

Water Rights (ECY/City Correspondence)

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
4601 N Monroe Street • Spokane, Washington 99205-1295 • (509)329-3400

March 11, 2015

Edward C. & Mary E. McCann
716 South McCann Lane
Othello, Washington 99344-9681

Re: Water Use on Adams County Parcel Nos. 252909021002, 2529090210236, 1529030740801, 1529030740802, 152903740803, 152903740804, 152903740805, 152903740806
WRIA 46 - Adams County – 508-14 Subarea

Dear Mr. & Mrs. McCann:

Following our March 10, 2015 meeting wherein you met with Kevin Brown and myself at our office I am sending this letter to recapture that conversation and offer technical assistance regarding your Group A project. You stated that you are utilizing a ground water well to serve 210± people potable water supply as approved by your State of Washington Department of Health Water System Plan. Additionally, you stated that you have a verbal agreement from years past that allows you to withdrawal irrigation water from a buried line from the Potholes Canal/PEC for your 14+ acre parcel of land.

As discussed based on the instantaneous and annual quantities identified in your Water System Plan your project exceeds the limits set forth under the groundwater permit exemption allowed for under Chapter 90.44-050 Revised Code of Washington, see enclosure. Ecology has made no formal determination if that exemption has been utilized in your area or if it is available to you.

As you know, I confirmed that the East Columbia Basin Irrigation District (ECBID) does not administer a water use allotment, contract, etc. to you from the Potholes Canal/PEC for the purpose of non-agricultural irrigation, etc.

17,000/GPD

Be advised, you do not have legal authority to serve potable water in excess of 5,000 gallons of water per day from your well, irrigation greater than one half acre in size and to serve irrigation water from the Potholes Canal/PEC to your project. You must stop providing water from your well for a single home or group of homes in excess of 5,000 gallons of water per day and watering a non-commercial lawn or garden greater than one-half acre in size (no gallon per day limit) until you secure a legal water source to do so. Additionally, you must stop providing water for irrigation purposes from the Potholes Canal/PEC until you enter into a formal agreement with the ECBID to do so.

An Application for a Water Right permit is enclosed for your use. Keep in mind; it could be multiple years until your application is acted on. In the meantime, you should seek out an existing viable water use authorization to transfer to your project. **If you have questions about this process, I am here to help.**

Thank you for your attention to this matter, for questions or further assistance contact:

Ecology: Katherine.Ryf@ecy.wa.gov; Spokane office 509-329-3586
Ecology: Kevin.Brown@ecy.wa.gov; Spokane office 509-329-3422
ECBID: Lisa Lusk, llusk@ecbid.org; Othello office 509-488-9671

Sincerely,

Katherine A. Ryf
Quincy Groundwater Management Subarea
Project Manager

KAR:md

By Certified Mail No. 7012 3460 0002 8022 5653

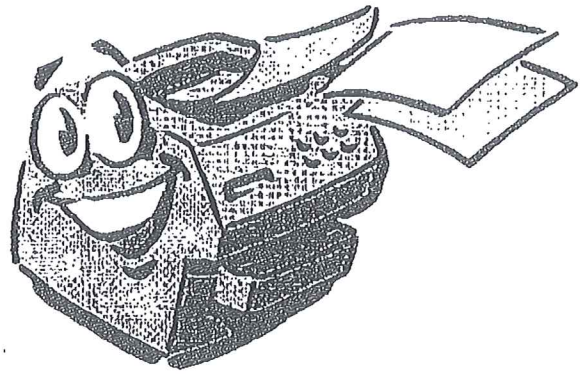
Enclosures: Application for a Water Right Permit; Form No. ECY 040-1-14 (Rev 05-2014)
Focus on Ground Water Permit Exemption RCW 90.44.050; Publication No. F-WR-92-104

cc: Paula Chapel, U.S. Bureau of Reclamation, P.O. Box 815, Ephrata, WA 98823
Lisa Lusk, East Columbia Basin Irrigation District, P.O. Box E, Othello, WA 99344

WASHINGTON STATE DEPARTMENT OF ECOLOGY

DEPARTMENT OF ECOLOGY, ERO
Water Resources Program
4601 North Monroe St. Spokane, WA 99205
Ph: 509-329-3400 Fax: 509-329-3529

FAX



Date: December 15, 2003

Pages: 7

To: ED M.

