Lewiston Orchards Irrigation District

Water System Master Plan

FINAL

July 2019

Prepared by:

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REGISTERED
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7/17/19
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RESOLUTION 2019-08

A RESOLUTION OF THE LEWISTON ORCHARDS IRRIGATION DISTRICT ADOPTING THE WATER SYSTEM MASTER PLAN.

WHEREAS the Lewiston Orchards Irrigation District (LOID) is a duly organized Irrigation District -- under the laws of the State of Idaho for the benefit of certain lands designated and commonly known as the Lewiston Orchards Irrigation District located within Nez Perce County and largely within the Lewiston City limits and,

WHEREAS, the Board of Directors establishes the organizational and administrative policies necessary for the efficient operation and economic well-being of the LOID; and

WHEREAS, the Board of Directors periodically reviews, considers and adopts new provisions, revisions and amendments to those policies for the reasonable administration, operation and maintenance of the domestic and irrigation water distribution systems for the benefit of the LOID patrons and other users; and

WHEREAS, the Board of Directors have determined that it is in the best interests of the LOID that a Water System Master Plan be drafted by J-U-B Engineers, Inc. A copy of said Water System Master Plan is attached hereto as Exhibit A.

NOW THEREFORE, BE IT RESOLVED, the Board of Directors of the Lewiston Orchards Irrigation District hereby approves The Lewiston Orchards Irrigation District Water System Master Plan drafted by J-U-B Engineers, Inc and dated July 2019. A copy of said Water System Master Plan is attached hereto as Exhibit A and incorporated herein.

DATED this 17th day of July, 2019.

LEWISTON ORCHARDS IRRIGATION DISTRICT

By: Frank Maresca
Frank Maresca
President of the Board of Directors

ATTEST: Devin Hill
Devin Hill
Board Secretary

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ES 1 Background

Introduction

The Lewiston Orchards Irrigation District (LOID) Master Plan has been executed by J-U-B ENGINEERS Inc. as an aid for Board Members and District Staff as they consider system improvements. The Plan builds on previous reports generated in 1965 and 1980 and shows LOID's commitment to the long-term reliability of their system. The District's mission states:

> *"The Lewiston Orchards Irrigation District (LOID) is a dual water purveyor committed to its fundamental objective of providing reliable water service for domestic and irrigation uses.*
>
> *It is the intent of the LOID to provide untreated irrigation water to all patrons within the irrigation district during the irrigation season at adequate pressure in an efficient manner and at a reasonable cost.*
>
> *It is also the intent of the LOID to provide quality and safe domestic water service for drinking at a reasonable cost to the residents of the District and its domestic annexations.*
>
> *The LOID is committed to the long-term reliability of systems."*

This Plan focuses on the domestic system, irrigation system distribution, and required improvements within the next 20 years. The Plan estimates water demands and needs at system build-out. Extensive efforts have been made to update LOID's growth plan through careful review of system records and interviews with District Staff. It is recommended that LOID review and update the Master Plan every five years or as future conditions deviate from discussion presented herein.

LOID is a dual water purveyor committed to provide reliable water service for domestic and irrigation use. The original distribution system was constructed in the early 1900's as a single domestic and irrigation system. The dual system was installed with funding and support from the Department of Interior, Bureau of Reclamation (Reclamation) in the 1940's.

The domestic system now relies on three (3) groundwater wells and an intertie with the City of Lewiston to provide drinking water. Irrigation water is provided from a combination of surface water and groundwater.

Scope, Purpose, and District Goals

Today, LOID continues to expand its groundwater supply while managing continued growth and providing quality water at effective rates. As the District develops outside its irrigation boundary, service must be provided with potable-only supply for both domestic and irrigation purposes.

This growth will have significant impact on the domestic and irrigation systems. In an effort to understand the impact of this growth, the District developed a domestic water model in 2006 – 2007 and an irrigation water model in 2008-2009. Due to increasing interest in development since that time the LOID Board recognized the importance of developing a complete Master Plan. This Plan will build on the existing water model summarized system recommendations and formalize a capital improvement plan.

This document includes a 20-year growth plan for the domestic and irrigation distribution system components and provides the District a tool to address current deficiencies and manage long-term water system planning. This Plan evaluates each component of the LOID system and provides recommendations for water supply, transmission, and storage to meet increasing demands of system users. The Plan recommendations are intended to be used as a tool to plan and budget for immediate and long-term improvements and should be revised on a periodic basis within the planning period to reflect changing District priorities and ratepayer requirements.

Improvement recommendations presented in this Plan are based on meeting the following criteria though the planning period:

Design Criteria

- Usage Behaviors - The most critical design assumption associated with this plan is continued operation of the irrigation system in a manner that is consistent with current usage. Any shift in usage from the irrigation system to the domestic system will have a significant impact on the evaluation and recommendations provided in this report. As such, the District should continue to monitor irrigation and domestic demands on an annual basis to identify said shift in usage behavior.
- Established System Operating Pressure – The District's goal is to maintain a normal operating pressure range of 40 – 100 psi.
- Pipeline Headloss – The LOID Board has established design pipeline headloss goal of less than 5 feet per 1,000 feet of pipe length.

- System Fire Flow Pressure – LOID seeks to maintain minimum pressure of 20 psi during maximum day demand under fire flow conditions as required in accordance with the IAC (IDAPA 58.01.08, Subsection 552.01.b).

Domestic System

- Redundancy – LOID will provide redundant water supply to meet maximum day demands through the planning period with the largest source out of service as required by Idaho Administrative Code (IDAPA 58.01.08, Subsection 501.17).
- Expanded System Operating Pressure – The District seeks to maintain normal operating pressure of 50 – 90 psi in new pressure zones as the District expands outside its existing service boundary.
- Standby Storage - The Idaho Administrative Code requires minimum standby storage of eight (8) hours under average day demand (IDAPA 58.01.08, Subsection 003.16). LOID has expanded this requirement to provide emergency supply through standby storage equivalent to one day at maximum day demand.

Fire Protection

It should be noted that it is neither the legal obligation nor part of LOID's mission statement to provide fire flow protection. Regardless, LOID recognizes the benefit to its patrons of providing water for fire protection, and as such has set the following fire suppression goals where possible within the District as shown in **Table ES-1**:

Table ES-1: Fire Suppression Goals

Land Use & Zoning	Min. Flow Rate (gpm)	Duration (hours)	Fire Storage Goals (gallons)
Residential	1,500	2	180,000
Commercial (from domestic system)	1,500	2	180,000
Commercial (from irrigation system)	1,500	4	360,000

Regulatory Issues

The Lewiston Orchards Irrigation District is a Public Water System as defined by the Idaho Department of Environmental Quality. The District is registered with the U.S. Environmental Protection Agency (US EPA) as water system ID2350015. It is classified as a large system, serving a population of approximately 20,000 (2017 estimate).

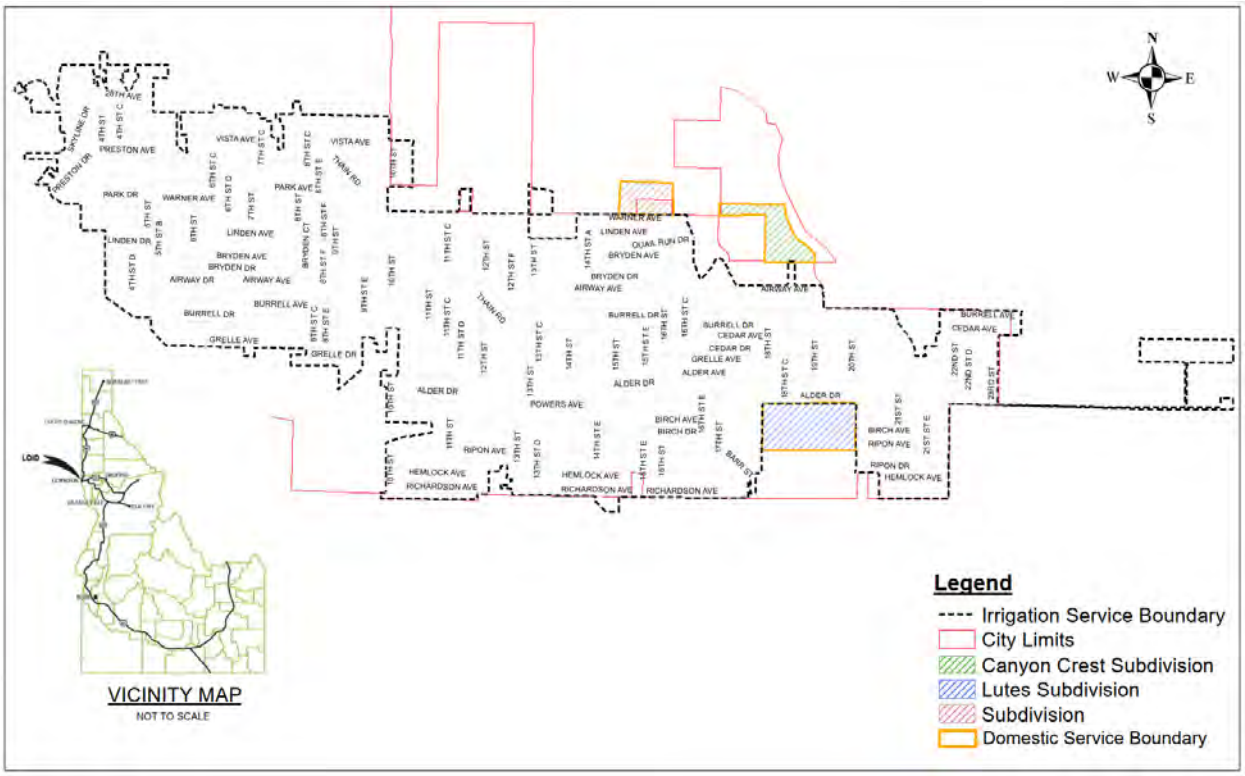
The rules, regulations and requirements for public drinking water systems are established by the Safe Drinking Water Act (SDWA) of 1974. The SDWA was implemented by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. LOID operates within the rules outlined above.

ES 2 Service Area and Population Growth

Service Area Description

The Lewiston Orchards Irrigation District area lies in the southeastern portion of the City of Lewiston, Idaho. The service area for the system covers approximately 4,000 acres on a plateau overlooking the central portion of the City. **Figure ES - 1** provides a vicinity map of the District. The LOID service area is enclosed by two service boundaries; the irrigation boundary and the domestic boundary.

Figure ES – 1 Vicinity Map



Under the agreement with Reclamation, the irrigation boundary is static and will not expand in the future. The domestic boundary, however, is not subject to the restrictions from Reclamation, and may be altered by the LOID Board. At this time, the vicinity map shows that the boundaries are similar, and that a significant portion of the domestic service area is bounded by the irrigation boundary.

Domestic System

Although a significant portion of the District is served by the dual domestic and irrigation system, there are three subdivisions which utilize potable-only service for both domestic and irrigation use.

Irrigation System

The service area for the Irrigation System can be referenced in **Figures ES-1.** The District provides irrigation water for a variety of purposes, including lawn care and agricultural use. Land areas within the District can generally be divided into four categories:

- Residential
- Commercial
- Agricultural
- Public

For purposes of this Plan, City parcels were visually categorized using zoning maps, aerial photos, and City of Lewiston GIS data.

Population Growth and Demographics

Demographics and Population projections will form the basis of water use projections for the future growth of the domestic and irrigation systems. As LOID is part of the City of Lewiston, there is no specific population data unique to the District. Anecdotal evidence from the District suggests a population of approximately 20,000 residents and forms the baseline of population projections.

An analysis of US Census Bureau data was conducted from 1960 to the present for the City of Lewiston and Nez Perce County. The analysis showed the areas have experienced growth at an exponentially instantaneous rate ranging from 0.68% to 0.74%. Following discussion with District personnel and the LOID Board, an exponentially instantaneous growth rate of 0.70% is used for this study, based on historical growth observed within the City of Lewiston and Nez Perce County. A graph depicting this projection is provided in **Figure ES-2.** The demographics of District growth are anticipated to mimic those within the existing service area, with predominately residential growth and negligible impact of commerce and industry.

The impact of system growth outside the District boundary has significant impact on the domestic system, as these potable-only connections will utilize domestic water for domestic and irrigation purposes. Based on discussion with LOID personnel, the District projects that

30% of future growth will occur as infill within the irrigation boundary as dual service connections and 70% will occur outside the irrigation boundary as potable-only service connections. **Table ES-2** provides a summary of this growth based on connection type.

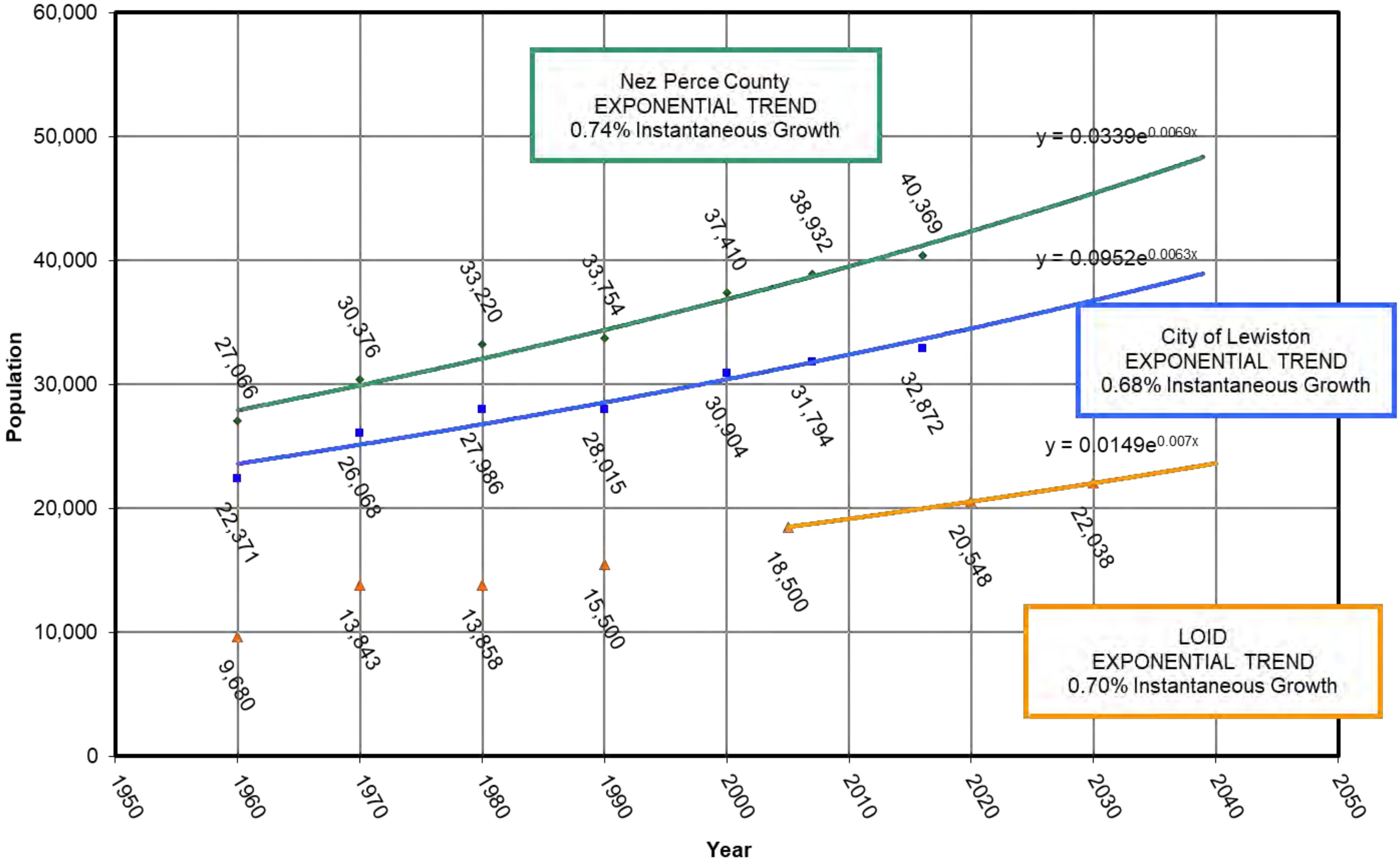
Table ES-2: Population Projection [A]

Year	Total Connections [B]		
	Dual Service	Potable-Only Service	System
2017	8,024	520	8,544
2027	8,207	955	9,162
2037	8,403	1,420	9,823

[A] Based on exponential instantaneous growth of 0.7%.

[B] **Based on projected future growth consisting of 30% dual service and 70% potable-only service connections.**

Figure ES-2: Population Growth



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ES 3 Domestic System

Introduction

The LOID Domestic System is comprised of five main components, as listed below:

- Water Supply
- Water Distribution
- Water Storage
- Telemetry and Controls
- Water Rights

Domestic Water Supply

The District currently utilizes three groundwater wells, Well No. 2, 3, and 4, for domestic water supply. The Well No. 5 project was completed in 2017 primarily for irrigation usage, but with additional infrastructure, could be used as a potential future domestic water source. In addition to groundwater sources, the District has an intertie connection to the City of Lewiston. City water is available during emergency situations; the District has both received and transferred water from the City through this connection. Detailed information on each well is in **Table ES-3**.

Table ES-3: District Well Information

Well No.	Construction Year [A]	Water Right [A] cfs (gpm)	Current Pumping Rate (gpm)	Total Well Depth [A] (bgs)	Static Level [B] (bgs)	Pump Chamber Diameter [A]	Cased Depth [A] (ft)
1	1978	1.34 (601)	0	1,795	851	8”	1,520
2	1987	2.13 (956)	520	1,959	501	13 ⅜”	1,376
3	1997	2.76 (1,239)	530	2,617	695	13 ⅜”	1,430
4	2003	3.34 (1,499)	990	1,625	847	16”	1,164
5	2014	18.00 (8,079)	2,000	1900	590	24”	1,705[C]

[A] Per IDWR Records

[B] Per Dale Ralston – Well No 5 Draft Report

A summary of LOID currently active domestic supply is provided in **Table ES-4**:

Table ES-4: Domestic Water Supply

Source	Supply
Well No. 2	520 gpm
Well No. 3	530 gpm
Well No. 4	990 gpm
City of Lewiston Intertie	1,000 gpm
TOTAL	**3,040 gpm**

Domestic Water Distribution

The LOID Water Distribution System consists of seven pressure zones. The specific boundaries of each zone are presented in **Figure ES-3**.

Figure ES-3 Domestic System Infrastructure

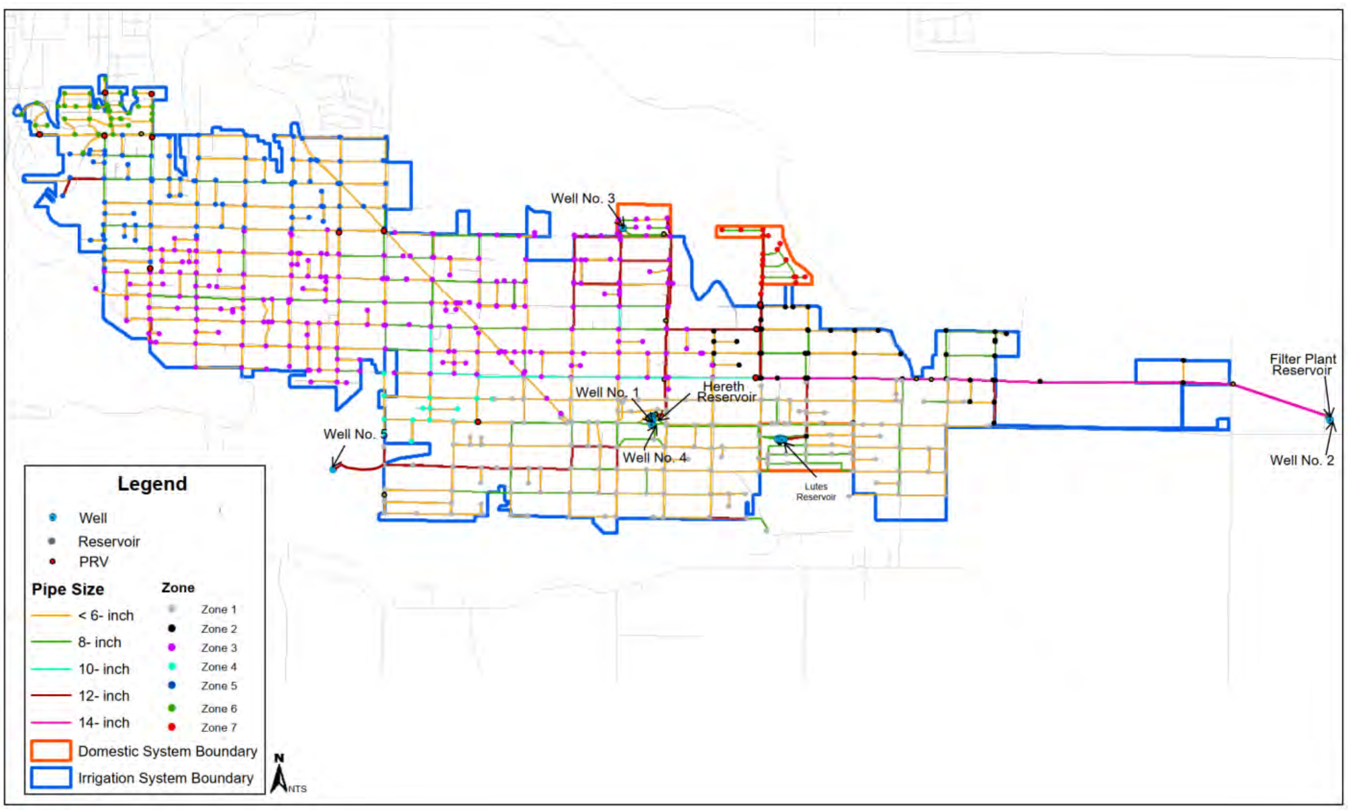


Table ES-5 provides the relative size of these zones on a per-acre basis.

Table ES-5: Pressure Zones

Zone	Service	Size (Acres)	Relative % of District
1	Dual Service	1,177	29%
	Potable-Only Service (Lutes Subdivision)	75	2%
2	Dual Service	405	10%
3	Dual Service	1,452	36%
4	Dual Service	97	2%
5	Dual Service	672	17%
6	Dual Service	108	3%
7	Dual Service	44	1%

Hereth Booster Station

All water from Hereth Tank is transmitted via this station, which has space for three pumps.

- Hereth Transfer - The Hereth transfer utilizes a 1,400 gpm Cornell pump and 75 HP motor to transport water to the Lutes tank.
- Hereth Booster – The Hereth booster serves the southern portion of the system. This Paco pump with 60 HP motor runs on a VFD.
- Hereth Irrigation Transfer – The irrigation transfer utilizes a 1,000 gpm Cornell pump and a 75 HP motor. A reduced pressure zone assembly provides cross control protection of the potable water system.

Lutes Booster Station

There are four pumps at the Lutes booster station, which is supplied via Lutes tank. The booster station was re-built in 2003, and houses four pumps completing two main functions:

- Lutes Transfer Pump - The Lutes transfer pump consists of one 1,025 gpm centrifugal Cornell pump and 100 HP motor. The pump delivers water to Pressure Zone 2 at the intersection of 19th and Grelle.
- Lutes Booster – The Lutes booster includes two 500 gpm VFD Paco pumps for boosting water to service the southern portion (Zones 1 & 4) of the LOID system. These pumps operate as needed based on pressure when the Hereth Booster cannot maintain pressures to the southern portion of the District. The pumps primarily serve the potable-only service area within the Lutes subdivision.

The final pump in the Lutes booster station is a Paco pump dedicated to fire flows with a capacity of 2,000 gpm. This pump only starts if the two smaller pumps are not able to keep up with system demands. If this pump starts, the two smaller pumps shut down.

Domestic Pipe Network

As irrigation mains were built to meet peak irrigation demands and fire flows when practical, the domestic system mains are smaller than those that might be observed in systems of similar magnitude. Due to the low peaking characteristics of a dual water system, much of the LOID domestic system is constructed of pipes less than 6 inches in diameter, fed by larger trunk lines ranging in size from 10 to 14 inches.

A summary of the sizes and materials within the system is provided in **Table ES-6**.

Table ES-6: LOID Existing Pipe & Material [A]

Pipe Material	Pipe Sizes (in)								
	< 4	4	6	8	10	12	14	36	> 36
Asbestos Cement	0	44613	23634	10859	9218	0	16246	0	0
PVC [B]	1189	75935	146732	91660	644	33287	0	0	0
Ductile Iron	689	0	0	6588	1325	9992	0	111	32
Galvanized iron	32992	894	1133	0	0	0	0	0	0
Steel	0	0	0	158	0	0	0	0	0
Copper	28	0	0	0	0	0	0	0	0
Total (Feet)	**34,898**	**121,442**	**171,499**	**109,265**	**11,187**	**43,279**	**16,246**	**111**	**32**
Total (Miles)	**6.61**	**23.00**	**32.48**	**20.69**	**2.12**	**8.20**	**3.08**	**0.02**	**0.01**

[A] Pipe type, length and sizes were generated by the 2018 WaterGEMS model of LOID domestic system and are approximate.

[B] Information obtained from the model does not separate PVC into 160 psi and C900 material.

Maintenance/Replacement

The District has an ongoing pipe replacement program. From 2014 to 2017, the District had replaced an average of 3,500 linear feet of domestic mainline per year, and replacement within the last 10-15 years had reached as high as 10,000 feet per year (2010) and as low as 3,000 feet per year in 2014. District policy requires replacement at minimum with 8-inch PVC.

Problem Areas

During discussion with LOID operators, several maintenance and pressure issues have been noted throughout the system.

Zone 2

- 19th and Burrell – This area experiences high pressures of greater than 100 psi.

Zone 3

- Thain Road Pipe – One particular area of concern is within Zone 3 along Thain Road. Class 160 PVC pipe with galvanized fittings was installed in this area in the 1970's. The pipe is extremely brittle and operators experience frequent maintenance issues and water main breaks, especially in areas where it was not bedded properly, as is the case along Thain.
- Cedar Avenue from 12th to 14th – Low pressures ranging from 35–40 psi in this area may be associated both with high pressure zone elevations and PRV pressure settings related to the Thain Road pipe.

Zone 5

- North of Park Avenue near Vineyards – Service to this area is challenging due to rapidly changing elevations in the area. The variation in elevation creates high pressures within much of the Zone.

Zone 6

- Vineyards – Although no specific pressure issues have been identified within the Vineyards area, water mains within this area are located in alleys. As such, replacement, repair and maintenance within this area are problematic due to private encroachment on the narrow right-of-way.

Domestic Water Storage

Storage provides the District with flow equalization, pressure stabilization, and emergency storage. Storage is critical to alleviate water shortages during water supply interruptions. The tanks are on a 3-5 year plan to be checked and cleaned if necessary.

The LOID system utilizes three storage reservoirs shown in **Figure ES-4** to provide total storage capacity of 4.6 million gallons as shown in **Table ES-7**.

Figure ES-4

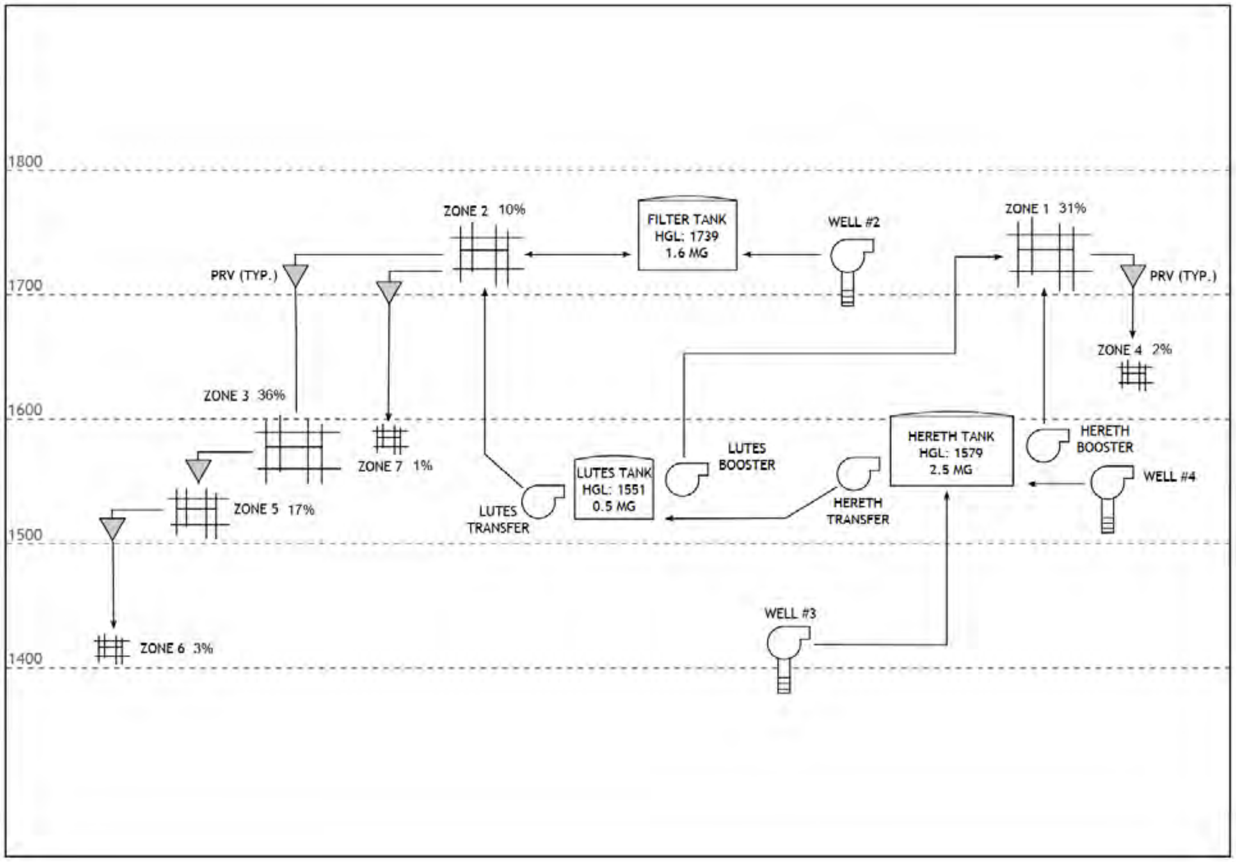


Table ES-7: Domestic System Storage Capacity

Storage	Volume (gallons)
Filter Plant Tank	1,600,000
Hereth Tank	2,500,000
Lutes Tank	500,000
Total	**4,600,000**

Filter Plant Tank

The Filter Plant Tank was constructed by Reclamation as part of the original Lewiston Orchards Project in 1949. It is a buried concrete tank with capacity of 1.6 million gallons.

Hereth Tank

The Hereth Tank, located in Hereth Park near 16^{th} and Powers, is of glass-lined, bolted steel construction with a capacity of 2.5 million gallons and a diameter of 135 feet.

Lutes Tank

The Lutes Tank was constructed for the Lutes Addition, near Powers Drive, in July 1979. It is a 70-foot diameter welded steel tank with a 500,000-gallon capacity.

Telemetry

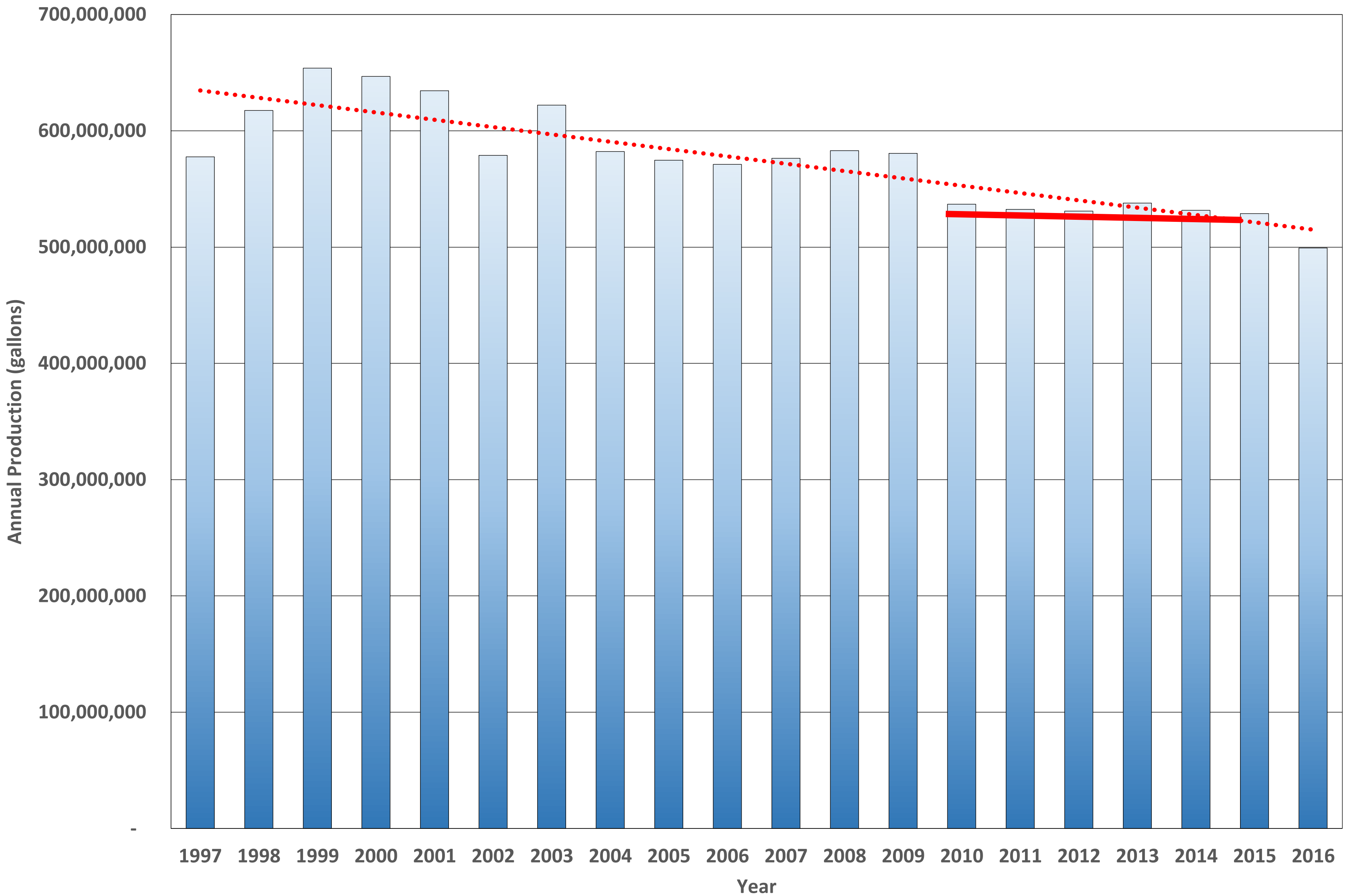
The LOID reservoirs are utilized to call for water from each of the Wells. It is important to note that typical tank settings may change with time based on seasonal fluctuations operational goals, and capital modifications including new source and/or storage supply. LOID personnel use a Supervisory Control and Data Acquisition (SCADA) system to control the system.

Existing Demand

Although the LOID system predominately consists of dual system service connections, water demands must be separated into dual service usage and potable-only service usage to understand the role each plays in the overall system and evaluate the impact of system growth. Water demands are typically calculated based on well production records to account for both usage and unaccounted water.

A historical look at water production, **Figure ES-5**, shows a general decline in water production over the past two decades. It appears the decline has leveled out in the period of 2010-2016 with slight decline again in 2016.

Figure ES-5: Domestic Water Production



Comparison of the 2010-2015 water production to the 2016 water production determined that 2016 was approximately 7% under the four-year average. Detailed water meter records were available for fiscal year 2016 dual and potable-only service connections. This data was analyzed to determine the existing domestic demands parsed out be the connection types. See **Table ES-6**.

Table ES-6: Existing Domestic Demands [A]

Demand Condition	Total System [B]	Dual Service Connections	Potable-only Service Connections
ADD	1.46 mgd	1.26 mgd	0.20 mgd
MDD	2.11 mgd	1.81 mgd	0.30 mgd
PHD		1,823 gpm[C]	520 gpm [D]

[A] Reported per connection values based on domestic units from July through June.

[B] Based on 2016-2017 billing records.

[C] Based on observed peaking factor of 1.45 within Northern portion of the District.

[D] Based on typical literature values (Reynolds, 1996).

Future Demand

Future demand projections are used to understand the impact of population growth on system infrastructure including water supply, system storage, and distribution system capacity. As with any projection, future water demands depend on observed growth and deviation from the growth assumptions presented in **Chapter 2** will correlate with a variation in the future demands presented herein based on actual population growth. Regardless, these future demands represent the culmination of discussions with District personnel and experience to provide a starting point to understand how population growth will impact LOID. **Table ES-7** shows a summary of projected domestic demands based on the existing connection demands presented in **Table ES-6,** and the population growth assumptions of **Chapter 2**.

Table ES-7: Projected Domestic Demands

Year	ADD (mgd)			MDD (mgd)		
	Dual Service	Potable-Only Service	System	Dual Service	Potable-Only Service	System
2027	1.29	0.44	1.73	1.87	0.88	2.75
2037	1.33	0.66	1.99	1.92	1.45	3.37

Water Rights

Water Rights give LOID authority to pump a specified volume of water based on a permitting process through the Idaho Department of Water Resources. In this process, the well location is established, the area of service, and a case is made that the water will have a "beneficial use". Based on an investigation of how much water will be used and stored, a permit is drafted for each point of diversion and an approved diversion rate is permitted to LOID. **Table ES-8** shows the diversion rates that were permitted to each well of the domestic and irrigation systems. **Appendix D** includes copies of Well No. 1 through 5 water rights documents. Well No. 6, currently under design and construction, does not yet have water rights.

Table ES-8: Water Rights

Storage	Diversion Rate cfs (gpm)	Maximum Storage Volume (AF)
Well No. 2	2.13 (956)	NA
Well No. 3	2.76 (1,239)	NA
Well No. 4	3.34 (1,499)	NA
Well No. 5	18.00 (8,079)	11,543.0

Domestic Supply Evaluation

The primary concern associated with any water supply is the quality and quantity of redundant sources. Reliability, as defined by DEQ, requires total supply to be evaluated with the largest source out of service. As displayed in **Table ES-9**, LOID has a redundant supply of 2,040 gpm (2.94 mgd).

Table ES-9: Redundant Water Supply [A]

Source	Supply	Deficiency
Well No. 2	520 gpm	-
Well No. 3	530 gpm	-
Well No. 4	990 gpm	-
City of Lewiston Intertie[B]	~~1,000 gpm~~	-
TOTAL	**2,040 gpm**	-
Max Day Demand (2017)	1,504 gpm	Not Deficient
Max Day Demand (2027	1,906 gpm	Not Deficient
Max Day Demand (2037)	2,338 gpm	288 gpm

[A] Redundant supply per IDAPA 58.01.08, Subsection 501.17.
[B] Supply is removed from analysis as it is the largest source.

While this supply is capable of meeting current and projected maximum day demands through 2027 the current supply is shy of meeting projected maximum day demands in 2037. Under current growth projections, MDD would be exceeded in approximately 2031. (**Figure ES-6**)

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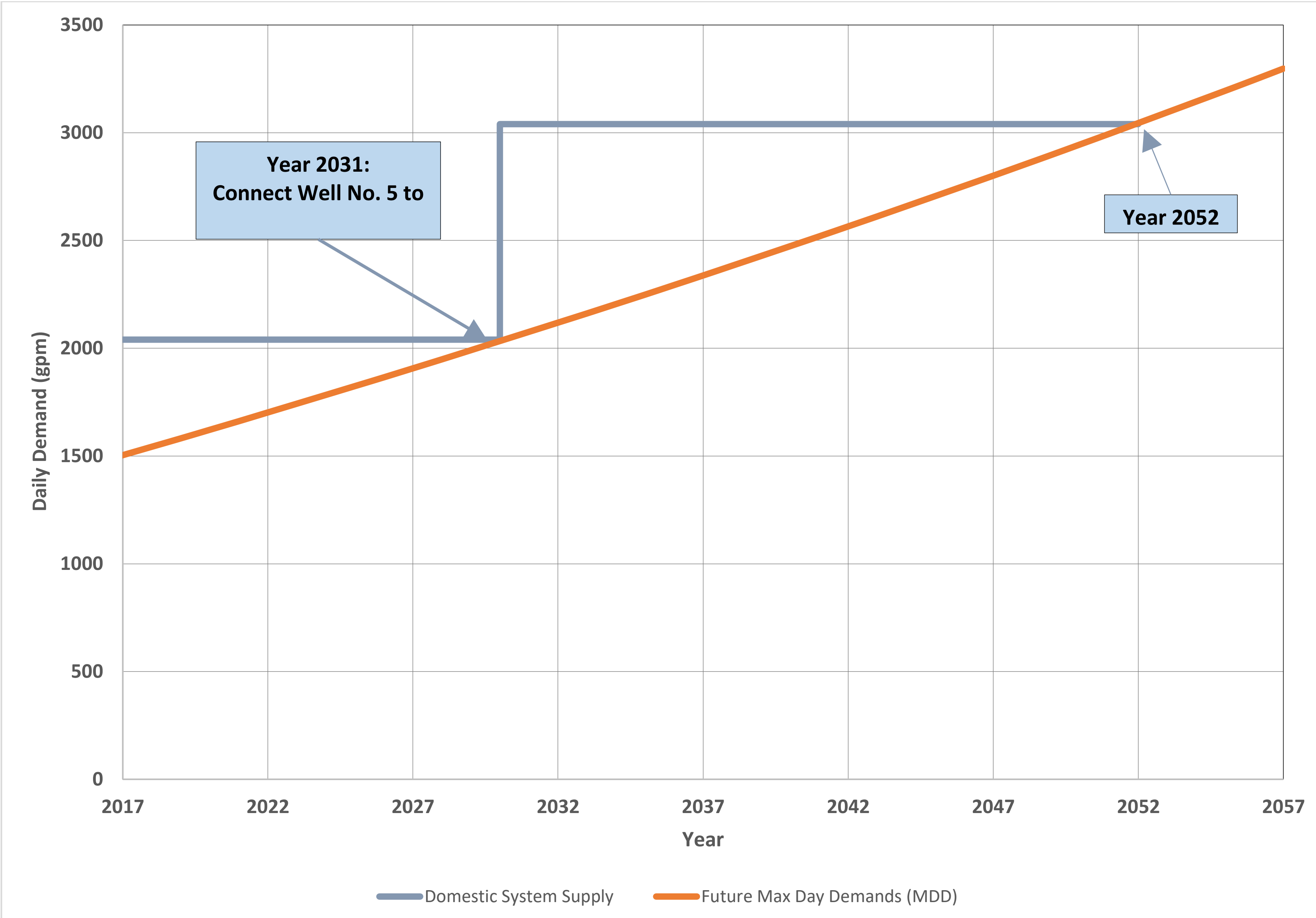
Figure ES-6: Domestic Existing System Supply



Domestic Storage Evaluation

Storage facilities consist of several components per the guidelines of the Idaho Administrative Code (IDAPA 58.01.08). A summary of storage requirements is shown in **Table ES-10** and **Figure ES-7**:

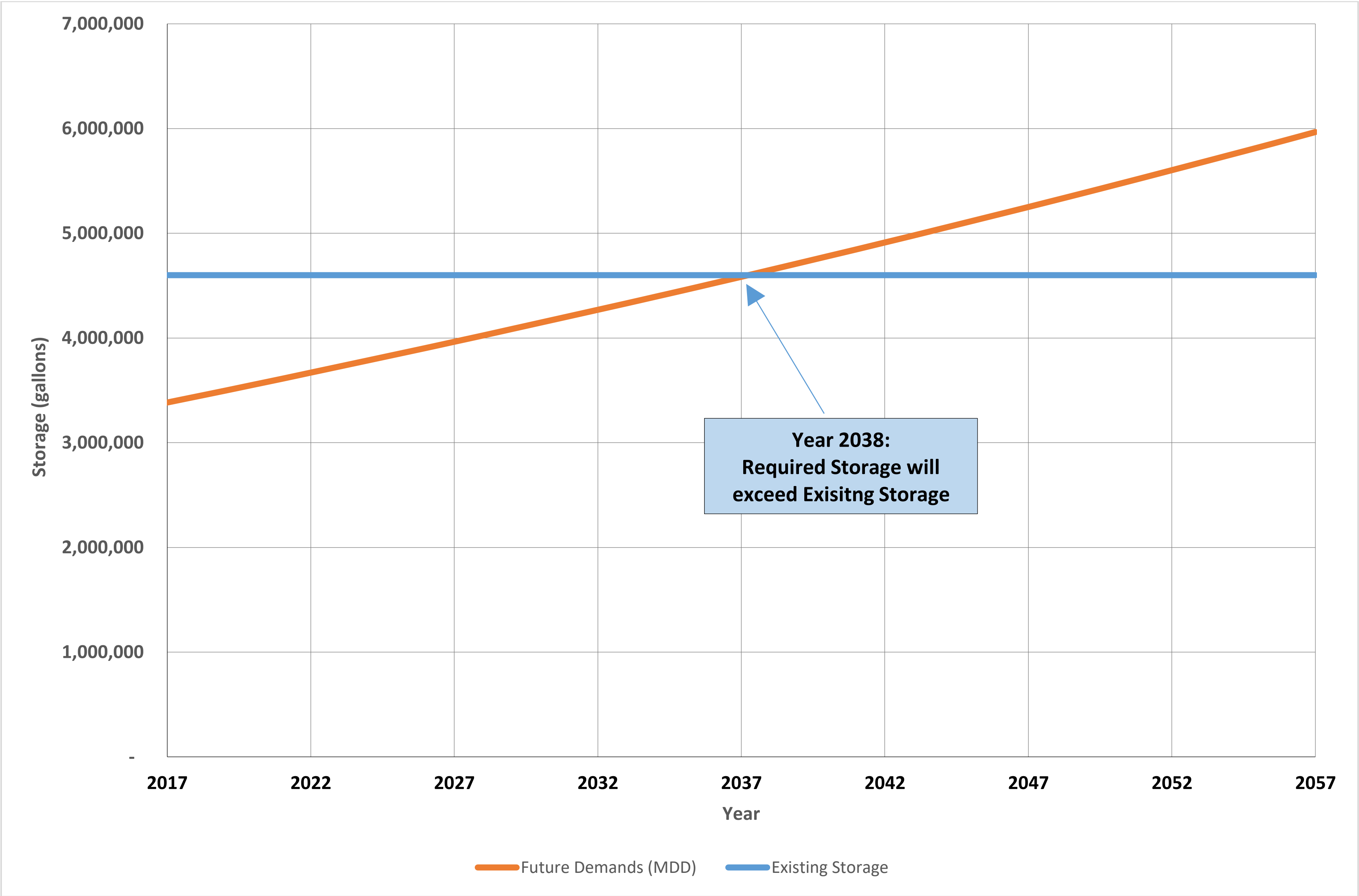
Table ES-10: Storage Volume Summary

Year	Dead Storage [A] (gal)	Operational Storage [B] (gal)	Equalization Storage[C] (gal)	Fire Suppression (gal)	Standby Storage (gal)	Total Storage (gal)
2017	473,000	240,000	145,000	360,000	2,165,836	3,383,836
2037	473,000	240,000	145,000	360,000	3,366,118	4,584,118

[A] Reference **Appendix K** for associated storage calculations.
[B] Storage requirements subject to increase with additional system storage.
[C] Equalization storage is subject to change based on modifications to system infrastructure, including supply and system boosters.

The current amount of storage of 4.6 million gallons is sufficient, but based on observed growth and changes in demands due to new potable-only service connections, LOID should re-evaluate storage requirements in the next 10 to 20 years.

Figure ES-7: Domestic Storage Capacity



Domestic System Distribution Evaluation

The LOID model was utilized to develop pressure profile maps to understand existing pressure issues. In addition, the model was utilized to understand the impact of future demands on pressures within the District. The maps show various pressures, including those outside the target ranges established by the Board.

Domestic Existing Distribution Evaluation

The distribution system generally provides pressures consistent with the target pressures of 40-100 psi. There are a few areas in Zone 1 that have pressures exceeding 100 psi, but have been operating for decades and have not experience maintenance issues. There is a lower pressure areas in Zone 3 on Cedar Ave from 10^{th} to 15^{th} St due to reduced pressures at the PRV stations. Zone 5 also has some high pressure areas due to the topography in the area.

Domestic Future Distribution Evaluation

The evaluation was completed under the following scenarios and design criteria:

1. Build-out Maximum Day Demand Scenario.
   Demand:
   - Maximum day demand for full build-out of existing system and anticipated growth areas.

   Design Criteria:
   - Maintain minimum pressure of 40 psi within existing system.
2. Build-out Fire Flow Scenario.
   Demand:
   - Maximum day demand for full build-out of existing system and anticipated growth areas.
   - Residential Fire flow of 1,500 gpm to anticipated growth area outside existing domestic boundary.

   Design Criteria:
   - Maintain minimum pressure of 20 psi within existing domestic boundary.

The cumulative impact of build-out development in growth Area 1, build-out demands in the existing domestic system and residential fire demand served through Zone 3 result in flows which exceed the capacity of the existing 14-inch main from the Filter Plant Tank and Lutes Transfer.

The build-out analysis to serve future areas was completed to provide distribution recommendations only. Both scenarios were evaluated with the following assumptions:

- Additional supply of 1,000 gpm to Zone 3.
- Increased PRV setting between Zone 2 and Zone 3 to 65 psi.

Maintenance/Replacement

Typical guidelines suggest that the useful life of domestic distribution systems ranges from 65-95 years (Clean, 2002). If replacement continues under the District's more aggressive schedule with annual replacement of 10,000 linear feet of domestic mainline, the entire system would be replaced by 2050. We recommend that LOID increase their replacement programs to keep up with the useful life of the system.

Water Quality

The District's groundwater supply has acceptable water quality, and according to discussion with LOID staff, there are is only one regulatory issues associated with water quality, Fluoride in Well No. 3.

System Reliability

System reliability consists of many items, including operating during a power outage, or operation with a system component out-of-service. By planning for these scenarios, LOID's system can be better prepared to provide service with a portion of its infrastructure out-of-service. Several the capital improvement will address system reliability.

Regulatory Issues

Fluoride in Well No. 3 is about 3 mg/l which is below the MCL of 4.0 mg/l but above the SMCL of 2.0 mg/l. LOID met the requirements for public notification in 2018 through the Consumer Confidence Report and will continue to do so in the future.

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ES 4 Irrigation System

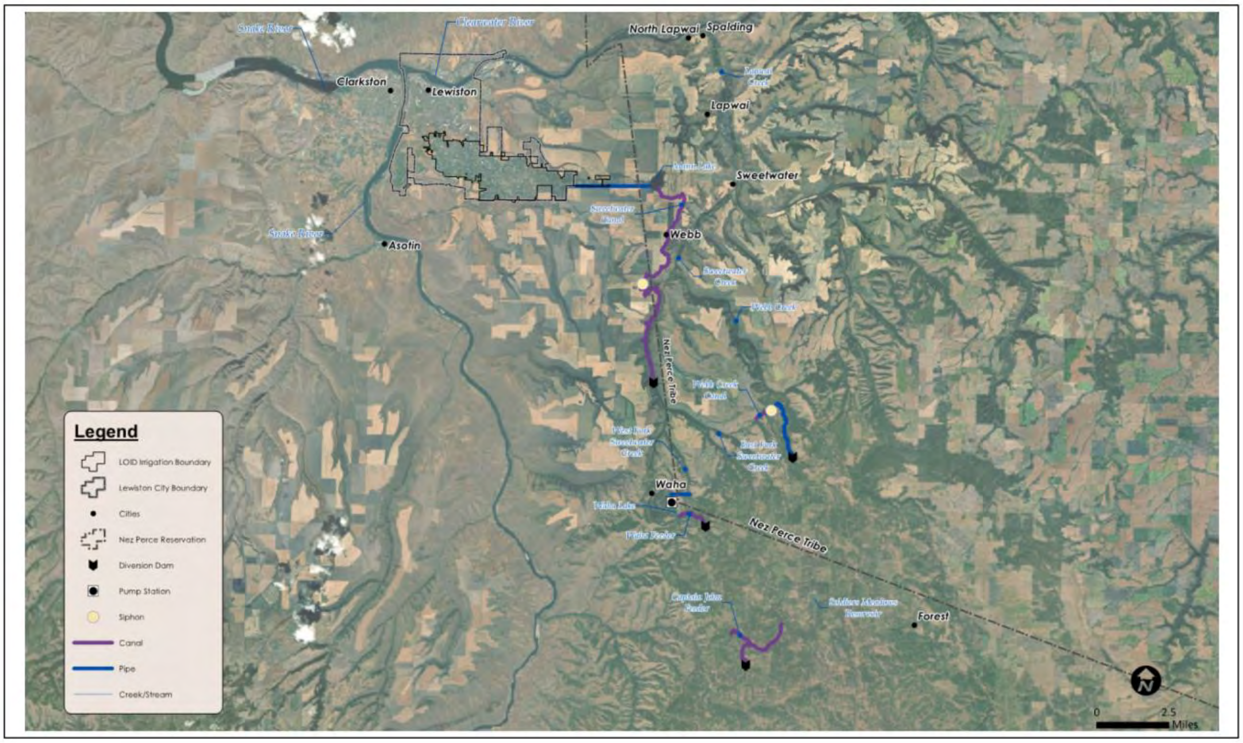
Introduction

The LOID Irrigation System serves the Lewiston Orchards with a surface water collection system and ground water pumping system that utilizes a series of diversion structures, reservoirs, feeder canals, wells, and a distribution network to provide irrigation service. Existing storage facilities and system supply are assumed to be sufficient to meet system demands within the planning period.

Water Supply, Collection and Storage

Surface water collection begins within the Craig Mountain drainage near the headwaters of Sweetwater Creek, located approximately 20 miles southeast of Lewiston. Water from Webb Creek and Captain John Creek is stored in the Soldiers Meadow Reservoir and released as need by the District. These flows run north in Webb Creek to the Webb Creek diversion dam, where water is diverted west to Sweetwater Creek via the Webb Creek canal. Flows are also collected from the west fork of Sweetwater Creek and stored in Lake Waha via the Waha feeder canal. This water is pumped from the lake back into the west fork as needed for irrigation. The final diversion, Sweetwater diversion dam, directs water to Mann Lake via the Sweetwater canal. It is important to note that Mann Lake is also referred to as Reservoir A. Water is drawn from Mann Lake from an underground pipeline penetrating the lake’s western levee. A map of this infrastructure is provided in **Figure ES-8**.

Figure ES-8 Irrigation Surface Water Collection System



A summary of the LOID storage reservoirs and diversion dams are provided in **Tables ES-11** and **ES-12**, respectively.

Table ES-11: Irrigation Storage Summary

Reservoir	Total Capacity (Acre-Feet)	Effective Capacity (Acre-Feet)
Mann Lake	2,440 [A]	1,740 [A, C]
Soldier's Meadow	2,369 [A]	2,369 [A]
Lake Waha	3,497 [A]	3,047 [A, B]

[A] Lewiston Orchards Irrigation District Manager's Report, December 30, 2017, Water Storage Report.

[B] Less 450 AC FT (pumping level)

[C] Less 500 AC FT (fire pool)

Table ES-12: Diversion Dam Summary [A]

Diversion Dam	Type	Structural Height	Hydraulic Height	Crest Length	Capacity	Location
Captain John Diversion	Log Crib Catch Basin	NA [B]	NA [B]	NA [B]	<5 cfs	Captain John Creek
West Fork Diversion	Concrete Overflow Weir	NA [B]	NA [B]	NA [B]	<20 cfs	West Fork Sweetwater
Webb Creek Diversion	Rockfill Overflow Weir with Concrete Crest Wall	20 feet	10 feet	75 feet	20 cfs	Webb Creek
Sweetwater Diversion	Rockfill Overflow Weir	12 feet	8 feet	80 feet	77 cfs	Sweetwater Creek

[A] Bureau of Reclamation Website: http://www.usbr.gov/projects

[B] NA (Not Available)

Lake Waha

Lake Waha is a natural lake used for off-stream storage. The lake is located approximately 15 miles from the Lewiston Orchards and west of the west fork of Sweetwater Creek.

Soldiers Meadow

Soldiers Meadow Reservoir is located on Webb Creek approximately 20 miles from the Lewiston Orchards. The Soldiers Meadow dam was originally constructed in 1923, and in 1986, extensive repairs were completed on the dam as part of Reclamation's Safety of Dams Program. The reservoir is owned by Reclamation and operated by LOID.

Mann Lake

Mann Lake, approximately seven miles southeast of Lewiston, is a man-made reservoir constructed in 1906. In 1999, Reclamation completed upgrades to the dam under the Safety of Dams Program. In addition, the dam's operating elevation was restricted, effectively reducing the reservoir capacity by one-third, to 1,960 acre-feet. Reclamation temporarily lifted this restriction in 2010, increasing the capacity to 2,440 acre-feet. Currently, the storage capacity is 2,440 acre-feet, but 500 acre-feet is retained for fire pool storage and the remaining 1,940 acre-feet is usable storage.

Well No. 5

LOID Well No. 5 was drilled in 2014 and completed in early 2017. The well was installed with a 800-foot surface seal and a 24-inch diameter surface casing. The well penetrates at a target depth of 1,900 feet and has a proven yield of 2,000 gpm.

Well No. 6

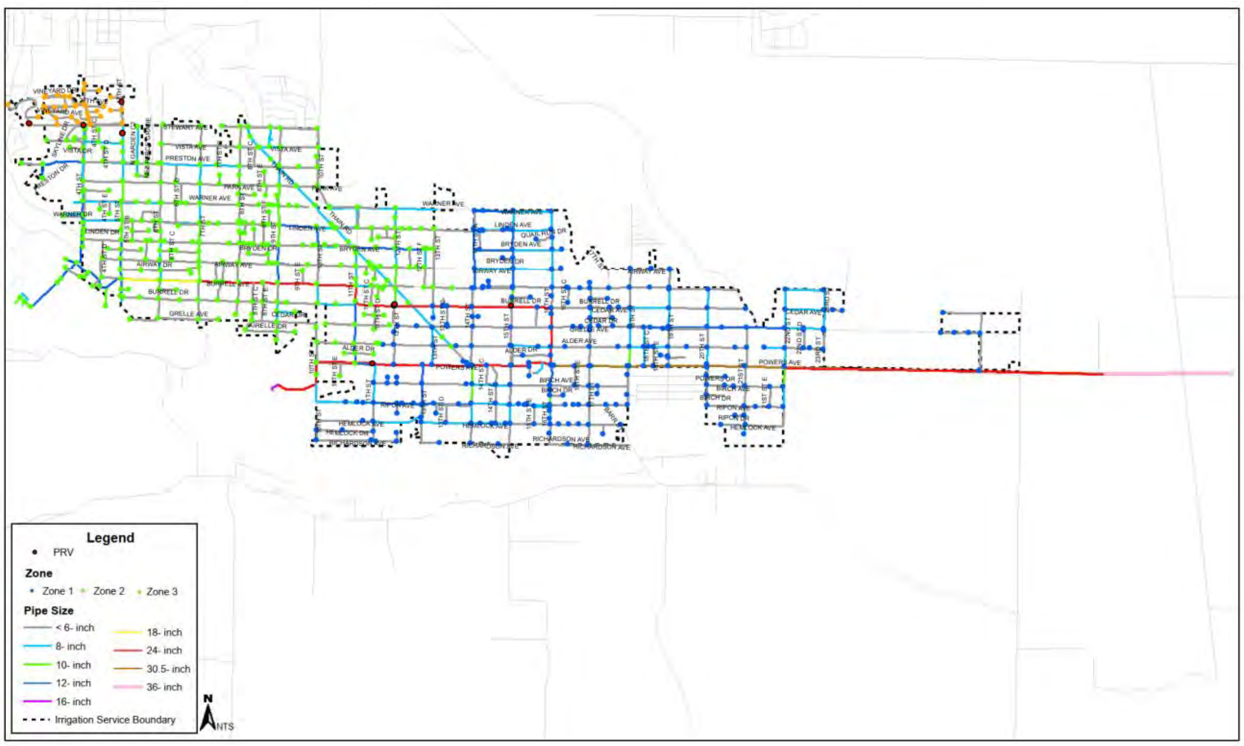
LOID Well No. 6 is currently under contract for design and construction with J-U-B ENGINEERS, Inc.

Irrigation Water Distribution

Irrigation Pipe Network

The LOID Irrigation System is divided by three pressure zones, separated by pressure reducing valves (PRVs). **Figure ES-9** shows existing irrigation system pipe sizes.

Figure ES-9 Irrigation Existing Distribution System



A summary of the sizes and materials within the system is provided in **Table ES-13**.

Table ES-13: LOID Irrigation Pipe Size and Materials [A]

Pipe Material	Pipe Size (in)										
	< 4	4	6	8	10	12	16	18	24	30.5	36
Asbestos Cement [B]	0	9252	0	0	0	0	0	0	0	0	0
PVC [C]	3501	58718	112852	83940	1977	25547	100	0	10604	0	0
Ductile Iron [D]	2785	5033	1873	1047	744	5524	0	0	0	0	0
Steel	11735	49080	20165	10820	10023	6654	0	2652	14502	18734	4411
Copper	0	0	0	0	0	0	0	0	0	0	0
Total (Feet)	**41,947**	**122,514**	**134,890**	**96,424**	**12,744**	**37,827**	**100**	**2,652**	**25,106**	**18,734**	**4,411**
Total (Miles)	**7.94**	**23.20**	**25.55**	**18.26**	**2.41**	**7.16**	**0.02**	**0.50**	**4.75**	**3.55**	**0.84**

[A] Pipe type, length and sizes were generated by the 2018 WaterGEMS model of LOID irrigation system and are approximate.
[B] Information obtained from the model does not separate PVC into 160 psi and C900 material.

Maintenance/Replacement

The District has an ongoing pipe replacement program. From 2014-2017, the District has replaced an average of nearly 5,400 linear feet of irrigation mainline per year, and staff replacement within the last 10-15 years has reached as high as 10,000 feet per year. District policy currently requires replacement at minimum with 8-inch PVC.

Problem Areas

During discussion with LOID operators, one main pressure issue was noted within the system.

Zone 1

- 16th & Richardson – LOID staff receives consistent complaints within this area during peak demands, when residents do not have sufficient pressure to irrigate.

LOID staff also identified a recurrent main maintenance issue in the vineyards area:

Zone 3

- Vineyards – Although no specific pressure issues have been identified within the Vineyards vicinity, LOID staff indicated that water mains within this area are located in alleys. As such, replacement, repair and maintenance within this area are problematic due to private encroachment in the narrow right-of-way.

Irrigation Water Demand

The Filter Plant flow meter provides the best information regarding water delivery in the irrigation system, as all irrigation water flows through this line prior to service. Delivery and peaking factor are summarized in **Table ES-14**.

Table ES-14: Irrigation Delivery [A]

Description	Acreage	**ADD** Acre-ft/day (gpm) [gpm/acre]	**MDD** Acre-ft/day (gpm) [gpm/acre]	**PHD** Acre-ft/day (gpm) [gpm/acre]
Total System	3,707	23.98 (5,430) [1.45]	49.4 (11,200) [2.99]	(16,900) [4.52]
Residential	2,652	[1.53]	[3.15]	[4.76]
Commercial	599	[0.40]	[0.82]	[1.24]
Agricultural	300	[2.36]	[4.86]	[7.34]
Public	156	[3.00]	[6.18]	[9.33]

[A] Reference **Appendix F**

Irrigation Distribution System Evaluation

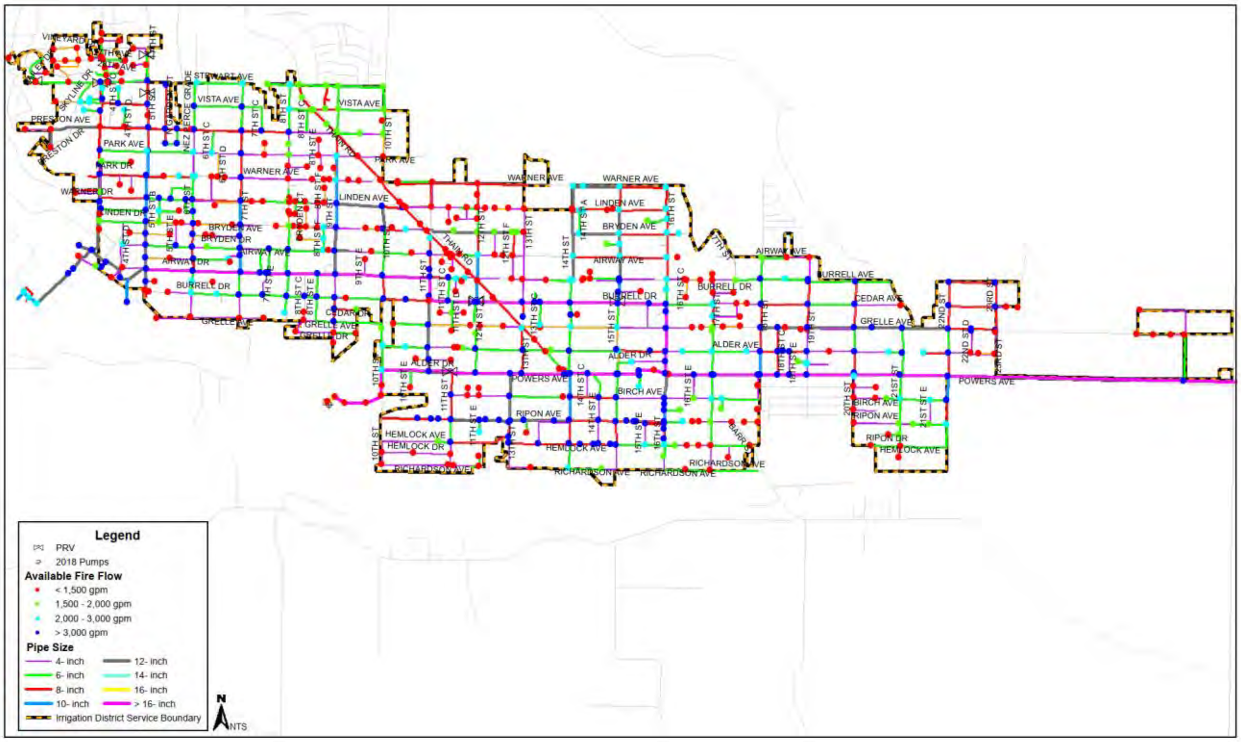
The LOID model was utilized to develop pressure maps to understand existing pressure issues. In addition, the model was utilized to understand the impact of future deliveries on pressures within the District. The maps show various pressures, including those outside the target ranges established by the Board. The most significant issue with the irrigation system distribution system is the undersized main from Mann Lake to 16th St. on Powers Ave.

Fire Flow

Available fire flow under the following conditions has been prepared in **Figure ES-10:**

- Minimum system pressure of 20 psi.
- Maximum day demand conditions.

Figure ES-10: Irrigation Available Fire Flow at Maximum Day Delivery



The figure shows that in general, residential fire flows of 1,500 gpm is not available near the boundary of the LOID Irrigation boundary. This is likely due to the prevalence of small diameter pipe of less than 8-inches in these areas.

Maintenance/Replacement

Typical guidelines suggest that the useful life of domestic distribution systems ranges from 65-95 years (Clean, 2002). If replacement continues under the District's more aggressive schedule with annual replacement of 10,000 linear feet of domestic mainline, the entire system would be replaced by 2050. We recommend that LOID increase their replacement programs to keep up with the useful life of the system.

Regulatory Issues

LOID does not have any regulatory issues associated with the Clean Water Act.

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ES 5 Capital Improvement Plan

Domestic System Capital Improvements

Table ES-15 provides summary of major capital improvements anticipated over the next 20 years. Detailed opinions of probable costs for each project are presented in **Appendix Q.**

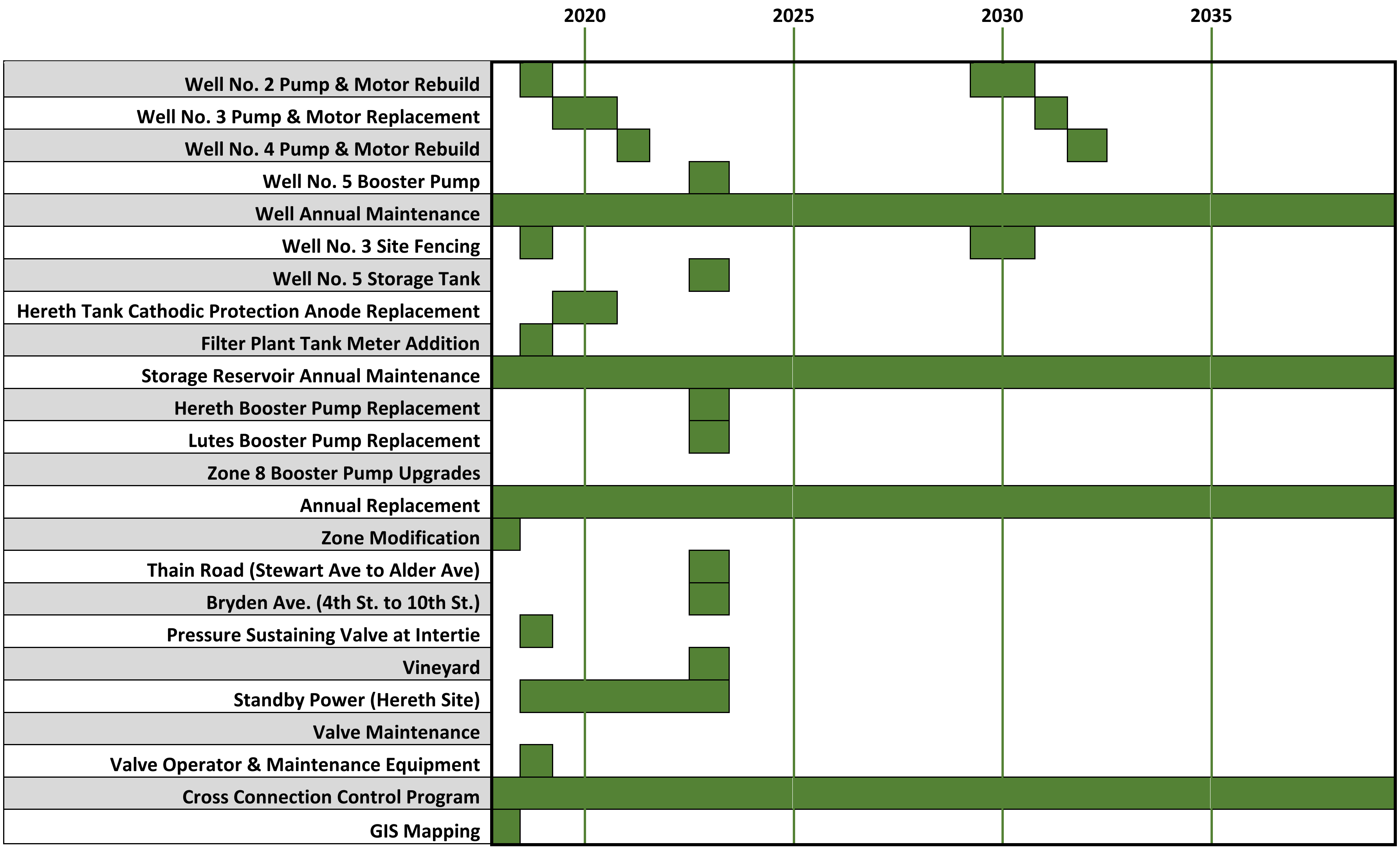
Table ES-15: Domestic System Major Capital Projects Summary

Item	Work Completed By	20-Year Total Capital Cost [A]
Supply		
Well No. 2 Pump & Motor Rebuild	Public Works Contractor [B]	$ 164,000
Well No. 3 Pump & Motor Replacement	Public Works Contractor [B]	$ 338,000
Well No. 4 Pump & Motor Rebuild	Public Works Contractor [B]	$ 378,000
Well No. 5 Booster Pump	Public Works Contractor [B]	$ 392,000
Well Annual Maintenance		$ 300,000
Well No. 3 Site Fencing	Public Works Contractor [B]	$ 10,700
Storage		
Well No. 5 Storage Tank	Public Works Contractor [B]	$ 1,500,000
Hereth Tank Cathodic Protection Anode Replacement	Public Works Contractor [B]	$ 25,000
Filter Plant Tank Meter Addition	Public Works Contractor [B]	$ 45,000
Storage Reservoir Annual Maintenance		$ 100,000
Booster Pump Stations		
Hereth Booster Pump Replacement	Public Works Contractor [B]	$ 101,000
Lutes Booster Pump Replacement	Public Works Contractor [B]	$ 203,000
Zone 8 Booster Pump Upgrades		
Distribution		
Annual Replacement		$ 10,000,000
Zone Modification	Public Works Contractor [B]	$ 475,000
Thain Road (Stewart Ave to Alder Ave)	Public Works Contractor [B]	$ 2,601,000
Bryden Ave. (4th St. to 10th St.)	Public Works Contractor [B]	$ 2,247,000
Pressure Sustaining Valve at Intertie	Public Works Contractor [B]	$ 1,000
Vineyard	Public Works Contractor [B]	$ 850,000
Well No. 5 to Zone 3	Public Works Contractor [B]	$978,000
Operation and Maintenance		
Standby Power (Hereth Site)	Public Works Contractor [B]	$ 556,000
Valve Maintenance		$ 980,000
Valve Operator & Maintenance Equipment	Public Works Contractor [B]	$ 33,000
Cross Connection Control Program		$ 1,960,000
GIS Mapping	Public Works Contractor [B]	$ 15,000

[A] Opinion of Probable Cost is presented in 2018 dollars. See **Appendix Q**.
[B] Opinion of Probable Cost for work completed by public works contractor includes contingency, engineering, and administrative fees.

The implementation schedule is presented in **Figure ES-11**.

Figure ES-11: Domestic System Contracted Projects Implementation Schedule [A]



[A] All dates are labelled only with beginning years, not entire duration, after 2023.

Rate Impact

The District does not have sufficient reserves to fund the major capital improvements listed in **Table ES-15** without a rate increase. A rate analysis was performed by LOID's Financial Director utilizing the Domestic System Capital Project Summary and Implementation Schedule. Rate increase of 4% - 7% each year over the next five (5) years will be needed to fund the recommendations in **Table ES-15**. These increases take into account utilizing LOID's designated investment funds.

Irrigation System Capital Improvements

Table ES-16 provides summary of major capital improvements. Detailed opinions of probable costs for each project are presented in **Appendix R.**

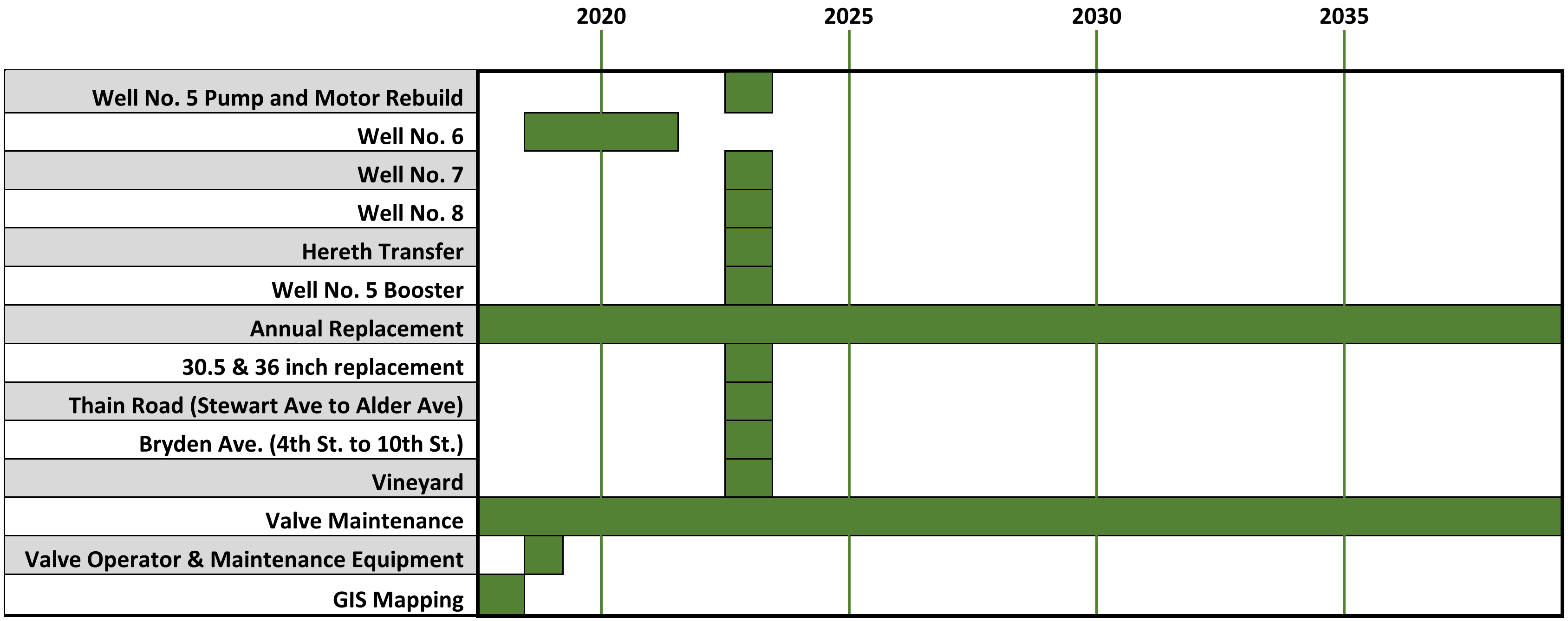
Table ES-16: Irrigation System Major Capital Projects Summary

Item	Work Completed By	20-Year Total Capital Cost [A]
Supply		
Well No. 5 Pump and Motor Rebuild	Public Works Contractor [B]	$ 234,000
Well No. 6	Public Works Contractor [B]	$ 7,294,000
Well No. 7	Public Works Contractor [B]	$ 7,294,000
Well No. 8	Public Works Contractor [B]	$ 7,294,000
Booster Pump Stations		
Hereth Transfer	Public Works Contractor [B]	$ 52,000
Well No. 5 Booster	Public Works Contractor [B]	$ 110,000
Distribution		
Annual Replacement		$ 10,000,000
30.5 & 36 inch replacement	Public Works Contractor [B]	$ 8,884,000
Thain Road (Stewart Ave to Alder Ave)	Public Works Contractor [B]	$ 2,601,000
Bryden Ave. (4th St. to 10th St.)	Public Works Contractor [B]	$ 2,092,000
Vineyard	Public Works Contractor [B]	$ 850,000
Operation and Maintenance		
Valve Maintenance		$ 980,000
Valve Operator & Maintenance Equipment	Public Works Contractor [B]	$ 33,000
GIS Mapping	Public Works Contractor [B]	$ 15,000

[A] Opinion of Probable Cost is presented in 2018 dollars. See **Appendix R**.
[B] Opinion of Probable Cost for work completed by public works contractor includes contingency, engineering, and administrative fees.

A rate analysis was performed by LOID's Financial Director utilizing the Irrigation System Major Capital Projects Summary and Implementation Schedule. Rate increases of 5% - 8% annually will be required to fund the recommendations in **Table ES-16**.

Figure ES-16: Irrigation System Contracted Projects Implementation Schedule [A]



[A] All dates are labelled only with beginning years, not entire duration, after 2023.

J·U·B ENGINEERS, INC.

1. Scope & Purpose

Introduction

The Lewiston Orchards Irrigation District (LOID) Master Plan has been executed by J-U-B ENGINEERS Inc. as an aid for Board Members and District Staff as they consider system improvements. The Plan builds on previous reports generated in 1965 and 1980 and shows LOID's commitment to the long-term reliability of their system. The District's mission states:

> *"The Lewiston Orchards Irrigation District (LOID) is a dual water purveyor committed to its fundamental objective of providing reliable water service for domestic and irrigation uses.*
>
> *It is the intent of the LOID to provide untreated irrigation water to all patrons within the irrigation district during the irrigation season at adequate pressure in an efficient manner and at a reasonable cost.*
>
> *It is also the intent of the LOID to provide quality and safe domestic water service for drinking at a reasonable cost to the residents of the District and its domestic annexations.*
>
> *The LOID is committed to the long-term reliability of systems."*

This Plan focuses on the domestic system, irrigation system distribution, and required improvements within the next 20 years. The Plan estimates water demands and needs at system build-out. Extensive efforts have been made to update LOID's growth plan through careful review of system records and interviews with District Staff. It is recommended that LOID review and update the Master Plan every five years or as future conditions deviate from discussion presented herein.

District History

LOID is a dual water purveyor committed to provide reliable water service for domestic and irrigation use. The original distribution system was constructed in the early 1900's as a single domestic and irrigation system. The dual system was installed with funding and support from the Department of Interior, Bureau of Reclamation (Reclamation) in the 1940's.

The domestic system was supplied by a combination of surface water, groundwater, and a City of Lewiston intertie. Surface water was treated at the Water Filtration Plant, originally constructed by Reclamation in the late 1940's and expanded by the District in the late 1970's with the addition of a rapid flow sand filter. In 1985, use of the Filtration Plant was discontinued and the domestic water supply was converted to groundwater. Currently, the domestic system is supplied by groundwater and a City of Lewiston intertie.

Well No. 5 was installed in 2014 to meet drinking water standards. It is primarily used to supply water to the irrigation system and is the groundwater source for this system. Currently, the irrigation system is supplied by surface water and groundwater.

System Ownership and Operation

The Lewiston Orchards Irrigation District entered an agreement with the Bureau of Reclamation in 1947 as part of the Lewiston Orchards Project. The Contract was amended in 1949. Copies of both Contracts are included in **Appendix A** for reference. Within these documents, Reclamation agreed to construct improvements and furnish irrigation and domestic water to areas within the District boundary. In turn, LOID reimbursed Reclamation over a 50-year period, and was responsible for system operation, maintenance, and upgrades. LOID currently owns and operates all capital improvements within the District. Reclamation has retained land ownership of Hereth Park and the Filter Plant.

The District operates under separate domestic and irrigation boundaries. At this time, a significant portion of the District is served by the dual domestic and irrigation system. It is critical to recognize the association between the systems within the District boundaries. Under the agreement with Reclamation, LOID cannot expand its current irrigation service area. The domestic boundary, in contrast, is a dynamic border that changes with time as the District expands its potable water service.

This study separates the two types of connections as follows:

- Dual Service Connections – Those connections which utilize separate domestic and irrigation services. Dual Service connections are located inside the LOID irrigation boundary.
- Potable-Only Service Connections – Those connections which utilize a single potable service for both domestic and irrigation purposes. Potable-only service connections are typically located inside the domestic boundary, and outside the irrigation boundary.

Due to the nature of the contract with Reclamation and the existing dual piping system within the irrigation boundary, new connections outside of the irrigation boundary will be Potable-Only Service Connections.

Scope, Purpose, and District Goals

Today, LOID continues to expand its groundwater supply while managing continued growth and providing quality water at effective rates. As the District develops outside its irrigation boundary, service must be provided with potable-only supply for both domestic and irrigation purposes.

This growth will have significant impact on the domestic and irrigation systems. In an effort to understand the impact of this growth, the District developed a domestic water model in 2006 – 2007 and an irrigation water model in 2008-2009. Due to increasing interest in development since that time the LOID Board recognized the importance of developing a complete Master Plan. This Plan will build on the existing water model summarized system recommendations and formalize a capital improvement plan.

This document includes a 20-year growth plan for the domestic and irrigation distribution system components and provides the District a tool to address current deficiencies and manage long-term water system planning. This Plan evaluates each component of the LOID system and provides recommendations for water supply, transmission, and storage to meet increasing demands of system users. The Plan recommendations are intended to be used as a tool to plan and budget for immediate and long-term improvements and should be revised on a periodic basis within the planning period to reflect changing District priorities and ratepayer requirements.

Prior to technical analysis for the LOID Master Plan, J-U-B worked with LOID Board Members and personnel to establish specific domestic and irrigation service goals within the District. Based on numerous discussions, the following design criteria were established by LOID to meet current and future water service needs. Improvement recommendations presented in this Plan are based on meeting the following criteria though the planning period:

Design Criteria

- Usage Behaviors - The most critical design assumption associated with this plan is continued operation of the irrigation system in a manner that is consistent with current usage. Any shift in usage from the irrigation system to the domestic system will have a significant impact on the evaluation and recommendations provided in this report. As such, the District should continue to monitor irrigation and domestic demands on an annual basis to identify said shift in usage behavior.
- Established System Operating Pressure – The District’s goal is to maintain a normal operating pressure range of 40 – 100 psi.

- Pipeline Headloss – The LOID Board has established design pipeline headloss goal of less than 5 feet per 1,000 feet of pipe length.
- System Fire Flow Pressure – LOID seeks to maintain minimum pressure of 20 psi during maximum day demand under fire flow conditions as required in accordance with the IAC (IDAPA 58.01.08, Subsection 552.01.b).
- **Domestic System**
    - Redundancy – LOID will provide redundant water supply to meet maximum day demands through the planning period with the largest source out of service as required by Idaho Administrative Code (IDAPA 58.01.08, Subsection 501.17).
    - Expanded System Operating Pressure – The District seeks to maintain normal operating pressure of 50 – 90 psi in new pressure zones as the District expands outside its existing service boundary. The Idaho Administrative Code (IAC) requires that public water systems maintain pressure above 40 psi within new service areas. (IDAPA 58.01.08, Subsection 552.01.b) In addition, IAC specifies maximum static pressure of 100 psi, and recommends that systems ordinarily keep static pressures below 80 psi.
    - Standby Storage - The Idaho Administrative Code requires minimum standby storage of eight (8) hours under average day demand (IDAPA 58.01.08, Subsection 003.16). LOID has expanded this requirement to provide emergency supply through standby storage equivalent to one day at maximum day demand.

Fire Protection

It should be noted that it is neither the legal obligation nor part of LOID's mission statement to provide fire flow protection. Regardless, LOID recognizes the benefit to its patrons of providing water for fire protection, and as such has set the following fire suppression goals where possible within the District as shown in **Table 1-1**:

Table 1-1: Fire Suppression Goals

Land Use & Zoning	Min. Flow Rate (gpm)	Duration (hours)	Fire Storage Goals (gallons)
Residential	1,500	2	180,000
Commercial (from domestic system)	1,500	2	180,000
Commercial (from irrigation system)	1,500	4	360,000

LOID's goals were reviewed by the local fire authority, Lewiston Fire Department. A letter supporting LOID's goal is in **Appendix E**.

Regulatory Issues

The Lewiston Orchards Irrigation District is a Public Water System as defined by the Idaho Department of Environmental Quality. The District is registered with the U.S. Environmental Protection Agency (US EPA) as water system ID2350015. It is classified as a large system, serving a population of approximately 20,000 (2017 estimate).

The rules, regulations and requirements for public drinking water systems are established by the Safe Drinking Water Act (SDWA) of 1974. The SDWA was implemented by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The SDWA authorizes the US EPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants that may be found in drinking water. The regulations were intended to monitor levels of potentially hazardous substances. These limits are referred to as Maximum Contaminate Levels (MCLs) and non-enforceable health goals (Maximum Contaminant Level Goals, or MCLGs) for each identified contaminant.

The SDWA was amended in 1986 and 1996. The 1986 amendments were intended to clarify key definitions, regulate additional contaminants, and enhance EPA enforcement authority. The 1996 amendments updated regulations regarding source water protection, operator training, funding for water system improvements, and identified public information as important components of safe drinking water. Additional drinking water requirements are established by the Code of Federal Regulations (CFR).

Although there are many regulations within the SDWA which apply to LOID, the most critical include:

- Source Water Protection – The 1996 SDWA amendments require states to perform a Source Water Assessment Program (SWAP). Although source water protection is not specifically monitored or mandated by SWDA, it is highly encouraged that agencies use information provided by SWAP to protect source water. The most recent SWAP for LOID was completed in January 2010 in collaboration with the City of Lewiston and the Asotin County Public Utility District (PUD). A copy of the Source Water Protection Plan is included in **Appendix J.**
- Groundwater Disinfection Rule (40 CFR 141.21) – Requires total coliform sampling for community water systems based on the population served by the system. 40 CFR

141.402 details analytical requirements and methods for groundwater source monitoring for microbial contamination.

- Lead and Copper Rule – 40 CFR 141.80 to 141.91 establishes an MCL of 0.015 mg/L for Lead and 1.3 mg/L for Copper based on 90th percentile of tap water samples. Sampling is required every six months and conducted as identified in 40 CFR 141.86.
- Disinfection Byproducts – 40 CFR 141.53, 141.542 and 141.130 to 141.135 establish Maximum Residual Disinfectant Level Goals (MRDLGs) and Maximum Contaminant Level Goals (MCLGs) as listed in **Table 1-2**:

Table 1-2: Disinfection Residuals and Byproducts

Type	Disinfectant Residual or By-Product	Maximum Residual or By-Product
MRDLG	Chlorine	4 mg/L (as Cl2)
MRDLG	Chloramines	4 mg/L (as Cl2)
MRDLG	Chlorine dioxide	0.8 mg/L(as ClO2)
MCLG	Bromodichloromethane	0 mg/L
MCLG	Bromoform	0 mg/L
MCLG	Bromate	0 mg/L
MCLG	Chlorite	0.8 mg/L
MCLG	Chloroform	0.07 mg/L
MCLG	Dibromochloromethane	0.06 mg/L
MCLG	Dichloroacetic acid	0 mg/L
MCLG	Monochloroacetic acid	0.07 mg/L
MCLG	Trichloroacetic acid	0.02 mg/L

2. Service Area And Population Growth

Introduction

System service area and population growth projections constitute an important part of a Master Plan. The future requirements of supply, storage, and distribution mains are directly dependent upon the rate of population growth. Knowing when particular components will be needed is critical so that these components can be financed, designed, and constructed to meet user demands.

Service Area Description

The Lewiston Orchards Irrigation District area lies in the southeastern portion of the City of Lewiston, Idaho. The service area for the system covers approximately 4,000 acres on a plateau overlooking the central portion of the City. **Figure 2-1** provides a vicinity map of the District. The LOID service area is enclosed by two service boundaries; the irrigation boundary and the domestic boundary. Elevations within the District service area vary by 650 vertical feet. A contour map of LOID is provided in **Figure 2-2**.

Under the agreement with Reclamation, the irrigation boundary is static and will not expand in the future. The domestic boundary, however, is not subject to the restrictions from Reclamation, and may be altered by the LOID Board. At this time, the vicinity map shows that the boundaries are similar, and that a significant portion of the domestic service area is bounded by the irrigation boundary.

The Lewiston Orchards was annexed by the City of Lewiston in 1969, and as such, there are two separate water systems within the City. LOID serves the area historically known as the "Lewiston Orchards." The water systems are connected, and in 2003-2004, it was mutually agreed between LOID and the City that the water main west of 13th on Warner Avenue would be served by the City, and the line east of 13th on Warner would be served by LOID.

Domestic System

Although a significant portion of the District is served by the dual domestic and irrigation system, there are three subdivisions which utilize potable-only service for both domestic and irrigation use. The Lutes subdivision, established in the 1970's, has reached full build-out. The Canyon Crest subdivision, annexed by the District in 2006, has observed moderate growth to date. These subdivisions are delineated in **Figure 2-1.** The North East Crossing Subdivision has been partially developed and there are plans for further development. The North East Crossing Subdivision is labelled as Area 1 in **Figure 2-4**.

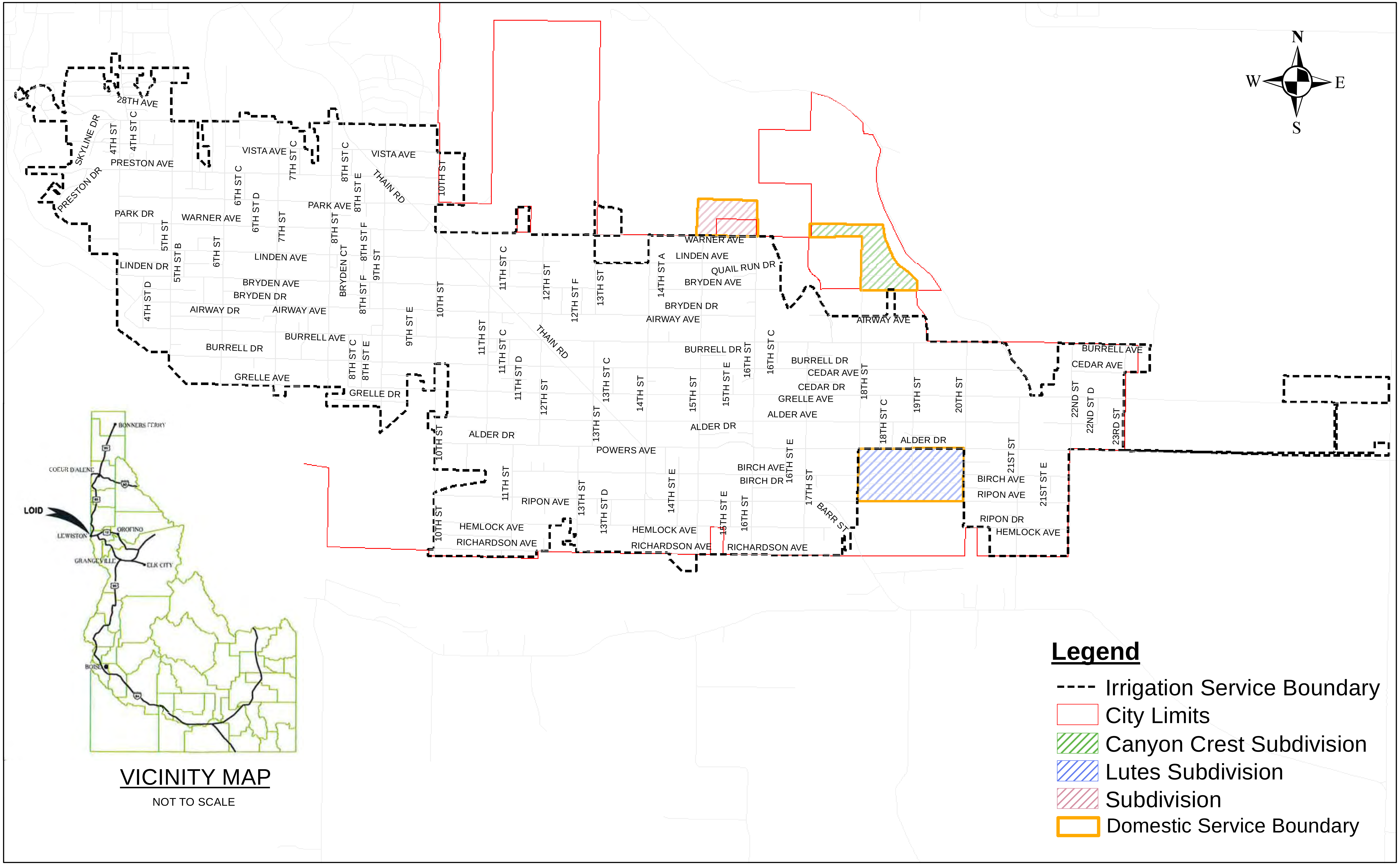
Irrigation System

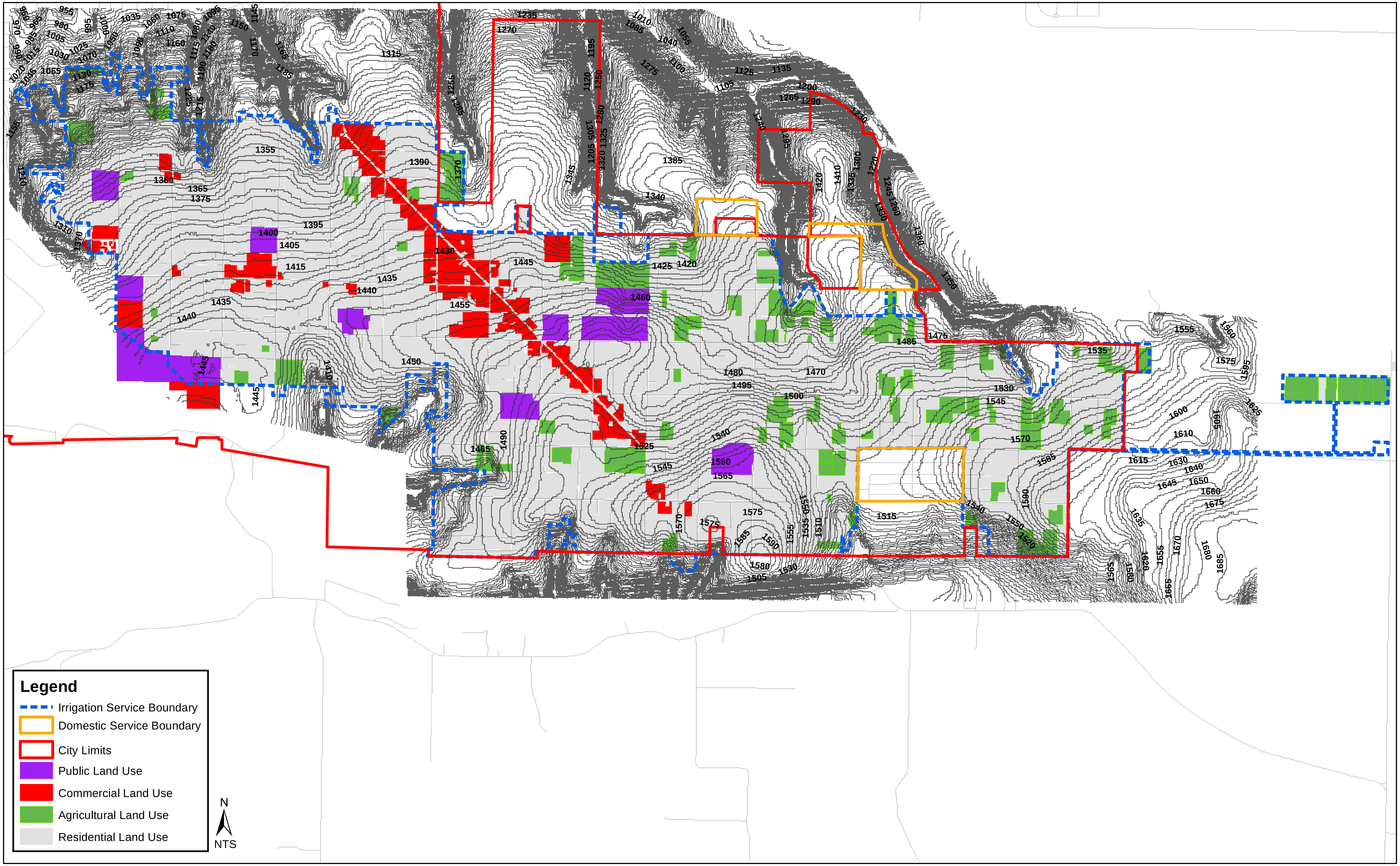
The service area for the Irrigation System can be referenced in **Figures 2-1.** The District provides irrigation water for a variety of purposes, including lawn care and agricultural use. Land areas within the District can generally be divided into four categories:

- Residential
- Commercial
- Agricultural
- Public

For purposes of this Plan, City parcels were visually categorized using zoning maps, aerial photos, and City of Lewiston GIS data. Land use areas are shown in **Figure 2-2.**

Figure 2-1: Vicinity Map *Lewiston Orchards Irrigation District*




Legend
Irrigation Service Boundary
Domestic Service Boundary
City Limits
Public Land Use
Commercial Land Use
Agricultural Land Use
Residential Land Use
N
NTS

Population Growth and Demographics

Demographics and Population projections will form the basis of water use projections for the future growth of the domestic and irrigation systems. As LOID is part of the City of Lewiston, there is no specific population data unique to the District. Anecdotal evidence from the District suggests a population of approximately 20,000 residents and forms the baseline of population projections.

An analysis of US Census Bureau data was conducted from 1960 to the present for the City of Lewiston and Nez Perce County. The analysis showed the areas have experienced growth at an exponentially instantaneous rate ranging from 0.68% to 0.74%. Following discussion with District personnel and the LOID Board, an exponentially instantaneous growth rate of 0.70% is used for this study, based on historical growth observed within the City of Lewiston and Nez Perce County. A graph depicting this projection is provided in **Figure 2-3.** The demographics of District growth are anticipated to mimic those within the existing service area, with predominately residential growth and negligible impact of commerce and industry.

The impact of system growth outside the District boundary has significant impact on the domestic system, as these potable-only connections will utilize domestic water for domestic and irrigation purposes. Based on discussion with LOID personnel, the District projects that 30% of future growth will occur as infill within the irrigation boundary as dual service connections and 70% will occur outside the irrigation boundary as potable-only service connections. **Figure 2-4** shows anticipated areas of commercial and residential growth, and **Table 2-1** provides a summary of this growth based on connection type.

Table 2-1: Population Projection [A]

Year	Total Connections [B]		
	Dual Service	Potable-Only Service	System
2017	8,024	520	8,544
2027	8,207	955	9,162
2037	8,403	1,420	9,823

[A] Based on exponential instantaneous growth of 0.7%.

[B] Based on projected future growth consisting of 30% dual service and 70% potable-only service connections.

Figure 2-3: Population Growth

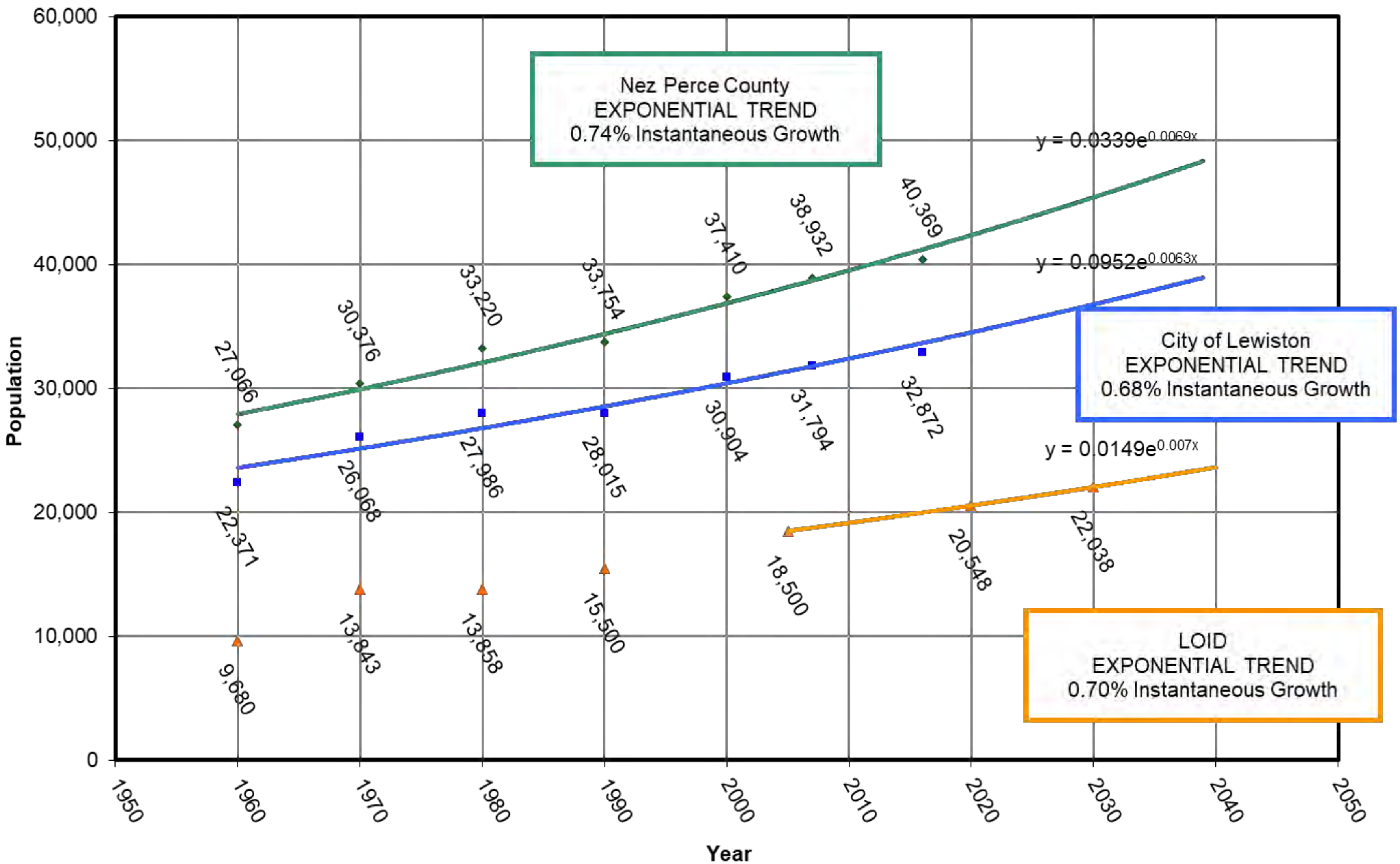
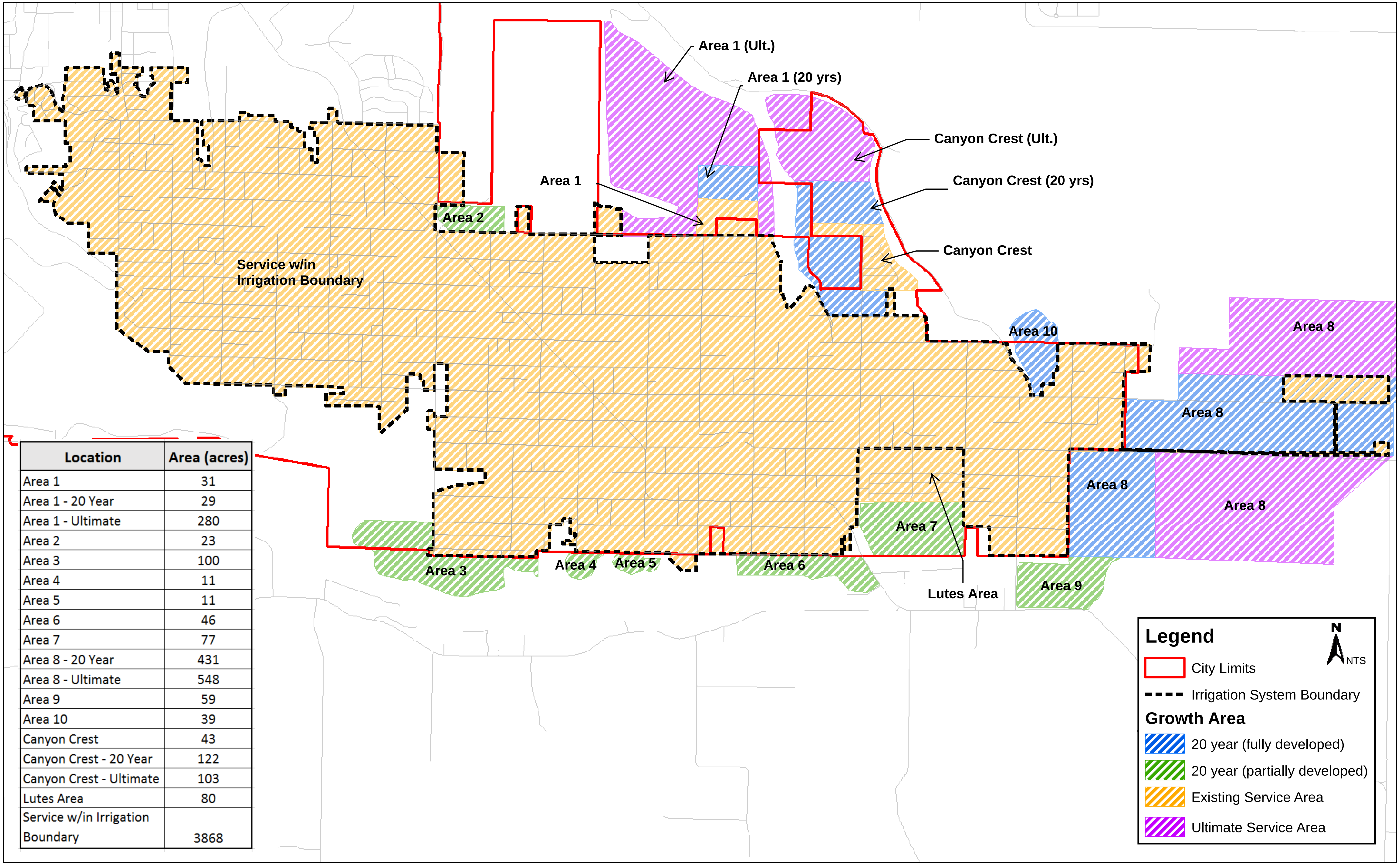


Figure 2-4: Anticipated Growth Areas



Location	Area (acres)
Area 1	31
Area 1 - 20 Year	29
Area 1 - Ultimate	280
Area 2	23
Area 3	100
Area 4	11
Area 5	11
Area 6	46
Area 7	77
Area 8 - 20 Year	431
Area 8 - Ultimate	548
Area 9	59
Area 10	39
Canyon Crest	43
Canyon Crest - 20 Year	122
Canyon Crest - Ultimate	103
Lutes Area	80
Service w/in Irrigation Boundary	3868

Development Policy

The District's current development policy within the boundary is to allow development and connection to the dual domestic and irrigation system with user buy-in fees. Development outside the existing domestic boundary is considered on a case-by-case basis. The developer is responsible to cover the initial costs of required infrastructure, and LOID takes ownership of the system. Three subdivisions have been added to the system since its inception.

- Lutes Subdivision - The Lutes subdivision was not annexed by the District, although LOID provides service to the area. Residents within Lutes receive service under a surplus water agreement.
- Canyon Crest Estates Subdivision – The Canyon Crest Estates Subdivision was annexed by the Board in December 2006. The subdivision consists of 375 potential housing units.
- N.E. Crossing – The Northeast Crossing Development has been developing small additions, 18-22 lots since 2016. Currently four additions have been constructed, totaling 80 lots.

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3. Existing Domestic System

Introduction

The LOID Domestic System is comprised of five main components, as listed below:

- Water Supply
- Water Distribution
- Water Storage
- Telemetry and Controls
- Water Rights

Each of the system components are developed in the following sections. **Figure 3-1** provides a hydraulic grade line (HGL) summary for reference throughout this section and the Plan. A plan view schematic of system infrastructure is shown in **Figure 3-2.**

Domestic Water Supply

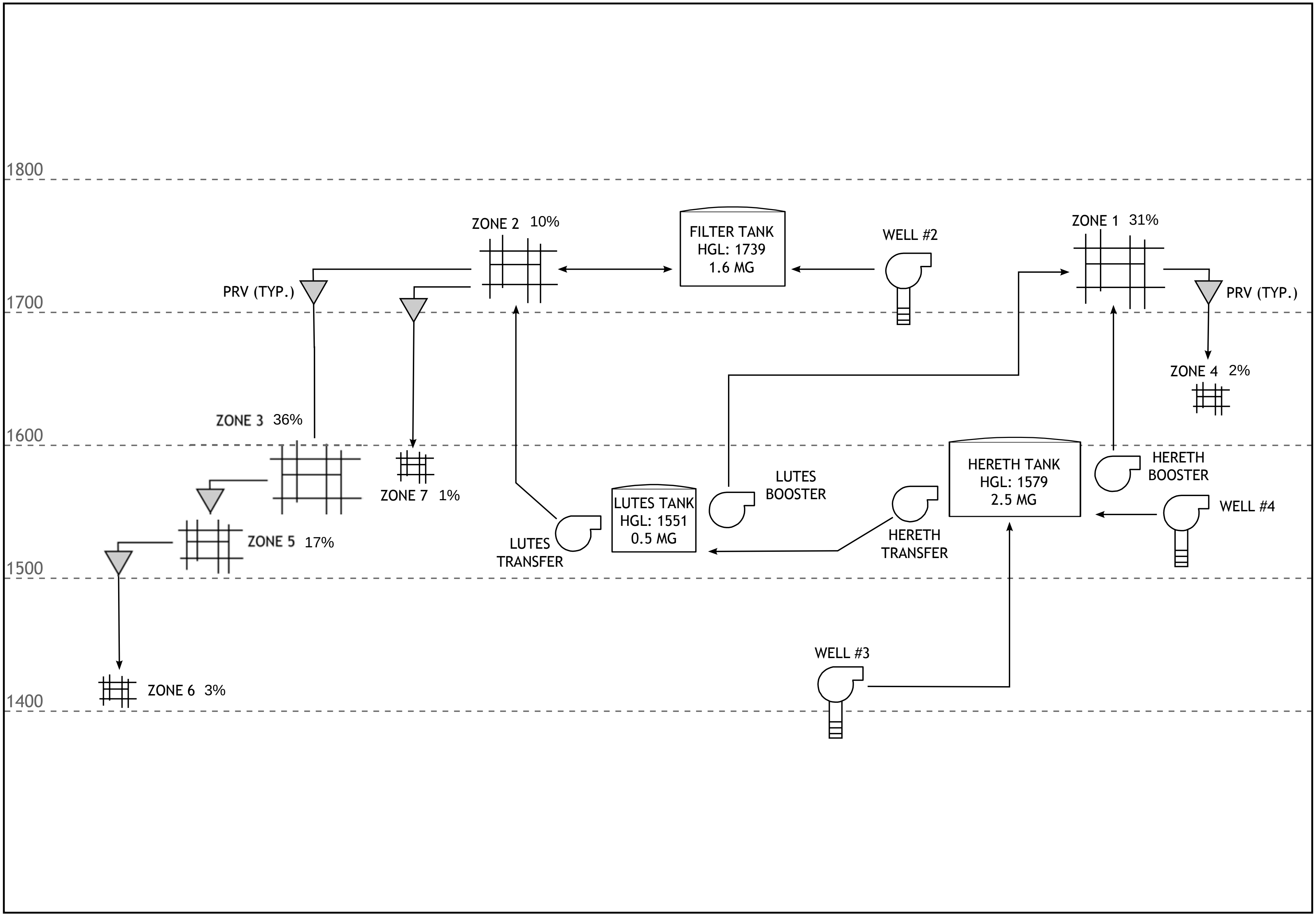
The District currently utilizes three groundwater wells, Well No. 2, 3, and 4, for domestic water supply. The Well No. 5 project was completed in 2017 primarily for irrigation usage, but with additional infrastructure, could be used as a potential future domestic water source. In addition to groundwater sources, the District has an intertie connection to the City of Lewiston. City water is available during emergency situations; the District has both received and transferred water from the City through this connection.

All wells draw water from the Lewiston Basin Aquifer (previously called the Russell Aquifer) which was designated a Sole Source Aquifer (SSA) in 1988. The Idaho Department of Environmental Quality (DEQ) website defines a sole source aquifer as “an aquifer that has been designated by the EPA as the sole or principal source of drinking water for an area.” The Lewiston Basin covers approximately 500 square miles of southeastern Washington and western north-central Idaho. This aquifer is recharged by several large surface water sources including the Snake and Clearwater rivers.

Although not required by Idaho Rules, the District currently treats each well with chlorine to provide chlorine residual in the storage tanks and distribution system. **Table 3-1** provides a summary of District Well information. The Well Drillers Logs for each well are provided in **Appendix B.**

Figure 3-1: Hydraulic Grade Line Schematic

Lewiston Orchards Irrigation District



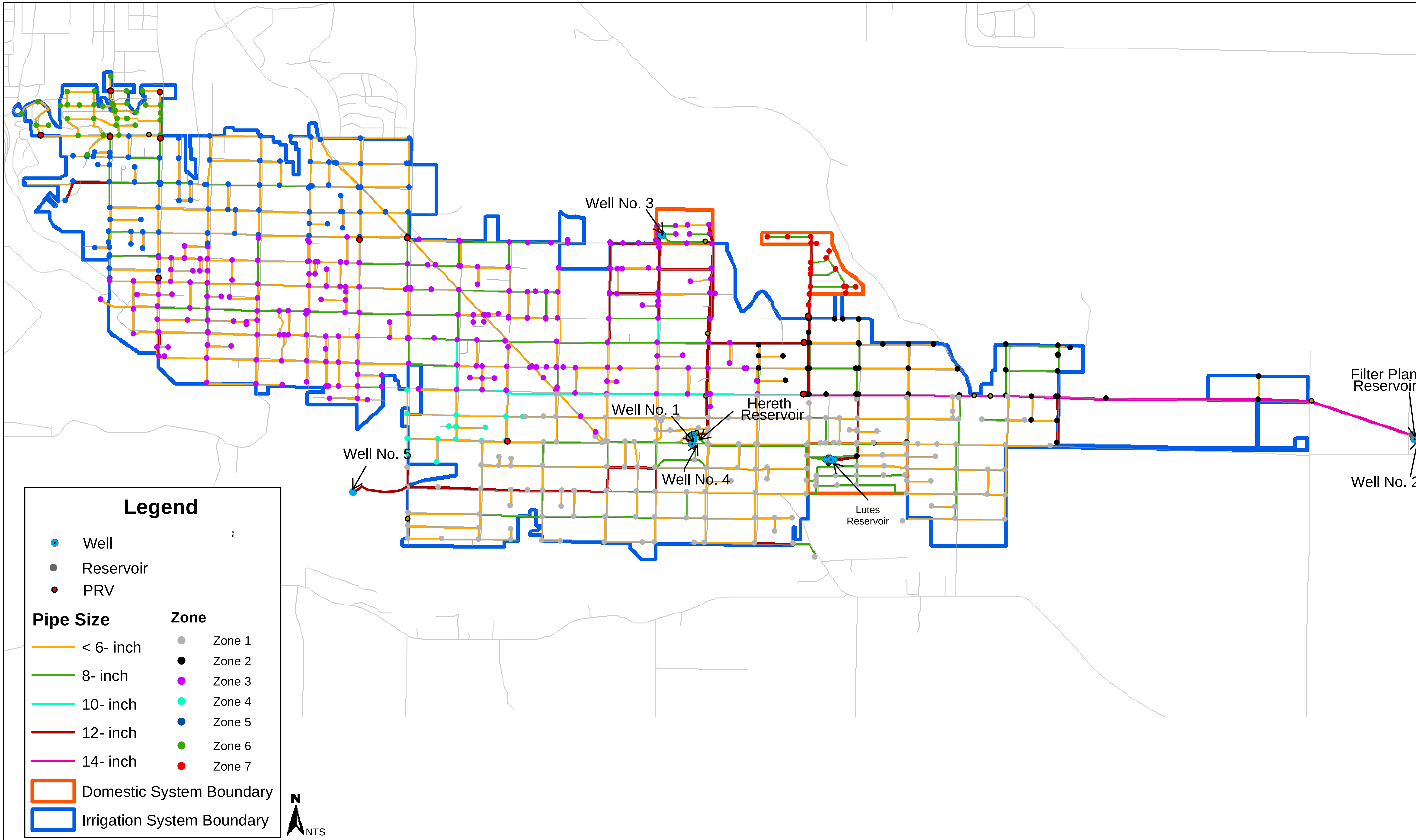

Well No. 3
Well No. 1
Hereth Reservoir
Well No. 5
Well No. 4
Lutes Reservoir
Filter Plant Reservoir
Well No. 2
Legend
Well
Reservoir
PRV
Pipe Size
< 6- inch
8- inch
10- inch
12- inch
14- inch
Zone
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Zone 6
Zone 7
Domestic System Boundary
Irrigation System Boundary
N
NTS

Table 3-1: District Well Information

Well No.	Construction Year [A]	Water Right [A] cfs (gpm)	Current Pumping Rate (gpm)	Total Well Depth [A] (bgs)	Static Level [B] (bgs)	Pump Chamber Diameter [A]	Cased Depth [A] (ft)
1	1978	1.34 (601)	0	1,795	851	8"	1,520
2	1987	2.13 (956)	520	1,959	501	13 ⅜"	1,376
3	1997	2.76 (1,239)	530	2,617	695	13 ⅜"	1,430
4	2003	3.34 (1,499)	990	1,625	847	16"	1,164
5	2014	18.00 (8,079)	2,000	1900	590	24"	1,705[C]

[A] Per IDWR Records

[B] Per Dale Ralston – Well No 5 Draft Report

Well No. 1

LOID Well No. 1 was drilled in 1978 but lost production capability over time and use was discontinued with the construction of Well No. 3. The water right for Well No. 1 had an additional diversion point added in 2009 so that this water license applies to Wells No. 1 and No. 4. Although it is not in use, the well has not been abandoned. The pump and motor have been removed and the well casing has been capped. Well No. 1 is occasionally used to collect aquifer water level information.

Well No. 2

LOID Well No. 2 was drilled in 1986 near the Filter Plant. The well was finished with a submersible pump and motor. Over the first 20-year period during which the well had been in service, discharge has decreased from 800 to 580 gpm. Although insufficient water level data is available to establish trends, the decrease in yield may be associated with long term water level decline.

The Well No. 2 motor operates at 3,600 rpm on a variable frequency drive (VFD). The Well is typically pumped 24 hours a day and discharges directly to the Filter Plant Tank. Operators currently try to maximize use of this pump, as it provides gravity supply to the District without additional booster pumping as shown in **Figure 3-1**. The VFD motor is typically run at a lower setting during seasonally low wintertime demand. The VFD setting is increased during the summer. Due to the relatively high motor speed, the motor is historically rebuilt on a regular basis every two to three years. Although, the last rebuild has lasted more than 10 years. The motor was re-built in 2004, and again in 2007. **Appendix C** provides additional information and serial numbers for Well No. 2 pump and motor.

A dual pump chlortec system capable of chlorine dosage at 36 lbs/day was installed in the Well No. 2 Wellhouse in 2018.

Well No. 3

LOID Well No. 3 was drilled in 1997 as a replacement for Well No. 1. The well was finished with a submersible pump and motor. The well has a specific capacity of approximately 1 gpm/ft. This correlates with high drawdown levels; therefore, the pump is manually throttled by a gate valve in the pump house plumbing tree to maintain sufficient water above the pump and motor assembly. In 2007, the flow meter was moved to minimize influence of the throttled valve on meter readings. Meter readings prior to that date should be used with caution due to potential inaccuracies associated with turbulent flows. The Well No. 3 discharge line is connected directly to Hereth tank via a dedicated main.

Due to high levels of hydrogen sulfide (H_2S) present from the source and low hydraulic efficiency, the well is operated on an as-needed basis, typically occurring when Wells No. 2 or No. 4 are out of service. The hydrogen sulfide is often associated with a "rotten egg" odor if present in high concentrations. Although the compound does not pose a health risk, the odor and taste of the water is unpleasant and therefore an undesirable trait in drinking water. In addition to the hydrogen sulfide, water temperature of the well is high, averaging 90ºF (McCollum, 2010). This may further compound objectionable characteristics associated with the water.

The hydrogen sulfide is removed by a process that involves over-chlorinating at the Wellhouse. The water, fed directly to Hereth tank via a dedicated main, is aerated using two surface aerators located in the tank which oxidize the hydrogen sulfide forming sulfate and releasing hydrogen gas. District staff indicates this method, together with efforts to minimize use of the well, are sufficient to control consumer complaints.

The Well No. 3 pump motor operates at 3,600 rpm, and due to the relatively high motor speed, requires repair on a regular basis every two to three years. The pump and motor were repaired in 2004 and again in 2007. **Appendix C** provides additional information and serial numbers for the Well No. 3 pump and motor. A dual pump chlorine system capable of chlorine dosage at 70 lb/day was installed at Well No. 3 in February, 2001.

Well No. 4

LOID Well No. 4 was drilled in 2002 and completed in 2005. Due to well alignment issues, the well was completed with a submersible Gould's pump and Sunstar motor. From 2006 through 2009 the pump and motor was removed 3 times due to motor thrust bearing failures. LOID elected not to reinstall the original Sunstar motor after the third failure and replaced the unit with an Indar motor in 2009. The Indar motor and original Goulds pump were installed in

March 2009, at which time the system failed upon startup. The system was removed again, and the Indar motor was found to be defective. The motor was fully warranted and replaced by the manufacturer for installation in April 2009, and the assembly has been in operation since that time. The motor operates at 1,750 rpm, and is anticipated to require fewer repairs than Wells No. 2 and No. 3 due to its lower operating speed.

Hydrogen sulfide is present in the water, although operators report it is negligible when compared with Well No. 3. **Appendix C** provides additional information for the Well No. 4 pump and motor. The well is typically pumped 9 to 12 hours per day directly to Hereth Tank. A dual pump Miox system capable of dosage at 50 lbs/day was installed in Wellhouse No. 4 in 2018.

Well No. 5

LOID Well No. 5 was drilled primarily for irrigation water demands but could be used as an additional domestic water source with additional infrastructure. The well system also includes piping for a future storage tank and open floor space in the well house for future chlorination processing or other equipment. **Chapter 4**: Water Supply, Collection, and Storage, and **Appendix C** provide additional information for Well No. 5.

City of Lewiston Intertie

The LOID system is connected to the City of Lewiston by a 12-inch ductile iron line between 13th and 14th on Warner. A new valve vault was installed at the intertie in 2009. The intertie main is split within the vault to allow independent flow measurement for each entity with a flow meter check valve and pressure reducing valve (PRV) assembly on each main. The connection is manually operated by LOID and the City. The LOID and City are currently working on automating the feed to the City of Lewiston by adding supervisory controls to monitor flow.

The District can use the source to directly feed pressure Zone 3 or to fill Hereth Tank. The LOID staff utilizes the supply through Hereth, and verbally request flows to match average daily usage. City personnel manually adjust their PRV to match this quantity of water.

The intertie was used to supply a significant portion of LOID water demand in 2007 when Wells No. 2 and No. 3 were out of service for repairs. The City has also utilized the LOID system to supplement their supply when the south high booster was out of service. High demands to the City during that time resulted in low pressure within Zone 3, and personnel indicated several LOID residents did not have water. Pressure sustaining features will be added to the PRV to maintain adequate pressures in the LOID system.

The connection can provide at least 1,000 gpm. The entities compensate each other under an expired agreement at $0.88 per 100 cubic feet. LOID and the City have analyzed the ability of each waste system to provide to each other. LOID can provide 1,000 gpm to the City and maintain maximum pressures greater than 20 psi as defined by IDAPA 5E.01.01.552.b.i for 4-5 hours. Lewiston can provide 1,000 gpm under peak hour conditions. See **Appendix H** for detached letters.

A summary of LOID domestic supply is provided in **Table 3-2**:

Table 3-2: Domestic Water Supply

Source	Supply
Well No. 2	520 gpm
Well No. 3	530 gpm
Well No. 4	990 gpm
City of Lewiston Intertie	1,000 gpm
TOTAL	**3,040 gpm**

Domestic Disinfection

LOID operators seek to maintain a chlorine residual of 1.2 ppm to provide disinfection. On-site chlorine generation units at each well provide sufficient chlorine to match the target rate.

Domestic Water Distribution

The LOID Water Distribution System, as shown in **Figure 3-1**, consists of seven pressure zones. The specific boundaries of each zone are presented in **Figure 3-2**. The District is generally divided into “halves” or two “portions,” and is serviced by a combination of water tanks, booster stations, and pressure reducing valves (PRVs). The southern portion of the system, comprised of Zones 1 and 4, is supplied through the Hereth and Lutes tanks via the Hereth and Lutes boosters, respectively. The northern portion of the system, comprised of Zones 2, 3, 5, 6 and 7, is supplied through the Filter and Lutes tanks via gravity flow and the Lutes transfer pumps, respectively. The Hereth transfer pumps feed the Lutes tank and are not directly connected to the Lutes Booster. **Table 3-3** provides the relative size of these zones on a per-acre basis.

Table 3-3: Pressure Zones

Zone	Service	Size (Acres)	Relative % of District
1	Dual Service	1,177	29%
	Potable-Only Service (Lutes Subdivision)	75	2%
2	Dual Service	405	10%

Zone	Service	Size (Acres)	Relative % of District
3	Dual Service	1,452	36%
4	Dual Service	97	2%
5	Dual Service	672	17%
6	Dual Service	108	3%
7	Dual Service	44	1%

Hereth Booster Station

All water from Hereth Tank is transmitted via this station, which has space for three pumps.

- Hereth Transfer - The Hereth transfer utilizes a 1,400 gpm Cornell pump and 75 HP motor to transport water to the Lutes tank. The pump's design operating pressure is higher than the actual operating pressure, and the pump has historically tripped off to avoid overheating the motor. To minimize this issue, the District increases the discharge on the pump by manually throttling a gate valve on the discharge line. Under the false head, the pump typically operates at 1,000 gpm.
- Hereth Booster – The Hereth booster serves the southern portion of the system. This Paco pump with 60 HP motor runs on a VFD. Although the pump placard states design operating flow of 900 gpm, the pump typically operates between 550-600 gpm.
- Hereth Irrigation Transfer – The irrigation transfer utilizes a 1,000 gpm Cornell pump and a 75 HP motor. The pump is controlled by a VFP to maintain a preset discharge rate. A reduced pressure zone assembly provides cross control protection of the potable water system.

Lutes Booster Station

There are four pumps at the Lutes booster station, which is supplied via Lutes tank. The booster station was re-built in 2003, and houses four pumps completing two main functions:

- Lutes Transfer Pump - The Lutes transfer pump consists of one 1,025 gpm centrifugal Cornell pump and 100 HP motor. The pump delivers water to Pressure Zone 2 at the intersection of 19th and Grelle. Water levels in the Filter Tank are used to control the transfer pump.
- Lutes Booster – The Lutes booster includes two 500 gpm VFD Paco pumps for boosting water to service the southern portion (Zones 1 & 4) of the LOID system. These pumps operate as needed based on pressure when the Hereth Booster cannot maintain

pressures to the southern portion of the District. The pumps primarily serve the potable-only service area within the Lutes subdivision.

The pumps typically operate on lead/lag settings which are manually changed by the operators on a periodic basis to maintain similar run times. Currently, the lead pump starts when pressure within Zone 1 drops below 78 psi. The VFD speeds up until the pump is at full capacity of 520 gpm. If this is insufficient to maintain the set point pressure, the lag pump starts and ramps up to meet demand. The Lutes booster pumps operate on a limited basis during the non-irrigation season, as the Hereth booster is sufficient to supply the southern portion of the District. During the irrigation season, the pumps typically operate 6-8 hours per day (McCollum, 2010)

The final pump in the Lutes booster station is a Paco pump dedicated to fire flows with a capacity of 2,000 gpm. This pump only starts if the two smaller pumps are not able to keep up with system demands. If this pump starts, the two smaller pumps shut down. The Lutes fire pump operates at approximately 37 psi.

Domestic Pipe Network

As irrigation mains were built to meet peak irrigation demands and fire flows when practical, the domestic system mains are smaller than those that might be observed in systems of similar magnitude. Due to the low peaking characteristics of a dual water system, much of the LOID domestic system is constructed of pipes less than 6 inches in diameter, fed by larger trunk lines ranging in size from 10 to 14 inches.

A summary of the sizes and materials within the system is provided in **Table 3-4**. This data was obtained from the WaterGEMS Hydraulic Model, further discussed in Chapter 6. Chapter 6 provides in-depth discussion of model development.

Table 3-4: LOID Existing Pipe & Material [A]

Pipe Material	Pipe Sizes (in)								
	< 4	4	6	8	10	12	14	36	> 36
Asbestos Cement	0	44613	23634	10859	9218	0	16246	0	0
PVC [B]	1189	75935	146732	91660	644	33287	0	0	0
Ductile Iron	689	0	0	6588	1325	9992	0	111	32
Galvanized iron	32992	894	1133	0	0	0	0	0	0
Steel	0	0	0	158	0	0	0	0	0
Copper	28	0	0	0	0	0	0	0	0
Total (Feet)	**34,898**	**121,442**	**171,499**	**109,265**	**11,187**	**43,279**	**16,246**	**111**	**32**

Total (Miles)	**6.61**	**23.00**	**32.48**	**20.69**	**2.12**	**8.20**	**3.08**	**0.02**	**0.01**
Total (Miles)									**96.21**

[A] Pipe type, length and sizes were generated by the 2018 WaterGEMS model of LOID domestic system and are approximate.
[B] Information obtained from the model does not separate PVC into 160 psi and C900 material.

The system uses several large distribution mains to route flows to general areas of use. A 14-inch main runs from the Filter Plant Tank to the intersection of 18th and Grelle, the boundary between Pressure Zones 2 and 3. From this point, the backbone splits to a 10-inch main that continues along Grelle, and an 8-inch main routed to Burrell Avenue along 18th. These lines loop back to meet at the intersection of 11th and Burrell. An 8-inch main continues from this point along Airway Avenue and also feeds the 6-inch line on Thain Road. An 8-inch main on Preston Avenue is served off the Thain Road line to provide service in Pressure Zone 5.

