Section 3 – Utilities

- Power
- Sewer
- Storm Water
- Water - Culinary
- Water - P.I.

Area Master Plan/Load Study for Micron Site Development

August 16, 2021

For: D.R. Horton

Micron Site Development

By: Michael Anderson, P.E. Utah 10652558-2202

Active Power Engineering, LLC

Executive Summary: This area plan/load study--required by the Lehi City Power Line Extension Policy--analyzes connecting the proposed load of the Micron Site development. The estimated load of the development is 10.62 MW (11.18 MVA). There is not existing capacity on the Lehi Power Littlefield substation and feeders for this amount of load. To serve the estimated load of this development an additional substation and feeders are needed. The Rocky Mountain Power 138 kV transmission line will need to be tapped to feed the new substation.

Scope: This area plan/load study analyzes for connection to the Lehi City power system the proposed load on the Micron site, a D.R. Horton development concept. Also included in the study are preliminary recommended locations of a new substation and power distribution feeder loops required to serve the development. The basis of this study are the development concept drawings and information provided by D.R. Horton. In addition, information on the Lehi City power system was provided by the Lehi City Power Department and was used in performing this study.

The requirements used in performing this analysis are shown in Table 1.

Table 1-Requirements

Requirement	Source
Connect and serve the proposed electrical load	D.R. Horton (Developer)
Perform Area Plan/Load Study for estimated load over 1 MW	Lehi City Power Line Extension Policy
Looped Feed system for developments with over 30 units	Lehi City Power Line Extension Policy
Substation transformers and feeders loaded less than 60% of rated capacity in normal operation	Lehi City Power Design Criteria
Customer/developer obtains and furnishes right-of-way and/or easements	Lehi City Power Line Extension Policy
Customer/developer installs curb, gutter, and sidewalk indicating permanent grade before electrical distribution lines are installed	Lehi City Power Line Extension Policy

Proposed Connected Load Estimate: D.R. Horton proposes to connect an estimated 10.62 MW of load (11.18 MVA at 0.95 power factor) for 1,597 residential units, mixed use units, parks, churches, and schools. The Lehi City Power Department Line Extension Policy requires this area plan/load study because the total estimated load is over 1,000 kW (1 MW) for this development.

Load estimates were based on the type and number of units proposed as provided in the information from D.R. Horton (refer to "Tabulations" on Figure 1 in the Appendix). The typical loads for the various types of units are the same as those used for other developments proposed in Lehi. The total load for the development was estimated using the typical unit loads, the number of units, and a coincidence factor (See Table 2). The load calculations were based on gas water heating and gas space heating. A demand coincidence factor was applied to account for the peak power use not occurring at the same time for all the units.

Table 2 -- Micron Site Development Load Estimate

Load Estimate based on:		Gas Heat				
Use/Type	**# Units (or ERUs)**	**kW per**	**Coincidence Factor**		**Total MW**	**Total MVA (0.95 p.f.)**
Mixed Use	464	6.2	0.72		2.07	2.18
Townhomes	565	5.5	0.68		2.11	2.22
Cottage	129	6	0.7		0.54	0.57
Horton Plus	205	7.5	0.7		1.08	1.13
Emerald	199	8	0.7		1.11	1.17
Estate	129	10	0.7		0.90	0.95
Active Adult	370	6	0.7		1.55	1.64
Parks and Open Space	16	10	1		0.16	0.17
Civic (Church/School)	170	8	0.8		1.09	1.15
Total	**2,247**			**Total**	**10.62**	**11.18**

Actual load of this development may be higher or lower than the estimate provided in this report based on the final unit types and unit numbers that are ultimately built.

For this study the new load is assumed to be connected over a seven-year period. Without more information on the exact amount of load that would be added each year it was assumed for this study that seven equal increments of load are connected. The first load increment would be built in 2022 and be seen on the Lehi Power system during the 2023 summer peak.

Available Power Facilities: There are four Lehi City 12.47 kV distribution feeders and one Lehi City substation in the area that were evaluated for serving the proposed load. Lehi City Power uses a design criteria of loading substation transformers and feeders to no more than 60% of rated capacity. Substations in the area that are projected to already be heavily load were not considered for serving the proposed load.

Littlefield substation has two transformers that are each rated 33 MVA. There are three distribution feeders for each transformer, but only four feeders are located where they can serve the development area. Table 3 shows the load recorded in 2021 on each substation transformer and the feeders that could serve the new load, as well as the forecasted 2023 loading on each.

Table 3-Transformer and Feeder Loading

					Base Year		**Forecast without Micron Site Development**	
					2021		**2023**	
Substation	**Transformer**	**Feeder**	**100% Capacity***	**Units**	**Load**	**Capacity Utilization (%)**	**Load**	**Capacity Utilization (%)**
Littlefield	**T1**		33	MVA	6.8	21%	11.1	34%
		812	500	amps	0	0%	2	0%
		813	500	amps	194	39%	272	54%
Littlefield	**T2**		33	MVA	10.1	31%	15.2	46%
		821	500	amps	138	28%	321	64%
		822	500	amps	0	0%	0	0%
* Lehi Power design criteria limits normal operating capacity of transformers and feeders to 60%								

Analysis of Development Load Addition: The Micron site development is estimated to add a total of about 11.18 MVA (518 amps) of load to whatever substation transformers and feeders it is fed from. About 1.6 MVA (about 73 amps) of load is added each year for seven years in this study.

Table 4 shows the impact of the Micron site development load at full buildout on the Littlefield substation transformers and feeders if Littlefield substation feeders alone are used as the source to feed the development.

Table 4--Micron Site Development Load Impact

					Forecast with Micron Site Development on Littlefield Sub	
					at Full Buildout	
Substation	**Transformer**	**Feeder**	**100% Capacity***	**Units**	**Load**	**Capacity Utilization (%)**
Littlefield	**T1**		33	MVA	17.58	53%
		812	500	amps	172	34%
		813	500	amps	367	73%
Littlefield	**T2**		33	MVA	24.19	73%
		821	500	amps	332	66%
		822	500	amps	322	64%
* Lehi Power design criteria limits normal operating capacity of transformers and feeders to 60						

Littlefield transformer T2 would be loaded above the 60% design criteria at full buildout of this development. Feeders 813, 821, and 822 would be used to serve the new load and would be loaded over their 60% capacity limits. Feeder 812 is used to offload 821 so new load can be served from 821. Another substation transformer and additional feeders appear to be needed in the area to achieve the capacity required by the Lehi Power design criteria and serve the development's load at full buildout.

Analysis of the load addition in increments over seven years shows which year new capacity is needed. Littlefield substation transformers and feeders have capacity for the new load added in 2023 through 2026, but additional load growth beyond 2026 would require new capacity in the form of a new substation, transformer, and feeders. The table that shows this analysis is in Figure 4 in the appendix.

Required System Additions: There are several system improvements and additions required in this area for connecting the estimated 10.62 MW (11.18 MVA) load for the Micron site development. The projects are listed in Table 5.

Table 5--Required System Additions

#	Project Description	Year Needed	Summary
1	Cross SR-92 with 822 & tie to 813	2023	Bore under SR-92 and two aqueducts. Tie 822 and 813. Feed new load from 822. *This project is in planning at Lehi Power for 2021-22 to make a loop feed for 813.*
2	Connect 812 to 821	2024	Extend 812 along Bull River Rd. Bore under SR-92 and two aqueducts. Tie 812 and 821. Transfer load from 821 to 812. Feed new development load from 821.
3	New Substation with 4 new feeders	2027	Build a new substation with one 33 MVA transformer and 4 new feeders. Tap the RMP 138 kV transmission line and connect to the new substation. Tie two new feeders from the new substation to 821 and 822. Use the other two new feeders to serve load east of new substation.

Projects #1 and #2 install new crossings of SR-92 extending Littlefield substations feeders to points on the north side of SR-92 where they can be used to serve the load of the development.

Project #3 is an additional substation transformer with four new feeders that is needed to serve the development load beyond 2026 to full build out. Property for the substation—zoned as public facilities—will need to be provided. The Rocky Mountain Power 138 kV transmission line will need to be tapped to feed the new substation. Two of the four new feeders from the substation feed the area east of the new substation and two other feeders from the new substation are needed to tie to 821 and 822.

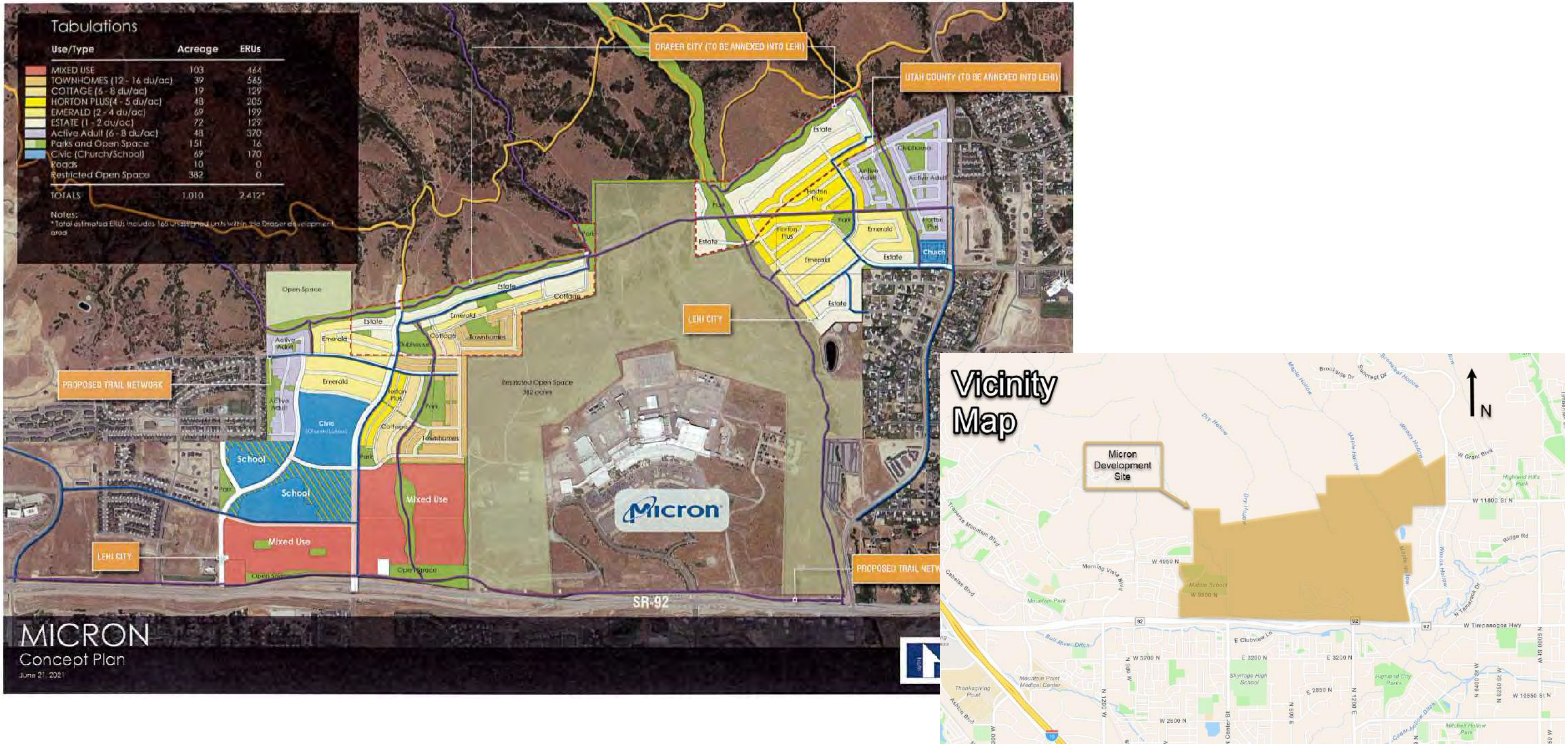
All feeders need to be installed in public utility easements where they are accessible to Lehi City Power's heavy equipment. Figure 3 in the Appendix shows most feeders following the roads in the development concept. The route shown to connect new feeders to the area east of the new substation is shown following the proposed trail network since this was the only improvement indicated in the area. This route will need to be built to be accessible to the utility's heavy equipment, or another suitable route must be identified. Connection of power and other utilities (water, sewer, etc.) to the east area of the development will likely follow the same route.

The drawings in the Appendix are based on the development layouts provided by D.R. Horton and have been marked-up to show existing and required substations and power distribution feeders. Final layouts are subject to change before final approval. The drawings in this report are preliminary and not for construction.

Summary: The estimated load of the Micron Site development is 10.62 MW (11.18 MVA) depending on the final unit types and unit numbers that are ultimately built. There is not enough existing capacity on the existing Littlefield substation and feeders in the area for the load at full buildout. To serve the estimated load of this development an additional substation and feeders are needed. The Rocky Mountain Power 138 kV transmission line will need to be tapped to feed the new substation.

Maps/Drawings

Figure 1. Development Concept and Vicinity Map



Tabulations

Use/Type	Acreage	ERUs
🟥 MIXED USE	103	464
TOWNHOMES (12 - 16 du/ac)	39	565
COTTAGE (6 - 8 du/ac)	19	129
HORTON PLUS(4 - 5 du/ac)	48	205
EMERALD (2 - 4 du/ac)	69	199
ESTATE (1 - 2 du/ac)	72	129
Active Adult (6 - 8 du/ac)	48	370
🟩 Parks and Open Space	151	16
🟦 Civic (Church/School)	69	170
Roads	10	0
Restricted Open Space	382	0
TOTALS	1,010	2,412*

Notes:
*Total estimated ERUs includes 165 unassigned units within the Draper development area

