BEFORE THE

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **CASCADIA WATER, LLC,** **Respondent.**	**DOCKET UW-240151**

WATER CONSUMER ADVOCATES OF WASHINGTON, INTERVENOR

November 20, 2024

Direct Exhibit of Blaine C. Gilles

Cascadia Response (Attachment 3) to WCAW DR 47

Exh. BCG-18

ESTATES WATER SYSTEMS, INC

RESERVOIR AND BOOSTER PUMP SYSTEM PROJECT REPORT

PWS ID#081669
Sequim, WA

August 2022

System Owner:
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CERTIFICATE OF ENGINEER

The technical material and data contained within this report has been prepared by or under the direction of the following registered professional engineer(s), licensed in accordance with the laws of the State of Washington to practice in the State of Washington.

QUICK REFERENCE PROJECT INFORMATION

General Information

Water System Name	Estates Water Systems, Inc
Public Water System ID	081669
Water System Type	Group A, Comm
Water System Location	Sequim, WA
Project Description	Capacity Analysis for Reservoir & Booster Pump Replacement
System Owner	Cascadia Water, LLC
System Contact	Dale L. Metzger
Consulting Engineer	Robert Bennion, PE – Davido Consulting Group

Proposed System Improvements

Storage	*Capacity:*	158,000 gal
	Dimensions:	30' Diameter x 30' Height
	Material:	Concrete
Booster Pump(s)	*Make & Model:*	Grundfos NBSE 020-110/9.92, 10 HP
	Capacity:	290 gpm @ 45 psi
	Pressure Settings:	65 psi/55 psi, 60 psi/50 psi, 55 psi/45 psi
Pressure Tank(s)	*Make – Model*	Amtrol WX-455C
	Tank Size:	370-gallon (1,110 gallons total)
	# of Tanks:	3

Existing System Summary

Service Connections	*Active:*	367 ERUs	
	Current Approval:	480 ERUs	
Water Rights	*Permit:*	G2-27344 P	G2-27484 P
	Priority Date:	6/6/1988	2/14/1989
	Instantaneous:	250 gpm	*500 gpm
	Annual:	240 ac-ft/yr	*240 ac-ft/yr
	Sources:	Well 1 & Well 2	Well 1 & Well 2
		**Total Q_i = 500gpm, Qa = 240 ac-ft/yr*	
Sources	*Name & ID:*	Well #1 ACA573	
	Capacity:	180 gpm	
	Depth:	607'	
	Name & ID:	Well #2 ACA574	
	Capacity:	180 gpm	
	Depth:	462'	
Design Values	*ADD:*	260 gpd/ERU	
	MDD:	830 gpd/ERU	
	PHD:	590 gpm	

Existing System Components:

Item to Remain		
Submersible Well Pump	*Well #1*	
	Make & Model:	7.5 HP Berkeley 6S2AH-2
	Capacity:	180 gpm @ 82 feet TDH
	Diameter/Depth:	4-inch / 607 feet
	Well #2	
	Make & Model:	7.5 HP Berkeley 6S2AM-3
	Capacity:	180 gpm @ 80 feet TDH
	Diameter/Depth:	6-inch / 436 feet
Distribution Mains	*Total Length:*	40,550 ft
	Length:	2,850-feet
	Diameter:	2-inch
	Length:	21,600-feet
	Diameter:	4-inch
	Length:	10,200-feet
	Diameter:	6-inch
	Length:	5,900-feet
	Diameter:	8-inch
Items To Be Replaced:		
Storage	*Reservoir #1*	
	Capacity:	30,000 gal
	Dimensions:	24' x 25' x 8'
	Material:	Concrete
	Reservoir #2	
	Capacity:	150,000 gal
	Dimensions:	34' x 68' x 10'
	Material:	Concrete
Booster Pump(s)	*Booster Pumps: 1, 2, and 3*	
	Make & Model:	Baldor JML1409T, 5 HP
	Capacity:	100 gpm @ 60 psi
	Pressure Settings:	60 psi/40 psi, 55 psi/35 psi, 50 psi/30 psi
	Fire Pump	
	Make & Model:	Baldor WCL1511T, 10 HP
	Capacity:	250 gpm @ 60 psi
	Pressure Settings:	40 psi/20 psi
Pressure Tank(s)	*Size:*	940 gal and 1300 gal
	# of Tanks:	1 each (2 total)

ABBREVIATIONS

ADD	Average Day Demand
AWWA	American Water Works Association
BDS	Bottom Dead Storage
DCG	Davido Consulting Group
DOE	Department of Ecology
DOH	Department of Health
DS	Dead Storage
ERU	Equivalent Residential Unit
ES	Equalizing Storage
fps	feet per second
FSS	Fire Suppression Storage
gal	gallons
gpd	gallons per day
gpm	gallons per minute
HGL	Hydraulic Grade Line
HP	horsepower
LF	linear feet
MCL	Maximum Contaminant Level
MDD	Maximum Day Demand
OS	Operational Storage
PE	Polyethylene
PHD	Peak Hour Demand
psi	pounds per square inch
PVC	Polyvinyl Chloride
SB	Standby Storage
TDH	Total Dynamic Head
TDS	Top Dead Storage

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1. PROJECT OVERVIEW

1.1 PROJECT DESCRIPTION

The Estates Inc. (System) is a Group A water system located in Clallam County, Washington just west of Sequim. The System currently has various deficiencies that need to be addressed. In the sanitary survey on December 8,2021 a significant finding was highlighted regarding the underground storage reservoirs. The DOH Sanitary Survey noted that, "Tank 2, the larger tank, has several locations on the north side and one on the east side that are leaking. ODW is aware Cascadia Water plans to replace both buried reservoirs with an above ground storage tank." This project report details the proposed replacement of the existing reservoirs with an above ground reservoir as well as new booster pumps, pressure tanks, and corresponding controls. Included in this report is a capacity analysis for the System, to determine the capacity of the system's facilities and properly size the proposed improvements. The capacity analysis is based on monthly source meter data from 2017-2020, well capacity, water rights, distribution main capacity, and hydraulic modeling. The analysis was done per the Washington State Department of Health (DOH) 2019 Water System Design Manual (Design Manual). The system was evaluated to verify that it meets the following requirements:

- Provide peak hour demand flow rate while maintaining 30 psi at each service connection
- Adequate source capacity to meet maximum day demand
- Adequate standby storage volume for the temporary loss of one of the system's wells
- Adequate storage and distribution capacity to meet fire demands, while maintaining 20 psi at each service connection
- Reliable operation (not subject to pressure loss or back flow)
- Compliance with system's Water Right Permits/Certificates

The capacity and reservoir sizing calculations recommend a 30-feet diameter by 30-feet tall concrete reservoir with a storage capacity of 158,600 gallons. This sizing will provide all necessary storage for the System up to its approved capacity. A subsequent project report will be provided in regard to a manganese treatment facility.

1.2 EXISTING SYSTEM

The Estates Inc. Water System is served by two groundwater wells that make up a wellfield. Well #1 was originally installed as a 6" well to 90 feet deep. In 1982 the well was deepened to provide additional pumping capacity. The 6" casing was extended to 210 feet and 4" casing was then installed to a depth of 607 feet. According the 1982 pump test, Well #1 has capacity to supply 201 gallons per minute (gpm) with a drawdown of 75-feet. While onsite, in May of 2022, the pumping rate was measured at approximately 180 gpm.

Well #2 was originally drilled in 1974 as an 8" casing to a depth of 76-feet with 10-feet of screens to a total depth of 86 feet. In 1983 the screens were removed and a 6" casing was installed to 437-feet. A series of screens were installed to a total completion depth of 462 feet. According the 1983 pump test, Well #2 has capacity to supply 225 gallons per minute (gpm) with a drawdown of 89-feet. While onsite, in May of 2022, the pumping rate was measured at approximately 180 gpm. See Appendix A for the Water Facilities Index (WFI), well logs, and other system information.

The source water from the Well #2 has elevated manganese. No water treatment is currently required or provided, however an oxidation/filtration system is being designed to reduce the level of manganese in the source water. The treatment design will be provided as a separate report. Pumped water from the wells is routed directly to fill the existing storage reservoirs. Well #1 pumps into Reservoir #1 (West reservoir) which has a storage capacity of 30,000 gallons. Well #2 pumps into Reservoir #2 (East reservoir) which has a storage capacity of 150,000 gallons. Reservoirs are rectangular with dimensions of 24' L x 25' W x 8'H and 34' L x 68' W x 10' H, respectively. The reservoirs are partially buried and are hydraulically connected by an 8-inch diameter. The system's wells, storage reservoirs, and booster pumps are located onsite with the pumphouse (Clallam County Parcel No 043004510880).

The System has three booster pumps and a dedicated fire flow pump which are located within the pumphouse mounted to the top of the concrete reservoirs. The lead booster pump has on/off pressure settings of 60 psi / 40

psi. Booster pumps #2 and #3 have on/off pressure settings of 55 psi / 35 psi and 50 psi / 30 psi. There is a booster pump selected solely for fire flow purposes and is only run for testing and fire emergencies. The fire pump is activated by using pressure switches and settings of 40 psi / 20 psi. Pump protection is provided by two hydropneumatic tanks that are connected to the system. One tank is 940-gallons and the other is 1,300-gallons. There is only one pressure zone for the system with some occasional loops in the distribution piping that help maintain system pressure. A backup generator powers the booster and fire pumps during a loss of power.

From the pumphouse, water is pumped through distribution piping to serve residential and non-residential connections within the service area. Distribution piping is composed of 2-, 4-, 6-, and 8-inch water mains primarily consisting of polyvinyl chloride (PVC) piping. A Total installed pipe length is estimated as 40,550 lineal feet. A map of the existing distribution system is provided in Appendix A. The service area is shown in Figure 1, outlined in red. The system serves 365 residential homes, one school, and one park, for a total of 367 connections. The system is currently approved to support up to 480 ERUs.

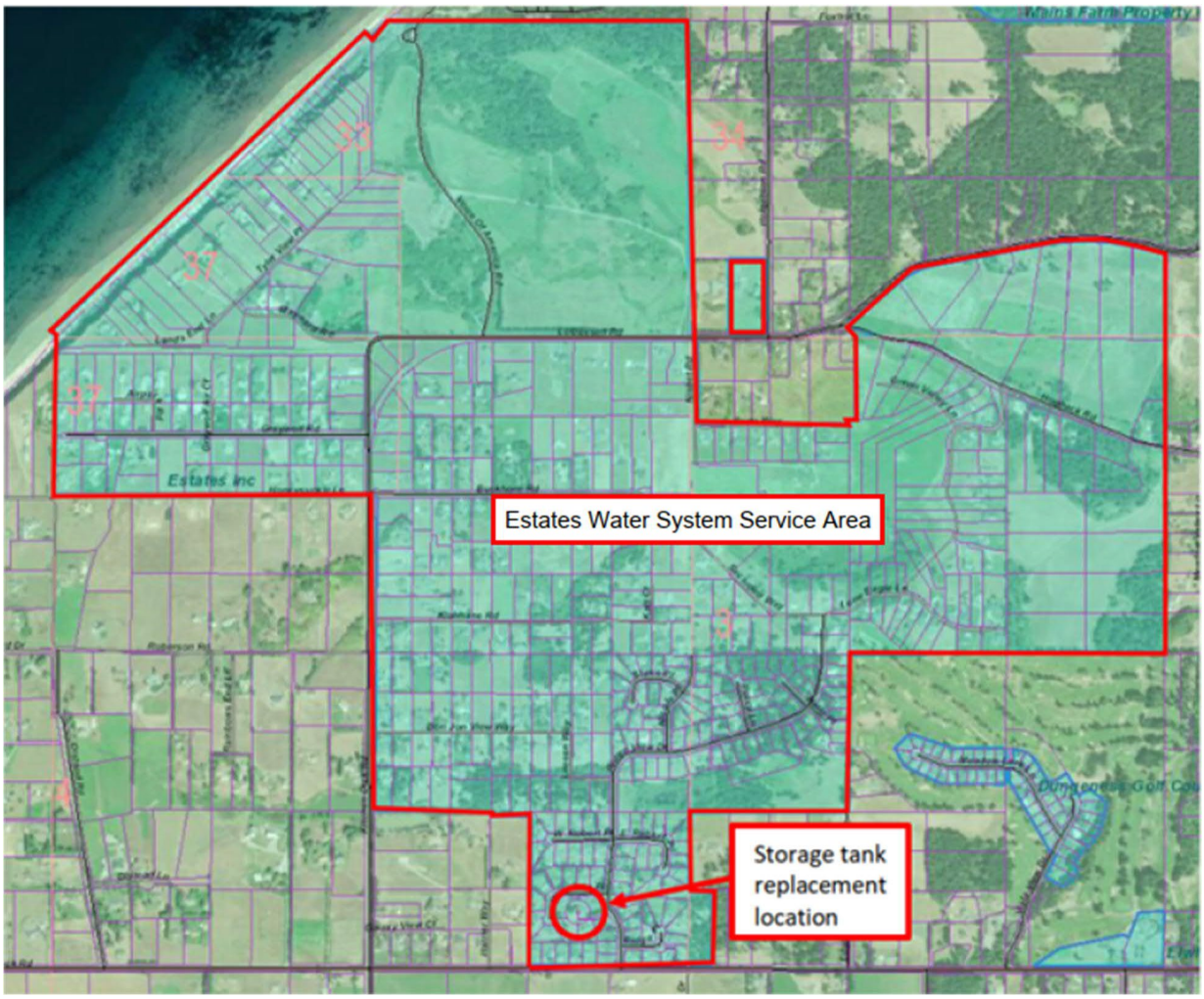

FIGURE 1 - SERVICE AREA

2. CAPACITY ANALYSIS AND DESIGN

The System's demands and capacity were estimated using the guidelines in chapters 3 and 4 of the Design Manual. The calculations are summarized in the following sections and are detailed in Appendix B. The capacity calculations

include an analysis of the System's water rights, source capacity, booster system capacity, and distribution system capacity.

2.1 BASIS OF DESIGN

The capacity analysis calculations are based on water usage data from 2017 through 2020, which is included in Appendix B. Those water usage values were used to estimate the capacity of the system's existing facilities, and to estimate the minimum storage requirements for the future storage. The reservoir sizing recommended in this report is based on the System's estimated water demand at the full approved capacity of 480 connections.

2.2 WATER DEMANDS

2.2.1 Average Day Demand

Average Day Demand (ADD) is defined as the average usage by an ERU each day in the system. It is calculated by total volume of water produced in one year divided by the number of days in the year and the number of connections in the distribution system. There is not reliable data available currently regarding the usage at the school and park served by the System, so they were each counted as a single connection for the purpose of calculating demands since this would provide a conservative ADD value. The ADD for the System was found to be 260 gpd/ERU (gallons per day per Equivalent Residential Unit).

2.2.2 Maximum Day Demand

The Maximum Day Demand (MDD) is ideally determined by meter readings and is the largest single-day usage of water based upon production. The MDD could not be determined from actual water use data due to lack of daily source meter readings. In the absence of daily source meter readings, the MDD is estimated using the Maximum Monthly Average Day Demand (MMADD), per Section 3.4.1 of the Design Manual. The MMADD represents the maximum average daily water usage per household over the period of a month. The MMADD was found to be 502 gpd/ERU. With a listed population of 913 individuals served by the system, an MDD:MMADD peaking factor of 1.65 was used resulting in a MDD of 830 gpd/ERU.

2.2.3 Peak Hour Demand

The peak hour demand (PHD) is the estimated maximum water usage over the course of an hour. The PHD was calculated in accordance with Section 3.4.2 of the Design Manual using Equation 3-1l:

Equation 3-1:

$$\mathrm{PHD} = \frac{\mathrm{MDD} \cdot (\mathrm{C} \cdot \mathrm{N} + \mathrm{F})}{1440} + 18$$

Where N is the number of connections or ERUs, and the variables C and F are coefficient based on system size as found in Table 3-1 of the Design Manual. The PHD when the System serves the maximum number of approved connections is 588 gpm, rounded to 590 gpm.

The PHD for the current number of connections (367) is 471 gpm, rounded to 470 gpm.

The ADD, MDD, and PHD were used in determining the capacity of each of the System's facilities. This analysis

TABLE 1: SYSTEM DESIGN VALUES

Parameter	Value
ADD	260 gpd/ERU
MDD	830 gpd/ERU
PHD (Current connections)	470 gpm
*PHD (Maximum approved connection)	590 gpm

**PHD of 630 gpm to support a potential of 520 ERUs was used for sizing the new reservoir.*

2.3 WATER RIGHTS

Water Right permits G2-27344P (June 6, 1988) and G2-27484P (February 14, 1989) were granted for both Well #1 and Well #2. The combined water rights allow for a combined maximum instantaneous flow rate of 500 gpm (Q_i) and an annual withdrawal of 240 acre-feet per year (Q_a). The system's water rights are included in Appendix A.

2.3.1 Water Right Capacity Based on Instantaneous Flow

The water rights for the System allows for an instantaneous pumping rate as of 500 gpm. Equation 4.4a from the Design Manual was used to determine the number of ERUs based upon Maximum Daily Demand (MDD) and water right. The number of ERUs that can be supported by the System's water right based on MDD is 867 ERUs.

Equation 4-4a:

$$N = \frac{(Q_i)}{(ERU_{MDD}/1440)}$$

N = ERUs Supported
Q_i = Instantaneous Allowed Pumping Rate (gallons/minute)
ERU_{MDD} = MDD value per ERU

$$\text{ERU} = \frac{500 \text{ gpm}}{830 \text{ gpd}/1440} = 867 \text{ ERUS}$$

2.3.2 Water Right Capacity Based on Annual Volume

The water rights for the System allows for a specified annual withdrawal of 240 acre-feet/year (78,200,000 gallons). Equation 4-4b is provided in the Design Manual to determine the number of ERUs based upon Average Daily Demand (ADD) and water right. The number of ERUs that can be supported by the System's water right based on ADD is 824 ERUs.

Equation 4-4b:

$$N = \frac{(Q_a)}{(ERU_{ADD})(365)}$$

N = ERUs Supported
Q_a = Annual Volume (gallons/year)
ERU_{ADD} = ADD value per ERU

$$\text{ERU} = \frac{78{,}200{,}000 \text{ gallons per year}}{260 \text{ gpd per ERU} * 365} = 824 \text{ ERUS}$$

2.4 SOURCE CAPACITY

Estates is served by two groundwater wells on the same parcel as the system reservoirs and pumphouse. The wells were originally drilled in the 1970s but were both deepened in 1982 and 1983 to serve the increased service area and connection. Information regarding each well is provided in Table 2. Well logs for each well are located in Appendix A.

TABLE 2: ESTATES - SOURCE INFORMATION

Estates, Inc.	Well 1	Well 2
Source Type	Well (Non GWI)	Well (Non GWI)
DOE Tag	ACA573	ACA574
Source Location	Sec 4 T30N R04W	Sec 4 T30N R04W
Purpose of Use	Domestic Water Supply – Primary	Domestic Water Supply – Seasonal
Place of Use	See Water Right	See Water Right
Year of Installation	1982	1983
App. Capacity (gpm)	200	225
Ex. Capacity (gpm)	180	180
Casing Size	See Well Log	See Well Log
Ground Elev. (ft)	135	134
Bottom Well Depth (ft)	607	463
Static Water Depth (ft)	58	58
Top of Screen (ft)	407	436
Bottom of Screen (ft)	592	462
Drawdown (ft)	75 (201 gpm)	89 (225 gpm)

2.4.1 Source Capacity Based on Maximum Day Demand

Section 4.4.2.7 of the Design Manual outlines the evaluation procedure to the number of ERUs that can be supported based upon source capacity and MDD. The Design Manual provides the equation 4.2 to determine source capacity with Equation 4-3 used to determine the ERU that could be supported by the determined source capacity. While onsite, in May of 2022, the pumping rate for each well was measured at approximately 180 gpm. While both wells could support additional pump capacity, these conservative values were used for the evaluation. The number of ERUs that can be supported the System's sources based on MDD is 520 ERUs.

Equation 4-2:

$$V_T = L(Q_j \cdot t_j)$$

V_T = Total volume of water delivered over 24-hours
Q_j = Individual Source Delivery Rate (gallons/minute)
Tj = Time that the source (over a 24-hour period) will operate. Assume 1,200 min per Section 3.10

$$V_T = (180\ \text{gpm} \cdot\ 1{,}200\ \text{min})_{\text{Source 1}} + (180\ \text{gpm} \cdot\ 1{,}200\ \text{min})_{\text{Source 2}} = 432{,}000\ \text{gallons}$$

Equation 4-3:

$$N = \frac{V_T}{ERU_{MDD}}$$

N = ERUs Supported
V_t = Delivery rate of source (gallons per minute)
ERU_{MDD} = MDD value per ERU

$$N = \frac{432{,}000\ \text{gal}}{830\ \text{gpd/ERU}} = 520\ \text{ERUs}$$

2.5 DISTRIBUTION MAINS

The distribution piping consists of mostly 2", 4-, and 6-inch PVC pipe. The age of the distribution system piping varies on when the system expanded. Original piping in the Mountain Park Subdivision was installed in the early 1970s. The piping was expanded into Division I, II and III of Dungeness Estates in the early 1980s.

Through hydraulic modeling discussed in Section 4, the distribution piping has the capacity to convey the future PHD of 590 gpm, but it does not have the capacity meet the fire flow requirements. The distribution system has several water mains less than 6 inches which do not have the capacity to convey fire flow without significant loss of pressure. When water mains are replaced in the future, they should be replaced with piping that is 6 inches or larger.

The expected life for PVC pipes is about 50-70 years, therefore, much of the System's distribution piping is reaching the end of its life expectancy. It is recommended that the system start planning for the replacement of the distribution system piping.

2.6 CAPACITY SUMMARY

The number of connections that the Estates Inc. water system can support was estimated using the methods outlined in the Design Manual, Chapter 4. The components analyzed include the instantaneous water right, the annual water right, and the source capacity. The distribution system and booster system were also analyzed, but they are not considered to be factors that would limit the maximum capacity of the water system since they can be upgraded.

The analysis demonstrated that the System has the physical and legal capacity to serve up to 520 ERUs, limited by the source capacity. The capacity analysis summary is provided in Table 4 below and calculations are provided in Appendix B.

TABLE 3: SYSTEM CAPACITY SUMMARY

Component	Value	Component Capacity (N)	Equation for N
Instantaneous Water Right, Q_i	500 gpm	867 ERUs	Q_i/MDD
Annual Water Right, Q_a	240 ac-ft/yr	824 ERUs	Q_a/ADD
Source	360 gpm	520 ERUs	Q_s/MDD

The system is currently approved for 480 ERUs which appears adequate to support growth for the next 10 to 20 years. However, the reservoir was designed to support the full 520 ERUS noted above to ensure additional capacity could be obtained if needed.

3. RESERVOIR DESIGN CALCULATIONS

The System currently has two partially buried storage reservoirs. Both reservoirs are planned to be demolished and replaced with a single new above grade reservoir. This report provides the recommended sizing and dimensions of the new reservoir. The construction plans for the new reservoir are included in this project submittal.

The new reservoir is designed to provide the System's storage needs for a total of 520 ERUs. Based on water usage data and capacity calculations discussed in this report, the recommended size of the of new reservoir is 158,600 gallons with a height of 30 feet and a diameter of 30 feet. The following storage components were analyzed to determine the size of the new reservoir:

- Dead Storage: Top Dead Storage (TDS) and Bottom Dead Storage (BDS)
- Operational Storage (OS)
- Equalizing Storage (ES)
- Standby Storage (SB)
- Fire Suppression Storage (FSS)

The new reservoir provides a storage per depth of 5,300 gal/ft. Reservoir sizing calculations are included in Appendix B and are summarized in the following sections.

3.1 DEAD STORAGE

Dead Storage (DS) is the unusable volume at the top and bottom of the reservoir. Top dead storage (TDS) is the unused volume of storage above the "off" setting for the well pumps. This area is needed to install a reservoir overflow pipe. Nine Inches (0.75 feet) of height will be provided as freeboard. Bottom dead storage (BDS) is the unusable space at the bottom of the reservoirs that is below the reservoir booster pump shut down safety switch. The tank outlet is fitted with a 6" silt stop, to trap precipitates prior to those solids entering the distribution system. The new reservoir will provide nine inches (0.75 feet) of BDS.

$$\text{TDS} = \text{Depth} \cdot \text{Volume per foot} = 0.75 \text{ ft} \cdot 5{,}300 \text{ gpf} = 4{,}000 \text{ gallons}$$

$$\text{BDS} = \text{Depth} \cdot \text{Volume per foot} = 0.75 \text{ ft} \cdot 5{,}300 \text{ gpf} = 4{,}000 \text{ gallons}$$

3.2 OPERATIONAL STORAGE

Operational storage (OS) is the volume that is stored between the on/off settings of the wells. Operational storage is used to protect the well pumps from excess cycling by minimizing the number of pump-starts per hour.

$$\text{OS} = \text{Depth} \cdot \text{Volume per foot} = 1.0 \text{ ft} \cdot 5{,}300 \text{ gpf} = 5{,}300 \text{ gallons}$$

$$\text{OS Runtime} = \frac{\text{OS}}{\text{Well Source Rate}} = \frac{5{,}300 \text{ gallons}}{360 \text{ gpm}} = 15 \text{ minutes}$$

The well pumps will run for a minimum of 15 minutes per fill cycle. This minimizes the total number of cycles to less than four per hour, where the maximum recommended start per hour is six unless manufacturer recommendations allow for more. The indicated operational storage will provide an adequate storage volume to support proper pump opertion.

3.3 EQUALIZING STORAGE

Equalizing storage is the volume of storage needed to provide water when the total source capacity is exceeded by the peak hourly demand. Per equation 7-1 from the Design Manual, equalizing storage is based on peak hour demand, as listed in Table 1, for 150 minutes:

Equation 7-1

$$\text{ES} = (\text{PHD} - \text{Q}_\text{S}) \cdot 150 \text{ minutes} = (630 \text{ gpm} - 360 \text{ gpm}) \cdot 150 \text{ minutes} = 40{,}500 \text{ gallons}$$

3.4 STANDBY STORAGE

Standby storage (SB) is the volume needed during emergencies, such as power outages, well pump failures, or other occurrences. Per Section 7.1.1.3 of the Design Manual, 200 gallons per ERU is recommended as the minimum volume of SB storage. At maximum approved capacity, the System will have 520 ERUs, resulting in a recommended SB volume of 104,000 gallons.

The standby storage that is provided by the proposed reservoir can be calculated as the remaining volume after operational storage, equalizing storage, and dead storage are accounted for. The standby storage provided by the new reservoir is calculated as follows:

$$\text{SB (available)} = \text{Reservoir Volume} - \text{TDS} - \text{OS} - \text{ES} - \text{BDS}$$

$$\text{SB (available)} = 158{,}600 - 4{,}000 - 5{,}300 - 40{,}500 - 4{,}000 = 104{,}800 \text{ gallons (or } 19.8 \text{ ft)}$$

3.5 FIRE SUPPRESSION STORAGE

Fire suppression storage is the volume of water necessary to supply adequate fire flow for a specified amount of time for the water system, as set by Clallam County. Fire suppression storage and stand-by storage may be nested inside one or the other, depending on which storage requirement is larger. Fire suppression storage is the minimum storage required to accommodate the fire-flow rate for a specified amount of time. Per Clallam County Code the minimum fire-flow and duration for the System is 500 gpm for 45 minutes. The building classification for the school that is served by the System is an R-3 residential occupancy and does not need additional fire flow.

$$\text{FSS} = \text{Fire flow rate (gpm)} \cdot \text{time (min)} = 500 \text{ gpm} \cdot 45 \text{ minutes} = 22{,}500 \text{ gallons}$$

The new reservoir provides 104,800 gallons of SB storage volume is more than adequate to provide the minimum FSS.

TABLE 4: EXISTING RESERVOIR COMPONENTS

Storage Component	Volume (gal)	Reservoir VF (ft)
TDS	5,300	0.75
OS	4,000	1.0
ES	40,500	7.6
SB/FSS	128,630	19.8
BDS	4,000	0.75
Reservoir Total	**158,600**	**30**

4. BOOSTER PUMP SYSTEM DESIGN CALCULATIONS

The guidelines for sizing a closed system booster pump station are described in Section 8.1.2 of the Design Manual. The System's Demands and flow rates are summarized in Section 2.2 of this report. System demands are calculated based on the approved number of connections.

1. Supply the system Peak Hour Demand (PHD) while providing at least 30-psi to all service connections.
2. While not currently required to provide fire flow, the pumps have been designed to meet future fire flow demands. The Design Manual requires Fire Flow (FF) during Maximum Day Demand (MDD) while supplying at least 20-psi to all service locations within the distribution system. In this scenario, the largest pump supplying the supplying pressure zone of the distribution system is assumed to be out of service. This is discussed in further detail below.

4.1 PUMP SELECTION & PRESSURE SETTINGS

The booster pumps will be replaced with four (4) 10 hp Grundfos NBSE 020-110/9.92 booster pumps. Per Section 8.1.2 of the Design Manual, the pumps have been sized to provide the future PHD (590 gpm) with the largest capacity pump out of service. In addition, the four pumps would be capable of providing residential fire flow requirements and MDD with the largest pump out of service. The four booster pumps will operate on an alternating lead/lag 1/lag 2/lag 3 configuration where the starting and lag pumps will alternate with each pump-start. The proposed pressure settings are summarized in Table 5 and pump curves, associated with the proposed equipment are included in Appendix E.

