CONSOLIDATION FEASIBILITY STUDY

SEPTEMBER 2016

BASIN VIEW WATER ASSOCIATION

WSDOH System ID No. 04530

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

CONSOLIDATION FEASIBLITY STUDY

BASIN VIEW WATER ASSOCIATION
WSDOH System ID No. 04530

BOARD PRESIDENT
Donald Hanes

SEC-TREASURER
Hugh Coffelt

CITY OF OTHELLO
WSDOH System ID No. 64850

MAYOR
Shawn Logan

CITY ADMINISTRATOR
Wade Farris

COMMUNITY DEVELOPMENT DIRECTOR
Travis Goddard

PUBLIC WORKS DIRECTOR
Terry Clements

FINANCE OFFICER
Spencer Williams

CITY CLERK
Debbie Kudrna, CMC

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

10/3/2016

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

CITY OF OTHELLO

CONSOLIDATION FEASIBILITY STUDY

BASIN VIEW WATER ASSOCIATION

WSDOH WATER SYSTEM ID NO.04530

TABLE OF CONTENTS

LIST OF FIGURES

(11x17 prints located at end of body of report)

APPENDICES

1.0 INTRODUCTION

1.1 Background

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

1.2 Scope

The project scope of work includes the following:

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

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

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

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

1.3 Contact Information

The contact information for the Basin View Water Association (BVWA) is shown on the WFI is as follows:

Primary Contact
Hugh Coffelt, Operator
Certification No. 009179

Address
859 S Crestline Rd
Othello, WA 99344-9518

Phone
Daytime: 509.488.2555
Mobile: 509.760.7054

Owner Contact
Donald Hanes, Board President

Address
875 S Crestline Rd
Othello, WA 99344-9518

Phone
Daytime: 509.488.9520

2.0 EXISTING SYSTEM

2.1 System Information

Basin View Water Association (BVWA) is located on the east side of Taylor Road and south of the Othello Manor Water System (OMWS) and west of the Highland Estates Water System (HEWS), approximately 1 mile southwest of the City of Othello City Limits, in Adams County in the southwest quarter corner of Section 16, Township 15 N, Range 29 E. (see **Figure 2**).

According to the Water Facilities Inventory (WFI) BVWA provides domestic water service to 22 active service connections. There are currently 30 parcels in the BVWA service area, 22 are built on (active connections) and 8 are vacant. The built on lots were metered within the past two years.

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

2.2 Service Area

The BVWA service area is shown on **Figure 2**. The service area is approximately 39 acres.

The service area consists of 30 residential zoned parcels. 22 are currently occupied by single-family residential houses and 8 are vacant.

Topography

The service area is slopes from northeast to southwest and varies in elevation from approximately 990’ to 945’ amsl.

2.3 Inventory of Facilities

The BVWA water system is shown on **Figure 2**. The water system is a closed system with a well pump, partially buried storage reservoir, booster pump, chlorination system, and distribution pipe.

The WSDOH Water Facilities Inventory (WFI) form lists the BVWA system as a Group A Community system serving a residential community with a population of 60. The system is owned by an Association.

Supply

The WSDOH WFI indicates that supply is provided via one permanent well (S01) and emergency supply is provided via intertie with Othello Manor Water System (S02) and is controlled by two in-line isolation valves. The system supply as noted in the WFI is summarized in the following table.

Table 2-1 Basin View Water Association Source Inventory [1]

Source Number	Source Name	Use	Metered	Treatment	Current Pumping Rate (gpm)
SO1	Well #1 – AFA201	Permanent	Yes	Chlorination	35
SO2	Othello Manor Water System; Intertie System ID Number – 64845 3	Emergency	No	Chlorination, Filtration	300
				Total:	335

[1] *Information obtained from the Water Facilities Inventory (last updated 1/21/14 as of this writing)*

See **Appendix B** for a copy of the well log.

Storage

The BVWA system is a closed system with one CIP concrete cistern with a total nominal volume of 10,000 gallons and usable volume of 8,400 gallons (volume between "pump off" and bottom). There is 6 feet between absolute high and low levels which equates to 1400 gallons per foot of height.

Distribution System

Per BVWA the distribution system consists of 1¼-inch, 1½-inch, 2-inch and 3-inch galvanized iron water mains with ¾-inch service pipe. There are no reported issues with the distribution system nor are there reported pressure drops during peak demands. All active services are individually metered.

Fire Flow

The BVWA system currently does not contain fire hydrants and does not provide fire flow.

Summary of Existing System

The following table summarizes the major components of the BVWA.

Table 2-2 Summary of Basin View Water Association System Components

System	Component	Description	
Supply	Well	ECY Well ID Tag:	AFA201
		Status:	Online
		Log available:	Yes
		Depth:	400’
		Casing:	8” diameter casing to 289’ bgs
		Screen:	Unknown
		Date constructed:	Approx. 1970
		SWL:	Approx. 12.3’ below wellhead elevation (~ Elev. 967.7’) per the well log (not field verified)
		Approx. wellhead elev.:	980’
		Present pumping rate:	35 gpm (well pump), reported by Assoc., not field verified
		Pump/motor:	Submersible Centrifugal, 5 HP
		Enclosure:	Partially underground CMU structure
		Location:	859 S Crestline Rd, Othello, WA 99344, USA
	Booster Pump	Pump/motor:	Booster pump, Continuous, 5 HP
		Present pumping rate:	96 gpm (booster pump)
		Discharge pressure:	Approx. 55 psi (at booster pump)
Storage	Reservoir	Construction type:	Cast in place concrete (partially underground)
		Approx. base elevation:	980’
		Date constructed:	Approx. 1970
		Volume:	10,000 nominal gallons (8,400 total usable volume)
		Pressure zones served:	One
		Location:	859 S Crestline Rd, Othello, WA 99344, USA
Distribution System	1 ¼”	900’	
	1 ½”	360’	
	2 “	860’	
	3 “	1,230’	
	Total	3,350 LF	
	Main materials	Galvanized Steel	
	Service Pressure	Approx. 55 – 60 psi	

2.4 Assessment of the Condition of the Existing Facilities

Site visits to observe the Association facilities was conducted on December 12, 2015 and March 3, 2016. The site visits included a tour of the Associations facilities. The following summarizes observations from the site visit regarding the condition of the existing facilities.

Supply

The well head was visible. The well head was capped, ECY tagged and there were no observable defects. The well pump was reported to be operating trouble free and has had no recent problems. The well log (approx. 1968) shows a static water level of 12.3 feet below the surface and the current static water level is reported by BVWA to be 210 feet below the surface. The condition of the supply appears to be good.

Storage

The storage consists of one CIP partially-buried concrete reservoir with a total nominal volume of 10,000 gallons and usable volume of 8,400 gallons (between pump off and bottom elevations). During periodic cleaning of the cistern no issues were observed.

Pump House

The pump house is a partially buried CMU structure with a locked and hinged wooden framed/metal roof and metal siding which is also provides access to the interior.

The piping within the pump house is primarily galvanized iron with brass valves. The interior piping, meter, PRV, electrical power, chlorine injection system, and control panels all appear to be in good condition. Overall the facility appeared to be in good condition and well maintained.

Distribution

The condition of the distribution system could not be observed. Customer service meters were installed in the last couple years and read for the first time in February, 2016. One typical meter installation was inspected and consisted of a small, shallow meter box with metal lid. The meter and above ground portion of the setter was observed and appeared to be in relatively new condition and was readily accessible and easily read.

Overall the distribution system has no reported leaks and appears to be in adequate condition.

2.5 Water Use, System Demands and Water Rights

2.5.1 Population/Connections

Existing

Basin View is a 30 lot residential subdivision with 22 occupied parcels and 8 vacant parcels.

- Existing Connections: 22 (active residential)

The WFI provided a population count for 2015 which is represented below.

- Existing Population: 60

Projected

The development includes 8 vacant lots within the Basin View boundary. Growth is therefore limited to the 8 vacant lots being built on and becoming active. Projected future connections are as follows:

- Projected Connections: 30 (active residential)

The future population is projected based on the average current population/connection (2.73 persons per residential connection) extrapolated on the assumption that the 8 vacant lots become active.

- Projected Population: 82

2.5.2 Water Use

Source meter data was provided by BVWA for 2014 and Jan-Oct of 2015. Water use is shown on the following tables. Water use represents domestic use only. The Association receives irrigation water from ECBID which is not represented in the source meter data.

Table 2-3: Water Use Summary

Description	Year					
	2013 (2)		2014 (1) (3)		2015 (1) (4)	
	(gal.)	(gpd)	(gal.)	(gpd)	(gal.)	(gpd)
Annual Total	2,519,600	6,900	2,463,500	6,700	2,264,000	6,200
Maximum Month	N/A	N/A	333,682	11,000	332,229	10,900
Average Month	209,967	6,900	205,292	6,800	188,667	6,200
Minimum Month	N/A	N/A	147,214	4,800	112,763	3,700

(1) *Source meter data*
(2) *WSDOH water use efficiency data was used because source meter readings were unavailable for 2013*
(3) *Source water meter readings were not available for each month. Months in 2014 not recorded were in April, May, June, August, and November*
(4) *Source meter data was provided for Jan-Oct with the exception of Feb and Jun. The annual total is projected by dividing the Jan-Oct total by 10 to get monthly average, then multiplying average by 12*

Leakage

Leaks have not been reported along the mainline. A review of the 2014 WSDOH water use efficiency data and 2014 source meter data indicates that there is a distribution system leakage of approximately 6%. A review of the service meter readings indicate that a leak may be present on one of the properties due to a water use which is 1,200% higher than the average property usage.

2.5.3 ERUs

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

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

Table 2-4: ERUs

Description	Year		
	2013	2014	2015 (1)
Total annual water use (source meter)	2,519,600	2,464,000	2,264,000
City of Othello gpd/ERU value (2)	453	453	453
Total System ERUs (3)	**15**	**15**	**14**

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

2.5.4 System Demands

Current

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

Table 2-5: Current Water System Demands

Description	ERUs	ADD			MDD (1)(2)			PHD (4)
		gpd/ERU	(gpd)	(gpm)	gpd/ERU	(gpd)	(gpm)	(gpm)
2013	15	453	6,800	5	994	14,900	10	49
2014	15	453	6,800	5	953	14,300	10	48
2015	14	453	6,300	4	1,014	14,200	10	48

(1) *2014/2015 MDD = MMAD(1.3); MMAD from Table 2-3*
(2) *2013 MDD = ADD x 2.19; based on average MDD/ADD ratio from 2014/2015*
(3) *PHD = (MDD/1440)(CN+F)+18, where C = 3.0, N = ERUs and F = 0, WSDOH WSDM Eq. 5-1*

Future

Future water system demands are estimated assuming the 8 vacant lots connect to the system become active per Section 2.5.1. Using the calculated ERUs from the highest water use year within the data period indicates there are approximately 1.47 connections per ERU. The 8 inactive connections are therefore equivalent to 6 ERUs (rounded). Future system demands will add 6 ERU to the peak 2013 water use with the resulting estimated future water demands shown on the following table.

Table 2-6: Future Water System

ERUs	ADD			MDD (1)			PHD (2)	Annual	
	gpd/ERU	(gpd)	(gpm)	gpd/ERU	(gpd)	(gpm)	(gpm)	(MG)	(acre-ft/yr)
21	453	9,500	7	994	20,900	15	60	3.5	10.6

(1) *MDD = (2.19)ADD based on average MDD/ADD ratio from 2014/2015*
(2) *PHD = (MDD/1440)(CN+F)+18, where C = 3.0, N = ERUs and F = 0, WSDOH WSDM Eq. 5-1*

2.5.5 Water Rights

The 1969 Permit to Appropriate Public Waters of the State of Washington allows the BVWA well to withdraw a Qi of 50 gpm and a Qa of 38 ac-ft/yr. See **Appendix B.**

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 (WSDOH) for public water supplies.

Washington Administrative Codes (WAC's) pertaining to public water systems administered by WSDOH 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 BVWA facilities evaluation and design.

