Preliminary Design Report
Zion Peak Water Company, LLC
Water System

May 2022

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Part I. Introduction

A. Scope

This preliminary design report is prepared to determine the design parameters for a culinary water system to serve the Little Ponderosa Subdivision. The developer of the subdivision is desirous to organize a private water company to serve the homes within the subdivision. Water for the system will be wholesale purchased from the East Zion Special Service District, and detailed source analysis is beyond the scope of this report. The new private water company is tentatively named the Zion Peak Water Company, LLC.

B. Existing Conditions

The Little Ponderosa Subdivision is located adjacent to the east boundary of Zion National Park in Kane County, Utah. The subdivision consists of 340 lots ranging in elevation from 6400 feet to 6500 feet in wooded mountainous terrain. Structures are anticipated to be primarily recreational part-time occupancy mountain homes. Several homes have been constructed in the subdivision that range from rustic to high quality. Water is provided individually by the homeowners.

Surrounding development consists of vacation resorts, rental cabins, recreational vehicle parks, restaurants, gift shops, and other mountain home subdivisions.

Part II. Water System Design

A. Water Usage

Utah Division of Drinking Water Rule R309-510 specifies design peak day water demand of 800 gallons per day per equivalent residential connection (ERC)[1] for indoor use. Outdoor water use is in addition to the specified indoor use. Annual design water use is specified to be 146,000 gallons per ERC. Rule R309-510 also provides for reduced design flows based on actual water use data.

The Little Ponderosa Subdivision will consist primarily of recreational homes that will be occupied only part-time, and it is expected that peak day use in the water system will be considerably less than demands where there would be full-time occupancy because many of the homes would be unoccupied at any given time. Also, very few homes will have irrigated landscaping and outside water usage is expected to be negligible.

i. Historical Water Usage in Vicinity

To provide a basis for reduced design flows, historical culinary water use data from three public water systems serving recreational developments in the vicinity of the Little Ponderosa Subdivision were obtained from the Utah Division of Water Rights data base. The data, including calculated ERC values, are shown in Tables 1A through 3A in Appendix B. The three water systems are classified transient non-community by the Division of Drinking Water and serve primarily commercial uses with limited individual house type connections. The water systems are shown on Figure 1 in Appendix A.

East Zion Special Service District (SSD)

This water system (PWSID 13044) serves approximately 63 residential type connections and a commercial facility consisting of 22 rental cabins, 13 RV lots, 2 shower houses, dormitory housing for 30 workers, 1 swimming pool, a mini-golf course with a fountain and stream, and a gift shop/small grocery store with restrooms. It is reported that the commercial facilities are metered as a single connection.

Ranch at Zion (Clear Creek Guest Ranch)

This water system (PWSID 13054) serves 6 large lodge units, sleeping from 12 to 65 people, and 1 residential connection.

Zion Mountain Resort

This water system (PWSID 13055) serves approximately 60 rental cabins and a restaurant/gift shop.

There is no report of water use for the East Zion SSD for 2021. The reported water use and ERC for both PWSs 13054 and 13055 for 2021 are significantly less than previous years. It is not known how the ERCs for the two systems are calculated, and the validity of the data is unverified.

[1] R309-10 Facility Design and Operation; Minimum Sizing Requirements, Table 510-1

5-year (2016-2020) average ERC water use for the three water systems, based upon the Division of Water Rights reports, is summarized in Table 1.

Table 1 – 2016-2020 Average Water Usage at Various Public Water Supply Systems

Month	2016-2020 Average – GPD/ERC		
	East Zion SSD PWSID 13044	Ranch at Zion PWSID 13054	Zion Mountain Resort PWSID 13055
January	72	165	95
February	83	206	113
March	107	209	106
April	168	253	119
May	267	268	116
June	340	319	151
July	340	295	132
August	267	351	118
September	231	351	115
October	185	259	106
November	103	225	106
December	84	184	95
Annual	**188**	**257**	**114**

The water reports for the East Zion SSD appear the most consistent and reasonable. It is noted that peak month usage occurs in the summer months of June and July where the daily use (averaged for the month) is 340 gallons per ERC.

Annual water use reported by the East Zion SSD is separated between residential use and commercial use based upon readings of meters at the system source and at the commercial connection. The annual residential water use is shown in Table 2. Residential usage varies from approximately 35% to 55% of the total system usage and averages at 44% of the system usage. It is noted that the annual average for residential use (182 gpd/connection, Table 2) closely matches the annual average for total system use (188 gpd/ERC, Table 1), and it is expected that the monthly residential usage would closely match the system usage shown in Table 1.

Table 2 – Residential Water Use (East Zion SSD)

Year	Residential Connections	Annual Residential Use (Acre-Feet)	Annual Residential Use (GPD/Conn)	Annual System Use (Acre-Feet)	Percentage Residential Use
2020	63	11.93	169	30.96	38.5%
2019	61	13.67	200	24.18	56.5%
2018	57	13.88	217	27.28	50.9%
2017	55	11.01	179	29.42	37.4%
2016	53	8.52	143	23.40	36.4%
2016-2020 Average			182	27.05	43.6%

A peaking factor of 1.15 is used to estimate the peak day on the peak month. Peak month is 340 gallons per day per ERC and applying a 1.15 peaking factor results in an estimated peak day demand of 391 gallons per connection.

B. Design Criteria

i. Water Usage

The Zion Peak Water Company will serve a maximum of 340 part-time type residential connections at full build-out of the Little Ponderosa Subdivision, which is based on the number of subdivided lots. It is noted that efforts are being made and incentives offered to combine lots and reduce the number of connections. It is anticipated that the final number of connections could be as low as 50% of the maximum 340 lots. For purposes of this analysis, the water system will be designed to the 340 maximum connections. It will be designed to supply, store, and distribute water at usage rates similar to existing part-time residential connections in the vicinity.

The Zion Peak Water System requests a reduction in minimum sizing requirements in accordance with Rule R309-510- 5 based upon usage data for a similar recreational home development in the vicinity of the proposed water system. Proposed design criteria are shown in Table 3. The peak day demand based on historical usage dictates a demand of 391 gallons per ERC. We propose to use this demand rounded to 400 gallons per ERC. Design water usage is summarized in Table 3.

Table 3 – Design Water Usage (Zion Peak Water Company, LLC)

Month	*Connections*	*Gallons per Day per Conn*[1]	*Gallons per Day*	*Gallons per Month*	*Acre-Feet per Month*
January	340	72	24,480	758,880	2.33
February	340	83	28,220	790,160	2.43
March	340	107	36,380	1,127,780	3.46
April	340	168	57,120	1,713,600	5.26
May	340	267	90,780	2,814,180	8.64
June	340	340	115,600	3,468,000	10.64
July	340	340	115,600	3,583,600	11.00
August	340	267	90,780	2,814,180	8.64
September	340	231	78.540	2,356,200	7.23
October	340	185	62,900	1,949,900	5.98
November	340	103	35,020	1,050,600	3.22
December	340	84	28,560	885,360	2.72
Annual Total				23,312,440	71.55

Design Parameter	*Connections*	*Gallons per Day per Conn*	*Gallons per Day*	*Gallons per Minute*	*Acre-Feet*
Peak Day Flow[2]	340	400	136,000	94.5	0.42
Peak Instantaneous Flow[3]				190	

[1] Table 1, Average System Usage

[2] Peak Day Flow = 1.15 x Peak Month Flow

[3] Peak Instantaneous Flow = 2 x Peak Day Flow

ii. Source

It is requested that the peak day demand of 400 gallons per day per connection be approved by the Utah Division of Drinking Water. This is in line with Table 510-1 for Recreational Home

Developments, without Note 2 limits on plumbing fixtures or dwelling area. It is further requested that average yearly demand of 71.55 acre feet (68,600 gallons per connection) be approved, without Note 1 requirements. Average daily demand, based on annual usage, would be approximately half of the peak day demand. Outside use is considered negligible.