TABLE 5: BOOSTER PUMP PRESSURE SETTINGS

(4) 10 hp Grundfos NBSE 020-110/9.92				
Pump Position	**On Settings**		**Off Settings**	
	Pressure - psi (ft) -	**Pump Rate - gpm -**	**Pressure - psi (ft) -**	**Pump Rate - gpm -**
Lead Pump	55-psi (127.1)	230 gpm	65-psi (150.2)	184 gpm
Lag #1	50-psi (115.5)	260 gpm	60-psi (138.6)	206 gpm
Lag #2	45-psi (104.0)	290 gpm	55-psi (127.1)	230 gpm
Lag #3	40-psi (92.4)	325 gpm	50-psi (115.5)	260 gpm

4.2 PRESSURE TANK SIZING

New hydropneumatic pressure tanks will be provided to provide pump protection to the booster pumps. The minimum pressure tank storage for each booster pump system was found using Equation 9-1 from the Design Manual:

The minimum pressure tank storage for each booster pump system was found using Equation 9-1 from the Design Manual:

Design Manual Equation 9-1:

$$T \geq \frac{(R)(Q_p)}{(N_C)(V_B)}$$

Where:

$$R = \frac{15(P_1 + 14.7)(P_2 + 14.7)}{(P_1 - P_2)/(P_2 + 9.7)}$$

T = Total number of pressure tanks (gallons)
P_1 = Pump-Off pressure for water system operation (psi)
P_2 = Pump-On pressure for water system operation (psi)
N_c = Number of pump operating cycles per hour (6 cycles per alternating pump)
Q_p = Pump delivery capacity at the midpoint of the selected pressure range (gpm)

The lead pump for the system has on/off pressure settings of 55-psi and 65-psi. Q_P was found to be 206 gpm at 60 psi. The number of pump cycles per hour, N_C, was assumed to be 24 total cycles per hour, or 6 cycles per hour per alternating pump. Using s 370-gallon Amtrol WX-455C bladder tanks, the minimum number of bladder tanks is 3. The pressure tanks should have an acceptance volume of 240 gallons which would equate to minimum pump run time of 1 minutes. This meets minimum run time recommendations from the pump manufacturer. Data regarding the proposed pressure tanks are included in Appendix E.

5. HYDRAULIC MODEL

EPA-NET was used to create a hydraulic model of the system with the proposed reservoir. EPA-NET uses the Hazen Williams equation to estimate head loss through distribution piping. The hydraulic model was used to evaluate how the proposed system operates, and to identify any deficiencies in the distribution system.

Three scenarios were used to model the system: (1) Peak Hour Demand, (2) Fire-Flow, and (3) Static Water Pressure. Each of the three scenarios and assumptions are summarized in Table 5.

TABLE 6: HYDRAULIC MODELING SCENARIOS, REQUIREMENTS, AND ASSUMPTIONS

Scenario	Demand Condition	Pressure Requirements for Distribution System	Scenario Assumptions
1	Peak Hour Demand	30 psi Minimum	• Pressure Tanks at the 2nd Lag Pump "On" setting
2	Fire Flow + Maximum Day Demand	20 psi Minimum	• Equalizing & Fire Suppression Storage Depleted • Pressure Tanks at the 2nd Lag Pump "On" setting
3	Static Water Pressure	*80 psi Maximum	• Top Dead Storage Depleted • Pressure tanks at the Lead Pump "Off" setting

**80 psi is the Engineer's maximum pressure recommendation within a distribution system but is not a DOH requirement*

5.1 PEAK HOUR DEMAND SCENARIO

The PHD scenario is used to determine if the distribution system has the capacity to deliver the PHD while providing a minimum of 30 psi to all service connections. The PHD of 590 gpm, associated with the current maximum number of approved connections (480 ERUs), was used in the hydraulic analysis to assess whether the distribution system has capacity to supply future demands. Since 3 of the booster pumps will be required to meet the PHD, the pressure setting at the pump house was set a 45-psi when the 2nd lag pump would turn on.

During the maximum PHD of 590 gpm, it was found that the system pressures ranged from 38 to 52 psi. Service pressures are above 30 psi during PHD, therefore, the distribution system has the capacity to meet the estimated PHD. The velocities within the distribution mains comply with the DOH Design Manual Section 6.2.6. All distribution mains are less than 8 feet per second (fps) with a maximum of 6.13 fps leading out from the pumphouse and a minimum of 0.3 fps at demand nodes. A copy of the results of the PHD model for the proposed system are included in Appendix D.

5.2 FIRE FLOW SCENARIO

Per Clallam County Fire Code, the System is required to provide 500 gpm for 45 minutes. Per section 8.1.2 of the Design Manual, the booster pump station should be capable of providing residential fire flow demands and MDD, with the largest pump out of service, while maintaining 20 psi at the service connections. The System MDD of 830 gpd/ERU equate to 280-gpm. For the fire flow hydraulic scenario, the MDD of 280 gpm was distributed throughout the system while the fire flow of 500 gpm was applied to a fire hydrant.

5.2.1 Existing System Fire Flow Deficiencies

In the current configuration the System has various deficiencies which make it unable to supply the distribution system with fire flow. In the current configuration, the following items do not meet the fire flow design requirements of the Design Manual:

1. With the largest pump out of service the 3 lead pumps can only supply 630 gpm, which is still 150 gpm below the combined MDD and fire flow demand of 780 gpm.
2. With all pumps operational, the fire pumps initiates at a pressure setting of 20-psi. Due to inadequate line sizing in the distribution system, almost all service connections are below the minimum pressure of 20-psi with pressures ranging from - 3.0- to 21-psi.
3. If the pressure settings for the system were increase appropriately to meet the minimum 20-psi pressure requirements throughout the distribution system, the system pumps would not be able to meet the combined MDD and fire flow demands.

A hydraulic model of the existing system is provided in Appendix C. This model is set up with all pumps operating and the system pressure set at the point the fire flow pump would initiate (20-psi).

5.2.2 Proposed Fire Flow Scenario

For the proposed hydraulic model, the system pressures were set at the point that the 2nd lag pump would turn on,45-psi, the largest pump was out of service, and the reservoir was set at the bottom of equalizing storage. The model was run several times with the fire flow placed at different fire hydrants with each run to determine the worst-case scenario.

During the combined MDD and fire flow demands of 780-gpm, it was found that the system pressures ranged from 24- to 47-psi. Currently, the north easter portion of the system (Blue Ribbon Farms – Division II) does not have fire hydrants installed and would be unable to provide fire flow. Future improvement to the distribution system should prioritize expanding capacity in this portion of the system. The projects necessary to increase the fire flow capacity to those portions of the system include:

1. The 6-inch PVC water main between the 8-inch line from the pumphouse and Nicole Place, to the North, should be replaced with an 8-inch line to enable the system function more efficiently with fire flow demands. The line replacement would total approximately 1,750-feet of new 8-inch water main. These improvements would also reduce the velocity of water during fire flow demand to levels recommended by the Design Manual.
2. Providing a loop to the distribution system at the eastern end of Buckhorn Road and Lotzgesell Road to the north. This would require the installation of approximately 850-feet of new 6-inch water main.
3. Replacing various portions of the 4-inch water main along and between Greywolf Road and Maynard Road with 6-inch water mains. This would require the installation of approximately 1,400-feet of 6-inch water main, depending on the desired configuration.

The proposed booster pump replacement will increase the capacity of the System to meet current and future demands. The noted future distribution system improvements will allow the system to expand the ability of the System to expand fire flow to additional portions of the communities served. A copy of the results of the fire flow model for the proposed system are included in Appendix D.

5.3 Static Water Pressure Scenario

The static water pressure scenario was used to estimate the highest water pressure that the distribution is expected to experience under normal operating conditions. This is estimated by setting all water demand to zero and setting the pressures within the pumphouse to the “off” setting for the lead booster pump, which is 65 psi.

The highest pressure on the distribution system was found to be about 82 psi. While the static water pressure on the system exceeds the maximum recommended pressure of 80 psi, this is not a DOH requirement and no negative impacts are expected to occur because of the static water pressure of 82 psi. Homeowners in these areas may install a pressure reducing valve at their own expense if desired. A copy of the results of the static system model are included in Appendix D.

6. CONCLUSIONS AND RECOMMENDATIONS

The Estates Inc. Water System was analyzed to determine the system capacity, to evaluate the suitability of the installed system’s components, and to recommend the capacity of a new reservoir and booster pump station identified in this project report. The System currently has 367 connections and is approved by the DOH for up to 480. In this capacity analysis, it was determined that the System has the physical and legal capacity to serve up to 520 ERUs, as limited by the source capacity.

The proposed improvements to the storage reservoir and booster pump system will provide additional reliability, capacity, and functionality to the system. The improvement will allow the System to function as intended and in accordance with the recommendation of the DOH Design Manual.

6.1 Recommended Improvements

The analysis of the system identified the following deficiencies which should be prioritize for the System:

- The 6-inch water main proceeding north for the System pumphouse along Ridge View Dr have excessive head loss during fire flow events. The 6-inch PVC water main between the 8-inch line from the pumphouse and Nicole Place, to the North, should be replaced with an 8-inch line to enable the system to properly convey the higher demands associated with fire flow.

- Providing a loop to the distribution system at the eastern end of Buckhorn Road and Lotzgesell Road to the north. This would require the installation of approximately 850-feet of new 6-inch water main
- Replacing various portions of the 4-inch water main along and between Greywolf Road and Maynard Road with 6-inch water mains. This would require the installation of approximately 1,400-feet of 6-inch water main, depending on the desired configuration
- The System is currently analyzing a treatment system to address elevated levels of manganese in the source water. The treatment system will be designed to support a flow rate up to the water right instantaneous withdrawal limit of 250 gpm to maximize system capacity.

7. OPERATION AND MAINTENANCE CONSIDERATIONS

The system is owned and operated by Cascadia Water. The proposed work is replacement of existing equipment and features, so the changes to the system operation and maintenance is not significantly affected. No or minimal water quality changes are expected from the replacement of the reservoir. The system's Operation and Maintenance (O&M) plan should be updated to include the manufacturer's recommended procedures for the new booster pumps, bladder tanks, floats, controls, and other new equipment. Maintenance should continue as usual and should consist of periodic cleaning and inspection of the reservoir and line flushing. Operational costs of the reservoir are not expected to change significantly.

APPENDIX A: SYSTEM INFORMATION

Water Facility Inventory (WFI)

WATER FACILITIES INVENTORY (WFI) FORM

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

ONE FORM PER SYSTEM

Quarter: 2
Updated: 01/18/2022

Printed: 3/28/2022
WFI Printed For: On-Demand
Submission Reason: No Change

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822 or email wfi@doh.wa.gov

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
08166 9	ESTATES INC	CLALLAM	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS	7. OWNER NAME & MAILING ADDRESS
DALE L. METZGER [MANAGER] PO BOX 92 SEQUIM, WA 98382	CASCADIA WATER, LLC MANAGER CULLEY J. LEHMAN PO BOX 549 FREELAND, WA 98249
STREET ADDRESS IF DIFFERENT FROM ABOVE	**STREET ADDRESS IF DIFFERENT FROM ABOVE**
ATTN ADDRESS CITY STATE ZIP	ATTN ADDRESS 220 NW SECOND AVENUE CITY PORTLAND STATE OR ZIP 97209

9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION	
Primary Contact Daytime Phone: (360) 477-9704		Owner Daytime Phone: (360) 331-7388	
Primary Contact Mobile/Cell Phone: (360) 477-9704		Owner Mobile/Cell Phone: (360) 661-7781	
Primary Contact Evening Phone: (xxx)-xxx-xxxx		Owner Evening Phone:	
Fax:	E-mail: xxxxxxxxxxxxxxxxxxx	Fax:	E-mail: xxxxxxxxxxxxxxxxxxx

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

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

SMA NAME: _____ SMA Number:

12. WATER SYSTEM CHARACTERISTICS (mark all that apply)

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

13. WATER SYSTEM OWNERSHIP (mark only one)

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

14. STORAGE CAPACITY (gallons)

180,000

15	16	17	18									19			20	21						22	23	24			
	SOURCE NAME	INTERTIE	SOURCE CATEGORY									USE				TREATMENT						DEPTH		SOURCE LOCATION			
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN TERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	WELL #1 WW ACA573				X								X			Y	X						407	200	SE SE	04	30N	04W
S02	WELL #2 WW ACA574				X								X			Y	X						436	200	SE SE	04	30N	04W
S03	WF (S01 & S02)			X									X			N	X						407	400	SE SE	04	30N	04W

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
08166 9	ESTATES INC	CLALLAM	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		365	480
A. Full Time Single Family Residences (Occupied 180 days or more per year)	365		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	1	1	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	1	1	0
28. TOTAL SERVICE CONNECTIONS		367	480

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per year? 913

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

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	250	250	250	250	1000	1000	1000	1000	1000	250	250	250
B. How many days per month is water accessible to the public?	30	30	30	30	30	30	30	30	30	30	30	30

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students, daycare children and/or employees are present each month that are NOT already included in the residential population?	25	25	25	25	25				25	25	25	25
B. How many days per month are they present?	20	20	20	20	20				15	20	20	20

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	1	1	1	1	1	1	1	1	1	1	1	1

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

35. Reason for Submitting WFI:

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

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

SIGNATURE: _____ **DATE:** _____

PRINT NAME: _____ **TITLE:** _____

Water Rights

STATB OP WASHINGTON
DEPARTMBNTOF ECOLOGY

PERMIT

TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

☐ Surface Water U1suod In accordance with ihe provtatona of Chapter 117, Laws of Washlnmon for 1917, and amendmenu Utoreto, end Ute.rules and regulations of Ute 06f)artment ot Ecology.)

Ci] Ground Water (Issued In accordance with Uta PJOVltlOIll of Chapter 263, Laws ot WashlnatOJ'l far 1945, and emendmenu Utareto, and tha ruletand ,egulat10111 of **tha Der,mment** of E'cOlogv,l

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
June 6, 1988	G 2-27344	G 2-27344 P	

NAMB
Estates Hater Systems, Inc.

ADDRESS ISTIll!&TI	(CITYI	ISTAT&t	IZIPCODEt
A7l w.s11 m 1ock street	Seftuim	Washington	98382

The applicant Is. pursuant to the Report of Examination which Jw been accepted by the applicant. hereby granted a permit to appropriate the following described public waters of the State of Washington, sub/ect to existing rights and to the limitations and provisions set out herein.

PUBUC WAJER TO SE APPROPRIA'IED

SOURCE
2 wells
TRIBUTARV OF IIF SURFACE WATERS)

MAXIMUM CUBIC PEET PER SECOND	MAXIMUM GALLONS PI!R MINUTE	MAXIMUM ACRIM!&ETPER YIIAR
	250	240

QUANTITY, TYPE OF USE, PERIOD OF USe
215 acre-feet per year commun1..1\' domestic supply as needed
(supplemental) (4aoservTces)

25 acre-feet per year
(primary)

LOCATION OP DIVERSION/WITHDRAWAi.

APPROXIMATE LOCATION OF DIVERSION-WITHDRAWAL.
1, 550 feet kfast and 490 feet North of Southeast corner of section 4.
2. 900 feet West and 490 feet North of Southeast corner of Section 4.

LOCATED WITHIN ISMALLI!ST LEGAL 8U8DIVISIONI

SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
4	30	4W	18	Clallam

ECORDED PLATTED PROPERTY

LOT	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WfflCtt WATER IS TO BE USED

Divisions 1, 2 and 3 of Blue Ribbon Farms; Matriottis' Mountain View Park Village; Divisions 1, 2 and 3 of Dungeness Estates; and}'(¼NW¼ Section 3, T. 30 No, R. 4 W.W.M.

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{I _ *f/zt1 90*

/JIW._

DESCIUffiIPN OF PJIDPOHB WORIS

Class I water system. Well logs for existing wells on file.

DSVILCIPMENTSCHEDULE

BEGIN PROJECT aV THIS DA1'81	COM fil' PROJECT BY THIS DATE,	WATER PUT TO FU&.I.USS aV THIS DATB1
Started	Se tember 1, 1990	September 1, 1991

PROVISIONS

The access port shall be maintained at all times on t e well (s).

Issued as a primary right in the amount of 25 acre-feet per year with the total annual withdrawal under all rights not to exceed 240 acre.-feet.

This permit shall be aub/ect ta cancellall n should the pennlitee fail , .comply with the aboue development • schedule a1ul/or fall to give notice to the Deplll'tment of Epotow o forms provided fly that Deparlment documenting such compliance.

Given under my hand and the seal of this office at Olympia *Washington, this.....,..... daJ-'*

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Christine Q. Gregoire, Director
Department **of Bc:ology**

ENGINEERING DATA

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&TATE OF WASHINGTON •
DEPARTMENT OP ECOLOGY

PERMIT

TO APPROPRIATE PUBUO WA1ER8 OF THE 8TA1& OF WASHINGTON

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February 14, 1989	32-27484	32-27484 P	G!RIIFICA18NUMBSA
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Estates Water Systems, Inc.

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174 W. Hemlock	Sequim	Washington	98382

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PUBUCWAmjs TO BEAPPROPRfAj&o

SOURCE
Two wells

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	500	240 (supplemental)

QUANTITY, TYPE OF USE, PERIOD OF USE		
240 acre-feet per year (supplemental to existing rights)	Community domestic supply (480 services)	:Yeai•round:as·needed·.:

LOCATION OE DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
1. 880 feet west and 490 feet north of the southeast corner of Section 4.
2. 900 feet west and 490 feet north of the southeast corner of Section 4.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, E. OR W. W.M.	W.R.I.A.	COUNTY
SE¼SE¼	4	30	4W	18	Clallam

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Divisions 1,2, and 3 of Blue Ribbon Estates, and the NW¼ of Sec. 3, intain Park Village, divisions 1,2, and 3 of Dungeness.

DESCRIPTION Of PROposep WORKS

w,n111:r x607 '
Well #2 6' x 463 '
Covered resem>irs totalUag 185,000pllons; distribution system pressurized by three S•hp, 167-s,m booster pumps; 10-hp backup pump.

IIEGINPIDIilff8"111BDA11:	aauFUI'I8 ADIEIITBY1"BGM'II	WA11!RM10NI.U886V1"1SDA11:
Started	Complete	September 1, 1991

PROVISIONS

·Ja accordance witb WAC 173-160-205, welJs (ahaU/shouJd) not be located within certain minimum distances of potential sources of contamination. These mfnlm,m distances shall comply with Jocal health repladons. ,as appropriate. In general, weDs shaD be located at least 100 feet from a sewer, septic tank, privy, or other ·...' source of **contamination.** Wells shall not bolacated wJtbln 1,000 feet of a solfd waste JandfiD.

'Inslalladon and maintenance of an aceeas port as described in Ground Water Bulletin No. 1 fs required.. An •. •·111te and aauae may be fnstalled in addition to the access pon.

A1{•·ed sileasurfDsdevlce shall be Installed and malntafned In accordance with RCW 90.03.360. WAC: :,· : . .-.up- (fnstaDatlon, operation, and maintenance requirements are attached).

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ENGINEERING DATA
OK

Well Logs

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Sel.-ond Copy - owner's Copy
Th.Jrd Copy-Orlllcr's :opv f3f•.t Ci!A 111 :.L.

WATER WELL REPORT

STATE OF WASHINGTON

Application No..... G- 47.- ::Zb / Sl

Pennlt No..... ......::-.....................i..

(1) **OWNER:** Name..P..<!../!....E..N.f.5L.G.5ZLl.t.t..L. Adct..../.3.7. ..k.c!.i.lr.!.f..d-.1kl......SX...SJ.u.....a:L..w!J.6:...'.J..f..:3 I'

(Z) LOCATION OF WELL: county....Q..{L.:,1.{,-:1..t:'.! ....11-?.'F...11 Sec ... . T.J.O.. N.. R .Y/...w.M.

ear !ntr and dlstance trom section or subdivision corner

(3) PROPOSED USE: Domestic O Industrial D Municlpal0 Irrigation D Test Well D Other 0

(4) TYPE OF WOUK: Owner'• number of well / (lt more than one)

N,ew well O Method: Dug D Bored 0
Deepened O Cable 0 Driven O
Recond1Uoned D Rotary 0 Jetted D

(5) DIMENSIONS: Diameter ol well —'--------------- !nche.t.
Drilled....__________tt. Depth of completed well...------------- "

(6) CONSTRUCTION DETAILS:

Casing inst,.!IP.d:..--..·-·-" Diam, trom _ ...._ .. ft. to ....-- ..- tt,
Threaded0 -·-·-" Diam, trom ------------ ft. to ------ tt
We ded0 ··-•· D!{IJ'.Jl, from -·-·..... .ft. to ....- tt.

Perforations: Yes ☐ No ☐
Type of pertor.ator use,d..-.c...
SIZE ol pertorAUons ------- ln, by ______ In.
pertor tions trom •.------ ft, to ______ tt.
perloro.Uons trom ------- tt. to • ft.
perforations from ft, to ft.

Screens: Yes ☐ No D
Manufacturer's Naine...
Type,______________________ Model No,__________
Dlam. ..·-·---- Slot dz.e -..-••·-·- !rom -·-·----· ft. to -··· ------ tt.
Dlam•..-.........-. Sl9t.slze ....- ..- from -··-·-- lt. to ··--· ----- ft.

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

Surface seal: Yes ☐ No☐ To what depth?-------------------- ft.
Material used in se,al______________________________
Dlaln y strata contain unusable water? Yes D No 0
Type of. water?.................................Depth of strata...... __________
Method of aeallng strata o

(7) PUMP: Manu/ucturer'• Nam•e...----------
Type:,.. HP

(S) W"-..TF.R LEVELS; Land-surface elevation ttbove hl<!<l:11 se.:. level....

Slatle level _______________............tt. below top ot well Date...........;..
Artesian pressure -..-....-....-,...•-·····.lbs. per square inch Dale......__________
Artesian water is controlled by..x..-—— ——————— (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level 1s lowered below static level

Was n pump test made? Yes0 No D It yes, by whom?.._..... ___________
Yield: al./mln w/ th !t.drawdown after hrs.

Recovery data (time taken as zero when pwnp turned off) (water level r,::asure;!.afteormZ.:oee ·1 ;-; wate . ec::)Leuel ·Tlme• "Water Leoet

Bailer test gal./min •wi ... wdown; att t?I"
Artesian flow .p.mt Dat
Temperature of water.._.•-·•······ Was a chemical analysis made? Yes D No D

(10) WELL LOG:

Formation: Describe bl/ color, character , iiie of matenal and strncture, and ah-ow thtckneu of aquifers arid the k(no and tiature of the material tn each stratum penetrated, to!th at lea.,t mu entru for each change of fonnatf.on.

MATERIAL	FROM	TO
DRILLED BY VAN AUSDLE		
YEAR UNKNOWN		
	90	110
GRAY CLAY	110	164
SILTY SAND W/CLAY LAYERS	164	182
MORE GRAVEL SHOWING	182	183
PRODUCING A SMALL AMT. OF H2O	183	211
SILT & CLAY LAYERS	211	
THIN LAYERS OF SHALE IN THE BLUE CLAY		224
SAND, GRAVEL & CLAY LAYERS	224	229
MUDDY SAND GRAVEL	229	244
SAND & SOME FINE GRAVEL	244	248
CLAY W/ LAYERS OF SAND & GRAVEL	248	274
BROWN CLAY & GRAVEL	274	320
YELLOW CLAY WITH LAYERS OF GRAVEL	320	380
LESS CLAY - MORE SAND & GRAVEL	380	385
CLAY SAND & GRAVEL	385	407
W.B. FINE-MEDIUM SAND	407	410
GRAY CLAY SAND & GRAVEL	410	428
W.B. COARSE SAND & GRAVEL	428	442
FINER SAND & GRAVEL W/ CLAY	442	456
GRAVEL W/LESS SAND W.B.	456	460
[illegible]	460	472
CEMENTED SAND & GRAVEL	[illegible]	[illegible]
[illegible] CLAY, GRAVEL HARD [illegible]	488	540
[illegible] CLAY	540	548
[illegible]	548	564
.13LCJ<. C'6..Ut1It.d S'aiJ.J + 6		568
f3lur. (1/4 & GRAVEL SEAMS	5{.,y	
Blur.. 0LAy' (;11titHL 2..	Sbf<	S,7
(3.;.J"T,·N cud O p..		

Work started.AUj ..-- L.J.. , 19-U. Completed......:.. ... 19..

WELL DRILLER'S STATEMENT:

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

N (Person, firm or corporation) (Type or print)

(Well Driller)

Llc nse No......O........ Date....:..........:...................., 19........

<.USE ADDITIONAL SHEETS IF NECESSARY)

f.CY 050-1·20

Fi:e Orl..:'r.:.: :ind Fir.:l Copy with Ve-p;..r••.;.;-nt o(F.cc:logy
S<..:>/\d Copy- Owner'!. C..:,py
Third Copy - Drill.::r'!'. Copy 1?J .Iv.ct

\V'>T r,'R \V'ELL R"'7"PQRT

STATE OF ,vAsro:--;GTON

App!i<_-;,tion :-:o.

Permit No.........

(1)0 ,VNER: Name..D..V...(',.r;:..:.r: ..(. ./. .!.'.':![.!J ...J.V. !.l. ..JL.!.J!/,.\. !.... Address... ../.<;:·?../.A. .T.1.£./...:.../ I_f. ......-. /..t._.k/.·..: (..(.L'..:.•. .5·..t..3{ ..-'!.:

LOCATION OF WRLL: County..f /.(!J/.. L!.J_............... ..- ....i,4 :2f ..... ', Sec....T.2..f....N., R.1/.f /w.M.

L..:jring.a!ld di..tance from section tlr subdivl!-.ion .corner

(3) PI Ol'OSBD USE: Domestic Industrial D MWUclpal0
lrrh:ation O Test Well 0 Other ¢

(4) TYPE OF WOUR: Owner's number o(well (if more than one).... ..... /
N w well O Method: Dug 0 Bored O
Deepened Cable Driven
Re:conditloned Rotary Jetted D

(5) DIMENSIONS: Diameter of well .f.<t....r, inches.
Drllled.................................!.t. Depth of completed well....... .Q ..7.... ft.

(6) CONS'.I'RUCTION DETAILS: 5!£-·i, D-9 K
Casing iust;,llr.d: ...." Diam. fro/f.[,.. !t:i"to r·-.. n.
Threaded O ....-.." Dl:un. irom lt.
Welded O ...." Diam. !rom ..'.......... {('tay..)./···

Pcrfor'-:1.tions: Yes☐ No J9
Type of pertosato, used DE1:Jr 6.19a
SIZE ol perto,RUon, ... So{J,fi..l1r"Ifr:, by ....>;?...... in.
.... pcrJo,aUons !Nm ...'fY(srJ{r,'O}°;,........ ft.
.... pc,tont!ons uom .... /i'I/),VJ?t----Ocr...... it.

Screens: Yes ,lX) No o P/n SR A c9cr1.>w I1
Manulacturcr's NAmc......lLQ.J?......J.?L!.UL:.
Type..::5-t.:(.).U.':.f... '.;i._).rrt(._...... Model Ko..J..Y.Jfl.{ ...J !.:...
Diasn.............._ Slot size ...---..-.... from . . . . H. to...................ft.
DlaF.:......:.......... Slot size .... !rom . ... it. to..................!t.

Gravel packed: Yes ☐ No)D Size ot gravel: ......
Gr:l\·cl pl:i,c-ed frum ft. to

Surface seal: Yes M No☐ To whqt.dcplh? _3..J ..... ft.
M:iteriul u-;ed In seal .B..:.rJ...:i.-:.i.."'!..f:-f...1..J J...................
Did any strata c-ont:iln unus::ible water? Yes0 No [i;
Type ot water?....... ..- Depth or :strata..
Method o! seuling str.ita off.... ...-..

(7) PUt-1P: M.inuiacturer·s Name..J::.l_< J.. .l.r.Y._.._........
Typ,: _5i..tli..i.1ID!S!)Ji,;......... ..... HP ....,S.::..........

(8) \YATER LEVELS· L;i.nd-surf.ii.:e elevation above mean sea level..................................fl.
St..atlc level ....) ....f.:..........-..!.t. below lop o! well Date .J.J..:.J./f..:.8-2::
Artesian pressure ..lbs. per square inch Date_...
A..11csl::in water is controlled by......... (Cap, valve, etc.)

(9) "\VELL TESTS: Drawdown ls amount w.;!cr level Js lowered t.<'low Si.rltlc level _g;-,:J JCA
W;,.s a p.;mp tc;:; moCc? Yes ;.J No O U yes, by whom?..p.;<.-1 LL.I.N[J...
Yield: gal./min. with ft. drawdown aHer hrs.
" S'E E AJ:TilCi1 cd· e,, lll(JJ.,1_{, :

Recovery data (time taken as 7.ero when pump turned off) (water level measured from well top t..., ,,.·..,tcr level)

Time	Water Level	Time	i.'.:tcr Level	Time	WateT Levet

Date of test ../.l..::....:.?.:.-!:...' -:1.d.
IhJler test... ....g:al./min. with.. ...ft. drnwdown a!tcr.................. hrs.
Artesian f!ow........-...... ..g.p.m, D:i.tc...
Temperature o! water...................\Vas a chemical analysis made? Yes V{. No-£

(10) WELL LOG://.'/\ (F- f\jC), .J.. I

Formation: Describi? b coioY;- charac- ci, S1.:c·<1 1 en st ctc_re, and show thick'li'SS of a ";J.ijers and the kind and nature of the mater.al m eoch stratum p nctrat-:d, w:th ot lerut one entrv for each c-han17.? of formation.

MATERIAL	FR0 .1	TD
6-lJ+.5,Liy' ":11 tJ.-i	L•	
(G P>tu. C-'J..11. -5::		
(:-hA fl (.\J.f:..	:'>'tr	
J',..(1£ <.'I.A•/ i.u:j(l f.1!111/iL	-.•c l	
I°"x"fcL.,E		
/<J'1		
O.:.-0-<:<c		
/4· <JeJ{rcf;,j_ /.e.s		P5·--
s, r: .'.-,....Ci:i.'		
Z.oo,Q..,['O,		
1@t:1/EZ::: 5'<"81,."' (_Lf""		
-V '(ASf 5tle<		
'/C..f, L/"fS S<1c.!,·1,		tP.S·
'< ')(.' La' (j(-/	15..S,	
-QI'		
'{" C.:)C		5.S.
"A>i - i>;7'		
------l;j;r,y, c-.s, { c 7 '		
J'..D:: J?.z11..c•..: n, s, f\{.		