- WSDOH Water System Design Manual (WSDM)
- Industry practice
- Engineering judgement

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

2.6.1 Supply

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

The BVWA operates a "closed" system meaning the system is closed to the atmosphere with a two-part supply system consisting of a well supplying a partially buried storage tank and a booster pump supplying the distribution system from the storage tank. BVWA does not provide FSS. Each part of the supply system will be evaluated individually based on its own criteria.

Since the BVWA is a closed system with a two-part supply system and does not provide FSS, the criteria used to evaluate the BVWA well supply will be based on the criteria above and the distribution system supply will be based on the WSDOH 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

BVWA is a closed system with equalizing storage and standby storage.

Underground Storage Reservoir

The partially buried storage reservoir provides equalizing storage and standby storage and will be evaluated based on the WSDOH WSDM Chapter 9 "Reservoir and Storage Volume"

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

Where:

ES = Equalizing storage component, in gallons

PHD = Peak hourly demand, in gpm, as defined in Chapter 5 of the WSDM manual

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

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

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

Where:

SB_{TSS} = Total standby storage for a single source water system, in gallons

ADD = Average day demand for the design year, in gpd/ERU

N = Number of ERUs

2.6.4 Fire Flow

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

2.6.5 Distribution System

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

2.6.6 Water Rights

The adequacy of the BVWA 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 BVWA supply consists of two parts:

1. Well pump which pumps groundwater to supply the partially buried reservoir
2. Booster pump which pumps from the partially buried 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 = 11 gpm (Table 2-5)

Future MDD = 15 gpm (Table 2-6)

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 11 gpm.

The current well capacity of 35 gpm is adequate to provide the estimated future MDD of 15 gpm.

Deficiencies

None.

2.7.1.2 Supply (booster pump)

Criteria

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

Required Capacity

Current PHD = 50 gpm (Table 2-5)

Future PHD = 60 gpm (Table 2-6)

Current Capacity

Current capacity = 96 gpm (Table 2-2)

Evaluation

Current booster pump capacity is adequate to supply current PHD.

Current booster pump capacity is adequate to supply future PHD.

Deficiencies

None.

2.7.2 Treatment

Criteria

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

Evaluation

The latest IOC test data was provided and is shown in Table 2-7. The latest VOC test data is shown in Table 2-8.

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

ANALYTE	RESULT (2)	UNITS	SRL (3)	Trigger	MCL	Exceeds MCL (X if yes)
Arsenic	<	mg/l	0.0030	0.0103	0.0104	
Barium	0.0510	mg/l	0.4000	2.0000	2.0000	
Cadmium	<	mg/l	0.0020	0.0049	0.0050	
Chromium	<	mg/l	0.0200	0.0999	0.1000	
Mercury	<	mg/l	0.0004	0.0019	0.0020	
Selenium	<	mg/l	0.0100	0.0499	0.0500	
Beryllium	<	mg/l	0.0008	0.0039	0.0040	
Antimony	<	mg/l	0.0060	0.0059	0.0060	
Thallium	<	mg/l	0.0020	0.0019	0.0020	
Cyanide	<	mg/l	0.0100	0.1999	0.2000	
Fluoride	0.6600	mg/l	0.5000	1.9999	4.0000	
Nitrite – N	<	mg/l	0.2000	0.4999	1.0000	
Nitrate – N	<	mg/l	0.2000	4.9999	10.0000	
Total Nitrate/Nitrite-N	<	mg/l	0.5000	--	--	
Iron	<	mg/l	0.1000	--	--	
Manganese	0.0210	mg/l	0.0100	--	--	
Silver	<	mg/l	0.1000	--	--	
Chloride	13.0000	mg/l	20.0000	--	--	
Sulfate	33.0000	mg/l	50.0000	--	--	
Zinc	0.0080	mg/l	0.2000	--	--	
Sodium	50.2000	mg/l	5.0000	--	--	
Hardness	47.5000	mg/l	10.0000	--	--	
Conductivity	421.0000	µmhos/cm	70.0000	--	--	
Turbidity	0.5000	NTU	0.1000	--	--	
Color	<	CU	15.0000	--	--	
Total Dissolved Solids	NA	mg/l	100.0000	--	--	
Nickel	<	mg/l	0.1000	0.0999	0.1000	
Lead	<	mg/l	0.0010	--	--	
Copper	<	mg/l	0.0200	--	--	

(1) *Test results provided for May 14, 2014*
(2) *"NA" indicates "not analyzed", "<" indicates "less than state reporting level"*
(3) *State Reporting Level*

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

ANALYTE	RESULT (2)	UNITS	SRL (3)	Trigger	MCL	Exceeds MCL (X if yes)
Vinyl Chloride	<	ug/L	0.5	0.5	2	
1,1-Dichloroethylene	<	ug/L	0.5	0.5	7	
1,1,1-Trichloroethane	<	ug/L	0.5	0.5	200	
Carbon Tetrachloride	<	ug/L	0.5	0.5	5	
Benzene	<	ug/L	0.5	0.5	5	
1,2-Dichloroethane	<	ug/L	0.5	0.5	5	
Trichloroethylene	<	ug/L	0.5	0.5	5	
1,4-Dichloroethylene	<	ug/L	0.5	0.5	75	
Dichloromethane	<	ug/L	0.5	0.5	5	
Trans-1,2-Dichlroethylene	<	ug/L	0.5	0.5	100	
Cis-1,2-dichloroethylene	<	ug/L	0.5	0.5	70	
1,2-Dichloropropane	<	ug/L	0.5	0.5	5	
Toluene	<	ug/L	0.5	0.5	1000	
1,1,2-Trichloroethane	<	ug/L	0.5	0.5	5	
Tetrachloroethylene	<	ug/L	0.5	0.5	5	
Chlorobenzene	<	ug/L	0.5	0.5	100	
Ethylbenzene	<	ug/L	0.5	0.5	700	
Styrene	<	ug/L	0.5	0.5	100	
1,2-Dichlorbenzene	<	ug/L	0.5	0.5	600	
1,2,4-Trichlorobenzene	<	ug/L	0.5	0.5	70	
Total Xylene	<	ug/L	0.5	0.5	10000	

(1) *Test results provided for May 20, 2015*
(2) *"<" indicates "less than state reporting level"*
(3) *State Reporting Level*

The system chlorinates at the source prior to entering the cistern. There appears to be a past history of total coliform hits as recent as 2013. A review of the WSDOH Sentry website indicates the system has no current water quality violations.

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

Deficiencies

None.

2.7.3 Storage

2.7.3.1 Underground Storage Reservoir

Criteria

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

Required Capacity

From Table 2-5 the current PHD is 50 gpm and from Table 2-2 the Q_S is 35 gpm.

ES = (50-35)(150) = 2,250 gallons

From Table 2-6 the estimated future PHD is 60 gpm and from Table 2-2 the Q_S is 35 gpm.

ES = (60-35)(150) = 3,750 gallons

From Table 2-5 the current/future ADD is 453 gpd/ERU and from Table 2-5 the current/future N is 15.

SB_{TSS} = (2 days)(453)(15) = 13,590 gallons

From Table 2-6 the current/future ADD is 453 gpd/ERU and from Table 2-5 the current/future N is 21.

SB_{TSS} = (2 days)(453)(21) = 19,026 gallons

Current Capacity

Per Table 2-2 the current storage capacity is 8,400 gallons.

Evaluation

The total current capacity needed to meet ES and SB storage requirements is 15,840 gallons and total future capacity needed to meet ES and SB storage requirements is 22,776 gallons. The current storage capacity of 8,400 gallons is inadequate for current and future equalizing and standby storage needs.

Deficiencies

The reservoir capacity is deficient by 7,440 gallons to meet current estimated ES and SB.

The reservoir capacity is deficient by 14,376 gallons to meet future estimated ES and SB.

2.7.4 Fire Flow

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

2.7.5 Distribution System

Criteria

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

Required Capacity

Based on the reported operating pressure at the booster pump there is a maximum 25 psi pressure loss available (57.7 feet of head loss).

Current Capacity

It is reported the distribution system is comprised of 1¼-inch, 1½-inch, 2-inch and 3-inch galvanized iron mains with ¾-inch service pipe.

Evaluation

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

The future calculated PHD of 60 gpm (Table 2-6) was split equally (2.0 gpm/connection) between the 30 existing and projected connections (Section 2.4.1) 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 observed pressure condition of 55 psi.

The BVWA has reported no system pressure deficiencies.

Table 2-9: Distribution System Hydraulic Analysis

Location	Elevation	Static Pressure (psi)	Calculated Pressure Loss during PHD (psi)	PHD System Pressure (psi)
North End Node	985	53.2	-5.1	48.1
Pump Enclosure Node	981	55.0	0.0	55.0
Middle West Branch Node	962	63.2	-3.1	60.1
South West Branch Node	953	67.1	-3.9	63.2
South End Node	969	60.1	-5.2	54.9

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

Deficiencies

None.

2.7.6 Water Rights

Criteria

The adequacy of the BVWA 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 BVWA appears to be withdrawing water based on a water right claim dated 5/7/1974. The Permit to Appropriate Public Waters of the State of Washington is dated 12/23/1969 with a maximum legal withdrawal of 50 gpm and an annual withdrawal of 38 acre/ft annually.

Evaluation

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

Table 2-10 Annual Water Use and Water Rights

Certifi-cate #	Name of Claimant	Priority Date	Source Name	Primary/ Supple-mental	Existing Water Rights		Future System Demand		Status excess/(deficiency)	
					(Qi)	(Qa)	(Qi) (1)	(Qa) (2)	(Qi)	(Qa)
PERMITS / CERTIFICATES					(gpm)	(acre-ft/yr)	(gpm)	(acre-ft/yr)	(gpm)	(acre-ft/yr)
9659	Basin View Water Company	08/13/1968	SO1	Primary	50	38	35	10.6	15	24.4

(1) *Qi = minimum required well pump capacity*
(2) *From Table 2-6*

Based on the above table it appears the Association is in compliance with their water right.

Deficiencies

None.

2.7.7 Summary of Deficiencies

The following table summarized the deficiencies.

Table 2-11 Summary of Deficiencies

System Component	Current System Capacity	Current Needs	Current Deficiency	Future Needs	Future Deficiency
Supply (well pump)	35 gpm	10 gpm	none	15 gpm	none
Supply (booster pump)	96 gpm	50 gpm	none	60 gpm	none
Treatment	No known issues		none		none
Storage (ES/SB)	8,400 gal.	15,840 gal.	(7,140 gal.)	22,776 gal.	(14,376 gal.)
Fire Flow	n/a	n/a	n/a	n/a	n/a
Distribution	adequate	adequate	none	adequate	none
Water Rights (Qi)	50 gpm	35 gpm	none	35 gpm	none
Water Rights (Qa)	38.0 ac-ft/yr	7.6 ac-ft/yr	none	10.6 ac-ft/yr	none

This report will base analysis and costs on the deficiencies noted above.

2.8 System Finances

Current Water Rates are reported as follows:

Basic Fee: $80/mo.

BVWA financial data was provided for the period 2013-2015. The latest 3-years data (2013-2015) is shown on the following table. Reserve balance was not provided.