The source of water for the Zion Peak Water System will by wholesale purchase from the East Zion SSD at the District's existing storage tank. The Special Service District will need to supply the peak day demand of 136,000 gallons, or 95 gallons per minute, and an annual volume of 71.55 acre feet to the Water Company.

Information available on the well(s) being used to supply water to the East Zion SSD is inconsistent and references two wells: "40-Acre Well" and "New Buffalo Well" (WIN 430961). The two wells have similar legal descriptions but they do not match exactly. Based on discussions with the well owner and operators, it appears the water rights of the East Zion SSD come from the "New Buffalo Well."

Table 4 – East Zion Special Service District Water Rights

Right Number	*Change Number*	*Quantity (Acre-Feet)*
81-2963	a40038	30.121
81-3201	a32511	55.6826
81-3202	a32511	w/81-3201
81-3961	a40770	0.45
81-4259	a32511	w/81-3201
81-4260	a32511	w/81-3201
81-4273	a40771	6.15
81-4348	a32511	w/81-3201
81-4393	a32511	w/81-3201
81-4661	a32511	w/81-3201
81-4662	a32511	w/81-3201
81-491	a32510	0.5
81-5036	a40768	4
81-5046	a40769	9.73
81-5047	a40767	5.4
81-760	a32511	w/81-3201
Total		**112.0336**

Current water rights total 112.0336 acre feet. The existing use by the East Zion SSD averages about 27 acre-feet (Table 2), leaving approximately 85 acre-feet available for the Zion Peak Water System. Anticipated water use by the Zion Peak Water System is about 72 acre-feet (Table 3).

Analysis of the East Zion SSD water delivery system is beyond the scope of this report, but it is assumed the peak day demand can be supplied to the Zion Peak Water System at the existing East Zion SSD water tank, as shown in Figure 2 in Appendix A.

Pump System

The existing East Zion SSD water tank is located at an elevation of 6590 feet. Water for the Zion Peak Water System must be pumped to a proposed tank at elevation 6720 feet. Pump rate to meet peak day demand in the Zion Peak Water System must be 95 gallons per minute.

A proposed pump station for the Zion Peak Water System is shown on Figure 2 in Appendix A at an elevation of 6480 feet. The pump station will have two 5 horsepower pumps, each with a capacity of 100 gallons per minute with a discharge head of 150 feet, which would allow for up to a 20' tall tank.

iii. Storage

Equalization storage of 400 gallons per connection is proposed in accordance with Table R510-4 for Recreational Home Developments for culinary use.

Kane County has adopted the International Fire Code (IFC) for its building regulations (County Code of Ordinances Section 8-1-1). Table B105.1(1) of the IFC requires fire flow of 1000 gallons per minute for 1 hour, and Rule R309-510-8(3)(c) requires minimum storage of 60,000 gallons for fire flow.

Total required storage capacity for the Zion Peak Water System is 196,000 gallons.

Proposed storage for the system will be in a 200,000 gallon tank which will be located at an elevation of 6720 feet, as shown on Figure 2 in Appendix A, to provide adequate pressure and flow to all connections.

iv. Distribution System

Utah Division of Drinking Water Rule R309-105-9 specifies the following minimum pressures in the water distribution system:

a) 20 psi during conditions of fire flow and fire demand experienced during peak day demand;
b) 30 psi during peak instantaneous demand; and
c) 40 psi during peak day demand.

The existing East Zion SSD water tank has an elevation of 6590 which provides a static water pressure of 40 psi or more below elevation 6497 feet. Almost all lots in the Little Ponderosa Subdivision are located above elevation 6497 feet and cannot be served from the existing tank.

The proposed Zion Peak Water System will tank will be located at an elevation of 6720 feet which will provide a static pressure of 40 psi at elevation 6628. All lots in the Little Ponderosa Subdivision are located below 6620 and will have a pressure greater than 40 psi.

The water system will consist of 8" pipes with some looping, as shown on Figure 2 in Appendix A. Fire hydrants will be located in accordance with IFC Table C102.1 such that all lots will be located within 250 feet of a hydrant.

A hydraulic modeling of the distribution system determined the following minimum pressures within the system during the following conditions:

a) 20 psi at Junction J-013 during peak day demand of 95 gallons and fire flow availability of 1,138 gallons per minute;
b) 43.7 psi at Junction J-013 during peak instantaneous demand of 190 gallons per minute; and
c) 44.4 psi at Junction J-013 during peak day demand of 95 gallons per minute.

Hydraulic modeling input and results are contained in Appendix C.

Part III. Cost Estimate

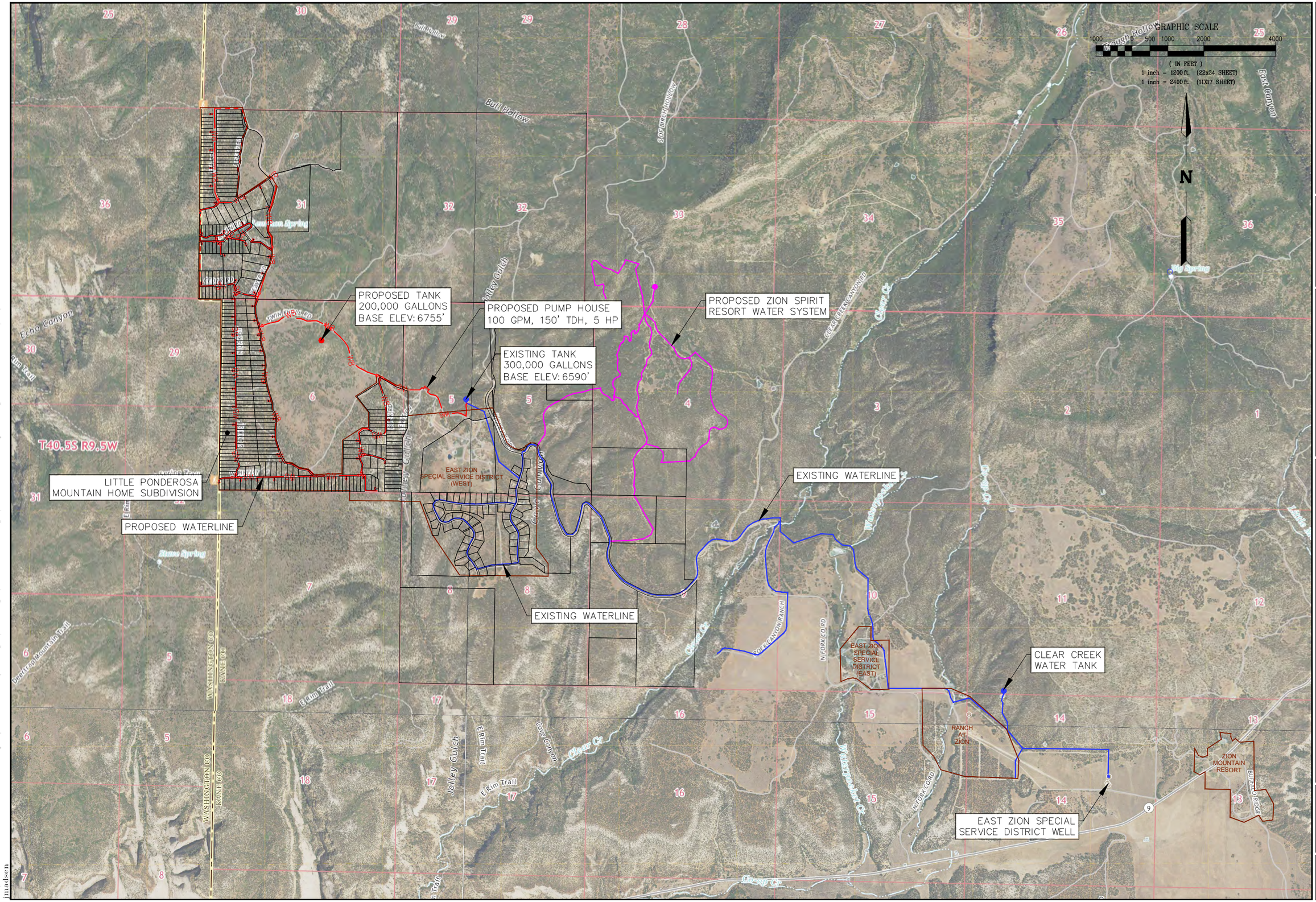
The estimated cost in 2022 dollars for the Zion Peak Water System is shown in Table 5.