Pressure Zones within the system are typically connected by PRV's to control downstream pressure. Several additional connections have been identified between Zones 1 and 2. Although these areas are separated by a pressure boundary, similar hydraulic grade lines make these connections possible without PRV's. The identified connections are listed:

- 21st Street & Grelle Avenue – 8-inch PVC – This connection utilizes a check valve to allow flow from Zone 2 to back feed into Zone 1. This connection can be utilized to fill Hereth tank from Zone 2. A gate bypass can be used to circumvent the check valve.
- 18th Street & Grelle Avenue – 6-inch AC – A check valve on this main operates in a similar fashion to the 21st and Grelle check valve. There is no bypass line around this valve.
- 19th Street & Grelle – 4-inch – A gate valve on this line controls flow and is normally off.
- 20th Street and Grelle – 2-inch Galvanized Iron – The District indicates this line has been abandoned.

Maintenance/Replacement

The District has an ongoing pipe replacement program. From 2014 to 2017, the District had replaced an average of 3,500 linear feet of domestic mainline per year, and replacement within the last 10-15 years had reached as high as 10,000 feet per year (2010) and as low as 3,000 feet per year in 2014. District policy requires replacement at minimum with 8-inch PVC. It is recommended that the District accelerate the replacement pipe projects for the domestic system in the near future.

The LOID system is comprised of several different material types as listed in **Table 3-4**. According to the operators, different pipe materials can be dated back to specific periods depending on District preferences at the time.

Problem Areas

During discussion with LOID operators, several maintenance and pressure issues have been noted throughout the system.

Zone 2

- 19th and Burrell – This area experiences high pressures of greater than 100 psi.

Zone 3

- Thain Road Pipe – One particular area of concern is within Zone 3 along Thain Road. Class 160 PVC pipe with galvanized fittings was installed in this area in the 1970's. The pipe is extremely brittle and operators experience frequent maintenance issues and water main breaks, especially in areas where it was not bedded properly, as is the case along Thain.

  Operators have converted nearly all services serving Thain Road from HDPE to copper and have made efforts to move services off this main where practical. In addition, and as a result of these pipe conditions, pressures are limited within Zone 3 by managing the PRV set points between Zone 2 and 3. While these techniques have been successful in reducing maintenance along Thain road, the PRV settings have led to low pressure issues on Thain from Burrell to Powers, and in the vicinity of 13th and Burrell.

- Cedar Avenue from 12th to 14th – Low pressures ranging from 35–40 psi in this area may be associated both with high pressure zone elevations and PRV pressure settings related to the Thain Road pipe.

Zone 5

- North of Park Avenue near Vineyards – Service to this area is challenging due to rapidly changing elevations in the area. The variation in elevation creates high pressures within much of the Zone.

Zone 6

- Vineyards – Although no specific pressure issues have been identified within the Vineyards area, water mains within this area are located in alleys. As such, replacement, repair and maintenance within this area are problematic due to private encroachment on the narrow right-of-way.

Domestic Water Storage

Storage provides the District with flow equalization, pressure stabilization, and emergency storage. Storage is critical to alleviate water shortages during water supply interruptions. The tanks are on a 3-5 year plan to be checked and cleaned if necessary.

The LOID system utilizes three storage reservoirs shown in **Figure 3-1** to provide total storage capacity of 4.6 million gallons as shown in **Table 3-5**.

Table 3-5: Domestic System Storage Capacity

Storage	Volume (gallons)
Filter Plant Tank	1,600,000
Hereth Tank	2,500,000
Lutes Tank	500,000
Total	**4,600,000**

Filter Plant Tank

The Filter Plant Tank was constructed by Reclamation as part of the original Lewiston Orchards Project in 1949. It is a buried concrete tank with capacity of 1.6 million gallons. The original plans show the bottom of the structure to be 116 x 116 feet. The bottom slopes up at a 1.5:1 as the tank widens to 139 feet, with vertical walls above this depth. Despite the tank's age, it is generally in good condition. The tank is located in Pressure Zone 2, near the intersection of Powers Avenue and Shady Lane.

Maintenance was performed on the Filter Plant Tank by Liquid Engineering Corporation in 2000 including debris removal and inspection. It was recommended in the report that this reservoir is cleaned and inspected every 3 years. This is an ongoing maintenance item.

In 2017, LOID modified the filter plant roof. Structurally there were no issues, but due to the original flat roof design, water ponding was occurring during precipitation events. LOID added foam material and an impermeable membrane over the existing concrete roof to provide a second layer of protection.

Hereth Tank

The Hereth Tank, located in Hereth Park near 16th and Powers, is of glass-lined, bolted steel construction with a capacity of 2.5 million gallons and a diameter of 135 feet. The tank, constructed in 1998, is in good condition and significant repairs are not anticipated in the near future. The tank is equipped with two surface aerators, operated to oxidize H_2S present in the Well No. 3 and Well No. 4 sources. The tank has been taken offline once since it was constructed to install the aerators. The tank suction consists of a bottom feed pipe with a 6-inch removable silt stop.

The tank is inspected by a dive team on a 3-5 year rotation. Minor maintenance and cleaning are performed during the inspections. No major maintenance has been identified.

Operation of the LOID system without the Hereth Tank is problematic, as all supply from Wells No. 3 and No. 4 must flow through the tank to reach the system. These Wells constitute 78% of the system supply, leaving the Hereth Tank as a critical link between water supply and constituent demand.

Lutes Tank

The Lutes Tank was constructed for the Lutes Addition, near Powers Drive, in July 1979. It is a 70-foot diameter welded steel tank with a 500,000-gallon capacity. The tank suction consists of a bottom feed pipe with a 6-inch removable silt stop. The tank was renovated in 2012, at which time significant structural repairs were completed on the roof beams. The tank was also repainted in 2012. To facilitate completion of this work, LOID personnel modified piping to allow the Hereth transfer line to bypass the Lutes tank and feed directly into Zone 2. The modification was sufficient to meet demands during the late spring, but LOID personnel report it would not be sufficient to meet summer demands.

Telemetry

The LOID reservoirs are utilized to call for water from each of the Wells. It is important to note that typical tank settings may change with time based on seasonal fluctuations operational goals, and capital modifications including new source and/or storage supply.

LOID personnel use a Supervisory Control and Data Acquisition (SCADA) system to control the system. Currently, software used by the district is sufficient for operations.

4. Existing Irrigation System

Introduction

The LOID Irrigation System serves the Lewiston Orchards with a surface water collection system and ground water pumping system that utilizes a series of diversion structures, reservoirs, feeder canals, wells, and a distribution network to provide irrigation service. Existing storage facilities and system supply are assumed to be sufficient to meet system demands within the planning period.

Water Supply Collection and Storage

Surface water collection begins within the Craig Mountain drainage near the headwaters of Sweetwater Creek, located approximately 20 miles southeast of Lewiston. Water from Webb Creek and Captain John Creek is stored in the Soldiers Meadow Reservoir and released as need by the District. These flows run north in Webb Creek to the Webb Creek diversion dam, where water is diverted west to Sweetwater Creek via the Webb Creek canal. Flows are also collected from the west fork of Sweetwater Creek and stored in Lake Waha via the Waha feeder canal. This water is pumped from the lake back into the west fork as needed for irrigation. The final diversion, Sweetwater diversion dam, directs water to Mann Lake via the Sweetwater canal. It is important to note that Mann Lake is also referred to as Reservoir A. Water is drawn from Mann Lake from an underground pipeline penetrating the lake's western levee. A map of this infrastructure is provided in **Figure 4-1**. A summary of the LOID storage reservoirs and diversion dams are provided in **Tables 4-1** and **4-2**, respectively.

Table 4-1: Irrigation Storage Summary

Reservoir	Total Capacity (Acre-Feet)	Effective Capacity (Acre-Feet)
Mann Lake	2,440 [A]	1,740 [A, C]
Soldier's Meadow	2,369 [A]	2,369 [A]
Lake Waha	3,497 [A]	3,047 [A, B]

[A] Lewiston Orchards Irrigation District Manager's Report, December 30, 2017, Water Storage Report.
[B] Less 450 AC FT (pumping level)
[C] Less 500 AC FT (fire pool)

Table 4-2: Diversion Dam Summary [A]

Diversion Dam	Type	Structural Height	Hydraulic Height	Crest Length	Capacity	Location
Captain John Diversion	Log Crib Catch Basin	NA [B]	NA [B]	NA [B]	<5 cfs	Captain John Creek
West Fork Diversion	Concrete Overflow Weir	NA [B]	NA [B]	NA [B]	<20 cfs	West Fork Sweetwater
Webb Creek Diversion	Rockfill Overflow Weir with Concrete Crest Wall	20 feet	10 feet	75 feet	20 cfs	Webb Creek
Sweetwater Diversion	Rockfill Overflow Weir	12 feet	8 feet	80 feet	77 cfs	Sweetwater Creek

[A] Bureau of Reclamation Website: http://www.usbr.gov/projects

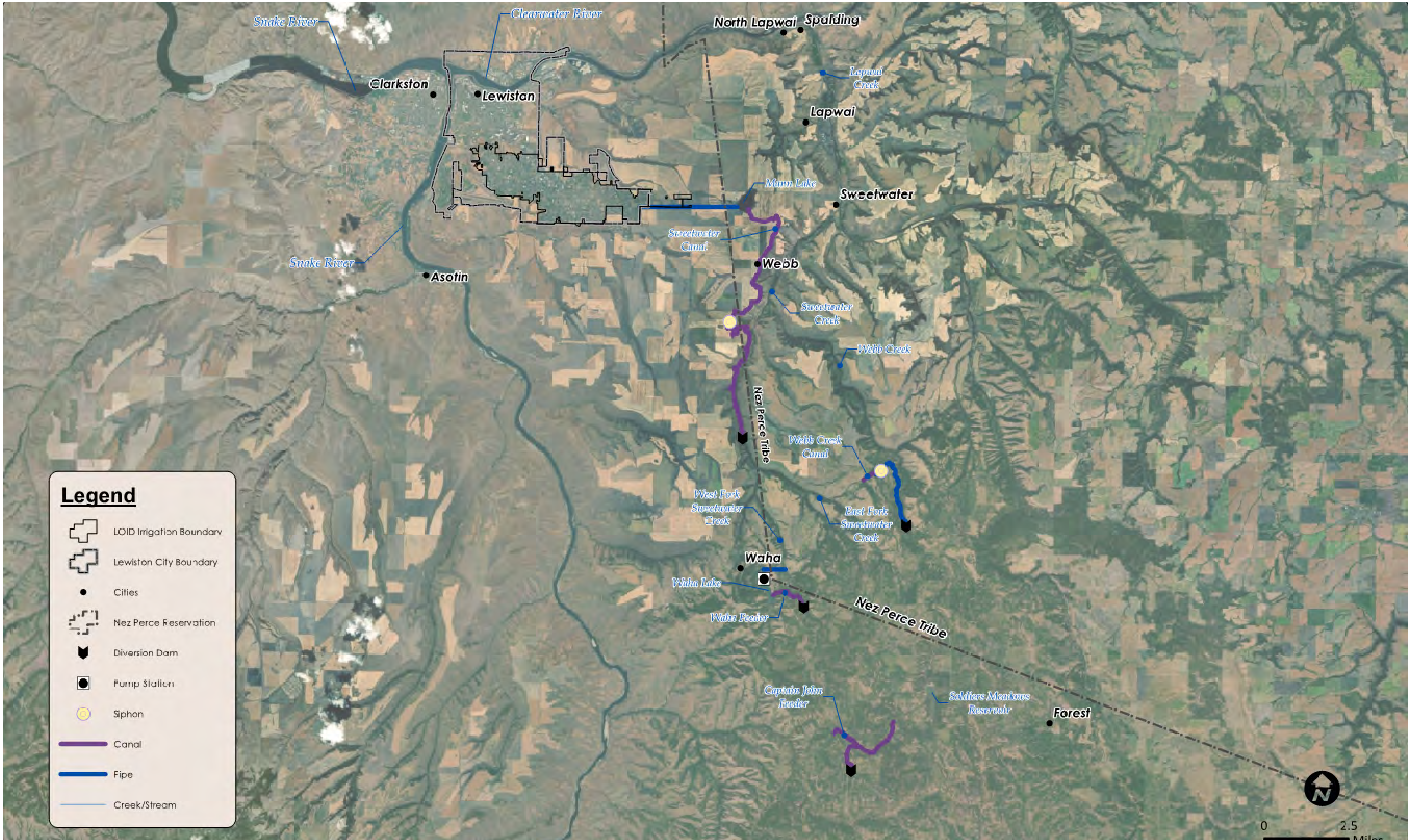
[B] NA (Not Available)

Lake Waha

Lake Waha is a natural lake used for off-stream storage. The lake is located approximately 15 miles from the Lewiston Orchards and west of the west fork of Sweetwater Creek.

Soldiers Meadow

Soldiers Meadow Reservoir is located on Webb Creek approximately 20 miles from the Lewiston Orchards. The Soldiers Meadow dam was originally constructed in 1923, and in 1986, extensive repairs were completed on the dam as part of Reclamation's Safety of Dams Program. The reservoir is owned by Reclamation and operated by LOID.


Snake River
Clearwater River
North Lapwai
Spalding
Lapwai Creek
Clarkston
Lewiston
Lapwai
Mann Lake
Sweetwater
Sweetwater Canal
Snake River
Webb
Asotin
Sweetwater Creek
Webb Creek
Nez Perce Tribe
Webb Creek Canal
West Fork Sweetwater Creek
East Fork Sweetwater Creek
Waha
Waha Lake
Waha Feeder
Nez Perce Tribe
Captain John Feeder
Soldiers Meadows Reservoir
Forest
Legend
LOID Irrigation Boundary
Lewiston City Boundary
Cities
Nez Perce Reservation
Diversion Dam
Pump Station
Siphon
Canal
Pipe
Creek/Stream
N
0
2.5
Miles

Mann Lake

Mann Lake, approximately seven miles southeast of Lewiston, is a man-made reservoir constructed in 1906. In 1999, Reclamation completed upgrades to the dam under the Safety of Dams Program. In addition, the dam's operating elevation was restricted, effectively reducing the reservoir capacity by one-third, to 1,960 acre-feet. Reclamation temporarily lifted this restriction in 2010, increasing the capacity to 2,440 acre-feet. Currently, the storage capacity is 2,440 acre-feet, but 500 acre-feet is retained for fire pool storage and the remaining 1,940 acre-feet is usable storage.

Well No. 5

LOID Well No. 5 was drilled in 2014 and completed in early 2017. The well was installed with a 800-foot surface seal and a 24-inch diameter surface casing. The well penetrates at a target depth of 1,900 feet and has a proven yield of 2,000 gpm. The well system includes a line shaft vertical turbine well pump at 600 Hp and a split case booster pump at 400 Hp to provide the 2,000 gpm. VFDs were used to match a set flow rate with varying discharge pressures.

The well system also includes piping for a future storage tank and open floor space in the well house for future chlorination processing or other equipment. This well was drilled primarily for irrigation water demands and to meet drinking water standards, but could be used as an additional domestic water source with additional infrastructure. **Appendix C** provides information for the Well No. 5 pump and motor.

Well No. 6

LOID Well No. 6 is currently under contract for design and construction with J-U-B ENGINEERS, Inc. This well is being designed for use with the irrigation system only. Site access, well drilling, well completion, and connection to the distribution system are the next steps for this well.

Irrigation Water Distribution

Irrigation Pipe Network

The LOID Irrigation System is divided by three pressure zones, separated by pressure reducing valves (PRVs). **Figure 4-2** shows existing irrigation system pipe sizes. A summary of the sizes and materials within the system is provided in **Table 4-3**. This data was obtained from the WaterGEMS Hydraulic Model. **Chapter 6** provides in-depth discussion of model development.

The system uses a large distribution main to route flows from Mann Lake to general areas of use. This main line begins at Mann Lake as a 36-inch line, necking down to a 30 ½-inch line at the Filter Plant, where it runs along Powers Avenue to 16th Street. A 24-inch backbone routes flow along 16th to Cedar Avenue, where it turns west and snakes along Cedar and Burrell Avenue's to end on 7th Street. Over 80% of the irrigation distribution system consists of pipes 8-inches and smaller.

Table 4-3: LOID Irrigation Pipe Size and Materials [A]

Pipe Material	Pipe Size (in)										
	< 4	4	6	8	10	12	16	18	24	30.5	36
Asbestos Cement [B]	0	9252	0	0	0	0	0	0	0	0	0
PVC [C]	3501	58718	112852	83940	1977	25547	100	0	10604	0	0
Ductile Iron [D]	2785	5033	1873	1047	744	5524	0	0	0	0	0
Galvanized iron [E]	23926	431	0	617	0	102	0	0	0	0	0
Steel	11735	49080	20165	10820	10023	6654	0	2652	14502	18734	4411
Copper	0	0	0	0	0	0	0	0	0	0	0
Total (Feet)	**41,947**	**122,514**	**134,890**	**96,424**	**12,744**	**37,827**	**100**	**2,652**	**25,106**	**18,734**	**4,411**
Total (Miles)	**7.94**	**23.20**	**25.55**	**18.26**	**2.41**	**7.16**	**0.02**	**0.50**	**4.75**	**3.55**	**0.84**
Total (Miles)											**93.73**

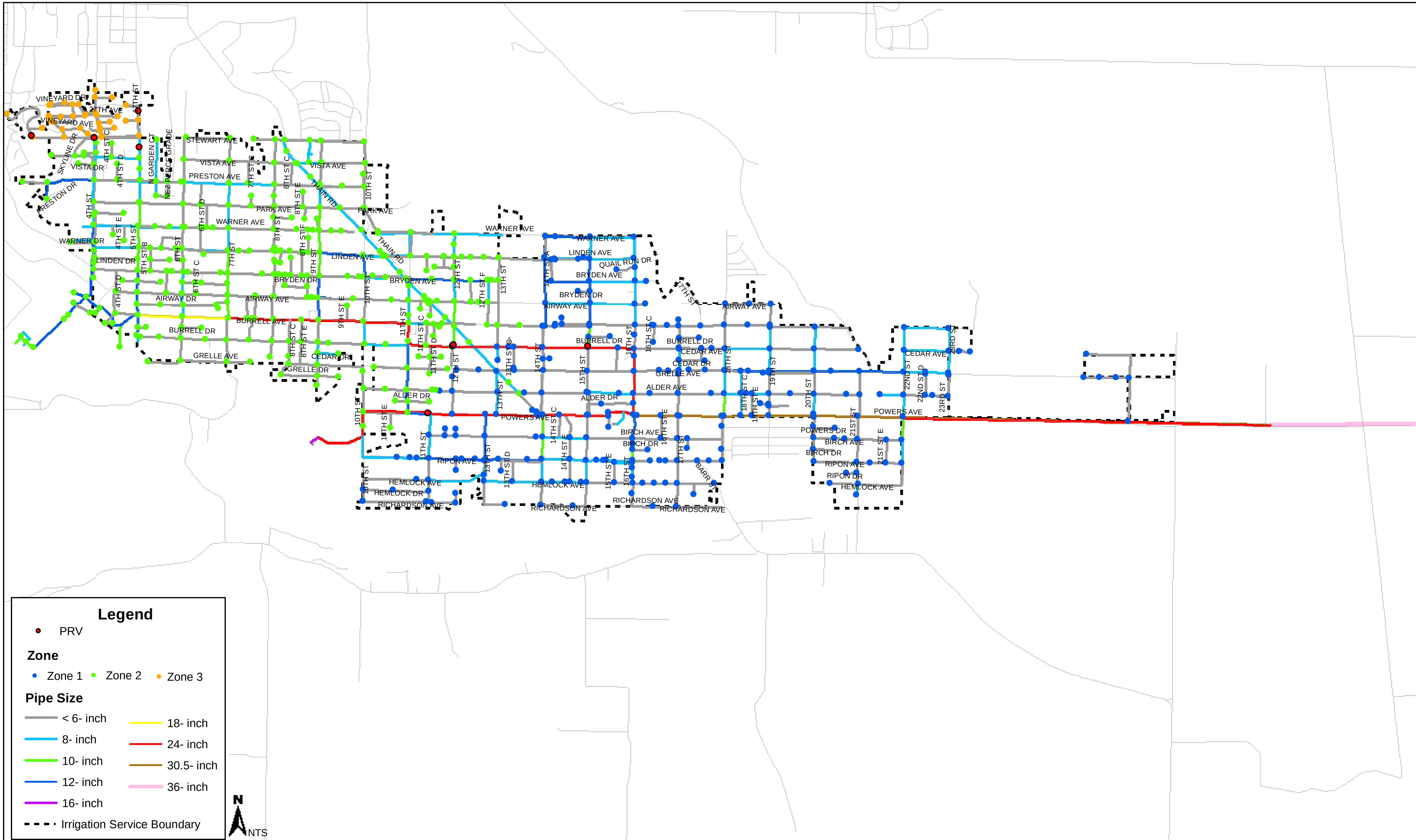
[A] Pipe type, length and sizes were generated by the 2018 WaterGEMS model of LOID irrigation system and are approximate.
[B] Information obtained from the model does not separate PVC into 160 psi and C900 material.

Flow Measurement

The LOID system utilizes one flow meter on the distribution side of the system off Mann Lake. The District records flows from this meter on a daily basis to track usage.

A number of services on the distribution system are un-metered. The District began installing meters on the irrigation system through a 50/50 grant/match program funded through the Bureau of Reclamation. All irrigation meters will be replaced by June 2019.

Figure 4-2: Existing Irrigation Distribution System *Lewiston Orchards Irrigation District*



Maintenance/Replacement

The District has an ongoing pipe replacement program. From 2014-2017, the District has replaced an average of nearly 5,400 linear feet of irrigation mainline per year, and staff replacement within the last 10-15 years has reached as high as 10,000 feet per year. District policy currently requires replacement at minimum with 8-inch PVC.

Problem Areas

During discussion with LOID operators, one main pressure issue was noted within the system.

Zone 1

- 16th & Richardson – LOID staff receives consistent complaints within this area during peak demands, when residents do not have sufficient pressure to irrigate.

LOID staff also identified a recurrent main maintenance issue in the vineyards area:

Zone 3

- Vineyards – Although no specific pressure issues have been identified within the Vineyards vicinity, LOID staff indicated that water mains within this area are located in alleys. As such, replacement, repair and maintenance within this area are problematic due to private encroachment in the narrow right-of-way.

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5. Water Demand and Delivery

Introduction

Water demands provide a base to understand how system growth will impact infrastructure. Historical demands and usage patterns are used to understand future system requirements based on projected growth.

This study utilizes historic water production records and SCADA information provided by LOID to develop demands for the domestic system and delivery for the irrigation system. The following terms are used to define water demands:

- Average Day Demand/Delivery (ADD): The average number of gallons of water consumed per day as calculated over the course of a year.
- Maximum Day Demand/Delivery (MDD): The maximum number of gallons of water used in one day.
- Peak Hour Demand/Delivery (PHD): The maximum amount of water used in a one-hour period.

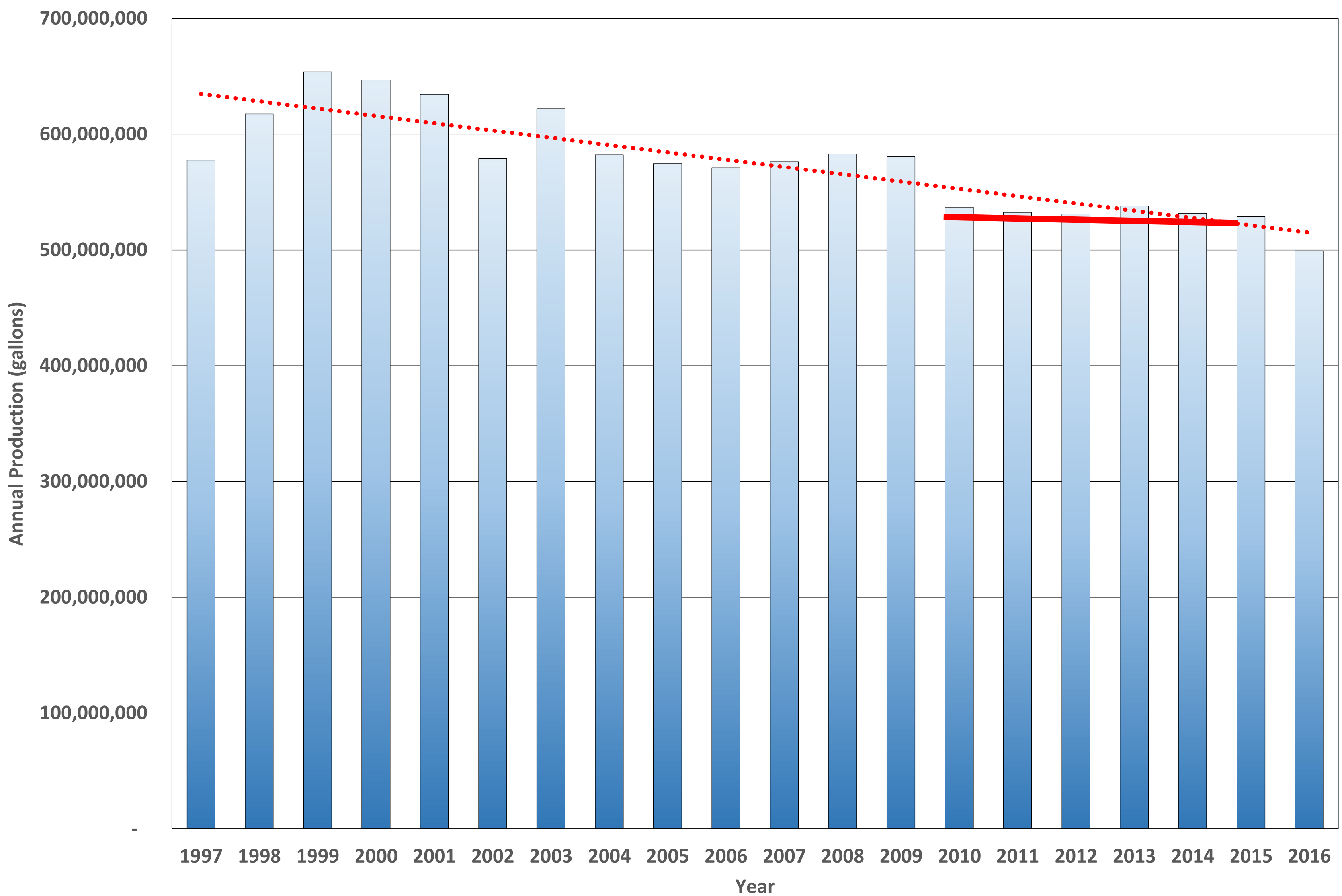
Existing Demand

Domestic Water

Although the LOID system predominately consists of dual system service connections, water demands must be separated into dual service usage and potable-only service usage to understand the role each plays in the overall system and evaluate the impact of system growth. Water demands are typically calculated based on well production records to account for both usage and unaccounted water.

A historical look at water production, **Figure 5-1**, shows a general decline in water production over the past two decades. It appears the decline has leveled out in the period of 2010-2016 with slight decline again in 2016.

Figure 5-1: Domestic Water Production



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Comparison of the 2010-2015 water production to the 2016 water production determined that 2016 was approximately 7% under the four year average. Detailed water meter records were available for fiscal year 2016 dual and potable-only service connections. This data was analyzed to determine the existing domestic demands parsed out be the connection types. See **Table 5-1**.

Table 5-1 presents Domestic water demands**.**

Table 5-1: Existing Domestic Demands [A]

Demand Condition	Total System [B]	Dual Service Connections	Potable-only Service Connections
ADD	1.46 mgd	1.26 mgd	0.20 mgd
MDD	2.11 mgd	1.81 mgd	0.30 mgd
PHD		1,823 gpm[C]	520 gpm [D]

[A] Reported per connection values based on domestic units from July through June.
[B] Based on 2016-2017 billing records.
[C] Based on observed peaking factor of 1.45 within Northern portion of the District.
[D] Based on typical literature values (Reynolds, 1996).

In addition to average day and maximum day demands, peak hour demand was calculated to estimate peak instantaneous demands and required storage. The peak hour demand represents the highest rate of water use occurring during a one-hour period within the system.

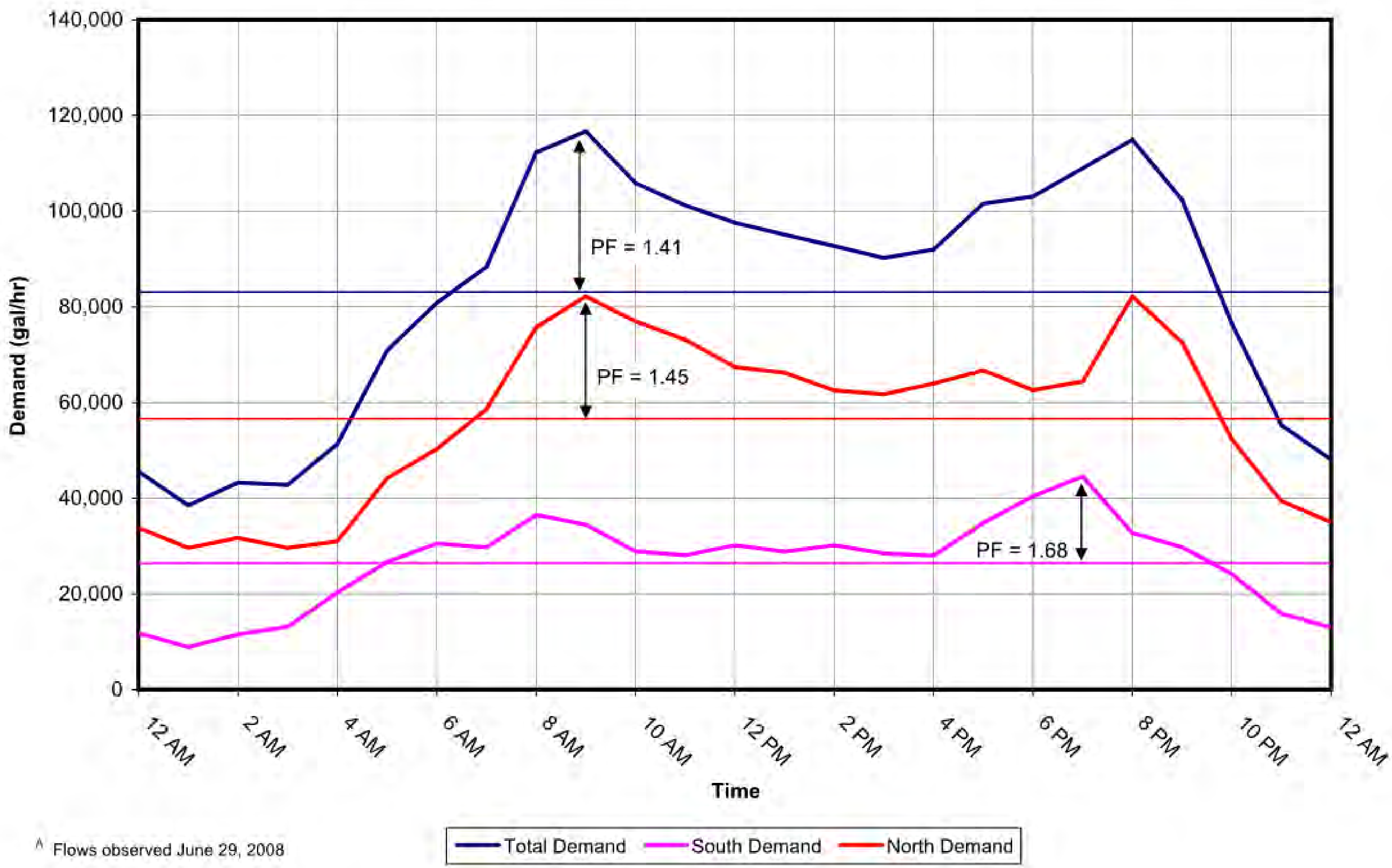
To identify peak hour demands within the system, a detailed data set with minimum hourly flows are required to understand these demands. Previous analysis of the LOID system was performed in 2008 based on data including well production, booster pump run times, and tank levels taken every minute. The data, spanning from June 27 through June 30, 2008, does not capture maximum day demands, but the daily flow observed on June 29 of 1.99 mgd was the maximum day demand from 2008. This represents 110% of the 2016 system maximum day demand; therefore, new diurnal curves were not developed. The data is used to develop a typical peaking factor and diurnal curve which will be applied to the LOID maximum day demand as a reasonable representation of system behavior under high demand conditions.

The observed diurnal curve, shown by **Figure 5-2**, provides a graphical representation of instantaneous flows. The graph shows the diurnal curves of the northern and southern portions, as well as the overall District diurnal. The curves generally show an early morning peak followed by a decrease in demand and a second peak in the early evening. This shape correlates with typical residential patterns, where highest demands occur in the morning hours as residents prepare for the workday, followed by decreased usage throughout the day. The second peak correlates with residents returning home, followed by late-night lows during periods of minimal demand. **Table 5-1** provides a summary of calculated peak hour demands.

As previously discussed, the southern portion of the system consists of Zones 1 and 4 and includes the Lutes subdivisions. These zones are supplied by the Hereth and Lutes Booster. Hourly demands for this portion of the District were calculated based on reported flows through these pumps.

The northern portion of the system consists of the remaining Zones, 2, 3, 5, 6, and 7. These Zones are supplied by the Lutes transfer and Well No. 2 via the Filter Tank. Hourly demands for this portion of the District were calculated by adding well production to Lutes transfer flows and subtracting change in storage at the Filter Tank.

Figure 5-2: Domestic Diurnal Curve



^ Flows observed June 29, 2008

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The varied peaks depicted in **Figure 5-2** show the impact that different types of services have on peak hour demands, as diurnal flows from the northern and southern portions of the District differ in both magnitude and shape. This variance may be explained in part by the influence of the Lutes Subdivision and potable-only service connections in the southern portion of the District. The late peak observed in the southern portion of the District may be explained in part by irrigation usage with the domestic system within the Lutes Subdivision.

The northern portion of the District consists of predominately dual service connections and exhibits a peak hour demand of approximately 1.45 times the daily average. This value, also known as the peaking factor, is used to estimate peak hour demands for dual service connections.

Due to a lack of available data to analyze the District's Potable-Only service diurnal demands, a typical peaking factor of 2.5 is used in this study to estimate potable-only service, peak hour demands (Reynolds, 1996). To validate this assumption the composite peak hour demand of the southern portion of the system was calculated based on the observed peaking factor of 1.45 for dual service connections and the estimated peaking factor of 2.5 for potable-only service connections. The calculated peak hour composite demand for the southern portion of the system correlates to a calculated peaking factor of 1.73. This tracks with the observed composite peaking factor within the southern portion of 1.68 and shows that the assumed peaking factor of 2.5 for potable-only service connections appears appropriate. This estimated peaking factor provides a conservative estimate of peak hour demands for potable-only service connections.

It is critical to note that the assumptions associated with development of potable-only service connection demands are rudimentary and based on a relatively small sample set within the District. The Lutes subdivision presents approximately 3% of total service connections. Lot size and population demographics are relatively uniform as compared with a broader sample throughout the community. Finally, the use of quarterly water usage to estimate demands including maximum day and peak hour all add a degree of uncertainty to the estimations presented herein. The potable-only service demands presented in **Table 5-1** represent a logical estimate based on available data and engineering judgment. As the District continues to grow outside its irrigation boundary through potable-only service, it is essential to gather more data on these types of connections. If estimated demands are lower or higher than observed values, there will be significant impact to the recommendations of this Plan with respect to system supply and storage requirements within the planning period.

Irrigation Water

The Filter Plant flow meter provides the best information regarding water delivery in the irrigation system, as all irrigation water flows through this line prior to service. As shown per **Figure 5-3**, the maximum day usage since 2001 was observed June 29, 2008 with delivery reported by District staff of 56.8 acre-feet. Flows from this day were utilized to establish peak diurnal curves and peaking factors for the system. LOID provided data in 5-minute increments to develop the diurnal curve, as shown by **Figure 5-4**. Delivery and peaking factor computations are provided in **Appendix F** and summarized in **Table 5-2**.

Table 5-2: Irrigation Delivery [A]

Description	**Acreage**	**ADD** Acre-ft/day (gpm) [gpm/acre]	**MDD** Acre-ft/day (gpm) [gpm/acre]	**PHD** Acre-ft/day (gpm) [gpm/acre]
Total System	3,707	23.98 (5,430) [1.45]	49.4 (11,200) [2.99]	(16,900) [4.52]
Residential	2,652	[1.53]	[3.15]	[4.76]
Commercial	599	[0.40]	[0.82]	[1.24]
Agricultural	300	[2.36]	[4.86]	[7.34]
Public	156	[3.00]	[6.18]	[9.33]

[A] Reference **Appendix F**

It should be noted that the maximum day usage reported by the District is not identical to the deliveries presented in **Table 5-2**. The cause of this discrepancy is due to the following:

- The District collects meter readings on a daily basis from the Filter Plant flow meter at approximately 8:00 a.m. Due to minor deviations in operator schedules, the period may be shortly less than or slightly greater than 24-hrs. In contrast, data obtained from the District's SCADA System facilitates review of an exact 24-hr period.

- Maximum Day Demands presented in this report correlate with the peak diurnal curve depicted in **Figure 5-4** and facilitates projection of future delivery curves. A diurnal curve and peaking factor analysis must utilize a common low flow period to eliminate shifts associated with above average usage. As shown in **Figure 5-4**, this low flow of approximately 1.2 acre-feet/hr occurs at noon. Therefore, the period of analysis for this report is from 12:00 p.m. to 12:00 p.m.

The observed diurnal curve, shown by **Figure 5-4**, provides a graphical representation of instantaneous flows recorded at the Filter Plant meter. The curves generally show a late-night peak followed by a decrease in delivery and a second peak in the early morning. This shape correlates with typical irrigation patterns, where highest deliveries occur as residents begin handset irrigation after the workday, followed by decreased usage during the midnight hours when automatic sprinkling is most prevalent. The second peak correlates handset sprinkling in the early morning hours, followed by daytime lows during periods of minimal delivery.

Figure 5-3: Irrigation Historical Maximum Day Delivery

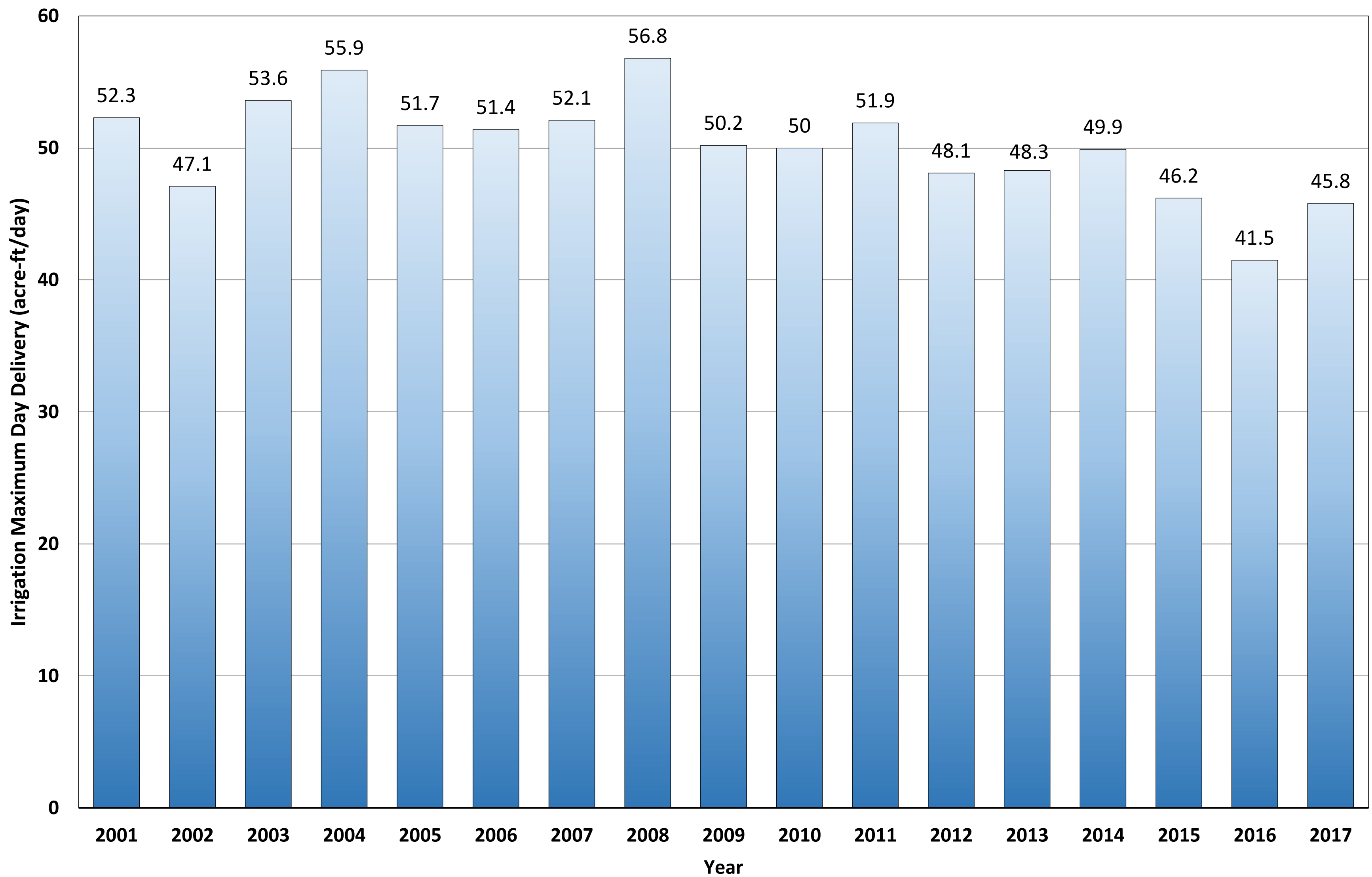
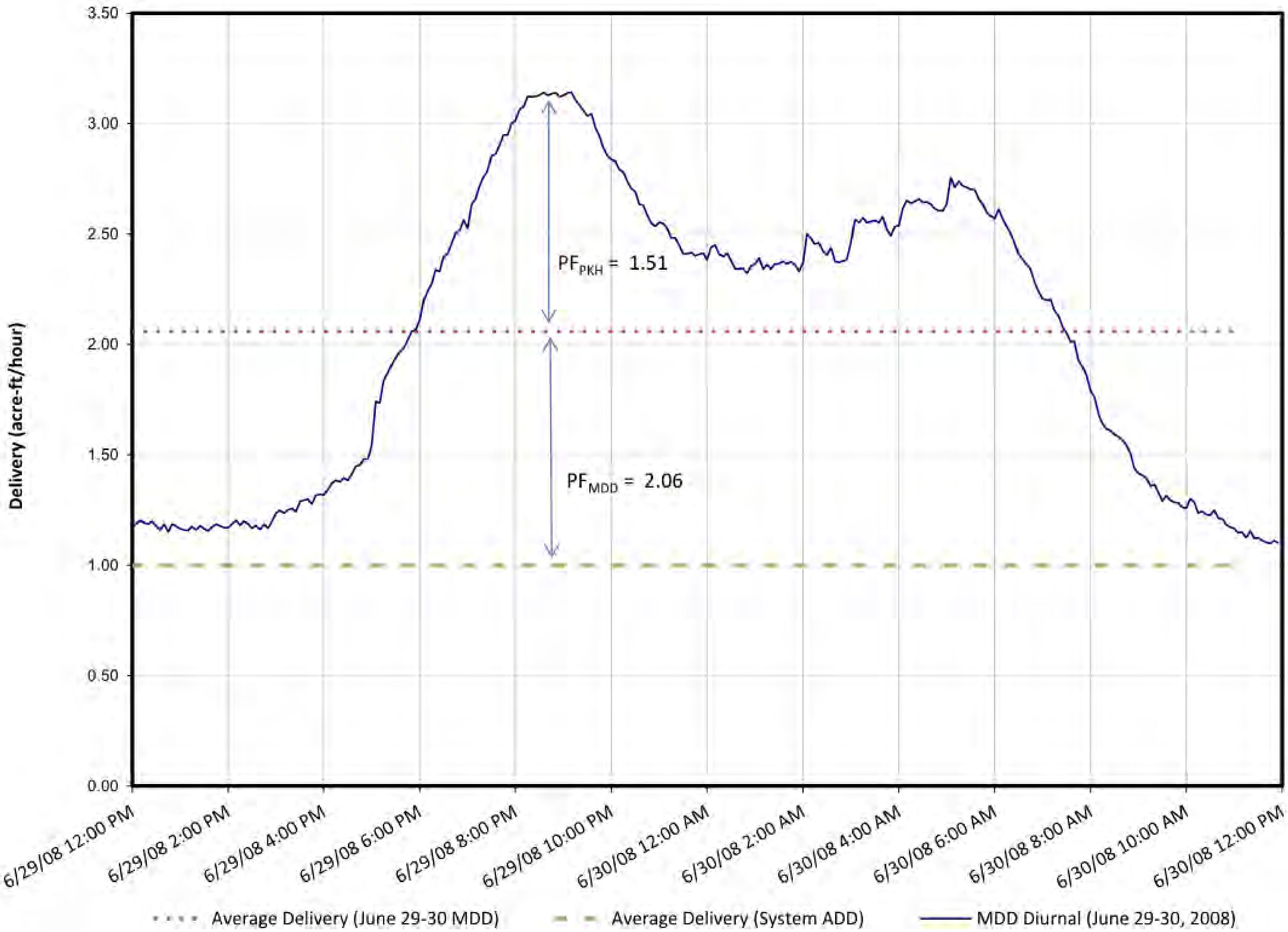


Figure 5-4: Irrigation Maximum Day Diurnal Curve



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Unaccounted Water

In addition to understanding system water demands, a water balance is often used to quantify the impact of unaccounted water within a system. A water balance is completed by analyzing the inflows and outflows within a water system, where the difference between well production (inflow) and metered usage (outflow) represents unaccounted water. In a system similar to LOID, unaccounted water can be attributed to several factors including:

1. Fire Fighting
2. Other Authorized Fire Hydrant Use
3. Flushing of Lines
4. Hydrant Flow Tests
5. Inaccurate Meters
6. Unmetered Connections
7. Municipal Equipment Washdown
8. Leakage from Joints

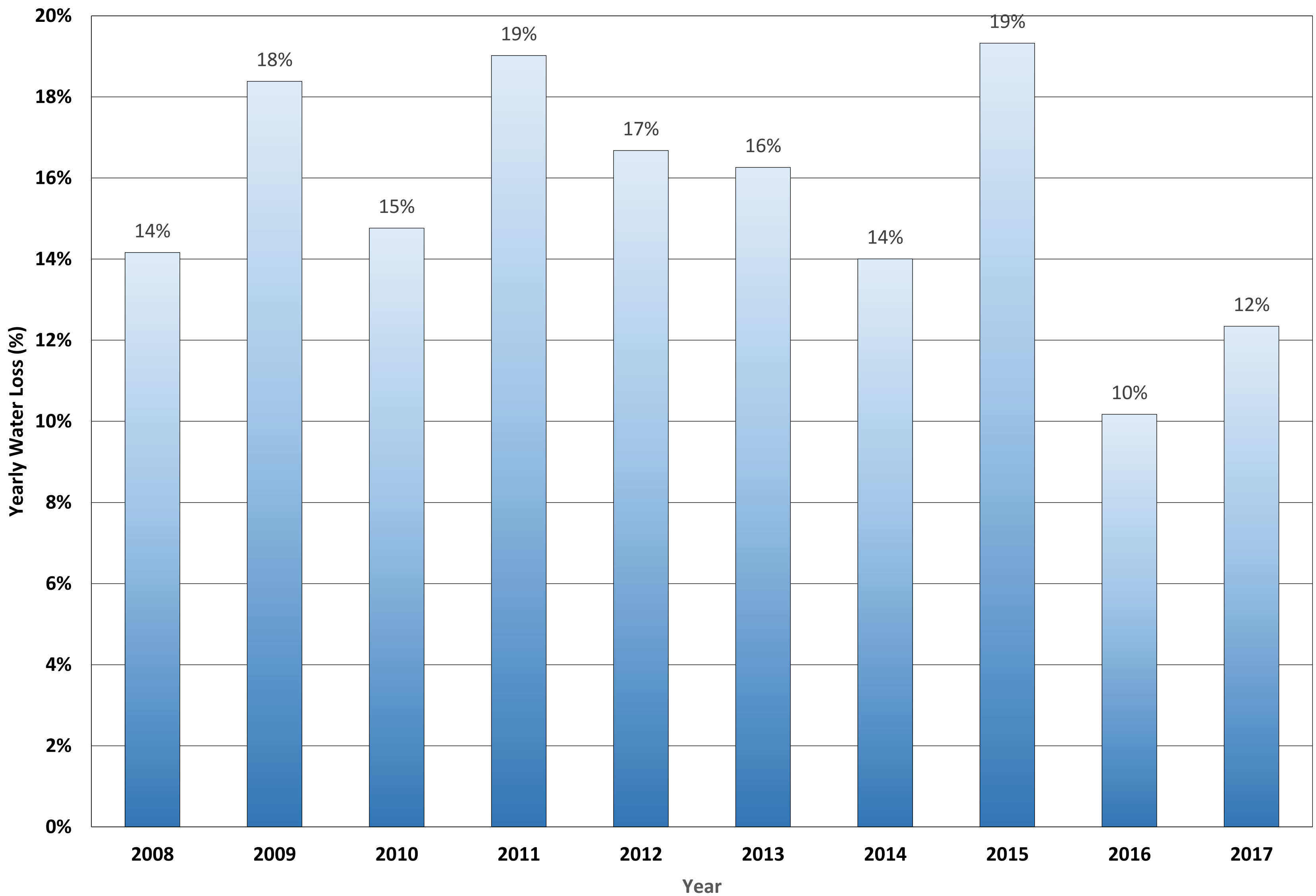
Accurate and reliable water records are required to estimate inflows and outflows within a water balance.

Domestic Water

A water balance can be problematic when collection of meter readings does not correlate with a specific production period, as is the case for LOID. Meters are read and billed on a quarterly basis. In addition, LOID utilizes three different billing cycles depending on a meter location within the District and only one-third of system meters are read and billed each month. Meter readings typically occur within the first ten days of the month. It is difficult to correlate those dates with specific water production for the same time period.

A yearly percentage of unaccounted water, from 2008 to 2018, provided in **Figure 5-5**. There is on average 15% unaccounted water within the system, whereas most water systems of this size experience unaccounted water in the range of 10% - 15%. This is on the higher end of the industry average and LOID personnel should continue to track and minimize unaccounted water.

Figure 5-5: Yearly Domestic Water Loss



Irrigation Water

The District currently meters less than 50% of irrigation services, and as such, unaccounted water cannot be assessed for the system. The LOID Irrigation System was installed prior to the domestic system. If it is assumed that the District has generally replaced equivalent lengths of mainline within each system, it could be reasonably assumed that unaccounted water is at least equivalent to that observed on the domestic system for the following reasons:

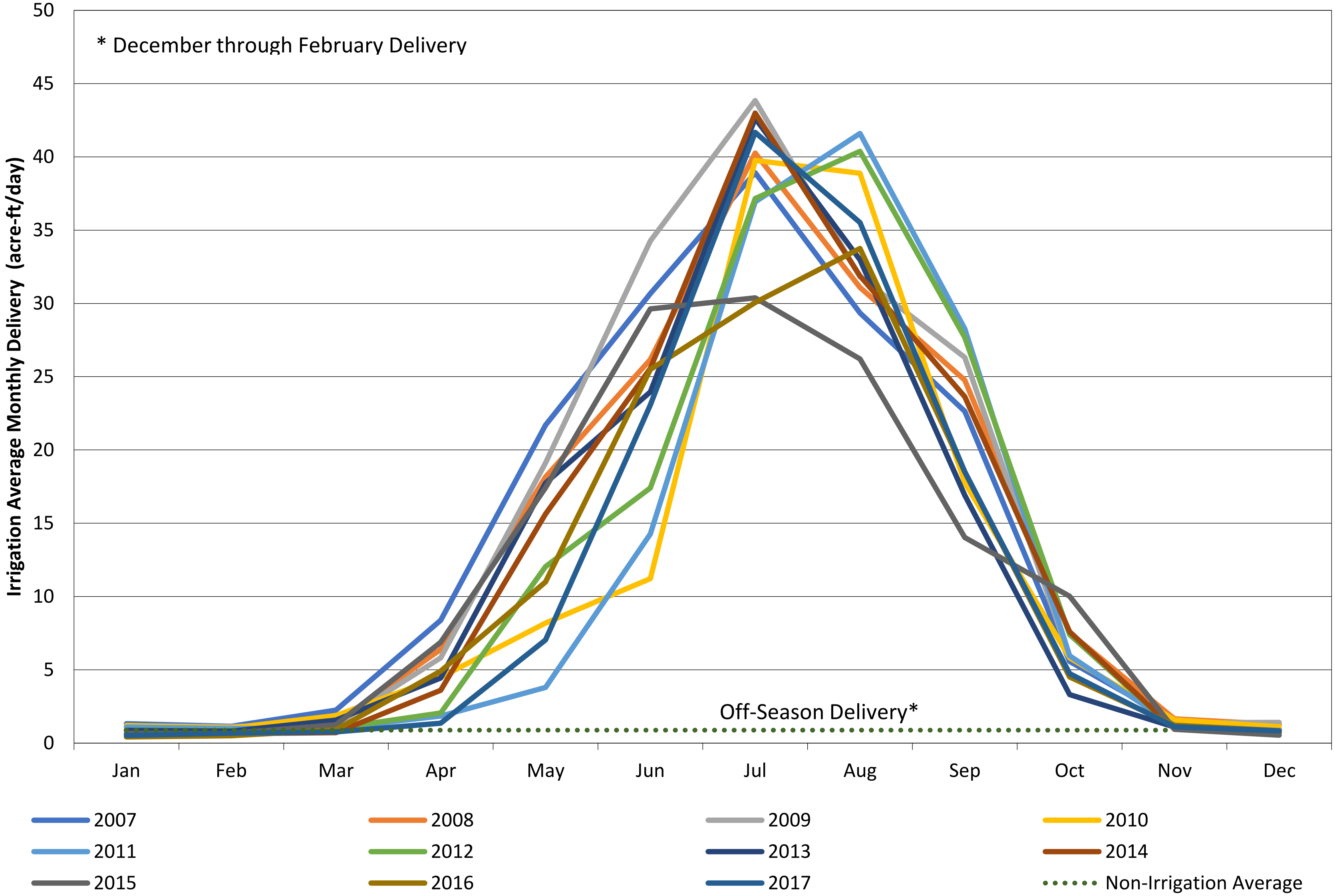
- There is no financial incentive for residents to repair irrigation service leaks, as they are not charged on a unit basis.
- There is no ability for LOID operators to pinpoint leaks based on metered usage.

According to LOID records, unaccounted domestic water has ranged from 10-19% over the recent years.

A cursory review of unaccounted water was completed by review of District records which track average flows per month. These records are provided graphically in **Figure 5-6**, and show limited usage during the months of December through February. Although this period is technically outside of the LOID irrigation period, irrigation is available for miscellaneous uses such as stock watering, car washing, etc… While the delivery for these uses cannot be quantified, if it is assumed that these uses are negligible, flows during this period could be attributed as lost water, and used to provide a rough estimate of unaccounted water.

As shown by **Figure 5-6**, the system experiences average delivery of 0.88 acre-feet per day during the months of December through February. When this delivery is applied across the entire year and compared with average annual deliveries this value represents unaccounted water. When this analysis is completed, unaccounted water is less than that observed on the domestic system and is not considered an accurate estimate. An estimate of 15-20% unaccounted water remains a conservative and appropriate estimate for the irrigation system until more data becomes available.

Figure 5-6: Irrigation Monthly Average Day Demand



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Future Water Demand

Domestic Water

Future demand projections are used to understand the impact of population growth on system infrastructure including water supply, system storage, and distribution system capacity. As with any projection, future water demands depend on observed growth and deviation from the growth assumptions presented in **Chapter 2** will correlate with a variation in the future demands presented herein based on actual population growth. Regardless, these future demands represent the culmination of discussions with District personnel and experience to provide a starting point to understand how population growth will impact LOID. **Table 5-3** shows a summary of projected domestic demands based on the existing connection demands presented in **Table 5-1,** and the population growth assumptions of **Chapter 2**.

Table 5-3: Projected Domestic Demands [A]

Year	ADD (mgd)			MDD (mgd)		
	Dual Service	Potable-Only Service	System	Dual Service	Potable-Only Service	System
2027	1.29	0.44	1.73	1.87	0.88	2.75
2037	1.33	0.66	1.99	1.92	1.45	3.37

[A] Based on Additional Connection Projections (Table 2-1) and per connection demands (Table 5-1).

As distribution systems have an estimated lifespan of 65-95 years (Clean, 2002), it is helpful to understand the impact of growth beyond the planning period to minimize required replacement prior to the end of a pipe network's useful life. As such, build-out demands were calculated for use in the model to provide pipeline sizing recommendations for the district.

Irrigation Water

Future delivery projections are used to understand the impact of population growth on system infrastructure and distribution system capacity. As the irrigation boundary is fixed, any increase in future delivery will be associated with system infill as properties are divided and developed. Future delivery has been developed based on the assumption that those areas identified as agricultural will ultimately convert to residential land use. **Table 5-4** provides a summary of anticipated delivery under this build-out condition.

The projected delivery presented in **Table 5-4** should be used with extreme caution due to the impacts of restrictions and distribution system losses on system delivery. If additional supply is available in the future, or if distribution losses associated with the 30 ½-inch transmission main on Powers Avenue are addressed, there is significant potential for irrigation deliveries to increase.

Table 5-4: Projected Irrigation Delivery (Build-out) [A]

Description	Acreage	ADD gpm/acre	MDD gpm/acre	PHD gpm/acre
Residential	2,952	[1.53]	[3.15]	[4.76]
Commercial	599	[0.40]	[0.82]	[1.24]
Public	156	[3.00]	[6.18]	[9.33]

[A] Reference **Appendix F**

Water Rights

Water Rights give LOID authority to pump a specified volume of water based on a permitting process through the Idaho Department of Water Resources. In this process, the well location is established, the area of service, and a case is made that the water will have a "beneficial use". Based on an investigation of how much water will be used and stored, a permit is drafted for each point of diversion and an approved diversion rate is permitted to LOID. **Table 5-5** shows the diversion rates that were permitted to each well of the domestic and irrigation systems. **Appendix D** includes copies of Well No. 1 through 5 water rights documents. Well No. 6, currently under design and construction, does not yet have water rights.

Table 5-5: Water Rights

Storage	Diversion Rate cfs (gpm)	Maximum Storage Volume (AF)
Well No. 2	2.13 (956)	NA
Well No. 3	2.76 (1,239)	NA
Well No. 4	3.34 (1,499)	NA
Well No. 5	18.00 (8,079)	11,543.0

6. Hydraulic Model Development

Introduction

An important part of LOID's Master Planning effort is to gain an understanding of the distribution system. One method to aid this assessment is use of a computer model, a tool that can be used to understand how a system reacts to various demands and projects how system growth will impact existing infrastructure. There are many acceptable ways to develop a water system model, based on assumptions that characterize the area and system under study. The assumptions used in a model are typically based on characteristics of the system, fluid hydraulics, and calibration testing. Consequently, development of the LOID water model is based on discussions with LOID staff as well as our modeling philosophy and past experience.

Model Development

To facilitate analysis of the LOID Water Systems, J-U-B ENGINEERS utilized Bentley WaterGEMS computer software. The model is based on the Hazen-Williams based EPANET flow analysis algorithm developed by the US Environmental Protection Agency. J-U-B built and currently maintains the District's model for ongoing analysis. LOID originally built the model using CyberNET software. LOID provided the model to J-U-B to develop the analysis tool referencing the CyberNET model database. J-U-B subsequently converted the analysis tool to WaterCAD and ultimately to WaterGEMS.

J-U-B and LOID personnel updated the physical database to reflect the current operating system through a series of spot checks and reviews. System updates included pipe size, length and type, node elevations, and connectivity. Node elevations were verified by overlaying Avista aerial contour maps purchased by the District. Model development was completed independently of this plan in 2006-2007 for Domestic and 2008-2009 for Irrigation.

Once the model provided an acceptable physical representation of the system, calculated demands were applied to junction nodes to identify distribution and pressure deficiencies.

Domestic Water

Flow is applied in the model based on existing and future growth boundaries defined by J-U-B and District staff. Each area was identified as either dual or potable-only service area and was assigned a maximum density based on existing District growth patterns. Existing water use data and connection numbers, for both dual and potable-only service, was provided by District Staff. From the data provided by the District and the growth rates discussed in **Chapter 2**, demands on a gpm/per connection basis were developed for each service boundary for the 2017, 2037, and ultimate buildout scenario. **Figure 6-1** shows each service boundary and the total ADD and MDD values applied within each service boundary for each scenario.

To further refine the demand input and distribute the demands for each service boundary evenly, theissen polygons were created within each boundary using the WaterCAD function. The theissen polygons method applies a percentage of the total service boundary demand to each node based on the percentage of area served by the corresponding node. **Figure 6-1** shows the water model demand areas for each demand junction.

The following **Table 6-1** shows the total demands used in the model:

Table 6-1: Model Domestic Demand Allocations

SCENARIO	ADD (gpm)	MDD, (gpm)
2017- Calibrated Demand	1,164	1,839
2037- 20 Year Buildout Demand	1,518	2,682
Ultimate Buildout Demand	2,535	5,092

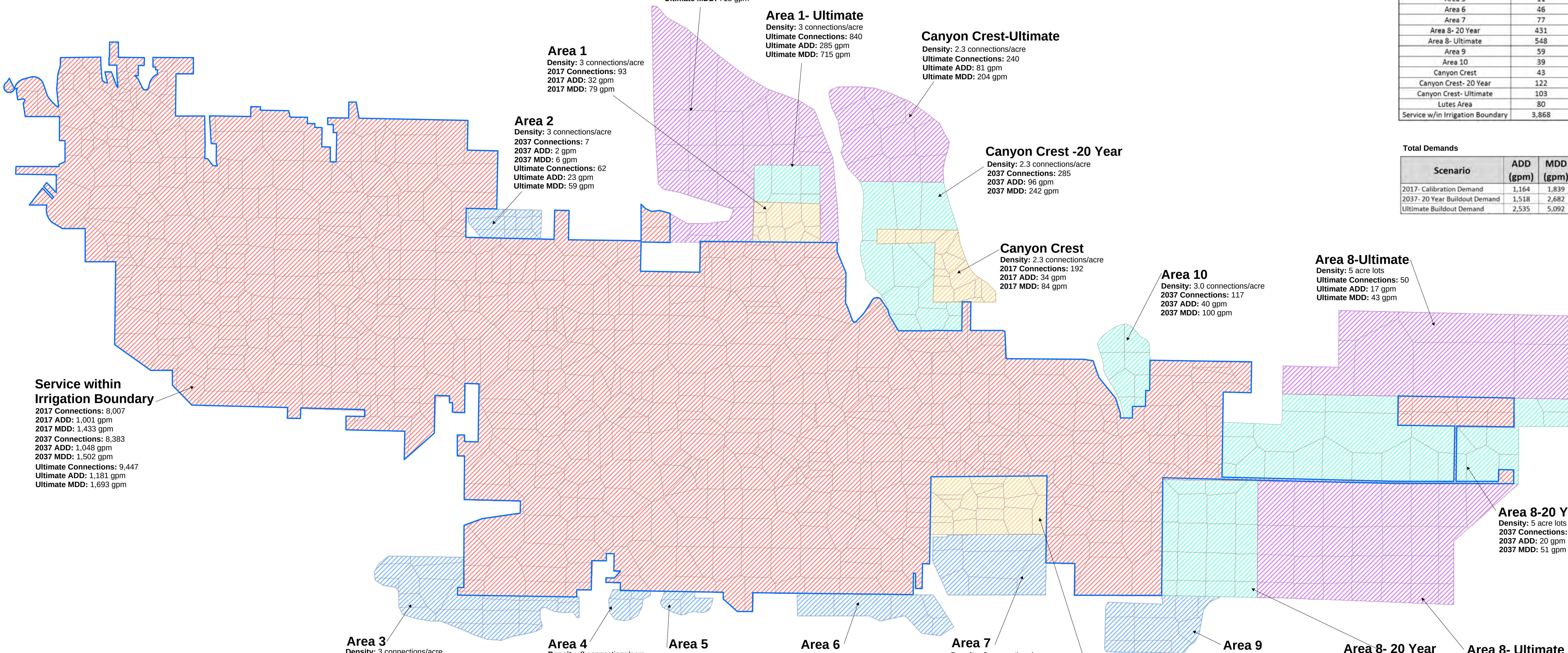
Irrigation Water

Each node within the model was assigned a tributary area and categorized based on adjacent land use. Where more than one land use was identified in a nodes tributary area, weighted deliveries were applied to the node based on respective area and weighted delivery. Separate scenarios were utilized with unique deliveries for maximum day and peak hour flows. Model demand allocation calculations were completed independently of this plan in 2009. Irrigation demand has not changed significantly since the model was created and was not updated for the 2017 master plan.

Demand Area Size	
Location	Area (acres)
Area 1	31
Area 1-20 Year	29
Area 1-Ultimate	280
Area 2	23
Area 3	100
Area 4	11
Area 5	11
Area 6	46
Area 7	77
Area 8- 20 Year	431
Area 8- Ultimate	548
Area 9	59
Area 10	39
Canyon Crest	43
Canyon Crest- 20 Year	122
Canyon Crest- Ultimate	103
Lutes Area	80
Service w/in Irrigation Boundary	3,868

Total Demands

Scenario	ADD (gpm)	MDD (gpm)
2017- Calibration Demand	1,164	1,839
2037- 20 Year Buildout Demand	1,518	2,682
Ultimate Buildout Demand	2,535	5,092



Notes:
* For the 2037 scenario, areas 2,3,4,5,6,7,&9 were developed to 10%
* Density for the Greco areas was determined in previous model analysis
* Density for the Canyon Crest expansion area was determined by current buildout densities for the area.
* Per discussion with Cory Baune, Area 8 will be built out in 5 acre parcels.

Model Calibration

Once the physical attributes and system demands within the model were complete, a calibration was completed to confirm a correlation with the actual water system. Fire hydrant flow testing was completed with assistance from LOID personnel and the fire department to record impact to system pressures. Hydrants were typically selected based on the following criteria:

1. Minimum pipe size of 6-inches.
2. Minimal connections between flush and pressure reading locations.
3. Anticipated pressure drops greater than 10 psi.
4. Adequate storm drainage for flushing.

Domestic Water

The domestic system has very few fire hydrants located at sporadic locations, as the irrigation system provides most fire flow within the District. Although hydrants were not always available at preferred locations, they were sufficient to complete model calibration. Pipe connections between the flush and pressure reading locations in Zone 6 made this hydrant less than ideal, but the selected location was the best available within the zone. Test sheets and field notes are included for reference in **Appendix I.**

A total of six domestic system fire hydrant tests were performed on August 17, 2017 to determine domestic system pressures under certain fire flow conditions. Of the six hydrant tests, one fire flow test resulted in unreliable data and was not used in calibration of the model.

Irrigation Water

Fire hydrant flow testing was completed with assistance from LOID personnel and the fire department to record impact to system pressures on August 17, 2017 (when system flows were equivalent to the system's annual average day demand, reference **Appendix I**).

A total of eight irrigation system fire hydrant tests were performed to determine irrigation system pressures under static flow and with an additional flow on the system. Of the eight hydrant tests, six obtained the required 10 psi residual pressure drop needed for calibration purposes.

Static Calibration

Before calibrating the model, the static pressures observed during hydrant testing are compared to modeled static pressures at the testing locations, without fire flows induced in the system. Static calibration establishes the system parameters controlling system head and pressure (tank elevations, pump operation setpoints, etc.).

Domestic Water

The following **Table 6-2** shows the relative errors for the modeled and observed fire hydrant static pressures.

Table 6-2: Domestic System Static Pressure Analysis

Location	Zone	Hydrant No.	Measured Pressure (psig)[A]	Model Pressure (psig)	% Error
11th & Ripon	1	*	92	90	2.7%
19th & Grelle	2	*	104	101	2.8%
NE Crossing	3	15-375	82	79	3.3%
6th & Warner	5	14-124	62	63	1.5%
Vineyard Drive	6	12-11	92	19	20.1%

[A] Observed August 17, 2017

*Hydrant number not legible.

Pressure Zone 6 is located on a steep incline in the northwestern edge of the District, with lines typically 4-inches and smaller. The test at Vineyard Drive, located within Zone 6, yielded questionable static and residual pressure. The relative error between the observed and modeled pressures is clearly excessive. Potential factors influencing this error include unknown PRV settings at the time of testing, several unknown pipe sizes, and pipe connectivity.

Irrigation Water

The following **Table 6-3** shows the relative errors for the modeled and observed fire hydrant static pressures.

Table 6-3: Irrigation System Static Pressure Analysis

Location	Zone	Hydrant No.	Measured Static Pressure (psi)[A]	Modeled Static Pressure (psi)	% Error
Burrell Ave and 22nd St	1	16-64	114	111	2.5%
Cedar Ave and 18th St	1	16-108	127	126	0.6%
13th St and Ripon	1	15-156	113	111	1.7%
16th St & Warner	1A	*	81	81	0.6%
8th & Linden	2	14-103	98	95	3.2%
5th & Park	2	14-34	118	115	3.0%
Cedar & 11th	2	*	68	64	5.7%
Wallace & 14th	3	12-96	94	101	6.9%

[A] Observed August 17, 2017

*Hydrant number not legible.

Dynamic Calibration

Dynamic calibration entails model calibration when known demand is placed on the system at fire hydrants. The demand induces a significant amount of flow on the system, and its reaction during the flow scenario is monitored and quantified. Generally, once the boundary conditions are established in the static calibration, dynamic calibration occurs and consists of adjusting the pipe friction parameters. The water model was calibrated through a reasonable adjustment of the Hazen-Williams roughness coefficient “C” pipe friction parameter. The roughness coefficient is directly correlated to headloss in water systems. These adjustments were applied globally based on pipe material, past experience, and typical values. Dynamic calibration was completed under two scenarios:

- Average Day Demand
- Fire Flow

Domestic Water

Table 6-4 provides a summary of Hazen-Williams coefficients used in the model calibration.

Table 6-4: Domestic System Hazen-Williams Roughness Coefficients

Pipe Material	"C" Factor [A]
Asbestos Cement	125
Ductile Iron	90
Galvanized Iron	90
PVC	110
Steel	100

[A] Composite Roughness including pipe, fittings, and valves.

Table 6-5 provides a summary of calibration results and shows four of five hydrants tested within 10% of the reported pressure. Typically, calibration of modeled pressures within 10% of observed static pressures, and within 15% of observed flow pressures is considered reasonable.

Table 6-5: Domestic System Model Calibration Results

Location	Zone	Flow Hydrant No.	Flow (gpm)	Test Hydrant No.	Measured Pressure (psig)[A]	Model Pressure (psig)	% Error
11th & Ripon	1	15-153	750	*	77	75	2.2%
19th & Grelle	2	16-108	888	*	92	89	3.8%
NE Crossing	3	15-376	750	15-375	70	73	4.7%
6th & Warner	5	14-63	475	14-124	44	48	8.4%
Vineyard Drive	6	12-44	336	12-11	50	64	28.8%

[A] Observed August 17, 2017

*Hydrant number not legible.

Due to the close proximity to the City of Lewiston's distribution system, further growth within Zone 6 is not expected, and the test was not utilized to calibrate the model. Results from Zone 6 should be utilized with caution due to unknown PRV settings at the time of testing, incorrect pipe sizes, and unidentified pipe connectivity. Additional hydrant testing and pressure monitoring is recommended to resolve this issue.

Irrigation Water

Table 6-6 provides a summary of Hazen-Williams coefficients used in model calibration.

Table 6-6: Irrigation System Hazen-Williams Roughness Coefficients

Pipe Material	"C" Factor [A]
Asbestos Cement	111
Ductile Iron	95
Galvanized Iron	85
PVC	130
Steel < 24"	85
Steel > 24"	95

[A] Composite roughness including pipe, fittings, and valves.

Table 6-7 provides a summary of calibration results, and shows all hydrants tested within 10% of the reported model pressure. Typically, calibration of modeled pressures within 10-15% of observed pressure is considered reasonable.

Table 6-7: Irrigation Model Calibration Results

Location	Zone	Flow Hydrant No.	Flow (gpm)	Test Hydrant No.	Measured Pressure (psig) A	Model Pressure (psig)	% Error
Burrell Ave and 22nd St	1	16-64	888	16-98	102	100	1.6%
Cedar Ave and 18th St	1	16-108	1,034	16-11	118	117	0.8%
13th St and Ripon	1	15-156	1,021	15-282	102	105	2.7%
16th St & Warner	1A	*	856	15-17	70	75	6.6%
8th & Linden	2	14-103	856	14-90	82	87	5.5%
5th & Park	2	14-34	919	14-140	102	94	7.5%
Cedar & 11th	2	*	822	*	62	64	2.6%
Wallace & 14th	3	12-96	856	12-92	68	64	6.3%

[A] Observed August 17, 2017

*Hydrant number not legible.

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7. Domestic System Evaluation

Introduction

The following water system evaluation will consider existing and anticipated system deficiencies based on the preceding chapters. The assessment represents a culmination of system review by J-U-B based on LOID goals set forth in Chapter 1, discussions with LOID staff, and general observations based on our experience.

Evaluation Analysis Summary

The planning period of this evaluation is limited to a 20-year timeframe, and a system evaluation has been prepared to understand and plan for required system upgrades within that timeframe. It should be noted that the evaluation presented is based on projected growth rates. Changes in population growth, the location of growth, and deviations from estimated usage have significant impact on the timing of this required infrastructure.

As the District continues to replace distribution piping on an annual basis, a build-out analysis becomes germane to LOID as this "new" infrastructure will be in place for an anticipated useful life exceeding 100 years. For this reason, the distribution system was evaluated under both existing and build-out demands to appropriately size pipes for full flow conditions as they are replaced in LOID's regular maintenance program.

The following infrastructure has been evaluated under various planning periods:

- Supply Evaluation – 20-year analysis
- Storage Evaluation – 20-year analysis
- Distribution Evaluation – Build-out Analysis

Domestic Supply Evaluation

The primary concern associated with any water supply is the quality and quantity of redundant sources. Reliability, as defined by DEQ, requires total supply to be evaluated with the largest source out of service. As displayed in **Table 7-1**, LOID has a redundant supply of 2,040 gpm (2.94 mgd).

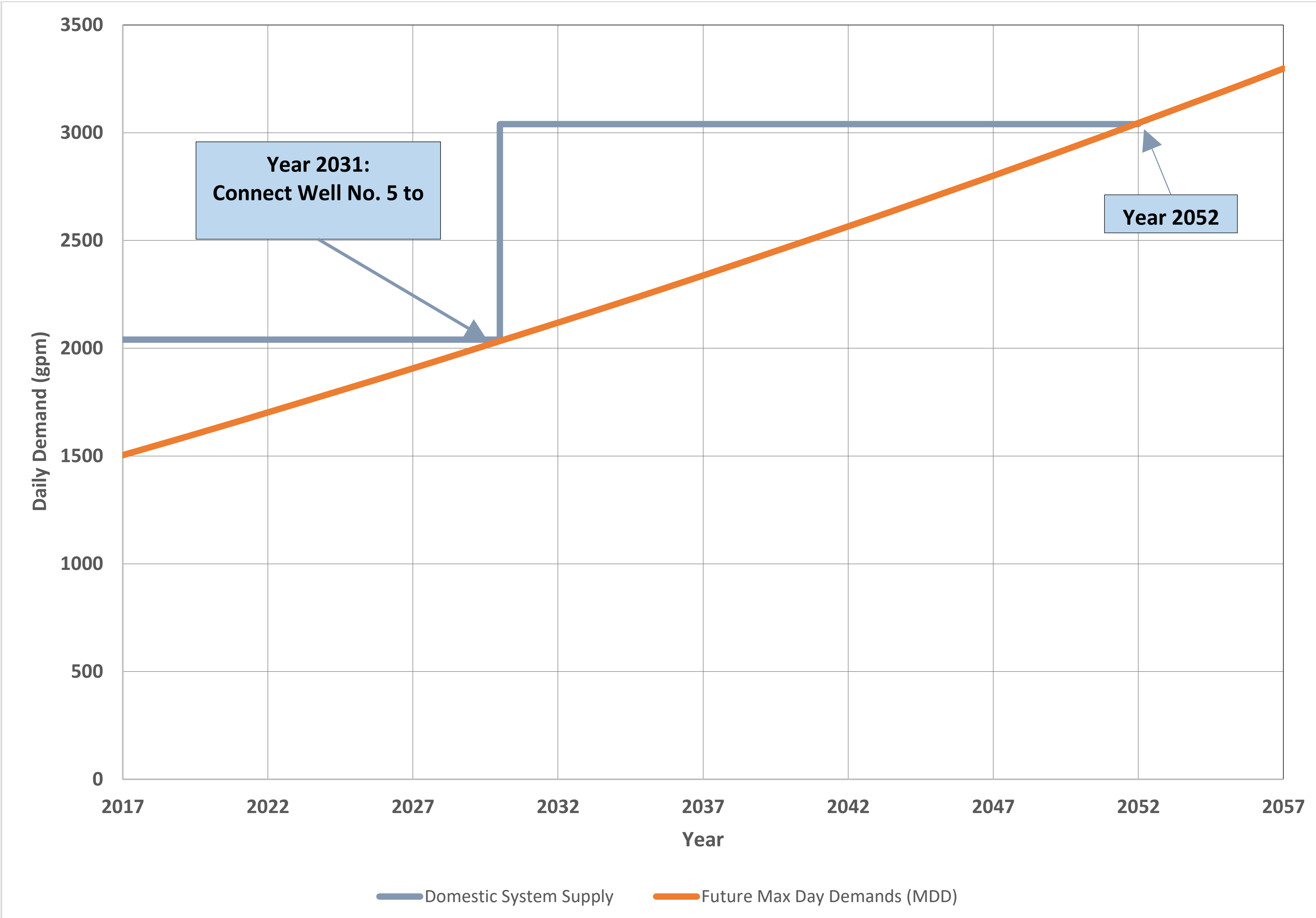
Table 7-1: Redundant Water Supply [A]

Source	Supply	Deficiency
Well No. 2	520 gpm	-
Well No. 3	530 gpm	-
Well No. 4	990 gpm	-
City of Lewiston Intertie[B]	~~1,000 gpm~~	-
TOTAL	**2,040 gpm**	-
Max Day Demand (2017)	1,504 gpm	Not Deficient
Max Day Demand (2027	1,906 gpm	Not Deficient
Max Day Demand (2037)	2,338 gpm	288 gpm

[A] Redundant supply per IDAPA 58.01.08, Subsection 501.17.
[B] Supply is removed from analysis as it is the largest source.

While this supply is capable of meeting current and projected maximum day demands through 2027 the current supply is shy of meeting projected maximum day demands in 2037. Under current growth projections, MDD would be exceeded in approximately 2031.

Figure 7-1: Domestic Existing System Supply



Domestic Storage Evaluation

Storage facilities consist of several components per the guidelines of the Idaho Administrative Code (IDAPA 58.01.08) as follows:

- Dead Storage – Storage that can provide only substandard flows and pressures. As booster stations are located off the Lutes and Hereth Tanks, there is negligible dead storage in these tanks. In addition, the Filter Plant Tank, Hereth and Lutes Boosters provide minimum pressure of 40 psi to most of Zone 1 as shown in **Figure 7-3**. For estimation purposes, it is assumed that the lower 2-feet of storage within each tank is dead storage; operationally it is not recommended to draw a tank dry due to accumulated materials on the tank floor.

- Operational Storage – Supplies water when sources are off. This component is the larger of: 1) the volume required to prevent excess pump cycling and ensure that the following volume components are full and ready for use when needed or, 2) the volume needed to compensate for the sensitivity of the water level sensors. Operational storage for LOID was calculated based on one foot of operational storage in each tank.

  This provides volume to compensate for water level sensitivity, and allows the following operation:

  1. Operational storage within Lutes tank is sufficient to allow the Hereth Transfer to operate 29 minutes.

  2. Operational storage within Hereth Tank is sufficient to allow Wells No. 3 and No. 4 to operate simultaneously for 61 minutes.

  3. Operational storage within the Filter Plant Tank is sufficient to allow Well No. 2 to operate 4 hours, 49 minutes.

- Equalization Storage - Storage to compensate for the difference between a water system's maximum firm pumping capacity and peak hour demand. Calculations associated with equalization storage are included in **Appendix K**.

- Fire Suppression Storage - The water needed to support fire flow in those systems that provide it. It should be noted that it is neither a legal obligation nor part of the mission statement of LOID to provide fire flow capability. The general intent of LOID fire flow storage is discussed in **Chapter 1.**

- Standby Storage - Standby storage provides a measure of reliability or safety factor should sources fail or when unusual conditions impose higher than anticipated demands. As discussed in **Chapter 1**, LOID will maintain one Maximum Day Demand for standby storage.

A summary of storage requirements is shown in **Table 7-2 and Figure 7-2**:

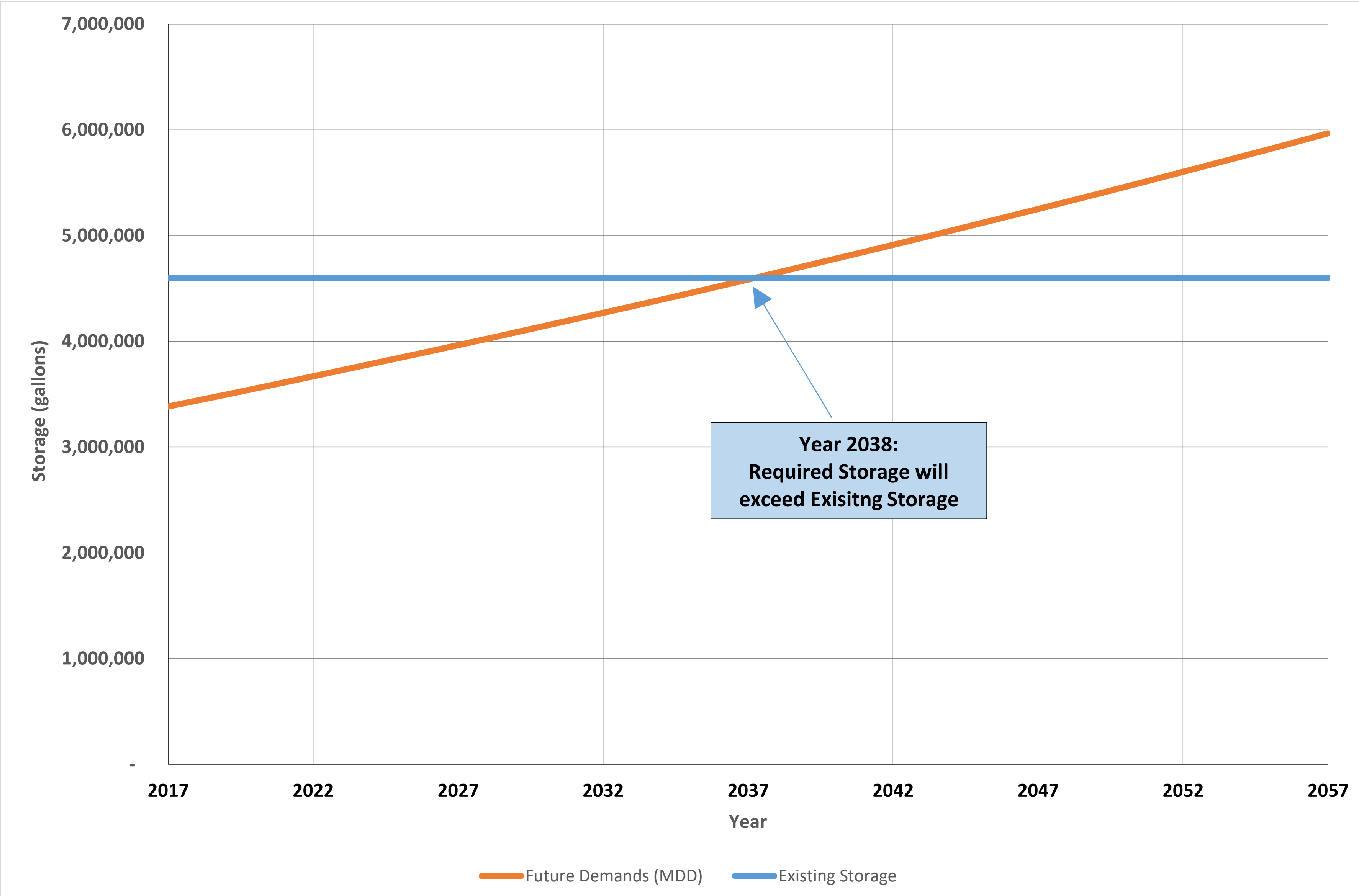
Table 7-2: Storage Volume Summary

Year	Dead Storage [A] (gal)	Operational Storage [B] (gal)	Equalization Storage[C] (gal)	Fire Suppression (gal)	Standby Storage (gal)	Total Storage (gal)
2017	473,000	240,000	145,000	360,000	2,165,836	3,383,836
2037	473,000	240,000	145,000	360,000	3,366,118	4,584,118

[A] Reference **Appendix K** for associated storage calculations.
[B] Storage requirements subject to increase with additional system storage.
[C] Equalization storage is subject to change based on modifications to system infrastructure, including supply and system boosters.

The current amount of storage of 4.6 million gallons is sufficient, but based on observed growth and changes in demands due to new potable-only service connections, LOID should re-evaluate storage requirements in the next 10 to 20 years.

Figure 7-2: Domestic Storage Capacity



Domestic System Distribution Evaluation

The LOID model was utilized to develop pressure profile maps to understand existing pressure issues. In addition, the model was utilized to understand the impact of future demands on pressures within the District. The maps show various pressures, including those outside the target ranges established by the Board.

Domestic Existing Distribution Evaluation

The pressure profile map provided in **Figure 7-3** shows pressure outside the target range 40-100 psi established by the Board for the existing system. These areas are generally localized by three areas:

<u>Zone 1</u>

- According to the model, pressures within Zone 1 are above minimum pressure requirements of 40 psi established by IDAPA. The District has not noted widespread pressure complaints in this Zone, although as shown in **Figure 7-3**, pressures in the vicinity of 10th Street and Richardson Avenue exceed 100 psi. Due to differential elevations in this Zone, LOID cannot decrease these pressures without negative impact to higher elevations near the irrigation boundary on 22nd and the area near 16th and Richardson.

<u>Zone 3</u>

- Cedar Avenue from 10th to 15th – Low Pressure – Pressure issues in this area are associated in part to high elevations and part to low PRV settings used to minimize maintenance issues with the Thain Road pipe.

<u>Zone 5</u>

- North of Park Avenue near Vineyards – Low elevations in this area make it impossible to decrease service pressure without under-pressurizing higher elevations within Zone 5.

Domestic Future Distribution Evaluation

The following evaluation has been completed under the following scenarios and design criteria:

3. Build-out Maximum Day Demand Scenario.

   <u>Demand:</u>

   - Maximum day demand for full build-out of existing system and anticipated growth areas.

   <u>Design Criteria:</u>

- Maintain minimum pressure of 40 psi within existing system.

4. Build-out Fire Flow Scenario.

   Demand:

   - Maximum day demand for full build-out of existing system and anticipated growth areas.
   - Residential Fire flow of 1,500 gpm to anticipated growth area outside existing domestic boundary.

   Design Criteria:

   - Maintain minimum pressure of 20 psi within existing domestic boundary.

The cumulative impact of build-out development in growth Area 1, build-out demands in the existing domestic system and residential fire demand served through Zone 3 result in flows which exceed the capacity of the existing 14-inch main from the Filter Plant Tank and Lutes Transfer. Options to provide this additional capacity will be developed in subsequent sections. The build-out analysis to serve future areas was completed to provide distribution recommendations only. Both scenarios were evaluated with the following assumptions:

- Additional supply of 1,000 gpm to Zone 3.
- Increased PRV setting between Zone 2 and Zone 3 to 65 psi.

The pressure profile map provided in **Figure 7-4** shows pressure under the fire flow scenario. The existing system cannot maintain existing pressures above 20 psi while simultaneously providing residential fire flow. Even with an increased PRV setting between Zones 2 and 3, pressures dip below allowable levels. For this reason, the irrigation system typically provides fire flows within the District.

Low pressure in Zone 3 has been a product of changing minimum pressure requirements over time and a result of pipe failures at the low elevation of the Zone. LOID plans to remedy this situation by splitting Zone 3 into two zones (3a and 3b) by installing four pressure reducing valves (PRV). This will allow for an increase in pressure of Zone 3a to solve low pressure around Cedar Avenue from 10th to 15th Street. Zone 3b will maintain the current pressure of Zone 3. LOID plans to complete the zone change in the fiscal year from July 2019 – June 2020.

Maintenance/Replacement

Typical guidelines suggest that the useful life of domestic distribution systems ranges from 65-95 years (Clean, 2002). If replacement continues under the District's more aggressive schedule with annual replacement of 10,000 linear feet of domestic mainline, the entire system would be replaced by 2050. We recommend that LOID increase their replacement programs to keep up with the useful life of the system.

Water Quality

The District's groundwater supply has acceptable water quality, and according to discussion with LOID staff, there is only one regulatory issues associated with water quality, Fluoride in Well No. 3.

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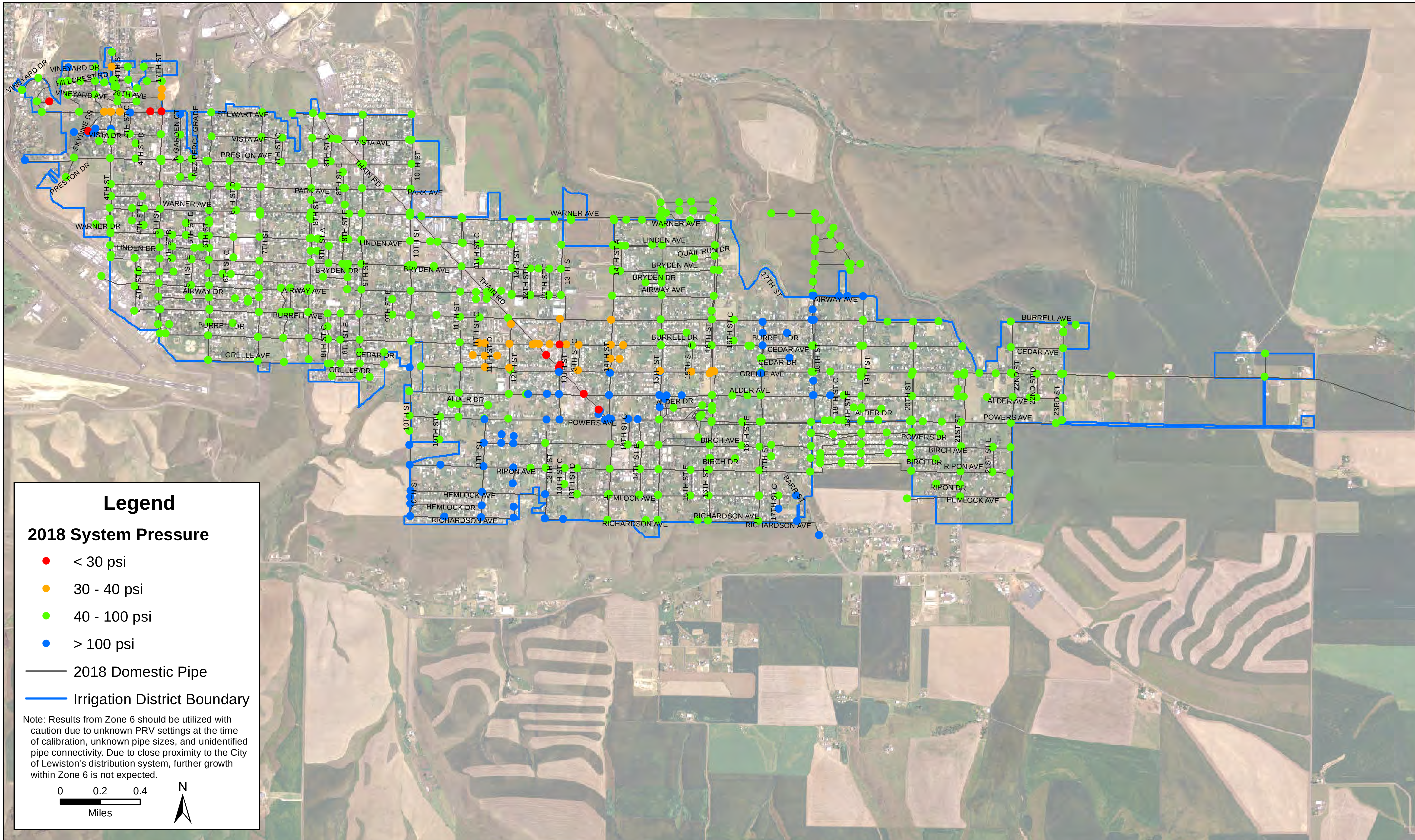
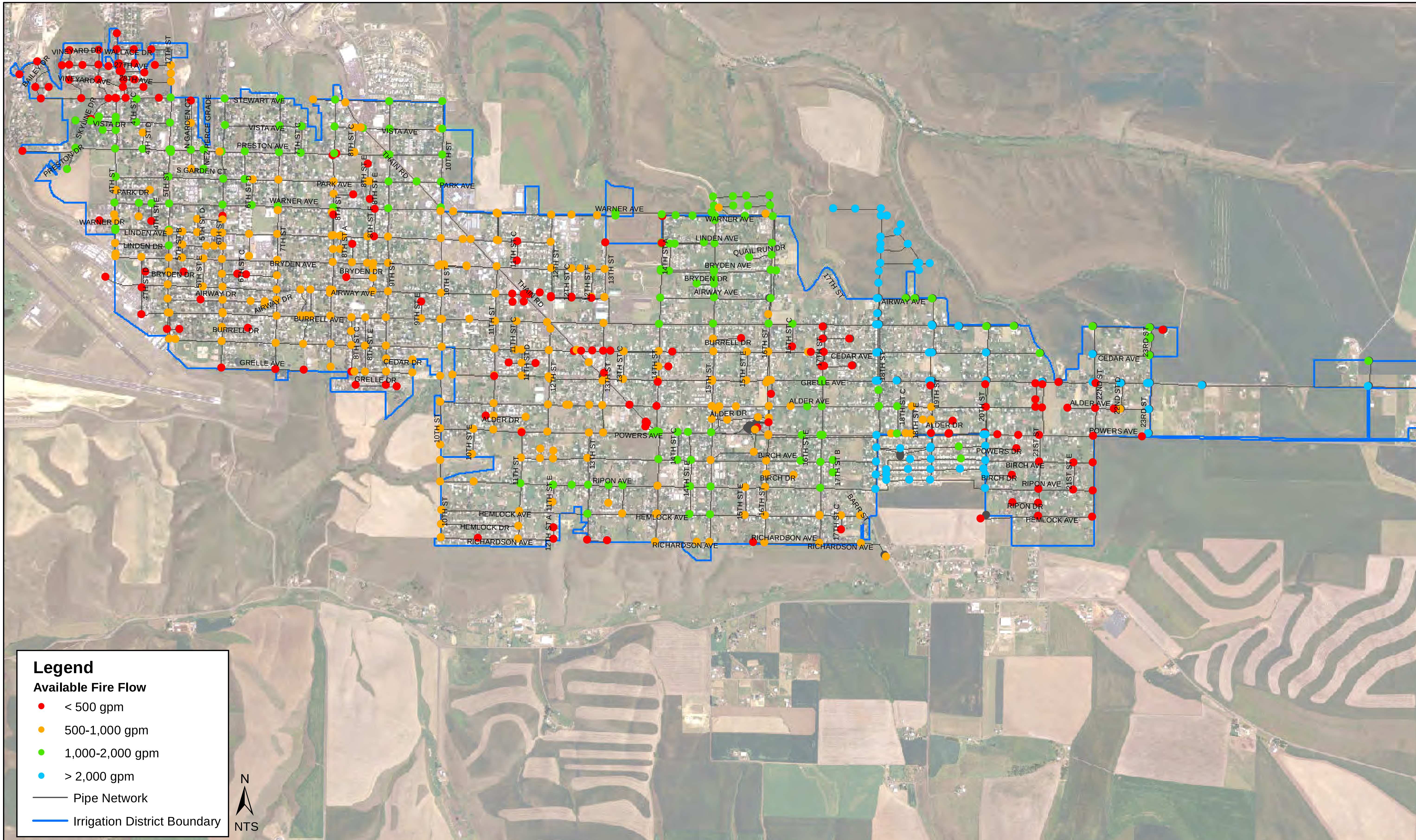
Figure 7-3: Maximum Day Demand Pressures





Legend
Available Fire Flow
< 500 gpm
500-1,000 gpm
1,000-2,000 gpm
> 2,000 gpm
Pipe Network
Irrigation District Boundary
N
NTS

System Reliability

System reliability consists of many items, including operating during a power outage, or operation with a particular system component out-of-service. By planning ahead for these scenarios, LOID's system can be better prepared to provide service with a portion of its infrastructure out-of-service.

Supply Reliability

Additional supply is projected to be needed in approximately 2031. LOID has already planned for additional supply and has drilled Well No. 5. At the current time, Well no. 5 supplies water to LOID's separate irrigation system. Well No. 5 was constructed to drinking water standards and will be the Districts next source of supply. In order for Well No. 5 to be added as a domestic supply, a storage tank, booster station, transmission piping, and disinfection system will need to be added.

Storage Reliability

One of the largest concerns with LOID's infrastructure is system operation with the Lutes or Hereth Tanks offline. Both of these tanks are steel and will need to be taken offline at some point in the future for maintenance and repair. As shown in **Figure 3-1**, all supply from Wells No. 3 and No. 4 flow through Hereth tank. These wells provide more than 75% of system supply, and Hereth Tank provides more than 50% of system storage.

Even more critically, over 50% of system supply must flow through the Lutes Tank to reach the northern portion of the District via the Lutes booster. Although the amount of available storage is sufficient on a volumetric basis, LOID system operation without either the Lutes or the Hereth Tanks is problematic, especially during maximum day demands, as the ability to feed the northern portion of the District from Wells No. 3 or No. 4 is limited.

Source Reliability

Source reliability is often associated with the geographic distance between sources, as sources within a similar proximity are more vulnerable to simultaneous groundwater contamination.

The District's current supply sources have good distribution throughout the system, thereby limiting source reliability issues. As LOID considers new well source locations in the future, source reliability and vulnerability should be considered during the location selection process to limit the potential for groundwater contamination to impact multiple sources.

Power Outage Reliability

The LOID system is vulnerable to a system wide power outage, as a majority of supply (Well No. 3 and No. 4) is transferred from storage to the distribution system via boosters. The District does not utilize generators on these pumps, and as such, the Filter Plant Tank would be used to supply District demand under a District-wide power outage. **Table 7-3** provides separate storage evaluation of the Filter Plant Tank's ability to serve the District under a power outage

Table 7-3: Power Outage – Storage Evaluation (2037)

Year	Dead Storage A (gal)	Operational Storage [A] (gal)	Equalization Storage [B] (gal)	Fire Suppression (gal)	Standby Storage[C] (gal)	Total Storage (gal)
2009	**202,000**	**217,000**	**0**	**360,000**	**663,750**	**1,442,750**

[A] Reference **Appendix K** for associated storage calculations.
[B] There is no equalization storage requirement in the Northern Portion of the System (Filter Plant Tank). Required equalization storage is associated with booster pumps, see **Appendix K.**
[C] Equivalent to 8 hours of average day demand as required per IDAPA 58.01.08.

Table 7-3 shows that the capacity of the Filter Plant tank (1.6 million gallons) is sufficient to meet IDAPA requirements under a system power outage. The model was also used to identify operating pressures from the Filter Plant Tank and found that given the tank is full at the onset of such a power outage, the tank would provide minimum pressure of 20 psi to the highest elevations in the District.

System Efficiency

Although a detailed efficiency analysis was not part of the scope of this Plan, it can be visually observed from **Figure 3-1** that a significant portion of the LOID water supply is pumped multiple times to reach the distribution system. All flows from Wells No. 3 and No. 4 to the northern portion of the District are pumped via Hereth and Lutes Transfers to Zone 2, yet this zone accounts for only 16% of the northern portion. Eighty-four percent (84%) of water supplied to the northern portion through the Hereth and subsequent Lutes Transfer pumps is therefore pumped to a higher-pressure zone than where it is used. The cost of this over-pumping through the Lutes Transfer through Zone 2 to Zones, 3, 5, and 6 has been estimated on the order of $10,000 per year based on the following assumptions:

- Estimated flow of 890 gpm from Wells No, 3 and No. 4 to Zones 3, 5, & 6
- Estimated motor efficiency of 80%
- Electrical cost of $0.084/kw-hr

Appendix L provides a summary of power cost calculations.

Regulatory Issues

Fluoride in Well No. 3 is about 3 mg/l which is below the MCL of 4.0 mg/l but above the SMCL of 2.0 mg/l. LOID met the requirements for public notification in 2018 through the Consumer Confidence Report and will continue to do so in the future.

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8. Irrigation System Evaluation

Introduction

The following water system evaluation will consider existing and anticipated system deficiencies based on the preceding chapters. The assessment represents a culmination of system review by J-U-B based on LOID goals set forth in **Chapter 1**, discussions with LOID staff, and general observations based on our experience

Evaluation Analysis Summary

As the District continues to replace distribution piping on an annual basis, a build-out analysis becomes germane to LOID as this "new" infrastructure will be in place for an anticipated useful life exceeding 100 years. For this reason, the distribution system was evaluated under both existing and build-out delivery to appropriately size pipes for full flow conditions as they are replaced in LOID's regular maintenance program. As discussed in **Chapter 5**, build-out delivery should be utilized with caution, as the impact of restrictions and distribution system pressure losses may have created artificially low maximum day and peak hour deliveries, which formed the basis of the build-out analysis. If additional supply becomes available in the future, or if distribution losses associated with the 30 ½-inch transmission main on Powers Avenue are addressed, there is significant potential for irrigation deliveries to increase.

Irrigation Distribution System Evaluation

The LOID model was utilized to develop pressure maps to understand existing pressure issues. In addition, the model was utilized to understand the impact of future deliveries on pressures within the District. The maps show various pressures, including those outside the target ranges established by the Board.

Pressure Distributions

Figures 8-1 and **8-2** provide pressure distribution under maximum day and peak hour delivery, respectively. The figures show that although the District can generally maintain minimum system pressure of 40 psi under maximum day delivery (**Figure 8-1**), the system experiences widespread low-pressure issues during peak hour delivery (**Figure 8-2**). A comparison of the two figures shows a system-wide pressure drop in the range of 30-40 psi. This loss can be traced back to the 30 ½-inch transmission main located on Powers Avenue from the Filter Plant to 22nd Street. As flows increase from maximum day to meet peak hour delivery, headloss in

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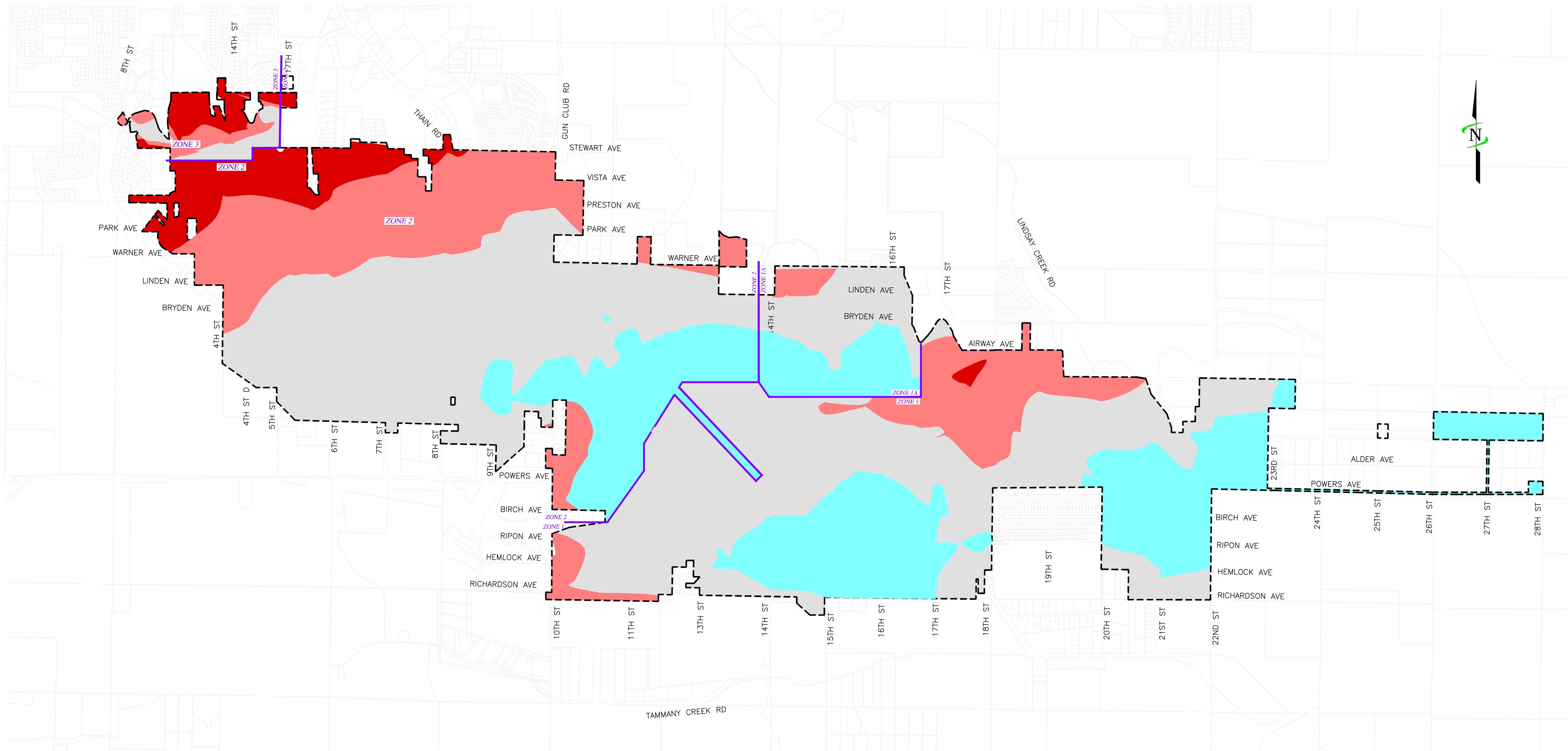

LEGEND

- LOID IRRIGATION BOUNDARY
- PRESSURE ZONE BOUNDARY
- < 40 PSI
- 40 – 60 PSI
- 60–80 PSI
- 80 – 100 PSI
- > 100 PSI

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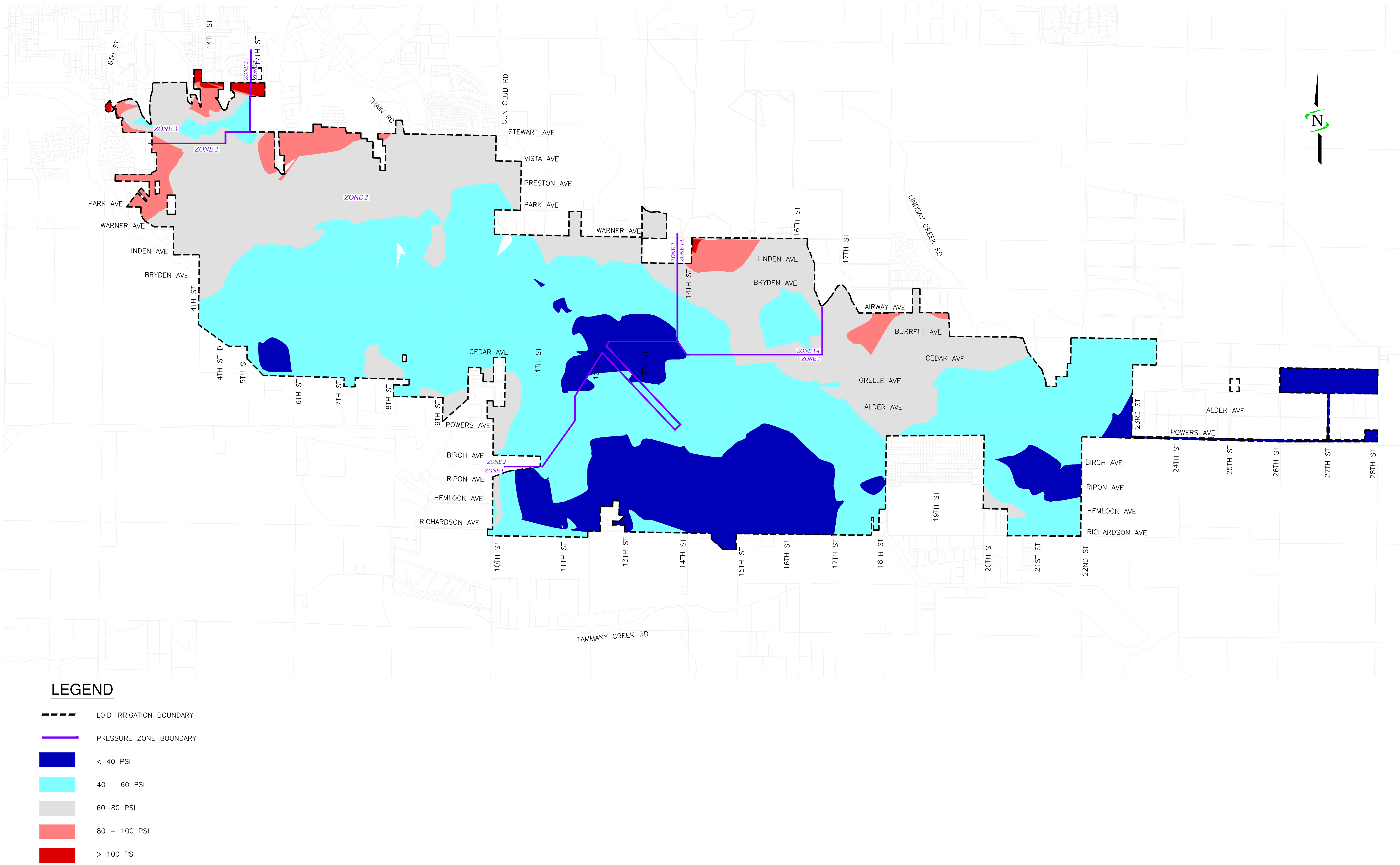
LAST UPDATED: 9/24/2012
PLOT DATE: 9/24/2012
FILE: IRR PRESSURE

LEWISTON ORCHARDS IRRIGATION DISTRICT
IRRIGATION MASTER PLAN

Figure 8-1
Existing Irrigation Maximum Day Demand Pressures



Plot Date:9/24/2012 9:50 AM Plotted By: William Holder
Date Created:7/28/2009 \\LEWSFILES\PUBLIC\PROJECTS\21-07-001-LOID\21-07-001-DRA\DWG\MASTER PLAN\IRR FIGURES\IRR PRESSURE.DWG

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LAST UPDATED: 9/24/2012
PLOT DATE: 9/24/2012
FILE: IRR PRESSURE

LEWISTON ORCHARDS IRRIGATION DISTRICT
IRRIGATION MASTER PLAN

Figure 8-2
Existing Irrigation Peak Hour Demand Pressures

this vicinity jumps from 4 feet per 1,000 feet to 8 feet per 1,000 feet, well above typical design guidelines. Further analysis of the mainline at the intersection of 22nd and Powers Avenue shows static pressure of 96; dropping to 50 psi under peak hour delivery. The transmission main acts as a bottleneck, impacting the entire system at peak flows.

The following generally describe localized pressure issues within each zone:

Zone 1

- According to the model, pressures within Zone 1 are outside the pressure range criteria established by the Board. LOID reports widespread pressure complaints from this zone in the vicinity of 12th to 17th Street between Richardson and Powers Avenue at peak hour delivery.

  In addition, during maximum day delivery, areas in the vicinity of Burrell Avenue and 18th Street experience pressures greater than 100 psi. Although these issues may be partially addressed with distribution improvements, LOID cannot address all pressure issues without negative impact to the highest or lowest elevations without pressure boundary modifications due to differential elevations in this zone.

Zone 2

- **Figure 8-1** shows pressures under maximum day demand north of Preston Avenue. Under peak hour demand, these pressures drop in the range of 20-40 psi due to headloss in the transmission main from the Filter Plant. Once the mainline pressure issues are addressed, the District may be able to provide balance between extreme pressures at lower elevations and low pressure at higher elevations by modifying PRV set points.

Fire Flow

Available fire flow under the following conditions has been prepared in **Figure 8-3:**

- Minimum system pressure of 20 psi.
- Maximum day demand conditions.

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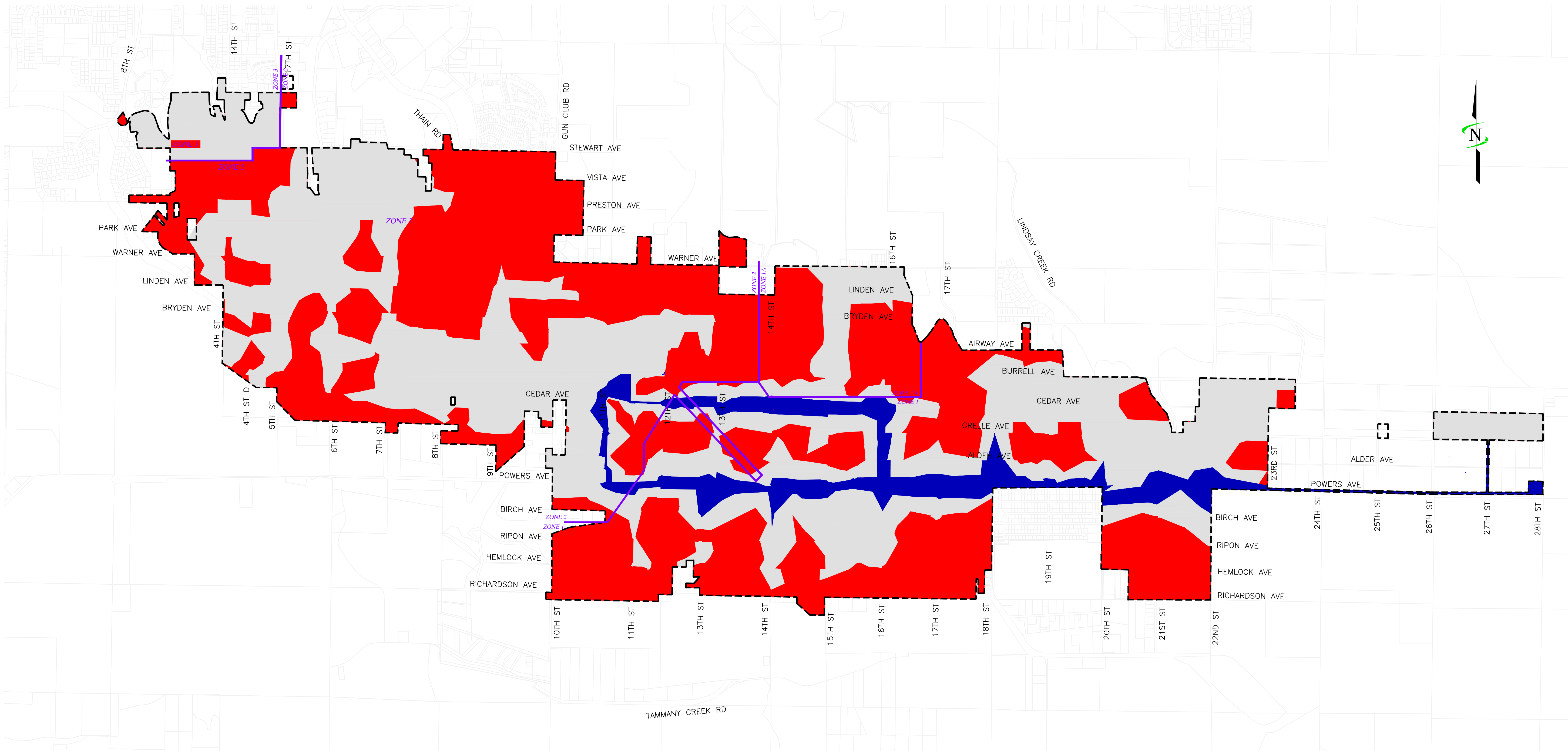

LEGEND

- LOID IRRIGATION BOUNDARY
- PRESSURE ZONE BOUNDARY
- < 1500 GPM
- 1500 < 3500 GPM
- > 3500 gpm

LAST UPDATED: 9/24/2012
PLOT DATE: 9/24/2012
FILE: IRR PRESSURE

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IRRIGATION MASTER PLAN

Figure 8-3
Irrigation Available Fire Flow at Maximum Day Delivery

Plot Date: 9/24/2012 9:51 AM Plotted By: William Holder
Date Created: 7/28/2009 \\LEWSFILES\PUBLIC\PROJECTS\21-07-001-LOID\21-07-001-DRA\DWG\MASTER PLAN\IRR FIGURES\IRR PRESSURE.DWG

The figure shows that in general, residential fire flows of 1,500 gpm is not available near the boundary of the LOID Irrigation boundary. This is likely due to the prevalence of small diameter pipe of less than 8-inches in these areas.

Maintenance/Replacement

Typical guidelines suggest that the useful life of domestic distribution systems ranges from 65-95 years (Clean, 2002). If replacement continues under the District's more aggressive schedule with annual replacement of 10,000 linear feet of domestic mainline, the entire system would be replaced by 2050. We recommend that LOID increase their replacement programs to keep up with the useful life of the system.

Regulatory Issues

LOID does not have any regulatory issues associated with the Clean Water Act.

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9. Domestic System Recommendations

Introduction

Based on the preceding text, discussion with LOID staff, and direction from the LOID Board, infrastructure recommendations have been prepared for the District. These recommendations provide guidelines to address current deficiencies and allow growth of the domestic system. The recommendations presented herein do not include design of required infrastructure to serve areas outside the District boundary, including the anticipated growth areas delineated in **Chapter 2**.

As stated in the initial plan assumptions, this evaluation is predicated on continued use of the irrigation system in a manner consistent with historical usage. If usage behavior shifts from the irrigation to domestic system due to increased reliance on potable water, it is critical to re-evaluate the recommendations presented herein.

Supply Recommendations

Current supply sources are sufficient to serve projected maximum day demands with the largest source out of service through 2020. By 2031 however, projected maximum day demands are anticipated to exceed the redundant supply. LOID should plan to complete an additional water supply in the next 10-12 years to meet estimated demand.

Well No. 5

The LOID Board has provided additional supply through drilling and completion of Well No. 5. Well No. 5 was drilled to be capable of producing 2,000 gpm, for irrigation and domestic supply. 500-1000 gpm could be used from Well No 5 for domestic supply purposes. Additional supply of 298 gpm is needed in the year 2037, therefore Well No. 5 is more than sufficient to meet projected demands. Well No. 5 was constructed to drinking water standards and is currently only used for the irrigation system. In order for Well No. 5 to be added as a domestic supply, a storage tank, booster station, transmission piping, and disinfection system will be added. The location of Well No. 5 is shown in **Figure 3-2**.

Finally, LOID utilizes the City intertie as an emergency water supply. As such, the District should develop an agreement with the City to formalize the quantity and availability of water through this connection.

Well No. 6

The LOID is currently (summer 2019) drilling Well No. 6 as an additional source of supply. Well No. 6 is designated as a municipal supply well and will primarily feed the irrigation system. Well No. 6 is being constructed to meet drilling water standards and could be converted to a domestic supply if needed in the future.

Distribution Recommendations

The following recommendations were developed with use of the model to address problematic areas and provide service under current and build-out conditions of anticipated growth areas.

Zone 1

Due to differential pressure elevations within Zone 1, LOID cannot serve the lowest elevations of the zone at less than 100 psi while maintaining minimum pressures at the highest elevations within the zone. The District has not noted high pressure complaints in this area, however; any future complaints could be addressed with individual pressure reducing valves.

Zone 2

The area of 19th and Burrell has been identified as a problematic area with pressures in excess of 100 psi. The hydraulic grade line within Zone 2 is controlled by water level elevations at the Filter Plant Tank, and as such, pressure at the low end of this Zone cannot be decreased without an alteration of zone boundaries. In lieu of an alteration, LOID could address high pressure issues in this area on a case-by-case basis with individual pressure reducing valves.

Zone 3

The deficiencies within Zone 3 are related to the brittle pipe on Thain Road and low operational pressures. The pipe is both a maintenance issue due to routine mainline breaks and an operational issue as the District must utilize the Zone 2 – Zone 3 PRV to limit pressure applied to this pipe. The following recommendations apply to areas within the Zone:

- Low operational pressure can be resolved by splitting Zone 3 into two (2) zones (3a and 3b) by installing four (4) pressure reducing valves as shown in **Figure 9-1**. This will allow for an increase in Zone 3a pressure to solve the low pressure area around Cedar Ave. from 10th Street to 15th Street. Zone 3b will maintain the current pressure of Zone 3. **Figures 9-2 and 9-3** illustrate the benefit to system pressures and available fire flow (outside the irrigation boundary).

- Thain Road Pipe – Brittle Pipe - Based on cursory discussion between LOID and the City of Lewiston, pavement on Thain Road will be replaced within the next 10-20 years. LOID should coordinate with the City to replace the brittle, 160 psi pipe in this area with a new 12-inch main and minimize the impact surface repair might have on the otherwise new street section.

- Bryden Avenue – Construction Coordination – Prior to the City's road expansion on Bryden Avenue, LOID should plan to upsize the existing 4-inch pipe with a 12-inch main to provide water flows capable of meeting the commercial area.

- City Intertie – LOID has observed issues with maintaining Zone 3 pressures when the City draws from the District. This issue would be resolved by adding a pressure sustaining feature to the valve, thereby maintaining system pressures when the valve is in operation.

Zone 6

Vineyards – Maintenance Issues – LOID should plan to move water mains out of alleys for future ease of replacement, repair and maintenance.

Anticipated Growth Area

Each one of the anticipated growth areas (**Figure 2-4**) was evaluated. A summary for each was prepared, see **Appendix Q**. Residential development within the growth areas can be served with the infrastructure improvements listed.

Storage Recommendations

- Filter Plant Tank – Although the Filter Plant Tank is reported to be in good condition, it is over 60 years old. LOID should complete a structural assessment of the tank and roof to determine if repairs will be required within the planning period. In addition, as a buried, cast-in-place concrete tank, subsurface leaks could be present contributing to the District's unaccounted water.

System Efficiency Recommendations

- Well No. 3 – The existing pump and motor within the well exceed its capacity, and a valve is manually throttled to create false head and control water level drawdown. LOID should plan to replace the pump and motor with a system sized to meet well capacity.

This modification will reduce wear in the manually throttled valve, and is generally more efficient, as the pump would operate against lower discharge head.

- Hereth Transfer – The existing pump and motor are not optimized for actual operating conditions to pump from Hereth to Lutes Tank. The District should plan to replace this pump with a more efficient design when the pump reaches the end of its useful life. This would allow transfer without creating false head by throttling a downstream gate valve.
- Zone 3 Supply – LOID should plan to minimize system pumping by providing supply directly to Zone 3. This will be accomplished when Well No. 5 is modified to a domestic source and connected to Zone 3a or 3b.

System Reliability Recommendations

System reliability is an important consideration as the District considers how to provide consistent service to constituents.

Storage Reliability

System operation with Hereth Tank offline – LOID should plan to allow the Hereth tank to be taken offline. Although Well No. 4 can feed directly to the Lutes Tank, the Hereth Tank provides more than 50% of system storage. Additional storage is required to provide system reliability and allow the tank to be taken offline for emergencies, maintenance and repairs.

Additional storage is projected to be needed in approximately 2038. Since a storage tank is needed at Well No. 5 to complete it as a source of supply, an additional storage tank of approximately one (1) million gallons (mg) is recommended to be added. A one (1) million-gallon tank will provide capacity until approximately 2048.

Source Reliability

LOID has good source reliability; however, it is not possible to utilize Well No. 2 to serve the southern portion of the District. Based on discussion with LOID staff, the Well No. 3 transmission main could be plumbed to allow Zone 3 to backfeed Hereth Tank.

As LOID considers new well source locations in the future, source reliability and vulnerability should be considered to limit potential for groundwater contamination to impact multiple sources.

Power Outage Reliability

The Filter Plant Tank is just capable of providing the minimum service requirements established by IDAPA 85.01.08. A significant portion of District storage cannot be utilized without booster pumps and is therefore inaccessible without standby power.

To improve system reliability beyond the minimum requirements, additional standby power (generator) should be installed. A review of possible locations and configuration was completed. Several options were evaluated. (See **Appendix S** for detailed descriptions)

- Option A: Reconfigure the electric utility service to provide a single 480V utility transformer and provide stand-by-power from a single generator to the entire facility.
- Option B: Reconfigure the electric utility service to provide a single 480V utility transformer for the Hereth Booster Station and Well 4, leaving the Office and Maintenance Shops on the existing services and provide stand-by-power from a single generator to the entire facility.
- Option C: Provide stand-by-power from a single generator to the Hereth Booster Station.
- Option D: Provide stand-by-power from a single 480V generator to Well 4.
- Option E: Provide stand-by-power from a single 2,400V generator to Well 4.
- Option F: Reconfigure the electric utility service to provide a single utility transformer for the Hereth Booster Station and Well 4 and provide stand-by-power from a single 480V generator to both locations.

Option A was selected as it provides the most robust system providing:

1. Power for Well No. 4, LOID's largest source.
2. Power for Hereth Booster capable of pressurizing Zone 1 and the ability to transfer water to Zone 2 and the filter plant tank.
3. Power for SCADA control at Well No. 4, Hereth Booster and Hereth tank.
4. Operational continuity with the main Office and Operation Shop.

Sanitary Survey

The Department of Environmental Quality completed an Enhanced Sanitary Survey of District infrastructure in December, 2014. Two significant deficiencies were found and have been addressed. All other minor deficiencies identified have been addressed, and a copy of the survey is provided in **Appendix O.**

Telemetry Recommendations

The software package utilized by the LOID SCADA system is capable of meeting current and near-term requirements. Regular software upgrades should be completed to keep the software up to date.

Summary

Table 9-1 shows a matrix summary of recommendations based on the preceding analysis and discussion. In addition, **Figure 9-4** shows pressures under maximum day demand, build-out conditions following completion of the following system modifications:

- Thain Road Mainline Upgrade
- Bryden Avenue Mainline Upgrade
- Well No. 5, Tank & VFD Booster
- Increased PRV setting at 18th and Grelle (70 psi)

The figure shows that under build-out demands, the system will maintain normal operating pressure of 40 psi. Some areas near lower zone boundary elevations may experience service pressures greater than 100 psi. The District may consider use of individual PRVs as required to address these issues as required.