Wor:.t. started...... .... 19..... .... Completed..J1J°C..f: ...,.··?.'/...l-. 19.,Y.2

WELL DRILLER'S STATEMENT:

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

NAME /l!!.1<..0.0....DL ..!.D.N.l.i'). ..<.'.:o., ..UV,'.:.!.................
(Pe:son, firm. or corPoration) (Type or print)

Address f?C, Eoy /GI r:;c•<,..'-.1.'L; l-vA
P ..{;·le r/--:.-7,,,,,/J;-fiv

[Signed J.. 11f...:J./. ,c.Jf.1,.;.i ;ii'£;tti'e i.......... ....

License No.......!.:?.:1/.'C....................... Dale..!:3.......P. ... ::.........., 19.. X.::

(USE ADDITIONAL SH:SITS ff :CESS.-\RYJ

PUMPING LOG No. ....

Pcc:-e No.

Date ....

Static Wcter Le'lel _£__$_ F{.

By STOICAN'DRILIJNG COMPA."IY

P.O. Box 161, Sequim, Wasci. - Phone E33-5530

Rt 3, Box 175, Port Orchard, Wash· - Phone Tel6-2057

DATE: LL-2:;.. -C_ :'l...

TIME	G.P.M.	Pumping Level	DRAWDOWN	Water Temp.	Puznp RP.M.	Remarks	
/2: 30 Pr1	/S1	. t, '1 ;=-r,				s1r+1<,	?u
1-:z:. 'fo							
11: r2..	/80					I #CJ?.t,qS;	J?A T.:J /:?::> 'jrm'
J..: f S'	ISO	7 2,			.,.?y,O		
·12:s.S-	I 80	7;1.					
I: f) t	/'f!O	1 J.				/; •C;i"i{'r	iJ? A-+;_':'iv
I, 7	O				:0 0		.:,ol G--P/?1
/; () 5"	{Ju I	77"					
I :Jo	;2.o I	_1 Jj					
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3: c	;J,o I	7 .5-'					
3:30	,;J. Cl	7S-'					
	;z o I	/ .) '					
.j):30	I	'i.S-'					
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S;3o	_;;o I	7:;-'					
S·3/						STOP.	7 2.ST

COIJE. p,1/ D.Al1A

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:-).• 3 G	b I		
.:X: 3 7	t,.;	b; IS	SB
S :3 8	!,O		
5:?:, c;-	{;C		
r·tjo	?C		

F.ile.o... a land First Copy with ... of Ecology
Second Copy - o....,ner's Copy
:n\lrd Copy- Driller's Copy

\\'ATER ,vELL REPOR'I'

STATE OF WASHINGTON

Application No. G...;l.:-''.'. --- ,
Permit No. G;:;l.--..d.CI..A0c.".e..

(1) OWNER: Name £0..e jt',1f1/?)o.TD.' ... Address DQZ.3.,'. .ccc.SE.(,'l'l:..tJ .t.08......?.d'.2.JJ.:

(2) LOCATION OF WELL: county(/-.-'cdJ. .S .;;i - Sc \,.5e'. \, sec.1/ ..T.:.J.<'...N., n..'.t.':l,1.w.M.

Bearing and distance from section or subdivision corner 9c.('r?<./, £; 1/·?0,r' A./, l't;..-, ,(..5"E, V:e. (J/ S<C. y"

(3) PROPOSED USE: D' Industrial D Municipal o
Irrigation O Test Well ☐ Other D

(4) TYPE OF WORK: Owner's number of well (if more than one) ;l
New well — Method: Dug O Bored D
Deepened — Cable D Driven D
Reconditioned D — Rotary 1}_ Jetted D

(5) DIMENSIONS: Diameter of well ..B...l>.)nches.
Drilled...........a...f!:.•............ ft. Depth of completed well...........::l...,k?..ft.

(6) CONSTRUCTION DETAILS:

Casing installed: ......JJ... Diam, from ......0.... tt. to ...1./.e...ft.
Threaded D • " Diam. from .... ft. to ....ft.
Welded " Diam. from .... ft. to ....ft.

Perforations: Yes ☐ No l\f
Type of perforator used ....
SIZE of perforations .... in. by.................................. in.
.... perforations from ...._.... .... ft. to.......................... ft.
.... perforations from _...................... ft. to .... ft.
perforations from ft. to ft.

Screens: Yes 1J No ☐
Manufacturer's Nsr,e............S.m..Jrtt............. ....
Type...S1..(<.fl!.L...: . Model No........·------
Diam. 7.. Slot size .k.7ci..... from -.7k... ft. to .....f/ .... ft.
Diam......Jl....... Slot size ...&:..a... :from ...RI..... ft. to ... J.Y. .. ft.

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

Surface seal: Yes !Jo☐ To what d'Jlh,'. ·-·········d.L,.···,'f•
Material used in seal /) e/l b.,;./l;;r_,,·"1"'·vdLLc. <'H.
Did any strata contain unusable water? Yes D No""
Type of water?...·----··-·........ Depth of strata ___
Method of sealing strata off.......

(7) PUMP: Manufacturer's Name________________________
Type: H.P....

(8) WATER LEVELS: Land-surface elevation above mean sea level. ;;:2cD ft.
Static level ---!,// L...._.. ft. below top of well Date/.3/.9..3/7.'.:/
Artesian pressure --····-..··-·-·-····lbs. per square inch Date....- ...._....
Artesian water is controlled by...........--.-----............ ·..
(Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes rJ No O If yes, by whom?..1)/2./..
Yield: .al./min. with ft. drawdown after hrs.
.. 7D f\lmP!N boC- " P.-rtoc!l£:P

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

Time	Water Level	Time	Water Level	Time	Water Level

Bailer test.-··--·-······gal./min. with_................-ft. drawdown after.-.·-············hrs.
Artesian flow --v--:v ....g p.m. Date l\-•-.·-·
Temperature of water..7-'.J:... Was a chemical analysis made? Yes No O

(10) WELL LOG:

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

MATERIAL	FROM	TO
<.t>f Cl)-_/;:" Sn:L.,	(1	-,
1:/flc,,,., <' n.lu /1'1/- ..	•,	,.- -
a"• u;.,11 <" " - Of-(, //,•, -	,-- t'	,: -"7
;, -, .,zV /5 0_ ,i I	.c-r:.	,.,.. ';L
" fl. .....«" - ¢-)	".7	
A nn ,...L ,,,- a 1/vz;,, ,./	".,	oy=
dDA11 ... _./		PL

Work started-..../ ,il././..3_ ., 1s.?JI. Completed....../o.?./.;;>.3......, 19..7.,,

WELL DRILLER'S STATEMENT:

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

NAME S-r.O! t\ n->.l J) (J t/ LJ'Al G- \.b. -:;:N(' ...K.J..b...
(Person, firm, or corporation) (Type or print)

t.l 1

(Well Driller)

0 JJ n-;z ,9. 7

License No....... ..:/...IJ.................. Date..(rck.\v.•··•........ , 19....

%!< (USE ADDITIONAL SHEETS IF NECESSARY)

"3- 7-7.J

WATER WELL REPORT

STATE OF WASHINGTON

Permit No. ...

(1) OWNER: Name ... Address ...

(2) LOCATION OF WELL: County ... Sec ... T.30...N., R.... (W.M.)

... and distance from section or subdivision corner

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

(4) TYPE OF WORK: Owner's number of well (if more than one) ...

New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

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

(6) CONSTRUCTION DETAILS:

Casing installed: ... Diam. from ... ft. to ... ft.
Threaded ☐ Diam. from ... ft. to ... ft.
Welded ☐ Diam. from ... ft. to ... ft.

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

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

Gravel/gravel ... fill size ... from ... ft.

Surface seal: Yes ☐ No ☐ To what depth? ... ft.
Material used in seal ...
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ... Depth of strata ...
Method of sealing strata off ...

(7) PUMP: Manufacturer's Name ...
Type: ... H.P. ...

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

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

Time	Water Level	Time	Water Level	Time	Water Level
...	...	...	...	...	...

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

Time	Water Level	Time	Water Level	Time	Water Level
...	...	...	...	...	...

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

(10) WELL LOG:

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

MATERIAL	FROM	TO
...	...	...

WELL DRILLER'S STATEMENT:

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

NAME ... (Person, firm, or corporation) (Type or print)

Address ...

[Signed] ... (Well Driller)

License No. ... Date ... 19...

(USE ADDITIONAL SHEETS IF NECESSARY)

PUMPING LOG I!oZ:.tJrIL f" ,

for. s%ft{; 1tif!!:1:z;: p/·

P.O. Box 161, Sequim, Wash. - Phone 683-5580
Rt 3, Box 175, Port Orchard, Wash - Phone TRS-2057

IUolL~ -
Job No............
fo;-,,,,'t/ :;r ,:)-,:)1,/..$'°i
Contrccl No.

p.;;:,e
D;,le ...£Ct..-S,J...

Sialie W<'lier Level. !J-S

DAT- J,;L&_,n- ,n /YZ //4.4),..-..17,f",f_ /4........ -- 4.171 • 9 73 r':2

TIME	G.P.M.	Pumping Level	DRAWDOWN	0Y,.(;,k, Water Ter.ip.	-'i' /,5,1 Pump R.P.M.	'"9t.J ,IJ/• Remarks	
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!.M Prn	-'.'?fl	'?/.	,,If -r- 0+-/	i D1r=n,':,.		ltdncJ /Ju r,u..	
/p? /l	.:J7'>	9-1.	"ly I	(		I -:2 S,:, JJ />f,	
Ir..', ,r	_J) 'f n	'i?t...	.;if		..t//_,L.	I.tj/1	"
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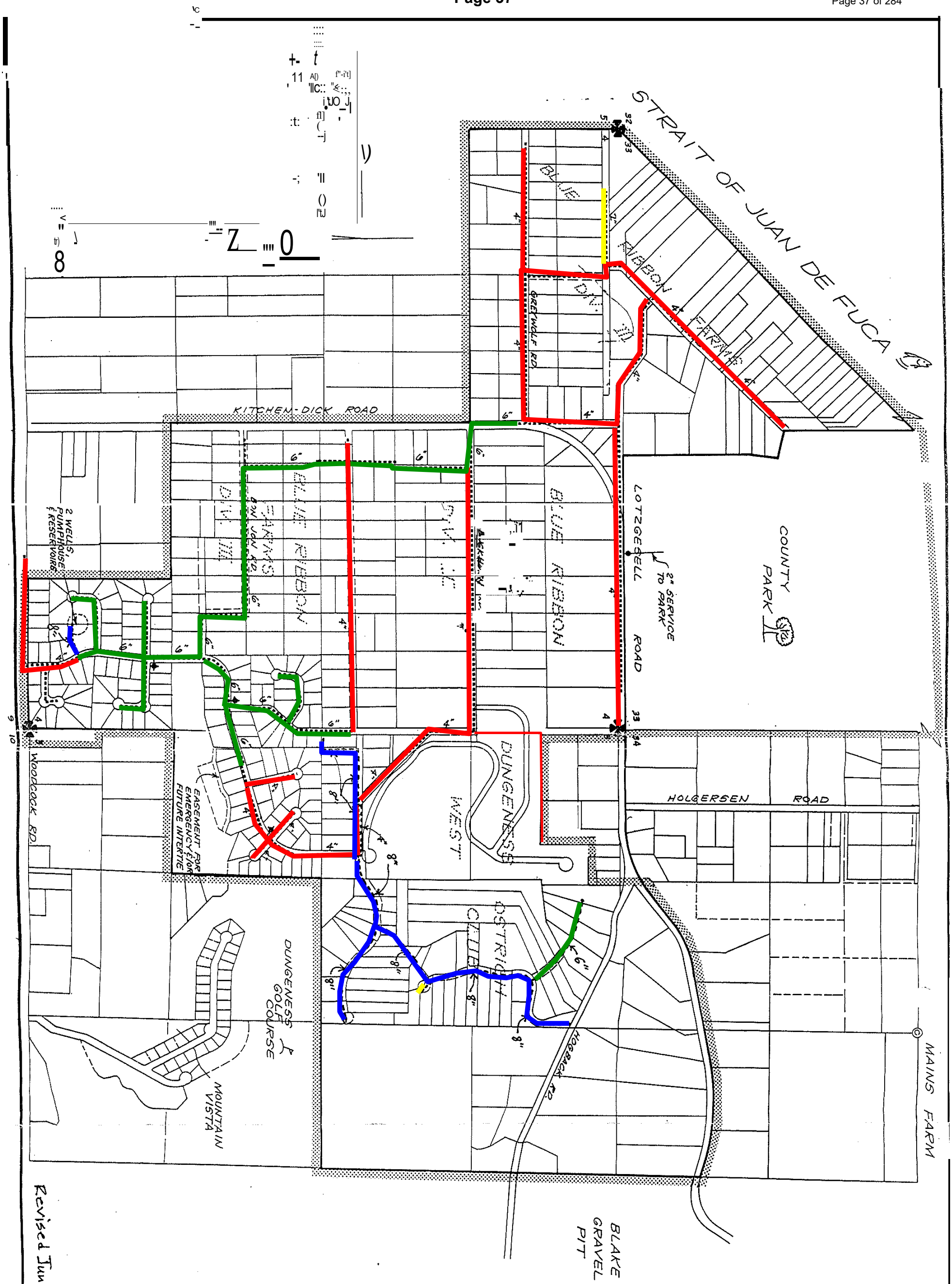
Existing System Map



Revised June 1.

EXISTING 'S,ERVICE AREA - FIGUI?E 2

ESTATES WATER SYSTEM
!993 COMPREHENSIVE WATER PLAN

i@ INTI
NORTHWESTERN TERRITORIES, INC.
Engineer, •Lind SulVO'fOfl ,P/ann,r,
ConstructIon CoonlInstIon •Mstsrlal• ni,ttng
717 SOUTH PEABOOV • POFIT ANGELES, WASHINGTON 98362 • (206) 452-8491

APPENDIX B: ENGINEERING CALCULATIONS

WATER SYSTEM INFORMATION

Date Printed: 8/11/2022

System:	Estates Inc.
PWS ID:	081669
Location:	Sequim, WA
Owner:	Cascadia Water, LLC
Operator:	Dale L. Metzger

Operating Permit	
Issue Date	9/1/2022
Color	Green

Water Facilities Inventory (WFI) Form	
Date Printed	3/28/2022
Active Residential Connections	365
Active Residential Population	913
Active Non-Residential Connections	2
Average Non-Residential Population	58
Approved Unused Connections	113
Approved Connections	480

RAW WATER USAGE DATA

System: Estates Inc.
PWS ID: 081669
Location: Sequim, WA

Year	2017*	2018*	2019*	2020*
January	1,275,116	1,472,800	1,126,200	1,409,200
February	1,495,959	1,148,500	1,591,800	1,255,200
March	1,461,997	1,368,900	1,464,100	1,865,700
April	1,586,487	1,603,600	2,232,700	3,300,000
May	1,609,876	3,496,600	3,741,900	4,007,900
June	4,827,172	4,253,500	4,369,500	3,640,800
July	5,459,190	5,341,100	4,798,900	5,529,700
August	4,272,386	5,257,200	4,830,200	4,764,600
September	2,919,137	3,268,300	3,065,300	3,649,800
October	1,439,779	1,777,200	1,765,500	1,965,800
November	1,247,191	831,700	1,342,100	1,439,800
December	1,311,234	863,400	1,456,600	1,341,131
Annual Total (Gal)	28,905,524	30,682,800	31,784,800	34,169,631

*From source meter readings

SOURCE INFORMATION

System: Estates Inc.
PWS ID: 081669
Location: Sequim, WA

Source		
Status	Active	
Source ID	Well 1	Well 2
DOE Well Tag	ACA573	ACA574
Category		
Use	Primary	Primary
Treatment	N/A	N/A
Capacity (gpm)	180	180
Depth to First Interval (ft)	407	436
Casing (in)	6"/4"	8"/6"/5"
Screen Diameter (in)	4"	5.5"
Location		
1/4, 1/4	SE SE	SE SE
Section	4	4
Township	30N	30N
Range	04W	04W
Pump Info		
Manufacturer	Berkeley	Berkeley
Model #	6S2AH-2	6S2AM-3
HP	7.5	7.5

WATER RIGHTS SUMMARY

Date Printed: 8/11/2022

System: Estates Inc.
PWS ID: 081669
Location: Sequim, WA

Certificate #	Name	Priority Date	Source Name	Primary or Supplemental	Q_i (gpm)	V_a (acre-ft)
G2-27344P	Estates Water Systems, Inc	06/06/88	2 Wells	Primary	250	240
G2-27484C	Estates Water Systems, Inc	02/14/89	2 Wells	Primary/ Supplemental	500	240
				Total	**500**	**240**
				max flow per day (gal)	600,000	10,454,400
				max flow per year (gal)	219,000,000	78,198,912
						214,244

Total
annual water rights (CF/yr)
annual water rights (gal/yr)
avg available daily water rights (gal)

Q_i = Maximum Instantaneous Flow Rate
V_a = Maximum Annual Withdrawal

CONNECTIONS BASED ON WATER USE DATA

Date Printed: 8/11/2022

System: Estates Inc.
PWS ID: 081669
Location: Sequim, WA

Year	Active Connections	Active Metered	Active Unmetered	Ready to Serve	Committed Connections
2018	367	367	0		
2019	367	367	0		
2020	367	367	0		
2021	367	367	0		
2022	367	367	0		

DOH Approved Connections	480

DEMAND BASED ON WATER USE DATA

System: Estates Inc.
PWS ID: 081669
Location: Sequim, WA

Year	Active Connections	Annual Withdrawal (gal)	Annual Withdrawal (ac-ft)	Annual Usage (gal)	Maximum Month Production (gal)	DSL / Unauthorized Use (gal)	Annual ADD (gpd)	Maximum Month ADD (gpd)	Annual ADD (gpd/ERU)	MMADD (gpd/ERU)	MDD** (gpd/ERU)
2017	367	28,905,524	88.7		5,459,190		79,193	181,973	216	496	818
2018	367	30,682,800	94.2		5,341,100		84,062	178,037	229	485	800
2019	367	31,784,800	97.6	30,266,324	4,830,200	1,518,476	87,082	161,007	237	439	724
2020	367	34,169,631	104.9	30,762,607	5,529,700	3,407,024	93,360	184,323	254	502	829
	Average	31,385,689	96.3	30,514,466	5,290,048	2,462,750	85,924	176,335	234	480	793
	Minimum	28,905,524	88.7	30,266,324	4,830,200	1,518,476	79,193	161,007	216	439	724
	Maximum	34,169,631	104.9	30,762,607	5,529,700	3,407,024	93,360	184,323	254	502	829

* June through September
** MDD = 1.65 (MMADD)

	Proposed	
ADD	260	gpd/ERU
MDD	830	gpd/ERU

Date Printed: 8/11/2022

PEAK HOUR DEMAND (PHD) CALCULATION

System: Estates Inc.
PWS ID: 081669
Location: Sequim, WA

From DOH Water System Design Manual (Section 3.4.2)

Equation 3-1: PHD = (MDD/1440)[(C)(N) + F] + 18

Where:
PHD = Peak Hourly Demand, total system (gpm)
C = Coefficient Associated with Ranges of ERUs
N = Number of ERUs based on MDD
F = Factor Associated with Ranges of ERUs
ERU_{MDD} = Maximum Day Demand per ERU, (gpd/ERU)

Table 3-1:

Range of N (ERUs)		C	F
15	50	3.0	0
51	100	2.5	25
101	250	2.0	75
251	500	1.8	125
501 +		1.6	225

MDD (gpd/ERU)	N (ERUs)	C	F	**PHD (gpm)**	*Scenario*
830	367	1.8	125.0	**470**	*Existing Connections*
830	480	1.8	125.0	**590**	*Max Approved Connections*
830	520	1.6	225.0	**630**	*Physical & Legal Capacity*

Date Printed: 8/11/2022

SOURCE-BASED PHYSICAL CAPACITY

System: Estates Inc.
PWS ID: 081669
Location: Sequim, WA

WATER RIGHT CALCULATIONS

Based on Annual Volume & Average Day Demand (Eqn 4-4b):

$N = Q_a/(365*ADD)$ *Where:* *N = Number of Service Connections, ERUs*
V_a = Annual Volume of Water Available from All Sources, as limited by Water Right (gallons/year)
ADD = Average Daily Demand per ERU (gpd/ERU)

	V_a (gal/year)	ADD (gpd/ERU)	N (ERUs)
Potential Connections	78,198,912	260	824

Based on Instantaneous Flow & Maximum Day Demand (Eqn 4-4a):

$N = Q_i/(MDD*1440)$ *Where:* *N = Number of Service Connections, ERUs*
MDD = Maximum Daily Demand per ERU (gpd/ERU)
Q_i = Instantaneous Maximum Water Right Flow Rate (gpm)

	Q_i (gpm)	MDD (gpd/ERU)	N (ERUs)
Potential Connections	500	830	867

SOURCE CALCULATIONS

Individual Source Capacity (Eqn 4-1):

$V_j = Q_j*t_j$ *Where:* *Vj = Total volume for source "j" over a specified period of time (gal/specified time period)*
Qj = Delivery rate of source (gal/unit time)
t_j = Time that flow (Qj) was delivered from source "j" (20 hrs recommended)

Total Source Capacity (Eqn 4-2):

$V_T=sum(Q_j*t_j)$ *Where:* *V_T = Total volume of water available to the system over a specified period of time (gal/specified time period)*
Q_j = Delivery rate of source (gal/unit time)
t_j = Time that flow (Qj) was delivered from source "j" (20 hrs recommended)

Source ID	Well 1	Well 2
Q_j Delivery Rate (gpm)	180	180
Max Pump Time (hours/day)	20	20
V_j Source Capacity (gal/day)	216,000	216,000

Q_s = 360 gpm

V_T = 432,000 gal/day

Based on Source Production & Maximum Day Demand (Eqn 4-3):

$N = V_T/MDD$ *Where:* *N = Number of Service Connections, ERUs*
MDD = Max Daily Demand per ERU (gpd/ERU)

	Q_s (gpm)	MDD (gpd/ERU)	N (ERUs)
Potential Connections	360	830	520

SUMMARY

ERUs	Condition	Limiting Factor
824	Water Right	Q_a
867	Water Right	Q_i
520	Source	Q_s

Source-Based Capacity: **520** ERUs

Limited by: **Qs** *Source*

STORAGE CAPACITY CALCULATIONS

System: Estates Inc.
ID No.: 081669
Location: Sequim, WA

Demands	
N (ERUs)	520
ADD (gpd/ERU)	260
MDD (gpd/ERU)	830
PHD (gpm)	630

Sources		
Source ID	Delivery Rate (gpm)	
Well 1	180	
Well 2	180	
Q_s =	360	
Q_s =	500	*water right limited*
Q_L =	180	*largest source*

Reservoirs					
Reservoir ID	Diameter (ft)	Height (ft)	Inside Area (sqft)	Volume (gal)	VF (gal/ft)
Tank 1	30	30	707	158,600	5,287
			Total	158,600	5,300

Top Dead Storage (TDS)	
Depth (ft)	Volume (gal)
0.75	3,975

STORAGE CAPACITY CALCULATIONS

System: Estates Inc.
ID No.: 081669
Location: Sequim, WA

Operational Storage (OS)	
Depth (ft)	Volume (gal)
1.0	5,300

Required Equalizing Storage (ES)		
PHD (gpm)	Q_s (gpm)	Volume (gal)
630	360	40,500

*ES = (PHD-Q_s)*150 or Zero*

Recommended Standby Storage (SB)					
ADD (gpd/ERU)	N (ERUs)	t_m (min)	Q_s (gpm)	Q_L (gpm)	Volume (gal)
260	520	1,440	360	180	104,000

SB_{TMS} = (2 days)[(ADD)(N) - t_m (Q_s - Q_L)] or (200)(N) whichever is greater

Fire Suppression Storage (FSS)		
Fire Flow (gpm)	t_m (min)	Volume (gal)
500	45	22,500

FSS = FFt_m*

Where: FF = Required fire flow rate (gpm)
t_m = Duration of FF rate (minutes)

Bottom Dead Storage (BDS)	
Depth (ft)	Volume (gal)
0.75	3,975

Available Storage Summary		
Component	Volume (gal)	Depth (ft)
TDS	3,975	0.8
OS	5,300	1.0
ES	40,500	7.6
SB/FSS	104,850	19.8
BDS	3,975	0.8
Total	**158,600**	**29.9**

Is the available SB/FSS…	
greater than recommended SB?	greater than required FSS?
yes	yes

Bladder Tank Sizing:

Variable	Value	Unit
P_1	65	psi
P_2	55	psi
Q_p	206	gpm
*N_c	24	cycles/hr
V_t	370	gal
R	128.8	

*For 4 alternating pumps.

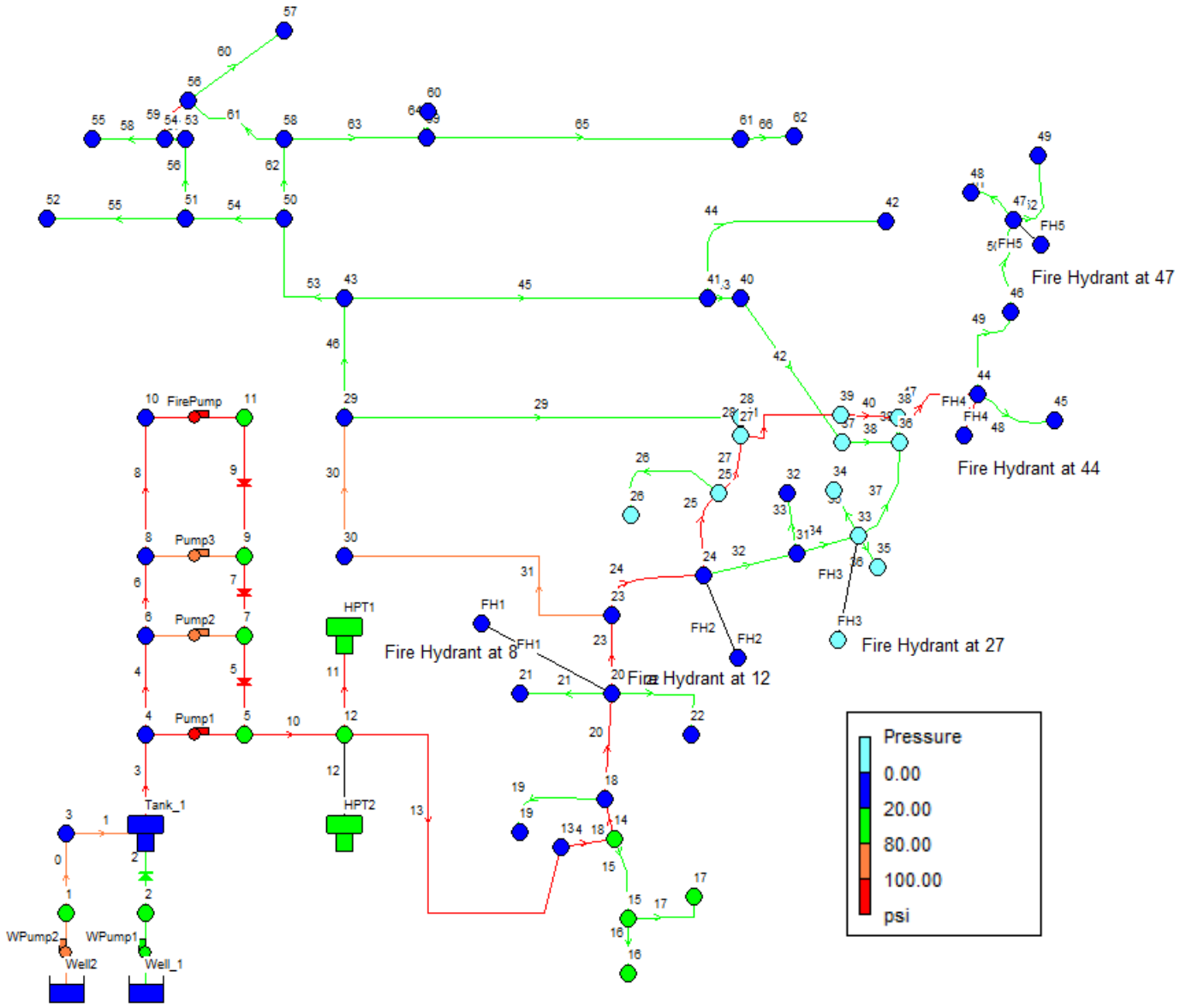
	Description
P_1 =	*Pump off pressure*
P_2 =	*Pump on pressure*
R =	*= 15 * (P1+14.7)(P2+14.7)/((P1-P2)(P2+9.7))*
Q_p =	*Pump Delivery capacity (gpm) at midpoint of on pump curve between P1 and P2*
N_c =	*Number of operating cycles per hour. Max number of pump motor starts per hour recommended by manufacturer. Without this information, this should be no more than 6 cycles/hour per alternating pump*
V_t =	*Gross volume of an individual bladder tank (gal)*
T_s =	*The number of bladder tanks. (See equation 9-1 from DOH Water system Design Manual, or equation 5-2 from Group B Design Manual)*

Equation 9-1: $T \geq \frac{(R)(Q_P)}{(N_c)(V_B)}$

T_s =	3 tanks

APPENDIX C: EXISTING SYSTEM HYDRAULIC MODEL

Estates Reservoir Replacement - Existing Fire Flow Scenario



EPANET 2.2

Estates Reservoir Replacement - Fire Flow Scenario

Network Table - Nodes

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 18	130	6.00	170.26	17.44
Junc 14	130	6.00	179.81	21.58
Junc 23	110	6.00	133.97	10.39
Junc 24	120	6.00	123.65	1.58
Junc 31	120	6.00	122.19	0.95
Junc 33	120	6.00	115.39	-2.00
Junc 38	110	6.00	107.28	-1.18
Junc 40	90	6.00	110.85	9.03
Junc 43	95	6.00	119.18	10.48
Junc 29	120	6.00	121.22	0.53
Junc 28	120	6.00	113.64	-2.76
Junc 30	125	6.00	125.20	0.09
Junc 50	95	6.00	118.75	10.29
Junc 58	95	6.00	117.91	9.93
Junc 61	90	6.00	117.43	11.89
Junc 53	100	6.00	117.78	7.71
Junc 51	95	6.00	117.95	9.95
Junc 15	130	6.00	179.70	21.54
Junc 16	130	6.00	179.70	21.54
Junc 17	130	6.00	179.69	21.53
Junc 13	140	0.00	182.81	18.55
Junc 19	130	6.00	170.24	17.43
Junc 20	120	6.00	151.70	13.74
Junc 22	120	6.00	151.68	13.73
Junc 21	120	6.00	151.68	13.73