Table 5 – Estimated Cost of Complete System

Item	*Quantity*	*Units*	*Unit Price*	*Item Total*
Tie-in to Existing System	1	LS	$ 5,000	$ 5,000
200,000 Gallon Storage Tank	1	LS	$ 400,000	$ 400,000
Pump Station	1	LS	$ 210,000	$ 210,000
6" PVC Pipe	3,500	LF	$ 45	$ 157,500
8" PVC Pipe	39,500	LF	$ 60	$ 2,370,000
Connections	170	EA	$ 750	$ 127,500
Valves	36	EA	$ 4,000	$ 144,000
Fire Hydrant	60	EA	$ 6,500	$ 390,000
			Subtotal	$ 3,804,000
			Contingency (10%)	$ 380,400
			Engineering & Legal (5%)	$ 190,200
			TOTAL	**$ 4,374,600**

A small portion of properties to the northeast that are located at an elevation lower than 6497 could be developed without the installation of the pump station and tank and would only require formation of the water system with the Division of Drinking Water and an 8" pipe extension with appurtenances and hydrants from the existing East Zion SSD tank. A detailed survey and design approved by the Division of Drinking Water would be required to verify this.

Appendix A. Figures



NO.	DATE	BY	DESCRIPTION

REVISIONS

PRELIMINARY
NOT FOR CONSTRUCTION

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VICINITY MAP

LITTLE PONDEROSA SUBDIVISION
KANE COUNTY, UTAH

PROJECT #	1814-01
NAME	RV
DATE	APRIL 2022
SCALE	AS NOTED
SHEET	FIGURE 1 1 OF 2
FILE	1814-01 EXH Report.dwg

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LITTLE PONDEROSA MOUNTAIN HOME SUBDIVISION

PROPOSED WATERLINE

FIRE HYDRANT (TYP.)

PROPOSED TANK
200,000 GALLONS
BASE ELEV: 6755'

PROPOSED PUMP HOUSE
100 GPM, 150' TDH, 5 HP

EXISTING TANK
300,000 GALLONS
BASE ELEV: 6590'

Stave Spring

Stave Spring Trail

Jolley Gulch

Clemmon Spring

W PINE ST

S OAK ST

N OAK ST

CEDAR RD

ASPEN RD

FIR RD

ROCKY RD

BEAVER RD

TWIN KNOLL RD

BUCK RD

LEWIS LN

N FORK CO

Bull He

6400

6800

29

32

31

6

5

7

GRAPHIC SCALE

500 0 250 500 1000 2000

(IN FEET)

1 inch = 500 ft. (22x34 SHEET)

1 inch = 1000 ft. (11X17 SHEET)

NO.	DATE	BY	DESCRIPTION

REVISIONS

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PROPOSED WATER SYSTEM

LITTLE PONDEROSA SUBDIVISION
KANE COUNTY, UTAH

PROJECT #	1814-01
NAME	RV
DATE	APRIL 2022
SCALE	AS NOTED
SHEET	FIGURE 2 2 OF 2
FILE	1814-01 EXH Report.dwg

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Appendix B. Calculated ERC Values

TABLE 1A

HISTORICAL WATER USE - EAST ZION SPECIAL SERVICE DISTRICT (PWSID 13044)

Source: 60 Acre Well															*Residential*		*Commercial*		
Water Rights Report-Acre Feet																*Annual*		*Annual*	
Year	*ERC*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Total*	*Connects*	*Use*	*ERC*	*Use*	*Total*
2020	163.49	0.76	0.75	2.01	1.10	2.98	4.23	4.78	3.70	3.61	4.03	1.18	1.44	30.57	63	11.93	100.49	19.03	30.96
2019	107.90	1.24	1.60	0.72	2.16	2.88	4.22	4.43	2.37	2.98	2.15	0.69	1.19	26.63	61	13.67	46.90	10.51	24.18
2018	112.02	0.96	0.39	1.15	2.86	3.98	4.17	3.95	3.49	2.22	1.73	1.37	1.24	27.51	57	13.88	55.02	13.40	27.28
2017	147.01	0.87	1.18	2.34	2.19	3.44	5.03	4.13	3.81	3.08	2.18	1.84	1.06	31.15	55	11.01	92.01	18.41	29.42
2016	145.58	0.54	0.71	0.86	1.50	3.39	2.91	4.06	3.70	2.29	1.89	1.31	0.24	23.40	53	8.52	92.58	14.88	23.40
																11.80			27.05
Gallons per Day per ERC																			
2020	163.49	49	52	129	73	192	281	307	238	240	259	78	93	166	63	169	100.49	169	169
2019	107.90	121	173	70	217	281	425	432	231	300	209	69	116	220	61	200	46.90	200	200
2018	112.02	90	41	108	277	373	404	371	327	215	162	133	116	219	57	217	55.02	217	217
2017	147.01	62	93	167	162	246	372	295	272	228	156	136	76	189	55	179	92.01	179	179
2016	145.58	39	55	62	112	245	217	293	267	171	136	98	17	143	53	143	92.58	143	143
5-Year Average		72	83	107	168	267	340	340	267	231	185	103	84	188		182		182	182

TABLE 2A

HISTORICAL WATER USE - RANCH AT ZION (PWSID 13054)