Table 9-1: Domestic System Recommendation Summary

Item	Current Recommendations (2018-2022)	Future (2023-2037) Recommendations
Supply		
Well No. 2 Pump & Motor Rebuild	Rebuild maintenance for proper future operation	
Well No. 3 Pump & Motor Replacement	Replace for proper future operation	
Well No. 4 Pump & Motor Rebuild	Rebuild maintenance for proper future operation	
Well No. 5 Booster Pump		Install Booster Pump to accommodate additional demand
Well Annual Maintenance		
Well No. 3 Site Fencing	Fence Site for safety standards	
Storage		
Well No. 5 Storage Tank		Additional storage required based on growth projections
Hereth Tank Cathodic Protection Anode Replacement	Replace for current operations	
Filter Plant Tank Meter Addition	Install meter for accurate measurements	
Storage Reservoir Annual Maintenance		
Booster Pump Stations		
Hereth Booster Pump Replacement		Replace Pumps 1 & 3
Lutes Booster Pump Replacement		Replace Pumps 1-4
Zone 8 Booster Pump Upgrades		Possibly needed within 20 yrs depending on growth rate in Zone 8
Distribution		
Annual Replacement		
Zone Modification	Modify Zones with PRVs to allow for better pressure distribution	
Thain Road (Stewart Ave to Alder Ave)		Replacement & upsize to 12-inch main
Bryden Ave. (4th St. to 10th St.)		Replacement & upsize to 12-inch main
Pressure Sustaining Valve at Intertie	Add pressure sustaining feature to maintain minimum system pressures	
Vineyard		Mainline relocation to streets from alleys
Operation and Maintenance		
Standby Power (Hereth Site)	Backup power provisions are recommended for Hereth site	
Valve Maintenance Program		
Valve Operator & Maintenance Equipment	Installation of a valve exercise skid is recommended for maintenance	
Cross Connection Control Program		
GIS Mapping		

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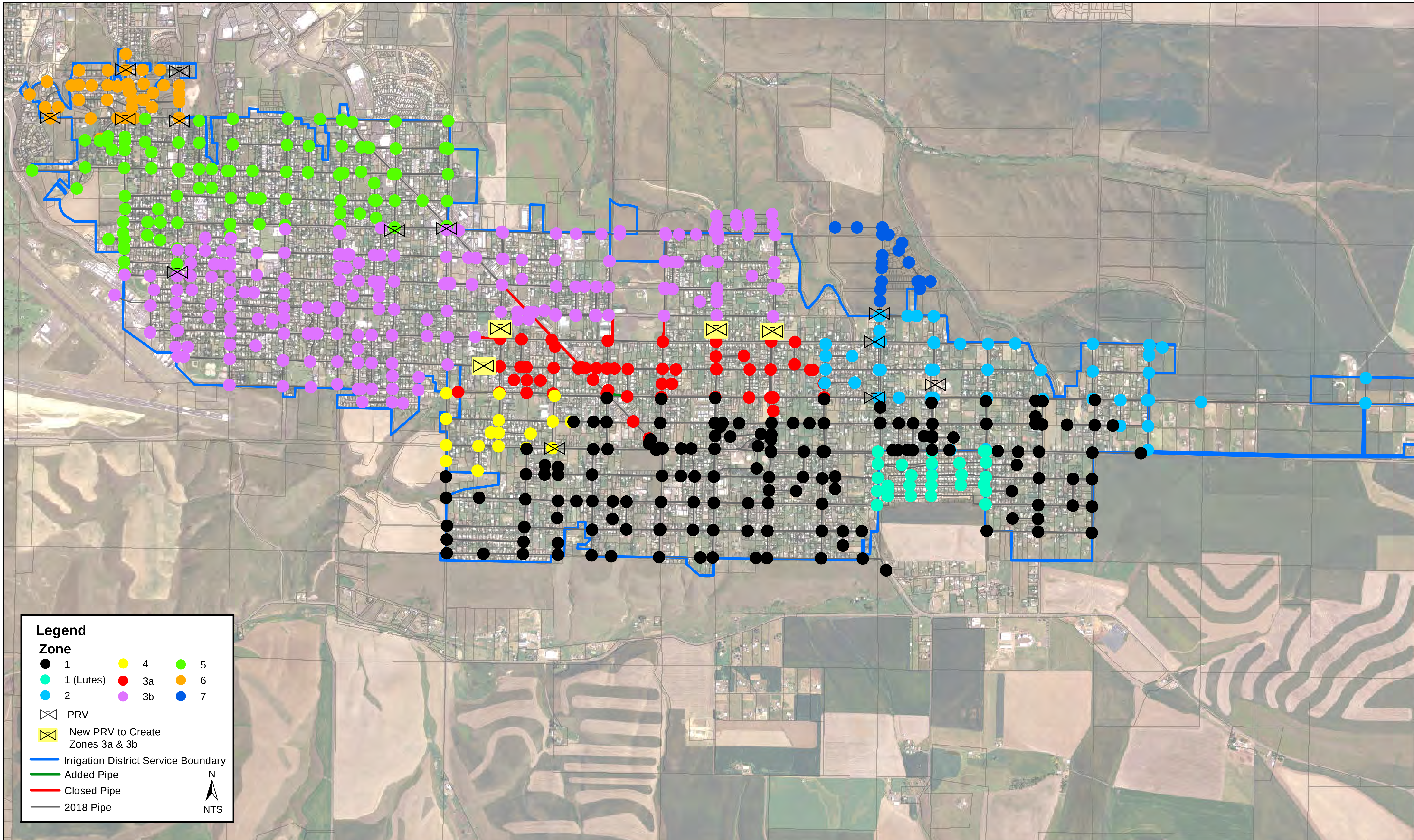
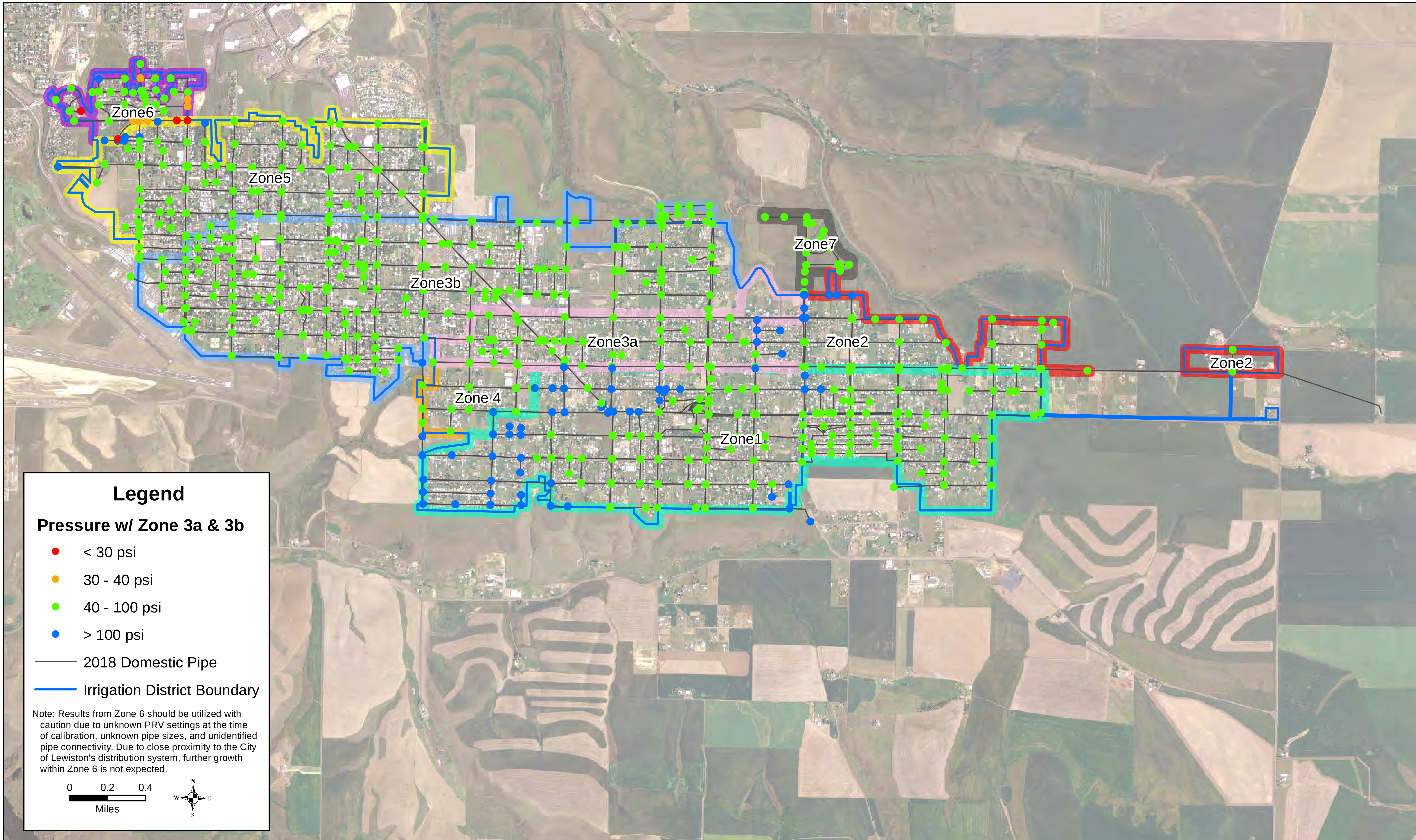


Legend
Zone
1
1 (Lutes)
2
4
3a
3b
5
6
7
PRV
New PRV to Create Zones 3a & 3b
Irrigation District Service Boundary
Added Pipe
Closed Pipe
2018 Pipe
N
NTS


Zone6
Zone5
Zone3b
Zone3a
Zone7
Zone2
Zone2
Zone 4
Zone1
Legend
Pressure w/ Zone 3a & 3b
< 30 psi
30 - 40 psi
40 - 100 psi
> 100 psi
2018 Domestic Pipe
Irrigation District Boundary
Note: Results from Zone 6 should be utilized with caution due to unknown PRV settings at the time of calibration, unknown pipe sizes, and unidentified pipe connectivity. Due to close proximity to the City of Lewiston's distribution system, further growth within Zone 6 is not expected.
0
0.2
0.4
Miles
N
S
E
W

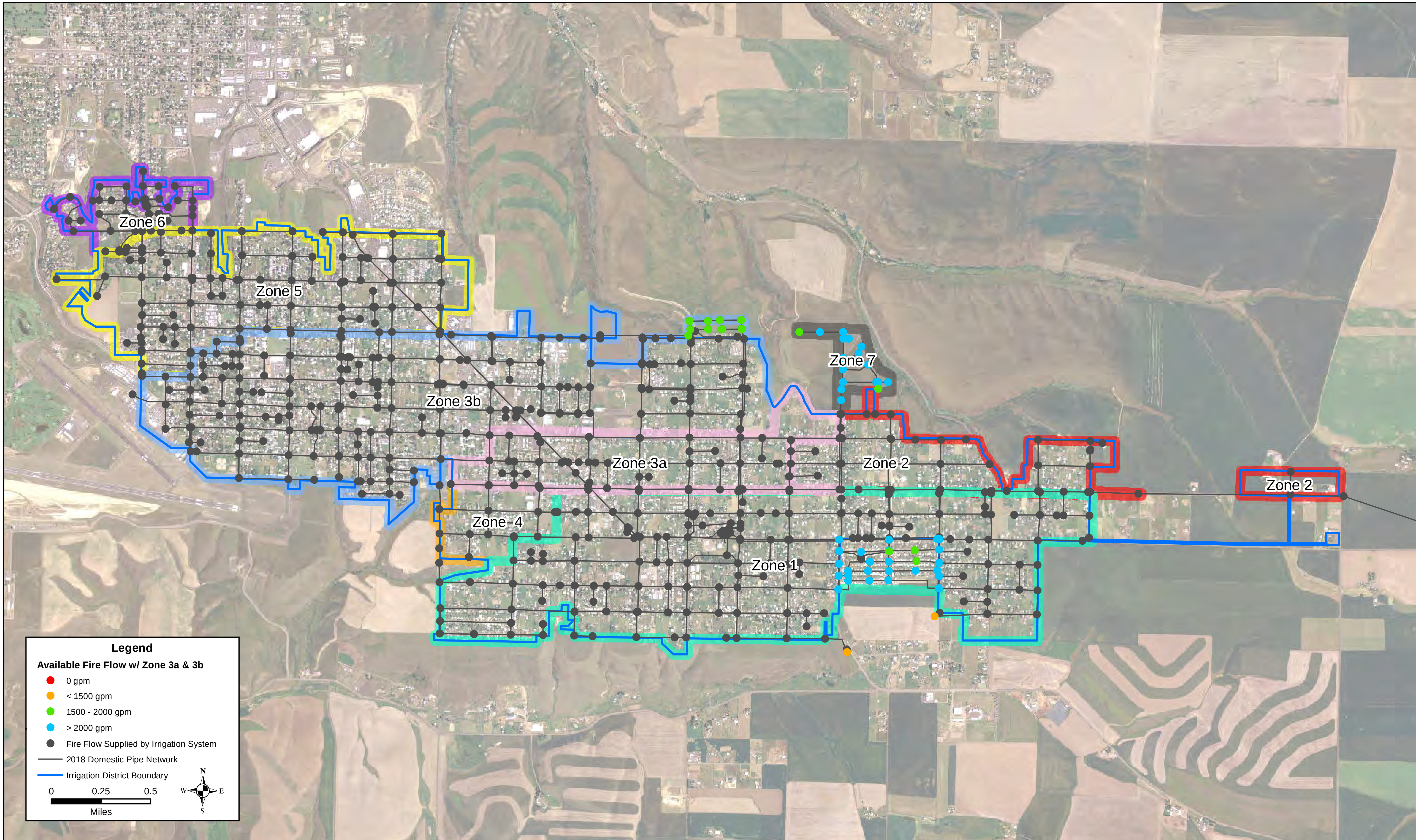
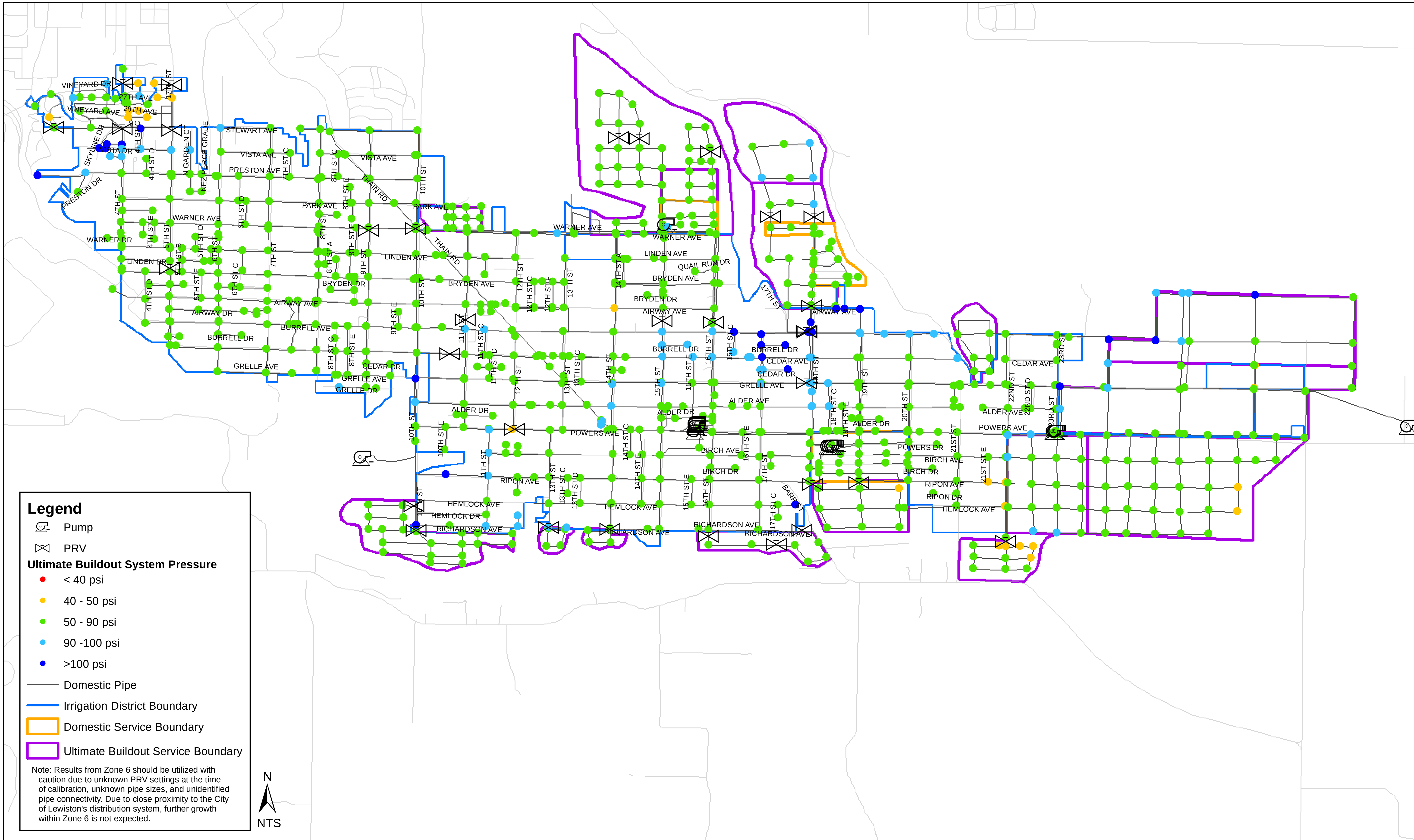

Zone 6
Zone 5
Zone 3b
Zone 3a
Zone 7
Zone 2
Zone 2
Zone 4
Zone 1
Legend
Available Fire Flow w/ Zone 3a & 3b
0 gpm
< 1500 gpm
1500 - 2000 gpm
> 2000 gpm
Fire Flow Supplied by Irrigation System
2018 Domestic Pipe Network
Irrigation District Boundary
0 0.25 0.5
Miles
N
W E
S

Figure 9-4: Domestic Max Day Demand Pressures (Build Out) *Lewiston Orchards Irrigation District*



10. Irrigation System Recommendations

Introduction

Based on the preceding text and discussion with LOID staff, infrastructure recommendations have been prepared for the District to address current deficiencies and build-out deliveries within the irrigation system.

Supply Recommendations

Figure 10-1 shows the following substantial upgrades based on the distribution system evaluation and discussion with LOID staff.

Bryden and Thain Upsize

Per discussion with District staff, the Bryden Avenue and Thain Road corridors will be improved by the City in the near future. This would be an ideal opportunity to improve connectivity and looping in these areas, improving peak hour pressures and fire flows in the predominately commercial corridors. 12-inch mains in these locations would provide a strong backbone to meet anticipated build-out delivery.

The following connections should be added during this future project:

- 12-inch mainline on Bryden Avenue between 4th Street and 10th Street.
- 12-inch line on Thain Road between Alder Avenue and Stewart Avenue.

Distribution Recommendations

Parallel Transmission Main

An additional transmission main forming a parallel line from 22nd Street to the Filter Plant along Powers Avenue would have the single greatest impact on distribution pressures, easing the bottleneck that currently exists in this vicinity. Although a 24-inch main would meet the District's design criteria with headloss of five feet per 1,000 feet, it is recommended that LOID upsize the pipe by one size to a 30-inch main, thereby doubling the capacity of the existing line.

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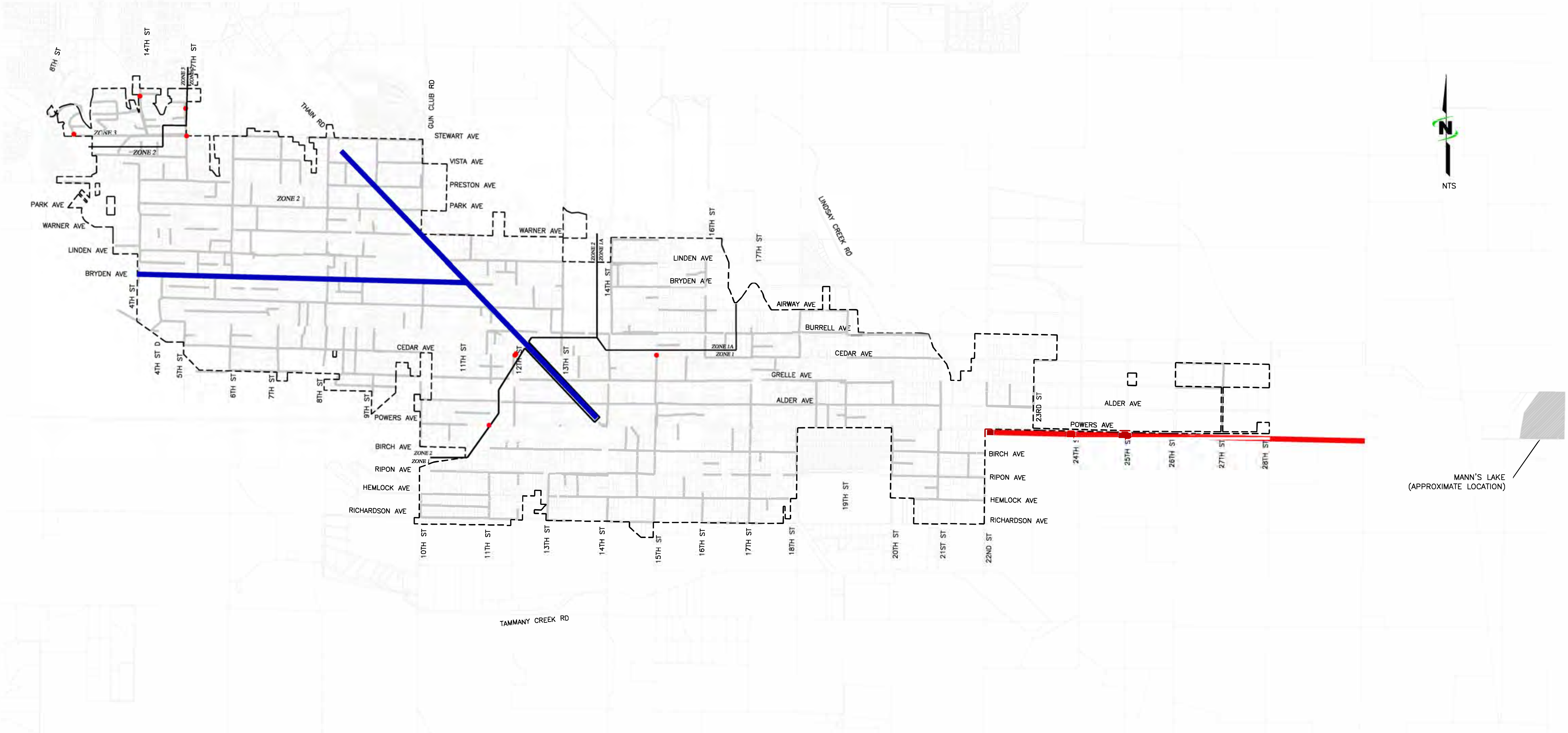


LEGEND

- IRRIGATION BOUNDARY
- PRESSURE ZONE BOUNDARY
- EXISTING DISTRIBUTION SYSTEM
- NEW 12–INCH LINE
- NEW PARALLEL 24–INCH LINE
- PRESSURE REDUCING VALVE

LAST UPDATED: 8/23/2012
PLOT DATE: 9/19/2012
FILE: IRR SYSTEM

J-U-B Engineers • Surveyors • Planners

LEWISTON ORCHARDS IRRIGATION DISTRICT
IRRIGATION MASTER PLAN

FIGURE 10-1
Recommended Improvements

System Efficiency Recommendations

Service Meters

The District should maintain current efforts to meter all irrigation services. Although the benefits of this program are numerous, one of the largest impacts will be the District's ability to quantify and reduce unaccounted water. In addition, although the categorized land use delivery presented in this plan are reasonable, metered system usage could be used to further refine these deliveries.

Summary

Table 10-1 shows a matrix summary of recommendations based on the preceding analysis and discussion.

Table 10-1: Irrigation System Recommendation Summary

Item	Current Recommendations (2018-2022)	Future (2023-2037) Recommendations
Supply		
Well No. 5 Pump and Motor Rebuild		Rebuild to ensure proper operation for the future
Well No. 6	Complete Well No. 6 to provide for increased demand	
Well No. 7		Install new well to provide for increased demand and switching to new system
Well No. 8		Install new well to provide for increased demand and switching to new system
Booster Pump Stations		
Hereth Transfer		Replace Pump
Well No. 5 Booster		Install Booster Pump Skid and on-site chlorination system
Distribution		
Annual Replacement		
30.5 & 36 inch replacement		
Thain Road (Stewart Ave to Alder Ave)		Replacement & upsize to 12-inch main is recommended
Bryden Ave. (4th St. to 10th St.)		Replacement & upsize to 12-inch main is recommended
Vineyard		Mainline relocation to streets from alleys is recommended
Operation and Maintenance		
Valve Maintenance		
Valve Operator & Maintenance Equipment	Installation of a valve exercise skid is recommended for maintenance	
GIS Mapping		

Upgrade Impact

The recommended upgrades will provide a significant improvement in peak hour delivery pressures as shown by **Figure 10-2**.

Zone 1

- The upgrades will eliminate the low-pressure issues under peak hour delivery, yet high pressures in the vicinity of Burrell Avenue will persist. LOID should address these issues on a case-by-case basis with individual pressure reducing valves.

Zone 2

- The upgrades will eliminate low pressure issues under peak hour delivery along the south-western zone boundary. Shown by **Figure 10-2**, minimum pressures in this area will typically range from 60-80 psi. Pressures in excess of 100 psi will remain along the northern zone boundary at lower elevations under current PRV settings. LOID may be able to reduce these pressures by changing the PRV settings between the Zone 1 and Zone 2 boundary, with care to maintain minimum pressure of 40 psi within highest elevations in the zone.

Zone 3

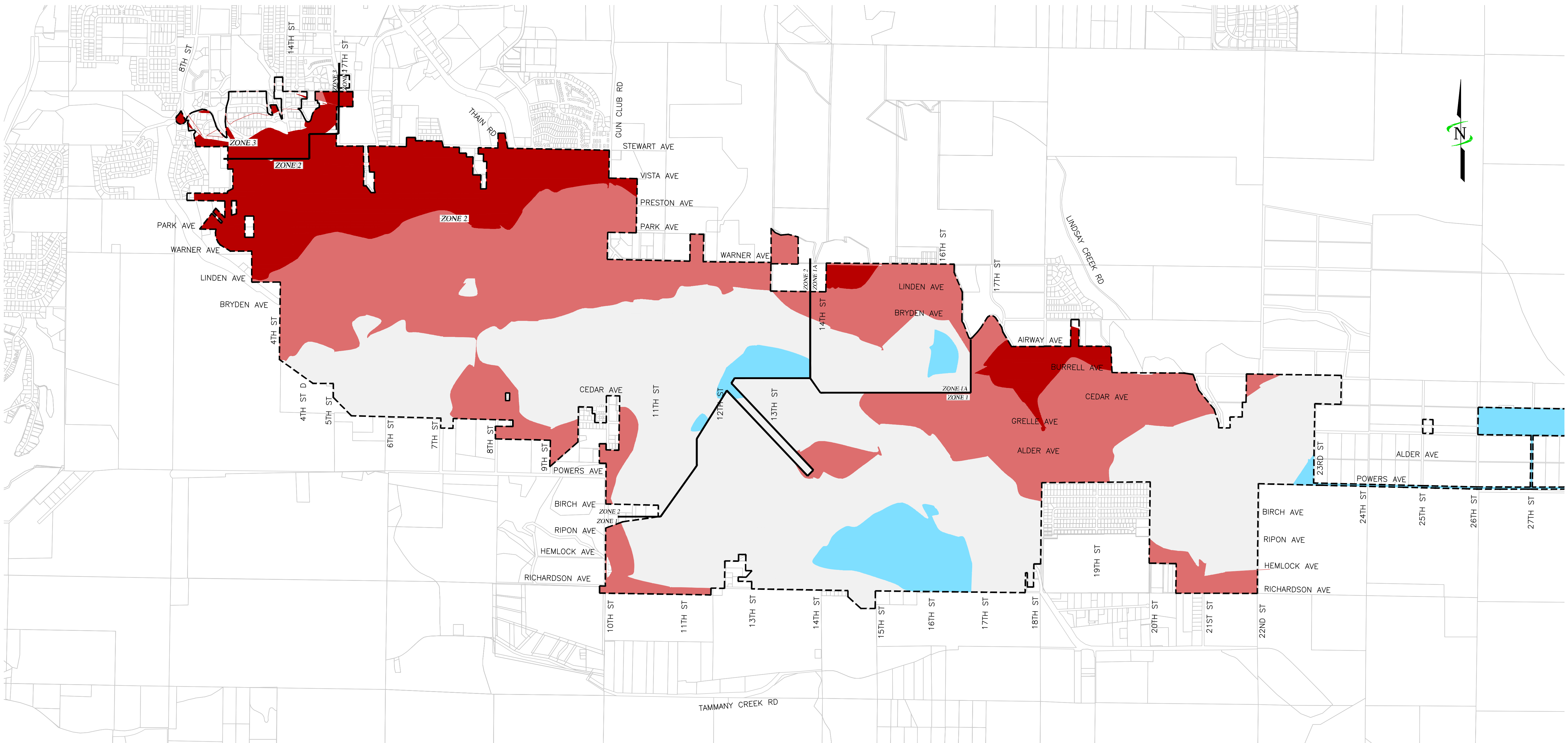
- Vineyards – Maintenance Issues – LOID should plan to move water mains out of alleys, as possible for future ease of replacement, repair and maintenance.

Fire Flow Recommendations

Figure 10-3 provides anticipated fire flows upon completion of the following as previously described:

- Parallel Transmission Main
- Bryden and Thain Upsize

As shown, although these upgrades increase the volume of available fire flows along the improved system backbone, fire flows in those areas serviced by 6-inch and smaller mains remain deficient. LOID should continue its aggressive maintenance and replacement program in the future to increase pipe sizes in these areas when possible.



LEGEND

- LOID IRRIGATION BOUNDARY
- PRESSURE ZONE BOUNDARY
- < 40 PSI
- 40 – 60 PSI
- 60–80 PSI
- 80 – 100 PSI
- > 100 PSI

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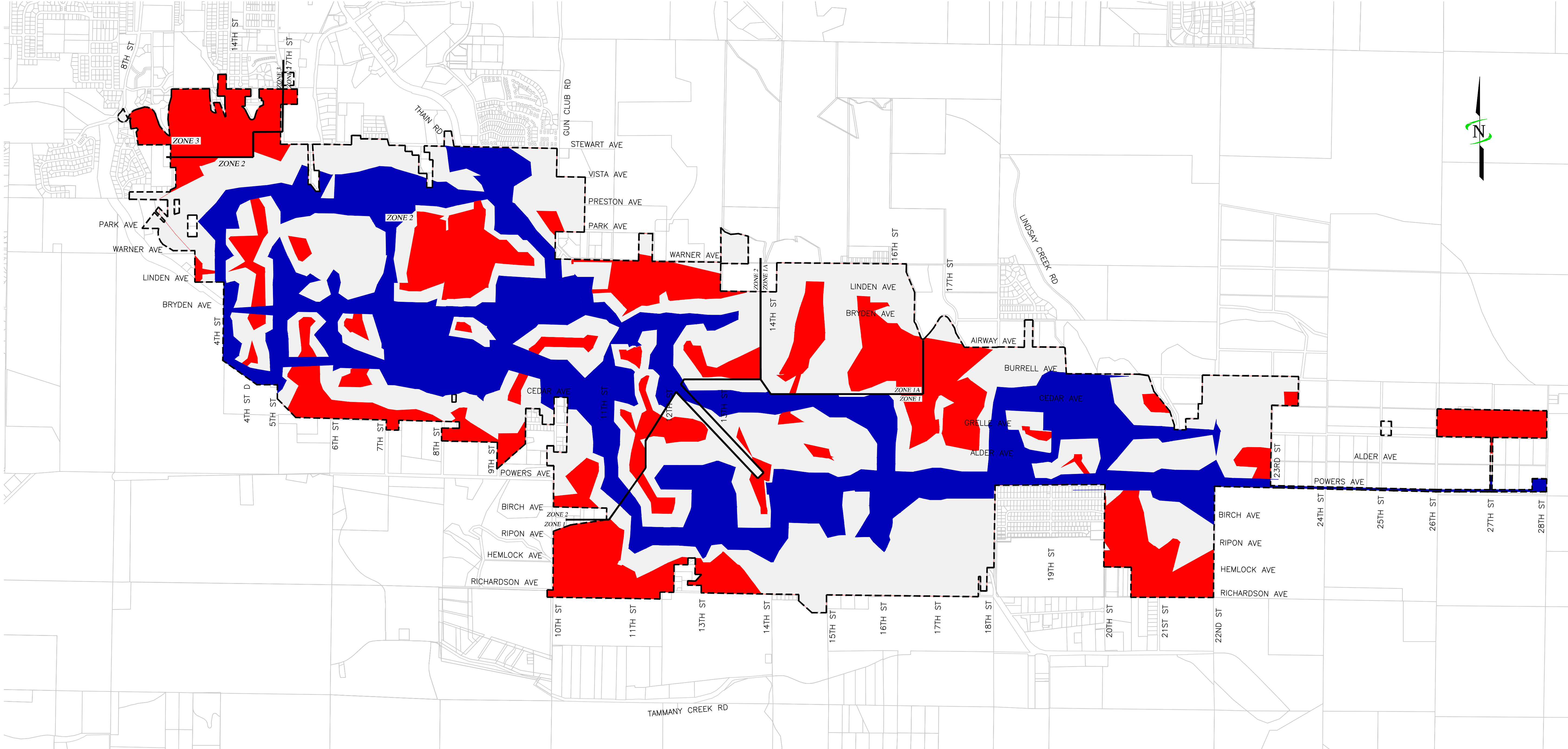
LAST UPDATED: 9/19/2012
PLOT DATE: 9/24/2012
FILE: IRR_BUILDOUT PRESSURE

Plot Date:9/24/2012 10:00 AM Plotted By: William Holder
Date Created 3/22/2010 \\LEWSFILES\PUBLIC\PROJECTS\21-07-001-LOID\21-07-001-DRA\DWG\MASTER PLAN\IRR FIGURES\IRR_BUILDOUT PRESSURE.DWG

LEWISTON ORCHARDS IRRIGATION DISTRICT
IRRIGATION MASTER PLAN

Figure 10-2
Irrigation Peek Hour Delivery Pressure



LEGEND

- LOID IRRIGATION BOUNDARY
- PRESSURE ZONE BOUNDARY
- < 1500 GPM
- 1500 < 3500 GPM
- > 3500 gpm

J-U-B Engineers • Surveyors • Planners

LAST UPDATED: 9/19/2012
PLOT DATE: 9/24/2012
FILE: IRR_BUILDOUT PRESSURE

Plot Date:9/24/2012 10:01 AM Plotted By: William Holder
Date Created: 3/22/2010 \\LEWSFILES\PUBLIC\PROJECTS\21-07-001-LOID\21-07-001-DRA\DWG\MASTER PLAN\IRR FIGURES\IRR_BUILDOUT PRESSURE.DWG

LEWISTON ORCHARDS IRRIGATION DISTRICT
IRRIGATION MASTER PLAN

Figure 10-3
Irrigation System Available Fire Flow at Max Day Demand (Build-out)

11. Operation and Maintenance

Introduction

A strong operations and maintenance program is vital to safeguard system infrastructure. Regular maintenance greatly reduces the necessity of expensive repairs and replacement of system components and equipment, and reduces problems associated with operation when a part of the system is not able to be used. Preventive maintenance contributes directly to the economical and operational efficiency of the system.

Most equipment within booster building and well houses requires periodic inspection, lubrication, and adjustment. As such, Operations and Maintenance personnel must establish a schedule for preventive maintenance and maintain good records to ensure that the maintenance is accomplished when required. A maintenance plan supported by management and carried out by LOID personnel will lead to a safe, well-operated, and reliable facility. Unscheduled or crisis maintenance is almost always a contributor to substandard facility operation, as well as costing more in the long term than routine preventive maintenance.

Recommendations

This scope of this study does not include an in-depth analysis of District operation and maintenance procedures; however, staff should endeavor to maintain the system based on generally accepted standards. Generally accepted maintenance procedures are provided in **Appendix P**, and include the following recommendations:

- Valve Exercising
- Flushing Pipelines
- Storage Tank Inspections
- Storage Tank Maintenance
- Routine Water Quality Monitoring
- Inspecting and Flushing Hydrants and Valves
- Maintaining Operating Pressure Range of Distribution System
- Tracking Unaccounted for Water
- Testing for Presence of Excess Biofilms
- Monitoring Corrosion

- Checking for Normal Mechanical Wear

While the provided list is not all-inclusive, it provides a reasonable starting point for the District to use as a self-assessment of their current operations and maintenance procedures.

Finally, as a dual water purveyor, LOID should establish a cross connection control program in an active, on-going effort to deliver safe water to all users. LOID currently uses purple pipe to distinguish non-potable vs. potable waste and closely monitors any service connection. Installation of main line (potable and non-potable) will meet minimum separation standards as described in IDAPA 58.01.

12. Domestic System Capital Improvement Plan

Introduction

Opinions of probable cost for improving LOID's water supply, storage, and distribution components are presented in this section for budgetary purposes. An attempt has been made to identify the improvement costs for immediate and planning year improvements. While an estimated year of construction is utilized to estimate equivalent uniform annual costs to finance the projects, capital infrastructure needs are based on system growth and changing needs. More accurate analysis and budget estimates should be prepared during the preliminary planning process as site locations and other design criteria are identified.

Planning level cost estimates are required to develop a Capital Improvement Plan for the District. The Association for the Advancement of Cost Engineering (AACE) has identified an expected accuracy range of cost estimates associated with different classes of project definition and design. As defined by AACE, Class 5 estimates, commonly associated with long-range capital planning, are typically within -35% to +65% of final project cost. Costs presented herein should therefore be utilized with caution, as the project definitions are not yet sufficient to yield a more accurate estimate. All costs are provided in 2018 dollars.

Financial

The District has an established history of utilizing self-financing Capital Projects based on user rates. In addition, the District charges new users a user buy-in fee. These fees are dependent on the pipe sizes for new services and an additional charge if an area desires to be annexed into the Domestic District. Fees are found on the LOID website, www.loid.net. Current rates are shown in **Table 12-1**.

Table 12-1: LOID Domestic Rates

Description	Cost ($)
Unit Charge	$13.34
Consumption	$2.40 / CCF*
Surplus Consumption	$3.60 / CCF
Connection Fee	$2,000 per connection

* CCF – One hundred cubic feet (748 gallons)

The objective of the buy-in fees is to cover initial infrastructure costs less cumulative depreciation. LOID will be preparing a rate study at the conclusion of the Master Plan to determine any rate adjustments needed to find future supply and storage needs.

Domestic System Capital Improvements

Table 12-2 provides summary of major capital improvements. Detailed opinions of probable costs for each project are presented in **Appendix Q.**

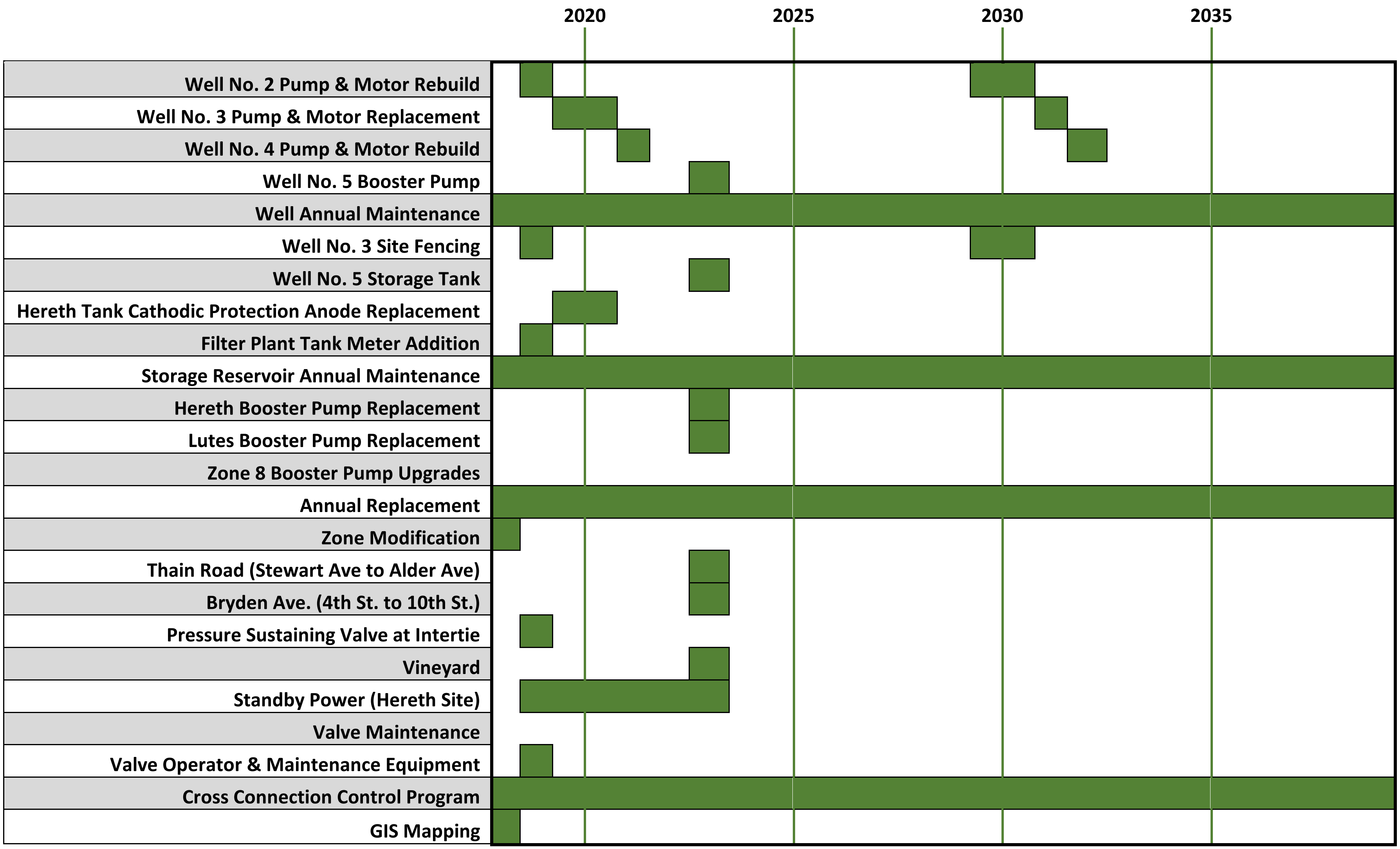
Table 12-2: Domestic System Major Capital Projects Summary

Item	Work Completed By	20-Year Total Capital Cost [A]
Supply		
Well No. 2 Pump & Motor Rebuild	Public Works Contractor [B]	$ 164,000
Well No. 3 Pump & Motor Replacement	Public Works Contractor [B]	$ 338,000
Well No. 4 Pump & Motor Rebuild	Public Works Contractor [B]	$ 378,000
Well No. 5 Booster Pump	Public Works Contractor [B]	$ 392,000
Well Annual Maintenance		$ 300,000
Well No. 3 Site Fencing	Public Works Contractor [B]	$ 10,700
Storage		
Well No. 5 Storage Tank	Public Works Contractor [B]	$ 1,500,000
Hereth Tank Cathodic Protection Anode Replacement	Public Works Contractor [B]	$ 25,000
Filter Plant Tank Meter Addition	Public Works Contractor [B]	$ 45,000
Storage Reservoir Annual Maintenance		$ 100,000
Booster Pump Stations		
Hereth Booster Pump Replacement	Public Works Contractor [B]	$ 101,000
Lutes Booster Pump Replacement	Public Works Contractor [B]	$ 203,000
Zone 8 Booster Pump Upgrades		
Distribution		
Annual Replacement		$ 10,000,000
Zone Modification	Public Works Contractor [B]	$ 475,000
Thain Road (Stewart Ave to Alder Ave)	Public Works Contractor [B]	$ 2,601,000
Bryden Ave. (4th St. to 10th St.)	Public Works Contractor [B]	$ 2,247,000
Pressure Sustaining Valve at Intertie	Public Works Contractor [B]	$ 1,000
Vineyard	Public Works Contractor [B]	$ 850,000
Well No. 5 to Zone 3	Public Works Contractor [B]	$978,000
Operation and Maintenance		
Standby Power (Hereth Site)	Public Works Contractor [B]	$ 556,000
Valve Maintenance		$ 980,000
Valve Operator & Maintenance Equipment	Public Works Contractor [B]	$ 33,000
Cross Connection Control Program		$ 1,960,000
GIS Mapping	Public Works Contractor [B]	$ 15,000

[A] Opinion of Probable Cost is presented in 2018 dollars. See **Appendix Q**.
[B] Opinion of Probable Cost for work completed by public works contractor includes contingency, engineering, and administrative fees.

The implementation schedule is presented in **Figure 12-1**.

Figure 12-1: Domestic System Contracted Projects Implementation Schedule [A]



[A] All dates are labelled only with beginning years, not entire duration, after 2023.

Rate Impact

The District does not have sufficient reserves to fund the major capital improvements listed in **Table 12-2** without a rate increase. The following scenarios were reviewed to capture the range of potential rate adjustments.

- Contracted Projects – Under this scenario, LOID would utilize a sinking fund to complete the major capital projects through a public works contractor. This scenario correlates with the highest rate impact.

- Debt Financed Plan – There would be no immediate rate impact with a debt financed plan, and the District would plan to run bonds as required to incur debt and finance future capital projects. This scenario results in the lowest immediate rate impact, although long-term it is more expensive to fund interest payments once debt is incurred.

- Self-Performance – All of the major capital projects identified in the Plan are associated with pipe replacement. Under this funding scenario, LOID would utilize its existing pipe replacement budget to complete these projects with LOID personnel. This scenario presents a middle ground rate impact which would avoid debt while drawing on existing budgets to mitigate the immediate rate impact.

A rate analysis was performed by LOID's Financial Director utilizing the Domestic System Capital Project Summary (**Table 12-2**) and Implementation Schedule (**Figure 12-1**). Rate increase of 4% - 7% each year over the next five (5) years will be needed to fund the recommendations in **Table 12-2**. These increases take into account utilizing LOID's designated investment funds.

13. Irrigation System Capital Improvement Plan

Introduction

Opinions of probable cost for improving LOID's water supply, storage, and distribution components are presented in this section for budgetary purposes. An attempt has been made to identify the improvement costs for immediate and planning year improvements. While an estimated year of construction is utilized to estimate equivalent uniform annual costs to finance the projects, capital infrastructure needs are based on system growth and changing needs. More accurate analysis and budget estimates should be prepared during the preliminary planning process as site locations and other design criteria are identified.

Planning level cost estimates are required to develop a Capital Improvement Plan for the District. The Association for the Advancement of Cost Engineering (AACE) has identified an expected accuracy range of cost estimates associated with different classes of project definition and design. As defined by AACE, Class 5 estimates, commonly associated with long-range capital planning, are typically within -35% to +65% of final project cost. Costs presented herein should therefore be utilized with caution, as the project definitions are not yet sufficient to yield a more accurate estimate. All costs are provided in 2012 dollars.

Financial

The District has an established history of utilizing self-financing Capital Projects based on user rates. In addition, the District charges new users a user buy-in fee. These fees are dependent on the pipe sizes for new services and an additional charge if an area desires to be annexed into the Domestic District. Fees are found on the LOID website, www.loid.net. Current rates are shown in **Table 13-1**.

Table 13-1: LOID Irrigation Rates

Description	Cost ($)
Unit Charge	$154.00 /unit/year
Acreage Charge	$215.00 / acre [A]

[A] Charged to the hundredth of one acre measured to the midline of the street

The objective of the buy-in fees is to cover initial infrastructure costs less cumulative depreciation. LOID will be preparing a rate study at the conclusion of the Master Plan to determine any rate adjustments needed to find future supply and storage needs.

Irrigation System Capital Improvements

Table 13-2 provides summary of major capital improvements. Detailed opinions of probable costs for each project are presented in **Appendix R.**

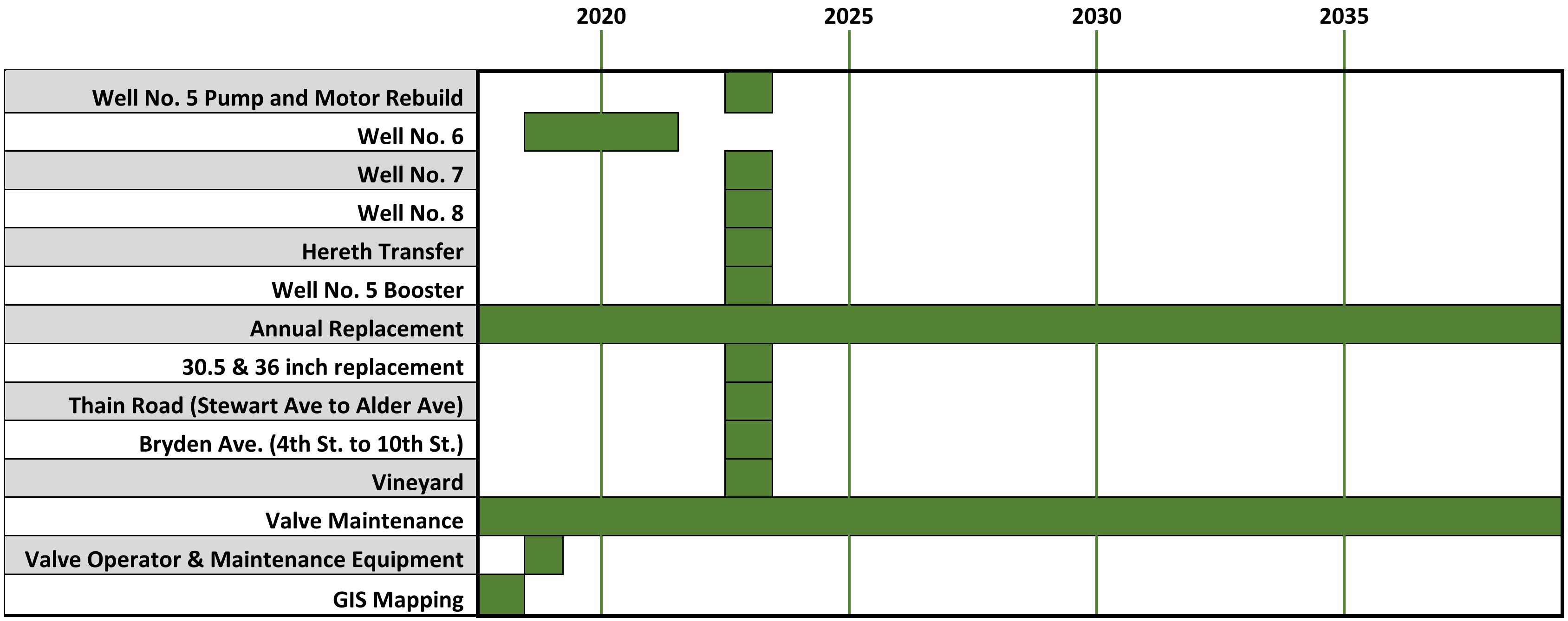
Table 13-2: Irrigation System Major Capital Projects Summary

Item	Work Completed By	20-Year Total Capital Cost [A]
Supply		
Well No. 5 Pump and Motor Rebuild	Public Works Contractor [B]	$ 234,000
Well No. 6	Public Works Contractor [B]	$ 7,294,000
Well No. 7	Public Works Contractor [B]	$ 7,294,000
Well No. 8	Public Works Contractor [B]	$ 7,294,000
Booster Pump Stations		
Hereth Transfer	Public Works Contractor [B]	$ 52,000
Well No. 5 Booster	Public Works Contractor [B]	$ 110,000
Distribution		
Annual Replacement		$ 10,000,000
30.5 & 36 inch replacement	Public Works Contractor [B]	$ 8,884,000
Thain Road (Stewart Ave to Alder Ave)	Public Works Contractor [B]	$ 2,601,000
Bryden Ave. (4th St. to 10th St.)	Public Works Contractor [B]	$ 2,092,000
Vineyard	Public Works Contractor [B]	$ 850,000
Operation and Maintenance		
Valve Maintenance		$ 980,000
Valve Operator & Maintenance Equipment	Public Works Contractor [B]	$ 33,000
GIS Mapping	Public Works Contractor [B]	$ 15,000

[A] Opinion of Probable Cost is presented in 2018 dollars. See **Appendix R**.
[B] Opinion of Probable Cost for work completed by public works contractor includes contingency, engineering, and administrative fees.

A rate analysis was performed by LOID's Financial Director utilizing the Irrigation System Major Capital Projects Summary (**Table 13-2**) and Implementation Schedule (**Figure 13-1**). Rate increases of 5% - 8% annually will be required to fund the recommendations in **Table 13.2**.

Figure 13-1: Irrigation System Contracted Projects Implementation Schedule [A]



[A] All dates are labelled only with beginning years, not entire duration, after 2023.

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15. Appendix

Appendix A – LOID/Reclamation Contracts

1947 Reclamation Contract

1949 Reclamation Contract Amendment

Appendix B – Well Driller's Log

Well No. 1

Well No. 2

Well No. 3

Well No. 4

Well No. 5

Appendix C – Pump and Motor Data

Well No. 2

Well No. 3

Well No. 4

Well No. 5

Hereth Booster

Hereth Transfer

Lutes Fire Pump

Lutes Booster Pumps

Lutes Transfer Pump

Appendix D – Well Water Rights

Appendix E – Lewiston Fire Department Letter

Appendix F – Irrigation Water Demand Calculations

Appendix G – Survey

Appendix H – LOID/City Intertie Information

Appendix I –Hydrant Testing and Field Notes

Domestic Hydrants

Irrigation Hydrants

Appendix J – Source Water Protection Plan

Appendix K – Domestic Storage Calculations

Appendix L – Power Cost Calculations

Appendix M – Well No. 5 Location Report

Appendix N – Not Used

Appendix O – Sanitary Survey

Appendix P – Operations and Maintenance Guide

Appendix Q – Domestic System Opinion of Probable Cost

Appendix R – Irrigation System Opinion of Probable Cost

Appendix S – Generator Addition Preliminary Study

Appendix A – LOID/Reclamation Contracts

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C O P Y

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Lewiston Orchards Project
Idaho

Repayment Contract Between the Lewiston Orchards Irrigation District and The United States

INDEX

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COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Lewiston Orchards Project
Idaho

Repayment Contract Between the Lewiston Orchards Irrigation District and The United States

THIS AGREEMENT, Made this 10th day of September, 1947, in pursuance of the Act of Congress approved June 17, 1902 (32 Stat. 388), and acts amendatory thereof or supplementary thereto, including Public Law No. 569 (79th Cong.), approved July 31, 1946, all of which acts are herein referred to as the Federal Reclamation Law, between THE UNITED STATES OF AMERICA, herein styled the United States, acting by and through the Assistant Secretary of the Interior, herein called the Secretary, and the LEWISTON ORCHARDS IRRIGATION DISTRICT, an irrigation district organized and existing under the laws of the State of Idaho, having its principal place of business at Lewiston, Nez Perce County, Idaho, herein styled the District;

WITNESSETH, That:

2. WHEREAS, the District has an irrigation system for the purpose of irrigating lands in the District, and a domestic water system in conjunction therewith for the purpose of supplying domestic water to the persons living on the lands in said District;

3. WHEREAS, the irrigation and domestic water systems of the District are such that adequate water for irrigation and adequate and pure water for domestic use cannot be supplied to lands in and served by the District;

4. WHEREAS, it is the desire of the District that the United States on a reimbursable basis shall construct such works as are necessary to the irrigation system in order to furnish irrigation water from the District sources of supply to the lands of the District, consisting of a gross acreage of approximately 3,490 acres, and to lands at present outside of but adjacent to the District, consisting of approximately 348 acres, and shall construct a domestic water treatment plant and distribution system to furnish domestic water to the c pants of said lands; and

5. WHEREAS, the United States is willing to undertake the construction of said irrigation works and domestic water facilities (herein referred to as the project) according to the terms and provisions of this contract as herein set forth;

NOW, THEREFORE, for and in consideration of the mutual and dependent stipulations herein set forth, it is hereby covenanted and agreed as follows:

UNITED STATES TO CONSTRUCT PROJECT;
LIMIT OF EXPENDITURE FOR CONSTRUCTION

6. (a) The United States will expend a sum not in excess of one million nine hundred and ninety thousand dollars ($1,990,000), or so much thereof as the Secretary deems necessary and expedient, toward the construction of works necessary to the irrigation system of the District, and the construction of a domestic water treatment and distribution system for the District, all as described in (b) hereof.

(b) The works to be constructed hereunder are to furnish irrigation water to a gross area of approximately 3,490 acres of land within the District and to approximately 348 acre of land situated in sections 7 and 8, township 35 north, range 5 west, Boise meridian, adjacent to the District on the northwest boundary thereof, and to treat and furnish domestic water to the occupants of such lands within and adjacent to the District; and, so far as such works are found by the Secretary to be feasible and necessary, will include the following:

(1) Concrete bench flume, headworks and sand trap to replace the existing wooden flumes, headworks and sand trap on Sweetwater Creek diversion canal;

(2) Concrete pipe siphon and Sweetwater Creek diversion canal to replace the existing chute and siphon which is of inadequate capacity;

(3) Diversion weir on Webb Creek to replace the existing timber crib structure;

(4) Steel pipe to replace the existing wooden flumes on Webb Creek diversion canal;

(5) Steel pipe irrigation distribution system to serve approximately 3,490 acres in the District, with mains of adequate capacity to permit the eventual extension of service by the District to approximately 348 acres of the project area adjoining the District on the northwest;

(6) Asbestos-cement pipe domestic water distribution system to serve the same area, with mains of adequate capacity to permit extension of service by the District to the adjoining acreage described, not including outlets or connections to pipes or facilities of individual water users; and

(7) Treating plant and clear water reservoir for the domestic water system.

The installation of outlets in the domestic water distribution system and the making of connections therefrom to the pipes or facilities of the individual water users is not a part of the work to be performed by the United States under this contract.

(c) Should it appear necessary or desirable to the Secretary, either before or during construction, the works mentioned and described by this article may be modified in design or location or works may be eliminated from or added to those mentioned and described above.

(d) When the Secretary notifies the District in writing that total expenditures have been made to the limit determined as provided in (a) of this article, the systems shall be deemed to have been completed within the meaning of this contract.

COST OF PROJECT TO BE REPAID BY DISTRICT

7. (a) The District will repay to the United States the total cost of the project, as determined by the Secretary, this total cost to comprise the costs of constructing the irrigation system and the domestic water system, and not to exceed one million nine hundred ninety thousand dollars ($1,990,000).

(b) Payment of the construction costs of the irrigation system shall be made in fifty (50) successive annual instalments, the first of which shall be due and payable on or before December 31 of the first full year following the year in which the irrigation system is substantially completed or in which construction work thereon is terminated if terminated before completion, each as determined and announced by the Secretary, or on or before December 31 of the first full calendar year following the termination of the development period should the Secretary fix such a period as provided in article 8.

(c) Payment of the construction costs of the domestic water system shall be made in fifty (50) annual instalments, the first of which shall be due and payable on or before December 31 of the first full year following the year in which the domestic water system substantially completed, or in which construction work thereon is terminated if terminated before completion, each as determined and announced by the Secretary.

(d) Pending the determination and announcement by the Secretary of the actual costs as provided in article 9(a) hereof, the estimated costs announced as provided in said article 9(a) shall constitute the basis for the annual instalments under this article. Each annual instalment under (b) and (c) above shall be, as nearly as practicable, one-fiftieth (1/50th) of such costs; provided, that, if the first instalment accruing is based on the Secretary's estimate of costs, the difference between that estimate and the actual obligation as finally determined and announced by the Secretary shall be spread equally, as nearly as practicable, over the instalments remaining unaccrued as of the time the actual obligation is determined and announced.

(e) Should the District so desire, the annual instalments under either (b) or (c) or both may be paid in two equal amounts, one to be paid on or before June 30 and one on or before December 31 of the year in which the total annual instalment accrues under this article.

DEVELOPMENT PERIOD MAY BE ESTABLISHED IN RELATION TO IRRIGATION FEATURES OF PROJECT

8. Upon the completion of the construction of the project, the Secretary may, in his discretion, fix a development period of not to exceed three (3) years for the irrigation features of the project. During said development period it will not be necessary for the District to make payments to the United States on the construction costs of the irrigation features of the project, but assessments over and above the amounts required to meet current expenses of the District chargeable to the irrigation system shall be made by the District in amounts approved by the Secretary to be used, among other things, for the establishment of the reserve required to be set up under the provisions of article 13.

STATEMENT OF COST TO BE FURNISHED BY THE SECRETARY

9. (a) Upon the completion of the works provided for in article 6 hereof or the termination of work thereon as determined by the Secretary, because of the failure of Congress to make the necessary appropriations therefor, or for other reasons, the Secretary shall furnish the District with a written statement of the estimated construction costs of said works, and thereafter as soon as the actual construction costs can be determined by the United States, a written statement of the same shall be furnished to the District by the

Secretary. All items of cost and expense referred to in article 10 hereof shall be included in said statements. The decision of the Secretary, as set out in said statement, as to the actual cost of the said works, will be final and conclusive and binding on all parties.

(b) In said statements the Secretary shall make a division of the costs between rrigation system and domestic water system and shall show the portion of the costs that is chargeable to the irrigation features of the project and the portion of the costs that is chargeable to the domestic water features of the project.

COMPUTATION OF COSTS

10. The construction costs which under this contract the District obligated itself to pay shall embrace all expenditures of whatsoever nature or kind in connection with, growing out of, or resulting from the work above described, including the cost of labor, material, equipment, engineering, legal work, superintendence, administration and overhead, right of way, property and damage of all kinds, and shall include all sums expended by the United States in surveys and investigations in connection with said project.

OPERATION AND MAINTENANCE OF PROJECT WORKS

11. (a) During the construction of the project, the District will continue to operate and maintain the portions of the project works that are not under construction, and will assume control of and operate and maintain any portion or unit of the project works upon completion of said portion or unit or on termination of work thereon, and on completion of the project or on the termination of work thereon, the District will operate and maintain the entire project. Should the District default in any manner in the performance of this contract and should it fail to correct said default after request in writing by the Secretary so to do, the United States may take charge and control of all or any part of the project and operate and maintain the same. Such operation and maintenance by the United States shall continue until the Secretary determines that the District is again capable of operating and maintaining all or any part of the project works then being operated and maintained by the United States and that all or a part of the project works should be retransferred to the District for operation and maintenance. When such determination is made, written notice thereof, together with the effective date of the retransfer, shall be given to the District; and the District shall accept the operation and maintenance of the portion of the project works thus retransferred on the effective date, and shall thereafter operate and maintain the same to the satisfaction of the Secretary.

(b) During the time any of the project works are operated and maintained by the United States, the cost of such operation and maintenance shall be paid annually in advance by the District to the United States. Such payments shall be on the basis of annual estimates made by the Secretary, these estimates to be on the basis of the fiscal year then employed by the District. Said annual estimate, hereinafter referred to as the operation and maintenance charge notice, shall contain a statement of the estimated cost of operation and maintenance to be incurred by the United States in the following fiscal year. Such operation and maintenance charge notice shall be furnished to the District on or before May 1 of the fiscal year preceding the fiscal year for which the notice is issued. When the United States takes over initially the operation and maintenance of any part of the project works, the Secretary shall give the District immediately:

(1) An operation and maintenance charge notice of the estimated amount of such charge from the time the United States started operating and maintaining said project works to the end of that fiscal year; and

(2) An operation and maintenance charge notice to cover the following fiscal year, where the initial taking over occurs after May 1 in any fiscal year.

(c) The District shall pay the amounts set out in any such operation and maintenance charge notice to be paid by the District on or before the date or dates as may be fixed by the Secretary, and shall without delay levy whatever special assessments or toll charges are necessary to raise the funds for payment of such amounts.

(d) Whenever in the opinion of the Secretary funds so advanced will be inadequate to operate and maintain the works being operated by the United States, he may give a supplemental operation and maintenance charge notice stating therein the amount of the District's share of the additional funds required, and the District shall advance such additional amount on or before the date specified in the supplemental notice. If funds advanced by the District under this article exceed the actual cost of operation and maintenance for such works for the year for which advanced, the surplus shall be credited on the operation and maintenance charge payment due for the succeeding year or in case there is no such payment due to the United States for the succeeding year, it shall be applied on the construction charge payment due for the succeeding year.

BASIS OF ASSESSMENT FOR IRRIGATION WATER;
BENEFITS TO BE APPORTIONED IN PROPORTION TO REPAYMENT ABILITY

12. (a) Operating units in single ownership in the project area to which irrigation water is to be provided hereunder vary in size from less than one acre to approximately cres. The majority of the units comprise less than five acres and are used primarily uburban residences rather than as self-sustaining farms. The per-acre value and benefits from reconstruction and rehabilitation of the irrigation system as herein provided are greater for these smaller sized operating units, and, consequently, the relative per-acre repayment ability thereof is greater.

(b) Taking account of the difference in relative per-acre repayment ability, as determined by the size of the operating unit in single ownership, in order equitably to apportion the benefits derived under this contract in accordance with the provisions of law relating thereto, the District shall make the annual assessments and charges for irrigation water on the following basis:

(1) There shall be established for each year a uniform charge for land in the District for which irrigation water is available from the project supply, herein called the assessable land, which charge shall be expressed as a rate per acre of assessable land; and

(2) There shall be established for each year a uniform operating unit charge for each operating unit, the amount of this charge to be sufficient, when taken together with the acreage charge provided in (1) above, to meet the requirements of article 13. The term "operating unit" shall mean at any given time:

(i) Each tract of land in the District occupied and operated by one person or other entity, either as owner or lessee, which person or entity does not have the right to possession of any other assessable lands in the District; and

(ii) Any two or more tracts of land in the District, whether or not contiguous, where the right to possession is in one person or other entity, either as owner or lessee, and where, as determined by the District's board of directors, the lands as a whole are being operated primarily for agricultural purposes.

Until otherwise established by the Secretary, the maximum rate per acre under (1) above the unit charge under (2) above shall be in this relationship:

The maximum rate under (1) shall not exceed five dollars and twenty-five cents ($5.25) during any year when the operating unit charge does not exceed twelve dollars ($12.00) per unit. In any year when the total annual costs for irrigation water would require assessments at rates exceeding the maximum fixed as above provided, the excess over the total of assessments based on those maximum rates shall be met as to half of such excess by increasing the uniform charge under (1) above, and the other half by increasing the unit charge under (2) above; unless the Secretary determines that the relative repayment ability of the various operating units requires a different distribution of this excess, and directs accordingly.

ASSESSMENTS TO BE LEVIED FOR IRRIGATION WATER
RESERVE FUND TO BE ESTABLISHED

13. (a) The District shall levy each year, as assessment or toll charges against the assessable lands of the District, amounts at least sufficient to provide funds to pay the annual instalment of the irrigation construction charge to become due in that year as provided in article 7, the annual operation and maintenance costs and all other charges, costs and expenses of the District allocated to the irrigation features of the project, including the obligations under article 16, increased by any deficit or decreased by any excess for the previous year. Levies hereunder shall be on the basis provided in article 12 against each operating unit in the District whether or not water is used.

(b) The annual charges to be collected by the District as provided in subsection (a) above shall include an annual amount of five hundred dollars ($500.00) for the accumulation of and the maintenance of a reserve fund which shall be in the sum of six thousand dollars ($6,000.00). Thereafter further annual charges shall be collected whenever, as of the time the amount of the annual assessment is fixed, the reserve fund has been reduced to an amount less than six thousand dollars ($6,000.00). Such fund shall be available only to meet the extraordinary and unforeseen costs of operation and maintenance and repair and betterments of the irrigation works which are determined by the Secretary to be excess of the normal operation and maintenance costs of such works. Such fund shall maintained by the District apart from other of its funds.

(c) Should it become necessary at any time for the District to make a supplemental levy after regular assessments or tolls have been levied, the supplemental levy shall also be made on the basis provided in article 12, with the same ratio between the uniform charge per acre and the operating unit charge as in the regular levy for that year, except that in no event shall the total uniform charge per acre in any one year exceed the maximum determined under article 12.

AMOUNT OF IRRIGATION WATER FURNISHED TO BE UNIFORM THROUGHOUT THE DISTRICT

14. The payment of the assessments mentioned in articles 12 and 13 shall entitle each assessable acre of land in the District to an irrigation water supply of not to exceed two and two-tenths (2.2) acre-feet, measured at the points of delivery to each operating unit. However, should it not be possible during any irrigation season to deliver this maximum amount, a lesser but uniform amount of irrigation water shall be established by the District Board as the maximum amount to be delivered to each assessable acre of land in the District. In fixing the amount of irrigation water to be furnished in any one year, the water supply, capacity of conduits, the needs of the domestic water system, and other matters affecting the delivery of water shall be considered. If the water supply in any year is adequate therefor, as determined by the District Board, water in excess of the maximum amount per assessable acre fixed by the District for that year may be supplied to any land in the project at rates per acre-foot to be established by the Board. The Board, in establishing such rates and by other appropriate methods, shall endeavor to secure the economical and beneficial use of irrigation water furnished by the District.

CHARGES FOR DOMESTIC WATER

15. (a) The District shall each year collect as a toll or charge from the users of domestic water an amount sufficient at least to pay the portion of the yearly payment on construction costs, the annual operation and maintenance cost and all other charges, costs and expenses of the District, including those mentioned in article 16 chargeable to the domestic water features of the District, increased by any deficit or decreased by any excess for the previous year.

(b) The charges to be collected by the District, as provided in subarticle (a) above, shall include an annual amount of five hundred dollars ($500.00) for the accumulation of and the maintenance of a domestic water system reserve fund, which fund shall be in the sum of six thousand dollars ($6,000.00). Thereafter, further amounts shall be collected whenever, as of the time the charges for domestic water for the next year are fixed, the reserve fund has been reduced to an amount less than six thousand dollars ($6,000.00). S[illegible]h fund shall be available only to meet the extraordinary and unforeseen costs of opera[illegible] and maintenance and repair and betterments of the domestic water system which are [illegible]ermined by the Secretary to be in excess of the normal operation and maintenance costs of such works. Such fund shall be maintained by the District apart from other of its funds

OVERHEAD, INSPECTION AND REPAIR CHARGES TO BE PAID BY THE DISTRICT

16. (a) On March 1 of each year, from the effective date of this contract until the District's construction cost obligations to the United States are repaid in full, the following costs shall be paid by the District to the United States for the calendar year ending on the preceding December 31:

(1) A cost to cover that part of the expense incurred by the United States in the operation of the office of the Chief Engineer and other detached offices of the Bureau of Reclamation, which in the opinion of the Secretary are properly and equitably chargeable to the District.

(2) The cost of all installations, repairs or maintenance by the United States of measuring and controlling devices and gauges under the provisions of article 26.

(3) The cost of all inspections under the provisions of article 29.

(4) The cost of repairs to the project works made by the United States under the provisions of article 28(c).

(5) The cost of all crop censuses and investigations under the provisions of article 30.

(6) Such other direct costs for special work performed for the benefit of the District or the project by the United States at the direction of the Secretary, and which in the opinion of the Secretary are for the use and benefit of the District.

(7) The costs incident to the transfer of the title to the project works to the United States under the provisions of article 27, including costs of abstracts or title reports and recording fees.

(b) The first payment under this article shall be due and payable on the first of March of the second year after the completion of the project or termination of work thereon, and shall cover the first year after the completion of the project or termination of work thereon, but the determinations of costs hereunder shall not include such items of cost that have accrued and for which the District has made other arrangements for payment or satisfaction.

(c) As soon as said costs are ascertainable each year, the Secretary shall give District a statement of the same and in each such statement shall inform the District as to the portion of the said costs chargeable to the irrigation system and the portion chargable to the domestic water system.

(d) In the event that due to lack of appropriations by the Congress, there are no funds available with which to do the work herein covered by subparagraphs (1), (2), (3), (4), (5), (6), and (7) of sub-section (a) of this article, and for which the District agrees to pay as herein provided, the District will pay to the United States in advance the estimated costs of such work as determined by the Secretary. In the event that such costs, as determined by the Secretary, are less than the funds advanced, appropriate credit shall be given upon such payments thereafter coming due under this article as the Secretary determines to be proper.

DISTRICT TO ENFORCE PAYMENT OF AMOUNTS DUE FOR IRRIGATION WATER AND DOMESTIC WATER

17. (a) The District will cause to be levied and collected all necessary assessments and charges for irrigation water and all necessary tolls and charges for domestic water, and will use all the power and resources of the District to meet the obligations of the District to make all payments to be made to the United States pursuant to the provisions of this contract in full on or before the day the same b ecome due, including, in regard to irrigation water, the taxing power of the District, the power to withhold delivery of water and to foreclose tax liens on lands in the District, and including, in regard to domestic water, the power to impose penalties not to exceed twelve per cent (12%) per annum for failure to pay before delinquency and to establish and foreclose liens.

(b) The District Board shall each year make a reasonable estimate of probable delinquencies in collections based upon past experience, and in regard to irrigation water shall levy assessments, tolls or other charges sufficiently large against lands in the District to collect and pay to the United States in full the amounts agreed upon in this contract on or before the dates when the same are due, taking into consideration the discount for prompt payment provided by the laws of the State of Idaho, and in regard to domestic water shall make charges and tolls sufficiently large to collect and pay to the United States full the amounts agreed upon in this contract on or before the dates when the same are due, and to secure the funds to meet the annual operation and maintenance costs, notwithstanding any individual delinquency which may occur in the payment of any district assessments, tolls, or other charges for either irrigation or domestic water.

(c) No irrigation water shall be delivered to any lands as to which payments due on account of the District's construction cost obligation to the United States are in arrears more than twelve months or as to which advance payments for operation and maintenance charges are in arrears.

GENERAL OBLIGATIONS OF THE DISTRICT

18. The District's obligations hereunder are general obligations under which the District as a whole is obligated to pay to the United States the full amount or amounts herein agreed upon according to the terms stated, notwithstanding any individual default in the payments to the District, and notwithstanding the failure of the District to collect from the irrigation water users or the domestic water users for any year an amount sufficient to pay the proportionate amount of the construction costs, operation and maintenance costs, and all other costs and expenses of the District that the District endeavors to collect from the users of irrigation water and from the users of domestic water.

INTEREST UPON DELINQUENT PAYMENTS

19. Every instalment or charge required to be paid to the United States under this contract, and which shall remain unpaid after it shall have become due and payable, shall bear interest at the rate of one-half of one per cent (1/2%) per month from the date of delinquency. The District shall impose on delinquencies in the payment of assessments, taxes or other charges levied by the District to meet its obligations under this contract, such penalties as it is authorized to impose under the laws of the State of Idaho.

PERFORMANCE OF WORK WITH CONTRIBUTED FUNDS

20. (a) Pursuant to the Act of March 4, 1921 (41 Stat. 1367, 1404), the United States, its option, may perform with funds contributed by the District any construction or maintenance work within the authority of the District but which is not otherwise provided for by this contract. If the United States determines that it will undertake any such work, funds therefor shall be advanced by the District as directed by the Secretary. The advance shall be accompanied by a certified copy of a resolution of the District's board of directors

describing the work to be done and authorizing its performance by the United States with the District's funds.

(b) After completion of any work so undertaken, the United States shall furnish District with a statement of the cost of the work done. Any unexpended balance of the s advanced will be refunded to the District or applied as otherwise directed by the District; and the amount by which the cost of such work exceeds the amount of funds advanced therefor shall be paid by the District to the United States as the Secretary may direct.

DELIVERY OF WATER

21. The District (and the United States, while it is operating and maintaining the projec works) will operate the project works to the end of making available to each assessable acre of land in the District during each irrigation season that quantity of irrigation water to which it is entitled as provided in article 14, and to the end of making ample domestic water available at all times at each connection or point of service on the domestic water distribution system.

DELIVERY OF WATER OUTSIDE OF DISTRICT

22. Except for approximately 348 acres of land adjacent to the District referred to in article 6 and except for deliveries being made to lands having valid rights to such service that antedate this contract, no water for either irrigation or domestic use shall be furnished to land outside of the District without the written approval of the Secretary. However, before water is furnished to the said 348 acres of land for either irrigation or domestic use, the terms on which the District will furnish such water shall be approved by the Secretary.

WATER TO BE DELIVERED TO NOT MORE THAN 160 ACRES UNDER THE OWNERSHIP OF ANY ONE PERSON

23. Pursuant to the provisions of the Federal Reclamation Law, no part of the irrigation water supply furnished through the project works constructed or reconstructed by the United States under this contract shall be delivered to more than one hundred sixty (160) acres in the ownership of any one person.

ALL WATER RIGHTS TO BE ACQUIRED BY THE DISTRICT

24. Should any additional water rights be needed to supply an adequate amount of irri-on and domestic water for water users in the District, the same shall be acquired by the District at its expense, and the District shall take such steps as may be deemed necessary by the Secretary to perfect its present water rights and to keep the same in good standing.

UNITED STATES NOT LIABLE FOR WATER SHORTAGE

25. On account of accidents, failure of the power supply, drought, inaccuracy in distribution, hostile diversion, prior or superior claims, or other causes, it is expected that there will occur at times a shortage in the quantity of water which will be available through the project works. In no event, however, whatsoever the cause, shall any liability accrue against the United States, or any of its officers, agents or employees from the damage, direct or indirect, arising from such shortage. Nor shall the payments to the United States provided for herein be reduced because of any such shortage or damage. Nor shall the United States be liable for any pollution of the domestic water or the failure of said domestic water to meet the requirements of the Health Department of the State of Idaho pertaining to domestic water.

MEASURING AND GAUGING DEVICES TO BE MAINTAINED BY DISTRICT

26. The District shall, at its own cost and expense, install and maintain to the satisfaction of the Secretary all necessary measuring and controlling devices needed in relation to the operation of the project works and also all measuring, controlling and gauging devices needed for a proper record of the water supply and a proper regulation of the same. Should the District fail to install and maintain such devices to the satsifaction of the Secretary, the United States may install and maintain the same or any part thereof and the cost and expense incident thereto shall be paid by the District as provided in article 16 hereof.

TITLE TO PROJECT WORKS

27. Title to all of the present irrigation system and domestic water system of the District, including all reservoirs, rights of way and all other appurtenances, shall be conveyed to the United States. Title to all project works constructed, reconstructed or repaired in ordance with this contract shall be and remain vested in the United States and all rights way and other property or rights hereafter acquired by the District shall be conveyed to the United States.

ACCEPTANCE OF CARE OF PROJECT WORKS

28. (a) The District will accept the possession of the project works that are reconstructed or constructed by the United States. The District shall keep said works and all other project works and property in good repair, and shall operate and maintain the same deliver water therefrom to lands within the District only in such a manner that the project works will remain in as good and efficient condition and of equal capacity for the diversion and distribution of water, both irrigation and domestic, as of the date of the acceptance of said property by the District and in full compliance with the provisions of this contract, the laws of the United States and the State of Idaho, and with the regulations of the Secretary now or hereafter made pursuant to the Federal Reclamation Law and the terms of this contract.

(b) The District shall hold the United States harmless from any claim for damages, injuries or claims of any other nature arising from the operation and maintenance of the project works by the District.

(c) Should the District fail at any time to repair and maintain any part of the project works while title to the same is in the United States, the United States may, after giving the District ten (10) days' notice to do such repair and maintenance work and its failure to undertake the same within that time, perform the repair and maintenance work which the United States deems necessary, and shall be reimbursed by the District for all costs and expenses incident thereto.

INSPECTION OF PROJECT WORKS

29. The Secretary may cause to be made from time to time a reasonable inspection of the project works for the purpose of ascertaining whether the terms of this contract are being carried out by the District. Such inspection shall include examinations of the project works and of the books, records and papers of the District, together with examinations in the office of the Bureau of Reclamation of all contracts, papers, plans, records and programs connected with said project works. The actual costs as determined by the Secretary of such inspection shall be charged to the District, which determination of costs shall be conclusive and binding on the District.

CROP REPORTS AND CENSUS

30. (a) The District shall keep an accurate record of all crops raised and agricultural livestock products produced on land in the District. The District shall furnish the United States on or before December 31 of each year a report on such crops, agricultural and livestock products, the report to be in the form prescribed by the United States.

(b) At such times as the Secretary deems it necessary or desirable, he may cause a crop census to be taken, and an investigation of the per-acre income to be made, of all or any part of the lands in the District, but such census and investigation shall not be taken oftener than once each calendar year. Such a census and investigation shall be for the purpose of checking the crop reports furnished to the United States by the District and of furnishing an independent source of information as to crops produced and crop returns from the lands in the District. In connection with such a census or investigation, the Secretary may require information to be given under oath. The cost of such crop census and investigation shall be paid by the District as provided by article 16.

BOOKS, RECORDS AND REPORTS

31. The District shall: (1) install and maintain a modern accounting system, to be acceptable to the Secretary, showing all financial transactions of the District, including a separate accounting system for the income and expenditures in relation to both the irrigation and comestic water systems, and furnish such financial statements and reports as may be required from time to time by the Secretary; and (2) keep such other records as the Secretary may request, in the manner and form he may desire, and submit such reports based thereon as he may require from time to time.

ACCESS TO BOOKS AND RECORDS

32. Subject to applicable Federal laws and regulations, the secretary of the District or his representative shall have full and free access at all reasonable times to the project accounting records and supporting documents of the Bureau of Reclamation relating to the construction, operation and maintenance of the project and the status of the accounts concerning the District's payments of construction and operation and maintenance charges and any other charge or charges due from the District to the United States, with the right at any time during office hours to make copies thereof. Subject to applicable state laws and regulations, the proper representatives of the United States shall have similar rights with respect to the accounts and records of the District.

COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Lewiston Orchards Project,
Idaho

Supplemental Repayment Contract between the Lewiston Orchards
Irrigation District and the United States

THIS AGREEMENT, Made this 2nd day of February, 1949, in pursuance of the Act of Congress approved June 17, 1902 (32 Stat. 388) and acts amendatory thereof or supplementary thereto, including the Act of Congress approved July 31, 1946 (60 Stat. 717), all of which acts are commonly known and referred to as the Federal Reclamation Law, between THE UNITED STATES OF AMERICA, herein styled the United States, acting by and through the Assistant Secretary of the Interior, herein called the Secretary, and the LEWISTON ORCHARDS IRRIGATION DISTRICT, an irrigation district organized and existing under and by virtue of the laws of the State of Idaho, having its principal place of business at Lewiston, Nez Perce County, Idaho, herein styled the District;

WITNESSETH THAT:

2. WHEREAS, the District is obligated as provided in contract of September 10, 1947, herein referred to as the 1947 contract, identified by Symbol No. Ilr-1502, to pay not to exceed $1,990,000 of the moneys spent in the construction of the irrigation and domestic water systems of the District (herein called the project), and it has become desirable to redefine the works to be constructed by the United States, and necessary to increase this maximum obligation to $2,500,000; and

3. WHEREAS, the parties desire to extend the possible term of the development period provided by the 1947 contract; and

4. WHEREAS, the parties desire to amend and correct some provisions of the 1947 contract with respect to the location of lands adjacent to the District for which works will be constructed;

NOW, THEREFORE, in consideration of the mutual and dependent stipulations herein forth, it is hereby covenanted and agreed as follows:

Maximum Obligation

5. The 1947 contract is hereby amended by substituting for the words and figures, "one million nine hundred and ninety thousand dollars ($1,990,000)", the words and figures, "two million five hundred thousand dollars ($2,500,000)", wherever the said words and figures "one million nine hundred and ninety thousand dollars ($1,990,000)" appear in articles 6 and 7 of the 1947 contract or in any other article of the 1947 contract.

Revised Article 6(b)

6. Subsection (b) of article 6 of the 1947 contract is hereby amended to read as follows:

"(b) The works to be constructed hereunder are to furnish irrigation water to a gross area of 3,490 acres of land within the District and to approximately 348 acres of land situated in Sections 7, 8, 9, 16, 17 and 18, Township 35 North, Range 5 West, Boise Meridian, adjacent to the District, and to treat and furnish domestic water to the occupants of said lands within and adjacent to the District; and, so far as such works are found by the Secretary to be feasible and necessary, will include the following:

(1) Concrete bench flume, headworks and sand trap to replace the existing wooden flumes, headworks and sand trap on Sweetwater Creek diversion canal;

(2) Sweetwater Creek concrete chute and pipe siphon to replace the existing chute and siphon of insufficient capacity;

(3) Diversion weir on Webb Creek to replace the existing timber crib structure;

(4) Concrete pipe to replace the existing wooden flumes on Webb Creek diversion canal.

(5) Steel pipe irrigation distribution system to serve approximately 3,490 acres in the District, with mains of adequate capacity to permit the eventual extension of service by the District to approximately 348 acres of the project area adjoining the District, including the installation of meter boxes on the property line of each operating unit and the interconnection of the main supply line with Reservoir "A";

(6) Asbestos-cement pipe domestic water distribution system to serve the same area, with mains of adequate capacity to permit extension of service by the District to the adjoining acreage described, including installing domestic service connections from the mains to the property lines and installing meter boxes on the property lines.

(7) Treating plant and clear water reservoir for the domestic water system.

The installation of the meters and the making of connections therefrom to the pipes or facilities of the water users is not a part of the work to be performed by the United States under this contract."

Revised Development

7. Article 8 of the 1947 contract is hereby amended by substituting for the words and figures, "three (3) years", the words and figures, "five (5) years", where the said words and figures, "three (3) years", appear in article 8 or in any other article of the 1947 contract.

Revised Article 36(b)

8. Subsection (b) of article 36 of the 1947 contract is hereby amended to read as follows:

"(b) The consent of the Secretary is hereby given to the inclusion within the District of approximately 348 acres of land referred to in Article 6."

Confirmation Required

9. The execution of this contract shall be authorized or ratified by the qualified electors of the District at an election held for that purpose. The District, after the election upon the execution of this contract, will proceed promptly to secure a final decree of proper court of the State of Idaho, approving and confirming this contract and making and adjudging it to be a lawful, valid and binding obligation of the District. The District shall furnish certified copies of such confirmation proceedings and decrees to the United States.

Status of 1947 Contract

10. Except as amended hereby, the 1947 contract shall remain in full force and effect.

Contingent on Appropriations or Allotment of Funds

11. The expenditure of any money or the performance of any work by the United States herein provided for, which may require appropriations of money by Congress or the allotment of Federal funds, shall be contingent on such appropriations or allotments being made The failure of Congress to appropriate funds, or the failure of any allotment of funds, shall not, however, relieve the District from any obligations theretofore accrued under this contract, nor give the District the right to terminate this contract as to any of its executory features. No liability shall accrue against the United States ~~in~~ case such funds are not so appropriated or allotted.

Officials Not to Benefit

12. No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this contract or to any benefit that may arise herefrom, but this restriction shall not be construed to extend to this contract if made with a corporation or company for its general benefit.

IN WITNESS WHEREOF, the parties hereto have signed their names the day and year first above written.

THE UNITED STATES OF AMERICA

By /s/ William E. Warne
Assistant Secretary of the Interior

(' L)

Attest:

Wilbur C. Kelley /s/
Secretary

LEWISTON ORCHARDS IRRIGATION DISTRICT

By /s/ Bert Schroeder
President of its Board of Directors

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Appendix B – Well Driller's Log

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Well No. 1

1. WELL OWNER

Name Lewiston Orchard Irrigation District

Address 1520 Powell Ave. Lewiston, Idaho

Owner's Permit No. Appl. # 85-146

2. NATURE OF WORK

85-78-N-16

☒ New well ☐ Deepened ☐ Replacement

☐ Abandoned (describe method of abandoning)

3. PROPOSED USE

☐ Domestic ☒ Irrigation ☐ Test ☐ Other (specify type)

☐ Municipal ☐ Industrial ☐ Stock ☐ Waste Disposal or Injection

4. METHOD DRILLED

☐ Cable ☒ Rotary ☐ Dug ☐ Other

5. WELL CONSTRUCTION

Diameter of hole 12-1/4"-22"-20" inches Total depth 1520 feet

Casing schedule: ☒ Steel ☐ Concrete

Thickness		Diameter		From		To	
3/8	inches	24	inches +	0	feet	33	feet
3/8	inches	16	inches	0	feet	1003	feet
3/8	inches	8	inches	994	feet	1520	feet
	inches		inches		feet		feet
	inches		inches		feet		feet

Was casing drive shoe used? ☒ Yes ☐ No

Was a packer or seal used? ☒ Yes ☐ No

Perforated? ☒ Yes ☐ No

How perforated? ☒ Factory ☐ Knife ☐ Torch

Size of perforation 1/8 inches by 2-1/2 inches

Number		From		To	
8 slots/ft	perforations	994	feet	1496	feet
	perforations		feet		feet
	perforations		feet		feet

Well screen installed? ☐ Yes ☒ No

Manufacturer's name

Type Model No.

Diameter Slot size Set from feet to feet

Diameter Slot size Set from feet to feet

Gravel packed? ☐ Yes ☒ No Size of gravel

Placed from feet to feet

Surface seal depth 33 Material used in seal: ☒ Cement grout ☐ Puddling clay ☐ Well cuttings

Sealing procedure used: ☒ Slurry pit ☐ Temporary surface casing ☐ Overbore to seal depth

6. LOCATION OF WELL

Sketch map location must agree with written location. 85

N W E

Subdivision Name Lewiston Orch. Irrigation District Tract No. 4

Lot No. 3 Block No. 64

7. WATER LEVEL

Static water level 835 feet below land surface.

Flowing? ☐ Yes ☒ No G.P.M. flow

Temperature °F. Quality

Artesian closed-in pressure p.s.i.

Controlled by: ☐ Valve ☒ Cap ☐ Plug

8. WELL TEST DATA

☒ Pump ☐ Bailer ☐ Other

Discharge G.P.M.	Drawdown	Hours Pumped
550	146'	2.5 hrs.

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
22	0	70	Basalt		X
22	70	75	Clay		X
22	75	85	Basalt		X
22	85	90	Clay		X
22	90	155	Basalt		X
22	155	160	Clay		X
22	160	275	Basalt		X
22	275	450	Clay		X
22	450	470	Basalt		X
22	470	480	Clay ~~Basalt~~		X
22	480	520	Basalt		X
22	520	535	Clay		X
22	535	600	Basalt Clay		X
20	600	620	Basalt		X
20	620	635	Clay		X
20	635	650	Basalt		X
20	650	670	Basalt	X	
20	670	740	Basalt		X
20	740	770	Basalt	X	
20	770	825	Basalt		X
20	825	870	Basalt	X	
20	870	920	Basalt		X
20	920	945	Basalt	X	
20	945	960	Basalt		X
20	960	1000	Basalt	X	
12-1	1000	1040	Basalt		X
12	1040	1080	Basalt	X	
12	1080	1160	Basalt		X
12	1160	1200	Basalt	X	
12	1200	1250	Basalt		X
12	1250	1280	Basalt	X	
12	1280	1375	Basalt	X	
12	1375	1425	Basalt	X	
12	1425	1500	Basalt	X	
12	1500	1520	Basalt		X

NOTE; Water Indication only determined by mud loss-No test was made to determine water availabili until well completion.

WEJ

RECEIVED JUL 24 Department of Water Resources Northern District Office

RECEIVED MAY 8 1978 Department of Water Resources Northern District Office

011070

10.

Work started 11-7-77 finished 2-3-78

11. DRILLERS CERTIFICATION

Firm Name Layne-Western Co. Inc. E. E. Luhdorff Div. Firm No. 109

Address P.O. Box 336, Moses Lake Date 4-28-78

Well No. 1

1. WELL OWNER

Name Lewiston Orchards Irrg Dist.

Address 1520 Powers Ave, Lewiston ID

Owner's Permit No. ALT-0289

2. NATURE OF WORK

85-78-N-16-1

☐ New well ☒ Deepened ☐ Replacement

☐ Abandoned (describe method of abandoning) ____

3. PROPOSED USE

☐ Domestic ☐ Irrigation ☐ Test ☒ Municipal

☐ Industrial ☐ Stock ☐ Waste Disposal or Injection

☐ Other ____ (specify type)

4. METHOD DRILLED

☐ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary

☐ Cable ☐ Dug ☐ Other ____

5. WELL CONSTRUCTION

Casing schedule: ☐ Steel ☐ Concrete ☐ Other ____

Thickness	Diameter	From	To
____ inches	____ inches +	____ feet	____ feet
____ inches	____ inches	____ feet	____ feet
____ inches	____ inches	____ feet	____ feet
____ inches	____ inches	____ feet	____ feet

Was casing drive shoe used? ☐ Yes ☐ No

Was a packer or seal used? ☐ Yes ☐ No

Perforated? ☐ Yes ☐ No

How perforated? ☐ Factory ☐ Knife ☐ Torch

Size of perforation ____ inches by ____ inches

Number	From	To
____ perforations	____ feet	____ feet
____ perforations	____ feet	____ feet
____ perforations	____ feet	____ feet

Well screen installed? ☐ Yes ☐ No

Manufacturer's name ____

Type ____ Model No. ____

Diameter ____ Slot size ____ Set from ____ feet to ____ feet

Diameter ____ Slot size ____ Set from ____ feet to ____ feet

Gravel packed? ☐ Yes ☐ No ☐ Size of gravel ____

Placed from ____ feet to ____ feet

Surface seal depth ____ Material used in seal: ☐ Cement grout ☐ Puddling clay ☐ Well cuttings

Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing ☐ Overbore to seal depth

Method of joining casing: ☐ Threaded ☐ Welded ☐ Solvent Weld ☐ Cemented between strata

Describe access port ____

6. LOCATION OF WELL

Sketch map location must agree with written location.

Subdivision Name ____

W E

7. WATER LEVEL

Static water level 830 feet below land surface.

Flowing? ☐ Yes ☒ No G.P.M. flow ____

Artesian closed-in pressure ____ p.s.i.

Controlled by: ☐ Valve ☐ Cap ☐ Plug

Temperature ____ °F. Quality ____

8. WELL TEST DATA

☐ Pump ☐ Bailer ☐ Air ☐ Other ____

Discharge G.P.M.	Pumping Level	Hours Pumped

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
	1520	1525	Med hard fractured brown basalt		
	1525	1530	Hard grey basalt		
	1530	1560	Med hard - grey black basalt		
	1560	1568	Red cinders - porous	X	
	1568	1575	brown blue grey, some porous some fractures		
	1575	1578	brown basalt		
	1578	1615	hard dense black basalt		
	1615	1620	Fractured, porous, brown basalt	X	
	1620	1625	" " black "		
	1625	1629	Heavily fractured grey black basalt w/ blue seams		
	1629	1635	rough, Fractured black and brown broken basalt		
	1635	1708	med hard black grey basalt some fractures		
	1708	1730	porous red soft basalt	X	
	1730	1735	" dark red " "		
	1735	1740	black soft basalt some porous		
	1740	1795	med soft black basalt		

Cut casing of 1249' & removed ≅ 250' of 8" perf. liner out of hole & reamed it from 12" to 15" from 1020 to 1249. When we moved on the hole we drilled through 4-5' of concrete, then drilled thru 15' of steel that had been cemented in place. A camara was ran when the 8" casing was pulled & there was a piece of pipe 2"x2' & a flat bar 1/4"x2'x2" on the outside of the 8" casing. These had been left or lost by the previous driller. We did not fish these out. Pipe at 1755' and bar at 1249'. Dick ? ?E said to leave it in hole

10.

Work started 5/26/82 finished 7/1/82

11. DRILLERS CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name Leach Well Dr. Firm No. 97

Address 821 W Broadway Date 7/21/82

Well No. 2

1. WELL OWNER

Name Lewiston Orchard Irrigation District

Address 1520 Powers Avenue
Lewiston, Idaho 83501

Owner's Permit No. 85-86-N-3

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning) ______

3. PROPOSED USE

☐ Domestic ☒ Irrigation ☐ Test ☒ Municipal
☐ Industrial ☐ Stock ☐ Waste Disposal or Injection
☐ Other ______ (specify type)

4. METHOD DRILLED

☒ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other ______

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other ______

Thickness	Diameter	From	To
.375 inches	20 inches	+ 0 feet	60 feet
.375 inches	16 inches	+ 3 feet	520 feet
.380 inches	13 3/8 inches	508 feet	1376 feet
inches	inches	feet	feet

Was casing drive shoe used? ☒ Yes ☐ No
Was a packer or seal used? ☐ Yes ☐ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation ______ inches by ______ inches

Number	From	To
perforations	feet	feet
perforations	feet	feet
perforations	feet	feet

Well screen installed? ☐ Yes ☒ No
Manufacturer's name ______
Type ______ Model No. ______
Diameter ___ Slot size ___ Set from ___ feet to ___ feet
Diameter ___ Slot size ___ Set from ___ feet to ___ feet
Gravel packed? ☐ Yes ☒ No ☐ Size of gravel ______
Placed from ______ feet to ______ feet
Surface seal depth 60' Material used in seal: ☒ Cement grout ☐ Puddling clay ☐ Well cuttings
Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing ☐ Overbore to seal depth
Method of joining casing: ☐ Threaded ☐ Welded ☐ Solvent Weld
☐ Cemented between strata
Describe access port ______

6. LOCATION OF WELL

MICROFILMED

Sketch map location must agree with written location.

N

W E

Subdivision Name MAR 14 1988

7. WATER LEVEL

Department of Water Resources

Static water level 192 feet below land surface.
Flowing? ☐ Yes ☒ No G.P.M. flow ______
Artesian closed-in pressure ______ p.s.i.
Controlled by: ☐ Valve ☐ Cap ☐ Plug
Temperature ______ °F. Quality good

8. WELL TEST DATA

Pg 1 of 2

Test by others
☐ Pump ☐ Bailer ☐ Air ☐ Other ______

Discharge G.P.M.	Pumping Level	Hours Pumped

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
24	0	17	sandy loam		
	17	22	broken basalt		
	22	36	gray basalt (hard)		
	36	51	black basalt broken		
17½	51	153	gray basalt		
	153	226	black & gray basalt		
	226	417	black basalt w/ clay		
	417	455	gray basalt lost cir.		
	455	498	lost circulation area		
			cem. back to 340' SWL 150'		
	498	520	gray basalt (hard)		
14 3/4	520	564	gray & black basalt		
	564	629	black basalt		
	XXXXXX				
	629	727	black basalt w/ clay		
	729	773	gray & blacl basalt		
	773	782	gray basalt		
	782	851	black basalt		
	851	908	gray & black basalt		
	908	1356	black basalt		
	1356	1376	gray basalt		
12¼	1376	1443	gray & black basalt		
	1443	1543	black & brown basalt		
	1543	1606	gray & black basalt		
	1606	1780	soft red-brown basalt	X	
TD	1780	1959	soft red-brown basalt	X	

G112[illegible]

16" casing cemented fron 520' tosurface, w/ 175 sacks-using float shoe thru injection line. 13 3/8 casing from 508' to 1376' w/ 175 sacks using float shoe and injection line.

10.

Work started 5/02/86 finished 8/05/86

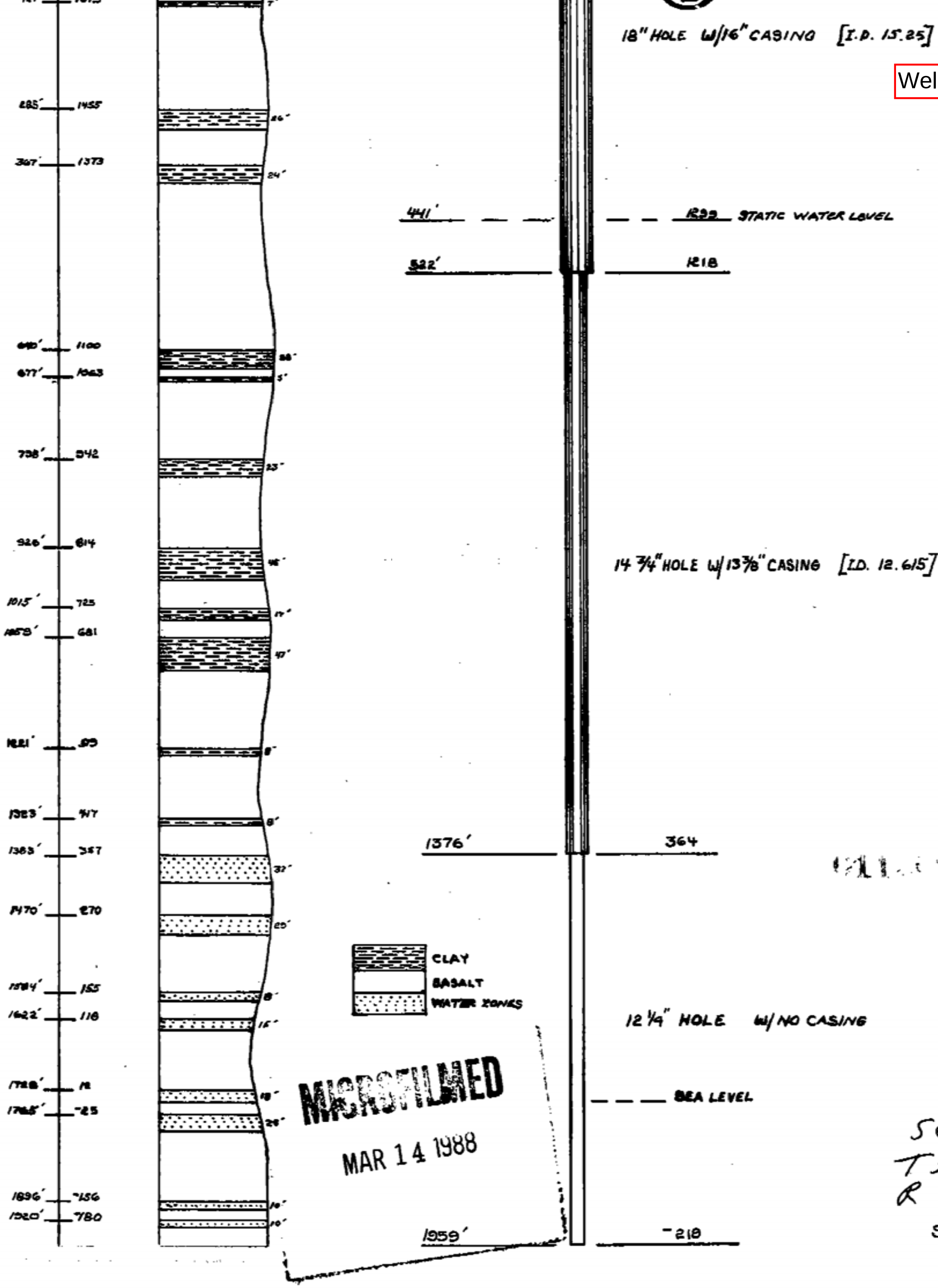
11. DRILLERS CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name Holman Drilling Corp. Firm No. 108

E. 3410 Ninth Avenue

Well No. 2



Sec 17
T35 N
R 4 W

S.F. 8/

Well No. 2

WELL AND AQUIFER TEST REPORT

LEWISTON ORCHARDS IRRIGATION DISTRICT

CONTRACTOR	PUMP MANUFACTURER	PROJECT	DATE
Jimmie Brock "Layne" Pasco, Wa.	Layne	Well #2 Test Pump	Sept. 16-17,1986
TYPE OF PUMP	**TYPE OF METER**	**DEPTH OF PUMP**	**ELEV-TOP OF HOLE**
12T Layne 9 Stage 4000 GPM Rating	12" Micrometer Flow Meter	700 Feet	1740 Feet MSL

DATA ON FLOW TEST

STATIC WATER LEVEL 393' Depth - Begin

TEST NO.	TIME START OF TEST	TIME END OF TEST	ELAPSED TIME MIN.	METER START OF TEST	METER END OF TEST	TOTAL WATER USED GAL.	WATER FLOW GALLONS PER. MINUTE
1	9/16 10:30 AM	9/17 11:45 AM	1515			1190800	400-800
2	9/17 11:45 AM	9/18 8:00 AM	1218	- Recovery test			0

DATA ON AQUIFER TEST

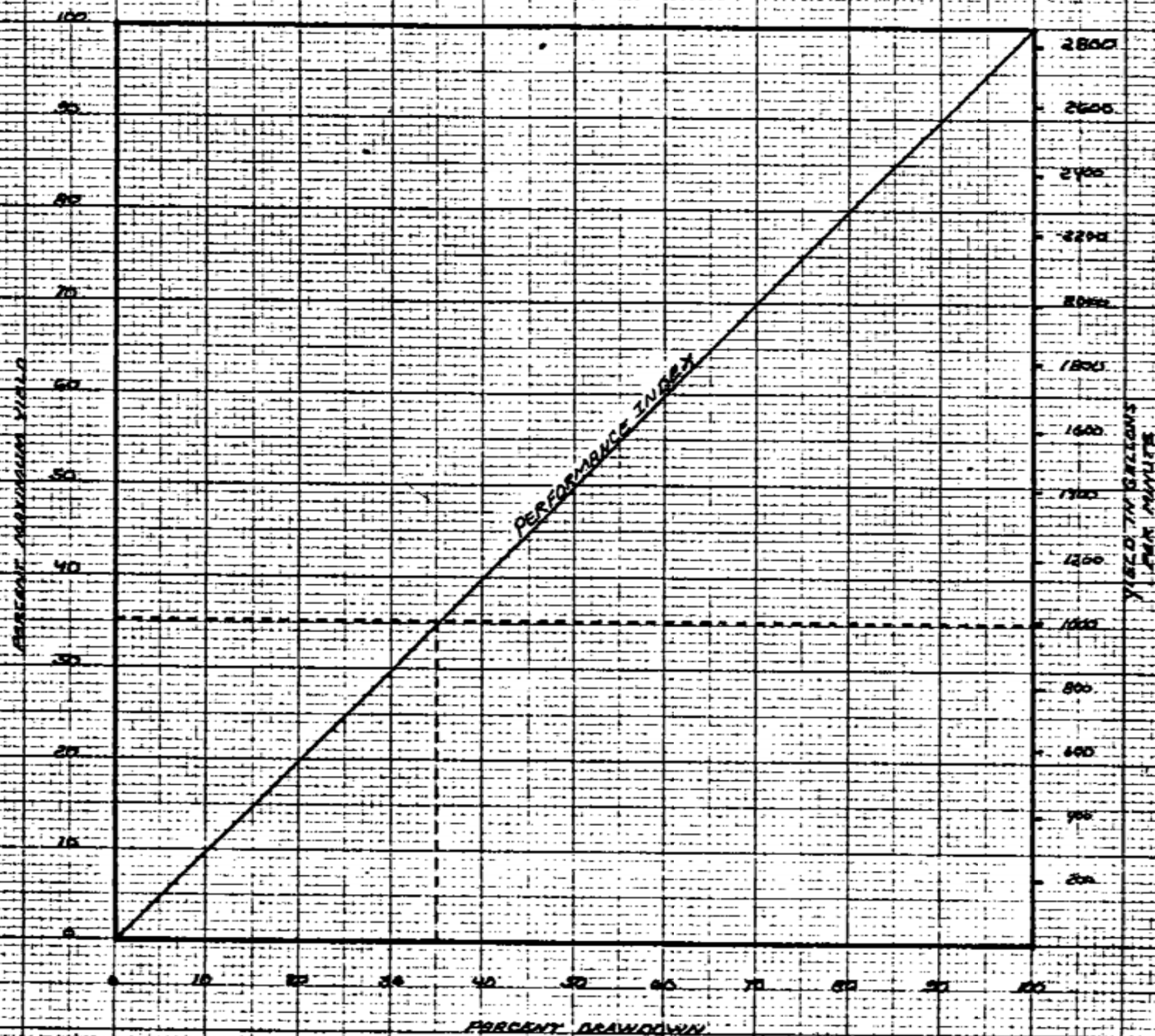
STATIC WATER LEVEL 441.2' -End

PUMPING DRAWDOWN				RESIDUAL DRAWDOWN		
TIME SINCE PUMP STARTED IN MINUTES	GAUGE READING P.S.I.	DRAWDOWN IN FEET	G.P.M.	TIME SINCE PUMP STOPED IN MINUTES	GAUGE READING P.S.I.	WATER-LEVEL RECOVERY (RESIDUAL) IN FEET
0	130 lbs.	0	0	1	28 lb.	57.8'
4	65	149.5'	400	2	58	127.1'
6	59	163.7'	400	3	96	214.8'
30	59	163.7'	400	4	100	224.1'
33	38	212.2'	600	5	102	228.7'
40	37	214.5'	600	10	106	237.9'
45	33	223.8'	600	20	108	242.6'
50	35	213.1'	600	60	109	244.9'
60	33	223.8'	600	375	109	244.9'
61	6	286.1'	800	1,095	109	244.9'
71	4	290.8'	800			
81	4	290.8'	800			
1,515	3	293.1'	800			

Sec 17
T 35N R 4W

Well No. 2

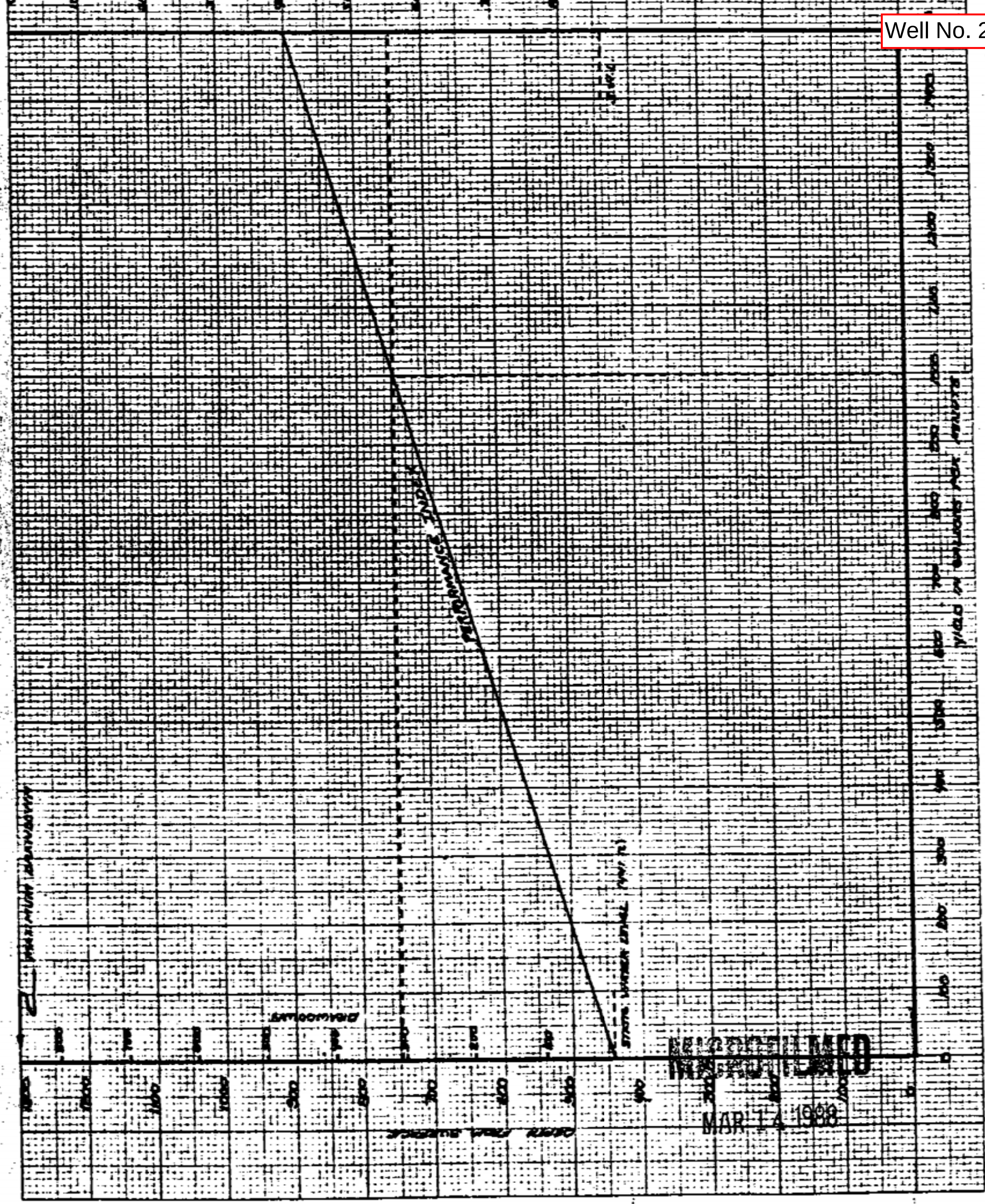
SPECIFIC CAPACITY .... 3.3 GPM PER Ft. DRAWDOWN
MAXIMUM DRAWDOWN .... 858.8 Ft.
MAXIMUM YIELD .... 2,834 GPM



20 Squares to the Inch

Sec 17 T 35 N R 4 W

Well No. 2



85-86-N-3 Sec 17 N T ~~35N~~
R4W

Well No. 3

Form 238-7
3/95 NOV 18 1997

NORTHERN REGION
IDWR

POSTED

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Use Typewriter or Ballpoint Pen

096324

Office Use Only
Inspected by J Carlson
Twp____ Rge____ Sec____
____1/4 ____1/4 ____1/4
Lat: : : Long: : :

1. DRILLING PERMIT NO. 85-97-N-0024-000
Other IDWR No. WELL TAG D 0003071

WR 85-07638

2. OWNER:
Name LEWISTON ORCHARDS IRRIGATION DIST
Address 1520 POWERS AVE
City LEWISTON State ID Zip 83501

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

Twp. 35 North ☒ or South ☐
Rge. 5 East ☐ or West ☒
Sec. 10, SW 1/4 SE 1/4 SW 1/4 (10 acres, 40 acres, 160 acres)
Gov't Lot ____ County NEZ PERCE
Lat: : : Long: : :
Address of Well Site 15TH ST + WARNER AVE City LEWISTON ID
(Give at least name of road + Distance to Road or Landmark)
Lt.______ Blk.______ Sub. Name______

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other______

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other______

6. DRILL METHOD
☐ Air Rotary ☐ Cable ☒ Mud Rotary ☐ Other REVERSE AIR ROTARY

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
				PRESSURE
NEAT CEMENT	0	119	180 SKS	GROUTED
NEAT CEMENT	0	1020	594 SKS	FROM BOTTOM
NEAT CEMENT	1390	1430	9 SKS	TO SURFACE

Was FLOAT shoe used? ☒Y ☐N Shoe Depth(s) 119-1020-1430
Was drive shoe seal tested? ☐Y ☒N How?______

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
20"	+1	119	.375	STEEL	☒	☐	☒	☐
16"	+3	1020	.375	STEEL	☒	☐	☒	☐
13 3/8	1000	1430	.330	STEEL	☐	☒	☒	☐

Length of Headpipe N/A Length of Tailpipe N/A

9. PERFORATIONS/SCREENS
☒ Perforations Method MILL CUT
☐ Screens Screen Type______

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
1035	1055	1/4 x 3	480	13 3/8	STEEL	☐	☒
1130	1150	1/4 x 3	480	13 3/8	STEEL	☐	☒
1215	1235	1/4 x 3	480	13 3/8	STEEL	☐	☒
1250	1270	1/4 x 3	480	13 3/8	STEEL		X
1375	1395	1/4 x 3	480	13 3/8	STEEL		X

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
675 ft. below ground Artesian pressure N/A lb.
Depth flow encountered 1035-2360 Describe access port or control devices: 2" PIPE WITH 2" PLUG

11. WELL TESTS:
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
500	122	797	4 HRS
1270	268	943	72 HRS
1540	337	1012	80 HRS

Water Temp. 78° Bottom hole temp. 99°
Water Quality test or comments: GOOD
Depth first Water Encountered 1035

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
24	0	5	LOESS BRN		X
24	5	25	BASALT GRY		X
24	25	32	CLAY BRN + GRY		X
24	32	114	BASALT GRY		X
24	114	120	BASALT + CLAY BRN	X	
18 1/2	120	227	BASALT GRY		X
18 1/2	227	425	BASALT + CLAY GRY		X
18 1/2	425	539	BASALT GRY		X
18 1/2	539	555	BASALT BRN + GRY		X
18 1/2	555	570	BASALT GRY		X
18 1/2	570	627	BASALT GRY TO PURPLE		X
18 1/2	627	630	CLAYSTONE GRN		X
18 1/2	630	648	BASALT GRY		X
18 1/2	648	668	CLAYSTONE GRN + GRY		X
18 1/2	668	922	BASALT GRY		X
18 1/2	922	934	BASALT GRY TO RED		X
18 1/2	934	960	BASALT GRY	X	
18 1/2	960	978	BASALT GRY		X
18 1/2	978	982	BASALT GRY TO BLU	X	
18 1/2	982	1020	BASALT GRY		X
14 3/4	1020	1058	BASALT GRY + RED	X	
14 3/4	1058	1123	BASALT GRY		X
14 3/4	1123	1137	BASALT MAROON + GRY 72°	X	
	1137	1200	BASALT GRY		X
	1200	1213	BASALT MAROON + GRY		X
	1213	1232	BASALT GRY		X
	1232	1270	BASALT MAROON + GRY	X	
	1270	1360	BASALT GRY		X
	1360	1385	BASALT MAROON PORUS 73°	X	
	1385	1430	BASALT GRY		X
12 1/4	1430	1468	BASALT GRY		X
12 1/4	1468	1492	BASALT GRY + RED	X	
			CONTINUED ON SHEET # 2		

Completed Depth 2617 (Measurable)
Date: Started 7-7-97 Completed 10-20-97

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name HOLMAN DRILLING CORP Firm No. 108

Firm Official Donald E. Holman Date 11-17-97
and
Supervisor or Operator Donald E. Holman Date 11-17-97
(Sign once if Firm Official & Operator)

SWSESW 10 35N 5 SHEET 1 OF 2

FORWARD WHITE COPY TO WATER RESOURCES

RECEIVED

Form 238-7
3/95

NOV 1 8 1997

NORTHERN REGION
IDWR

PAGE 2 of 2

Well No. 3

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT
Use Typewriter or Ballpoint Pen

096325

Office Use Only
Inspected by J Carlson
Twp ____ Rge ____ Sec ____
____1/4 ____1/4 ____1/4
Lat: : : Long: : :

1. DRILLING PERMIT NO. 85-97-N-0024-000

Other IDWR No. WELL TAG D 000 3471

WR 85-07638

2. OWNER:

Name LEWISTON ORCHARDS IRRIGATION DIST

Address 1520 POWERS AVE

City LEWISTON State ID Zip 83501

3. LOCATION OF WELL by legal description:

Sketch map location must agree with written location.

Twp. ____ North ☐ or South ☐
Rge. ____ East ☐ or West ☐
Sec. ____, ____1/4 ____1/4 ____1/4 (10 acres, 40 acres, 160 acres)
Gov't Lot ____ County ____
Lat: : : Long: : :
Address of Well Site ____ City ____
(Give at least name of road + Distance to Road or Landmark)

Lt. ____ Blk. ____ Sub. Name ____

4. USE:
☐ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK check all that apply (Replacement etc.)
☐ New Well ☐ Modify ☐ Abandonment ☐ Other ____

6. DRILL METHOD
☐ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other ____

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD

Was drive shoe used? ☐ Y ☐ N Shoe Depth(s) ____
Was drive shoe seal tested? ☐ Y ☐ N How? ____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Length of Headpipe ____ Length of Tailpipe ____

9. PERFORATIONS/SCREENS
☐ Perforations Method ____
☐ Screens Screen Type ____

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
						☐	☐
						☐	☐
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:

____ft. below ground Artesian pressure ____lb.
Depth flow encountered ____ft. Describe access port or control devices: ____

11. WELL TESTS:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time

Water Temp. ____ Bottom hole temp. ____
Water Quality test or comments: ____
Depth first Water Encountered ____

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
12 1/4	1492	1524	BASALT GRY		X
	1524	1546	BASALT GRY + BRN 74°	X	
	1546	1569	BASALT BRN		X
	1569	1624	BASALT GRY + BRN 76.3°	X	
	1624	1674	BASALT GRY		X
	1674	1804	BASALT BRN + GRY 76°	X	
	1804	1830	BASALT GRY		X
	1830	1888	BASALT GRY PORUS 76.8°	X	
	1888	1965	BASALT GRY		X
	1965	2028	BASALT GRY + BRN		X
	2028	2213	BASALT GRY		X
	2213	2242	BASALT GRY FRACTURED 77°	X	
	2242	2312	BASALT GRY		X
	2312	2333	BASALT GRY + RED		X
	2333	2349	BASALT GRY		X
	2349	2360	BASALT GRY CLINKERY 80°	X	
	2360	2617	BASALT GRY 78°		X

ALL CASING AND LINER WERE GROUTED WITH NEAT CEMENT USING CEMENT FLOAT SHOES AND INJECTION LINE FROM SURFACE

Completed Depth 2617 (Measurable)
Date: Started 7-7-97 Completed 10-20-97

13. DRILLER'S CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name HOLMAN DRILLING CORP Firm No. 108

Firm Official Donald E. Holman Date 11-17-97

and

Supervisor or Operator Donald E. Holman Date 11-17-97

(Sign once if Firm Official & Operator)

SWSESW 10 25 ... SHEET # 2 OF 2

FORWARD WHITE COPY TO WATER RESOURCES

DE: 1-16-03 85

Well No. 4

Form 238-7
11/97

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only
Inspected by ______
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat: : : Long: : :

1. WELL TAG NO. D 0022736
DRILLING PERMIT NO. 784458
Other IDWR No. WATER RIGHT No. 85-15356

2. OWNER:
Name LEWISTON ORCHARDS IRRIGATION DIST.
Address 1520 POWERS AVE
City LEWISTON State ID Zip 83501

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

N / W / E / S (X in NW section of sketch grid)

Twp. 35 North ☒ or South ☐
Rge. 05 East ☐ or West ☒
Sec. 22, NW 1/4 NE 1/4 NW 1/4 (10 acres / 40 acres / 160 acres)
Gov't Lot ____ County NEZ PERCE
Lat: : : Long: : :
Address of Well Site 1520 POWERS AVE.
City LEWISTON
(Give at least name of road + Distance to Road or Landmark)

Lt.______ Blk.______ Sub. Name ______

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ______

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other ______

6. DRILL METHOD
☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other ______

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
CEMENT	0	265	330 SKS	TREMMIE
CEMENT	856	866	20 SKS	TREMMIE

Was drive shoe used? ☐ Y ☒ N Shoe Depth(s) ______
Was drive shoe seal tested? ☐ Y ☐ N How? ______

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
20"	0	457	.375	STEEL	☒	☐	☒	☐
18"	444'	866	.375	STEEL	☒	☐	☒	☐
16"	SEE ATTACHED				☐	☐	☐	☐

Length of Headpipe ______ Length of Tailpipe ______

9. PERFORATIONS/SCREENS
Perforations Method ______
Screens Screen Type CARBON STEEL

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
SEE ATTACHED						☐	☐
						☐	☐
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
845 ft. below ground Artesian pressure ____ lb.
Depth flow encountered ______ ft. Describe access port or control devices: ______

11. WELL TESTS:
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
1000+GPM	N/A	N/A	4 HRS
DRILL STEM AT 1600'			

Water Temp. 76°F - 81° Bottom hole temp. 81°F
Water Quality test or comments: ______
Depth first Water Encounter 1026

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	N
			SEE ATTACHED SHEET		

RECEIVED
JAN 13 2003
Department of Water Resources

Completed Depth 1625 FEET (Measurable)
Date: Started 9/12/02 Completed 12/16/02

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name GEO-TECH EXPLORATIONS Firm No. 610
Firm Official [signature] Date 1/8/03
and
Driller or Operator [signature] Date 1-8-03
(Sign once if Firm Official & Operator)

FORWARD WHITE COPY TO WATER RESOURCES

Well No. 4

Geo-Tech Explorations, Inc.
19700 SW Teton
Tualatin, OR 97062
Ph: (503) 692-6400, Fax: (503) 692-4759

Well Name:	Lewiston Orchards Irrigation District Well No. 4
Well Tag No.	[redacted]
Drilling Permit #	784458
Well ID #	355519
Water Right No.	85-15356

Bore Dia.	From	To	LITHOLOGIC LOG	Water Yes	Water No
24"	0	2	Fill Rock		x
" "	2	3	Top Soil		x
" "	3	18	Silty Clay, Brown, some gravels		x
" "	18	60	Basalt weathered fractured		x
" "	60	76	Clay brown sticky		x
" "	92	260	Basalt fractured medium		x
" "	260	265	Basalt fractured lenses of shale black coal like		x
20"	265	283	Basalt fractured lenses of shale black coal like		x
" "	283	310	Basalt fractured with gray claystone		x
" "	310	320	Basalt medium		x
" "	320	371	Claystone soft green some tan		x
" "	371	396	Basalt cuttings rounded gray with clay foam color brown to green		x
" "	396	423	Med soft cuttings same as above foam color brown		x
" "	423	456	Extremely soft holding back on bit cuttings same as above foam color brownish		x
" "			gray. Large chunks of gray claystone on bit when removed. Caving problems		x
" "			from 230' to 456'		x
" "	456	465	Basalt vesicular black		x
" "	465	487	Basalt gray to black medium		x
" "	487	492	Basalt vesicular black		x
" "	492	640	Basalt fractured black		x
" "	640	680	Claystone brown		x
" "	680	701	Basalt broken weathered		x
" "	701	735	Basalt fractured black		x
" "	735	759	Basalt gray hard		x
" "	759	767	Basalt vesicular black		x
" "	767	837	Basalt fractured black		x
" "	837	866	Basalt fractured black some red		x
18"	866	952	Basalt black		x
" "	952	963	Basalt black with brown claystone		x
" "	963	988	Basalt black fractured		x
" "	988	1028	Basalt black		x
" "	1028	1049	Basalt black with brown scoria	x	
" "	1049	1060	Basalt black		x
" "	1060	1110	Basalt black with brown		x
" "	1110	1168	Basalt black		x
" "	1168	1182	Basalt black with brown scoria	x	
" "	1182	1208	Basalt black		x
" "	1208	1229	Basalt black with gray		x
" "	1229	1246	Basalt black with brown scoria	x	
" "	1246	1252	Basalt black		x
" "	1252	1264	Scoria black		x
" "	1264	1266	Basalt black with gray		x
12"	1266	1390	Basalt black with gray		x
" "	1390	1415	Scoria brown	x	
10"	1417	1577	Basalt black		x
" "	1577	1601	Basalt black with brown	x	
" "	1601	1625	Basalt black		x

Well No. 4

Geo-Tech Explorations, Inc.
19700 SW Teton
Tualatin, OR 97062
Ph: (503) 692-6400, Fax: (503) 692-4759

Well Name:	Lewiston Orchards Irrigation District Well No. 4
Well Tag No.	D0022736
Drilling Permit #	784458
Well ID #	355519
Water Right No.	85-15356

Bore Dia.	From	To	LITHOLOGIC LOG	Water Yes	Water No
24"	0	2	Fill Rock		x
" "	2	3	Top Soil		x
" "	3	18	Silty Clay, Brown, some gravels		x
" "	18	60	Basalt weathered fractured		x
" "	60	76	Clay brown sticky		x
" "	92	260	Basalt fractured medium		x
" "	260	265	Basalt fractured lenses of shale black coal like		x
20"	265	283	Basalt fractured lenses of shale black coal like		x
" "	283	310	Basalt fractured with gray claystone		x
" "	310	320	Basalt medium		x
" "	320	371	Claystone soft green some tan		x
" "	371	396	Basalt cuttings rounded gray with clay foam color brown to green		x
" "	396	423	Med soft cuttings same as above foam color brown		x
" "	423	456	Extremely soft holding back on bit cuttings same as above foam color brownish		x
" "			gray. Large chunks of gray claystone on bit when removed. Caving problems		x
" "			from 230' to 456'		x
" "	456	465	Basalt vesicular black		x
" "	465	487	Basalt gray to black medium		x
" "	487	492	Basalt vesicular black		x
" "	492	640	Basalt fractured black		x
" "	640	680	Claystone brown		x
" "	680	701	Basalt broken weathered		x
" "	701	735	Basalt fractured black		x
" "	735	759	Basalt gray hard		x
" "	759	767	Basalt vesicular black		x
" "	767	837	Basalt fractured black		x
" "	837	868	Basalt fractured black some red		x
18"	868	952	Basalt black		x
" "	952	963	Basalt black with brown claystone		x
" "	963	988	Basalt black fractured		x
" "	988	1028	Basalt black		x
" "	1028	1049	Basalt black with brown scoria	x	
" "	1049	1060	Basalt black		x
" "	1060	1110	Basalt black with brown		x
" "	1110	1168	Basalt black		x
" "	1168	1182	Basalt black with brown scoria	x	
" "	1182	1208	Basalt black		x
" "	1208	1229	Basalt black with gray		x
" "	1229	1246	Basalt black with brown scoria	x	
" "	1246	1252	Basalt black		x
" "	1252	1264	Scoria black		x
" "	1264	1266	Basalt black with gray		x
12"	1266	1390	Basalt black with gray		x
" "	1390	1415	Scoria brown	x	
10"	1417	1577	Basalt black		x
" "	1577	1601	Basalt black with brown	x	
" "	1601	1625	Basalt black		x

Well No. 4

Geo-Tech Explorations, Inc.
19700 SW Teton
Tualatin, OR 97062
Ph: (503) 692-6400, Fax: (503) 692-4759

Well Name:	Lewiston Orchards Irrigation District Well No. 4
Well Tag No.	D0022736
Drilling Permit #	784458
Well ID #	355519
Water Right No.	85-15356

Bore Dia.	From	To	LITHOLOGIC LOG	Water Yes	Water No
24"	0	2	Fill Rock		x
" "	2	3	Top Soil		x
" "	3	18	Silty Clay, Brown, some gravels		x
" "	18	60	Basalt weathered fractured		x
" "	60	76	Clay brown sticky		x
" "	92	260	Basalt fractured medium		x
" "	260	265	Basalt fractured lenses of shale black coal like		x
20"	265	283	Basalt fractured lenses of shale black coal like		x
" "	283	310	Basalt fractured with gray claystone		x
" "	310	320	Basalt medium		x
" "	320	371	Claystone soft green some tan		x
" "	371	396	Basalt cuttings rounded gray with clay foam color brown to green		x
" "	396	423	Med soft cuttings same as above foam color brown		x
" "	423	456	Extremely soft holding back on bit cuttings same as above foam color brownish		x
" "			gray. Large chunks of gray claystone on bit when removed. Caving problems		x
" "			from 230' to 456'		x
" "	456	465	Basalt vesicular black		x
" "	465	487	Basalt gray to black medium		x
" "	487	492	Basalt vesicular black		x
" "	492	640	Basalt fractured black		x
" "	640	680	Claystone brown		x
" "	680	701	Basalt broken weathered		x
" "	701	735	Basalt fractured black		x
" "	735	759	Basalt gray hard		x
" "	759	767	Basalt vesicular black		x
" "	767	837	Basalt fractured black		x
" "	837	866	Basalt fractured black some red		x
18"	866	952	Basalt black		x
" "	952	963	Basalt black with brown claystone		x
" "	963	988	Basalt black fractured		x
" "	988	1028	Basalt black		x
" "	1028	1049	Basalt black with brown scoria	x	
" "	1049	1060	Basalt black		x
" "	1060	1110	Basalt black with brown		x
" "	1110	1168	Basalt black		x
" "	1168	1182	Basalt black with brown scoria	x	
" "	1182	1208	Basalt black		x
" "	1208	1229	Basalt black with gray		x
" "	1229	1246	Basalt black with brown scoria	x	
" "	1246	1252	Basalt black		x
" "	1252	1264	Scoria black		x
" "	1264	1266	Basalt black with gray		x
12"	1266	1390	Basalt black with gray		x
" "	1390	1415	Scoria brown	x	
10"	1417	1577	Basalt black		x
" "	1577	1601	Basalt black with brown	x	
" "	1601	1625	Basalt black		x

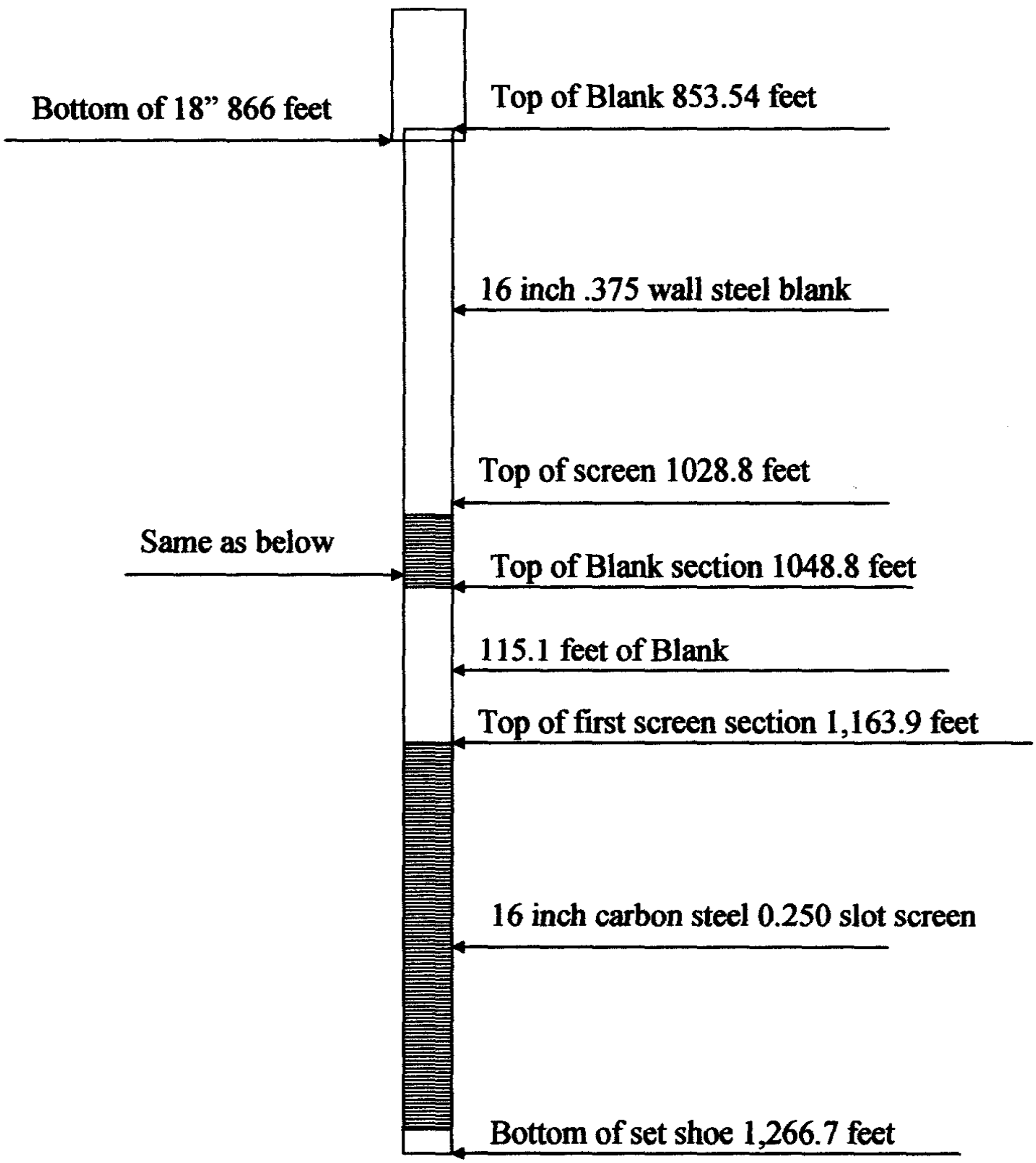
Well No. 4

Geo-Tech Explorations, Inc.
19700 SW Teton
Tualatin, OR 97062
Ph: (503) 692-6400, Fax: (503) 692-4759

Well Name:	Lewiston Orchards Irrigation District Well No. 4
Well Tag No.	D0022736
Drilling Permit #	784458
Well ID #	355519
Water Right No.	85-15356

Bore Dia.	From	To	LITHOLOGIC LOG	Water Yes	Water No
24"	0	2	Fill Rock		x
" "	2	3	Top Soil		x
" "	3	18	Silty Clay, Brown, some gravels		x
" "	18	60	Basalt weathered fractured		x
" "	60	76	Clay brown sticky		x
" "	92	260	Basalt fractured medium		x
" "	260	265	Basalt fractured lenses of shale black coal like		x
20"	265	283	Basalt fractured lenses of shale black coal like		x
" "	283	310	Basalt fractured with gray claystone		x
" "	310	320	Basalt medium		x
" "	320	371	Claystone soft green some tan		x
" "	371	396	Basalt cuttings rounded gray with clay foam color brown to green		x
" "	396	423	Med soft cuttings same as above foam color brown		x
" "	423	456	Extremely soft holding back on bit cuttings same as above foam color brownish		x
" "			gray. Large chunks of gray claystone on bit when removed. Caving problems		x
" "			from 230' to 456'		x
" "	456	465	Basalt vesicular black		x
" "	465	487	Basalt gray to black medium		x
" "	487	492	Basalt vesicular black		x
" "	492	640	Basalt fractured black		x
" "	640	680	Claystone brown		x
" "	680	701	Basalt broken weathered		x
" "	701	735	Basalt fractured black		x
" "	735	759	Basalt gray hard		x
" "	759	767	Basalt vesicular black		x
" "	767	837	Basalt fractured black		x
" "	837	866	Basalt fractured black some red		x
18"	866	952	Basalt black		x
" "	952	963	Basalt black with brown claystone		x
" "	963	988	Basalt black fractured		x
" "	988	1028	Basalt black		x
" "	1028	1049	Basalt black with brown scoria	x	
" "	1049	1060	Basalt black		x
" "	1060	1110	Basalt black with brown		x
" "	1110	1168	Basalt black		x
" "	1168	1182	Basalt black with brown scoria	x	
" "	1182	1208	Basalt black		x
" "	1208	1229	Basalt black with gray		x
" "	1229	1246	Basalt black with brown scoria	x	
" "	1246	1252	Basalt black		x
" "	1252	1264	Scoria black		x
" "	1264	1266	Basalt black with gray		x
12"	1266	1390	Basalt black with gray		x
" "	1390	1415	Scoria brown	x	
10"	1417	1577	Basalt black		x
" "	1577	1601	Basalt black with brown	x	
" "	1601	1625	Basalt black		x

Production zone screen and blank as built for LOID well # 4



Well No. 5

Form 238-7
6/07

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D D0067993

Drilling Permit No. 874026

Water right or injection well # 85-15755

2. OWNER: Lewiston Orchards Irrigation District

Name

Address 1520 Powers Ave.