Fax #: 509-488-2099

From: Katherine Yerbich (RYF)

Phone #: 509-329-3586 M-F 9:30-5P (*EWUniversity from 11:30-1:30P*)

Notes: Per our conversation I have attached a focus sheet discussing water rights; the exemption is on page 3 of this fax.
Page 7 is a list from our tracking system showing all water right documents within 9-15-29.

If you have any further well log/water right questions please contact me directly or visit us on the web.
Well logs are on the web at http://www.ecy.wa.gov
lower right hand side of web page/image viewer/Text search by STR)

IF THERE IS A PROBLEM WITH THIS FAX, PLEASE CONTACT W.R. OFFICE SUPPORT STAFF: Molly (509) 329-3443 or MaryJane (509) 329-3510

Other Facts You Should Know

- The state water codes are based on a "first in time, first in right" premise. This means that any new water right is subject to existing rights. Therefore, your application may be denied, or your water use may be regulared or modified if it adversely affects existing rights. This will also protect your water right against impairment by future applicants.
- If you propose to use ground water and it is interconnected to surface water, your ground water use may be subject to the same conditions as a proposed or existing surface water use.
- Water rights carry no right-of-way privileges. If the water source you wish to use is not on your property, you must make right-of-way arrangements with the appropriate property owner(s).
- Water right certificates remain attached to the land described on the water right, unless specifically withheld from the deed at the time of sale. When you are buying property, make sure the water right is included with the property. You might want to make sure that the water rights mentioned are valid and recognized by Ecology. In contrast to water right certificates, water right applications and permits are not attached to the land and must be assigned to the new water user. Check with Ecology if you have questions about water rights for property you have acquired or are thinking about purchasing.
- Changes to an existing water right can be requested under a separate water right change application.
- If you are required to have a water right, no construction or water use should begin before a water right permit is obtained.

Definition of Key Terms

Water Right Claim

A *water right claim* is a statement of claim to a water use that began before the State Water Codes were adopted and is not covered by a permit or certificate. A claim may represent a valid water right if it describes a surface water use that began before 1917 or a ground water use that began before 1945, a water right claim that was filed with the state during an open filing period designated under RCW 90.14 (the Water Rights Claim Registration Act), or is covered by the ground water exemption.

Water Right Permit

A *water right permit* is permission given to water right applicants by the state to develop a water right. Water rights are developed when water right applicants follow the provisions outlined in their permit, using water for the purposes and up to the limits stated in the permit. Water right permits remain in effect until the water right certificate is issued, if all terms of the permit are met, or the permit has been canceled.

Water Right Certificate

A *water right certificate* is issued by the Department of Ecology to certify that water users have the authority to use a specific amount of water under certain conditions. These conditions are based on beneficial use of water under your water right permit. The water right certificate is a legal document recorded at your county auditor's office. The certificate completes the process of obtaining your water right. Once a certificate is issued, no expansion is allowed under the water right.

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Questions & Answers

Water Rights in Washington

1-509-456-2997
Kathern Y

The Department of Ecology manages the state's water resources, while trying to meet the varied needs of Washington's public waters. By protecting our natural resources, we preserve our quality of life and ensure a healthy environment, while maintaining a strong economy.

Washington State's rivers serve as a source of community water supply and support production of over 80 billion kilowatt hours of electricity per year, with wholesale value exceeding one billion dollars. Sport anglers spend more than half a billion dollars each year enjoying the fish that thrive in our waters. The state's commercial fisheries are valu at more than $159 million. More than 1.6 million acres of croplands in Washington are irrigated and provide in excess of two billion dollars of crop value. Of equal importance the industrial development, recreation, and aesthetic enjoyment. With such great demand being placed on Washington's water supply, water rights play a crucial role in managing and allocating this finite resource.