Source: 60 Acre Well															*Residential*		*Commercial*		
Water Rights Report-Acre Feet (Note: Monthly usage is estimated based on source meter)																*Annual*		*Annual*	
Year	*ERC*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Total*	*Connects*	*Use*	*ERC*	*Use*	*Total*
2021	101.09	3.04	3.15	3.48	3.58	3.69	4.32	4.85	4.55	4.17	4.17	3.43	3.07	45.50	2	0.9	99.09	44.59	45.49
2020	624.61	6.28	9.07	9.38	13.43	15.01	15.38	15.89	16.20	15.24	14.56	14.09	11.62	156.15	1	0.25	623.61	155.90	156.15
2019	623.61	6.68	9.03	9.33	14.10	15.89	18.20	16.20	21.40	20.90	19.70	11.96	8.62	172.01	0	0.00	623.61	172.10	172.10
2018	623.61	10.10	11.20	13.90	14.90	16.90	18.20	15.96	22.60	21.70	13.90	11.80	8.66	179.82	0	0.00	623.61	179.82	179.82
2017	623.61	11.00	12.00	14.50	15.30	17.00	19.00	18.60	23.00	22.00	14.00	12.00	11.00	189.40	0	0.00	623.61	189.40	189.40
2016	623.61	14.79	14.79	14.79	14.79	14.79	20.93	20.93	20.93	20.93	14.79	14.79	14.79	202.04	0	0.00	623.61	200.00	200.00
Gallons per Day per ERC																			
2021	101.09	316	350	362	385	384	464	504	473	448	434	369	319	401	2	401	99.09	401	401
2020	624.61	106	163	158	234	253	267	267	273	265	245	245	196	223	1	223	623.61	223	223
2019	623.61	113	169	157	246	268	317	273	361	364	332	208	145	246	0	0	623.61	246	246
2018	623.61	170	209	234	260	285	317	269	381	378	234	206	146	257	0	0	623.61	257	257
2017	623.61	185	224	244	266	287	331	313	388	383	236	209	185	271	0	0	623.61	271	271
2016	623.61	249	266	249	258	249	365	353	353	365	249	258	249	288	0	0	623.61	286	286
6-Year Average		165	206	209	253	268	319	295	351	351	259	225	184	257					

TABLE 3A

HISTORICAL WATER USE - ZION MOUNTAIN RESORT (PWSID 13055)

Source: 60 Acre Well

Water Rights Report-Acre Feet (Note: Well is used only for emergency, backup, and future growth)

Year	*ERC*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Total*
2021						0.97	1.35							2.32
2020							1.83	2.69						4.52
2019							1.72							1.72
2018							1.07							1.07
2017					2.55		2.56							5.11
2016														0.00

Source: Big Spring

Water Rights Report-Acre Feet

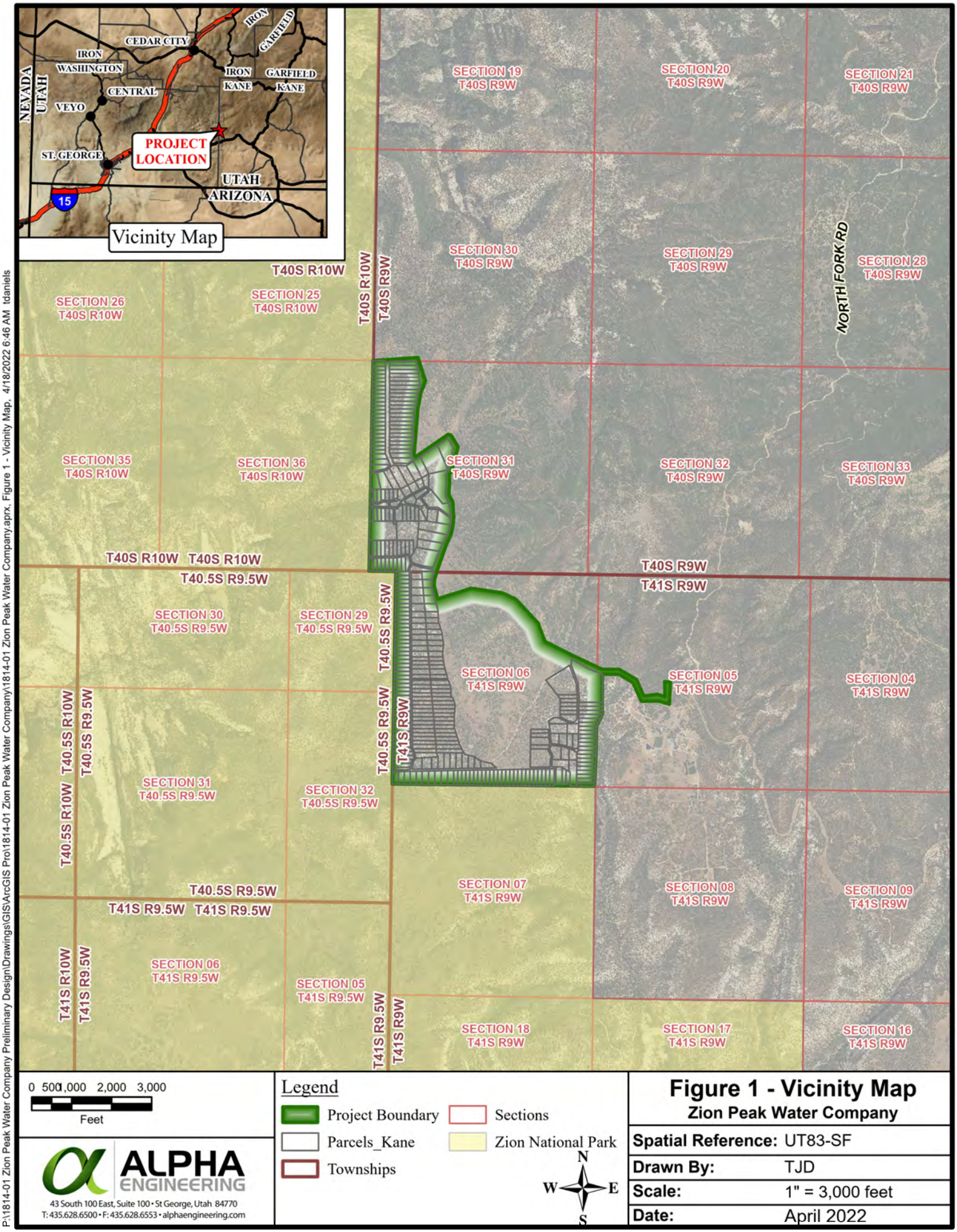
Year	*ERC*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Total*
2021		1.01	1.08	1.23	1.52	1.69	1.92	2.13	2.27	2.25	2.06	1.75	1.54	20.45
2020		4.65	6.14	6.62	6.96	7.98	8.89	9.24	9.14	7.57	6.22	6.09	4.57	84.07
2019		6.13	6.49	6.75	6.76	7.73	8.29	6.75	6.62	6.67	6.58	6.44	6.10	81.31
2018		6.50	6.52	6.52	6.52	6.52	6.52	6.52	6.52	6.52	7.13	6.52	6.50	78.81
2017		6.80	6.80	6.80	6.80	6.80	6.81	6.80	6.80	6.80	6.80	6.80	6.80	81.61
2016		5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	67.92