Maps/Drawings

Figure 2. Lehi City Power Substations and Feeders

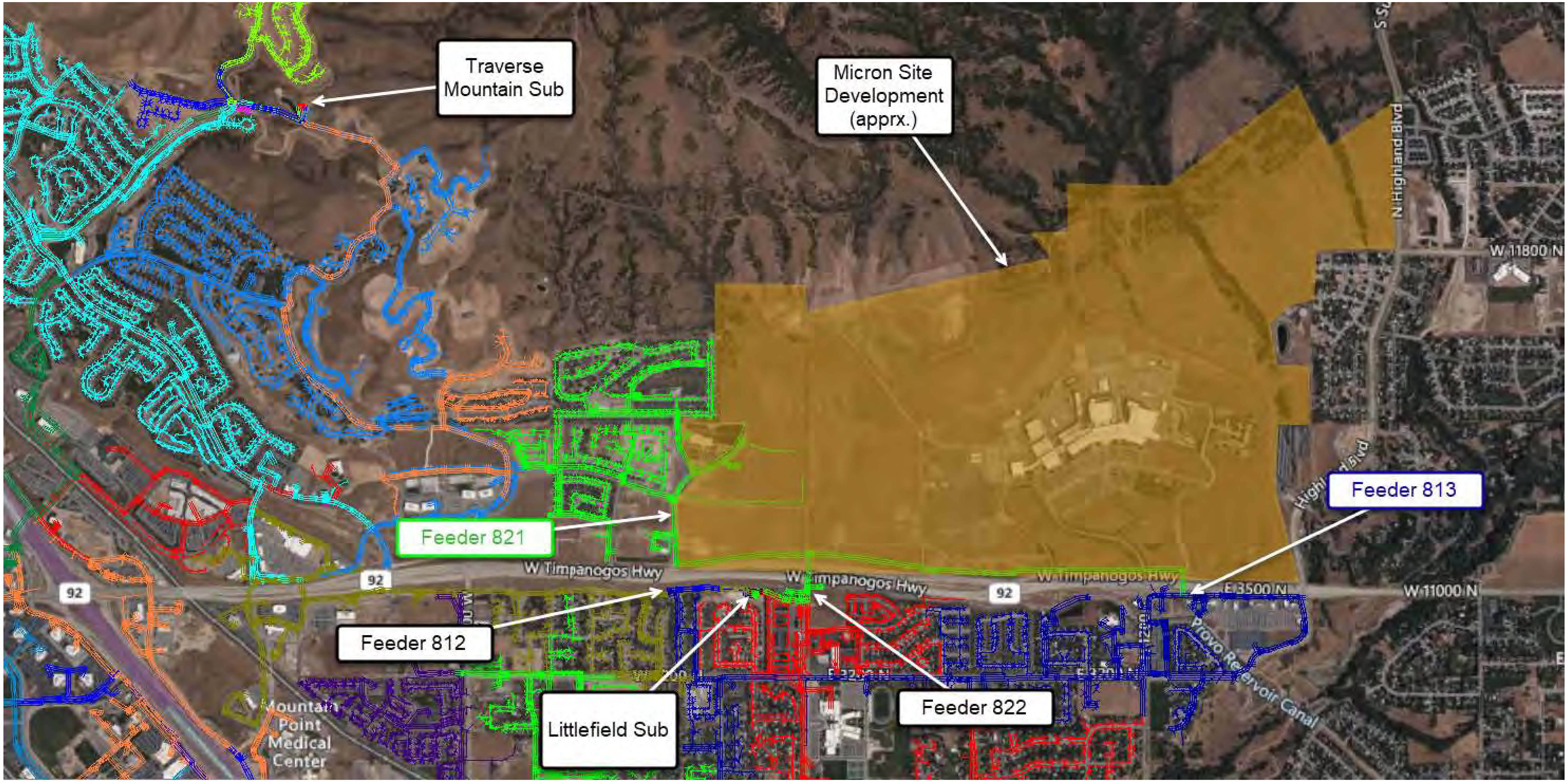
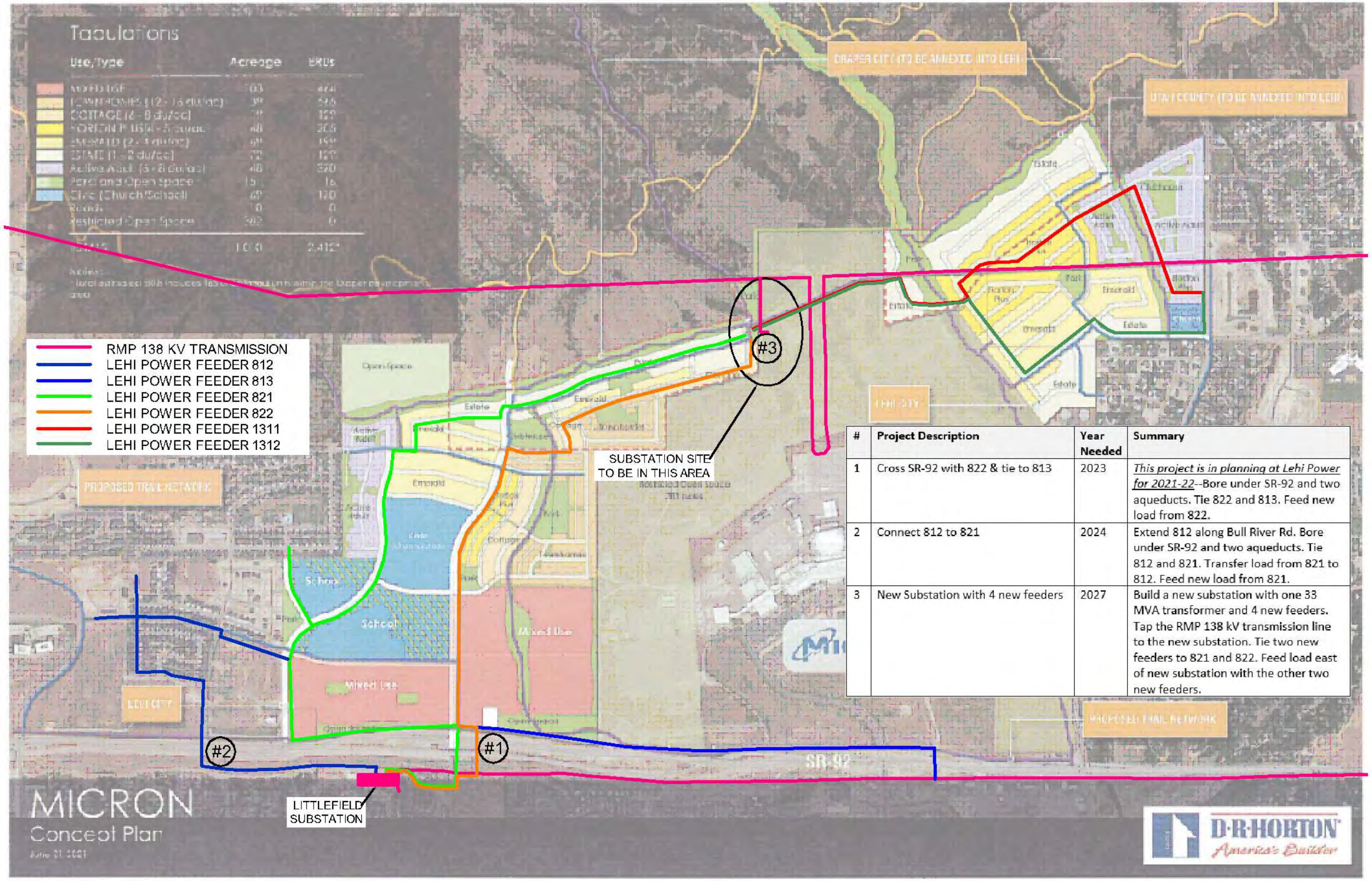


Figure 3. New Substation and Feeders Required at Full Buildout



#	Project Description	Year Needed	Summary
1	Cross SR-92 with 822 & tie to 813	2023	*This project is in planning at Lehi Power for 2021-22*--Bore under SR-92 and two aqueducts. Tie 822 and 813. Feed new load from 822.
2	Connect 812 to 821	2024	Extend 812 along Bull River Rd. Bore under SR-92 and two aqueducts. Tie 812 and 821. Transfer load from 821 to 812. Feed new load from 821.
3	New Substation with 4 new feeders	2027	Build a new substation with one 33 MVA transformer and 4 new feeders. Tap the RMP 138 kV transmission line to the new substation. Tie two new feeders to 821 and 822. Feed load east of new substation with the other two new feeders.

Figure 4. Substation and Feeder Loading Analysis for Full Buildout

					Forecast with Micron Site Development on Littlefield Sub		**Forecast with Micron Site Development on Littlefield Sub**		**Forecast with Micron Site Development on Littlefield Sub**		**Forecast with Micron Site Development on Littlefield Sub**		**Forecast with Micron Site Development on Littlefield Sub and New Sub**		**Forecast with Micron Site Development on Littlefield Sub and New Sub**		**Forecast with Micron Site Development on Littlefield Sub and New Sub**	
					2023		**2024**		**2025**		**2026**		**2027**		**2028**		**2029**	
Substation	**Transformer**	**Feeder**	**100% Capacity***	**Units**	**Load**	**Capacity Utilization (%)**	**Load**	**Capacity Utilization (%)**	**Load**	**Capacity Utilization (%)**	**Load**	**Capacity Utilization (%)**	**Load**	**Capacity Utilization (%)**	**Load**	**Capacity Utilization (%)**	**Load**	**Capacity Utilization (%)**
Littlefield	**T1**		33	MVA	14.74	45%	15.24	46%	15.5	47%	15.78	48%	15.41	47%	15.7	48%	16	48%
		812	500	amps	172	34%	172	34%	172	34%	172	34%	172	34%	172	34%	172	34%
		813	500	amps	279	56%	286	57%	293	59%	300	60%	278	56%	286	57%	294	59%
Littlefield	**T2**		33	MVA	13.07	40%	15.05	46%	17.04	52%	19.04	58%	18.82	57%	19.27	58%	19.74	60%
		821	500	amps	228	46%	233	47%	238	48%	243	49%	188	38%	193	39%	199	40%
		822	500	amps	0	0%	73	15%	146	29%	219	44%	249	50%	249	50%	249	50%
New Micron Devel. Sub	**T1**		33	MVA									2.89	9%	4.47	14%	6.05	18%
		CB11	500	amps									61	12%	134	27%	207	41%
		CB12	500	amps									73	15%	73	15%	73	15%

* Lehi Power design criteria limits normal operating capacity of transformers and feeders to 60%

Skye Area Plan

SEWER SECTION

July 18, 2022

STATE OF UTAH
BENJAMIN C.
TUCKETT
No. 9786726
07-18-2022
REGISTERED PROFESSIONAL ENGINEER

Prepared By:

LEI
ENGINEERS
SURVEYORS
PLANNERS

3302 N Main Street
Spanish Fork, UT 84660
(801) 798-0555

Skye

Sewer

Design Criteria:

Minimum Pipe Size: 8”

Minimum Slope: 0.34%

Design Flow:

Residential	100 gallons per person per day (UT R317-3-2.2.B.1) 3.8 capita / Dwelling Unit
Mixed Use	794 ERUs allocated with Land Use Plan 3.8 capita / ERU 100 gpd / capita
Civic	29 ERUs allocated with Land Use 3.8 capita / ERU 100 gpd / capita
School	24 ERUs allocated with Land Use Plan 3.8 capita / ERU 100 gpd / capita
Peak Factor	3.0

Summary of Results (Project Sizes):

Design Flow (West A):	Flow:	Pipe Size Req’d:
Pipe 1	16 gpm (peak)	8” @ 0.34%
Pipe 2	675 gpm (peak)	8” @ 1.56% or 10” @ 0.48%
Pipe 3	694 gpm (peak)	8” @ 1.65% or 10” @ 0.50%
Pipe 4	732 gpm (peak)	8” @ 1.83% or 10” @ 0.56%
Pipe 5	798 gpm (peak)	8” @ 2.17% or 10” @ 0.66%.
Pipe 6	1,081 gpm (peak)	8” @ 3.98% or 10” @ 1.22%
Pipe 7	1,093 gpm (peak)	8” @ 4.07% or 10” @ 1.24%
Pipe 8	1,428 gpm (peak)	18” @ 0.12%
Pipe 9	30 gpm (peak)	8” @ 0.34%
Pipe 10	76 gpm (peak)	10” @ 0.25%
Pipe 11	442 gpm (peak)	8” @ 0.67%
Pipe 12	525 gpm (peak)	12” @ 0.20%
Pipe 13	2,135 gpm (peak)	18” @ 0.21%
Total Flow West Side A	**2,135 gpm (peak)**	

Design Flow (East B):	**Flow:**	**Pipe Size Req'd:**
Pipe 14	110 gpm (peak)	8" @ 0.34%
Pipe 15	134 gpm (peak)	8" @ 0.34%
Pipe 16	135 gpm (peak)	8" @ 0.34%
Pipe 17	49 gpm (peak)	8" @ 0.34%
Pipe 18	43 gpm (peak)	8" @ 0.34%
Pipe 19	83 gpm (peak)	8" @ 0.34%
Pipe 20	143 gpm (peak)	8" @ 0.34%
Pipe 21	62 gpm (peak)	8" @ 0.34%
Pipe 22	104 gpm (peak)	8" @ 0.34%
Pipe 23	321 gpm (peak)	8" @ 0.37%
Pipe 24	473 gpm (peak)	8" @ 0.77%
Total Flow East Side B	**473 gpm (peak)**	

See Appendix A for an exhibit showing each pipe location and Appendix B for a detailed breakdown of sewer flows and pipe sizing.

Allowable Flows:

West Side:

The original Micron area plan called for an allowable discharge of 1,851 gallons per minute (gpm) into the existing sewer system in 500 W, as well as 62 gpm into the existing outfall near 600 E. Based on recent monitoring of the existing 600 E outfall, it was found that capacity there is lower than expected. The city has requested to route all discharge from the west side into the existing 500 W outfall. The overall total projected flow into this outfall is expected to be 1,897 gpm. For future planning purposes, the 500 W trunkline was sized to accommodate flows from an additional 300 ERU's above the Skye area plan. This increases the total discharge into that line to 2,135 gpm.

East Side:

The maximum allowable flow on the east side of Skye was determined based on an agreement between Lehi City and the Timpanogos Special Service District (TSSD). This agreement states that a maximum average flow of 227,000 gallons per day (GPD) is allowed to flow into the existing sewer system. Using a peaking factor of 3, this converts to approximately 473 gpm. The new area plan proposes that 473 gpm will flow into the system.

Methodology:

All pipes were designed according to the Utah administrative Rules as listed below:

R317-3-2. Sewers.

2.1. General. Construction of a new sewer system project may not begin unless the applicant has submitted an engineering report detailing the design, and construction plans to the executive secretary for review and approval evidenced by a construction permit. The executive secretary will not normally review construction plans for extensions of the existing sewer systems to new areas or replacement of sanitary sewers in the existing sewer systems unless requested or required by state or federal funding programs. Rain water from roofs, streets, and other areas, and ground water from foundation drains must not be allowed to enter the sewer system through planning, design and construction quality assurance and control measures.

2.2. Basis of Design

A. Planning Period. Sewers should be designed for the estimated ultimate tributary population or the 50-year planning period, whichever requires a larger capacity. The executive secretary may approve the design for reduced capacities provided the capacity of the system can be readily increased when required. The maximum anticipated capacity required by institutions, industrial parks, etc. must be considered in the design.

B. Sewer Capacity. The required sewer capacity shall be determined on the basis of maximum hourly domestic sewage flow; additional maximum flow from industrial plants; inflow; ground water infiltration; potential for sulfide generation; topography of area; location of sewage treatment plant; depth of excavation; and pumping requirements.

1. Per Capita Flow. New sewer systems shall be designed on the basis of an annual average daily rate of flow of 100 gallons per capita per day (0.38 cubic meter per capita per day) unless there are data to indicate otherwise. The per capita rate of flow includes an allowance for infiltration/inflow. The per capita rate of flow may be higher than 100 gallons per day (0.38 cubic meter per day) if there is a probability of large amounts of infiltration/inflow entering the system.

2. Design Flow

a. Laterals and collector sewers shall be designed for 400 gallons per capita per day (1.51 cubic meters per capita per day).

b. Interceptors and outfall sewers shall be designed for 250 gallons per capita per day (0.95 cubic meter per capita per day), or rates of flow established from an approved infiltration/inflow study.

c. The executive secretary will consider other rates of flow for the design if such basis is justified on the basis of supporting documentation.

C. Design Calculations. Detailed computations, such as the basis of design and hydraulic calculations showing depth of flow, velocity, water surface profiles, and gradients shall be submitted with plans.

2.3. Design and Construction Details

A. Minimum Size

1. No gravity sewer shall be of less than eight inches (20 centimeters) in diameter.
2. A 6-inch (15 centimeters) diameter pipe may be permitted when the sewer is serving only one connection, or if the applicant justifies the need for such diameter on the basis of supporting documentation.

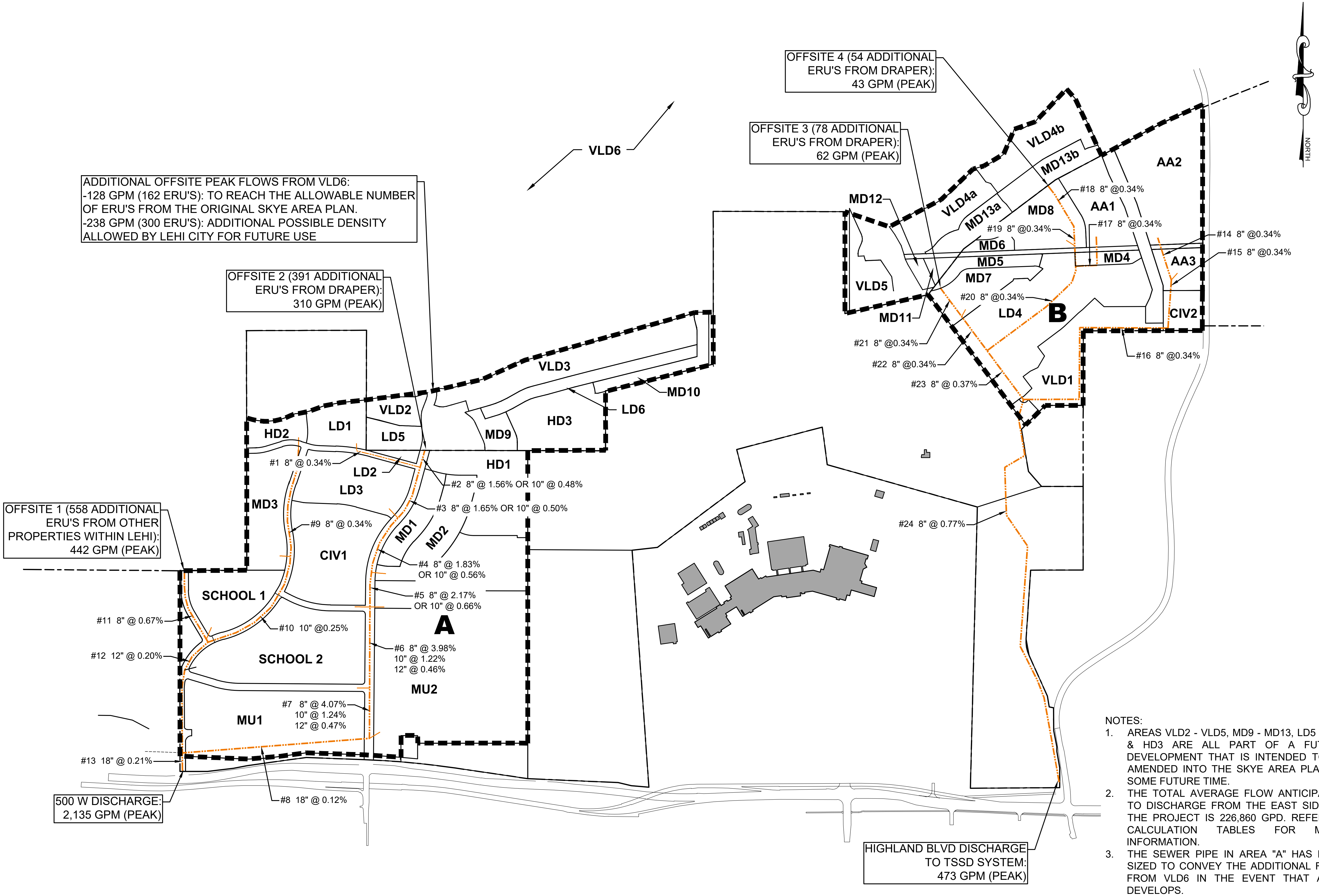
B. Depth. Sewers should be sufficiently deep to receive sewage from basements and to prevent freezing. Insulation shall be provided for sewers that cannot be placed at a depth sufficient to prevent freezing.

C. Odor and Sulfide Generation. The design shall incorporate features to control and mitigate odor and sulfide generation in sewers. Such features may include steeper slope to achieve higher velocity, reaeration through induced turbulence, etc.