Table 2-12 Annual Operation Budget

Description	2013	2014	2015
INCOME			
Big Bend Capital Credits	$239.66	$0.00	($1,064.08)
Water	$22,202.73	$24,284.61	$22,975.10
Electrical Pump Charge	$49.00	$0.00	$0.00
Total Income Received	$22,491.39	$24,284.61	$21,911.02
EXPENSES			
Computer and Internet Expenses	$415.36	$200.00	$0.00
Insurance	$1,250.00	$1,250.00	$1,250.00
Irrigation water	$2,767.13	$3,409.36	$3,315.19
Miscellaneous (1)	$314.02	$22,108.30	$16,240.56
Office Supplies	$149.70	$55.78	$0.00
Postage and Delivery	$46.00	$104.84	$147.00
Professional Fees	$397.30	$601.50	$623.80
Repairs and Maintenance	$1,827.80	$661.71	$3,881.12
Secretary Expense	$1,500.00	$1,175.00	$1,200.00
Small Tools and Equipment	$466.29	$0.00	$53.91
System Manager	$1,500.00	$2,279.51	$2,983.60
Utilities	$4,146.06	$2,132.53	$3,723.02
Water testing	$645.00	$247.50	$782.50
Total Expenses	$15,424.66	$34,226.03	$34,200.70
BALANCE (assume transfer to/from reserves)	$7,066.73	($9,941.42)	($12,289.68)

(1) *Installation of meters/meter boxes, etc.*

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

Table 2-13 Annual Operation Budget – Summary per Connection

Description	2013	2014	2015
Active Connections	22	22	22
REVENUE			
Annual Revenue per Connection	$1,022	$1,104	$996
Monthly Revenue per Connection	$85	$92	$83
EXPENSES			
Annual Expenses per Connection	$701	$1,556	$1,555
Monthly Expenses per Connection	$58	$130	$130
Monthly net per connection (reserves)	$27	($38)	($47)

Based on the above tables it appears the water system finances are insufficient to support the system with the current rate structure. This is due to the expenses incurred during the meter installation project conducted in 2014 and 2015.

Based on 2013 budget the rate structure appears to be adequate to cover the daily operational expenses, ongoing maintenance and repairs and reserves appear adequate for equipment replacement and improvements as needed (i.e. the meter installation project).

3.0 CONSOLIDATION

3.1 Improvements required to meet City Standards

3.1.1 Supply

The existing BVWA 8-inch diameter well, with a 35 gpm capacity, is likely too low for the City to utilize cost-effectively. The well is also located on a portion of a residential lot with inadequate space for the City to operate and maintain effectively. Therefore, this well would likely be required to be abandoned by the Association as part of a consolidation.

3.1.2 Distribution

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

- Replace the existing 1 ¼, 1 ½, 2 and 3-inch water main with a minimum 8-inch diameter DI/PVC water main
- Replace the existing ¾-inch diameter service pipes with new 1-inch diameter K copper pipe
- Install a sampling station
- Install a 2-inch blow-off at each of the temporary dead ends (expected to be extended in the future to serve Highland Estates Water System)
- Install fire hydrants at the spacing required per City standards

3.1.3 Storage

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

3.1.4 Estimated Cost of Improvements to meet Othello's Standards

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

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

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

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

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

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

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

Table 3-3 Estimated Improvements Cost

Description	Est. Quan.	Units	Unit Price	Amount
Main (8-inch PVC)	3100	LF	$28	$86,800
Valves, fittings, restraints	3100	LF	$13	$40,300
Fire hydrants	3100	LF	$9	$27,900
Service connections (1)	3100	LF	$18	$55,800
Surface Replacement	3100	LF	$10	$31,000
Sampling Station	1	EA	$2,000	$2,000
2" Blow-off	3	EA	$2,000	$6,000
			Subtotal	$250,000
			Mobilization 10%	$25,000
			Contingency 20%	$50,000
			Estimated construction cost	$325,000
			Environmental approvals 10% (assuming must meet DWSRF loan requirements)	$14,000
			Engineering 25% (design, construction management/inspection)	$81,000
			ESTIMATED PROJECT COST	$420,000
			ESTIMATED PROJECT COST/LF	$135

(1) *Used 1/2 the Table 3-1 value due to large lots and spacing between connections*

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 Bench Rd., approximately 800 feet east of State Route 24 at Buena Vista. City water service can be extended to BVWA by constructing a transmission main from Bench Rd./Buena Vista west on Bench Rd. and south on Taylor Rd. approximately 4,400 feet and 3,800 feet respectfully.

The connection will allow for Othello Manor Water System (OMWS) and Highland Estates Water System (HEWS) to connect to the City system and could provide a cost sharing partner to BVWA for the water main extension. BVWA 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 BVWA is within the City of Othello UGA and it is presumed at some point in the future the City of Othello's water system will be extended to serve the UGA. Therefore the transmission main sizing will also be evaluated using growth figures and fire flows provided by the City.

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

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

Criteria

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

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

Fire flows as follows:

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

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

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

Evaluation/Conclusion

The transmission main sizing was evaluated under both scenarios required in the WSDOH WSDM for both BVWA 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.)
BVWA [1]	21	14	60	1000	PHD	60	8
City of Othello UGA Area 4 [2]	285	133	215	1000	PHD	215	8
BVWA [1]	21	14	60	1000	MDD/FF	1014	8
City of Othello UGA Area 4 [2]	285	133	215	1000	MDD/FF	1133	10

(1) *From Table 2-6*
(2) *See Appendix C*
(3) *From BVWA, north along Taylor Rd, East on Bench Rd (see Figure 5)*

3.2.3 Estimated Cost to Connect to City of Othello Water System

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

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

Description	Estimated Quantity	Unit	Unit Price	Amount (BVWA) (8-inch T-Main)	Amount (City of Othello) (upsize to 10-inch)
Main & install (8-inch)	7,300	LF	$28	$204,400	
Main & install (upsize to 10-inch) (includes upsizing 8-inch improvements., see Figure 5)	8,000	LF	$4		$32,000
Valves, fittings, restraints (8-inch)	7,300	LF	$7	$51,100	
Valves, fittings, restraints (upsize to 10-inch) (includes upsizing 8-inch improvements., see Figure 5)	8,000	LF	$1		$8,000
Fire hydrants	7,300	LF	$9	$65,700	
Service connections	7,300	LF	$2	$14,600	
Surface Restoration	7,300	LF	$2	$14,600	
Irrigation Canal Crossing (16" casing, 8" carrier pipe)	200	LF	$350	$70,000	
Irrigation Canal Crossing (upsize to 24" casing, 10" carrier pipe)	200	LF	$150		$30,000
PRV Vault	1	EA	$15,000	$15,000	
			Subtotal	$435,000	$70,000
			Mobilization 10%	$44,000	$7,000

Description	Estimated Quantity	Unit	Unit Price	Amount (BVWA) (8-inch T-Main)	Amount (City of Othello) (upsize to 10-inch)
Contingency 20%				$87,000	$14,000
Estimated construction cost				$566,000	$91,000
Environmental approvals allowance (assuming must meet DWSRF loan requirements)				$24,000	
Engineering 25% (design, construction management/inspection)				$142,000	$23,000
ESTIMATED PROJECT COST				$732,000	$114,000
ESTIMATED PROJECT COST/LF				$100	

3.3 Estimated Impact to City System

The impact of consolidating the BVWA 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 BVWA system demands from Table 2-5 and 2-6.

Table 3-6 Current City of Othello Water System Demands

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

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

3.3.1 Supply

Criteria

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

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

Current Capacity

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

Table 3-7 Current City Supply

Well No.	WSDOH ID No.	Current Capacity (gpm)
2	01	-
3	02	800
4	06	430
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 BVWA 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				
BVWA	Current (4)	10				
Total		4,710	347	5,057	7,155	2,098
City of Othello	Current (3)	4,700				
BVWA	Future (5)	15				
Total		4,715	347	5,062	7,155	2,093

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

Conclusion

The City has adequate supply capacity to serve BVWA 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 BVWA system demands. No deficiencies within the existing City of Othello water system were found.

The hydraulic model was then run adding the BVWA 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 BVWA and the future UGA with no improvements required.

3.3.3 Storage

Criteria

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

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

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

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

Where:

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

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

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

Where:

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

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

Fire Suppression Storage (FSS): Storage volume required to provide the maximum fire flow

rate and duration (min. system pressure 20 psi)

- FSS = (FF)(duration)

Where:

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

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

Current Capacity

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

Evaluation

Operational Storage

Extending service to BVWA 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
BVWA	60	7,155	150	0
Combined	7,660	7,155	150	75,725

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

Standby Storage

Description	Duration (days)	ADD (gpd/ERU)	ERUs	t_M	Q_S (gpm)	Q_L (gpm)	SB (Eq.9-3) (gal.)	SB (200 gpd/ERU) (gal.)
Othello	2	453	10,490	1440	7155	2500	<0	2,098,000
BVWA	2	453	21	1440	7155	2500	<0	4,200
Combined	2	453	10,511	1440	7155	2500	<0	2,102,200

Fire Suppression Storage

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

Dead Storage

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

Storage Comparison

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

Table 3-9 Storage Comparison

Description	CITY OF OTHELLO		OTHELLO/BVWA	
	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		75,725
Bottom of ES (2)	1203.9		1203.7	
SB		2,098,013		2,102,200
Bottom of SB (3)	1168.9		1168.7	
FSS		1,500,000		1,500,000
Bottom of FSS (4)	1178.9		1178.7	
Base Elevation	1119.6		1119.6	

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

Conclusion

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

3.3.4 Water Rights

Criteria

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

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

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

Current Water Right

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

Qi = 9,550 gpm

Qa = 7,100 acre-ft/yr

Evaluation

The impact on the City's water rights of consolidating the BVWA 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)
BVWA	0	10.6 (2)
Total	7,155	5,310.6
Water Right	9,550	7,100
Excess/(deficiency)	2,395	1,789.4
BVWA Water Rights Transfer	50 (3)	38 (3)
City of Othello Water Rights post Consolidation (4)	9,600	7,138

(1) *From Table 3-6*
(2) *From Table 2-6*
(3) *From Table 2-10*
(4) *Adds current BVWA water right amounts, actual amount would be determined by ECY. ECY may limit Qi to current pump rate (35 gpm) and Qa to current use (7.6 acre-ft/tr)*

Conclusion

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

Based on estimated future water use from Table 2-11, extending water service to BVWA will not affect Qi and will use 10.6 acre-ft/yr of the City's Qa. Consolidating with BVWA and acquiring the water right associated with BVWA's well could potentially add 50 gpm (current BVWA Qi) to the City's Qi and 38 acre-ft/yr (maximum convertible Qa for well) to the City's Qa which would offset the BVWA annual water use impact to the City's Qa.

Actual Qi/Qa amounts would be determined by ECY. ECY may limit Qi to current pump rate (35 gpm) and Qa to current use (7.6 acre-ft/tr).

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 2-12 are estimated as follows.

FUNDING

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

DWSRF: Drinking Water State Revolving Fund

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

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

CDBG-GP: Community Development Block Grant

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

This funding source is grant and repayment is not required.

USDA-RD: United States Department of Agriculture Rural Development

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

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

COST ESTIMATE

Table 3-13 Estimated Capital Improvements Cost

Description	Est. Amount
Replace existing 10,000 gallon storage tank with new 24,000 gallon underground storage tank (precast tank(s), piping, level controls, etc.)	$60,000
Estimated Cost of Capital Improvements	$60,000
Estimated Annual Debt Service (assuming USDA-RD funding at 4.5% for 20 yrs)	$4,600

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

Table 3-14 Estimated Operation and Maintenance Cost

Description	Amount
Annual O&M [1]	$22,900
Estimated annual debt service on capital improvements [2]	$4,600
Total Estimated Annual System Cost	$27,500

(1) *Based on average Table 2-12 "income received" and rounded to nearest $1,000 (assumes 2014 – 2015 miscellaneous costs are non-recurring, funded via reserves and rate increases are not required)*
(2) *From Table 3-13*

3.4.2 Consolidated System

Considered below are several consolidation scenarios that affect the cost impacts of the consolidation on BVWA. These scenarios include Othello Manor Water System (OMWS) and/or Highland Estates Water System (HEWS) consolidating with City of Othello Water System and sharing the consolidation costs with BVWA. In each scenario the cost of connection may be shared based on the total length of transmission main required to connect each of the water systems to the City of Othello Water System (shared with OMWS and HEWS) and internal BVWA distribution system pipe that would be shared only with HEWS.