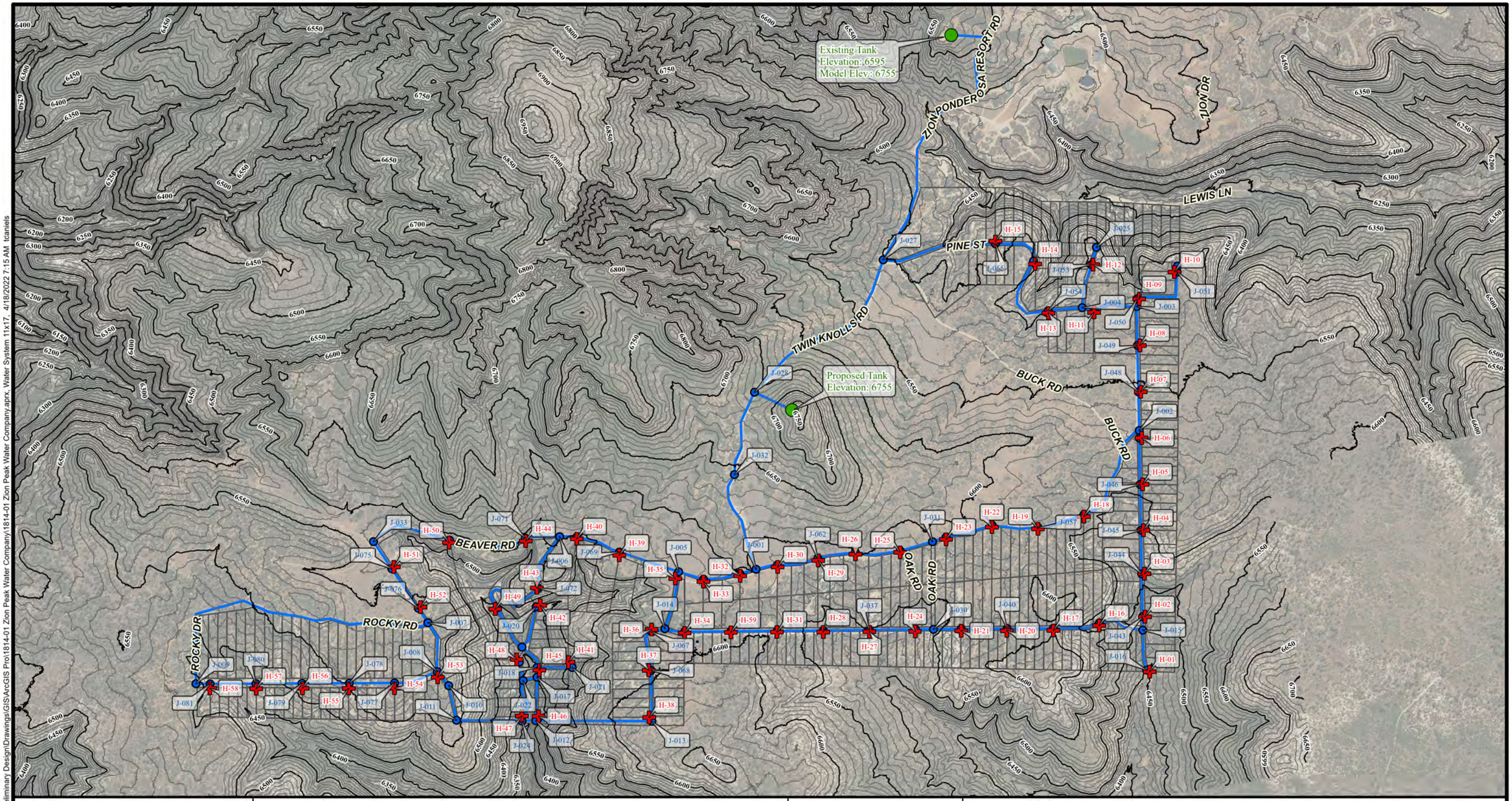
Source: Combined Well and Springs

Water Rights Report-Acre Feet

															Residential		*Commercial*		
Year	*ERC*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Total*	*Connects*	*Annual Use*	*ERC*	*Annual Use*	*Total*
2021	189.66	1.01	1.08	1.23	1.52	2.66	3.27	2.13	2.27	2.25	2.06	1.75	1.54	22.77	16	1.69	173.66	18.35	20.04
2020	431.03	4.65	6.14	6.62	6.96	7.98	10.72	11.93	9.14	7.57	6.22	6.09	4.57	88.59	8	1.60	423.03	84.61	86.21
2019	731.31	6.13	6.49	6.75	6.76	7.73	10.01	6.75	6.62	6.67	6.58	6.44	6.10	83.03	3	0.33	728.31	80.98	81.31
2018	728.31	6.50	6.52	6.52	6.52	6.52	7.59	6.52	6.52	6.52	7.13	6.52	6.50	79.88	0	0.00	728.31	78.81	78.81
2017	728.31	6.80	6.80	6.80	9.35	6.80	9.37	6.80	6.80	6.80	6.80	6.80	6.80	86.72	0	0.00	728.31	81.61	81.61
2016	728.31	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	67.92	0	0.00	728.31	64.96	64.96
Gallons per Day per ERC																			
2021	189.66	56	64	68	87	147	187	118	126	129	114	100	85	107	16	94	173.66	94	94
2020	431.03	113	160	161	175	195	270	291	223	191	152	153	111	183	8	178	423.03	178	178
2019	731.31	88	103	97	100	111	149	97	95	99	95	96	88	101	3	98	728.31	99	99
2018	728.31	94	104	94	97	94	113	94	94	97	103	97	94	98	0	0	728.31	97	97
2017	728.31	98	109	98	139	98	140	98	98	101	98	101	98	106	0	0	728.31	100	100
2016	728.31	82	87	82	84	82	84	82	82	84	82	84	82	83	0	0	728.31	79	79
5-Year Average		95	113	106	119	116	151	132	118	115	106	106	95	114					

Appendix C. WaterGEMS Output


Vicinity Map
NEVADA
UTAH
CEDAR CITY
IRON
WASHINGTON
CENTRAL
VEYO
ST. GEORGE
PROJECT LOCATION
IRON
GARFIELD
KANE
UTAH
ARIZONA
15
SECTION 19 T40S R9W
SECTION 20 T40S R9W
SECTION 21 T40S R9W
SECTION 30 T40S R9W
SECTION 29 T40S R9W
SECTION 28 T40S R9W
NORTH FORK RD
T40S R10W
T40S R9W
SECTION 26 T40S R10W
SECTION 25 T40S R10W
SECTION 35 T40S R10W
SECTION 36 T40S R10W
SECTION 31 T40S R9W
SECTION 32 T40S R9W
SECTION 33 T40S R9W
T40.5S R9.5W
T41S R9W
SECTION 30 T40.5S R9.5W
SECTION 29 T40.5S R9.5W
SECTION 06 T41S R9W
SECTION 05 T41S R9W
SECTION 04 T41S R9W
T40.5S R10W
SECTION 31 T40.5S R9.5W
SECTION 32 T40.5S R9.5W
SECTION 07 T41S R9W
SECTION 08 T41S R9W
SECTION 09 T41S R9W
T41S R9.5W
T41S R10W
SECTION 06 T41S R9.5W
SECTION 05 T41S R9.5W
SECTION 18 T41S R9W
SECTION 17 T41S R9W
SECTION 16 T41S R9W
0 500 1,000 2,000 3,000
Feet
Legend
Project Boundary
Parcels_Kane
Townships
Sections
Zion National Park
N
W
E
S
ALPHA ENGINEERING
43 South 100 East, Suite 100 • St George, Utah 84770
T: 435.628.6500 • F: 435.628.6553 • alphaengineering.com
Figure 1 - Vicinity Map
Zion Peak Water Company
Spatial Reference: UT83-SF
Drawn By: TJD
Scale: 1" = 3,000 feet
Date: April 2022
P:\1814-01 Zion Peak Water Company Preliminary Design\Drawings\GIS\ArcGIS Pro\1814-01 Zion Peak Water Company\1814-01 Zion Peak Water Company.aprx, Figure 1 - Vicinity Map, 4/18/2022 6:46 AM tdaniels



0 500 1,000 2,000
Feet

Legend

- Parcels_Kane
- Water Tank
- Fire Hydrant
- Junction

Proposed Waterline

- 6"
- 8"