Estates Reservoir Replacement - Fire Flow Scenario

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 25	120	6.00	118.46	-0.67
Junc 26	120	6.00	118.42	-0.68
Junc 32	120	5.00	122.17	0.94
Junc 34	120	5.00	115.36	-2.01
Junc 35	120	5.00	115.36	-2.01
Junc 41	90	5.00	111.10	9.14
Junc 44	100	5.00	104.81	2.09
Junc 42	100	5.00	111.06	4.79
Junc 62	90	5.00	117.43	11.89
Junc 45	100	5.00	104.81	2.09
Junc 46	95	5.00	104.81	4.25
Junc 47	95	5.00	104.80	4.25
Junc 48	90	6.00	104.80	6.41
Junc 49	90	5.00	104.80	6.41
Junc 54	100	5.00	117.78	7.70
Junc 55	100	5.00	117.76	7.70
Junc 52	95	5.00	117.93	9.93
Junc 56	100	6.00	117.78	7.70
Junc 57	100	5.00	117.77	7.70
Junc 59	95	5.00	117.62	9.80
Junc 60	95	5.00	117.55	9.77
Junc 12	140	0.00	186.86	20.30
Junc 11	140	0.00	188.54	21.03
Junc 9	140	0.00	188.44	20.99
Junc 7	140	0.00	188.17	20.87
Junc 5	140	0.00	187.66	20.65

Estates Reservoir Replacement - Fire Flow Scenario

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 4	140	0.00	164.50	10.61
Junc 6	140	0.00	163.99	10.40
Junc 8	140	0.00	163.72	10.28
Junc 10	140	0.00	163.62	10.23
Junc 2	52	0.00	166.52	49.62
Junc 1	52	0.00	165.70	49.26
Junc 3	140	0.00	165.34	10.98
Junc FH1	120	0.00	151.70	13.74
Junc FH2	120	0.00	123.65	1.58
Junc FH3	120	0.00	115.39	-2.00
Junc 36	110	6.00	107.31	-1.16
Junc 37	115	6.00	108.15	-2.97
Junc 39	115	6.00	108.59	-2.78
Junc 27	120	6.00	113.60	-2.77
Junc FH4	100	500.00	104.73	2.05
Junc FH5	95	0.00	104.80	4.25
Resvr Well_1	52	-149.82	52.00	0.00
Resvr Well2	52	-223.71	52.00	0.00
Tank Tank_1	140	-751.47	165.30	10.96
Tank HPT1	140	348.00	186.20	20.02
Tank HPT2	140	0.00	186.20	20.02

Estates Reservoir Replacement - Fire Flow Scenario

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 18	250	6	140	-753.00	8.54	38.23
Pipe 24	600	6	140	489.17	5.55	17.20
Pipe 32	800	6	140	145.51	1.65	1.82
Pipe 34	600	4	140	134.51	3.43	11.34
Pipe 37	900	4	140	118.51	3.03	8.97
Pipe 30	1000	6	140	221.83	2.52	3.98
Pipe 31	2100	6	140	227.83	2.59	4.18
Pipe 53	900	6	140	71.00	0.81	0.48
Pipe 62	800	4	140	37.17	0.95	1.05
Pipe 56	700	4	140	16.83	0.43	0.24
Pipe 54	1300	4	140	27.83	0.71	0.61
Pipe 29	2300	4	140	-69.02	1.76	3.30
Pipe 46	1100	6	140	146.81	1.67	1.85
Pipe 15	400	4	140	18.00	0.46	0.27
Pipe 16	100	4	140	6.00	0.15	0.04
Pipe 17	300	4	140	6.00	0.15	0.04
Pipe 14	300	8.0	140	777.00	4.96	9.98
Pipe 20	500	6	140	741.00	8.41	37.11
Pipe 21	500	4	140	6.00	0.15	0.04
Pipe 22	500	4	140	6.00	0.15	0.04
Pipe 23	500	6	140	723.00	8.20	35.46
Pipe 25	600	6	140	337.66	3.83	8.66
Pipe 27	600	6	140	325.66	3.70	8.10
Pipe 26	1000	4	140	6.00	0.15	0.04
Pipe 35	1000	4	140	5.00	0.13	0.03

Estates Reservoir Replacement - Fire Flow Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 33	1000	4	140	5.00	0.13	0.03
Pipe 36	1000	4	140	5.00	0.13	0.03
Pipe 43	100	4	140	-59.81	1.53	2.53
Pipe 45	2400	4	140	-69.81	1.78	3.37
Pipe 66	100	4	140	5.00	0.13	0.03
Pipe 44	1500	4	140	5.00	0.13	0.03
Pipe 47	500	8	140	531.00	3.39	4.93
Pipe 48	500	8	140	5.00	0.03	0.00
Pipe 49	500	8	140	21.00	0.13	0.01
Pipe 50	600	8	140	16.00	0.10	0.01
Pipe 51	300	6	140	6.00	0.07	0.00
Pipe 52	400	8	140	5.00	0.03	0.00
Pipe 19	500	4	140	6.00	0.15	0.04
Pipe 55	1000	4	140	5.00	0.13	0.03
Pipe 57	50	4	140	10.83	0.28	0.11
Pipe 58	700	4	140	5.00	0.13	0.03
Pipe 61	1400	4	140	10.17	0.26	0.10
Pipe 59	200	4	140	0.83	0.02	0.00
Pipe 60	500	4	140	5.00	0.13	0.03
Pipe 63	800	4	140	-21.00	0.54	0.36
Pipe 65	1700	4	140	11.00	0.28	0.11
Pipe 64	100	2	140	5.00	0.51	0.75
Pipe 11	10	4	140	348.00	8.88	65.97
Pipe 12	10	4	140	0.00	0.00	0.00
Pipe 10	10	6	140	1125.00	12.77	80.42
Pipe 5	10	6	140	873.81	9.92	50.36

Estates Reservoir Replacement - Fire Flow Scenario

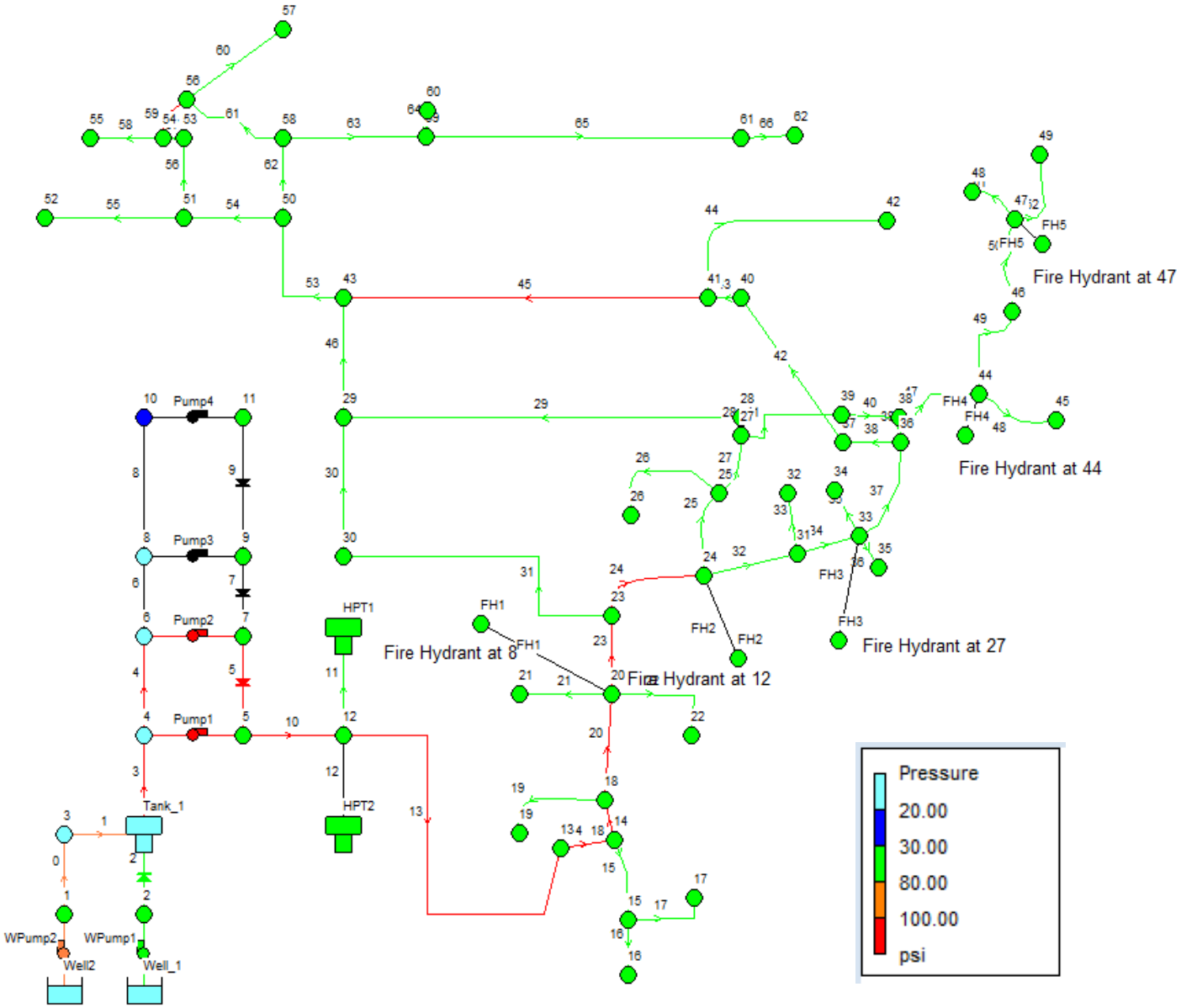
Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 9	10	6	140	375.08	4.26	10.52
Pipe 4	10	6	140	873.81	9.92	50.36
Pipe 8	10	6	140	375.08	4.26	10.52
Pipe 3	10	6	140	1125.00	12.77	80.42
Pipe 7	10	6	140	624.06	7.08	27.00
Pipe 2	88	4	140	149.82	3.82	13.85
Pipe 13	100	6	140	777.00	8.82	40.52
Pipe 6	10	6	140	624.06	7.08	27.00
Pipe 0	88	6	140	223.71	2.54	4.04
Pipe 1	10	6	140	223.71	2.54	4.04
Pipe FH1	10	6	140	0.00	0.00	0.00
Pipe FH2	10	6	140	0.00	0.00	0.00
Pipe FH3	10	6	140	0.00	0.00	0.00
Pipe 39	2	4	140	160.31	4.09	15.70
Pipe 38	500	4	140	-47.81	1.22	1.67
Pipe 42	1300	4	140	-53.81	1.37	2.08
Pipe 40	500	8	140	-376.68	2.40	2.61
Pipe 28	100	6	140	-63.02	0.72	0.39
Pipe 41	1000	8	100	-382.68	2.44	5.01
Pipe FH4	5	6	140	500.00	5.67	17.91
Pipe FH5	10	6	140	0.00	0.00	0.00
Pump Pump1	#N/A	#N/A	#N/A	251.19	0.00	-23.17
Pump Pump2	#N/A	#N/A	#N/A	249.75	0.00	-24.18
Pump Pump3	#N/A	#N/A	#N/A	248.98	0.00	-24.72
Pump FirePump	#N/A	#N/A	#N/A	375.08	0.00	-24.93
Pump WPump1	#N/A	#N/A	#N/A	149.82	0.00	-114.52

Estates Reservoir Replacement - Fire Flow Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pump WPump2	#N/A	#N/A	#N/A	223.71	0.00	-113.70

APPENDIX D: PROPOSED SYSTEM HYDRUALIC MODELS

Estates Reservoir Replacement - Peak Hour Demand Scenario



EPANET 2.2

Estates Reservoir Replacement - Peak Hour Demand Scenario

Network Table - Nodes

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 18	130	12.00	237.19	46.44
Junc 14	130	12.00	243.38	49.13
Junc 23	110	12.00	219.39	47.40
Junc 24	120	12.00	215.38	41.33
Junc 31	120	12.00	214.69	41.03
Junc 33	120	12.00	212.53	40.09
Junc 38	110	12.00	211.62	44.03
Junc 40	90	12.00	209.32	51.70
Junc 43	95	12.00	209.26	49.51
Junc 29	120	12.00	211.82	39.79
Junc 28	120	12.00	212.34	40.01
Junc 30	125	12.00	214.05	38.59
Junc 50	95	12.00	207.39	48.70
Junc 58	95	12.00	203.73	47.11
Junc 61	90	12.00	201.59	48.35
Junc 53	100	12.00	203.18	44.71
Junc 51	95	12.00	203.93	47.20
Junc 15	130	12.00	242.99	48.96
Junc 16	130	12.00	242.97	48.95
Junc 17	130	12.00	242.95	48.94
Junc 13	140	0.00	245.17	45.57
Junc 19	130	12.00	237.12	46.42
Junc 20	120	12.00	227.69	46.66
Junc 22	120	12.00	227.63	46.64
Junc 21	120	12.00	227.63	46.64

Estates Reservoir Replacement - Peak Hour Demand Scenario

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 25	120	12.00	213.67	40.59
Junc 26	120	12.00	213.54	40.53
Junc 32	120	12.00	214.57	40.98
Junc 34	120	12.00	212.40	40.04
Junc 35	120	12.00	212.40	40.04
Junc 41	90	12.00	209.27	51.68
Junc 44	100	12.00	211.56	48.34
Junc 42	100	12.00	209.07	47.26
Junc 62	90	12.00	201.58	48.35
Junc 45	100	12.00	211.55	48.34
Junc 46	95	12.00	211.53	50.49
Junc 47	95	12.00	211.51	50.48
Junc 48	90	12.00	211.50	52.65
Junc 49	90	12.00	211.50	52.65
Junc 54	100	12.00	203.15	44.70
Junc 55	100	12.00	203.06	44.66
Junc 52	95	12.00	203.80	47.14
Junc 56	100	12.00	203.15	44.70
Junc 57	100	12.00	203.09	44.67
Junc 59	95	12.00	202.38	46.53
Junc 60	95	12.00	202.00	46.37
Junc 12	140	0.00	247.59	46.62
Junc 11	140	0.00	248.05	46.82
Junc 9	140	0.00	248.05	46.82
Junc 7	140	0.00	248.05	46.82
Junc 5	140	0.00	247.95	46.77

Estates Reservoir Replacement - Peak Hour Demand Scenario

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 4	140	0.00	169.64	12.84
Junc 6	140	0.00	169.54	12.80
Junc 8	140	0.00	169.54	12.80
Junc 10	140	0.00	208.79	29.81
Junc 2	52	0.00	171.06	51.59
Junc 1	52	0.00	170.35	51.28
Junc 3	140	0.00	170.04	13.01
Junc FH1	120	0.00	227.69	46.66
Junc FH2	120	0.00	215.38	41.33
Junc FH3	120	0.00	212.53	40.09
Junc 36	110	12.00	211.62	44.03
Junc 37	115	12.00	210.72	41.47
Junc 39	115	12.00	211.75	41.92
Junc 27	120	12.00	212.34	40.01
Junc FH4	100	0.00	211.56	48.34
Junc FH5	95	0.00	211.51	50.48
Resvr Well_1	52	-138.84	52.00	0.00
Resvr Well2	52	-210.16	52.00	0.00
Tank Tank_1	140	-380.30	170.00	13.00
Tank HPT1	140	141.29	243.95	45.04
Tank HPT2	140	0.00	243.95	45.04

Estates Reservoir Replacement - Peak Hour Demand Scenario

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 18	300	6	140	-540.00	6.13	20.65
Pipe 24	600	6	140	293.78	3.33	6.69
Pipe 32	800	6	140	96.50	1.10	0.85
Pipe 34	600	4	140	72.50	1.85	3.61
Pipe 37	900	4	140	36.50	0.93	1.01
Pipe 30	1000	6	140	162.22	1.84	2.23
Pipe 31	2100	6	140	174.22	1.98	2.54
Pipe 53	900	6	140	156.00	1.77	2.07
Pipe 62	800	4	140	82.44	2.10	4.58
Pipe 56	700	4	140	37.56	0.96	1.07
Pipe 54	1300	4	140	61.56	1.57	2.67
Pipe 29	2300	4	140	16.09	0.41	0.22
Pipe 46	1100	6	140	166.31	1.89	2.33
Pipe 15	400	4	140	36.00	0.92	0.99
Pipe 16	100	4	140	12.00	0.31	0.13
Pipe 17	300	4	140	12.00	0.31	0.13
Pipe 14	300	8	140	588.00	3.75	5.96
Pipe 20	500	6	140	516.00	5.86	18.99
Pipe 21	500	4	140	12.00	0.31	0.13
Pipe 22	500	4	140	12.00	0.31	0.13
Pipe 23	500	6	140	480.00	5.45	16.61
Pipe 25	600	6	140	185.28	2.10	2.85
Pipe 27	600	6	140	161.28	1.83	2.20
Pipe 26	1000	4	140	12.00	0.31	0.13
Pipe 35	1000	4	140	12.00	0.31	0.13
Pipe 33	1000	4	140	12.00	0.31	0.13

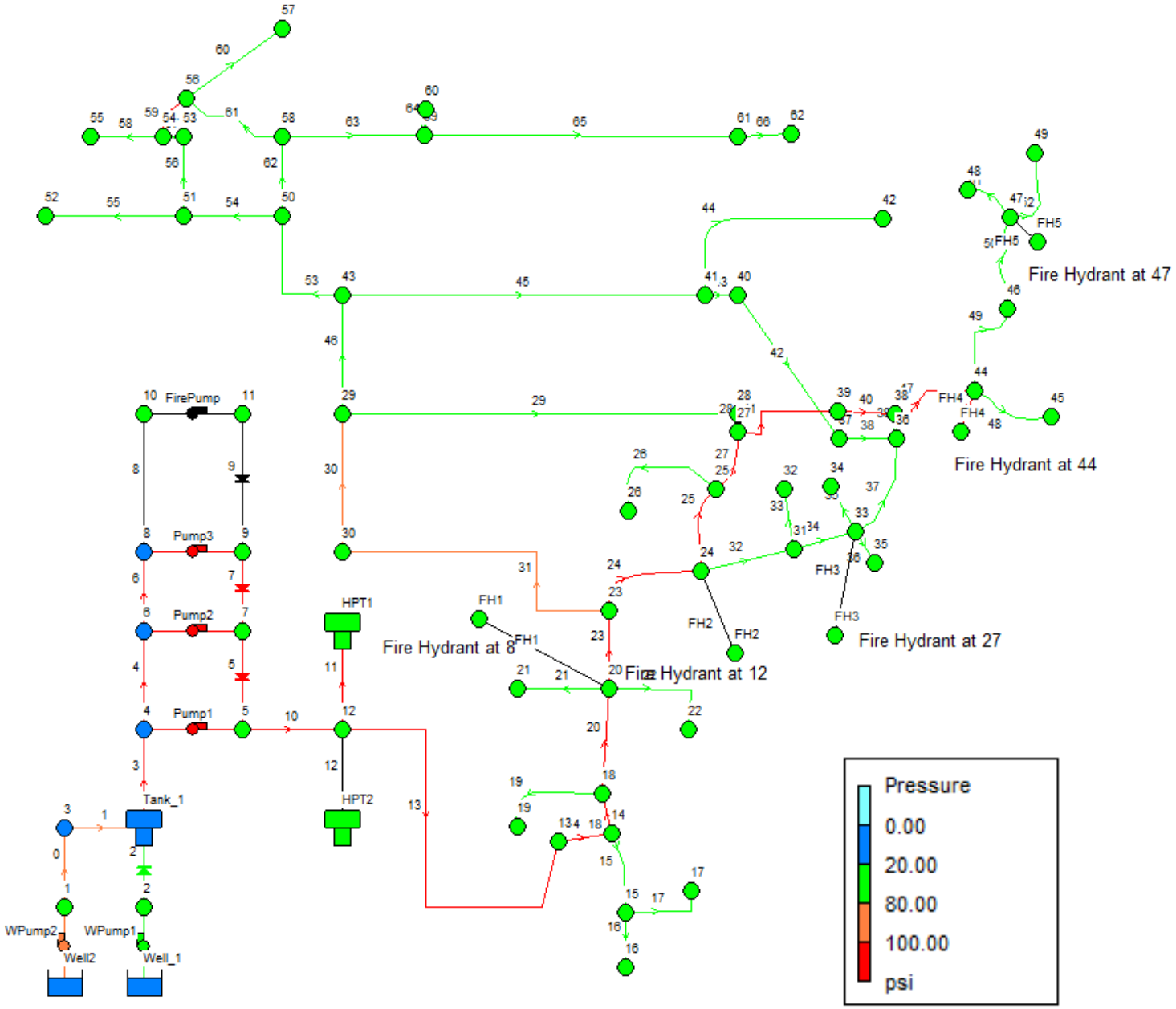
Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 36	1000	4	140	12.00	0.31	0.13
Pipe 43	100	4	140	25.69	0.66	0.53
Pipe 45	2400	4	140	1.69	0.04	0.00
Pipe 66	100	4	140	12.00	0.31	0.13
Pipe 44	1500	4	140	12.00	0.31	0.13
Pipe 47	500	8	140	72.00	0.46	0.12
Pipe 48	500	8	140	12.00	0.08	0.00
Pipe 49	500	8	140	48.00	0.31	0.06
Pipe 50	600	8	140	36.00	0.23	0.03
Pipe 51	300	6	140	12.00	0.14	0.02
Pipe 52	400	8	140	12.00	0.08	0.00
Pipe 19	500	4	140	12.00	0.31	0.13
Pipe 55	1000	4	140	12.00	0.31	0.13
Pipe 57	50	4	140	25.56	0.65	0.52
Pipe 58	700	4	140	12.00	0.31	0.13
Pipe 61	1400	4	140	22.44	0.57	0.41
Pipe 59	200	4	140	1.56	0.04	0.00
Pipe 60	500	4	140	12.00	0.31	0.13
Pipe 63	800	4	140	-48.00	1.23	1.68
Pipe 65	1700	4	140	24.00	0.61	0.47
Pipe 64	100	2	140	12.00	1.23	3.78
Pipe 11	10	2	140	-141.29	14.43	363.66
Pipe 12	10	4	140	0.00	0.00	0.00
Pipe 10	10	6	140	729.29	8.28	36.03
Pipe 5	10	6	140	364.36	4.13	9.97
Pipe 9	10	6	140	0.00	0.00	0.00
Pipe 4	10	6	140	364.36	4.13	9.97
Pipe 8	10	6	140	0.00	0.00	0.00

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 3	10	6	140	729.29	8.28	36.03
Pipe 7	10	6	140	0.00	0.00	0.00
Pipe 2	88	4	140	138.84	3.54	12.03
Pipe 13	100	6	140	588.00	6.67	24.18
Pipe 6	10	6	140	0.00	0.00	0.00
Pipe 0	88	6	140	210.16	2.38	3.60
Pipe 1	10	6	140	210.16	2.38	3.60
Pipe FH1	10	6	140	0.00	0.00	0.00
Pipe FH2	10	6	140	0.00	0.00	0.00
Pipe FH3	10	6	140	0.00	0.00	0.00
Pipe 39	2	4	140	-25.19	0.64	0.51
Pipe 38	500	4	140	49.69	1.27	1.79
Pipe 42	1300	4	140	37.69	0.96	1.08
Pipe 40	500	8	140	-109.19	0.70	0.26
Pipe 28	100	6	140	28.09	0.32	0.09
Pipe 41	1000	8	100	-121.19	0.77	0.60
Pipe FH4	5	6	140	0.00	0.00	0.00
Pipe FH5	10	6	140	0.00	0.00	0.00
Pump Pump1	#N/A	#N/A	#N/A	364.94	0.00	-78.31
Pump Pump2	#N/A	#N/A	#N/A	364.36	0.00	-78.51
Pump Pump3	#N/A	#N/A	#N/A	0.00	0.00	0.00
Pump Pump4	#N/A	#N/A	#N/A	0.00	0.00	0.00
Pump WPump1	#N/A	#N/A	#N/A	138.84	0.00	-119.06
Pump WPump2	#N/A	#N/A	#N/A	210.16	0.00	-118.35

Estates Reservoir Replacement - Fire Flow Scenario



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Estates Reservoir Replacement - Fire Flow Scenario

Network Table - Nodes

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 18	130	6.00	230.93	43.73
Junc 14	130	6.00	240.49	47.87
Junc 23	110	6.00	194.64	36.68
Junc 24	120	6.00	184.32	27.87
Junc 31	120	6.00	182.87	27.24
Junc 33	120	6.00	176.06	24.29
Junc 38	110	6.00	167.95	25.11
Junc 40	90	6.00	171.52	35.32
Junc 43	95	6.00	179.86	36.77
Junc 29	120	6.00	181.89	26.82
Junc 28	120	6.00	174.31	23.53
Junc 30	125	6.00	185.87	26.37
Junc 50	95	6.00	179.42	36.58
Junc 58	95	6.00	178.59	36.22
Junc 61	90	6.00	178.11	38.18
Junc 53	100	6.00	178.46	34.00
Junc 51	95	6.00	178.63	36.24
Junc 15	130	6.00	240.38	47.83
Junc 16	130	6.00	240.37	47.83
Junc 17	130	6.00	240.37	47.82
Junc 13	140	0.00	243.48	44.84
Junc 19	130	6.00	230.91	43.72
Junc 20	120	6.00	212.37	40.03
Junc 22	120	6.00	212.35	40.02
Junc 21	120	6.00	212.35	40.02

Estates Reservoir Replacement - Fire Flow Scenario

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 25	120	6.00	179.13	25.62
Junc 26	120	6.00	179.09	25.61
Junc 32	120	5.00	182.84	27.23
Junc 34	120	5.00	176.03	24.28
Junc 35	120	5.00	176.03	24.28
Junc 41	90	5.00	171.78	35.43
Junc 44	100	5.00	165.49	28.38
Junc 42	100	5.00	171.74	31.08
Junc 62	90	5.00	178.10	38.18
Junc 45	100	5.00	165.49	28.38
Junc 46	95	5.00	165.48	30.54
Junc 47	95	5.00	165.48	30.54
Junc 48	90	6.00	165.48	32.70
Junc 49	90	5.00	165.48	32.70
Junc 54	100	5.00	178.45	33.99
Junc 55	100	5.00	178.43	33.99
Junc 52	95	5.00	178.60	36.22
Junc 56	100	6.00	178.45	33.99
Junc 57	100	5.00	178.44	33.99
Junc 59	95	5.00	178.29	36.09
Junc 60	95	5.00	178.22	36.06
Junc 12	140	0.00	244.48	45.27
Junc 11	140	0.00	245.65	45.78
Junc 9	140	0.00	245.65	45.78
Junc 7	140	0.00	245.56	45.74
Junc 5	140	0.00	245.21	45.59

Estates Reservoir Replacement - Fire Flow Scenario

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 4	140	0.00	164.57	10.65
Junc 6	140	0.00	164.22	10.50
Junc 8	140	0.00	164.13	10.45
Junc 10	140	0.00	204.89	28.12
Junc 2	52	0.00	166.52	49.62
Junc 1	52	0.00	165.70	49.26
Junc 3	140	0.00	165.34	10.98
Junc FH1	120	0.00	212.37	40.03
Junc FH2	120	0.00	184.32	27.87
Junc FH3	120	0.00	176.06	24.29
Junc 36	110	6.00	167.98	25.12
Junc 37	115	6.00	168.82	23.32
Junc 39	115	6.00	169.26	23.51
Junc 27	120	6.00	174.27	23.52
Junc FH4	100	500.00	165.40	28.34
Junc FH5	95	0.00	165.48	30.54
Resvr Well_1	52	-149.82	52.00	0.00
Resvr Well2	52	-223.71	52.00	0.00
Tank Tank_1	140	-696.26	165.30	10.96
Tank HPT1	140	292.79	244.00	45.06
Tank HPT2	140	0.00	244.00	45.06

Estates Reservoir Replacement - Fire Flow Scenario

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 18	250	6	140	-753.00	8.54	38.23
Pipe 24	600	6	140	489.17	5.55	17.20
Pipe 32	800	6	140	145.51	1.65	1.82
Pipe 34	600	4	140	134.51	3.43	11.34
Pipe 37	900	4	140	118.51	3.03	8.97
Pipe 30	1000	6	140	221.83	2.52	3.98
Pipe 31	2100	6	140	227.83	2.59	4.18
Pipe 53	900	6	140	71.00	0.81	0.48
Pipe 62	800	4	140	37.17	0.95	1.05
Pipe 56	700	4	140	16.83	0.43	0.24
Pipe 54	1300	4	140	27.83	0.71	0.61
Pipe 29	2300	4	140	-69.02	1.76	3.30
Pipe 46	1100	6	140	146.81	1.67	1.85
Pipe 15	400	4	140	18.00	0.46	0.27
Pipe 16	100	4	140	6.00	0.15	0.04
Pipe 17	300	4	140	6.00	0.15	0.04
Pipe 14	300	8.0	140	777.00	4.96	9.98
Pipe 20	500	6	140	741.00	8.41	37.11
Pipe 21	500	4	140	6.00	0.15	0.04
Pipe 22	500	4	140	6.00	0.15	0.04
Pipe 23	500	6	140	723.00	8.20	35.46
Pipe 25	600	6	140	337.66	3.83	8.66
Pipe 27	600	6	140	325.66	3.70	8.10
Pipe 26	1000	4	140	6.00	0.15	0.04
Pipe 35	1000	4	140	5.00	0.13	0.03
Pipe 33	1000	4	140	5.00	0.13	0.03
Pipe 36	1000	4	140	5.00	0.13	0.03