City Lewiston State Id Zip 83501

3. WELL LOCATION:

Twp. 35 North ☒ or South ☐ Rge. 5 East ☐ or West ☒

Sec. 20 ____ 1/4 NW 1/4 NE 1/4
(10 acres) (40 acres) (160 acres)

Gov't Lot ____ County Nez Perce

Lat. 46 ° 22'1"N (Deg. and Decimal minutes)

Long. 116 ° 59'11"W (Deg. and Decimal minutes)

Address of Well Site approx. 1600 LF west of intersection of Ripon and 10th ST City Lewiston
(Give at least name of road + Distance to Road or Landmark)

Lot. ____ Blk. ____ Sub. Name ____

4. USE:

☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation ☐ Thermal ☐ Injection
☒ Other fire protection

5. TYPE OF WORK:

☒ New well ☐ Replacement well ☐ Modify existing well
☐ Abandonment ☐ Other ____

6. DRILL METHOD:

☒ Air Rotary ☐ Mud Rotary ☐ Cable ☐ Other flooded reverse

7. SEALING PROCEDURES:

Seal material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method/procedure
neat cement	0	26	81 ft³	trimmie
neat cement	0	810	~~2375~~ 1530 ft³	trimmie

8. CASING/LINER:

Diameter (nominal)	From (ft)	To (ft)	Gauge/ Schedule	Material	Casing	Liner	Threaded	Welded
32	0	26	1/2	steel	☒	☐	☐	☒
24	+3	810	1/2	steel	☒	☐	☐	☒
14	See Attached			HSLA	☒	☐	☐	☒
					☐	☐	☐	☐

Was drive shoe used? ☐ Y ☒ N Shoe Depth(s) ____

9. PERFORATIONS/SCREENS:

Perforations ☒ Y ☐ N Method Ful flo Louvered

Manufactured screen ☒ Y ☒ N Type ____

Method of installation Welded beveled ends

From (ft)	To (ft)	Slot size	Number/ft	Diameter (nominal)	Material	Gauge or Schedule
See Attached		0.20	120	14	HSLA	3/8" HSLA
Completion Casing has welded collars						

Length of Headpipe 0.63 (Bulk see Sch) Length of Tailpipe 25.49 ft

Packer ☐ Y ☒ N Type ____

10. FILTER PACK:

Filter Material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method
N/A				

11. FLOWING ARTESIAN:

Flowing Artesian? ☐ Y ☒ N Artesian Pressure (PSIG) ____

Describe control device ____

12. STATIC WATER LEVEL and WELL TESTS:

Depth first water encountered (ft) ____ Static water level (ft) 592' TOC

Water temp. (°F) 86.5 Bottom hole temp. (°F) ____

Describe access port 2" threaded port in locking cap

Well test:

Drawdown (feet)	Discharge or yield (gpm)	Test duration (minutes)
22.71	3000	2160

Test method: Pump ☒ Bailer ☐ Air ☐ Flowing artesian ☐

Water quality test or comments: ____

13. LITHOLOGIC LOG and/or repairs or abandonment:

Bore Dia. (in)	From (ft)	To (ft)	Remarks, lithology or description of repairs or abandonment, water temp.	Water Y	Water N
			attached		

Completed Depth (Measurable):

Date Started: Dec 11,2014 Date Completed: 4/19/15

14. DRILLER'S CERTIFICATION:

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Boart Longyear Co. No. 438

*Principal Driller [signature] Date 5-7-15

*Driller [signature] Date 3-11-14

*Operator II [signature] Date 3-11-14

Operator I Ubaldo Perez Date 3-11-14

* Signature of Principal Driller and rig operator are required.

Well No. 5

LOID #5 LITHOLOGY

38" - 0-26'	BLACK BASALT	Water - No
28" - 26-70'	BLACK BASALT	Water - No
28" - 70-80'	FRACTURED BASALT	Water - No
28" - 80-132'	GRAY/GREEN CLAYIE	Water - No
28" - 132 '	SANDY LAYER	Water - No
28" - 133-290'	GRAY/GREEN CLAYIE	Water - No
28" - 290-378'	BLACK BASALT	Water - No, HARD
28" - 378-388'	FRACTURED BASALT	Water – No, RED/BROWN
28" - 388-505'	BLACK BASALT	Water – No, HARD
28" - 505-514'	CLAYIE	Water – No, GRAY/GREEN
28" - 514-554'	BLACK BASALT	Water – No, HARD
28" - 554-563'	BLACK BASALT SOME CLAYS	Water – No, SOFTER
28" - 563-585'	BLACK BASALT	Water – No, HARD
28" – 585'	CLAY LAYER	Water – No, SOFT TEAL IN COLOR
28" - 586-613'	BLACK BASALT	Water – Yes 592ft f/ TOC, HARD
28" - 613-625'	CLAY/BASALT LAYERS	Water – Yes, MEDIUM/SOFT
28" - 625-660'	BLACK BASALT	Water – Yes, HARD
28" - 660-661'	CLAY	Water – Yes
28" - 661-680'	BASALTS	Water – Yes
28" - 680-683'	CLAYIE	Water – Yes
28" - 683-697'	CLAY/BASALT MIX	Water – Yes, SOFT
28" - 697-810'	BLACK BASALT	Water – Yes, HARD- END OF 28" HOLE
19" - 810-834'	BLACK BASALT	Water – Yes, HARD- 19" HOLE
19" - 834-863'	RED/BROWN BASALT	Water – Yes, MEDIUM/SOFT BROKEN
19" - 863-902'	BLACK BASALT	Water – Yes, HARD
19" - 902-937'	RED/BROWN BASALTS	Water – Yes, MEDIUM/SOFT BROKEN
19" - 937-1028'	BLACK BASALT	Water – Yes, HARD

Well No. 5

19" - 1028-1044'	RED/BROWN BASALTS	Water – Yes, MED/SOFT BROKEN
19" - 1044-1140'	BLACK BASALT	Water – Yes, HARD
19" - 1140-1178'	RED/BROWN BASALTS	Water – Yes, MED/SOFT BROKEN
19" - 1178-1279'	BLACK BASALT	Water – Yes, HARD
19" - 1279-1293'	RED/BROWN BASALTS	Water – Yes, MED/SOFT BROKEN
19" - 1293-1360'	BLACK BASALT	Water – Yes, SOFTER
19" - 1360-1421'	BLACK BASALT	Water – Yes, HARD
19" - 1421-1461'	RED/BROWN SOME CALCITE	Water – Yes, MED
19" - 1461-1487'	BLACK BASALT	Water – Yes, HARD
19" - 1487-1526'	RED/BROWN BASALTS	Water – Yes, MED/SOFT
19" - 1526-1584'	BLACK BASALT	Water – Yes, HARD
19" - 1584-1644'	RED/BROWN BASALTS	Water – Yes, MED/SOFT
19" - 1644-1683'	BLACK BASALT	Water – Yes, MED
19" - 1683-1705'	BLACK BASALT	Water – Yes, HARD-END OF 19" HOLE
12.25" - 1705-1710 '	BLACK BASALT	Water – Yes, HARD- 12 ¼ HOLE
12.25" - 1710-1716 '	BLACK/BROWN POROUS	Water – Yes, MED
12.25" - 1716-1755 '	BLACK BASALT	Water – Yes, MED/HARD
12.25" - 1755-1757 '	POROUS BLACK	Water – Yes, MED/SOFT
12.25" - 1757-1808 '	BLACK BASALT	Water – Yes, MED/HARD
12.25" - 1808-1825 '	RED/BROWN SOME CALCITE	Water – Yes, MED/SOFT
12.25" - 1825-1831 '	POROUS BLACK	Water – Yes, MED/SOFT
12.25" - 1831-1842 '	BLACK BASALT	Water – Yes, MED/HARD
12.25" - 1842-1843 '	BASALT CALCITE	Water – Yes, MED/SOFT
12.25" - 1843-1868 '	BLACK BASALT	Water – Yes, MED/HARD
12.25" - 1868-1875 '	BLACK/BROWN BASALTS	Water – Yes, MED/SOFT
12.25" - 1875-1900' 1/4'"	BLACK BASALT	Water – Yes, MED/HARD- END OF 12

Well No. 5

LOID WELL # 5

Well Number:	**Well # 5**
Date:	3/24/2015
Casing Size and Weight:	14" O.D. / 3/8" Wall / 54.57 PPF / Weld Collars

1	25.49	25.49	BLANK	33		0	65		0
2	6.71	32.2	BLANK	34		0	66		0
3	40.12	72.32	BLANK	35		0	67		0
4	40.08	112.4	BOTT. 10' Screen	36		0	68		0
5	40.1	152.5	BLANK	37		0	69		0
6	40.09	192.59	BLANK	38		0	70		0
7	40.11	232.7	BLANK	39		0	71		0
8	40.18	272.88	BLANK	40		0	72		0
9	40.09	312.97	BOTT. 20' Screen	41		0	73		0
10	40.15	353.12	BLANK	42		0	74		0
11	40.13	393.25	40' FF	43		0	75		0
12	40.12	433.37	40' FF	44		0	76		0
13	39.97	473.34	BLANK	45		0	77		0
14	40.1	513.44	BLANK	46		0	78		0
15	40.09	553.53	TOP 20' Screen	47		0	79		0
16	40.15	593.68	BLANK	48		0	80		0
17	40.11	633.79	BLANK	49		0	81		0
18	40.13	673.92	BLANK	50		0	82		0
19	40.08	714	BOTT. 20' Screen	51		0	83		0
20	40.09	754.09	BLANK	52		0	84		0
21	40.08	794.17	BLANK	53		0	85		0
22	40.13	834.3	BLANK	54		0	86		0
23	40.08	874.38	BLANK	55		0	87		0
24	29.99	904.37	BLANK	56		0	88		0
25	0.63	905	Back off sub.	57		0	89		0
26		905		58		0	90		905
27		905		59		0			
28		905		60		0	**Total Casing Set:**		905
29		905		61		0			
30		905		62		0			
31		905		63		0			
32		905		64		905			

Notes:

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Appendix C – Pump and Motor Data

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Well No. 2

NEW INSTALLATION
CHANGE OUT
RESIZE
CONTINUATION PAGE

INSTALL REPORT

DATE STARTED:	31-Jul-07	DATE COMPLETED:	31-Jul-07
F/S MAN:	MIKE JUSTUS	C/S MAN:	
DST NUMBER:	156144	S/R #:	1480684

BAKER HUGHES
Centrilift

CUSTOMER / WELL INFORMATION

CUSTOMER	LEASE	SITE / WELL NO.	FIELD	COUNTY	STATE
LEWISTON ORCHARDS IRR. D	WSW	# 2	LEWISTON	NEZ PERCE	ID

TOTAL WELL DEPTH	CASING SIZE / WT.	TUBING SIZE	TUBING TALLY	NO. OF JOINTS	AVG. JT. LENGTH
1,920	13 1/2		1,185.00	29	40.86

MOTOR SETTING DEPTH	LINER SIZE / WT.	TOP OF LINER AT	PERF OR OPEN HOLE INTERVAL
1237.00	NA	NA	

BOTTOM HOLE TEMPERATURE	TUBING PRESSURE	ANNULUS PRESSURE	PUMP OUTPUT BPD OIL / WATER
100		NA	

MOTOR JACKET P/N	JACKET SIZE/ LENGTH/ WT.	MATERIAL	PUMP UP TIME	FASTENER TYPE
NA	NA	NA		CARBON STL. [X] MONEL

CHECK VALVE SIZE	SET AT	NEW / USED	DRAIN VALVE SIZE	SET AT	NEW / USED	BREAKOFF PLUG
	TOP2JNT					BRASS [X] MONEL

DOWN HOLE EQUIPMENT INFORMATION

PUMP S/N	# OF STAGES	TYPE	MODEL	NEW / USED	COATING TYPE	LENGTH
Z01167929	9	WI - 700	IWP	USED	NA	9' 4"
Total Stages	9					

INTAKE/GAS SEP S/N	MODEL	SCREEN (Y / N)	NEW / USED	COATING TYPE	LENGTH
INTERGAL		YES	USED		

Setting Depth of Intake 1185.00

SEAL S/N	MODEL	NEW / USED	COATING TYPE	LENGTH
Z31H54579	HSCT3-HL-CWU-CL5-INV (TANDEM)	USED	NA	13' 8 1/2"
ADAPTER	562 MOTOR TO 675 SEAL	USED	NA	4 1/2"

MOTOR S/N	HP	VOLTAGE	AMPERAGE	MODEL	NEW / USED	COATING TYPE	LENGTH
Z21K66156	38	2370	98	KME	USED	NA	29' 5"
RERATE	304	2290	81	KME-X			

Total Equipment Length 0.00

CABLE S/N	P/N	SIZE	TYPE	REEL NO.	ARMOR	NEW / USED	FIELD SPLICES @	LENGTH
		2	CPNR	NA	GALV	USED	MLE	1300 + -

Total Length 0

MLE S/N	PART NUMBER	SIZE	TYPE	ARMOR	NEW / USED	LENGTH
10218601	C78125-090	5	KT3	GALVANIZED	NEW	90'

CABLE BAND MATERIAL	BAND TYPE	GEARBOX S/N	G/B SERIES	G/B RATIO	CROSSOVER S/N
STAINLESS STEEL	POWER [X] HAND	NA	NA	NA	NA

DOWNHOLE SENSOR S/N	D/H SENSOR TYPE	D/H SENSOR MODEL	NEW / USED	LENGTH	MTR Temp Start	Stable	INT Temp	START-PSI	STABLE-PSI
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

ELECTRICAL

CONTROLLER S/N	SIZE / KVA / V / AMPS	MODEL	FUSE / MCP FUSE	OL SETTING 120% MAX	UL SETTING	RESET TIMER

TRANSFORMER S/N	CONNECT	RATIO	KVA / AMPERAGE	WELLHEAD SIZE / TYPE	MANUFACTURER

PRIMARY VOLTAGE	CONTROL CIRCUIT VOLTAGE-NO LOAD	CV-LOAD	CT RATIO	PT SIZE	TAPS

ELECTRICAL READINGS

INSULATION RESISTANCE	A-B	B-C	C-A	A-GND	B-GND	C-GND
MOTOR	0.8	0.8	0.8	5KM	5KM	5KM
MOTOR						
MOTOR						
MOTOR ASSEMBLY						
CABLE & MLE	5KM	5KM	5KM	5KM	5KM	5KM
CABLE & MOTOR – SURFACE	1.4	1.4	1.4	5KM	5KM	5KM
CABLE & MOTOR – BOTTOM						
VOLTAGE – NO LOAD						
VOLTAGE – LOAD						
AMPERAGE – START / STABLE						

CUSTOMER REP.
CHUCK DICKERSON

ADVISED ME TO RERUN
PUMP / INT/SEP / SEAL
MOTOR / MLE / CABLE

RELEASED PRIOR TO START: YES / NO
PRIMARY LIGHTNING ARRESTOR: YES / NO
SECONDARY LIGHTNING ARRESTOR: YES / NO

COMMENTS: RAN ORIGINAL MOTOR SEAL & PUMP AFTER BEING TESTED & OR REPAIRED. DID NOT START WELL. CUSTOMER WILL START WELL AT A LATER DATE, I WAS RELEASED AFTER EQUIP. WAS ASSEMBLED.

Cable Band Integrity Check:	Beginning of install	1/4 of installation	1/2 of installation	3/4 of installation	Bottom
Field Service Technician: (Initial)					
Cable Service Technician: (Initial)					
Well Service Rig Operator: (Initial)					
Customer Representative: (Initial)					

Well No. 2

BAKER HUGHES

Centrilift

AREA **REPORT** **DST**

No 0 **No** 156144

STARTUP ____ **SERVICE** ____ **RESTART** ____

CUSTOMER	**LEWISTON ORCHARDS IRR. DIST**	COUNTY (PROVIDENCE)	**NEZ PERCE**	STATE (COUNTRY)	**ID**		
Facility/Field	**LEWISTON**	Unit/Lease	**WSW**	No	**# 2**	CITY	**LEWISTON**

EQUIPMENT

VSC Sn	**102415**	Model	**4350-3VS**	Amps	**469**	KVA	**390**	Program	**ICS**
Motor Mfg	**Centrilift**	Volts	**2290**	Amps	**81**	Hp	**304**	Serv fact	
Cable Size	**2**	Ft	**1300**	Volts/ft	**22.01**	Temp Factor	**1.07**	Cable Drop	**31**
Pump Mfg	**Centrilift**	Model	**IWP**	Series	**675**	Stages	**9**	Type	**WI - 700**

Intake: Std ☐ Rotary ☐ Vortex ☐ Rev. Flow ☐ Min Hz **53** BPD ____ Max Hz **63** BPD ____

Check valve **TOP2JNT** JAP Setting Depth **1237** ft Bottom Hole Temp. **100** F deg

Xform SN **0** Voltage **2598** Ratio **5.413** Switch 1 **B** 2 **E** Conn D ☐ Y ☒

Drive **INPUT** volts **UNLOADED**
a/b ____ a/c ____ b/c ____

Drive **INPUT** volts to **GND**
a) ____ b) ____ c) ____

Drive **INPUT** volts to **LOADED**
a/b ____ a/c ____ b/c ____

Drive **INPUT** amps
@Hz ____ a) ____ b) ____ c) ____
@Hz ____ a) ____ b) ____ c) ____

Drive **OUTPUT** volts
@Hz ____ a/b ____ a/c ____ b/c ____
@Hz ____ a/b ____ a/c ____ b/c ____

Drive **OUTPUT** amps
@Hz ____ a) ____ b) ____ c) ____
@Hz ____ a) ____ b) ____ c) ____

DOWN HOLE MOTOR AMPS
@Hz ____ a) ____ b) ____ c) ____
@Hz ____ a) ____ b) ____ c) ____

Surface **VOLTS** Phase to **GND**
a) ____ b) ____ c) ____

MOTOR & CABLE ohms **PHASE to PHASE**
a/b **0.0** a/c **0.0** b/c **0.0**

MOTOR & CABLE ohms **PHASE to GND**
a **0** b **0** c **0**

SETUP OR OPERATING PARAMETERS

469	OVERLOAD AMPS	470	60 Hz VOLTS	4.0	SYNCH DELAY	53.0	LO SPD CLMP
5	OVERLOAD TIME	10.0	START FREQ.	63.0	HI SPD CLMP	0	V BOOST
445	I LIMIT	-	V BOOST SYNC	10	ACCEL TIME	70	REG GAIN %
492	I LIMIT SYNC	480	V CLAMP	10	DECEL TIME	-	SLIP COMP %
3	FLT RESTARTS	263	AMPS UL SET	FR SET	CONTRL SET PT	ICS	PROGRAM REV
30	MIN RESTART FLT	240	MIN RESTART	-	JOG FREQUENCY	-	SF RATE
30	MIN FLT RESET	5	UL RESTARTS	-	FREQUENCY AVOID	-	SN SEC
	SET SPEED (Hz)	30	SEC UL TRIP	FWD	ROTATION OUT	-	I-DC (10)
	RUN SPEED (Hz)	1	MODE		CONTROL SIG	-	I-LIMIT (7)

REASON FOR SERVICE CODE (CHECK ONE)

1	☐ COLD WEATHER	2	☐ CUSTOMER DAMAGE	3	☐ CUSTOMER INEXPERIENCE	4	☐ DOWN HOLE CABLE
5	☐ DOWN HOLE EQUIPMENT	6	☐ DRIVE MOVED	7	☐ ENGINEERING PROBLEM	8	☐ LIGHTING
9	☐ LINE SLAP	10	☐ MANUFACTURING PROBLEM	11	☐ WRONG COMPONENT	12	☐ CHANGED SETTINGS
13	☐ UNKNOWN REASON	14	☐ OIL CONTAMINATED	15	☐ OVER HEATED	16	☐ POWER GRID BUMP OR SAG
17	☐ POWER OR PHASE LOSS	18	☐ REVERSE ROTATION	19	☐ SAFETY MODIFICATION	20	☐ SERVICE MAN INEXPERIENCE
21	☐ SHIPPING DAMAGE	22	☐ SIZED WRONG	23	☐ TAMPERED WITH	24	☐ WATER IN DRIVE
15	☐ BAD INPUT XFORMER	26	☐ BAD OUTPUT XFORMER	27	☐ NEW STARTUP	28	☐ RESTART
29	☐ SURFACE CABLE BAD	30	☐ COMPONENT FAILURE	31	☐ FIELD MODIFICATION	32	☐ WORK DELAY/CONTINUE
33	☐ PC BOARD FAILURE	34	☐ ADVERSE WELL COND.	35	☐ OTHER CUSTOMER EQUIP	36	☐ CUST. REQ CONSUL.
37	☐ LOOSE CONNECTION	38	☐ FAN/PUMP MOTOR FAILED	39	☐ NO PROBLEM FOUND	40	☐ INTERMITTENT

COMMENTS

MIKE JUSTUS (307) 272-1272

JOB START Date 30/Jul/07 **Completed Date** ____ **Serviced by** MIKE JUSTUS

AutographPC®
Centrilift - A Baker Hughes company

(303) 573-2737 1675 Broadway ste 1500, Denver CO 80203

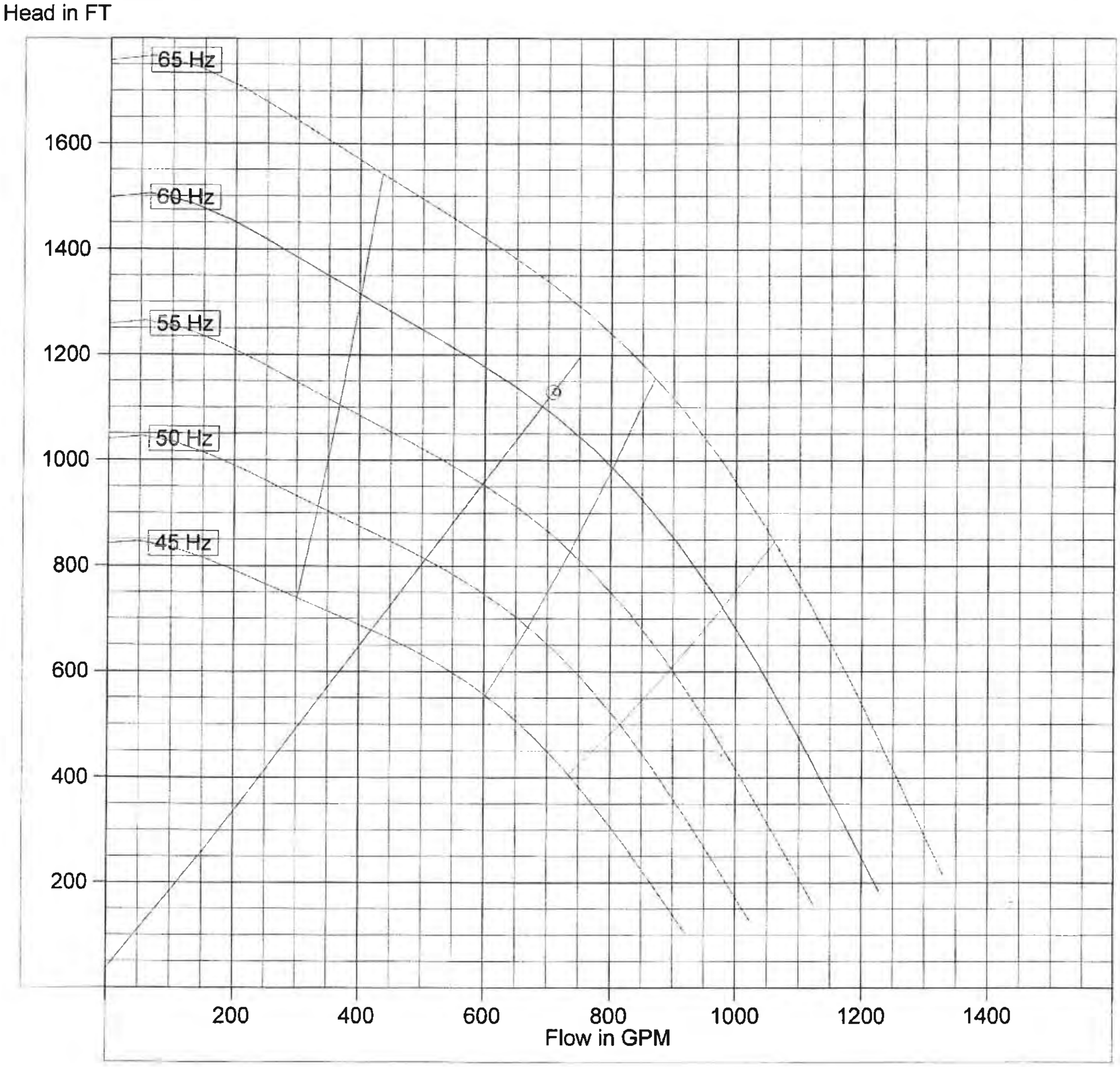
September 26,2007

Project: LOID # 2
Customer: Cory Baune
Well: LOID # 2
Engineer: Jakob Kreutzer

Pump: 9-875 WIE700
Motor: KMH 342 HP 2575V 81 A [562Series]
Cable: #4 CEBE 5kV ,6970ft
Controller: VSD 2250-VT 260kVA/ 480V/ 313A

No comments
No comments *NOTE: Motor ratings at 60Hz
This extra line only shows on reports * Note: Set VSD to 61.0 Hz

9-875 WIE700



Well No. 2

AutographPC®
Centrilift - A Baker Hughes company
(303) 573-2737 1675 Broadway ste 1500, Denver CO 80203

September 26,2007

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No comments
No comments *NOTE: Motor ratings at 60Hz
This extra line only shows on reports * Note: Set VSD to 61.0 Hz

Input Parameters:

Fluid Properties:
Oil Gravity = 35.0 °API
Water Cut = 100 %
SG water = 1.01 rel to H2O
SG gas = 0.65 rel to air
Sol GOR = 4.469 scf/STB
Prod GOR = 4.469 scf/STB
Bot Hole Temp = 95.0 °F
Surf Fluid Temp= 90.0 °F

Gas Impurities:
N2 = 0 %
H2S = 0 %
CO2 = 0 %

Bubble Point Pressure
Pb = 14.7psia

Inflow Performance:
Datum = 1194ft
Perfs V. Depth = 1194ft
Datum Static P = 522psi
Test Flow = 630GPM
Test Pressure = 97.94psi
PI = 1.487GPM/psi
IPR Method = Straight PI

Target:
Pump Setting Depth
(vertical) = 1194ft
Desired Flow = 750GPM
Gas Sep Eff = 99.99%
Tbg Surf Press = 14.0psi
Csg Surf Press = 0psi

Casing & Tubing: Roughness = 0.0006 in

Casing ID (in)	12.52
Tubing ID (in)	8.071
Vertical Depth (ft)	1500
Measured Depth (ft)	1500

Correlations PVT:

Dead Visc:	**Saturated Visc:**	**UnderSaturated:**	**Gas Visc:**
Beggs & Robinson	Beggs & Robinson	Vasquez & Beggs	Lee
Oil Compress:	**Formation Vol:**	**Z factor:**	**Bubble Point P:**
Kartoatmodjo	Standings	Hall & Yarborough	Standings

Correlations Multiphase:
Tubing Flow: Hagedorn & Brown
Casing Flow: Hagedorn & Brown

Well No. 2

AutographPC®

Centrilift - A Baker Hughes company

(303) 573-2737 1675 Broadway ste 1500, Denver CO 80203

September 26,2007

Operating Parameters / Selection:

Design Point:

Desired flow (total)	= 708 GPM	Frequency	= 61.0 Hz
% water	= 100.0 %	GOR into pump	= 4.469 scf/STB
% Gas into pump	= 0.0 %bs /0.0 %	TDH	= 1129 FT
		Friction Loses	= 8.972 FT

Pump Selection:

	Intake	Discharge	Pump Selected:
Pressure	= 45.92 psi	536 psi	IMW 9-875 WIE700
Flowrate	= 713 GPM	712 GPM	Pshaft RPM = 3574
Specific Gravity	= 1.002 rel-H2O	1.004 rel-H2O	Pump shaft HP at 61.0 Hz = 274 (34 %)
Viscosity	= 0.702Cp	0.717Cp	Required Motor HP at 60.0 Hz = 275

No comments

Seal was not sized

Motor Selection:

Terminal Voltage	=2482.7 V	Fluid Speed	=2.312ft/s
Motor Current	=67.5 A		
Load acc to N.P.	=80.4 %	Internal Temp	=168°F
Shaft Load	=19.6 %	Motor Selected:	KMH 342 HP 2575V 81 A [562Series]

No comments *NOTE: Motor ratings at 60Hz

Cable Selection:

* Note: Cable operating conditions may not match those used to size the motor.

Surface Length	= 50.0ft	Wellhead Voltage	= 2075.8V
Tubing Length	= 6970ft	Wellhead kVA	= 124.7kVA
MLE length	= 30.0ft	Voltage Drop	= 128.3V
Surface Temp	= 75°F	Cond Temp (main)	= 153°F
		Temp Rating	= 400°F

Surface Cable	Main Cable	MLE Cable
#4 CEBE 5kV 50.0ft	#4 CEBE 5kV 6970ft	#5 MLE-KT3 3kV 30.0ft

No comments

Controller Selection:

* Note: Controller operating conditions may not match those used to size the cable.

Input kVA	= 105.8kVA	Voltage Input	= 480V
System kW	= 101.6kW	Max Well Head Volts	= 2072V
Max Ctrl Current	= 187.5A	Max Frequency	= 60.0Hz (8.00V/Hz)
Power Cost/kWH	= 0.05$/kW	Start Frequency	= 10.0Hz
Total Power Cost	= $3657/month	Step-up Trafo	= 5.408 ratio
		Selected: VSD 2250-VT 260kVA/ 480V/ 313A	

No comments

---- End of Report ----

Well No. 2

Baker Hughes -- Centrilift
(918) 341-9600 200 W Stuart Roosa Dr, Claremore, OK 74017

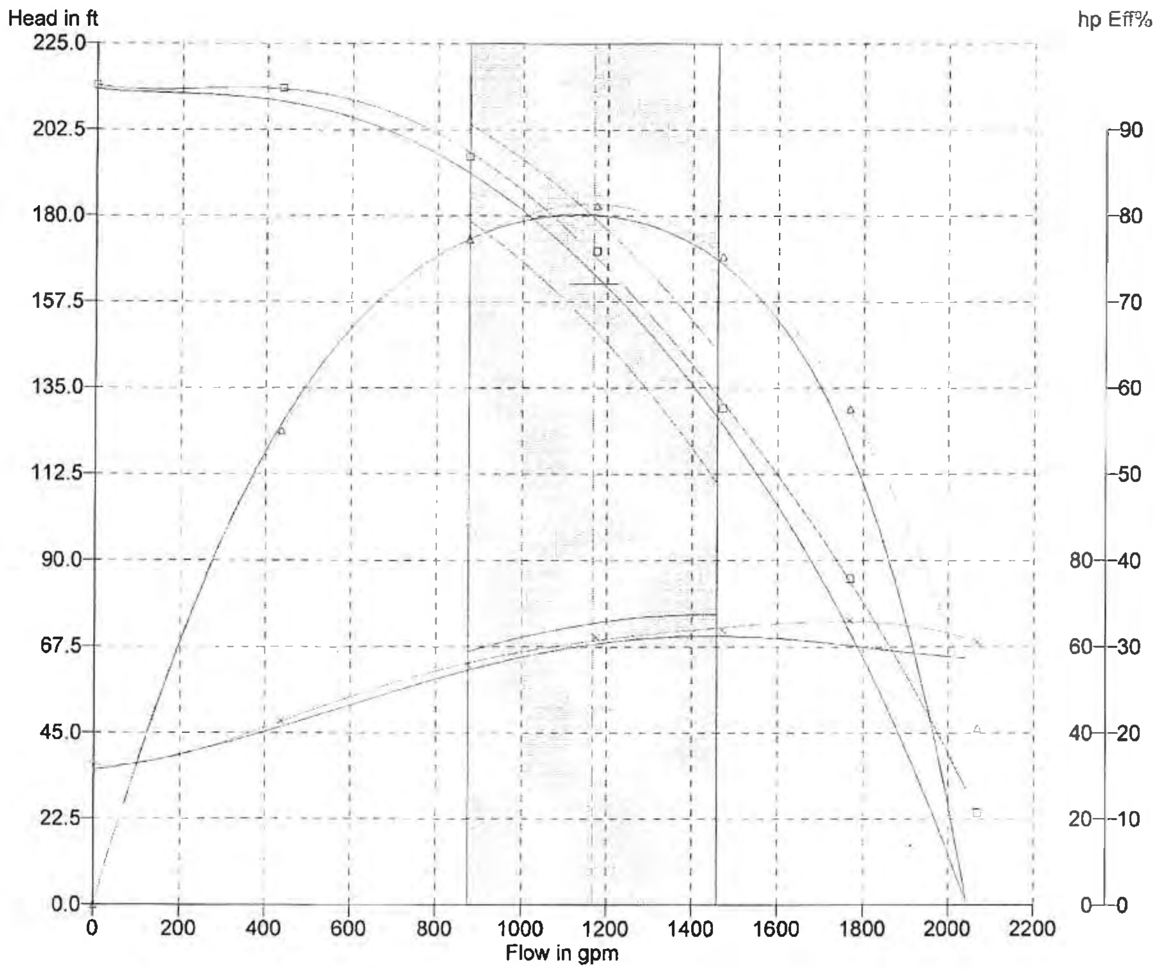
Stage Type: WJJ1200A
Serial Number: 10395021
Customer: HGB
Well Name: N/A
Well ID: N/A
Tested By: DDJ
Remarks: C021002183 WJJP

Stages: 8
New Pump

Tested: 9/7/2007

BHP and HEAD are corrected to DENSITY=1.000
Rate, Head and BHP are corrected to 3500 RPM

	Test Point	Flow (gpm)	Head (ft/Stage)	Power (hp/Stage)	Eff (%)
	1	0	214.1	32.40	0
	2	436.89	213.4	42.70	55.039
	MIN	874.77	195.5	55.80	77.256
	BEP	1175	170.8	62.30	81.181
	MAX	1471	129.7	63.90	75.263
	6	1769	85.30	66.10	57.54
	7	2068	24.10	61.10	20.561
PERCENT DEV:					
	MIN	875.1	1.70%	2.31%	
	BEP	1167	2.29%	2.63%	1.36%
	MAX	1459	1.23%	2.24%	
API LIMITS:					
	MIN	875.1	-5.00%	8.00%	
	BEP	1167	-5.00%	8.00%	-10.00%
	MAX	1459	-5.00%	8.00%	



Well No .3

NEW INSTALLATION
CHANGE OUT
RESIZE
CONTINUATION PAGE

INSTALL REPORT

DATE STARTED:	11-5 & 6-07	DATE COMPLETED:	
F/S MAN:	BILL SULLENGER	C/S MAN:	
DST NUMBER:	303354	S/R #:	

BAKER HUGHES
Centrilift

CUSTOMER / WELL INFORMATION

CUSTOMER	LEASE	SITE / WELL NO.	FIELD	COUNTY	STATE
LEWISTON ORCHARDS IRR. D	LOID	3	LOID	NEZ PEARCE	ID

TOTAL WELL DEPTH	CASING SIZE / WT.	TUBING SIZE	TUBING TALLY	NO. OF JOINTS	AVG. JT. LENGTH
2617 OPEN HOLE 1415	16" & 13 3/8	7" 8RD CASING		30	0.00

MOTOR SETTING DEPTH	LINER SIZE / WT.	TOP OF LINER AT	PERF OR OPEN HOLE INTERVAL
0.00			OPEN HOLE @ 1415

BOTTOM HOLE TEMPERATURE	TUBING PRESSURE	ANNULUS PRESSURE	PUMP OUTPUT BPD OIL / WATER

MOTOR JACKET P/N	JACKET SIZE/ LENGTH/ WT.	MATERIAL	PUMP UP TIME	FASTENER TYPE
				CARBON STL. X MONEL

CHECK VALVE SIZE	SET AT	NEW / USED	DRAIN VALVE SIZE	SET AT	NEW / USED	BREAKOFF PLUG
						BRASS MONEL

DOWN HOLE EQUIPMENT INFORMATION

PUMP S/N	# OF STAGES	TYPE	MODEL	NEW / USED	COATING TYPE	LENGTH
10395021	8	JJ1200	JJWP	NEW		
Total Stages	8					

INTAKE/GAS SEP S/N	MODEL	SCREEN (Y / N)	NEW / USED	COATING TYPE	LENGTH

Setting Depth of Intake 0.00

SEAL S/N	MODEL	NEW / USED	COATING TYPE	LENGTH
31H54140				

MOTOR S/N	HP	VOLTAGE	AMPERAGE	MODEL	NEW / USED	COATING TYPE	LENGTH
21H48263	500	2300	127	HMT	NEW		

Total Equipment Length 0.00

CABLE S/N	P/N	SIZE	TYPE	REEL NO.	ARMOR	NEW / USED	FIELD SPLICES @	LENGTH
				2/0 FL	GALV		2	1950
							Total Length	1950

MLE S/N	PART NUMBER	SIZE	TYPE	ARMOR	NEW / USED	LENGTH
10308506	C58598	2	KLHT	GALVANIZED	NEW	40'

CABLE BAND MATERIAL	BAND TYPE	GEARBOX S/N	G/B SERIES	G/B RATIO	CROSSOVER S/N
	POWER HAND				

DOWNHOLE SENSOR S/N	D/H SENSOR TYPE	D/H SENSOR MODEL	NEW / USED	LENGTH	MTR Temp Start	Stable	INT Temp	START-PSI	STABLE-PSI

ELECTRICAL

CONTROLLER S/N	SIZE / KVA / V / AMPS	MODEL	FUSE / MCP FUSE	OL SETTING 120% MAX	UL SETTING	RESET TIMER

TRANSFORMER S/N	CONNECT	RATIO	KVA / AMPERAGE	WELLHEAD SIZE / TYPE	MANUFACTURER

PRIMARY VOLTAGE	CONTROL CIRCUIT VOLTAGE-NO LOAD	CV-LOAD	CT RATIO	PT SIZE	TAPS

ELECTRICAL READINGS

INSULATION RESISTANCE	A-B	B-C	C-A	A-GND	B-GND	C-GND
MOTOR	0.6	0.6	0.6	5K	5K	5K
MOTOR						
MOTOR						
MOTOR ASSEMBLY						
CABLE & MLE	10K	10K	10K	10K	10K	10K
CABLE & MOTOR – SURFACE	0.8	0.8	0.8	10K	10K	10K
CABLE & MOTOR – BOTTOM						
VOLTAGE – NO LOAD						
VOLTAGE – LOAD						
AMPERAGE – START / STABLE						

CUSTOMER REP.
GENE McCOLLUM

ADVISED ME TO RERUN
PUMP | INT/SEP | SEAL
MOTOR | MLE | CABLE

RELEASED PRIOR TO START
X YES NO

PRIMARY LIGHTNING ARRESTOR
YES NO

SECONDARY LIGHTNING ARRESTOR
YES NO

COMMENTS: RAN 200' NEW CABLE ON BOTTOM. RAN NEW PUMP AND SEAL WITH REBUILT MOTOR.

Cable Band Integrity Check:	Beginning of Install	1/4 of Installation	1/2 of Installation	3/4 of Installation	Bottom
Field Service Technician: (Initial)					
Cable Service Technician: (Initial) Well Service Rig Operator: (Initial)					
Customer Representative: (Initial)					

Global Pumps & Equipment™
Engineered Products Division
Fluid In Motion

Well No. 4

Customer: Lewiston Orchards Irrigation
PO: 7043 - 501076
Project:
Order #: 89013 - 89014
Date: 4/15/2009 7:55:49AM

Pump Model: 12CHC
Pump Type: Submersible
Pump Number: 89014
Stages: 13
Upper Impeller Dia: 8.5000
Upper Impeller Qty: 13
Lower Impeller Dia: 0.0000
Lower Impeller Qty: 0

Design Flow (GPM): 1000.0
Design Head (Ft): 950.0
Efficiency (%): 86.0
Motor: Indar
Motor SN: 103809
Motor HP: 300.0
Nominal RPM: 1750.0
Design RPM: 1750.0

Specific Gravity: 1.0
Viscosity (SSU): 1.1
Water Temp (F): 64.0
Test Line: 6"
Upper Bowl Material: D.I.
Lower Bowl Material: N/A
Upper Imp Material: Silicon-Bronze
Lower Imp Material: N/A

Test Data

GPM	RPM	PSI	TDH (ft)	Vel Head Loss (ft)	Pipe Friction (ft)	Total TDH (ft)	kW	HP*	EFF (%)	
0	1781	485.55	1,126.73	0.00	0.00	1126.73	122	142.21	0.00	
400	1772	470.75	1,092.56	0.38	0.05	1092.99	158	187.36	58.93	
600	1764	469.96	1,090.73	0.85	0.11	1091.68	191	226.26	73.10	
800	1756	455.55	1,057.44	1.51	0.18	1059.13	223	268.16	79.79	
1000	1750	423.14	982.58	2.35	0.27	985.20	249	299.04	83.20	**
1325	1745	336.67	782.84	4.13	0.46	787.43	270	324.36	81.23	
1650	1743	223.50	521.41	6.41	0.69	528.51	280	336.29	65.48	

* Motor HP from manufacturer's curve minus losses.

** Design Point.

NPSH Typical Catalog Data

NPSHr	9.8	9.8	10.1	12.3	16.0	16.0	16.0
Flow	400.0	600.0	800.0	1000.0	1200.0	1200.0	1200.0

Customer Approval

By: ______________________

Title: ______________________

Date: ______________________

Certified Test

By: ______________________

Title: ______________________

Date: ______________________

Global Pumps & Equipment™

Engineered Products Division

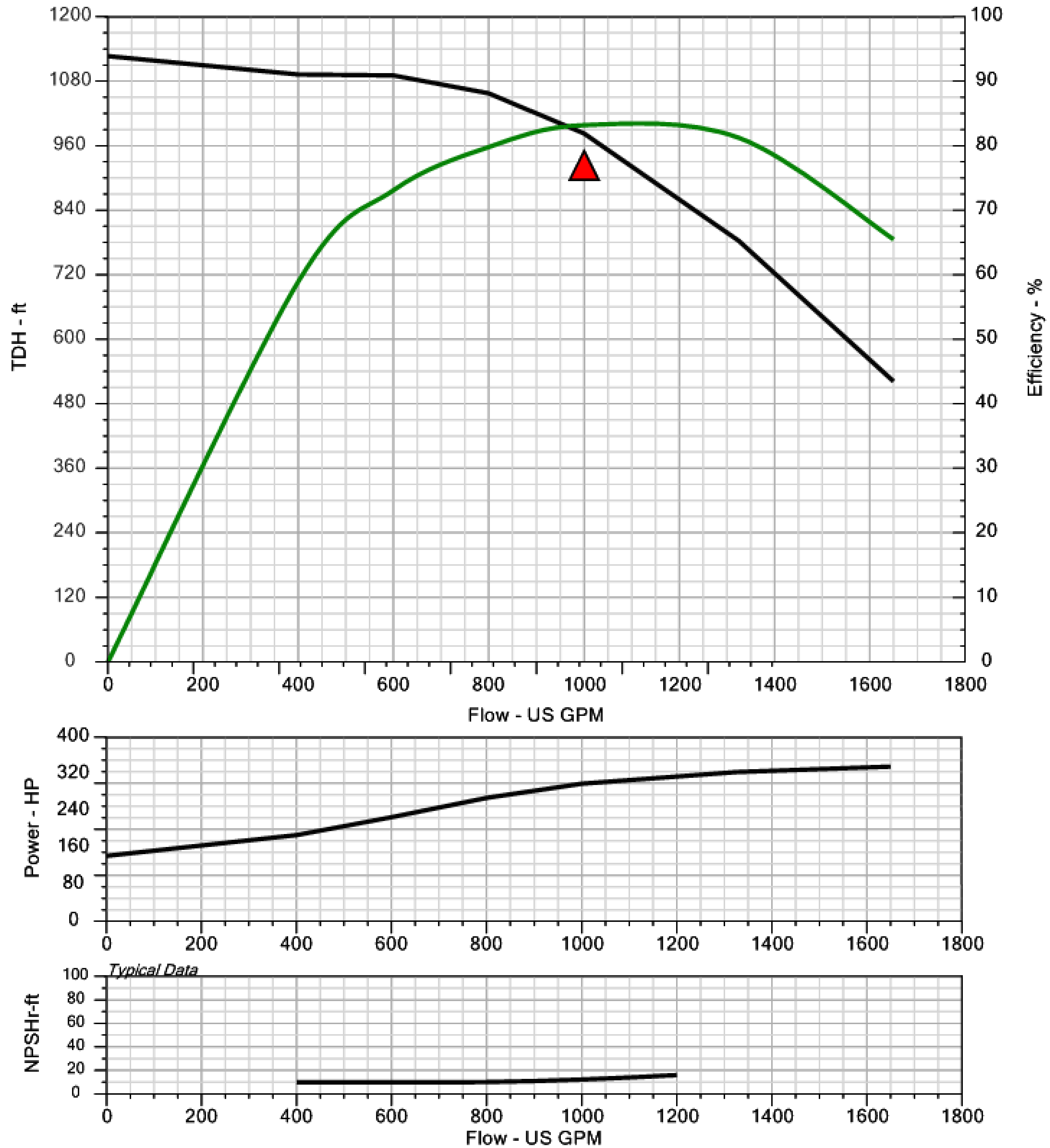
Fluid In Motion

Well No. 4

Customer: Lewiston Orchards Irrigation **Order #:** 89013 - 89014

PO: 7043 - 501076 **Project:** **Date:** 4/15/2009 7:55:49AM

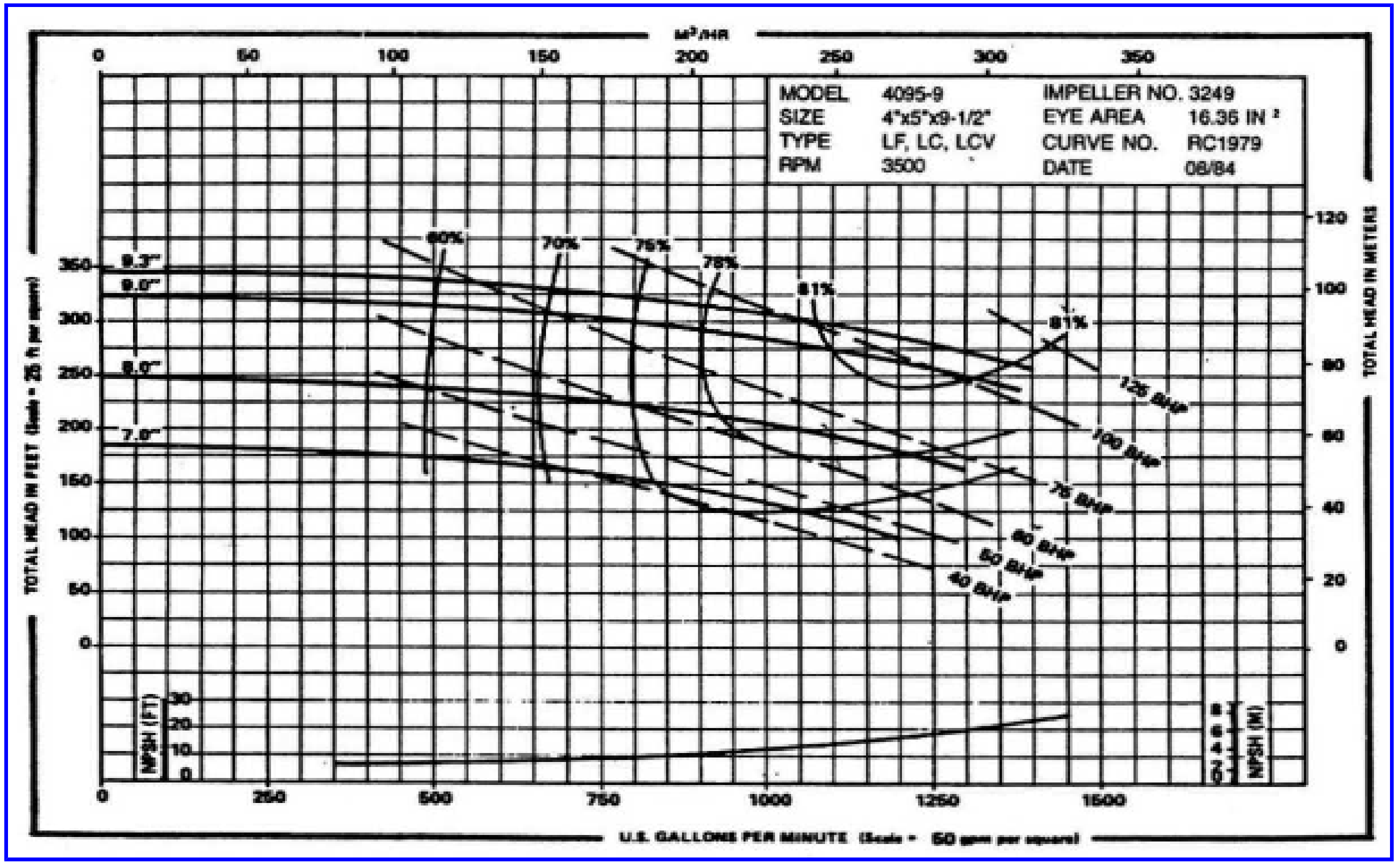
Raw Data



PACO PUMPS

LCV - 40959 - 3500 RPM - Performance Curve

Project:	Tag #	P.O. #	By:
Location:	Model: **40959**	Cust Ref#	Date: **2/12/2010**
Contractor:	Stages: **1**	Agent/Rep:	Rev. #
Engineer:	Service:	Doc #	Qty:



Hereth Booster
CAT #20-40959-1A0001-19.11
Serial # 01B0016401
900 gpm @ 180'
Impeller 7.5"
60 Hp Motor

Motor Data					
HP:	**60**	Voltage:	**208-230/460**	Eff:	
RPM:	**3500**	Phase:	**Three phase**	S.F.:	**1.15**
Encl.:	**ODP**	Hz:	**60**		

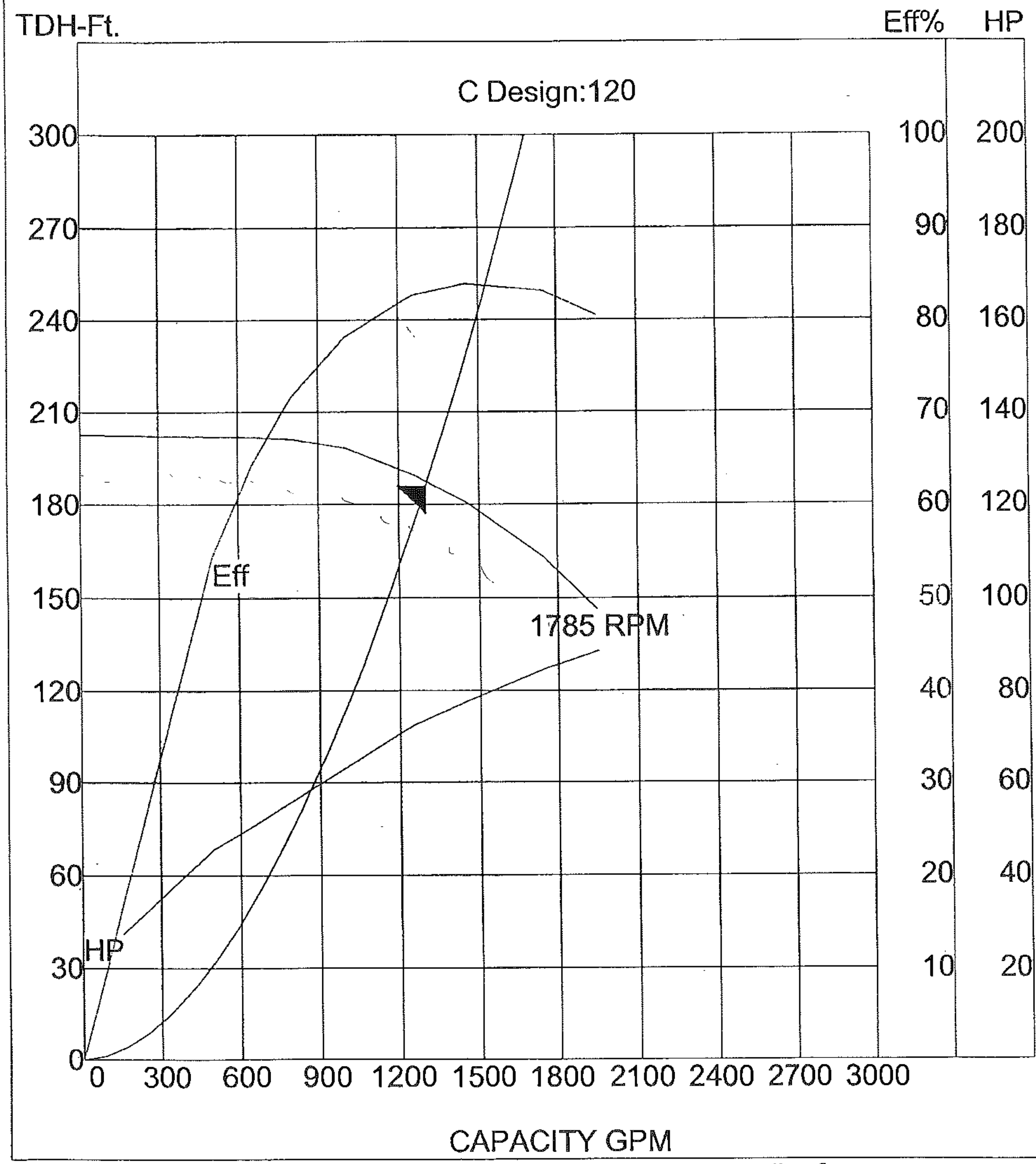
HERETH (1) Hereth Transfer

CORNELL PUMP COMPANY TRANSFER

P.O. Box 6334
Portland, Oregon 97228-6334

Phone (503)653-033(
FAX (503)653-033{

5HH 1300 GPM @186' TDH, 1785 RPM 13.56" Impeller
83%Efficiency, 72.5 HP, NPSHR: 10 Ft.



Performances Shown Are Approximate Water Performances
Internet: http//www.cornellpump.com E-Mail: info@cornellpump.com

Lutes Booster

PACO PUMPS®

PACO Pumps, Inc.
P.O. Box 12924 • 845 92nd Avenue
Oakland, CA 94604-2924

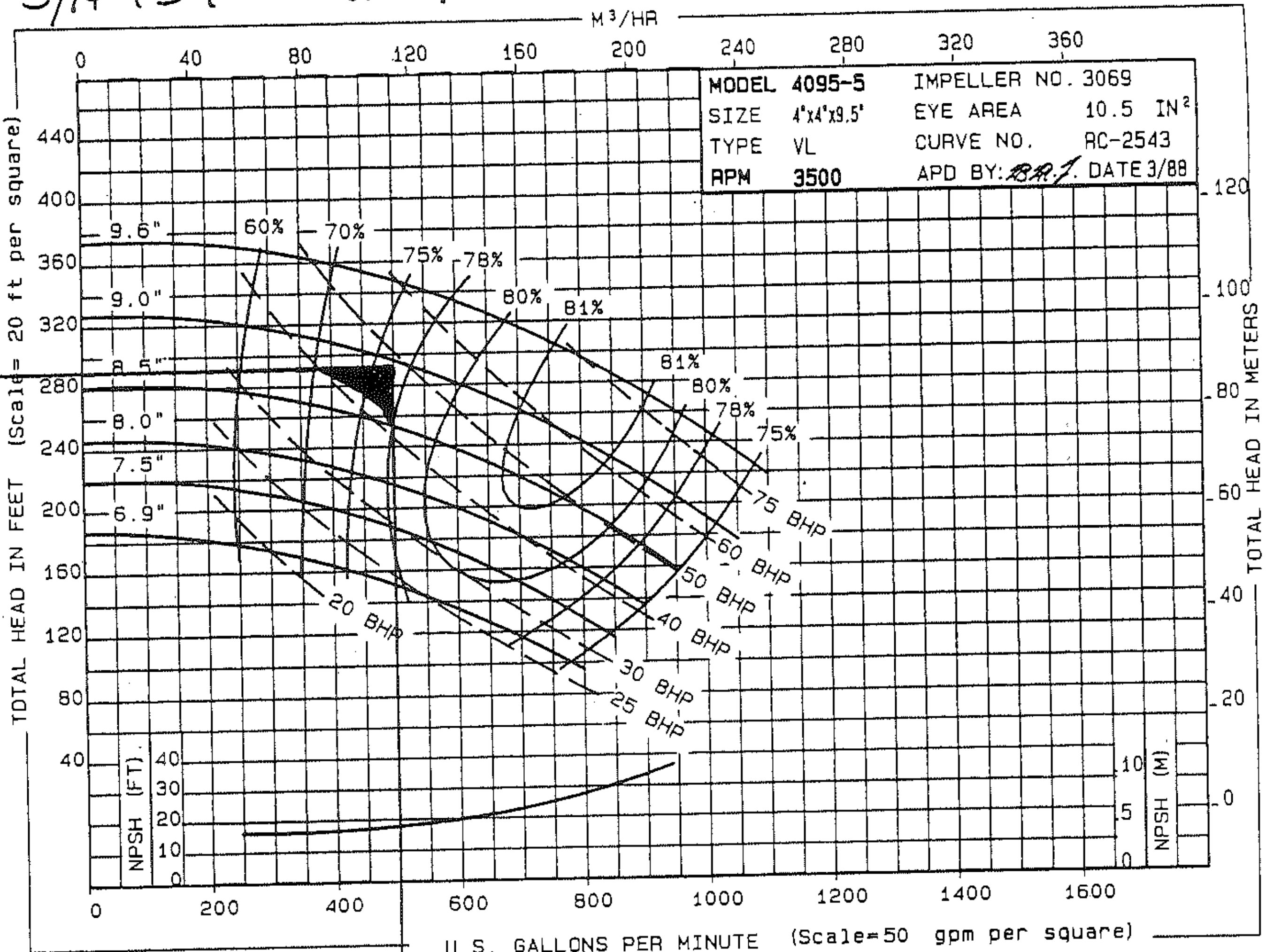
IN-LINE CENTRIFUGAL PUMPS
Type VL

PERFORMANCE CURVES — 3500 RPM

S/N 13405-1.1 A,B

Cat# 16-40955-1A0101-1891 EE

MODEL	4095-S	IMPELLER NO.	3069
SIZE	4"x4"x9.5"	EYE AREA	10.5 IN²
TYPE	VL	CURVE NO.	RC-2543
RPM	3500	APD BY:	DATE 3/88



* Lutes Booster

2 pumps;

one VFD driven -

other VFD or

constant speed?

2/89 Supersedes 1/84

Lutes Fire Booster

IN LINE CENTRIFUGAL PUMPS

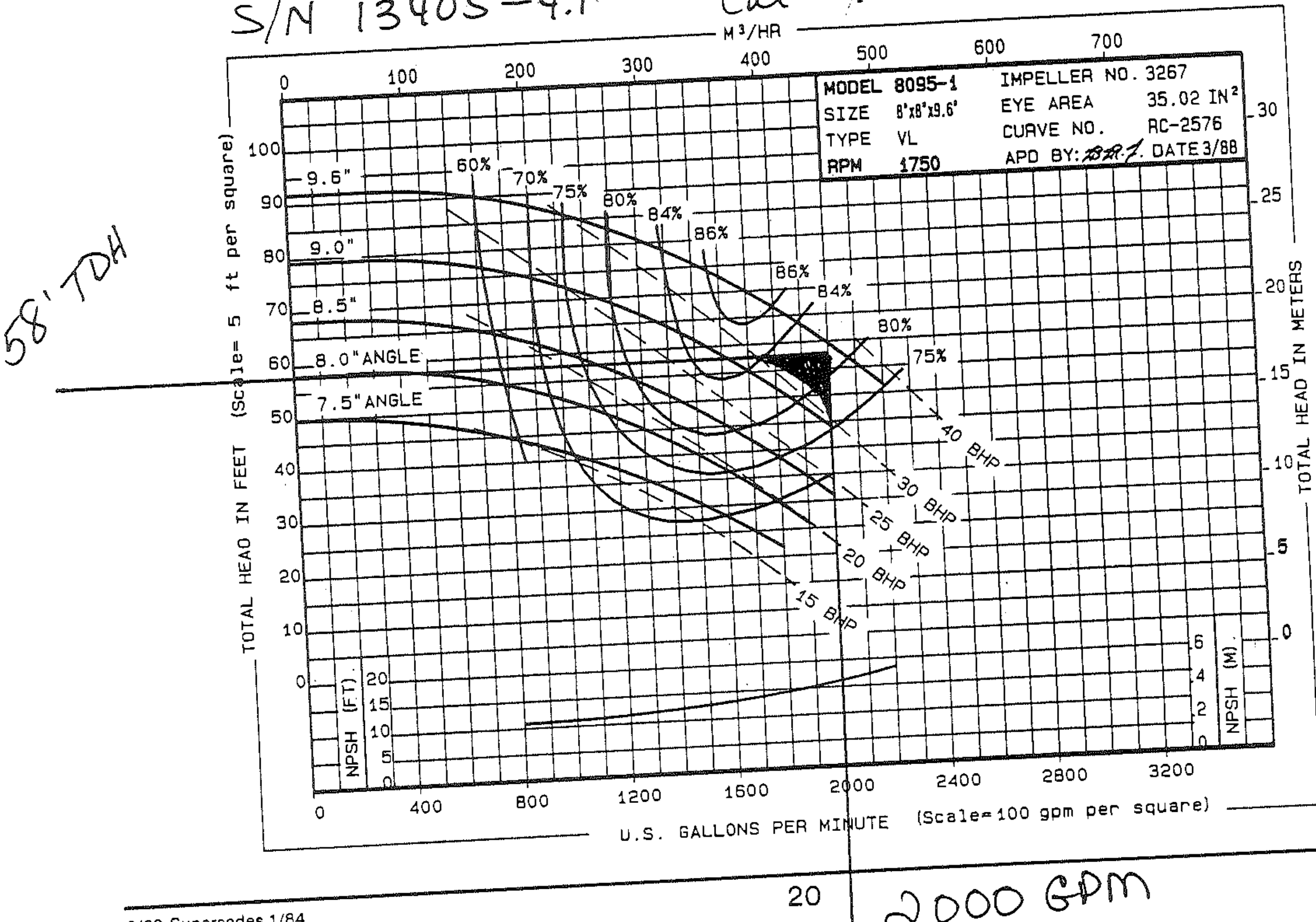
Type VL

PACO PUMPS®

PACO Pumps, Inc.
P.O. Box 12924 • 845 92nd Avenue
Oakland, CA 94604-2924

PERFORMANCE CURVES — 1750 RPM

S/N 13405—4.1   Cat # 16-80951-1A0101-1892EE



* LUTES BOOSTER 2000 gpm FIRE PUMP.

START WHEN 2-500gpm DO NOT KEEP UP. SHUT DOWN 2-500gpm PUMPS AND STARTS THIS ONE.

2/89 Supersedes 1/84

Lutes Transfer

SUPERSEDES 132-54
APRIL 1985

Lutes Transfer

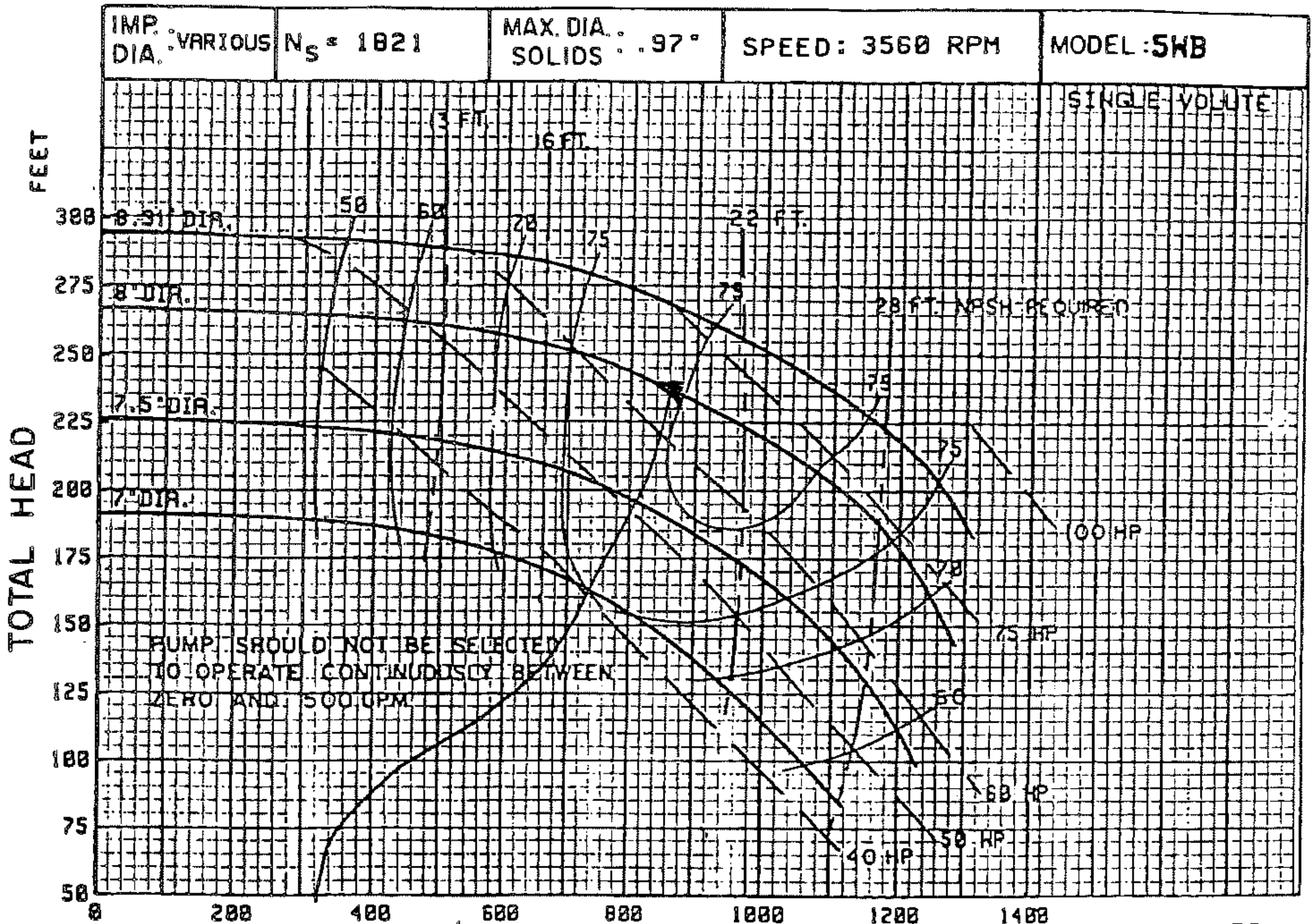
132-54

OCT. 1991

MODEL 5WB PUMP

SPEED - 3600 RPM
CLOSED IMPELLER

60 HERTZ



875 GPM @ 240' TDH

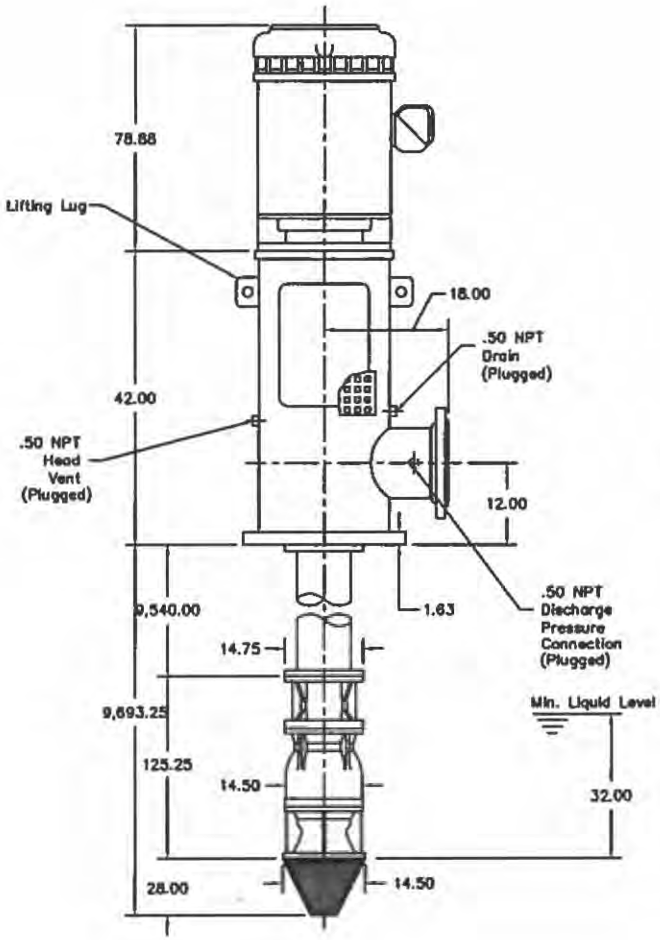
FT. x (.305) = METERS

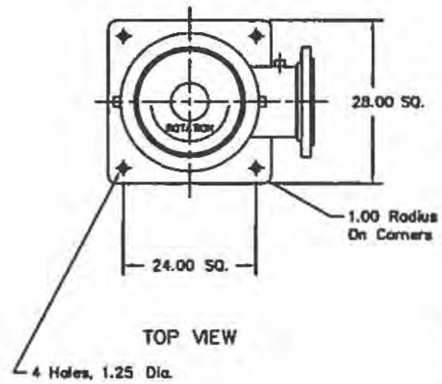
GPM x (.227) = CUBIC METERS PER HOUR

	MAXIMUM IMPELLER DIAMETER	
HP	FOR FULL MOTOR LOAD	FOR FULL MOTOR LOAD + 15% S.F.
100	A(8.31")	
75	B(8.19")	B+(8.31")
60	C(7.62")	C+(8.0")
50	D(7.25")	D+(7.56")
40	E(6.75")	E+(7.12")

Model 5YB-CC 100-2
S/N 105379 8.94
TC 04230

Performances shown are for close-coupled electric configuration with packing. Other mounting styles may require horsepower and/or performance adjustments.





TOP VIEW

MOTOR

600 H.P. Vertical HOLLOW Shaft
1800 R.P.M. 3 Phase 60 Cycle 460 Volts
WP-1 Enclosure Mfg. U.S. Motors
Premium Efficient, Type RUEI

DISCHARGE HEAD – TYPE HF

12HF24 Discharge Head
12" 150# Raised Face Discharge Flange
flange holes straddle vertical centerline
Shaft Seal TENSION ASSEMBLY

COLUMN

12" Column Pipe
2.19" Diameter Enclosed Lineshaft
3.50" Enclosing Tube

PUMP

8 Stage 15EMM Bowl ENCLOSED Impeller

Strainer Type CONICAL

MATERIALS

Bowls CAST IRON	Column STEEL
Impellers BRONZE	Brg. Retainer RUBBER
Pump Shaft 416 S.S.	Lineshaft C-1045
Bowl Brgs. BRONZE	Lineshaft Brgs. BRONZE
Head STEEL	
Strainer 316 S.S.	Enclosing Tube STEEL

Driver Weight 4,850 lbs. Pump Weight 54,600 lbs.

REVISIONS

REV	DESCRIPTION						

Pump Tech, Inc
Lewiston Orchards Irrigation District

CUSTOMER INFORMATION

Flow: 2,000 GPM
Head: 813' TDH

OPERATING CONDITIONS

STATUS OF APPROVAL

ORDER NO.

DRAWN BY	DATE
GL	11/15

FLOWSERVE Pump Division

DWG TITLE: GENERAL ARRANGEMENT

SIZE A2 DRAWING NO. REV

SCALE UNITS in SHEET NO. n/p

Well No. 5

Customer	: Flowserve
Item number	: -
Service	: PumpTech, Inc. - LOID
Flowserve reference	: Default 0.1
Date	: September 18, 2015

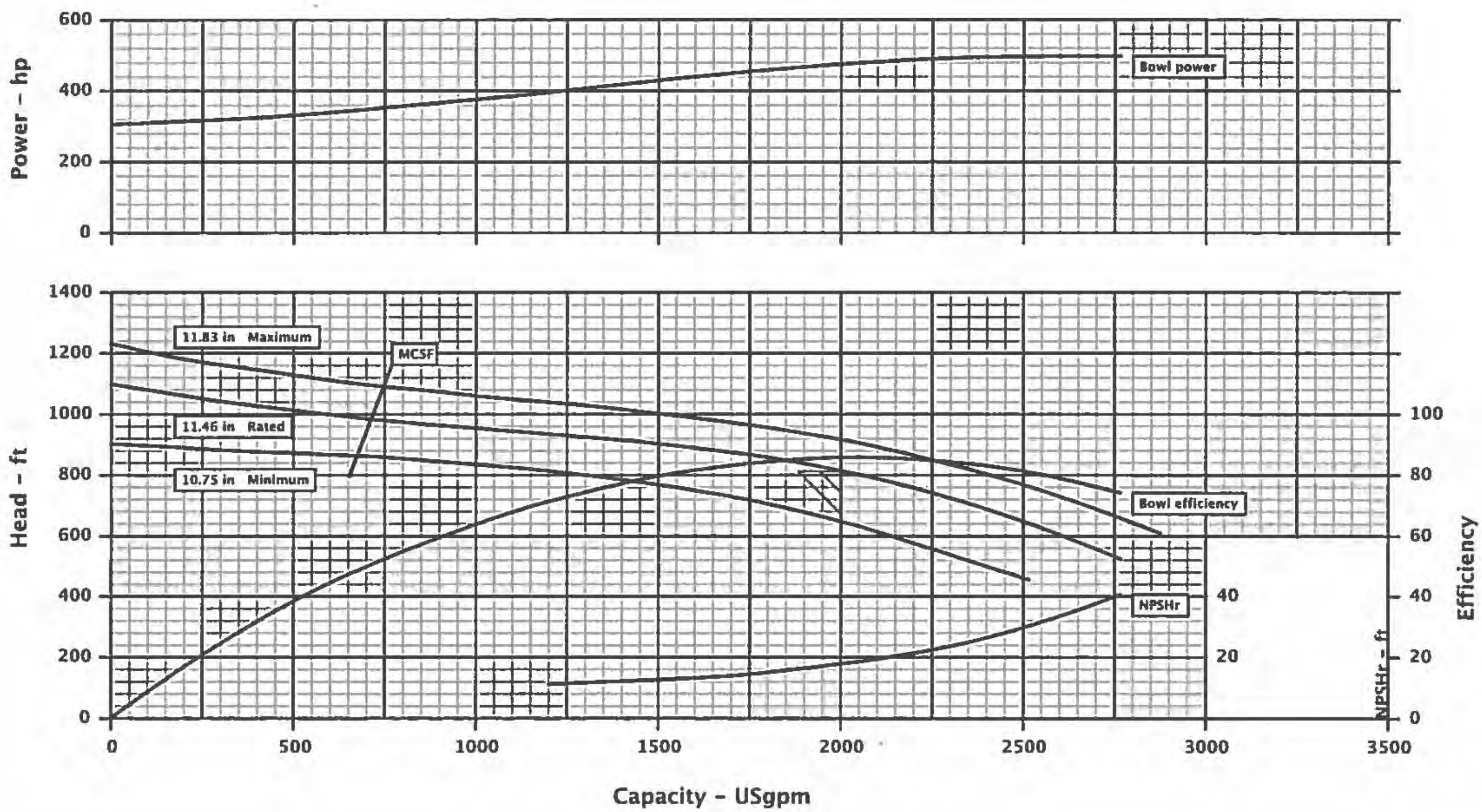
FLOWSERVE

Capacity	: 2000.0 USgpm	Specific gravity	: 1.000
Head	: 813.00 ft	Pump speed	: 1775 rpm

Pump size & type	: 15EMM
Based on curve no.	: EC-2377
Number of stages	: 8
Test tolerance	: Hydraulic Institute Level A

CURVES ARE APPROXIMATE, PUMP IS GUARANTEED FOR ONE SET OF CONDITIONS, CAPACITY HEAD AND EFFICIENCY

Bowl performance shown below is corrected for materials, viscosity and construction.



Bowl head of 813.69 ft corresponds with 813.0 ft head at low liquid level adjusted for elevation and friction losses

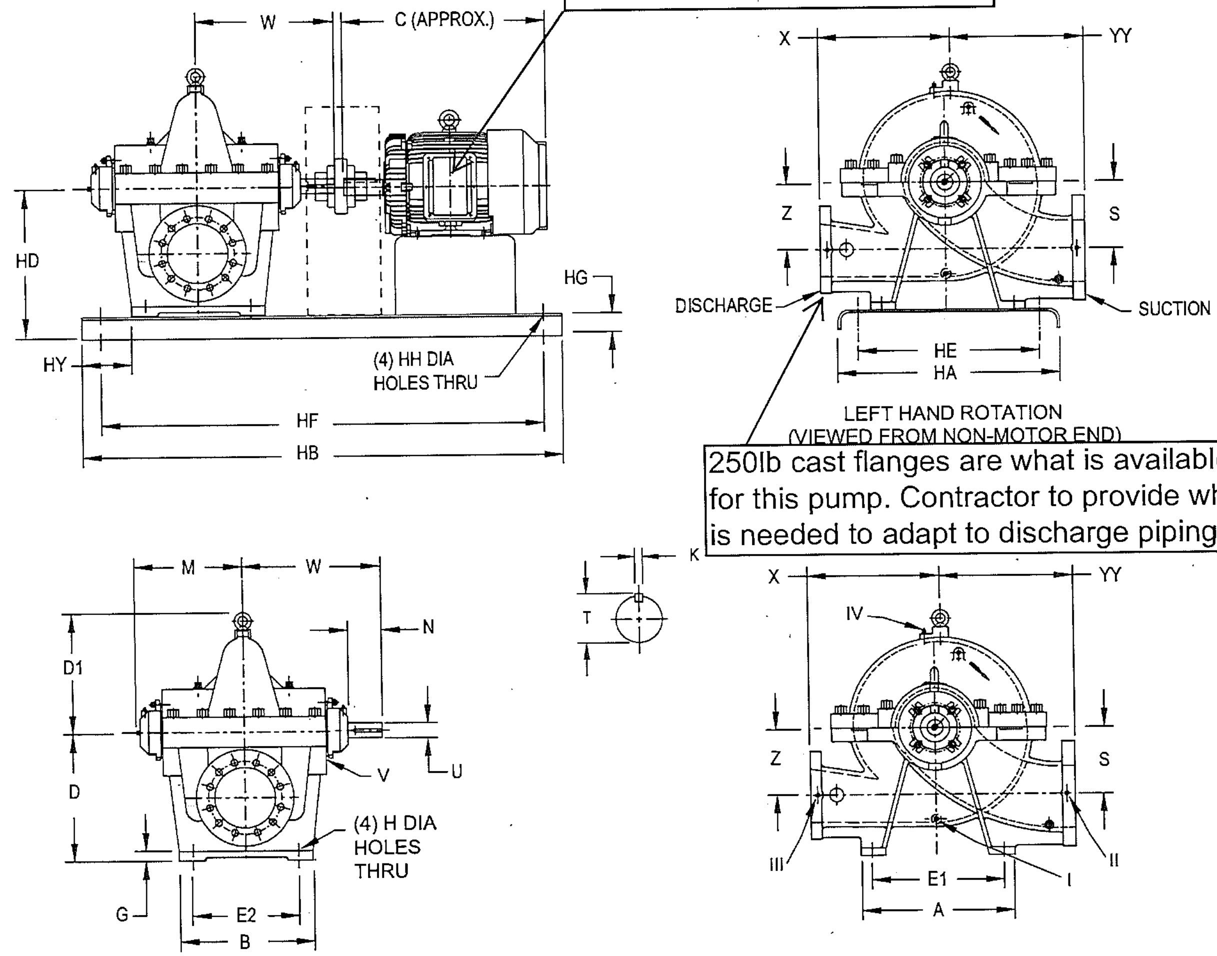
FlowSelex v2.2

Well 5 Irrigation Booster

GENERAL ARRANGEMENT DRAWINGS

motor to be supplied with Nidec standard oversized conduit box

250lb cast flanges are what is available for this pump. Contractor to provide what is needed to adapt to discharge piping



Base	Base WT	HA	HB	HD	HE	HF	HG	HH	HY
398	510.0	26.00	98.00	26.00	19.00	95.50	4.75	1.00	5.00

Model	A	B	C	D	D1	E1	E2	G	H	K	M	N	S	T	U	W	X	YY	Z
6x8-22 HD	22.06	17.75	55.00	21.25	18.25	19.25	15.38	1.13	1.14	0.50	14.63	5.25	11.81	2.38	2.13	19.81	19.69	23.63	11.81

NOTES

All Dimensions Are In inches ± 0.38 in

Not For Construction Unless Certified By Engineering

HORIZONTIAL SPLIT CASE PUMP

340 SERIES HD

COMPLETE PUMP

PUMP DATA			
Casing Matl	Cast Iron	Shaft Matl	416/420SS Shaft
Impeller Matl	Bronze	Sleeve Matl	Bronze
Disc. Position	-	RPM	1760 rpm
Pump WT	1,585.0 lb	Est. Shipping WT	6,120.0 lb
GENERAL DATA			
Flow	2,000.0 USgpm	Head	455.0 ft
Liquid	Water		
Liquid Temp	68.00 deg F	SG	1.000 SG
Viscosity	1.00 cP		
MECHANICAL SEAL DATA			
Mfr	-	Type	-
Size	0.00 in	API Code	Plan 22
COUPLING DATA			
Mfr	Falk	Type	Non-Spacer
Size	50R10	Cplg Guard By	-
Matl	-		
MOTOR DATA			
Mfr	USM	Frame	449T
Pump Pwr Max	411 hp	Pump Pwr Rated	306 hp
Enclsoure	TEFC	RPM	1800
Rotation	-	Phase	3
Cycles	60	HP	450
Motor WT	4,025.0 lb	Volts	460
PUMP FLANGES			
Flange	Size	Rating (ANSI)	Facing
Suction	8.00 in	-	FF
Discharge	6.00 in	250#	FF

TAP	TAP CONNECTION
I	Casing Drain Connection (1/2"-14NPT)
II	Discharge Nozzle Connection (1/4"-18 NPT)
III	Suction Nozzle Connection (1/4"-18 NPT)
IV	Casing Vent ~~(1/4"-18 NPT)~~ 1/2" NPT
V	Stuffing Box Drain (1/4"-18NPT)
VI	-

CERTIFICATION CONTENT	
Customer	PUMPTECH, INC.
Service	BOOSTER PUMP
Date	09 Dec 2015 10:38 AM
P.O. Number	-
Item Number	003
Certified For	-
Certified By	-

AMERICAN-MARSH PUMPS "DURABILITY BY DESIGN SINCE 1873"

WARNING
DO NOT OPERATE THIS MACHINE WITHOUT PROTECTIVE GUARD IN PLACE. ANY OPERATION OF THIS MACHINE WITHOUT PROTECTIVE GUARD CAN RESULT IN SEVERE BODILY INJURY

6x8-22 HD

Well 5 Irrigation Booster

Pump Performance Datasheet

Customer	: PUMPTECH, INC.	Quote number	: 442284
Customer reference	: LEWISTON ORCHARD IRRIGATION DISCTRICT	Size	: 6x8-22 HD
		Stages	: 1
Item number	: 003	Based on curve number	: 6x8-22 HD
Service	: BOOSTER PUMP	Date last saved	: 01 Oct 2015 4:21 PM
Quantity	: 1		

Operating Conditions

Flow, rated	: 2,000.0 USgpm
Differential head / pressure, rated (requested)	: 455.0 ft
Differential head / pressure, rated (actual)	: 456.8 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Frequency	: 60 Hz

Performance

Speed, rated	: 1760 rpm
Impeller diameter, rated	: 20.88 in
Impeller diameter, maximum	: 22.88 in
Impeller diameter, minimum	: 17.75 in
Efficiency	: 75.11 %
NPSH required / margin required	: 10.69 / 0.50 ft
Ns (total flow) / Nss (imp. eye flow)	: 932 / 8,245 US Units
MCSF	: -
Head, maximum, rated diameter	: 495.9 ft
Head rise to shutoff	: 8.98 %
Flow, best eff. point (BEP)	: 2,816.5 USgpm
Flow ratio (rated / BEP)	: 71.01 %
Diameter ratio (rated / max)	: 91.26 %
Head ratio (rated dia / max dia)	: 82.34 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

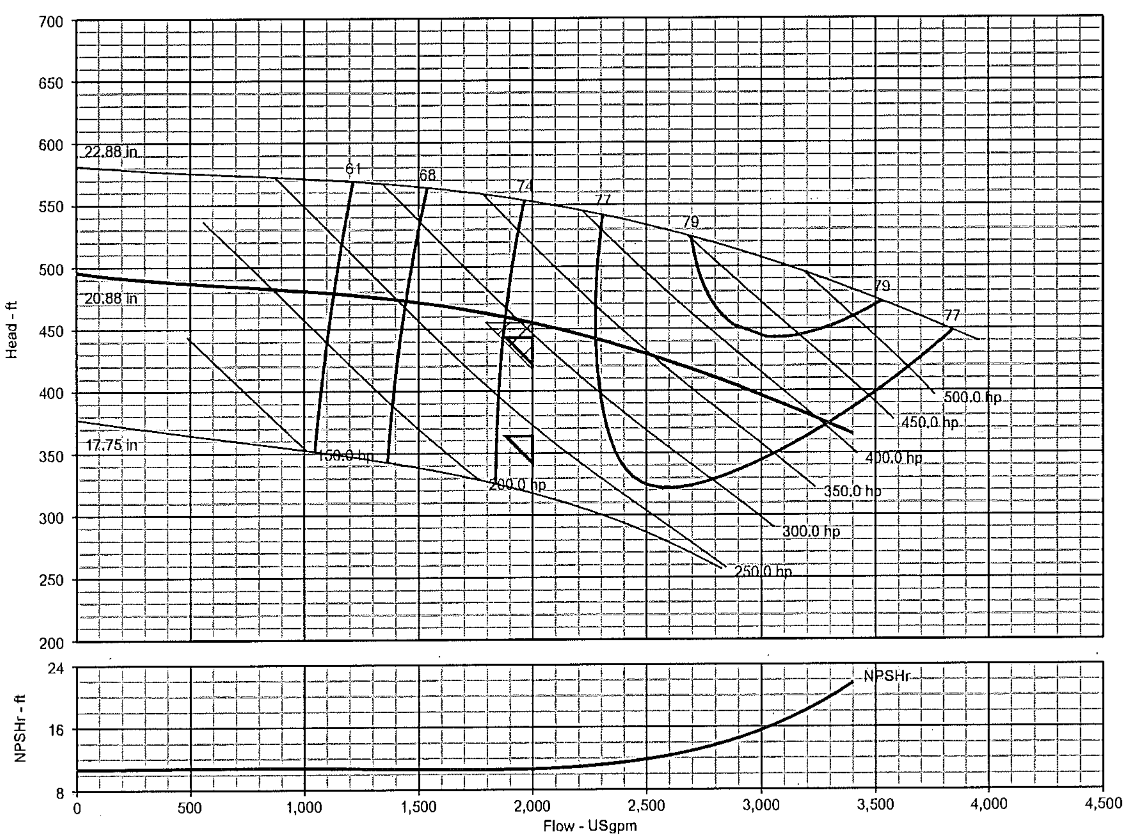
Material selected	: Cast Iron Bronze Fitted

Pressure Data

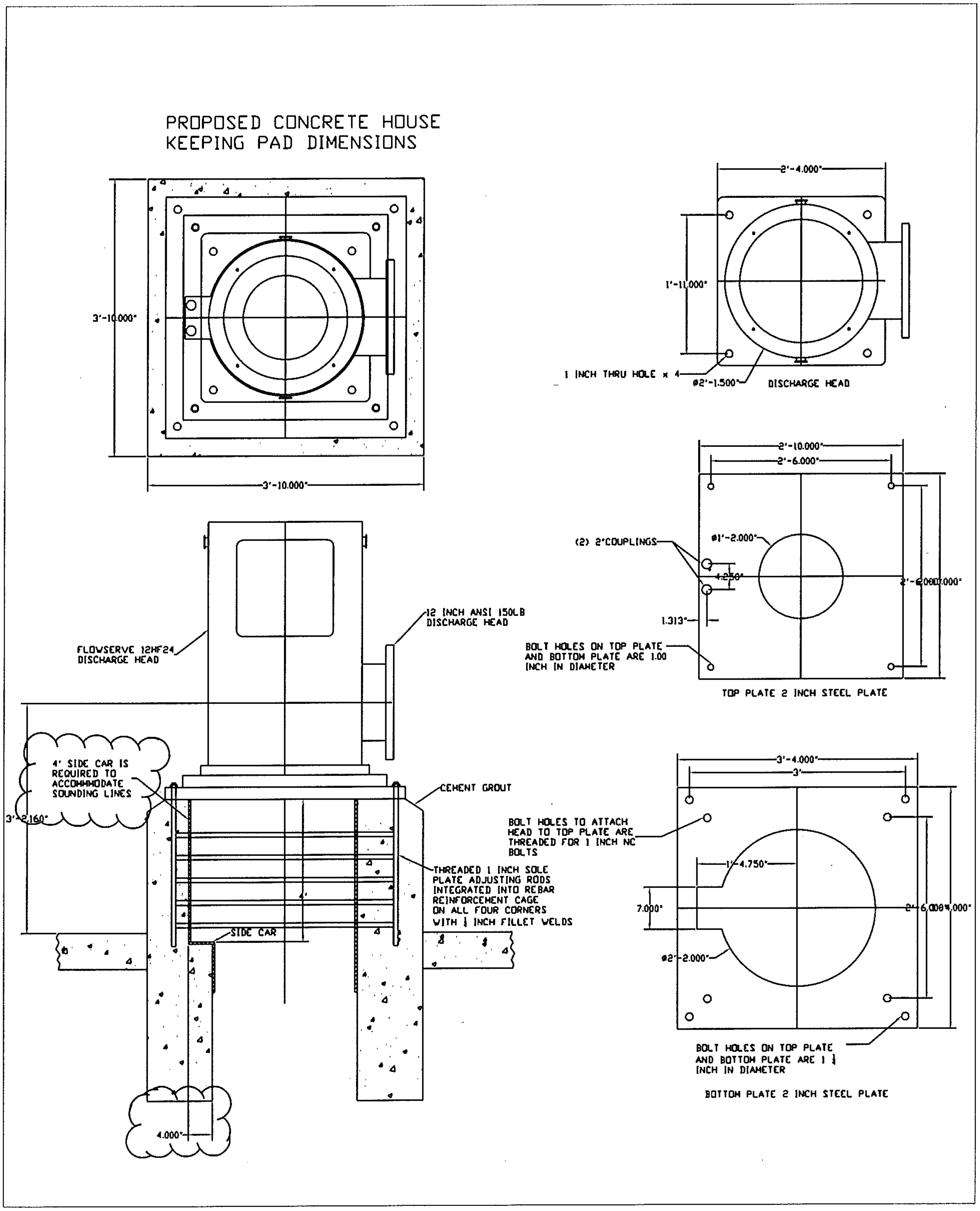
Maximum working pressure	: 214.6 psi.g
Maximum allowable working pressure	: 500.0 psi.g
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: 750.0 psi.g

Driver & Power Data

Driver sizing specification	: Maximum power
Margin over specification	: 0.00 %
Service factor	: 1.15
Power, hydraulic	: 230 hp
Power, rated	: 306 hp
Power, maximum, rated diameter	: 412 hp
Minimum recommended motor rating	: ~~450 hp / 336 kW~~



Well 5 Irrigation Booster



PumpTech inc
12020 SE 32nd ST
Bellevue, WA. 98005
(425) 644-8501 Fax: (425) 562-9213

LOID WELL No. 5

TWO PLATE SOLE PLATE SYSTEM

SIZE	DRAWN BY.	DWG NO.	REV
	MJD	121077	3
SCALE NONE		DATE. 01/11/2016	

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Appendix D – Well Water Rights

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Well No. 1

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

TRANSFER OF WATER RIGHT

TRANSFER NO. 75194

This is to certify that: LEWISTON ORCHARDS IRRIGATION DISTRICT
1520 POWERS AVE
LEWISTON ID 83501
(208)746-8235

has requested a change to the water right(s) listed below. This change in water right(s) is authorized pursuant to the provisions of Section 42-222, Idaho Code. A summary of the changes is also listed below. The authorized change for each affected water right, including conditions of approval, is shown on the following pages of this document.

Summary of Water Rights Before the Proposed Change

Right	Origin/Basis	Priority	Rate	Volume	Acre Limit	Total Acres	Source
85-7146	WR/Decreed	04/29/1977	1.34 cfs	N/A	N/A	N/A	GROUND WATER

Purpose of Transfer (Changes Proposed)

Current Number	Split	POD	POU	Add POD	Period of Use	Nature of Use
85-7146	NO	NO	NO	YES	NO	NO

Summary of Water Rights After the Approved Change

Existing Right	New No. (changed portion)	Transfer Rate	Transfer Volume	Acre Limit	Total Acres	New No. (remaining portion)	Remaining Rate	Remaining Volume	Remaining Acre Limit	Remaining Total Acres
85-7146	**85-7146**	1.34 cfs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
COMBINED TOTALS		**1.34 cfs**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Detailed Water Right Description(s) attached

Dated this 18th day of February, 2009

Robert G. Haynes

Robert G. Haynes, P.E., Regional Manager

Well No. 1

WATER RIGHT NO. 85-7146

As Modified by Transfer No. 75194

In accordance with the approval of Transfer No. 75194, Water Right No. 85-7146 is now described as follows.

Right Holder: LEWISTON ORCHARDS IRRIGATION DISTRICT
1520 POWERS AVE
LEWISTON ID 83501

Priority Date: April 29, 1977

Source: GROUND WATER

BENEFICIAL USE	From		To	Diversion Rate
MUNICIPAL	01/01	to	12/31	1.34 CFS

LOCATION OF POINT(S) OF DIVERSION:

GROUND WATER	NWNENW	Sec. 22 Twp 35N	Rge 05W	NEZ PERCE COUNTY
GROUND WATER	NWNENW	Sec. 22 Twp 35N	Rge 05W	NEZ PERCE COUNTY

CONDITIONS OF APPROVAL

1. Pursuant to Section 42-1412(6), Idaho Code, this water right is subject to such general provisions necessary for the definition of the rights or for the efficient administration of water rights as may be determined by the Snake River Basin Adjudication court at a point in time no later than the entry of the final unified decree.
2. The right holder shall accomplish the change authorized by this transfer within 1 year of the date of this approval.
3. Failure of the right holder to comply with the conditions of this transfer is cause for the Director to rescind approval of the transfer.
4. A map depicting the place of use boundary for this water right at the time of this approval is attached to this document for illustration purposes.

This water right is subject to all prior water rights and shall be administered in accordance with Idaho law and applicable rules of the Department of Water Resources.

Dated this 18th day of February, 2009

Robert G. Haynes

Robert G. Haynes, P.E., Regional Manager

State of Idaho
Department of Water Resources

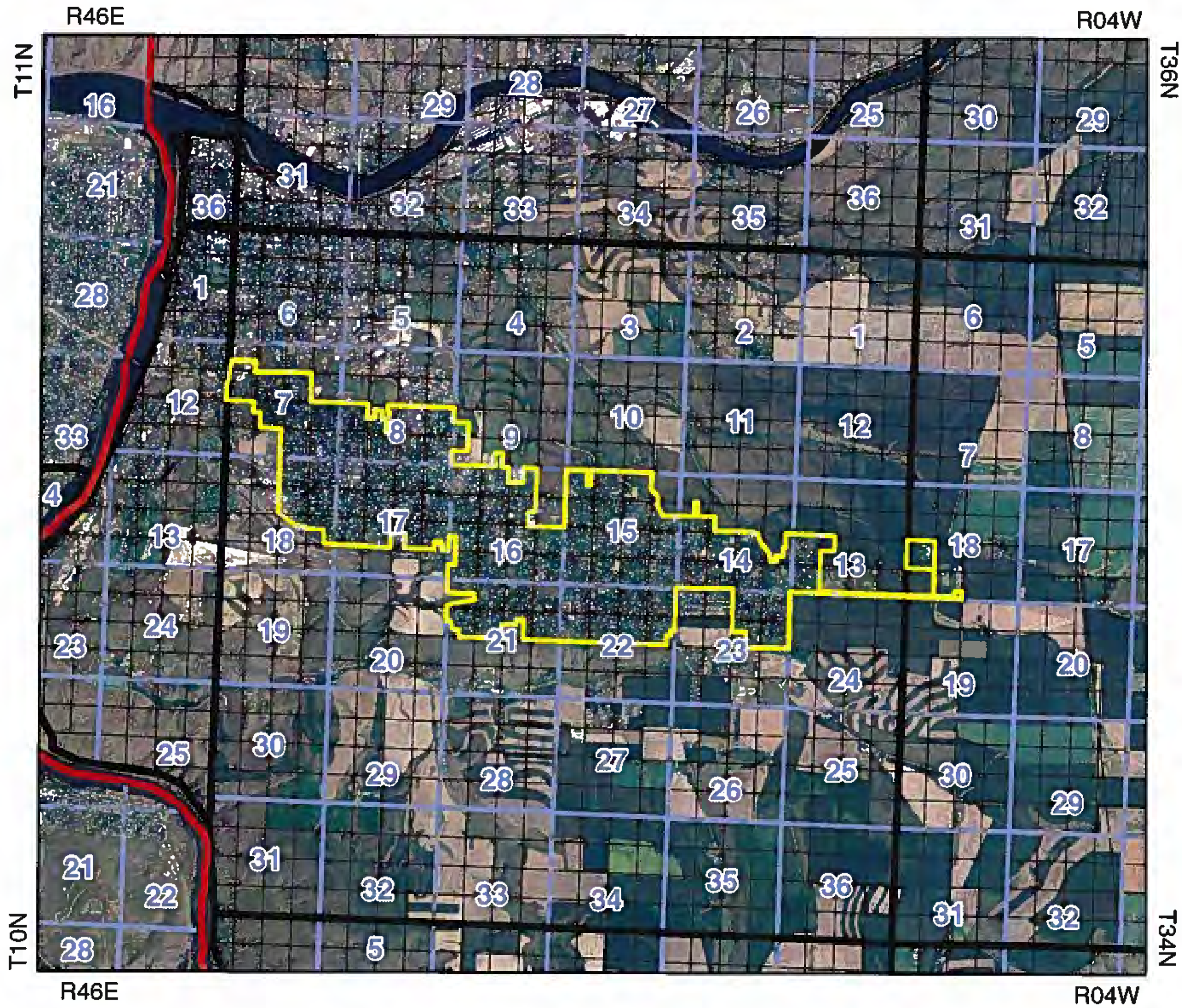
Well No. 1

Transfer Of Water Right

Transfer No. 75194

Water Service Area Boundary for Lewiston Orchards Irrigation District
Rights: 85-7146

December 17, 2008



0 1 2 4 Miles

Legend

- Water Service Area Boundary
- Townships
- PLS Sections
- Quarter Quarters

N

Well No. 2

State of Idaho

Department of Water Resources

WATER RIGHT LICENSE

WATER RIGHT NO. 85-07428

Priority: February 28, 1985 Maximum Diversion Rate: 2.13 CFS

This is to certify, that LEWISTON ORCHARDS IRRIGATION DISTRICT
1520 POWERS AVE
LEWISTON ID 83501 has complied with the terms and conditions of the permit, issued pursuant to Application for Permit dated February 28, 1985; and has submitted Proof of Beneficial Use on May 20, 1987. An examination indicates that the works have a diversion capacity of 2.130 cfs of water from a **GROUNDWATER** **source, and a water right has been established as follows:**

BENEFICIAL USE	PERIOD OF USE	RATE OF DIVERSION	ANNUAL VOLUME
MUNICIPAL	01/01 to 12/31	2.13 CFS	

LOCATION OF POINT(S) OF DIVERSION: SWSW , Sec. 17, Township 35N, Range 04W
NEZ PERCE County

PLACE OF USE: MUNICIPAL

TWN	RGE	SEC			
35N	04W	18	NESW	NWSW	SESW
			NWSE		
		19	NWNE		
	05W	7	SWNE	SENE	SWNW
			SENW	NESW	NWSW
			SWSW	SESW	NESE
			NWSE	SWSE	SESE
		8	SWNE	SWNW	NESW
			NWSW	SWSW	SESW
			NESE	NWSE	SWSE
			SESE		
		9	NWSW	SWSW	SESW
		13	NENE	SENE	NESW
			NWSW	SWSW	NESE
			SESE		
		14	SWNW	NESW	NWSW
			SWSW	SESW	NESE
			NWSE	SWSE	SESE
		15	NWNE	SWNE	SENE
			NENW	NWNW	SWNW
			SENW	NESW	NWSW
			SWSW	SESW	NESE
			NWSE	SWSE	SESE
		16	NWNE	SWNE	SENE
			NENW	NWNW	SWNW
			SENW	NESW	NWSW
			SWSW	SESW	NESE
			NWSE	SWSE	SESE
		17	NENE	NWNE	SWNE
			SENE	NENW	NWNW
			SWNW	SENW	NESW
			NWSW	SESW	NESE

JAN 20 1994

Well No. 2

State of Idaho
Department of Water Resources

WATER RIGHT LICENSE

WATER RIGHT NO. 85-07428

PLACE OF USE: MUNICIPAL

TWN	RGE	SEC			
			NWSE	SWSE	SESE
		18	NENE	NWNE	SWNE
			SENE	NENW	NWNW
			SWNW	NESW	NWSW
			SWSW	SESW	NESE
			NWSE		
		20	NESE		
		21	NENE	NWNE	SWNE
			SENE	NENW	NWNW
			SWNW	SENW	NESW
			NWSW		
		22	NENE	NWNE	SWNE
			SENE	NENW	NWNW
			SWNW	SENW	
		23	NENE	NWNE	SWNE
			SENE	NENW	NWNW
	06W	12	SWSE	SESE	

CONDITIONS/REMARKS:

1. This water right is appurtenant to the described place of use.
2. This right is subject to all prior water rights and may be forfeited by five years of non-use.
3. Modifications to or variance from this license must be made within the limits of Section 42-222, Idaho Code, or the applicable Idaho law.
4. The issuance of this right in no way grants any right-of-way or easement across the land of another.
5. Place of use is located within the boundaries of the Lewiston Orchards Irrigation District service area.

This license is issued pursuant to the provisions of Section 42-219, Idaho Code. Witness the seal and signature of the Director, affixed at Boise, this 16TH day of November, 1993.

Acting for R. Keith Higginson, Director

JAN 20 1994

State of Idaho
Department of Water Resources

Well No. 3

Water Right License

WATER RIGHT NO. 85-07638

Priority: April 12, 1997 Maximum Diversion Rate: 2.76 CFS

This is to certify, that LEWISTON ORCHARDS IRRIGATION DISTRICT
1520 POWERS AVE
LEWISTON ID 83501 has complied with the terms and conditions of the permit, issued pursuant to Application for Permit dated April 11, 1997; and has submitted Proof of Beneficial Use on September 2, 1998. An examination indicates that the works have a diversion capacity of 2.760 cfs of water from a GROUNDWATER source, and a water right has been established as follows:

BENEFICIAL USE	PERIOD OF USE	RATE OF DIVERSION	ANNUAL VOLUME
MUNICIPAL	01/01 to 12/31	2.76 CFS	

LOCATION OF POINT(S) OF DIVERSION: SESW , Sec. 10, Township 35N, Range 05W
NEZ PERCE County

PLACE OF USE: See Remarks

CONDITIONS OF APPROVAL AND REMARKS

1. After specific notification by the department, the right holder shall install a suitable measuring device or shall enter into an agreement with the department to determine the amount of water diverted from power records and shall annually report the information to the department.
2. Place of use is located within the service area of Lewiston Orchard Irrigation District.
3. Point of diversion is also known as Well No. 3.

This license is issued pursuant to the provisions of Section 42-219, Idaho Code. The water right confirmed by this license is subject to all prior water rights and shall be administered in accordance with Idaho law and applicable rules of the Department of Water Resources. Signed and sealed this 16th day of April, 1999.

Acting for KARL J. DREHER, Director

MICROFILMED

AUG 1 1 1999

Well No. 4

State of Idaho
Department of Water Resources

Water Right License

WATER RIGHT NO. 85-15356

Priority: November 16, 2007 Maximum Diversion Rate: 2.31 CFS

It is hereby certified that LEWISTON ORCHARDS IRRIGATION DISTRICT
1520 POWERS AVE
LEWISTON ID 83501 has complied with the terms and conditions of the permit, issued pursuant to Application for Permit dated April 03, 2002; and has submitted Proof of Beneficial Use on November 16, 2007. An examination confirms water is diverted from:

SOURCE
GROUND WATER

and a water right has been established as follows:

BENEFICIAL USE	**PERIOD OF USE**	**DIVERSION RATE**
MUNICIPAL	01/01 to 12/31	2.31 CFS

LOCATION OF POINT(S) OF DIVERSION:
GROUND WATER NE1/4NW1/4 Sec. 22, Twp 35N, Rge 05W, B.M. NEZ PERCE County

CONDITIONS OF APPROVAL

This license is issued pursuant to the provisions of Section 42-219, Idaho Code. The water right confirmed by this license is subject to all prior water rights and shall be used in accordance with Idaho law and applicable rules of the Department of Water Resources.

1. A map depicting the place of use boundary for this water right at the time of this approval is attached to this document for illustrative purposes.

2. Place of use is within the service area of Lewiston Orchards Irrigation District municipal water supply system as provided for under Idaho Law.

3. This right does not grant any right-of-way or easement across the land of another.

This license is issued pursuant to the provisions of Section 42-219, Idaho Code. The water right confirmed by this license is subject to all prior water rights and shall be used in accordance with Idaho law and applicable rules of the Department of Water Resources.

Signed this 4 day of February, 2014.

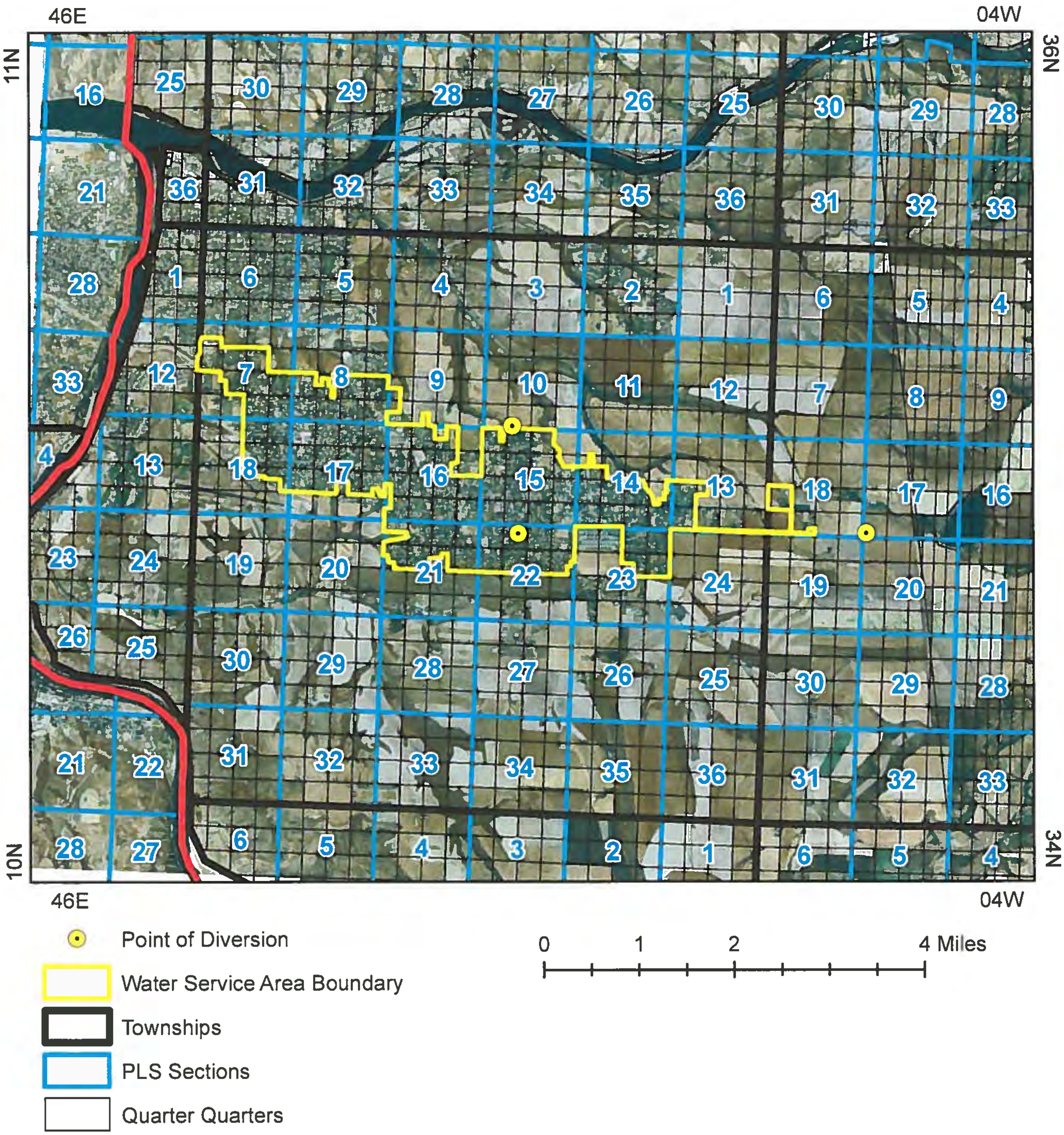
Keith E. [signature]
For, GARY SPACKMAN
Director

Well No. 4

State of Idaho
Department of Water Resources

Water Right License

85-15356



Well No. 5

State of Idaho
Department of Water Resources

Amendment of Permit

NO. 85-15755

Date of Priority: May 08, 2014

Maximum Diversion Rate: 18.00 CFS
Maximum Storage Volume: 11,543.0 AF

This is to certify that LEWISTON ORCHARDS IRRIGATION DISTRICT
1520 POWERS AVE
LEWISTON ID 83501

has applied for an amendment of a permit and the amendment is APPROVED for development of water as follows:

Source: GROUND WATER

BENEFICIAL USE	PERIOD OF USE	RATE OF DIVERSION	ANNUAL VOLUME
DIVERSION TO STORAGE	01/01 to 12/31	18.00 CFS	
MUNICIPAL	01/01 to 12/31	18.00 CFS	
MUNICIPAL STORAGE	01/01 to 12/31		11,543.0 AF
MUNICIPAL FROM STORAGE	01/01 to 12/31		8,500.0 AF
FIRE PROTECTION	01/01 to 12/31	18.00 CFS	
FIRE PROTECTION STORAGE	01/01 to 12/31		3,043.0 AF

LOCATION OF POINT(S) OF DIVERSION:

GROUND WATER NE¼NW¼ Sec. 22, Twp 35N, Rge 05W, B.M. NEZ PERCE County
GROUND WATER SW¼SW¼ Sec. 17, Twp 35N, Rge 04W, B.M. NEZ PERCE County
GROUND WATER SE¼SW¼ Sec. 10, Twp 35N, Rge 05W, B.M. NEZ PERCE County
GROUND WATER NE¼NW¼ Sec. 22, Twp 35N, Rge 05W, B.M. NEZ PERCE County
GROUND WATER NW¼NE¼ Sec. 20, Twp 35N, Rge 05W, B.M. NEZ PERCE County
GROUND WATER NE¼NE¼ Sec. 20, Twp 35N, Rge 05W, B.M. NEZ PERCE County
GROUND WATER NE¼NE¼ Sec. 20, Twp 35N, Rge 05W, B.M. NEZ PERCE County
GROUND WATER SW¼NE¼ Sec. 20, Twp 35N, Rge 05W, B.M. NEZ PERCE County

PLACE OF USE: MUNICIPAL STORAGE and FIRE PROTECTION STORAGE

Twp Rge Sec	NE				NW				SW				SE				
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	Totals
35N 04W 16							X L10	X L11	X L22	X L23 L24	X L25 L26	X L27					
35N 04W 17													X L11			X L18 L19	
35N 04W 20	X L16 L17																
35N 04W 21						X L7 L8											

State of Idaho
Department of Water Resources

Amendment of Permit

NO. 85-15755

PLACE OF USE: FIRE PROTECTION

Twp Rge Sec	NE				NW				SW				SE				Totals
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
35N 04W 17										X	X	X L 4			X L 16 L 17	X L 18	
35N 04W 18									X	X L 3	X L 4	X	X	X		X	
35N 04W 19		X															
35N 04W 20		X L 1			X												
35N 05W 7			X	X	X		X L 2	X	X	X L 3	X L 4	X	X	X	X	X	
35N 05W 8			X	X			X	X	X	X	X	X	X	X	X	X	
35N 05W 9										X	X	X			X	X	
35N 05W 10											X	X			X		
35N 05W 11											X						
35N 05W 13							X	X	X	X	X	X	X	X	X	X	
35N 05W 14			X	X	X	X	X	X	X	X	X	X	X	X	X	X	
35N 05W 15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
35N 05W 16	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
35N 05W 17	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
35N 05W 18	X	X	X	X	X			X					X	X			
35N 05W 20	X			X									X				
35N 05W 21	X	X	X	X	X	X	X	X	X	X			X	X			
35N 05W 22	X	X	X	X	X	X	X	X	X	X							
35N 05W 23	X	X	X	X	X	X											
35N 06W 12				X													

Well No. 5

State of Idaho
Department of Water Resources

Amendment of Permit

NO. 85-15755

CONDITIONS OF APPROVAL

1. Proof of application of water to beneficial use shall be submitted on or before **August 01, 2019.**
2. Subject to all prior water rights.
3. This right does not grant any right-of-way or easement across the land of another.
4. Project construction shall commence within one year from the date of permit issuance and shall proceed diligently to completion unless it can be shown to the satisfaction of the Director of the Department of Water Resources that delays were due to circumstances over which the permit holder had no control.
5. Right holder shall comply with the drilling permit requirements of Section 42-235, Idaho Code and applicable Well Construction Rules of the Department.
6. Prior to the diversion and use of water under this approval, the right holder shall comply with applicable county zoning and use ordinances.
7. Water shall not be diverted for fire protection use under this right except to fight or repel an existing fire.
8. Water shall not be diverted from fire protection storage except to fight or repel an existing fire.
9. After specific notification by the Department, the right holder shall install a suitable measuring device or shall enter into an agreement with the Department to use power records to determine the amount of water diverted and shall annually report the information to the Department.
10. Place of use for municipal and municipal from storage is within the service area of the Lewiston Orchards Irrigation District as provided for under Idaho law.
11. In connection with the proof of beneficial use submitted for this permit, the permit holder shall also submit a report showing the total annual volume, the maximum daily volume, and the maximum instantaneous rate of flow diverted from the points of diversion authorized for this permit during the development period. The report shall also show the maximum instantaneous rate of diversion, either measured or reasonably estimated by a qualified professional engineer, geologist, or certified water rights examiner, for the entire Lewiston Orchards Irrigation District municipal water system. The report shall also describe and explain how water diverted under this permit provides an additional increment of beneficial use of water or a new source of water for the Lewiston Orchards Irrigation District municipal water system as opposed to an alternative point of diversion for prior water rights from the same water source already held and used by the Lewiston Orchards Irrigation District for its municipal water system.
12. Prior to or in connection with the proof of beneficial use statement to be submitted for municipal water use under this right, the right holder shall provide the department with documentation showing that the water supply system is being regulated by the Idaho Department of Environmental Quality as a public water supply and that it has been issued a public water supply number.
13. This right authorizes the diversion of an annual total of 11,543 acre-feet to be used for the initial filling of the pond or reservoir, for the replacement of losses caused by seepage and evaporation from the pond or reservoir and for the storage of water for municipal and fire protection purposes.
14. The pond or reservoir established by the storage of water under this right shall not exceed a total capacity of 2,440 acre-feet or a total surface area of 90 acres.
15. This right is intended to replace the use of existing surface water rights 85-16, 85-2049, 85-2063, 85-2065, 85-2146, 85-2147, 85-4483, 85-11087, and 85-15424 within the Lewiston Orchards Irrigation District over time. Concurrent with this replacement effort, the existing surface water rights may be changed to other purposes of use or places of use, subject to approval by the Department within the appropriate statutory process. Meanwhile, for use within the Lewiston Orchards Irrigation District, this right when combined with the existing surface water rights shall not exceed a total diversion rate of 110.30 cfs or a total storage volume of 19,306.0 acre-feet.

Well No. 5

State of Idaho
Department of Water Resources

Amendment of Permit

NO. 85-15755

CONDITIONS OF APPROVAL CONTINUED

16. Pursuant to Idaho Code Section 42-233, this right authorizes the diversion and use of the low temperature geothermal resource (bottom hole temperature of at least 85˚F but less than 212˚F) that may be encountered due to the regular rate of increasing temperature with respect to increasing depth, also known as the geothermal gradient, in the wells used as the points of diversion for this right. This authorization is granted because (i) there is no feasible alternative use of the resource; (ii) there is no economically viable source of water having a bottom hole temperature of eighty-five (85) degrees or less in a well available; and (iii) the exemption is in the public interest. This right does not authorize diversion of a low temperature geothermal resource attributable to hydro-geologic factors other than the geothermal gradient. If a low temperature geothermal resource not attributable to the geothermal gradient is encountered during construction of wells to be used as points of diversion for this right, the right holder or well driller must contact the Department immediately for further instructions, consistent with the drilling permit issued for the well.
17. Wells constructed after the date of this approval as points of diversion for this right shall be designed to appropriate water exclusively from the regional aquifer found in the Grande Ronde formation.

This amendment of permit is issued pursuant to the provisions of Section 42-211, Idaho Code. Witness the signature of the Director, affixed at Boise, this 12 day of February, 2015.

For GARY SPACKMAN, Director

Appendix E – Lewiston Fire Department Letter

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22 July 2019

Eugene B. Metz
Lewiston Orchards Irrigation District
1520 Powers, Avenue
Lewiston, ID 83501

Dear Manager Metz,

This letter is in response to the fire flow goals outlined in the Lewiston Orchards Irrigation District Master Plan. The fire prevention division and I have reviewed the proposed fire suppression goals and find that the fire flows listed in Table 1-1 of the letter provided to the fire department, does meet our needs and we support those goals.

We appreciate the direction LOID is heading with planning for the future by working to improve fire suppression in the district. Please feel free to contact me at 208-743-3554 if you have any further questions or needs.

Sincerely,

Travis A. Myklebust
Fire Chief

LEWISTON ORCHARDS LOID IRRIGATION DISTRICT
Domestic and Irrigation Water
1520 Powers Avenue Lewiston, ID 83501 (208)746-8235

July 12, 2019

Chief Travis Myklebust
1245 Idaho Street
Lewiston, Idaho

RE: Lewiston Orchards Irrigation District Water Master Plan – Fire Flows

Dear Mr. Myklebust:

The Lewiston Orchards Irrigation District (LOID) is finalizing the Water Master Plans that cover the domestic and irrigation water systems that LOID manages. This has been a long process that considers patron needs, regulatory requirement, water system condition and future needs.

The dual systems (domestic and irrigation) have developed over the last 70 years as the Lewiston Orchards has grown from an agricultural based system to an urban setting. Historically, the irrigation system has carried the fire suppression water for the system. The irrigation system is limited to the boundaries set by the federal government back in 1948 and do not incorporate the entire service area of the LOID. Therefore, a small portion of domestic system carries the fire suppression water outside of the irrigation system boundaries. Due to the nature of how this system, and for that matter all systems, developed there are varying volumes of fire suppression water available throughout the system.

The Master Plan that has been developed over the past year has identified fire suppression as one of the goals to improve. This will be done over time as it is a large challenge to upgrade and upsize the system to meet new requirements. LOID has set fire suppression goals per the following table.

Table 1-1: Fire Suppression Goals

Land Use & Zoning	Min. Flow Rate (gpm)	Duration (hours)	Fire Storage Goals (gallons)
Residential	1,500	2	180,000
Commercial (from domestic system)	1,500	2	180,000
Commercial (from irrigation system)	1,500	4	360,000

These goals have been used to complete the modeling for the domestic and irrigation. For the commercial areas, which are only present in the irrigation system boundary, the total available flow goal combines both systems for a total of 3,000 gpm. The irrigation system utilizes Mann's lake as a storage reservoir with a minimum pool storage capacity of over 1,620,000,000 gallons so there is no concern over volume of water available in the commercial zones.

Residential developments outside the irrigation district will rely on the domestic system. The goal has been set consistent with the International Fire Code to be conservative. LOID understands that Lewiston operates on a reduce standard and will on a case by case basis grant exception to the goal only if LOID receives a letter from the Lewiston Fire Department accepting the reduced flow standards. This is the case for the proposed Skyview Estates subdivision that is working its way through approval.

LOID would appreciate if you would review this letter and let us know if you have any questions. Idaho Department of Environmental Quality has asked LOID to provide a letter in the Master Plan from the Lewiston Fire Department concurring with the fire flow goals outlined above. Would you please provide a letter that concurs with the goals set within the Master Plan?

Please give me a call at 208-746-8235 if you have any questions.

Sincerely,

Barney Metz

Barney Metz
General Manager

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Appendix F – Irrigation Water Demand Calculations

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J-U-B ENGINEERS, Inc.
ENGINEERS • SURVEYORS • PLANNERS
1630 23rd Avenue, Suite 1101-A
Lewiston, ID 83501
208-746-9010
Fax: 208-746-9926

Date: ~~March 31, 2010~~ Updated 9/19/12

To: Amy Uptmor

CC: 21-07-001-100

From: Nicolas Hiebert

Subject: LOID Irrigation Demands

Purpose

Demands for LOID Irrigation System and WaterCAD model were developed during the fall of 2009 for the District's Irrigation Master Plan. Average day demand (ADD), maximum day demand (MDD), and peak hour demand (PHD), were developed to facilitate analysis of system pressures and fire flow conditions within the system WaterCAD model.

The purpose of this technical memo is as follows:

- Present available data used in the analysis and discuss development of the data.
- Establish demand distribution for land use found within the system and present total system usage.
- Present final demands inserted into the WaterCAD model.

Available Data and Development

System Infrastructure

The irrigation system is supplied by Mann's Lake Reservoir through a 36-inch transmission line that reduces to a 30.5-inch line at the Filter Plant. A flow meter is located at the Filter Plant and records all flow entering the distribution system. A majority of the system is not metered at the customer connection. In 2008, the District placed the first 350 irrigation customer meters on the east side of the system. These customer meters tracked monthly usage from April – October of 2008.

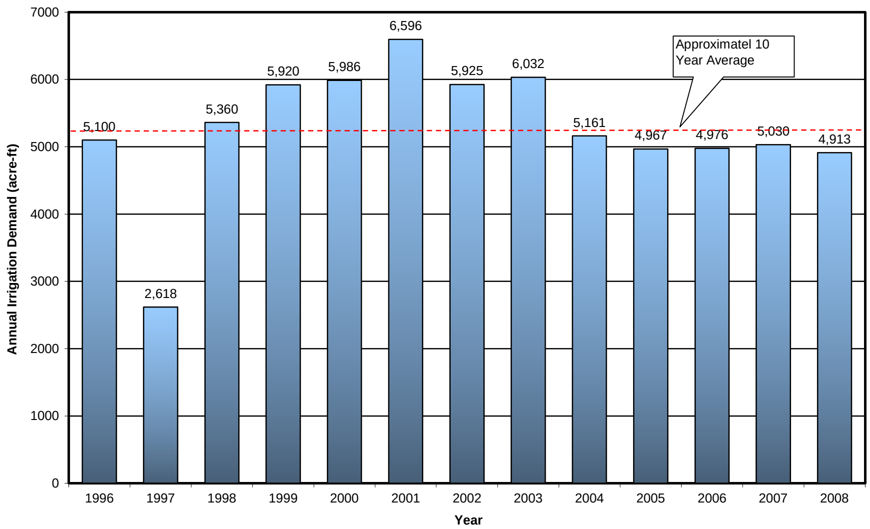
Available Data

The District provided daily flow data for the 2008 irrigation season (April 10 – October 20). Daily average flows were used to estimate ADD and MDD for the system. The data indicated that for the 2008 irrigation season, MDD occurred on June 29th. Therefore, data was analyzed in five minute intervals for the 29th to determine PHD. The District also provided historical monthly data to assist in developing usage trends.

Data Development

System flow data from 2008 was compared to historical usage in an attempt to identify usage trends. Cumulative annual demands are shown on **Figure 1**. System flows appear to show consistent demands from 2004-2008, while demands from 1996-2003 appear to fluctuate. Annual irrigation usage is dependent on variables that may include the following:

FIGURE 1: Irrigation Annual Demand

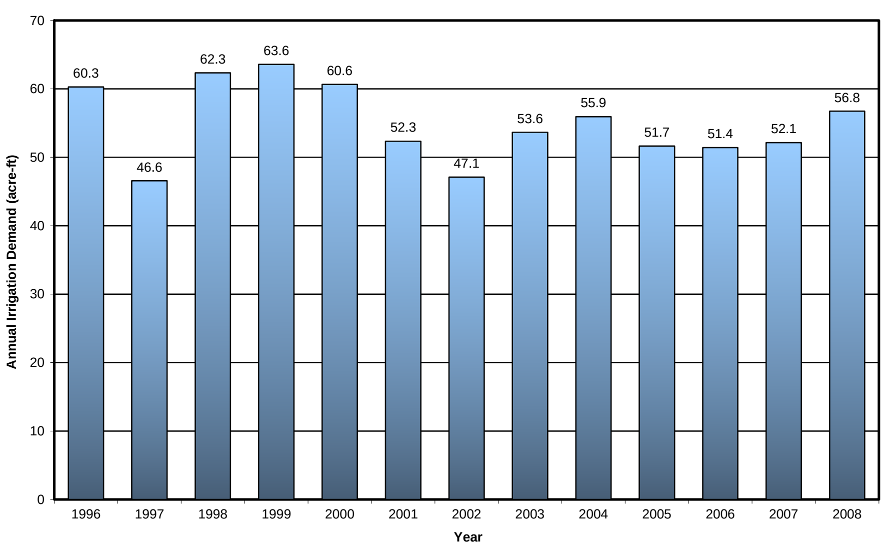


- Climate Conditions (i.e. temperature, duration, precipitation, etc.)
- Water Restrictions
- Water Conservation and Education

These factors have the greatest impact during the beginning and end of an irrigation season, and as such, MMD's were compared from 1993 to 2008, see **Figure 2**.

A reported maximum day demand of 56.8 acre-feet was observed in 2008, and is the highest recorded daily flow since 2000. As such, data from 2008 was utilized to provide the water demand data set. Although ADD's presented herein were relatively consistent from 2004-2008, the District should utilize these demands with caution, as historically usage from 1999-2003 was approximately 20% higher than the recent period. The low annual usage in 2008 may be due to limited irrigation usage during the spring and fall months, which could be influence greatly by climatic conditions. Because growth will not be allowed outside the existing irrigation boundary, this analysis assumes that future ADD will remain relatively consistent in the near future.

FIGURE 2: Irrigation MDD per Peak Month



Demand Distribution & System Usage

General

Demand distribution is typically developed to accurately model how flow is distributed throughout the system. As discussed earlier, a majority of the system is un-metered at the customer connections, which presents an interesting challenge for developing demand distribution within the system. To establish demand distribution within the irrigation system, the system was visually categorized into one of the four land use types based on aerial photos and City of Lewiston GIS data. Each land parcel was assigned to either: 1) Residential, 2) Commercial, 3) Agricultural, or 4) Public Land use. Roads and right-of-ways were not included in the categorization and thus the total area of land use was slightly less than the total area found within the irrigation boundary. **Figure 3** shows the land use areas and **Table 1** shows the distribution within the system area.

Residential, Agricultural, & Public Demand Distribution

District records of monthly usage from April – October of 2008 for the 350 customer meters, was used to estimate the distribution of demand. The meters were installed at residential, agricultural, and public land use locations; however meters were not installed on commercial land use. **Table 1** shows the area represented by meters for each land use.

Table 1: Land Use Areas

Usage Type	Land Use Area[1], Acre	Percent of Total	Metered Area[2], Acre
Residential	2,652	71.5%	248
Commercial	599	16.2%	--
Agricultural	300	8.1%	8
Public	156	4.2%	49
Total[3]	3,707		

[1] Areas established from visual survey of 2008 aerial photos and GIS parcel data.
[2] Areas represented by 350 meters (w/ exception of commercial) set on the irrigation system in 2008 by the District
[3] Actual irrigation boundary acreage is 3,828.

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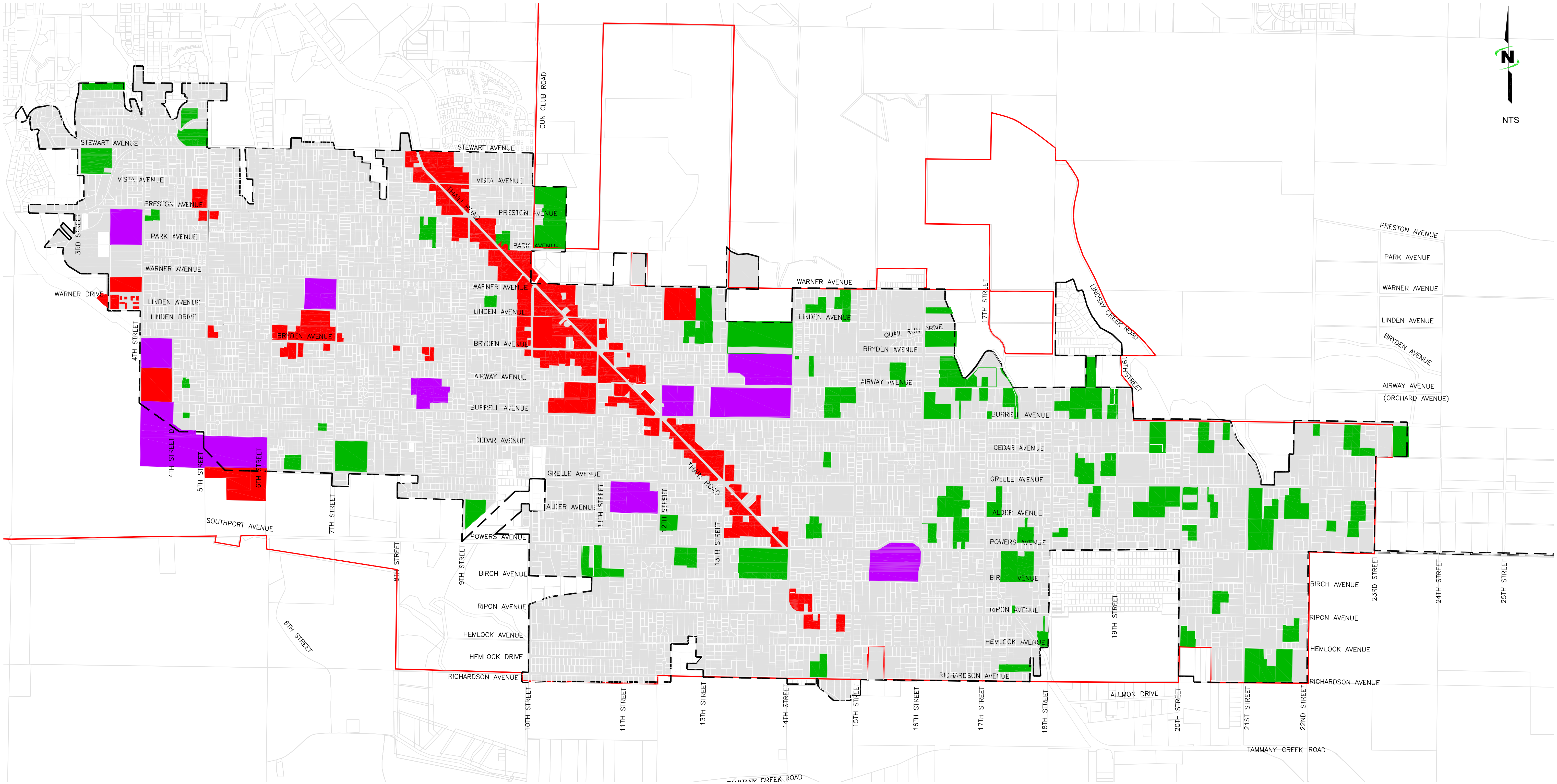

LEGEND

- CITY LIMITS
- LOID DOMESTIC BOUNDARY
- 2008 RESIDENTIAL LAND USE
- 2008 AGRICULTURAL LAND USE
- 2008 COMMERCIAL LAND USE
- 2008 PUBLIC LAND USE

Plot Date: 1/15/2010 10:57 AM Plotted By: Nicolas Hiebert
Date Created: 1/15/2010 F:\PROJECTS\21-07-001-LOID\21-07-001-DRA\DWG\MASTER PLAN\LAND_USE TYPES.DWG

LAST UPDATED: 1/14/2010
PLOT DATE: 1/15/2010
FILE: LAND_USE TYPES

J-U-B
Engineers • Surveyors • Planners

LEWISTON ORCHARDS IRRIGATION DISTRICT
DEMAND DEVELOPMENT
FIGURE 3
2008 LAND USE TYPES

The data during the month of April appeared to be inflated and is likely related to usage during an unknown period outside the irrigation season Typically, irrigation demand is low during the spring months of April and May, increasing to peak use in late June or early August (as discussed in the Data Developing Section) and then tapering to lower use in the fall months of September and October. Approximately half of the meter readings did not appear to follow this trend during the month of April. These meters exhibited peak flows in April, which often doubled the peak flows of midsummer. **Figure 4** shows several meters that exhibited this erroneous distribution and several meters that yielded expected distribution. Because of this, meter usage for the month of April was not included in estimating the demand distribution. The distribution of residential, agricultural, and public use ADD was established based on meter usage from May 1 – Oct 20, 2008. See **Table 2** for demand distribution based on meter usage.