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N E S W

2 of 2

Figure 2 - Water System Location

Zion Peak Water Company

Spatial Reference:	Utah State Plane NAD 83, feet
Drawn By:	TJD
Scale:	1" = 1,000 feet
Date:	April 2022

FlexTable: Hydrant Table (LittlePonderosaWaterModel.wtg)

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Hydraulic Grade (ft)	Pressure (psi)	Fire Flow (Available) (gpm)	Pressure (Calculated Residual @ Total Flow Needed) (psi)	Pressure (Calculated Residual) (psi)	Satisfies Fire Flow Constraints?
199	H-01	6,448.97	6,754.73	132.3	2,162	109.0	39.0	True
200	H-02	6,476.06	6,754.73	120.6	2,188	101.3	42.2	True
201	H-03	6,514.65	6,754.73	103.9	2,279	85.4	23.1	True
202	H-04	6,538.35	6,754.74	93.6	2,244	76.2	20.0	True
203	H-05	6,559.72	6,754.75	84.4	2,184	68.4	20.0	True
204	H-06	6,568.89	6,754.76	80.4	2,247	66.1	20.0	True
205	H-07	6,554.04	6,754.77	86.8	2,392	72.7	20.0	True
206	H-08	6,535.00	6,754.78	95.1	2,544	81.0	20.0	True
207	H-09	6,521.57	6,754.78	100.9	2,606	86.4	20.0	True
208	H-10	6,517.05	6,754.78	102.9	2,175	82.5	20.0	True
209	H-11	6,521.68	6,754.80	100.9	2,725	87.5	20.0	True
210	H-12	6,508.97	6,754.80	106.4	2,455	89.3	20.0	True
211	H-13	6,499.85	6,754.81	110.3	2,934	97.3	20.0	True
212	H-14	6,497.57	6,754.85	111.3	3,096	99.4	20.0	True
213	H-15	6,490.65	6,754.87	114.3	3,394	103.9	20.0	True
214	H-16	6,533.98	6,754.72	95.5	2,079	75.3	20.7	True
215	H-17	6,596.84	6,754.72	68.3	1,617	47.8	20.0	True
216	H-18	6,562.42	6,754.76	83.2	2,180	67.5	20.0	True
217	H-19	6,573.85	6,754.76	78.3	2,062	62.3	20.0	True
218	H-20	6,587.98	6,754.72	72.1	1,675	51.3	20.0	True
219	H-21	6,559.69	6,754.71	84.4	1,883	63.6	20.0	True
220	H-22	6,592.91	6,754.76	70.0	1,874	53.7	20.0	True
221	H-23	6,590.20	6,754.76	71.2	1,904	55.0	20.0	True
222	H-24	6,528.03	6,754.71	98.1	2,098	77.3	20.0	True
223	H-25	6,583.38	6,754.76	74.1	2,012	58.6	20.0	True
224	H-26	6,597.04	6,754.77	68.2	1,935	53.4	20.0	True
225	H-27	6,546.56	6,754.71	90.1	1,996	69.6	20.0	True
226	H-28	6,538.38	6,754.71	93.6	2,080	73.7	20.0	True
227	H-29	6,586.71	6,754.77	72.7	2,115	58.8	20.0	True
228	H-30	6,589.64	6,754.77	71.4	2,227	59.0	20.0	True
229	H-31	6,589.55	6,754.71	71.5	1,747	52.4	20.0	True
231	H-32	6,594.51	6,754.76	69.3	2,164	56.7	20.0	True
232	H-33	6,581.36	6,754.74	75.0	2,125	60.5	20.0	True
233	H-34	6,593.92	6,754.72	69.6	1,826	52.5	20.0	True

FlexTable: Hydrant Table (LittlePonderosaWaterModel.wtg)

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Hydraulic Grade (ft)	Pressure (psi)	Fire Flow (Available) (gpm)	Pressure (Calculated Residual @ Total Flow Needed) (psi)	Pressure (Calculated Residual) (psi)	Satisfies Fire Flow Constraints?
234	H-35	6,573.17	6,754.73	78.6	1,978	61.1	20.0	True
235	H-36	6,582.76	6,754.71	74.4	1,900	57.0	20.0	True
236	H-37	6,595.35	6,754.71	68.9	1,707	50.0	20.0	True
237	H-38	6,618.60	6,754.71	58.9	1,416	37.9	20.0	True
238	H-39	6,563.49	6,754.72	82.7	1,961	63.8	20.0	True
239	H-40	6,546.68	6,754.71	90.0	2,035	70.2	20.0	True
240	H-41	6,457.46	6,754.71	128.6	1,983	101.8	36.9	True
241	H-42	6,463.39	6,754.71	126.0	1,993	98.9	32.4	True
242	H-43	6,528.67	6,754.71	97.8	2,016	76.0	21.7	True
243	H-44	6,543.16	6,754.71	91.5	1,933	69.5	20.0	True
244	H-45	6,402.48	6,754.71	152.4	1,983	129.7	75.2	True
245	H-46	6,384.15	6,754.71	160.3	1,960	138.2	86.8	True
246	H-47	6,373.76	6,754.71	164.8	1,980	136.7	68.8	True
247	H-48	6,417.13	6,754.71	146.1	1,980	120.6	59.3	True
248	H-49	6,445.86	6,754.71	133.6	2,005	110.9	54.7	True
249	H-50	6,531.52	6,754.71	96.6	1,906	72.4	20.0	True
250	H-51	6,541.73	6,754.70	92.1	1,791	66.7	20.0	True
251	H-52	6,554.48	6,754.70	86.6	1,722	61.4	20.0	True
252	H-53	6,579.97	6,754.70	75.6	1,536	49.8	20.0	True
253	H-54	6,587.60	6,754.70	72.3	1,418	44.3	20.0	True
254	H-55	6,548.94	6,754.70	89.0	1,602	59.4	20.0	True
255	H-56	6,514.44	6,754.70	104.0	1,752	73.3	20.0	True
256	H-57	6,472.57	6,754.70	122.1	1,802	90.6	31.4	True
257	H-58	6,487.17	6,754.70	115.7	1,811	84.0	23.4	True
259	H-59	6,593.30	6,754.71	69.8	1,768	51.7	20.0	True

FlexTable: Junction Table (LittlePonderosaWaterModel.wtg)