Q. ***What is a water right?***

A. A water right is a legal authorizarion to use a certain amount of public water for specific beneficial purposes. Washington State law requires certain users of public water to receive approval from the state prior to actual use of the water. Approval i granted in the form of a water right permit or certificate. In addition to state-authorized water rights, Washington recognizes valid water right claims and federal reserved water rights.

Domestic exemption

There is on exemption from the requirement of obtaining a water right. You do not need to apply for a water right if you use a total of 5,000 gallons or less of ground wat from a well each day for any of the following combinations:

- Stockwatering purposes,
- Single or group domestic purposes,
- Industrial purposes, or
- Watering a lawn or noncommercial garden that is a half acre or less in size.

Although you are exempt from the water right permit process in these cases, all other water laws and regulations apply.

Q. ***Who needs a water right?***

A. A water right is necessary if you plan to divert any amount of water for any use from

- Surface waters (water located above ground)

Publication #96-1804-S&WR

- Lakes
- Rivers
- Streams
- Springs

- Ground waters
  - If you plan to withdraw more than 5,000 gallons per day; or
  - If you plan to irrigate more than a half acre of lawn or noncommercial garden.

Q. *Why are water rights required?*

A. Water rights ensure proper allocation and management of Washington's water resources. Our state's waters are a public resource and their use should return the maximum benefit to the public.

Q. *What criteria does Ecology use when making water right decisions?*

A. Water right permits are issued by Ecology only if the proposed use meets the following requirements:

- Water will be put to beneficial use;
- No impairment to existing, or senior rights;
- Water is available for appropriation; and
- Issuance of the requested water right will not be detrimental to the public's welfare.

In making water right decisions, consideration is given to areas with basin assessments or basin management plans, stream closures, instream flows, hydraulic continuity (surface water interconnected to ground water), seawater intrusion, and availability of alternative water supplies.

Q. *How do I apply for a water right?*

A. Water rights are issued by Ecology's regional offices in Lacey, Bellevue, Yakima, and Spokane. Contact the regional office nearest you for a Water Right Application and the accompanying instructions (see addresses on back). The following will help you understand the steps in the process:

1. Fill our your application, using the accompanying instructions. The minimum fee required to file an application is $10, and more may be needed based on the volume of water requested.

2. Return the completed application to Ecology's regional office, Water Resources Program. Don't forge to include your application fee.

3. Once an application is received by Ecology it will be assessed for completeness. Ecology will send you a *legal notice* for you to publish in a newspaper with general circulation in the county (or counties) where water is to be withdrawn, stored, and used.

The notic published once a week for two cons ive weeks. It includes:

- The basic facts of your requested; and
- Offer the public 30 days to protest if they feel your proposed water use would impair other uses of the resource. This 30-day protest period begins on the last day that your legal notice is published.

4. After final publication of the notice, send Ecology the original, notarized *Affidavit of Publication*, which is obtained from the publishing newspaper. Ecology cannot take action on your water right request until the Affidavit has been submitted.

5. Ecology will conduct an investigation of the application, which may include a field examination of your proposal to validate the information on the application and will apply the four criteria mentioned above. The results of the investigation are summarized in a *Report of Examination*. The report contains Ecology's decision on your water right request, which will recommend either a denial or an approval. If approved, your permit may contain specific conditions.

6. Ecology sends you, and all those who have filed a protest, a copy of the report. You (and others) have 30 days to accept or appeal the Examiner's recommendation to Washington's Environmental Hearings Office, Pollution Control Hearings Board.

7. Provided there are no appeals to your proposed water use and your permit fee (based on types of use) has been paid, you are issued your *Permit to Appropriate Public Waters*. The permit allows you to begin construction of your water system and to put the water to use. It will contain a reasonable schedule, and a date by which you should put the water to use.

8. When your construction has been completed and the water has been put to use, your must submit a *Proof of Appropriation* affidavit form. The Proof of Appropriation form includes:
   - Exactly what facilities or equipment you are operating;
   - How much water you are using;
   - For water purpose;
   - Where the water is being used; and
   - A statement that all conditions of the permit have been met.

9. Ecology may choose to inspect your completed project based on the information you have provided in Step 8. After the inspection has been completed, or if Ecology determines an inspection is not necessary, certificate recording fees for the state and county will be requested by Ecology.