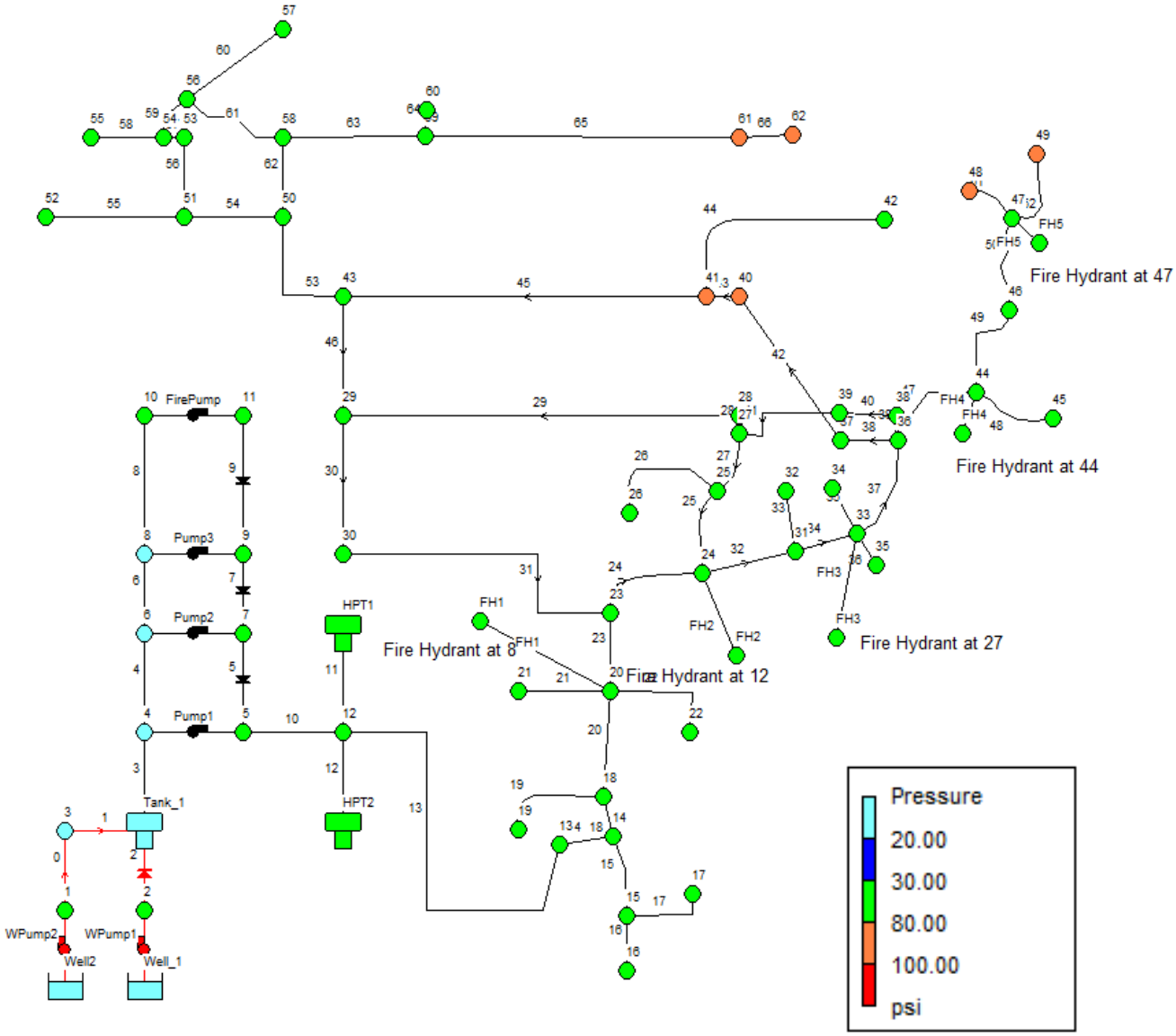
Estates Reservoir Replacement - Fire Flow Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 43	100	4	140	-59.81	1.53	2.53
Pipe 45	2400	4	140	-69.81	1.78	3.37
Pipe 66	100	4	140	5.00	0.13	0.03
Pipe 44	1500	4	140	5.00	0.13	0.03
Pipe 47	500	8	140	531.00	3.39	4.93
Pipe 48	500	8	140	5.00	0.03	0.00
Pipe 49	500	8	140	21.00	0.13	0.01
Pipe 50	600	8	140	16.00	0.10	0.01
Pipe 51	300	6	140	6.00	0.07	0.00
Pipe 52	400	8	140	5.00	0.03	0.00
Pipe 19	500	4	140	6.00	0.15	0.04
Pipe 55	1000	4	140	5.00	0.13	0.03
Pipe 57	50	4	140	10.83	0.28	0.11
Pipe 58	700	4	140	5.00	0.13	0.03
Pipe 61	1400	4	140	10.17	0.26	0.10
Pipe 59	200	4	140	0.83	0.02	0.00
Pipe 60	500	4	140	5.00	0.13	0.03
Pipe 63	800	4	140	-21.00	0.54	0.36
Pipe 65	1700	4	140	11.00	0.28	0.11
Pipe 64	100	2	140	5.00	0.51	0.75
Pipe 11	10	4	140	292.79	7.48	47.91
Pipe 12	10	4	140	0.00	0.00	0.00
Pipe 10	10	6	140	1069.79	12.14	73.26
Pipe 5	10	6	140	711.67	8.08	34.44
Pipe 9	10	6	140	0.00	0.00	0.00
Pipe 4	10	6	140	711.67	8.08	34.44
Pipe 8	10	6	140	0.00	0.00	0.00
Pipe 3	10	6	140	1069.79	12.14	73.26

Estates Reservoir Replacement - Fire Flow Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 7	10	6	140	355.56	4.03	9.53
Pipe 2	88	4	140	149.82	3.82	13.85
Pipe 13	100	8	140	777.00	4.96	9.98
Pipe 6	10	6	140	355.56	4.03	9.53
Pipe 0	88	6	140	223.71	2.54	4.04
Pipe 1	10	6	140	223.71	2.54	4.04
Pipe FH1	10	6	140	0.00	0.00	0.00
Pipe FH2	10	6	140	0.00	0.00	0.00
Pipe FH3	10	6	140	0.00	0.00	0.00
Pipe 39	2	4	140	160.32	4.09	15.71
Pipe 38	500	4	140	-47.81	1.22	1.67
Pipe 42	1300	4	140	-53.81	1.37	2.08
Pipe 40	500	8	140	-376.69	2.40	2.61
Pipe 28	100	6	140	-63.02	0.72	0.39
Pipe 41	1000	8	100	-382.69	2.44	5.01
Pipe FH4	5	6	140	500.00	5.67	17.91
Pipe FH5	10	6	140	0.00	0.00	0.00
Pump Pump1	#N/A	#N/A	#N/A	358.12	0.00	-80.64
Pump Pump2	#N/A	#N/A	#N/A	356.11	0.00	-81.33
Pump Pump3	#N/A	#N/A	#N/A	355.56	0.00	-81.52
Pump FirePump	#N/A	#N/A	#N/A	0.00	0.00	0.00
Pump WPump1	#N/A	#N/A	#N/A	149.82	0.00	-114.52
Pump WPump2	#N/A	#N/A	#N/A	223.71	0.00	-113.70

Estates Reservoir Replacement - Static Pressure Scenario



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Estates Reservoir Replacement - Static Pressure Scenario

Network Table - Nodes

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 18	130	0.00	278.60	64.39
Junc 14	130	0.00	278.60	64.39
Junc 23	110	0.00	278.60	73.05
Junc 24	120	0.00	278.60	68.72
Junc 31	120	0.00	278.60	68.72
Junc 33	120	0.00	278.60	68.72
Junc 38	110	0.00	278.60	73.05
Junc 40	90	0.00	278.60	81.72
Junc 43	95	0.00	278.60	79.55
Junc 29	120	0.00	278.60	68.72
Junc 28	120	0.00	278.60	68.72
Junc 30	125	0.00	278.60	66.55
Junc 50	95	0.00	278.60	79.55
Junc 58	95	0.00	278.60	79.55
Junc 61	90	0.00	278.60	81.72
Junc 53	100	0.00	278.60	77.39
Junc 51	95	0.00	278.60	79.55
Junc 15	130	0.00	278.60	64.39
Junc 16	130	0.00	278.60	64.39
Junc 17	130	0.00	278.60	64.39
Junc 13	140	0.00	278.60	60.06
Junc 19	130	0.00	278.60	64.39
Junc 20	120	0.00	278.60	68.72
Junc 22	120	0.00	278.60	68.72
Junc 21	120	0.00	278.60	68.72

Estates Reservoir Replacement - Static Pressure Scenario

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 25	120	0.00	278.60	68.72
Junc 26	120	0.00	278.60	68.72
Junc 32	120	0.00	278.60	68.72
Junc 34	120	0.00	278.60	68.72
Junc 35	120	0.00	278.60	68.72
Junc 41	90	0.00	278.60	81.72
Junc 44	100	0.00	278.60	77.39
Junc 42	100	0.00	278.60	77.39
Junc 62	90	0.00	278.60	81.72
Junc 45	100	0.00	278.60	77.39
Junc 46	95	0.00	278.60	79.55
Junc 47	95	0.00	278.60	79.55
Junc 48	90	0.00	278.60	81.72
Junc 49	90	0.00	278.60	81.72
Junc 54	100	0.00	278.60	77.39
Junc 55	100	0.00	278.60	77.39
Junc 52	95	0.00	278.60	79.55
Junc 56	100	0.00	278.60	77.39
Junc 57	100	0.00	278.60	77.39
Junc 59	95	0.00	278.60	79.55
Junc 60	95	0.00	278.60	79.55
Junc 12	140	0.00	278.60	60.06
Junc 11	140	0.00	278.60	60.06
Junc 9	140	0.00	278.60	60.06
Junc 7	140	0.00	278.60	60.06
Junc 5	140	0.00	278.60	60.06

Estates Reservoir Replacement - Static Pressure Scenario

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 4	140	0.00	174.00	14.73
Junc 6	140	0.00	174.00	14.73
Junc 8	140	0.00	174.00	14.73
Junc 10	140	0.00	226.30	37.39
Junc 2	52	0.00	174.92	53.26
Junc 1	52	0.00	174.32	53.00
Junc 3	140	0.00	174.03	14.75
Junc FH1	120	0.00	278.60	68.72
Junc FH2	120	0.00	278.60	68.72
Junc FH3	120	0.00	278.60	68.72
Junc 36	110	0.00	278.60	73.05
Junc 37	115	0.00	278.60	70.89
Junc 39	115	0.00	278.60	70.89
Junc 27	120	0.00	278.60	68.72
Junc FH4	100	0.00	278.60	77.39
Junc FH5	95	0.00	278.60	79.55
Resvr Well_1	52	-128.76	52.00	0.00
Resvr Well2	52	-197.90	52.00	0.00
Tank Tank_1	140	326.66	174.00	14.73
Tank HPT1	140	0.00	278.60	60.06
Tank HPT2	140	0.00	278.60	60.06

Estates Reservoir Replacement - Static Pressure Scenario

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 18	300	6	140	0.00	0.00	0.00
Pipe 24	600	6	140	0.03	0.00	0.00
Pipe 32	800	6	140	0.05	0.00	0.00
Pipe 34	600	6	140	0.05	0.00	0.00
Pipe 37	900	4	140	0.05	0.00	0.00
Pipe 30	1000	6	140	-0.03	0.00	0.00
Pipe 31	2100	6	140	-0.03	0.00	0.00
Pipe 53	900	6	140	0.00	0.00	0.00
Pipe 62	800	4	140	0.00	0.00	0.00
Pipe 56	700	4	140	0.00	0.00	0.00
Pipe 54	1300	4	140	0.00	0.00	0.00
Pipe 29	2300	4	140	0.02	0.00	0.00
Pipe 46	1100	6	140	-0.01	0.00	0.00
Pipe 15	400	4	140	0.00	0.00	0.00
Pipe 16	100	4	140	0.00	0.00	0.00
Pipe 17	300	4	140	0.00	0.00	0.00
Pipe 14	300	8	140	0.00	0.00	0.00
Pipe 20	500	6	140	0.00	0.00	0.00
Pipe 21	500	4	140	0.00	0.00	0.00
Pipe 22	500	4	140	0.00	0.00	0.00
Pipe 23	500	6	140	0.00	0.00	0.00
Pipe 25	600	6	140	-0.02	0.00	0.00
Pipe 27	600	6	140	-0.02	0.00	0.00
Pipe 26	1000	4	140	0.00	0.00	0.00
Pipe 35	1000	4	140	0.00	0.00	0.00

Estates Reservoir Replacement - Static Pressure Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 33	1000	4	140	0.00	0.00	0.00
Pipe 36	1000	4	140	0.00	0.00	0.00
Pipe 43	100	4	140	0.01	0.00	0.00
Pipe 45	2400	4	140	0.01	0.00	0.00
Pipe 66	100	4	140	0.00	0.00	0.00
Pipe 44	1500	4	140	0.00	0.00	0.00
Pipe 47	500	8	140	0.00	0.00	0.00
Pipe 48	500	8	140	0.00	0.00	0.00
Pipe 49	500	8	140	0.00	0.00	0.00
Pipe 50	600	8	140	0.00	0.00	0.00
Pipe 51	300	6	140	0.00	0.00	0.00
Pipe 52	400	8	140	0.00	0.00	0.00
Pipe 19	500	4	140	0.00	0.00	0.00
Pipe 55	1000	4	140	0.00	0.00	0.00
Pipe 57	50	4	140	0.00	0.00	0.00
Pipe 58	700	4	140	0.00	0.00	0.00
Pipe 61	1400	4	140	0.00	0.00	0.00
Pipe 59	200	4	140	0.00	0.00	0.00
Pipe 60	500	4	140	0.00	0.00	0.00
Pipe 63	800	4	140	0.00	0.00	0.00
Pipe 65	1700	4	140	0.00	0.00	0.00
Pipe 64	100	2	140	0.00	0.00	0.00
Pipe 11	10	4	140	0.00	0.00	0.00
Pipe 12	10	4	140	0.00	0.00	0.00
Pipe 10	10	6	140	0.00	0.00	0.00
Pipe 5	10	6	140	0.00	0.00	0.00

Estates Reservoir Replacement - Static Pressure Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 9	10	6	140	0.00	0.00	0.00
Pipe 4	10	6	140	0.00	0.00	0.00
Pipe 8	10	6	140	0.00	0.00	0.00
Pipe 3	10	6	140	0.00	0.00	0.00
Pipe 7	10	6	140	0.00	0.00	0.00
Pipe 2	88	4	140	128.76	3.29	10.46
Pipe 13	100	6	140	0.00	0.00	0.00
Pipe 6	10	6	140	0.00	0.00	0.00
Pipe 0	88	6	140	197.90	2.25	3.22
Pipe 1	10	6	140	197.90	2.25	3.22
Pipe FH1	10	6	140	0.00	0.00	0.00
Pipe FH2	10	6	140	0.00	0.00	0.00
Pipe FH3	10	6	140	0.00	0.00	0.00
Pipe 39	2	4	140	0.03	0.00	0.00
Pipe 38	500	4	140	0.01	0.00	0.00
Pipe 42	1300	4	140	0.01	0.00	0.00
Pipe 40	500	8	140	0.04	0.00	0.00
Pipe 28	100	6	140	0.02	0.00	0.00
Pipe 41	1000	8	100	0.04	0.00	0.00
Pipe FH4	5	6	140	0.00	0.00	0.00
Pipe FH5	10	6	140	0.00	0.00	0.00
Pump Pump1	#N/A	#N/A	#N/A	0.00	0.00	0.00
Pump Pump2	#N/A	#N/A	#N/A	0.00	0.00	0.00
Pump Pump3	#N/A	#N/A	#N/A	0.00	0.00	0.00
Pump FirePump	#N/A	#N/A	#N/A	0.00	0.00	0.00
Pump WPump1	#N/A	#N/A	#N/A	128.76	0.00	-122.92

Estates Reservoir Replacement - Static Pressure Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pump WPump2	#N/A	#N/A	#N/A	197.90	0.00	-122.32

APPENDIX E: EQUIPMENT SPECIFICATIONS

GRUNDFOS

Company name:
Created by:
Phone:

Date: 29/07/2022

Qty.	Description
1	**NBSE 020-110/9.92**

Note! Product picture may differ from actual product

Product No.: 92613424

The pumps are non-self-priming, single-stage, centrifugal volute pumps with axial inlet port, radial outlet port and horizontal shaft.
The pump has a back pull-out design enabling removal of the motor, motor stool, cover and impeller without disturbing the pump housing or pipework.
All pumps are according to ISO 5199 standards, adjusted for American dimensions on pump and its flanges.

Inlet and outlet flanges are according to ASME 16.1/16.42. Dimensions and rated performance are according to 175/363 PSI (12/25 bar).

The mechanical shaft seal has dimensions according to EN 12756.

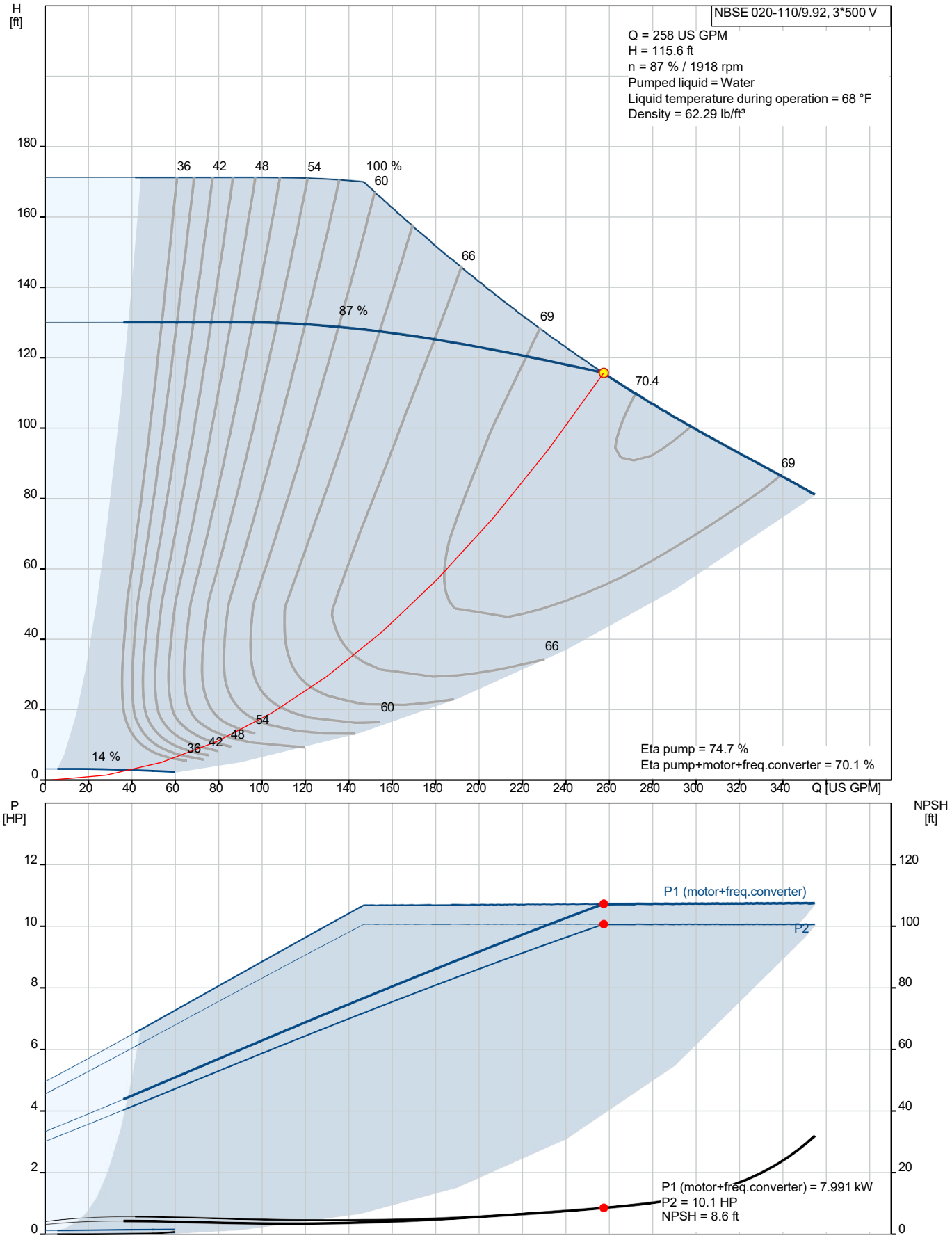
Motors are with main dimensions to NEMA standards. The pumps can be equipped with an MLE motor with integrated frequency converter or connected to a Grundfos CUE external frequency converter.

GRUNDFOS

Company name:
Created by:
Phone:

Date: 29/07/2022

92613424 NBSE 020-110/9.92 AASG6S2ESBQQEMCA 60 Hz

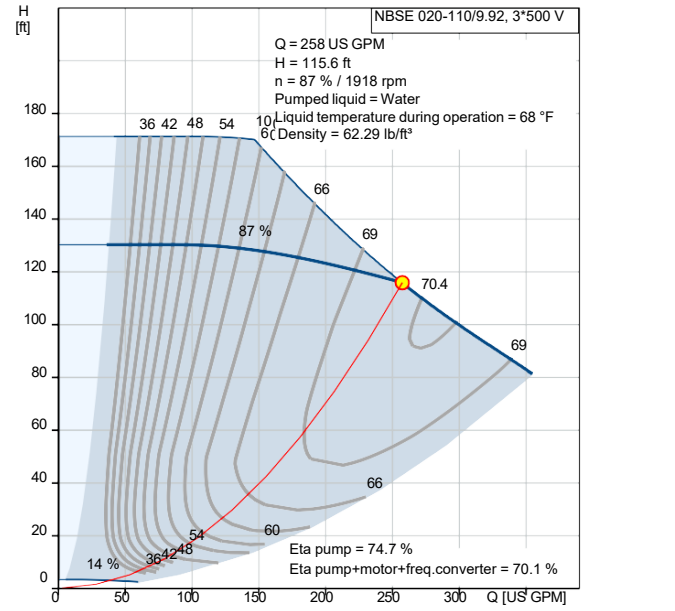


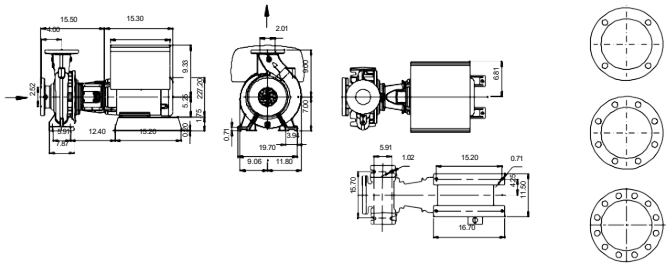
GRUNDFOS

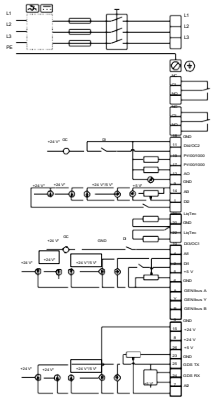
Company name:
Created by:
Phone:

Date: 29/07/2022

Description	Value
General information:	
Product name:	NBSE 020-110/9.92 AASG6S2ESBQQEMCA
Product No:	92613424
EAN number:	5715117077009
Price:	
Technical:	
Pump speed on which pump data are based:	2200 rpm
Actual calculated flow:	258 US GPM
Resulting head of the pump:	115.6 ft
Actual impeller diameter:	9.92 in
Code for shaft seal:	BQQE
Curve tolerance:	2B HI 14.6:2016
Pump version:	A
Materials:	
Pump housing:	Cast iron
Pump housing:	EN-GJL-250
Pump housing:	ASTM A48-35
Impeller:	Stainless steel
Impeller:	EN 1.4308
Impeller:	AISI 304
Internal pump house coating:	No coating
Material code:	S2
Code for rubber:	E
Shaft:	Stainless steel
Shaft:	EN 1.4201/1.4034
Shaft:	AISI 420
Installation:	
t max amb:	122 °F
Maximum operating pressure:	174.05 psi
Type of connection:	ANSI
Size of inlet connection:	2.5 inch
Size of outlet connection:	2 inch
Pressure rating for connection:	Class 125
Mounting options design code:	B
Support block (Yes/No):	Y
Connect code:	G
Liquid:	
Pumped liquid:	Water
Liquid temperature range:	-13 .. 248 °F
Selected liquid temperature:	68 °F
Density:	62.29 lb/ft³
Electrical data:	
Motor standard:	NEMA
Motor type:	132H
IE efficiency class:	IE5
Rated power - P2:	10 HP
Mains frequency:	60 Hz
Rated voltage:	3 x 440-480 V
Rated current:	12.2-11.3 A
Cos phi - power factor:	0.91-0.90
Rated speed:	180-2200 rpm
Efficiency:	93.6%
Motor efficiency at full load:	93.6 %
Number of poles:	4
Enclosure class (IEC 34-5):	IP55
Insulation class (IEC 85):	F
Built-in motor protection:	ELEC
Motor No:	99198235
Mounting designation (IEC 34-7, Code I):	NEMA type C / foot
Bearing insulation type N-end:	STEEL BEARING
Controls:	
Control panel:	HMI300 - Advanced
Function Module:	FM300 - Advanced







GRUNDFOS

Company name:
Created by:
Phone:

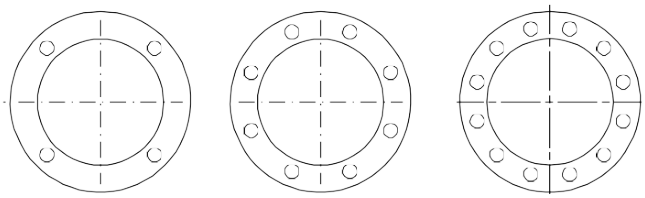
Date: 29/07/2022

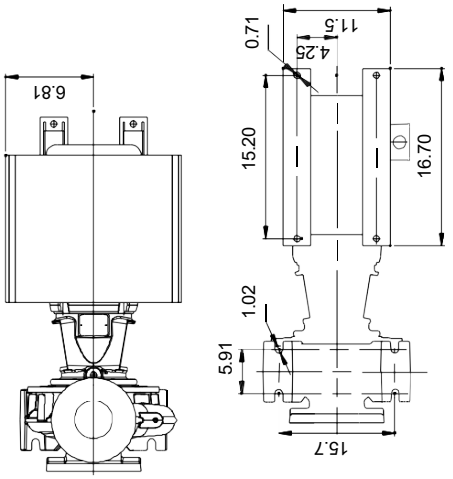
Description	Value
Others:	
DOE Pump Energy Index VL:	0.40
Net weight:	316 lb
Gross weight:	318 lb
Shipping volume:	9.43 ft³
Country of origin:	US

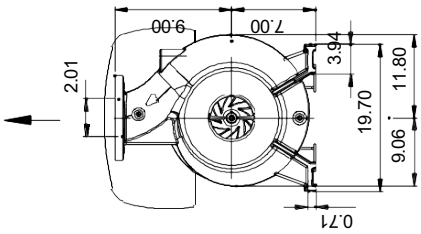
Company name:
Created by:
Phone:

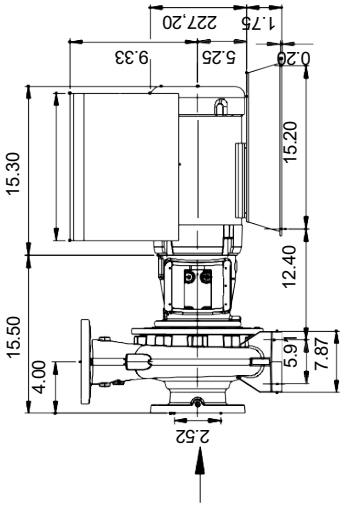
Date: 29/07/2022

92613424 NBSE 020-110/9.92 AASG6S2ESBQQEMCA 60 Hz









Note! All units are in [in] unless others are stated.
Disclaimer: This simplified dimensional drawing does not show all details.

Commercial Water Systems Tanks

Full Acceptance Bladder Models

- Larger sizes for high flow systems.
- Replaceable bladder; full acceptance design.
- Industry's thickest heavy duty butyl bladder.
- NSF/ANSI/CAN STD 61.

Bladder Only

ASME Full Acceptance Bladder Series Specifications

Model Number	Tank Volume (Gallons)	Max. Accept. Volume (Gallons)	A Diameter (Inches)	B Height (Inches)	System Conn.[1] NPTF (Inches)	Shipping Weight (lbs.) Max. Working Pressure				
						125 PSI	150 PSI	175 PSI	250 PSI	300 PSI
WX-447C	53	53	24	45	2	263	289	368	420	462
WX-448C	80	80	24	59	2	315	338	430	492	540
WX-449C	106	106	24	73	2	319	350	440	507	557
WX-450C	132	132	24	87	2	351	392	454	570	627
WX-451C	158	158	30	73	2	493	587	680	813	894
WX-452C	211	211	30	91	2	602	627	694	1,007	1,107
WX-453C	264	264	36	86	3	676	752	846	1,095	1,204
WX-454C	317	317	36	98	3	762	840	959	1,264	1,390
WX-455C	370	370	36	110	3	843	930	1,060	1,350	1,485
WX-456C	422	422	48	82	3	1,154	1,418	1,655	1,700	1,826
WX-457C	528	528	48	97	3	1,331	1,500	1,870	2,231	2,450
WX-458C	660	660	60	84	4	1,450	1,740	2,030	2,320	2,750
WX-459C	792	792	60	99	4	2,169	2,385	3,036	3,470	3,690
WX-460C	925	925	60	107	4	2,300	2,530	3,220	3,680	3,910
WX-461C	1,056	1,056	60	121	4	2,638	2,900	3,695	4,220	4,485
WX-462C	1,320	1,320	72	104	4	3,500	3,850	4,900	5,600	5,950
WX-463C	1,980	1,980	72	140	4	4,100	4,510	5,740	6,560	6,970

[1]*Malleable Iron System Connection.*
Maximum Operating Temperature: 240°F. Factory Pre-charge: 25 PSIG.