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
29	J-001	6,598.16	0	6,754.77	67.8
31	J-002	6,566.63	1	6,754.76	81.4
33	J-003	6,525.00	1	6,754.78	99.4
35	J-004	6,517.67	1	6,754.80	102.6
38	J-005	6,573.35	0	6,754.73	78.5
40	J-006	6,551.83	0	6,754.71	87.8
42	J-007	6,562.05	1	6,754.70	83.4
44	J-008	6,576.55	1	6,754.70	77.1
46	J-009	6,511.08	0	6,754.70	105.4
49	J-010	6,579.93	1	6,754.70	75.6
51	J-011	6,553.74	0	6,754.70	86.9
53	J-012	6,372.48	1	6,754.71	165.4
55	J-013	6,620.86	2	6,754.71	57.9
57	J-014	6,581.58	1	6,754.72	74.9
60	J-015	6,478.22	1	6,754.73	119.6
62	J-016	6,451.04	1	6,754.73	131.4
65	J-017	6,394.90	1	6,754.71	155.7
67	J-018	6,400.59	1	6,754.71	153.2
69	J-019	6,411.25	1	6,754.71	148.6
72	J-020	6,459.40	1	6,754.71	127.8
74	J-021	6,460.01	1	6,754.71	127.5
76	J-022	6,396.24	1	6,754.71	155.1
78	J-023	6,413.44	0	6,754.71	147.7
80	J-024	6,366.55	1	6,754.71	167.9
82	J-025	6,505.00	3	6,754.80	108.1
84	J-026	6,519.28	1	6,754.78	101.9
88	J-027	6,501.12	1	6,754.93	109.8
108	J-028	6,659.71	0	6,754.94	41.2
110	J-029	6,499.62	2	6,754.85	110.4
114	J-030	6,541.77	1	6,754.71	92.1
117	J-031	6,593.27	0	6,754.76	69.9
120	J-032	6,643.51	0	6,754.86	48.2
123	J-033	6,538.37	0	6,754.71	93.6
260	J-034	6,593.39	2	6,754.71	69.8
264	J-035	6,590.05	2	6,754.71	71.2
268	J-036	6,539.19	3	6,754.71	93.2
272	J-037	6,548.34	3	6,754.71	89.3
276	J-038	6,529.20	2	6,754.71	97.6
280	J-039	6,558.75	2	6,754.71	84.8
284	J-040	6,587.52	3	6,754.72	72.3
288	J-041	6,595.50	3	6,754.72	68.9
292	J-042	6,525.94	2	6,754.72	99.0
297	J-043	6,476.84	1	6,754.73	120.2
301	J-044	6,510.63	1	6,754.73	105.6
305	J-045	6,533.99	2	6,754.74	95.5
309	J-046	6,559.00	2	6,754.75	84.7
313	J-047	6,568.57	1	6,754.76	80.6

FlexTable: Junction Table (LittlePonderosaWaterModel.wtg)

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
317	J-048	6,554.13	1	6,754.77	86.8
321	J-049	6,534.67	1	6,754.78	95.2
325	J-050	6,522.50	1	6,754.78	100.5
329	J-051	6,518.62	1	6,754.78	102.2
333	J-052	6,521.62	1	6,754.80	100.9
337	J-053	6,506.21	1	6,754.80	107.6
341	J-054	6,498.03	1	6,754.81	111.1
346	J-055	6,492.60	3	6,754.87	113.5
350	J-056	6,562.23	1	6,754.76	83.3
354	J-057	6,574.92	2	6,754.76	77.8
358	J-058	6,592.18	1	6,754.76	70.3
362	J-059	6,590.96	1	6,754.76	70.9
366	J-060	6,584.20	1	6,754.76	73.8
370	J-061	6,598.31	1	6,754.77	67.7
374	J-062	6,587.93	1	6,754.77	72.2
378	J-063	6,589.06	1	6,754.77	71.7
382	J-064	6,596.04	1	6,754.76	68.7
386	J-065	6,582.99	1	6,754.74	74.3
391	J-066	6,593.91	2	6,754.72	69.6
395	J-067	6,584.36	1	6,754.71	73.7
399	J-068	6,596.12	3	6,754.71	68.6
404	J-069	6,565.00	1	6,754.72	82.1
408	J-070	6,548.45	1	6,754.71	89.2
412	J-071	6,543.84	0	6,754.71	91.2
416	J-072	6,528.93	1	6,754.71	97.7
426	J-073	6,445.52	1	6,754.71	133.8
430	J-074	6,536.85	0	6,754.71	94.3
434	J-075	6,542.12	0	6,754.70	92.0
438	J-076	6,553.90	0	6,754.70	86.9
443	J-077	6,588.21	2	6,754.70	72.0
447	J-078	6,554.36	3	6,754.70	86.7
451	J-079	6,516.75	3	6,754.70	102.9
463	J-080	6,475.01	3	6,754.70	121.0
467	J-081	6,483.04	2	6,754.70	117.5

FlexTable: Pipe Table (LittlePonderosaWaterModel.wtg)

Current Time: 0.000 hours

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss (ft)
P-116	136	J-052	J-004	8.0	-30	0.19	0.00
P-144	492	J-061	J-060	8.0	10	0.06	0.00
P-88	146	J-015	J-043	8.0	-18	0.11	0.00
P-91	464	J-043	J-044	8.0	-19	0.12	0.01
P-94	473	J-044	J-045	8.0	-20	0.13	0.01
P-97	502	J-045	J-046	8.0	-22	0.14	0.01
P-100	502	J-046	J-047	8.0	-25	0.16	0.01
P-101	82	J-047	J-002	8.0	-26	0.16	0.00
P-103	418	J-002	J-048	8.0	-23	0.15	0.01
P-106	502	J-048	J-049	8.0	-24	0.16	0.01
P-107	422	J-049	J-003	8.0	-26	0.16	0.01
P-109	80	J-003	J-050	8.0	3	0.02	0.00
P-112	713	J-050	J-051	8.0	2	0.01	0.00
P-84	509	J-041	J-042	8.0	-14	0.09	0.00
P-115	480	J-003	J-052	8.0	-29	0.19	0.01
P-81	503	J-040	J-041	8.0	-11	0.07	0.00
P-118	478	J-004	J-053	8.0	4	0.03	0.00
P-119	194	J-053	J-025	8.0	3	0.02	0.00
P-121	370	J-004	J-054	8.0	-35	0.22	0.01
P-122	889	J-054	J-029	8.0	-35	0.23	0.03
P-9	564	J-007	J-008	8.0	3	0.02	0.00
P-125	1,254	J-027	J-055	8.0	40	0.25	0.06
P-129	1,183	J-056	J-002	8.0	3	0.02	0.00
P-132	514	J-057	J-056	8.0	4	0.03	0.00
P-135	501	J-058	J-057	8.0	6	0.04	0.00
P-137	154	J-031	J-059	8.0	8	0.05	0.00
P-138	523	J-059	J-058	8.0	7	0.05	0.00
P-141	368	J-060	J-031	8.0	9	0.06	0.00
P-113	62	J-051	J-026	8.0	1	0.01	0.00
P-29	471	J-022	J-024	8.0	1	0.01	0.00
P-11	3,351	J-009	J-007	8.0	-4	0.03	0.00
P-12	197	J-008	J-010	8.0	-7	0.05	0.00
P-13	384	J-010	J-011	8.0	-8	0.05	0.00
P-14	860	J-011	J-012	8.0	-8	0.05	0.00
P-15	1,258	J-012	J-013	8.0	-9	0.06	0.00
P-17	637	J-014	J-005	8.0	-23	0.14	0.01
P-19	439	J-015	J-016	8.0	1	0.01	0.00
P-21	471	J-012	J-017	8.0	0	0.00	0.00
P-22	104	J-017	J-018	8.0	-3	0.02	0.00
P-23	296	J-018	J-019	8.0	-4	0.03	0.00
P-25	476	J-019	J-020	8.0	1	0.01	0.00
P-26	382	J-018	J-021	8.0	1	0.00	0.00
P-85	498	J-042	J-015	8.0	-16	0.10	0.00
P-28	205	J-022	J-023	8.0	0	0.00	0.00
P-126	550	J-055	J-029	8.0	37	0.24	0.02
P-33	2,108	J-027	J-028	8.0	-14	0.09	0.01
P-42	3,243	Existing Tank	J-027	8.0	27	0.17	0.07

FlexTable: Pipe Table (LittlePonderosaWaterModel.wtg)