Table 3-15 Estimated Cost Sharing with Othello Manor and Highland Estates [1] [2]

Description	Est. Quan.	Unit	Unit Price [3]	Amount		Othello Manor Only	Higland Estates Only	Both
Portion of shared consolidation transmission Main	6,600	LF	$100	$662,000		($331,000)	($331,000)	($444,000)
Portion of shared consolidation transmission Main	950	LF	$100	$95,000			($47,500)	($47,500)
Portion of shared improvements distribution main	1,500	LF	$135	$203,000			($101,500)	($101,500)
ESTIMATEDSHARED PROJECT COST				$960,000		($331,000)	($480,000)	($593,000)

(1) *This does not include estimated cost to upsize to 10-inch main*
(2) *See Figure 6*
(3) *From Tables 3-3 and 3-5*

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

Table 3-16 Estimated Improvements Cost and Annual Debt Service

Description	Consolidation Scenario			
	BVWA	BVWA and OMWS	BVWA and HEWS	BVWA, OMWS and HEWS
Estimated Cost to Improve BVWA [1]	$420,000	$420,000	$420,000	$420,000
Estimated Cost to extend service to BVWA [2] (does not include City portion to upsize t-main)	$732,000	$732,000	$732,000	$732,000
Cost sharing reduction [3]		($331,000)	($480,000)	($593,000)
Total Capital Cost	$1,152,000	$821,000	$672,000	$559,000

Description	Consolidation Scenario			
	BVWA	BVWA and OMWS	BVWA and HEWS	BVWA, OMWS and HEWS
Annual Debt Service [4]				
DWSRF Loan (1% interest for 20 yrs) [5]	$63,800	$45,500	$37,200	$31,000
DWSRF Loan w/50% Loan Forgiveness (1% interest for 24 yrs) [6]	$27,100	$19,300	$15,800	$13,200

(1) *From Table 3-3*
(2) *From Table 3-5*
(3) *From Table 3-15*
(4) *Assume consolidation funded by City via. City application to WSDOH for DWSRF construction loan funds*
(5) *Assumes a not economically disadvantaged system with project completed within 24 months of contract execution.*
(6) *DWSRF will provide 50% principal forgiveness for eligible consolidation projects with repayment extended to 24 years. Consolidation of these water systems may qualify due to the water rights issue with* BVWA *and the ECY letter stating* BVWA *is to cease operations until adequate water rights are secured. This will have to be discussed with DWSRF prior to applying for funding.*

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 3-17 Comparison of Costs

Description	BVWA remain separate system		Consolidation Scenario							
			BVWA		BVWA and OMWS		BVWA and HEWS		BVWA, OMWS and HEWS	
			DWSRF Loan	DWSRF Loan (w/50% forgiveness) [4]	DWSRF Loan	DWSRF Loan (w/50% forgiveness) [4]	DWSRF Loan	DWSRF Loan (w/50% forgiveness) [4]	DWSRF Loan	DWSRF Loan (w/50% forgiveness) [4]
Annual O&M [1]	$22,900									
Estimated Debt Service on Improvements [2]	$4,600		$63,800	$27,100	$45,500	$19,300	$37,200	$15,800	$31,000	$13,200
Estimated Annual Cost	$27,500		$63,800	$27,100	$45,500	$19,300	$37,200	$15,800	$31,000	$13,200
Connections (2016) [3]	22		22	22	22	22	22	22	22	22
Est. Cost Per Connection/month	$104		$242	$103	$172	$73	$141	$60	$117	$50
City of Othello base water rate [5] (outside city)			$51	$51	$51	$51	$51	$51	$51	$51
Total Estimated cost per connection/month	$104		$293	$154	$223	$124	$192	$111	$168	$101

(1) *From Table 3-14*
(2) *From Table 3-14 / 3-16*
(3) *From Table 2-13*

(4) *DWSRF will provide 50% principal forgiveness for eligible consolidation projects and extend repayment to 24 yrs. Eligibility will be determined by WSDOH and DWSRF.*

(5) *Does not include overage charges. Base rate is $34 with 50% surcharge ($17) outside the City. It is possible the City could count this $17 monthly surcharge amount toward the debt service lowering the Total Estimated cost per Connection/Month by $17*

Important notes about the above table:

- All estimated improvements costs are based on current regional costs for PUBLIC WORKS construction which require competitive bidding, prevailing wage rates, more restrictive environmental investigations and requirements, MBE/DBE requirements and generally higher overhead and administrative cost. It is recommended BVWA perform their own estimates for privately funded construction to compare with the estimated improvement costs contained herein.

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

- It is recommended BVWA make contact with Othello Manor and Highland Estates, possibly the golf course as well as others who may benefit from the City of Othello water main extension and discuss cost sharing opportunities which would likely reduce BVWA share of the above estimated costs.

3.5 Barriers to Consolidation

Potential barriers to consolidation are identified as follows:

- Overall estimated cost of the improvements required for consolidation and significant impact to the monthly user rates without participation from other systems
- Financing of improvements (alternative funding or City sponsored DWSRF application)
- Eligibility of system consolidation for DWSRF 50% loan forgiveness
- Coordination between the City and BVWA for funding and construction of the improvements
- Coordination between Othello Manor and Highland Estates (and or other potential cost sharing partners) regarding their motivation for consolidation

4.0 NEXT STEPS/SCHEDULE

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

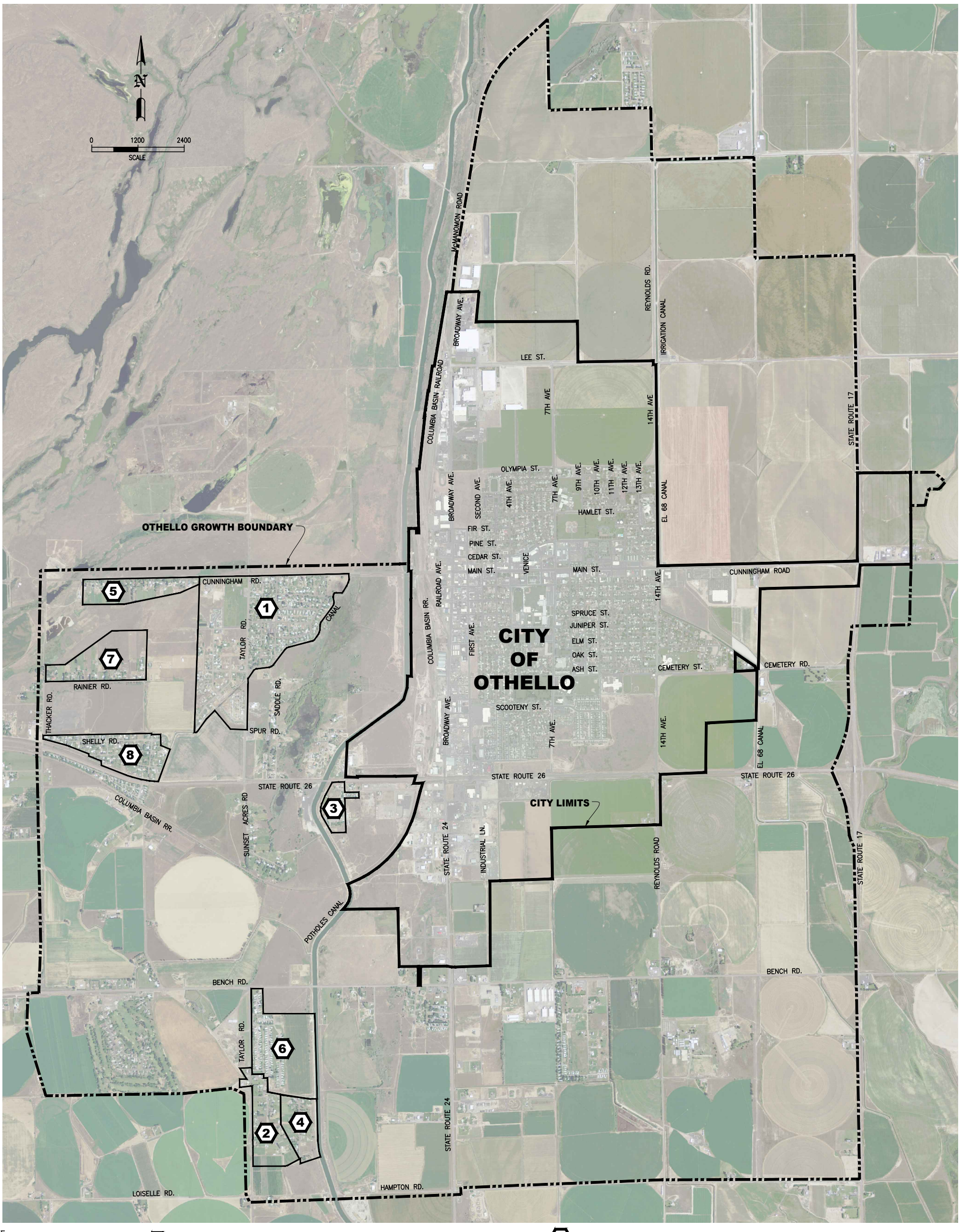
- The capital improvement program and projected budget must be updated to include the construction projects to be pursued in 2017.
- The systems contemplated for consolidation in 2017 must be included in the future service area.
- The amendment is subject to State Environmental Policy Act; the City is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

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

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

The following steps and schedule are proposed:

Submit draft report to WSDOH for review/approval:	July 29, 2016
Submit final report to WSDOH/City of Othello for approval: *(revised per WSDOH comments)*	August 31, 2016
Submit to BVWA for review/consideration:	August 31, 2016
City/ BVWA 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/ BVWA negotiate consolidation/water service agreement:	October 1, 2017 – December 31, 2017
City negotiate grant/loan agreement with DWSRF:	January 1, 2018 – February 28, 2018
City sign grant/loan agreement with DWSRF:	March 1, 2018
City negotiate engineering agreement for design/construction management and inspection of improvements; environmental process and approval requirements:	March 1, 2018 – March 31, 2018
City execute engineering agreement:	April 1, 2018
Complete environmental approval process, design improvements	April 1, 2018 – June 30, 2018
WSDOH design review/approval DWSRF environmental review/approval	July 1, 2018 – July 31, 2018
Advertise for bids, bid period, award, process insurance/agreements, issue notice to proceed:	August 1, 2018 – September 15, 2018
Construct improvements:	September 15, 2018 – October 15, 2018
System(s) consolidation complete:	October 15, 2018



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

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

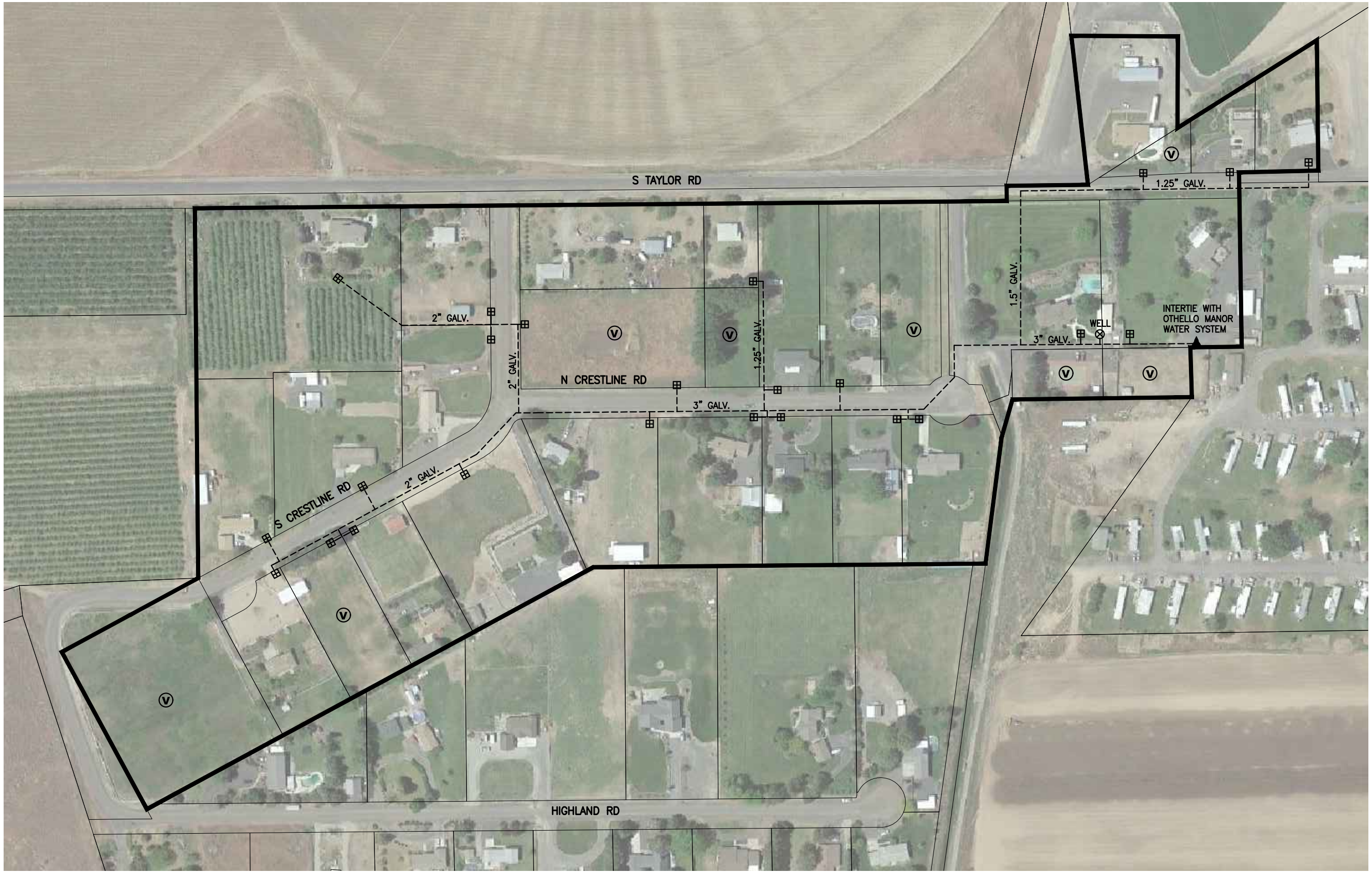
SCALE:	AS SHOWN
DESIGNED:	–
DRAWN:	TVP
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08
DATE:	8/26/16

VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

CONSOLIDATION FEASIBILITY STUDY SYSTEM

FIGURE
1



1720803 BVWA Exhibit

LEGEND

- BVWA BOUNDARY
- PARCEL LINE
- WATER LINE
- WELL
- METER
- VACANT

0 100 200
SCALE

SCALE:	AS SHOWN
DESIGNED:	JSM
DRAWN:	TVS
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	7/27/16

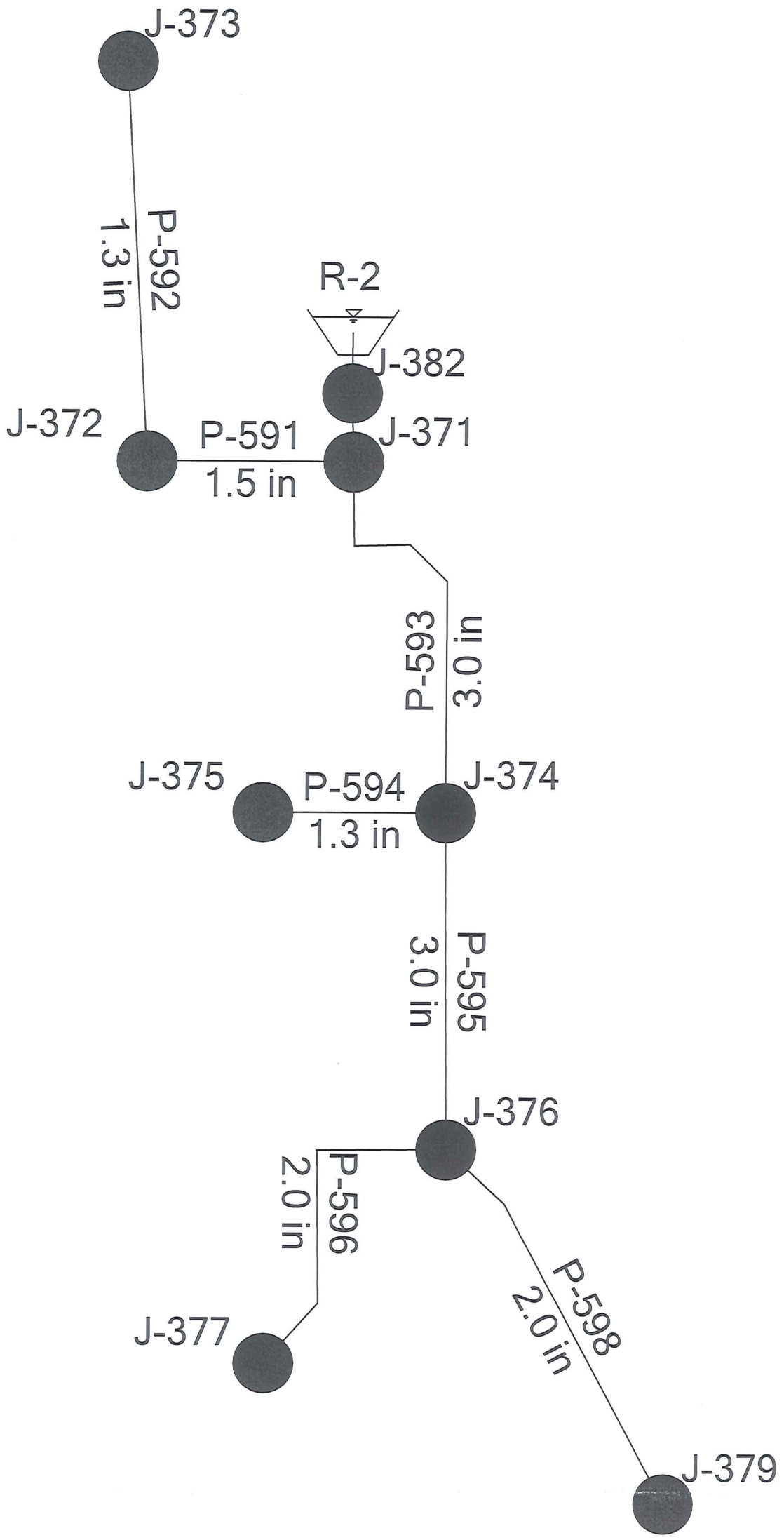
VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

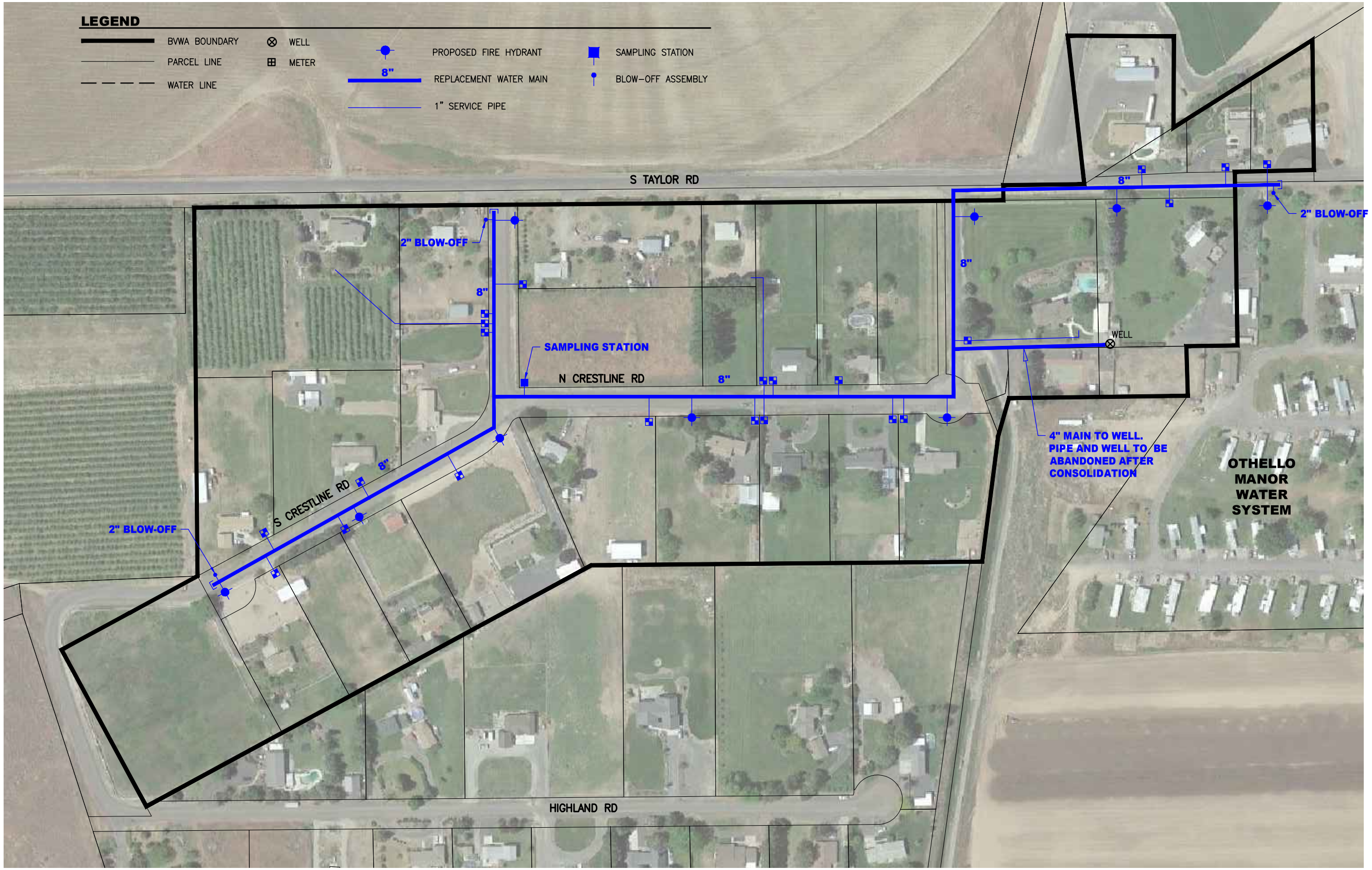
CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