D. Slope

1. The pipe diameter and slope shall be selected to obtain velocities to minimize settling problems.
2. All sewers shall be designed and constructed to give mean velocities of not less than 2 feet per second (0.61 meter per second), when flowing full, based on Manning's formula using an n value of 0.013.
3. Sewers shall be laid with uniform slope between manholes.
4. Table R317-3-2.3(D)(4) shows the minimum slopes which shall be provided; however, slopes greater than these are desirable.

Appendix A: Pipe Location Exhibit



OFFSITE 4 (54 ADDITIONAL ERU'S FROM DRAPER): 43 GPM (PEAK)

OFFSITE 3 (78 ADDITIONAL ERU'S FROM DRAPER): 62 GPM (PEAK)

ADDITIONAL OFFSITE PEAK FLOWS FROM VLD6:
-128 GPM (162 ERU'S): TO REACH THE ALLOWABLE NUMBER OF ERU'S FROM THE ORIGINAL SKYE AREA PLAN.
-238 GPM (300 ERU'S): ADDITIONAL POSSIBLE DENSITY ALLOWED BY LEHI CITY FOR FUTURE USE

OFFSITE 2 (391 ADDITIONAL ERU'S FROM DRAPER): 310 GPM (PEAK)

OFFSITE 1 (558 ADDITIONAL ERU'S FROM OTHER PROPERTIES WITHIN LEHI): 442 GPM (PEAK)

500 W DISCHARGE: 2,135 GPM (PEAK)

HIGHLAND BLVD DISCHARGE TO TSSD SYSTEM: 473 GPM (PEAK)

NOTES:

1. AREAS VLD2 - VLD5, MD9 - MD13, LD5 - LD6 & HD3 ARE ALL PART OF A FUTURE DEVELOPMENT THAT IS INTENDED TO BE AMENDED INTO THE SKYE AREA PLAN AT SOME FUTURE TIME.
2. THE TOTAL AVERAGE FLOW ANTICIPATED TO DISCHARGE FROM THE EAST SIDE OF THE PROJECT IS 226,860 GPD. REFER TO CALCULATION TABLES FOR MORE INFORMATION.
3. THE SEWER PIPE IN AREA "A" HAS BEEN SIZED TO CONVEY THE ADDITIONAL FLOW FROM VLD6 IN THE EVENT THAT AREA DEVELOPS.

LEI
ENGINEERS
SURVEYORS
PLANNERS
3302 N. Main Street
Spanish Fork, UT 84660
Phone: 801.798.0555
Fax: 801.798.9393
office@lei-eng.com
www.lei-eng.com

SKYE
LEHI, UTAH

SEWER PLAN

REVISIONS
1 -
2 -
3 -
4 -
5 -

LEI PROJECT #: 2020-0067
DRAWN BY: RWH
DESIGNED BY: BCT
SCALE: 1" = 1000'
DATE: 07/18/2022

SHEET
A

Appendix B: Detailed Pipe Flows and Pipe Sizing

SKYE AREA PLAN

Sewer Flows - West Side A

	Land Use	Area	Residential Units or ERU's	Capita/ERU	Capita	Flow/Capita	Average Flow	Peak Factor	Peak Hourly Flow	
		(acres)	(units)	(capita/unit)	(capita)	(gpd/capita)	(gpd)		(gpd)	(gpm)
🟥	Mixed Use	103.02	794	3.8	3,017	100	301,700	3.0	905,100	629
🟦	Civic	22.59	27	3.8	103	100	10,300	3.0	30,900	21
🟨	LD	24.24	72	3.8	273	100	27,300	3.0	81,900	57
🟪	HD	20.72	228	3.8	866	100	86,600	3.0	259,800	180
🟨	MD	25.17	86	3.8	326	100	32,600	3.0	97,800	68
🟧	MD	11.42	55	3.8	209	100	20,900	3.0	62,700	44
🟪	School	42.98	24	3.8	91	100	9,100	3.0	27,300	19
🟩	Offsite 1	290.18	558	3.8	2,120	100	212,040	3.0	636,120	442
🟩	Offsite 2	66.37	391	3.8	1,486	100	148,580	3.0	445,740	310
🟩	VLD6 (Additional Offsite)	N/A	462	3.8	1,756	100	175,560	3.0	526,680	366
	Total West Side A		**2,697**		**10,247**		**1,024,680**		**3,074,040**	**2,135**

Sewer Flows - East Side B

	Land Use	Area	Residential Units or ERU's	Capita/ERU	Capita	Flow/Capita	Average Flow	Peak Factor	Peak Hourly Flow	
		(acres)	(units)	(capita/unit)	(capita)	(gpd/capita)	(gpd)		(gpd)	(gpm)
🟪	AA	41.03	236	3.8	897	100	89,700	3.0	269,100	187
🟦	Civic	4.44	2	3.8	8	100	800	3.0	2,400	2
🟨	LD	35.72	90	3.8	342	100	34,200	3.0	102,600	71
⬜	VLD	15.71	20	3.8	76	100	7,600	3.0	22,800	16
🟨	MD	28.20	117	3.8	444	100	44,400	3.0	133,200	93
🟩	Offsite 3	33.75	78	3.8	296	100	29,640	3.0	88,920	62
🟩	Offsite 4	19.59	54	3.8	205	100	20,520	3.0	61,560	43
	Total East Side C		**597**		**2,269**		**226,860**		**680,580**	**473**

Sewer Flows - Offsite Detailed

	Offsite Area	Land Use	Area	Residential Units or ERU's	Capita/ERU	Capita	Flow/Capita	Average Flow	Peak Factor	Peak Hourly Flow	
			(acres)	(units)	(capita/unit)	(capita)	(gpd/capita)	(gpd)		(gpd)	(gpm)
🟩	Offsite 1	Canyon Hills (Existing)	78.67	244	3.8	927	100	92,720	3.0	278,160	193
🟩		Peck Property (Lehi - 1.5 units/ac)	58.89	88	3.8	334	100	33,440	3.0	100,320	70
🟩		Entrata (Draper - 1.5 units/ac))	149.28	224	3.8	851	100	85,120	3.0	255,360	177
🟩		Canyon Hills Church	3.34	2	3.8	8	100	760	3.0	2,280	2
	Total Offsite 1			**558**		**2,120**		**212,040**		**636,120**	**442**
🟩	Offsite 2	VLD2	4.22	10	3.8	38	100	3,800	3.0	11,400	8
🟩		VLD3	20.60	50	3.8	190	100	19,000	3.0	57,000	40
🟩		LD5	4.27	16	3.8	61	100	6,080	3.0	18,240	13
🟩		LD6	7.42	46	3.8	175	100	17,480	3.0	52,440	36
🟩		HD3	15.06	241	3.8	916	100	91,580	3.0	274,740	191
🟩		Clubhouse	5.81	10	3.8	38	100	3,800	3.0	11,400	8
🟩		MD9	3.70	10	3.8	38	100	3,800	3.0	11,400	8
🟩		MD10	5.28	8	3.8	30	100	3,040	3.0	9,120	6
	Total Offsite 2			**391**		**1,486**		**148,580**		**445,740**	**310**
🟩	Offsite 3	VLD4a	10.43	30	3.8	114	100	11,400	3.0	34,200	24
🟩		VLD5	6.81	16	3.8	61	100	6,080	3.0	18,240	13
🟩		MD11	1.95	6	3.8	23	100	2,280	3.0	6,840	5
🟩		MD12	1.70	4	3.8	15	100	1,520	3.0	4,560	3
🟩		MD13a	5.08	22	3.8	84	100	8,360	3.0	25,080	17
	Total Offsite 3			**78**		**296**		**29,640**		**88,920**	**62**
🟩	Offsite 4	VLD4b	12.56	31	3.8	118	100	11,780	3.0	35,340	25
🟩		MD13b	7.03	23	3.8	87	100	8,740	3.0	26,220	18
	Total Offsite 4			**54**		**205**		**20,520**		**61,560**	**43**
🟩	Additional Offsite	VLD6 - To meet A.P. allowable flows	N/A	162	3.8	616	100	61,560	3	184,680	128
🟩		VLD6 - Extra ERU's allowed for future planning	N/A	300	3.8	1,140	100	114,000	3	342,000	238
	Total Additional Offsite			**462**		**1,756**		**175,560**		**526,680**	**366**

Skye Area Plan

Sewer Pipe Sizing

Pipe ID.	Contributing Area (ac)	Peak Hourly Flow (gpm)	Peak Hourly Flow (cfs)	Pipe Dia. (inches)	Min Slope (%)	Qpipe (cfs)	Velocity (fps)	Pipe Check
1	**LD1**	16	0.04	8	0.34	0.70	2.02	OK
2	**Offsite 2, VLD6**	675	1.50	8	1.56	1.51	4.32	OK
3	**Offsite 2, VLD6, LD1, LD2**	694	1.55	8	1.65	1.55	4.45	OK
4	**Offsite 2, VLD6, LD1, LD2, LD3**	732	1.63	8	1.83	1.63	4.68	OK
5	**Offsite 2, VLD6, LD1, LD2, LD3, MD1, MD2**	798	1.78	8	2.17	1.78	5.10	OK
6	**Offsite 2, VLD6, LD1, LD2, LD3, MD1, MD2, HD1, Civ1, MU2 (partial)**	1081	2.41	8	3.98	2.41	6.91	OK
7	**Offsite 2, VLD6, LD1, LD2, LD3, MD1, MD2, HD1, Civ1, MU2 (partial), School 2**	1093	2.44	8	4.07	2.44	6.98	OK
8	**Offsite 2, VLD6, LD1, LD2, LD3, MD1, MD2, HD1, Civ1, MU2, School 2**	1428	3.18	18	0.12	3.64	2.06	OK
9	**HD2**	30	0.07	8	0.34	0.70	2.02	OK
10	**HD2, MD3**	76	0.17	10	0.25	1.09	2.01	OK
11	**Offsite 1**	442	0.98	8	0.67	0.99	2.83	OK
12	**HD2, MD3, Offsite 1, School 1**	525	1.17	12	0.20	1.59	2.03	OK
13	**Offsite 2, VLD6, LD1, LD2, LD3, MD1, MD2, HD1, Civ1, MU2, School 2, HD2, MD3, Offsite 1, School 1, MU1**	**2135**	4.76	18	0.21	4.81	2.72	OK
14	**AA2/CH**	110	0.25	8	0.34	0.70	2.02	OK
15	**AA2/CH, AA3**	134	0.30	8	0.34	0.70	2.02	OK
16	**AA2/CH, AA3, Civ2**	135	0.30	8	0.34	0.70	2.02	OK
17	**AA1**	49	0.11	8	0.34	0.70	2.02	OK
18	**Offsite 4**	43	0.10	8	0.34	0.70	2.02	OK
19	**Offsite 4, MD8, MD6**	83	0.19	8	0.34	0.70	2.02	OK
20	**Offsite 4, MD8, MD4, AA1**	143	0.32	8	0.34	0.70	2.02	OK
21	**Offsite 3**	62	0.14	8	0.34	0.70	2.02	OK
22	**Offsite 3, MD7, MD5**	104	0.23	8	0.34	0.70	2.02	OK
23	**Offsite 3, MD7, MD5, Offsite 4, MD8, MD4, AA1, LD4/CH**	321	0.72	8	0.37	0.73	2.11	OK
24	**Offsite 3, MD7, MD5, Offsite 4, MD8, MD4, AA1, LD4/CH, AA2/CH, AA3, Civ2, VLD1**	**473**	1.05	8	0.77	1.06	3.04	OK

Skye Area Plan

STORM DRAIN SECTION

July 12, 2022

STATE OF UTAH
BT
BENJAMIN C.
TUCKETT
No. 9786726
7/12/2022
REGISTERED PROFESSIONAL ENGINEER

Prepared By:

LEI
ENGINEERS
SURVEYORS
PLANNERS

3302 N Main Street
Spanish Fork, UT 84660
(801) 798-0555

Design Criteria:	Area west of Texas Instruments Facility – Maximum allowable discharge into existing storm system in SR-92 to be 196 cfs (See exhibits A and B in Appendix B) Area east of Texas Instruments Facility – *Pond 2*: Maximum allowable discharge rate for native ground: 0.1 cfs/acre Maximum allowable discharge rate for developed ground: 0.2 cfs/acre *Pond 3*: Maximum allowable discharge into existing storm system to be 72.65 cfs per historic rates as indicated by existing pipe Infiltration – Assumed through bottom of ponds as recommended by geotechnical report. Specific pond infiltration rates can be found in Table 2, and the infiltration report is provided in Appendix C. All ponds were sized to handle the runoff from the 100-year 24-hour storm and will be designed to retain the 80th percentile storm to comply with local and state MS4 requirements. All trunklines and pipes were sized to accommodate the runoff from a 10-year storm. Pipes and inlets that discharge to the detention ponds were sized for the 100-year storm to ensure that all storm runoff is captured and conveyed to the ponds.
Minimum pipe size: Pipe Type:	12” Pipe type per Lehi City design standards.
Summary of Results:	Three ponds will be required to detain the runoff flows from the project. Two of the three ponds are proposed, and one will need to be expanded to fit the projected runoff. See Appendix E for exhibits showing the locations of all ponds, pipes, and contributing areas. • Pond 1 is an existing pond that will need to be resized to detain the excess runoff from the new development. • Ponds 2 and 3 are proposed ponds to be placed within the project. Pond 2 will discharge into the existing Maple Hollow drainage; Pond 3 will discharge into an existing pipeline constructed for upstream historic flows Seven other detention ponds are currently located on or near the existing Texas Instruments property. • Pond A will be removed with the new development, and all discharge from the contributing area will be caught in pipes and directed through the project to be detained in Pond 1. • Ponds B-D will remain undisturbed. It is assumed that they have been constructed with sufficient capacity to handle all flows from the Texas Instruments facility as well as any applicable upstream flows. • Pond E is an existing pond located in Canyon Hills. The discharge used in this study is the design discharge from the subdivision, which includes pass-through flows from the upper areas labeled as Offsite 1 and Offsite 2. • Pond F is an existing detention pond that will be removed with the new development. A portion of the flows going to this pond will be conveyed directly to the existing system at 500 West. • Pond G is an existing detention pond that will be removed with the new development. All flows previously discharging to this pond will be conveyed to and detained in Pond 1.

Methodology:

All basin and runoff modeling was done with the Autodesk Storm and Sanitary Analysis software (SSA). The model was run using the Soil Conservation Service (SCS) Technical Release-55 (TR-55) method. Subbasins were entered into the model based on each land use “pod”. Each subbasin in the model was assigned a curve number and time of concentration based on soil type, slope, and proposed land use. Table 1 on the following page provides a summary of each subbasin and its corresponding area, curve number, and time of concentration. Refer to the exhibits in Appendix E for the location of all subbasins and pipes.

Curve Numbers: The TR-55 method uses curve numbers (CN) to represent the amount of rainfall that will runoff a particular surface. The curve number is based on the ground cover as well as the hydrologic soil classification. Using local hydrologic soil groups published by the Natural Resources Conservation Service (NRCS), as well as recommended curve numbers for land use from *Stormwater Conveyance Modeling and Design* from Haestad and Durrans, each subbasin was assigned a composite curve number for use in calculating runoff. Refer to Appendix D for the NRCS soil map and CN values.

Time of Concentration: The time of concentration is the time it takes for the rainfall to travel from the hydraulically most distant point of each subbasin to the bottom, or outfall, of that subbasin. The time of concentration was calculated based on the methodology outlined in TR-55 published by the United States Department of Agriculture (USDA), dated June 1986. Based on this methodology, Manning’s Kinematic Equation was used for the first 300 feet of overland flow to find the sheet flow time. For the next section of flow, which is represented by shallow concentrated flow, the velocity of the flow was determined using the equation $v = 16.1345 * \sqrt{S}$ for offsite/open space areas and $v = 20.3282 * \sqrt{S}$ for developed areas. The third and final section of flow is the open channel flow once the runoff enters and is conveyed by the storm drain pipes or channels. For this section, an assumed velocity of 3 feet per second (fps) was used to estimate the travel time. Once all these separate times were calculated they were added up as the total time of concentration. For smaller subbasins, a minimum time of concentration of 6 minutes was used per guidelines within the SCS method.

Design Rainfall and Storm Depth: The storm depth is necessary to estimate the total amount of rain that will fall during a specific storm event. Based on the TR-55 methodology the storm was modeled using the SCS type 2 storm event. All three new detention ponds were sized to accommodate the 24-hour 100-year storm. Rainfall depths were chosen based on NOAA Atlas 14, Volume 1, Version 5, and are located in Appendix A.

Subbasin Discharge: The peak discharge from each subbasin was calculated within the model as described above using the SCS method. Certain subbasins were assumed to detain runoff onsite and discharge into the proposed system at a specified rate. School 1 and School 2 have existing detention systems onsite. Therefore, all of School 1 and the west side of School 2 were modeled to discharge into the system at a rate of 0.2 cfs/acre. The discharge from the east side of the School 2 site is being caught in existing underground retention. Additionally, all mixed use and civic areas will be required to detain storm water onsite at a rate of 0.2 cfs/acre. Offsite 1 and Offsite 2 flow into the existing Canyon Hills stormwater system, which discharges at a controlled rate of approximately 27.6 cfs based on the original design of that system.