Figure 4: Sample of 2008 IRR Meters

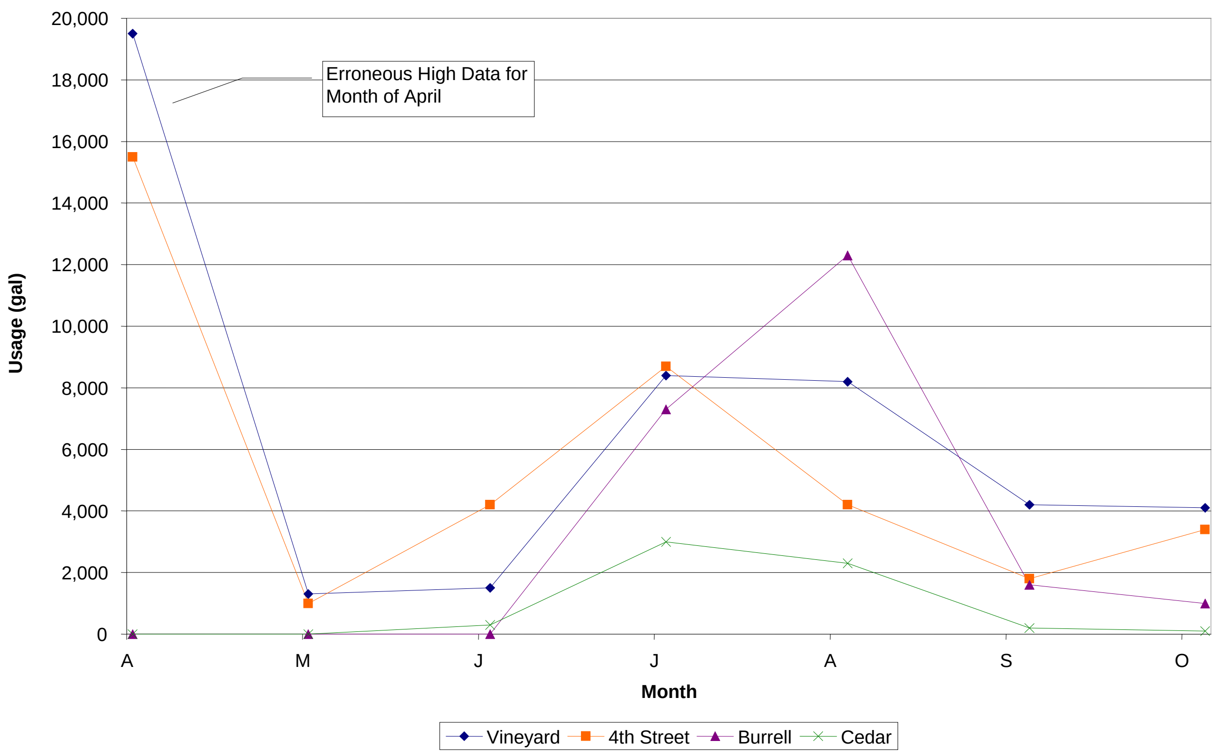

Table 2: Demand Distribution for Metered Land Use

Usage Type	Metered Land Use ADD (gpm per acre) [1]
Residential	1.53
Agricultural	2.36
Public	3.0

[1] Demand distribution is estimated from 350 meters (w/ exception of commercial)

Commercial Demand Distribution

Commercial demand distribution was estimated as a fraction of residential demand based on the ratio of pervious areas between the two land use types. This analysis assumes that commercial land use will have more buildings, parking lots, sidewalks, and other impervious areas that will not be irrigated. In contrast residential land use will likely have a higher area of lawns, gardens, and other areas that will be irrigated. The City of Lewiston provided storm water GIS data with impervious areas for commercial and residential parcels located in the Lewiston Orchards area. Based on this data, a typical residential lot is 77% pervious area while a typical commercial lot consists of 20% pervious area as show in **Table 3**. Because of this, it was estimated that the commercial ADD was 26% of residential by the ratio of these percentages as seen in **Equation 3**. See last page for development of this equation.

Table 3: Impervious Ratios

Land Use Type	% Pervious of Total Area
Residential[1]	77%
Commercial[2]	20%

[1] Residential Pervious Ratio based on City GIS data of sample of 350 Orchards lots
[2] Commercial Pervious Ratio based on City GIS data for areas in Orchards

Equation 3: $Factor_{Commercial} = Commercial/Residential$

$Factor_{Commercial} = \mathbf{0.20/0.77} = \mathbf{0.26}$

Total System Usage

The following demands were established by analysis of the 2008 data shown above,

- ADD: 7.82 MGD
- MDD: 16.11 MGD (occurred on 6/29/08)
- PHD: 24.35 MGD (occurred on 6/29/08 9:00PM)

It should be noted that the maximum day usage reported by the District is not identical to the demands presented above. The cause of this discrepancy is due to the following:

- The District collects meter readings on a daily basis from the Filter Plant flow meter at approximately 8:00 a.m. Due to minor deviations in operator schedules, the period may be shortly less than or slightly greater than 24-hrs. In contrast, data obtained from the District's SCADA System facilitates review of an exact 24-hr period.

- Maximum Day Demands presented in this report correlate with the peak diurnal curve and facilitates projection of future delivery curves. A diurnal curve and peaking factor analysis must utilize a common low flow period to eliminate shifts associated with above average usage. This low flow of approximately 1.2 acre-feet/hr occurs at noon. Therefore, the period of analysis is from 12:00 p.m. to 12:00 p.m.

Demand Distribution Verification

System ADD was calculated using 2008 data from the system flow meter located near the Filter Plant. It was anticipated that the annual system ADD of 4,653 acre-feet would correlate with land use ADD. This assumes that usage from non-metered customers, throughout the entire system, would be equivalent to demand distributions developed for the land use types. As shown in **Table 4**, the sum of estimated land use ADD was calculated as 4,717 acre-feet, and is slightly greater than the observed system ADD of 4,653 acre-feet. Because of this, the demand distribution was adjusted by a factor of 0.99 to match annual system ADD. Since a majority of the system is un-metered at the customer connection, unaccounted water was not included in this analysis. Thus, demands may be slightly conservative due to leakage within the system.

Table 4: ADD Demand Distribution

Usage Type	Metered Land Use ADD (gpm per Acre)	Annual Metered Land Use ADD (Acre-feet)	0.99 Factored ADD (gpm per Acre)
Residential[1]	1.53	3,502	1.52
Commercial[2]	0.4	204	0.39
Agricultural[1]	2.36	611	2.33
Public[1]	3.0	400	2.97
Total[3]		4,717	

[1] Demand distribution is estimated from 350 meters (w/exception of commercial)
[2] Commercial demand is estimated at 26% of residential by ratio of impervious areas, City of Lewiston GIS data.
[3] Compared with total system ADD of 4,653 acre-feet.

Peaking Factors

Peaking factors were established to facilitate model development and to better understand usage trends within the system. Peaking factors were calculated by the following equations:

- Equation 1: $PF_{MDD} = MDD/ADD$
- Equation 2: $PF_{PHD} = PHD/MDD$

Based upon the 2008 demands, the following peaking factors were established:

- MDD peaking factor: $PF_{MDD} = 2.06$
- PHD peaking factor: $PF_{PHD} = 1.51$

WaterCAD Model Demands Existing Model Demands

Demands were developed for the WaterCAD model as previously discussed and inserted into the model. MDD and PHD demands were calculated using peaking factors as discussed above.

Existing Model Demands

Table 5 shows the approximate existing system demand distribution on a per acre basis used within the WaterCAD model to simulate the existing system.

Table 5: Existing Model Demands

Usage Type	System Area (Acre)	ADD (gpm per Acre)	MDD (gpm per Acre)[1]	PHD (gpm per Acre)[1]
Residential	2652	1.53	3.15	4.76
Commercial	599	0.4	0.82	1.24
Agricultural	300	2.36	4.86	7.34
Public	156	3	6.18	9.33

[1] MDD and PHD demands per land use developed by peaking factors.

Future Model Demands

Ultimate demands were developed for the WaterCAD model to simulate future usage conditions. Because the irrigation boundary is set, all future growth will occur inside the current boundary. The assumption was made that this growth would occur within agricultural land use areas. Thus, ultimate demands were calculated based on all agricultural land use being converted to residential land use. **Table 6** shows the approximate future system demand distribution within the WaterCAD model, on a per acre basis

Table 6: Future Model Demands

Usage Type	System Area (Acre)	ADD (gpm per Acre)	MDD (gpm per Acre)	PHD (gpm per Acre)
Residential	2952	1.53	3.15	4.76
Commercial	599	0.4	0.82	1.24
~~Agricultural~~[1]	~~0~~	~~2.36~~	~~4.86~~	~~7.34~~
Public	156	3	6.18	9.33

[1] Assumes that all agricultural land use will be converted to residential land use in the future.

Assumption

There is some factor F that correlates an acreage's pervious area to the ADD
and

$$F_{residential} = F_{commercial} = F$$

$$ADD_{res} = \frac{Pervious\ Area_{res}}{Acre} \bullet F \ \& \ ADD_{Com} = \frac{Pervious\ Area_{com}}{Acre} \bullet F$$

$$F = \frac{(ADD_{res})}{(Pervious\ Area_{res/acre})}$$

$$ADD_{com} = \left(\frac{Pervious\ Area_{com}}{Acre}\right) \quad (ADD_{res}) \quad \left(\frac{Acre}{Pervious\ Area_{res}}\right)$$

$$ADD_{com} = \frac{0.20}{0.77} \bullet ADD_{res} = 0.26\ ADD_{res}$$

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Appendix G – Survey

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Golding Surveying & Mapping

P.O. Box 1818, Lewiston, Idaho 83501
(208) 746-5720

Terry T. Golding
Idaho P.L.S.#7379
Wisconsin R.L.S.#1468
California L.S.#6007

J.U.B. Engineers, Inc
1630 23rd. Ave., suite 1101-a
Lewiston, ID 83501

REPORT OF SURVEY

On November 17, 2009 I used a Topcon dual frequency, R.T.K. G.P.S. to tie control points as provided and per instruction. These points are directly tied to N.G.S. monument PID RZ1487, a first order horizontal and first order vertical local benchmark with a 1983 Idaho State Plane, west zone, NAVD 88 vertical datum coordinate of:

N 1715234.132', E 2323684.536', Z 1522.054'

Expect accuracies of +- 0.05 horizontal and vertical, the coordinates are as follows:

```
2,1715234.132,2323684.536,1522.054,RZ1487
1000,1716380.701,2334763.103,1651.997,init
1004,1716116.056,2347056.231,1816.926,rodinconc
1008,1716402.378,2344669.797,1814.375,fdbc#5
1012,1716401.262,2321466.798,1560.256,setx
1021,1717818.440,2325965.544,1525.044,fhbase+2.40top
1026,1716852.895,2340653.934,1727.581,fdbolt.1uptoc
1031,1716500.415,2344879.907,1816.507,a1rodinconc
1034,1716684.415,2344957.936,1816.745,a2rodinconc
```

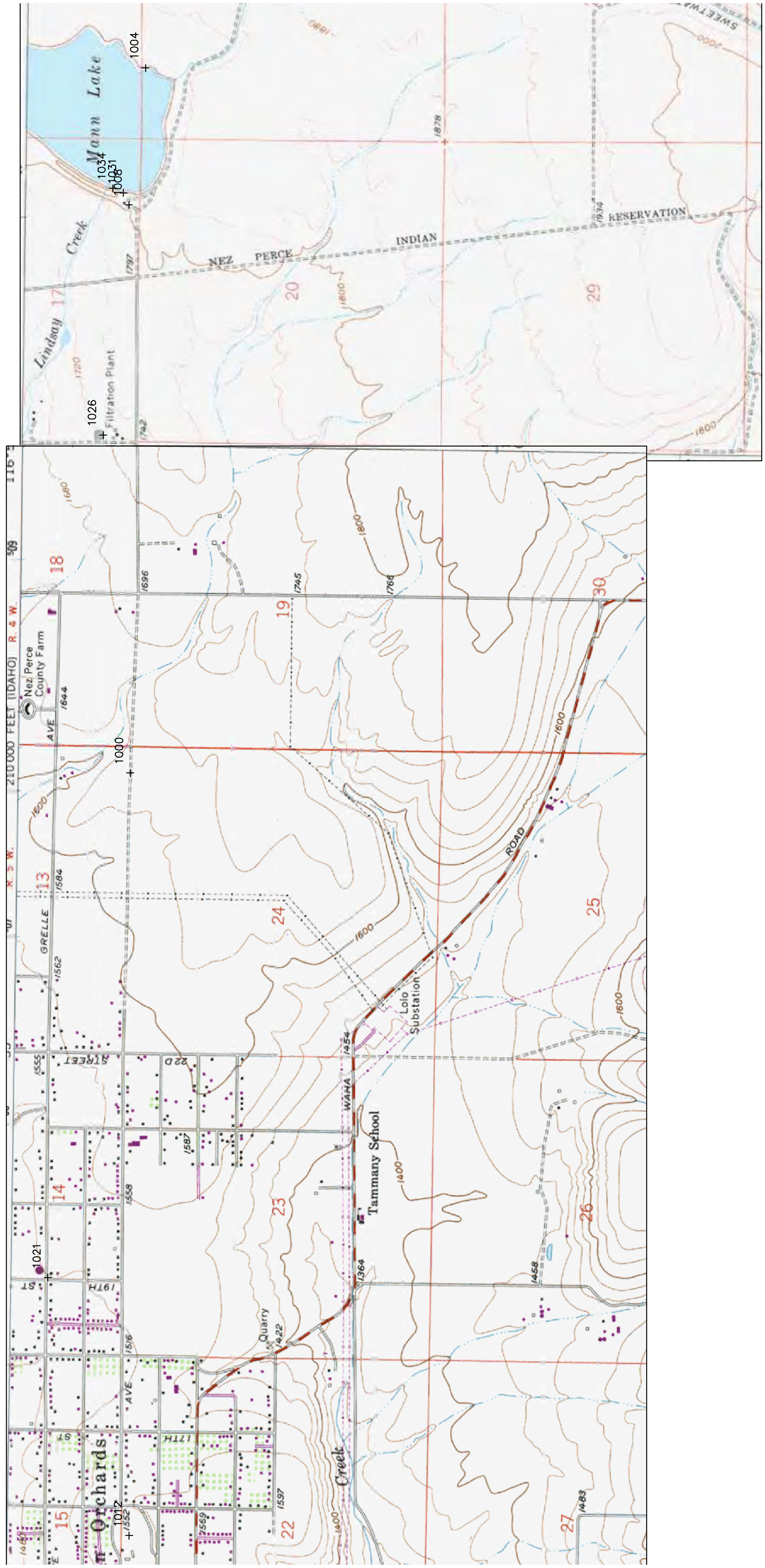
If you have any questions please call or write my office.

Sincerely,

Terry T. Golding **11/18/2009**

Terry T. Golding date
Idaho Professional Land Surveyor #7379
Ref.: JN973report

PROFESSIONAL LAND SURVEYOR
REGISTERED
7379
STATE OF IDAHO
TERRY T. GOLDING



Mann Lake
Lindsay Creek
Filtration Plant
NEZ PERCE INDIAN RESERVATION
1004
1034
1031
1008
1026
1000
1021
1012
Nez Perce County Farm
GRELLE AVE
Lolo Substation
WAHA ROAD
Tammany School
Orchards
Quarry
Creek
210 000 FEET (IDAHO)
R. 4 W.
R. 5 W.

Appendix H – LOID/CITY Intertie Information

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January 8, 2019

Mr. Barney Metz
Lewiston Orchard Irrigation District
1520 Powers Avenue
Lewiston, ID 83501

RE: Capacity Summary of LOID to City of Lewiston Intertie

Background

The Lewiston Orchards Irrigation District ("LOID") and the City of Lewiston ("City") water systems are connected via an intertie located along Warner Ave at approximately 13th Street. The purpose of intertie is to provide each system with a backup source of supply in the event that either system experiences difficulties in producing sufficient water or is in an emergency situation, such as a fire flow event. The intertie has been operational for decades.

The intertie consists of 12 inch water mains along Warner Ave. and a vault with control valving located at approximately 13th Street. LOID owns the piping east of the intertie and the City owns the piping west of the control vault.

As part of both system's Water Master Planning efforts, there has been recent discussions about the operation and capacity of the intertie. This following is a summary of LOID's capacity with respect to the intertie with the City. The City is also reviewing the capacity of their system and will provide LOID with a similar summary letter.

Current Capacity – 2018

The capacity of the LOID system has been evaluated in the draft Water Master Plan. Under an "emergency" scenario (such as a fire flow) LOID's system could provide up to 1,000 gpm to the City via the intertie line. In this scenario, LOID will be able to provide maximum day demand in LOID's system and minimum pressures of greater than 20 psi as defined by IDAPA 58.01.01.552.b.i. The duration of the an "emergency "event" is limited to 4-5 hours.

Under maximum day demand conditions, LOID could supply up to 500 gpm to the City over a longer period of time, up to 30 days. This is predicated on LOID having all sources available during this period of time. Supply of water in excess of 30 days would need to be evaluated by LOID.

2020 Capacity

LOID is in the process of reconfiguring the distribution system by splitting an existing zone to provide increase pressure to a lower pressure area. Once this pressure zone is split in the 2019 construction season, the LOID system will be able to provide 1,000 gpm under the "emergency" scenario and provide maximum day demand with a minimum pressure greater than 40 psi to LOID connections. The duration of the an "emergency " event is limited to 4-5 hours.

Under maximum day demand conditions, LOID could supply up to 500 gpm to the City over a longer period of time, up to 30 days. This is predicated on LOID having all sources available during this period of time. Supply of water in excess of 30 days would need to be evaluated by LOID.

Currently the intertie is operated with manual valves. The LOID will not utilize the intertie in an emergency scenario, therefore manual operation is sufficient for LOID's system needs. Based on a meeting with the City, the City would like to utilize the intertie as a source during fire flow scenarios, therefore would like to have the intertie automated with control valves. The current control valve configuration will need to be reviewed and additional pressure sustaining measures added to the system to maintain appropriate pressures with LOID's system during an emergency event.

Please feel free to call if you have any questions or want to review any of this analysis in more detail.

Sincerely,
J-U-B ENGINEERS, Inc.

Cory R. Baune, P.E.

PROFESSIONAL ENGINEER
REGISTERED
10958
1/8/19
STATE OF IDAHO
CORY R. BAUNE

Mountain
WATERWORKS

February 12, 2019

Mr. Chris Davies, P.E.
Public Works Director
215 D Street, Suite B
Lewiston, ID 83501

PROFESSIONAL ENGINEER
LICENSED
16884
03/25/2019
STATE OF IDAHO
RYAN J. REHDER

RE: Emergency Supply Capacity from City of Lewiston to LOID Intertie

Background

The City of Lewiston (City) and the Lewiston Orchards Irrigation District (LOID) public water systems are interconnected at a control valve vault located on the north side of Warner Avenue about ¼ mile east of the intersection of Warner Avenue and 12th Street in the southeast portion of the City's water system. The intertie allows one water system to supply the other in the event of emergencies such as a fire or loss of supply capacity. The City side of the intertie is served by 16-inch and 12-inch transmission mains from the South High Booster Station and Reservoir.

The City is currently in the process of developing an updated Water Facility Plan, and is re-evaluating the available supply capacity to the intertie taking into account growth and development in the area upstream of the intertie. The LOID undertook a similar review process, and provided the City with a letter indicating up to 1,000 gpm is available through the intertie during a short-term (4 to 5-hour duration) emergency event, or up to 500 gpm for a longer period up to one month.

Available Capacity

Under an emergency scenario, the City currently has adequate firm capacity (i.e. with the largest pump offline) at the South High Booster Station to supply up to 1,000 gpm under peak hour conditions to the LOID while maintaining pressure in its distribution system above 40 psi. Emergency supply availability under these conditions assumes the City does not need to simultaneously provide maximum day demand plus fire flow in its own water system. Provision of water for longer periods will require City review and approval.

The Tri-Partnership development project located to the west of the LOID intertie is projected to place significant additional demand on the South High Booster Station. The City can provide up to 1,000 gpm to LOID under the conditions described above through completion of the first construction phase in the Tri-Partnership development. The amount of emergency supply available to the intertie after Phase 1 is complete will depend on the City's construction of new water supply and storage infrastructure to supplement the South High Booster Station and Reservoir. It is recommended that emergency supply capacity be re-evaluated following completion of future phases of the Tri-Partnership project or new water infrastructure designed to supplement existing supply and storage in the southeast portion of the distribution system.

Sincerely,

Ryan Rehder, P.E.
Mountain Waterworks, Inc.

City of Lewiston
IDAHO'S ONLY SEAPORT
POST OFFICE BOX 617 • LEWISTON, IDAHO 83501
(208) 746-3671

January 19, 2004

Mr. Kevin Casey, Manager
Lewiston Orchards Irrigation District
1529 Powers Avenue
Lewiston, ID 83501

Dear Kevin:

In 1995, the City and LOID entered into an agreement for sale of water to one another at a rate based upon the actual cost of production. Thus, the rate is calculated just on those elements of the system utilized to produce and deliver the water to the other party. In 1995, that rate was calculated at $0.69 per 100 cubic feet for water sold by the City to LOID, and in 2001, the rate was increased to $1.00 per 100 cubic feet.

We have just completed the audit for the fiscal year 2003 and I am pleased to be able to announce, that based upon year 2003 costs, we are able to reduce the rate charged to LOID to $0.88 per 100 cubic feet. Attached is a copy of the actual figures utilized to determine the cost and it reflects, as accurately as possible, the actual cost of supplying water to you through the intertie line for domestic use. In accordance with the September 11, 1995, agreement, please consider this letter the 30-day notice required by the agreement.

As always, I appreciate the ability to cooperate and interact for the good of our patrons. Best wishes to you and members of the Board in 2004.

Sincerely,

Jan

Janice Vassar
City Manager

cc: Sandi Hagemann, Interim Public Works Administrator
David Six, Wastewater/Water Systems Manager
Don Roberts, City Attorney
Honorable Mayor and City Council

TREE CITY USA

Printed on recycled paper

LOID Rate Calculation
FY 2003

I. Cost of Intake and Treatment

Total Cost – Production, Treatment, and Interest	$745,092
Total Production (gallons)	1,431,904,000
" " (100 cu ft)	1,914,310
Cost per 100 cu. ft.	**$0.39**

II. Cost of Maintenance and Distribution

(Maintenance of distribution facilities needed to furnish water to LOID includes two reservoirs, two boosters, and water lines)

Estimated annual maintenance cost	$137,359
Estimated annual distribution cost	$ 68,313
Total cost	$205,672
Cost 100 cu ft	**$0.11**

III. Cost of Depreciation

Total depreciation cost	$385,000
Cost per 100 cu ft	**$0.20**

IV. Contingency for Losses **@15%**

V. Cost of Administration

(Adm. Expense is expressed as a percentage of total cost)

Adm. Cost	$254,241
Total expense	$2,430,454
% Adm. Cost	**@9.6%**

Cost to LOID

I.	**Production**		**$0.39**
II.	**Maint. & Distribution**		**$0.11**
III.	**Depreciation**		**$0.20**
	Subtotal	**$0.70**	
IV.	**Contingency**		**$0.11**
V.	**Adm. Cost**		**$0.07**
	Total cost per 100 cu ft		**$0.88**

Prepared by Dave Six, Wtr/WW Sys Mgr.

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Appendix I –Hydrant Testing and Field Notes

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Domestic System

Darwin Calibrator

Location	Static Scenario or Hydrant Flow (gpm)	Junction Node	Observed Pressure (psig)	Model Pressure (psig)	Pressure Difference (psig)	% Error	Notes from 2017
11th and Ripon	***Static***	***790: J-1063***	***92 psi***	***89 psi***	***3 psi***	2.8%	***Zone #1***
	750 gpm	790: J-1063	77 psi	74 psi	3 psi	3.8%	
19th and Grelle	***Static***	***808: J-2022***	***104 psi***	***103 psi***	***1 psi***	0.7%	***Zone #2***
	888 gpm	808: J-2022	92 psi	88 psi	4 psi	4.4%	
13th and Burrell	***Static***				***Erroneous Test***		***Zone #3***
	-						
6th and Warner	***Static***	***251: J-5067***	***62 psi***	***63 psi***	***1 psi***	1.4%	***Zone #5***
	475 gpm	251: J-5067	44 psi	48 psi	4 psi	8.2%	*Close to PRV
Vineyards	***Static***	***755: J-6017***	***92 psi***	***73 psi***	***18 psi***	20.1%	***Zone #6***
	336 gpm	755: J-6017	50 psi	64 psi	14 psi	28.5%	* Close to PRV
NE Crossing	***Static***	***2507: J-7211***	***82 psi***	***80 psi***	***2 psi***	***2.5%***	***Zone #3***
	750 gpm	2507: J-7211	70 psi	73 psi	3 psi	4.0%	

Scenario

Location	Static Scenario or Hydrant Flow (gpm)	Junction Node	Observed Pressure (psig)	Model Pressure (psig)	Pressure Difference (psig)	% Error	Notes from 2017
11th and Ripon	***Static***	***790: J-1063***	***92 psi***	***90 psi***	***3 psi***	2.7%	***Zone #1***
	750 gpm	790: J-1063	77 psi	75 psi	2 psi	2.2%	
19th and Grelle	***Static***	***808: J-2022***	***104 psi***	***101 psi***	***3 psi***	2.8%	***Zone #2***
	888 gpm	808: J-2022	92 psi	89 psi	4 psi	3.8%	
13th and Burrell	***Static***				***Erroneous Test***		***Zone #3***
	650 gpm						
6th and Warner	***Static***	***251: J-5067***	***62 psi***	***63 psi***	***1 psi***	1.5%	***Zone #5***
	475 gpm	251: J-5067	44 psi	48 psi	4 psi	8.4%	
Vineyards	***Static***	***755: J-6017***	***92 psi***	***74 psi***	***19 psi***	20.1%	***Zone #6***
	336 gpm	755: J-6017	50 psi	64 psi	14 psi	28.8%	
NE Crossing	***Static***	***2507: J-7211***	***82 psi***	***79 psi***	***3 psi***	***3.3%***	***Zone #3***
	750 gpm	2507: J-7211	70 psi	73 psi	3 psi	4.7%	

Adjustment Group	Darwin Calibrator	Scenario
PVC Pipe	110	110
AC Pipe	125	125
Galvanized Pipe	91	90
Ductile Iron Pipe	90	90
demand multiplier	0.8	0.8

* Flow from Hereth Booster 335

Irrigation System

DARWIN CALIBRATOR- IRRIGATION MODEL

Field Data Snapshot	Junction	Observed Hydraulic Grade (ft)	Simulated Hydraulic Grade (ft)
3305: Burrell & 22nd-Static	386: J-2004	1,791.40	1,783.10
3306: Cedar & 18th-19th-Static	362: J-2034	1,786.30	1,782.90
3307: 16th & Warner-Static	2417: H-195	1,620.50	1,619.90
3308: 13th & Ripon-Static	400: J-1116	1,787.90	1,781.70
3309: 8th & Linden-Static	2633: H-310	1,632.10	1,626.10
3310: 5th & Park- Static	2741: H-361	1,631.60	1,624.70
3311: Wallace & 14th-Static	2848: H-412	1,392.40	1,408.30
3312: Cedar & 11th-Static	311: J-3061	1,639.50	1,631.30
3313: Burrell & 22nd-Flow	386: J-2004	1,763.80	1,762.80
3314: Cedar & 18th-19th-Flow	362: J-2034	1,765.60	1,766.10
3315: 16th & Warner-Flow	2417: H-195	1,595.10	1,605.10
3316: 13th & Ripon-Flow	400: J-1116	1,762.60	1,773.40
3317: 8th & Linden-Flow	2633: H-310	1,595.30	1,606.10
3318: 5th & Park-Flow	2741: H-361	1,594.80	1,596.60
3319: Wallace &14th-Flow	2848: H-412	1,332.50	1,322.40
3320: Cedar & 11th- Flow	311: J-3061	1,625.70	1,630.80

Location	Static Scenario or Hydrant Flow (gpm)	Junction Node	Observed Pressure (psig)	Model Pressure (psig)	Pressure Difference (psig)	% Error	Comments
Burrell and 22nd	***Static***	***386: J-2004***	***114 psi***	***110 psi***	***4 psi***	***3.2%***	
	888 gpm	386: J-2004	102 psi	101 psi	0 psi	0.4%	Zone 1
Cedar and 18th	***Static***	***362: J-2034***	***127 psi***	***125 psi***	***1 psi***	***1.2%***	
	1,034 gpm	362: J-2034	118 psi	118 psi	0 psi	0.2%	Zone 1
16th and Warner	***Static***	***2417: H-195***	***81 psi***	***80 psi***	***0 psi***	***0.3%***	
	856 gpm	2417: H-195	70 psi	74 psi	4 psi	6.2%	Zone 1A
13th and Ripon	***Static***	***400: J-1116***	***113 psi***	***110 psi***	***3 psi***	***2.4%***	
	1,021 gpm	400: J-1116	102 psi	106 psi	5 psi	4.6%	Zone 1
8th and Linnden	***Static***	***2633: H-310***	***98 psi***	***96 psi***	***3 psi***	***2.6%***	
	856 gpm	2633: H-310	82 psi	87 psi	5 psi	5.7%	Zone 2
5th and Park	***Static***	***2741: H-361***	***118 psi***	***115 psi***	***3 psi***	***2.5%***	
	919 gpm	2741: H-361	102 psi	102 psi	1 psi	0.8%	Zone 2
Wallace and 14th	***Static***	***2848: H-412***	***94 psi***	***101 psi***	***7 psi***	***7.3%***	
	856 gpm	2848: H-412	68 psi	63 psi	4 psi	6.5%	Zone 3
Cedar and 11th	***Static***	***311: J-3061***	***68 psi***	***64 psi***	***4 psi***	***5.2%***	
	822 gpm	311: J-3061	62 psi	64 psi	2 psi	3.6%	Zone 2

SCENARIO CALIBRATION- IRRIGATION MODEL

Field Data Snapshot	Junction	Observed Pressure	Simulated Pressure
3305: Burrell & 22nd-Static	386: J-2004	114.00	111.10
3306: Cedar & 18th-19th-Static	362: J-2034	127.00	126.20
3307: 16th & Warner-Static	2417: H-195	81.00	80.50
3308: 13th & Ripon-Static	400: J-1116	113.00	111.10
3309: 8th & Linden-Static	2633: H-310	98.00	94.90
3310: 5th & Park- Static	2741: H-361	118.00	114.50
3311: Wallace & 14th-Static	2848: H-412	94.00	100.50
3312: Cedar & 11th-Static	311: J-3061	68.00	64.10
3313: Burrell & 22nd-Flow	386: J-2004	102.00	100.40
3314: Cedar & 18th-19th-Flow	362: J-2034	118.00	117.10
3315: 16th & Warner-Flow	2417: H-195	70.00	74.60
3316: 13th & Ripon-Flow	400: J-1116	102.00	104.80
3317: 8th & Linden-Flow	2633: H-310	82.00	86.50
3318: 5th & Park-Flow	2741: H-361	102.00	94.40
3319: Wallace &14th-Flow	2848: H-412	68.00	63.70
3320: Cedar & 11th- Flow	311: J-3061	62.00	63.60

Location	Static Scenario or Hydrant Flow (gpm)	Junction Node	Observed Pressure (psig)	Model Pressure (psig)	Pressure Difference (psig)	% Error	Comments
Burrell and 22nd	***Static***	***386: J-2004***	***114 psi***	***111 psi***	***3 psi***	***2.5%***	
	888 gpm	386: J-2004	102 psi	***100 psi***	2 psi	1.6%	Zone 1
Cedar and 18th	***Static***	***362: J-2034***	***127 psi***	***126 psi***	***1 psi***	***0.6%***	
	1,034 gpm	362: J-2034	118 psi	117 psi	1 psi	0.8%	Zone 1
16th and Warner	***Static***	***2417: H-195***	***81 psi***	***81 psi***	***1 psi***	***0.6%***	
	856 gpm	2417: H-195	70 psi	75 psi	5 psi	6.6%	Zone 1A
13th and Ripon	***Static***	***400: J-1116***	***113 psi***	***111 psi***	***2 psi***	***1.7%***	
	1,021 gpm	400: J-1116	102 psi	105 psi	3 psi	2.7%	Zone 1
8th and Linnden	***Static***	***2633: H-310***	***98 psi***	***95 psi***	***3 psi***	***3.2%***	
	856 gpm	2633: H-310	82 psi	87 psi	5 psi	5.5%	Zone 2
5th and Park	***Static***	***2741: H-361***	***118 psi***	***115 psi***	***4 psi***	***3.0%***	
	919 gpm	2741: H-361	102 psi	94 psi	8 psi	7.5%	Zone 2
Wallace and 14th	***Static***	***2848: H-412***	***94 psi***	***101 psi***	***7 psi***	***6.9%***	
	856 gpm	2848: H-412	68 psi	64 psi	4 psi	6.3%	Zone 3
Cedar and 11th	***Static***	***311: J-3061***	***68 psi***	***64 psi***	***4 psi***	***5.7%***	
	822 gpm	311: J-3061	62 psi	64 psi	2 psi	2.6%	Zone 2

Roughness Factors		
Material	**Darwin**	**Scenario**
3322: Asbestos Cement Pipe	111	111
3323: PVC Pipe	130	130
3324: Ductile Iron Pipe	95	95
3325: Steel Pipe Material	85	85
3326: Galvanized Pipe Material	85	85
3327: Steel Pipe Material >=24"	95	95

Appendix J – Source Water Protection Plan

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Drinking Water Source Protection Plan for the City of Lewiston & Lewiston Orchards Irrigation District

In collaboration with the Asotin County Public Utility District, Clarkston, WA

January 26, 2010

Date Reviewed	Reviewed By	Comments (attach additional document as needed)

REVIEW AND UPDATE SEMI-ANNUALLY

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ACKNOWLEDGMENTS

The members of the Lewiston-Clarkston Valley Drinking Water Source Protection Planning Team wish to acknowledge several agencies and people who assisted with the development and implementation of this plan. Gratitude is extended to the Asotin County Public Utility District members in Clarkston, Washington for their participation and guidance through the planning process. Appreciation is granted to the Idaho Department of Environmental Quality Lewiston Regional Office and Boise State Office for providing significant resources and technical assistance throughout the planning process, and especially to Anna Moody for her extensive guidance and coordination of the planning and implementation process. Particular notice goes to Bill Bonner, University of Idaho Intern, for his dedicated support to the development of this plan and subsequent outreach materials. The Planning Team also recognizes the City of Lewiston Council members in 2009, and the Lewiston Orchards Irrigation District Board members for their support of drinking water source protection in the Lewiston-Clarkston Valley. The final Drinking Water Source Protection Plan was completed through the editing assistance provided by Holly Luther of the Idaho Department of Environmental Quality, Lewiston Regional Office.

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EXECUTIVE SUMMARY

Groundwater, a life-sustaining resource for the world's population, is increasingly at risk for contamination. Regardless of how "pristine" a community's groundwater may be, the only way to ensure good water quality and quantity for future generations is to implement measures now to protect this invaluable resource.

Under the Safe Drinking Water Act Amendments of 1996, the State of Idaho is required by the U.S. Environmental Protection Agency to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the Act. This requirement resulted in the generation of two reports (Source Water Assessment for the City of Lewiston, PWS 2350014 and Source Water Assessments for the Lewiston Orchards Irrigation District, PWS 2350015; DEQ 2009) by the State of Idaho Department of Environmental Quality that provides compliance assistance to the City of Lewiston (City) and Lewiston Orchards Irrigation District drinking (LOID or District) water systems. These assessments were based on a land-use inventory of the designated assessment areas, sensitivity factors associated with each well, and aquifer characteristics. Some cities and water districts, such as Lewiston and the Irrigation District, have utilized the information provided by the Source Water Assessments and have developed a protection plan for their drinking water sources.

This Drinking Water Source Protection Plan includes the following:

- Description of the City of Lewiston and Lewiston Orchards Irrigation District drinking water systems;
- Summary of other public regulated entities pumping water from the Lewiston Basin Aquifer, including the Asotin County Public Utility District #1;
- Development of a Community Planning Team and its duties;
- Analytical delineation of the area from which the Cities' and District's wells draw drinking water from the Lewiston Basin aquifer;
- Management tools that may be used to protect the sources of drinking water;
- A Management Plan and Implementation Schedule for protection activities; and
- Contingency planning in case of a drinking water emergency.

Regardless of how thoughtful and far-reaching a drinking water source protection plan may be, implementation and follow-through are critical to successful protection. The City of Lewiston and LOID must be diligent in their protection efforts in order to meet the growing demands of population growth, encroachment and the added threats of contamination.

The most important steps that the City and District must take to ensure protection of the drinking water for the community are as follows: (1) address and rectify noted deficiencies as identified in the latest sanitary survey; (2) work with local land owners, cities and conservation agencies to prevent contamination from entering well areas; and (3) develop and provide public awareness and education materials to water users.

This Drinking Water Source Protection Plan is a "living document" and as such, may be adjusted by the Community Planning Team and water system personnel to best reflect what has been accomplished, and what will be accomplished in the future. In **2009** volunteer planning team members developed this Drinking Water Source Protection Plan. This Plan was reviewed by the Department of Environmental Quality found to satisfy the eight elements required to be a "State Certified Plan.

1.0 INTRODUCTION

Drinking water source protection[1] is a voluntary program implemented at the local level. The City of Lewiston (City or Lewiston), Lewiston Orchard Irrigation District (LOID or District), community volunteers, with assistance from the Asotin County Public Utility District (PUD) and City of Clarkston residents, have developed this Drinking Water Source Protection Plan (DWSP) to outline the process that will be used to help prevent contamination of groundwater that supplies the community's drinking water. Because the groundwater from which the City of Lewiston, LOID, surrounding cities and communities, such as Lapwai, Idaho, and Clarkston and Asotin, Washington, draw water from, is designated a sole source aquifer—the Lewiston Basin Aquifer—protection of this resource is critical to the health and welfare of the community. Drinking water source protection will help protect this resource from groundwater contamination by monitoring land use and implementing protection efforts in the geographic area overlying the aquifer.

Although the City of Lewiston draws a majority of it's source of drinking water from the Clearwater River, it is the hope of City personnel and this Planning Team, that first developing a regional *groundwater* source protection plan will lay a pathway for future regional *surface water* source protection planning. Some implementation measures outlined in this Plan address surface water source protection as well.

Many materials such as pesticides, fertilizers, organic chemicals, human and animal wastes can contaminate groundwater. The degree of contamination depends on many factors, including soil characteristics, volume of contaminant, contaminant properties, climate and groundwater flow. Once groundwater becomes contaminated, it is often difficult and expensive to clean up. A public water system (PWS) that is supplied by an aquifer that has become contaminated may be required to conduct additional monitoring and may need to install water treatment equipment or find a new source of drinking water. The most cost-effective approach is to prevent contamination before it occurs, rather than attempting to remedy contamination problems after they have occurred.

1.1 Drinking Water System Information for Those Planning for Protection

The City of Lewiston and Lewiston Orchards Irrigation District are the primary water purveyor's for the City of Lewiston. The City of Lewiston is located in Nez Perce County of North-Central Idaho. Two major river bodies confine the City, the Clearwater River to the north and the Snake River to the west, which borders the Cities of Clarkston and Asotin, Washington. The City of Clarkston also pumps water from the same aquifer as Lewiston and LOID.

The City of Lewiston PWS serves approximately 15,000 people through 5,842 service connections. The system is comprised of four active groundwater wells (see Table 1 for construction information and Figure 1 for geographic location), including Well #3, which is primarily used for irrigating the Lewiston Cemetery, a surface water treatment plant for the Clearwater River, eight distribution pumping stations, a distribution system, and seven finished

[1] *The term "Drinking Water Source Protection" is synonymous with Source Water/Wellhead Protection and these terms may be used interchangeably throughout this Plan.*

water reservoirs for a combined storage capacity of 15.6 million gallons (MG). In addition, the City has two inactive wells that serve as emergency backup sources and are primarily used for irrigation; and the City and LOID share an emergency inter-tie between systems.

The Lewiston Orchards Irrigation District PWS serves approximately 18,000 people through 6,317 service connections. The system is comprised of three active groundwater wells (see Table 2 for construction information and Figure 1 for geographic location), three distribution pumping stations, a distribution system and three finished water reservoirs for a combined storage capacity of 4.5 MG.

The District also serves irrigation water to customers through a separate system from a surface water source. This source is Mann Lake Reservoir. The Reservoir is fed by a series of lakes and creeks. Beginning at the divide of the Salmon River drainage and collecting water through Soldiers Meadow Reservoir, Lake Waha, Sweetwater, and Webb Creek, water is transported through approximately 20 miles of canals owned by the U.S. Bureau of Reclamation and released into Mann Lake Reservoir and then transported to the Lewiston Orchards.

The Asotin County Public Utility District #1 in Clarkston, Washington, serves approximately 20,000 people through 6,900 connections. The PUD serves the City of Clarkston and the unincorporated surrounding area, covering a 20 square-mile geographical area. The system is comprised of seven groundwater wells, of which six are active (see Table 3 for construction information and Figure 1 for geographic location). Well #4 is maintained as a standby well. There are three distribution pumping stations, and eight finished water reservoirs for a total storage capacity of 9 MG.

Tested water for all wells in The City of Lewiston and LOID systems indicate no volatile organic chemicals (VOCs), synthetic organic chemicals (SOCs) or total coliform bacteria in repeat samples have been detected. The naturally occurring radiological (RADs) chemicals such as alpha and beta emitters, radium and uranium, as well as the inorganic chemicals (IOCs) antimony, arsenic, barium, chromium, fluoride, nitrate, nickel and selenium have been detected in tested water from some or all of the wells. All detected RAD and IOC results were below the maximum contaminant levels (MCLs) as set forth in the *National Primary Drinking Water Standards* under the *Safe Drinking Water Act*. Although no contaminants have been detected at or above MCLs in water pumped from the deeper Lewiston Basin Aquifer, portions of the more shallow or upper aquifer are designated by the Idaho Department of Environmental Quality (DEQ) as the Lindsay Creek Nitrate Priority Area due to degraded groundwater quality. In addition, the upper aquifer is designated as the Lindsay Creek Groundwater Management Area by the Idaho Department of Water Resources (IDWR) for probable water quantity issues.

Tested water for all wells in the Asotin PUD indicate no VOCs, SOCs or total coliform bacteria in repeat samples have been detected. Radionuclides such as alpha and beta emitters, as well as the IOCs arsenic, fluoride and nitrate have been detected in tested water from some or all of the wells. All detected RAD and IOC results were below the MCLs as set forth in the *National Primary Drinking Water Standards* under the *Safe Drinking Water Act*.

Tables 1, 2 and 3 provide a summary of well construction information for all active groundwater wells in the Lewiston, LOID and Asotin PUD water systems. In addition to well completion data (where available), the water age is provided that was determined from an isotopic age dating study conducted by the Idaho DEQ and is described further in Section 3.1.

Table 1. City of Lewiston Well Construction Summary Information

Well	Well Depth bls/ Surface Elev. amsl (ft)	Water Level bls/ amsl (ft)	Casing: diameter/ thickness (in)	Casing: depth (ft)/ formation	Screened Interval (ft)	Surface Seal: depth (ft)/ formation	Drill Year	Sanitary Survey Elements (A/B) [3]	Age Date Years
Well #1A[1]	735/730	42/688	16/0.375	167/NA	No Screen, open hole 505-735	NA	1961	A/B	NI
Well #2[1] **(Pepsi Park)**	267/735	20/715	12/NI	71/Grey Basalt	No Screen, Open hole 71-153	71/Grey Basalt	1965	A/B	NI
Well #3 16th St.	600/855	124/ 731	26/0.312, 20/0.312, 16/0.280	394/Soft green shale	No screen, open hole 394-600	394/Soft green shale	1953	A/B	NI
Well #4 TPI[2]	358/790	121/ 669	16/NI, 12/NI	134/Hard basalt	No screen, open hole 134-358	134/Hard basalt	1951	A/B	NI
Well #5 Country Club	600/825	142/ 683	15/NI 12/NI 10/NI	40/Pink clay	290-600	40/Pink clay	1953; 2009	A/B	5,074
Well #6 Golf Course	1794/1275	549/ 726	20/ 0.375, 16/0.344, 13⅜/0.500	990/Hard gray basalt	No screen, open hole 990-1794	670/Grey Basalt	1995; 1998	A/B	24,600

[1]Wells #1 and #2 are emergency back-up sources and used for irrigation only, [2]TPI = Treatment Plant Intake, NI = No information was available, [3]A = Well and surface seal compliance; [3]B = Protected from surface flooding, bls = below land surface, amsl = above mean sea level

Table 2. LOID Well Construction Summary Information

Well	Well Depth bls/ Surface Elev. amsl (ft)	Water Level bls/ amsl (ft)	Casing: diameter/ thickness (in)	Casing: depth (ft)/ formation	Screened Interval (ft)	Surface Seal: depth (ft)/ formation	Drill Year	Sanitary Survey Elements (A/B)[1]	Age Date Years
Well #2	1957/1740	500/ 1240	20/0.375, 16/0.375, 13⅜/0.380	1376/ Gray basalt	NI	520/ Gray and black basalt	1986	A/B	12,164
Well #3	2617/1420	694/ 726	20/0.375, 16/0.375, 13⅜/0.380	1430/ Gray basalt	1035-1055, 1130-1150, 1215-1235, 1250-1270, 1375-1395	1430/ Gray basalt	1997	A/B	34,670
Well #4	1625/1555	845/ 710	20/0.375, 18/0.375, 16/0.375	1266.7/ Black scoria	866-1267, open hole 1267-1625	265/ Black and red fractured basalt	2002	A/B	NI

NI = No information was available, [1]A = Well and surface seal compliance, B = Protected from surface flooding, bls = below land surface, amsl = above mean sea level

Table 3. APUD Well Construction Summary Information

Well	Well Depth bgs/ Surface Elev. amsl (ft)	Water Level bls/ amsl (ft)	Casing: diameter/ thickness (in)	Casing: depth (ft)/ formation	Screened Interval (ft)	Surface Seal: depth (ft)/ formation	Drill Year	Sanitary Survey Elements (A/B)[1]	Age Date Years
Well #1	970/850	140/ 710	24,NI 16,NI 12,NI 10,NI	615/ black basalt	380	100/ broken basalt	1957	NI	NI
Well #2	1900/793	70/ 723	12,NI	119/ broken basalt	240	120/ broken basalt	1906	NI	10,000
Well #3	1103/999	275/ 724	24,NI 20,NI	559/ soft gray basalt	500	125/broken basalt	1960	NI	5,000
Well #4	1012/876	155/ 721	24,NI 20,NI 12,NI	451/ soft basalt	345	142/ soft basalt	1960	NI	NI
Well #5	1330/1147	440/ 707	30,NI 24,NI 20,NI	1087/ black basalt	652	175/ broken basalt	1961	NI	NI
Well #6	1069/993	262/ 731	30,NI 24,NI 20,NI	902/ black basalt	499	170/ black basalt	1961	NI	NI
Well# 7	1340/1180	464/ 716	20,NI 16,NI	653/ black basalt	653	100/ soft basalt	1977	NI	11,000

NI = No information was available, bls = below land surface, amsl = above mean sea level

In addition to the public drinking water systems described previously, the City of Lapwai, Idaho and Asotin, Washington pump water from the Lewiston Basin Aquifer; their summaries are provided in Table 4.

Table 4. City of Asotin & Lapwai Well Construction Data.

Well	Well Depth bgs/ Surface Elev. amsl (ft)	Water Level bls/ amsl (ft)	Casing: diameter/ thickness (in)	Casing: depth (ft)/ formation	Screened Interval (ft)	Surface Seal: depth (ft)/ formation	Drill Year	Sanitary Survey Elements (A/B)[1]	Age Date Years
Asotin Well #1	539/760	64/696	12/NI	419/ broken basalt	NI	100/ broken basalt	1961	NI	NI
Asotin Well #2	522/730	33/697	20/NI 16/NI	401/ broken basalt	NI	120/ broken basalt	1961	NI	NI
Lapwai Well #5	460/1055	NI	12/NI	NI	NI	NI	NI	A/B	NI
Lapwai JD Well	220/950	12/938	10/NI 8/NI	205/hard gray basalt	164-206	50/tan clay	1995	A/B	NI
Lapwai Ball Field Well #4	255/990	40/950	10/.278	198/hard gray basalt	NI	29/soft basalt	1970	A/B	NI

NI = No information was available, [1]A = Well and surface seal compliance, B = Protected from surface flooding, bls = below land surface, amsl = above mean sea level

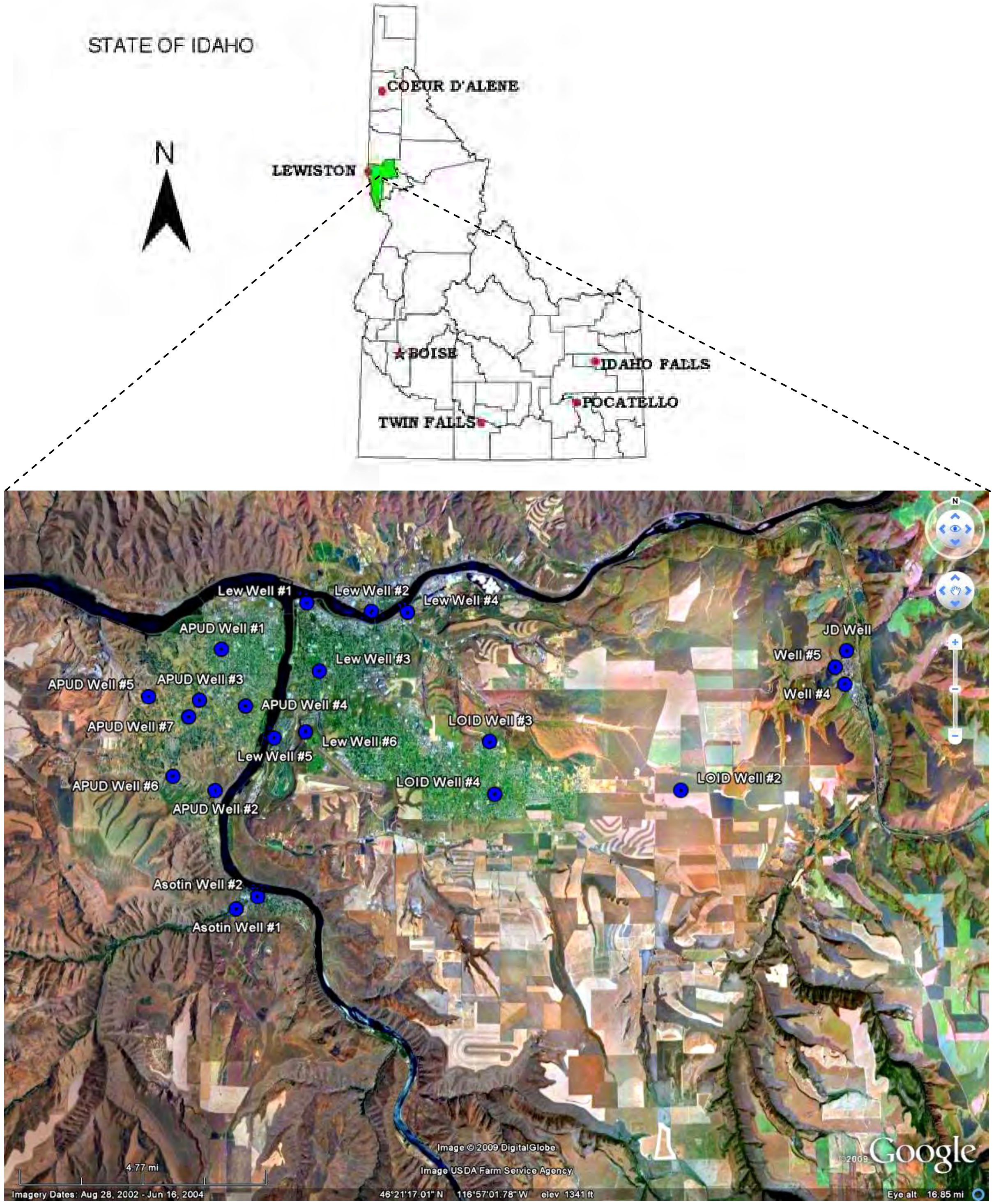

Figure 1. Geographic location of active City of Lewiston, LOID, Asotin PUD, City of Asotin, and Lapwai Wells.

Well construction directly affects the ability of the well to protect the aquifer from contaminants. System construction scores (found in the Lewiston and LOID's Source Water Assessments, DEQ 2009 a & b) are reduced when information shows that potential contaminants will have a more difficult time reaching the intake of the well. Lower scores imply a system that is better protected from contaminants. If the casing and annular seal both extend into a low permeability unit, then the possibility of cross contamination from other aquifer layers is reduced and the system construction score goes down. If the highest production interval is greater than 100 feet below the water table, then the system is considered to have better buffering capacity. When information is adequate, a determination is made as to whether the casing and annular seals extend into low permeability units and whether all current PWS construction standards are met. (This section excerpted from DEQ 2009 a & b)

Each system's available well logs allowed for a determination as to whether current PWS standards are being met. Though the Lewiston and LOID wells may have been in compliance with Idaho standards when they were completed, current PWS well construction standards are more stringent. The IDWR *Well Construction Standards Rules* (IDAPA §37.03.09) require all PWSs to follow Idaho DEQ standards. The DEQ's *Idaho Rules for Public Drinking Water Systems* (IDAPA §58.01.08.510) include provisions for screening requirements, aquifer pump tests, surface casing vents, and thickness of casing. Table 5, reproduced from IDAPA §58.01.08.900.02, lists the required steel casing thickness for various diameter wells.

Table 5. Well Casing Standards for Public Water System Wells

Diameter of Steel Casing (inches)	Thickness (inches)
≤6	0.280
8	0.322
10	0.365
12-20	0.375
22-36	0.500

Well tests are required at the design pumping rate for 24 hours or until stabilized drawdown has continued for at least six hours when pumping at 1.5 times the design pumping rate. The City of Lewiston Well #3 (16th St), Well #5 (Country Club), and Well #6 (Golf Course) do not meet all well construction standards based on current IDWR requirements. Due to limited information it is unknown if Well #4 (Treatment Plant Intake, TPI) meets current well construction standards. LOID Well #3 does not meet all well construction standards based on current IDWR requirements and Wells #2 and #4 meet current standards. All wells that do not meet current construction standards were assessed an additional system construction point in their respective SWA Reports (DEQ 2009a & 2009b) susceptibility rating.

In June of 1995 Washington State Department of Health conducted source water assessments for the Asotin PUD's active wells. Their source water assessments are available upon request from Tim Simpson with the Asotin PUD.

1.2 Drinking Water Source Protection Steps

The City of Lewiston and Lewiston Orchards Irrigation District Community Planning Team prepared this Drinking Water Source Protection Plan in accordance with the Idaho Source Water/Wellhead Protection Plan, and followed the 5-step process for source water protection. These five steps are:

Step 1	Formation of a community planning team;
Step 2	Delineation of the land area to be protected;
Step 3	Identification of potential sources of contamination;
Step 4	Development and implementation of a management plan for the drinking water protection area;
Step 5	Planning for future drinking water sources and possible emergencies through the development of a contingency plan/emergency response plan.

This Plan was developed during **2009** with technical assistance from the Idaho Department of Environmental Quality, Lewiston Regional Office, University of Idaho Internship Program and the Technical Services Division of the Idaho DEQ in Boise.

1.3 Drinking Water Source Protection and Source Water Assessment

Source water assessment involves two of the five drinking water protection steps. These two steps are delineation (Step 2) and contaminant inventory (Step 3). An additional source water assessment step includes a susceptibility analysis, which helps identify contaminant threats to the system by evaluating land use, contaminant sources, well construction, and hydrologic conditions, such as geology and soil type. By pursuing drinking water source protection, the City of Lewiston and LOID are addressing the primary goal of the source water assessment process.

2.0 COMMUNITY TEAM (Planning Team)

The members of the City of Lewiston and Lewiston Orchards Irrigation District Drinking Water Source Protection Planning Team, and assistants from the Asotin Public Utility District and City of Clarkston, include the following individuals listed in Table 6.

Table 6. Lewiston and LOID PWS Drinking Water Protection Planning Team

Contact	Position
Barney Metz	Lewiston Orchards Irrigation District Manager, Team Coordinator
David Six	Water Wastewater Systems Manager, City of Lewiston
Gene McCollum	Watermaster, LOID
Tim Simpson	Asotin County Public Utilities District General Manager
Don Roberts	Resident, City of Lewiston
Margie Weber	Resident, City of Lewiston
Dick Wyatt	Retired Engineer & Resident, Lewiston Orchards
George Dekan	Asotin PUD Customer, Retired Idaho DEQ and City of Clarkston resident
Don Nuxoll	Asotin PUD Commissioner
Phil Shinn	City of Lewiston Forester

Team member list is in no particular order

Technical Assistance was provided by:

Anna Moody	Idaho DEQ, Lewiston Regional Office
Bill Bonner	University of Idaho, Moscow
Technical Services	Idaho DEQ, Boise State Office

2.1 Duties of the Planning Team

Barney Metz is selected to be the Team Coordinator and has the responsibility of planning future Team meetings and coordinating the Implementation Schedule. The Team Coordinator will be the lead contact for any outside references to this Plan. The Idaho DEQ is available to provide continued support and technical assistance to the Planning Team regarding any of the Plan's strategic components.

The Planning Team Will:

- Hold meetings at least semi-annually to review and update the Plan and its components, such as the Implementation Schedule for future and completed activities, and the Contingency Plan—meetings will be announced;
- Update the potential contaminant source inventory;
  - Remove potential contaminant sources that no longer exist or no longer pose a threat;
  - Add any new sources of potential contaminants found in the Source Water Assessment Area (see Appendix A Table A1);
  - Evaluate new potential contaminant sources for their risk to the drinking water systems;
  - Prioritize the risk of contaminant sources within Zones IA or IB; and

    - Develop and implement a protection strategy, and add new strategies to the Implementation Schedule;
- Use information materials found in "Protecting Drinking Water Sources in Idaho" (DEQ 2007) to implement public education and outreach activities in accordance with the Implementation Schedule;

Examples of potential activities include:

    - Host community resident workshops to inform, educate and seek public comment regarding the Protection Plan, potential contaminants in the area, and management strategies for drinking water source protection;
    - Make drinking water source protection materials available to city residents;
        - Develop/maintain/distribute fact sheet summarizing the Drinking Water Source Protection Plan;
        - Improve upon current websites to include drinking water source protection information;
        - Include frequent water quality remainders with the water bills;
    - Hold annual household hazardous waste collection events;
    - Develop and/or improve upon water conservation programs;
    - Work with City Parks and Recreation to implement Water-Wise Demonstration Project;
    - Continue annual Public Works Day;
- Evaluate the need and applicability of a City of Lewiston and LOID Wellhead/Drinking Water Source Protection Ordinance (Appendix B provides an example of a Wellhead/Drinking Water Source Protection Ordinance); and
- Initiate discussions with Nez Perce County Planning and Zoning to promulgate the process of establishing a County Wellhead/Drinking Water Source Protection Ordinance and/or Overlay District.

3.0 SOURCE WATER ASSESSMENT AREA DELINEATION

The Lewiston and LOID PWS *Source Water Assessment Reports* (DEQ 2009 a & b) provide detailed descriptions of the delineated Source Water Assessment Areas (See Appendices C and D for delineations and potential contaminate inventory's). These source water assessments are excerpted in the following sections.

The delineation process establishes the physical area around each well, which becomes the focal point for assessment and protection. The process includes mapping the boundaries of the zone of contribution into time-of-travel (TOT) zones (zones IA/IB, II, and III indicate the number of years necessary for a particle of water to reach a pumping well) for water in the aquifer. The Source Water Assessment Area (SWA) is divided into four TOT zones, all zones are designed to prevent microbial or chemical contamination of the Lewiston and LOID PWS drinking water supply wells.

- Zone IA is the sanitary setback zone designed to prevent microbial contamination within a 100-foot radius of the well. This setback zone is established in the *Idaho Rules for Drinking Water Systems* (IDAPA §58.01.08.900.01) and as of May, 2009 requires that: *sewer lines, livestock, canals, streams, ditches, lakes, ponds, tanks used to store non-potable substances, storm water facilities disposing storm water originating off the well lot, and any potential source of contamination must be 50 feet from the source water/wellhead and that: home septic tanks, seepage pits, disposal fields, and privies are 100 feet away*.
- Zone IB is the 0-3 year TOT zone;
- Zone II is the 3-6 year TOT zone; and
- Zone III is the 6-10 year TOT zone.

The computer model used to delineate each drinking water source included site-specific data. Some of that data came from driller's well logs (see Appendices E and F for available well logs) and hydrogeologic reports.

3.1 Hydrogeology

The Grande Ronde Formation of the Columbia River Basalt Flows provides the majority of the groundwater in the vicinity of Lewiston because of its great thickness, extensive lateral continuity, and lack of fine-grained interbeds. Grande Ronde wells in the vicinity of Lewiston produce up to 2000 gallons per minute. The Grande Ronde is easily accessible to drilling at the confluence of the Clearwater and Snake Rivers and some of the tributary valleys such as Lapwai Creek where it has been exposed by erosion (Crosthwaite 1989). The Grande Ronde aquifer at Lewiston is called the "Lewiston Aquifer" (EPA 1988), as well as the "Lewiston Basin Deep Aquifer" (Wyatt-Jaykim 1994).

Major faults, anticlinal folds, and a major topographic divide (the Blue Mountains) have been assumed by various parties (EPA 1988; Wyatt-Jaykim 1994) to form the regional impermeable boundaries of the Lewiston Basin Deep Aquifer. To the north, the aquifer is bounded by the Clearwater Escarpment, commonly referred to as the Lewiston Hill. Faults at the toe of Lewiston Hill include the Vista and Wilma faults. The northeastern boundary of the Lewiston Basin Deep Aquifer is considered to be the Cottonwood Creek Fault. The southeastern boundary is the Limekiln fault along the front of the Craig Mountains, which meets the Snake River at Limekiln rapids. From the Snake River westward, the Grande Ronde fault is considered to be the southern boundary of the Aquifer, until it meets the Blue Mountain topographic divide. This major topographic divide is assumed to be a regional groundwater divide.

Within the Lewiston Basin Deep Aquifer, water is generally assumed to flow from recharge in the highlands to discharge into the Snake and Clearwater Rivers. In addition, Cohen and Ralston (1980) mapped areas of possible river/aquifer interconnection, and proposed that (a) the aquifer discharges to the Snake below Lewiston, (b) the aquifer is recharged from surface water from Lapwai Creek plus the Clearwater in the reach intersecting Lapwai Creek, and (c) that the aquifer is recharged from surface water in the vicinity of the confluence of the Snake River with Asotin Creek. These locations for surface water recharge to the aquifer were postulated where the basalt is dipping away from the creek.

Average precipitation in the Lewiston-Clarkston valley is 13 inches per year, whereas nearby higher elevation areas average close to 25 inches annually (Cohen and Ralston 1980). A modeling effort documented by Wyatt-Jaykim (1994), concluded on the basis of available data that 1 to 2 inches per year is a conservative estimate for recharge to the basalt aquifers in the vicinity of Lewiston and Lewiston Orchards. This ignores irrigation losses that would contribute to recharge of the basalts overlying the Grande Ronde in the vicinity of the Lewiston Orchards (DEQ 2002).

A study conducted by the Idaho DEQ in 2005 titled, ‘Isotopic Age Dating of Municipal Water Wells in the Lewiston Basin, Idaho’, resulted in an analysis of the aquifers hydrologic isotope data and correlating hydrogeology. The study concludes approximately half of the water is modern, or is input from rivers, suggesting surface water influence. Tests conducted in the study indicate the age range in the Lewiston Basin to be between 2,830 and 34,670 years (DEQ 2005). See tables 1, 2 and 3 for water age of some Lewiston, LOID and Asotin PUD wells sampled in this study.

4.0 POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION

An inventory of potential sources of contamination is the third step of a drinking water source protection plan. Sources that could potentially contaminate the drinking water supply for the Lewiston and LOID PWSs, as well as the Asotin PUDs water system, include both *point* and *nonpoint* sources of contamination. Point sources of contamination occur at distinct locations and nonpoint sources of contamination often occur over large areas.

Point sources of contamination are often regulated and require permits or registration for facilities and/or activities that sell, store, use, or produce potential contaminants regulated under the *Safe Drinking Water Act*, such as gas stations with underground storage tanks. There must be a potential for a release of those potential contaminants at a high enough level that could affect drinking water quality. It is important to understand that a release may never occur from a listed point source, particularly if the facility is using best management practices (BMPs) that are designed to reduce contamination risks. Nonpoint sources of contamination can result from normal every day activities such as lawn chemical usage, septic drain fields, household practices and agricultural activities.

If a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that they are in violation of any local, state, or federal environmental law or regulation. What it does mean is that the ***<u>potential</u>*** for contamination exists due to the nature of the business, industry, or operation. Many land and business owners may not be aware that they are located near a public water supply well, or that their operations have the potential to impact groundwater quality. Identifying those potential sources of contamination serves two purposes: 1) it provides local officials with an understanding of the potential for contamination; and 2) it provides basic information that can be useful for developing management tools and determining where they should be implemented.

There are a number of methods water systems can use to work cooperatively with facilities generating a potential contaminant source. These involve education about, and encouragement of regular inspections for stored materials, while encouraging land and business owners to implement BMPs. In addition, outreach and education for the community regarding the potential risks to the water supply can instill long-lasting, transferrable awareness.

4.1 Enhanced Inventory of Potential Sources of Contamination

A two-phased potential contaminant inventory of the source water assessment area was conducted in 2002 and again in 2008 by DEQ. The first phase involved identifying and documenting potential contaminant sources within the City of Lewiston and LOID source water assessment areas through the use of computer databases and geographic information systems (GIS). These sources were then identified on a map in proximity to the sources using GIS. The second or enhanced phase of the contaminant inventory, most recently conducted in 2009, involved contacting the water system operators to verify, identify, and add additional potential sources in the area.

Some of the potential sources of contamination identified (See tables in Appendices C and D) in the delineated SWA areas (See figures in Appendices C and D) include, among others, transportation corridors, service stations, and storm drains. Contaminants of concern are primarily chemicals such as petroleum products, solvents and degreasers (VOCs), pesticides and herbicides (SOCs), and commercial nitrogen fertilizers (IOCs). Tables C1-D3 (Appendices C and D) list potential contaminant sources, the contaminants of concern, information sources and associated TOT zones.

Land use within the City of Lewiston's area of impact and surrounding the City include: urban and suburban residential land uses, small ranches, industrial business operations, non-industrial business operations and non-irrigated agriculture. Each of these land uses have associated nonpoint sources of contamination. Rural nonpoint sources include chemicals from pesticides (insecticides and herbicides) and fertilizers applied through agricultural practices, and leachate from private septic systems that have not been maintained. Nonpoint sources of contamination within the SWA areas and City boundaries include urban stormwater runoff and hazardous chemicals associated with incorrect household and business storage, usage and disposal such as; cleaning solvents, used motor oil, degreasers, landscaping fertilizers/pesticides, etc.

5.0 SOURCE WATER PROTECTION MANAGEMENT TOOLS

An effective drinking water source protection program is tailored to the local source water assessment and drinking water protection area. A community with a fully developed source water protection program will incorporate many strategies and activities. Due to the time involved with the movement of groundwater, source water protection activities should be directed toward long-term management strategies.

Two broad categories of management approaches are available for drinking water source protection; these are regulatory and non-regulatory approaches. Regulatory approaches rely on the assistance of city and county enforcement agencies, such as Planning and Zoning Commissions, to provide an "umbrella" of protection and address issues that might affect the SWA area. These methods can include zoning overlays or ordinances that address land uses, water conservation, design standards on new or existing facilities, and mandatory practices to prevent pollution. Non-regulatory approaches rely on the voluntary implementation of public awareness and educational outreach programs. Such methods may include backflow prevention education, news releases regarding conservation measures, a kids day out for storm drain marking, or lawn care maintenance workshops. The ultimate goal of both of these types of measures is to create awareness in order to empower the public so they can implement drinking water source protection efforts in their daily lives.

For the City of Lewiston and LOID, protection activities should first focus on correcting any deficiencies identified in each system's enhanced sanitary survey. Both water systems should maintain sanitary standards for each source in the sanitary setback protection area (Zone IA). In addition, a strong public education program should be a primary focus of any protection plan, and partnering with local agencies and industry groups may provide for the successful implementation of this plan.

A combination of regulatory and non-regulatory methods will be utilized to manage contaminant sources located within each SWA area.

5.1 Regulatory Approaches

The Planning Team will encourage the City to: (1) cite the *Idaho Rules for Public Drinking Water Systems*, which prohibits particular sources of contamination within the setback area (Zone IA) of a public drinking water well, (2) pursue a zoning change for the SWA areas for the City and LOID wells, and (3) pursue county development of an overlay district and zoning. An example of a Wellhead/Drinking Water Source Protection Ordinance can be found in Appendix B. Section 9.5.1 discusses regulatory measures that could be adopted by the City of Lewiston to protect water quality.

5.2 Non-regulatory and Voluntary Approaches

These management approaches are intended to reach as broad a spectrum of the community as possible. Protection of the communities' drinking water *is* possible, but only if the whole community cooperates to achieve protection. Public education is an essential tool for drinking water source protection, and the majority of the non-regulatory approaches discussed in the following sections rely on public education for effective implementation. The Implementation Strategy (Table 7 in Section 9) is also discussed in many of the following approaches.

5.2.1 Public Education

Ongoing public education will be provided to the general public, the business community, LOID board members and municipal officials on the necessity of protecting the water supply. Such education includes many of the public participation activities and events described within Sections 6.0 and 9.0. These public participation activities and events include Planning Team meetings, advertisement of this plan, informational mailings in water bills, annual public works days, water-wise demonstration projects, school district activities, website development, City Council presentations and LOID Board presentations, and storm drain marking.

5.2.2 Pollution Prevention

Pollution prevention is waste prevention and resource conservation. Today, the emphasis is on preventing waste from being generated in the first place, versus recycling an unused, over-purchased waste material. Goals of pollution prevention are to: conserve natural resources and protect the quality of the land, water and air, work toward the reuse of items, use products with long lives, use natural resources efficiently and use processes that reduce consumption and waste. Pollution prevention is source reduction or any practice that reduces the amount of any pollutant entering any waste stream.

A good example of a pollution problem is the runoff and downward leaching of lawn fertilizer applications. The primary source of such a problem is the over-application of fertilizer associated with an over-application of water, or a normal application of fertilizer associated with an over-application of water. One example of pollution prevention would be to address the appropriate application of fertilizer and other chemicals to a lawn, along with the proper application of water. The use of BMPs is strongly suggested (Section 5.2.3).

The City of Lewiston and LOID community Planning Team will provide information on pollution prevention practices relevant to homeowners and businesses alike. Pollution prevention will be most effective at reducing the amount of household hazardous waste stored on site by creating awareness of recycling opportunities. The Idaho DEQ regional and state office Pollution Prevention (P2) Program are available to assist with prevention activities and development of educational resources. The owners of each potential contaminant source identified in the inventories (Appendices C and D) will be informed of Idaho's "Voluntary Pollution Prevention Program" and the additional assistance these program personnel can provide, such as 'A Business Guide to Pollution Prevention, 2002' and 'Idaho Environmental Guide: A Resource for Local Governments, 2009' available at http://www.deq.state.id.us/ieg/.

5.2.3 Best Management Practices

Best Management Practices applicable to many potential contaminant sources may either be distributed to those listed in Appendices C-D, or made available through the City of Lewiston and LOID. These BMPs can be applicable to both point and nonpoint sources of contamination, such as abandoned wells, agricultural and homeowner usage of fertilizers and pesticides, spill prevention within businesses where chemicals are handled, USTs, and agrichemical mixing and storage. Information on how to obtain technical and financial assistance for BMP implementation will also be provided where available. The DEQ is available to assist the City of Lewiston and LOID in identifying appropriate BMPs or identifying agencies or entities that can help provide BMPs and implementation assistance. In concert with performance based zoning regulations, the City may also provide pollution prevention and BMP outreach tailored to specific business practices.

5.2.4 Water Conservation

Another non-regulatory management approach that will be pursued by the City of Lewiston and LOID, with assistance from the Planning Team, will be to encourage potable and irrigation water conservation. Water conservation can help a community in many ways, including:

- Reduce the total quantity of water withdrawn from groundwater aquifers, thus slowing the movement of contaminants within the aquifer and allowing a longer period of time for natural processes to degrade them;
- Reduce pumping and distribution costs associated with ground and surface water withdrawal;
- Reduce the load on municipal waste treatment facilities; and
- Control over-application of lawn and garden irrigation water to limit leaching of agricultural chemicals into the groundwater.

5.2.5 Water Quality Data Reviews

Water quality data from the City and LOID wells, and any groundwater quality monitoring results in the vicinity of the City of Lewiston and LOID SWA areas, will be reviewed by the Planning Team Coordinator and DEQ at least once every five years prior to recertification of this Plan (certification is for a period of five years), or more often if significant new data is made available or water quality problems are identified in the vicinity. This will help evaluate trends or identify threats to the City and District’s drinking water sources. Groundwater quality monitoring results from private wells in the Lewiston and LOID area can be provided by the DEQ, the Idaho State Department of Agriculture, or the U.S. Geological Survey, where available. Relevant information will be made available to the community via the Planning Team Coordinator or the appropriate state or federal agency.

5.2.6 Home*A*Syst.

The Home*A*Syst Project (H*A*S) is designed to help homeowners become aware of conditions or practices on their property that increase the risk of drinking water contamination. The H*A*S materials allow a homeowner, farmer, or rancher to assess practices and activities for their potential to contaminate groundwater, and fact sheets are available to provide information about practices and structures that can help reduce the risk of groundwater contamination. The project is coordinated by the Idaho Association of Soil Conservation Districts and is available at no cost to interested parties. Copies of Home*A*Syst Project materials will be made available through (Lewiston/LOID/Planning Team), or on-line at http://homeasyst.idahoag.us/.

5.2.7 Hazardous Waste Collection

Planning Team members will encourage the development of a local household and small quantity generator businesses hazardous waste collection day and at a minimum, will inform residents of household hazardous waste collection events within Nez Perce and Asotin counties.

6.0 MANAGEMENT TOOLS AND PROTECTION MEASURES FOR PRIORITY POTENTIAL CONTAMINANT SOURCES

The Lewiston-Clarkston Valley DWSP Planning Team has prioritized public outreach and education efforts for homeowner's and their related activities that are potential nonpoint sources of contamination. The focus of this outreach and education will be to foster development of a valley-wide awareness about the importance of protecting our drinking water sources. Although the Team recognizes there are potential sources of contamination identified in the TOT zones for each drinking water source, implementation strategies are targeted for potential contaminant sources overlying the entire Lewiston Basin Aquifer.

The Planning Team will evaluate and identify any specific potential contaminant sources as part of the semi-annual plan review. Appropriate management tools and protection measures will be initiated or updated as potential contaminant sources are identified.

6.1 Management Tools

An education program will be initiated and utilized to create public awareness regarding the vulnerability of the Lewiston/LOID drinking water sources to potential contaminant sources. Section 9 outlines a proposed implementation strategy and schedule.

7.0 CONTINGENCY AND EMERGENCY RESPONSE PLAN

A contingency and emergency response plan (ERP) is designed to assist and facilitate community actions in the event of a drinking water emergency, as well as address the potential need for long-term replacement or augmentation of the existing drinking water supply. The ERP is the blueprint outlining roles and responsibilities in the event that the system experiences a disruption, whether a minor or major event. Such disruptions may be due to contamination, loss of power, natural disasters such as drought or flooding, or other circumstances where the system(s) cannot provide services. The ERP will assist the City and LOID officials to make difficult decisions in adverse conditions, as well as increase the likelihood that correct and immediate action will be taken to prevent or minimize damage or potential public health risk, both in the long and short term.

The City of Lewiston and LOID's respective Contingency and Emergency Response Plans are not included in this DWSP Plan, as they contain sensitive water system information and are maintained separately from the components of this Plan. Each system's plan include:

- Roles and responsibilities for water system, city, and county personnel as well as other state and federal agencies in the case of an emergency;
- A description of water system characteristics;
- Identification of potential emergency situations;
- General response procedures for each emergency situation; and
- Short-term contingency and long-term contingency plans, including alternative water supplies.

Long-term planning for additional water sources include development of new wells, additional or combined water rights and increased water system capacity. Each new potential water source and location will be evaluated based on *Idaho Rules for Public Drinking Water Systems* (IDAPA 58.01.08) for its proximity to potential sources of contamination in order to reduce risk and susceptibility to contamination.

The Lewiston Orchards Irrigation District is in the planning phase for developing a new well and expect to have a well site selection/approval, and possibly begin drilling by mid-2010. The City of Lewiston is in the process of applying to the IDWR in order to combine water rights from various sources for consistency in decreed pumping rights from the entire aquifer. In addition, the City is in the process of long-term planning to upgrade and/or replace the current Clearwater River treatment plant in order to increase production capacity from 13 million gallons per day (MGD) to 20 MGD.

7.1 Emergency Spill Response

The primary concern during any hazardous materials spill is immediate public health and safety. In the event of a release of hazardous materials, the designated personnel will contact appropriate state and federal agencies for a rapid and concise response. The Idaho Bureau of Hazardous Materials Action Plan and Emergency Spill Response Flow Chart (Appendix H) may be referred to. The City of Lewiston and LOID will also implement their respective ERPs in case the water systems are impacted.

8.0 PROTECTION STRATEGIES FOR NEW WELLS

This Plan includes a review of water quality and supply, and an evaluation of the need for new water sources. When a potential need is identified, SWA areas will be estimated to determine the safest location for a new water source. New drinking water sources will be delineated in a manner consistent with the delineation process for existing drinking water sources. In addition, if there are major changes to an existing sources construction, discharge rate or pumping rate, then the existing delineation should be reviewed to ensure that it still represents the appropriate source water protection zones. Delineations may be updated or modified if significant new information becomes available.

The delineation for any new or modified well site will be inventoried for any potential contaminant sources, and the risk evaluated. The anticipated pumping rate and existing knowledge of the aquifer will be used to determine which proposed location for potential new wells would provide the least risk of contamination. The City of Lewiston, LOID and the Protection Planning Team will then take appropriate actions to prevent unwanted development near the new well site.

9.0 IMPLEMENTATION STRATEGY

The strategy for implementing this Drinking Water Source Protection Plan is an important component of the local protection program. Without the continued efforts and support of the Community Planning Team and the community as a whole, the protection of the City of Lewiston and Lewiston Orchards Irrigation District's, as well as the Asotin PUD's drinking water sources, may not be accomplished as intended within this Plan. Table 7 contains the schedule outlining the protection strategy developed by the Planning Team.

The Implementation Schedule is a guide that the City Water Division, Irrigation District, Asotin PUD, and Community Planning Team can use to implement drinking water source protection activities. The schedule is designed to implement protection activities that will create a sustainable source water protection program.

In addition to activities targeting groundwater quality *and* quantity protection, some activities are applicable to surface water sources for drinking water. Because the Planning Team recognizes this Plan primarily addresses groundwater sources and not the City of Lewiston's surface water source (the Clearwater River), the Team has included activities that reach across sources and generally speak to water quality and quantity for the future of all sources of drinking water.

Although this is the first written source water protection plan for Lewiston and LOID, both systems have already been engaged in protection efforts. In addition, the Asotin PUD maintains its own wellhead protection plan, which is updated every six years. Some of the past and current Lewiston and LOID source water protection activities include:

- Developing water master plan's with contracted water resource professionals that allow for contingency planning, capacity development and sustainable infrastructure planning—all important mechanisms for source water protection;
- Maintaining metered domestic water services, which are widely shown to foster greater conservation through customer awareness gained from increased cost per unit of water;
- The City of Lewiston has conducted outreach and education for local school's by providing a tour of the water plant and teaching the cycle of water in our City from the river to the tap and back to the river; and annually, the City of Lewiston conducts outreach and education at the Nez Perce County Fair regarding water resources and conservation;
- Because the Irrigation District has a separate limited source of irrigation water, they have been hard-pressed to increase conservation and therefore, have routinely hired interns to conduct outreach and education on household BMPs related to indoor and outdoor water use and conservation.

Among other source water protection activities, the PUD is involved in water use efficiency projects and watershed planning for natural resource management and conservation. The Asotin PUD is involved with the City of Lewiston and LOID DWSP planning process to gain additional information of what other users drawing water form the same aquifer are doing in regards to protection. The Asotin PUD intends to develop and implement additional strategies that will compliment this Plan.

The PUD began work in 2007 to assist the Vinland Cemetery Association in improving water use efficiency at the Vineland Cemetery. This project included: an audit of the existing irrigation system and design, development of a plan for the installation of a new water efficient system; installation of the new system; an educational component for training on landscape management with water use efficiency at the forefront; and grants, donations and in-kind labor for implementation.

The irrigation system audit estimated the project will save 4.5 to 5.0 million gallons of water per year; and energy savings from reduced water production at PUD facilities is calculated at 1 kilowatt for every 333 gallons or an estimated annual energy savings of 13,500 to 15,000 kilowatt hours. The irrigation system plan was developed based on this audit. The project was scheduled to be completed in the Fall of 2009.

Since 2002 the Asotin PUD (lead agency), along with Asotin, Columbia, Garfield, and Whitman Counties of Washington State, and the City of Clarkston have been involved in a collaborative watershed planning program for the Middle Snake Watershed. To date this group has: completed an assessment of the watershed, developed a watershed plan, developed a detailed implementation plan, and performed a hydro geological study of the area for addressing human water supply needs, in-stream flows, water quality, and habitat issues. Information regarding this program can be found online at: http://www.asotinpud.org.

Table 7. Five-Year Implementation Schedule

Goal Date/ (Assignments)	*Protection Activity Scope of Work*	*Potential Contaminant Source Addressed/Method*
Year 1 *December 2009*	*Achieve State Certification of this Drinking Water Source Protection Plan*	*All sources/Public awareness and education; water conservation; pollution prevention; threat preparedness; BMPs.*
Continuous *(All)*	*Community Outreach* • *Newspaper articles* • *Workshop: What is our Protection Plan about?* • *Informational mailings on/with water bills* • *Lewiston Home and Garden Show* • *Nez Perce & Asotin County Fair booths* • *Other media outlets: Opinion Please*	*All sources/Public awareness and education; water conservation; pollution prevention; threat preparedness; BMPs.*
August 2009/ Continuous *(Water Systems)*	*Protection Plan Pamphlet* *Develop, post on websites, mail to valley's water customers, distribute, update as needed*	*All sources/Public awareness and education; water conservation; pollution prevention; BMPs.*
August 2009/ Continuous *(lead by Phil Shinn)*	*Modie Park Water Wise Demonstration and Outreach* • *Turf grass demonstration at Park* • *Native plant landscape demonstration at Park* • *Workshops* • *Weather station installation, information broadcasting* • *Farmer's Market outreach* • *Nez Perce & Asotin County Fair booths*	*All sources/Public awareness and education; water conservation; pollution prevention; BMPs.*
September 2009/ Continuous *(Barney & Dave)*	*Web Site Development* *Post Source Water Protection information (including BMP), Planning Team activity updates and contacts*	*All sources/Public awareness and education; water conservation; pollution prevention; threat preparedness; BMPs.*
Fall 2009—'11 *(City & DEQ)*	*Storm Drain Marking* *In coordination with City Stormwater Program, Street Maintenance program and volunteer citizen groups*	*All Sources/Public awareness and education; pollution prevention*
Year 2 *Spring 2010* *(Water Systems)*	*Post Drinking Water Protection Area Signs*	*All Sources/Public awareness and education; pollution prevention preparedness;*

Table 7. Continued

Goal Date	*Protection Activity Scope of Work*	*Potential Contaminant Source Addressed/Method*
May 2010 – Annual *(Margie, Anna, Don)*	*School Outreach Activities* • *Water Awareness Week Activities*	*All sources/Public awareness and education; water conservation; pollution prevention; threat preparedness; BMPs.*
Spring/Summer 2010 *(All)*	*Develop Household Hazardous Waste Outreach, Education and Collection Program* • *Post signs at the Nez Perce County waste transfer site, in coordination with Lewiston Solid Waste Services, directing homeowners where/when household hazardous wastes can be disposed of* • *Develop Annual County-Wide collection event, possibly in coordination with adjoining counties*	*Non-point sources/Public awareness and education; pollution prevention; threat preparedness; BMPs.*
Fall 2010 – Spring 2011	*Inventory Public and Private Wells in and above the Lewiston Basin Aquifer/Owner Education*	*All sources/Public awareness and education; pollution prevention; threat preparedness; BMPs.*
Fall 2010/ Ongoing *(TBD)*	*Septic Inventory/Maintenance Outreach* • *Using City of Lewiston GIS Septic Inventory Coverage, identify and target property owners with septic systems for BMP maintenance education*	*All sources/Public education; pollution prevention; BMPs.*
2010 /2011? *(TBD)*	*Aquifer Placemat* • *Develop placemat with assistance from community resident graphic artists such as LCSC students*	*All sources/Public awareness and education; water conservation; pollution prevention; threat preparedness; BMPs.*
Winter 2010/ Continuous *(PWSs)*	*Develop/Implement Active Cross Connection Control Education Programs*	*All sources/Public awareness and education; pollution prevention; threat preparedness; BMPs.*
Fall/Winter 2010 *(PWSs)*	*Provide City Council and LOID Board with Implementation update*	*All sources/Public awareness and education*
Ongoing *(All)*	• *Community Outreach* • *Protection Plan Pamphlet* • *Modie Park Water Wise Demonstration and Outreach* • *Website Development* • *Storm Drain Marking*	*All sources/Public awareness and education; water conservation; pollution prevention; threat preparedness; BMPs.*

Table 7. Continued

Goal Date	*Protection Activity Scope of Work*	*Potential Contaminant Source Addressed/Method*
Year 3 *January 2011* *(TBD)*	*Apply to DEQ for Source Water Protection Grant Funding (Potential outreach video)*	*All sources/Public awareness and education; water conservation; pollution prevention; threat preparedness; BMPs.*
Ongoing *(All)*	• *Community Outreach* • *School Outreach Activities* • *Protection Plan Pamphlet* • *Modie Park Water Wise Demonstration and Outreach* • *Website Development* • *Storm Drain Marking* • *Provide Household Hazardous Waste Outreach, Develop Collection Program* • *Well Inventory/Outreach* • *Septic System Maintenance Outreach* • *Aquifer Placemat* • *Cross Connection Control Outreach/Education*	*All sources/Public awareness and education; water conservation; pollution prevention; threat preparedness; BMPs.*
Fall 2011 *(TBD)*	*Seek Grant Funding from other Sources for Source Water Protection Implementation*	*All sources/Public awareness and education; water conservation; pollution prevention; threat preparedness; BMPs.*
Fall/Winter 2011(PWSs)	*Update City Council and LOID Board Regarding Source Water protection Implementation*	*All sources/Public awareness and education*
Years 4 & 5 *2012* *(TBD)*	*Develop Educational DVD for Distribution* *~ Possibly through Grant funding sources*	*All sources/Public awareness and education; water conservation; pollution prevention; threat preparedness; BMPs.*
Ongoing *2012-2013* *(All)*	• *Community Outreach* • *School Outreach Activities* • *Protection Plan Pamphlet* • *Modie Park Water Wise Demonstration and Outreach* • *Website Development* • *Storm Drain Marking* • *Provide Household Hazardous Waste Outreach, Develop Collection Program* • *Well Inventory/Outreach* • *Septic System Maintenance Outreach* • *Aquifer Placemat* • *Cross Connection Control Outreach/Education*	*All sources/Public awareness and education; water conservation; pollution prevention; threat preparedness; BMPs.*
2013	*Approach City of Lewiston & Nez Perce County to Develop Overlay Districts in Critical Drinking Water Protection Areas For Land Use Planning and Source Protection*	*All sources/; pollution prevention; threat preparedness; BMPs.*

9.1 Plan for the future

To assure a safe drinking water supply for residents of the Lewiston-Clarkston Valley, the Community Planning Team will implement this DWSP Plan as a long-term protection strategy for the City of Lewiston and Lewiston Orchards Irrigation District. The strategy outlined in this Plan will be reviewed and updated as necessary to accommodate changes due to population growth, economic development or changes in land use. The Implementation Schedule in Table 7 is for 2009-2013. In addition to the DWSP Plan, the Contingency Plans will require regular updates. The Lewiston and LOID Source Water Assessment reports will be utilized as a tool to help assess potential hazards to drinking water quality. The DEQ is available to provide technical assistance to the Planning Team whenever new potential contaminant sources need to be addressed.

9.2 Planning Team

The Drinking Water Source Protection Planning Team for the City of Lewiston and Orchards Irrigation District, with collaboration from City of Clarkston residents and Asotin County PUD, will meet at least semi-annually to coordinate DWSP activities and to review and update the Implementation Schedule. The meetings should focus on evaluating how well the protection activities are working and to determine whether more outreach needs to be conducted. These meetings should also review and update the potential contaminant inventories, the Contingency Plan, and other sections as appropriate. Meeting notices should be made public to increase participation from members within the community.

9.3 Delineation

New drinking water sources will be delineated in a manner consistent with the delineation process used for the existing drinking water sources. If there are major changes to an existing source's construction, discharge rate or pumping rate, then the existing delineation should be reviewed to ensure that it still represents the appropriate drinking water source protection zones. Delineation's may be updated or modified if significant new information becomes available.

9.4 Potential Contaminant Inventory

The Community Planning Team will update the potential contaminant inventory for the SWA areas as new, significant potential contaminant sources are noted within the SWA areas through general observations. If new sources of contamination are found, they will be added to the existing inventory. New sources will also need to be assessed for pollution prevention.

9.5 Best Management Practice

The Planning Team will coordinate efforts to implement the contaminant management practices within Section 5.0 in accordance with the Implementation Schedule in Table 7. The implementation strategy for the City of Lewiston and LOID includes both regulatory and non-regulatory approaches, with the focus on non-regulatory approaches. Public education and community involvement are important implementation components. The Planning Team will organize public education with the assistance of partnering state and federal agencies.

9.5.1 Regulatory Approaches

The Planning Team will evaluate the need and desirability of the regulatory approaches described in this section.

Bonding- Facilities may be required to post a bond prior to operation in a drinking water source protection area. Bonds can cover costs associated with spill response or remediation efforts.

Building Codes- Local building codes offer protection through special standards applicable to facilities which are remodeled or constructed in a drinking water source protection area. Building codes can require low flow fixtures, backflow prevention and other design features to conserve and protect water quality.

Conservation Ordinance- Conservation Ordinances generally assign mandatory hours and days of outdoor irrigation during particular warm weather seasons/months and prohibit irrigation of impervious surfaces, unless otherwise stated or a variance is granted.

Design Standards- Design standards typically are regulations that apply to the design and construction of buildings or structures. This tool can be used to ensure that new buildings or structures placed within a drinking water source protection area are designed so as not to pose a threat to the water supply, such as requiring an impermeable liner on a settling pond or managing on-site storm water for the prevention of runoff.

Operating Standards- Operating standards are regulations that apply to ongoing land-use activities to promote safety or environmental protection. Such standards can minimize the threat to a drinking water source protection area from ongoing activities such as the storage and use of hazardous substances through requirements such as secondary containment and spill response capabilities, or requiring that septic systems be properly maintained.

Performance Standards- Performance standards are used to regulate development within drinking water source protection areas by enforcing predetermined standards for water quality. They may be applied at a predetermined groundwater monitoring compliance point, at the point of injection, or through the use of contaminant source modeling. One example is the requirement that the amount of storm water runoff be the same before and after construction when developing or improving a site.

Potential Source Prohibitions or Restrictions- Source prohibitions or restrictions are regulations that prohibit or place restrictions on the use of certain chemicals that pose a high risk to water contamination such as Atrazine or Trichloroethene, or prohibit or place restrictions on the placement of some high-risk potential contaminant sources such as underground storage tanks, underground injection wells, lagoons, feedlots, or landfills.

Site Plan Review- Site plan reviews are regulations requiring developers to submit for approval plans for developments occurring within a given area. This tool ensures compliance with regulations or other requirements made within a drinking water source protection area.

Special Permitting or Reviews- Special permits or reviews are used to set conditions for certain uses and activities that pose a high risk to water contamination within drinking water source protection areas if left unregulated. One example is to require that new feedlots within certain drinking water source protection area zones be required to have a city or county permit or review that requires groundwater quality monitoring and the use of certain water quality protection management practices.

Subdivision Ordinances- Subdivision ordinances are applied to land divided into two or more sub-units for sale or development. Local governments use this tool to protect drinking water areas in which ongoing development is causing contamination. An example of a subdivision ordinance would be to require a minimum lot size for single family homes using septic systems so as to limit septic system density and subsequent groundwater contamination.

Transport Prohibitions- The transport of chemical compounds, which pose a high risk to water quality if spilled, can be restricted within a drinking water source protection area by requiring alternative transportation routes.

Zoning Ordinance- Zoning ordinances typically are comprehensive land-use requirements designed to direct the development of an area. Many local governments have used zoning to restrict or regulate certain land uses, which have the potential to contaminate water within drinking water source protection areas.

Zoning Overlay-Overlay zones can be used in conjunction with conventional zoning to create special districts that protect a drinking water source protection area. Overlay zones are applied to areas singled out for special protection, such as a drinking water source protection area, and add regulations to those controls already in place. This method helps address "grandfathered" potential contaminant sources in drinking water source protection areas.

9.5.2 Non-regulatory Approaches

The Planning Team will coordinate efforts to implement non-regulatory approaches to drinking water source protection, with the City of Lewiston and LOID taking the lead role toward implementing many of the approaches found in Section 5.2. A major component of the Implementation Strategy is to work with the local community and the various local, state, and federal programs for implementation assistance. This includes obtaining assistance from the Home*A*Syst coordinator, DEQ Pollution Prevention Program personnel and the local DEQ Source Water Protection Coordinator as discussed under Sections 5.2.2 , 5.2.3 and 5.2.6.

The DEQ Lewiston Regional Source Water Protection Coordinator and other appropriate DEQ support personnel, as requested by the Planning Team, can assist in the area of coordinating support among the various local, state, and federal programs. The DEQ Source Water Protection Coordinator will also help with water quality data reviews (Section 5.2.5) and can provide technical assistance for public education outreach on best management practices (Sections 5.2.1 and 5.2.3).

The Planning Team will work with the local community where desirable to help identify and pursue available funding opportunities for implementing various drinking water source protection approaches. Funding sources may include:

- Environmental Quality Improvement Project funds for agricultural BMP implementation through the NRCS;
- Source Water Protection Grants through DEQ;
- Nonpoint Source Section 319 BMP implementation funding through DEQ (Chapter 4 of the Idaho Nonpoint Source Management Plan contains a comprehensive list of funding sources available for implementation of BMPs);
- Environmental Protection Agency Safewater/Sourcewater Grant funding; and
- The Environmental Finance Center at Boise State University or

9.6 Additional Implementation Considerations

The City of Lewiston and LOID Contingency Plans and efforts associated with planning for additional well source locations, will be updated on an as-needed basis, as determined by the Planning Team. Once source water assessment information is made available, the Planning Team will evaluate the information, particularly the susceptibility analyses, and decide if there are any needed modifications or additions to this Plan or its implementation. Information from capacity development and the City of Lewiston and LOID water system master plans will also be taken into consideration for drinking water source protection planning and implementation purposes, as determined by the Planning Team.

10.0 PUBLIC PARTICIPATION

Public participation during the development of this Drinking Water Source Protection Plan has included the following:

- Public notification;
- Public meetings;
- Board meeting;
- Onsite visits
- City Council presentation.

Additional public participation will be pursued as part of the implementation process. Citizens can obtain updated information on the City of Lewiston/LOID Drinking Water Source Protection Plan, implementation efforts, Source Water Assessments, and drinking water issues from the Team Coordinator, or through a public records request submitted to DEQ.

11.0 VULNERABILITY ASSESSMENT

Water systems are critical to every community. Protection of public drinking water systems must be a high priority for local officials and water system owners and operators. Water systems must be a high priority to ensure an uninterrupted water supply, which is essential for the protection of public health (safe drinking water and sanitation) and safety (fire fighting).

Adequate security measures will help prevent loss of service through vandalism, pranks or malicious acts. If a system is prepared, such actions may even be prevented. The appropriate level of security is best determined by the water system at the local level.

A "vulnerability assessment" is the identification of weaknesses in water system security, focusing on defined threats that could compromise its ability to provide adequate potable water, and/or water for fire fighting. The vulnerability assessment document is designed for use by water system personnel. Physical facilities pose a high degree of exposure to any security threat. This assessment should be conducted on all components of a system (wellhead or surface water intake, treatment plant, storage tank(s), pumps, distribution system, and other important components of the system).

The purpose of this document is to start the process of security vulnerability assessment and security enhancements. Security is not an end point, but a goal that can be achieved only through continued efforts to assess and upgrade a system.

This is a sensitive document and as such should be stored separately in a secure place at the water system. A duplicate copy should also be retained at a secure off-site location. Access to this document should be limited to key water system personnel and local officials as well as the state drinking water primacy agency and others on a need-to-know basis. Therefore, each system's respective Vulnerability Assessment will not be included in this report.

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GLOSSARY

Aquifer – A geologic formation, group of formations, or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.

Aquitard - A low-permeability geologic unit that can store groundwater and also transmit it slowly from one aquifer to another.

AST (Aboveground Storage Tank) – Sites with aboveground storage tanks.

Best Management Practices (BMPs) – Conservation practices or systems of practices and management measures that (1) reduce water quality degradation caused by nutrients, animal waste, toxics, and sediment, as well as control soil loss; and (2) minimize adverse impacts on surface water, groundwater flow, and circulation patterns and on the biological, chemical, and physical characteristics of wetlands.

Capacity – The flow rate that a pump is capable of producing; a water utility's ability to have resources available to meet the water service needs of its customers. In this context, capacity is the combination of water plant- and service-related activities necessary to meet the quantity, quality, peak loads, and other service needs of the various customers or classes of customers served by the utility.

Community System – A public water system serving at least 15 service connections used by year-round residents or regularly serving at least 25 year-round residents.

Contaminant – Any physical, chemical, biological, or radiological substance or matter in water.

Contaminant Source Inventory – A record of the activities on a watershed or aquifer recharge area that have a potential to contaminate water.

Contingency Plan – A document that details the intended actions of a water utility under specified adverse conditions.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – A well discharging under pressure to a deep subsurface stratum. Such a well is often used to dispose of liquid waste streams to a suitable confined poor-water-quality aquifer that is generally considered unusable for other purposes; injection wells regulated under the Idaho Department of Water Resources generally for the disposal of storm water runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Groundwater Management Area – All or part of a groundwater basin that may be approaching critical where the basin does not have sufficient groundwater to provide a reasonably safe supply certain uses at the current or projected rates of withdrawal

Group I Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Inorganic Contaminant (IOC) – An inorganic substance regulated by the US Environmental Protection Agency in terms of compliance monitoring for drinking water. Contained on the agency's list are contaminants as diverse as asbestos, nitrate (NO_3^-), cyanide, and nickel. This abbreviation came into common use in the US Environmental Protection Agency's Phase V drinking water regulations. An inorganic contaminant is sometimes called an inorganic chemical.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Maximum Contaminant Level (MCL) – A value defined under the Safe Drinking Water Act Section 1401 (3) as the maximum permissible level (concentration) of a contaminant in water delivered to any user of a public water system. Maximum contaminant levels are the legally enforced standards in the United States.

Microbes – A microscopic organism, either plant or animal, invisible to the naked eye. Examples are algae, bacteria, fungi, protozoa, and viruses.

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

Nonpoint Source – Waste material that enters a water body from overland flow rather than out of a pipe or channel; an unconfined discharge of waste.

Organic Priority Areas – These are any areas where greater than 25% of wells/springs show levels greater than 1% of the primary standard or other health standards.

P2 – An acronym for pollution prevention.

Perched Aquifer – A small lens of unconfined groundwater separated from an underlying main body of groundwater by an impermeable unsaturated zone.

Point Source – A discharge that comes out of the end of a pipe – as opposed to runoff or a discharge from a field or similar source, which is called a nonpoint source.

Sanitary Survey – An on-site review of a water utility's water source, facilities, equipment, and operations and maintenance records for the purpose of evaluating the system's adequacy in producing and distributing safe drinking water.

Sole Source Aquifer – An aquifer that has been designated by the U.S. Environmental Protection Agency as a sole source or principal source that serves greater than 50 percent of an areas drinking water.

Synthetic Organic Chemical (SOC) – An organic compound that is commercially made. Some synthetic organic chemicals are contaminants in drinking water and are regulated by the US Environmental Protection Agency. The regulated synthetic organic contaminants include volatile organic chemicals, pesticides, herbicides, polychlorinated biphenyls, selected treatment chemicals (e.g. Acrylamide), and polynuclear aromatic hydrocarbons.

Time of Travel (TOT) – The determination, usually by modeling, of the time in years for groundwater recharge to travel from a certain field point to the wellhead.

Vadose Zone – The unsaturated portion of the soil column between the land surface and the water table. A better term is *unsaturated zone*.

Volatile Organic Compound (VOC) – A class or organic compounds that includes gases and volatile liquids. Many volatile organic chemicals are used as solvents. A number of these compounds are regulated by the US Environmental Protection Agency.

Wastewater Land Application Site – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

Zone IA – Sanitary setback zone designed to prevent microbial contamination within a 100-foot radius of the wellhead. This setback zone is established in the *Idaho Rules for Drinking Water Systems* (IDAPA §58.01.08) and requires that: sewer lines, livestock, canals, streams, ditches, lakes, ponds, tanks used to store non-potable substances, storm water facilities disposing storm water originating off the well lot, and any potential source of contamination must be 50 feet from the source water/wellhead and that: home septic tanks, seepage pits, disposal fields, and privies are 100 feet away

Zone IB – Corresponds with the 3-year time of travel for a contaminant to reach the wellhead.

Zone II – Corresponds with the 6-year time of travel for a contaminant to reach the wellhead.

Zone III – Corresponds with the 10-year time of travel for a contaminant to reach the wellhead.

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APPENDIX A Overview of Potential Contaminant Sources

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Table A1 provides an overview of potential contaminant sources and the contaminants that may be associated with each source. These sources represent many of the businesses, industries, operations, land uses, and environmental conditions that handle, generate, store, apply, dispose of, or provide a pathway for the contaminants of concern. The sources are separated into four categories:

1) Commercial/Industrial,
2) Agricultural/Rural,
3) Residential/ Municipal, and
4) Miscellaneous.

These sources can apply to either groundwater or surface water, and many can apply to both ground and surface water. Where a potential contaminant source generally applies to only groundwater or surface water, it is noted within Table A1.

Table A-1. Potential Contaminant Sources (Ground and Surface Water)

Source		**Potential Contaminants** [1,2,3]
Commercial/Industrial		
Automobile	Body Shops/ Repair Shops	Waste oils, gasoline and diesel fuels; solvents, acids, paints, automotive wastes[4], miscellaneous cutting oils.
	Car Washes	Soaps, detergents, waxes, miscellaneous chemicals, hydrocarbons.
	Gas Stations	Petroleum fuels, oil, solvents, miscellaneous wastes.
Boat Services/Repair/Refinishing		Gasoline and diesel fuels, oil, septage from boat waste disposal area, wood preservative and treatment chemicals, paints, waxes, varnishes, automotive wastes[4].
Cement/Concrete Plants		Diesel fuel, solvents, oils, miscellaneous wastes.
Chemical/Petroleum Processing/Storage		Hazardous chemicals, solvents, hydrocarbons, heavy metals.
Dry Cleaners		Solvents (tetrachloroethylene, petroleum solvents), spotting chemicals (trichloroethane, methyl chloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate).
Electrical/Electronic Manufacturing		Cyanides, metal sludge, caustic (chromic acid), solvents, oils, alkalis, acids, paints and paint sludges, PCBs.
Fleet/Trucking/Bus Terminals		Waste oil, solvents, gasoline and diesel fuel from vehicles and storage tanks, fuel oil, other automotive wastes[4].
Food Processing		Nitrates, salts, phosphorous, miscellaneous food wastes, chlorine, ammonia, ethylene glycol.
Furniture Repair/Manufacturing		Paints, solvents, degreasing and solvent recovery sludge's, lacquers, sealants.
Hardware/Lumber/Parts Stores		Hazardous chemical products in inventories, heating oil and fork lift fuel from storage tanks, wood-staining and treating products such as creosote, paints, thinners, lacquers, varnishes.

Source	Potential Contaminants [1,2,3]
Home Manufacturing	Solvents, paints, glues and other adhesives, waste insulation, lacquers, tars, sealants, epoxy wastes, miscellaneous chemical wastes.
Junk/Scrap/Salvage Yards	Automotive wastes[4], PCB contaminated wastes, any wastes from businesses[5] and households[6], oils, lead.
Machine Shops	Solvents, metals, miscellaneous organics, sludges, oily metal shavings, lubricant and cutting oils, degreasers (tetrachloroethylene), metal marking fluids, mold-release agents.
Metal Plating/Finishing/Fabricating	Sodium and hydrogen cyanide, metallic salts, hydrochloric acid, sulfuric acid, chromic acid, boric acid, paint wastes, heavy metals, plating wastes, oils, solvents.
Mines/Gravel Pits	Mine spills or tailings that often contain metals, acids, highly corrosive mineralized waters, metal sulfides, metals, acids, minerals sulfides, other hazardous and nonhazardous chemicals, petroleum products and fuels.
Photo Processing/Printing	Biosludges, silver sludges, cyanides, miscellaneous sludges, solvents, inks, dyes, oils, photographic chemicals.
Plastics/Synthetics Producers	Solvents, oils, miscellaneous organic and inorganics (phenols, resins), paint wastes, cyanides, acids, alkalis, wastewater treatment sludges, cellulose esters, surfactant, glycols, phenols, peroxides, etc.
Research/University/Hospital Laboratories	X-ray developers and fixers[7], infectious wastes, radiological wastes, biological wastes, disinfectants, asbestos, beryllium, solvents, infectious materials, drugs, disinfectants, miscellaneous chemicals.
Wood Preserving/Treating	Wood preservatives: creosote, pentachlorophenol, arsenic, heavy metals.
Wood/Pulp/Paper Processing and Mills	Metals, acids, sulfides, other hazardous and nonhazardous chemicals, organic sludges, sodium hydroxide, chlorine, hypochlorite, chlorine dioxide, hydrogen peroxide, methanol, paint sludges, solvents, creosote, coating and gluing wastes.
Agricultural/Rural	
Livestock Auction Lots/Boarding Stables	Nitrates, phosphorous, bacteria, and viruses, total dissolved solids.
Confined Animal Feeding Operations Slaughter House and Butcher Facilities	Nitrates, phosphorous, chloride, chemical sprays and dips for controlling insect, bacteria and viruses, total dissolved solids.
Farm Machinery Repair	Automotive wastes[4], solvents, fuel.
Crops - Irrigated and Non-irrigated	Pesticides[8], nitrate & phosphorous (from fertilizers), salts, sediment (from runoff)
Wastewater/Sludge/Manure Land Application or Disposal Locations	Nitrates, metals, salts, bacteria and viruses.
Lagoons/Liquid Wastes	Nitrates, livestock sewage wastes, salts, bacteria.

Source	Potential Contaminants [1,2,3]
Pesticide/Fertilizer/Petroleum Storage & Transfer Areas	Pesticides[8] , nitrate, phosphorous, petroleum residues.
Residential/Municipal	
Airports (Maintenance/Fueling Areas)	Jet fuels, deicers, diesel fuel, chlorinated solvents, automotive wastes[4], heating oil, building wastes[5].
Camp Grounds/RV Parks, Marinas	Septage, gasoline, diesel fuel from boats, pesticides[8], household hazardous wastes from recreational vehicles (RVs)[6].
Drinking Water Treatment plants	Treatment chemicals
Golf Courses	Pesticides[8], nitrate, phosphorous, arsenic.
Landfills/Dumps	Organic and inorganic chemical contaminants; waste from households[6] and businesses[5], nitrates, oils, metals, solvents.
Motor Pools	Automotive wastes[4]: solvents, waste oils, fuel storage.
Railroad Yards/Maintenance/Fueling Areas	Diesel fuel; herbicides for rights-of-way[8], creosote from preserving wood ties, solvents, paints, waste oils.
School Maintenance Facilities	Machinery/vehicle serving wastes, gasoline.[4].
Septic Systems (large community systems or 10 single systems on 40 acres)	Bacteria, viruses, nitrates, salts, dissolved solids, improperly disposed of household or business wastes[5,6,9].
Utility Stations/Maintenance Areas	PCBs from transformers and capacitors, oils, solvents, sludges, acid solution, metal plating solutions (chromium, nickel, cadmium).
Waste Transfer/Recycling Stations	Residential and commercial solid waste residues.
Wastewater Effluent to Surface Waters (primarily surface water concern)	Municipal wastewater, sludge[10], treatment chemicals[11], nitrates, heavy metals, bacteria, nonhazardous wastes
Miscellaneous	
Above Ground Storage Tanks	Diesel, gasoline, other chemicals.
Construction/Demolition Areas (Plumbing, Heating, and Air Conditioning, Painting, Carpentry, Flooring, Roofing and Sheet Metal etc.)	Solvents, asbestos, paints, glues and other adhesives, wastes insulation, lacquers, tars, sealants, epoxy waste, miscellaneous chemical wastes, explosives, sediment.
Historic Gas Stations	Diesel fuel, gasoline, kerosene.
Historic Waste Dumps/Landfills	Leachate, organic and inorganic chemicals, waste from households[6], and businesses[5], nitrates, oils, heavy metals, solvents.
Injection Wells/Dry Wells/Sumps (primarily groundwater concern)	Storm water runoff, used oils, antifreeze, gasoline, solvents, other petroleum products, pesticides[8], and other chemical substances.
Storm Water Drainage to Surface Waters (primarily surface water concern)	Storm water runoff, oils, antifreeze, metals, sediment, and pesticides, and a wide variety of other substances.

Source	Potential Contaminants [1,2,3]
Military Installations	Wide variety of hazardous and nonhazardous wastes depending on the nature of the facility, diesel fuels, jet fuels, solvents, paints, waste oils, heavy metals, radioactive wastes, explosives.
Surface Water - Stream/Lakes/Rivers/Recharge Sites	Groundwater: bacteria and viruses, cryptosporidium Surface Water: nitrates, pesticides, sediment from Ag. Return drains.
Transportation Corridors	Herbicides in highway right-of-way[8], road salt (sodium and calcium chloride), road salt anti-corrosives (phosphate and sodium ferrocyanide), automotive wastes[4], nitrate or phosphorous from fertilizer use.
Forest Roads /Logging (primarily surface water concern)	Sediment, fuel spills.
Landslides/Burn Areas (primarily surface water concern)	Sediment.
Underground Storage Tanks	Diesel, gasoline, heating oil, other chemical and petroleum products.
Unsealed or Abandoned Wells, and Test Holes (primarily groundwater concern)	Storm water runoff, solvents, nitrates, septic tanks, hydrocarbons, and a wide variety of other substances.

1 In general, surface or groundwater contamination stems from the misuse and improper disposal of liquid and solid wastes; the illegal dumping or abandonment of household, commercial, or industrial chemicals; the accidental spilling of chemicals from trucks, railways, aircraft, handling facilities, and storage tanks; or the improper siting, design, construction, operation, or maintenance of agricultural, residential, municipal, commercial, and industrial drinking water wells and liquid and solid waste disposal facilities. Contaminants also can stem from atmospheric pollutants, such as airborne sulfur and nitrogen compounds, which are created by smoke, flue dust, aerosols, and automobile emissions, fall as acid rain, and percolate through the soil. When the sources list in these tables are used and managed properly, water contamination is not likely to occur.

2 Contaminants can reach groundwater from activities occurring on the land surface, such as industrial waste storage; from sources below the land surface but above the water table, such as septic systems; from structures beneath the water table, such as wells; or from contaminated recharge water.

3 This table lists the most common potential contaminants, but not all-potential contaminants. For example, it is not possible to list all potential contaminants contained in storm water runoff or from military installations.

4 Automobile wastes can include gasoline; antifreeze; automatic transmission fluid; battery acid; engine and radiator flushes; engine and metal degreasers; hydraulic (brake) fluid; and motor oils.

5 Common wastes from public and commercial buildings include automotive wastes; and residues from cleaning products that may contain chemicals such a xylenols, glycol esters, isopropanol, 1, 1, 1, -trichloroethane, sulfonates, chlorinated phenols, and cresol.

6 Households wastes include common household products that can contain a wide variety of toxic or hazardous components.

7 X-ray developers and fixers may contain reclaimable silver, glutaldehyde, hydroquinone, potassium bromide, sodium sulfite, sodium carbonate, thiosulfates, and potassium alum.

8 Pesticides include herbicides, insecticides, rodenticides, and fungicide. EPA has registered approximately 50,000 different pesticide products for use in the United States. Many are highly toxic and quite mobile in the subsurface.

9 Septic tank/cesspool cleaners include synthetic organic chemicals such as 1, 1, 1,-trichloroethane, tetrachloroethylene, carbon tetrachlorine, and methylene chloride.

10 Municipal wastewater treatment sludge can contain organic matter, nitrates; inorganic salts; heavy metals; coliform and noncoliform bacteria; and viruses.

11 Municipal wastewater treatment chemicals include calcium oxide; alum; activated alum; polymers; ion exchange resins; sodium hydroxide; chlorine; ozone; and corrosion inhibitors.

Source: Adapted from EPA (1993).

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APPENDIX B Sample Wellhead/Drinking Water Source Protection Ordinance

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SECTION 1. **Short Title and Purpose**.

A. This ordinance shall be known as the **"Wellhead/Drinking Water Source Protection Plan"**.

B. It is the purpose of this ordinance to promote the public health, safety, and general welfare, and to minimize public and private loses due to contamination of the public water supply, and to formalize groundwater protection/pollution abatement and control procedures. Specific goals are to:

1. Protect human life and health;

2. Insure that the public is provided with a sustainable safe potable water supply;

3. Minimize expenditure of public money for pollution remediation projects;

4. Minimize regulations on land use; and,

5. Minimize business interruptions;

SECTION 2. **Definitions**. When used in this ordinance, the following words and phrases shall have the meanings given in this section:

A. **Agricultural Runoff Waste Water**. Water diverted for irrigation but not applied to crops, or runoff of irrigation tail water from the cropland as a result of irrigation.

B. **Aquifer Remediation Related Wells**. These wells shall include those used to prevent, control, or remediate aquifer pollution, including--but not limited to--Superfund sites.

C. **Community Water System**. A public system which serves at least fifteen (15) service connections used by year-round residents or regularly serves at least twenty-five (25) year-round residents.

D. **Facility**. Refers to any business or corporation that is built, installed, or established to serve a particular purpose.

E. **Hazardous Waste Disposal Facility**. A hazardous waste treatment, storage, or disposal facility which receives hazardous material as described in Part 40 Chapter 260.1 of the Code of Federal Regulations.

F. **Hazardous Waste or Material**. Any waste or material which because of its quantity, concentration, physical, chemical or infectious characteristics may:

1. Cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or,

2. Pose a substantial present or potential hazard to human health or to the environment when improperly treated, stored, transported, disposed of or otherwise managed; or,

3. Any material or substance designated as a hazardous or toxic substance defined by Title 40 Part 261.3 of the Code of Federal Regulations, or any material or substance designated as a hazardous or toxic substance by the State of Idaho, acting through the Division of Environmental Quality or any successor agency.

G. **Injection**. The subsurface emplacement of fluids.

H. **Livestock Confinement Operation**. As defined elsewhere in the Code.

I. **Non-Community Water System**. A public water system that is not a community water system.

J. **Public Water System**. A system that provides the public with piped water for human consumption, if such system has at least fifteen (15) service connections or regularly serves an average of at least twenty-five (25) individuals daily at least sixty (60) days out of the year. Such term includes:

1. any collection, treatment, storage, and distribution facilities under control of the operator of such system, and used primarily in connection with such system; and,

2. any collection or pretreatment storage facilities not under such control that are used primarily in connection with such system.

A public water system is either a "community water system" or a "non-community water system."

K. **Sanitary Landfill**. A solid waste disposal operation where the wastes are spread on land in thin layers, compacted to the smallest practical volume, and covered with cover material once each day of operation in order to safeguard against environmental pollution, nuisances, and health hazards.

L. **Special Drainage Wells** are those used for disposing of water from sources other than direct precipitation. Examples of this well type include: landslide control drainage wells, potable water tank overflow drainage wells, swimming pool drainage wells, and lake level control drainage wells.

M. **Storm Water Runoff**. Water discharged as a result of rain, snow, or other precipitation.

N. **Time of Travel Districts (TOT)**. The time required for a contaminant to move in the ground from a specific point to a well.

O. **Underground Injection Well**. Any excavation or artificial opening into the ground which meets the following three criteria:

1. A bored, drilled or dug hole, or a driven mine shaft, or a driven well point; and,

2. It is deeper than its largest straight-line surface dimension; and,

3. It is used for or intended to be used for injection.

P. **Wellhead/Drinking Water Source Protection Overlay District (WHP/DWSP)**. A land use designation on the Land Use Map, or a zoning designation on a zoning map, that modifies the basic underlying designation in some specific manner. The Drinking Water Source Protection Overlay District will also appear in the Hazardous Component of the Comprehensive Plan. A map will define specific area districts centering around wells supplying drinking water to a public water system. The map is delineated using one of the following methods:

1. Calculated Fixed Radius;

2. Arbitrary Fixed Radius;

3. Simplified Variable Shapes;

4. Semi-analytical, and Analytical Methods;

5. Hydrogeologic Mapping;

6. Numerical Modeling

and follow the guidelines established in the Idaho Wellhead Protection Plan.

Q. **Community Wellhead**. The upper terminal of a well, including adapters, ports, seals, valves and other attachments.

R. **Wellhead/Drinking Water Source Protection Overlay District IA**. A minimum fixed radius extending no less than fifty (50) feet radially from the wellhead supplying potable water to the public water supplies.

S. **Wellhead/Drinking Water Source Protection Overlay District IB**. A three (3) year time of travel district (TOT) as defined in Section 2.

T. **Wellhead/Drinking Water Soruce Protection Overlay District II**. A six (6) year time of travel district (TOT) as defined in Section 2.

U. **Wellhead/Drinking Water Source Protection Overlay District III**. A ten (10) year time of travel district (TOT) as defined in Section 2.

SECTION 3. **Establishment of Wellhead/Drinking Water Source Protection Overlay District**. There is hereby established a wellhead/drinking water source protection overlay district identified and described as all the area within the ten (10) year TOT district around public water supplies as shown on the official zoning map. It is further established that these areas be composed of Four(4) districts, Wellhead/drinking water source Protection Overlay District IA, Wellhead/drinking water source Protection Overlay District IB, Wellhead/drinking water source Protection Overlay District II, and Wellhead/drinking water source Protection Overlay District III as they are defined in this Chapter. The Board of Commissioners may record with the County Recorder's Office a metes and bounds description of the Wellhead/drinking water source Protection Overlay District.

SECTION 4. **Prohibited uses within Zone IA of the Wellhead/Drinking Water Source Protection Area**. Uses permitted within Zone IA shall be limited to necessary public water supply wellhead equipment including the following, wellhead facility buildings, water storage tanks, disinfection equipment, disinfection chemical storage and approved landscaping. All other uses shall be prohibited.

SECTION 5. **Prohibited uses within Zone IB of the Wellhead/Drinking Water Source Protection Area**. The following uses or conditions shall be and are hereby prohibited within Zone IB of the Wellhead/drinking water source Protection areas:

A. Sanitary landfills.

B. Livestock Confinement Operations.

C. Hazardous waste Disposal Facility.

D. Injection well is a prohibited use **except for the following**:

1. Closed systems.

E. Existing sewer lines shall not be closer than one hundred (100) feet of a wellhead or of new sanitary system and sewer lines shall not be closer than one hundred fifty (150) feet of a wellhead.

F. Existing septic tanks or drain fields shall not be closer than one hundred (100) feet of a wellhead and new installation of septic tanks or drain fields shall not be closer than two hundred (200) feet away from the wellhead.

G. Junk or salvage yards.

H. Disposal of waste oil, oil filters, tires and all other petroleum products.

I. All manufacturing or industrial businesses involving the collection, handling, manufacture, use, storage, transfer or disposal of any hazardous solid or liquid material or waste having potential impact on groundwater, and any land use activities posing a hazard or threat to existing groundwater quality, except upon issuance of a Special Use Permit. The Special Use Permit process may be instigated by the Zoning Administrator during the application review process.

SECTION 6. **Prohibited Uses within Zone II of the Drinking Water Source Protection Area**. The following uses or conditions shall be and are prohibited within Zone II of the Wellhead/drinking water source Protection Area:

A. Sanitary landfills;

B. Hazardous Waste Disposal Facility;

C. Injection well is a prohibited use **except for the following**:

1. Deep well injection (below 18 feet in depth):

   a. Geothermal Heat;

   b. Heat Pump Return;

   c. Cooling Water Return.

2. Shallow well injection only (less than 18 feet in depth), including:

   a. Storm Runoff;

   b. Agricultural Runoff Waste Water;

   c. Special Drainage Water;

   d. Aquifer Recharge;

   e. Aquifer Remediation;

   f. Septic Systems (General).

D. All manufacturing or industrial businesses involving the collection, handling, manufacture, use, storage, transfer or disposal of any hazardous solid or liquid material or waste having potential impact on groundwater, and any land use activities posing a hazard or threat to existing groundwater quality, except upon issuance of a Special Use Permit. The Special Use Permit process may be instigated by the Zoning Administrator during the application review process.

SECTION 7. **Prohibited Uses within Zone III of the Wellhead/drinking water source Protection Area**. The following uses or conditions shall be and are prohibited within Zone III of the Wellhead/drinking water source Protection area:

A. Injection well is a prohibited use **except for the following**:

1. Deep well injection (below 18 feet in depth):

   a. Geothermal Heat;

   b. Heat Pump Return;

   c. Cooling Water Return.

2. Shallow well injection only (less than 18 feet in depth):

   a. Storm Runoff;

   b. Agricultural Runoff Waste Water;

   c. Special Drainage Water;

d. Aquifer Recharge;

e. Aquifer Remediation;

f. Septic Systems (General).

B. All manufacturing or industrial businesses involving the collection, handling, manufacture, use, storage, transfer or disposal of any hazardous solid or liquid material or waste having potential impact on groundwater, and any land use activities posing a hazard or threat to existing groundwater quality, except upon issuance of a Special Use Permit. The Special Use Permit process may be instigated by the Zoning Administrator during the application review process.

SECTION 8. **Notice of Proposed Action to Operator of Public or Community Water Supply**. Whenever there is a request which requires a Special Use Permit from the Planning and Zoning Commission for land lying within a Wellhead/drinking water source Protection District, written notice of the hearing shall be given to the entity operating the public or community water supply within that overlay district. The Planning and Zoning Commission may require a granting of easements for monitoring wells if the commission deems it appropriate for protection of the public water supply.

SECTION 9. **Non-Conforming Uses**. Any legal use existing at the time of the adoption of this ordinance and listed as a prohibited use herein, shall become a legal non-conforming use and may not be expanded or improved except as otherwise provided in the zoning ordinance.

SECTION 10. **Enforcement**. It shall be unlawful for any person, corporation, government entity or business to occupy or use the land within the area designated in the Wellhead/drinking water source Protection Overlay District of Zone I, II, and III contrary to, or in violation of, any of the provisions of this Chapter.

SECTION 11. **Amendments**. Proposed amendments will require advance notice to all entities operating public or community water supplies that this ordinance effects.

APPENDIX C City of Lewiston Source Delineations & Potential Contaminant Inventories

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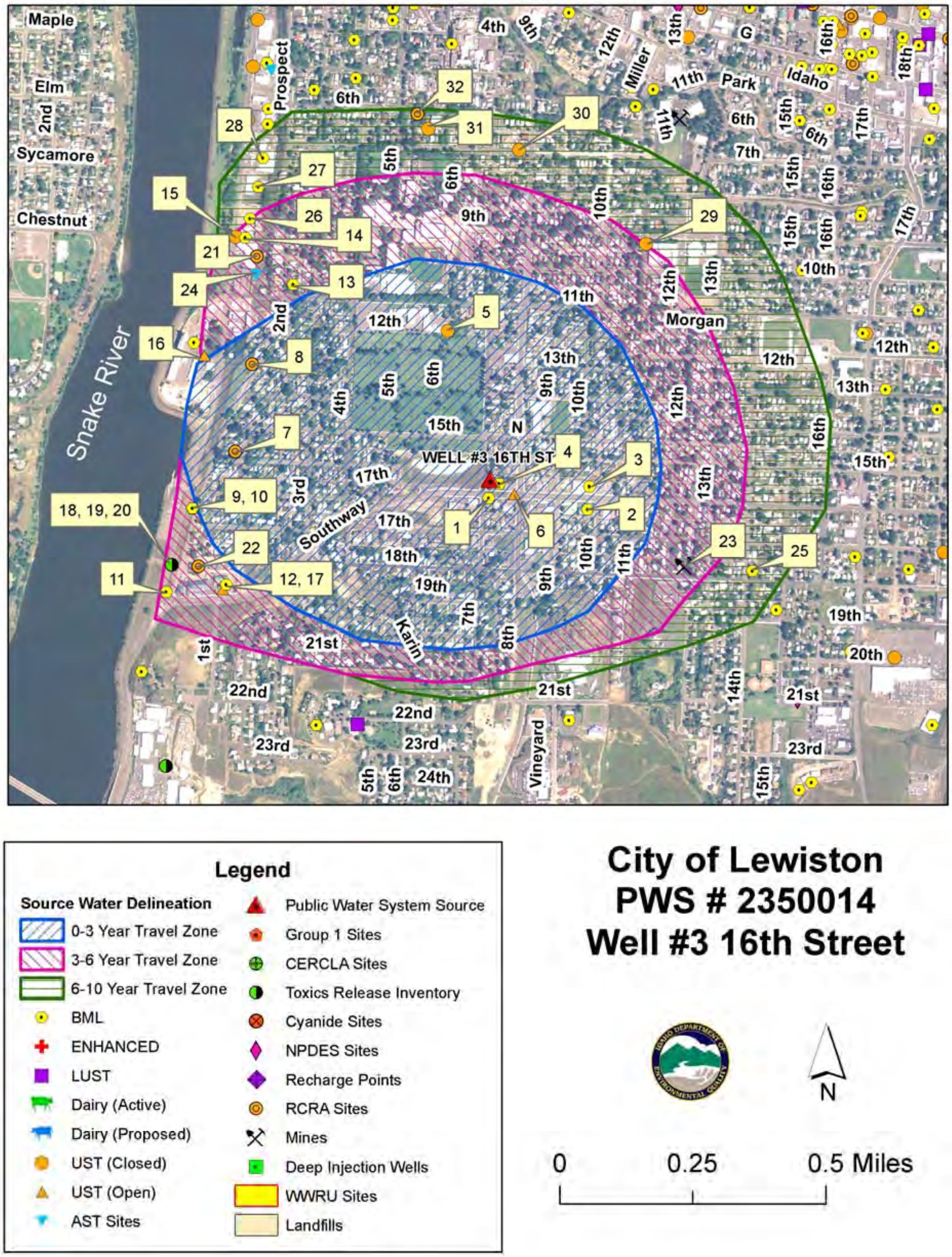

Figure C-1. City of Lewiston Well #3 16th St delineation and potential contaminant markers.

Table C-1. Potential Contaminant Sources for City of Lewiston Well #3.

Map ID	Contaminant Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants3
1	Convenience Store & Gasoline Station	0-3 YR	Database Search	VOC, SOC
2	Retail Produce & Garden Supplies	0-3 YR	Database Search	IOC, SOC, VOC
3	Plumbing, Heating, Air Conditioning, Ventilation	0-3 YR	Database Search	IOC, VOC, SOC
4	Veterinary Clinic	0-3 YR	Database Search	IOC, SOC, Microbial Contaminants
5	UST site; Closed	0-3 YR	Database Search	IOC, VOC
6	UST site; Open	0-3 YR	Database Search	IOC, VOC
7	RCRA Site	0-3 YR	Database Search	IOC, VOC, SOC
8	RCRA Site	0-3 YR	Database Search	IOC, VOC, SOC
9	Retail Light Truck Accessories & Service	3-6 YR	Database Search	IOC, VOC, SOC
10	Retail Golf Cars, Parts and Accessories, Service	3-6 YR	Database Search	IOC, VOC, SOC
11	RV Maintenance & Repair	3-6 YR	Database Search	IOC, VOC, SOC
12, 17	UST Site; Convenience Store and Gasoline Station	3-6 YR	Database Search	VOC, SOC
13	Ammunition Manufacturing	3-6 YR	Database Search	IOC, VOC, SOC
14	Full Service Glass Shop	3-6 YR	Database Search	VOC, SOC
15	UST Site; Closed	3-6 YR	Database Search	VOC, SOC
16	UST Site; Open	3-6 YR	Database Search	VOC, SOC
18, 19, 20	TRI Site	3-6 YR	Database Search	IOC, VOC, SOC
21	RCRA Site	3-6 YR	Database Search	IOC, VOC, SOC
22	RCRA Site	3-6 YR	Database Search	IOC, VOC, SOC
23	Gravel Pit	3-6 YR	Database Search	IOC, VOC, SOC
24	AST Site	3-6 YR	Database Search	VOC, SOC
25	Building Maintenance & Janitorial	6-10 YR	Database Search	IOC, VOC, SOC

Map ID	Contaminant Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants3
26	Petroleum Site	6-10 YR	Database Search	VOC, SOC
27	Boat Repair and Custom Metal Fabrication	6-10 YR	Database Search	IOC, VOC, SOC
28	Boat Manufacturing & Retail	6-10 YR	Database Search	VOC, SOC
29	UST Site; Closed	6-10 YR	Database Search	VOC, SOC
30	UST Site; Closed	6-10 YR	Database Search	VOC, SOC
31	UST Site; Closed	6-10 YR	Database Search	VOC, SOC
32	RCRA Site	6-10 YR	Database Search	IOC, VOC, SOC
n/a	City Park	0-3 YR	GIS Map	IOC, SOC
n/a	Snake River	0-3 YR 3-6 YR 6-10 YR	GIS Map	IOC, VOC, SOC, microbial contaminants
n/a	Transportation Corridors	0-3 YR 3-6 YR 6-10 YR	GIS map	IOC, VOC, SOC, microbial contaminants

1Refer to the glossary
2TOT = time-of-travel (in years) for potential contaminant to reach the wellhead
3IOC = inorganic chemical; VOC = volatile organic chemical; SOC = synthetic organic chemical

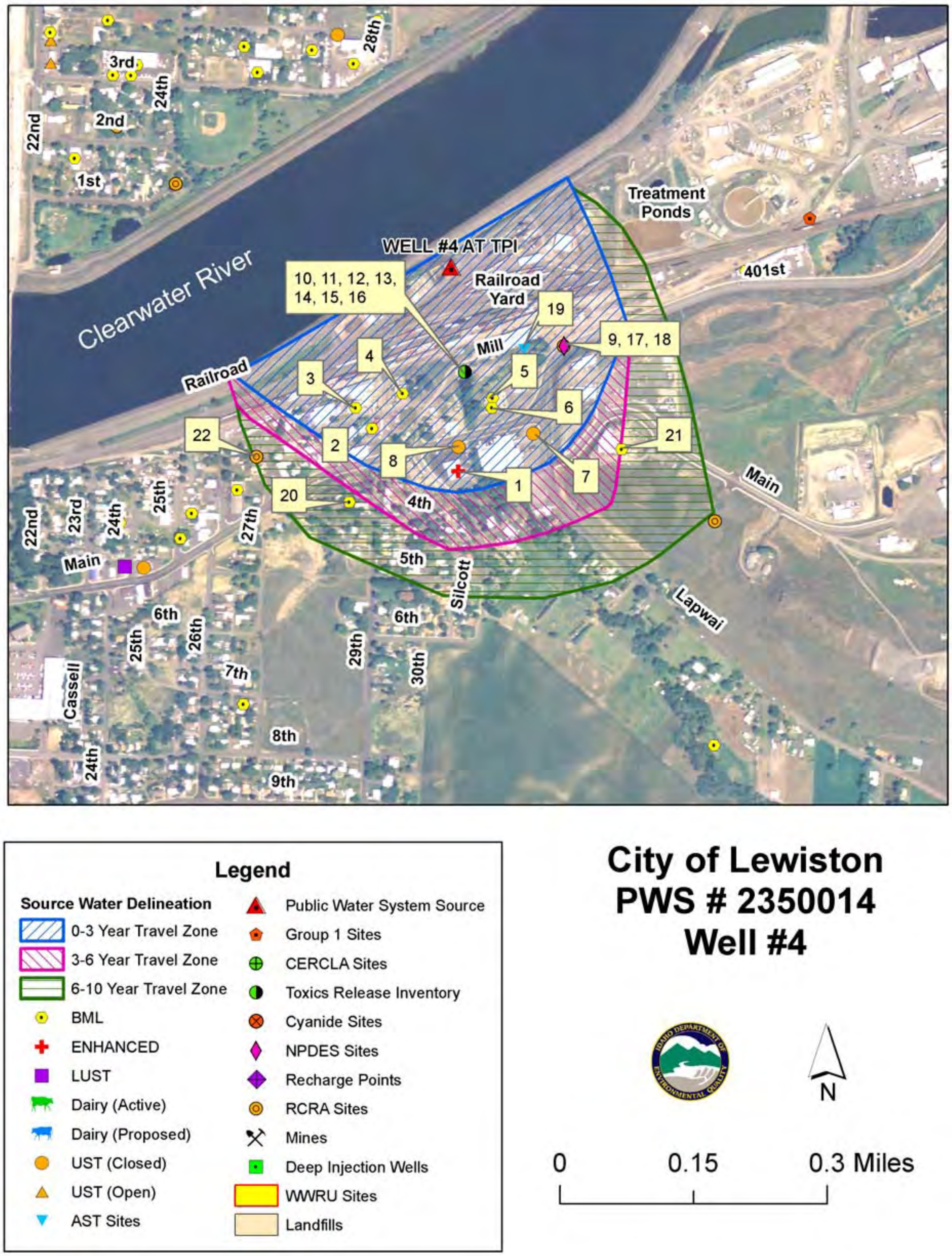

Figure C-2. City of Lewiston Well #4 TPI delineation and potential contaminant markers.