BVWA EXISTING WATER SYSTEM AND
WATER SYSTEM BOUNDARY

FIGURE
2

Figure 3
BVWA Distribution System Hydraulic Model





1720803 BVWA Exhibit

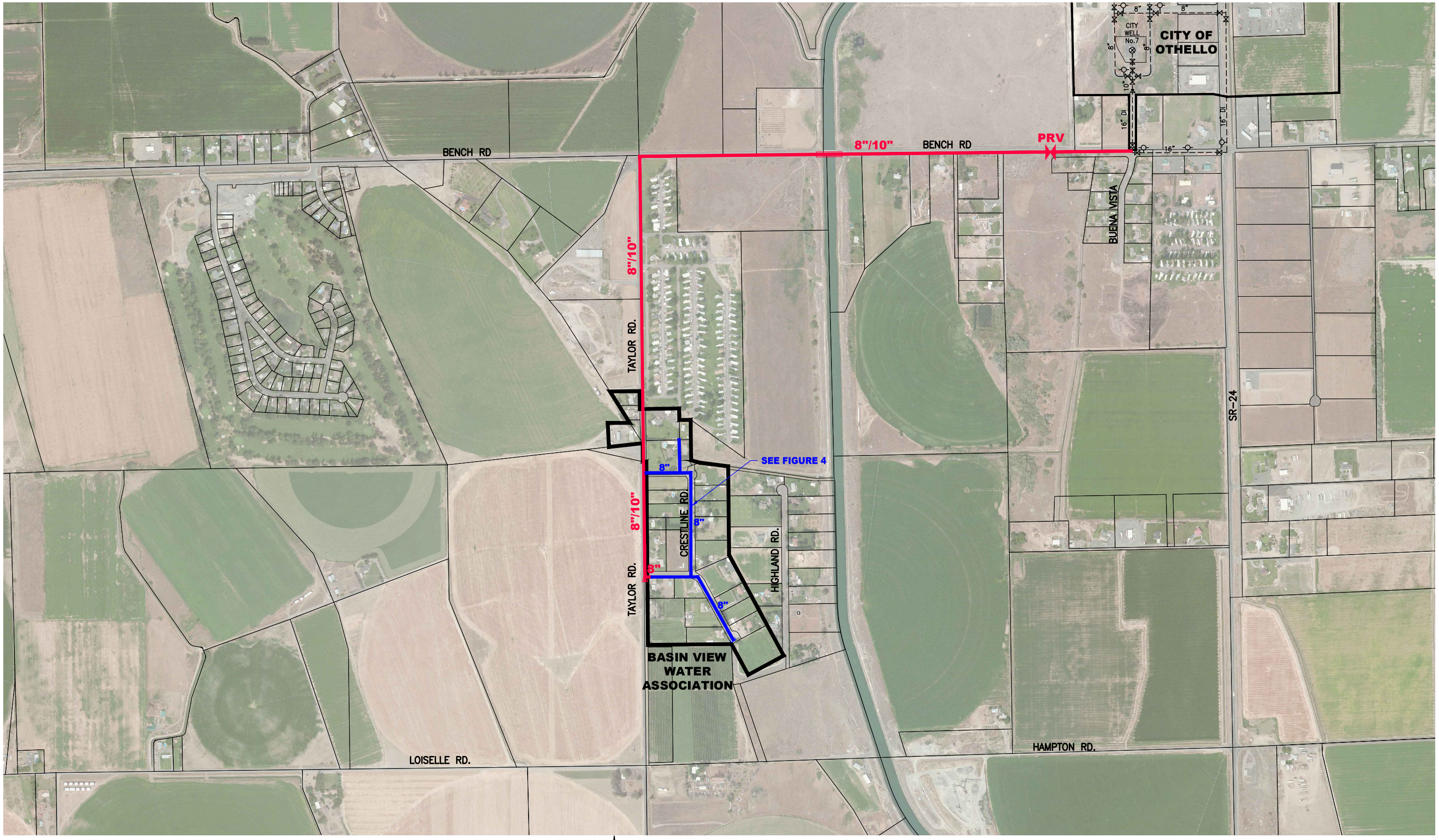
SCALE:	AS SHOWN
DESIGNED:	JSM
DRAWN:	TVS
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	7/27/16

VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

BVWA PROPOSED IMPROVEMENTS REQUIRED TO MEET CITY STANDARDS

FIGURE
4



1720803 BVWA Exhibit

SCALE:	AS SHOWN
DESIGNED:	JSM
DRAWN:	TVS
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	7/27/16

LEGEND

- BVWA BOUNDARY
- PARCEL LINE
- 8" PROPOSED WATER MAIN
- PRV PRESSURE RELIEF VALVE

0 400 800
SCALE

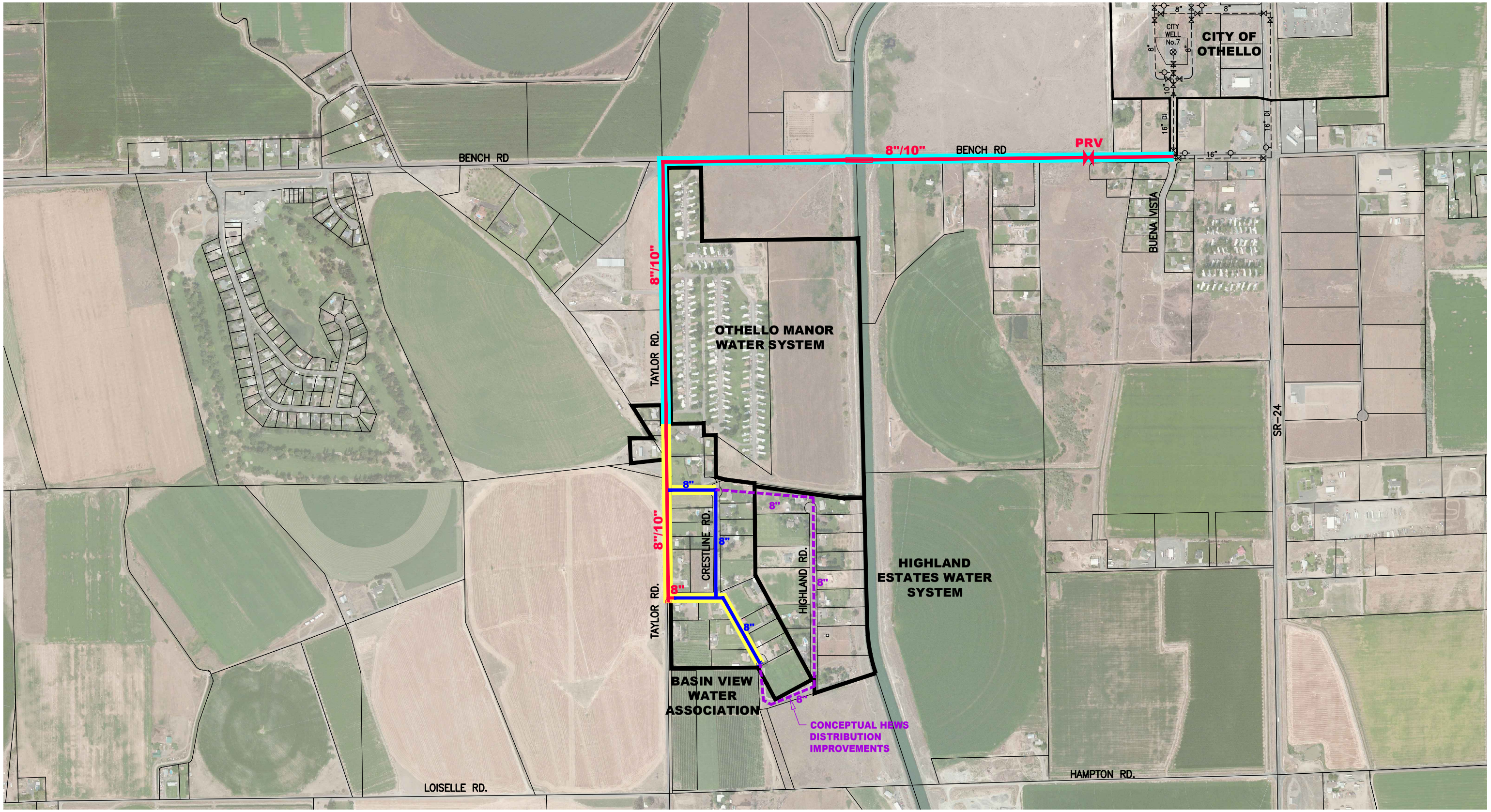
N

VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES

BVWA CONSOLIDATE IMPROVEMENTS

FIGURE
5



LEGEND

- BOUNDARY
- PARCEL LINE
- 8"/10" PROPOSED WATER MAIN
- COST SHARING WITH OMWS & HEWS
- COST SHARING WITH HEWS

0 400 800
SCALE

N

1720803 BVWA Exhibit

SCALE:	AS SHOWN
DESIGNED:	JSM
DRAWN:	TVS
CHECKED:	
APPROVED:	
PROJ. NO.:	172-08-03
DATE:	7/27/16

VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

CITY OF OTHELLO, WASHINGTON
WATER SYSTEM CONSOLIDATION FEASIBILITY STUDIES
BVWA
COST SHARING WITH OMWS AND HEWS

FIGURE
6

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: 01/21/2014
Printed: 7/18/2016
WFI Printed For: On-Demand
Submission Reason: No Change

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
04530 N	BASIN VIEW WATER ASSOCIATION	ADAMS	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS

HUGH COFFELT [SEC-TREASURER]
BASIN VIEW WATER ASSN
859 S CRESTLINE RD
OTHELLO, WA 99344-9518

7. OWNER NAME & MAILING ADDRESS — **8. OWNER NUMBER: 000340**

BASIN VIEW WATER ASSN
DONALD HANES — BOARD PRESIDENT
875 S CRESTLINE RD
OTHELLO, WA 99344-9518

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS
CITY STATE ZIP

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS
CITY STATE ZIP

9. 24 HOUR PRIMARY CONTACT INFORMATION

Primary Contact Daytime Phone: (509) 488-2555
Primary Contact Mobile/Cell Phone: (509) 760-7054
Primary Contact Evening Phone: (xxx)-xxx-xxxx
Fax:
E-mail: xxxxxxxxxxxxxxxxxxx

10. OWNER CONTACT INFORMATION

Owner Daytime Phone: (509) 488-9520
Owner Mobile/Cell Phone:
Owner Evening Phone: (xxx)-xxx-xxxx
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
- [ ] Investor
- [x] Private
- [ ] Special District
- [ ] State

14. STORAGE CAPACITY (gallons)

8,400

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 - AFA201		X										X					X					260	35	NW SW	16	15N	29E
S02	Othello Manor Water System	64845 3													X			X	X					300	SE NW	16	15N	29E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
04530 N	BASIN VIEW WATER ASSOCIATION	ADAMS	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		22	22
A. Full Time Single Family Residences (Occupied 180 days or more per year)	22		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	0	0	0
28. TOTAL SERVICE CONNECTIONS		22	22

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per year? 60

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

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

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

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

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

35. Reason for Submitting WFI:

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

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

SIGNATURE: _____ **DATE:** _____

PRINT NAME: _____ **TITLE:** _____

APPENDIX B

Water Rights, Well Log

S. F. No. 370-B—OS—6-67.

$10.00 examination fee should accompany each application.

STATE OF WASHINGTON
DEPARTMENT OF WATER RESOURCES
Division of Water Management

PRIORITY
Date 8-13-68
Time 2:00 PM
Accepted WRI

APPLICATION FOR A PERMIT

To Appropriate Public Ground Waters
OF THE STATE OF WASHINGTON

Application No. G. W. 9659

I, BASIN VIEW WATER COMPANY, INC.
(Name of applicant)

of c/o CAW & CAW
P. O. Box 355, Othello, Washington 99344
(Complete post office address)

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

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

located 2-1/2 miles southwest of Othello, Washington
(Give approximate distance and direction from nearest city or town)

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

Zone ..... (Leave blank)

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

2. *The quantity of water which applicant intends to withdraw for beneficial use is* 50 *gallons per minute;* ..... *acre feet per year.*

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

4. *The time during which water will be required each year* ~~all year~~ continuously

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

(a) ~~N. 0° 19' 16" E. 186.5'~~ N and ~~S. 89° 40' 44" E. 306'~~ E from the West Quarter corner ~~of being~~ of Sec. 16
(Give distance and bearing from nearest corner of section or legal subdivision)

being within the ~~SW1/4 of SW1/4 of the NW1/4~~ *of Sec.* 16, *Twp.* 15 N., *Rge.* 29E.
(Give smallest legal subdivision) (E. or W.)

or (b) If within limits of recorded platted property, town or city: Lot 12 & 13, *Block* .....,

of The plat of Basin View Plat.
(Give name of plat or addition) (If within town or city, give name)

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

6. DESCRIPTION OF WORKS:

(a) Well will be drilled *(Dug or drilled) and have a diameter of* 8 *inches and an estimated depth of* 400 *feet.*

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

None

(c) Distribution system to be described:

10,000 gallon storage cistern to be distributed to lots by buried galvanized pipe.

(d) If pumps are to be used, give size and type:

One 5 h.p pressure pump and one 5 h.p. centrifugal pump

(e) Give capacity and type of motor or engine to be used:

5 h.p three phase electric motor

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

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

(Name)	(Direction)	(Distance)
O. Frans Yorgesen	West	500 feet

SUPPLY THE FOLLOWING INFORMATION ACCORDING TO USE PROPOSED:

7. *For Municipal Supply: To supply the city, town, or community of* Basin View *, in the county of* Adams *, having a present population of* 28 *, and an estimated population of* 150 *, in 19* 70 *.*

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

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

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

The plat of Basin View Plat, within W½ Sec 16, T. 15N., R. 29E. W.M.

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

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

(Owner, lessee, contract buyer, etc.)

11. *Do you have any other water rights appurtenant to the above described property?*

If so, from what source?