10. Ecology will issue a Certificate of Water Right, based on the information you have submitted and the field inspection. The certificate cannot exceed what has actually been put to use up to the conditions of the permit. Any development authorized requires that a new application be submitted. This certificate is recorded at the County Auditor's Office in the county where the project is located and at Ecology. The County Auditor will forward your certificate to you. It becomes the legal record of your water right.

Q. ***How long will it take for me to receive my water right?***

A. Depending upon the complexities of water availability and use within your watershed, obtaining a water right permit may take anywhere from months to years.

Q. ***Once I get my water right certificate, what are my rights to use the water?***

A. Your rights are outlined in your water right certificate. A water right is subject to relinquishment if it is unused, without sufficient cause, for five or more consecutive years. Once exception is water claimed for municipal water supply purposes. It is important to note and follow any conditions of your permit or certificate.

Q. ***Does my water right protect me during drought?***

A. Not directly. A water right does not guarantee the availability of water during drought. The degree of reliability depends on your seniority as a water right holder.

Q. ***How do I get more information?***

A. For more information about water rights and the application process, please contact the Department of Ecology regional office nearest you.

Northwest Regional Office	3190 - 160th Avenue SE Bellevue, WA 98008-5452	(425) 649-7000 TDD (425) 649-4259
Southwest Regional Office	P.O. Box 47775 Olympia, WA 98504-7775	(360) 407-6300 TDD (360) 407-6306
Eastern Regional Office	N. 4601 Monroe, ~~Suite 202~~ Spokane, WA 99205-1295	(509) ~~456-2926~~ 329-3400 TDD (509) ~~458-2055~~ 329-3564
Central Regional Office	15 W. Yakima Ave., Suite 200 Yakima, WA 98902-3452	(509) 575-2597 TDD (509) 454-7673
Vancouver Field Office	2108 Grand Boulevard Vancouver, WA 98661-4622	(360) 690-7171 TDD (509) 458-2055
Nooksack Field Office	1204 Railroad Ave., Suite 200 Bellingham, WA 98225	(360) 738-6250

This document can be accessed through Ecology's home page on the World Wide Web. The address is: http://www/wa/gov/ecology/

If you have special accommodation needs or require this document in an alternative format, please contact Paula Smith at (360) 407-6607 (Voice) or (360) 407-6006 (TDD).

The City of Othello

500 East Main Street OTHELLO, WASHINGTON 99344 Telephone (509) 488-5686
Fax (509) 488-0102

March 17, 2015

Katherine A. Ryf
Quincy Groundwater Management Subarea
Project Manager
Department of Ecology
4601 N Monroe Street
Spokane, WA 99205-1295

Katherine,

Mr. McCann showed me the letter he received from your office on March 11, 2015. Mr. McCann's water association is one of the small water systems that the City has requested Department of Health state revolving fund grants for. We hope to hear within a week as to whether these funds will be available for planning activities for this water association.

As you may know, the City of Othello has 54.55% has low-middle income population according to HUD. In addition, the City currently has a rental vacancy rate of .04%, with a total of 5 units on the market at this time. In addition, with a median income of $42,432 (2013 estimate) which is 29% lower than the median income for Washington State.

Given this, the City's concern is that an immediate cessation of water service to approximately 200 Adams County residents will create a housing demand that the City of Othello cannot immediately absorb.

In my conversation with Mr. McCann. I agreed that the City needed to partner with him to determine the best course of action for supplying water to the association's customers. The requested DOH grant will help both parties determine how to proceed at this point.

Therefore, the City requests that additional time be negotiated to allow for proper water system planning. We should know about grant funding within two weeks and request that much time to talk to the Department of Health. Within that time we should be able to determine how soon planning can start. We would then contact you with an update as soon it is available. If you have any questions please contact me at tgoddard@othellowa.gov or at 509-488-5686. Thanks very much.