Table C-2. Potential Contaminant Sources for City of Lewiston Well #4.

Map ID	Contaminant Description1	TOT Zone2 (years)	Source of Information	Potential Contaminants3
1	Auto Body Repair	0-3 YR	Database Search	IOC, VOC, SOC
2	Auto Repair Service	0-3 YR	Database Search	IOC, VOC, SOC
3	Specialty Construction	0-3 YR	Database Search	IOC, VOC, SOC
4	Manufacturing, Powder Coating	0-3 YR	Database Search	IOC, VOC, SOC
5	Storage Warehouse & Manufacturing	0-3 YR	Database Search	IOC, VOC, SOC
6	Tractor Retail Sales	0-3 YR	Database Search	IOC, VOC, SOC
7	UST Site; Closed	0-3 YR	Database Search	VOC, SOC
8	UST Site; Closed	0-3 YR	Database Search	VOC, SOC
9, 17, 18	NPDES Site, RCRA Site	0-3 YR	Database Search	IOC, VOC, SOC
10, 11, 12, 13, 14, 15, 16	TRI Site	0-3 YR	Database Search	IOC, VOC, SOC
19	AST Site	0-3 YR	Database Search	VOC, SOC
20	Mobile RV Repair Service	6-10 YR	Database Search	IOC, VOC, SOC
21	Machine & Fabrication Shop	6-10 YR	Database Search	IOC, VOC, SOC
22	RCRA Site	6-10 YR	Database Search	IOC, VOC, SOC
n/a	Clearwater River	0-3 YR 3-6 YR 6-10 YR	GIS Map	IOC, VOC, SOC, microbial contaminants
n/a	Transportation Corridors	0-3 YR 3-6 YR 6-10 YR	GIS map	IOC, VOC, SOC, microbial contaminants
n/a	Railroad Yard	0-3 YR 3-6 YR 6-10 YR	GIS map	IOC, VOC, SOC
n/a	Treatment Ponds	6-10 YR	GIS map	IOC, VOC, SOC

1Refer to the glossary
2TOT = time-of-travel (in years) for potential contaminant to reach the wellhead
3IOC = inorganic chemical; VOC = volatile organic chemical; SOC = synthetic organic chemical

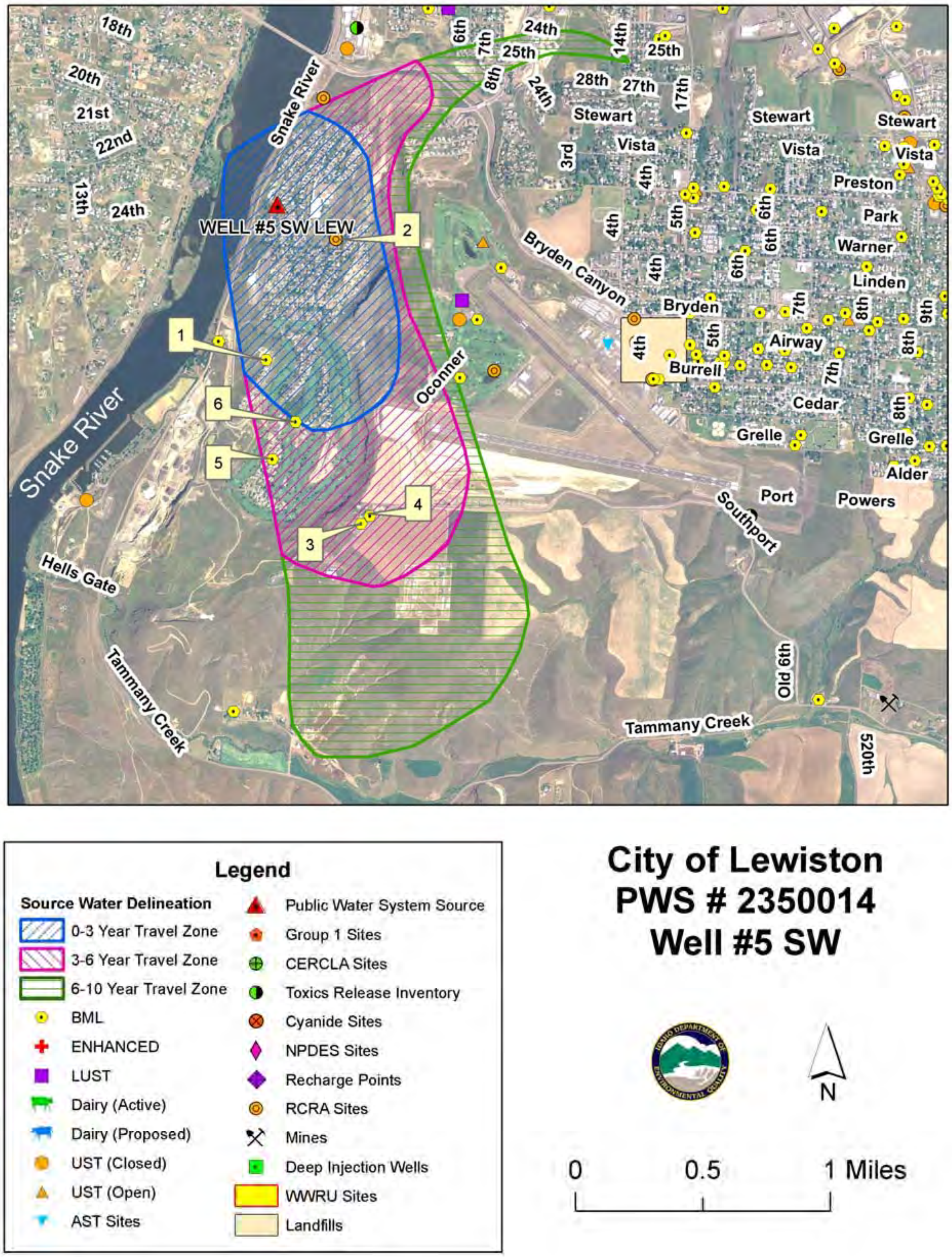

Figure C-3. City of Lewiston Well #5 Country Club delineation and potential contaminant markers

Table C-3. Potential Contaminant Sources for City of Lewiston Well #5.

Map ID	Contaminant Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants3
1	Aircraft Maintenance & Repair	0-3 YR	Database Search	IOC, VOC, SOC
2	RCRA Site	0-3 YR	Database Search	IOC, VOC, SOC
3	Custom Welded Trailers Manufacturing & Sales	3-6 YR	Database Search	IOC, VOC, SOC
4	Manufacturing of Aluminum Jet Boats	3-6 YR	Database Search	IOC, VOC, SOC
5	Equipment Rental	3-6 YR	Database Search	IOC, VOC, SOC
6	Country Club	3-6 YR	Database Search	IOC, SOC
n/a	Snake River	0-3 YR 3-6 YR 6-10 YR	GIS Map	IOC, VOC, SOC, microbial contaminants
n/a	Golf Course	0-3 YR 3-6 YR	GIS Map	IOC, SOC
n/a	Airport	3-6 YR 6-10 YR	GIS Map	IOC, VOC, SOC
n/a	Transportation Corridors	0-3 YR 3-6 YR 6-10 YR	GIS map	IOC, VOC, SOC, microbial contaminants

1Refer to the glossary
2TOT = time-of-travel (in years) for potential contaminant to reach the wellhead
3IOC = inorganic chemical; VOC = volatile organic chemical; SOC = synthetic organic chemical

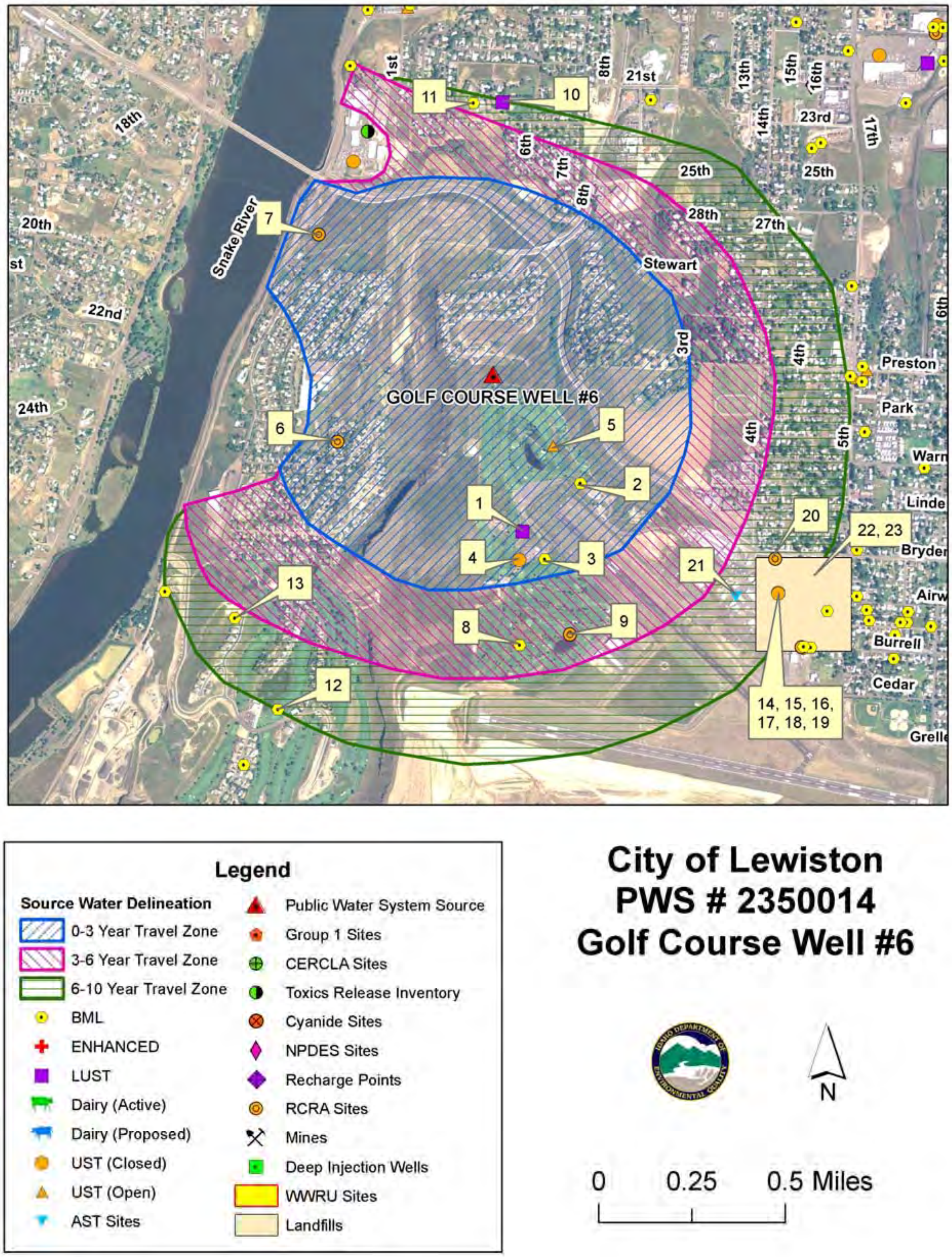

Figure C-4. City of Lewiston Golf Course Well delineation and potential contaminant markers.

TableC-4. Potential Contaminant Sources for City of Lewiston Well #6.

Map ID	Contaminant Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants3
1	LUST Site; Site Cleanup Completed Unknown	0-3 YR	Database Search	VOC, SOC
2	Solid Waste Site Collection & Haul	0-3 YR	Database Search	IOC, VOC, SOC, Microbial Contaminants
3	Rotorcraft Charters, Sales & Service	0-3 YR	Database Search	IOC, VOC, SOC
4	UST Site; Closed	0-3 YR	Database Search	VOC, SOC
5	UST Site; Open	0-3 YR	Database Search	VOC, SOC
6	RCRA Site	0-3 YR	Database Search	IOC, VOC, SOC
7	RCRA Site	0-3 YR	Database Search	IOC, VOC, SOC
8	Public Golf Course	3-6 YR	Database Search	IOC, SOC
9	RCRA Site	3-6 YR	Database Search	IOC, VOC, SOC
10	LUST Site; Site Cleanup Incomplete GROUND WATER	6-10 YR	Database Search	VOC, SOC
11	Residential Treatment Facility	6-10 YR	Database Search	IOC, VOC, SOC
12	Country Club	6-10 YR	Database Search	IOC, SOC
13	Aircraft Maintenance & Repair	6-10 YR	Database Search	IOC, VOC, SOC
14	UST Site; Closed	6-10 YR	Database Search	VOC, SOC
15	UST Site; Closed	6-10 YR	Database Search	VOC, SOC
16	UST Site: Closed	6-10 YR	Database Search	VOC, SOC
17	UST Site; Closed	6-10 YR	Database Search	VOC, SOC
18	UST Site; Closed	6-10 YR	Database Search	VOC, SOC
19	UST Site; Closed	6-10 YR	Database Search	VOC, SOC
20	RCRA Site	6-10 YR	Database Search	IOC, VOC, SOC

Map ID	Contaminant Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants3
21	AST Site	6-10 YR	Database Search	VOC, SOC
22	Transfer Station, Active	6-10 YR	Database Search	IOC, VOC, SOC
23	Municipal Landfill, Closed	6-10 YR	Database Search	IOC, VOC, SOC
n/a	Snake River	0-3 YR 3-6 YR 6-10 YR	GIS Map	IOC, VOC, SOC, microbial contaminants
n/a	Golf Course	0-3 YR 3-6 YR	GIS Map	IOC, SOC
n/a	Airport	0-3 YR 3-6 YR 6-10 YR	GIS Map	IOC, VOC, SOC
n/a	Transportation Corridors	0-3 YR 3-6 YR 6-10 YR	GIS map	IOC, VOC, SOC, microbial contaminants

1Refer to the glossary
2TOT = time-of-travel (in years) for potential contaminant to reach the wellhead
3IOC = inorganic chemical; VOC = volatile organic chemical; SOC = synthetic organic chemical

APPENDIX D Lewiston Orchards Irrigation District Source Delineations & Potential Contaminant Inventories

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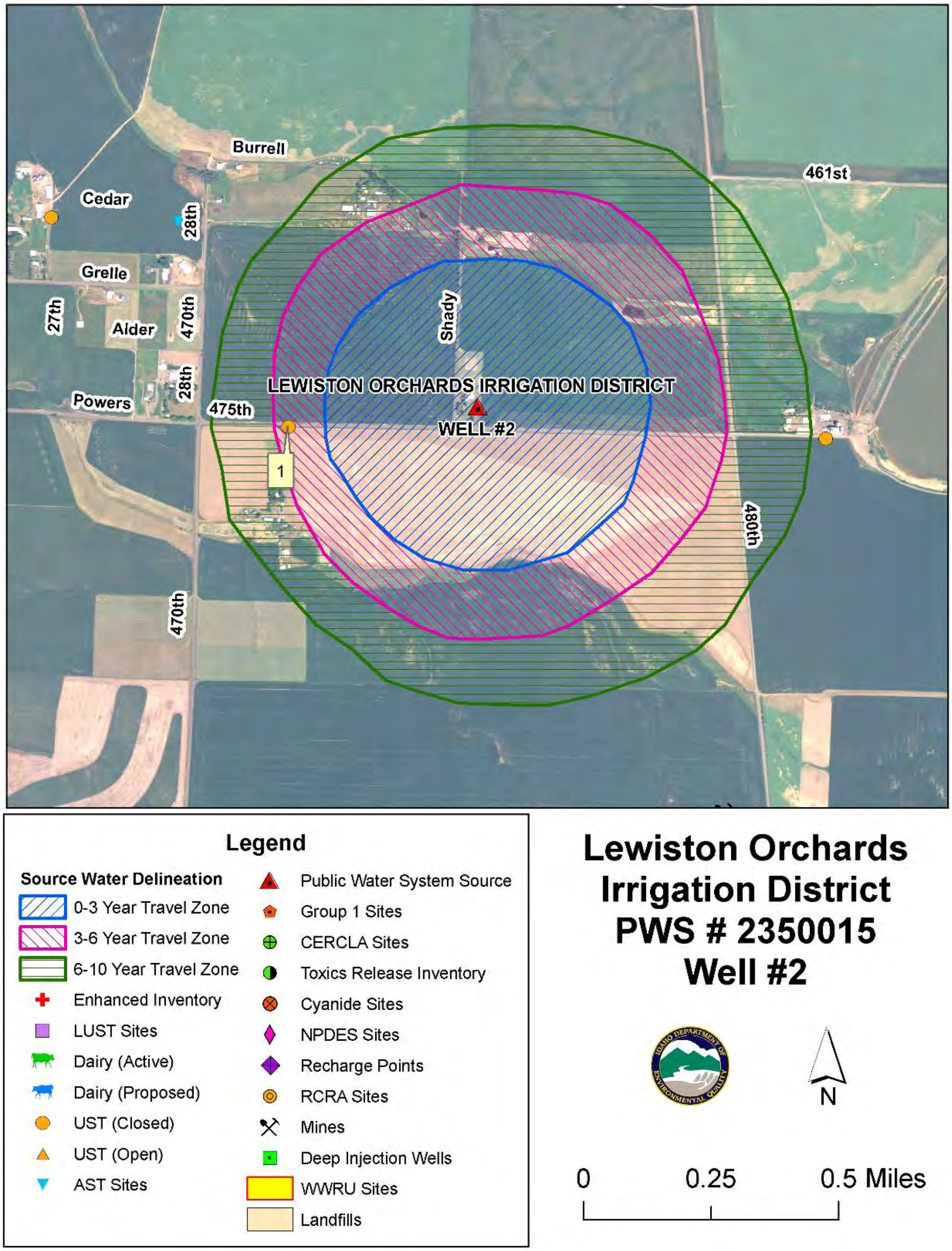

Figure D-1. LOID Well #2 delineation and potential contaminant markers.

Table D-1. Potential Contaminant Sources for Lewiston Orchards Irrigation District Well #2.

Map ID	Contaminant Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants[3]
1	UST Site	0-3 YR	Database Search	VOC, SOC
n/a	Transportation Corridors	0-3 YR 3-6 YR 6-10 YR	GIS map	IOC, VOC, SOC, microbial contaminants
n/a	Dryland agriculture	0-3 YR 3-6 YR 6-10 YR	Database Search / GIS Map	IOC, VOC, SOC, microbial contaminants

[1]Refer to the glossary
[2]TOT = time-of-travel (in years) for potential contaminant to reach the wellhead
[3]IOC = inorganic chemical; VOC = volatile organic chemical; SOC = synthetic organic chemical

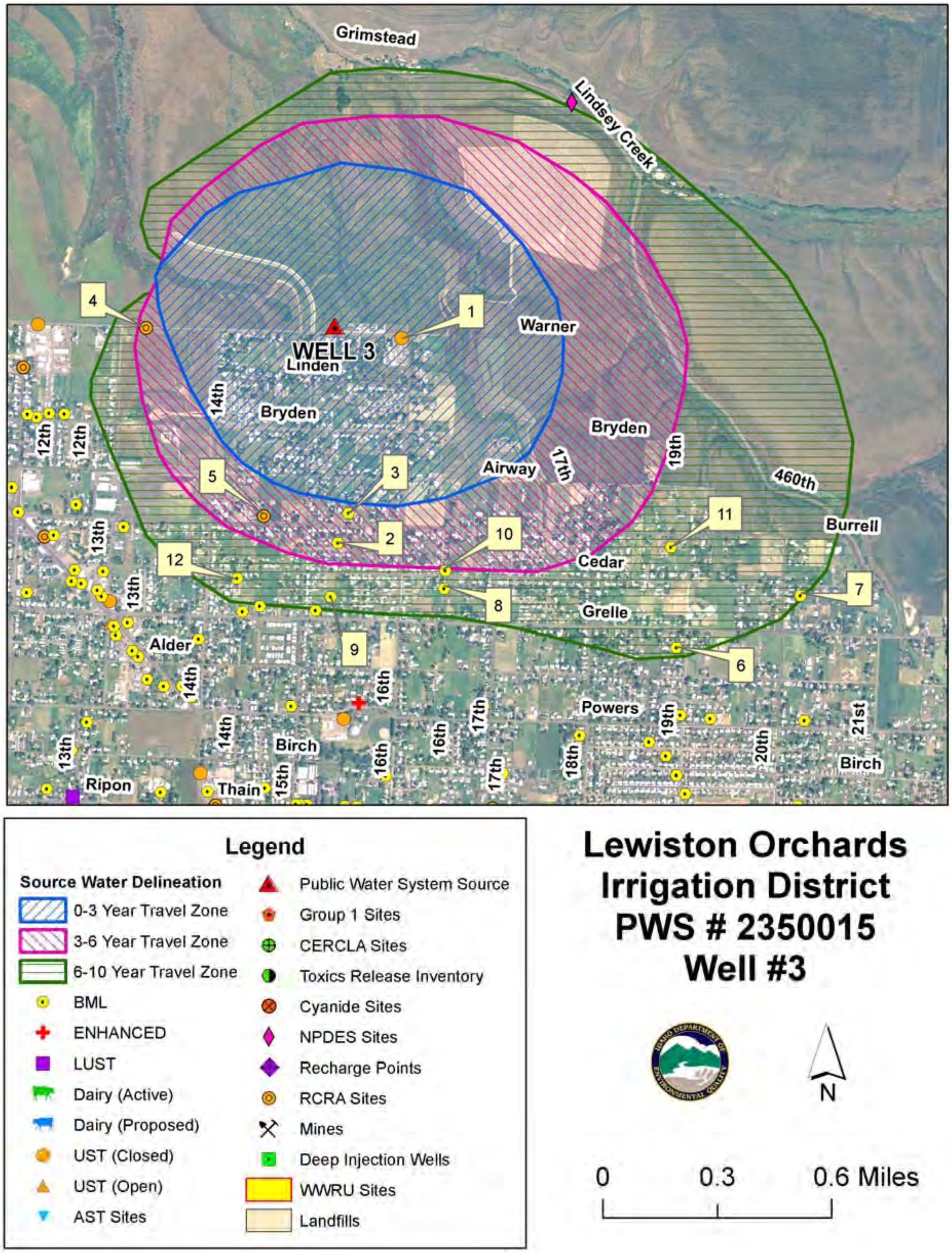

Figure D-2. LOID Well #3, delineation and potential contaminant markers.

Table D-2. Potential Contaminant Sources for Lewiston Orchards Irrigation District Well #3.

Map ID	Contaminant Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants[3]
1	UST Site; Closed	0-3 YR	Database Search	VOC, SOC
2	Installation of Floor Coverings - All Types	3-6 YR	Database Search	IOC, VOC, SOC
3	Portable Welding & Metal Fabrication - off site	3-6 YR	Database Search	IOC, VOC, SOC
4	RCRA Site	3-6 YR	Database Search	IOC, VOC, SOC
5	RCRA Site	3-6 YR	Database Search	IOC, VOC, SOC
6	Installation of Floor Coverings	6-10 YR	Database Search	IOC, VOC, SOC
7	Manufacturing of Bullets	6-10 YR	Database Search	IOC, VOC, SOC
8	Dental Restorations, Products & Castings	6-10 YR	Database Search	IOC, VOC, SOC
9	Excavation and Installation of Septic Systems	6-10 YR	Database Search	IOC, VOC, SOC
10	Used Auto Parts Locating Service	6-10 YR	Database Search	IOC, VOC, SOC
11	Manufacturing - Aluminum Boats	6-10 YR	Database Search	IOC, VOC, SOC
12	Hydraulic Hose Maintenance, Repair & Installation	6-10 YR	Database Search	IOC, VOC, SOC
n/a	Transportation Corridors	0-3 YR 3-6 YR 6-10 YR	GIS map	IOC, VOC, SOC, microbial contaminants
n/a	Dryland agriculture	0-3 YR 3-6 YR 6-10 YR	Database Search / GIS Map	IOC, VOC, SOC, microbial contaminants

[1]Refer to the glossary
[2]TOT = time-of-travel (in years) for potential contaminant to reach the wellhead
[3]IOC = inorganic chemical; VOC = volatile organic chemical; SOC = synthetic organic chemical

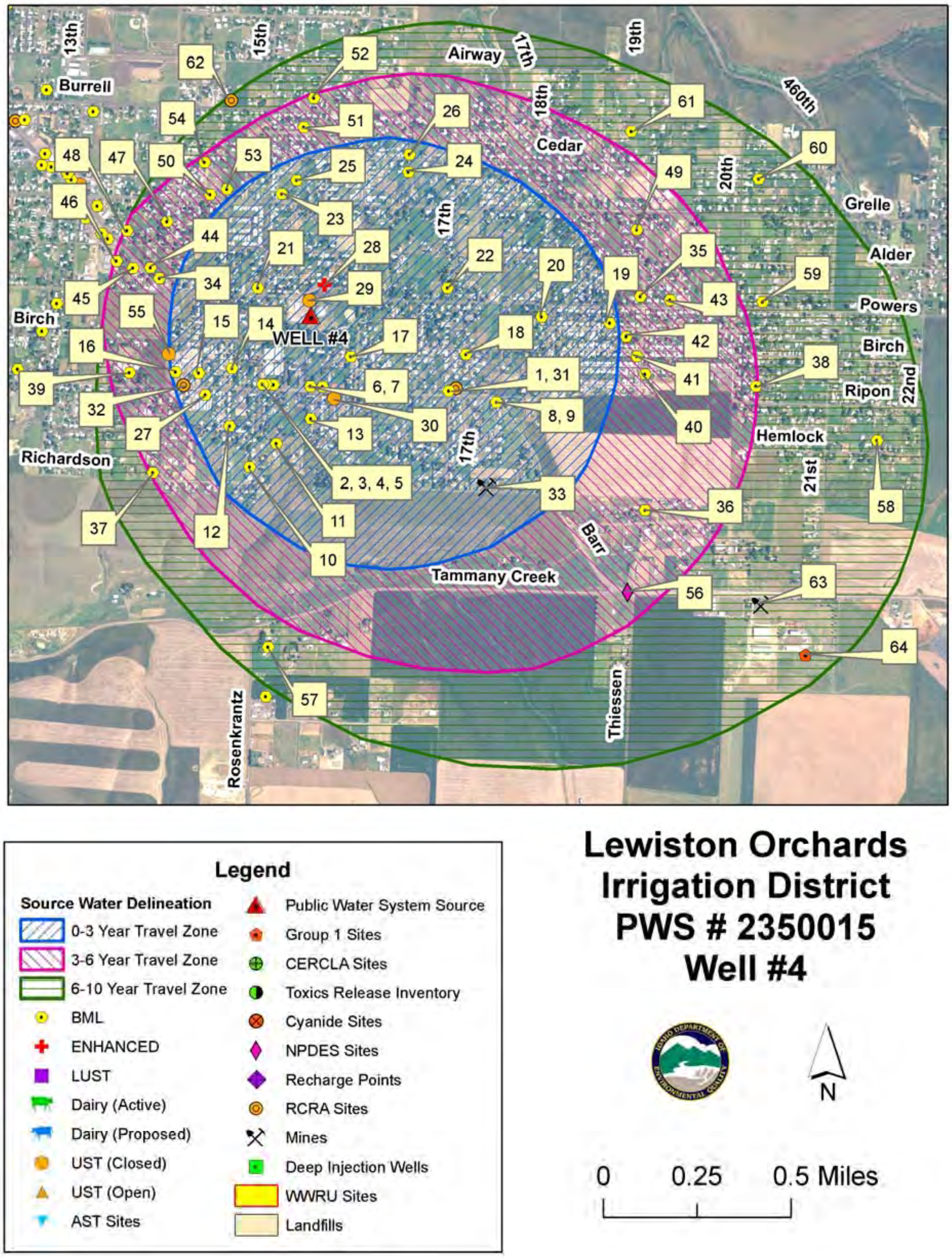

Figure D-3. LOID Well #4 delineation and potential contaminant markers.

Table D-3. Potential Contaminant Sources for Lewiston Orchards Irrigation District Well #4.

Map ID	Contaminant Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants[3]
1	Sign Manufacturing	0-3 YR	Database Search	IOC, VOC, SOC
2	Retail Building Specialty Materials	0-3 YR	Database Search	IOC, VOC, SOC
3	Automobile Towing & Repossession	0-3 YR	Database Search	IOC, VOC, SOC
4	Wholesale/Retail Sale of Floor, Wall & Window Co	0-3 YR	Database Search	VOC, SOC
5	Auto Body & Paint Repair & Service	0-3 YR	Database Search	IOC, VOC, SOC
6	Taxidermy	0-3 YR	Database Search	IOC, VOC, SOC, Microbial bacteria
7	Laundromat	0-3 YR	Database Search	IOC, VOC, SOC, Microbial bacteria
8	Retail & Mail Order Auto Parts	0-3 YR	Database Search	IOC, VOC, SOC
9	Household Appliance Repair & Service	0-3 YR	Database Search	IOC, VOC, SOC
10	Mobile Welding Service	0-3 YR	Database Search	IOC, VOC, SOC
11	Lawn & Tree Trimming Services (Private Property	0-3 YR	Database Search	IOC, VOC, SOC
12	Photography	0-3 YR	Database Search	IOC, VOC
13	Cleaning and Painting Services	0-3 YR	Database Search	IOC, VOC, SOC
14	Conifer Seedling Nursery (Greenhouse Site)	0-3 YR	Database Search	IOC, VOC, SOC, Microbial bacteria
15	Truss Manufacturing	0-3 YR	Database Search	IOC, VOC, SOC
16	Retail Livestock Feed, Log Home Kits & Hillsboro	0-3 YR	Database Search	IOC, SOC, Microbial bacteria
17	Taxicab Company	0-3 YR	Database Search	IOC, VOC, SOC
18	Taxidermy	0-3 YR	Database Search	IOC, VOC, SOC, Microbial bacteria
19	Matting & Framing	0-3 YR	Database Search	IOC, VOC
20	Garage Door Sales, Installation & Repair	0-3 YR	Database Search	IOC, VOC, SOC
21	Solidworks Modeling and Training, CNC Programming	0-3 YR	Database Search	IOC, VOC, SOC
22	Taxidermy	0-3 YR	Database Search	IOC, VOC, SOC, Microbial bacteria
23	Hardwood Floor Installation & Finishing	0-3 YR	Database Search	IOC, VOC, SOC
24	Dental Restorations, Products & Castings	0-3 YR	Database Search	IOC, VOC, SOC
25	Excavation and Installation of Septic Systems	0-3 YR	Database Search	IOC, VOC, SOC, Microbial bacteria

Map ID	Contaminant Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants[3]
26	Used Auto Parts Locating Service	0-3 YR	Database Search	IOC, VOC, SOC
27	Garage Doors Sales & Service, Mini Storage	0-3 YR	Database Search	IOC, VOC, SOC
28	Utility Station/Maintenance Area	0-3 YR	Enhanced Inventory	IOC, VOC, SOC
29	UST Site; closed	0-3 YR	Database Search	VOC, SOC
30	UST Site; closed	0-3 YR	Database Search	VOC, SOC
31	RCRA Site	0-3 YR	Database Search	IOC, VOC, SOC
32	RCRA Site	0-3 YR	Database Search	IOC, VOC, SOC
33	Mine; sand and gravel	0-3 YR	Database Search	IOC, VOC, SOC, Microbial bacteria
34	Retail Used Autos & New Campers	3-6 YR	Database Search	VOC, SOC
35	Construction, Residential Remodel & Windows	3-6 YR	Database Search	IOC, VOC, SOC
36	Construction, Pole Buildings	3-6 YR	Database Search	IOC, VOC, SOC
37	Pesticides & Herbicides Application, Service & A	3-6 YR	Database Search	IOC, SOC
38	Tree Trimming Service	3-6 YR	Database Search	IOC, VOC, SOC
39	Manufacturing of Pallets, Lathes & Stakes	3-6 YR	Database Search	IOC, VOC, SOC
40	Water Tender Support, Dust Abatement, Construction	3-6 YR	Database Search	IOC, VOC, SOC
41	Concrete, Excavation	3-6 YR	Database Search	IOC, VOC, SOC
42	Mobile Fabrication Services	3-6 YR	Database Search	IOC, VOC, SOC
43	Construction - Concrete, Excavation	3-6 YR	Database Search	IOC, VOC, SOC
44	Used Auto Sales	3-6 YR	Database Search	VOC, SOC
45	Pool Installation & Service	3-6 YR	Database Search	IOC, SOC
46	Auto Repair & Service	3-6 YR	Database Search	IOC, VOC, SOC
47	Tractor Service, Landscaping, Tilling, Mowing &	3-6 YR	Database Search	IOC, VOC, SOC
48	Portable Toilet Rentals & Septic Pumping	3-6 YR	Database Search	IOC, VOC, SOC
49	Installation of Floor Coverings	3-6 YR	Database Search	IOC, VOC, SOC
50	Pest Control Services	3-6 YR	Database Search	IOC, SOC
51	Installation of Floor Coverings - All Types	3-6 YR	Database Search	IOC, VOC, SOC
52	Portable Welding & Metal Fabrication - off site	3-6 YR	Database Search	IOC, VOC, SOC
53	Tractor Service	3-6 YR	Database Search	IOC, VOC, SOC
54	Hydraulic Hose Maintenance, Repair & Installation	3-6 YR	Database Search	IOC, VOC, SOC
55	UST Site; closed	3-6 YR	Database Search	VOC, SOC
56	NPDES Site	3-6 YR	Database Search	IOC, SOC

Map ID	Contaminant Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants[3]
57	Excavation & Utilities	6-10 YR	Database Search	IOC, VOC, SOC
58	Carpet & Upholstery Cleaning Service	6-10 YR	Database Search	IOC, VOC, SOC
59	Transport Service	6-10 YR	Database Search	IOC, VOC, SOC
60	Manufacturing of Bullets	6-10 YR	Database Search	IOC, VOC, SOC
61	Manufacturing - Aluminum Boats (Business Office	6-10 YR	Database Search	IOC, VOC, SOC
62	RCRA Site	6-10 YR	Database Search	IOC, VOC, SOC
63	Mine; clay	6-10 YR	Database Search	IOC, VOC, SOC
64	Group 1 Site	6-10 YR	Database Search	IOC, VOC, SOC
n/a	Transportation Corridors	0-3 YR 3-6 YR 6-10 YR	GIS map	IOC, VOC, SOC, microbial contaminants
n/a	Dryland agriculture	0-3 YR 3-6 YR 6-10 YR	Database Search/ GIS Map	IOC, VOC, SOC, microbial contaminants

[1]Refer to the glossary
[2]TOT = time-of-travel (in years) for potential contaminant to reach the wellhead
[3]IOC = inorganic chemical; VOC = volatile organic chemical; SOC = synthetic organic chemical

APPENDIX E City of Lewiston Well Logs

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1A

WELL LOG AND REPORT TO THE STATE RECLAMATION ENGINEER OF IDAHO

Log No. JUL 7 1961
Rec. Department of Reclamation
Well No.
Permit No.
(DO NOT FILL IN)

Owner City of Lewiston Address Lewiston, Idaho

Driller Midland Drilling Co., P.O.Box 637 Address Walla Walla Lic. No. 147

Location of Well: SE 1/4 NE 1/4 Sec. 36, T. 36 N/S, R 6WBM E/W Nez Perce County,

and ____ feet N/S, and ____ feet E/W from ____ Corner of ____ 1/4 ____ 1/4 Sec. ____

Size of Drilled Hole 24" x 20" Total depth of Well 505 feet

Give depth of standing water from surface 32'6" Water Temp. 63 °Farenheit

On pumping test delivery was 617 g.p.m. or ____ c.f.s. Drawdown was 113.5 feet.

Size of pump and motor used to make the test 6-71 Twin GMC-1.37 to 1 stepdown; 1200 GPM Turbine

Length of time pumped during check was Twenty five hr., thirty minutes.

If flowing well, give flow in c.f.s. ____ or g.p.m. ____ and shut in pressure ____

If flowing well, describe control works ____
(TYPE AND SIZE OF VALVE, ETC.)

Water will be used for Domestic use Weight of casing per linear foot 24"-94.62#; 20"-78.60#

Thickness of casing 3/8" Casing material Steel
(E.G., PIPE, CONCRETE, WOOD.)

Diameter, length and location of casing 24" - 88.17' @ 88.17'; 20" - 182' @ 182'
(CASING 12" IN DIAMETER AND UNDER GIVE INSIDE DIAMETER; CASING OVER 12" IN DIAMETER GIVE OUTSIDE DIAMETER.)

Number and size of perforations -- located ____ feet to ____ feet from surface of ground.

Other perforations ____

Date of commencement of well Feb. 5, 1960 Date of completion of well May 5, 1960

Type of well rig 36L2 BE cable rig

CASING RECORD

DIAM. CASING	FROM FEET	TO FEET	LENGTH	"REMARKS" -- SEALS, GROUTING, ETC.
24"	0	88.17'	88.17'	40 bags cement at 88' - 102'
20"	0	182.0'		

nads

GENERAL INFORMATION—Pumping Test, Quality of Water, Etc.

Water clear - Good quality

SENE S. 36, 36N 6W

Figure E-1a, City of Lewiston Well #1.

WELL LOG

From Feet	To Feet	Type of Material	Drilling Time Hrs.	Drilling Time Min.	Water-bearing Formation Ans. Yes or No	Casing Perforated Ans. Yes or No
0	15	Topsoil - Gravel	10			
15	40	Coarse gravel- water 35'-38'	15		yes	
40	75	Cemented gravel	23			
75	138	Basalt-Broken dk. & med. dk. (cem't. hole)	160			
138	167	Sand- lite and md. hard	30			
167	195	Clay on shells - brokn bas.	50			
195	228	Bas.-dk. md. hd.- brok	30			
228	235	Bas.-gray hd.	18			
235	245	Bas.-Dk med. hd.	20			
245	253	" gray hd.	14			
253	270	" gray med. hd.	25			
270	275	" black. soft	2			
275	313	" dk. broken	20			
313	331	" " gray md. hd.	50			
331	336	" dk. md. hd.	5		yes	
336	354	" br. md.-brok.	20			
354	373	" dk. md. hd.-brok	20			
373	408	" dk. md. hd.-some black	36		yes	
cont'd on page 2.		If more space is required use Sheet No. 2				

WELL DRILLERS STATEMENT

This well was drilled under my jurisdiction and the above information is true and correct to the best of my knowledge and belief.

Signed Midland Drilling Co.

By Charles Jungmann
Charles Jungmann, Vice President

License No. 147

Dated July 6, 1961

Figure E-1b, City of Lewiston Well #1

SHEET NO. 2

Well Driller Midland Drilling Co.

Well Location Lewiston, Idaho

WELL LOG

From Feet	To Feet	Type of Material	Drilling Time Hrs.	Drilling Time Min.	Water-bearing Formation Ans. Yes or No	Casing Perforated Ans. Yes or No
408	413	Bas. gray, hd.	8			
413	418	" Dk. md. hd	2			
418	434	" gray. hd.	26			
434	444	" dk. med. hd.	15			
444	448	" gray med. hd.	20			
448	463	" gray hd.	20		yes	
463	469	" gr. md. to hd.	10		yes	
469	486	" lite br. md.	22		yes	
486	492	" dk. md. hd.	9		yes	
492	505	" br. md. hd.	18		yes	no
		uadd				

Figure E-1c, City of Lewiston Well #1

RECEIVED
JUN 28 1962
Department of Reclamation

WELL LOG AND REPORT OF THE STATE RECLAMATION ENGINEER OF IDAHO

Permit No. ______ Well No. 1A County Nez Perce

Locate well in section

NW¼	NE¼
SW¼	SE¼

Owner City of Lewiston, Idaho

Address Lewiston, Idaho

Driller Charles Jungmann Drilling Company

Address Box 423, Walla Walla, Washington

Well location SE ¼ NE ¼ Sec. 36, T. 36 N/S, R. 6WBM E/W

Size of drilled hole 20" x 16"

Total depth of well 735'

Give depth to standing water from the ground 42'3" Water temp. 63 °Fahr.

On "Pumping Test" delivery was 1677 g.p.m. or ______ c.f.s. Drawdown was 212 feet.

Size of pump and motor used to make test 6-71 GMC Diesels with pump capacity of 3000 GPM

Length of time of test 24 hours ______ minutes.

If flowing well, give flow ______ c.f.s. or ______ g.p.m. and of shut off pressure ______

If flowing well, described control works ______ (TYPE AND SIZE OF VALVE, ETC.)

Water will be used for Domestic Weight of casing per lineal foot 16" – 62.57 lbs

Thickness of casing 3/8" wall Casing material Steel (STEEL, CONCRETE, WOOD, ETC.)

Diameter, length and location of casing 338'-10" of 16" from 167' to 505' (CASING 12" IN DIAMETER OR LESS, GIVE INSIDE DIAMETER; CASING OVER 12" IN DIAMETER, GIVE OUTSIDE DIAMETER)

CASING RECORD

Diam. Casing	From Feet	To Feet	Length	Remarks—seals, grouting, etc.
16"	167'	505'	338'-10"	Liner

Number and size of perforations 3" x ¼" (12 perforations per ft.) located 190' feet to 503' feet from ground

Date of commencement of well Nov. 15, 1961 Date of completion of well Jan. 28, 1962

SENE S 36 36N 6W

Figure E-1d, City of Lewiston Well #1

WELL LOG

From Feet	To Feet	Type of Material	Water-bearing Formation Ans. Yes or No	Casing Perforated Ans. Yes or No
505	521	Hard grey basalt		
521	547	Hard dark basalt		
547	598	Brown soft basalt	Yes	no casing
598	606	Dark hard basalt		
606	646	Grey basalt, very hard		
646	679	Dark hard basalt		
679	698	Hard grey basalt		
698	732	Variegated basalt	Yes	no casing
732	735	Hard grey basalt		
		This well was deepened in this operation from		
		505' to 735'		
		If more space is required use Sheet No. 2		

WELL DRILLER'S STATEMENT

This well was drilled under my supervision and the above information is true and correct to the best of my knowledge and belief.

Signed O. Jungmann Drilling Company

By [signature]

License No. 484 A

Dated Feb. 17, 1962.

Figure E-1e, City of Lewiston Well #1

WELL LOG AND REPORT TO THE

STATE RECLAMATION ENGINEER OF IDAHO

Log No.______
Rec.______, 19__
Well No.______
Permit No.______

(DO NOT FILL IN)

Owner: Potlatch Forests, Inc. Address: Lewiston, Idaho

Driller: Charles Jungmann Drilling Co. Address: 115 Rees Ave., Walla Walla, Wash. Lic. No. [illegible]

Location of Well: ____ ¼ ____ ¼ Sec. ____, T. ____ N/S, R. ____ E/W ____ County,

and ____ feet N/S, and ____ feet E/W from ____ Corner of ____ ¼ ____ ¼ Sec. ____

Size of Drilled Hole 12 " x 10 " Total depth of Well 153 '

Give depth of standing water from surface 52 ' Water Temp. 59 °Farenheit

On pumping test delivery was 240 g.p.m. or ____ c.f.s. Drawdown was 3 feet.

Size of pump and motor used to make the test Hercules Gas 35 HP

Length of time pumped during check was 8 hr., ____ minutes.

If flowing well, give flow in c.f.s. ____ or g.p.m. ____ and shut in pressure ____

If flowing well, describe control works ____ (TYPE AND SIZE OF VALVE, ETC.)

Water will be used for Domestic Weight of casing per linear foot 12 " at 45 #, 10 " at 32 #

Thickness of casing ____ Casing material Steel (E.G., PIPE, CONCRETE, WOOD.)

Diameter, length and location of casing 12 " Casing 53 ' 11 " at 53 ', 10 " Casing 71 ' at 70 '
(CASING 12" IN DIAMETER AND UNDER GIVE INSIDE DIAMETER; CASING OVER 12" IN DIAMETER GIVE OUTSIDE DIAMETER.)

Number and size of perforations None located ____ feet to ____ feet from surface of ground.

Other perforations ____

Date of commencement of well January 21, 1965 Date of completion of well February 26, 1965

Type of well rig Cable Tool 22 W Bucyrus Erie

CASING RECORD

DIAM. CASING	FROM FEET	TO FEET	LENGTH	"REMARKS" -- SEALS, GROUTING, ETC.
12 "	+ 1	53 '	53 ' 11 "	Cement Seal Between 10 " and 12 " Casing
10 "	+ 1	70 '	71 '	

GENERAL INFORMATION—Pumping Test, Quality of Water, Etc.

Figure E-2a, City of Lewiston Well #2

Drinking water Well
#2 West of Main Offi
Gr Elev. 740.4

WELL LOG

From Feet	To Feet	Type of Material	Drilling Time Hrs.	Drilling Time Min.	Water-bearing Formation Ans. Yes or No	Casing Perforated Ans. Yes or No
0	4	Silt				
4	16	Cobbles & Boulders			Yes	
16	25	Cemented Gravel				
25	54	Sand-Clay				
54	68	Broken Basalt				
68	103	Grey Basalt				
103	114	Black Basalt				
114	128	Grey Hard Basalt				
128	145	Dark Basalt- Brown Basalt			Yes	
145	153	Hard Grey Basalt				
		If more space is required use Sheet No. 2				

WELL DRILLER'S STATEMENT

This well was drilled under my jurisdiction and the above information is true and correct to the best of my knowledge and belief.

Signed Charles Jungmann Drilling Co.

By [signature] Owner,

License No. 434 A

Dated March 24, 1965

Figure E-2b, City of Lewiston Well #2

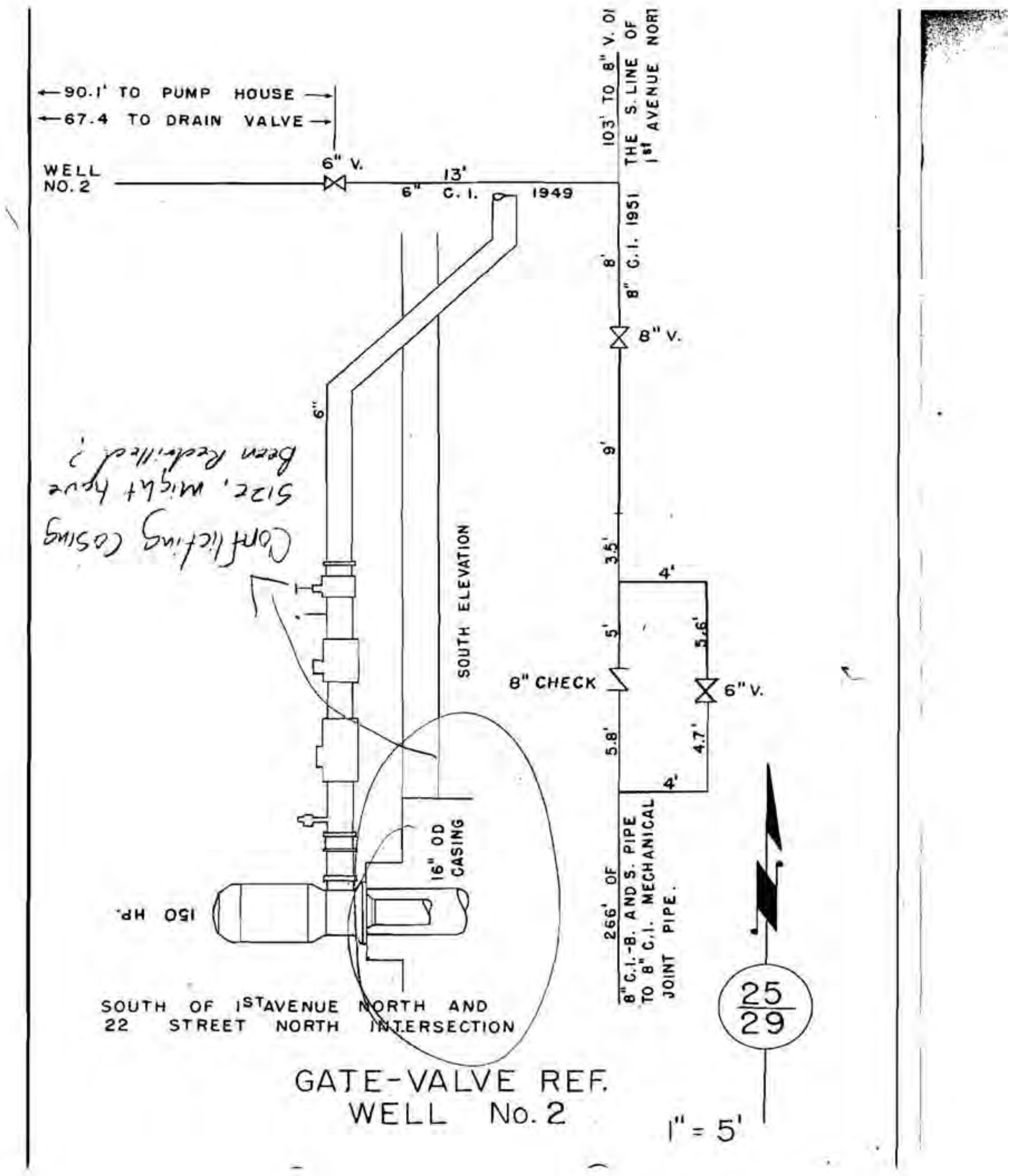

Figure E-2c, City of Lewiston Well #2

t/le Well #2

Well #2 (Pepsi Park)

N 46°
25.286' mins.
W 117°
00.027 mins.

Well Head # (DEQ) E0005227

No Record on Net @ DEQ for this Number?

Figure E-2d, City of Lewiston Well #2

CITY WELL NO. 2

ELEVATION: 735'

DEPTH: 275' 1996 MAR. 267'

STATIC WATER LEVEL 20' 1996 MAR 11'

NOTE: Indication of most water.
Up to 4" cobbles. Caved in &
couldn't go lower.
H_2S odor at first - Since disappeared.

Ran 48 hour pump test & water draw down
to 215 ft. from 20 ft.. Temp 60°F at end of
test and only 3°F higher than water in Well #1.
Yield 720 gpm.

DIAMETER: 12"

SW 1/4; NW 1/4; SEC. 32; T 36N; R5W; BM

600 g.p.m. - 1.33 cfs - underground 13 STAGE 75 Hp MOTOR

PUMP TYPE: Turbine 30" BORE HOLE

PUMP TEST TO BE PERFORMED IN APRIL

Figure E-2e, City of Lewiston Well #2

WELL LOG AND REPORT TO THE
STATE RECLAMATION ENGINEER OF IDAHO

CNT'D

Log No. ....
Rec. .... 19....
Well No. 85-53-N-2
Permit No. P-24350
85-2099
DO NOT FILL IN

027817

Owner CITY OF LEWISTON WELL NO. 3 Driller A. A. DURAND & SON

Address c/o R. C. Lowrie, City Engineer Address Walla Walla, Washington Lic. No. 565

Location of Well: NW ¼ SW ¼ Sec. 6, T. 35 N, R. 5 W County. Nez Pierce
N½ of Lot 7 Block 8 Riverview Addition - on Corner 7th & 16th Ave.
and ....feet N/S, and..........feet E/W from..........corner of.......¼.......¼ Sec.

Water will be used for Municipal Water Supply Total depth of well 600'

Size of drilled hole Shown Below Weight of casing per linear foot Shown Below

Thickness of casing Standard Weights Casing Material Steel
e.g., pipe, concrete, wood.

Diameter, length and location of casing Shown Below
(Casing 12" in diameter and under give inside diameter; casing over 12" in diameter give outside diameter.)

Number and size of perforations ---------- located ---------- feet to ---------- feet

from surface of ground. Rock Well - No alluviums or perforations functioning to yield present supply

Other Perforations:

If flowing well, give flow in c.f.s. NO or g.p.m. .... and shut in pressure ....

If nonflowing well, give depth of standing water from surface 107' 6" (7/1/53 Confined Water)

If flowing well, describe control works ....
(Type and size of valve, etc.)

On pumping test delivery was 1200 g.p.m. or July 1953 c.f.s. Drawdown was 52 feet

Length of time pumped during check was 6 hr. -- min. Water temp. 68 °Fahrenheit.

Date of commencement of well 3/12/53 Date of Completion of well 7/3/53

Type of well rig 36L-3 Bucyrus Erie Oil Field Spudder

Telescope Hole w/Underground Reduction CASING XXXXXX And Completed Open Hole Record

Diam. Casing	From Feet	To Feet	Length	Wt.	"Remarks" — Seals, Grouting, Etc.
26 O.D.	G.S.	122	122	5/16"	(Continuous Pressure Grout Seal Within Annular
20 O.D.	G.S.	177' 8	177' 8"	5/16"	(Space between Ground Surface & 177' 8".
16 O.D.	90	394	304	9/32"	(16" O.D. Casing Mills Knife Perforated between (371' - 386' For Pump Test #2 but Pressure (Grouted afterwards including footing of casing (before Final Pump Test #3.
15 I.D.	394	600	206		Open Basalt Rock Hole

GENERAL INFORMATION—Pumping Test, Quality of Water, Etc.

Final Well Pumping Test #3 on July 1, 1953 - Static Water Level - 107' 6" Drawdown of Following Stabilized Pumping Rates: 700 G.P.M. at 23' - 818 G.P.M. at 28' - 1000 G.P.M. at 38' - 1218 G.P.M. at 53' - 1272 G.P.M. at 60'. Water Temp. 68 deg. F. Air Temp. 88 deg. F. Water Quality : PH 8 - Total Hardness 39 - Turbidity -0- Fluorides 1.2p.p.m. Analysis by City of Lewiston Laboratory.

NW SW S6 35N 5W

81

Figure E-3, City of Lewiston Well #3.

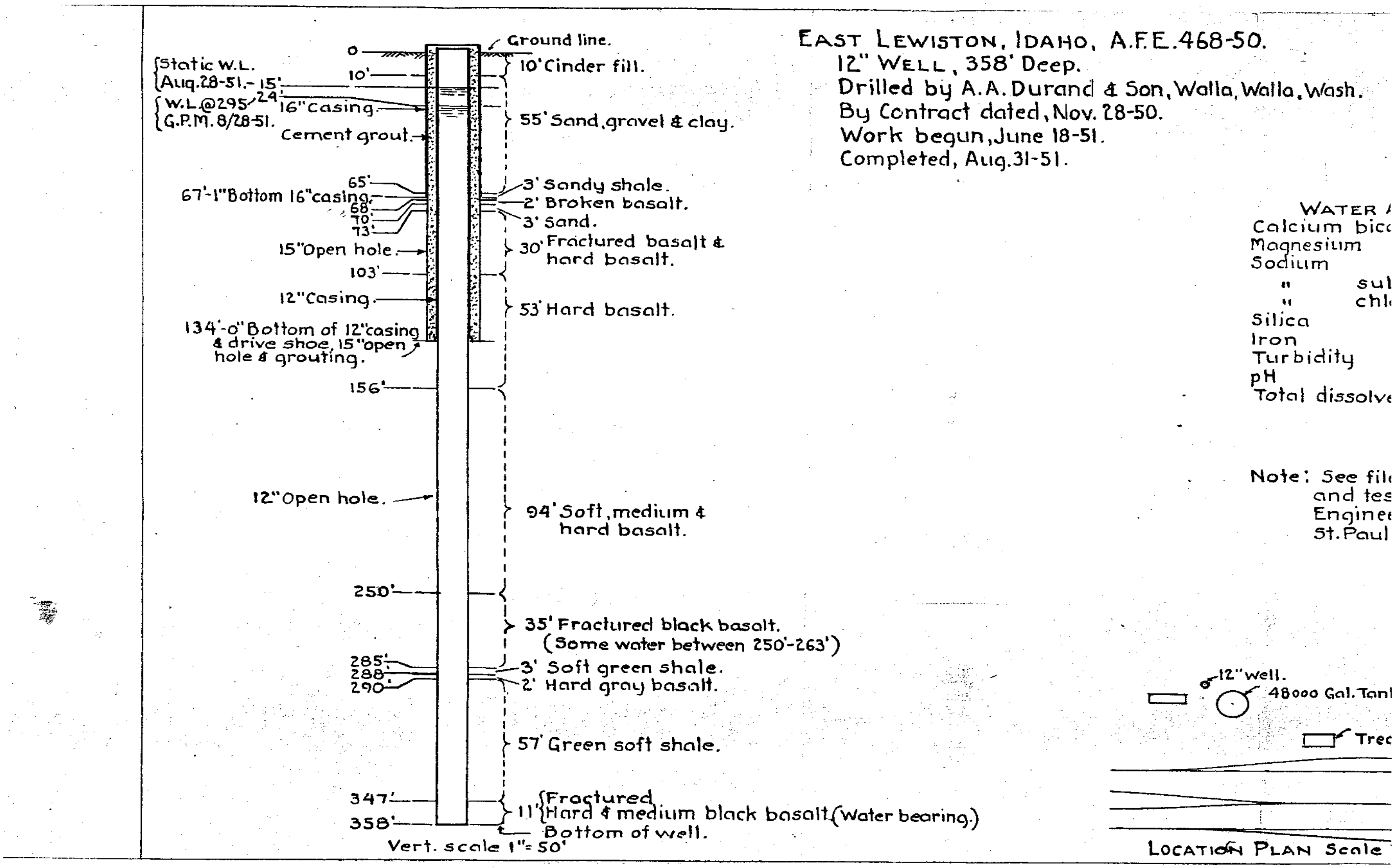

Figure E-4, City of Lewiston Well #4.

WELL LOG AND REPORT TO THE

STATE RECLAMATION ENGINEER OF IDAHO

Log No. ____
Rec. ____ 19__
Well No. ____
Permit No. G-27618
DO NOT FILL IN

Owner Roy Huffman Driller A. A. Durand & Son

3100 Country Club Drive Wash.

Address Lewiston, Idaho Address P. O. Box 437, Walla Walla No. 47

Location of Well: Lot 4 ¼ ¼ Sec. 12 T. 35 N/S R. 6 E/W Boise Meridian Nez Perce County.

and ____ feet N/S, and ____ feet E/W from ____ corner of ____ ¼ ____ ¼ Sec. ____

Water will be used for Domestic-Industrial Total depth of well 600'

Size of drilled hole 15½" x 12" x 10" Weight of casing per linear foot 16" 62.5 lb. 10" 33 lb.

Thickness of casing See Weights Casing Material Standard Steel Pipe (e.g. pipe, concrete, wood)

Diameter length and location of casing See Log Below (Casing 12" in diameter and under give inside diameter; casing over 12" in diameter give outside diameter.)

Number and size of perforations None located ____ feet to ____ feet from surface of ground.

Other Perforations: None

If flowing well, give flow in c.f.s. ____ or g.p.m. ____ and shut in pressure ____

If nonflowing well, give depth of standing water from surface ____

If flowing well, describe control works ____ (Type and size of valve, etc.)

On pumping test delivery was 805 g.p.m. or ____ c.f.s. Drawdown was 108' feet

Length of time pumped during check was 12 hr. ____ min. Water temp. 63 °Fahrenheit.

Date of commencement of well 8/18/53 Date of Completion of well 11/14/53

Type of well rig Bucyrus-Erie 29T Oil Field Spudder

FINISHED OPEN ROCK HOLE AND CASING RECORD DEPTH OF WELL 600'

Diam. Casing	From Feet	To Feet	Length	"Remarks" — Seals, Grouting, Etc.
16" OD x 15¼" ID	0.5	40'	40'	Casing - Natural Clay Seal (15' of Yellow & pink clay)
15¼"	40'	[illegible]	[illegible]	Open Rock Hole
12"	86	306	220'	Open Rock Hole
10" I.D. x 10-3/4"	306	330	25	Casing [illegible]
10"	330	600	270'	Open Rock Hole

GENERAL INFORMATION—Pumping Test, Quality of Water, Etc.

PUMP TEST NO. 1 - FINAL - NOVEMBER 13, 14, 1953 - 12 Hrs. S. W. L. 128'

GPM	PUMPING LEVEL	DRAWDOWN	
805'	236'	108'	Water Temp. 63 deg. F.
554	192'	64'	Well Cleared Up And In
370'	156'	38'	Good Useable Condition
			Water Pure

S.12 35N 6W

Figure E-5a, City of Lewiston Well #5.

WELL NAME. ROY HUFFMAN IRRIGATION WELL WORKS NO. 1

T. 35 N, R. 5 W, S. 12, STATE Idaho COUNTY Nez Perce CITY Lewiston

LOCATED: 3100 Country Club Drive ELEV.

WANTS:

START: August 18, 1953 FINISH November 14, 1953

	DIAM.	DEPTH FROM	TO	FT.	SWL	FORMATIONS & CONTENTS - WORK
		0	8	8		Black Boulders & Top Soil - No
		8	22	14		" " Only - No
		22	25	3		Coarse Black Basalt Gravel No
		25	33	8		Yellow clay - No
		33	40	7		Pink Clay
		40	88	48		Dark, Dense, Fine Grain Basalt - No
		88	128	40		Very Hard Black Basalt - No
		128	145	17		Brown Clay Interbed - No
		145	205	60		Medium Hard Black Basalt Solid - No
		205	217	12		Broken Black Basalt (Aquifer) - S.W.L. 170'
		217	261	44		Very Hard Black Basalt " " " "
		261	300	39		Medium And Ver Hard Black Basalt" " " 160'
		300	310	10		Soft Blue Clay
		310	317	7		Green Soft Clay
		317	485	168		Very Hard Black Basalt " " " 150'
		485	490	5		Brown Honeycomb Basalt (Aquifer)" " " 140'
		490	496	6		Hard Black Basalt " " " 140'
		496	500	4		Soft Black Basalt (Aquifer) " " " 130'
		500	535	35		Dense Hard Black Basalt " " " 130
		535	545	10		Soft Black Basalt " " " 136
		545	554	9		Broken Black Basalt " " " 136'
		554	600	46		Very Hard To Medium Black
						Basalt - Intermittent aquifer zones caving
		S. 12	35N	6W		

usbs

Figure E-5b, City of Lewiston Well #5.

WELL LOG

From Feet	To Feet	Type of Material	Drilling Time Hrs.	Drilling Time Min.	Water-bearing Formation Ans. Yes or No	Casing Perforated Ans. Yes or No
		If more space is required use Sheet No. 2				

WELL DRILLERS STATEMENT

This well was drilled under my jurisdiction and the above information is true and correct to the best of my knowledge and belief.

Signed ......

By Paul Durand

License No. 47

Dated Nov 20, 19 53

Subscribed and sworn before me this 19th day of November 19 53

Cecil B. Sheahin
Notary Public

Walla Walla, Washington
Residing at

My Commission expires Jan. 13, 1953

Figure E-5c, City of Lewiston Well #5.

PAGE 1

Form 238-7
7/94

POSTED

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Use Typewriter or Ball Point Pen

1/2

1. DRILLING PERMIT NO. 85 - 94 - C - 0082 - 000
Other IDWR No. 85-07601

2. OWNER:
Name: City of Lewiston, Idaho
Address: P.O. Box 617
City: Lewiston State: ID Zip: 83501

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

N / W / E / S

Twp. 35 North ☒ or South ☐
Rge. 6 East ☐ or West ☒
Sec. 12, NW 1/4 SE 1/4 SE 1/4 (10 acres, 40 acres, 160 acres)
Gov't Lot ____ County ____

Address of Well Site: 445 Oconner Road
City: Lewiston
(Give at least name of road + Distance to Road or Landmark)

Lt. ____ Blk. ____ Sub. Name ____

4. PROPOSED USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK
☐ New Well ☒ Modify or Repair ☐ Replacement ☐ Abandonment

6. DRILL METHOD
☒ Mud Rotary ☒ Air Rotary ☒ Cable ☐ Other ____

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
Neat Cement	0	60	3 yds	poured into
				hole around casing
Neat Cement	0	670	45 yds	pumped

Was drive shoe used? ☐ Y ☒ N Shoe Depth(s) ____
Was drive shoe seal tested? Y ☐ N ☒ How? ____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
20"	0	60	375	Steel	☒	☐	☒	☐
16"	0	638	344	Steel	☒	☐	☒	☐
13.375	625	990	500	Steel	☐	☒	☒	☐

Length of Headpipe ____ Length of Tailpipe ____

9. PERFORATIONS/SCREENS N/A
☐ Perforations Method ____
☐ Screens Screen Type ____

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
						☐	☐
						☐	☐
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
560 ft. below ground Artesian pressure ____ lb.
Depth flow encountered ____ ft. Describe access port or control devices:

NWSESE 12 35N 6W

11. WELL TESTS:
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
1500 GPM	Approx 400'	850	6 Hrs.

Water Temp. 81 F Bottom hole temp. 81 F
Water Quality test or comments: N/A
* distance from kelly bushing approx 10'

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
26	*0	4	Topsoil		X
26	4	60	Clay and broken basalt *1		X
18½	60	120	Black basalt soft		X
18½	120	220	Black basalt fractured		X
18½	220	255	Basalt with clay		X
18½	255	277	Black and brown basalt		X
18½	277	300	Black basalt hard		X
18½	300	420	Clay, sand and broken basalt		X
18½	420	484	Black basalt soft		X
18½	484	494	White Sand	X	
18½	494	510	Sand and broken basalt	X	
18½	510	610	Gray basalt fractured hard		X
18½	610	647	Gray basalt hard *2		X
18½	647	670	Black basalt soft		X
18½	670	700	Gray basalt hard		X
18½	700	730	Black basalt		X
18	730	755	Black and brown basalt		X
15	755	796	Gray basalt medium hard		X
14½	796	840	Gray basalt hard		X
14½	840	946	Basalt hard		X
14½	946	988	Black basalt & Red soft	X	
14½	988	1010	Basalt Gray hard *3		X
12¼	1110	1126	Basalt gray med hard		X
12¼	1126	1137	Basalt red and black soft	X	
12¼	1137	1156	Basalt gray hard		X
12¼	1156	1178	Basalt red & black soft	X	
12¼	1178	1270	Basalt gray		X
12¼	1270	1298	Basalt red & black soft	X	
12¼	1298	1401	Gray basalt fractured	X	
12¼	1401	1430	Basalt Black & Red	X	
			*1 Set 20" casing to this depth		
			*2 Set 16" casing to this depth		
			*3 Set 13.375" liner to this depth		

Completed Depth 1430 from ground level (Measurable)
Date: Started 5/2/95 Completed December 4/95

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name AQUA DRILLING and ENGINEERING Firm No. 553
Firm Official Doug Galipeau Date 12/8/95
and
Supervisor or Operator Doug Galipeau Date 12/8/95
(Sign once if Firm Official & Operator)

FORWARD WHITE COPY TO WATER RESOURCES

Figure E-6a, City of Lewiston Well #6, Golf Course Well.

RECEIVED
SEP 24 1998
NORTHERN REGION
IDWR

mailed to Cd'A 9-23-98

Form 238-7
3/9

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT
Use Typewriter or Ballpoint Pen

076055

Office Use Only
Inspected by ______
Twp____ Rge____ Sec____
____1/4 ____1/4 ____1/4
Lat: : : Long: : :

1. DRILLING PERMIT NO. 85 -94 - C-0082 100
Other IDWR No. Tag #D0003670
Water Right #85-07601

2. OWNER:
Name City of Lewiston
Address PO BOx 617
City Lewiston, State ID Zip 83501

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

POSTED

Twp. 35 North ☒ or South ☐
Rge. 06 East ☐ or West ☒
Sec. 12 , NW 1/4 SE 1/4 SE 1/4
10 acres 40 acres 160 acres
Gov't Lot ____ County Nez Perce
Lat: : : Long: : :
Address of Well Site 445 O'Conner Rd.
City Lewiston
(Give at least name of road + Distance to Road or Landmark)
Lt.________ Blk.________ Sub. Name________

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☒ Irrigation
☐ Thermal ☐ Injection ☐ Other________

5. TYPE OF WORK check all that apply (Replacement etc.)
☐ New Well ☐ Modify ☐ Abandonment ☒ Other deepen

6. DRILL METHOD
☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other________

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
deepen only			N/A	

Was drive shoe used? ☐ Y ☐ N Shoe Depth(s)________
Was drive shoe seal tested? ☐ Y ☐ N How?________

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
					☐	☐	☐	☐
open hole				N/A	☐	☐	☐	☐
					☐	☐	☐	☐

Length of Headpipe________ Length of Tailpipe________

9. PERFORATIONS/SCREENS
☐ Perforations Method________
☐ Screens Screen Type________

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
						☐	☐
N/A						☐	☐
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
565 ft. below ground Artesian pressure ______ lb.
Depth flow encountered ________ ft. Describe access port or control devices: airline at pump test

35N 6W 12

11. WELL TESTS:
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
500	2ft	960	6 hr
1000	4ft	960	18 hr
1330	7ft	960	1 hr

Water Temp. 83.8° Bottom hole temp. ______
Water Quality test or comments: ________
Depth first Water Encountered 1428

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
			This log is for deepening Lewiston City Well #6, previously drilled to 1428' (±) by Aqua Drilling & Engineering.		
9-7/8" dia.					
	1428	1440	Basalt, maroon, vesicular, soft	x	
	1440	1555	Basalt, med,dk.gray,dense, hard		x
	1555	1565	Basalt,maroon,vesic,soft	x	
	1565	1575	Basalt,med.dk.gray,dense,hard		x
	1575	1595	Basalt,maroon,rubble,soft	x	
	1595	1613	Basalt, dk gray,glassy, frag.,soft		?
	1613	1635	Basalt,yellow gray, rubble, soft	x	
	1635	1655	Basalt,red-brn,rubble,soft	x	
	1655	1738	Basalt,med.gray,dense,hard		x
	1738	1760	Basalt,red-brn,vesic,soft	x	
	1760	1794	Basalt,med,dk.gray,dense soft		x
			Note: major aquifer at 1635-1655; minor aquifers at 1428-1440, 1555-1565, 1575-1600, 1613-1625, 1738-1755. All aquifers are part of the Grande Ronde aquifer system and have common SWLs.		

Completed Depth 1793' (Measurable)
Date: Started 7-27-98 Completed 8-29-98

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name FEDCO Firm No. 463
Firm Official Nancy Caldwell Date 9-22-98
and
Supervisor or Operator________ Date________
(Sign once if Firm Official & Operator)

FORWARD WHITE COPY TO WATER RESOURCES

Figure E-6b, City of Lewiston Well #6, Golf Course Well, deepening log .

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APPENDIX F Lewiston Orchards Irrigation District Well Logs

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Form 238-7
1/78

sent to
copy North

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

USE TYPEWRITER OR BALLPOINT PEN

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

RECEIVED JUN 26 1987
Department of Water Resources

1. WELL OWNER

Name Lewiston Orchard Irrigation District
Address 1520 Powers Avenue
Lewiston, Idaho 83501
Owner's Permit No. 85-86-N-3

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning) ____

3. PROPOSED USE

☐ Domestic ☒ Irrigation ☐ Test ☒ Municipal
☐ Industrial ☐ Stock ☐ Waste Disposal or Injection
☐ Other ____ (specify type)

4. METHOD DRILLED

☒ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other ____

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other ____

Thickness	Diameter	From	To
.375 inches	20 inches	+ 0 feet	60 feet
.375 inches	16 inches	+ 3 feet	520 feet
.380 inches	13 3/8 inches	508 feet	1376 feet
inches	inches	feet	feet

Was casing drive shoe used? ☒ Yes ☐ No
Was a packer or seal used? ☐ Yes ☐ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation ____ inches by ____ inches

Number	From	To
perforations	feet	feet
perforations	feet	feet
perforations	feet	feet

Well screen installed? ☐ Yes ☒ No
Manufacturer's name ____
Type ____ Model No. ____
Diameter ____ Slot size ____ Set from ____ feet to ____ feet
Diameter ____ Slot size ____ Set from ____ feet to ____ feet
Gravel packed? ☐ Yes ☒ No ☐ Size of gravel ____
Placed from ____ feet to ____ feet
Surface seal depth 60' Material used in seal: ☒ Cement grout ☐ Puddling clay ☐ Well cuttings
Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing ☐ Overbore to seal depth
Method of joining casing: ☐ Threaded ☐ Welded ☐ Solvent Weld
☐ Cemented between strata
Describe access port ____

6. LOCATION OF WELL

Sketch map location must agree with written location.

MICROFILMED MAR 14 1988

N / W / E / S — X

Subdivision Name ____
Lot No. ____ Block No. ____
County Nez Perce
SW ¼ SW ¼ Sec. 17, T. 35 N/S, R. 4 E/W

7. WATER LEVEL

Static water level 192 feet below land surface.
Flowing? ☐ Yes ☒ No G.P.M. flow ____
Artesian closed-in pressure ____ p.s.i.
Controlled by: ☐ Valve ☐ Cap ☐ Plug
Temperature ____ °F. Quality good

8. WELL TEST DATA

Test by others

Pg 1 of 2

☐ Pump ☐ Bailer ☐ Air ☐ Other ____

Discharge G.P.M.	Pumping Level	Hours Pumped

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
24	0	17	sandy loam		
	17	22	broken basalt		
	22	36	gray basalt (hard)		
	36	51	black basalt broken		
17½	51	153	gray basalt		
	153	226	black & gray basalt		
	226	417	black basalt w/ clay		
	417	455	gray basalt lost cir.		
	455	498	lost circulation area		
			cem. back to 340' SWL 150'		
	498	520	gray basalt (hard)		
143/4	520	564	gray & black basalt		
	564	629	black basalt		
	629	727	black basalt w/ clay		
	729	773	gray & blacl basalt		
	773	782	gray basalt		
	782	851	black basalt		
	851	908	gray & black basalt		
	908	1356	black basalt		
	1356	1376	gray basalt		
12¼	1376	1443	gray & black basalt		
	1443	1543	black & brown basalt		
	1543	1606	gray & black basalt		
	1606	1780	soft red-brown basalt	X	
TD	1780	1959	soft red-brown basalt	X	

G11268

16" casing cemented from 520' tosurface, w/ 175 sacks-using float shoe thru injection line. 13 3/8 casing from 508' to 1376' w/ 175 sacks using float shoe and injection line.

10.

Work started 5/02/86 finished 8/05/86

11. DRILLERS CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name Holman Drilling Corp. Firm No. 108
Address E. 3410 Ninth Avenue Spokane, WA 99202 Date 6/17/87

Signed by (Firm Official) Arnold E. Holman PRES.
and
(Operator) Arnold E. Holman

USE ADDITIONAL SHEETS IF NECESSARY — FORWARD THE WHITE COPY TO THE DEPARTMENT

Figure F-1, LOID Well #2.

Form 238-7
3/95

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT
Use Typewriter or Ballpoint Pen

Office Use Only
Inspected by ______
Twp ____ Rge ____ Sec ____
____1/4 ____1/4 ____1/4
Lat: : : Long: : :

1. DRILLING PERMIT NO. 85-97-N-0024-000
Other IDWR No. WELL TAG D 000 3071

2. OWNER:
Name LEWISTON ORCHARDS IRRIGATION DIST
Address 1520 POWERS AVE
City LEWISTON State ID Zip 83501

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

Twp. 35 North ☒ or South ☐
Rge. 5 East ☐ or West ☒
Sec. 10 SW 1/4 SE 1/4 SW 1/4
Gov't Lot ____ County NEZ PERCE
Lat: : : Long: : :
Address of Well Site 15TH ST + WARNER AVE City LEWISTON ID
(Give at least name of road + Distance to Road or Landmark)
Lt. ____ Blk. ____ Sub. Name ____

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other ____

6. DRILL METHOD
☐ Air Rotary ☐ Cable ☒ Mud Rotary ☐ Other REVERSE AIR ROTARY

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
				PRESSURE
NEAT CEMENT	0	119	180 SKS	GROUTED
NEAT CEMENT	0	1020	594 SKS	FROM BOTTOM
NEAT CEMENT	1390	1430	9 SKS	TO SURFACE

Was FLOAT shoe used? ☒Y ☐N Shoe Depth(s) 119-1020-1430
Was drive shoe seal tested? ☐Y ☒N How? ____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
20"	+1	119	.375	STEEL	☒	☐	☒	☐
16"	+3	1020	.375	STEEL	☒	☐	☒	☐
13 3/8	1000	1430	.330	STEEL	☐	☒	☒	☐

Length of Headpipe N/A Length of Tailpipe N/A

9. PERFORATIONS/SCREENS
☒ Perforations Method MILL CUT
☐ Screens Screen Type ____

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
1035	1055	4X3	480	13 3/8	STEEL	☐	☒
1130	1150	4X3	480	13 3/8	STEEL	☐	☒
1215	1235	4X3	480	13 3/8	STEEL	☐	☒
1250	1270	4X3	480	13 3/8	STEEL		X
1375	1395	4X3	480	13 3/8	STEEL		X

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
675 ft. below ground Artesian pressure N/A lb.
Depth flow encountered 1035-2360 Describe access port or control devices: 2" PIPE WITH 2" PLUG

11. WELL TESTS:
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
500	122	797	4 HRS
1270	268	943	72 HRS
1540	337	1012	80 HRS

Water Temp. 78° Bottom hole temp. 99°
Water Quality test or comments: GOOD
Depth first Water Encountered 1035

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
24	0	5	LOESS BRN		X
24	5	25	BASALT GRY		X
24	25	32	CLAY BRN + GRY		X
24	32	114	BASALT GRY		X
24	114	120	BASALT + CLAY BRN	X	
18 1/2	120	227	BASALT GRY		X
18 1/2	227	425	BASALT + CLAY GRY		X
18 1/2	425	539	BASALT GRY		X
18 1/2	539	555	BASALT BRN + GRY		X
18 1/2	555	570	BASALT GRY		X
18 1/2	570	627	BASALT GRY TO PURPLE		X
18 1/2	627	630	CLAYSTONE GRN		X
18 1/2	630	648	BASALT GRY		X
18 1/2	648	668	CLAYSTONE GRN + GRY		X
18 1/2	668	922	BASALT GRY		X
18 1/2	922	934	BASALT GRY TO RED		X
18 1/2	934	960	BASALT GRY	X	
18 1/2	960	978	BASALT GRY		X
18 1/2	978	982	BASALT GRY TO BLU	X	
18 1/2	982	1020	BASALT GRY		X
14 3/4	1020	1058	BASALT GRY + RED	X	
14 3/4	1058	1123	BASALT GRY		X
14 3/4	1123	1137	BASALT MAROON + GRY 72°	X	
	1137	1200	BASALT GRY		X
	1200	1215	BASALT MAROON + GRY		X
	1213	1232	BASALT GRY		X
	1232	1270	BASALT MAROON + GRY	X	
	1270	1360	BASALT GRY		X
	1360	1385	BASALT MAROON BRN 73°	X	
	1385	1430	BASALT GRY		X
12 1/4	1430	1468	BASALT GRY		X
12 1/4	1468	1492	BASALT GRY + RED	X	
			CONTINUED ON SHEET #2		

Completed Depth 2617 (Measurable)
Date: Started 7-7-97 Completed 10-20-97

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name HOLMAN DRILLING CORP Firm No. 108
Firm Official [signature] Date 11-17-97
and
Supervisor or Operator [signature] Date 11-17-97
(Sign once if Firm Official & Operator)

SHEET 1 OF 2
FORWARD WHITE COPY TO WATER RESOURCES

Figure F-2a, LOID Well #3.

Form 238-7
95

IDAHO DEPARTMENT OF WATER RESOURCES

WELL DRILLER'S REPORT

Use Typewriter or Ballpoint Pen

Office Use Only
Inspected by ______
Twp.____ Rge.____ Sec.____
____1/4 ____1/4 ____1/4
Lat: : : Long: : :

1. DRILLING PERMIT NO. 85-97-N-0024-000
Other IDWR No. WELL TAG D 000 3471

2. OWNER:
Name LEWISTON ORCHARDS IRRIGATION DIST
Address 1520 POWERS AVE
City LEWISTON State ID Zip 83501

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

N / E / S

Twp.______ North ☐ or South ☐
Rge.______ East ☐ or West ☐
Sec.______, ____1/4 (10 acres) ____1/4 (40 acres) ____1/4 (160 acres)
Gov't Lot ____ County ______
Lat: : : Long: : :
Address of Well Site ______ City ______
(Give at least name of road + Distance to Road or Landmark)
Lt.____ Blk.____ Sub. Name ______

4. USE:
☐ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ______

5. TYPE OF WORK check all that apply (Replacement etc.)
☐ New Well ☐ Modify ☐ Abandonment ☐ Other ______

6. DRILL METHOD
☐ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other ______

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD

Was drive shoe used? ☐ Y ☐ N Shoe Depth(s) ______
Was drive shoe seal tested? ☐ Y ☐ N How? ______

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Length of Headpipe ______ Length of Tailpipe ______

9. PERFORATIONS/SCREENS
☐ Perforations Method ______
☐ Screens Screen Type ______

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
						☐	☐
						☐	☐
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
______ ft. below ground Artesian pressure ______ lb.
Depth flow encountered ______ ft. Describe access port or control devices: ______

11. WELL TESTS:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time

Water Temp. ______ Bottom hole temp. ______
Water Quality test or comments: ______
Depth first Water Encountered ______

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
12¼	1492	1524	BASALT GRY		X
	1524	1546	BASALT GRY + BRN 74°	X	
	1546	1569	BASALT BRN		X
	1569	1624	BASALT GRY + BRN 76.5°	X	
	1624	1674	BASALT GRY		X
	1674	1804	BASALT BRN + GRY 76°	X	
	1804	1830	BASALT GRY		X
	1830	1888	BASALT GRY PORUS 76.5°	X	
	1888	1965	BASALT GRY		X
	1965	2028	BASALT GRY + BRN		X
	2028	2213	BASALT GRY		X
	2213	2242	BASALT GRY FRACTURED 77°	X	
	2242	2312	BASALT GRY		X
	2312	2333	BASALT GRY + RED		X
	2333	2349	BASALT GRY		X
	2349	2360	BASALT GRY CLINKERY 80°	X	
	2360	2617	BASALT GRY 78°		X

ALL CASING AND LINER WERE GROUTED WITH NEAT CEMENT USING CEMENT FLOAT SHOES AND INJECTION LINE FROM SURFACE

Completed Depth 2617 (Measurable)
Date: Started 7-7-97 Completed 10-20-97

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name HOLMAN DRILLING CORP Firm No. 108
Firm Official [signature] Date 11-17-97
and
Supervisor or Operator [signature] Date 11-17-97
(Sign once if Firm Official & Operator)

SHEET # 2 OF 2

FORWARD WHITE COPY TO WATER RESOURCES

Figure F-2b, LOID Well #3.

DE: 1-16-03 85

Form 238-7
11/97

IDAHO DEPARTMENT OF WATER RESOURCES

WELL DRILLER'S REPORT

Office Use Only
Inspected by ____
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat: : : Long: : :

1. WELL TAG NO. D 0022736
DRILLING PERMIT NO. 784458
Other IDWR No. WATER RIGHT No. 85-15356

2. OWNER:
Name LEWISTON ORCHARDS IRRIGATION DIST.
Address 1520 POWERS AVE
City LEWISTON State ID Zip 83501

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

Twp. 35 North ☒ or South ☐
Rge. 05 East ☐ or West ☒
Sec. 22, NW 1/4, NE 1/4 NW 1/4
Gov't Lot ____ County NEZ PERCE
Lat: : : Long: : :
Address of Well Site 1520 POWERS AVE.
City LEWISTON
(Give at least name of road + Distance to Road or Landmark)

Lt. ____ Blk. ____ Sub. Name ____

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other ____

6. DRILL METHOD
☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other ____

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
CEMENT	0	265	330 SKS	TREMMIE
CEMENT	856	866	20 SKS	TREMMIE

Was drive shoe used? ☐Y ☒ N Shoe Depth(s) ____
Was drive shoe seal tested? ☐ Y☐ N How? ____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
20"	0	457	.375	STEEL	☒	☐	☒	☐
18"	444'	866	.375	STEEL	☒	☐	☒	☐
16"	SEE ATTACHED				☐	☐	☐	☐

Length of Headpipe ____ Length of Tailpipe ____

9. PERFORATIONS/SCREENS
Perforations Method ____
Screens Screen Type CARBON STEEL

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
SEE ATTACHED						☐	☐
						☐	☐
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
845 ft. below ground Artesian pressure ____ lb.
Depth flow encountered ____ ft. Describe access port or control devices: ____

11. WELL TESTS:
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
1000+GPM	N/A	N/A	4 HRS
DRILL STEM AT 1600'			

Water Temp. 76°F - 81° Bottom hole temp. 81°F
Water Quality test or comments: ____
Depth first Water Encounter 1026

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
			SEE ATTACHED SHEET		

RECEIVED
JAN 13 2003
Department of Water Resources

Completed Depth 1625 FEET (Measurable)
Date: Started 9/12/02 Completed 12/16/02

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name GEO-TECH EXPLORATION Firm No. 610
Firm Official [signature] Date 1/8/03
and
Driller or Operator [signature] Date 1-8-03
(Sign once if Firm Official & Operator)

FORWARD WHITE COPY TO WATER RESOURCES

Figure F-3a, LOID Well #4.

Geo-Tech Explorations, Inc.
19700 SW Teton
Tualatin, OR 97062
Ph: (503) 692-6400, Fax: (503) 692-4759

Well Name:	Lewiston Orchards Irrigation District Well No. 4
Well Tag No.	[redacted]
Drilling Permit #	784458
Well ID #	355519
Water Right No.	85-15356

Bore Dia.	From	To	LITHOLOGIC LOG	Water Yes	Water No
24"	0	2	Fill Rock		x
" "	2	3	Top Soil		x
" "	3	18	Silty Clay, Brown, some gravels		x
" "	18	60	Basalt weathered fractured		x
" "	60	76	Clay brown sticky		x
" "	92	260	Basalt fractured medium		x
" "	260	265	Basalt fractured lenses of shale black coal like		x
20"	265	283	Basalt fractured lenses of shale black coal like		x
" "	283	310	Basalt fractured with gray claystone		x
" "	310	320	Basalt medium		x
" "	320	371	Claystone soft green some tan		x
" "	371	396	Basalt cuttings rounded gray with clay foam color brown to green		x
" "	396	423	Med soft cuttings same as above foam color brown		x
" "	423	456	Extremely soft holding back on bit cuttings same as above foam color brownish		x
" "			gray. Large chunks of gray claystone on bit when removed. Caving problems		x
" "			from 230' to 456'		x
" "	456	465	Basalt vesicular black		x
" "	465	487	Basalt gray to black medium		x
" "	487	492	Basalt vesicular black		x
" "	492	640	Basalt fractured black		x
" "	640	680	Claystone brown		x
" "	680	701	Basalt broken weathered		x
" "	701	735	Basalt fractured black		x
" "	735	759	Basalt gray hard		x
" "	759	767	Basalt vesicular black		x
" "	767	837	Basalt fractured black		x
" "	837	866	Basalt fractured black some red		x
18"	866	952	Basalt black		x
" "	952	963	Basalt black with brown claystone		x
" "	963	988	Basalt black fractured		x
" "	988	1028	Basalt black		x
" "	1028	1049	Basalt black with brown scoria	x	
" "	1049	1060	Basalt black		x
" "	1060	1110	Basalt black with brown		x
" "	1110	1168	Basalt black		x
" "	1168	1182	Basalt black with brown scoria	x	
" "	1182	1208	Basalt black		x
" "	1208	1229	Basalt black with gray		x
" "	1229	1246	Basalt black with brown scoria	x	
" "	1246	1252	Basalt black		x
" "	1252	1264	Scoria black		x
" "	1264	1266	Basalt black with gray		x
12"	1266	1390	Basalt black with gray		x
" "	1390	1415	Scoria brown	x	
10"	1417	1577	Basalt black		x
" "	1577	1601	Basalt black with brown	x	
" "	1601	1625	Basalt black		x

Figure F-3b, LOID Well #4

Figure F-3c, LOID Well #4

Geo-Tech Explorations, Inc.
19700 SW Teton
Tualatin, OR 97062
Ph: (503) 692-6400, Fax: (503) 692-4759

Well Name:	Lewiston Orchards Irrigation District Well No. 4
Well Tag No.	D0022736
Drilling Permit #	784458
Well ID #	355519
Water Right No.	85-15356

Bore Dia.	From	To	LITHOLOGIC LOG	Water Yes	Water No
24"	0	2	Fill Rock		x
" "	2	3	Top Soil		x
" "	3	18	Silty Clay, Brown, some gravels		x
" "	18	60	Basalt weathered fractured		x
" "	60	76	Clay brown sticky		x
" "	92	260	Basalt fractured medium		x
" "	260	265	Basalt fractured lenses of shale black coal like		x
20"	265	283	Basalt fractured lenses of shale black coal like		x
" "	283	310	Basalt fractured with gray claystone		x
" "	310	320	Basalt medium		x
" "	320	371	Claystone soft green some tan		x
" "	371	396	Basalt cuttings rounded gray with clay foam color brown to green		x
" "	396	423	Med soft cuttings same as above foam color brown		x
" "	423	456	Extremely soft holding back on bit cuttings same as above foam color brownish		x
" "			gray. Large chunks of gray claystone on bit when removed. Caving problems		x
" "			from 230' to 456'		x
" "	456	465	Basalt vesicular black		x
" "	465	487	Basalt gray to black medium		x
" "	487	492	Basalt vesicular black		x
" "	492	640	Basalt fractured black		x
" "	640	680	Claystone brown		x
" "	680	701	Basalt broken weathered		x
" "	701	735	Basalt fractured black		x
" "	735	759	Basalt gray hard		x
" "	759	767	Basalt vesicular black		x
" "	767	837	Basalt fractured black		x
" "	837	866	Basalt fractured black some red		x
16"	866	952	Basalt black		x
" "	952	963	Basalt black with brown claystone		x
" "	963	988	Basalt black fractured		x
" "	988	1028	Basalt black		x
" "	1028	1049	Basalt black with brown scoria	x	
" "	1049	1060	Basalt black		x
" "	1060	1110	Basalt black with brown		x
" "	1110	1168	Basalt black		x
" "	1168	1182	Basalt black with brown scoria	x	
" "	1182	1208	Basalt black		x
" "	1208	1229	Basalt black with gray		x
" "	1229	1246	Basalt black with brown scoria	x	
" "	1246	1252	Basalt black		x
" "	1252	1264	Scoria black		x
" "	1264	1266	Basalt black with gray		x
12"	1266	1390	Basalt black with gray		x
" "	1390	1415	Scoria brown	x	
10"	1417	1577	Basalt black		x
" "	1577	1601	Basalt black with brown	x	
" "	1601	1625	Basalt black		x

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Well Tag No.	D0022736
Drilling Permit #	784458
Well ID #	355519
Water Right No.	85-15356

Bore Dia.	From	To	LITHOLOGIC LOG	Water Yes	Water No
24"	0	2	Fill Rock		x
" "	2	3	Top Soil		x
" "	3	18	Silty Clay, Brown, some gravels		x
" "	18	60	Basalt weathered fractured		x
" "	60	76	Clay brown sticky		x
" "	92	260	Basalt fractured medium		x
" "	260	265	Basalt fractured lenses of shale black coal like		x
20"	265	283	Basalt fractured lenses of shale black coal like		x
" "	283	310	Basalt fractured with gray claystone		x
" "	310	320	Basalt medium		x
" "	320	371	Claystone soft green some tan		x
" "	371	396	Basalt cuttings rounded gray with clay foam color brown to green		x
" "	396	423	Med soft cuttings same as above foam color brown		x
" "	423	456	Extremely soft holding back on bit cuttings same as above foam color brownish		x
" "			gray. Large chunks of gray claystone on bit when removed. Caving problems		x
" "			from 230' to 456'		x
" "	456	465	Basalt vesicular black		x
" "	465	487	Basalt gray to black medium		x
" "	487	492	Basalt vesicular black		x
" "	492	640	Basalt fractured black		x
" "	640	680	Claystone brown		x
" "	680	701	Basalt broken weathered		x
" "	701	735	Basalt fractured black		x
" "	735	759	Basalt gray hard		x
" "	759	767	Basalt vesicular black		x
" "	767	837	Basalt fractured black		x
" "	837	866	Basalt fractured black some red		x
18"	866	952	Basalt black		x
" "	952	963	Basalt black with brown claystone		x
" "	963	988	Basalt black fractured		x
" "	988	1028	Basalt black		x
" "	1028	1049	Basalt black with brown scoria	x	
" "	1049	1060	Basalt black		x
" "	1060	1110	Basalt black with brown		x
" "	1110	1168	Basalt black		x
" "	1168	1182	Basalt black with brown scoria	x	
" "	1182	1208	Basalt black		x
" "	1208	1229	Basalt black with gray		x
" "	1229	1246	Basalt black with brown scoria	x	
" "	1246	1252	Basalt black		x
" "	1252	1264	Scoria black		x
" "	1264	1266	Basalt black with gray		x
12"	1266	1390	Basalt black with gray		x
" "	1390	1415	Scoria brown	x	
10"	1417	1577	Basalt black		x
" "	1577	1601	Basalt black with brown	x	
" "	1601	1625	Basalt black		x

Figure F-3d, LOID Well #4

Figure F-3e, LOID Well #4

Geo-Tech Explorations, Inc.
19700 SW Teton
Tualatin, OR 97062
Ph: (503) 692-6400, Fax: (503) 692-4759

Well Name:	Lewiston Orchards Irrigation District Well No. 4
Well Tag No.	D0022736
Drilling Permit #	784458
Well ID #	355519
Water Right No.	85-15356

Bore Dia.	From	To	LITHOLOGIC LOG	Water Yes	Water No
24"	0	2	Fill Rock		x
" "	2	3	Top Soil		x
" "	3	18	Silty Clay, Brown, some gravels		x
" "	18	60	Basalt weathered fractured		x
" "	60	76	Clay brown sticky		x
" "	92	260	Basalt fractured medium		x
" "	260	265	Basalt fractured lenses of shale black coal like		x
20"	265	283	Basalt fractured lenses of shale black coal like		x
" "	283	310	Basalt fractured with gray claystone		x
" "	310	320	Basalt medium		x
" "	320	371	Claystone soft green some tan		x
" "	371	396	Basalt cuttings rounded gray with clay foam color brown to green		x
" "	396	423	Med soft cuttings same as above foam color brown		x
" "	423	456	Extremely soft holding back on bit cuttings same as above foam color brownish		x
" "			gray. Large chunks of gray claystone on bit when removed. Caving problems		x
" "			from 230' to 456'		x
" "	456	465	Basalt vesicular black		x
" "	465	487	Basalt gray to black medium		x
" "	487	492	Basalt vesicular black		x
" "	492	640	Basalt fractured black		x
" "	640	680	Claystone brown		x
" "	680	701	Basalt broken weathered		x
" "	701	735	Basalt fractured black		x
" "	735	759	Basalt gray hard		x
" "	759	767	Basalt vesicular black		x
" "	767	837	Basalt fractured black		x
" "	837	866	Basalt fractured black some red		x
18"	866	952	Basalt black		x
" "	952	963	Basalt black with brown claystone		x
" "	963	988	Basalt black fractured		x
" "	988	1028	Basalt black		x
" "	1028	1049	Basalt black with brown scoria	x	
" "	1049	1060	Basalt black		x
" "	1060	1110	Basalt black with brown		x
" "	1110	1168	Basalt black		x
" "	1168	1182	Basalt black with brown scoria	x	
" "	1182	1208	Basalt black		x
" "	1208	1229	Basalt black with gray		x
" "	1229	1246	Basalt black with brown scoria	x	
" "	1246	1252	Basalt black		x
" "	1252	1264	Scoria black		x
" "	1264	1266	Basalt black with gray		x
12"	1266	1390	Basalt black with gray		x
" "	1390	1415	Scoria brown	x	
10"	1417	1577	Basalt black		x
" "	1577	1601	Basalt black with brown	x	
" "	1601	1625	Basalt black		x

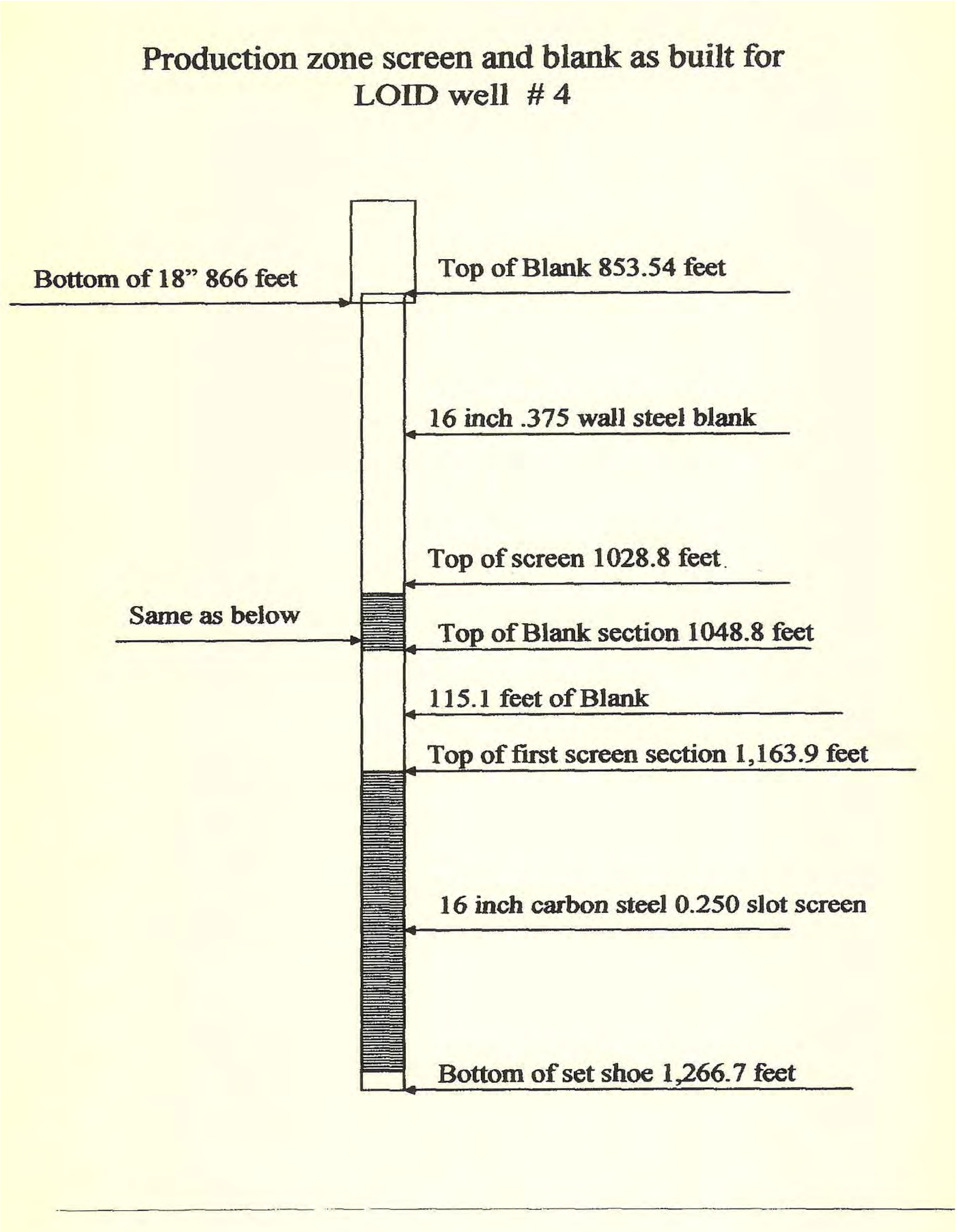

Figure F-3f, LOID Well #4

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APPENDIX G DWSP Plan Certification Checklist

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Drinking Water Source Protection Plan Certification Checklist

Public Water System Name: ___________________________________

Local Contact: ____

Date Returned to Water System: _______________________________

Drinking Water Source Protection Plan **Approved _____** **Disapproved _____**

Idaho Source Water Protection Plan guidance - *Protecting Drinking Water Sources in Idaho*, *August 2000* Pg. 28 of the document states "If a plan is found to satisfy all eight elements, then the community will be recognized by DEQ as having a "State Certified Plan". Additionally, supporting information describing each of the required elements is referenced as well.

Required Elements of Certified Drinking Water Source Protection Plan Element Addressed

Element 1 Description of Planning Team Participant Roles and Duties
Yes **No**
(Reference *Step 1:* Formation *of a Community Planning Team*)

Element 2 Delineation of the Source Water Protection Area
Yes **No**
(Reference *Step 2: Delineation of the Land Area to be Protected*)

Element 3 An Inventory of Potential Sources of Contamination
Yes **No**
(Reference *Step 3: Identification of Potential Contaminant Sources*)

Element 4 Management Tools and Protection Measures that will be Pursued to Manage Potential Sources of Contamination
Yes **No**
(Reference *Step 4: Development and Implementation of a Management Plan for Source Water Protection Area*)

Element 5 A Contingency Plan
Yes **No**
(Reference *Step 5a: Development of a Contingency Plan*)

Element 6 A Protection Strategy for New Wells or Intakes
Yes **No**
(Reference *Step 5b: Planning for Future Drinking Water Sources*)

Element 7 A Public Participation and Education component
Yes **No**

Element 8 An Implementation Strategy
Yes **No**
(what will be done, when will it be done, and by whom)

If a plan is found to satisfy all eight elements, then the community will be recognized by DEQ as having a "State Certified Plan". This certification will cover a three year period, after which re-certification can be pursued by the community. Re-certification will include an evaluation of the community's success in implementing source water protection as a measure of the community's strategy. (element 8)

Reviewers	**Agency/Affiliation**

APPENDIX H Emergency Response Flow Chart

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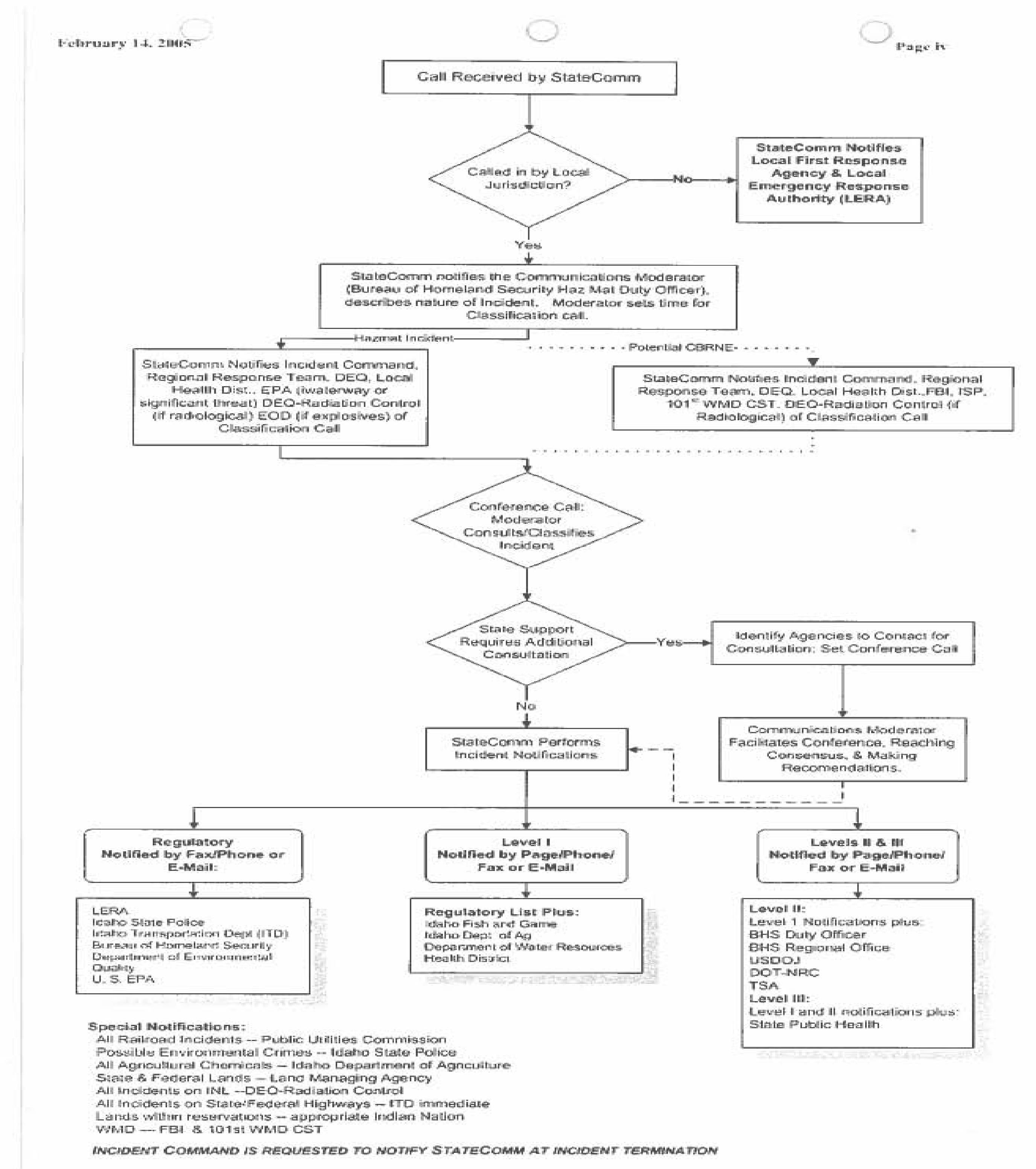

Figure H. Emergency Response Flow Chart.

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APPENDIX I City of Lewiston Water Rights

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CITY OF LEWISTON WATER RIGHT CLAIMS					
IDENTIFICATION NO. WATER RIGHT CLAIM	**PRIORITY DATE**	**LOCATION**	**AMOUNT CLAIMED**		**STATUS OF SOURCE**
			CFS	**GALS.**	
A86-04034	6/1/1890	Clearwater River Intake	10.7	6,915,110	Primary Intake
A86-04032	6/1/1951	Well #2	1	646,272	Irrigation- Standby Domestic
A85-02099	8/6/1953	Well #3	2.67	1,725,546	Irrigation - Standby domestic
A85-04017	7/1/1960	Well #1	4	2,585,088	Standby Domestic/Fire Flow
A85-04019	7/1/1960	Well #4	2.3	1,486,425	Domestic Use
A85-02131	9/25/1964	Supplements for well #4/0.7 #3/1.2, #1//1.0, #2/1.0	3.9	2,520,460	See status of wells 1, 2, 3, & 4
A85-07015	1/15/1970	Well #5	0.85	578,684	Operational
A85-07158	6/23/1977	Well #5	1.38	891,855	Operational
A86-07090	9/13/1978	Clearwater River Intake	7.9	5,105,548	Primary Intakes
A86-07324	10/7/1993	Clearwater River Intake	18.6	12,020,659	Secondary Intakes
A85-07601	7/7/1997	Well #6	1.11	717,362	Irrigation/Domestic
		Total	**54.41**	**35,193,009**	

Figure I-1, City of Lewiston Water Rights Claims.

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APPENDIX J Lewiston Orchards Irrigation District Water Rights

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LOID WATER RIGHT CLAIMS					
IDENTIFICATION NO. WATER RIGHT CLAIM	**PRIORITY DATE**	**LOCATION**	**AMOUNT CLAIMED**		**STATUS OF SOURCE**
			CFS	**GALS.**	
85-7428	2-28-1985	Well #2	2.13		Municipal
85-7638	4-12-1997	Well #3	2.76		Municipal
85-15356	11-16-2007	Well #4	3.34		Municipal
		Total	**8.32**		

Figure J-1, LOID Rights Claims

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Appendix K – Domestic Storage Calculations

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Current System

Equalization storage is required to compensate for the difference between a water system's maximum pumping capacity and peak hour demands. The following analysis were completed to calculate the required equalization storage within the District:

1. Peak Hour Demand Allocation
2. Supply Allocation
3. Control Volume Determination
4. Volumetric Analysis

Peak Hour Demand Allocation

The first step to calculating equalization storage is to estimate peak hour demands. These demands were calculated based on one-hour diurnal curves observed in the northern and southern portions of the system on June 29, 2008. The selected diurnal curves for each service type are shown in **Table 1**.

Dual Service Connections
The diurnal curve from the northern portion of the system was utilized to estimate the diurnal curve for all dual service connections, as this portion of the District consists of this service type. The shape of this diurnal is provided in **Figure 1**.

Potable-Only Service Connections.
Although the southern portion of the system is influenced by the potable-only service connections, a significant portion of this area also consists of dual service connections. Therefore, the diurnal curve from the southern portion of the system could not be utilized to estimate the diurnal curve of potable-only service connections. A diurnal curve was obtained from AWWA Manual M32 to approximate typical usage patterns of potable-only service connections, see **Figure 1.**

Next, District maximum day demands were allocated to each pressure zone based on service type and in proportion to the zone's service area. The results of this demand allocation are given in **Table 2**.

Supply Allocation

In a similar fashion to demand allocations, available supply was allocated by zone in proportion to a supply source's service area.

Control Volume Determination

Next, several distribution control volumes as delineated in **Figure 2** were selected for analysis. In these analysis, booster stations were assumed to operate at full capacity, regardless of location on the supply or demand side of the control volume.

- Northern Zones
  - Demand: Based on allocated demand per zone, see **Table 2**.
  - Supply: Calculated based on Well No. 2 Capacity and Lutes Transfer Capacity for total supply of 1,525 gpm. Since the allocated supply from Wells No. 3 and No. 4 to the Northern Zones (1,054 gpm) is greater than the Lutes Transfer Capacity, it is reasonable to assume that Lutes Transfer could operate under an extended state under supply from the southern zone sources.
- Southern Zones
  - Demand: Based on allocated demand per zone, see **Table 2**, plus the Lutes Transfer Capacity of 1,025 gpm.
  - Supply: Calculated based on allocated supply of Wells No. 3 and No. 4 to the Southern Zones (706 gpm)

In addition to the distribution control volumes, control volumes were also created around boosted areas to assess equalization storage requirements based on booster system operation, see **Figure 3**. In these scenarios, the supply side of the control volume was assumed to operate under 24 hour operation at full capacity, and the demand side of the control volume was assumed to approximate the booster supply's proportional service area demand.

For example, to estimate the demands in the southern portion of the system, the Lutes Booster (1,000 gpm capacity) provides approximately 53 percent of flows to the southern zones, with the Hereth Booster (900 gpm capacity) providing the remaining 47 percent of flows to these areas. The Lutes Booster "demand" was estimated as the product of total demand of the southern zones (**Table 2**) and the booster's proportional capacity to serve these areas (53%)

For consistency across control volumes the Hereth Booster is assumed to operate at full capacity on both demand and supply sides of the control volumes.

- Lutes Boosters
  - Demand: Demand is equivalent to the proportional service area demands of the Lutes Transfer & the Lutes Booster pumps.
  - Supply: Supply is equivalent to full capacity of the Hereth Transfer Pump (1,000 gpm)

- Hereth Boosters
    - Demand: Demand is equivalent to the proportional service area demand of the Hereth Booster pump and full capacity of the Hereth Transfer pump.
    - Supply: Supply is equivalent to the full capacity of Wells No. 3 and No. 4 (1,760 gpm)

Volumetric Analysis

Finally, peak hour demand and supply was analyzed across each control volume as previously defined. The results of this volumetric analysis are provided in the following tables:

Table 3	Southern Zones
Table 4	Northern Zones
Table 5	Lutes Boosters
Table 6	Hereth Boosters

Summary

The results of the analysis show that a total storage of approximately 75,000 gallons is required to provide equalization storage to the distribution system. On further analysis, approximately 145,000 gallons of storage is required to operate the booster systems. The larger of these is the controlling requirement. Therefore it is estimated that 145,000 gallons of storage, located in the Lutes tank, is required to provide the difference between peak hour demands and system supply within the LOID system.

Future System

While it is difficult to estimate a system growth rate, it is even more challenging to determine the physical location of growth within a system. For this reason, a broad distribution analysis was completed for planning year 2030 peak hour demands, based on the previously selected diurnal curves. Booster equalization analysis was not completed due to the variability associated with the geographical location of estimated growth.

For purposes of this analysis, the assumption was made that 50% of projected growth will occur in the northern portion of the system, and 50% of projected growth will occur in the southern portion of the system. The future system equalization analysis was completed for the broad distribution system in a similar fashion to the existing system analysis. The analysis provided in Tables 7 and 8 shows that there is a slight increase in required equalization storage in the southern portion of the system in planning year 2030. Despite this increase, the current booster analysis controls, and therefore there is no increase in required equalization storage over the planning period. Equalization storage requirements should be revisited if the District finds that it cannot maintain appropriate amounts of operational and standby storage due to the future increase of peak hour demands.

Table 1 - Diurnal Peaking Factors

Time	Diurnal Peaking Factors	
	Dual Service Connections [A]	Potable-Only Service Connections [B]
0:00	0.59	0.38
1:00	0.52	0.23
2:00	0.55	0.2
3:00	0.52	0.21
4:00	0.54	0.23
5:00	0.77	0.38
6:00	0.88	0.56
7:00	1.02	0.9
8:00	1.32	1.2
9:00	1.43	1.3
10:00	1.34	1.35
11:00	1.27	1.34
12:00	1.17	1.33
13:00	1.15	1.24
14:00	1.09	1.22
15:00	1.08	1.23
16:00	1.11	1.28
17:00	1.16	1.4
18:00	1.09	1.58
19:00	1.12	1.7
20:00	1.43	1.75
21:00	1.26	1.69
22:00	0.91	1
23:00	0.69	0.5

[A] LOID Northern Peak Hour Factors, 6/29/08

[B] Typical Diurnal Peak Hour Factors (AWWA, M32)

Table 2 - Allocated Peak Hour Demand (gph)

	Zone 1 Composite		Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	System
Time	Dual	Potable-Only	Dual	Dual	Dual	Dual	Dual	
0:00	15,400	4,008	5,299	18,605	1,269	8,792	1,413	54,786
1:00	13,514	2,426	4,650	16,327	1,114	7,716	1,240	46,986
2:00	14,457	2,109	4,975	17,466	1,191	8,254	1,327	49,779
3:00	13,514	2,215	4,650	16,327	1,114	7,716	1,240	46,775
4:00	14,143	2,426	4,866	17,086	1,166	8,075	1,298	49,059
5:00	20,140	4,008	6,930	24,332	1,660	11,499	1,848	70,417
6:00	22,916	5,906	7,885	27,686	1,889	13,084	2,103	81,469
7:00	26,714	9,492	9,192	32,274	2,202	15,252	2,451	97,577
8:00	34,518	12,656	11,878	41,703	2,845	19,708	3,167	126,475
9:00	37,478	13,711	12,896	45,279	3,089	21,398	3,439	137,288
10:00	35,068	14,238	12,067	42,368	2,890	20,022	3,218	129,871
11:00	33,340	14,132	11,472	40,280	2,748	19,035	3,059	124,066
12:00	30,721	14,027	10,571	37,115	2,532	17,540	2,819	115,324
13:00	30,197	13,078	10,391	36,483	2,489	17,241	2,771	112,648
14:00	28,495	12,867	9,805	34,426	2,348	16,269	2,615	106,824
15:00	28,154	12,972	9,688	34,015	2,320	16,074	2,583	105,807
16:00	29,149	13,500	10,030	35,217	2,402	16,643	2,675	109,616
17:00	30,406	14,765	10,463	36,736	2,506	17,360	2,790	115,026
18:00	28,521	16,664	9,814	34,458	2,350	16,284	2,617	110,707
19:00	29,359	17,929	10,102	35,470	2,420	16,762	2,694	114,736
20:00	37,478	18,456	12,896	45,279	3,089	21,398	3,439	142,034
21:00	33,078	17,824	11,382	39,963	2,726	18,886	3,035	126,893
22:00	23,859	10,547	8,210	28,825	1,966	13,622	2,189	89,218
23:00	17,966	5,273	6,182	21,706	1,481	10,258	1,649	64,515
Total (gallons)	628,583	255,226	216,292	759,427	51,803	358,885	57,678	2,327,896

Table 3 - Southern Portion

	Demand						Supply		Analysis
Time	Zone 1		Zone 4	Lutes Transfer Capacity	Total		Southern Zone allocated capacity of Well No. 3 and Well No. 4 (gal)		Scenario S1 EQ Storage (gal)
	Dual	Potable-Only	Dual		Southern Portion				
0:00	15,400	4,008	1,269	61,500	82,176		105,600		0
1:00	13,514	2,426	1,114	61,500	78,553		105,600		0
2:00	14,457	2,109	1,191	61,500	79,258		105,600		0
3:00	13,514	2,215	1,114	61,500	78,342		105,600		0
4:00	14,143	2,426	1,166	61,500	79,234		105,600		0
5:00	20,140	4,008	1,660	61,500	87,308		105,600		0
6:00	22,916	5,906	1,889	61,500	92,211		105,600		0
7:00	26,714	9,492	2,202	61,500	99,907		105,600		0
8:00	34,518	12,656	2,845	61,500	111,519		105,600		5,919
9:00	37,478	13,711	3,089	61,500	115,777		105,600		10,177
10:00	35,068	14,238	2,890	61,500	113,696		105,600		8,096
11:00	33,340	14,132	2,748	61,500	111,720		105,600		6,120
12:00	30,721	14,027	2,532	61,500	108,779		105,600		3,179
13:00	30,197	13,078	2,489	61,500	107,263		105,600		1,663
14:00	28,495	12,867	2,348	61,500	105,210		105,600		0
15:00	28,154	12,972	2,320	61,500	104,947		105,600		0
16:00	29,149	13,500	2,402	61,500	106,551		105,600		951
17:00	30,406	14,765	2,506	61,500	109,177		105,600		3,577
18:00	28,521	16,664	2,350	61,500	109,035		105,600		3,435
19:00	29,359	17,929	2,420	61,500	111,208		105,600		5,608
20:00	37,478	18,456	3,089	61,500	120,523		105,600		14,923
21:00	33,078	17,824	2,726	61,500	115,128		105,600		9,528
22:00	23,859	10,547	1,966	61,500	97,872		105,600		0
23:00	17,966	5,273	1,481	61,500	86,220		105,600		0
Total							2,534,400		73,176

Table 4 - Northern Portion

	Demand						Supply		Analysis
Time	Zone 2	Zone 3	Zone 5	Zone 6	Total		Lutes Transfer Capacity Plus Well 2 Capacity		Scenario N1 EQ Storage (gal)
	Dual	Dual	Dual	Dual	Northern Portion				
0:00	5,299	18,605	8,792	1,413	34,110		91,500		0
1:00	4,650	16,327	7,716	1,240	29,933		91,500		0
2:00	4,975	17,466	8,254	1,327	32,021		91,500		0
3:00	4,650	16,327	7,716	1,240	29,933		91,500		0
4:00	4,866	17,086	8,075	1,298	31,325		91,500		0
5:00	6,930	24,332	11,499	1,848	44,609		91,500		0
6:00	7,885	27,686	13,084	2,103	50,758		91,500		0
7:00	9,192	32,274	15,252	2,451	59,170		91,500		0
8:00	11,878	41,703	19,708	3,167	76,456		91,500		0
9:00	12,896	45,279	21,398	3,439	83,011		91,500		0
10:00	12,067	42,368	20,022	3,218	77,675		91,500		0
11:00	11,472	40,280	19,035	3,059	73,846		91,500		0
12:00	10,571	37,115	17,540	2,819	68,045		91,500		0
13:00	10,391	36,483	17,241	2,771	66,885		91,500		0
14:00	9,805	34,426	16,269	2,615	63,114		91,500		0
15:00	9,688	34,015	16,074	2,583	62,360		91,500		0
16:00	10,030	35,217	16,643	2,675	64,564		91,500		0
17:00	10,463	36,736	17,360	2,790	67,349		91,500		0
18:00	9,814	34,458	16,284	2,617	63,172		91,500		0
19:00	10,102	35,470	16,762	2,694	65,028		91,500		0
20:00	12,896	45,279	21,398	3,439	83,011		91,500		0
21:00	11,382	39,963	18,886	3,035	73,266		91,500		0
22:00	8,210	28,825	13,622	2,189	52,847		91,500		0
23:00	6,182	21,706	10,258	1,649	39,794		91,500		0
Total									0

Table 5 - Lutes Boosters

	Demand		Supply		Analysis
Time	Lutes Transfer plus Lutes Booster PHD (gal)		Hereth Transfer (gal)		Scenario L1 EQ Storage (gal)
0:00	31,850		60,000		0
1:00	27,216		60,000		0
2:00	28,789		60,000		0
3:00	27,074		60,000		0
4:00	28,406		60,000		0
5:00	40,825		60,000		0
6:00	47,357		60,000		0
7:00	56,956		60,000		0
8:00	73,859		60,000		13,859
9:00	80,171		60,000		20,171
10:00	75,964		60,000		15,964
11:00	72,621		60,000		12,621
12:00	67,591		60,000		7,591
13:00	65,961		60,000		5,961
14:00	62,597		60,000		2,597
15:00	62,023		60,000		2,023
16:00	64,262		60,000		4,262
17:00	67,492		60,000		7,492
18:00	65,198		60,000		5,198
19:00	67,635		60,000		7,635
20:00	83,361		60,000		23,361
21:00	74,606		60,000		14,606
22:00	52,261		60,000		0
23:00	37,560		60,000		0
Total					143,342

Table 6 - Hereth Boosters

	Demand		Supply		Analysis
Time	Scenario H2 - Hereth Transfer Capacity plus Hereth Booster Demand		Well No. 3 plus Well No. 4 Capacity		Scenario H2 EQ Storage (gal)
0:00	76,157		105,600		0
1:00	74,179		105,600		0
2:00	75,168		105,600		0
3:00	74,179		105,600		0
4:00	74,838		105,600		0
5:00	81,131		105,600		0
6:00	84,043		105,600		0
7:00	88,028		105,600		0
8:00	96,216		105,600		0
9:00	99,321		105,600		0
10:00	96,793		105,600		0
11:00	94,980		105,600		0
12:00	92,232		105,600		0
13:00	91,682		105,600		0
14:00	89,896		105,600		0
15:00	89,539		105,600		0
16:00	90,583		105,600		0
17:00	91,902		105,600		0
18:00	89,924		105,600		0
19:00	90,803		105,600		0
20:00	99,321		105,600		0
21:00	94,705		105,600		0
22:00	85,033		105,600		0
23:00	78,850		105,600		0
Total					0

Table 7 - Planning Year 2030, Southern Portion

	Demand							Supply	Analysis
Time	Zone 1		Zone 4	2030 Additional Southern Demand		Lutes Transfer Capacity	Total	Southern Zone allocated capacity of Well No. 3 and Well No. 4 (gal)	Scenario S1 EQ Storage (gal)
	Dual	Potable-Only	Dual	Dual	Potable-Only		Southern Portion		
0:00	15,400	4,008	1,269	42	98	61,500	82,316	105,600	0
1:00	13,514	2,426	1,114	37	59	61,500	78,649	105,600	0
2:00	14,457	2,109	1,191	39	52	61,500	79,348	105,600	0
3:00	13,514	2,215	1,114	37	54	61,500	78,433	105,600	0
4:00	14,143	2,426	1,166	38	59	61,500	79,331	105,600	0
5:00	20,140	4,008	1,660	55	98	61,500	87,460	105,600	0
6:00	22,916	5,906	1,889	62	145	61,500	92,418	105,600	0
7:00	26,714	9,492	2,202	72	232	61,500	100,212	105,600	0
8:00	34,518	12,656	2,845	94	310	61,500	111,922	105,600	6,322
9:00	37,478	13,711	3,089	102	336	61,500	116,214	105,600	10,614
10:00	35,068	14,238	2,890	95	349	61,500	114,140	105,600	8,540
11:00	33,340	14,132	2,748	90	346	61,500	112,156	105,600	6,556
12:00	30,721	14,027	2,532	83	343	61,500	109,206	105,600	3,606
13:00	30,197	13,078	2,489	82	320	61,500	107,665	105,600	2,065
14:00	28,495	12,867	2,348	77	315	61,500	105,602	105,600	2
15:00	28,154	12,972	2,320	76	318	61,500	105,341	105,600	0
16:00	29,149	13,500	2,402	79	331	61,500	106,961	105,600	1,361
17:00	30,406	14,765	2,506	82	362	61,500	109,621	105,600	4,021
18:00	28,521	16,664	2,350	77	408	61,500	109,520	105,600	3,920
19:00	29,359	17,929	2,420	80	439	61,500	111,726	105,600	6,126
20:00	37,478	18,456	3,089	102	452	61,500	121,076	105,600	15,476
21:00	33,078	17,824	2,726	90	436	61,500	115,654	105,600	10,054
22:00	23,859	10,547	1,966	65	258	61,500	98,195	105,600	0
23:00	17,966	5,273	1,481	49	129	61,500	86,398	105,600	0
Total								2,534,400	78,664

Table 8 - Planning Year 2030 - Northern Portion

	Demand Summary								Supply		Analysis
Time	Zone 2	Zone 3	Zone 5	Zone 6	2030 Additional Northern Demand		Total		Lutes Transfer Capacity Plus Well 2 Capacity		Scenario N1 EQ Storage (gal)
	Dual	Dual	Dual	Dual	Dual	Potable-Only	Northern Portion				
0:00	5,299	18,605	8,792	1,413	42	98	34,249		91,500		0
1:00	4,650	16,327	7,716	1,240	37	59	30,029		91,500		0
2:00	4,975	17,466	8,254	1,327	39	52	32,112		91,500		0
3:00	4,650	16,327	7,716	1,240	37	54	30,024		91,500		0
4:00	4,866	17,086	8,075	1,298	38	59	31,423		91,500		0
5:00	6,930	24,332	11,499	1,848	55	98	44,762		91,500		0
6:00	7,885	27,686	13,084	2,103	62	145	50,965		91,500		0
7:00	9,192	32,274	15,252	2,451	72	232	59,474		91,500		0
8:00	11,878	41,703	19,708	3,167	94	310	76,860		91,500		0
9:00	12,896	45,279	21,398	3,439	102	336	83,449		91,500		0
10:00	12,067	42,368	20,022	3,218	95	349	78,118		91,500		0
11:00	11,472	40,280	19,035	3,059	90	346	74,282		91,500		0
12:00	10,571	37,115	17,540	2,819	83	343	68,472		91,500		0
13:00	10,391	36,483	17,241	2,771	82	320	67,287		91,500		0
14:00	9,805	34,426	16,269	2,615	77	315	63,506		91,500		0
15:00	9,688	34,015	16,074	2,583	76	318	62,754		91,500		0
16:00	10,030	35,217	16,643	2,675	79	331	64,974		91,500		0
17:00	10,463	36,736	17,360	2,790	82	362	67,793		91,500		0
18:00	9,814	34,458	16,284	2,617	77	408	63,658		91,500		0
19:00	10,102	35,470	16,762	2,694	80	439	65,547		91,500		0
20:00	12,896	45,279	21,398	3,439	102	452	83,565		91,500		0
21:00	11,382	39,963	18,886	3,035	90	436	73,792		91,500		0
22:00	8,210	28,825	13,622	2,189	65	258	53,169		91,500		0
23:00	6,182	21,706	10,258	1,649	49	129	39,972		91,500		0
Total											0

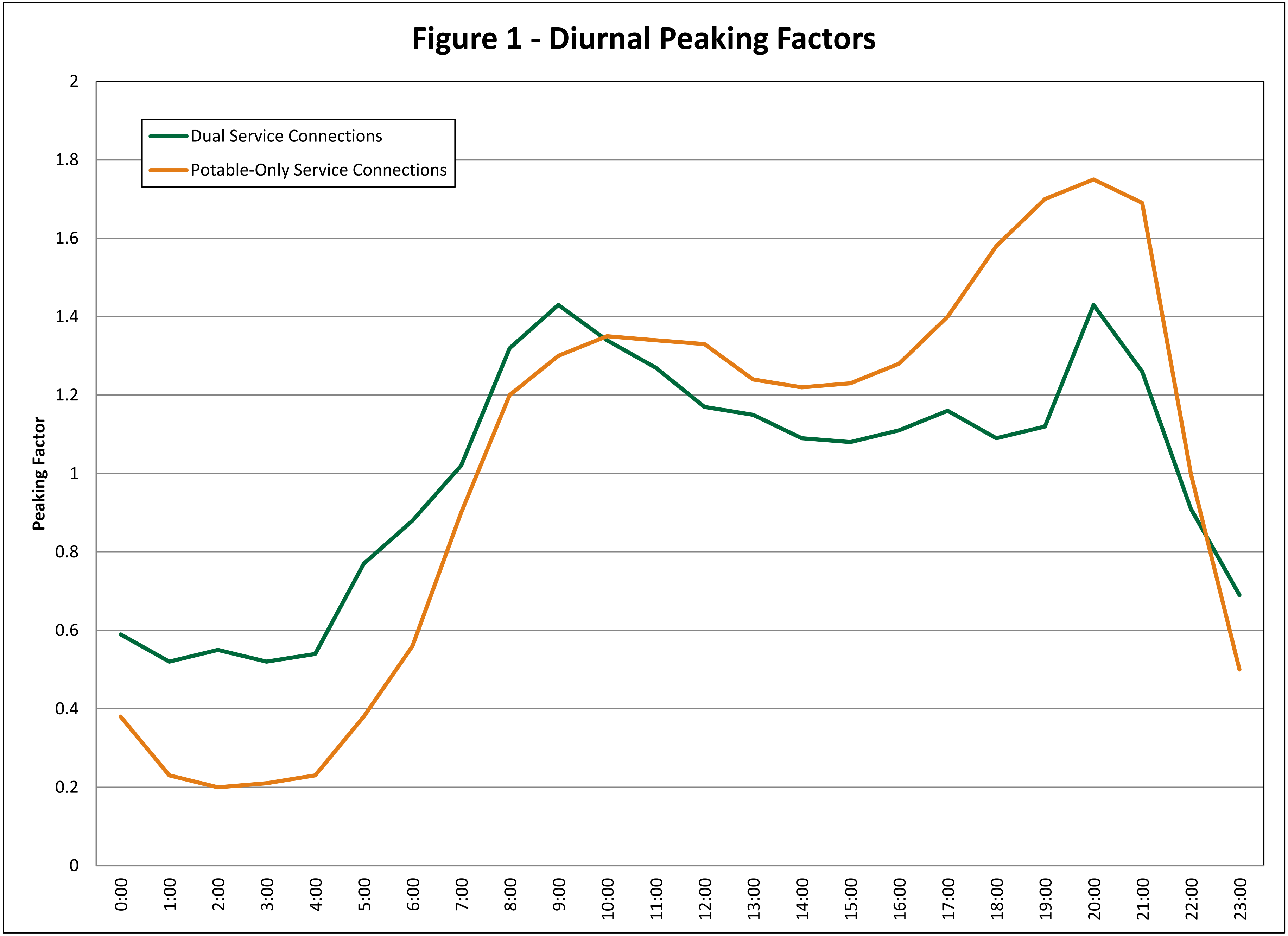


Figure 1 - Diurnal Peaking Factors
Dual Service Connections
Potable-Only Service Connections
Peaking Factor
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00

Figure 2 - Distribution Control Volumes

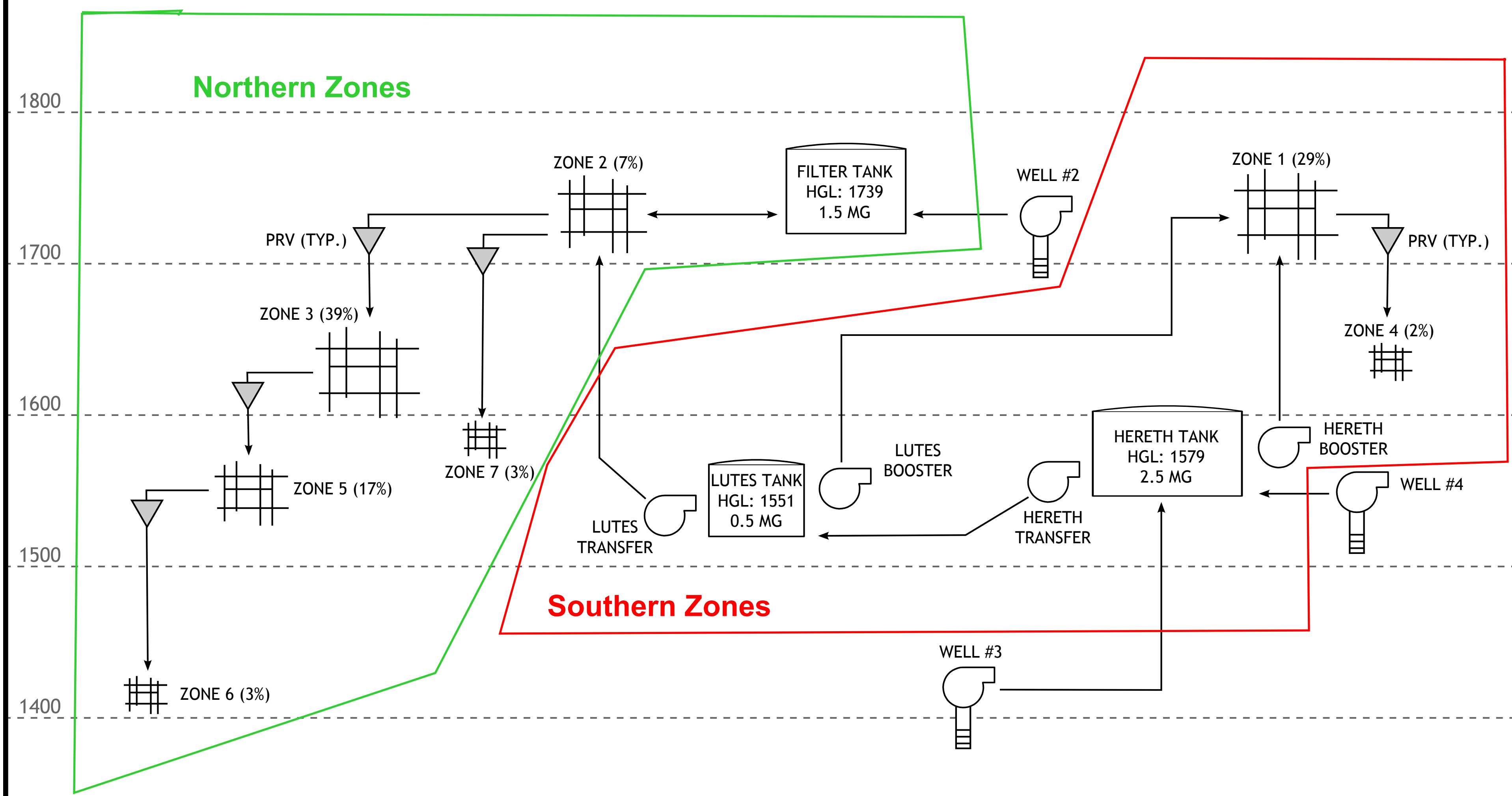
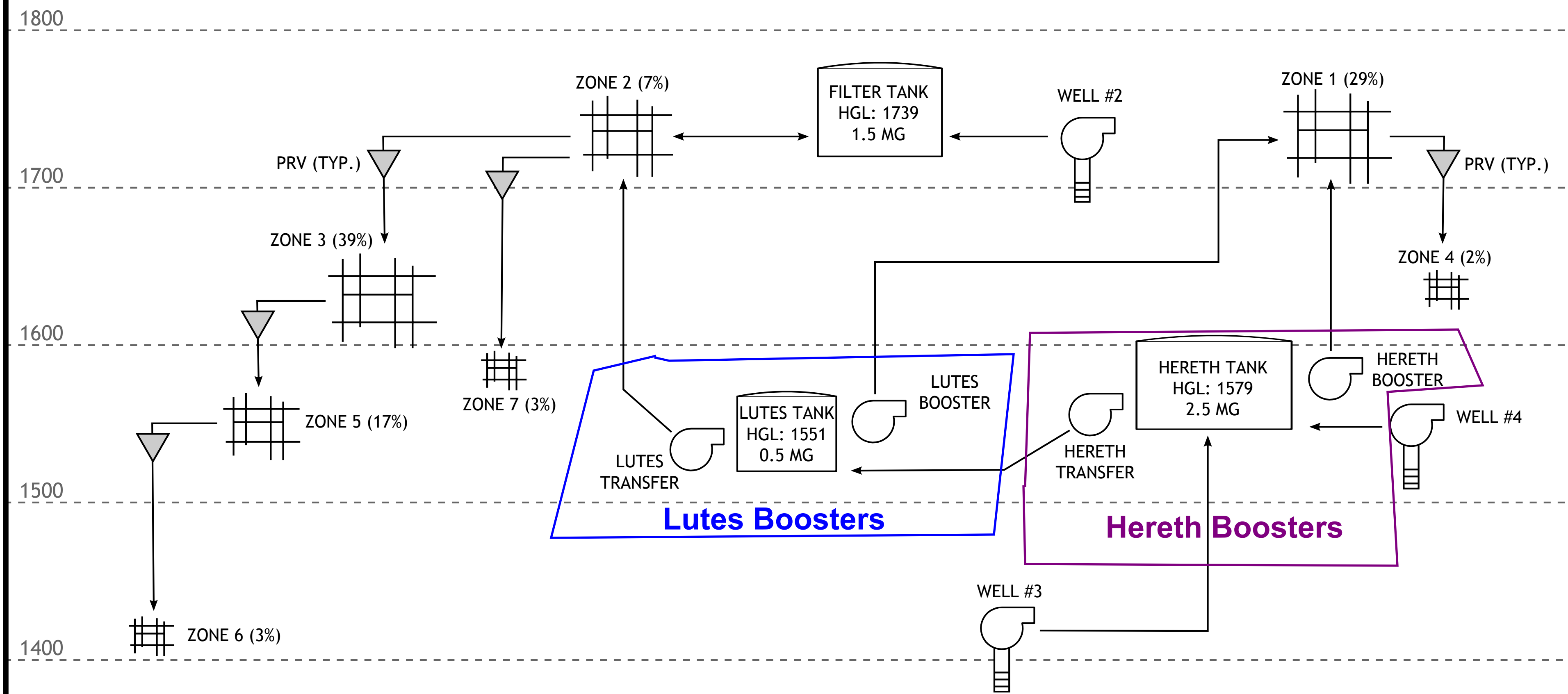


Figure 3 - Booster Control Volumes



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Appendix L – Power Cost Calculations

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J-U-B ENGINEERS, Inc.