Table 1: Summary of Subbasins with Associated Areas, Curve Numbers, and Times of Concentration

Offsite Areas and Pods			
Subbasin	**Area (ac)**	**Curve Number**	**Tc (min)**
AA1	11.17	89.89	20.08
AA2	21.54	89.27	28.92
AA3	5.31	89.43	22.80
Civic 1	22.58	85.81	6.84
Civic 2	4.47	86.88	6.00
Clubhouse	4.77	61.00	6.00
HD1	4.42	84.08	14.38
HD2	3.02	89.00	17.51
HD3	10.87	82.00	18.55
HD4	15.06	85.04	26.27
LD1	7.08	74.44	24.29
LD2	1.01	72.00	23.88
LD3	16.14	77.79	27.55
LD4	23.96	80.69	33.00
LD5	9.11	81.00	44.96
LD6	4.48	72.00	21.72
LD7	20.79	72.00	30.19
LD8	15.44	72.18	47.96
LD9	13.52	72.28	31.05
MD1	14.20	79.30	22.33
MD2	6.76	82.76	21.75
MD3	10.55	85.35	22.76
MD4	8.28	80.26	26.53
MD5	3.86	76.63	25.10
MD6	1.76	75.03	18.23
MD7	11.82	80.88	31.56
MD8	2.44	85.00	28.08
MD9	3.64	82.00	15.94
MD10	7.40	82.00	44.22
MD11	5.28	75.00	41.62
MD12	9.36	75.00	33.76
MD13	5.79	75.13	24.02
Mixed Use 1	17.87	92.67	6.39
Mixed Use 2	15.91	93.87	6.00
Mixed Use 3	19.33	87.33	14.51
Mixed Use 4	30.31	93.56	10.87
Mixed Used 5	33.65	92.13	8.80

Subbasin	Area (ac)	Curve Number	Tc (min)
Offsite 1	162.20	59.97	41.72
Offsite 2	94.34	64.11	66.48
Offsite 3	165.79	72.08	37.00
Offsite 4	131.80	78.39	35.39
Offsite 5	30.13	70.24	21.12
Open Space 1	0.28	61.00	6.54
Open Space 2	2.25	73.67	6.76
Open Space 3	3.71	72.50	21.19
Open Space 4	9.08	70.23	18.68
Open Space 5	1.65	65.21	13.96
Open Space 6	7.36	69.29	24.60
Open Space 7	1.07	74.00	6.00
Open Space 8	0.74	70.90	6.00
Open Space 9	0.68	61.00	13.39
Open Space 10	0.72	61.00	11.15
Park 1	1.65	61.00	7.67
Park 2	2.62	70.38	28.99
Park 3	3.10	74.00	33.93
Road - Left 1	0.87	97.00	6.00
Road - Left 2	2.67	97.00	7.43
Road - Left 3	3.93	97.00	7.48
Road - Left 4	2.41	97.00	8.17
Road - North	1.61	97.00	6.00
Road - Right 1a	1.67	97.00	7.60
Road - Right 1b	0.89	97.00	6.00
Road - Right 2	4.47	97.00	10.21
Road - Right 3	3.54	97.00	10.94
Road - Right 4	5.58	97.00	16.93
Restricted Open Space	76.81	75.54	58.98
School 1	12.71	80.95	6.00
School 2	14.66	80.29	7.88
VLD1	10.53	80.00	47.18
VLD2	5.20	80.00	43.44
VLD3	4.43	72.68	25.17
VLD4	7.58	70.29	20.51

System Discharges:

West Side

According to a study done by MW Brown, the Lehi City allowable discharge for the area west of the Texas Instruments facility, including adjacent properties, is **196.0 cfs** (See Drainage Agreement Exhibit B – Allowable Flow Rate in Appendix B). The SR-92 storm drain trunk line was designed to handle the 196.0 cfs peak offsite discharge from the Skye property and surrounding areas. The model in this study has been developed to size the detention pond with the appropriate discharge rate and provide a proposed drainage plan that will not exceed the 196.0 cfs of offsite drainage. Pond 1 and the existing outfall at 500 West will make up the west discharge of Skye. Pond 1 will detain flows and discharge into the existing system at 66.6 cfs. The existing detention pond near 500 W will be removed and the 100-year discharge from 500 W will flow undetained into the existing system at a rate of 67.48 cfs, still under the outfall capacity of 76.28 cfs as shown in the drainage agreement in Appendix B. The new drainage concept is intended to utilize the existing pipes in 500 W as much as possible to route the flows to the existing outfall in SR-92. Part of the existing pipe system routes drainage across the street into the pond through a series of smaller pipes. With the removal of the pond, new 36” pipes will need to be installed to extend the system past the pond and into the outfall in SR 92. The existing orifice near the pond will be removed and all pipes leading to the pond and running through the pond will be abandoned or removed as well. The combined discharge of Pond 1 and the 500 W outfall is 134.08 cfs, well under the allowed 196.0 cfs discharge. Refer to Table 2 for a summary of discharges from each pond. The Utah Department of Transportation (UDOT) has directed that the maximum allowable discharge into SR-92 is 0.2 cfs/acre. The 134.08 cfs discharge outlined above represents a discharge rate of 0.15 cfs/acre, well below the 0.2 cfs/acre allowed.

East Side

Pond 2

The east side drainage to Pond 2 will be restricted in a similar way the original area plan specified – 0.1 cfs/acre and 0.2 cfs/acre for native ground and developed ground, respectively. Pond 2 will discharge into the existing Maple Hollow drainage that sits to the west. See Table 2 below for a summary of each discharge from the project.

Pond 3

There is an existing storm drain line that captures historic drainage from the east side of the Skye area plan, as well as native areas above. It sits just to the north of the Dry Creek Highlands subdivision. Pond 3 will capture the runoff from the upstream area and discharge into this existing storm drain line at or below the existing pipe capacity (72.65 cfs), which is assumed to be the historic flow. Discharge from Pond 3 will not exceed this capacity and will remain consistent with historic flows. See Table 2 below for a summary of each discharge from the project.

Table 2: Discharge Information

Pond	Contributing Area (acre)	Infiltration Rate (in/hr)	Peak Inflow (cfs)	Required Volume (cf)	Required Volume (acre-ft)	100-Year Peak Detained Discharge (cfs)	Allowable Discharge (cfs)
Pond 1	515.12	15.00	195.60	257,646	5.91	66.6	
500 W Discharge	366.37	-	67.48	-	-	67.48 (undetained)	
Total West Discharge	**881.46**		**263.09**			**134.08**	**196**
Pond 2	129.12[1]	10.8	86.53	109,869	2.52	25.82	25.82
Pond 3	191.06	15.00	131.78	121,259	2.78	72.63	72.65[2]

Notes:

1. *Pond 2 has no undeveloped contributing areas.*
2. *Discharge of Pond 3 is capped at 72.65 cfs per existing pipe capacity*

Low Impact Development (LID) Requirement:

The storm drain system for the new development will follow local & state requirements for the MS4 program. This will include designing all detention ponds with the ability to retain the 80th percentile volume while releasing historic discharge into the existing system. Any commercial sites within the development that will need to detain onsite will be required to retain the 80th percentile storm and will be encouraged to implement other LID practices.

Pond Sizing:

The sizing of the ponds for the development depended largely on the maximum allowable discharges mentioned above, as well as infiltration into the ground. The geotechnical report provided infiltration rates near the areas of Ponds 1, 2, and 3. A factor of safety of 2.5 was applied to the rates at Pond 2 and 3 for a more conservative estimate. The infiltration rate for Pond 1 was exceptionally high (240 in/hr), so a factor of safety of 16 was used to provide a more reasonable rate consistent with the other ponds. These rates were used in calculating ground infiltration through the bottom of the pond. Refer to the infiltration test results in Appendix C for more details. All ponds are designed to detain the runoff from the 100-year 24-hour storm and to discharge within the maximum allowable discharge requirements presented above.

Pipe and Channel Sizing:

All pipes were sized for the 10-year peak flows using the Manning's Equation within the SSA model. According to this method, pipe size is based on peak inflow from contributing areas, the approximate slope of the project based on existing contours, and an assumed manning's n value of 0.013. Table 3 below shows all expected pipe sizing within the model. See Appendix E for locations of each pipe.

All channels shown in the model are existing channels that will be used to convey water to and from detention ponds. Dimensions of the existing channels were modeled to ensure that they had sufficient capacity for the flows. See Table 4 below for channel sizing and Appendix F for channel cross section designs.

Debris Basins:

Debris basins will be required above the project to prevent debris from coming into the development during flood events. These basins were sized and designed in collaboration with GeoStrata geotechnical engineers to capture all debris and storm runoff. The debris basins will be owned and maintained by the HOA. An exhibit from the geotechnical report showing the proposed locations of the debris basins can be seen in Appendix G.

Conclusion:

An SSA model was developed to size detention basins and trunk lines for the Skye development. One existing pond will be upsized, and two ponds will be added on the east side. All discharges from the project will remain under the allowable rates.

Table 3: Pipe Lengths, Slopes, Sizes, and Flows

Pipe Number	Length (ft)	Average Slope (%)	Pipe Diameter (inches)	Peak Flow (cfs)	Design Flow Capacity (cfs)
100	539.00	9.28	12	2.79	10.29
102	650.09	1.08	12	2.78	3.70
103	380.00	10.53	12	3.82	11.56
106*	714.00	5.46	24	33.50	52.86
109	450.00	6.67	12	2.04	9.20
110	646.00	3.87	18	10.43	20.66
113	480.00	3.13	15	8.15	11.42
114	1072.00	0.93	18	8.68	10.15
115	482.00	8.30	12	0.97	10.26
116*	1041.00	0.67	36	54.62	55.40
117*	1800.00	5.67	36	157.19	158.82
118	155.00	3.23	12	6.16	6.40
119	559.85	7.14	12	6.11	9.52
122	863.04	7.30	12	7.81	9.24
123*	1271.00	2.68	24	27.58	37.03
124*	232.93	6.87	36	81.85	174.82
125	803.00	8.09	12	0.54	10.14
127	190.42	7.88	12	3.04	10.00
128	1266.67	1.03	12	2.94	3.61
130	542.36	0.92	12	2.77	3.42
131	301.46	9.95	12	0.27	11.24
132	373.19	10.72	12	0.66	11.66
134	351.91	15.63	12	0.38	14.09
135	663.03	6.03	12	0.32	8.75
139*	175.64	6.26	30	67.48	102.62
141	750.00	3.60	12	1.10	5.86
142	130.00	0.77	12	1.64	3.12
145	500.24	7.00	12	6.31	9.42
146	848.96	7.30	15	13.62	17.32
147	1329.82	9.40	12	2.37	10.92
148	961.97	4.16	12	6.77	9.44
149	327.27	7.64	12	3.69	9.85
150*	677.46	2.07	24	31.45	32.55
152	939.17	6.50	15	14.63	16.46
154	272.00	16.52	12	0.11	12.55
65	457.36	6.34	15	13.91	16.27
81	260.00	5.38	12	6.54	6.99
90	877.00	7.53	12	7.94	9.77
92	647.00	6.49	12	6.12	9.08
93	866.00	8.08	12	1.42	10.13

*Pipes 106, 116, 117, 123, 124, 139, 150 were sized to capture and convey the 100-year storm

Table 4: Channel Dimensions and Flows

Channel Segment	Length (ft)	Average Slope (%)	Channel Height (ft)	Channel Width (ft)	Peak Flow (cfs)	Design Flow Capacity (cfs)
143	460	4.35	1.5	55	115.17	234.29
144	250	7.60	1.0	50	121.03	143.30
153	1158	5.70	1.0	50	85.89	124.10

Appendix A: NOAA Rainfall Data

NOAA Atlas 14, Volume 1, Version 5
Location name: Lehi, Utah, US*
Coordinates: 40.4394, -111.8468
Elevation: 4973ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	**2**	**5**	**10**	**25**	**50**	**100**	**200**	**500**	**1000**
5-min	**0.130** (0.115–0.151)	**0.165** (0.146–0.191)	**0.227** (0.198–0.263)	**0.283** (0.244–0.329)	**0.371** (0.313–0.435)	**0.454** (0.372–0.535)	**0.549** (0.437–0.656)	**0.661** (0.506–0.803)	**0.842** (0.610–1.05)	**1.01** (0.699–1.28)
10-min	**0.198** (0.174–0.230)	**0.252** (0.222–0.291)	**0.345** (0.302–0.400)	**0.431** (0.372–0.501)	**0.565** (0.476–0.662)	**0.691** (0.566–0.814)	**0.835** (0.664–0.997)	**1.01** (0.770–1.22)	**1.28** (0.929–1.59)	**1.53** (1.06–1.95)
15-min	**0.246** (0.216–0.285)	**0.312** (0.275–0.361)	**0.428** (0.374–0.496)	**0.534** (0.461–0.620)	**0.701** (0.590–0.820)	**0.856** (0.702–1.01)	**1.04** (0.823–1.24)	**1.25** (0.955–1.52)	**1.59** (1.15–1.98)	**1.90** (1.32–2.42)
30-min	**0.331** (0.290–0.383)	**0.420** (0.370–0.486)	**0.576** (0.504–0.667)	**0.719** (0.621–0.836)	**0.943** (0.795–1.11)	**1.15** (0.945–1.36)	**1.39** (1.11–1.67)	**1.68** (1.29–2.04)	**2.14** (1.55–2.66)	**2.56** (1.77–3.25)
60-min	**0.410** (0.359–0.474)	**0.519** (0.458–0.602)	**0.713** (0.624–0.826)	**0.890** (0.769–1.03)	**1.17** (0.984–1.37)	**1.43** (1.17–1.68)	**1.73** (1.37–2.06)	**2.08** (1.59–2.53)	**2.65** (1.92–3.29)	**3.16** (2.20–4.03)
2-hr	**0.512** (0.464–0.580)	**0.640** (0.576–0.723)	**0.836** (0.748–0.945)	**1.02** (0.902–1.16)	**1.31** (1.13–1.50)	**1.58** (1.33–1.82)	**1.90** (1.55–2.22)	**2.27** (1.78–2.70)	**2.87** (2.14–3.51)	**3.42** (2.44–4.28)
3-hr	**0.595** (0.543–0.663)	**0.736** (0.672–0.818)	**0.931** (0.845–1.03)	**1.11** (0.999–1.24)	**1.39** (1.23–1.56)	**1.64** (1.42–1.86)	**1.95** (1.63–2.23)	**2.31** (1.88–2.73)	**2.90** (2.25–3.55)	**3.44** (2.57–4.33)
6-hr	**0.785** (0.728–0.854)	**0.965** (0.892–1.05)	**1.17** (1.08–1.28)	**1.36** (1.25–1.49)	**1.64** (1.48–1.79)	**1.87** (1.66–2.06)	**2.13** (1.86–2.38)	**2.44** (2.09–2.77)	**3.02** (2.50–3.58)	**3.53** (2.84–4.37)
12-hr	**1.01** (0.929–1.10)	**1.23** (1.14–1.34)	**1.49** (1.37–1.62)	**1.71** (1.56–1.87)	**2.02** (1.83–2.23)	**2.28** (2.04–2.53)	**2.56** (2.25–2.87)	**2.87** (2.47–3.26)	**3.35** (2.81–3.90)	**3.75** (3.07–4.44)
24-hr	**1.13** (1.05–1.21)	**1.38** (1.29–1.49)	**1.65** (1.54–1.77)	**1.87** (1.75–2.01)	**2.17** (2.02–2.33)	**2.40** (2.23–2.57)	**2.63** (2.44–2.90)	**2.89** (2.64–3.30)	**3.39** (2.91–3.94)	**3.79** (3.10–4.48)
2-day	**1.35** (1.26–1.45)	**1.65** (1.55–1.77)	**1.98** (1.85–2.11)	**2.24** (2.09–2.39)	**2.59** (2.42–2.77)	**2.87** (2.66–3.06)	**3.15** (2.90–3.36)	**3.42** (3.14–3.67)	**3.79** (3.45–4.08)	**4.07** (3.68–4.53)
3-day	**1.48** (1.37–1.59)	**1.81** (1.68–1.95)	**2.16** (2.01–2.33)	**2.46** (2.29–2.64)	**2.86** (2.65–3.08)	**3.18** (2.93–3.42)	**3.50** (3.21–3.77)	**3.82** (3.49–4.13)	**4.26** (3.85–4.62)	**4.59** (4.13–5.07)
4-day	**1.60** (1.48–1.73)	**1.96** (1.82–2.13)	**2.35** (2.18–2.54)	**2.68** (2.48–2.89)	**3.13** (2.89–3.38)	**3.48** (3.20–3.77)	**3.85** (3.52–4.17)	**4.22** (3.84–4.58)	**4.72** (4.25–5.15)	**5.11** (4.57–5.61)
7-day	**1.90** (1.76–2.07)	**2.33** (2.16–2.53)	**2.79** (2.58–3.02)	**3.16** (2.92–3.42)	**3.67** (3.38–3.97)	**4.06** (3.73–4.40)	**4.46** (4.08–4.83)	**4.86** (4.43–5.28)	**5.39** (4.87–5.88)	**5.80** (5.20–6.35)
10-day	**2.15** (1.99–2.32)	**2.63** (2.44–2.84)	**3.13** (2.90–3.37)	**3.52** (3.27–3.80)	**4.05** (3.74–4.36)	**4.44** (4.09–4.78)	**4.82** (4.44–5.20)	**5.20** (4.77–5.62)	**5.69** (5.18–6.17)	**6.04** (5.48–6.57)
20-day	**2.83** (2.62–3.06)	**3.48** (3.22–3.75)	**4.11** (3.81–4.43)	**4.61** (4.26–4.95)	**5.23** (4.83–5.62)	**5.68** (5.24–6.11)	**6.11** (5.63–6.57)	**6.52** (6.00–7.02)	**7.02** (6.44–7.59)	**7.38** (6.74–7.99)
30-day	**3.42** (3.17–3.68)	**4.19** (3.88–4.51)	**4.93** (4.58–5.31)	**5.51** (5.11–5.93)	**6.26** (5.79–6.73)	**6.80** (6.28–7.32)	**7.33** (6.75–7.90)	**7.83** (7.19–8.46)	**8.46** (7.73–9.16)	**8.90** (8.11–9.67)
45-day	**4.27** (3.97–4.59)	**5.22** (4.86–5.62)	**6.13** (5.71–6.59)	**6.83** (6.36–7.34)	**7.73** (7.19–8.30)	**8.38** (7.78–9.00)	**9.00** (8.35–9.67)	**9.59** (8.87–10.3)	**10.3** (9.49–11.1)	**10.8** (9.92–11.7)
60-day	**5.07** (4.70–5.44)	**6.19** (5.76–6.67)	**7.26** (6.75–7.80)	**8.08** (7.51–8.67)	**9.12** (8.46–9.79)	**9.85** (9.14–10.6)	**10.6** (9.77–11.4)	**11.2** (10.4–12.1)	**12.0** (11.0–13.0)	**12.5** (11.5–13.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