Partial Acceptance Bladder Models

- Replaceable bladder; partial acceptance design.
- Industry's thickest heavy duty butyl bladder.
- Available in compact sizes for limited space.

ASME Partial Acceptance Bladder Series Specifications

Model Number	Tank Volume (Gallons)	Max. Accept. Volume (Gallons)	A Diameter (Inches)	B Height (Inches)	System Conn.[1] NPTF (Inches)	Shipping Weight (lbs.) Max. Working Pressure
						125 PSI
WX-35CL	10	10	10	37	1¼	69
WX-50CL	13	11	12	37	1¼	76
WX-85CL	22	11	16	35	1¼	92
WX-100CL	26	11	16	39	1¼	98
WX-130CL	34	27	20	35	1½	136
WX-165CL	44	27	20	40	1½	146
WX-200CL	53	27	24	41	1½	198
WX-300CL	80	27	24	56	1½	236
WX-400CL	106	53	24	69	2	282
WX-500CL	132	53	24	83	2	316
WX-600CL	158	53	30	67	2	450

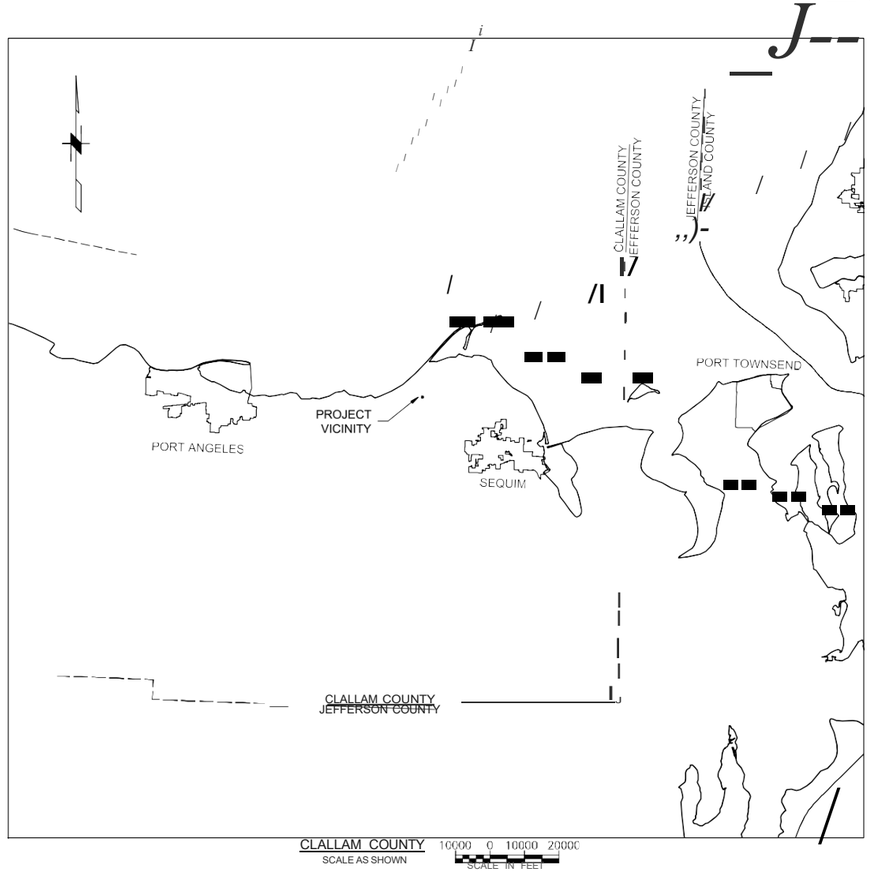
[1]*Malleable Iron System Connection.*
Maximum Operating Temperature: 240°F. Factory Pre-charge: 25 PSIG

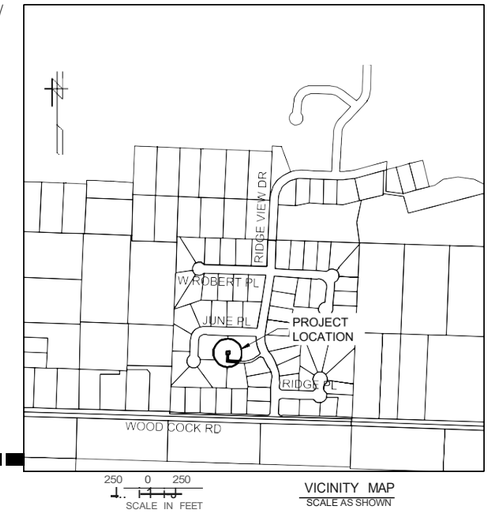
WORTHINGTON INDUSTRIES
1400 Division Road, West Warwick, RI 02893 USA
T: 800.426.8765 **www.amtrol.com**

Turbulator DeepDrawn
188 AntiLegionella LOW-LEAD

APPENDIX F: PROJECT PLANS

ESTATES
NEW RESERVOIR AND TREATMENT
SEQUIM, WA





SHEET LIST TABLE	
SHEET NO.	SHEET TITLE
C01	COVER SHEET
CO2	NOTES & ABBREVIATIONS
C03	EXISTING CONDITIONS
C04	SITE PLAN
C05	PUMPHOUSE PLAN
C06	ATEC DETAILS
CO?	ATEC DETAILS
COB	TREATMENT DETAILS
C09	RESERVOIR DETAILS
C10	DETAILS
C11	DETAILS

CONTACT INFORMATION:

APPLICANT:
CULLEY LEHMAN
CASCADIA WATER, LLC.
PO BOX 549
FREELAND, WA 98249

PH: 360.331.7388
CIVIL ENGINEER:
ROBERT L BENNION, PE
DAVIDO CONSULTING GROUP, INC.
P.O. BOX 1132
FREELAND, WA 98249
PH: 360.331.4131

SURVEYOR:
JAMES WENGLER, PLS, CFeds
WENGLER SURVEYING & MAPPING
703 E EIGHTH STREET
PORT ANGELES, WA 98362
PH: 360.457.9600

PARCEL INFORMATION:

PARCELS:
CLALLAM COUNTY PARCEL NO. 043004510880

SURVEY INFORMATION:

1.) THIS SURVEY IS BASED UPON THE WASHINGTON COORDINATE SYSTEM GRID, NORTH ZONE, NORTH AMERICAN DATUM OF 1983, 1991 ADJUSTMENT (NAD83/91), SAID DATUM WAS DERIVED FROM TIES TO THE MONUMENTS OCCUPYING THE QUARTER CORNER OF SECTIONS 4 AND 9 AND THE CORNER OF SECTIONS 3, 4, 9 AND 10 AS SHOWN ON BOOK 31 OF SURVEYS, PAGE 89, AUDITOR'S FILE NUMBER 715131 AND BOOK 38 OF SURVEYS, PAGE 85, AUDITOR'S FILE NUMBERS 1998-1003375 AND 1998-1003376, RECORDS OF CLALLAM COUNTY, WASHINGTON.
ALL DISTANCES SHOWN HEREON HAVE BEEN REDUCED BY AN AVERAGE COMBINED SCALE AND ELEVATION THE AVERAGE SCALE FACTOR IS 0.99994225. THE AVERAGE ELEVATION FACTOR IS .99999710. THE AVERAGE COMBINED FACTOR IS 0.99993935. TO OBTAIN GROUND DISTANCES MULTIPLY SAID DISTANCES BY 1.00006065.

THE CONVERGENCE ANGLE AT THE MONUMENT OCCUPYING THE CORNER OF SECTIONS 3, 4, 9, AND 10 IS -1°45'14.23"

2.) THE VERTICAL DATUM USED FOR THIS SURVEY IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AS DERIVED FROM TRIGONOMETRIC TIES TO THE MONUMENTS OCCUPYING THE QUARTER CORNER OF SECTIONS 4 AND 9 AND THE CORNER OF SECTIONS 3, 4, 9 AND 10 AS SHOWN ON BOOK 31 OF SURVEYS, PAGE 89, AUDITOR'S FILE NUMBER 715131 AND BOOK 38 OF SURVEYS, PAGE 85, AUDITOR'S FILE NUMBERS 1998-1003375 AND 1998-1003376, RECORDS OF CLALLAM COUNTY, WASHINGTON.

THE TOPOGRAPHIC ELEMENTS SHOWN HEREON WERE DETERMINED FROM DIRECT FIELD TRIGONOMETRIC MEASUREMENTS PERFORMED ON 4-27-2022. THE ACCURACY OF THE CONTOURS ARE 0.5 FEET VERTICALLY. SPOT ELEVATIONS ARE ACCURATE TO 0.1 FEET.

THE PURPOSE OF THE TOPOGRAPHIC PORTION OF THIS SURVEY IS TO PRODUCE A TOPOGRAPHIC MAP OF THE SUBJECT PROPERTY FOR CIVIL ENGINEERING DESIGN.

LEED AP

DCG civil structural

CALL 811
2 BUSINESS DAYS
BEFORE YOU DIG

BASE MAP TOPOGRAPHY PROVIDED BY OTHERS. DCG CANNOT BE HELD LIABLE FOR ACCURACY. CONTRACTOR SHALL FIELD VERIFY GRADES, UTILITIES, & ALL OTHER EXISTING FEATURES & CONDITIONS. IF CONDITIONS ARE NOT AS SHOWN & DESIGN PLANS CANNOT BE CONSTRUCTED AS SHOWN, CONTACT DCG PRIOR TO CONSTRUCTION

PROJ. MANAGER
DESIGNED BY JS/RLB
DRAWN BY JS
CHECKED BY
SCALE AS SHOWN
REV
SHEET NUMBER
C01

WATER NOTES:

1. WATER MAINS, VALVES, FITTINGS, HYDRANTS, SERVICES, AND ALL OTHER COMPONENTS SHALL BE INSTALLED AND PRESSURE TESTED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE AND MUNICIPAL CONSTRUCTION, WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, SECTION 7-09.
2. THE CONTRACTOR SHALL PROVIDE CASCADIA WATER, LLC AND THEIR OPERATOR, CULLEY LEHMAN (360.331.7388), A MINIMUM OF 72 HOURS NOTICE OF ANY PLANNED CONNECTION TO AN EXISTING PIPELINE. THIS INCLUDES LIVE TAPS. NOTICE IS REQUIRED SO ANY DISRUPTIONS TO EXISTING SERVICES CAN BE SCHEDULED. THE CONTRACTOR SHALL NOTIFY CUSTOMERS INVOLVED OR AFFECTED OF THE WATER SERVICE INTERRUPTION 24 HOURS IN ADVANCE OF THE INTERRUPTION. THE CONTRACTOR SHALL MAKE EVERY EFFORT TO SCHEDULE WATER MAIN CONSTRUCTION WITH A MINIMUM INTERRUPTION OF WATER SERVICE.
3. IN CERTAIN SITUATIONS, THE WATER COMPANY MAY DICTATE SCHEDULING OF WATER MAIN SHUTDOWNS SO AS NOT TO IMPOSE UNNECESSARY SHUTDOWNS DURING SPECIFIC PERIODS TO EXISTING CUSTOMERS.
4. ALL WATER MAINS SHALL BE PVC SCH 80 (2" OR LESS), PVC C900, OR DI CLASS 52 PIPE AS SPECIFIED ON THE PLANS. HIGH DENSITY POLYETHYLENE (HOPE) PIPE SDR 9 MAY BE USED IN PLACE OF PVC SPECIFIED ON PLANS. HOPE PIPE SHALL BE BLACK PE 4710, MADE OF NEW RESINS, AND MEETING THE REQUIREMENTS OF ASTM D3350 CELL CLASSIFICATION OF PE445574C/E, TYPE II, GRADE PE47, AS WELL AS: ASTM F714, AWWA C901, AND AWWA C906. PROVISIONS FOR PIPE EXPANSION MUST BE ACCOUNTED FOR WHEN INSTALLING HOPE PIPING.
5. WATER MAIN FITTINGS SHALL DUCTILE IRON. DUCTILE IRON FITTINGS SHALL MEET THE REQUIREMENTS OF AWWA C153 AND JOINTS SHALL MEET THE REQUIREMENTS OF AWWA C111. DUCTILE IRON FITTINGS SHALL BE CEMENT MORTAR LINED, MEETING THE REQUIREMENTS OF AWWA C104. GASKETS FOR FLAT FACED OR RAISED FACED FLANGES SHALL BE 1/8-INCH THICK NEOPRENE HAVING A DUROMETER OF 60 PLUS OR MINUS 5 OR 1/16-CLOTH INSERTED. DUCTILE IRON PIPE SHALL BE INSTALLED WITH POLYETHYLENE SHEATHING FOR CORROSION PROTECTION. THE TYPE, MATERIAL, AND IDENTIFICATION MARK FOR BOLTS AND NUTS SHALL BE PROVIDED. BOLTS, NUTS, AND WASHERS USED FOR SECURING FITTINGS SHALL BE OF SIMILAR MATERIALS. STEEL BOLTS SHALL MEET THE REQUIREMENTS OF ASTM A307 OR ASTM F568 FOR CARBON STEEL OR ASTM F593 OR ASTM F738 FOR STAINLESS STEEL. NUTS SHALL MEET THE REQUIREMENTS OF ASTM A563 OR ASTM A563 FOR CARBON STEEL OR ASTM F594 OR ASTM F836 FOR STAINLESS STEEL. IRON BOLTS AND NUTS SHALL MEET THE REQUIREMENTS OF ASTM A536, GRADE 65-45-12.
6. ALL NON-METALLIC PIPE AND SERVICES SHALL BE INSTALLED WITH CONTINUOUS TRACER TAPE INSTALLED 12 TO 18 INCHES UNDER THE FINAL GROUND SURFACE. NO BREAKS OR SPLICES WILL BE ALLOWED. A CONTINUOUS LOOP SHALL BE PLACED FROM THE MAIN LINE TO THE METER BOX AND BACK TO THE MAIN LINE. THE MARKER SHALL BE PLASTIC NON-BIODEGRADABLE, METAL CORE OR BACKING WHICH CAN BE DETECTED BY A STANDARD METAL DETECTOR. TAPE SHALL BE TERRA TAPE "D" OR APPROVED EQUAL. IN ADDITION TO TRACER TAPE, INSTALL 14 GAUGE COATED COPPER WIRE, TAPED TO THE TOP OF PIPE, BROUGHT UP AND TIED OFF AT VALVE BODY.
7. THE MINIMUM COVER FOR ALL WATER MAINS FROM TOP OF PIPE TO FINISH GRADE SHALL BE 36 INCHES UNLESS OTHERWISE APPROVED BY THE ENGINEER.
8. ALL VALVES AND FITTINGS SHALL BE DUCTILE IRON WITH ANSI FLANGES OR MECHANICAL JOINT ENDS. ALL EXISTING VALVES SHALL BE OPERATED BY WATER COMPANY PERSONNEL. VALVE BOXES SHALL BE INSTALLED ON ALL BURIED VALVES. THE BOX SHALL BE OF CAST IRON, TWO-PIECE SLIP TYPE, 5-1/4 INCH SHAFT, WITH A BASE CORRESPONDING TO THE SIZE OF THE VALVE. THE COVER SHALL HAVE THE WORD "WATER" CAST IN IT. THE VALVE BOX SHALL BE TYLER UNION 6855 SERIES OR EQUAL APPROVED BY THE WATER COMPANY. THE COVER SHALL BE A TYLER UNION STANDARD DROP LID 145325 OR EQUAL APPROVED BY THE WATER COMPANY.
9. GATE VALVES, 6 INCH TO 12 INCH. THE DESIGN, MATERIALS AND WORKMANSHIP OF ALL GATE VALVES SHALL CONFORM TO, OR EXCEED THE REQUIREMENTS OF AWWA C515 LATEST REVISION. GATES VALVES SHALL BE RESILIENT SEAT NON-RISING STEM (NRS) WITH TWO INTERNAL O-RING STEM SEALS. GATE VALVES SHALL BE MUELLER A-2361. GATE VALVES SHALL BE USED ON ALL 6 TO 12 INCH LINES.
10. VALVE BOX. ALL VALVES SHALL HAVE A STANDARD CAST IRON WATER VALVE BOX SET TO GRADE. IF VALVES ARE NOT SET IN PAVED AREA, A 3 FOOT BY 3 FOOT BY 4 INCH CONCRETE OR ASPHALT PAD SHALL BE SET AROUND EACH VALVE BOX AT FINISHED GRADE. IN AREAS WHERE VALVE BOX FALLS IN ROAD SHOULDER, THE DITCH AND SHOULDER SHALL BE GRADED BEFORE PLACING ASPHALT OR CONCRETE PAD.
11. VALVE MARKER POST. VALVE MARKER POSTS SHALL BE 4 INCH X 4 INCH REINFORCED CONCRETE OR SCHEDULE 40 STEEL POSTS 5 FEET LONG, WITH 2 FOOT MINIMUM BURY, STAMPED WITH "W" AND DISTANCE TO VALVE. POST SHALL BE PAINTED WITH 1 BASE COAT AND 2 COATS BLUE OIL BASE ENAMEL.
12. THE CONTRACTOR SHALL NOTIFY THE ENGINEER A MINIMUM OF 48 HOURS PRIOR TO PERFORMING A HYDROSTATIC PRESSURE TEST. THE PRESSURE TEST SHALL BE PERFORMED IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION 7-09.3(23).
13. THE SYSTEM IMPROVEMENTS SHALL BE DISINFECTED IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION 7-09.3(24) AND AWWA STANDARD C652. A SATISFACTORY BACTERIOLOGICAL TEST RESULT FOR A WATER SAMPLE COLLECTED FROM THE IMPROVEMENTS SHALL BE PROVIDED TO THE ENGINEER PRIOR TO RECONNECTING TO THE DISTRIBUTION SYSTEM.
14. ALL MATERIAL THAT COMES INTO CONTACT WITH DRINKING WATER SHALL BE IN ACCORDANCE WITH ANSI/NSF 61.

EROSION AND SEDIMENTATION CONTROL (ESC) NOTES:

1. THE CONTRACTOR SHALL MEET ISLAND COUNTY STANDARDS AND REQUIREMENTS BY USING APPROPRIATE BEST MANAGEMENT PRACTICES (BMPS) FOR EROSION AND SEDIMENTATION CONTROL.
2. EROSION ON- AND OFF-SITE. DURING AND AFTER CONSTRUCTION, THE CONTRACTOR SHALL MINIMIZE EROSION AND SEDIMENTATION ON-SITE AND SHALL PROTECT PROPERTIES AND WATER COURSES DOWNSTREAM FROM THE SITE FROM EROSION DUE TO INCREASES IN THE VELOCITY AND PEAK FLOW RATE OF STORM WATER RUNOFF FROM THE SITE.
3. TRANSPORT OF SEDIMENT. THE CONTRACTOR SHALL PREVENT THE TRANSPORT OF SEDIMENT FROM THE SITE THROUGH MEASURES SUCH AS MULCHING, MATTING, COVERING, SILT FENCES, SEDIMENT TRAPS, SETTLING PONDS AND PROTECTIVE BERMS USING THE FOLLOWING BMPS: FILTER FENCE, STRAW BALE BARRIER, BRUSH BARRIER, GRAVEL FILTER BERM, SEDIMENT TRAP, TEMPORARY SEDIMENT POND, PRESERVING NATURAL VEGETATION, AND/OR BUFFER ZONES. TRANSPORT OF SEDIMENT ONTO PAVED SURFACES SHALL BE MINIMIZED, AND IF SEDIMENT IS TRANSPORTED ONTO A PAVED SURFACE, THE PAVED SURFACE SHALL BE CLEANED AT THE END OF EACH DAY IN ACCORDANCE WITH BMPS IN THE DRAINAGE MANUAL, OR APPROVED BY THE DIRECTOR.
4. STABILIZING EXPOSED SOIL. THE CONTRACTOR SHALL PREVENT ON-SITE EROSION BY STABILIZING ALL SOILS THAT ARE TEMPORARILY EXPOSED AND NOT BEING ACTIVELY WORKED, THROUGH SUCH METHODS AS THE INSTALLATION OF SEEDING, MULCHING, MATTING AND COVERING. CONTRACTOR SHALL APPLY ONE OR MORE OF THE FOLLOWING TEMPORARY ESC BMPS: TEMP SEEDING, MULCHING AND MATTING, CLEAR PLASTIC COVERING, AND/OR DUST CONTROL.
5. DENUDED AREAS SHALL BE STABILIZED AND SOIL STOCKPILES AS ESTABLISHED IN THE DRAINAGE MANUAL.
6. STORM DRAIN INLETS SHALL BE PROTECTED USING BMP STORM DRAIN INLET PROTECTION. THE RECOMMENDED INLET PROTECTION ALTERNATIVES ARE TRIANGULAR SILT DIKES; BIOLOGS; EXERTS (FOSS ENVIRONMENTAL): DANDY BAGS; AND, STRAW WATTLES.
7. NO MORE THAN THREE HUNDRED (300) FEET OF TRENCH MAY REMAIN OPEN AT ONE TIME. EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES, UNLESS INCONSISTENT WITH SAFETY OR SITE CONSTRAINTS.
8. DISCHARGE FROM DEWATERING DEVICES. WATER FROM A DEWATERING DEVICE SHALL DISCHARGE INTO A SEDIMENT-RETENTION BMP.
9. MAINTENANCE AND REPAIR OF EROSION AND SEDIMENTATION CONTROL MEASURES. THE CONTRACTOR SHALL MAINTAIN AND REPAIR AS NECESSARY ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENTATION CONTROL BMPS TO ASSURE THEIR CONTINUED PERFORMANCE.
10. TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE MAINTAINED UNTIL FINAL SITE STABILIZATION.

GENERAL NOTES:

1. THE CONTRACTOR SHALL NOTIFY THE SYSTEM A MINIMUM OF 24 HOURS PRIOR TO STARTING ANY WORK.
2. THE CONTRACTOR SHALL NOTIFY THE UNDERGROUND UTILITY LOCATE CENTER AT 1-800-424-5555 AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
3. THE CONTRACTOR SHALL PROTECT IN PLACE, ALL UTILITIES, STRUCTURES AND FEATURES, WHETHER OR NOT SHOWN ON THESE PLANS. ANY DAMAGE TO EXISTING UTILITIES OR FEATURES SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
4. LOCATIONS OF EXISTING FEATURES AND UTILITIES AS SHOWN ON THESE DRAWINGS ARE APPROXIMATE AND BASED ON THE BEST AVAILABLE INFORMATION. ACTUAL LOCATIONS SHALL BE DETERMINED BY THE CONTRACTOR.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MEANS, METHODS AND SEQUENCE OF CONSTRUCTION.
6. ALL WORK SHALL CONFORM TO CURRENT APPROVED STANDARD PLANS AND WSDOT/APWA STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION.
7. THE CONTRACTOR SHALL BE REQUIRED TO KEEP ACCURATE AS-BUILT DRAWINGS AND DELIVER THIS INFORMATION TO THE OWNER FOR PREPARATION OF AS-BUILT DRAWINGS.
8. WATER MAINS SHALL BE PROPERLY DISINFECTED, FLUSHED, AND HAVE A SATISFACTORY BACTERIOLOGICAL TEST RESULT FROM A WATER SAMPLE COLLECTED FROM THE PIPE BEFORE ENTERING SERVICE.
9. UTILITY SERVICE INTERRUPTIONS SHALL NOT EXCEED TWO HOURS.
10. 24 HOUR NOTICE SHALL BE PROVIDED TO ALL PROPERTY OWNERS/OCCUPANTS OF ANY UTILITY SERVICE OR ACCESS INTERRUPTIONS.
11. ONE LANE TRAFFIC MUST BE MAINTAINED AT ALL TIMES ON COUNTY ROADS. ROAD CLOSURES WILL NOT BE ALLOWED UNLESS EXPRESSLY AUTHORIZED AND APPROVED BY ISLAND COUNTY.
12. PROPER SIGNAGE AND FLAGGERS ARE REQUIRED PER THE MUTCD. FLAGGERS SHALL HAVE CURRENT CARDS INDICATING THAT THEY ARE QUALIFIED TO PERFORM THE REQUIRED TRAFFIC CONTROL.
13. ACCESS TO PRIVATE PROPERTY SHALL BE RESTORED DAILY.
14. STREETS SHALL BE SWEPT DAILY OR AS NEEDED.

SURVEY LEGEND/ADDITIONAL NOTES:

HI	WATER METER	--W--	BURIED WATER LINE
	WATER VALVE	--UGP--	BURIED POWER
X	CARSON/TE GUARD POST		EDGE OF GRAVEL
□	4-INCH X 4-INCH WOOD GUARD POST		EDGE OF LANDSCAPE
*	ADDRESS SIGN		EAVE LINE
□	MAILBOX	XXX	FENCE
	PERSISTENT TREE		
0	DECIDUOUS TREE		
C	ROCK		
LP J	ELECTRIC METER		
●	SET: ON 4-28-2022, A 5/8-/NCH REBAR WITH A SURVEYOR'S PLASTIC IDENTIFICATION CAP STAMPED "WENGLER PLS 26304"		

ABBREVIATIONS:

0	DIAMETER (SYMBOL)
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APWA	AMERICAN PUBLIC WORKS ASSOCIATION
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWWA	AMERICAN WATER WORKS ASSOCIATION
CPEP	CORRUGATED POLYETHYLENE PIPE
CY	CUBIC YARD
DI	DUCTILE IRON
DIA	DIAMETER
DIST	DISTRIBUTION
DRN	DRAIN PIPE
EA	EACH
EX	EXISTING
FL	FLANGE
GAL	GALLON
GI	GALVANIZED IRON
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
IPT	IRON PIPE THREAD
L	LENGTH
LF	LINEAR FEET
MIN	MINIMUM
MJ	MECHANICAL JOINT
ml	MILLILITER
N/C	NORMALLY CLOSED
N/0	NORMALLY OPEN
NTS	NOTTO SCALE
PPM	PARTS PER MILLION
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
SF	SQARE FEET
SCH	SCHEDULE
SEC	SECTION
SQ	SQUARE
STD	STANDARD
STO	STORAGE
THK	THICKNESS
TYP	TYPICAL
W	WIDTH
WI	WITH
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

PROJECT LEGEND:

-w	EX WATERLINE
--W--	PROPOSED WATERLINE
	EX FENCE
--X--	PROPOSEDFENCE
-0	STRAW WATTLES
	PROPOSED DRAIN PIPE
H	EX GATE VALVE
H	PROPOSED GATE VALVE
y-C	PROPOSED MJ BEND W/ THRUST BLOCKING
r	PROPOSED FL BEND
	GRAVEL
	GRASS LINED CHANNEL

LEED AP

DCG civil structural

CALL 811
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(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

BASE MAP/TOPOGRAPHY PROVIDED BY OTHERS. DCG CANNOT BE HELD LIABLE FOR ACCURACY. CONTRACTOR SHALL FIELD VERIFY GRADES, UTILITIES, & ALL OTHER EX FEATURES & CONDITIONS. IF CONDITIONS ARE NOT AS SHOWN &/OR PLANS CANNOT BE CONSTRUCTED AS SHOWN, CONTACT DCG PRIOR TO CONSTRUCTION

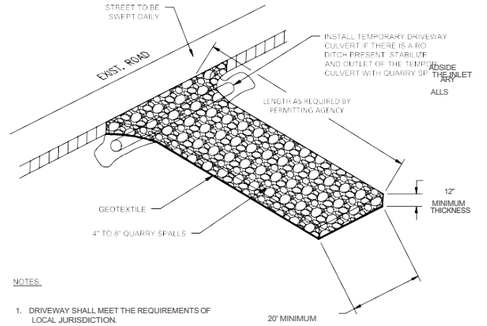
PROJ. MANAGER	RLB
DESIGNED BY	ISIRLB
DRAWN BY:	JS
CHECKED BY	RLB
SCALE	ASSHOWN
DATE:	

SHEET NUMBER
CO2

SCALE IN FEET

KEY NOTES:

KEY	NOTE:	DETAIL/ SHEET
CD	DEMOLISH EXISTING PADS AND WELL BUILDING	
0	CONSTRUCTION ENTRANCE	CE/C03
®	PROTECT EXISTING WELL BUILDINGS ANO PROPANE TANK. LOCATE EXISTING GAS LINES	
©	EROSION CONTROL DOWNHILL OF SITE (PER WA DOE BMP)	EC/C03
®	ELECTRICAL SUPPLY WIRES, PANELS AND GENERATOR TO BE RELOCATED	
©	PROPANE LINE	
0	RECENTLY INSTALLED PAD FOR GENERATOR, CAN BE RELOCATED IF NEEDED	
©	ELECTRICAL LINE	

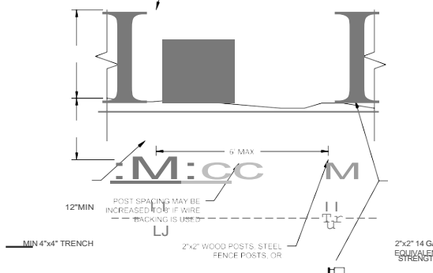


NOTES:

1. DRIVEWAY SHALL MEET THE REQUIREMENTS OF LOCAL JURISDICTION.
IT IS RECOMMENDED THAT THE ACCESS BE CROWNED SO THAT RUNOFF DRAINS OFF THE PAO
3. STABILIZED ACCESS SHALL BE USED IN ALL AREAS OF THE SITE WITH VEHICLE TRAFFIC AND PARKING INCLUDING BUILDING PADS, RECYCLED

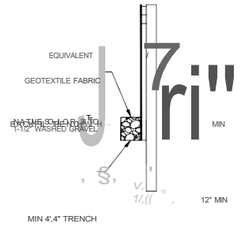
CONSTRUCTION ENTRANCE

NTS



NOTES:

1. SILT FENCES ARE TO BE INSTALLED DOWN-SLOPE OF THE PROPOSED TRENCHING.
2. SILT FENCE OR WATTLES SHALL REMAIN IN PLACE UNTIL SECTIONS OF PIPE ARE INSTALLED ANO TRAILS/DISTURBED AREAS ARE RESTORED
IF THERE IS FLOW IN A STREAM DURING CONSTRUCTION ACTIVITIES THE CONTRACTOR SHALL PROVIDE A TEMPORARY BYPASS UPSTREAM OF PIPE INSTALLATION TO CONVEY STREAM FLOW AROUND THE CONSTRUCTION AREA



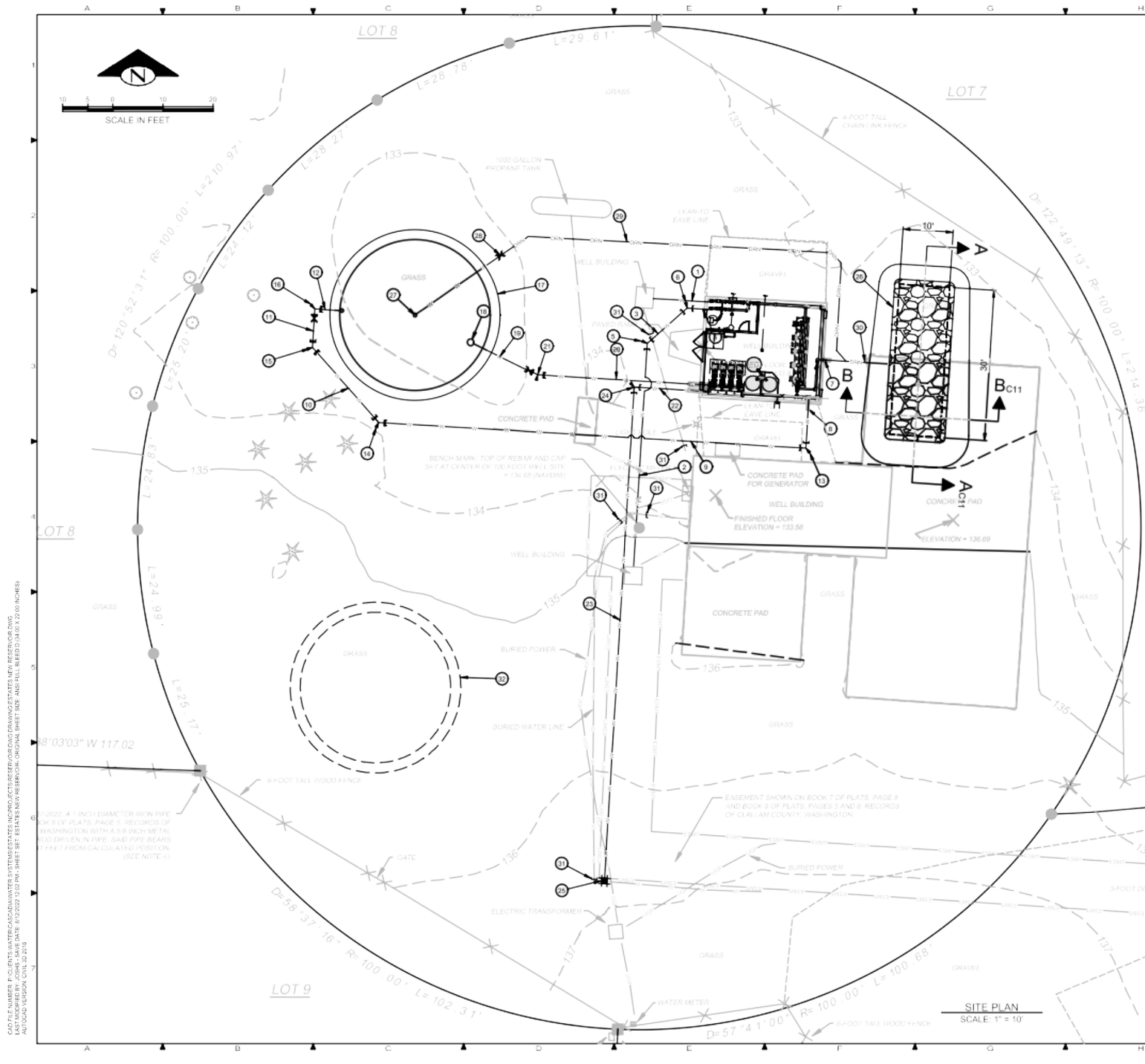
SILT FENCING
EROSION CONTROL DETAIL
NTS

EXISTIN_G CONDITIONS AND TESC
SCALE: 1"= 10'

CALL 811
2 BUSINESS DAYS
BEFORE YOU DIG

PROJ. MANAGER:	RDB
DESIGNED BY:	ISIRLB
DRAWN BY:	JS
CHECKED BY	
SCALE	ASSHOWN
DATE:	
REVI T	
OF	
-1L	

SHEET NUMBER
C03



KEY NOTES:

KEY	NOTE:	DETAIL/ SHEET
1	17 LF 4" PVC C900 WELL #1 FILL LINE	D/C11
2	44 LF 4" PVC C900 WELL #2 FILL LINE	D/C11
3	11 LF 4" PVC C900 WELL #2 FILL LINE	D/C11
4	5 LF 4" PVC C900 WELL #2 FILL LINE	D/C11
5	(1) 4" 45° BEND (MJ) CONC THRUST BLOCK	F/C11
6	(1) 4" 45° BEND (MJ) CONC THRUST BLOCK	F/C11
7	SEE PUMPHOUSE PLANS FOR LAYOUT	C05
8	10 LF 6" PVC C900 RESERVOIR FILL LINE	D/C11
9	85 LF 6" PVC C900 RESERVOIR FILL LINE	D/C11
10	20 LF 6" PVC C900 RESERVOIR FILL LINE	D/C11
11	8 LF 6" PVC C900 RESERVOIR FILL LINE	D/C11
12	5 LF 6" PVC C900 RESERVOIR FILL LINE CONNECT TO VERTICAL PIPING PER RESERVOIR DETAILS	D/C11
13	(1) 6" 90° BEND (MJ) CONC THRUST BLOCK	F/C11
14	(1) 6" 45° BEND (MJ) CONC THRUST BLOCK	F/C11
15	(1) 6" 45° BEND (MJ) CONC THRUST BLOCK	F/C11
16	(1) 6" 90° BEND (FLxMJ) (1) 6" GATE VALVE (FLxMJ) CONC THRUST BLOCKS	E&F/C11
17	PROPOSED 30-FT DIAMETER x 30-FT TALL 158,000 GAL LON CONCRETE RESERVOIR/STRUCTURAL PLANS AND PERMIT FROM RESERVOIR CONTRACTOR	C09
18	RESERVOIR OUTLET	
19	15 LF 8" PVC C900 RESERVOIR OUTLET LINE	D/C11
20	34 LF 8" PVC C900 RESERVOIR OUTLET LINE	D/C11
21	(1) 8" 22.5° BEND (FLxMJ) (1) 8" GATE VALVE (FLxMJ) CONC THRUST BLOCKS	E&F/C11
22	20 LF 8" PVC C900 PRESSURIZED DISTRIBUTION LINE	D/C11
23	99 LF 8" PVC C900 PRESSURIZED DISTRIBUTION LINE	D/C11
24	(1) 8" 90° BEND (MJ) CONC THRUST BLOCK	F/C11
25	CONNECT TO EXISTING 8" PRESSURIZED DISTRIBUTION LINE. FITTING, ADAPTERS, AND COUPLERS AS NEEDED	-
26	30'x10'x2' BACKWASH INFILTRATION AREA (BOTTOM AREA: 300 SF)	H/C11
27	4" RESERVOIR DRAIN LINE	-
28	4" ISOLATION VALVE FOR RESERVOIR DRAIN LINE (NORMALLY CLOSED)	E/C11
29	95 LF 4" PVC 3034 DRAIN LINE (CONNECT TO BACKWASH LINE)	-
30	15 LF 8" PVC 3034 BACKWASH LINE (DAYLIGHT IN BACKWASH INFILTRATION AREA)	-
31	CUP, CAP, AND ABANDON UNUSED LINE	-
32	POTENTIAL FUTURE RESERVOIR SITE	

No.	DATE	BY	REVISION

DCG civil structural
P.O. Box 1732
Poulsbo, WA 98370
P: 360.731.4131
360.731.5131
www.dcgwp.com

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2 BUSINESS DAYS
BEFORE YOU DIG

BASE MAP/TOPOGRAPHY PROVIDED BY OTHERS. DCG CANNOT BE HELD LIABLE FOR ACCURACY. CONTRACTOR SHALL FIELD VERIFY GRADES, UTILITIES, & ALL OTHER EX FEATURES & CONDITIONS. IF CONDITIONS ARE NOT AS SHOWN &/OR PLANS CANNOT BE CONSTRUCTED AS SHOWN, CONTACT DCG PRIOR TO CONSTRUCTION.

CASCADIA WATER, LLC
PO BOX 549
FREELAND, WA 98249

ESTATES NEW RESERVOIR AND TREATMENT
SEQUIM WA, 98382
SITE PLAN

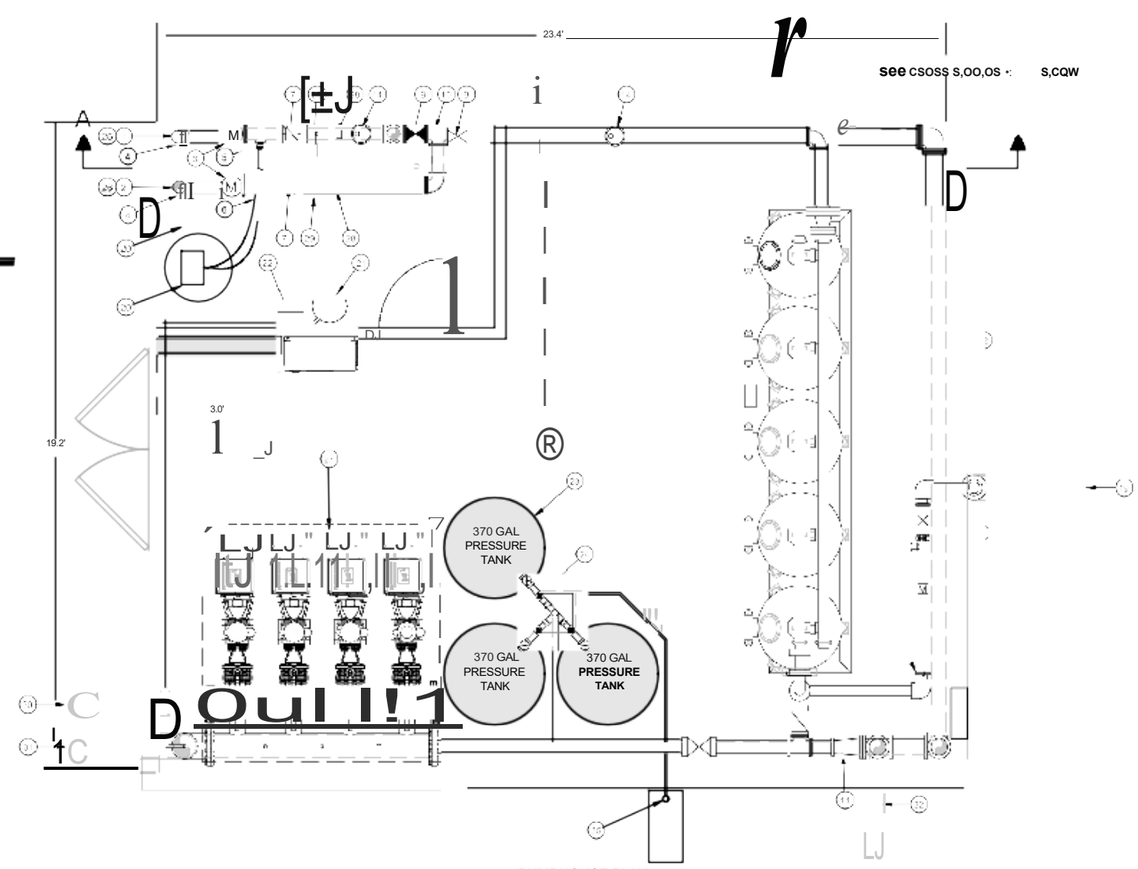
PROJ. MANAGER:	RJB
DESIGNED BY:	GHB
DRAWN BY:	JS
CHECKED BY:	RJB
SCALE:	AS SHOWN
DATE:	REV: -
SHEET NUMBER	C04

CAD FILE NUMBER: P:\CLIENTS\WATER\CASCADIA\WATER SYSTEMS\ESTATES INC\PROJECTS\RESERVOIR\DWG\DRAWING\ESTATES NEW RESERVOIR.DWG
LAST MODIFIED BY: JOSHS - SAVE DATE: 8/12/2022 12:02 PM - SHEET SET: ESTATES NEW RESERVOIR - ORIGINAL SHEET SIZE: ANSI FULL BLEED D (34.00 X 22.00 INCHES)
AUTOCAD VERSION: CIVIL 3D 2019

KEY NOTES:

KEY	NOTE:	DETAIL/ SHEET
0	4" LINE FROM WELL 1	
0	4" LINE FROM WELL 2	
Ⓡ	2" SOURCE METER	
Ⓒ	4" TEE WITH SAMPLE TAP AND PRESSURE GAUGE	
Ⓡ	WELL 1 SODIUM HYPOCHLORITE INJECTION POINT	
Ⓡ	WELL 2 SODIUM HYPOCHLORITE INJECTION POINT	
0	4" CHECK VALVE	
Ⓡ	4" ISOLATION GATE VALVE (NORMALLY OPEN)	
Ⓡ	4" ISOLATION GATE VALVE (NORMALLY CLOSED)	
@	WELL 2 TREATMENT BY-PASS LINE	
@	4"x6" REDUCER	
@	6" TREATMENT BY-PASS LINE	
@	PRESSURE SUSTAINING SOLENOID VALVE OR APPROVED EQUAL (N/O). VALVE TO BE ACTIVATED BY ATEC CONTROLLER DURING BACKWASH OPERATIONS. SET TO MAINTAIN UPSTREAM PRESSURE OF 30 PSI DURING BACKWASH	
@	INSTALL AIR RELEASE VALVE WITH SADDLE TAP, ISOLATION VALL VALVE, AND FITTINGS/ADAPTERS AS NECESSARY	
@	ATEC FILTRATION SYSTEM, SECURE WITH ANCHOR BOLTS INTO CONCRETE FLOOR	
@	INSTALL VALMATIC AIR RELEASE VALVE MODEL 15A.3 WITH LOW DUROMETER SEAT AT 2" COUPLING ON ATEC FILTER INLET LINE WITH ISOLATION BALL VALVE	
@	INSTALL 60" BACKWASH ASSEMBLY OVER 6" FILTER BYPASS LINE. BACKWASH ASSEMBLY CONTAINS FLOWMETER, THROTTLING VALVE, AND SIGHT GLASS	
@	BACKWASH AIR GAP	AIC10
@	6" PVC BACKWASH DRAIN LINE TO PROPOSED BACKWASH INFILTRATION AREA	
@	SODIUM HYPOCHLORITE CHEMICAL INJECTION PUMPS AND STORAGE TANK. PROVIDE SEPARATE, DEDICATED ELECTRICAL OUTLETS WITH CIRCUIT THAT IS ENERGIZED WHEN WELL PUMPS ARE ACTIVATED. FLOWSWITCH TO DEACTIVATE THESE CIRCUITS IN NO-FLOW CONDITION	CIC10
@	GUARDIAN G1814P EYEWASH OR APPROVED EQUAL MOUNT TO WALL	
@	EEMAX HA013240 INSTANT HOT WATER HEATER, OR APPROVED EQUAL. SET TO 80 F.	
@	370 GALLON PRESSURE TANK	
@	EQUIP EACH A COUPLER, ISOLATION BALL VALVE AND A 314" PRESSURE RELIEF VALVE. PRV MUST BE ASME SECTION VIII CERTIFIED. PLUMB TO EXTERIOR AS SHOWN.	
@	FINISH PVC PIPING WITH 90 TURNED DOWN. PLACE 24 MESH SCREEN OVER END. FINISH PIPING APPROX. 12" ABOVE SPLASH BLOCK.	
@	PIPING THROUGH FLOOR. GROUT AROUND PIPE AS NEEDED.	
@	INSTALL BOOSTER PUMP SLED AND SECURE TO THE FLOOR. BOOSTER PUMPS TO INCLUDE: (4) -10 HP GRUNDFOS NBSE 020-110/9.92 (8) 4" ISOLATION VALVES ON INLET AND DISHCHARGE OF EACH PUMP. (4) 4" CHECK VALVE ON DISCHARGE (1) 8" DI SUCTION MANIFOLD (1) 8" DI PRESSURE MANIFOLD (2) PRESSURE GAUGES (1) VALMATIC AIRNACUUM RELEASE VALVE MODEL 100S OR EQUIVALENT (4) PRESSURE CONTROL SWITCHES (ON/OFF) WI ALTERANTING LEAD/LAG PUMPS: 55165 PSI (LEAD) 50160 PSI (LAG 1) 45155 PSI (LAG 2) 40150 PSI (LAG 3) (1) VALMATIC AIR RELEASE VALVE MODEL 15A OR EQUIVALENT	
@	HYPOCHLORITE PUMP FLOWSWITCH. SEE KEYNOTE 20. ENSURE THAT DEDICATED OUTLET CONTROLLED BY THIS FLOW SWITCH IS CLEARLY LABELED	
@	POST TREATMENT SAMPLE TAP	
@	8" SUCTION LINE FROM RESERVOIR	
@	8" PRESURE LINE TO DISTRIBUTION	
@	6" RESERVOIR FILL LINE	

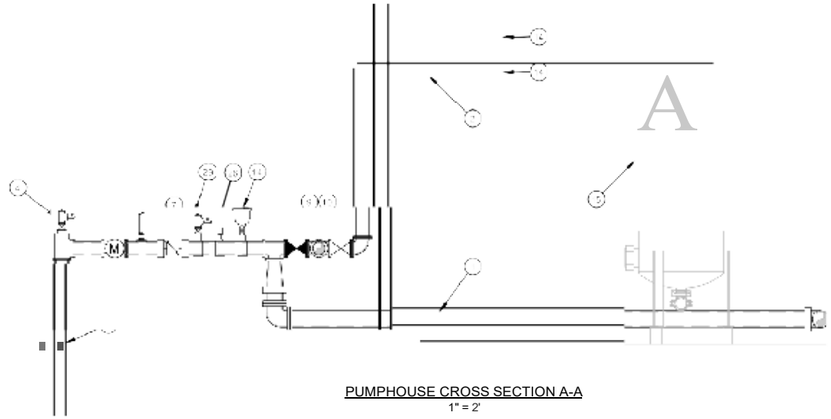
SCALE IN FEET



PUMPHOUSE PLAN
1" = 2'

PUMPHOUSE NOTES:

1. INSTALL AIR RELEASE VALVES AT PLUMBING HIGH POINTS.
2. PIPING INSIDE PUMPHOUSE TO BE 2" PVC SCH. 80 UNLESS OTHERWISE NOTED. PIPE SHALL BE SECURED AS NECESSARY. SEE DETAIL B/C10 FOR PIPE SUPPORT DETAIL
3. ALL COMPONENTS IN CONTACT WITH WATER SHALL BE NSF 61 CERTIFIED.
4. DASHED PIPING IS BELOW GRADE/FLOOR.
5. PROVIDE SHUTTER MOUNTED EXHAUST FAN MOUNTED HIGH ON ONE PUMPHOUSE WALL FOR EACH ROOM. PROVIDE LOW MOUNTED AIR INLETS ON EACH PUMPHOUSE WALL PROVIDE 24 HOUR TIMER FOR VENTILATION FAN.
6. INSTALL WALL MOUNTED HEATER(S) IN PUMPHOSUE SET TO 45° FAHRENHEIT

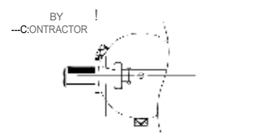


PUMPHOUSE CROSS SECTION A-A
1" = 2'

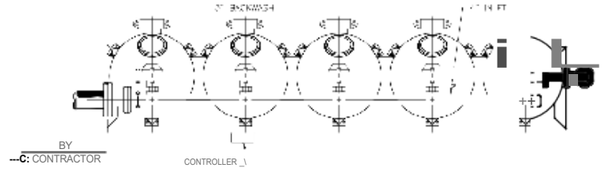
CALL 811
2 BUSINESS DAYS
BEFORE YOU DIG

PROJ. MANAGER: KLB
DESIGNED BY: IS/KLB
DRAWN BY: JS
CHECKED BY: KLB
SCALE: AS SHOWN
DATE:

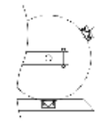
SHEET NUMBER
COS



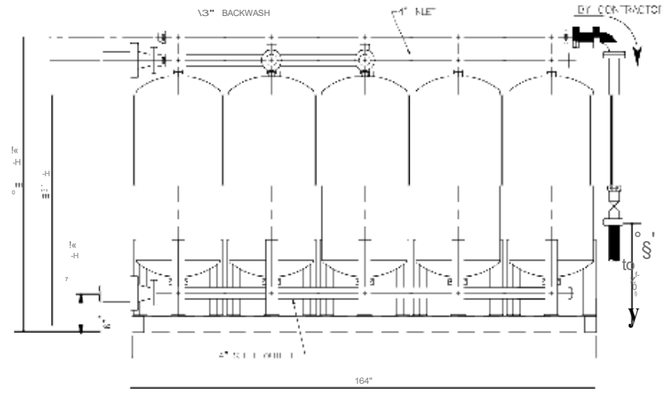
LEFT SIDE, FILTERS REMOVED

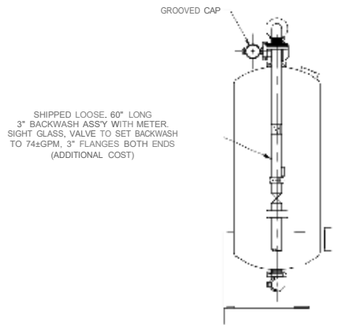


PLAN VIEW



RIGHT SIDE, FILTERS REMOVED





LEFT ELEVATION

FRONT ELEVATION

RIGHT ELEVATION

NOTE: A 60" LONG, 3-INCH BACKWASH FLANGED BACKWASH ASSEMBLY WITH REGULATING VALVE, METER AND SIGHT GLASS CAN BE SHIPPED LOOSE TO REGULATE BACKWASH TO 137 GPM, (EXTRA COST ITEM).

P.O. BOX 10329
BAINBRIDGE ISLAND, WASHINGTON 98110-0329
PHONE: (360) 414-9223

DRAWN BY:
APPROVED BY:
NO. DATE BY APVD

MOVE CHECK SCALE
SCALEABLE IN 22x34 - 1"... 1'-0"
SCALEABLE IN 11,17 - 1/2... 1'-0"

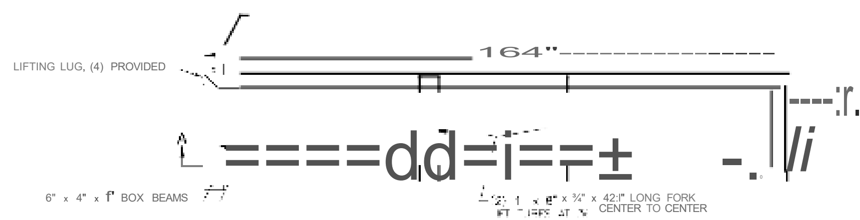
IRON AND MANGANESE TREATMENT
ESTATES WATER SYSTEM
NORTH AND SOUTH WELLS

FILTER DETAILS

SHEET NO. 1 of 1
DWG NO
DATE: 8/20/2021

CALL 811
2 BUSINESS DAYS
BEFORE YOU DIG

PROJ. MANAGER
DESIGNED BY: TS/RLB
DRAWN BY: JS
CHECKED BY: RLB
SCALE: AS SHOWN
DATE:
REV.1 T
OF
1 ...1L
SHEET NUMBER
C06



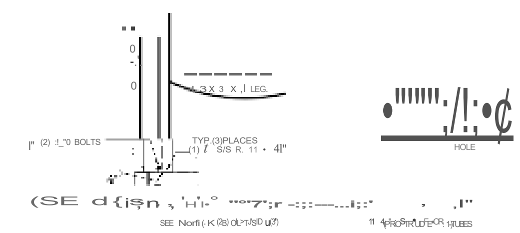
SKID PLAN

(5 FILTER)

SCALE IN FEET
NOTE CHECK SCALE
SCALEABLE IN 22,34 - 1" - 1'-0"
SCALEABLE IN 22,34 - 1· - 1•-0·

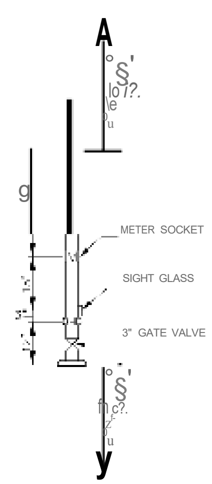
BILL OF MATERIAL			
ITEM	QTI'	PART NO.	
	1	PFS-CPL03	3· GROOVED COUPLING, CAST IRON W/ BOLTS & GASKET
	3	PFS-CPL04	,. GROOVED COUPLING. CAST IRON w/ BOLTS & GASKET
	1	PFS-CA.P08	e· GROOVED END CAP
	1	PFS-CPL08	8" GROOVED COUPLING. CAST IRON w/ BOLTS & NIflS
	1	PFS=HHP11	11·,1s· HAND HOLE PLATE
	1	PFS-HHG11	11·,15· HAND HOLE GASKET
	1	PFS-HHC,S11	11",1S" HAND HOLE BOLT SET
	1	PFS-HHCR11	11·,15· HAND HOLE HOLD DOWN CRAB
	1	UA S$48	3",3",3" SERIES 350 BERMAD BACKWASH VAi.VE
	1	V-8f4	UNDER-DRAIN ASSEMBLY 316L SS W/ SCH 80 PVC CAP COMPL£TE

NOTE, QUANTITIES FOR ONE (1) TANK

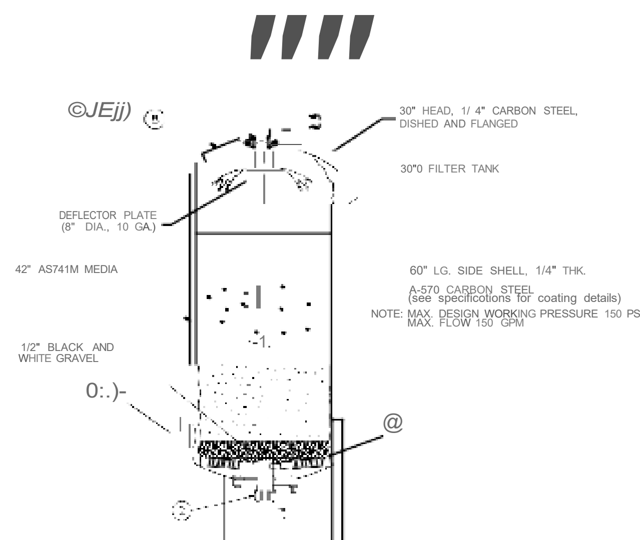


SECTION A-A
SCALE 1" = 1'-0"

SCAL£ IN FEIT
NOif CHECK SCALf
SCAI..EABL..E IN 22,34 - 1" - 1'-0"
SCAL..EABLE IN 11"17 - 1/2" - 1•-0•



BACKWASH ASSEMBLY
~~(SHIPPED LOOSE)~~
(ADDITIONAL COST)



TANK SECTION

NOTES: (1) DESIGNER SHALL DETERMINE NO. AND DEPTH OF ANCHOR BOLTS TO SUIT LOCAL CODE REQUIREMENTS. FOUR BOLTS ARE REQUIRED AS A MINIMUM AT EXTERIOR GUSSETS.

(2) ANCHOR BOLT HOLES ARE TO BE DRILLED INTO CONCRETE FOUNDATION THROUGH OVERSIZED DRILL HOLES IN GUSSETS IN SKID ASSEMBLY BY INSTALLATION CONTRACTOR.

(3) 1/4" THICK S/S PADS ARE PROVIDED UNDER SKIDS FOR CLEARANCE BETWEEN SKIDS AND CONCRETE FOUNDATION. SIX PADS ARE PROVIDED FOR 2 & 3 FILTER SKIDS. EIGHT PADS FOR 3-14 FILTER SKIDS

NOTE:
~~DIMENSIONS GIVEN ARE FOR THE CONTRACTOR'S INFORMATION BUT WILL VARY BECAUSE OF NORMAL FABRICATION TOLERANCES.~~
CONTRACTOR SHALL CONNECT EXTERIOR PIPING TO FIT THE ATEC UNIT AS SHIPPED.

~~FILTER TANKS AND MANIFOLDS ON THIS SHEET SUPPLIED BY ATEC SYSTEMS.~~

THE CONTRACTOR Will. BE RESPONSIBLE FOR:
1. UNLOI-OING THE UNITS I-ND PLACING THEM IN THE CORRECT INSTALL.ED LOCATION.
2. ATTACH MANIFOLDS CONNECTING THE TWO BANKS OF FILTERS.
3. LOADING THE TWO TYPE OF MEDIA INTO THE FILTER.
4. CONNECTING POWER SUPPLY TO FILTER BACKWASH PLC (120 VAC, SWITCHED CIRCUIT).

P.O. BOX I0329
BAINBRIDGE ISLAND, WASHINGTON 98110-0329
PHONE: (360) 414-9223

DRAWN BY:
11.PR'OBY:
NO. DATE BY APVO

NOJF· CHECK SCALf
SCAI...EABLE IN 22:w: - 1" .. 1·-0·
SCALEABLE IN 11:<17 - 1/2w .. 1•-0·

IRON AND MANGANESE TREATMENT
ESTATES WATER SYSTEM
NORTH ANO SOUTH WELLS

FILTER DETAILS

STIBETNO 2 of I
DWG."10
D,\TE: 8/20/2021

LEED AP

DCG civil structural

CALL 811
2 BUSINESS DAYS
BEFORE YOU DIG

PROJ. MANAGER
DESIGNED BY
DRAWN BY
CHECKED BY
SCALE
DATE:
SHEET NUMBER

CO?