1630 23rd Ave, Suite 1101-A
Lewiston, Idaho 83501
P: 208.746.9010
F: 208.746.9926

Client	**Lewiston Orchards Irrigation District**
Project Name	**Domestic Master Plan**
Project Number	21-07-001
By	Amy Uptmor
Task Description	Estimate savings loss of over-pumping to Zone 2 from Lutes Tank
Date	March, 2010

Equations

$\text{Power}(\gamma, Q, H) := \gamma \cdot Q \cdot H$ Power Equation

Input Values

$Q := 890\text{gpm}$	Estimated Flow From Wells No. 3 & No. 4 to serve Zones 3, 5, & 6
$H := 60\text{ft}$	Estimated Static Head Differential between Zones 2 and 3.
$\eta_p := 0.80$	Estimated Pump Efficiency of Lutes Transfer at operating point
$\eta_m := 0.80$	Estimated Motor Efficiency of Lutes Transfer
$\text{Electricity} := \dfrac{0.083\text{dollars}}{\text{kWh}}$	Estimated Electrical Cost per kilowatt-hour

Calculations

$$\text{Cost} := \frac{\text{Power}(\gamma, Q, H)}{\eta_p \cdot \eta_m} \cdot 1\text{yr} \cdot \text{Electricity} = 11443 \cdot \text{dollars}$$

Units

$gpm := \frac{gal}{min}$

$psi := \frac{lb}{in^2}$

$cfs := \frac{ft^3}{sec}$

$fps := \frac{ft}{sec}$

$gpd := \frac{gal}{day}$

$mgd := 10^6 \frac{gal}{day}$

$cy := yd^3$

$kWh := 1000W \cdot hr$

$dollars := 1$

Key

Input Values

Output Value

Check Value

Design constants

$\gamma := 62.4 \frac{lbf}{ft^3}$ Weight of Water

$\nu := 1.059 \cdot 10^{-5} \frac{ft^2}{sec}$ Kinematic Viscosity

$\rho := 1.94 \frac{slug}{ft^3}$ Mass of Water

Appendix M – Well No. 5 Location Report

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RHS Ralston Hydrologic Services, Inc.
GROUND WATER CONSULTING AND EDUCATION
1122 East B Street, Moscow, ID USA 83843
Voice and FAX 208-883-0533, E-mail ralston@moscow.com

LOCATION AND DESIGN OF WELL #5 FOR THE LEWISTON ORCHARDS IRRIGATION DISTRICT

Prepared for

J-U-B Engineers

Lewiston, Idaho

April 2010

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INTRODUCTION

Four deep wells have been drilled to provide domestic water for the Lewiston Orchards Irrigation District (LOID) located in Lewiston, Idaho (Figure 1). LOID provides a duel domestic and irrigation water supply for residents of the Orchards portion of the City of Lewiston. LOID #1 was drilled in 1978, was subsequently deepened and since has been taken out of production. LOID wells #2, #3 and #4 were drilled in 1986, 1997 and 2002 respectively. LOID #4 was drilled near the location of LOID #1. All of the wells obtain water from basalt that is part of the Columbia River Basalt Group.

The purpose of this report is to present information in support of the location and design of a new well (LOID #5) for the district. This report is divided into six sections: 1) Introduction, 2) Hydrogeologic setting, 3) Analysis of LOID wells and Lewiston well #6, 4) Analysis of alternative well locations, 5) Analysis of well design and construction options and 6) Conclusions and recommendations.

Information for this report has been drawn from published reports and maps, from LOID well operational data and from discussions with a number of individuals. The references of particular importance are the a report to Progressive Engineering Inc. that provides location and design information for LOID #4 (Ralston Hydrologic Services, 2001), an Idaho Geological Survey geologic map of the Lewiston area (Bush and Garwood, 2001), a draft report to Progressive Engineering Inc. that describes the construction of LOID #4 (Ralston Hydrologic Services, 2003) and a letter report to LOID that provides the results of pump testing of LOID #4 (Ralston Hydrologic Services, 2004).

HYDROGEOLOGIC SETTING

The LOID service area is located within the Lewiston Basin, which is a broad synclinal trough underlain to great depth by layers of basalt and sediments of the Columbia River Basalt Group (Figure 2). The Lewiston Hill is the northern boundary of the basin; this feature includes the steep northern flank of the syncline and several small faults. A northeast-southwest trending fault separates the basin from the uplifted Craig Mountain to the south. The structural basin is dominated by an east-west trending syncline that forms a shallow bowl. The confluence of the Snake and Clearwater Rivers is near the lowest portion of the structural basin.

The primary formations of interest within the Columbia River Basalt Group in the Lewiston Basin are the Saddle Mountains Formation, the Wanapum Formation and the Grande Ronde Formation. A geologic analysis of cutting samples from LOID well #4 resulted in the following stratigraphic interpretation.

Depth range in feet	Geologic Unit
0 to 423	Saddle Mountains Formation
423 to 456	Sweetwater Interbed
456 to 640	Priest Rapids Member of the Wanapum Formation
640 to 680	Vantage Interbed equivalent
680 to 1625	Grande Ronde Formation

The Grande Ronde Formation has been divided into four stratigraphic units based on residual magnetic polarity in the rock. From bottom to top these are R1 (Tgr1 – lower reversed polarity unit), N1 (Tgn1 – lower normal polarity unit), R2 and N2. The N2 unit is not present in the Lewiston basin. Outcrop areas for the remaining three units are shown on Figure 2. The R2 (Tgr2) unit outcrops along the lower reach of Lapwai Creek, and along the Clearwater River for some distance below the confluence with Lapwai Creek. Unit N1 (Tgn1) underlies R2 and outcrops along Sweetwater Creek, Lapwai Creek above the confluence with Sweetwater Creek and along the Clearwater River near and above the mouth of Lapwai Creek. The N1 (Tgr1) outcrops only along the Snake River south of Asotin and south of the Craig Mountain fault.

The regional ground-water flow system in the Grande Ronde Formation within the Lewiston basin has been well documented for much of the area (Cohen and Ralston, 1980). The dominant area of recharge for the regional ground-water flow system within the Grande Ronde Formation is believed to be located south of Asotin along the Snake River. Figure 2 shows the outcrop areas of the three units near the river. The northward dip of the rocks is greater than the gradient of the Snake River thus resulting in the three Grande Ronde units outcropping in the river with the lowest unit further south than the upper two units. The primary discharge area for the aquifer is believed to be west of Clarkston near Chief Timothy Park where the geologic structures that form the Lewiston grade cross the river.

All of the larger production wells in the Lewiston Basin penetrate and obtain ground water from basalt aquifers (water producing zones) within the Grande Ronde Formation. Most of the smaller yield private wells are shallower and are completed in either the Saddle Mountains or the Wanapum Formations. The general pattern is that ground-water levels decrease with greater well depth until the regional aquifer is penetrated; deeper wells have lower ground-water levels than shallow wells. Ground water is obtained from zones of fracturing located primarily at contacts between individual basalt flows. The total yield of a given well is the sum of the yields of each of the flow contact aquifers penetrated by the screened or open-hole portions of the well.

Information on a select number of the deep wells that penetrate and obtain ground water from the Grande Ronde Formation of the Columbia River Basalts is presented in Table 1. These include wells for LOID, the City of Lewiston and the Asotin County Public Utility District #1. Locations of the wells are shown on Figure 3. The majority of the wells listed in Table 1 obtain water from the regional aquifer in the Grande Ronde Formation. These wells all have ground-water levels approximately at the elevation of the Snake and Clearwater Rivers (660 to 720 feet). These wells include three for LOID, one for the City of Lewiston and four for the Asotin County Public Utility District (APUD). These wells penetrate to depths as great as about 1,200 feet below sea level. The static water levels in these wells are near the elevation of the Snake and Clearwater River because the regional aquifer within the Grande Ronde Formation is hydraulically connected to the Snake and probably the Clearwater River. Long-term water level decline has been minimal within the deep wells because of this hydraulic connection with the river system.

Table 1 Information on Selected Deep Wells in the Lewiston Basin								
Well No.	Discharge	Static Depth to Water	Pumping Depth to Water	Surface Elevation	Well Depth	Well Bottom Elevation	Specific Capacity	Water Level Elevation
	(gpm)	(ft)	(ft)	(ft)	(ft)	(ft)	(gpm/ft)	(ft)
APUD #1	2950	186	241	850	970	-120	54	664
APUD #5	2235	420	525	1147	1330	-183	21	727
APUD #6	3225	287	333	993	1069	-76	70	706
APUD #7	2900	450	567	1180	1340	-160	25	730
LOID #1		851		1554				703
LOID #2	500	501	900	1742	1957	-215	1	1241
LOID #3	660	695	1312	1419	2617	-1198	1	724
LOID #4	1100	847	870	1566	1625	-59	47	719
Lew #6	1330	565	572	1272	1793	-521	190	707
NPH PW	500	26	77	814	679	135	10	788
Schaub PW	1000	650	685	1461	1200	261	29	811
Round Up	264	190	353	1407	630	777	2	1217

Four of the wells listed in Table 1 have water-level elevations that are higher than the normal range for the regional aquifer. Well LOID #2 is almost 2,000 feet deep but has a water level elevation that is about 500 feet higher than wells that obtain water from the regional aquifer. The available information indicates that the aquifer that provides water for LOID #2 well is structurally isolated from the regional aquifer system to the west. The three other wells (NPH PW, Schaub PW and Round Up) are considerably shallower than the wells that penetrate the regional aquifer. The NPH PW and the Schaub PW have slightly higher ground-water elevations than the typical range for the regional aquifer in the Grande Ronde Formation. These wells may be hydraulically connected to the Clearwater River at a location east of the area shown on Figure 2. The Round Up 2009 well is deep enough to penetrate the top of the Grande Ronde Formation but not deep enough to intercept the regional aquifer. The water-level elevation in the Round Up 2009 well is about 500 feet higher than wells completed in the regional aquifer in the Grande Ronde Formation. This well likely is completed in a local aquifer within the top of the Grande Ronde Formation.

DESCRIPTION AND ANALYSIS OF LOID WELLS AND LEWISTON #6 WELL

The five deep wells that have been drilled in the Lewiston Orchards area include the four LOID wells plus Lewiston #6 (Figure 1). The legend on Figure 2 shows the stratigraphic completions (screened or open intervals) for the three LOID wells that are currently in use. LOID #2 is completed opposite the lower two units of the Grande Ronde Formation (R1 and N1). LOID #3 obtains water from all three of the units while LOID #4 obtains water only from the upper two of the units (N1 and R2). A similar geologic interpretation is not available for Lewiston #6. Information on each of the five wells is given below.

LOID #1

LOID #1 was drilled to a depth of 1,520 feet using a mud rotary rig in 1977 and then deepened to a total depth of 1,795 feet in 1982. According to the well drillers report, 16-inch diameter casing was installed from 0 to 1,003 feet with 8-inch diameter casing from 994 to 1,520 feet. The 8-inch diameter casing was slotted in the depth range of 994 to 1,496 feet. The portion of the well below 1,520 feet was left open hole.

The yield of the well when first drilled was much less than anticipated. The reduced well yield likely was a result of formation damage caused by the loss of drilling mud into the basalt fractures. The well was cleaned and deepened in an attempt to repair the formation damage and obtain a larger yield. A borehole television survey of LOID #1, taken in February 2001, shows the bottom of the first section of casing is at a depth of 990 feet. The top of the liner is at a depth of 1,240 feet with the bottom of the liner at a depth of 1,502 feet. The tape shows that the slots in the upper portion of the liner in well #1 are about 80 percent open. The slots at a depth of about 1,400 feet appear to be only about 40 to 50 percent open. The deeper slots (at about 1,430 feet) appear to be nearly completely plugged. The static water level is given at a depth of 827 feet, which gives a water level elevation of about 734 feet above sea level.

The discharge history of LOID #1 shows a decrease in well yield from about 800 gpm (gallons per minute) in the early 1980's to less than 400 gpm in the late 1990's. The well was taken out of service in July 1998. The low initial yield probably was caused by formation damage associated with drilling the well using a mud rotary rig. The decrease in yield likely was due to the gradual plugging of the slots in the casing in the depth interval from about 1,300 feet to about 1,500 feet.

LOID #2

LOID #2 was drilled using a mud rotary rig in 1986 to a total depth of 1,959 feet. According to the well drillers report, 16-inch diameter casing was installed from 0 to 520 feet with 14-inch diameter casing from 508 to 1,376 feet. The well was completed with 12-inch diameter open hole in the depth interval of 1,376 feet to 1,959 feet. The water producing zones noted on the log are in the depth interval of 1,606 to 1,959 feet.

A borehole television survey taken in September 2003 showed the bottom of the casing at 1,366 feet and the bottom of the well at 1,609 feet. Cory Baune of J-U-B Engineers (personal communication, 2009) indicated that a cable tool rig was used to clean out the bottom of LOID #2. However, problems occurred and a set of drilling tools were left in the well.

The yield characteristics of LOID #2 are as follows. The well was pumped at a rate of about 500 gpm for 3 hours on October 23, 2003. The maximum drawdown was about 401 feet (Figure 4). The specific capacity (discharge divided by drawdown) value for LOID #2 is about 1 gpm/ft (gallons per minute per foot of drawdown). The relatively low specific capacity of LOID #2 probably is a result of mud loss into the fractures during drilling.

The discharge history of LOID #2 shows a variation in discharge rate from about 600 to 800 gpm for most of the period of record. A higher discharge rate was recorded in 1987 shortly after the well was drilled. The reported discharge in 2009 is about 500 gpm. LOID #2 is pumped nearly continuously throughout the year. Insufficient water-level data are available to determine any long-term pattern to static water-level elevations.

LOID #3

LOID #3 was drilled in 1997 to a total depth of 2,617 feet using three different drilling techniques. An air rotary rig was used to construct the well from land surface to a depth of 120 feet. The depth interval from 120 feet to 1,035 feet was drilled using a direct mud rotary approach. The portion of the well from 1,035 feet to 2,617 feet was drilled using the reverse circulation mud method. According to the well drillers report, 16-inch diameter casing was installed from 0 to 1,020 feet with 14-inch diameter casing from 1,000 to 1,430 feet. The 14-inch diameter casing was perforated in the following depth intervals: 1,035 to 1,055 feet, 1,130 to 1,150 feet, 1,215 to 1,235 feet, 1,250 to 1,270 feet, and 1,375 to 1,395 feet. The portion of the well below 1,430 feet was left open hole.

A borehole television tape of well #3, obtained in September 1997 was difficult to interpret for the cased portion of the well because the water was cloudy. Use of the side view camera only showed perforations at a depth of 1,375 feet. No perforations could be seen using the side view camera at depths of 1,378 feet, 1,395 feet and 1,410 feet. The end of the casing could be seen at a depth of 1,440 feet.

The yield characteristics of LOID #3 are as follows. The well was pumped at a rate of about 660 gpm for about 8 hours on June 17, 2009 (Figure 5). The maximum drawdown was about 616 feet. The specific capacity value is approximately 1 gpm/ft.

LOID #4

LOID #4 was drilled in 2002 using an air rotary drilling rig to a total depth of 1,625 feet. According to the well drillers report, 20-inch diameter casing was installed from 0 to 457 feet, 18-inch diameter casing from 444 to 866 feet and 16-inch diameter casing and screen from 853 to 1,267 feet. Wire-wrapped well screen was installed in the depth intervals of 1,028 to 1,048 feet and 1,164 to 1,264 feet. The portion of the well below a depth of 1,267 feet was left open hole.

The yield characteristics of LOID #4 are excellent. The well was pumped at a rate of about 1,100 gpm for about 10 hours on June 17, 2009 (Figure 6). The maximum drawdown was about 23 feet. The specific capacity value is approximately 47 gpm/ft. The discharge and drawdown data show that LOID #4 is the most productive of the LOID wells.

The primary problem with LOID #4 is that the borehole has deviation/alignment issues. A submersible pump has been used in the well because pump suppliers would not guarantee the operation of a line-shaft turbine pump (Cory Baune, personal communication, 2009). Figure 7 shows the results of a deviation/alignment test conducted on LOID #4. Alternative approaches to avoid the deviation/alignment problem in the construction of LOID #5 is addressed a later section of the report.

The hydraulic connection of LOID #4 with LOID #1 and LOID #3, all completed in the regional aquifer, is evident based on water-level data from the three wells. Figure 8 shows water-level data from wells LOID #4 and LOID #1 for four days in June 2009 when LOID #4 was being pumped intermittently at a rate of about 1,100 gpm. The drawdown in the pumping well (LOID #4) was about 23 feet. LOID #1, located about 291 feet away, had a drawdown of about 13 feet. Figure 9 shows hydrographs for wells LOID #4 and LOID #3 for the same time period. Operation of LOID #4 caused about 0.6 feet of drawdown in LOID #3 which is located about 5,916 feet away.

Lewiston #6

Lewiston well #6 was drilled in 1995 and deepened in 1998, in both cases using an air rotary drilling rig. According to the well drillers report, 16-inch diameter casing was installed from 0 to 638 feet, with 14-inch diameter casing from 625 to 990 feet. None of the casing is perforated. The well is completed open hole below a depth of 990 feet.

Prior to deepening, the well had a reported yield of 1,500 gpm with about 400 feet of drawdown. However, the yield was much lower when a pump was installed in the well approximately six months later. Lowell Cutshaw (personal communication, 2009) indicated that the decrease in well yield likely was caused by problems associated with grouting the casing in the upper portion of the well. The well was then deepened from about 1,430 feet to 1,794 feet. The reported yield after deepening was 1,330 gpm with 7 feet of drawdown. Dave Six (personal communication, 2009) indicated that pumping of other wells in the area including an Asotin PUD well in Clarkston, causes a water-level change in Lewiston #6.

ANALYSIS OF ALTERNATIVE WELL LOCATIONS

Well Location Criteria

The location criteria for a new LOID well are as follows: 1) LOID #5 should penetrate the regional aquifer within the Grande Ronde Formation; 2) well inference from existing LOID or other production wells should be minimized; 3) to the extent possible, a lower elevation drill site should be selected minimize the static depth to water and likely the well depth; 4) the drill site should accommodate well construction issues such as water supply, waste water disposal and noise; and 5) the well location be compatible with the LOID storage and distribution system. The well location criteria except for LOID storage and distribution are discussed in the following paragraphs.

The regional aquifer underlies the western portion of the LOID service area. The eastern boundary of the regional aquifer exists between LOID #4 and LOID #2 but the exact location is not known. The northern boundary of the regional aquifer is approximately the Clearwater River. The southern aquifer boundary is not known but likely is south of the Tammany area. The aquifer extends to the west into the State of Washington. The yield characteristics of the new well completed in regional aquifer should be good if formation damage caused by drilling is minimized. The yield obtained by the new well will depend upon the number of basalt flow contact zones that are penetrated by the well as the fracture characteristics of each zone. The new LOID well drilled at any location within the regional aquifer should have a specific capacity that exceeds 20 gpm/ft. As is shown on Table 1, the specific capacity of many of the wells that penetrate the regional aquifer exceeds 40 gpm/ft.

Some well interference (water-level decline caused by operation of another production well) will occur regardless of where LOID #5 is located within the regional aquifer. The amount of well interference that occurs between wells depends on the distance between wells, the aquifer characteristics and the individual pumping rates. The available information indicates that well interference should be less than 20 feet if the new well is located at least 400 to 500 feet away from another production well. This means that LOID #5 should not cause more than 20 feet of drawdown on another well. It also means that another production well should not cause more than about 20 feet of drawdown in the new LOID well.

Location of the new LOID well at a lower elevation drilling site will result in lower well construction costs. The pump chamber casing would not need to extend as deep because the ground-water level would be closer to land surface. A difference in surface elevation of 100 to 150 feet is possible within the general LOID service area.

Issues associated with well construction are important relative to selection of a drilling site. The drilling site needs to be large enough to accommodate the drilling rig, support equipment, a waste-water control pond and must have a means to dispose of water generated during drilling. The discharge amount during drilling can exceed several thousand gallons per minute if a direct air rotary rig is used. The site also needs to have a water supply source for drilling operations. The distance to homes and businesses need to be sufficient to allow drilling to occur without exceeding noise restrictions.

Four alternative well locations were selected for evaluation in consultation with Cory Baune of J-U-B Engineers (personal communication, 2008 and 2009). The locations are shown on Figure 9. The locations were selected based on proximity to the LOID storage and distribution system, land availability and suitability for well construction. The Site A is the easternmost of the potential drilling areas and is located slightly east of midway between LOID #2 and LOID #4. Site B is near the intersection of Grelle Avenue and 19th Street and is northwest of LOID #4. Site C is in Hereth Park where LOID #4 and LOID #1 are located. Site D is located about two miles west of LOID #4 near the east end of the airport. The following sections of the report present evaluations of the four areas based on the well location criteria of penetration of the regional aquifer, potential interference with existing production wells and drill site elevation. The site evaluations pertain to larger portions of the Lewiston Orchards area than the immediate areas shown on Figure 9.

Analysis of Area A

Area A is located about slightly east of midpoint between wells LOID #4 and LOID #2 at a land surface elevation of about 1,580 feet. The primary disadvantage of Area A is the low probability of penetrating the regional aquifer. The location and nature of the hydraulic boundary between the ground-water system penetrated by LOID #2 and the regional aquifer are not known. Construction of a new LOID well east of the hydraulic boundary is not recommended because of possible interference with LOID #2 and the potential for long-term water-level decline. Area A is more than a mile from LOID #2 and LOID #4 so well interference should not be significant. The land elevation of Area A is similar to both Area B and Area C. ***LOID well #5 should not be located in Area A because of the low probability of penetrating the regional aquifer.***

Analysis of Area B

Area B is located about one mile northeast of LOID #4 and about one mile southeast of LOID #3 at a land elevation of about 1,570 feet. The primary disadvantage of Area B is the moderate potential of penetrating the regional aquifer. Well interference should not be a major problem because of the distances to LOID #3 and LOID #4. ***Area B is a better choice for a new well than Area A but not as good as either Area C or Area D.***

Analysis of Area C

The third well location alternative is to place the new LOID well within Hereth Park where LOID #1 and LOID #4 are located. The land elevation is about 1,560 feet. The primary advantage of Area C is the certainty that the new well would penetrate the regional aquifer. The primary disadvantage of Area C is the potential well interference between LOID #5 and LOID #4. Operation of LOID #4 at a rate of about 1,100 gpm resulted in 23 feet of drawdown in the pumping well and about 13 feet of drawdown 291 feet away in LOID #1. Thus, the drawdown in LOID #5 from the operation of LOID #4 probably will be in the range of 10 to 20 feet at any location in the park as long as the wells are located 300 or more feet apart. This amount of mutual interference between wells will not be a major problem is there is sufficient available drawdown (distance between the static water level and the top of the pump) in each well. For example, the difference between the depth to the pump in LOID #4 (about 1,015 feet according to Amy Uptmor, personal communication, 2009) and the pumping depth to water (about 870 feet) is sufficient to accommodate 10 to 20 feet of additional drawdown associated with the operation of LOID #5. ***Area C is a much better choice for location of a new well than either Area A or Area B.***

Analysis of Area D

The fourth alternative is to place the new well about two miles west of LOID #4 near the east end of the airport. The land elevation is about 1,460 feet. The closest production well is Lewiston #6 at slightly more than one mile. The primary advantage of Area D is that the well drilled would penetrate the regional aquifer system. A secondary advantage is that there would be less interference with existing production wells than area C. ***Area D has a land surface elevation about 100 feet lower than Area C which would result a reduced static depth to water and probably reduced well construction costs. Area D is a much better choice for location of a new well than either Area A or Area B.***

Discussion of Well Location Analysis

Of the four sites selected for well location analysis, Area C and Area D are clearly better choices than Area A or Area B. Well interference problems would be less in Area D than in Area C. Also, the static depth to water should be about 100 feet less in Area D than in Area C. These two factors would favor Area D over Area C for the location of LOID #5. Other sites located west of LOID #4 would have the same advantages as Areas

D and C. Final selection of the well location will depend on factors such as land availability and the compatibility with the LOID storage and distribution system.

ANALYSIS OF WELL DESIGN AND CONSTRUCTION OPTIONS

General Considerations

The design and construction of LOID #4 was successful in every way except for the deviation/alignment problem described above. Thus, the experience gained from construction of LOID #4 can be used to guide construction of LOID #5. The steps involved in construction of the LOID #4 in 2002 using an air rotary rig are outlined below (Ralston Hydrologic Services, 2003, page 2).

- A 24-inch diameter hole was drilled to a depth of 265 feet using direct air rotary techniques.
- A 20-inch diameter hole was drilled to a depth of 457 feet using duel rotary, reverse air techniques. A rotary table was used to advance 20-inch casing to 457 feet. The open portion of the annual space, from about 265 feet to land surface, was grouted using a tremie pipe.
- A 20-inch diameter open hole was drilled to 866 feet. Because of water and borehole instability problems, the hole was filled with grout back to 700 feet. The grout was then drilled out to a depth of 866 feet.
- Eighteen-inch diameter casing was placed in the well from 444 feet to 866 feet. The casing was placed into grout in the bottom of the well. This resulted in a grout seal around the bottom of the 18-inch casing in the depth range of 856 to 866 feet.
- An 18-inch diameter open hole was drilled to 1,266 feet. Water producing zones were identified during drilling. Injection tests were run to investigate the productivity of the producing zones.
- A 12-inch diameter open hole was drilled to 1,417 feet with a 10-inch open hole from 1,417 to 1,625 feet. Additional injection tests were run.
- A borehole television log was obtained of the well. The log was used to refine identification of the water-producing zones. As part of the survey, a rock was found to have blocked the hole at a depth of 1,460 feet.
- The rock was removed and the well was cleaned to total depth.
- The 16-inch screen and casing assembly was placed in the hole in the depth range of 853 feet to 1,267 feet. The screened intervals were from 1,029 to 1,049 feet and 1,164 to 1,266 feet.
- The well was developed using air surging and then capped. The drilling equipment was removed from the site.
- A final injection test was run on the completed well.
- An additional borehole television log of the well was run.
- An aquifer test was conducted on the well in 2003.

The submersible pump that was installed in LOID #4 is housed in the 16-inch diameter casing at a depth of about 1,015 feet. The maximum diameter of the submersible pump assembly (motor, bowls and screen) is 13 inches.

Selection of a Drilling Technology

The experience gained from the construction of deep wells in the Lewiston Basin indicates that construction of LOID #5 in the water producing zones within the regional aquifer should be should be accomplished using an air rotary drilling rig. Well construction in the production zones using a mud rotary rig is not recommended because of extensive formation damage caused by mud losses into fracture zones in the basalt. Use of a cable tool rig is not favored because of the slow rate of drilling. Variations of air rotary drilling technology likely would be used to construct LOID #5. These variations include the use of a down-hole hammer, reserve versus direct air drilling and the use of a dual rotary drilling rig (allows rotation of the casing to aid in casing advancement).

The combined use of mud rotary and air rotary drilling technologies may provide advantages for the construction of LOID #5. The upper portion of the well (down to the bottom of the surface seal and likely the bottom of the pump chamber casing) could be constructed using a mud rotary rig. The rig would then be switched to air rotary for penetration of the regional aquifer.

The reason for possibly using mud rotary drilling for the upper portion of LOID #5 is related to the geologic section to be penetrated by the well. The geologic information from LOID #4 and Lewiston #6 (wells closest to drill sites C and D) both show the presence of unstable or caving zones in the upper portion of the geologic section. A sedimentary interbed is in the depth interval of 423 to 456 feet in LOID #4 and in the depth interval of 484 to 510 feet in Lewiston #6. An additional sedimentary zone is present in LOID #4 in the depth interval of 640 to 680 feet. A mud rotary rig could be used to drill through these unstable zones without having to install additional casing (such as the 18-inch casing installed in LOID #4). In any event, the lower portion of LOID #5 would be drilled using air rotary techniques to minimize formation damage to the water producing zones.

Well Design Components

The primary components of a production well are the surface seal (required to prevent contaminants from surface from entering the aquifer), the pump chamber casing (diameter and depth necessary to house the pump) and the lower portion of the well which penetrates into the aquifer (diameter based on desired yield and depth based on aquifer characteristics). The lower portion of the well may be cased with screen sections or may remain open hole if the borehole is stable. The method(s) of drilling and the steps of construction are selected based on the hydrogeologic conditions and the desired well yield.

Surface Seal

The surface seal for LOID #5 must prevent the migration of surface contaminants into the ground water and also limit the hydraulic interconnection of shallower aquifers that have much higher water-level elevations and the regional aquifer. The seal must be a minimum thickness of 2 inches (i.e. between a 24-inch diameter borehole and a 20-inch diameter casing). LOID #4 has a grout surface seal to a depth of 265 feet. An additional grout seal was placed around the bottom of the string of 18-inch diameter casing in the depth interval of 856 to 866 feet. According the well driller's report, Lewiston #6 has a grout seal around 16-inch diameter casing to a depth of 670 feet. Tom Moore of the Idaho Department of Environmental Quality (personal communication, 2009) indicated that by regulation the seal must extend to a minimum depth of 58 feet. He also indicated that the surface seal should extend to a sufficient depth to prevent water movement from overlying aquifers to the regional aquifer.

As an initial design decision, the surface seal for LOID #5 shall extend to a minimum depth of 700 feet. It may be logical to place the surface seal to the bottom of the pump chamber casing (about 1,200 feet) if a mud rotary rig is used for construction of the upper portion of the well.

Pump Chamber Casing

The target yield of the well provides the basis for selection of the diameter of the pump chamber casing to be used in the well. The **Ground Water Manual** (U.S. Bureau of Reclamation, 1995, page 430) presents recommended diameters for pump chamber casing based on the use of a line-shaft turbine pump. Based on a target yield of 2,000 gpm, the design diameter of the pump chamber casing should be 16 to 20 inches. However, the design table from the **Ground Water Manual** may not be valid for LOID #5 because of the great depth to water and the potential need for a submersible pump. The selection of the pump chamber diameter needs to be done after an analysis of potential pump configurations.

The depth of the pump chamber casing is selected based on the target maximum anticipated depth of setting for the pump. The pump depth generally is selected based on the sum of the static depth to water plus the maximum anticipated drawdown plus a safety factor. As an example, the 16-inch diameter pump chamber in LOID #4 extends to a depth of about 1,028 feet (top of the uppermost screened interval). LOID #4 has a static depth to water of about 847 feet and a drawdown at 23 feet at a discharge rate of about 1,100 gpm. The pump in LOID #4 was set at a depth of about 1,015 feet, about 13 feet above the top of the uppermost screen section. The producing interval in the depth interval of 1,028 to 1,048 feet was selected to be screened in LOID #4 based on the presumption that the available drawdown (distance from the top of the screen to the static water level) was sufficient to accommodate drawdown from well operation, drawdown from operation of other wells plus a safety factor. During well operation, the pump in LOID #4 is located about 145 feet below the pumping water level.

As an initial design decision, the pump chamber depth in LOID #5 will be selected to be about 150 feet below the static depth to water in the well. Assuming a specific capacity value of 20 gpm/ft, about 100 feet of drawdown would occur at a pumping rate of 2,000 gpm. A pump setting of 150 feet below the static water level would accommodate some well interference effects and leave a factor of safety.

Other Casing

More than one string of casing likely will be required in the upper portion of LOID #5 if the entire well is constructed using an air rotary rig. Several caving zones were encountered during the construction of LOID #4 (Area C locale). A duel-rotary rig was used to place 20-inch diameter casing in the depth interval of 265 to 457 feet in this portion of the borehole. Also, cement grout was pumped into the borehole to stabilize the well in the depth range of about 700 to 866 feet. There are indications of borehole instability on the well driller's report for Lewiston #6 at several depths (Area D locale).

The depth range of 300 to 420 is logged as "clay, sand and broken basalt" and "white sand and sand and broken basalt" is logged in the depth interval of 484 to 510 feet. Lewiston #6 includes 16-inch diameter casing to a depth of 638 feet and 14-inch diameter casing from 625 feet to 990 feet.

Drilling the upper portion of LOID #5 with a mud rotary rig will allow construction of the well without an additional string of casing. The surface seal would be placed around the pump chamber casing. The well construction could consist of construction of a borehole to the anticipated depth of the pump chamber (about 150 feet below the static water level). The borehole would be 24 inches in diameter if a 20-inch diameter pump chamber is used. The surface seal could extend to the full depth of the pump chamber casing or be terminated at a shallower depth if desired.

The well specifications could be prepared to include only the desired depth and diameter of pump chamber casing and the minimum depth of the surface seal. The drilling firms would be requested to describe how the well will be constructed (mud or air rotary) and any associated strings of casing. In this case, the bid documents would specify that the pump chamber would extend to a depth of about 150 feet below the static water level. The bid documents would also specify that the minimum surface seal depth would be 700 feet.

Depth and Diameter of Well Screen and/or Open Hole

The diameter of the borehole below the bottom of the pump chamber casing can be considerably smaller than the pump chamber casing since does not need to be sized to accommodate the pump. The purpose of the lower portion of the well is to provide entry of water into the borehole and serve as a transmission line up to the pump. The **Ground Water Manual** (U.S. Bureau of Land Management, page 446) provides the following recommendations for minimum screen (or open hole) diameter based on desired well yield: 1) 10-inch diameter for 800 to 1,400 gpm; and 2) 12-inch diameter for 1,400 to 2,500 gpm.

LOID #4 was constructed with an 18-inch diameter borehole and a 16-inch diameter casing and screen section to a depth of 1,267 feet. A 12-inch diameter open hole was drilled to a depth of 1,417 feet with a 10-inch diameter open hole drilled to a depth of 1,625 feet. The 16-inch diameter casing/screen assembly was installed to a depth of 1,267 feet so the pump could be set deeper if required at some time in the future. The portion of the borehole below 1,267 feet was not cased and screened and was drilled at a smaller diameter in an effort to reduce well construction costs.

As an initial design condition, the lower portion of LOID #5 will have casing and screen that is the same diameter as the pump chamber casing in the depth interval from about 150 feet to 300 feet below the static water level. The deeper portion of the well will be drilled and completed with a 12-inch diameter open hole unless unstable borehole conditions are encountered.

Specific Drilling Requirements

The borehole plumbness and alignment is a special problem that must be addressed in the design and construction of LOID #5. A typical approach is to require testing of plumbness and alignment by the procedure described in the American Water

Works Association publication entitled **AWWA Standard for Water Wells** (American Water Works Association, 1998). This AWWA testing procedure should be included in the well design package for LOID #5.

The causes and potential solutions for borehole deviation and alignment problems were discussed with three individuals with a broad background in well construction (Adcock, 2009; Hiddleston, 2009 and Stadeli, 2009). Adcock (2009) and Hiddleston (2009) believe that proper stabilization of the drilling bit should eliminate the deviation and alignment problems encountered in LOID #4. The weight being applied to the bit during drilling operations is also a factor in deviation and alignment problems. Gerald Adcock (personal communication, 2009) volunteered to develop a draft specification pertaining to bit stabilization that could be included in the well design package for LOID #5. The draft specification would be provided to Ron Hiddleston and Robert Stadeli for their review and comments. Adcock (2009) recommended using devises to measure the weight applied to the bit during drilling. A Geolograph can be used to document both the weight applied on the bit and the penetration rate during drilling operations. Use of a Geolograph or similar device on the drilling rig for LOID #5 can be included in the well design package.

Several different types of gyroscope tools are available to determine borehole inclination and azimuth in wells. Use of such a tool within the drill steel at various times during the project (one-third depth intervals) would provide a check on borehole deviation and alignment (Hiddleston, 2009). Use of this type of testing procedure could be included in the well design package.

CONCLUSIONS AND RECOMMENDATIONS

The regional aquifer in the Lewiston Basin should be the target for construction of LOID #5. The regional aquifer is known to exist under the western portion of the LOID service area and extend into the Washington portion of the basin. The LOID #2 well is completed in an aquifer that is hydraulically isolated from the regional aquifer. Thus, the eastern boundary of the regional aquifer is located at an undisclosed site east of LOID #4 and west of LOID #2. The specific location and geologic characteristics of the eastern boundary of the regional aquifer are not known.

The western two of the four potential locations included in the analysis (Areas C and D) would be suitable sites for LOID #5. The new LOID well should not be located in Areas A and B because of the uncertainty of whether the new well would penetrate the regional aquifer. Areas C and D and any other well site location near or west of LOID #4 are suitable for construction of LOID #5. Area D is ranked slightly above Area C because this site is at lower elevation which translates to a smaller static depth to water and likely a shallower drilled well. Area D also has a lower potential for well interference because it is located a greater distance than Area C from other major producing wells.

The lower portion of LOID #5 (below the pump chamber casing) should be constructed using an air rotary drilling rig and not a mud rotary rig. Several variations on air rotary drilling may be used for the well including down-hole hammer, dual rotary and/or reverse air rotary. The upper portion of the well (above the bottom of the pump chamber casing) can be constructed with either mud rotary or air rotary drilling technology.

The key components of the design for LOID #5 are a surface seal (minimum depth of about 700 feet) and the pump chamber depth (about 150 feet below the static water level) and pump chamber diameter. Selection of the diameter of the pump chamber casing would be based on additional information relative to pump design alternatives. Construction of the upper portion of the well using an air rotary rig likely would require an additional string of casing (at least one pipe size larger than the pump chamber casing). Construction of the upper portion of the well using a mud rotary rig might be accomplished without the additional string of casing.

Deviation/alignment problems within the new well should be addressed by the application of standards coupled with testing during well construction. The AWWA procedures (American Water Works Association, 1998) should be required along with application of gyroscopic surveys at various points during the construction project. The drilling guidelines might include specifications related to drill bit stabilization and the weight applied to the bit during drilling.

The well design, casing diameters and depths and drilling methods should be reevaluated once a final well site is selected. The additional evaluation would be based on site-specific conditions.

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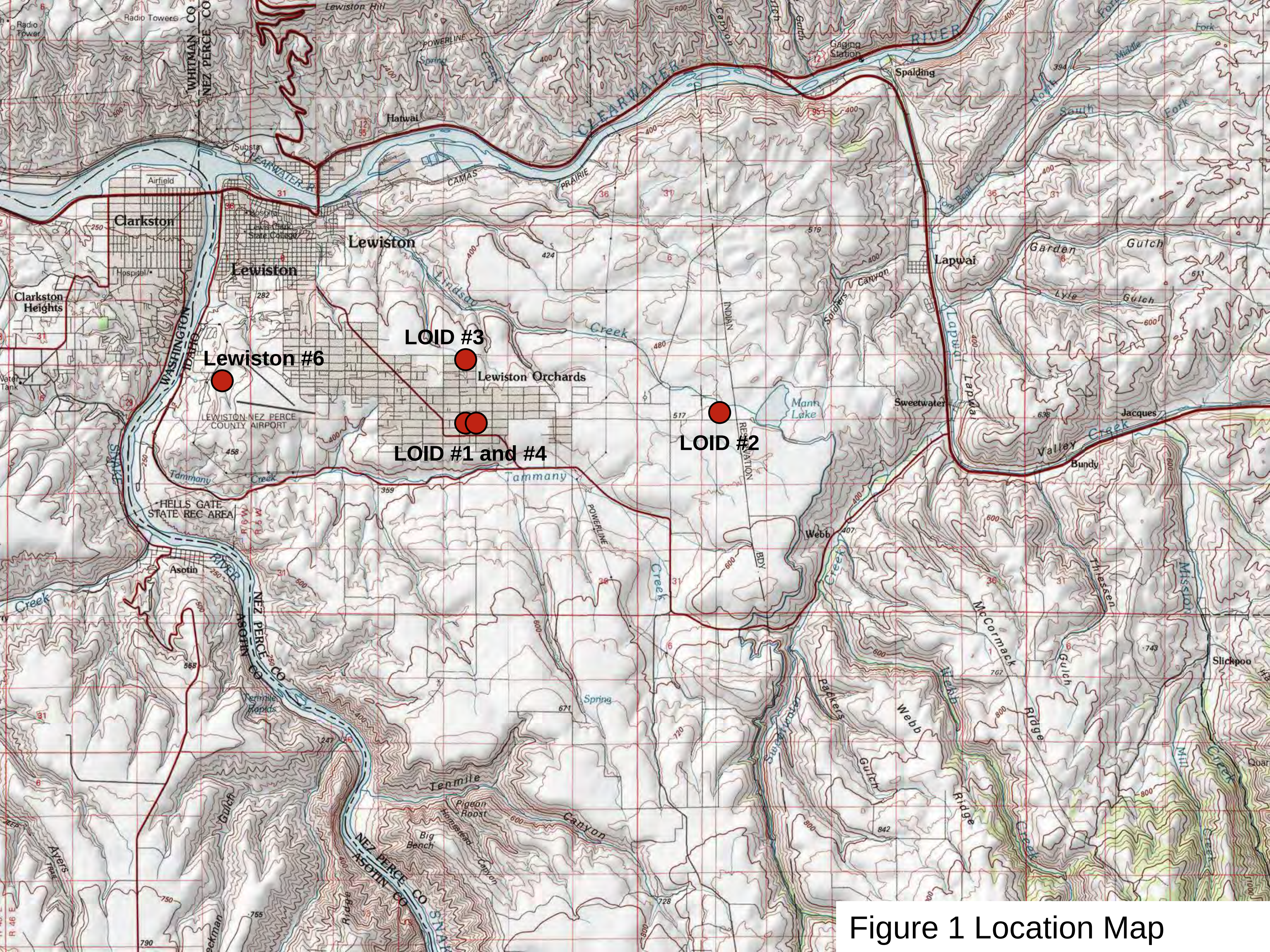


Figure 1 Location Map

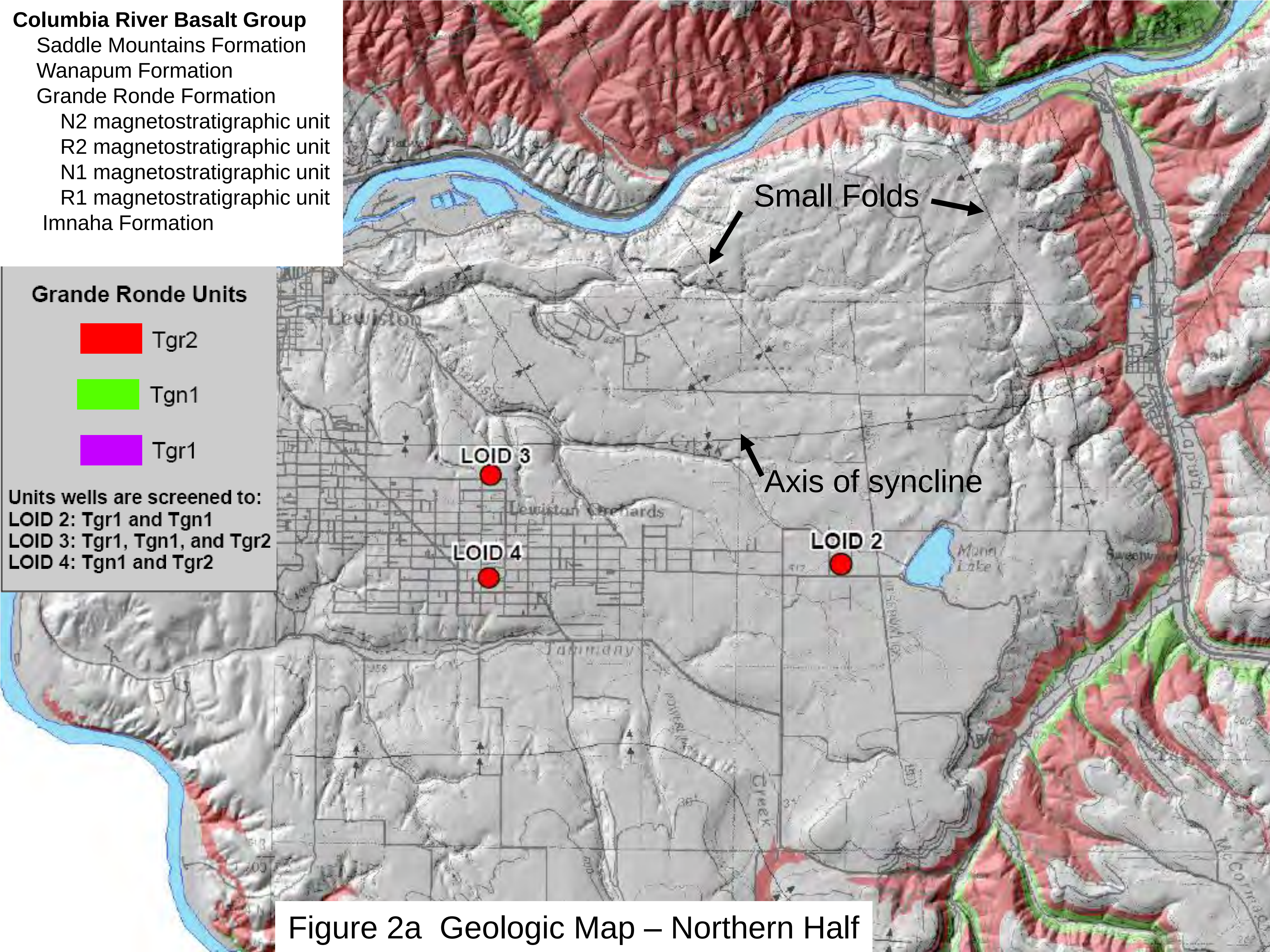


Figure 2a Geologic Map – Northern Half

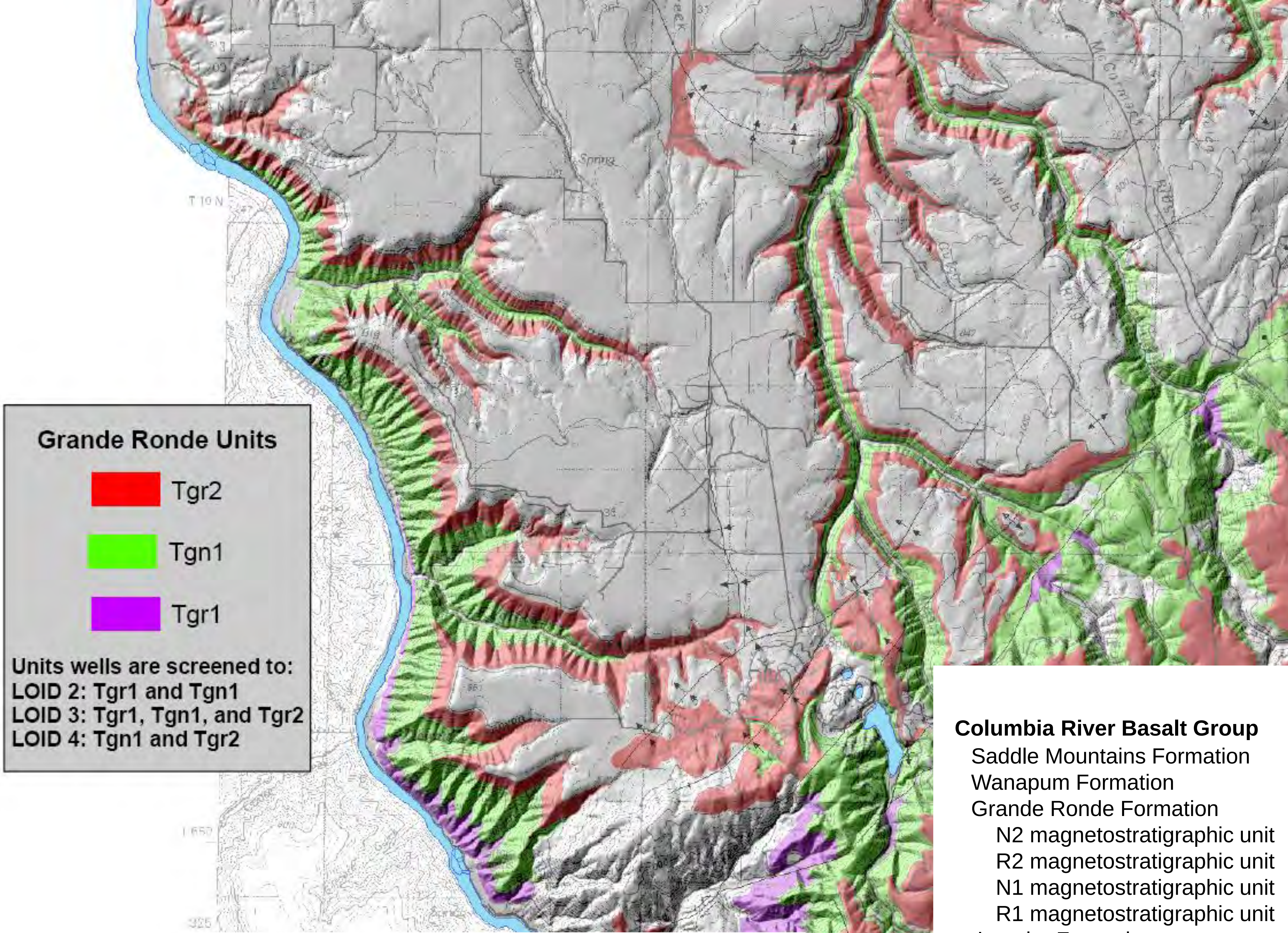
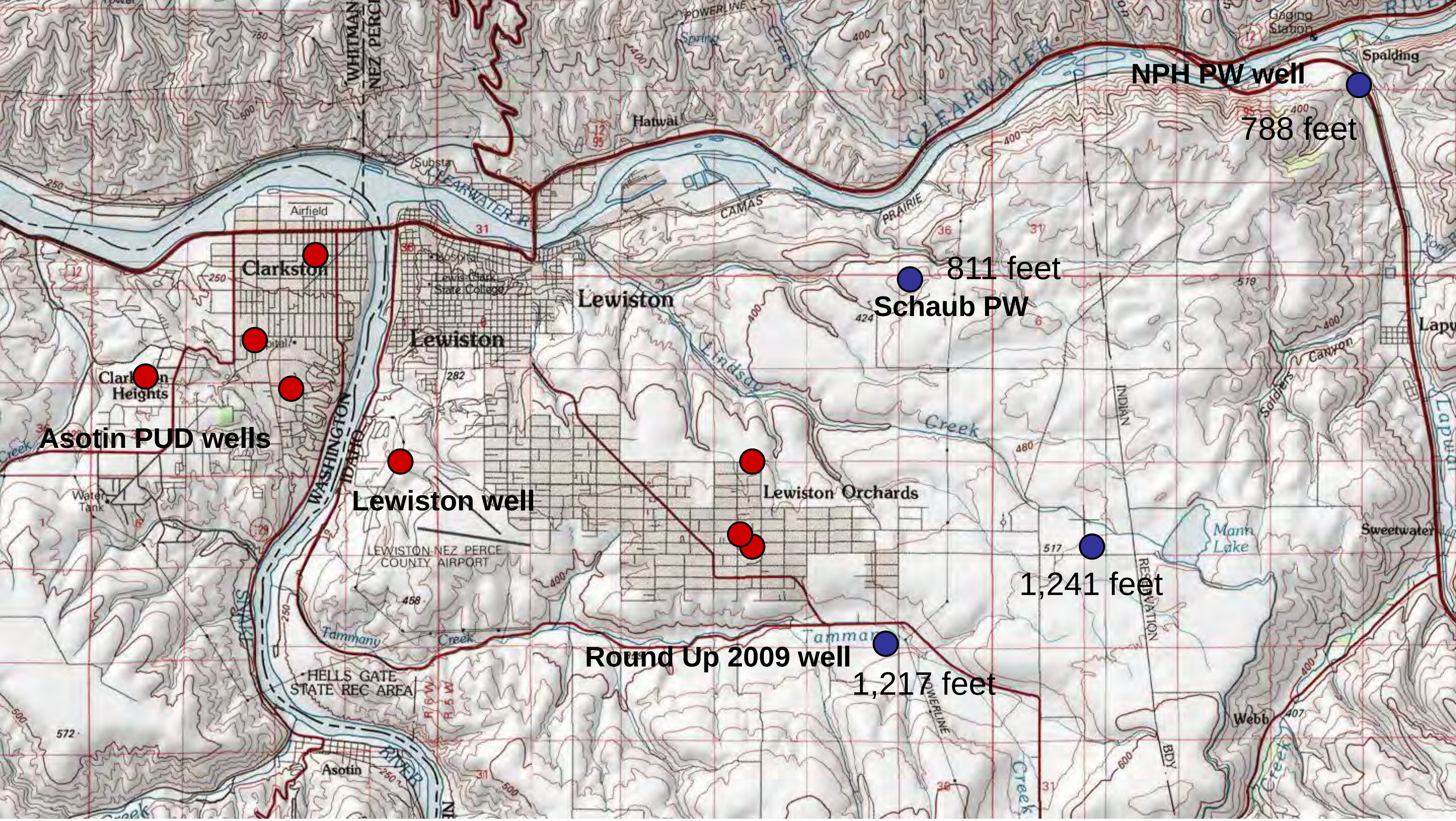


Figure 2b Geologic Map – Southern Half



Wells with water-level elevations ranging from 660 to 720 feet

Wells with water-level elevations higher than 720 feet

Figure 3 Locations of Selected Deep Wells in the Lewiston Basin

Figure 3 LOID Well #2 Aquifer Test on October 23, 2003

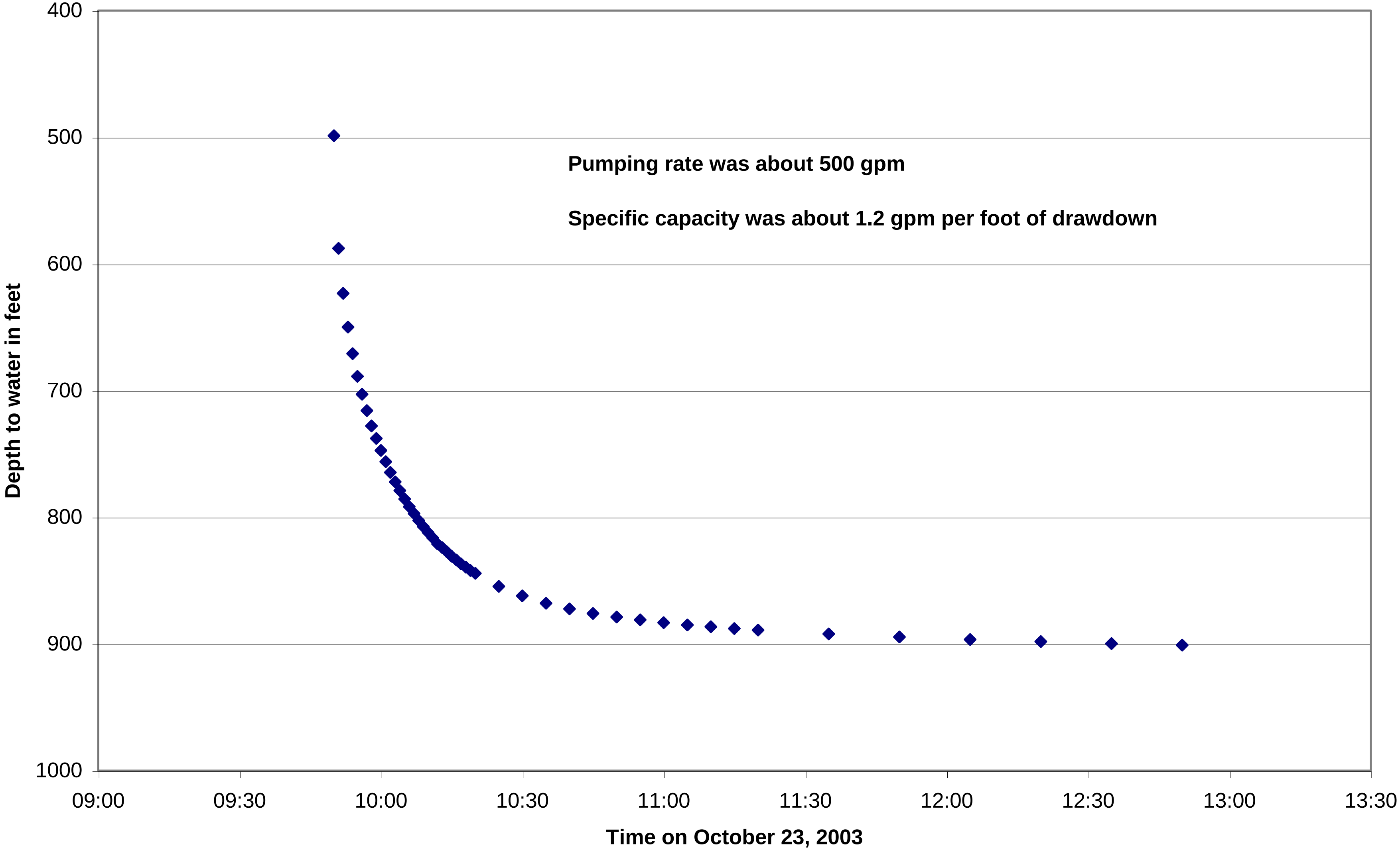


Figure 4 Water-Level Data for LOID Well #2

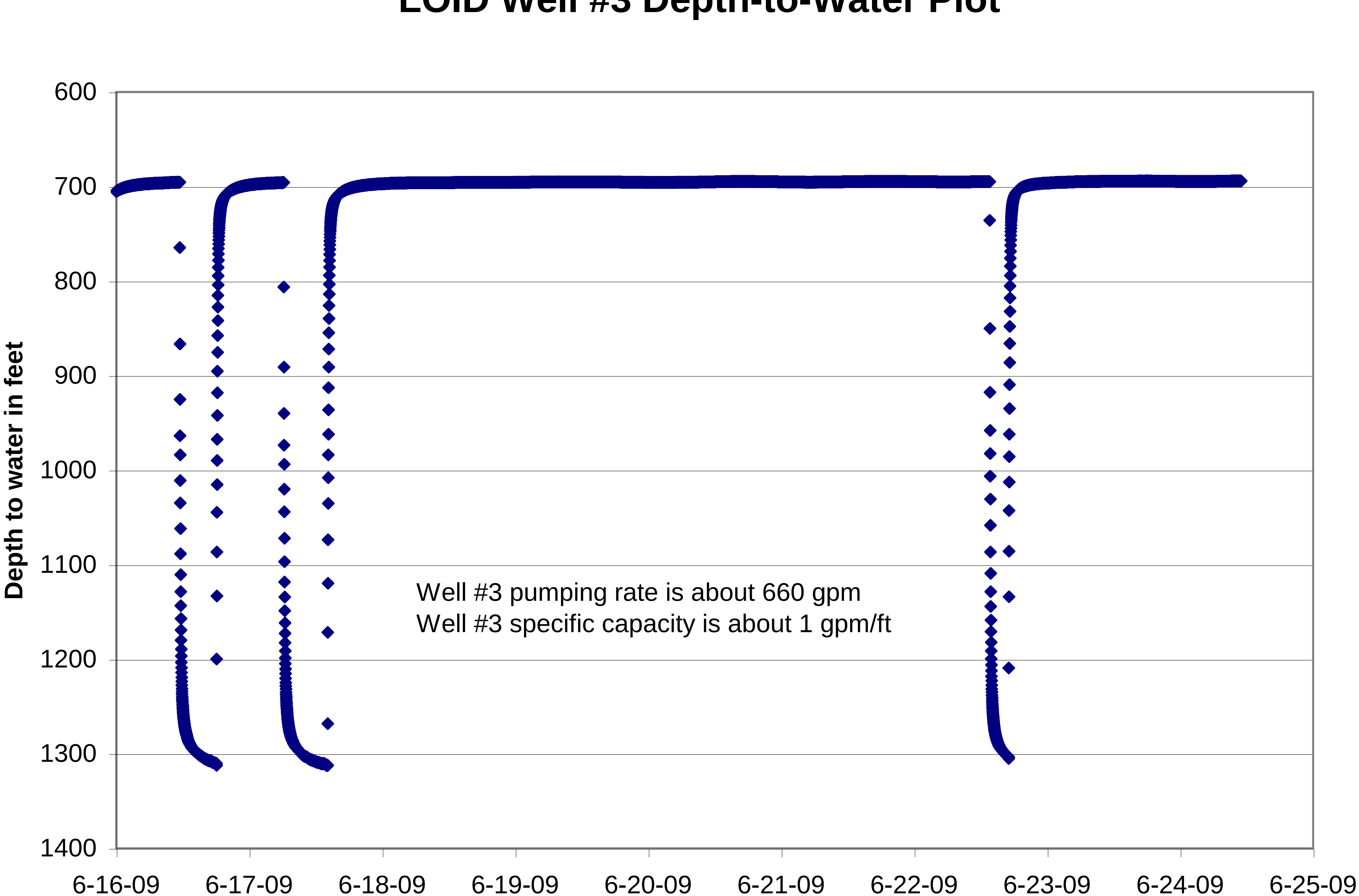


Figure 5 Water-Level Data for LOID Well #3

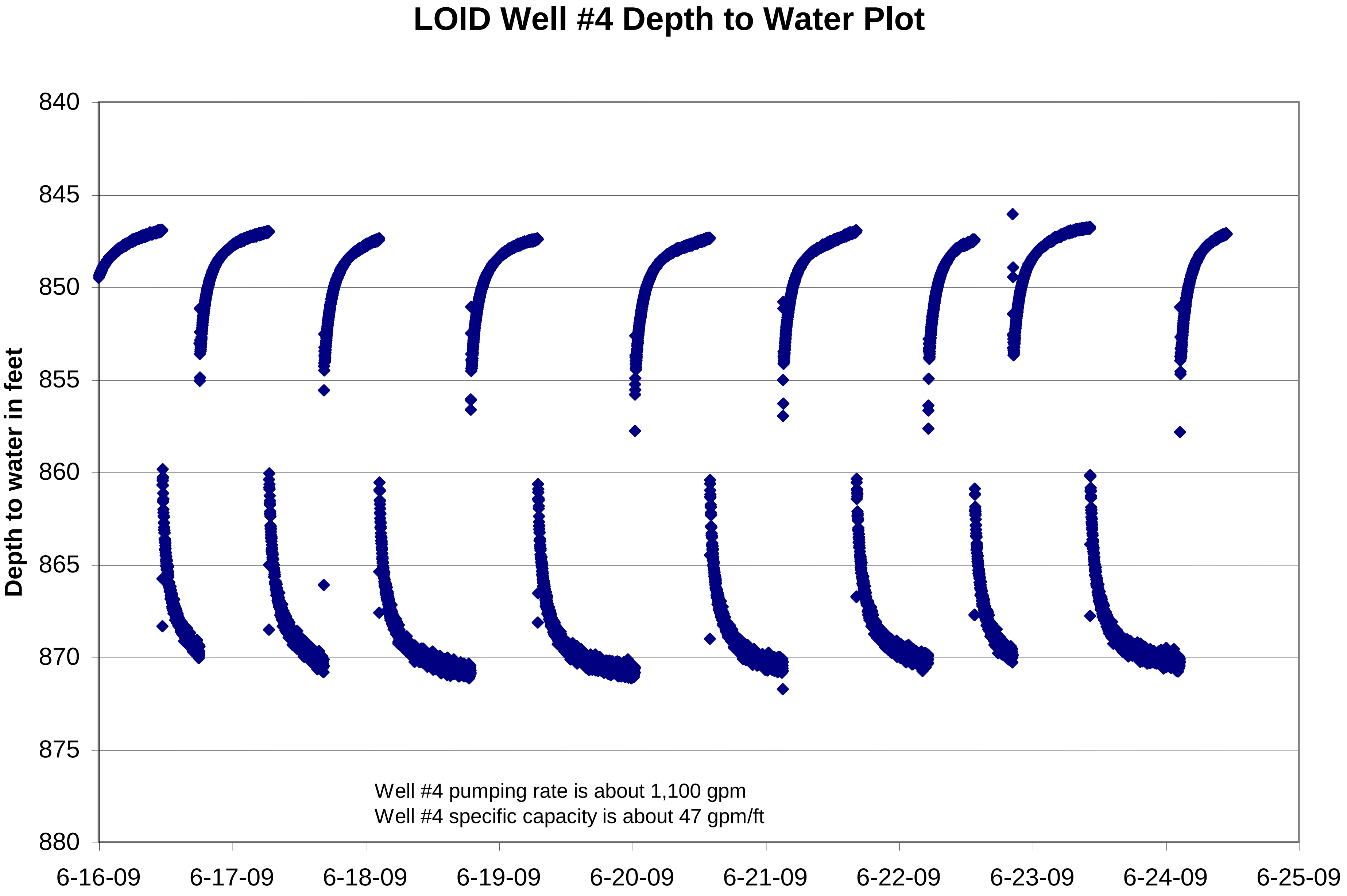
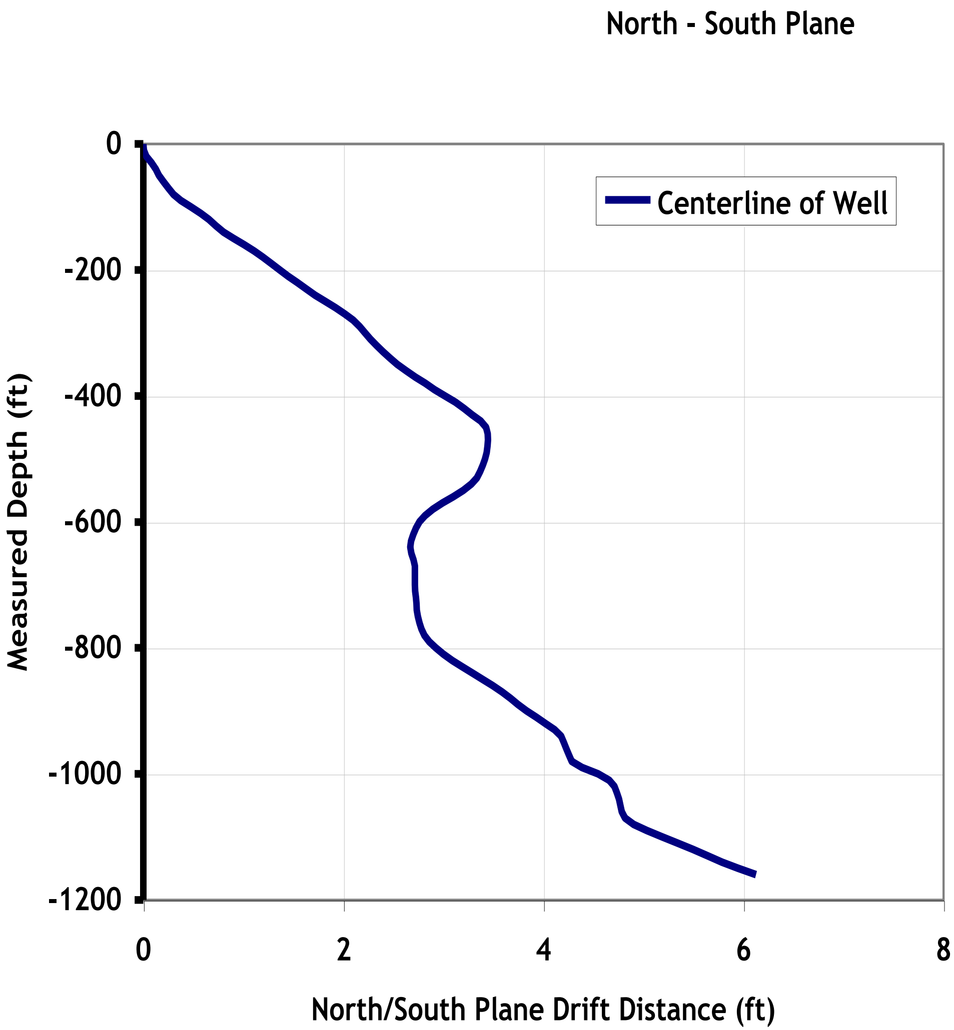


Figure 6 Water-Level Data for LOID Well #4



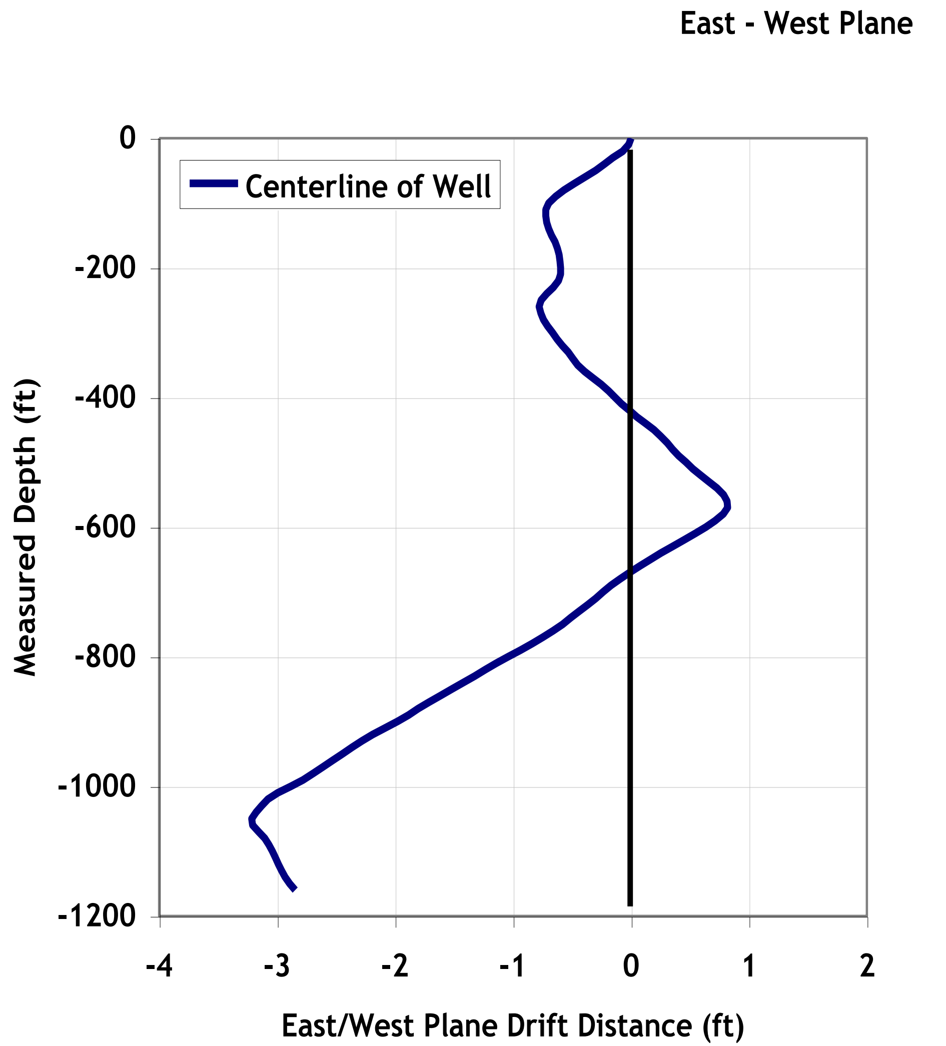


Figure 7 LOID Well #4 Deviation / Alignment Test

LOID #1 is an abandoned well located about 291 feet from LOID #4

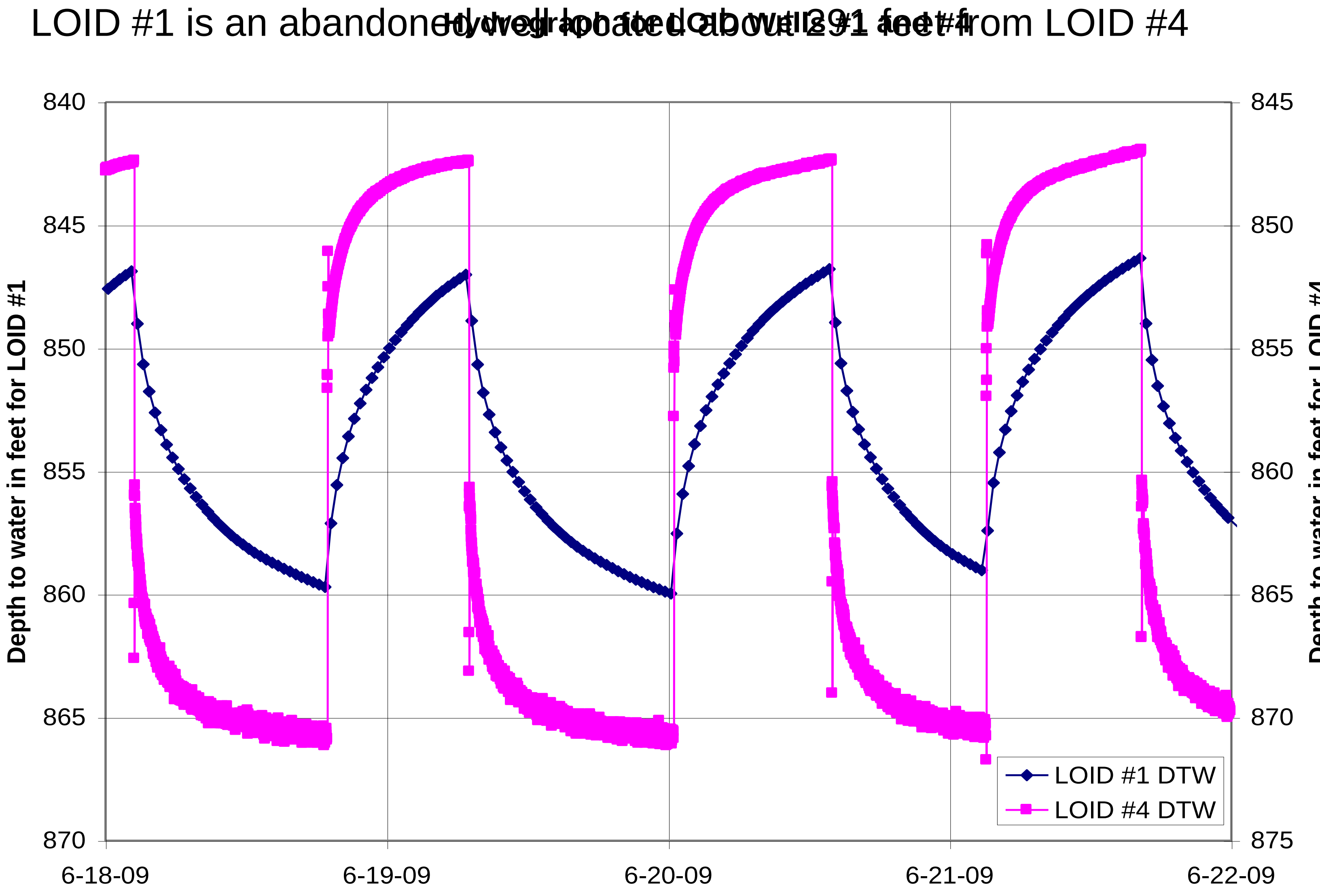


Figure 8 Water-Level Data from LOID Wells #4 and #1

LOID #3 is located about 5,916 feet from LOID #4

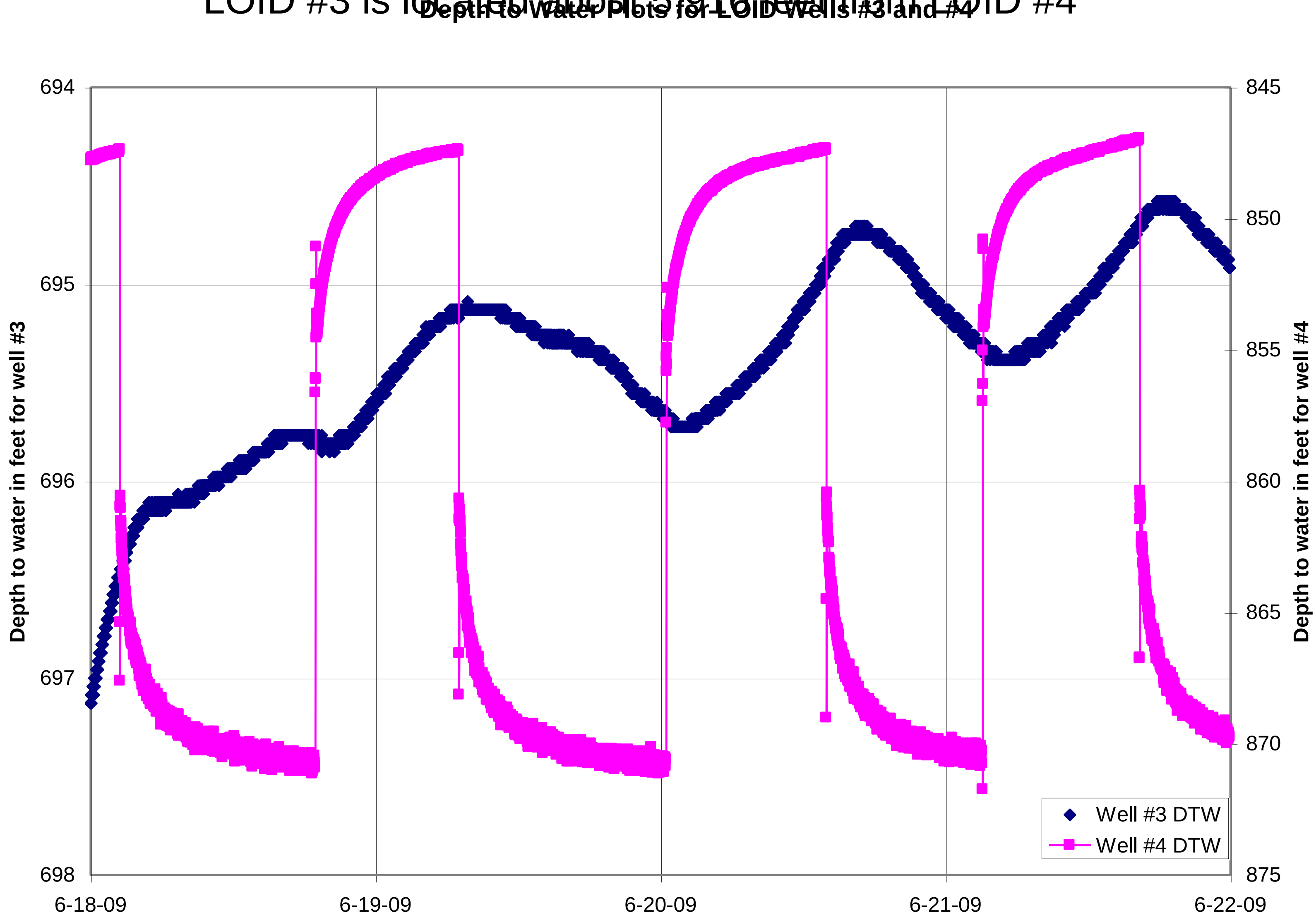


Figure 9 Water-Level Data For LOID Wells #4 and #3

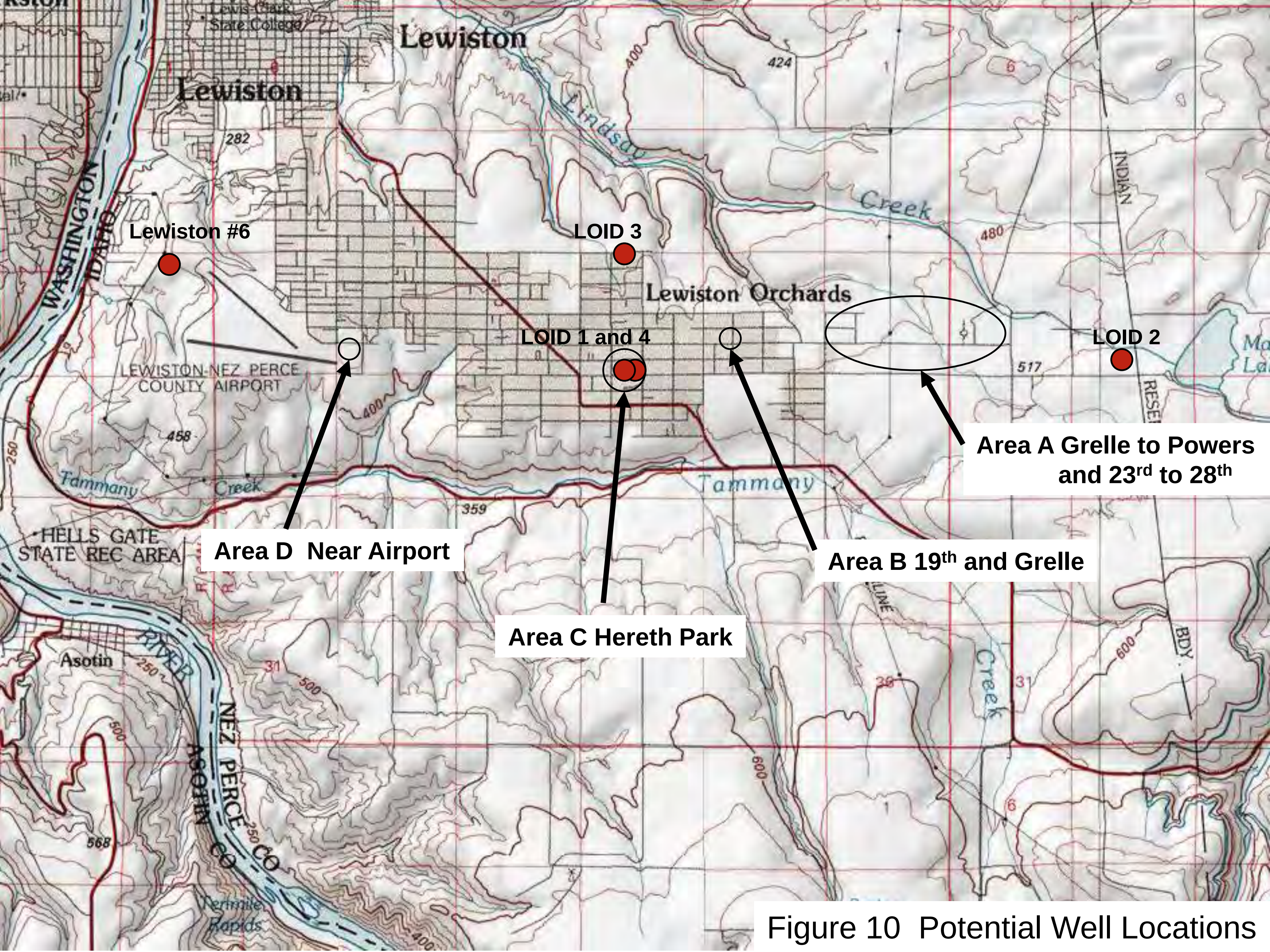


Figure 10 Potential Well Locations

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Appendix N – not used

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Appendix O – Sanitary Survey

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STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

1118 F Street Lewiston, Idaho 83501 (208) 799-4370

C.L. "Butch" Otter, Governor
Curt Fransen, Director

December 30, 2014

Gene McCollum
Lewiston Orchards Irrigation District
1520 Powers Ave
Lewiston, ID 83501
gmccollum@loid.net

Subject: December 10, 2014 Enhanced Sanitary Survey – Lewiston Orchards Irrigation District, PWS ID2350015

Dear Mr. McCollum:

On December 10, 2014, the Idaho Department of Environmental Quality (DEQ) conducted an Enhanced Sanitary Survey of the Lewiston Orchards Irrigation District (LOID) public drinking water system. Enclosed is a report that provides a list of significant deficiencies, deficiencies, and recommended improvements for your system. Per Idaho Rules for Public Drinking Water Systems (IDAPA 58.01.08) the significant deficiencies identified in the enclosure require consultation, corrective actions, and verification by DEQ that these actions have been completed according to the following timeline. For your convenience and reporting purposes, Table 1 is provided with the enclosed report to submit a corrective action plan.

- **Within 30 days** of receiving this written notification, please consult with DEQ and submit a corrective action plan (CAP) for addressing the significant deficiencies noted in the enclosed Enhanced Sanitary Survey Report.
- **Within 120 days** of receiving this notification**,** all significant deficiencies must be corrected unless an alternative timeline has been approved by DEQ. DEQ shall be notified in writing with accompanying documentation when the significant deficiencies in the CAP have been resolved.

Thank you for your time and assistance during the inspection. Please contact me by email at Megan.Larson@deq.idaho.gov or by phone at (208) 799-4370 to discuss the deficiencies identified in the inspection report.

Sincerely,

Megan Larson
Drinking Water Analyst

Enclosure (1)

ec: Michael Camin, DEQ
TRIM: 2009ABM4969

Drinking Water System Sanitary Survey Report

SYSTEM:	Lewiston Orchards Irrigation District	SURVEY DATE:	December 10, 2014
PWS No.:	ID2350015	INSPECTED BY:	Megan Larson
COUNTY:	Nez Perce	SOURCE(S):	3 Groundwater Wells
SYSTEM TYPE:	Community	POPULATION/ CONNECTIONS:	20,000 People/ 8107 Connections

This report summarizes the findings of the sanitary survey inspection of the Lewiston Orchards Irrigation District (LOID) public drinking water system conducted on December 10, 2014, by the Idaho Department of Environmental Quality (DEQ). Following this summary are lists of significant deficiencies, deficiencies and recommended improvements for LOID. All deficiencies requiring corrective action are listed in Table 1 (pages 7-8).

The following people were present during the sanitary survey in addition to the inspector:

- Barney Metz, District Manager, LOID
- Gene McCollum, Designated Operator, LOID

PREVIOUS SANITARY SURVEY NOTES

A sanitary survey was conducted on June 3, 2009, by DEQ which listed several significant deficiencies including the following:

1. Well #2 inability to pump to waste,
2. Lack of smooth nosed sample taps for Wells #3 and #4 after treatment,
3. Overflow capability for the Filter Plant Reservoir,
4. Manhole access was not adequate for the Filter Plant Reservoir,
5. Improperly licensed back up operators, and
6. Incomplete Operations and Maintenance manual.

SURVEY SUMMARY

LOID public drinking water system is a community water system which serves approximately 20,000 people through 8,107 metered connections. LOID provides drinking water and fire flow through use of three (3) groundwater wells, three (3) storage reservoirs, and three (3) booster stations. An emergency inter-tie with the City of Lewiston is available and has been used in the past. LOID also manages a separate irrigation system through use of Mann Lake Reservoir and is currently under contract with the Bureau of Reclamation to drill a new well to supplement irrigation water. Eventually this well is expected to become a dual purpose well to provide domestic drinking water in addition to irrigation water. Idaho Department of Water Resources has requested LOID apply for low temperature geothermal well designations for all sources due to water temperature exceeding 85 degrees Fahrenheit.

Sources

Well #2 (Tag# EO005289) is located near the old LOID water treatment plant off of Powers

Avenue near Mann Lake Reservoir. The well was drilled in 1986 to a depth of 1959 feet below ground surface (bgs). Telescoping 13 3/8, 16, and 20-inch casing extends to 1376 feet bgs and a cement grout surface seal extends to 520 feet bgs. At the time of inspection, static water level was 1048 bgs and a submersible Centrilift Hughes 304 horsepower (hp) pump provides up to 550 gallons per minute (gpm).

Well #2 is housed within a pump house on a fenced well lot. All setback requirements appear to be met. The well is properly cased and sealed to preclude surface water entry and is provided with a screened vent, flow meter, and pressure gauge. The well can be pumped to waste through provided valves near the Filter Plant Reservoir. The locked pump house is kept clean and in good repair and is provided with adequate heating, ventilation, and lighting.

Well #3 (Tag# EO005763) is located off Warner Avenue and was drilled in 1997 to a depth of 2617 feet bgs. Telescoping 13 3/8, 16, and 20-inch casing extends to 1430 feet bgs and a cement grout seal is provided to 1430 feet bgs. The casing is perforated at intervals between 1035 to 1395 feet bgs. At the time of inspection, static water level was 691 feet bgs and a submersible Centrilift Hughes 500 hp pump provides up to 650 gpm.

Well #3 is located on a fenced well lot with all appurtenances located inside a pump house. All setback requirements appear to be met. The well is properly cased and sealed to preclude surface water entry and is provided with a vent, flow meter, pressure gauge, and smooth nosed sample tap. A soft start system is provided which allows the system to pump to waste for five minutes upon start up, after which a cla-valve slowly closes and sends the water to the distribution system piping. The locked pump house is kept clean and in good repair and is provided with adequate heating, ventilation, and lighting.

Well #4 (Tag# EO009286), the primary production well for LOID, is located at Hereth Park near the LOID administration building. The well was drilled in 2002 to a depth of 1625 feet bgs. Telescoping 16, 18, and 20-inch casing extends to 1267 feet bgs and a cement grout is provided to 265 feet bgs. The casing is screened from 1029 to 1049 feet bgs and from 1164 to 1265 feet bgs. At the time of drilling, static water level was 845 feet bgs. A submersible Goulds 300 hp pump provides approximately 1,000 gpm.

Well #4 is located on a fenced well lot with all appurtenances inside a pump house. Park property is within 10 feet from the well and fertilizers may be applied to this area (Deficiency 1). In addition an access road is closer than 50 feet from the well. The well is properly cased and sealed to preclude surface water entry and is provided with a vent, flow meter, pressure gauge, and smooth nosed sample tap. The well can be pumped to waste at the design capacity of the well. The locked pump house is kept clean and in good repair and is provided with adequate heating, ventilation, and lighting.

LOID pump houses and facility buildings throughout the system have threaded taps in need of backflow prevention (Deficiency 2).

Well #5, currently being drilled, is located at 10th Street and Ripon Avenue. The primary purpose of this well will be for irrigation but is projected to become a dual purpose source, providing additional drinking water for LOID.

Treatment

LOID treats all three sources with disinfection for taste and odor control. Sodium hypochlorite 0.8% solution is manufactured on-site at each well with Clor-Tec equipment and Diamond Crystal Solar Salt. The Well #2 treatment plant is located at the old filter plant, with a six (6) pound salt system that injects into the old treatment plant clear well. The Well #3 treatment plant is located in the pump house with a system that uses 70 pounds of salt. The Well #4 treatment plant is located in the pump house at Hereth Park with a system that uses 24 pounds of salt.

Most solution day-tanks are clearly labeled and chemicals are kept covered and secure with appropriate backflow prevention, drains, overflows, and vents. However, the Well #2 solution tank is not properly vented to the outside atmosphere (Deficiency 3). Operations and maintenance manuals are provided for treatment equipment and dosing requirements, but not for all daily operations. Routine chorine residuals are collected and recorded throughout the distribution system along with total coliform sampling. Back-up chemical feed equipment is available for all systems.

A post-treatment sample tap for Well #2 is located at the filter plant lab sink. Sample taps are provided post treatment within each pump house for Well #3 and Well #4. All sample taps must be of the smooth nosed style for collection of bacteria samples (Deficiency 2).

Finished Water Storage

Finished water storage is provided by three (3) storage tanks with a combined capacity of 4,600,000 gallons; Hereth Park Reservoir, Lutes Subdivision Reservoir, and the Filter Plant Reservoir. Water production ranges from 1.3 million gallons per day (gpd) to 3.0 million gpd. Therefore, in case of an emergency, the system has approximately three (3) to four (4) days' supply under use restrictions. All reservoirs were cleaned and/or inspected in 2013, are safely accessible to the inspector, and water levels are measured through ultrasonic sensors for information relay to SCADA. All reservoirs are located within security fencing to preclude unauthorized access.

The **Hereth Park Reservoir (ID#12841)** is located on the LOID property at Hereth Park to the North of Well #4. This bolted steel reservoir was constructed in 1997 with a total capacity of 2.5 million gallons. A proper overflow is provided. Condition of the access manhole and vent was not inspected. Photo documentation of the internal gasket on the access manhole and condition of the vent screen shall be provided to DEQ by LOID (Potential Deficiency).

The **Lutes Reservoir (ID#12843)** is located off of 18th Street and Powers Drive. This bolted steel reservoir was constructed in 1981 with a total capacity of 500,000 gallons. The reservoir has bending and waving of the sidewalls due to being drug into place by tractors when constructed. Structural integrity inspections have determined this reservoir to be in good condition. In 2012 the reservoir was found to have severe internal corrosion and in 2013 was provided with new roof beams and painted with a galvanizing process to resist future corrosion. The overflow for the reservoir runs into the storm water system with an air gap provided. Condition of the access manhole and vent was not inspected. Photo documentation of the internal gasket on the access manhole and condition of the vent screen shall be provided to DEQ by LOID (Potential Deficiency).

The **Filter Plant Reservoir (ID#12845)** is located at the old filter plant off of Shady Lane near Mann Lake Reservoir. This below ground concrete tank was constructed in 1950 with a total capacity of 1.6 million gallons. An internal overflow is provided and discharges into a series of storm water manholes that discharge upstream of Lindsey Creek. Final discharge location was not inspected. The roof of the reservoir is not sloped to facilitate drainage (Significant Deficiency 1) and standing water was visible. According to the operator, the roof is not currently leaking into the finished water; however, DEQ has concerns over the potential for contamination. Surrounding ground is graded to prevent standing water within 50 feet of the reservoir. There are four (4) vents provided for the reservoir, all of which had corroded and broken screen (Significant Deficiency 2). All vents must be covered with 24 mesh non-corrodible screen to exclude potential contamination as required by IDAPA 58.01.08.544.08.d. Since the previous survey, a raised access manhole has been provided which extends at least four (4) inches high with a two (2) inch overlapping water tight lid. The manhole is not elevated 24 inches above the surface of the roof as required by IDAPA 58.01.08.544.07.b but does not appear to have a potential for flooding.

<u>Distribution</u>

LOID serves approximately 20,000 residents with 8107 metered connections. There are more than 500 fire hydrants but only 57 are connected to the drinking water system, the rest are connected to the irrigation water system. Valves are exercised on an as needed basis and dead end mains are flushed annually or more as needed. The distribution system consists of PVC, Ductile Iron, Galvanized Steel, and Asbestos Cement pipe with pipes ranging in size from 2- to 12-inches in diameter. Two pressure zones are present; north and south. Pressure is maintained throughout the distribution system by gravity and three (3) booster/transfer stations.

The **Hereth Park booster/transfer station** is located near the Hereth Park Reservoir and is provided with a Cornell 72.5 hp vertical turbine pump that transfers water to the Lutes Reservoir when needed and a Baldor 60 hp vertical turbine pump that boosts water to the system.

The **Lutes booster/transfer station** is located at the Lutes Reservoir and is provided with two (2) Baldor 40 hp vertical turbine pumps that boost water to the system, one (1) Baldor 40 hp vertical turbine pump that is used for fire flow to the South pressure zone, and one (1) Cornell 100 hp vertical turbine pump that transfers water to the Filter Plant Reservoir.

The **Filter Plant booster station** is located at the Filter Plant Reservoir and is provided with a Goulds 5 hp submersible pump that boosts water to the system. There are also two (2) Well X-Trol 119 gallon bladder hydropneumatic tanks that maintain pressure to seven (7) residences. An isolation valve is not provided for one of the tanks (Deficiency 4).

All necessary piping and appurtenances are provided and pressure is monitored through the SCADA system. Automatic shut offs are provided. All taps within the pump houses must be provided with backflow prevention (Deficiency 2). Auxiliary power is not provided at any location and is required upon major modification.

Monitoring, Reporting and Data Verification

LOID is current with all required monitoring and reporting, per the Idaho Rules. This includes monthly total coliform (TC) bacteria sampling and chemical sampling. All sampling records and records pertaining to the PWS are maintained at the LOID administration building and retained longer than the required retention schedule. A written TC sampling site plan was available to view and met all requirements.

System Management Operation and Operator

LOID is classified as a Distribution Class 3 system. Geral (Gene) McCollum is the responsible charge operator and is licensed as a Distribution 4 Operator. Matthew Carpenter is the backup operator and is licensed as a Distribution 4 Operator as well. LOID employs several additional operators that are each licensed as at least a Distribution 1 Operator.

LOID's Board makes management decisions for the capital improvements and financial decisions for the water system and meets monthly. The water system is current with the payment of drinking water fees and charges a $12.35 unit charge plus $2.24 per cubic feet. User fees were adjusted as of July 1, 2014. An annual audit is conducted each year and a copy of the most recent audit was provided to DEQ. A water master plan is approximately 80% complete and is being written by J-U-B Engineers. LOID uses this document for planning although it is not complete.

LOID has written Operations and Maintenance schedules, daily tasks, and contact information. DEQ recommends an Operations and Maintenance manual that includes daily operating instructions, operator safety procedures, location of valves and other key system features, parts list and parts order forms, and information for contacting the water system operator. A Cross Connection Control Program is available and the operator is sufficiently trained in cross connection control. LOID has a leak detection program. LOID has a state certified Source Water Protection Plan. Recertification is recommended every five (5) years. Recertification assistance is available from both DEQ and the Idaho Rural Water Association.

SIGNIFICANT DEFICIENCIES

Significant Deficiency Definition. As identified during a sanitary survey, any defect in a system's design, operation, maintenance, or administration, as well as any failure or malfunction of any system component, that the Department or its agent determines to cause, or have potential to cause, risk to health or safety, or that could affect the reliable delivery of safe drinking water.

Storage:

1. The roof of the Filter Plant reservoir is not sloped to facilitate drainage, as required by IDAPA 58.01.08.544.09. and IDAPA 58.01.08.544.09.c. [ST08]
2. There are four (4) vents provided for the reservoir, all of which had corroded and broken screen. All of the vents for storage structure Filter Plant Reservoir are not covered with 24 mesh non-corrodible screen to exclude potential contamination, as required by IDAPA 58.01.08.544.08.d. [ST22]

DEFICIENCIES

Groundwater Source:

1. Park property is within 10 feet from Well #4 and fertilizers may be applied to this area, which is not in accordance with IDAPA 58.01.08.512.01. [GW14]
2. LOID pump houses and facility buildings throughout the system have threaded taps. The sample taps that are used to collect bacteria samples are not of the smooth-nosed type without interior or exterior threads, pursuant to IDAPA 58.01.08.501.09. [GW23] In addition, all threaded non-sample taps installed in the pump houses are not equipped with an appropriate backflow prevention device, as required by IDAPA 58.01.08. 541.01.n.[GW31]

Treatment Application:

3. The Well #2 solution tank is not properly vented. Vents are not discharged to the outside atmosphere above grade and remote from air intakes, as required by IDAPA 58.01.08.531.02.m. [TR19]

Hydropneumatic Tanks:

4. The hydropneumatic tank(s) cannot be isolated from the system, as required by IDAPA 58.01.08.547.01.b. [HT03]

RECOMMENDATIONS

1. DEQ recommends an operation and maintenance manual is provided for the PWS that includes daily operating instructions, operator safety procedures, location of valves and other key system features, parts list and parts order forms and information for contacting the water system operator.

Significant Deficiency & Deficiency Corrective Action Plan for Lewiston Orchards Irrigation District, PWS #: ID2350015

Table 1. Corrective Action Plan

Significant Deficiency	Corrective Action	Planned Completion Date	Actual Completion Date	Initials (when complete)
1. The roof of the Filter Plant reservoir is not sloped to facilitate drainage. [ST08]				
2. All of the vents for storage structure Filter Plant Reservoir are not covered with 24 mesh non-corrodible screen to exclude potential contamination. [ST22]				
Deficiency	**Corrective Action**	**Planned Completion Date**	**Actual Completion Date**	**Initials (when complete)**
1. Park property is within 10 feet from Well #4 and fertilizers may be applied to this area. [GW14]				
2. The sample taps that are used to collect bacteria samples are not of the smooth-nosed type. [GW23] All threaded non-sample taps installed in the pump houses are not equipped with an appropriate backflow prevention device.[GW31]				

Deficiency	Corrective Action	Planned Completion Date	Actual Completion Date	Initials (when complete)
3. The Well #2 solution tank is not properly vented. Vents are not discharged to the outside atmosphere above grade and remote from air intakes. [TR19]				
4. The hydropneumatic tank(s) cannot be isolated from the system. [HT03]				

I certify, to the best of my knowledge that all significant deficiencies have been corrected and meet the requirements pursuant to IDAPA 58.01.08. (*signature when all deficiencies have been corrected, initials after each date when corrected)**

Signature: ____ Date: ________________

Photographic Documentation

Name of Facility: Lewiston Orchards Irrigation District

Inspector(s): Megan Larson

Inspection Date: Wednesday, December 10, 2014

Purpose of Inspection: Sanitary Survey

Publish Date: Friday 19 December 2014

Table of Photographs:

Photograph 1: Hereth Park Reservoir Overflow

Photograph 2: Hereth Park Reservoir

Photograph 3: Hereth Park Booster Station

Photograph 4: Hereth Park Booster Station

Photograph 5: Hereth Park Booster Station

Photograph 6: Hereth Park Booster Station

Photograph 7: Hereth Park Booster Station

Photograph 8: Hereth Park Booster Station

Photograph 9: Hereth Park Booster Station

Photograph 10: Well #4

Photograph 11: Well #4 Pump House

Photograph 12: Well #4

Photograph 13: Well #4 Appurtenances

Photograph 14: Well #4 Threaded Tap

Photograph 15: Well #4 Sample Tap and Pressure Gauge

Photograph 16: Well #4 Appurtenances


Photograph 17: Well #4 Chlorination


Photograph 18: Well #4 Chlorination Daytank


Photograph 19: Well #4 Chlorination


Photograph 20: Well #4 Chlorination

Photograph 21: Course Salt

Photograph 22: Well #3

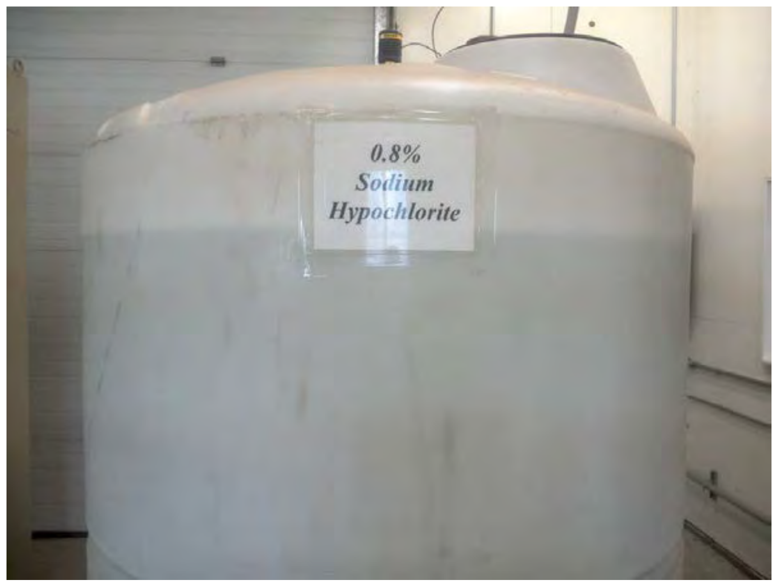
Photograph 23: Well #3 Appurtenances

Photograph 24: Well #3

Photograph 25: Well #3 Sample Tap and Pressure Gauge

Photograph 26: Well #3 Appurtenances

Photograph 27: Well #3 Chlorination



Photograph 28: Well #3 Chlorination Daytank

Photograph 29: Well #3 Chlorination


Photograph 30: Lutes Booster Station


Photograph 31: Lutes Booster Station Transfer Pump

Photograph 32: Lutes Booster Station Fire Pump

Photograph 33: Lutes Booster Station

Photograph 34: Lutes Booster Station

Photograph 35: Lutes Reservoir

Photograph 36: Lutes Reservoir

Photograph 37: Well #2 Chlorination


Photograph 38: Well #2 Chlorination Daytank


Photograph 39: Well #2 Chlorination


Photograph 40: Well #2 Chlorination


Photograph 41: Filter Plant Reservoir View from Filter Plant


Photograph 42: Filter Plant Reservoir Access Manhole


Photograph 43: Filter Plant Reservoir Standing Water


Photograph 44: Filter Plant Reservoir Standing Water

Photograph 45: Filter Plant Reservoir Vent

Photograph 46: Filter Plant Reservoir Vent

Photograph 47: Filter Plant Reservoir Vent

Photograph 48: Filter Plant Reservoir Vent

Photograph 49: Filter Plant Reservoir Vent

Photograph 50: Filter Plant Reservoir Access

Photograph 51: Filter Plant Reservoir Access

Photograph 52: Filter Plant Hydro Tanks

Photograph 53: Filter Plant Hydro Tanks Isolation Valve

Photograph 54: Filter Plant Booster

Photograph 55: Filter Plant view from Booster Station

Photograph 56: Well #2 Pump House

Photograph 57: Well #2

Photograph 58: Well #2 Appurtenances

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Appendix P – Operations and Maintenance Guide

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United States
Environmental Protection
Agency

Distribution Systems:
A Best Practices Guide

Introduction	
Purpose	This Guide discusses the importance of maintaining your distribution system.
Target Audience	This Guide is intended for owners and operators of all public water systems serving fewer than 10,000 persons.

Distribution Systems

Distribution Systems usually consist of:

- Piping and fittings
- Pumps and pump stations
- Meters
- Storage tanks
- Backflow prevention devices
- Hydrants and valves

Importance of Maintaining Your Distribution System

A properly maintained distribution system is important for ensuring that you can: provide high quality water to your customers, continue operating in the event of an emergency, help minimize property damage as a result of responding to an emergency, and help prevent contamination events. A properly maintained distribution system can also extend equipment life-cycles and minimize problems related to minor or major equipment failures.

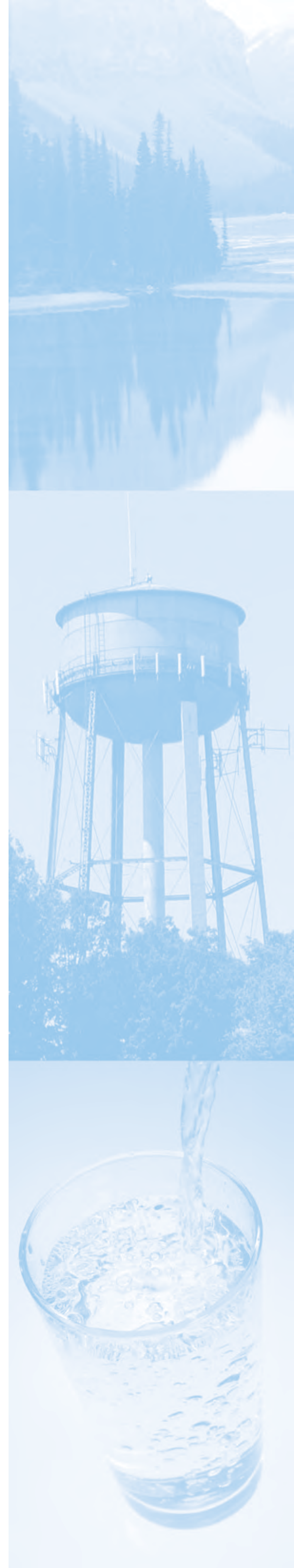
Distribution System Routine and Preventative Maintenance Tasks

The following table provides suggested frequencies of routine and preventative maintenance tasks for systems under normal operation. However, any time a system experiences water quality issues, the appropriate tasks should be performed as frequently as needed. Contact your state for more information.

Task	***Benefits***	***Suggested Frequency***
Valve exercising	◆ Improves reliability. ◆ Familiarizes crews with valve location. ◆ Identifies inoperable valves. ◆ Locates obstructed valve boxes. ◆ Ensures isolation of distribution system sections when necessary.	Annually.
Flushing pipelines	◆ Removes aged water from the pipeline. ◆ Reduces buildup of biofilms and sediments. ◆ Restores disinfectant residual.	Annually for all piping. More often in areas with water quality issues (e.g., dead ends).
Storage tank inspections	◆ Detects vandalism. ◆ Identifies defects. ◆ Ensures that access hatches are locked. ◆ Ensures that vents, overflows, and drains are screened.	Daily or weekly for vandalism. Annually for other items.

Distribution System Routine and Preventative Maintenance Tasks (continued)		
Task	***Benefits***	***Suggested Frequency***
Storage tank maintenance	• Improves protection against sources of contamination. • Extends the useful life of the equipment.	Every 3 years for cleaning. Painting and repairs as dictated by inspection.
Routine water quality monitoring (e.g., pH, temperature)	• Provides information on potential contamination of raw and finished water. • Helps determine effectiveness of treatment. • Helps assure the compatibility of the water with the materials.	Will vary depending on water quality and state regulations.
Inspecting and flushing hydrants and valves	• Ensures that hydrants and valves are operable and that no water losses occur. • Ensures that hydrants and valves are not susceptible to tampering.	Once or twice per year.
Maintaining operating pressure range of distribution system	• Reduces the risk of backflow contamination. • Helps your system provide better service to customers. • Reduces damage to infrastructure due to excess pressure. • Provides adequate fire flow.	Continuously.
Tracking unaccounted for water	• Can reduce pumping and treatment costs. • Helps identify leaks, breaks, stolen water, and inaccurate meters.	Daily at the source. Monthly or during routine meter reading at customer connections.
Testing for presence of excess biofilms	• Indicates a presence of inadequate chlorine residual, possible high disinfection byproduct levels, and water stagnation.	Monthly in conjunction with Total Coliform sampling.
Monitoring corrosion	• Identifies the need to modify treatment or conduct flushing.	Annually.
Checking for normal wear (such as in mechanical parts found in pumps and control valves)	• Can extend the useful life of infrastructure components. • Helps avoid unnecessary replacement or operational costs.	According to the manufacturer's recommendations.

For additional information:
Call the Safe Drinking Water Hotline at 1-800-426-4791, visit the EPA Web site at www.epa.gov/safewater/smallsys.html, or contact your State drinking water representative.



Appendix Q – Domestic System Opinion of Probable Cost

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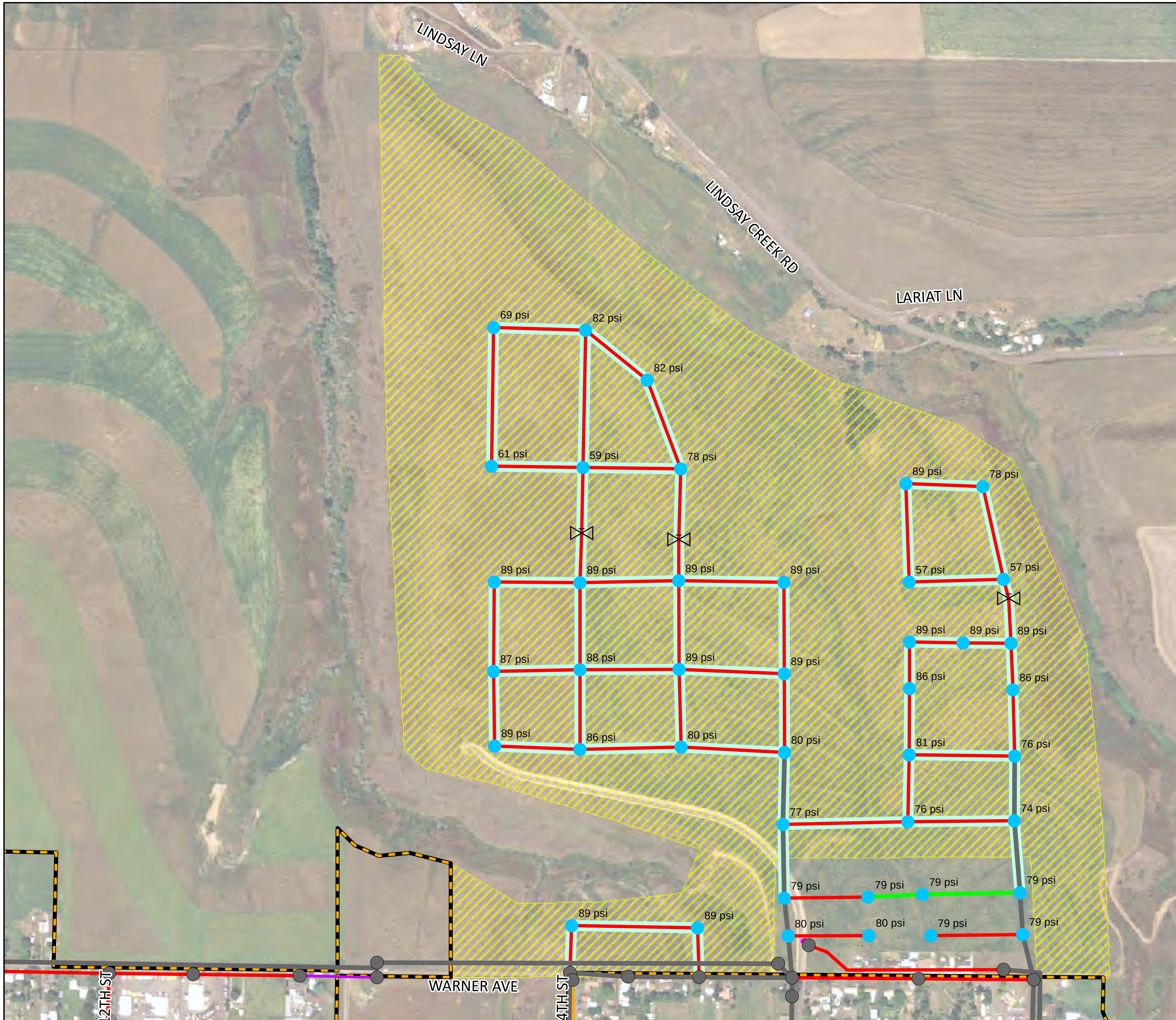

Lewiston Orchards Irrigation District

Area 1 Expansion

N
W E
S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve
- Internal CIP w/ Rock
- Internal CIP

0 860 1,720
Feet

Description:

Expansion to the North of Warner Avenue between 13th and 16th Street.

Infrastructure:

Continuation of the West and East 12-inch backbone line. Looping of all 8-inch lines. Installation of PRV's where shown or when pressures exceed 90 psi

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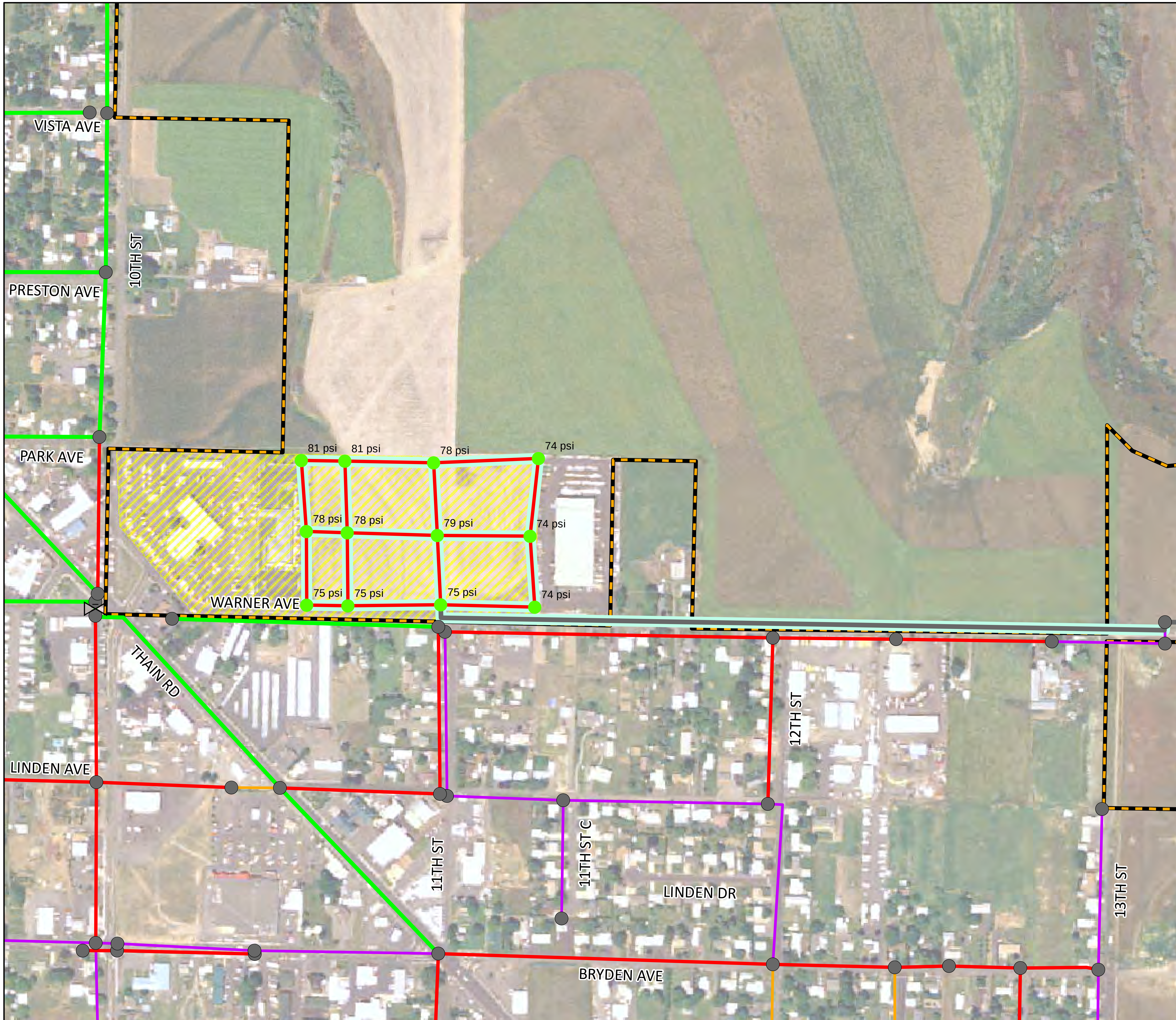
Lewiston Orchards Irrigation District

Area 2 Expansion



Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve
- Internal CIP w/ Rock
- Internal CIP

0 590 1,180
Feet

Description:

Expansion to the North of Warner Avenue between 11th and 10th Street.

Infrastructure:

Connect to the 12-inch transmission main on 13th Street and Warner Ave with 12-inch backbone. Looping of all 8-inch lines required.

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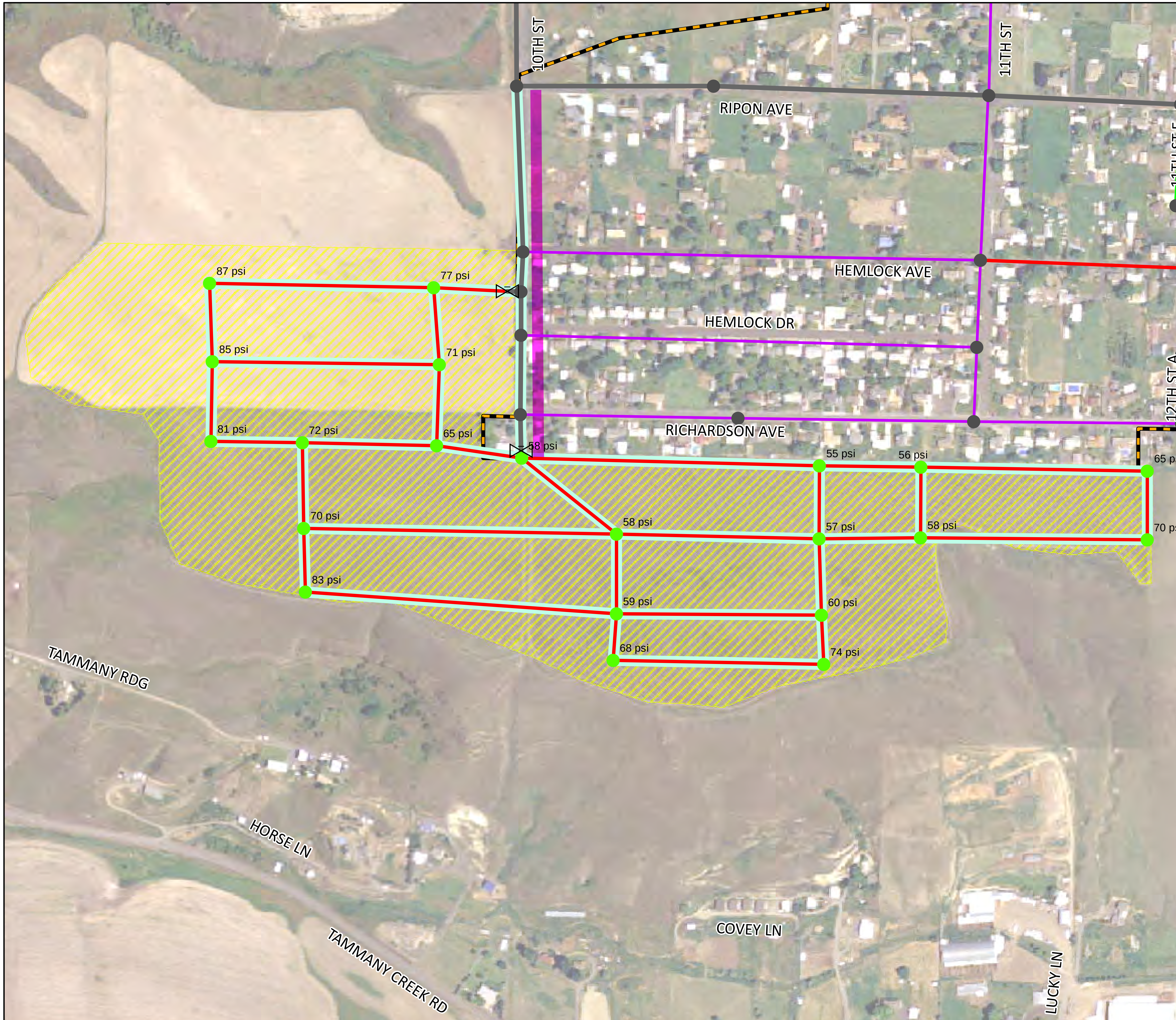

Lewiston Orchards Irrigation District

Area 3 Expansion

N W E S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve
- Internal CIP w/ Rock
- Internal CIP

0 610 1,220
Feet

Description:

Expansion to the South between 10th & 12th Street A.

Infrastructure:

Connection to the 12-inch backbone line on Ripon and 10th Street. Looping of 8-inch internal piping. New pressure Zone requires addition of 2 PRV's at indicated locations.

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan

DATE: 8/16/2018

DESCRIPTION: Expansion Area 3- Potential Internal CIP

CIP Code: 3

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 10,000
2.00	**Construction Traffic Control**			5.0%	$ 10,000
3.00	**Water Main**				
3.03	12" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	1,213	LF	$ 39	$ 46,785
	Trench Excav./Backfill for 4-8 ft deep	1,213	LF	$ 24	$ 29,112
3.09	Bedding - 10" - 14"	1,213	LF	$ 7	$ 8,491
3.11	Rock Excavation	1,213	LF	$ 10	$ 12,130
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	1,213	LF	$ 17	$ 20,475
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 8,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	27	EA	$ 2,500	$ 67,389
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance			5.0%	$ 10,000
6.02	None			0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 222,000**
	Contingency [1]				**$ 44,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 40,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 306,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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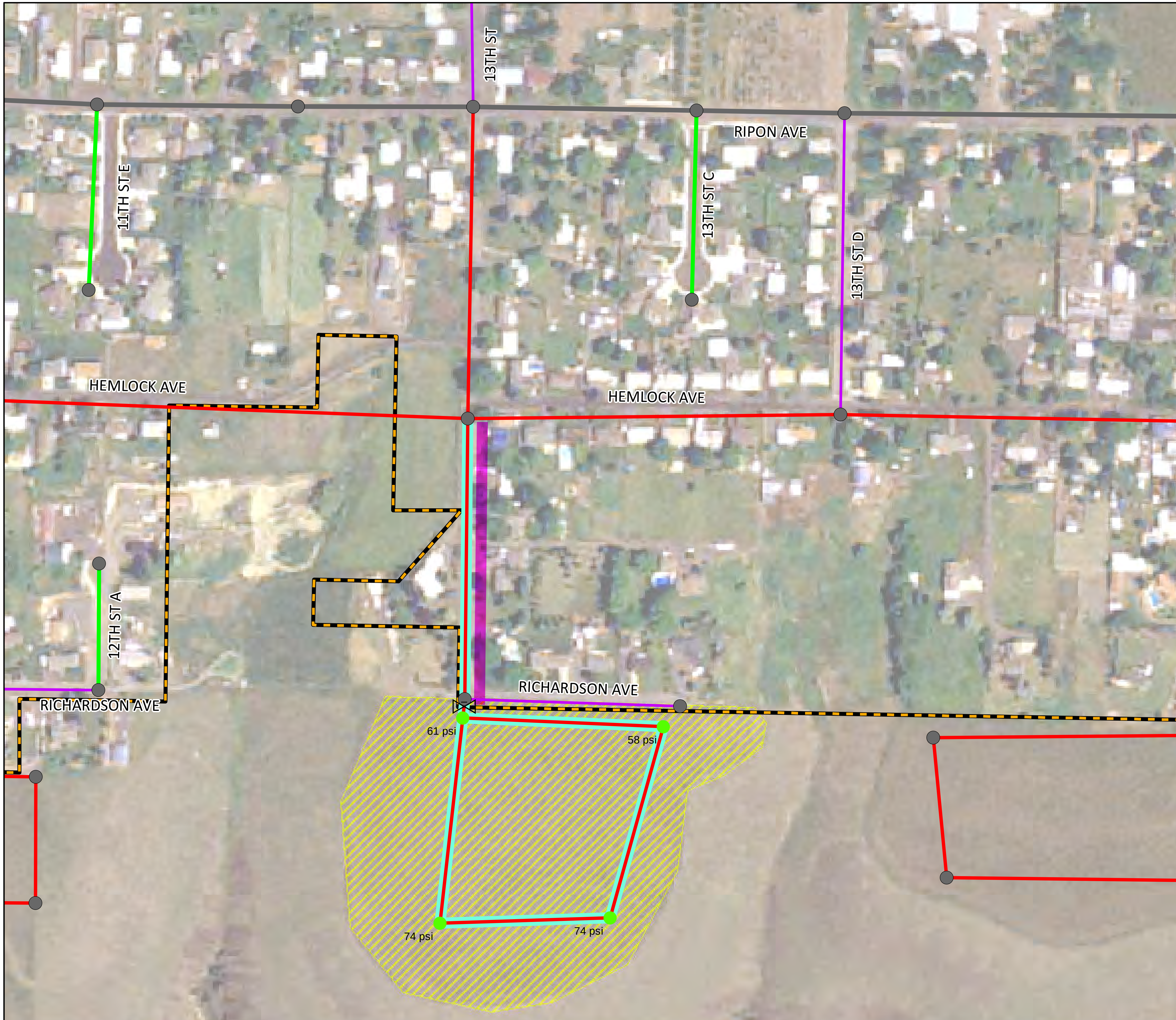

Lewiston Orchards Irrigation District

Area 4 Expansion

N W E S

Legend

Available Fire Flow
- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter
- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve
- Internal CIP w/ Rock
- Internal CIP

0 340 680
Feet

Description:
Expansion to the South of Richardson Avenue and 13th Street.