12. *Construction work will begin on or before* well completed Jan 1, 1970

13. *Construction work will be completed on or before* JAN 1, 1971

14. *Water will be put to complete beneficial use on or before* approximately 1970 JAN 1, 1972

BASIN VIEW WATER COMPANY, INC.

By: E J Shepherd
President (Signature of applicant)

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

E. J. Shepherd — 1144 E. Spruce, Othello, Wash.
Daniel E. Simpson — 808 E. Oak, Othello, Wash.
(Name) (Address)

Daniel E. Simpson

BY: E J Shepherd
(Signature of legal landowner)

Signed in the presence of us as witnesses:

(Name) (Address of witness)

(Name) (Address of witness)

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

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

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

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

Division of Water Management.
Department of Water Resources.

DIRECTIONS FOR PREPARING APPLICATIONS

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

2. Write plainly in ink or use typewriter.

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

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

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

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

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

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

If within the limits of incorporated town or city:

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

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

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

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

SCHEDULE OF FEES DUE IN CONNECTION WITH OBTAINING GROUND WATER RIGHTS

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

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

For irrigation, permit fees are as follows:

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

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

10¢ per acre over 1,000 acres.

Permit fee for other uses: Twice the examination fee.

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

State of Washington
Department of Ecology

RECEIVED
DEPARTMENT OF ECOLOGY
MAY 23 1974 109619
CASH OTHER X NONE

Water Right Claims Registration

Water Right Claim

Name Basin View Water Co. Inc. (Short Form) 36

Address Rt. 1 Box 690

Othello, Wash. Zip Code 99344 Phone No. 488-2555

1) Source from which the right to take and make use of water is claimed: ☐ Surface Water ☒ Ground Water

If surface water, please indicate source; give name if known:

_____
(River, stream, lake, pond, spring, etc.)

2) Purpose(s) for which water is used:

☒ Domestic ☐ Stockwatering ☐ Irrigation (lawn and garden) ☐ Other Use (specify) _____

3) Legal description of lands on which water is used: _____

Basin View Plat

If located within the limits of a recorded platted property:

Units #77+202 Block 49 of Columbia Basin Project
(Give name of plat or addition)

In addition, please indicate Sec. 16 T. 15 N. R. 29 E/W. W.M.

County in which lands are located Adams

DO NOT USE THIS SPACE

The filing of a statement of claim does not constitute an adjudication of any claim to the right to use of waters as between the water use claimant and the state or as between one or more use claimants and another or others. This acknowledgment constitutes receipt for the filing fee.

Date Registered

This has been assigned Water Right Claim Registry No.

SEP 5 74 75420

Director, Department of Ecology

I hereby swear that the above information is true and accurate to the best of my knowledge and belief.

X R. J. Kittaw

Date 5/7/74

If claim filed by designated representative print or type full name and mailing address of agent below.

☒ Additional information relating to water quality and/or well construction is available.

A FEE OF $2.00 MUST ACCOMPANY THIS WATER RIGHT CLAIM

Return all three copies with carbons intact, along with your fee to:
Department of Ecology, Water Right Claims Registration, Olympia, Washington 98504

ORIGINAL DOE

S. F. No. 7354—OS—8-69.

STATE OF WASHINGTON
DEPARTMENT OF WATER RESOURCES
DIVISION OF WATER MANAGEMENT

Permit to Appropriate Public Waters of the State of Washington

Book No. 19 of Ground Water Permits, on page 9464 under Application No. 9659.

BASIN VIEW WATER COMPANY, INC.

of Othello, Washington

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

Priority date of this permit is August 13, 1968

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

The quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 50 gallons per minute; 38 acre-feet per year, to be used for the following purposes: community domestic supply, as more definitely set out below.

Approximate location(s) of the point(s) of withdrawal is/~~are~~: 186.5 feet north and 306 feet east from the west quarter corner of Sec. 16

being within Lots 12 and 13, of the plat of Basin View Plat

of Sec. 16, Twp. 15 N., Rge. 29 E. W.M., Adams County,

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

Domestic/~~municipal~~ Community supply: 50 gallons per minute; 38 acre-feet per year, during entire year.

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

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

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

The plat of Basin View Plat, within W½ Sec. 16, T. 15 N., R. 29 E.W.M.

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

A suitable measuring device shall be installed and maintained in proper working order as close as practical to the pumping station and in all instances ahead of the first discharge point for the purpose of measuring both the instantaneous withdrawal rate and the annual volumetric use of water in acre-feet. The owner and/or operator of the system shall be required to furnish records of water use to the department as may be requested.

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

This well is subject to closure at any time the above provisions are not complied with to the satisfaction of the Department of Water Resources.

DESCRIPTION OF PROPOSED WORKS:

The well will be drilled (Dug or drilled) and have a diameter of 8 inches, and depth of 400 feet.

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

DEVELOPMENT SCHEDULE:

Construction work shall begin on or before Started

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

January 1, 1971

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

January 1, ~~1972~~ 12-31-72

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

Given under my hand and the seal of this office at Olympia, Washington, this 23rd day of December, 19 69

Glen H. Lidbeck

Assistant Director
Division of Water Management
Department of Water Resources

ENGINEERING DATA
OK

Report of Examination on Ground Water

Received date August 13, 1968 Date of exam. November 7, 1968 Appli. No. 9659

Name Basin View Water Company, Inc. Address c/o Caw & Caw, Attorneys at Law, /P. O. Box 355, Othello, Wash.

Type of works a well Dimensions 8" x 400'

Progress of works well drilled and in use.

Quantity applied for 50 g.p.m. - acre-feet per year

Legal sub. Lot 12 / and 13, of the Plat of Basin View Plat Sec. 16 Twp. 15 N., Rge. 29 E. County Adams

Use community domestic supply

Irrigation-acreage: Present 0 Planned - Feasible

Municipal: Population 28 as of 1968

Industrial

Time pump will be operated Continuously

Other water rights appurtenant to this land None

Proximity to existing works, springs, wells, or streams - In Columbia Basin Project Unit 77

Area Sub-area Zone

RECOMMENDATIONS

Approved for 50 g.p.m. 38 acre-feet per year, subject to existing water rights. (1 acre-foot 325,850 gallons.)

"The installation of an access port as described in attached Ground Water Bulletin No. 1 shall be required prior to issuance of final certificate of water right. The applicant may, for his own convenience, wish to install an air-line and gage in addition to the access port."

Present studies of ground water use and availability of water for additional withdrawals have evidenced the need for more exact information as to the quantity of water pumped from any given well. Therefore, "A suitable measuring device shall be installed and maintained in proper working order as close as practical to the pumping station and in all instances ahead of the first discharge point for the purpose of measuring both the instantaneous withdrawal rate and the annual volumetric use of water in acre-feet. The owner and/or operator of the system shall be required to furnish records of water use to the department as may be requested."

With the development of the Columbia Basin Project, the ground water characteristics of the land within the project have undergone considerable change, including a substantial commingling of natural and "artificially stored" ground waters. In view of the requirement for obtaining additional information concerning the quantities of natural and "artificially stored" ground water available for appropriation, it is considered in the public interest that permit should issue subject to the following provision: "This permit authorizes the withdrawal of public ground waters within the exterior boundaries of the Columbia Basin Irrigation Project based on a conditional determination that public waters are available for beneficial use, and is issued subject to review and a final determination by the Department of Water Resources as to the availability of public ground waters based upon conclusions to be derived from a comprehensive, quantitative ground water study now in progress and scheduled for completion on or before December 31, 1972. No Certificate of Water Right, as provided by RCW 90.44.080, will issue under this permit prior to the above scheduled completion date of the comprehensive water study nor until a final determination is made by the Department of Water Resources as to the availability of public ground waters. Further, this permit is issued subject to any prior right to artificially stored ground water which may be established by declaration as provided in RCW 90.44.130. By acceptance of this permit permittee expressly consents to this provision."

At the time of field investigation by Bob Stevens, Watermaster, the well was drilled, and a 5 horse power submersible pump installed. This Basin View Plat is located in the Columbia Basin Project, Unit 77. However, the applicant states that no water will be used for irrigation, either from the project or the well.

The plan is to install a 10,000 gallon cistern with a 5 horse power booster. The static water level at the time of investigation was 123 feet below land surface.

The water allowance for the community domestic supply of 21 homes is based on a per capita use of 400 gallons, or 1.792 acre-feet per home per year for a total of 38 acre-feet to be used continuously throughout the year.

Signed at Olympia, Washington
this 23 day of October, 1969.

Charles K. McDonald

CHARLES K. McDONALD, Engineer
Division of Water Management

OCD NO CONT STRK

permit 9464

App. #9659

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

WELL LOG

Record by B. L. Price
Source Well Log

Location: State of WASHINGTON
County Adams
Area
Map
SW ¼ NW ¼ sec. 16 T. 15N., R. 29 E. W.

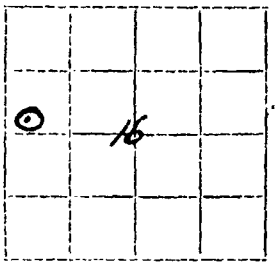


Diagram of Section

Drilling Co. B. L. Price
Address Route 1, Box 88A (No town shown)
Method of Drilling Cable Date , 19
Owner Basin View Water Co., Inc.
Address P. O. Box 355, Othello, WA. 99344
Land surface, datum 980 ft. above / below
SWL: 12.3 Date Not shown, 19 Dims. 8"x400'

CORRELATION	MATERIAL	From (feet)	To (feet)
	(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)		
	Community domestic, municipal		
	Casing: 8" from 0-289'		
	Well tests: Yield-40 gpm w/? DD (Bailed)		
	Gravel & boulder	0	75
	Clay, yellow	75	200
	Clay, blue	200	260
	Sand, blue	260	289
	Rock, hard	289	298
	Shale rock/blue	298	350
	Rock, red	350	375
	Rock, hard	375	392
	Breake (?)	392	400

Turn up

Sheet ..... of ..... sheets

Well Tagging Form

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Unique Well Tag No: AFA 201 04530 N 01

RECORD VERIFICATION (check ✓ one)

- [ ] Well Report available *(please attach this form to the well report and submit it to the Ecology Regional Office near you)*
- [ ] Verification inconclusive
- [X] Well Report not available

WELL OWNERSHIP, IF DIFFERENT FROM WELL REPORT

First Name: Basin View Water Assn. Last Name:

Street Address: 859 S. Crestline Rd

City: Othello, 99344 State: WA

LOCATION OF WELL, IF DIFFERENT FROM WELL REPORT

Well Address:

City: County: Adams

T. 15 N. R. 29 E W.M. Sec. 16 NW 1/4 of the SW

FOR AGENCY USE ONLY

Latitude 46 47 . 23.52824 N "

Longitude 119 11 . 46.11078 W "

- [X] GPS
- [ ] Topographic Map
- [ ] Survey
- [ ] Computer generated

Elevation at land surface 304.387 feet/meters *(circle one)*

- [ ] Digital Altimeter
- [ ] Topographic Map
- [X] Other GPS

Additional information, if available:

- [ ] Location marked on topographic map *(please attach)*
- [ ] Location marked on air photo *(please attach)*

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

FOR AGENCY USE ONLY

WELL CHARACTERISTICS

Physical Description of well (size of casing, type of well, housing, etc.)

In well pit, Covered.

Location of Well identification Tag:

on well head.

Was supplemental tag needed for ease of identifying well? ☐ Yes ☒ No

If yes, where was tag placed? _____

D	C	B	A
E	F	G	H
(M)	L	K	J
N	P	Q	R

Scale 1:24,000 (1"=2,000')

Indicate the location of the well within the Section by drawing a dot at that point.