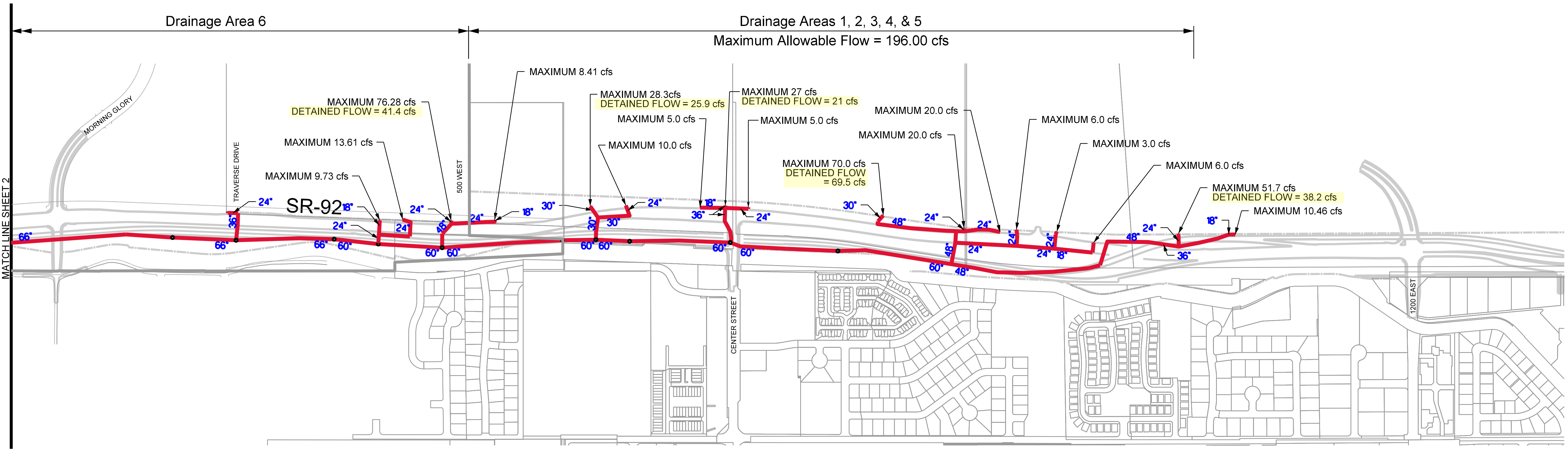
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

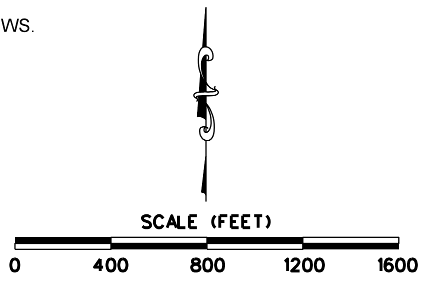
Appendix B: Allowable Discharge Exhibits



NOTES

1- DOES NOT INCLUDE UDOT FLOWS.

2- MAXIMUM DETAINED FLOWS ARE DETAINED 100 YR FLOWS.



MW
BROWN
ENGINEERING, INC
Office: (801) 377-1790 Fax: (801) 377-1789
578 East 770 North, Orem UT 84097

REGISTERED PROFESSIONAL ENGINEER
NO. 174774
MATT W.
BROWN
STATE OF UTAH

No.	Date	By	Notes

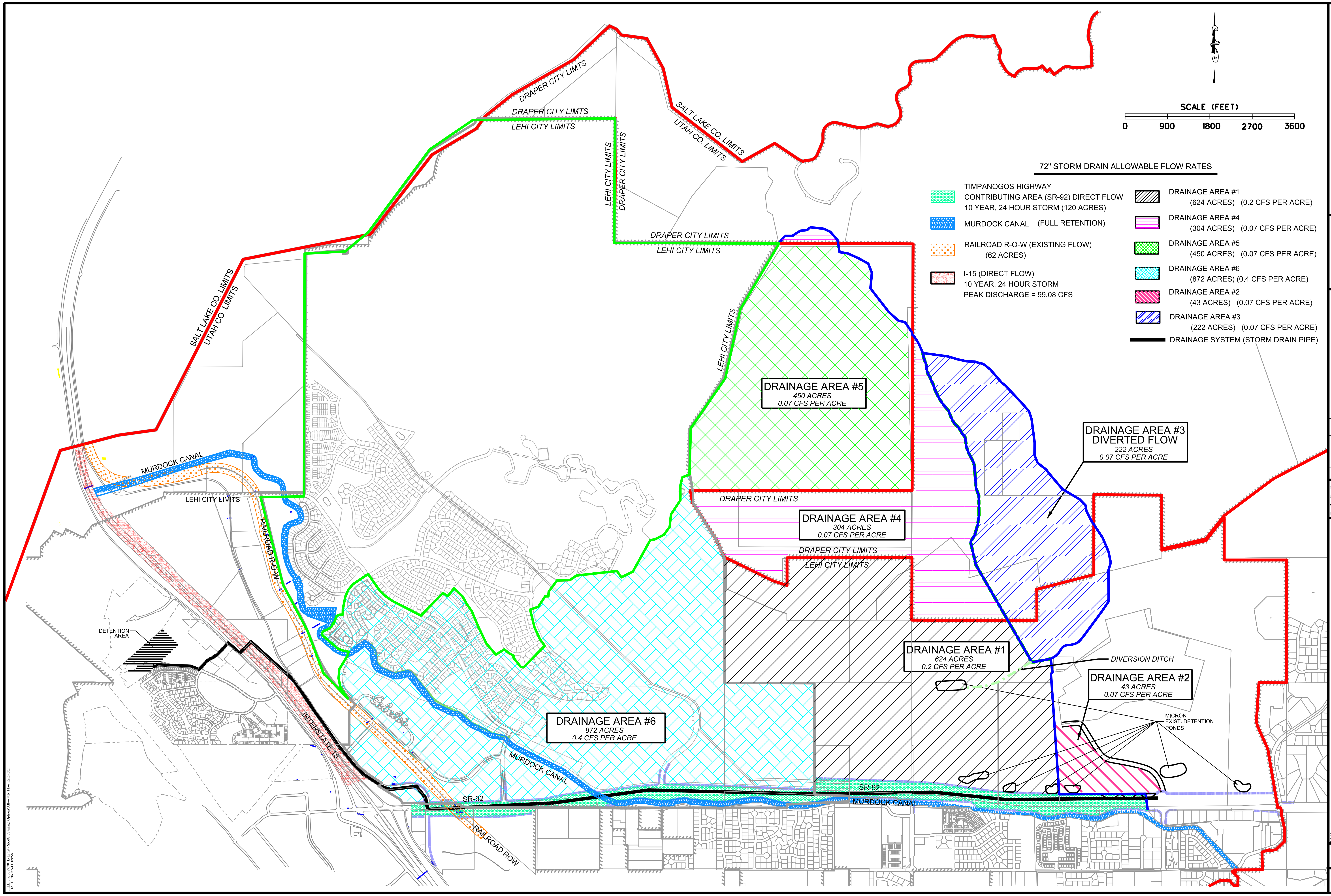
REVISIONS

Designed
Drawn J.M .MYERS
Checked M.W. BROWN
Date 4-09-2013

Title: DRAINAGE AGREEMENT EXHIBIT B
Client: LEHI CITY ALLOWABLE FLOW RATE
Drawing Name: REVISED - AUG 13, 2013

PROJECT NO.
2012.059

SHEET NO.
2



FILE: J:\2008\070_Lehi City SR-92 Drainage Options\Allowable Flow Rates.dgn
DATE: 20-Jan-11 09:58

MW BROWN ENGINEERING, INC
Office: (801) 377-1790 Fax: (801) 377-1789
578 East 770 North, Orem UT 84097

REVISIONS

No.	Date	By	Notes

Designed
Drawn D.A. BUFFO
Checked M.W. BROWN
Date JANUARY 27, 2010

Title: EXHIBIT "A"
Client: LEHI CITY ALLOWABLE FLOW RATE
DATE JANUARY 4, 2013

PROJECT NO.
2012.059

SHEET NO.
1

Appendix C: Geotechnical Report with Infiltration Testing

GeoStrata
14425 S Center Point Way, Bluffdale, Utah 84065
T: (801) 501-0583 ~ info@geostrata-llc.com

6/23/2021
#10183430-2202
CALEB RICHARD ALLRED

To: **D.R. Horton**
Attention: Dan Mitchell
12351 South Gateway Park Place
Draper, Utah 84020

From: **Caleb R. Allred, P.E.**
Project Geotechnical Engineer

Date: **June 23, 2021**

Subject: **Micron Property – Infiltration Testing**
Approximately 500 West and State Road 92
Lehi, Utah
GeoStrata Job No. 589-100

Mr. Mitchell;

At your request, GeoStrata has completed infiltration testing in general accordance with Appendix C of the Utah Administrative Code R317-4 for the proposed retention pond areas as highlighted on an Exhibit Map provided by LEI within the Micron Property located in the Lehi, Utah. Due fencing and limited site access one of the infiltration locations was more north along the same drainage. The location of the infiltration testing is shown on Plate A-1, *Infiltration Test Location Map*.

GeoStrata completed the infiltration testing generally according to Appendix C of the Utah Administrative Code R317-4, because this method provides guidelines of how to prepare the infiltration hole and how to perform the test and complete the test. The problem with infiltration testing is the testing is very difficult to reproduce. A relatively small change in elevation or location can provide produce a variety of results. We recommend that during the design of the retention areas that the infiltration rates provided in the letter have a factor of safety applied, and the infiltration rates used in design are compared to published documents for similar soil types such as Utah City Engineers Association, Saturated Hydraulic Conductivity Rate According to Soil Types (https://www.ucea.net/copy-of-wet-swales-7).

On June 17th, 2021, the test pits were excavated at the four locations as shown in Plate A-1 and the infiltration tests were performed at depths of between 4 feet 10 inches and 5 feet 6 inches below the existing ground surface. Subsurface soils at the site varied dramatically across the property. Logs of the subsurface conditions, as encountered in the explorations, were recorded at the time of excavation by a qualified representative of GeoStrata and are presented on Plates B-1 through B-4. GeoStrata has elected to classify the soils according to both USCS and USDA methods. To aid with the soil classification we have completed laboratory testing, results of the laboratory testing are included on Plates B-1 to B-4.

INFILTRATION TEST RESULTS

The infiltration testing was completed by excavating a hole that was approximately 4 inches in diameter and between 14 to 20 inches in depth. The excavated hole was then prepared to remove the smeared soils and 2 to 3 inches of gravel was placed in the bottom of the hole. The hole was then filled to a minimum of 12 inches above the gravel. According to Appendix C of the Utah Administrative Code R317-4 the infiltration tests at IT-2, IT-3, and IT-4 consisted of Type 1 or Type 2 soils, (12 inches of water seeps away in 10 minutes, two times in succession. As such, the Test Procedure for Type 1 and Type 2 soils was completed for this location.

Infiltration Test Location IT-1 did not meet the Type 1 or Type 2 soil classification and the 4-hour saturation period, and minimum 16-hour swell period was achieved prior to running the final infiltration test. A summary of the results of our infiltration testing is as follows;

Micron Property Lehi, Utah Location: IT-1 Soils: CL-ML (Sandy Clay Loam) Test Elevations: 5-ft to 5-ft 6-in Diameter: 4 inches				
Depth	Time Difference (minutes)	Depth Difference (inches)	Infiltration Rate	
			(min/in)	(in/hour)
5-5½	30	7	4.29	14.00
5-5½	30	6	5.00	12.00
5-5½	30	5	6.00	10.00
5-5½	30	4.75	6.32	9.50
5-5½	30	4.5	6.67	9.00
5-5½	30	4.5	6.67	9.00
Finalized Rate			6.67	9.00

Micron Property Lehi, Utah Location: IT-2 Soils: SM (Loamy Sand) Test Elevations: 4-ft 6-in to 5-ft Diameter: 4 inches				
Depth	Time Difference (minutes)	Depth Difference (inches)	Infiltration Rate	
			(min/in)	(in/hour)
4½-5	2	8	0.25	240.00
4½-5	2	8	0.25	240.00
4½-5	2	8	0.25	240.00
Finalized Rate			0.25	240.00

Copyright © 2021 GeoStrata

Micron Property
Lehi, Utah
Location: IT-3 Soils: Sandy SILT (Loam)
Test Elevations: 5-ft to 5-ft 6 inches   Diameter: 4 inches

Depth	Time Difference (minutes)	Depth Difference (inches)	Infiltration Rate	
			(min/in)	(in/hour)
4½-5	10	5.25	1.90	31.50
4½-5	10	5	2.00	30.00
4½-5	10	4.75	2.11	28.50
4½-5	10	4.5	2.22	27.00
4½-5	10	4.5	2.22	27.00
Finalized Rate			2.22	27.00

Micron Property
Lehi, Utah
Location: IT-4 Soils: Clayey SAND (Sandy Loam)
Test Elevations: 5-ft to 5-ft 6 inches   Diameter: 4 inches

Depth	Time Difference (minutes)	Depth Difference (inches)	Infiltration Rate	
			(min/in)	(in/hour)
5-5½	5	3.5	1.43	42.00
5-5½	5	3.5	1.43	42.00
5-5½	5	3.25	1.54	39.00
5-5½	5	3.125	1.60	37.50
5-5½	5	3.125	1.60	37.50
5-5½	5	3.125	1.60	37.50
Finalized Rate			1.60	37.50

It should be noted that the tests were performed using clean water. Sediment collected from runoff may reduce the performance of the retention ponds resulting in slower than observed infiltration rates. If possible, sediment should be settled/filtered out of the flow prior to entering the drainage area.

The results of the testing contained in this memorandum are based on the information available to us at the time of our evaluation, the results of our field observations, our limited subsurface exploration and our understanding of the proposed site development. This memorandum was prepared in accordance with the generally accepted standard of practice at the time the report was written. No other warranty, expressed or implied, is made.

This memorandum was written for the exclusive use of D.R. Horton and only for the proposed project described herein. It is the Client's responsibility to see that all parties to the project including the Designer, Contractor, Subcontractors, etc. are made aware of this memorandum in its entirety. We are not responsible for the technical interpretations by others of the information described or documented in this memorandum. The use of information contained in this memorandum for bidding purposes should be done at the Contractor's option and risk.