Infrastructure:
Connection to the 8-inch line on Hemlock and 13th Street with 8-inch pipe. Looping of 8-inch mains in expansion area required. New pressure zone requires the addition of one PRV at the indicated location.

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District Facility Plan — **DATE:** 8/16/2018

DESCRIPTION: Expansion Area 4- Potential Internal CIP

CIP Code: 4

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 5,000
2.00	**Construction Traffic Control**			5.0%	$ 5,000
3.00	**Water Main**				
3.01	8" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	633	LF	$ 23	$ 14,711
	Trench Excav./Backfill for 4-8 ft deep	633	LF	$ 23	$ 14,559
3.08	Bedding - 4" - 8"	633	LF	$ 6	$ 3,798
3.11	Rock Excavation	633	LF	$ 10	$ 6,330
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	633	LF	$ 17	$ 10,685
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 4,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	14	EA	$ 2,500	$ 35,167
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance			5.0%	$ 4,000
6.02	None			0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 103,000**
	Contingency [1]				**$ 21,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 19,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 143,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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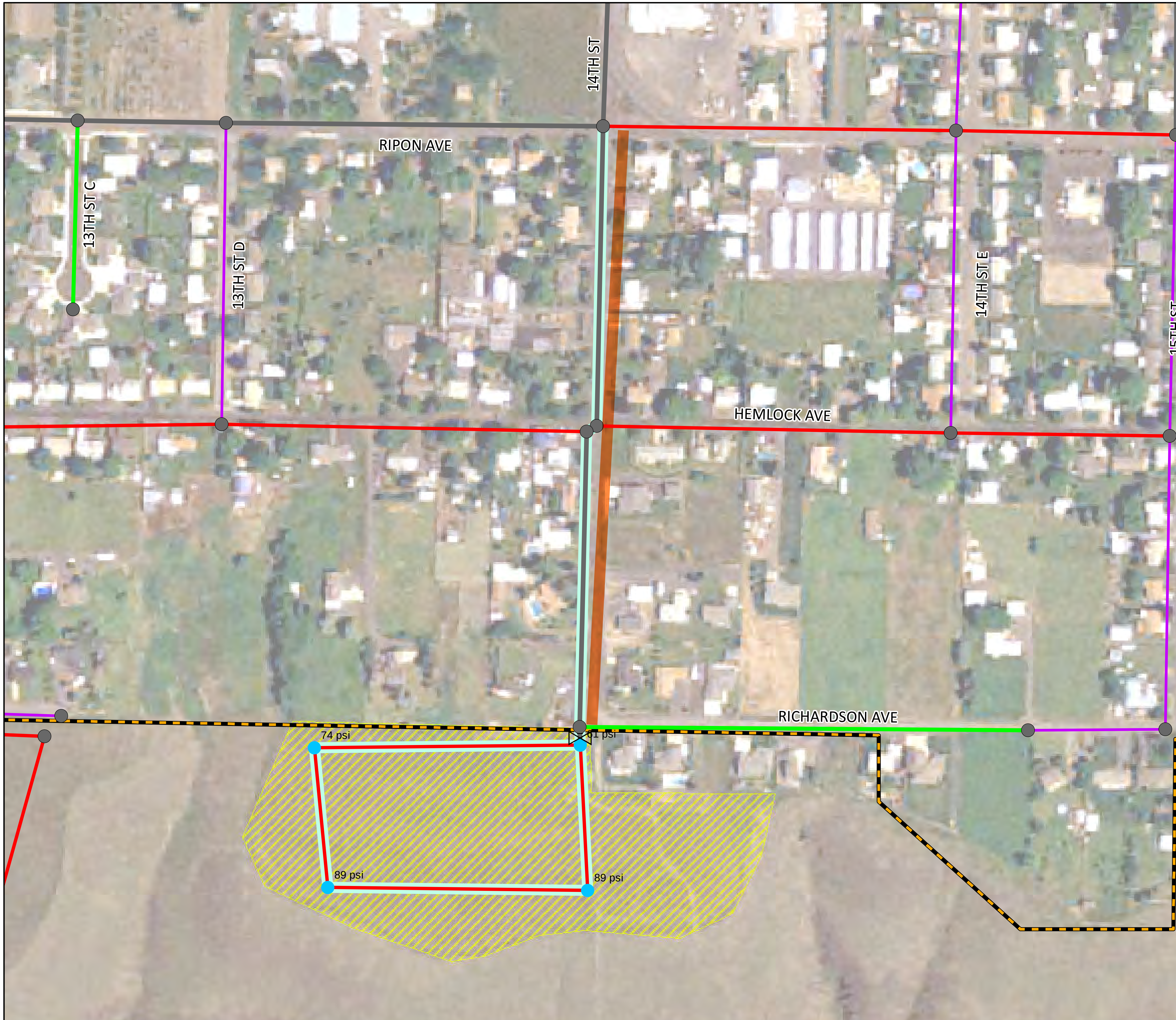

Lewiston Orchards Irrigation District

Area 5 Expansion

N W E S

Legend

Available Fire Flow
- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter
- < 2- inch
- 10- inch
- 4- inch
- 12- inch
- 6- inch
- > 14- inch
- 8- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Internal CIP w/ Rock
- Pressure Reducing Valve
- Internal CIP

0 340 680
Feet

Description:

Expansion to the South of Richardson Avenue and 14th Street.

Infrastructure:
Connection to the 12-inch main on Ripon and 14th Street with 12-inch pipe. Looping of 8-inch mains in expansion area required. New pressure zone requires the addition of one PRV at the indicated location.

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan

DATE: 8/16/2018

DESCRIPTION: Expansion Area 5- Potential Internal CIP

CIP Code: 5

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 11,000
2.00	**Construction Traffic Control**			5.0%	$ 11,000
3.00	**Water Main**				
3.03	12" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	1,369	LF	$ 39	$ 52,802
	Trench Excav./Backfill for 4-8 ft deep	1,369	LF	$ 24	$ 32,856
3.09	Bedding - 10" - 14"	1,369	LF	$ 7	$ 9,583
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	1,369	LF	$ 17	$ 23,109
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 9,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	30	EA	$ 2,500	$ 76,056
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance			5.0%	$ 10,000
6.02	None			0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 235,000**
	Contingency [1]				**$ 47,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 42,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 324,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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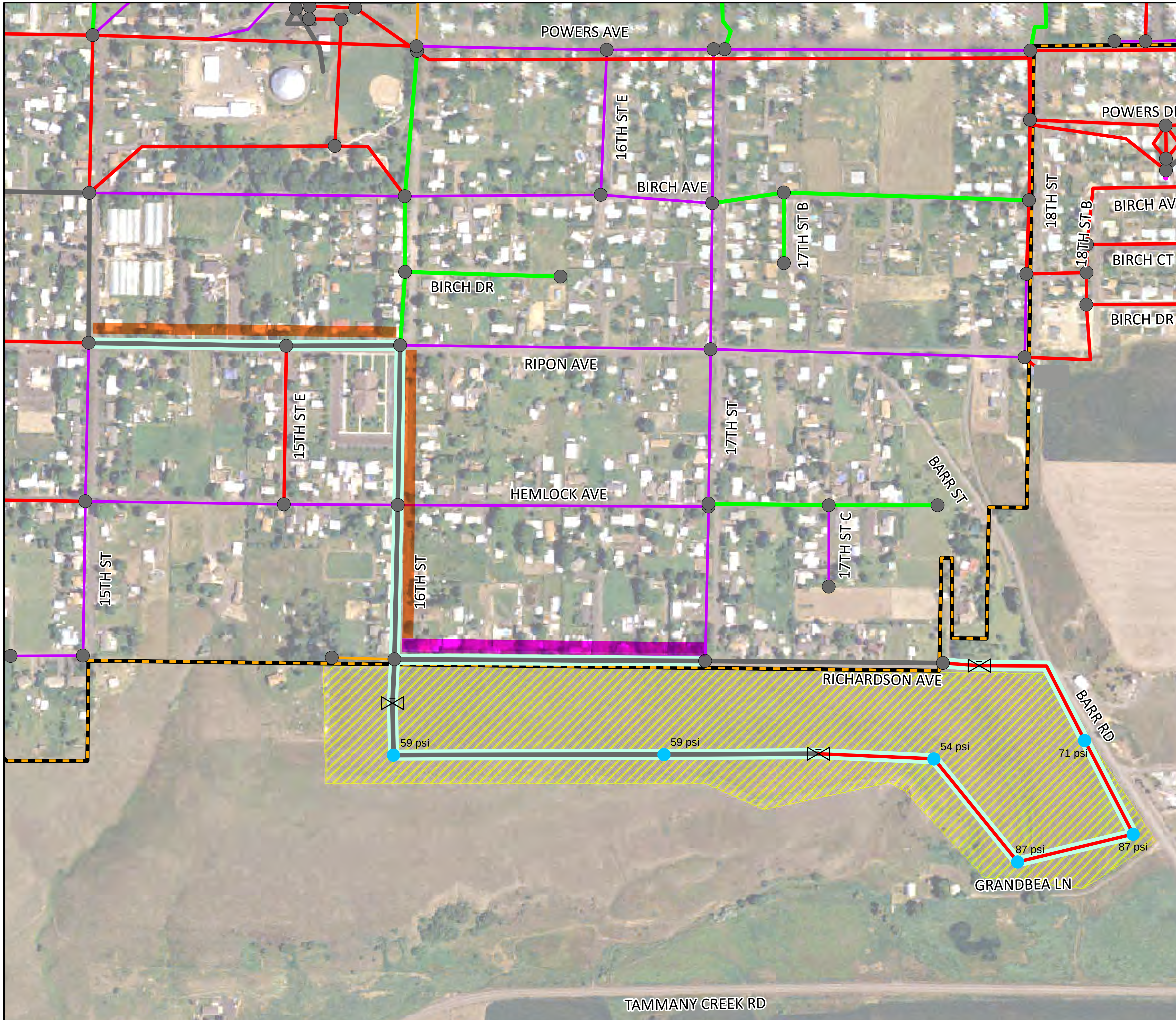
Lewiston Orchards Irrigation District

Area 6 Expansion



Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve
- Internal CIP w/ Rock
- Internal CIP

0 630 1,260

Feet

Description:

Expansion to the South of Richardson Avenue between 16th and Barr Road.

Infrastructure:

Connection to the 12-inch main on Ripon and 15th Street with 12-inch piping as indicated in the figure. Looping of 8-inch mains in expansion area is required. Addition of PRV's where indicated, or where pressures exceed 90 psi.

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

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PROJECT: Lewiston Orchards Irrigation District Facility Plan — **DATE:** 8/16/2018

DESCRIPTION: Expansion Area 6- Potential Internal CIP

CIP Code: 6

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 32,000
2.00	**Construction Traffic Control**			5.0%	$ 32,000
3.00	**Water Main**				
3.03	12" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	4,016	LF	$ 39	$ 154,897
	Trench Excav./Backfill for 4-8 ft deep	4,016	LF	$ 24	$ 96,384
3.09	Bedding - 10" - 14"	4,016	LF	$ 7	$ 28,112
3.11	Rock Excavation	1,334	LF	$ 10	$ 13,340
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	4,016	LF	$ 17	$ 67,790
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 26,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	89	EA	$ 2,500	$ 223,111
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance			5.0%	$ 30,000
6.02	None			0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 704,000**
	Contingency [1]				**$ 141,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 127,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 972,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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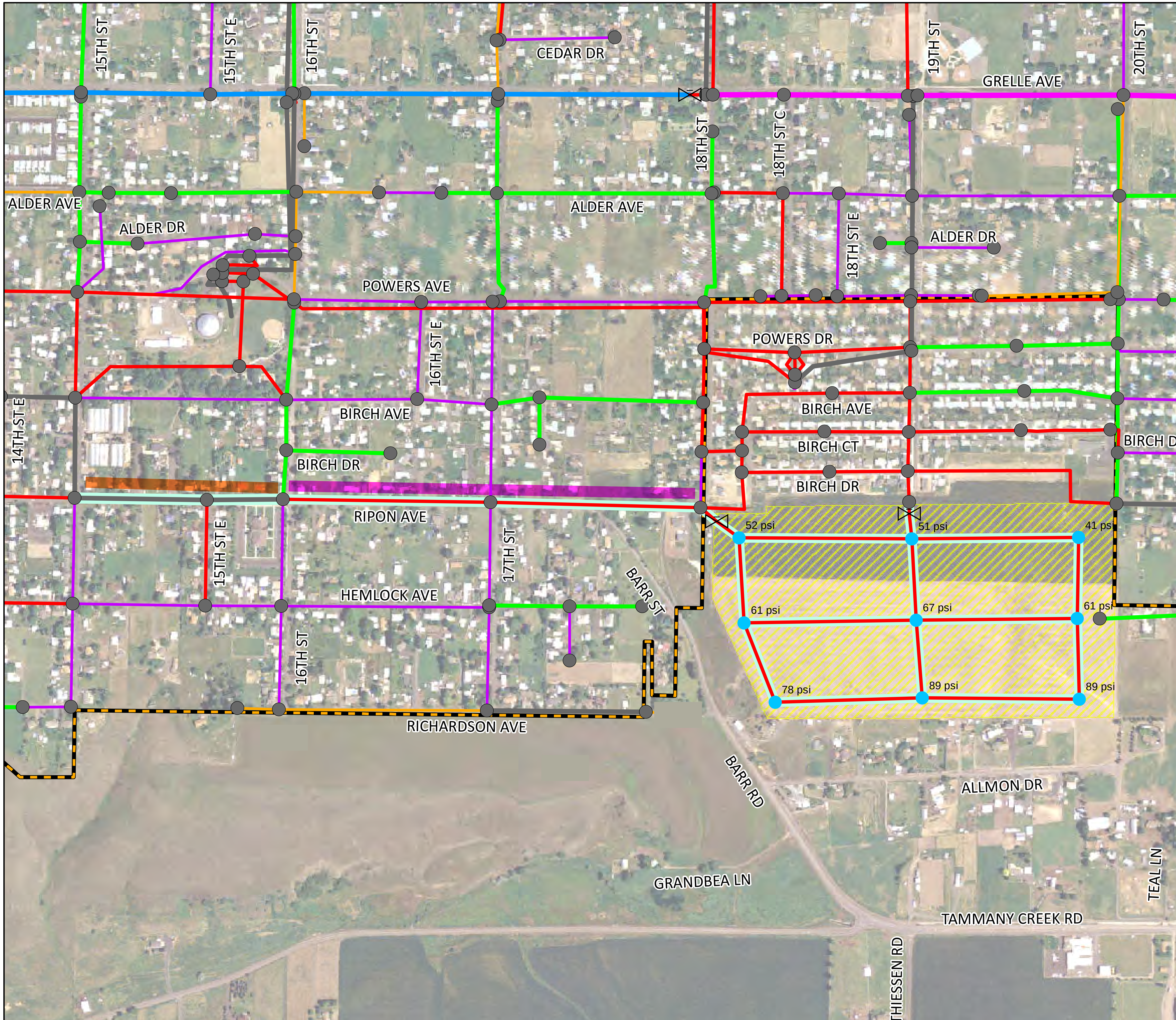

Lewiston Orchards Irrigation District

Area 7 Expansion

N
W E
S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 10- inch
- 4- inch
- 12- inch
- 6- inch
- > 14- inch
- 8- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Internal CIP w/ Rock
- Pressure Reducing Valve
- Internal CIP

0 950 1,900
Feet

Description:
Expansion to the South of Birch Drive between 18th and 20th Street.

Infrastructure:
Connection to the 12-inch main on Ripon and 15th Street with 12-inch & 8-inch piping as indicated in the figure. Looping of 8-inch mains in expansion area is required. New pressure zone requires addition of two PRV's where indicated.

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

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PROJECT: Lewiston Orchards Irrigation District
Facility Plan

DATE: 8/16/2018

DESCRIPTION: Expansion Area 7- Potential Internal CIP

CIP Code: 7

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	**Description**	**Est. Quant.**	**Unit**	**Unit Price**	**Total Price**
1.00	**Mobilization**			5.0%	$ 30,000
2.00	**Construction Traffic Control**			5.0%	$ 30,000
3.00	**Water Main**				
3.01	8" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	2,678	LF	$ 23	$ 62,237
	Trench Excav./Backfill for 4-8 ft deep	2,678	LF	$ 23	$ 61,594
3.03	12" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	1,335	LF	$ 39	$ 51,491
	Trench Excav./Backfill for 4-8 ft deep	1,335	LF	$ 24	$ 32,040
3.08	Bedding - 4" - 8"	2,678	LF	$ 6	$ 16,068
3.09	Bedding - 10" - 14"	1,335	LF	$ 7	$ 9,345
3.11	Rock Excavation	2,678	LF	$ 10	$ 26,780
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	4,013	LF	$ 17	$ 67,739
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 24,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	89	EA	$ 2,500	$ 222,944
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance			5.0%	$ 29,000
6.02	None			0.0%	$ -
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 663,000**
				Contingency [1]	**$ 133,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 119,000**
				TOTAL PROBABLE COST IN 2018 DOLLARS [3]	**$ 915,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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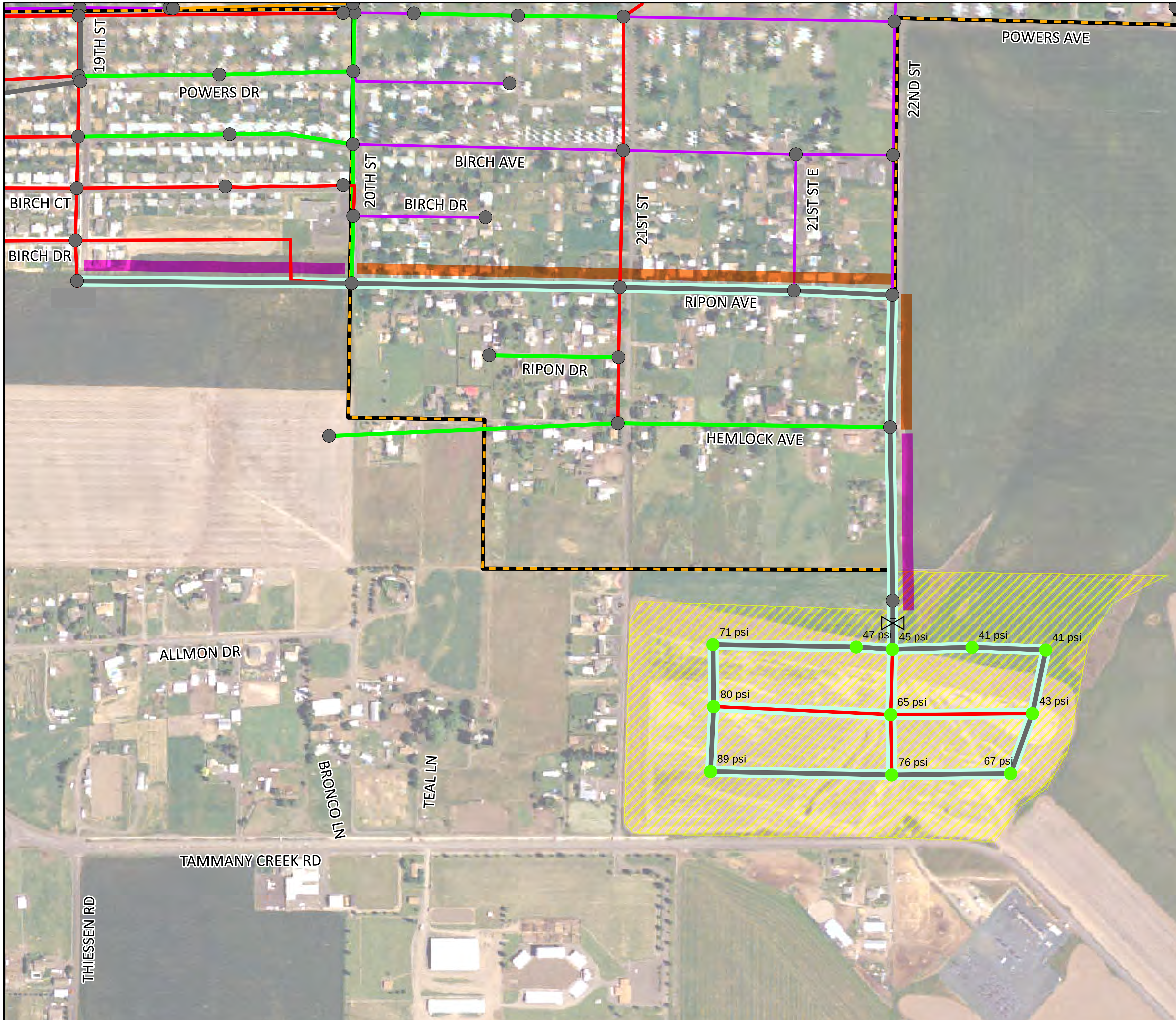
Lewiston Orchards Irrigation District

Area 9 Expansion



N
W E
S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve
- Internal CIP w/ Rock
- Internal CIP

0 720 1,440
Feet

Description:

Expansion to the South of Hemlock Avenue on 22nd Street.

Infrastructure:

Connection to the 8-inch main on Birch and 19th Street with 12-inch piping as indicated in the figure. Looping of 12-inch backbone in expansion area is required. New pressure zone requires addition of one PRV's where indicated.

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan

DATE: 8/16/2018

DESCRIPTION: Expansion Area 9- Potential Internal CIP

CIP Code: 9

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	**Description**	**Est. Quant.**	**Unit**	**Unit Price**	**Total Price**
1.00	**Mobilization**			5.0%	$ 33,000
2.00	**Construction Traffic Control**			5.0%	$ 33,000
3.00	**Water Main**				
3.03	12" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	4,104	LF	$ 39	$ 158,291
	Trench Excav./Backfill for 4-8 ft deep	4,104	LF	$ 24	$ 98,496
3.09	Bedding - 10" - 14"	4,104	LF	$ 7	$ 28,728
3.11	Rock Excavation	2,141	LF	$ 10	$ 21,410
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	4,104	LF	$ 17	$ 69,276
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 27,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	91	EA	$ 2,500	$ 228,000
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance			5.0%	$ 32,000
6.02	None			0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 729,000**
	Contingency [1]				**$ 146,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 131,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 1,006,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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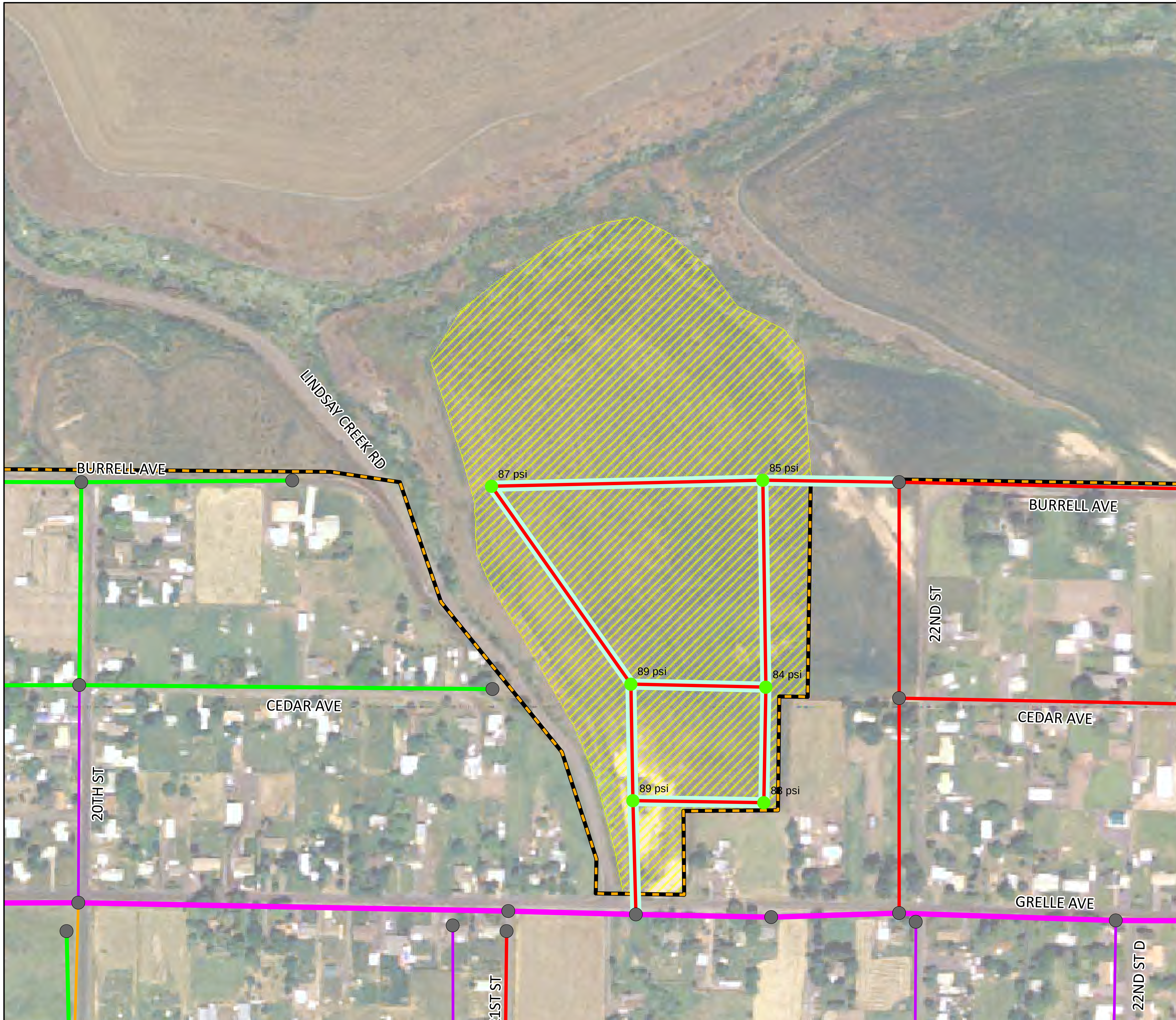

Lewiston Orchards Irrigation District

Area 10 Expansion

N
W E
S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve

0 475 950
Feet

Description:

Expansion to the North of Grelle Ave between 21st and 22nd Street

Infrastructure:

Connection to the 8-inch main on Burrell and 22nd. Connection to the 14-inch main on Grelle. Looping of all 8-inch internal piping required.

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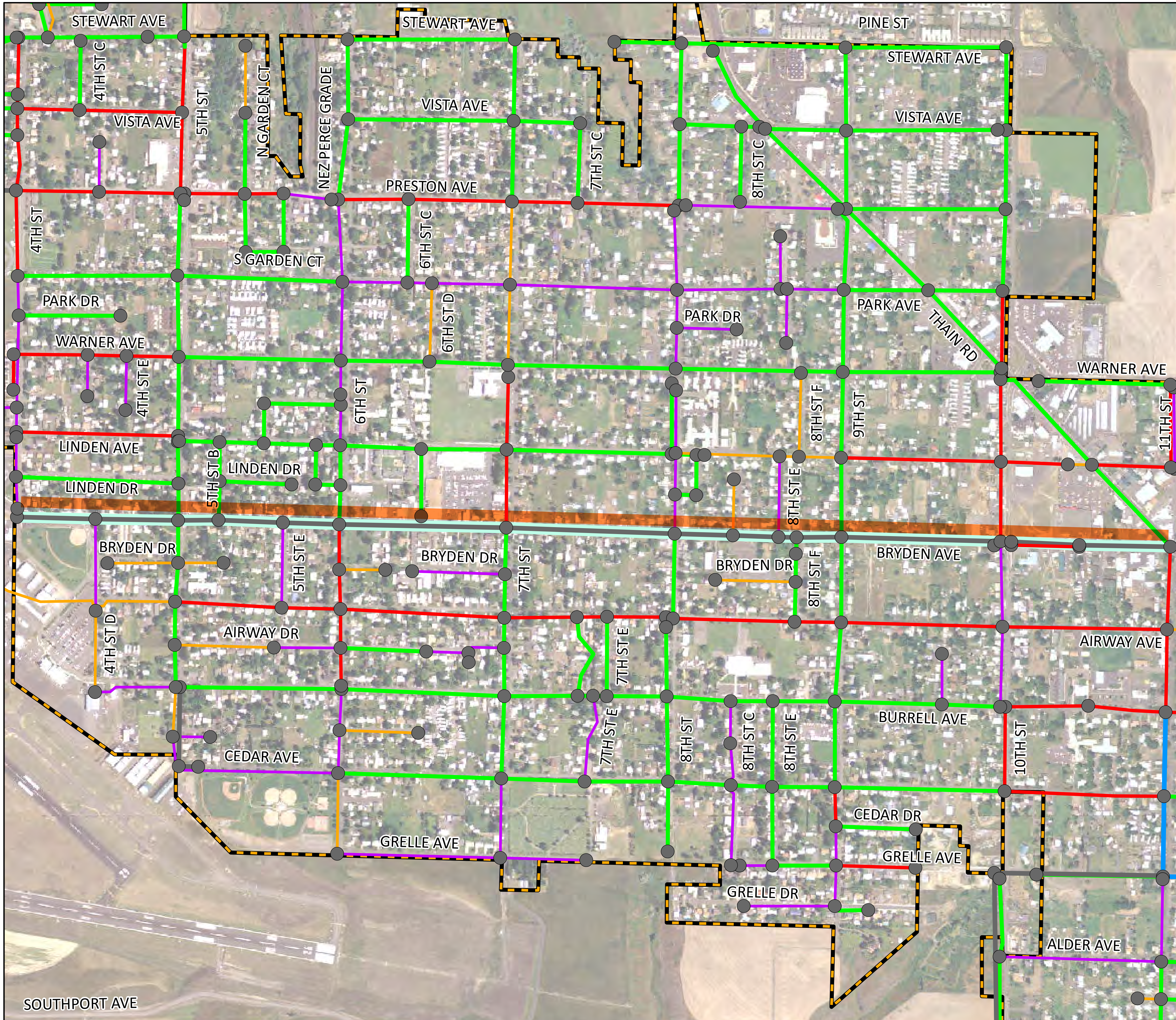
Lewiston Orchards Irrigation District

Bryden Upsize CIP



N
W E
S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve
- Internal CIP w/ Rock
- Internal CIP

0 1,100 2,200
Feet

Description:

Upsize Bryden Avenue mainline to increase fire flow and the level of service in the along the commercial corridor.

Infrastructure:

Replace 9,300 feet of 6 and 4-inch water main with 12-inch PVC pipe.

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT:	Lewiston Orchards Irrigation District Facility Plan	**DATE:**	8/16/2018
DESCRIPTION:	Bryden CIP- Upsizing to 12-inch		
CIP Code:	B		
		J-U-B PROJ. NO.:	21-17-004

ITEM NO.	**DESCRIPTION**	**SCHEDULE OF VALUES**			
		QTY	**UNIT**	**UNIT PRICE**	**TOTAL COST**
ITEM No.	**Description**	**Est. Quant.**	**Unit**	**Unit Price**	**Total Price**
1.00	**Mobilization**			5.0%	$ 74,000
2.00	**Construction Traffic Control**			5.0%	$ 74,000
3.00	**Water Main**				
3.03	12" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	9,278	LF	$ 39	$ 357,852
	Trench Excav./Backfill for 4-8 ft deep	9,278	LF	$ 24	$ 222,672
3.09	Bedding - 10" - 14"	9,278	LF	$ 7	$ 64,946
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	9,278	LF	$ 17	$ 156,613
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 58,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	206	EA	$ 2,500	$ 515,444
5.03	Traffic Signals			2.5%	$ 34,000
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance			5.0%	$ 70,000
6.02	None			0.0%	$ -
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,628,000**
				Contingency [1]	**$ 326,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 293,000**
				TOTAL PROBABLE COST IN 2018 DOLLARS [3]	**$ 2,247,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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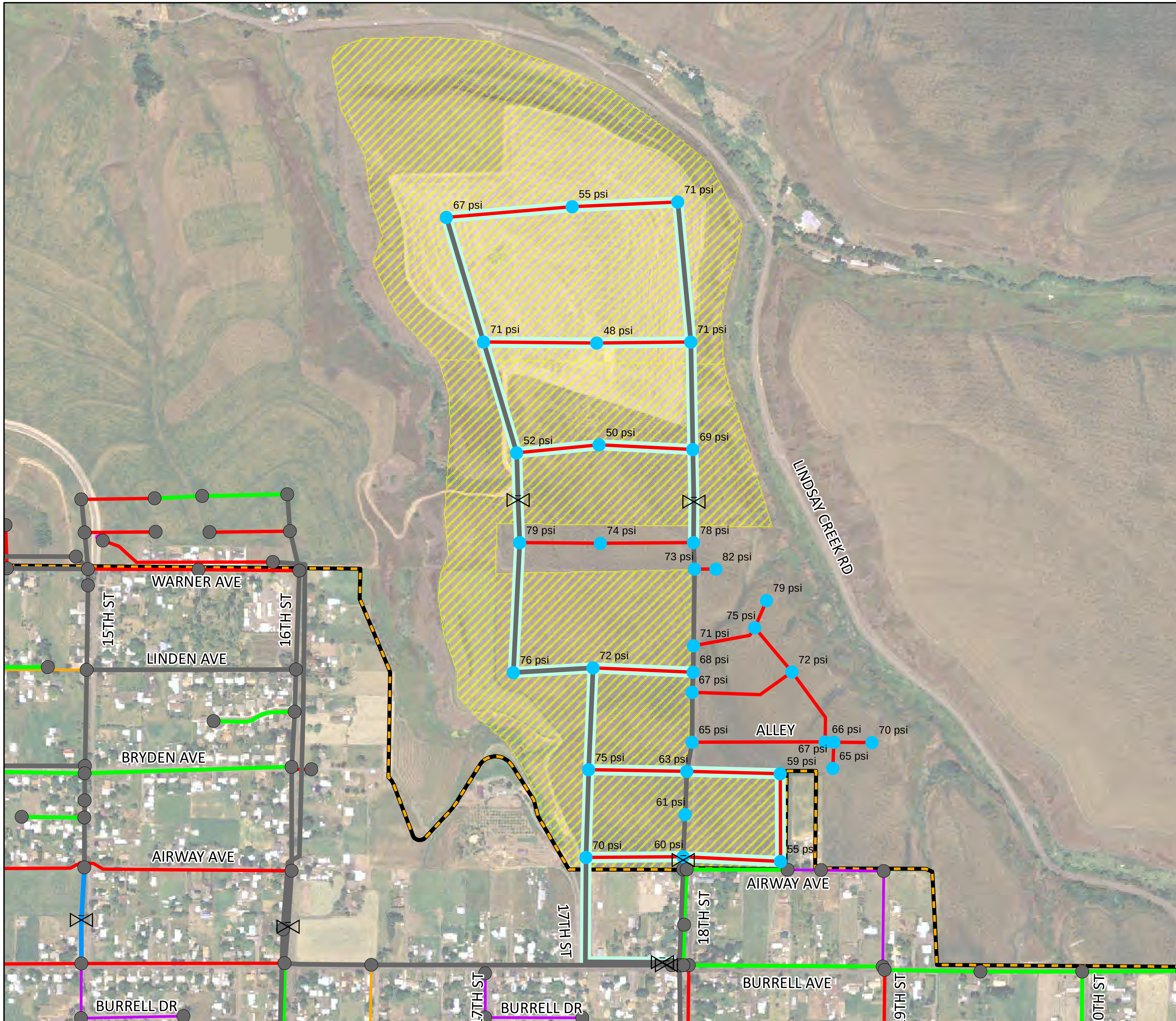

Lewiston Orchards Irrigation District

Canyon Crest Expansion Area

N
W E
S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve
- Internal CIP w/ Rock
- Internal CIP

0 990 1,980
Feet

Description:

Expansion to the North of Airway Avenue between 17th and 19th Street.

Infrastructure:

Connection to the 12-inch main on Burrell and 17th Street with additional PRV. Connection to main must be prior to PRV located on Burrell and 18th Street. Continuation of 12-inch backbone line as indicated on figure. Looping of all 8-inch piping required. Two additional PRV's to be installed when pressures exceed 90 psi

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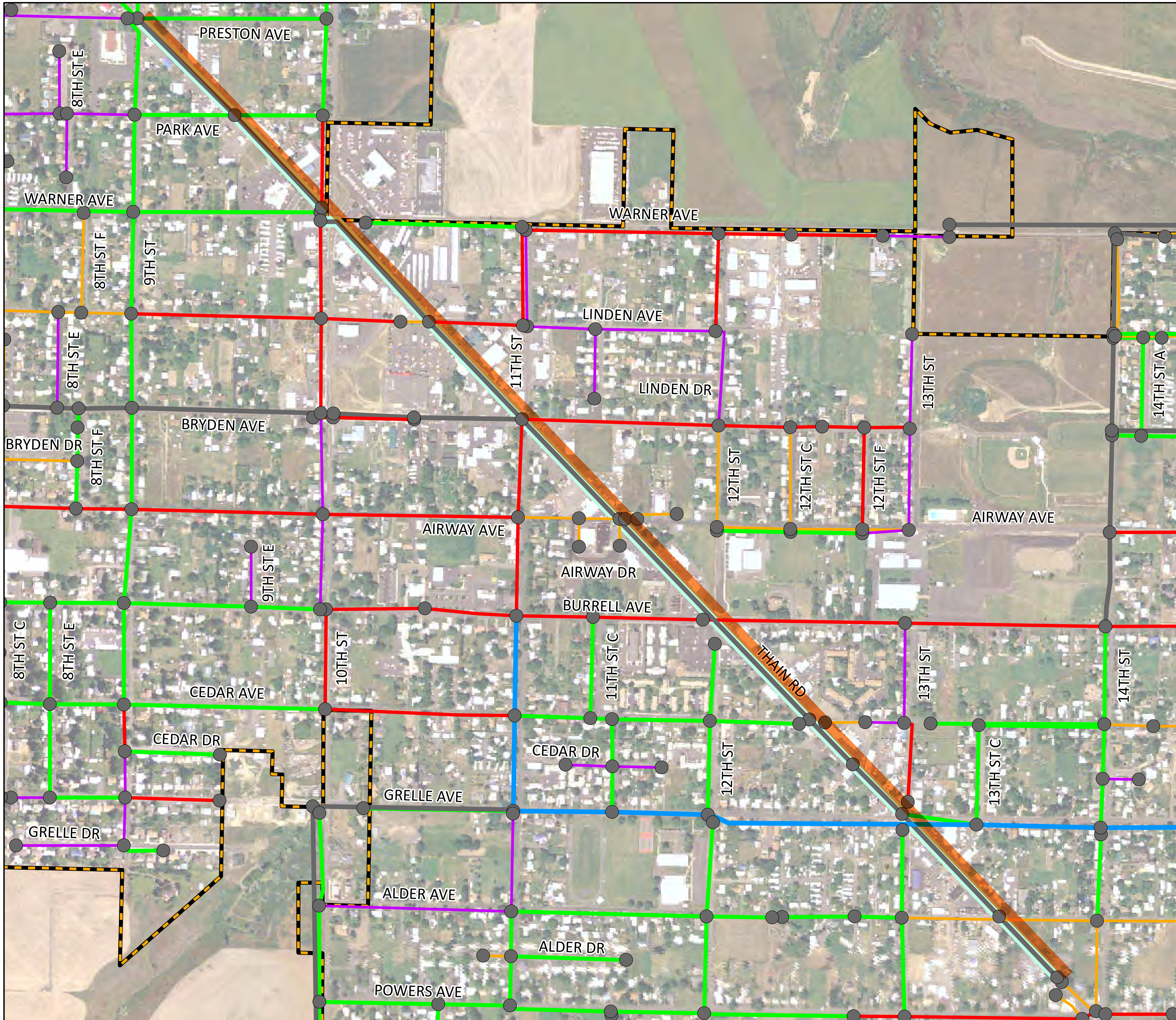

Lewiston Orchards Irrigation District

Thain Upsize CIP

N W E S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve
- Internal CIP w/ Rock
- Internal CIP

0 1,000 2,000
Feet

Description:

Upsize Thain Road mainline to reduce maintenance, increase level of service and fire flow for surrounding areas.

Infrastructure:

Replace 9,000 linear feet of 6-inch and 4-inch mainline with 12-inch PVC pipe.

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan

DATE: 8/16/2018

DESCRIPTION: Thain CIP- Upsizing to 12-inch

CIP Code: T

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 86,000
2.00	**Construction Traffic Control**			5.0%	$ 86,000
3.00	**Water Main**				
3.03	12" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	8,978	LF	$ 39	$ 346,281
	Trench Excav./Backfill for 4-8 ft deep	8,978	LF	$ 24	$ 215,472
3.09	Bedding - 10" - 14"	8,978	LF	$ 7	$ 62,846
4.00	**Surface Repair**				
4.05	Asphalt - Trench Patch width (5-feet wide repair) 5	8,978	LF	$ 34	$ 303,008
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 56,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	200	EA	$ 2,500	$ 498,778
5.03	Traffic Signals			2.5%	$ 37,000
5.04	Mainline stub outs (pipe and fitting costs, installation and markup, excavation backfill and surface repair)	14	EA	$ 8,000	$ 112,000
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance			5.0%	$ 82,000
6.02	None			0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 1,885,000**
	Contingency [1]				**$ 377,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 339,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 2,601,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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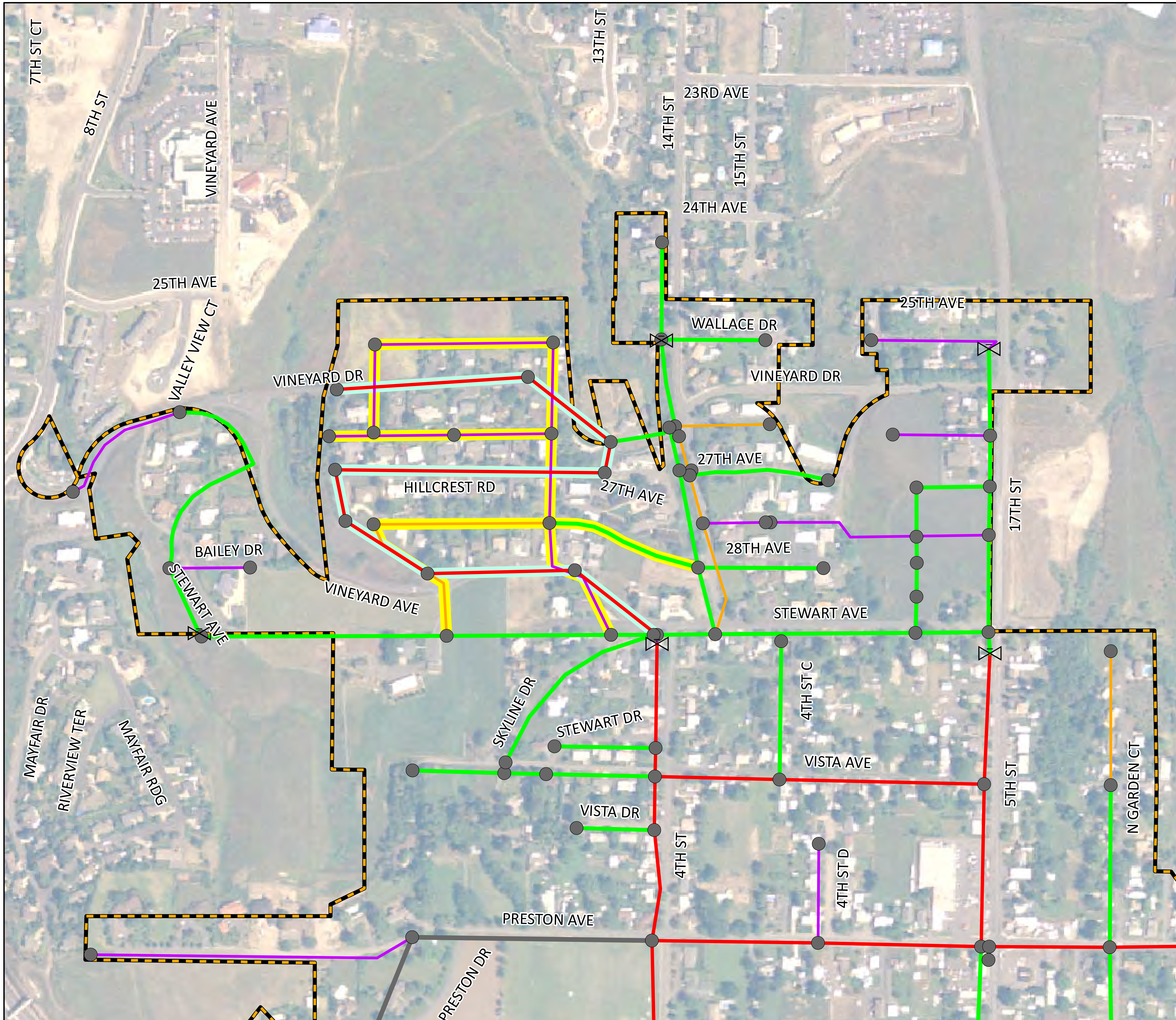

Lewiston Orchards Irrigation District

Vineyards 8-inch Upgrade CIPP

N W E S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Abandon Pipe
- Pressure Reducing Valve

0 590 1,180
Feet

Description:

Increase LOS and improve maintenance accessibility by upsizing and moving the mainline in Vineyards Subdivision to Vineyard Drive.

Infrastructure:

740 Linear feet of 8-inch PVC pipe along Vineyards Drive. Abandon 1,045 feet of 6-inch PVC. Replacement and reconnecting services to new mainline.

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan
DATE: 8/16/2018

DESCRIPTION: Vineyards CIPP- Upsizing to 8-inch
CIP Code: Vineyards

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 28,000
2.00	**Construction Traffic Control**			5.0%	$ 28,000
3.00	**Water Main**				
3.01	8" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	4,017	LF	$ 23	$ 93,355
	Trench Excav./Backfill for 4-8 ft deep	4,017	LF	$ 23	$ 92,391
3.08	Bedding - 4" - 8"	4,017	LF	$ 6	$ 24,102
3.12	Water Mainline Abandonment	5,183	LF	$ 2	$ 10,366
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	4,017	LF	$ 17	$ 67,807
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 22,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	89	EA	$ 2,500	$ 223,167
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance			5.0%	$ 27,000
6.02	None			0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 616,000**
	Contingency [1]				**$ 123,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 111,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 850,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

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4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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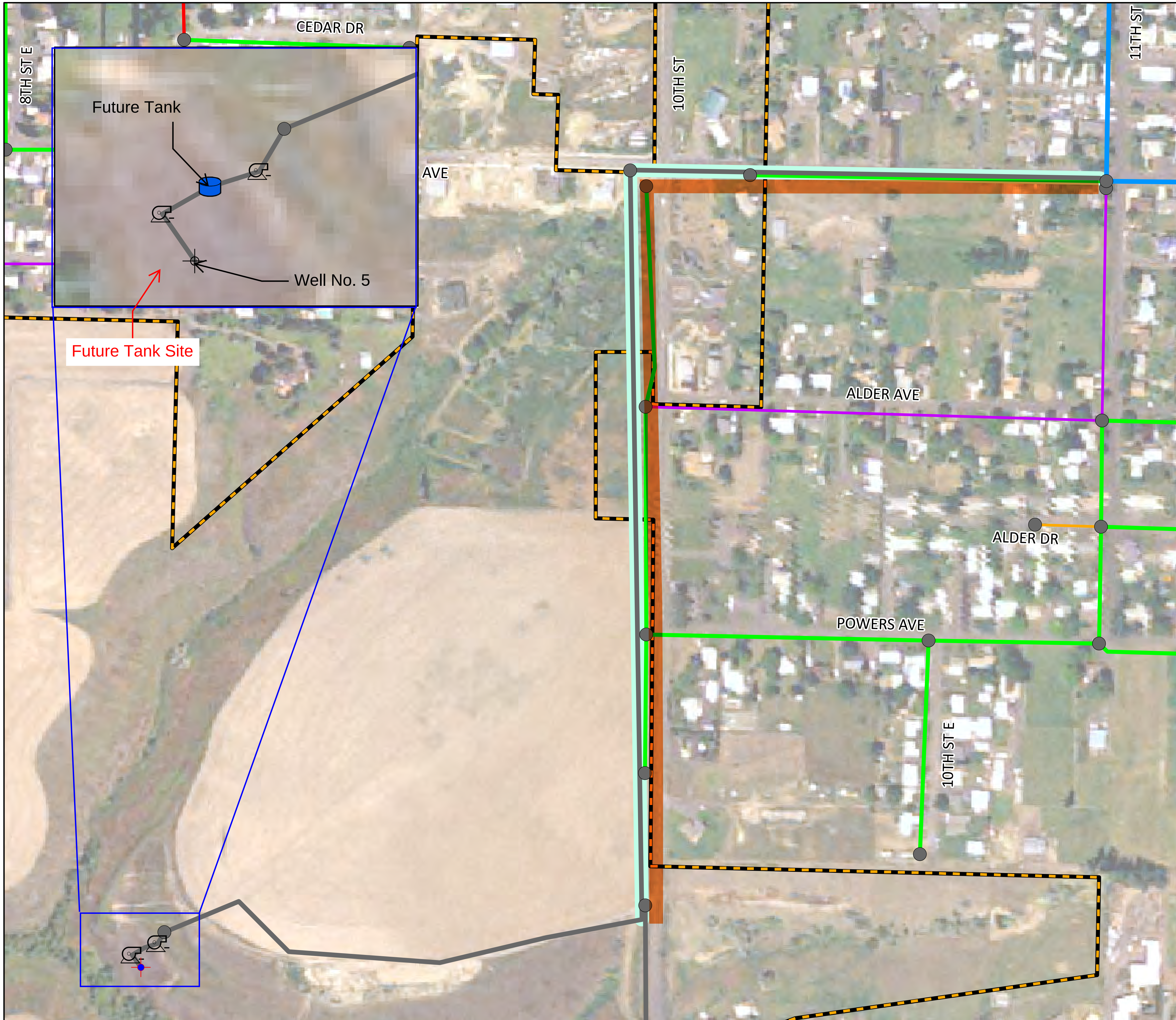

Lewiston Orchards Irrigation District

Well No. 5 CIP

N
W
E
S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve
- Internal CIP w/ Rock
- Internal CIP

0 430 860
Feet

Description:

Additional gpm source to be input into Zone 3a at 11th street and Grelle Avenue.

Infrastructure:

An additional tank, pump, and 3,500 feet of 12-inch transmission main. Phasing of pumps or pumps in parallel may be required as demand increases in the domestic system.

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan
DATE: 8/16/2018

DESCRIPTION: Well No. 5 CIP
CIP Code: Well No. 5

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 32,000
2.00	**Construction Traffic Control**			5.0%	$ 32,000
3.00	**Water Main**				
3.03	12" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	3,499	LF	$ 39	$ 134,956
	Trench Excav./Backfill for 4-8 ft deep	3,499	LF	$ 24	$ 83,976
3.09	Bedding - 10" - 14"	3,499	LF	$ 7	$ 24,493
3.11	Rock Excavation	3,499	LF	$ 10	$ 34,990
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	3,499	LF	$ 17	$ 59,063
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 14,000
5.06	Well No. 5 Additions				
	Well Drilling	1		$ 50,000	$ 50,000
	Pump, Motor, & Column Piping	1		$ 150,000	$ 150,000
	Electrical &HVAC	1	EA	$ 75,000	$ 75,000
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance		0%	5.0%	$ 18,000
6.02	None		0%	0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 708,000**
	Contingency [1]				**$ 142,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 128,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 978,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

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4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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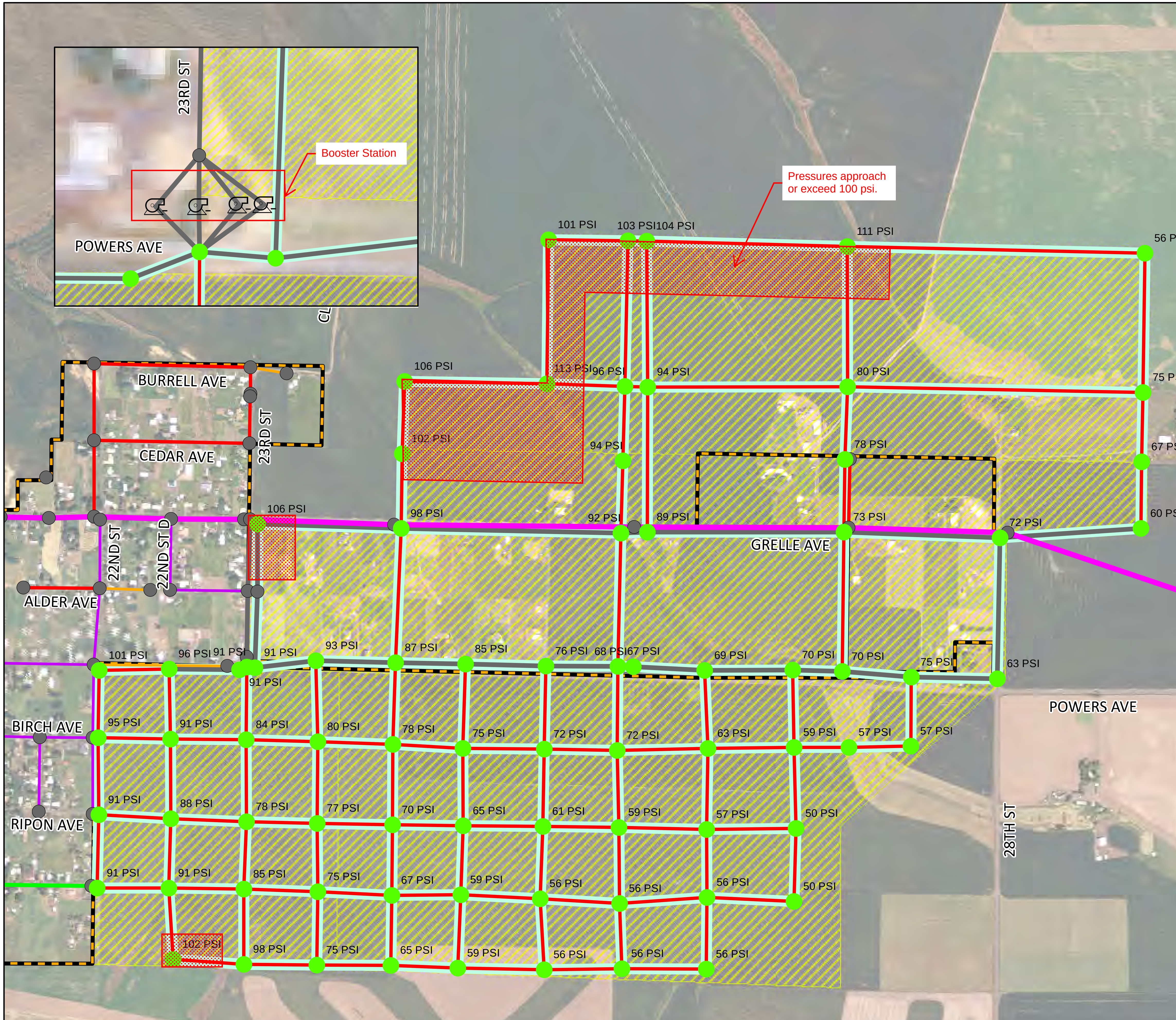

Lewiston Orchards Irrigation District

Area 8 Expansion

N W E S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Pressure Reducing Valve

0 1,300 2,600
Feet

Description:

Creation of Zone 8 boosted zone to provide required pressure and fire flow capability.

Infrastructure:

Booster Station meeting LOID and IDEQ requirements. 12-inch loop on Powers Ave, 23rd-28th, 28th Ave, Grelle Ave from 23rd-28th and 23rd Ave. All other network piping 8-inch.

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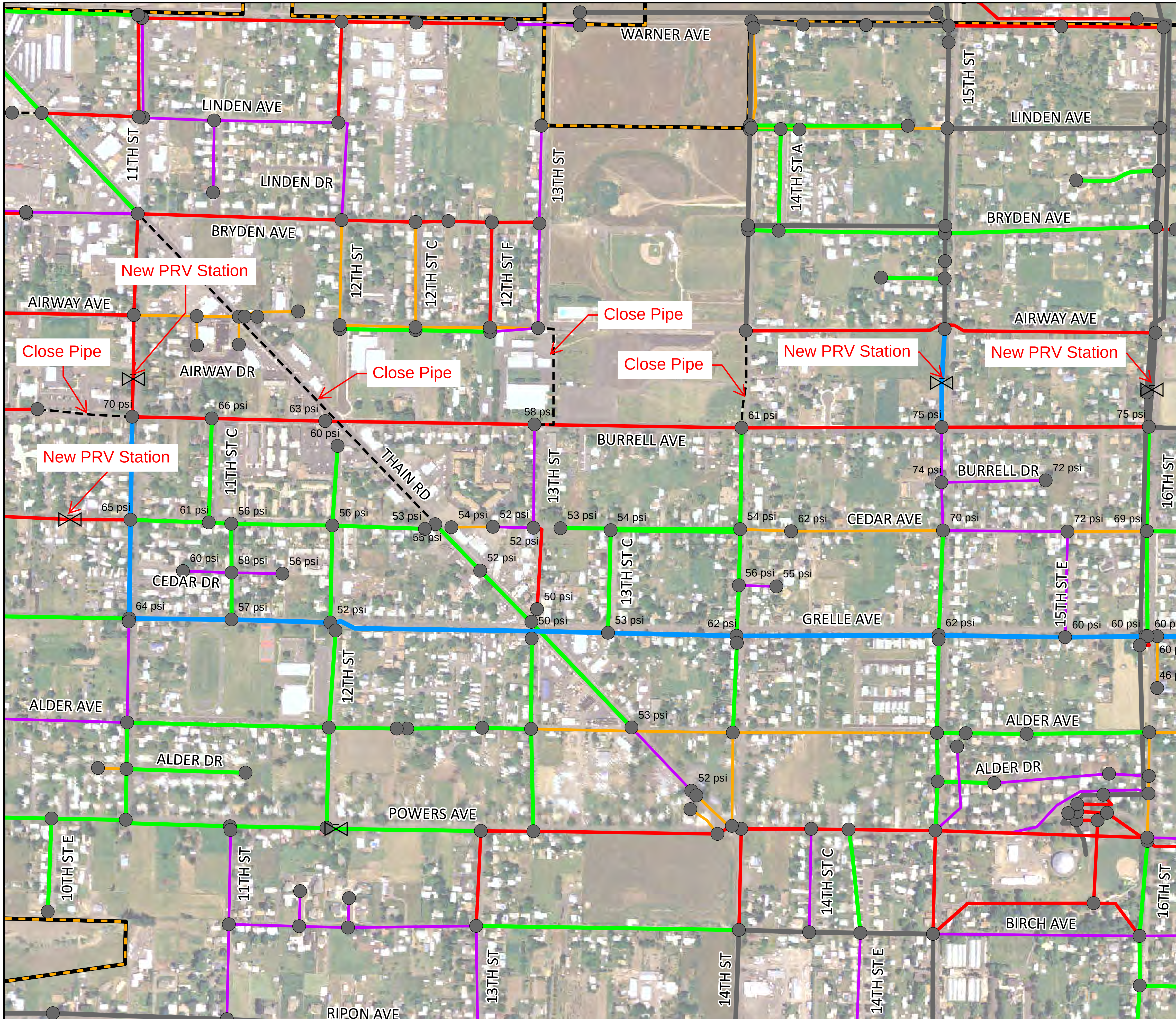
Lewiston Orchards Irrigation District

CIP for Zone Modification



N
W E
S

Legend

Available Fire Flow

- < 1500 gpm
- 1500 - 2000 gpm
- > 2000 gpm
- Fire Flow Supplied by Irrigation System

Pipe Diameter

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- > 14- inch
- Future Pipe
- Irrigation District Service Boundary
- Expansion Area
- Closed Pipe
- Pressure Reducing Valve

0 970 1,940
Feet

Description:
Modify Zone 3 boundary by creating two separate zones, 3a and 3b, to increase pressures from 11th & 16th Street between Burrell and Grelle Avenue.

Infrastructure:
Install four additional PRV stations at the specified locations. Close the four identified locations to provide further zone isolation.

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan

DATE: 8/16/2018

DESCRIPTION: Zone Modification CIP

CIP Code: Z

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 15,000
2.00	**Construction Traffic Control**			5.0%	$ 15,000
3.00	**Water Main**				
4.00	**Surface Repair**				
5.00	**Project Specific Considerations**				
5.05	Prefabricated PRV Station (i.e.Materials, Piping, & Appurtances)	4	EA	$ 75,000	$ 300,000
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance			5.0%	$ -
6.02	None			0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 330,000**
	Contingency [1]				**$ 66,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 79,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 475,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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Appendix R – Irrigation System Opinion of Probable Cost

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Lewiston Orchards Irrigation District

CIP: 12-inch Thain Upsize

Legend

Available Fire Flow
- < 1,500 gpm
- 1,500 - 2,000 gpm
- 2,000 - 3,000 gpm
- > 3,000 gpm

PRV
2018 Pumps
Irrigation Source
Irrigation District Service Boundary

Pipe Network
- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- 14- inch
- 16- inch
- > 16- inch

Description: THAIN UPSIZE CIP

N W E S

0 0.2 0.4 0.6 0.8
Miles

Reuse of Drawings: This document, and the ideas and designs incorporated herein, as an instrument of professional service, is the property of J-U-B ENGINEERS Inc., and is not to be used in whole or in part for any other project without the express written authorization of J-U-B ENGINEERS Inc.

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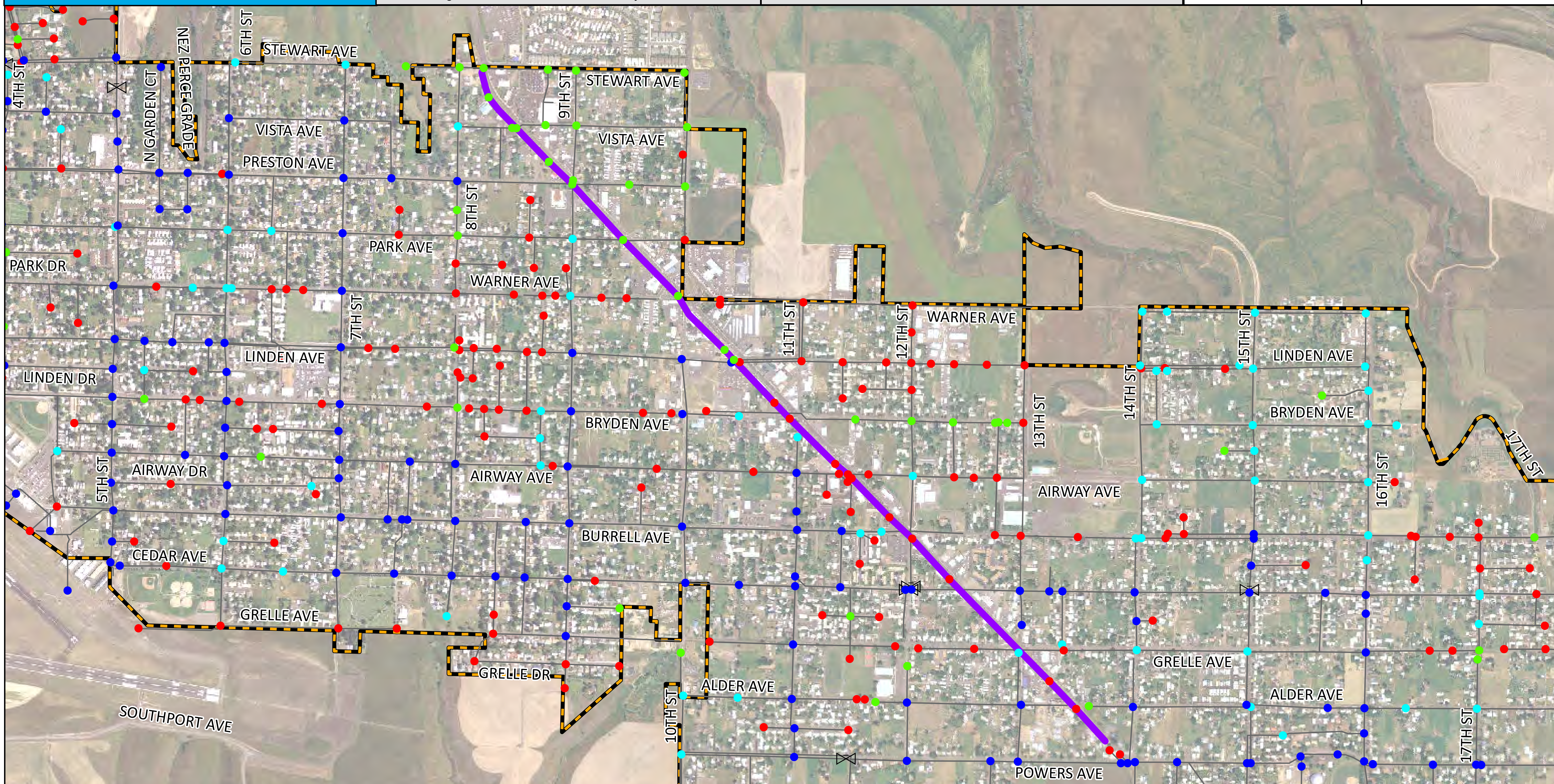

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District Facility Plan **DATE:** 8/16/2018

DESCRIPTION: Thain Upsize to 12-inch

CIP Code: Thain Upsize

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 91,000
2.00	**Construction Traffic Control**			5.0%	$ 91,000
3.00	**Water Main**				
3.03	12" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	10,714	LF	$ 39	$ 413,239
	Trench Excav./Backfill for 4-8 ft deep	10,714	LF	$ 24	$ 257,136
3.09	Bedding - 10" - 14"	10,714	LF	$ 7	$ 74,998
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	10,714	LF	$ 17	$ 180,852
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 67,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	238	EA	$ 2,500	$ 595,222
5.03	Traffic Signals			2.5%	$ 40,000
5.04	Mainline stub outs (pipe and fitting costs, installation and markup, excavation backfill and surface repair)	14	EA	$ 8,000	$ 112,000
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance		0%	5.0%	$ 87,000
6.02	None		0%	0.0%	$ -
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 2,009,000**
				Contingency [1]	**$ 402,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 362,000**
				TOTAL PROBABLE COST IN 2018 DOLLARS [3]	**$ 2,773,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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Lewiston Orchards Irrigation District

CIP: 12-inch Bryden Upsize

Legend

Available Fire Flow

- < 1,500 gpm
- 1,500 - 2,000 gpm
- 2,000 - 3,000 gpm
- > 3,000 gpm

PRV

2018 Pumps

Irrigation Source

Irrigation District Service Boundary

Pipe Network

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- 14- inch
- 16- inch
- > 16- inch

Description: BRYDEN UPSIZE CIP

N
W
E
S

0 0.1 0.2 0.3 0.4
Miles

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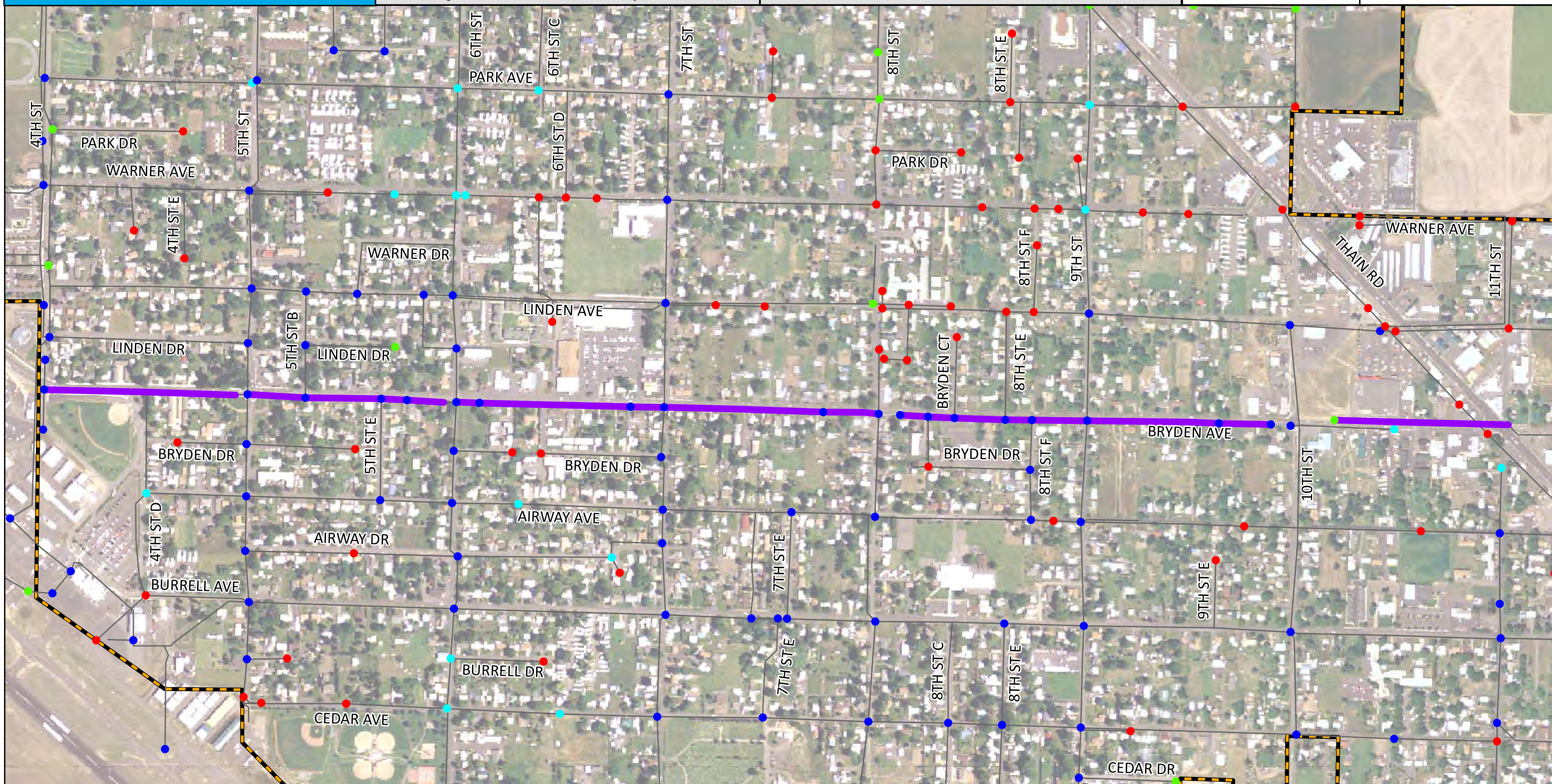

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan
DATE: 8/16/2018

DESCRIPTION: Bryden Upsize to 12-inch
CIP Code: Bryden Upsize

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 69,000
2.00	**Construction Traffic Control**			5.0%	$ 69,000
3.00	**Water Main**				
3.03	12" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	8,632	LF	$ 39	$ 332,936
	Trench Excav./Backfill for 4-8 ft deep	8,632	LF	$ 24	$ 207,168
3.09	Bedding - 10" - 14"	8,632	LF	$ 7	$ 60,424
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	8,632	LF	$ 17	$ 145,708
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 54,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	192	EA	$ 2,500	$ 479,556
5.03	Traffic Signals			2.5%	$ 32,000
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance		0%	5.0%	$ 66,000
6.02	None		0%	0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 1,516,000**
	Contingency [1]				**$ 303,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 273,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 2,092,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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Lewiston Orchards Irrigation District

CIP: 8-inch Vineyards Upgrades

Legend

Available Fire Flow

- < 1,500 gpm
- 1,500 - 2,000 gpm
- 2,000 - 3,000 gpm
- > 3,000 gpm
- PRV
- 2018 Pumps
- Irrigation Source
- Irrigation District Service Boundary

Pipe Network

- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- 14- inch
- 16- inch
- > 16- inch

Description:

- 8-inch PVC Upgrade
- Abandon Existing Pipe

N S W E

0 0.05 0.1 0.15 0.2
Miles

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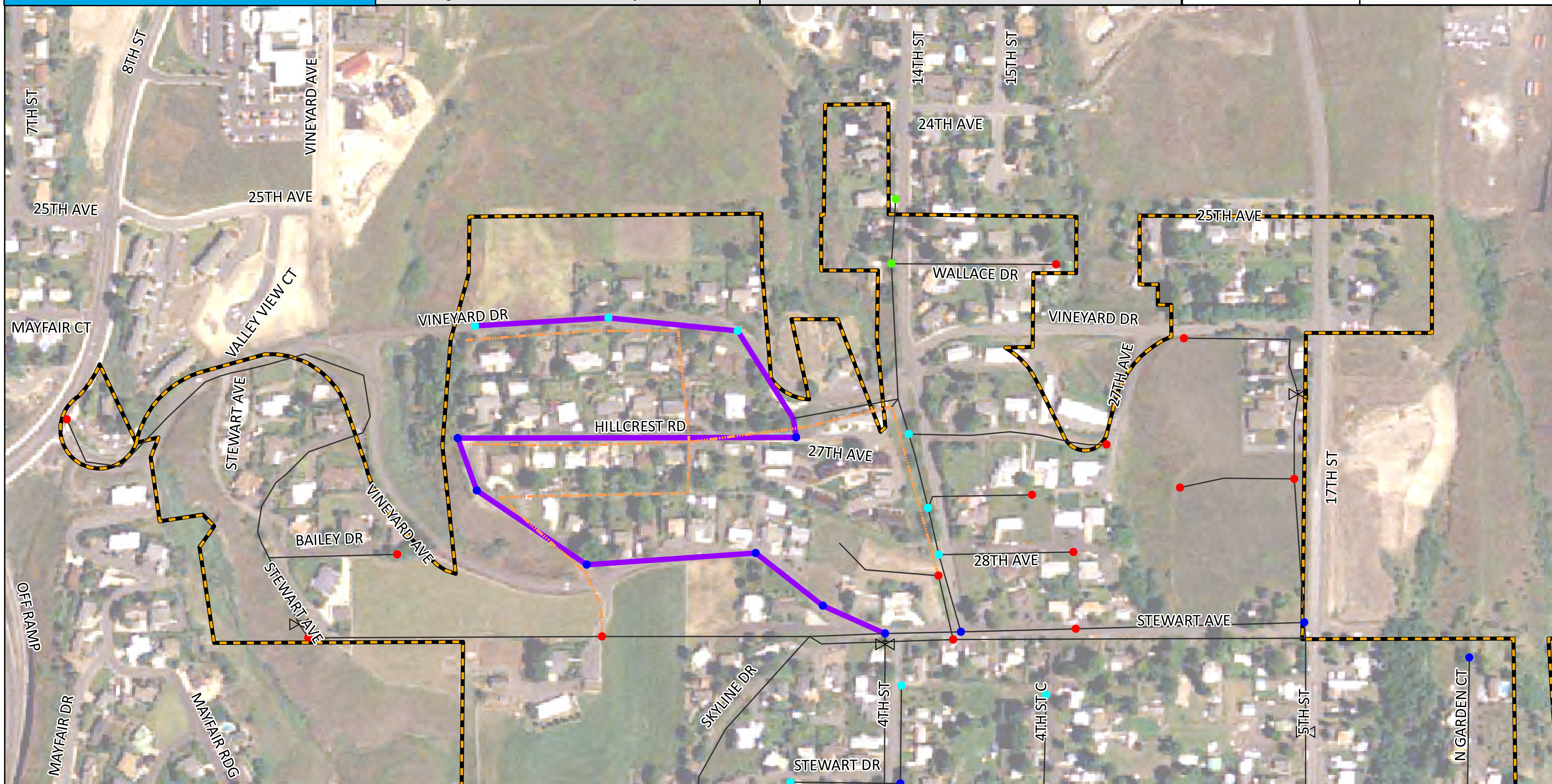

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ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan
DATE: 8/16/2018

DESCRIPTION: Vinyards Upsize to 8-inch
CIP Code: Vineyards Upgrade

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 27,000
2.00	**Construction Traffic Control**			5.0%	$ 27,000
3.00	**Water Main**				
3.01	8" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	3,885	LF	$ 23	$ 90,287
	Trench Excav./Backfill for 4-8 ft deep	3,885	LF	$ 23	$ 89,355
3.08	Bedding - 4" - 8"	3,885	LF	$ 6	$ 23,310
3.12	Water Mainline Abandonment	4,253	LF	$ 2	$ 8,506
4.00	**Surface Repair**				
4.03	Asphalt - Trench Patch width (5-feet wide repair) 4	3,885	LF	$ 17	$ 65,579
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 21,000
5.02	Service Installation (meter and appurtances, markup and installation, piping and connection to main, excavation and surface repair)6	86	EA	$ 2,500	$ 215,833
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance		0%	5.0%	$ 26,000
6.02	None		0%	0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 594,000**
	Contingency [1]				**$ 119,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 107,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 820,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

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Lewiston Orchards Irrigation District

CIP: 24-inch Parallel Main 16th to Mann Lake

Legend

Available Fire Flow
- < 1,500 gpm
- 1,500 - 2,000 gpm
- 2,000 - 3,000 gpm
- > 3,000 gpm

PRV
2018 Pumps
Irrigation Source
Irrigation District Service Boundary

Pipe Network
- < 2- inch
- 4- inch
- 6- inch
- 8- inch
- 10- inch
- 12- inch
- 14- inch
- 16- inch
- > 16- inch

Description:
- Parallel-Phase 1
- Parallel-Phase 2
- Parallel-Phase 3
- Parallel- Phase 4

N W E S

0 0.275 0.55 0.825 1.1
Miles

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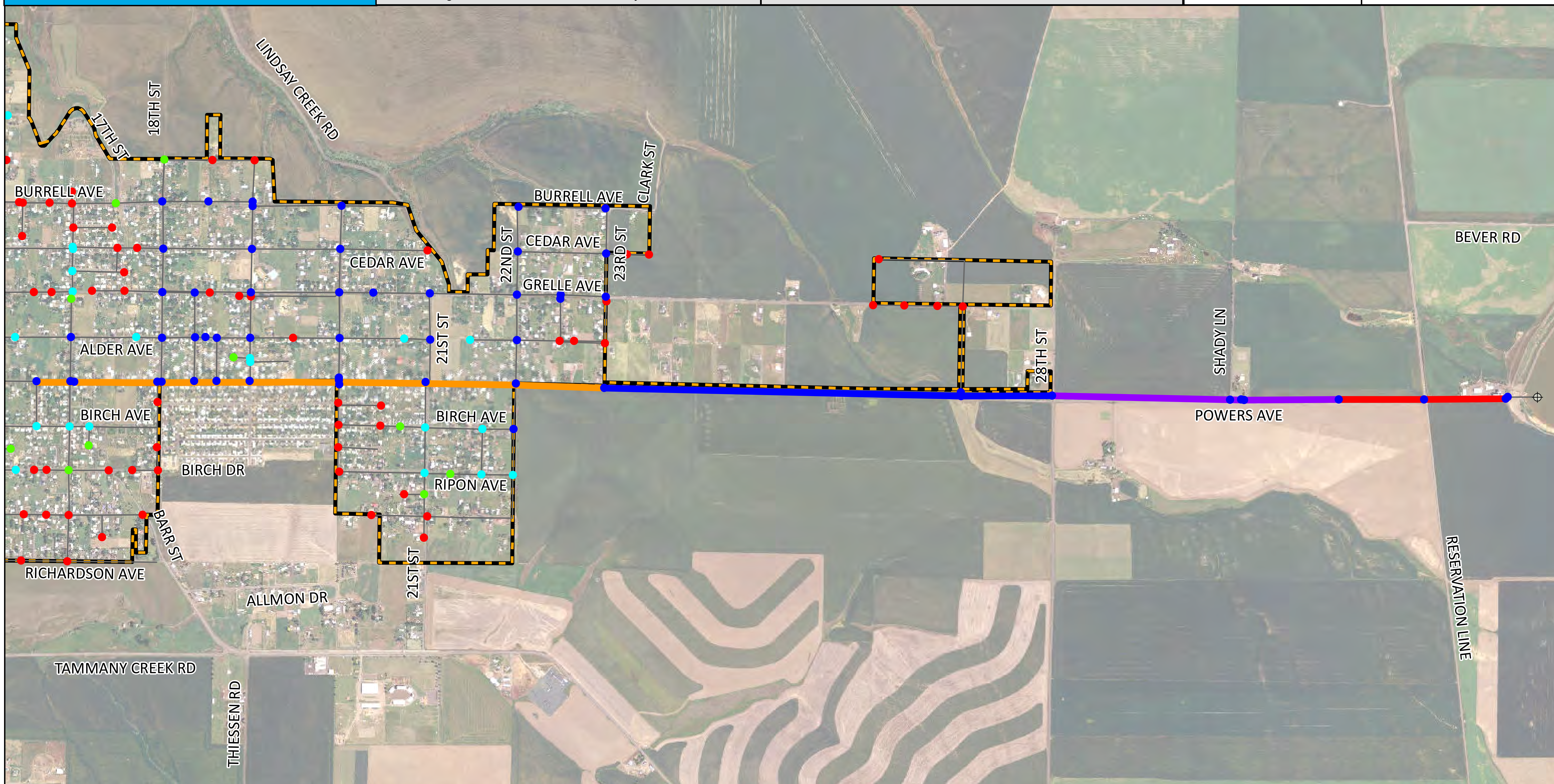

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J-U-B ENGINEERS, INC.

ENGINEER'S OPINION OF PROBABLE COST

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan
DATE: 8/16/2018

DESCRIPTION: Parallel 24-inch Mainline between 23rd & 28th
CIP Code: Parallel-Phase 1

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 101,000
2.00	**Construction Traffic Control**			5.0%	$ 101,000
3.00	**Water Main**				
3.07	24" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	6,669	LF	$ 178	$ 1,185,148
	Trench Excav./Backfill for 4-8 ft deep	6,669	LF	$ 50	$ 333,450
3.10	Bedding - 16" - 24"	6,669	LF	$ 14	$ 93,366
4.00	**Surface Repair**				
4.04	Asphalt - 1/2 Street width per City Standards (10-feet wide repair) 4	6,669	LF	$ 34	$ 225,079
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 81,000
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance		0%	5.0%	$ 96,000
6.02	None		0%	0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 2,216,000**
	Contingency [1]				**$ 443,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 399,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 3,058,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan

DATE: 8/16/2018

DESCRIPTION: Parallel 24-inch Mainline between 16th & 23rd

CIP Code: Parallel-Phase 2

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 128,000
2.00	**Construction Traffic Control**			5.0%	$ 128,000
3.00	**Water Main**				
3.07	24" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	8,450	LF	$ 178	$ 1,501,650
	Trench Excav./Backfill for 4-8 ft deep	8,450	LF	$ 50	$ 422,500
3.10	Bedding - 16" - 24"	8,450	LF	$ 14	$ 118,300
4.00	**Surface Repair**				
4.04	Asphalt - 1/2 Street width per City Standards (10-feet wide repair) 4	8,450	LF	$ 34	$ 285,188
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 102,000
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance		0%	5.0%	$ 121,000
6.02	None		0%	0.0%	$ -
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 2,807,000**
				Contingency [1]	**$ 561,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 505,000**
				TOTAL PROBABLE COST IN 2018 DOLLARS [3]	**$ 3,873,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan
DATE: 8/16/2018

DESCRIPTION: Parallel 24-inch Mainline between 28th & Filter Plant
CIP Code: Parallel-Phase 3

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 64,000
2.00	**Construction Traffic Control**			5.0%	$ 64,000
3.00	**Water Main**				
3.07	24" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	4,262	LF	$ 178	$ 757,400
	Trench Excav./Backfill for 4-8 ft deep	4,262	LF	$ 50	$ 213,100
3.10	Bedding - 16" - 24"	4,262	LF	$ 14	$ 59,668
4.00	**Surface Repair**				
4.04	Asphalt - 1/2 Street width per City Standards (10-feet wide repair) 4	4,262	LF	$ 34	$ 143,843
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 52,000
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance		0%	5.0%	$ 61,000
6.02	None		0%	0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 1,415,000**
	Contingency [1]				**$ 283,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 255,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 1,953,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

201 S Jackson St, Moscow, ID 83843 / 208.746.9010

PROJECT: Lewiston Orchards Irrigation District
Facility Plan
DATE: 8/16/2018

DESCRIPTION: Parallel 24-inch Mainline between Filter Plant to Mann Lake
CIP Code: Parallel- Phase 4

J-U-B PROJ. NO.: 21-17-004

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1.00	**Mobilization**			5.0%	$ 38,000
2.00	**Construction Traffic Control**			5.0%	$ 38,000
3.00	**Water Main**				
3.07	24" Water Main Pipe				
	Pipe, fittings, valves, hydrants (excavation, bedding, backfill not included)	2,523	LF	$ 178	$ 448,362
	Trench Excav./Backfill for 4-8 ft deep	2,523	LF	$ 50	$ 126,150
3.10	Bedding - 16" - 24"	2,523	LF	$ 14	$ 35,322
4.00	**Surface Repair**				
4.04	Asphalt - 1/2 Street width per City Standards (10-feet wide repair) 4	2,523	LF	$ 34	$ 85,151
5.00	**Project Specific Considerations**				
5.01	Potable and Non-Potable Separation (percentage of pipe costs)			5.0%	$ 30,000
6.00	**Miscellaneous Other**				
6.01	Bonding and Insurance		0%	5.0%	$ 36,000
6.02	None		0%	0.0%	$ -
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 837,000**
	Contingency [1]				**$ 167,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 151,000**
	TOTAL PROBABLE COST IN 2018 DOLLARS [3]				**$ 1,155,000**

1 Estimated at 20% of construction subtotal.

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 15% of construction subtotal, including contingency

3 Costs are in 2018 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

4 Asphalt Surface Repair Assumes a typical section of 3" AC on 6" of 3/4" Base

5 Asphalt Surface Repair Assumes a typical section of 6" AC on 12" of 3/4" Base

6 Estimated at 2 service laterals per 90 linear feet of pipe

Appendix S – Generator Addition Preliminary Study

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Update Cost Estimate

AEI Engineering Incorporated
1910 NW Boulevard, Suite 201, Coeur d' Alene, ID 83814
(208) 666-4001 (208) 666-4021 FAX

ELECTRICAL CONSTRUCTION COST ESTIMATE

Client	J-U-B Engineers	Date	6/25/2018
Project No.	M18122	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option A	QUANTITY		MATERIAL		LABOR		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	
Generator 700kW	1	EA	200000	$200,000	160	$12,000	$212,000
Service ATS (1200A)	1	EA	12000	$12,000	25	$1,875	$13,875
Electrical Gear (1200A MDP)	1	LS	5500	$5,500	40	$3,000	$8,500
Shops Transformer (75KVA)	1	LS	5000	$5,000	20	$1,500	$6,500
Office Transformer (25KVA)	1	LS	3000	$3,000	20	$1,500	$4,500
Well 4 Transformer (300KVA)	1	LS	33000	$33,000	50	$3,750	$36,750
Ductbank 2" PVC Conduit	1390	LF	4.82	$6,700	4.58	$6,366	$13,066
Ductbank 4" PVC Conduit	80	LF	11.2	$896	20	$1,600	$2,496
600 KCMIL Conductors	1360	LF	18.13	$24,657	4.5	$6,120	$30,777
2 AWG 5kV Conductors	1600	LF	11.81	$18,896	4	$6,400	$25,296
1 AWG Conductors	60	LS	2.87	$172	2	$150	$322
Site Electrical Trenching and Backfill	830	LF			5.75	$4,773	$4,773
HH	3	EA	200	$600	200	$600	$1,200
HH Cover	3	EA	300	$900	50	$150	$1,050
Ground Rod	3	EA	100	$300	60	$180	$480
Utility Charges							$25,000
SUBTOTALS				$311,621		$49,964	$386,585
MISCELLANEOUS						(10%)	$38,658
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$112,689
						TOTAL	$537,932

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ELECTRICAL CONSTRUCTION COST ESTIMATE

Client	J-U-B Engineers	Date	6/25/2018
Project No.	M18122	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option B	QUANTITY		MATERIAL		LABOR		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	
Generator 700kW	1	EA	200000	$200,000	160	$12,000	$212,000
Hereth ATS (400A)	1	EA					$5,900
Well 4 ATS (400A)	1	EA					$5,900
Office ATS (225A)	1	EA					$2,700
Shops ATS (225A)	1	EA					$3,950
Shops Transformer (75KVA)	1	LS	5000	$5,000	20	$1,500	$6,500
Office Transformer (25KVA)	1	LS	3000	$3,000	20	$1,500	$4,500
Well 4 Transformer (300KVA)	1	LS	33000	$33,000	50	$3,750	$36,750
Ductbank 2" PVC Conduit	1390	LF	4.82	$6,700	4.58	$6,366	$13,066
Ductbank 4" PVC Conduit	80	LF	11.2	$896	20	$1,600	$2,496
600 KCMIL Conductors	1360	LF	18.13	$24,657	4.5	$6,120	$30,777
2 AWG 5kV Conductors	1600	LF	11.81	$18,896	4	$6,400	$25,296
1 AWG Conductors	60	LS	2.87	$172	2	$150	$322
Site Electrical Trenching and Backfill	830	LF			5.75	$4,773	$4,773
HH	3	EA	200	$600	200	$600	$1,200
HH Cover	3	EA	300	$900	50	$150	$1,050
Ground Rod	3	EA	100	$300	60	$180	$480
Utility Charges							$15,000
SUBTOTALS				$294,121		$45,089	$372,660
MISCELLANEOUS						(10%)	$37,266
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$108,630
						TOTAL	$518,556

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ELECTRICAL CONSTRUCTION COST ESTIMATE

Client	J-U-B Engineers	Date	6/25/2018
Project No.	M18122	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option C	QUANTITY		MATERIAL		LABOR		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	
Generator 175kW	1	EA	50000	$50,000	80	$6,000	$56,000
Hereth ATS (400A)	1	EA					$5,900
Ductbank 4" PVC Conduit	200	LF	11.2	$2,240	20	$4,000	$6,240
600 KCMIL Conductors	320	LF	18.13	$5,802	4.5	$1,440	$7,242
Site Electrical Trenching and Backfill	200	LF			5.75	$1,150	$1,150
HH	1	EA	200	$200	200	$200	$400
HH Cover	1	EA	300	$300	50	$50	$350
Ground Rod	1	EA	100	$100	60	$60	$160
Utility Charges							$1,000
SUBTOTALS				$58,642		$12,900	$78,442
MISCELLANEOUS						(10%)	$7,844
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$22,866
						TOTAL	$109,151

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ELECTRICAL CONSTRUCTION COST ESTIMATE

Client	J-U-B Engineers	Date	6/25/2018
Project No.	M18122	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option D	QUANTITY		MATERIAL		LABOR		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	
Generator 400kW	1	EA	92000	$92,000	160	$12,000	$104,000
Service ATS (600A)	1	EA	9500	$9,500	25	$1,875	$11,375
Well 4 Transformer (300KVA)	1	LS	43260	$43,260	50	$3,750	$47,010
Ductbank 2" PVC Conduit	80	LF	4.82	$386	4.58	$366	$752
Ductbank 4" PVC Conduit	80	LF	11.2	$896	20	$1,600	$2,496
600 KCMIL Conductors	400	LF	18.13	$7,252	4.5	$1,800	$9,052
2 AWG 5kV Conductors	320	LF	11.81	$3,779	4	$1,280	$5,059
Site Electrical Trenching and Backfill	100	LF			5.75	$575	$575
HH	1	EA	200	$200	200	$200	$400
HH Cover	1	EA	300	$300	50	$50	$350
Ground Rod	1	EA	100	$100	60	$60	$160
Utility Charges							$5,000
SUBTOTALS				$157,673		$23,556	$186,229
MISCELLANEOUS						(10%)	$18,623
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$54,286
						TOTAL	$259,138

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ELECTRICAL CONSTRUCTION COST ESTIMATE

Client	J-U-B Engineers	Date	6/25/2018
Project No.	M18122	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option E	QUANTITY		MATERIAL		LABOR		
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	TOTAL COST
2400V Generator 400kW	1	EA	150000	$150,000	160	$12,000	$162,000
2400V Service ATS	1	EA	100000	$100,000	80	$6,000	$106,000
Ductbank 2" PVC Conduit	80	LF	4.82	$386	4.58	$366	$752
Ductbank 4" PVC Conduit	80	LF	11.2	$896	20	$1,600	$2,496
2 AWG 5kV Conductors	320	LF	11.81	$3,779	4	$1,280	$5,059
Site Electrical Trenching and Backfill	100	LF			5.75	$575	$575
HH	1	EA	200	$200	200	$200	$400
HH Cover	1	EA	300	$300	50	$50	$350
Ground Rod	1	EA	100	$100	60	$60	$160
Utility Charges							$5,000
SUBTOTALS				$255,661		$22,131	$282,792
MISCELLANEOUS						(10%)	$28,279
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$82,434
						TOTAL	$393,505

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ELECTRICAL CONSTRUCTION COST ESTIMATE

Client	J-U-B Engineers	Date	6/25/2018
Project No.	M18122	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option F	QUANTITY		MATERIAL		LABOR		
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	TOTAL COST
Generator 700kW	1	EA	200000	$200,000	160	$12,000	$212,000
Hereth ATS (600A)	1	EA	9500	$9,500	25	$1,875	$11,375
Well 4 ATS (400A)	1	EA					$5,900
Well 4 Transformer (300KVA)	1	LS	33000	$33,000	50	$3,750	$36,750
Ductbank 2" PVC Conduit	500	LF	4.82	$2,410	4.58	$2,290	$4,700
Ductbank 4" PVC Conduit	80	LF	11.2	$896	20	$1,600	$2,496
600 KCMIL Conductors	940	LF	18.13	$17,042	4.5	$4,230	$21,272
2 AWG 5kV Conductors	1600	LF	11.81	$18,896	4	$6,400	$25,296
Site Electrical Trenching and Backfill	600	LF			5.75	$3,450	$3,450
HH	3	EA	200	$600	200	$600	$1,200
HH Cover	3	EA	300	$900	50	$150	$1,050
Ground Rod	3	EA	100	$300	60	$180	$480
Utility Charges							$10,000
SUBTOTALS				$283,544		$36,525	$335,969
MISCELLANEOUS						(10%)	$33,597
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$97,935
						TOTAL	$467,501

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ELECTRICAL CONSTRUCTION COST ESTIMATE

Client	J-U-B Engineers	Date	6/25/2018
Project No.	M18122	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option G	QUANTITY		MATERIAL		LABOR		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	
Used 1000kW Generator	1	EA	65000	$65,000	160	$12,000	$77,000
Service ATS (1200A)	1	EA	12000	$12,000	25	$1,875	$13,875
Electrical Gear (1200A MDP)	1	LS	5500	$5,500	40	$3,000	$8,500
Shops Transformer (75KVA)	1	LS	5000	$5,000	20	$1,500	$6,500
Office Transformer (25KVA)	1	LS	3000	$3,000	20	$1,500	$4,500
Well 4 Transformer (300KVA)	1	LS	33000	$33,000	50	$3,750	$36,750
Ductbank 2" PVC Conduit	1390	LF	4.82	$6,700	4.58	$6,366	$13,066
Ductbank 4" PVC Conduit	80	LF	11.2	$896	20	$1,600	$2,496
600 KCMIL Conductors	1360	LF	18.13	$24,657	4.5	$6,120	$30,777
2 AWG 5kV Conductors	1600	LF	11.81	$18,896	4	$6,400	$25,296
1 AWG Conductors	60	LS	2.87	$172	2	$150	$322
Site Electrical Trenching and Backfill	830	LF			5.75	$4,773	$4,773
HH	3	EA	200	$600	200	$600	$1,200
HH Cover	3	EA	300	$900	50	$150	$1,050
Ground Rod	3	EA	100	$300	60	$180	$480
Utility Charges							$25,000
SUBTOTALS				$176,621		$49,964	$251,585
MISCELLANEOUS						(10%)	$25,158
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$73,337
						TOTAL	$350,080

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4/18/2012

J-U-B Engineers, Inc.
1630 23rd Ave, Suite 1101-A
Lewiston, ID 83501

Attention: Mr. Cory Baune, P.E.

Subject: Lewis Orchards Irrigation District (LOID) Generator Addition Preliminary Study - DRAFT

Dear Cory:

Please find our summary report below:

<u>Introduction</u>

After participating in the site walk-through and meeting with J-U-B and LOID, we have research the cost and feasibility of various methods of providing stand-by power to the facilities discussed (Hereth Booster Station, LOID Office, LOID Maintenance Shops, and LOID Well 4). Prior to discussing the stand-by generator options, a brief overview of the existing electrical utility services is presented.

<u>Overview</u>

The existing electrical distribution system consists of four separate utility services at each of the following sites:

1. Hereth Booster Station (three phase - served by a 225KVA, 480/277V utility transformer).
2. LOID Office (single phase - served by a 240/120V residential type utility transformer).
3. LOID Maintenance Shops (three phase - served by a 50 & 25KVA, 240/120V open delta configured utility transformers).
4. LOID Well 4 (three phase - served by a 1000KVA, 2,400V delta connected utility transformer).

The attached “Sketch – 1” provides a basic one line diagram of the overall system.

Based on discussions with District personnel and a review of the project sites we have researched a few possible scenarios for adding stand-by power to the following LOID sites (herein referred to as the “facility”):

1. Hereth Booster Station
2. LOID Office
3. LOID Maintenance Shops
4. LOID Well 4

A summary of results and conclusions is presented in the following paragraphs. All design and cost values are preliminary and will need to be revised during actual design.

Stand-by Power Potential Options

We have developed seven options for providing stand-by power; they are as follows:

- Option A: Reconfigure the electric utility service to provide a single 480V utility transformer and provide stand-by power from a single generator to the entire facility.
- Option B: Reconfigure the electric utility service to provide a single 480V utility transformer for the Hereth Booster Station and Well 4, leaving the Office and Maintenance Shops on the existing services and provide stand-by power from a single generator to the entire facility.
- Option C: Provide stand-by power from a single generator to the Hereth Booster Station.
- Option D: Provide stand-by power from a single 480V generator to Well 4.
- Option E: Provide stand-by power from a single 2,400V generator to Well 4.
- Option F: : Reconfigure the electric utility service to provide a single utility transformer for the Hereth Booster Station and Well 4 and provide stand-by power from a single 480V generator to both locations.

Reference attached sketches for a diagrammatic representation of the above options.

Stand-by Power Potential Option Preliminary Probable Construction Cost

The following is a summary of the preliminary probable cost for the evaluated options. A more detailed cost summary is attached for reference.

- Option A: $472,500
- Option B: $456,602
- Option C: $101,880
- Option D: $241,567
- Option E: $391,675
- Option F: $399,681

Stand-by Power Potential Option Preliminary Engineering Cost

The following is a summary of the preliminary engineering cost for the evaluated options:

- Option A: $23,625
- Option B: $22,830
- Option C: $5,094
- Option D: $5,494
- Option E: $19,583
- Option F: $19,984

Recommendations

Based on the above preliminary analysis we have the following general recommendations:

1. If stand-by power is desired at all locations, we would recommend Option B for the following reasons:
    a. Slightly less cost than Option A.

    b. Provides a more reliable system by maintaining separate utility services (reducing common mode failure points).
    c. This option can be constructed in phases if necessary to control capital expenditures.
2. If stand-by power is desired at the Hereth Booster Station and Well 4, we would recommend Option F for the following reasons:
    a. Least cost, note this is essentially a sub-set of Option B.
3. If stand-by power is desired only at the Hereth Booster Station, we would recommend Option C.
4. If stand-by power is desired only at Well 4, we would recommend Option D.

The use of a rental type portable generator is technically feasible for the Hereth Booster Station, LOID Office, and LOID Maintenance Shops with the addition of local manual transfer switches and generator receptacles. This is not an option at LOID Well 4 because of the 2400 volt service. This option may present availability problems; for example if the rental generator is needed during a natural disaster where others may also need the same generators.

As a note of clarification, the single largest cost impact is providing stand-by service to the 2,400V Well 4 system. Medium voltage generators and transfer switch gear are prohibitively expensive and require additional maintenance. The standard method of providing stand-by service to 2,400V systems (of the Well 4 HP) is to use additional transformers so that the transfer switches and generator remain 480V.

There are numerous variations and further refinements which should be considered during the final design stages, however, the above information should assist in the preliminary planning phase of the project.

Please call with any questions or comments.

Sincerely,

Raymond J. Watkins

Raymond J. Watkins

ONE–LINE DIAGRAM (EXISTING SYSTEM) 1 –

NOT TO SCALE

REVISIONS		
REV	BY	DATE

DRAWING STATUS		
	BY	DATE
DRAWN	TLS	4/13/12
DESGN	RJW	4/13/12
CHKD	RJW	4/13/12
ENGR		
APPR		

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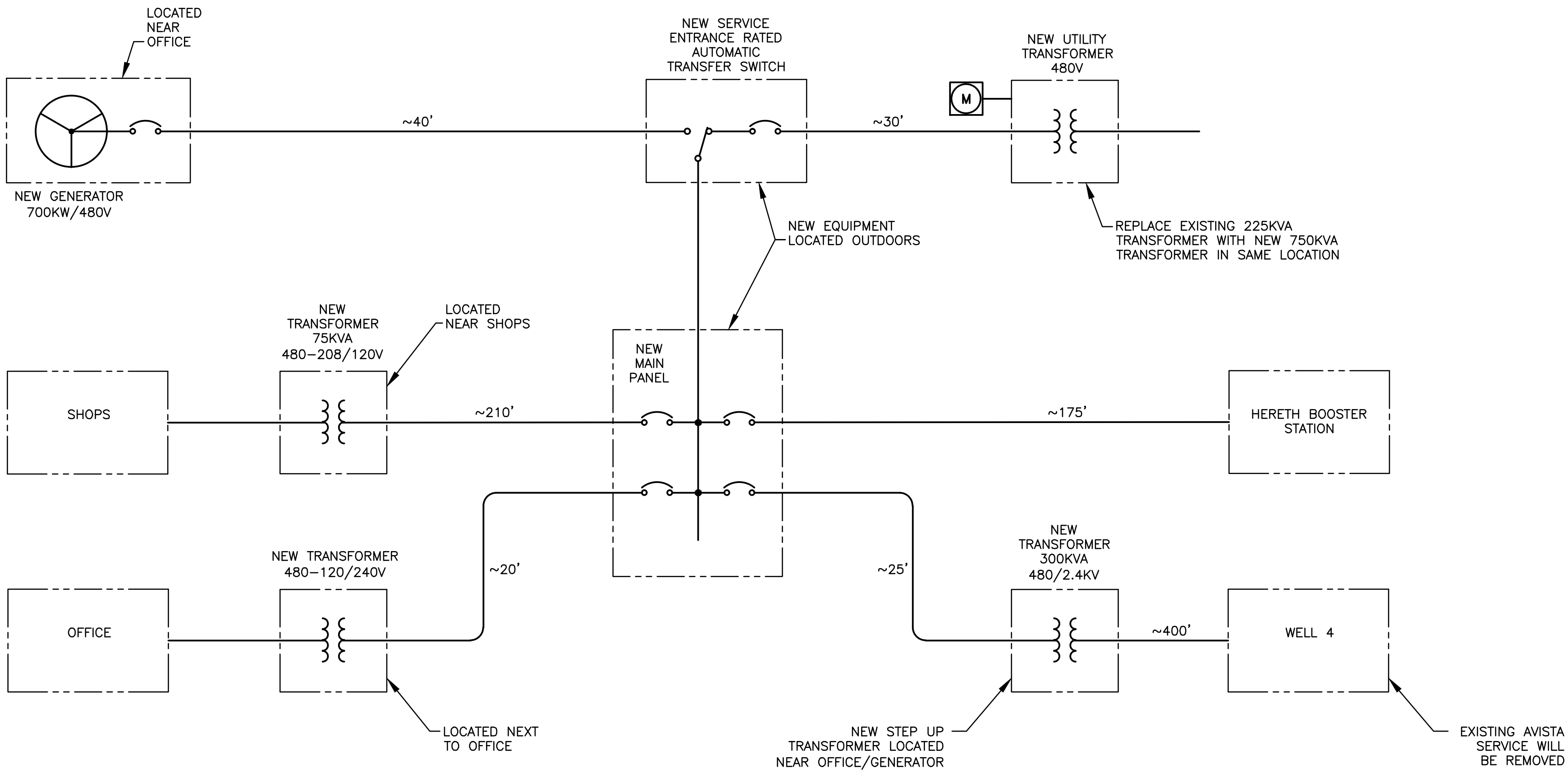
PROJECT
LOID
GENERATOR ADDITON

TITLE
ONE–LINE DIAGRAM (EXISTING SYSTEM)

SCALE: NONE	ACAD FILE NAME: M12106–SK–1	DWG NUMBER SKETCH–1	REV
PROJECT NO: M12106	SHEET: 1 OF 1		



ONE–LINE DIAGRAM (OPTION A)
NOT TO SCALE
1
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REVISIONS			DRAWING STATUS		
REV	BY	DATE		BY	DATE
			DRAWN	TLS	4/13/12
			DESGN	RJW	4/13/12
			CHKD	RJW	4/13/12
			ENGR		
			APPR		

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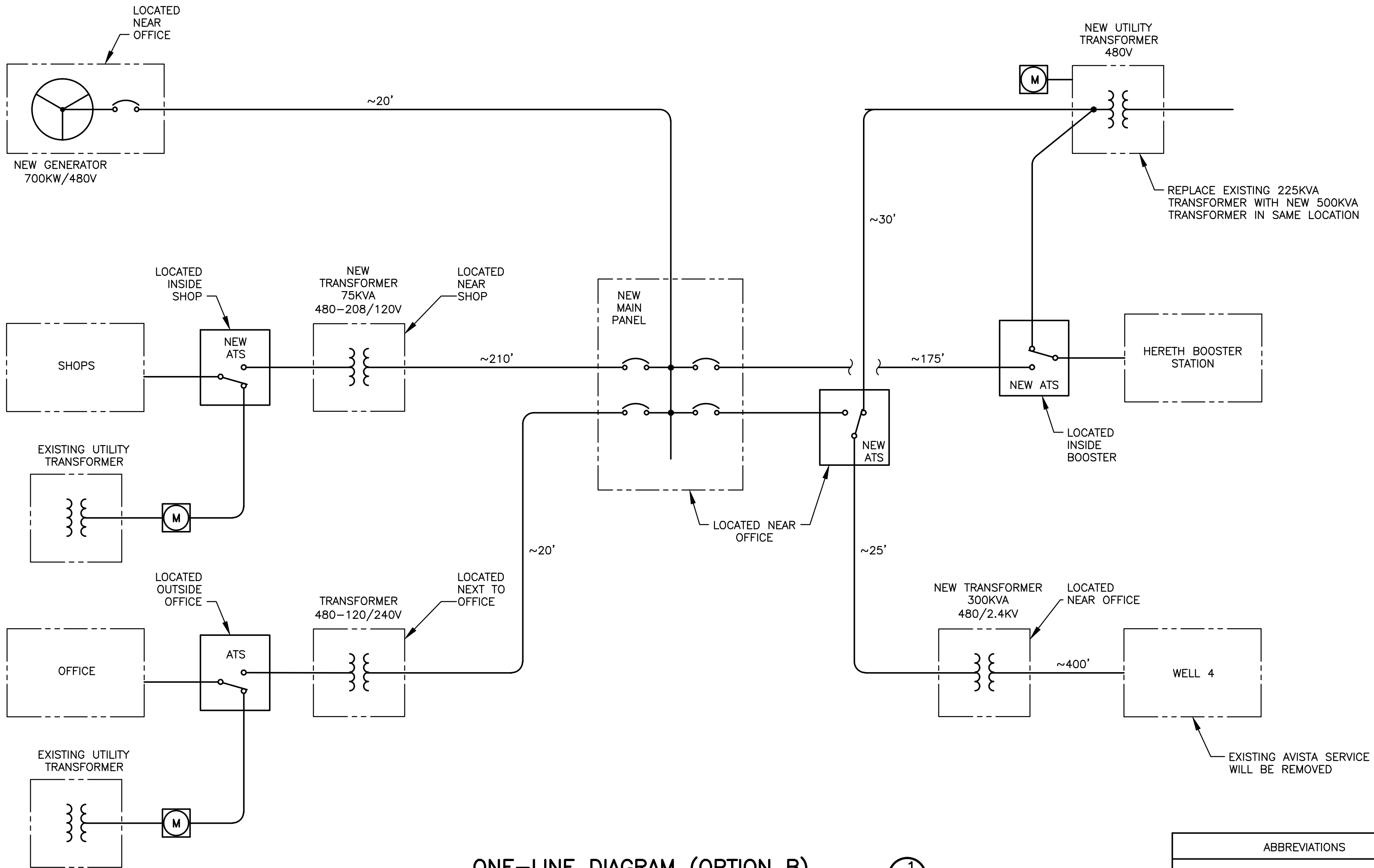
PROJECT
LOID
GENERATOR ADDITON

TITLE
ONE–LINE DIAGRAM (OPTION A)

SCALE: NONE	ACAD FILE NAME: M12106–SK–A	DWG NUMBER	
PROJECT NO: M12106	SHEET: 1 OF 6	SKETCH–A	REV



ONE–LINE DIAGRAM (OPTION B) ①

NOT TO SCALE

ABBREVIATIONS
ATS – AUTOMATIC TRANSFER SWITCH

REVISIONS			DRAWING STATUS		
REV	BY	DATE		BY	DATE
			DRAWN	TLS	4/13/12
			DESGN	RJW	4/13/12
			CHKD	RJW	4/13/12
			ENGR		
			APPR		

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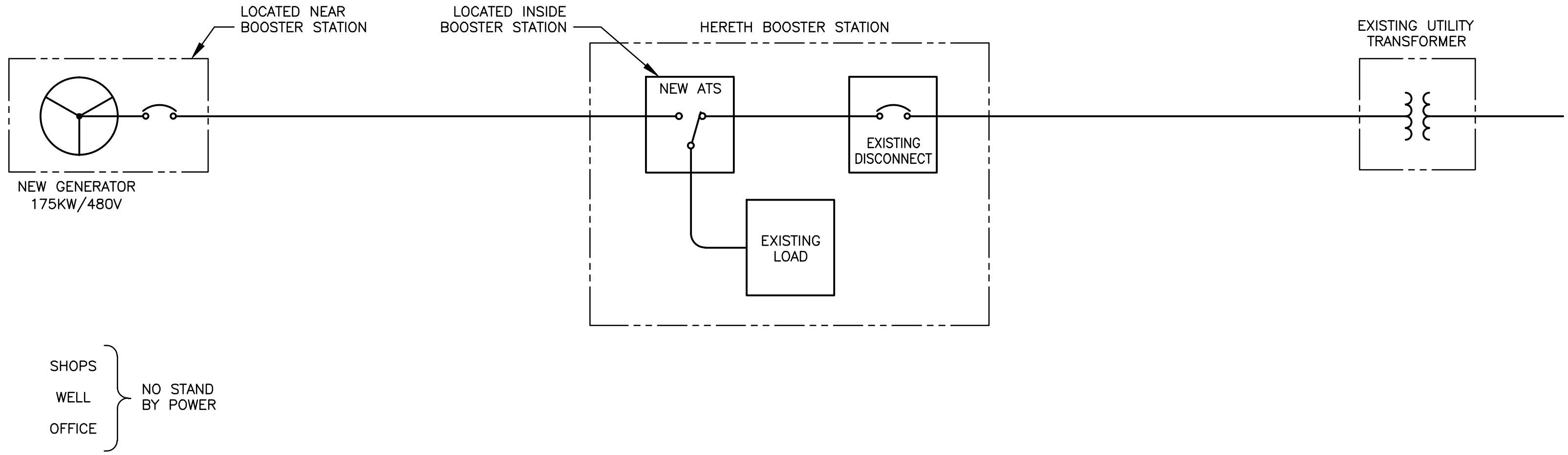
PROJECT: LOID GENERATOR ADDITON

TITLE: ONE–LINE DIAGRAM (OPTION B)

SCALE:	NONE	ACAD FILE NAME:	M12106–SK–B	DWG NUMBER	SKETCH–B	REV
PROJECT NO:	M12106	SHEET:	2 OF 6			



ONE-LINE DIAGRAM (OPTION C) 1/–

NOT TO SCALE

ABBREVIATIONS
ATS – AUTOMATIC TRANSFER SWITCH

REVISIONS		
REV	BY	DATE

DRAWING STATUS		
	BY	DATE
DRAWN	TLS	4/13/12
DESGN	RJW	4/13/12
CHKD	RJW	4/13/12
ENGR		
APPR		

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PROJECT: LOID GENERATOR ADDITON

TITLE: ONE-LINE DIAGRAM (OPTION C)

SCALE:	ACAD FILE NAME:	DWG NUMBER	REV
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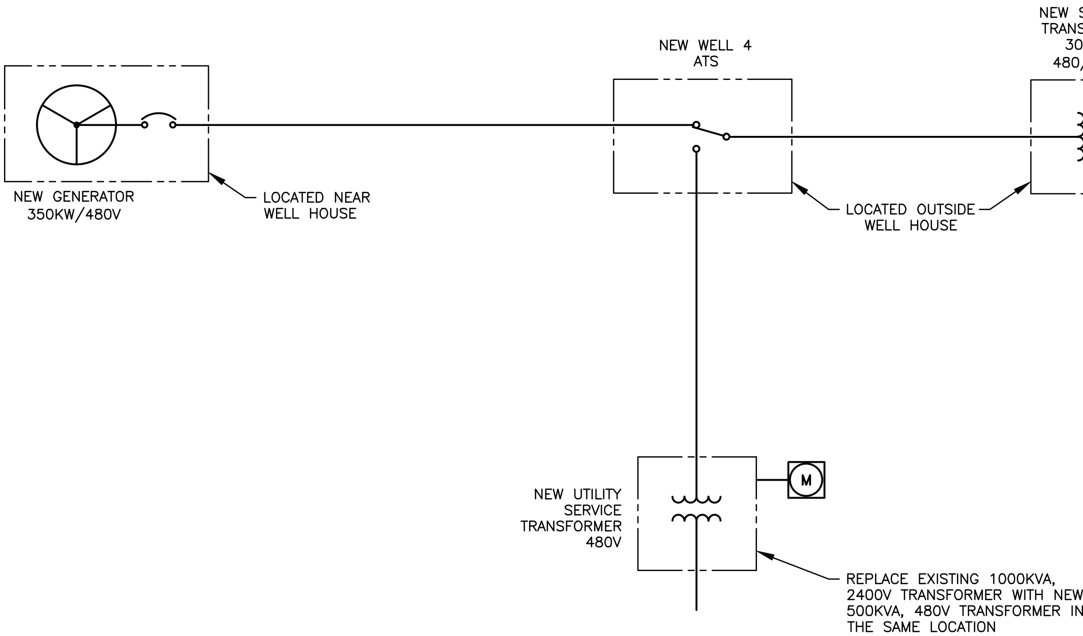
PROJECT NO: M12106	SHEET: 3 OF 6		



ONE-LINE DIAGRAM (OPTION D)

NOT TO SCALE

1
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ABBREVIATIONS

ATS – AUTOMATIC TRANSFER SWITCH

REVISIONS		
REV	BY	DATE

DRAWING STATUS		
	BY	DATE
DRAWN	TLS	4/13/12
DESGN	RJW	4/13/12
CHKD	RJW	4/13/12
ENGR		
APPR		

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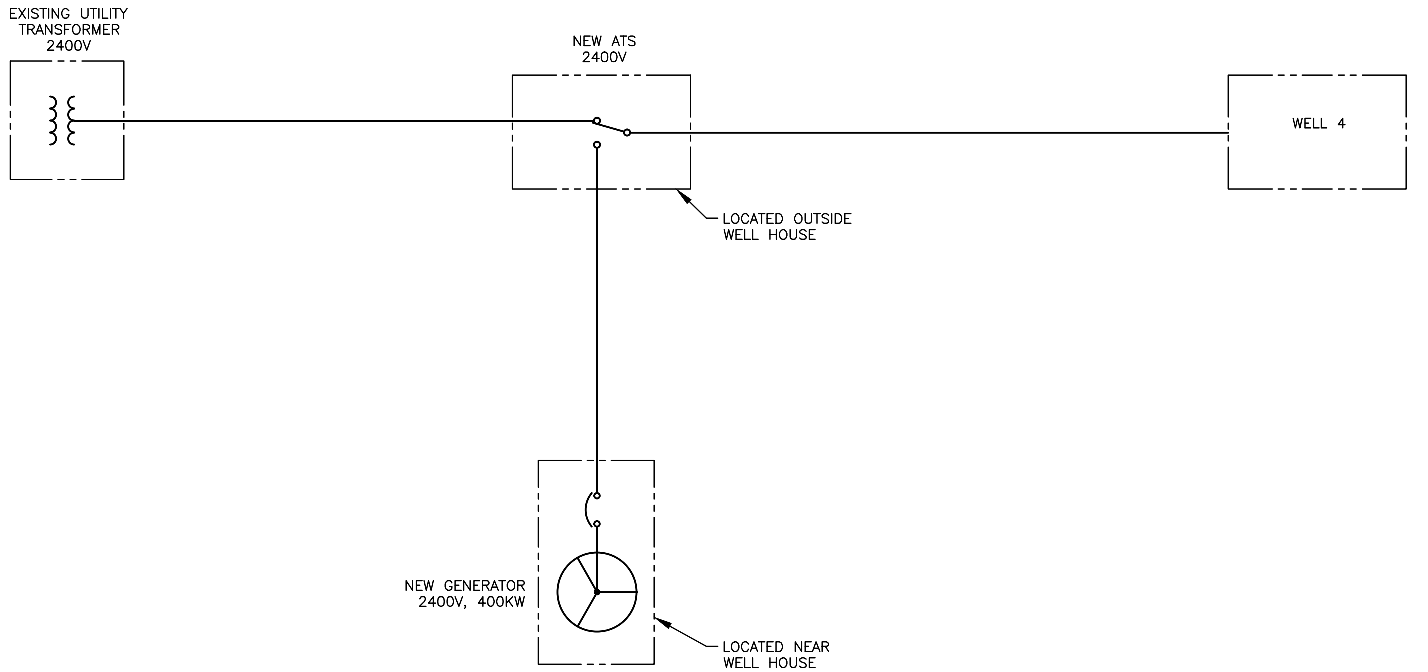
PROJECT
LOID
GENERATOR ADDITON

TITLE
ONE-LINE DIAGRAM (OPTION D)

SCALE: NONE	ACAD FILE NAME: M12106-SK-D	DWG NUMBER	REV
PROJECT NO: M12106	SHEET: 4 OF 6	SKETCH-D	



ONE–LINE DIAGRAM (OPTION E)

NOT TO SCALE

1
–

ABBREVIATIONS
ATS – AUTOMATIC TRANSFER SWITCH

REVISIONS		
REV	BY	DATE

DRAWING STATUS		
	BY	DATE
DRAWN	TLS	4/13/12
DESGN	RJW	4/13/12
CHKD	RJW	4/13/12
ENGR		
APPR		

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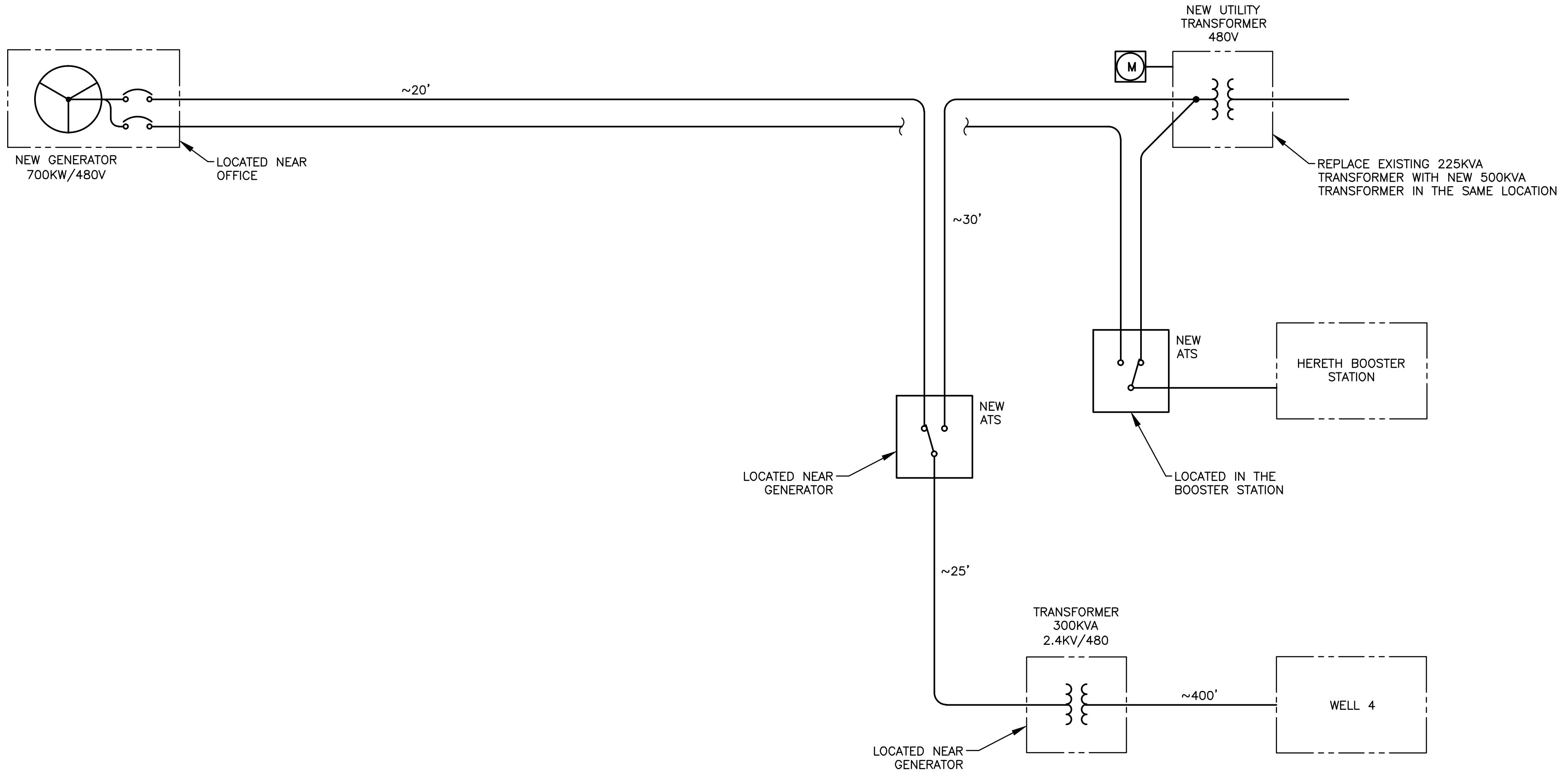
PROJECT: LOID GENERATOR ADDITON

TITLE: ONE–LINE DIAGRAM (OPTION E)

SCALE: NONE	ACAD FILE NAME: M12106–SK–E	DWG NUMBER: SKETCH–E	REV
PROJECT NO: M12106	SHEET: 5 OF 6		



ONE-LINE DIAGRAM (OPTION F)

NOT TO SCALE

1
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ABBREVIATIONS
ATS – AUTOMATIC TRANSFER SWITCH

REVISIONS		
REV	BY	DATE

DRAWING STATUS		
	BY	DATE
DRAWN	TLS	4/13/12
DESGN	RJW	4/13/12
CHKD	RJW	4/13/12
ENGR		
APPR		

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PROJECT
LOID
GENERATOR ADDITON

TITLE
ONE–LINE DIAGRAM (OPTION F)

SCALE: NONE	ACAD FILE NAME: M12106–SK–F	DWG NUMBER SKETCH–F	REV
PROJECT NO: M12106	SHEET: 6 OF 6		

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ELECTRICAL CONSTRUCTION COST ESTIMATE

Client	J-U-B Engineers	Date	3/9/2012
Project No.	M12106	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option A	QUANTITY		MATERIAL		LABOR		
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	TOTAL COST
Generator 700KW	1	EA	175000	$175,000	160	$12,000	$187,000
Service ATS	1	EA	9500	$9,500	25	$1,875	$11,375
Electrical Gear (MDP)	1	LS	5500	$5,500	40	$3,000	$8,500
Shops Transformer	1	LS	5000	$5,000	20	$1,500	$6,500
Office Transformer	1	LS	3000	$3,000	20	$1,500	$4,500
Well 4 Transformer	1	LS	33000	$33,000	50	$3,750	$36,750
Ductbank 2" PVC Conduit	1390	LF	4.82	$6,700	4.58	$6,366	$13,066
Ductbank 4" PVC Conduit	80	LF	30	$2,400	30	$2,400	$4,800
600 KCMIL Conductors	1360	LF	15.5	$21,080	4.5	$6,120	$27,200
2 AWG 5kv Conductors	1600	LF	0.5	$800	4	$6,400	$7,200
1 AWG Conductors	60	LS	0.3	$18	2	$150	$168
Site Electrical Trenching and Backfill	830	LF			5.75	$4,773	$4,773
HH	3	EA	200	$600	200	$600	$1,200
HH Cover	3	EA	300	$900	50	$150	$1,050
Ground Rod	3	EA	100	$300	60	$180	$480
Utility Charges							$25,000
SUBTOTALS				$263,798		$50,764	$339,562
MISCELLANEOUS						(10%)	$33,956
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$98,982
						TOTAL	$472,500

AEI Engineering Incorporated
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ELECTRICAL CONSTRUCTION COST ESTIMATE

Client	J-U-B Engineers	Date	3/9/2012
Project No.	M12106	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option B	QUANTITY		MATERIAL		LABOR		
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	TOTAL COST
Generator 700KW	1	EA	175000	$175,000	160	$12,000	$187,000
Hereth ATS	1	EA					$5,900
Well 4 ATS	1	EA					$5,900
Office ATS	1	EA					$2,700
Shops ATS	1	EA					$3,950
Shops Transformer	1	LS	5000	$5,000	20	$1,500	$6,500
Office Transformer	1	LS	3000	$3,000	20	$1,500	$4,500
Well 4 Transformer	1	LS	33000	$33,000	50	$3,750	$36,750
Ductbank 2" PVC Conduit	1390	LF	4.82	$6,700	4.58	$6,366	$13,066
Ductbank 4" PVC Conduit	80	LF	30	$2,400	30	$2,400	$4,800
600 KCMIL Conductors	1360	LF	15.5	$21,080	4.5	$6,120	$27,200
2 AWG 5kv Conductors	1600	LF	0.5	$800	4	$6,400	$7,200
1 AWG Conductors	60	LS	0.3	$18	2	$150	$168
Site Electrical Trenching and Backfill	830	LF			5.75	$4,773	$4,773
HH	3	EA	200	$600	200	$600	$1,200
HH Cover	3	EA	300	$900	50	$150	$1,050
Ground Rod	3	EA	100	$300	60	$180	$480
Utility Charges							$15,000
SUBTOTALS				$248,798		$45,889	$328,137
MISCELLANEOUS						(10%)	$32,814
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$95,652
						TOTAL	$456,602

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ELECTRICAL CONSTRUCTION COST ESTIMATE

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Project No.	M12106	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option C	QUANTITY		MATERIAL		LABOR		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	
Generator 175KW	1	EA	40000	$40,000	80	$6,000	$46,000
Hereth ATS	1	EA					$5,900
Ductbank 4" PVC Conduit	200	LF	30	$6,000	30	$6,000	$12,000
600 KCMIL Conductors	320	LF	15.5	$4,960	4.5	$1,440	$6,400
Site Electrical Trenching and Backfill	175	LF			5.75	$1,006	$1,006
HH	1	EA	200	$200	200	$200	$400
HH Cover	1	EA	300	$300	50	$50	$350
Ground Rod	1	EA	100	$100	60	$60	$160
Utility Charges							$1,000
SUBTOTALS				$51,560		$14,756	$73,216
MISCELLANEOUS						(10%)	$7,322
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$21,343
						TOTAL	$101,880

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ELECTRICAL CONSTRUCTION COST ESTIMATE

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Project No.	M12106	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option D	QUANTITY		MATERIAL		LABOR		
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	TOTAL COST
Generator 400KW	1	EA	92000	$92,000	160	$12,000	$104,000
Service ATS	1	EA	9500	$9,500	25	$1,875	$11,375
Well 4 Transformer	1	LS	33000	$33,000	50	$3,750	$36,750
Ductbank 2" PVC Conduit	80	LF	4.82	$386	4.58	$366	$752
Ductbank 4" PVC Conduit	80	LF	30	$2,400	30	$2,400	$4,800
600 KCMIL Conductors	400	LF	15.5	$6,200	4.5	$1,800	$8,000
2 AWG 5kv Conductors	320	LF	0.5	$160	4	$1,280	$1,440
Site Electrical Trenching and Backfill	100	LF			5.75	$575	$575
HH	1	EA	200	$200	200	$200	$400
HH Cover	1	EA	300	$300	50	$50	$350
Ground Rod	1	EA	100	$100	60	$60	$160
Utility Charges							$5,000
SUBTOTALS				$144,246		$24,356	$173,602
MISCELLANEOUS						(10%)	$17,360
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$50,605
						TOTAL	$241,567

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ELECTRICAL CONSTRUCTION COST ESTIMATE

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Project No.	M12106	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option E	QUANTITY		MATERIAL		LABOR		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	
2400V Generator 400KW	1	EA	150000	$150,000	160	$12,000	$162,000
2400V Service ATS	1	EA	100000	$100,000	80	$6,000	$106,000
Ductbank 2" PVC Conduit	80	LF	4.82	$386	4.58	$366	$752
Ductbank 4" PVC Conduit	80	LF	30	$2,400	30	$2,400	$4,800
2 AWG 5kv Conductors	320	LF	0.5	$160	4	$1,280	$1,440
Site Electrical Trenching and Backfill	100	LF			5.75	$575	$575
HH	1	EA	200	$200	200	$200	$400
HH Cover	1	EA	300	$300	50	$50	$350
Ground Rod	1	EA	100	$100	60	$60	$160
Utility Charges							$5,000
SUBTOTALS				$253,546		$22,931	$281,477
MISCELLANEOUS						(10%)	$28,148
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$82,051
						TOTAL	$391,675

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ELECTRICAL CONSTRUCTION COST ESTIMATE

Client	J-U-B Engineers	Date	3/9/2012
Project No.	M12106	Estimator	RJW
Project	LOID Generator Addition	Project Phase	Preliminary

Option F	QUANTITY		MATERIAL		LABOR		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	HRS	TOTAL	
Generator 700KW	1	EA	175000	$175,000	160	$12,000	$187,000
Hereth ATS	1	EA					$5,900
Well 4 ATS	1	EA					$5,900
Well 4 Transformer	1	LS	33000	$33,000	50	$3,750	$36,750
Ductbank 2" PVC Conduit	500	LF	4.82	$2,410	4.58	$2,290	$4,700
Ductbank 4" PVC Conduit	80	LF	30	$2,400	30	$2,400	$4,800
600 KCMIL Conductors	940	LF	15.5	$14,570	4.5	$4,230	$18,800
2 AWG 5kv Conductors	1600	LF	0.5	$800	4	$6,400	$7,200
Site Electrical Trenching and Backfill	600	LF			5.75	$3,450	$3,450
HH	3	EA	200	$600	200	$600	$1,200
HH Cover	3	EA	300	$900	50	$150	$1,050
Ground Rod	3	EA	100	$300	60	$180	$480
Utility Charges							$10,000
SUBTOTALS				$229,980		$35,450	$287,230
MISCELLANEOUS						(10%)	$28,723
CONTRACTOR OVERHEAD	(15%)		& PROFIT	(10%)		(26.5%)	$83,728
						TOTAL	$399,681