Respectfully,

Travis Goddard
Community Development Director

ATG:tg

APPENDIX C

City of Othello Hydraulic Model Information

Conceptual Future UGA Service Extension, ERUs and Transmission Main Sizing

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

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

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

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

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

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

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

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

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

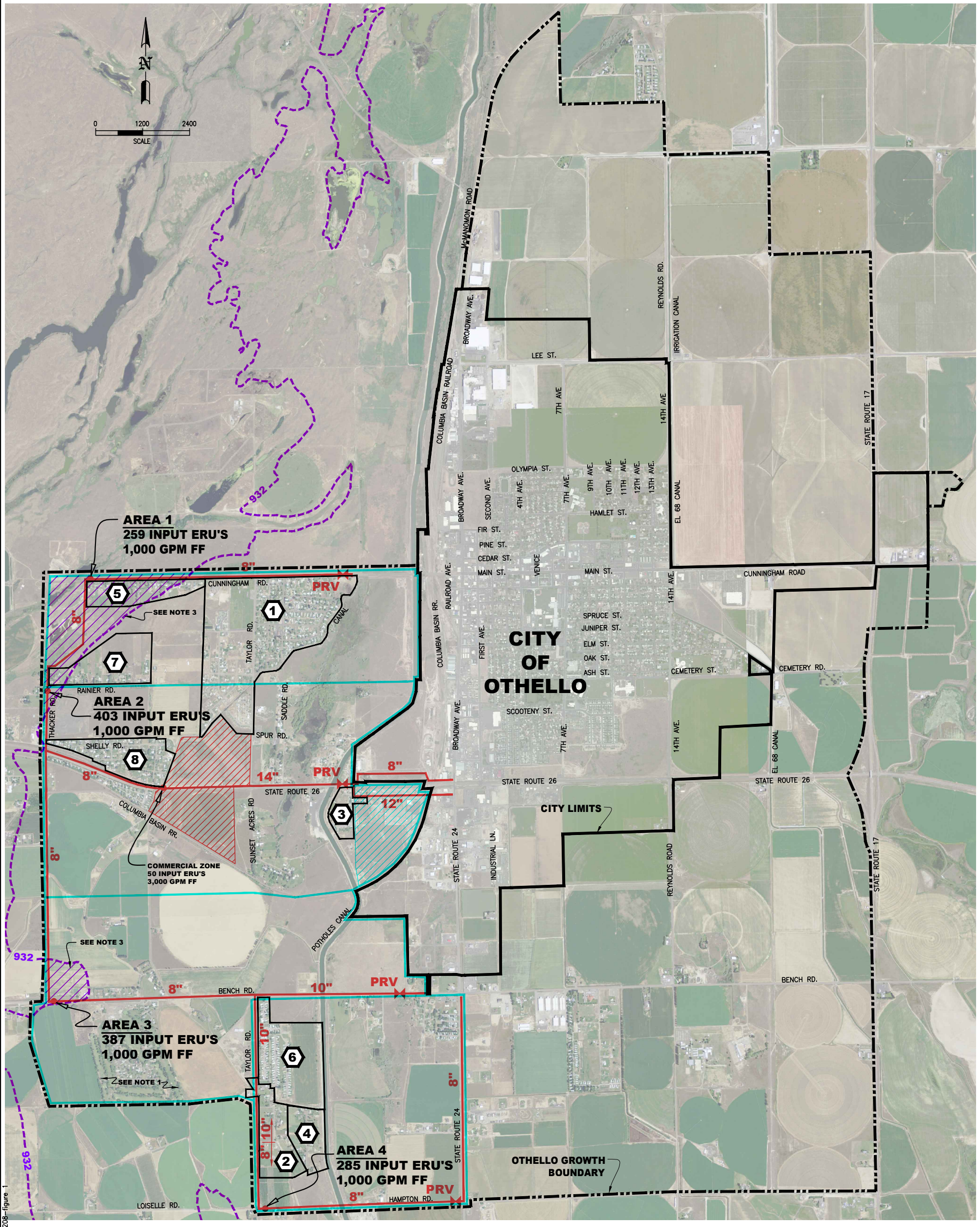
15. ADD, MDD, PHD and FF were evaluated based on the CFS UGA land area