Copyright © 2021 GeoStrata

ATTACHMENTS

GeoStrata

Copyright, 2020

D.R. Horton
Mircon Property - Infiltration Testing
Lehir, Utah
Project Number: 589-100

Infiltration Test Location Map

Plate A-1

DATE		
STARTED:	6/17/21	
COMPLETED:	6/18/21	
BACKFILLED:	6/18/21	

D.R. Horton
Micron Property Infiltration Testing
Lehi, Utah

Project Number 589-100

GeoStrata Rep: C. Allred

Rig Type: Track-hoe

TEST PIT NO:

IT-1

Sheet 1 of 1

LOCATION

NORTHING EASTING ELEVATION -ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits
0	0			▨	SM	Silty SAND - slightly moist, light brown, some organics thoughout						
				▨	CL-ML	Silty CLAY with sand - medium stiff, moist, brown (Sandy Clay Loam)						
1	5											
						Bottom of Test Pit @ 5.5 Feet						
2												

Plastic Limit ├ Moisture Content ● Liquid Limit ┤

10 20 30 40 50 60 70 80 90

GeoStrata

Copyright (c) 2021, GeoStrata

SAMPLE TYPE
- ▯ - GRAB SAMPLE
- ▨ - 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- ▼ - MEASURED
- ▽ - ESTIMATED

NOTES:

Plate

B - 1

DATE		
STARTED:	6/17/21	
COMPLETED:	6/17/21	
BACKFILLED:	6/17/21	

D.R. Horton
Micron Property Infiltration Testing
Lehi, Utah

Project Number 589-100

GeoStrata Rep: C. Allred

Rig Type: Track-hoe

TEST PIT NO:

IT-2

Sheet 1 of 1

LOCATION

NORTHING EASTING ELEVATION -ft

DEPTH (FEET)	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	SP	Poorly Graded SAND - slightly moist, brown, some organic thoughout					
	GM	Silty GRAVEL with sand - medium dense, moist, brown, 3-inch minus materials					
	SM	Silty SAND - medium dense, moist, brown (Loamy Sand)		7.5	38.8		
5		Bottom of Test Pit @ 5 Feet					

Moisture Content and Atterberg Limits

Plastic Limit — Moisture Content ● — Liquid Limit

10 20 30 40 50 60 70 80 90

METERS: 0, 1, 2

FEET: 0, 5

SAMPLE TYPE

▯ - GRAB SAMPLE

▯ - 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL

▼- MEASURED

▽- ESTIMATED

NOTES:

GeoStrata

Copyright (c) 2021, GeoStrata

Plate

B - 2

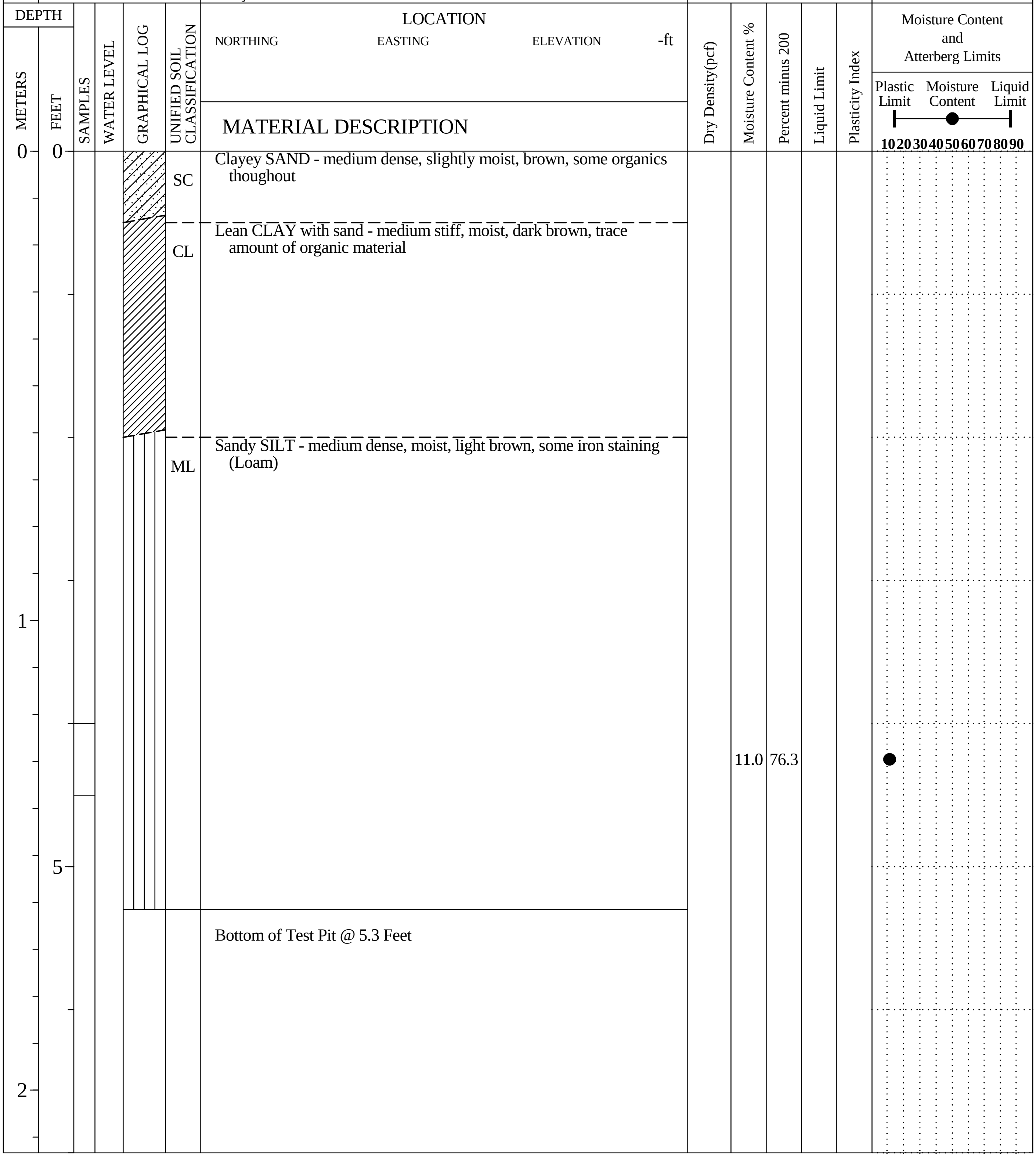
DATE		
	STARTED:	6/17/21
	COMPLETED:	6/17/21
	BACKFILLED:	6/17/21

D.R. Horton
Micron Property Infiltration Testing
Lehi, Utah
Project Number 589-100

GeoStrata Rep: N. Flores
Rig Type: Track-hoe

TEST PIT NO:
IT-3
Sheet 1 of 1

LOCATION
NORTHING EASTING ELEVATION -ft



UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
SC	Clayey SAND - medium dense, slightly moist, brown, some organics thoughout					
CL	Lean CLAY with sand - medium stiff, moist, dark brown, trace amount of organic material					
ML	Sandy SILT - medium dense, moist, light brown, some iron staining (Loam)		11.0	76.3		
	Bottom of Test Pit @ 5.3 Feet					

GeoStrata

Copyright (c) 2021, GeoStrata

SAMPLE TYPE
▯ - GRAB SAMPLE
▨ - 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
▼- MEASURED
▽- ESTIMATED

NOTES:

Plate
B - 3

DATE		
STARTED:	6/17/21	
COMPLETED:	6/17/21	
BACKFILLED:	6/17/21	

D.R. Horton
Micron Property Infiltration Testing
Lehi, Utah
Project Number 589-100

GeoStrata Rep: N. Flores
Rig Type: Track-hoe

TEST PIT NO:
IT-4
Sheet 1 of 1

LOCATION
NORTHING EASTING ELEVATION -ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit; 10 20 30 40 50 60 70 80 90)
0	0			▨	SC	Clayey SAND - medium dense, slightly moist to moist, brown to gray-brown, some organics in the top 6 inches (Sandy Loam)						
1		▯		▨				2.5	26.2			●
	5			▨								
						Bottom of Test Pit @ 5.5 Feet						
2												

SAMPLE TYPE
▯ - GRAB SAMPLE
▨ - 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
▼ - MEASURED
▽ - ESTIMATED

NOTES:

Copyright (c) 2021, GeoStrata

Plate
B - 4

Appendix D: NRCS Soil Group Map and Curve Numbers

Hydrologic Soil Group—Salt Lake Area, Utah, and Utah County, Utah - Central Part
(Micron)

Map Scale: 1:12,800 if printed on D landscape (34" x 22") sheet.

0	150	300	600	900	Meters
0	500	1000	2000	3000	Feet

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

Natural Resources
Conservation Service

MAP LEGEND

Area of Interest (AOI)

▭ Area of Interest (AOI)

Soils

Soil Rating Polygons

- ▭ A
- ▭ A/D
- ▭ B
- ▭ B/D
- ▭ C
- ▭ C/D
- ▭ D
- ▭ Not rated or not available

Soil Rating Lines

- 〰 A
- 〰 A/D
- 〰 B
- 〰 B/D
- 〰 C
- 〰 C/D
- 〰 D
- 〰 Not rated or not available

Soil Rating Points

- ▣ A
- ▣ A/D
- ▣ B
- ▣ B/D
- ▣ C
- ▣ C/D
- ▣ D
- ▣ Not rated or not available

Water Features

〰 Streams and Canals

Transportation

- ┼┼┼ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

Background

▩ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Salt Lake Area, Utah
Survey Area Data: Version 13, Jun 8, 2020

Soil Survey Area: Utah County, Utah - Central Part
Survey Area Data: Version 13, Jun 8, 2020

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 19, 2016—Sep 14, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table 5.5 Runoff curve numbers for urban areas (Mockus, 1969)[a]

Cover Description	Average Percent Impervious Area[b]	Curve Numbers for Hydrologic Soil Group			
Cover Type and Hydrologic Condition		**A**	**B**	**C**	**D**
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[c]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious area only)[d]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1 to 2 in. sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre (506 m^2) or less (town houses)	65	77	85	90	92
1/4 acre (1,012 m^2)	38	61	75	83	87
1/3 acre (1,349 m^2)	30	57	72	81	86
1/2 acre (2,023 m^2)	25	54	70	80	85
1 acre (4,047 m^2)	20	51	68	79	84
2 acres (8,094 m^2)	12	46	65	77	82
Developing urban areas					
Newly graded area (pervious areas only, no vegetation)[e]		77	86	91	94
Idle lands (CNs are determined using cover types similar to those in Table 5.6)					

a. Average runoff condition, and $I_a = 0.2S$.

b. The average percent impervious area shown was used to develop the composite *CNs*. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a *CN* of 98, and pervious areas are considered equivalent to open space in good hydrologic condition.

c. *CNs* shown are equivalent to those of pasture. Composite *CNs* may be computed for other combinations of open space cover type.

d. Composite *CNs* for natural desert landscaping should be computed using Figure 2.3 or 2.4 (in TR-55) based on the impervious area percentage ($CN = 98$) and the pervious area *CN*. The pervious area *CNs* are assumed equivalent to desert shrub in poor hydrologic condition.

e. Composite *CNs* to use for the design of temporary measures during grading and construction should be computed using Figure 2.3 or 2.4 (in TR-55) based on the degree of development (impervious area percentage) and the *CNs* for the newly graded pervious areas.

Table 5.7 Runoff curve numbers for other agricultural lands[a] (Mockus, 1969)

Cover Description		Curve Numbers for Hydrologic Soil Group			
Cover Type	Hydrologic Condition	A	B	C	D
Pasture, grassland, or range-continuous forage for grazing[b]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow-continuous grass, protected from grazing and generally mowed for hay		30	58	71	78
Brush—brush-weed grass mixture with brush the major element[c]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30[d]	48	65	73
Woods-grass combination (orchard or tree farm)[e]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods[f]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30[d]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots		59	74	82	86

a. Average runoff condition, and $I_a = 0.2S$

b. *Poor:* less than 50% ground cover or heavily grazed with no mulch. *Fair:* 50 to 75% ground cover and not heavily grazed. *Good:* more than 75% ground cover and lightly or only occasionally grazed

c. *Poor:* less than 50% ground cover. *Fair:* 50 to 75% ground cover. *Good:* more than 75% ground cover

d. Actual curve number is less than 30; use $CN = 30$ for runoff computations

e. *CNs* shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the *CNs* for woods and pasture.

f. *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning. *Fair:* Woods are grazed but not burned, and some forest litter covers the soil. *Good:* Woods are protected from grazing, and litter and brush adequately cover the soil

Table 5.8 Runoff curve numbers for arid and semiarid rangelands[a] (Mockus, 1969)

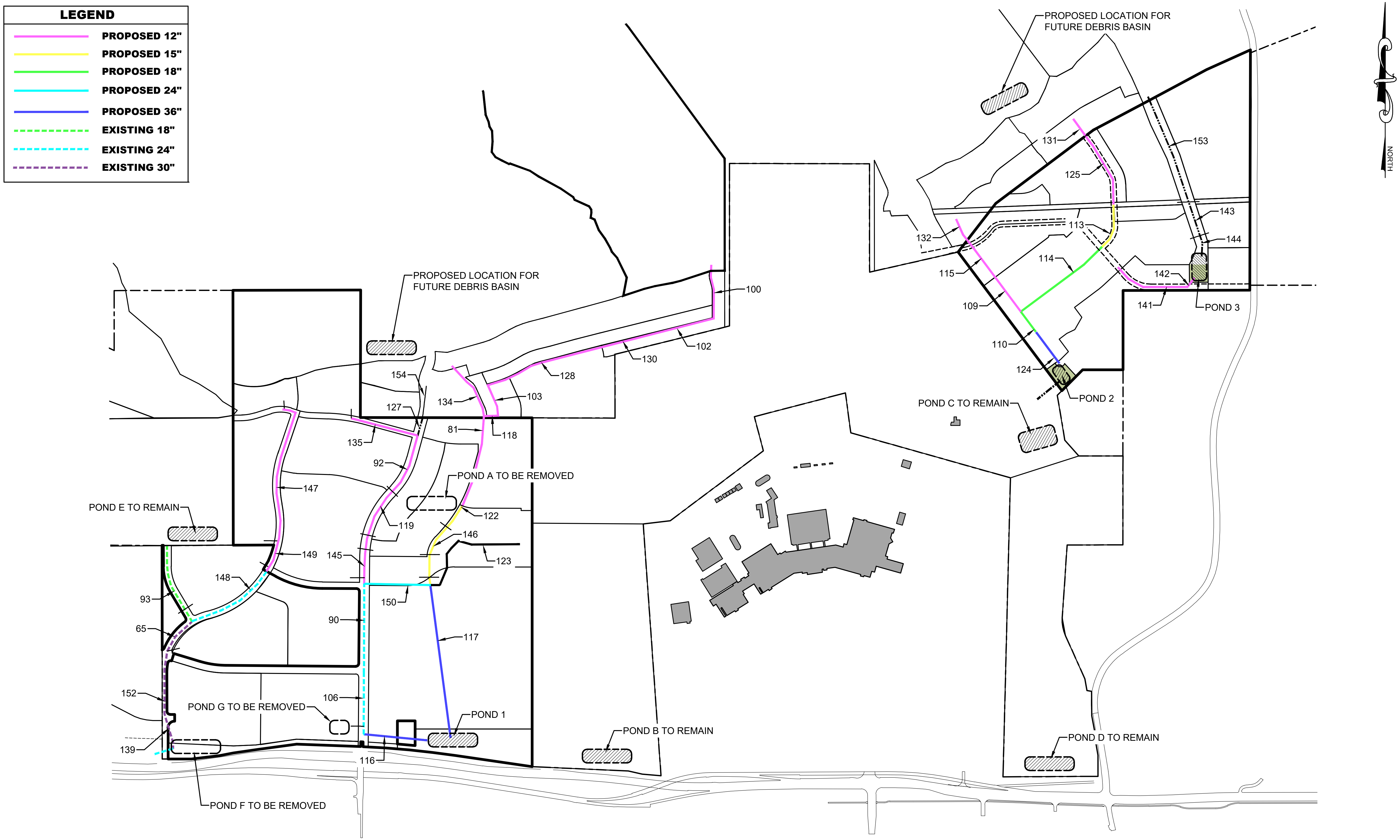
Cover Description		Curve Numbers for Hydrologic Soil Group:			
Cover Type	Hydrologic Condition[b]	A[c]	B	C	D
Herbaceous-mixture of grass, weeds, and low-growing brush, with brush the minor element	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen-mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper-pinyon, juniper, or both; grass understory	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub-major plants include saltbush, greasewood, creosote-bush, blackbrush, bursage, palo verde, mesquite, and cactus	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

a. Average antecedent moisture condition, and $I_a = 0.2S$. For range in humid regions, use Table 5.7.

b. *Poor:* less than 30% ground cover (litter, grass, and brush overstory). *Fair:* 30 to 70% ground cover. *Good:* more than 70% ground cover.

c. Curve numbers for group A have been developed for desert shrub.