SECTION 16

COMMENTS:

FOR ECOLOGY WATER RESOURCES PROGRAM ONLY

Water Right # _____ Date Issued _____

Circle One: Application Permit Certificate Claim Exempt

APPENDIX C

City of Othello Hydraulic Model Information

Conceptual Future UGA Service Extension, ERUs and Transmission Main Sizing

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

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

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

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

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

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

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

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

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

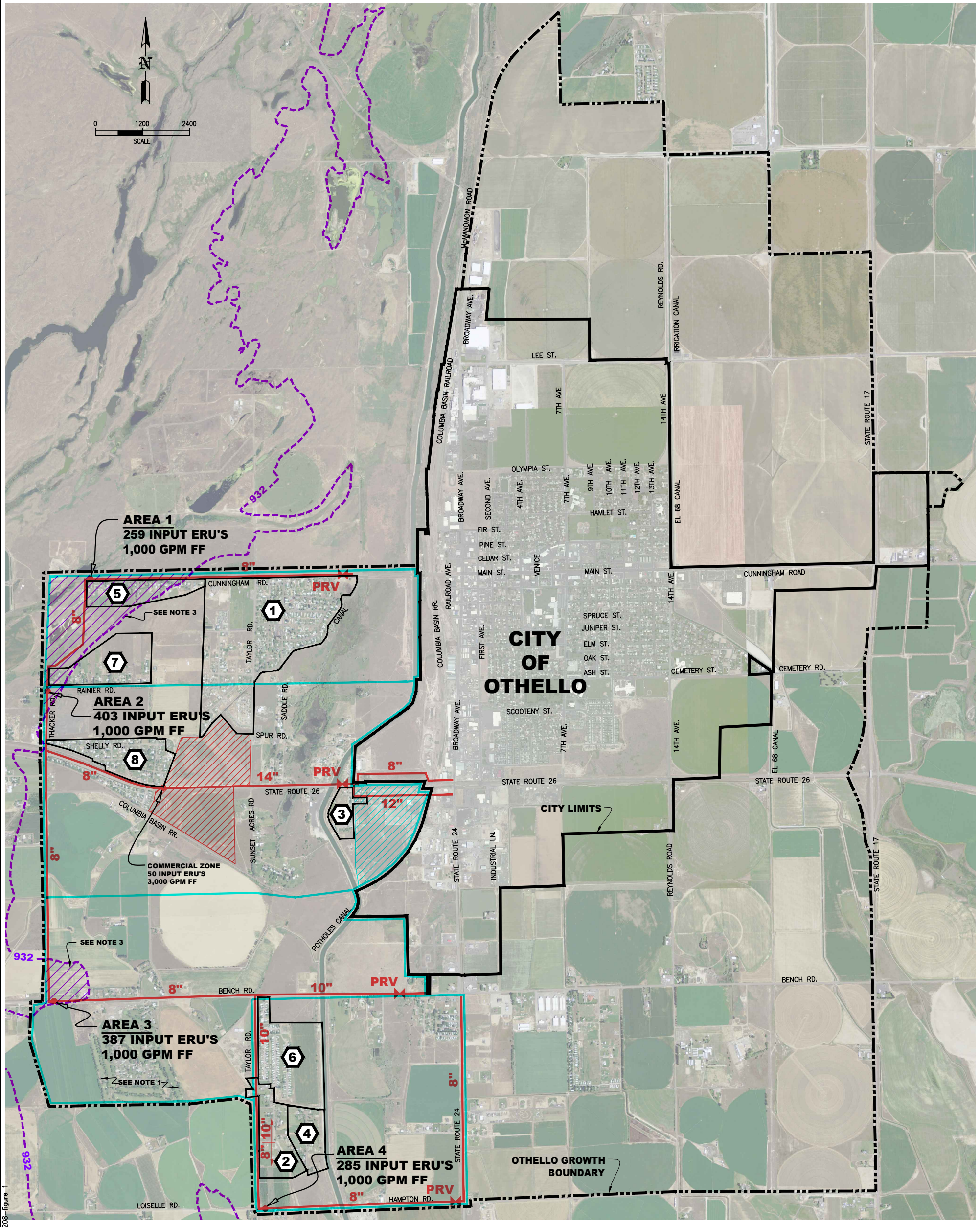
15. ADD, MDD, PHD and FF were evaluated based on the CFS UGA land area

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

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

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

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



LEGEND

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

NOTES

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

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

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

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

APPENDIX D

Long-term water supply study excerpts

VARELA & ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

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

TECHNICAL MEMO

TO: City of Othello, WA

FROM: Jesse Cowger, PE

DATE: August 24, 2016

RE: Water Supply Plan Summary

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

Background

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

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

Project Description and Scope

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

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

Systematic Evaluation of Existing Wells

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

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

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

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

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

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

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

Options for Addressing Fluoride in Well 6

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

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

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

Option 2: Dedicate Well 6 to Supplying Industrial Users

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Discussion of Options for Addressing Fluoride in Well 6

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

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

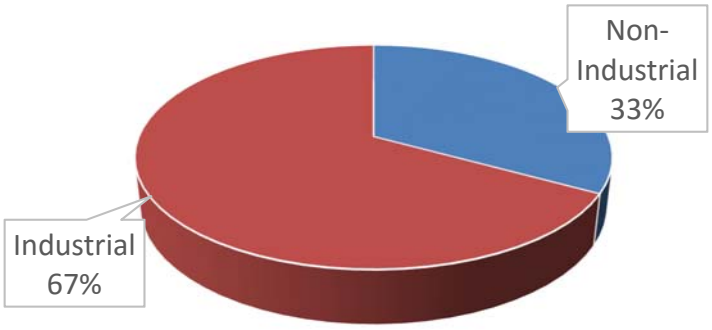
Option	Advantages	Disadvantages
5) Use Well 6 as ASR Injection Well	• May reduce concentration of fluoride in Well 6 to below MCL. • Would not require reducing the pumping rate of Well 6 • If ASR implemented, may slow the decline of the Wanapum aquifer • Supplemental source of supply would reduce the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

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

Meeting Present and Future Water Demand

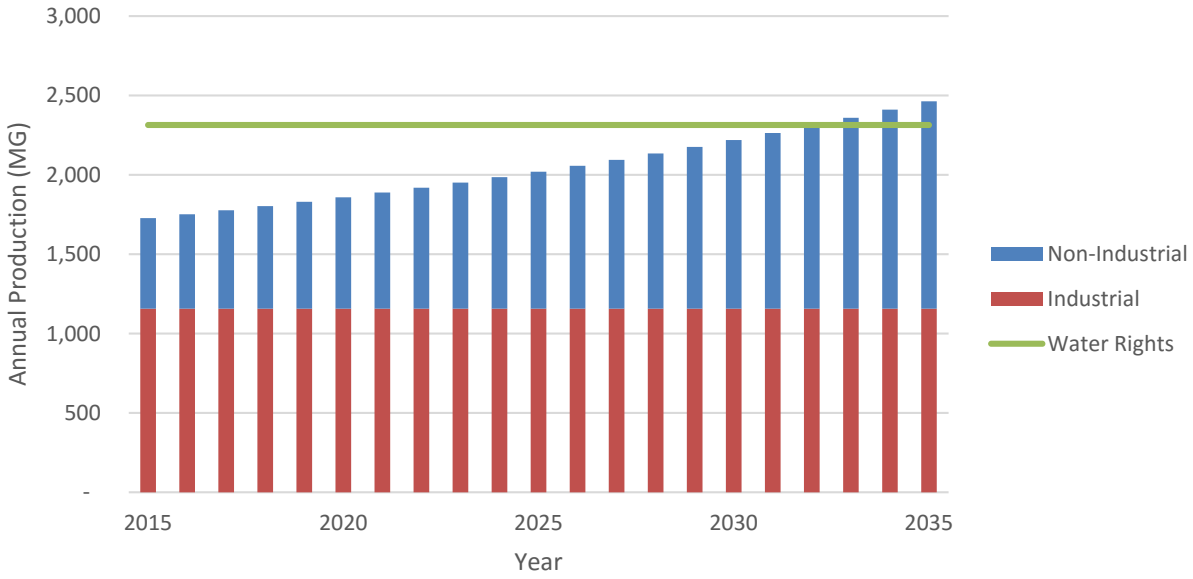
On March 28, 2016 Othello adopted its updated Comprehensive Plan (Comp Plan). The Comp Plan lays out an ambitious vision for growth in Othello which includes population growing from 7,780 in 2015 to 17,825 in 2035. The population growth projected in the Comp Plan equates to an annual rate of 4.23%. In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

Ratio of Industrial and Non-Industrial Water Use



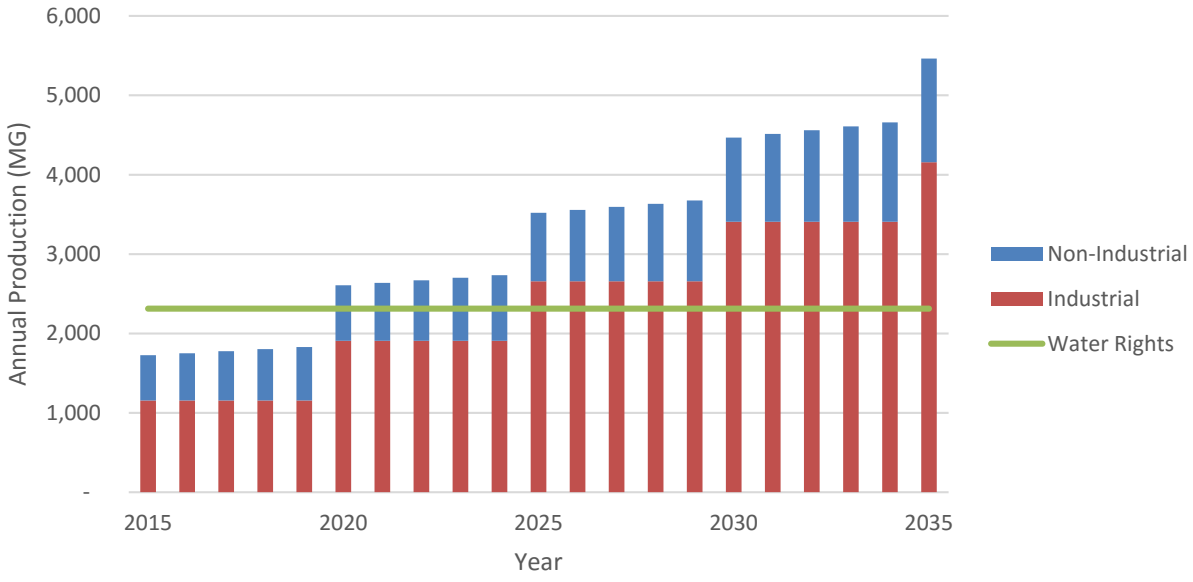
If non industrial water use increases proportionally with projected population growth and industrial demand remains static, the following demand curve results:

Projected Water Demand: No New Industrial Customers



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

Projected Water Demand: New Industrial Customer Every Five Years



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

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

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

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

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

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

Mid to Long-Term: Develop Supplemental Source of Supply

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

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

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

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

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

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

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

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

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

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

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

- Availability of funding

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

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

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

Appendix X

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

1.1 Estimated Impact to City System

1.1.1 Estimated System Demands

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

Table 1: Current City of Othello Water System Demands

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

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

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

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

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

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

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

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

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

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

1.1.2 Supply

Criteria

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

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

Current Capacity

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

Table 4: Current City Supply

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

Evaluation

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

Table 5: Supply Capacity Evaluation

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

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

Conclusion

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

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

1.1.3 Distribution

Criteria

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

Hydraulic Analysis Model

As described in Section 3.2.2 of each individual report.

Evaluation

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

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

Conclusion

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

1.1.4 Storage

Criteria

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

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

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

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

Where:

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

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

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

Where:

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

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

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

- FSS = (FF)(duration)

Where:

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

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

Current Capacity

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

Evaluation

Operational Storage

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

Equalizing Storage

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

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

Standby Storage

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

Fire Suppression Storage

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

Dead Storage

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

Storage Comparison

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

Table 6: Storage Comparison

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

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

Conclusion

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

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

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

1.1.5 Water Rights

Criteria

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

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

Current Water Right

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

Qi = 9,550 gpm

Qa = 7,100 acre-ft/yr

Evaluation

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

Table 7: Water Rights Evaluation

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

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

Conclusion

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

1.1.6 Summary of Impacts of Consolidation on City Water System

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

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

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

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