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

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

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

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



LEGEND

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

NOTES

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

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

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

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

APPENDIX D

Long-term water supply study excerpts

VARELA & ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

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TECHNICAL MEMO

TO: City of Othello, WA

FROM: Jesse Cowger, PE

DATE: August 24, 2016

RE: Water Supply Plan Summary

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

Background

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

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

Project Description and Scope

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

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

Systematic Evaluation of Existing Wells

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

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

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

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

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

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

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

Options for Addressing Fluoride in Well 6

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

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

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

Option 2: Dedicate Well 6 to Supplying Industrial Users

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Discussion of Options for Addressing Fluoride in Well 6

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

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

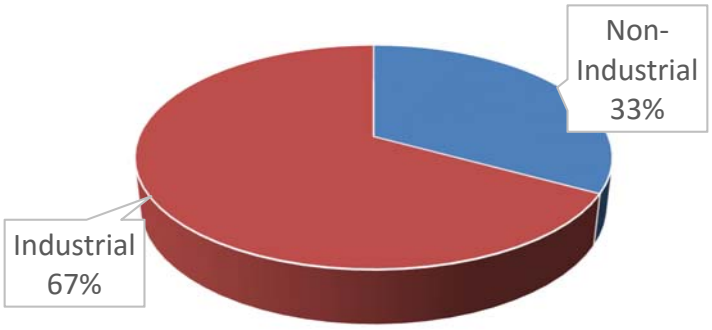
Option	Advantages	Disadvantages
5) Use Well 6 as ASR Injection Well	• May reduce concentration of fluoride in Well 6 to below MCL. • Would not require reducing the pumping rate of Well 6 • If ASR implemented, may slow the decline of the Wanapum aquifer • Supplemental source of supply would reduce the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

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

Meeting Present and Future Water Demand

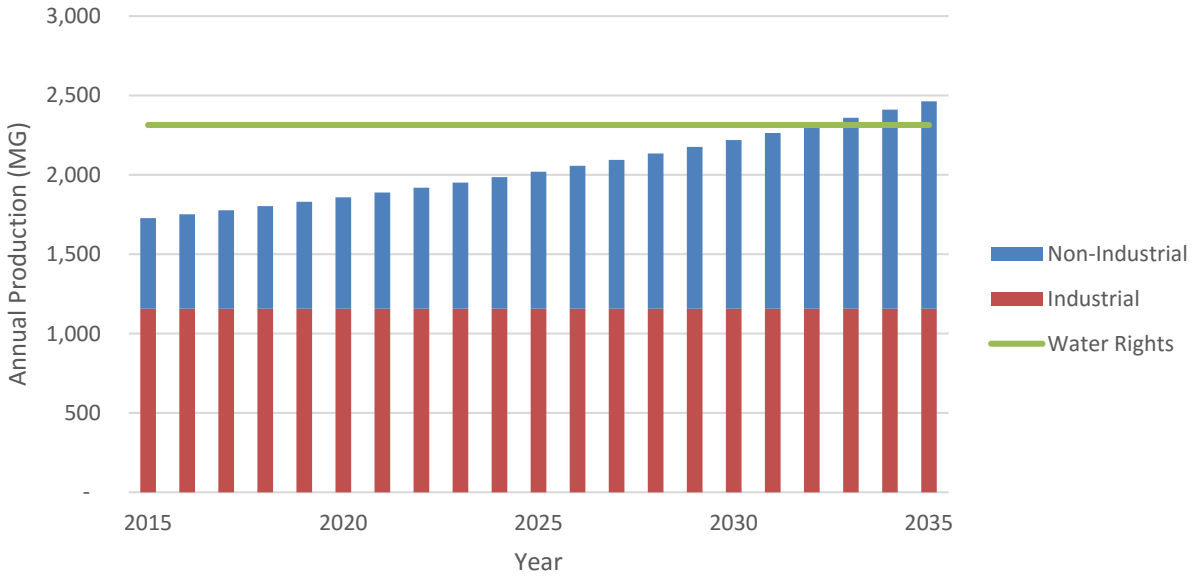
On March 28, 2016 Othello adopted its updated Comprehensive Plan (Comp Plan). The Comp Plan lays out an ambitious vision for growth in Othello which includes population growing from 7,780 in 2015 to 17,825 in 2035. The population growth projected in the Comp Plan equates to an annual rate of 4.23%. In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