Appendix E: Pond and Pipe Location Exhibit



LEI

ENGINEERS
SURVEYORS
PLANNERS

3302 N. Main Street
Spanish Fork, UT 84660
Phone: 801.798.0555
Fax: 801.798.9393
office@lei-eng.com
www.lei-eng.com

SKYE
LEHI, UTAH

POND & PIPE EXHIBIT

REVISIONS
1 -
2 -
3 -
4 -
5 -

LEI PROJECT #:
2011-0066

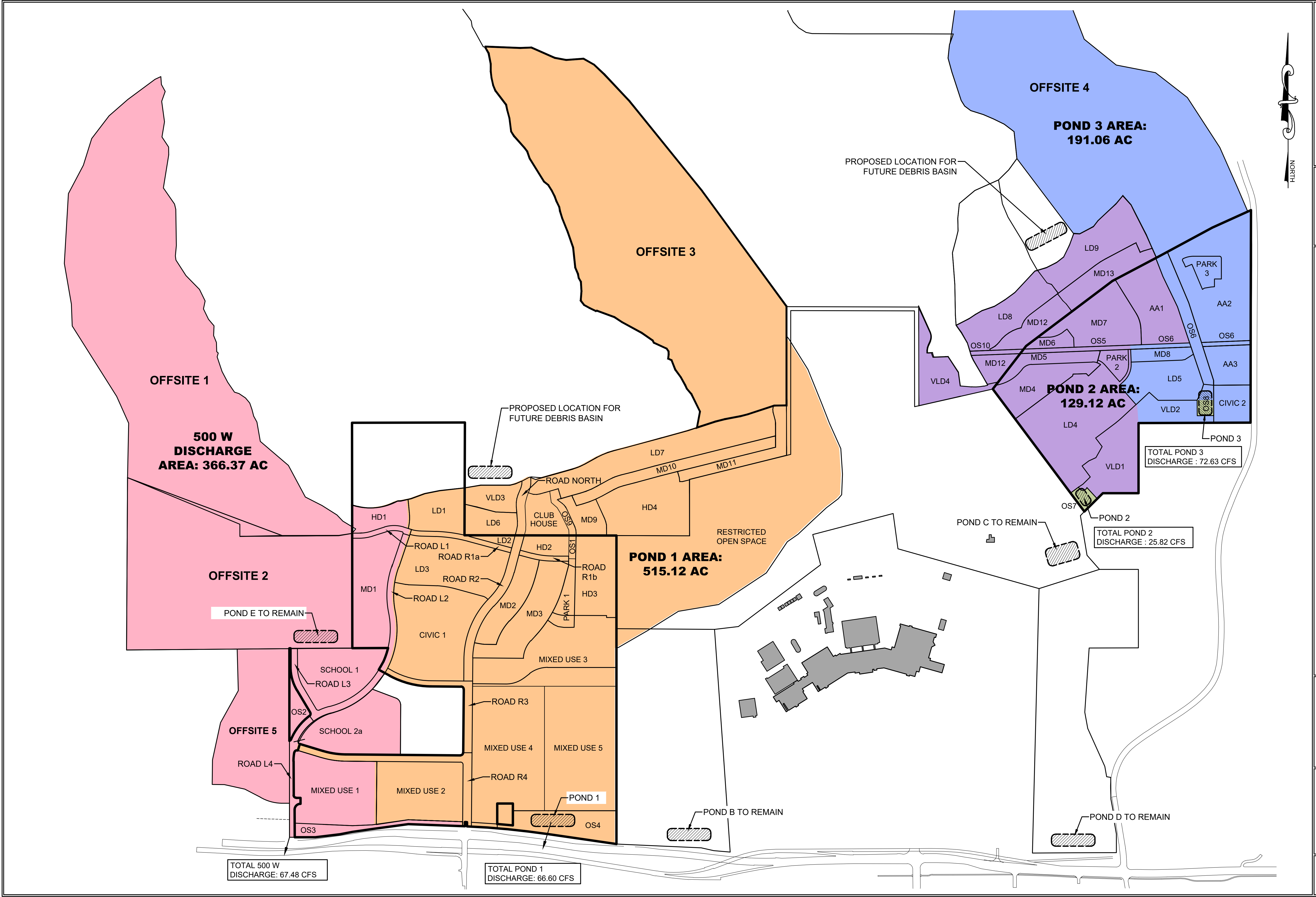
DRAWN BY:
RWH

DESIGNED BY:
BCT

SCALE:
1" = 1000'

DATE:
07/08/2022

SHEET
E1



LEI

ENGINEERS
SURVEYORS
PLANNERS

3302 N. Main Street
Spanish Fork, UT 84660
Phone: 801.798.0555
Fax: 801.798.9393
office@lei-eng.com
www.lei-eng.com

SKYE
LEHI, UTAH

OVERALL CONTRIBUTING AREA EXHIBIT

REVISIONS
1 -
2 -
3 -
4 -
5 -

LEI PROJECT #:
2011-0066
DRAWN BY:
RWH
DESIGNED BY:
BCT
SCALE:
1" = 1000'
DATE:
07/08/2022

SHEET
E2

Appendix F: Channel Cross Section Designs

Channel Report

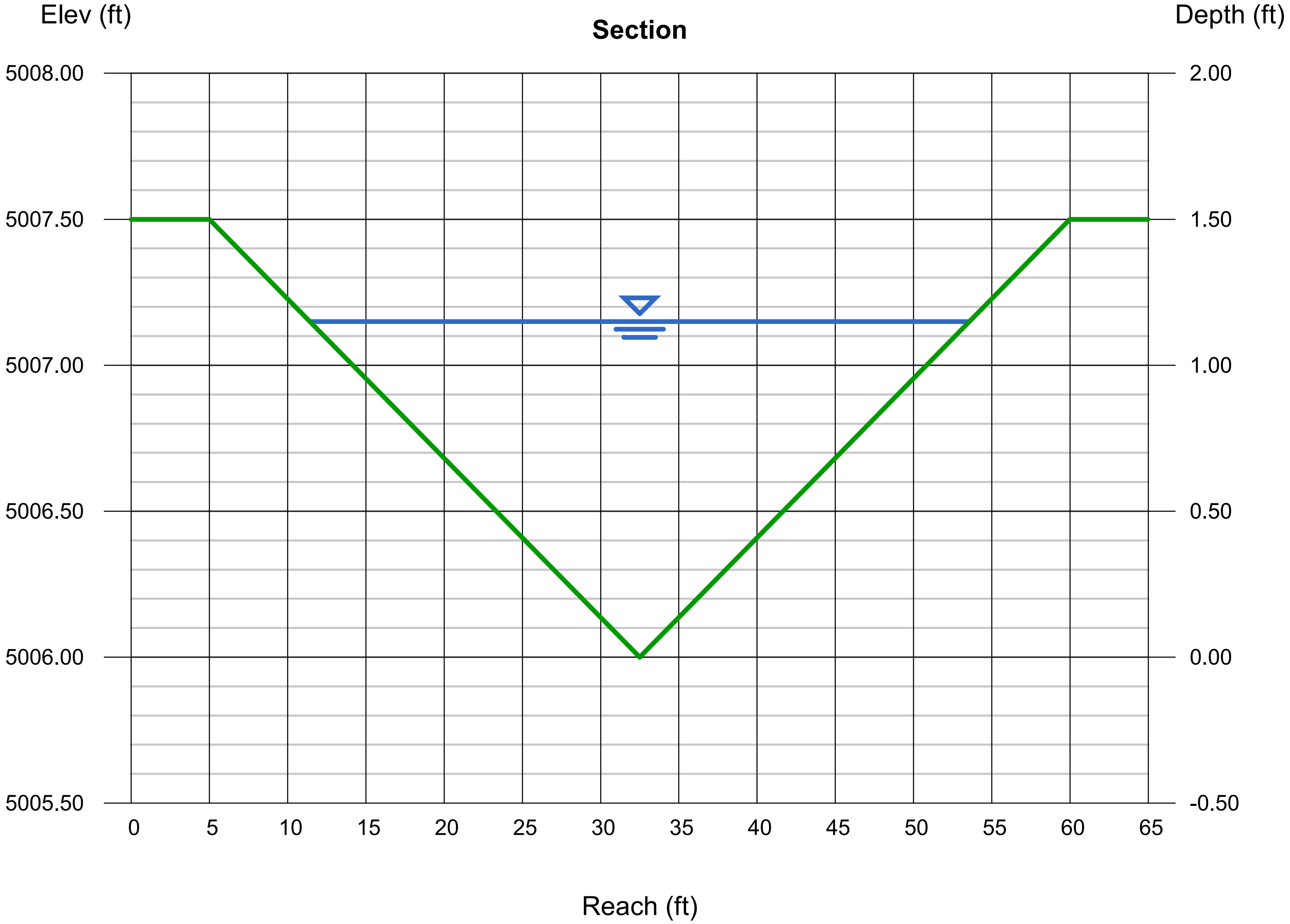
Channel 143

Triangular
Side Slopes (z:1) = 18.33, 18.33
Total Depth (ft) = 1.50

Invert Elev (ft) = 5006.00
Slope (%) = 4.35
N-Value = 0.045

Calculations
Compute by: Known Q
Known Q (cfs) = 115.17

Highlighted
Depth (ft) = 1.15
Q (cfs) = 115.17
Area (sqft) = 24.24
Velocity (ft/s) = 4.75
Wetted Perim (ft) = 42.22
Crit Depth, Yc (ft) = 1.20
Top Width (ft) = 42.16
EGL (ft) = 1.50



Channel Report

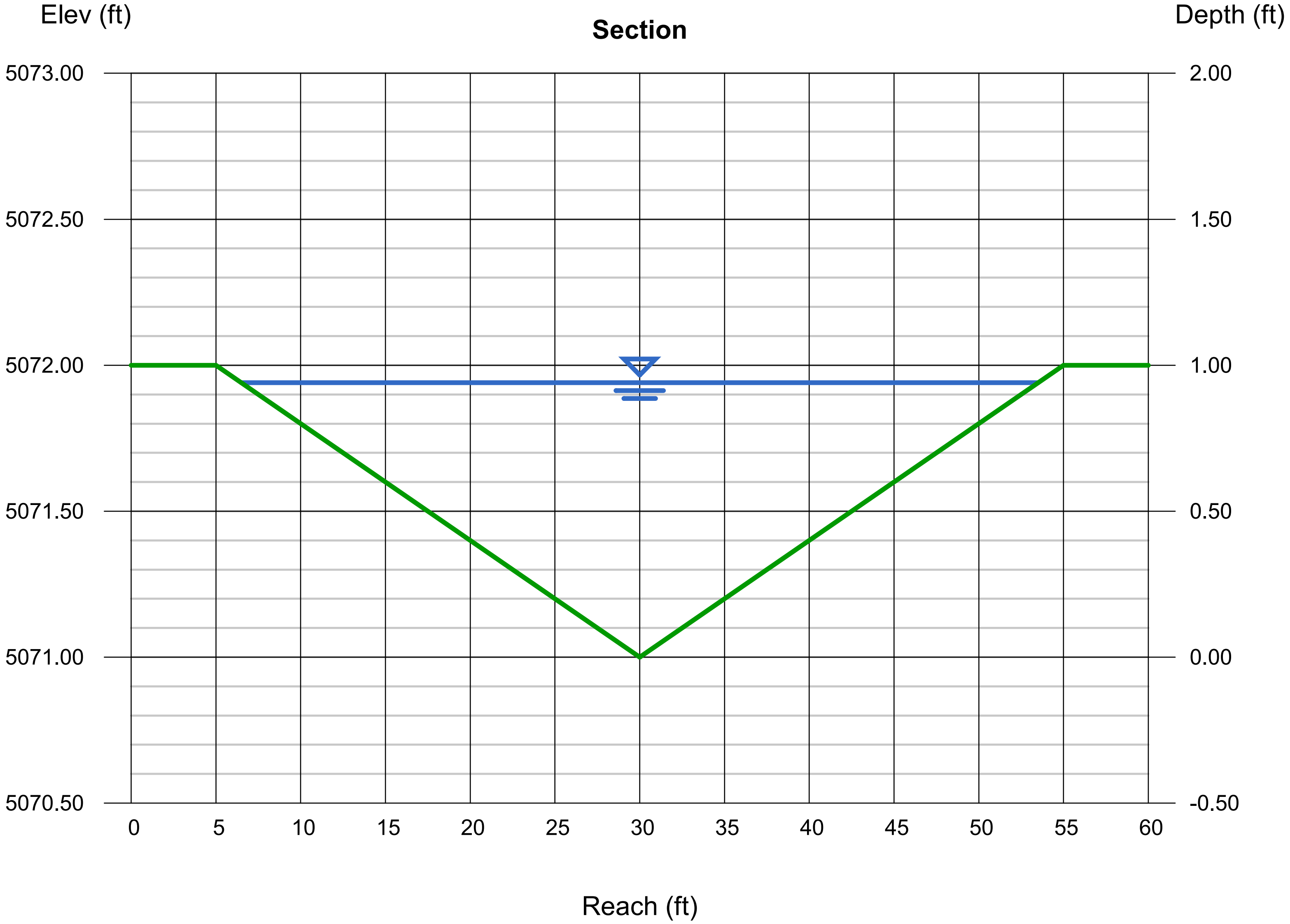
Channel 144

Triangular
Side Slopes (z:1) = 25.00, 25.00
Total Depth (ft) = 1.00

Invert Elev (ft) = 5071.00
Slope (%) = 7.60
N-Value = 0.045

Calculations
Compute by: Known Q
Known Q (cfs) = 121.03

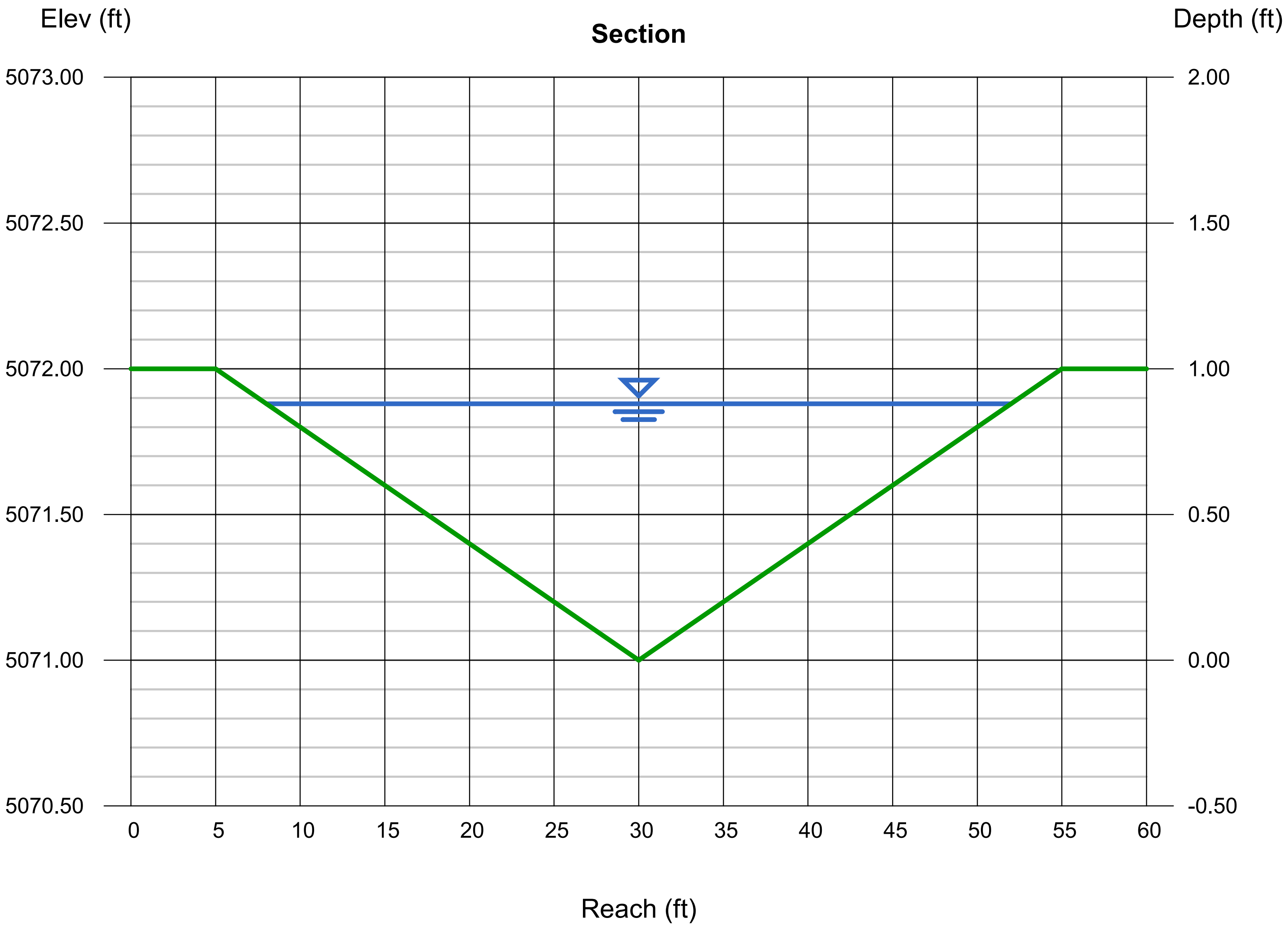
Highlighted
Depth (ft) = 0.94
Q (cfs) = 121.03
Area (sqft) = 22.09
Velocity (ft/s) = 5.48
Wetted Perim (ft) = 47.04
Crit Depth, Yc (ft) = 1.00
Top Width (ft) = 47.00
EGL (ft) = 1.41