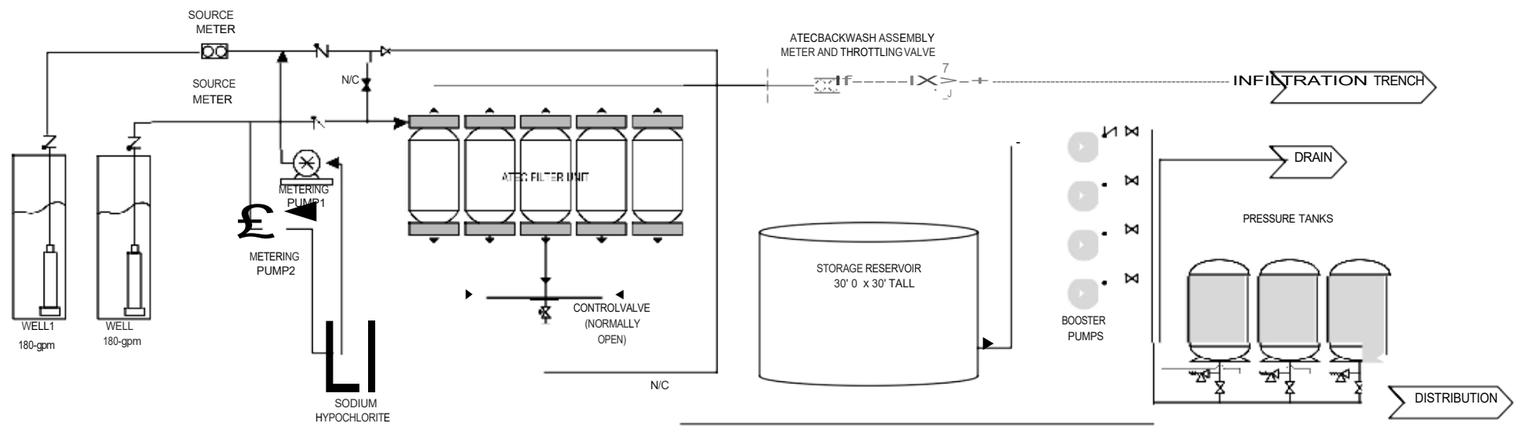
WELL #1 CHLORINATOR SYSTEM SPECIFICATIONS	
STOCK SOLUTION RAW STRENGTH	12.5%
RAW CHLORINE	1 GALLON
TOTAL FEED SOLUTION	5 GALLONS
FEED SOLUTION CONCENTRATION	25,000 PPM
REQUIRED FEED PUMP RATE	0.74 GPH
REQUIRED OUTPUT ADJUSTMENT	74%
METERING PUMP FLOW RANGE	0.05-1.0 GPH
RESERVOIR FILL FLOW RATE	180 GPM

WELL #2 CHLORINATOR SYSTEM SPECIFICATIONS	
STOCK SOLUTION RAW STRENGTH	12.5%
RAW CHLORINE	1 GALLON
TOTAL FEED SOLUTION	5 GALLONS
FEED SOLUTION CONCENTRATION	25,000 PPM
REQUIRED FEED PUMP RATE	0.73GPH
REQUIRED OUTPUT ADJUSTMENT	73%
METERING PUMP FLOW RANGE	0.05-1.0 GPH
RESERVOIR FILL FLOW RATE	180GPM

CONTROLLER SETTINGS	
FLOW RATE AT INJECTION POINT	180 GPM
BACKWASH FREQUENCY	24 HOURS
BACKWASH RATE PER FILTER	74GPM
BACKWASH DURATION	5 MIN
TOTAL BACKWASH QUANTITY	1,850 GAL

EQUIPMENT LIST		
EQUIPMENT	TYPE	AMOUNT
AIR RELEASE VALVE	MAXAIR AIR AND VACUUM VALVES 6522	
PRESSURE GAUGES	0-100 PSI	
CONTROL VALVE	3" PRESSURE SUSTAINING VALVE BERMAD MODEL 730-55	
METERING PUMP	LMI P051-A30HI	
PRESSURE TANKS	370 GALLONS	
FLOW CONTROL SWITCH	4" HARWIL Q-10N/10691/NO	

'ALL ITEMS SHALL BE THE MODELS SHOWN ABOVE OR AN ENGINEER APPROVED EQUAL MEETING THE REQUIREMENTS OF THE PROJECT SPECIFICATIONS.



TREATMENT SYSTEM SCHEMATIC
NOTTO SCALE

CALL 811
2 BUSINESS DAYS
BEFORE YOU DIG

OTHERS. DCG CANNOT BE HELD LIABLE FOR ACCURACY. CONTRACTOR SHALL FIELDVERIFYGRADES,UTILITIES,&ALL OTHERFEATURES&CONDITIONS.IF CONDITIONS ARE NOT AS SHOWN &/OR PANS CANNOT BE CONSTRUCTED AS SHOWN CONTACT DCG PRIOR TO CONSTRUCTION

PROJ. MANAGER RLB
DESIGNED BY ISR/LB
DRAWN BY JB
CHECKED BY RLB
SCALE AS SHOWN
DATE
REV. 1
OF
SHEET NUMBER

COB

¾" X 2" VERTICAL"L" BOLTED TO ROOF WITH¾" STAINLESS STEEL KWIK BOLTS

4' ACCESS HATCH

SAFETY AIR VENT

42"

6"OVERFLOW

PROVIDE 90° AT TOP OF PIPE. INVERT ELEVATION 14' ABOVE TOP OF INTERIOR

INTERNAL LADDER

6" FILL LINE FROM PUMP HOUSE

LENGTH AS REQUIRED WITH SAFE CLIMBING

SECURE 24 MESH SCREEN ON RESERVOIR OVERFLOW

8"T06" REDUCER

ANTI-VORTEX PLATE SEE SHEET B/C11 FOR DETAIL

8" OUTLET (BOOSTER PUMP SUCTION LINE)

6• ABOVE FINISHEDk INTERIOR FLOOR

4" TANK DRAIN

TANK BASE PER TANK ENGINEER

TANK CROSS SECTION

BASE PLAN VIEW

ROOF PLAN VIEW

AIRVENT

0: HANDLE

6'

4" PVC PIPE AND FITTINGS

PIPE BRACKETS AS REQUIRED

RESERVOIR SET POINTS	
CONTROL POINT	HEIGHT
HIGH LEVEL ALARM	29' 6"
WELL PUMPS OFF	29' 3"
LEAD WELL ON	28' 9"
LAG WELL ON	28' 3"
LOW LEVEL ALARM	20' O"
BOOSTER PUMP SHUT-OFF	O' 9"

NOTE:

RESERVOIR DESIGN AND STRUCTURAL ENGINEERING IS THE RESPONSIBILITY OF THE RESERVOIR CONTRACTOR. CONTRACTOR TO PROVIDE SITE COMPLIANT DESIGN AND

REQUIRED CONSTRUCTION BUILDING PERMIT FROM ISLAND COUNTY. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL DETAILS ON THIS SHEET.

FRAME OPENING LENGTH

QUANTITY & LOCATION OF SPRINGS VARIES WITHSIZE

LIFTING MECHANISM W/ REINFORCED COMPOSITE TUBES & ELECTROCOATED COMPRESSION SPRINGS

GUIDE ARM (if req'd)

GASKET (all around SLAML

INSIDE & OUTSIDE HAN W/ PADLOCK HASPS

ARM BR

HANDLES TO BE INSTALLED ON SITE BY CUSTOMER

FRAME W/ CAPFLASHING (corners full welded)

HOLD OPEN ARM W/ NYLON ROLLER

5f [140mm]

1½" [38mm]

2r [67mm]

3 1." [78 mm]

SECTION

ENTRY HATCH DETAIL

NOTTO SCALE

ROOF HATCH

1 ¼"PIPE NIPPLE WELDED TO RAIL WITH¾" X 2" FLAT BAR SAFETY RAILING ATTACHMENT

24"

1/8" PLATE TOP

COVER SIDE

¾"X2"RAILS

24 MESH SS SCREEN AROUND

• 1'-0"

VERTICALS ATTACHED W/ SS

BANDS, FULLY SEAL VENT

ANCHOR TABS (qty & location varies w/ size)

1"RIGID FIBERGLASS INSULATION

EYE BOLT

GAUGE BOARD

STAINLESS STEEL DE WIRES

PULLEY

STEEL TARGET ½"x5½"x6"

EYE BOLT

ELEVATION

TARGET DETAIL

COVER

1"THICK FIBER GLASS COVER INSULATION

GUIDE WIRE / BRACKET (TOP & BOTTOM)

STEEL TARGET

PULLEY

PLAN

NCLOSED \ULLEYS

1:2 TANK HEIGHT

2"X4" NUMBERS

5½" x 20" SQUARE STAINLESS STEEL FLOAT

SEE "TARGET DETAIL"

1"x6"PVC GAUGE BOARD KWIK BOLT TO WALL

Ye" S.S. GUIDE WIRES

GUIDE WIRE BRACKET (TOP & BOTTOM)

SIDE VIEW

WATER LEVEL INDICATOR DETAIL

ANTI-VORTEX PLATE

Digitally signed y Robert L Benni Date: 2022.08.1 -0700

BASE MA?TOPOGRAPHY PROVIDED BY OTHERS. DCO CANNOT BE HELD LIABLE FOR ACCURACY. CONTRACTOR SHALL FIELD VERIFY GRADES, UTILITIES, & ALL OTHERENDFEATURES&CONDITIONS.IF CONDITIONS ARENOT AS SHOWN &/OR PLANS CANNOT BE CONSTRUCTED AS SHOWN, CONTACT DCO,PRIOR TO CONSTRUCTION

HATCH

COVER & RISER

TERIOR W/ SCREEN

TREATMENT

4"PVC

RNAL ' OVERFLOW

LADDER H WATER LEVEL

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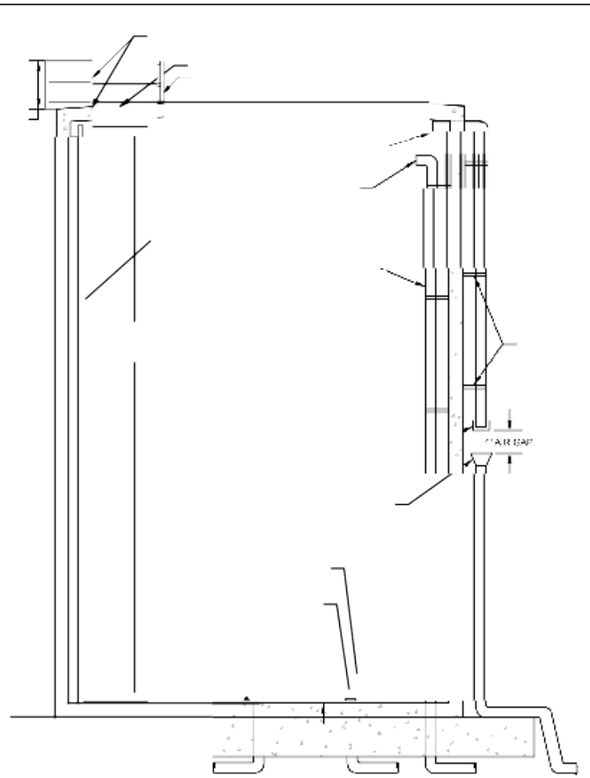
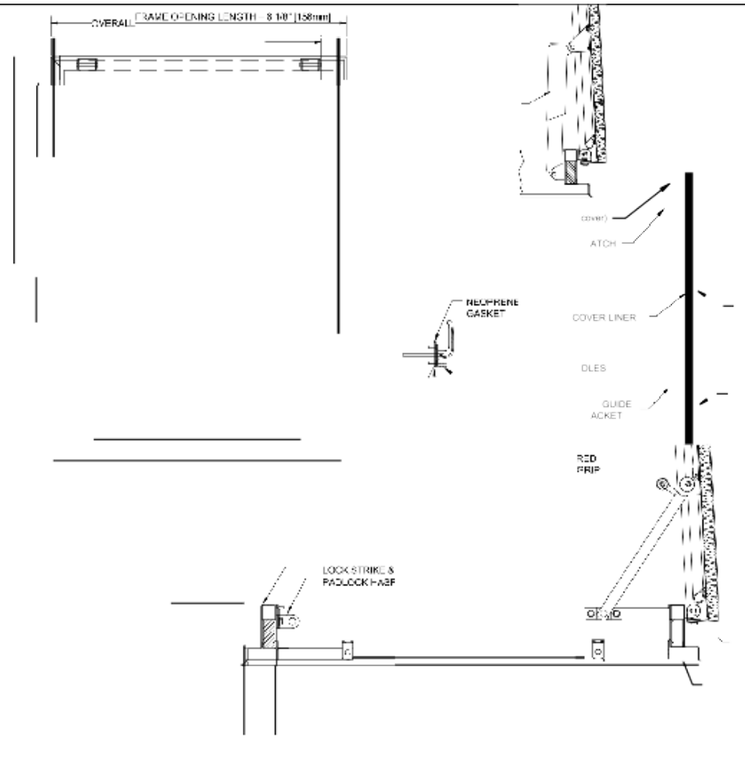
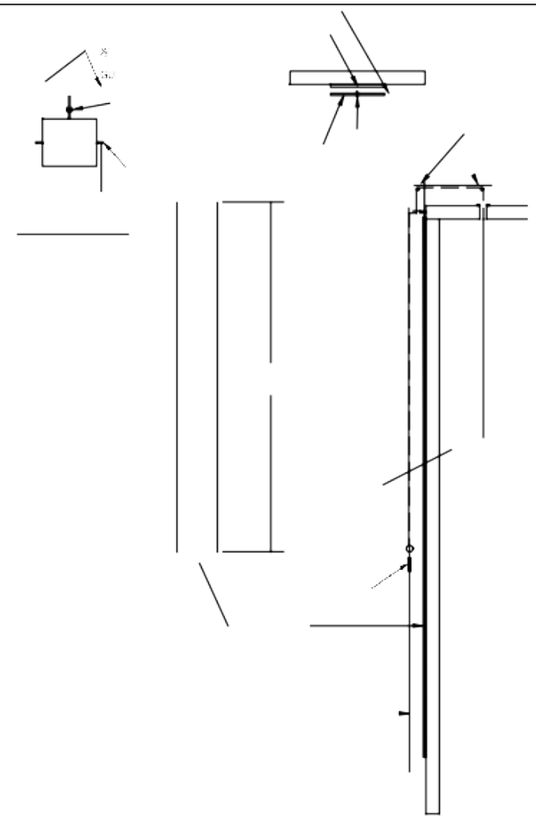
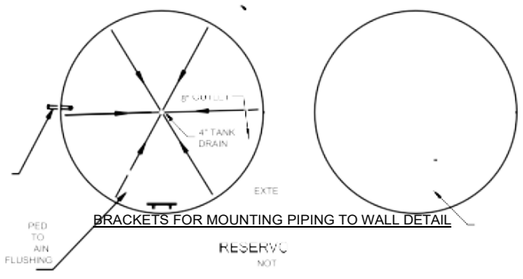
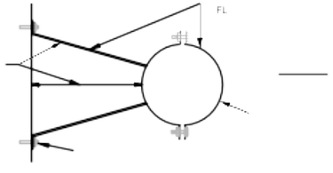


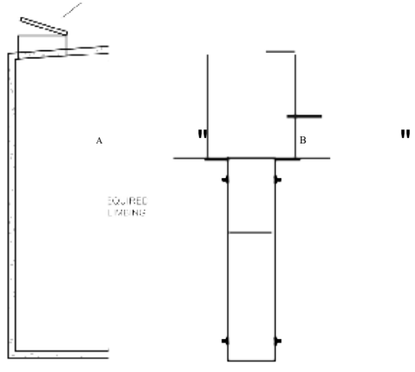


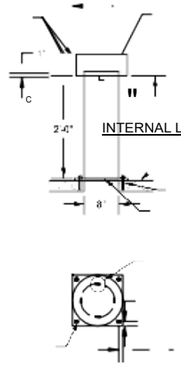




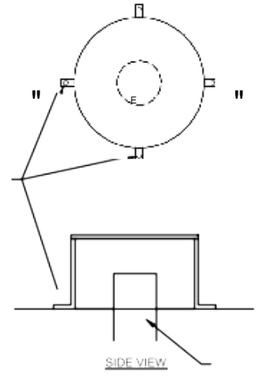
BRACKETS FOR MOUNTING PIPING TO WALL DETAIL







INTERNAL LADDER DETAIL



AIR VENT DETAILS

G " H "

VORTEX PLATE DETAIL

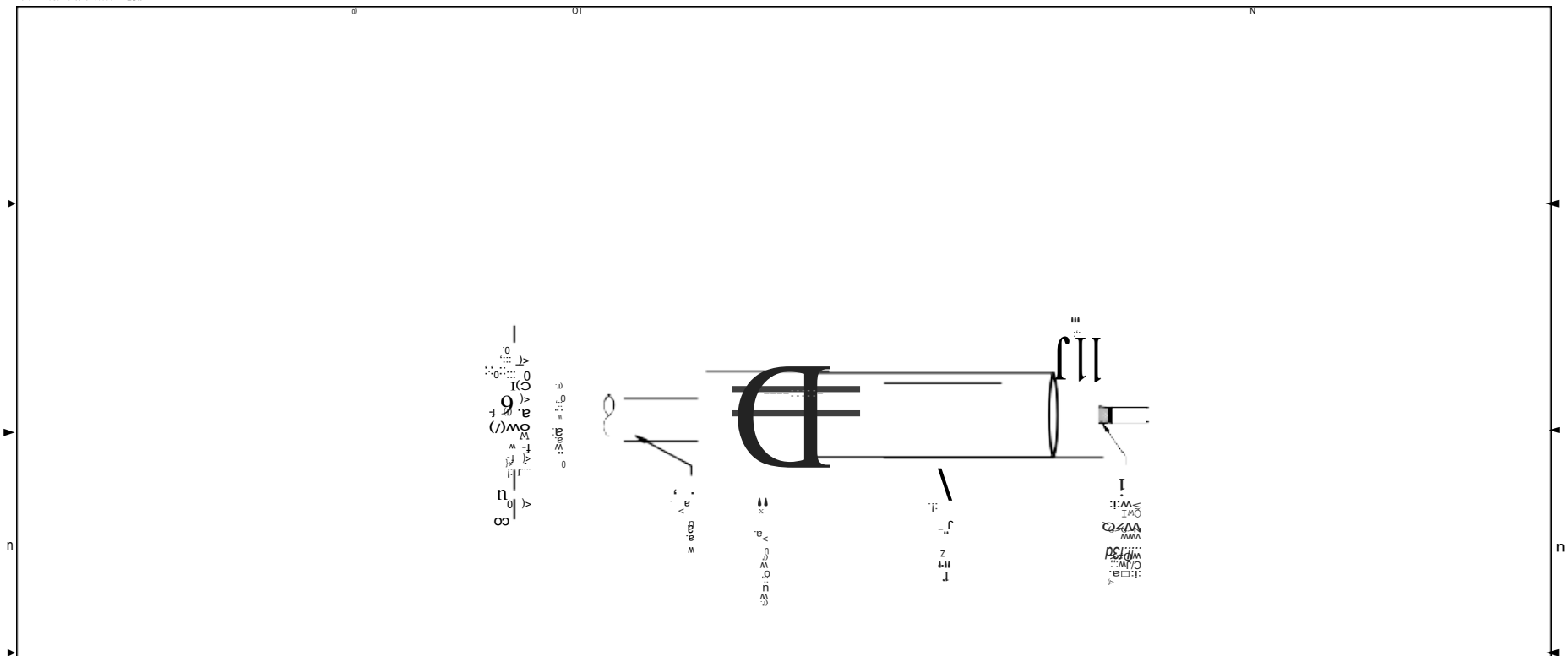
"

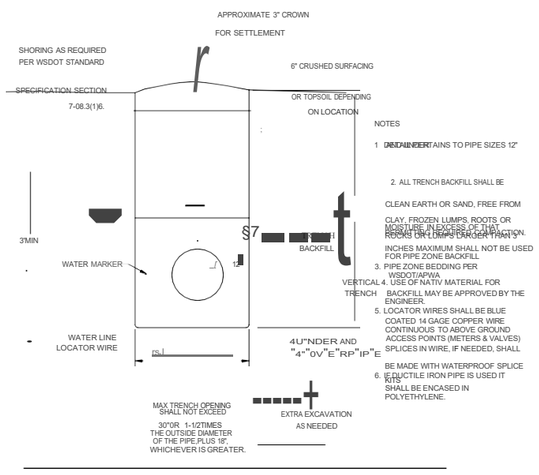
AFTER FABRICATION

SHEET NUMBER

C09

"

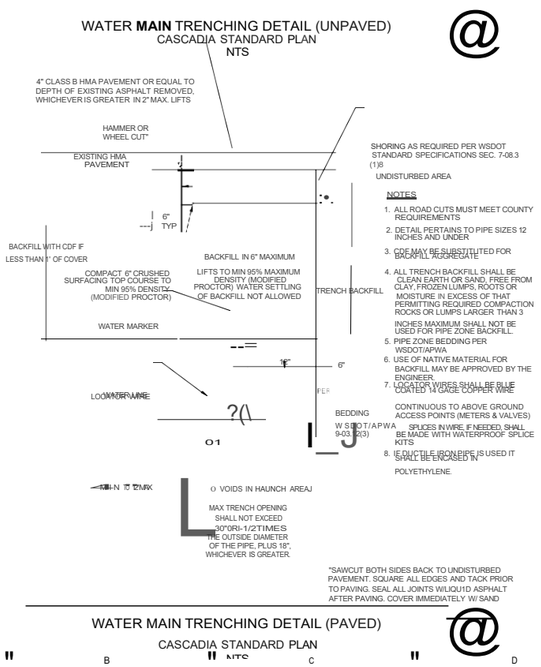




NOTES

1. TRENCH WIDTH CONTAINS TO PIPE SIZES 12"
2. ALL TRENCH BACKFILL SHALL BE CLEAN EARTH OR SAND, FREE FROM CLAY, FROZEN LUMPS, ROOTS OR MOISTURE IN EXCESS OF THAT PERMITTING REQUIRED COMPACTION ROCKS OR LUMPS LARGER THAN 3 INCHES MAXIMUM SHALL NOT BE USED FOR PIPE ZONE BACKFILL
3. PIPE ZONE BEDDING PER WSDOT/APWA
4. USE OF NATIV MATERIAL FOR BACKFILL MAY BE APPROVED BY THE ENGINEER
5. LOCATOR WIRES SHALL BE BLUE COATED 14 GAGE COPPER WIRE CONTINUOUS TO ABOVE GROUND ACCESS POINTS (METERS & VALVES) SPLICES IN WIRE, IF NEEDED, SHALL BE MADE WITH WATERPROOF SPLICE KITS
6. IF DUCTILE IRON PIPE IS USED IT SHALL BE ENCASED IN POLYETHYLENE.

WATER **MAIN** TRENCHING DETAIL (UNPAVED)
CASCADIA STANDARD PLAN
NTS



NOTES

1. ALL ROAD CUTS MUST MEET COUNTY REQUIREMENTS
2. DETAIL PERTAINS TO PIPE SIZES 12 INCHES AND UNDER
3. CDF MAY BE SUBSTITUTED FOR BACKFILL AGGREGATE
4. ALL TRENCH BACKFILL SHALL BE CLEAN EARTH OR SAND, FREE FROM CLAY, FROZEN LUMPS, ROOTS OR MOISTURE IN EXCESS OF THAT PERMITTING REQUIRED COMPACTION ROCKS OR LUMPS LARGER THAN 3 INCHES MAXIMUM SHALL NOT BE USED FOR PIPE ZONE BACKFILL.
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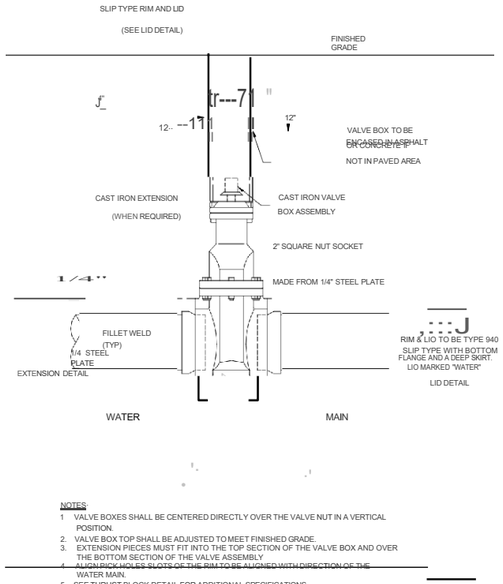
7. LOCATOR WIRES SHALL BE BLUE COATED 14 GAGE COPPER WIRE CONTINUOUS TO ABOVE GROUND ACCESS POINTS (METERS & VALVES) SPLICES IN WIRE, IF NEEDED, SHALL BE MADE WITH WATERPROOF SPLICE KITS
8. IF DUCTILE IRON PIPE IS USED IT SHALL BE ENCASED IN POLYETHYLENE.

*SAWCUT BOTH SIDES BACK TO UNDISTURBED PAVEMENT. SQUARE ALL EDGES AND TACK PRIOR TO PAVING. SEAL ALL JOINTS W/LIQUID ASPHALT AFTER PAVING. COVER IMMEDIATELY W/ SAND

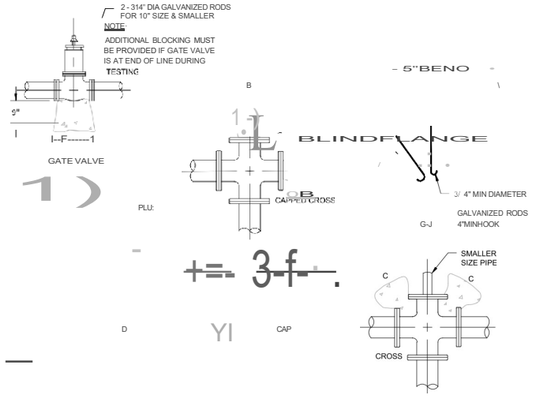
WATER MAIN TRENCHING DETAIL (PAVED)
CASCADIA STANDARD PLAN
NTS



NOTES:

1. VALVE BOXES SHALL BE CENTERED DIRECTLY OVER THE VALVE NUT IN A VERTICAL POSITION.
2. VALVE BOX TOP SHALL BE ADJUSTED TO MEET FINISHED GRADE.
3. EXTENSION PIECES MUST FIT INTO THE TOP SECTION OF THE VALVE BOX AND OVER THE BOTTOM SECTION OF THE VALVE ASSEMBLY
4. ALIGN PICK HOLES SLOTS OF THE RIM TO BE ALIGNED WITH DIRECTION OF THE WATER MAIN.
5. SEE THRUST BLOCK DETAIL FOR ADDITIONAL SPECIFICATIONS

WATER MAIN GATE VALVE ASSEMBLY
CASCADIA STANDARD PLAN
NTS

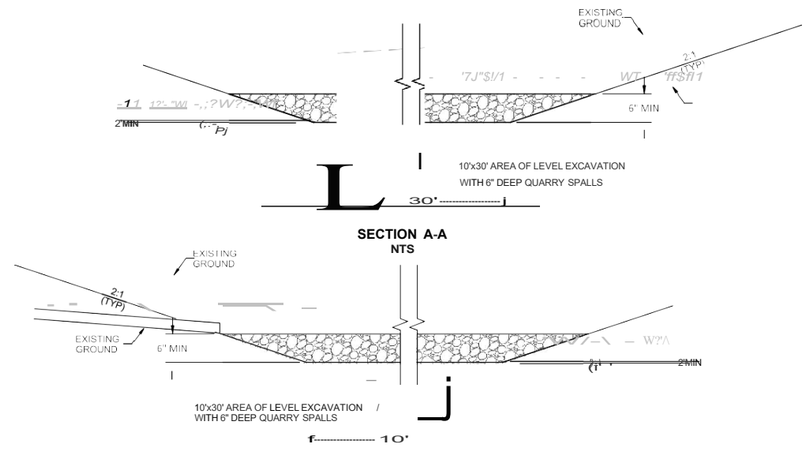


PIPE SIZE	MIN. BEARING AGAINST UNDISTURBED SOIL 22.5° BEND			90° BEND:			VERTICAL THRUST BLOCKING			
	A-90° (SF)	B-TEE (SF)	C-45° (SF)	D-22.5° (SF)	E-11.25° (SF)	F-GV* (SF)	A-90° (CY)	A-90° (CY)	A-90° (CY)	A-90° (CY)
4"	2000 PSI CONCRETE THRUST BLOCK - TABLE									
6"	10									
8"	18	12	10							
10"	24	22	14							

NOTES:

1. BEARING AREA OF CONCRETE THRUST-BLOCK BASED ON 250 PSI PRESSURE AND SAFE SOIL BEARING LOAD OF 1,000 POUNDS PER SQUARE FOOT
2. AREAS MUST BE ADJUSTED FOR OTHER PIPE SIZES, PRESSURES AND SOIL CONDITIONS.
3. CONCRETE BLOCKING SHALL BE CAST IN PLACE AND HAVE A MINIMUM OF 36 SQUARE INCHES BEARING AGAINST THE FITTING.
4. BLOCK SHALL BEAR AGAINST FITTINGS ONLY AND SHALL BE CLEAR OF JOINTS TO PERMIT TAKING UP OR DISMANTLING OF JOINT.
5. CONTRACTORS SHALL INSTALL BLOCKING ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATION PRESSURE UNDER ALL CONDITIONS OF SERVICE. TEST NOT TO EXCEED 250 PSI AT LOWEST POINT.

WATER MAIN THRUST BLOCK DETAIL
CASCADIA STANDARD PLAN
NTS



SECTION B-B
NTS

BACKWASH INFILTRATION POND DETAIL
PROJECT DETAIL
NTS

CALL 811
2 BUSINESS DAYS
BEFORE YOU DIG

PROJ. MANAGER RLB
DESIGNED BY ISR/LS
DRAWN BY: JS
CHECKED BY RLB
SCALE ASSHOWN
DATE:
REV.I T
OF

SHEET NUMBER
C11