Ratio of Industrial and Non-Industrial Water Use



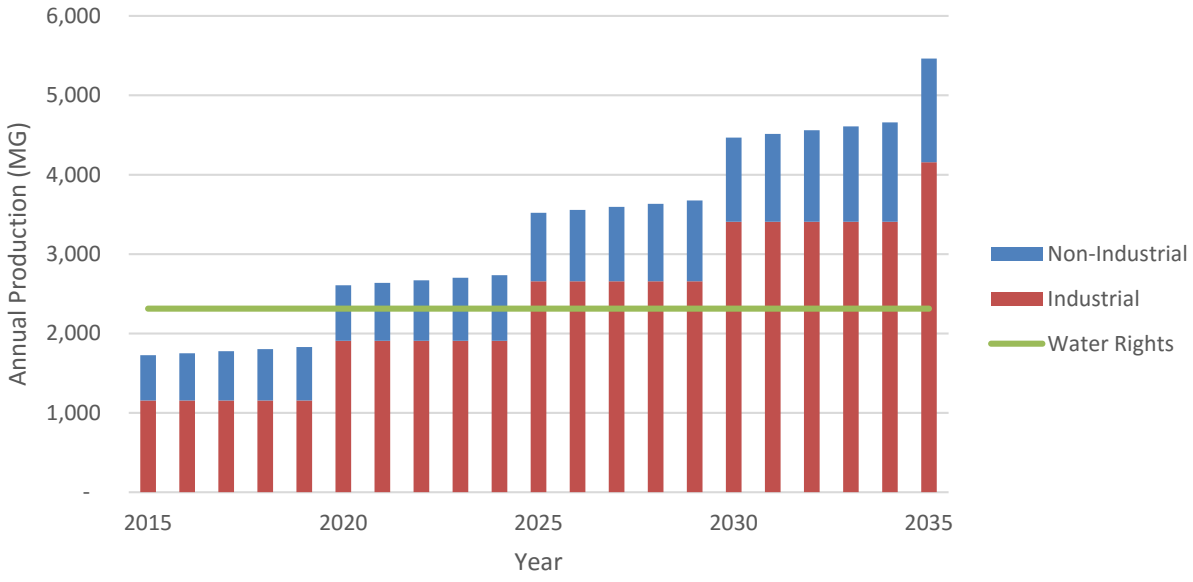
If non industrial water use increases proportionally with projected population growth and industrial demand remains static, the following demand curve results:

Projected Water Demand: No New Industrial Customers



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

Projected Water Demand: New Industrial Customer Every Five Years



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

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

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

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

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

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

Mid to Long-Term: Develop Supplemental Source of Supply

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

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

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

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

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

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

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

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

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

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

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

- Availability of funding

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

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

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

Appendix X

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

1.1 Estimated Impact to City System

1.1.1 Estimated System Demands

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

Table 1: Current City of Othello Water System Demands

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

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

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

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

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

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

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

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

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

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

1.1.2 Supply

Criteria

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

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

Current Capacity

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

Table 4: Current City Supply

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

Evaluation

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

Table 5: Supply Capacity Evaluation

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

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

Conclusion

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

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

1.1.3 Distribution

Criteria

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

Hydraulic Analysis Model

As described in Section 3.2.2 of each individual report.

Evaluation

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

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

Conclusion

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

1.1.4 Storage

Criteria

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

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

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

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

Where:

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

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

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

Where:

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

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

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

- FSS = (FF)(duration)

Where:

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

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

Current Capacity

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

Evaluation

Operational Storage

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

Equalizing Storage

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

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

Standby Storage

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

Fire Suppression Storage

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

Dead Storage

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

Storage Comparison

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

Table 6: Storage Comparison

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

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

Conclusion

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

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

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

1.1.5 Water Rights

Criteria

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

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

Current Water Right

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

Qi = 9,550 gpm

Qa = 7,100 acre-ft/yr

Evaluation

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

Table 7: Water Rights Evaluation

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

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

Conclusion

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

1.1.6 Summary of Impacts of Consolidation on City Water System

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

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

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

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