Current Time: 0.000 hours

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss (ft)
P-43	449	J-028	New Tank	8.0	-69	0.44	0.06
P-50	939	J-028	J-032	8.0	55	0.35	0.08
P-51	1,114	J-032	J-001	8.0	55	0.35	0.09
P-63	500	J-034	J-035	8.0	4	0.03	0.00
P-66	502	J-035	J-036	8.0	2	0.01	0.00
P-69	499	J-036	J-037	8.0	-1	0.00	0.00
P-72	499	J-037	J-038	8.0	-3	0.02	0.00
P-73	201	J-038	J-030	8.0	-5	0.03	0.00
P-75	300	J-030	J-039	8.0	-6	0.04	0.00
P-78	498	J-039	J-040	8.0	-8	0.05	0.00
P-27	155	J-017	J-022	8.0	2	0.01	0.00
P-166	462	J-068	J-067	8.0	-13	0.09	0.00
P-196	516	J-075	J-076	8.0	8	0.05	0.00
P-159	229	J-014	J-066	8.0	8	0.05	0.00
P-160	502	J-066	J-034	8.0	6	0.04	0.00
P-175	377	J-006	J-071	8.0	9	0.06	0.00
P-163	148	J-067	J-014	8.0	-14	0.09	0.00
P-191	903	J-074	J-033	8.0	8	0.05	0.00
P-197	187	J-076	J-007	8.0	8	0.05	0.00
P-190	861	J-071	J-074	8.0	8	0.05	0.00
P-193	355	J-033	J-075	8.0	8	0.05	0.00
P-188	862	J-073	J-072	8.0	-8	0.05	0.00
P-169	677	J-005	J-069	8.0	19	0.12	0.01
P-187	510	J-019	J-073	8.0	-7	0.04	0.00
P-172	493	J-069	J-070	8.0	18	0.12	0.01
P-173	189	J-070	J-006	8.0	18	0.11	0.00
P-179	630	J-072	J-006	8.0	-9	0.06	0.00
P-165	551	J-013	J-068	8.0	-11	0.07	0.00
P-150	448	J-063	J-062	8.0	11	0.07	0.00
P-147	414	J-062	J-061	8.0	11	0.07	0.00
P-219	154	J-081	J-009	8.0	-4	0.03	0.00
P-218	497	J-080	J-081	8.0	-2	0.01	0.00
P-149	236	J-001	J-063	8.0	12	0.08	0.00
P-215	499	J-079	J-080	8.0	1	0.00	0.00
P-206	513	J-078	J-079	8.0	4	0.02	0.00
P-152	182	J-001	J-064	8.0	42	0.27	0.01
P-155	401	J-064	J-065	8.0	42	0.27	0.02
P-203	490	J-077	J-078	8.0	6	0.04	0.00
P-200	487	J-008	J-077	8.0	9	0.06	0.00
P-156	281	J-065	J-005	8.0	41	0.26	0.01
P-198	27	J-076	H-52	6.0	0	0.00	0.00
P-80	22	J-040	H-20	6.0	0	0.00	0.00
P-182	71	J-021	H-41	6.0	0	0.00	0.00
P-77	19	J-039	H-21	6.0	0	0.00	0.00
P-183	37	J-018	H-45	6.0	0	0.00	0.00
P-74	21	J-038	H-24	6.0	0	0.00	0.00
P-184	56	J-012	H-46	6.0	0	0.00	0.00

FlexTable: Pipe Table (LittlePonderosaWaterModel.wtg)

Current Time: 0.000 hours

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss (ft)
P-185	56	J-024	H-47	6.0	0	0.00	0.00
P-71	18	J-037	H-27	6.0	0	0.00	0.00
P-65	12	J-035	H-31	6.0	0	0.00	0.00
P-68	17	J-036	H-28	6.0	0	0.00	0.00
P-205	57	J-078	H-55	6.0	0	0.00	0.00
P-217	54	J-080	H-57	6.0	0	0.00	0.00
P-192	27	J-074	H-50	6.0	0	0.00	0.00
P-199	61	J-008	H-53	6.0	0	0.00	0.00
P-62	10	J-034	H-59	6.0	0	0.00	0.00
P-189	22	J-073	H-49	6.0	0	0.00	0.00
P-202	57	J-077	H-54	6.0	0	0.00	0.00
P-208	53	J-079	H-56	6.0	0	0.00	0.00
P-195	30	J-075	H-51	6.0	0	0.00	0.00
P-181	47	J-020	H-42	6.0	0	0.00	0.00
P-186	40	J-023	H-48	6.0	0	0.00	0.00
P-154	24	J-064	H-32	6.0	0	0.00	0.00
P-161	13	J-066	H-34	6.0	0	0.00	0.00
P-117	19	J-052	H-11	6.0	0	0.00	0.00
P-120	20	J-053	H-12	6.0	0	0.00	0.00
P-158	82	J-005	H-35	6.0	0	0.00	0.00
P-157	25	J-065	H-33	6.0	0	0.00	0.00
P-123	25	J-054	H-13	6.0	0	0.00	0.00
P-90	27	J-043	H-02	6.0	0	0.00	0.00
P-127	29	J-055	H-15	6.0	0	0.00	0.00
P-111	23	J-050	H-09	6.0	0	0.00	0.00
P-130	18	J-056	H-18	6.0	0	0.00	0.00
P-133	15	J-057	H-19	6.0	0	0.00	0.00
P-151	20	J-063	H-30	6.0	0	0.00	0.00
P-136	20	J-058	H-22	6.0	0	0.00	0.00
P-139	23	J-059	H-23	6.0	0	0.00	0.00
P-148	21	J-062	H-29	6.0	0	0.00	0.00
P-142	17	J-060	H-25	6.0	0	0.00	0.00
P-220	49	J-081	H-58	6.0	0	0.00	0.00
P-99	26	J-046	H-05	6.0	0	0.00	0.00
P-180	17	J-072	H-43	6.0	0	0.00	0.00
P-86	28	J-042	H-16	6.0	0	0.00	0.00
P-87	36	J-016	H-01	6.0	0	0.00	0.00
P-177	33	J-071	H-44	6.0	0	0.00	0.00
P-124	36	J-029	H-14	6.0	0	0.00	0.00
P-93	29	J-044	H-03	6.0	0	0.00	0.00
P-145	21	J-061	H-26	6.0	0	0.00	0.00
P-114	29	J-051	H-10	6.0	0	0.00	0.00
P-96	26	J-045	H-04	6.0	0	0.00	0.00
P-164	25	J-067	H-36	6.0	0	0.00	0.00
P-171	35	J-069	H-39	6.0	0	0.00	0.00
P-102	26	J-047	H-06	6.0	0	0.00	0.00
P-105	25	J-048	H-07	6.0	0	0.00	0.00

FlexTable: Pipe Table (LittlePonderosaWaterModel.wtg)

Current Time: 0.000 hours

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss (ft)
P-168	51	J-013	H-38	6.0	0	0.00	0.00
P-167	25	J-068	H-37	6.0	0	0.00	0.00
P-108	27	J-049	H-08	6.0	0	0.00	0.00
P-83	22	J-041	H-17	6.0	0	0.00	0.00
P-174	22	J-070	H-40	6.0	0	0.00	0.00

Notes

FlexTable: Reservoir Table (LittlePonderosaWaterModel.wtg)

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
87	Existing Tank	6,755.00	<None>	27	6,755.00
28	New Tank	6,755.00	<None>	69	6,755.00