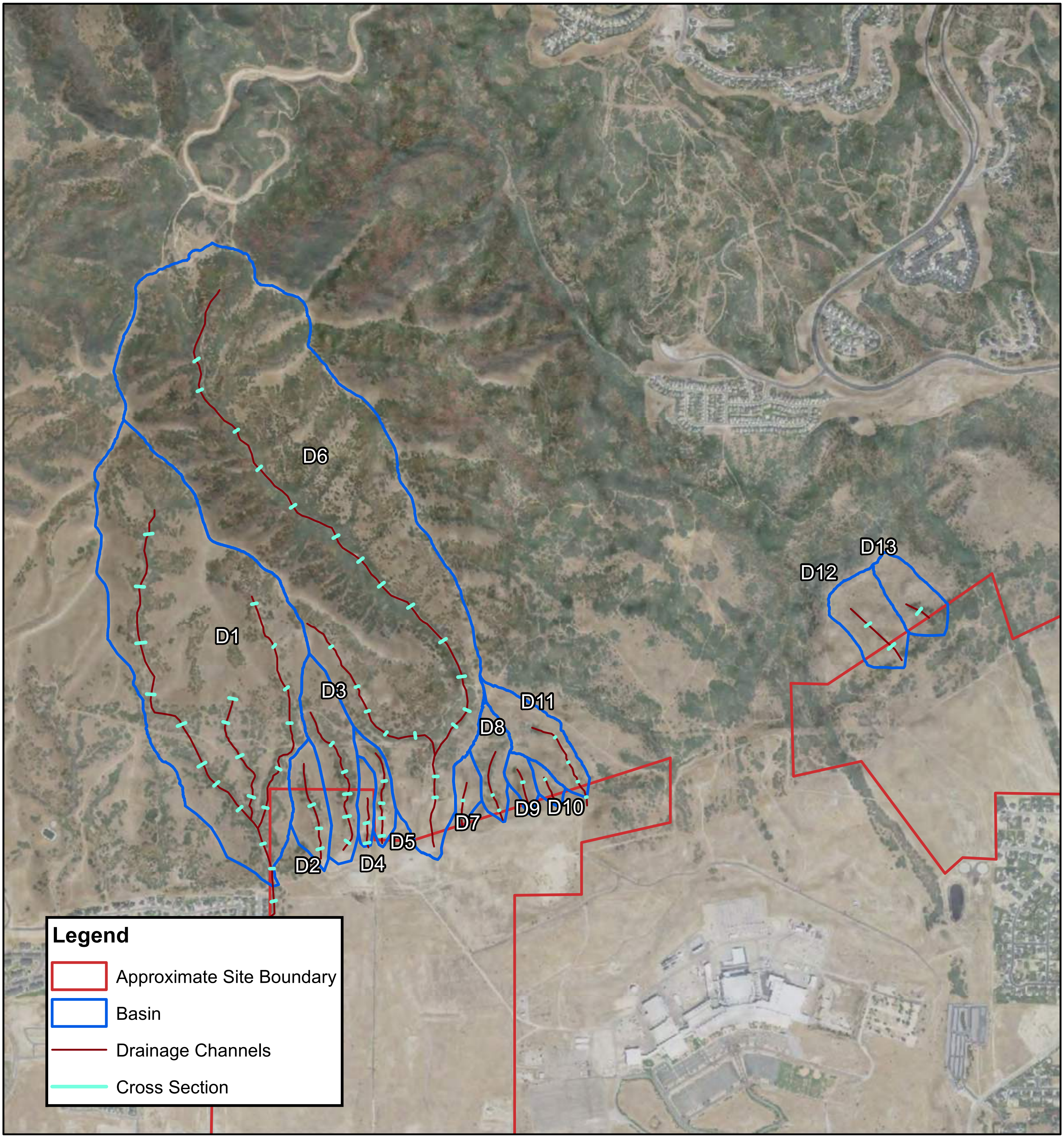
Channel Report

Channel 153

Triangular		**Highlighted**	
Side Slopes (z:1)	= 25.00, 25.00	Depth (ft)	= 0.88
Total Depth (ft)	= 1.00	Q (cfs)	= 85.89
		Area (sqft)	= 19.36
Invert Elev (ft)	= 5071.00	Velocity (ft/s)	= 4.44
Slope (%)	= 5.70	Wetted Perim (ft)	= 44.04
N-Value	= 0.045	Crit Depth, Yc (ft)	= 0.95
		Top Width (ft)	= 44.00
Calculations		EGL (ft)	= 1.19
Compute by:	Known Q		
Known Q (cfs)	= 85.89		

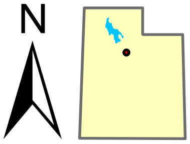


Appendix G: Debris Basin Exhibit



1:20,000

Basemap:
2012 12.5 cm HRO aerial imagery and hillshades derived from
DEMs provided by the State of Utah AGRC



GeoStrata

Copyright, 2021

Debris Flow Hazard Study
DR Horton
Micron Project
Lehi, Utah
Project Number: 589-100

Debris Flow Assessment Map

Plate
A-8

SKYE
AREA PLAN

CULINARY WATER SECTION

(HAL Project No.: 432.02.100)

Richard M Noble

REGISTERED PROFESSIONAL ENGINEER
No. 168241
RICHARD M. NOBLE
7/14/2022
STATE OF UTAH

July 2022

HANSEN
ALLEN
& LUCE INC
ENGINEERS

INTRODUCTION

The culinary water element of the Skye Area Plan includes all of the infrastructure needed to provide a reliable supply of drinking water to 1,751 equivalent residential units (ERU) to be located adjacent to the Texas Instruments (formerly Micron) facility in Lehi, Utah. The plan also provides for an additional 985 ERUs of future development not included in this area plan but to be addressed in future area plan amendments. The system includes a well, storage tank, booster pump station, pipelines, and pressure reducing stations (see Figures 1 and 2). In addition to drinking water, the system will provide fire protection water service to commercial and institutional buildings that will be constructed with sprinkler fire protection systems. Additionally, with the provided fire flow, any home exceeding 5,000 square feet will require an automatic fire sprinkler system, per municipal code: 10-3-1.

Water Source

The culinary water source for the Skye Area Plan includes a single new well to be constructed within Family Park at approximately 2200 North and 600 East (see Figure 2). The well will be constructed according to drinking water standards and will have an equipped flow capacity of 866 gallons per minute (gpm). Of this capacity, 554 gpm is allocated to this area plan and 312 gpm is allocated to future area plan amendments.

Offsite Transmission Pipeline

A new 8-inch-diameter transmission pipeline will be constructed to connect the well to the City's existing water distribution system. The 4,800-foot-long pipeline will be constructed within the 600 East street right-of-way and will connect to existing 10-inch diameter and 8-inch diameter pipelines at 600 East and 3200 North (see Figure 2).

Booster Pump Station

A new 866 gpm booster pump station will be constructed near the outlets of the existing Lower Hills Tanks to provide lift into the upper zone of Skye Area (see Figure 1). The booster pump will be designed to operate concurrently with the well pump so that when the well pump is turned on the booster pump will also turn on. Through this method of operation the Skye Area will not need to rely on storage capacity from the Lower Hills Tanks. Concurrent operation of the well pump and the booster pump will also avoid overtaxing the existing transmission/distribution pipeline system

Storage Tank

A new 1.1-million-gallon water storage tank will be constructed to north of the Skye Area. Of this storage capacity, 840,000 gallons will be provided for this area plan and the remaining 160,000 gallons will be provided for a future plan amendment. The elevation of the overflow will match the overflow elevation of the existing Seasons Tank (Elev. 5342 ft.), which is located west of the Skye Area.

Pressure Reducing Stations

The plan includes six new pressure reducing stations and 3 existing pressure reducing stations that will control pressures in an upper middle and lower pressure zone. The pressure reducing stations will use a 20-foot by 18-foot buried concrete vault that will contain valves for both the culinary water system and the pressurized irrigation system. The vaults will be constructed outside the street right-of-way in a public utility easement according to Lehi City standards.

Distribution Pipelines

Distribution pipelines ranging from 6-inches to 12-inches in diameter will provide for distribution of water throughout the Skye Area in accordance with Lehi City pressure requirements (see Figures 1, 3, and 4). Distribution pipelines will use PVC C-900 pipe materials for all pipelines within Lehi City street rights-of-way. Pipelines constructed within easements on privately-owned land will use Class 350 Ductile Iron Pipe. The following are the pipe numbers for these ductile iron pipes: M4936, M2003, M4941, M3030, and M4500.

Project Phasing

The long-term plan for the Skye Area includes three phases as shown in Figure 5. Phase 1 represents this area plan and includes 1,751 Equivalent Residential Connections (ERC). Phase 2 represents a future area plan amendment that will contain an area to be addressed in a boundary adjustment between Lehi and Draper Cities and includes 523 ERCs. Phase 3 is a long-term future phase that is located north on Phases 1 and 2 and includes 462 ERCs. Future area plan amendments will be required for Phases 2 and 3. However, capacity for these future phases has been included in determining source, transmission, booster pump, and storage (Phase 2 only) capacities as listed in Table 1.

Within Phase 1 an interim phase of development will occur. The plan outlined in this document represents the long-range plan for the culinary water system. However, construction of these facilities will likely take 1 to 2 years to accomplish. Lehi City has agreed that, on an interim basis, up to 467 ERUs of new development can be constructed in the Skye area based on available existing capacity in the Seasons Tank and the Sand Pit Well. For purposes of this determination, an ERU will be considered a platted and occupied equivalent residential unit.

Certain other Lehi City water system infrastructure projects that are currently in progress must also be completed before this interim development can proceed. These improvements include re-equipping the Sand Pit Well, construction of the Vialletto Pressure Irrigation Reservoir and Booster Pump Station, construction of the Flight Park Pressure Irrigation Reservoir and Booster Pump Station, and construction of the 1200 East Culinary Water Booster Pump Station. Completion of the long-range source, transmission, booster pumps, and storage outlined in this plan is required before development beyond the interim number of ERUs can occur.

Table 1 - Micron Area Culinary Water System
Design Criteria and System Requirements (Results)

	Lehi City Design Criteria	Results	Notes
ERCs		1,751 ERC	Phase 1 Development (this area plan)
		523 ERC	Phase 2 Development (boundary adjustment between Lehi and Draper)
		462 ERC	Phase 3 Development (long-term future)
		2,736 ERC	Total of 3 Phases
Source (Peak Daily Flow)	**456 gpd/ERC**	554 gpm	Phase 1 Development (this area plan)
		166 gpm	Phase 2 Development (boundary adjustment between Lehi and Draper)
		146 gpm	Phase 3 Development (long-term future)
		866 gpm	Total of 3 Phases
Peak Hourly Flow	0.80 gpm / ERC	1,401 gpm	Phase 1 Development (this area plan)
		418 gpm	Phase 2 Development (boundary adjustment between Lehi and Draper)
		- gpm	Phase 3 peak flow not included in this analysis
		1,819 gpm	Total of Phases 1 and 2
Peak Instantaneous	1.00 gpm/ERC	1,751 gpm	Phase 1 Development (this area plan)
		523	Phase 2 Development (boundary adjustment between Lehi and Draper)
		-	Phase 3 peak flow not included in this analysis
		2,274	Total of Phases 1 and 2
Equalizaiton Storage:	400 gallons/ERC	700,400 gal.	Phase 1 Development (this area plan)
		209,200 gal.	Phase 2 Development (boundary adjustment between Lehi and Draper)
		- gal.	Phase 3 storage not included in this analysis
		909,600 gal.	Total of Phases 1 and 2
Emergency Storage	20% EQ Storage	140,080 gal.	Phase 1 Development (this area plan)
		41,840 gal.	Phase 2 Development (boundary adjustment between Lehi and Draper)
		- gal.	Phase 3 storage not included in this analysis
		181,920 gal.	Total of Phases 1 and 2
Total Culinary Storage		**1,091,520 gal.**	
Minimum Pressure	50 psi at peak hourly + fire 20 psi at extreme peak	50.01 psi 51.48 psi	at Node M555 at Node M555
Fire Flow	550 gpm	550 gpm	Interior sprinkler flows are not intended to provide for tall stacks or high sprinkler rates

Micron Area Plan Amendment

Updated from "Latest ERU's for HAL" spreadsheet from Ben Tuckett 04-2022

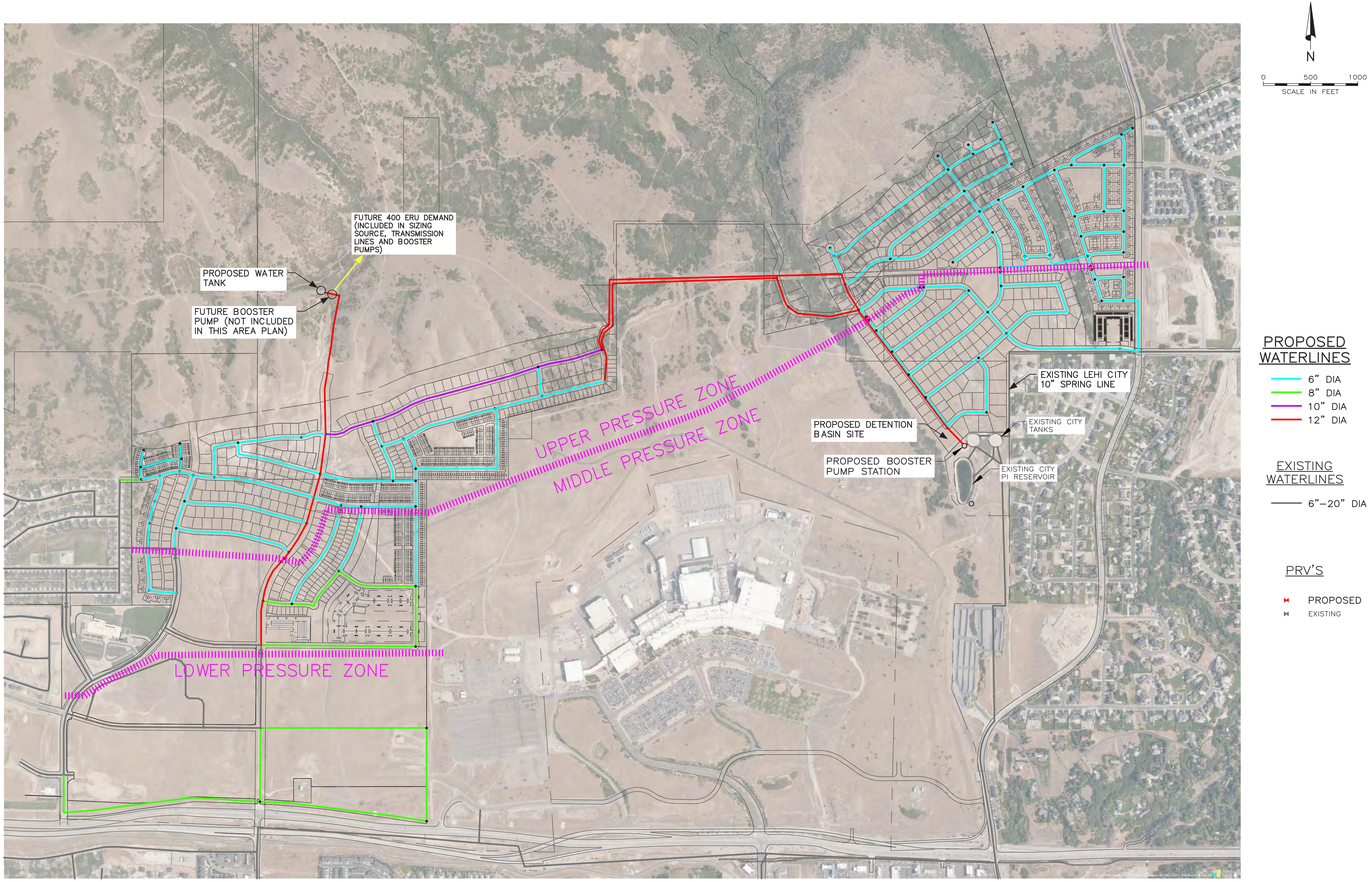
				ERUs/Parcel
Parcel	Land Use	Acres	Density	Units
1	Open Space	3.67		
2	Open Space	8.9		
3	Gardner MU	100	4.6	460
4	DR Horton MU	20.6	16.2	334
5	Middle School	30.2		
6	Open Space	2.3	2	0
7	Elementary School	12.7		
8	Single Story Duplex	6.7	4	28
9	Horton Plus (Alley)	7.5	4	30
10	Church Site	22.7	1	27
11	Horton Plus (Alley)	6.8	4	28
12	Cotttage	10.5	5.2	55
13	Park	2.6	0	0
14	Townhomes	13.6	4.3	59
15	Alley-Load Towns	3	43.7	131
16	Emerald	1	3	4
17	Emerald	16.1	3	48
18	Townhomes	4.1	6	6
Newly Added	Alley-Load Towns			32
19	Emerald	6.7	3	20
Total (Lehi - west portion)				1262
20	Emerald	4.3	3.7	16
21	Emerald	4.4	2.3	10
22	Clubhouse	4.4	3	10
23	Emerald	19.1	2	50
24	Cottage (changed)	7	6.6	46
25	Cottage	3.8	2.6	10
26	Townhomes	15.1	6.9	104
Newly Added	Alley-Load Towns			137
27	Cottage	5.3	1.5	8
28	Park	3	0	0
29	30' Buffer Easement	1.6	0	0
Total (Draper -west portion)				391
West Total				1653

Parcel	Land Use	Acres	Density	Units
30A	Estates	10	1.3	13
30B	Estates	1	2.0	2
31A	Emerald	9.1	2.9	26
31B	Emerald	24.1	2.7	64
32	Park	2.1	0	5
33a	Horton Plus	3.1	3.2	10
33b	Horton Plus	5.3	3.6	19
34A	Cottage	1	6.0	6
34B	Cottage	2.3	7.8	18
35	Cottage	2.4	5.4	13
36	Estates	2.7	1.9	5
37	Church	3.6	1.5	2
38	Active Adult	5.3	5.7	30
39	Active Adult	24.6	5.4	134
40	Park	6.7	0	5
41	Active Adult	11.1	5.6	62
42	Horton Plus	12.3	3.3	40
43A	Cottage	1.3	8.5	11
Total (Lehi - east portion)				465
43B	Cottage	0.3		2
44	Cottage	1.1	0	4
45	Horton Plus	1.6	2.5	4
46	Horton Plus	12	3.8	45
47	Park	2	0.0	0

48	Emerald	23	2.7	61
49	Park	6.8	0.0	0
50	Horton Plus (changed)	6.2	2.1	13
51	Horton Plus (changed)	1.2	2.5	3
Total (Draper - east portion)				132
East Total				597

TOTAL MICRON AREA	2250	plus 350 additional lots above project.

FILE NAME: PROJECTS\432 – DR HORTON\02.100 – MICRON PROPERTY\CAD\FIGURES\FIGURE 1 WATER.DWG FILE DATE: 1.4.2022 14:32:31 (CAH)



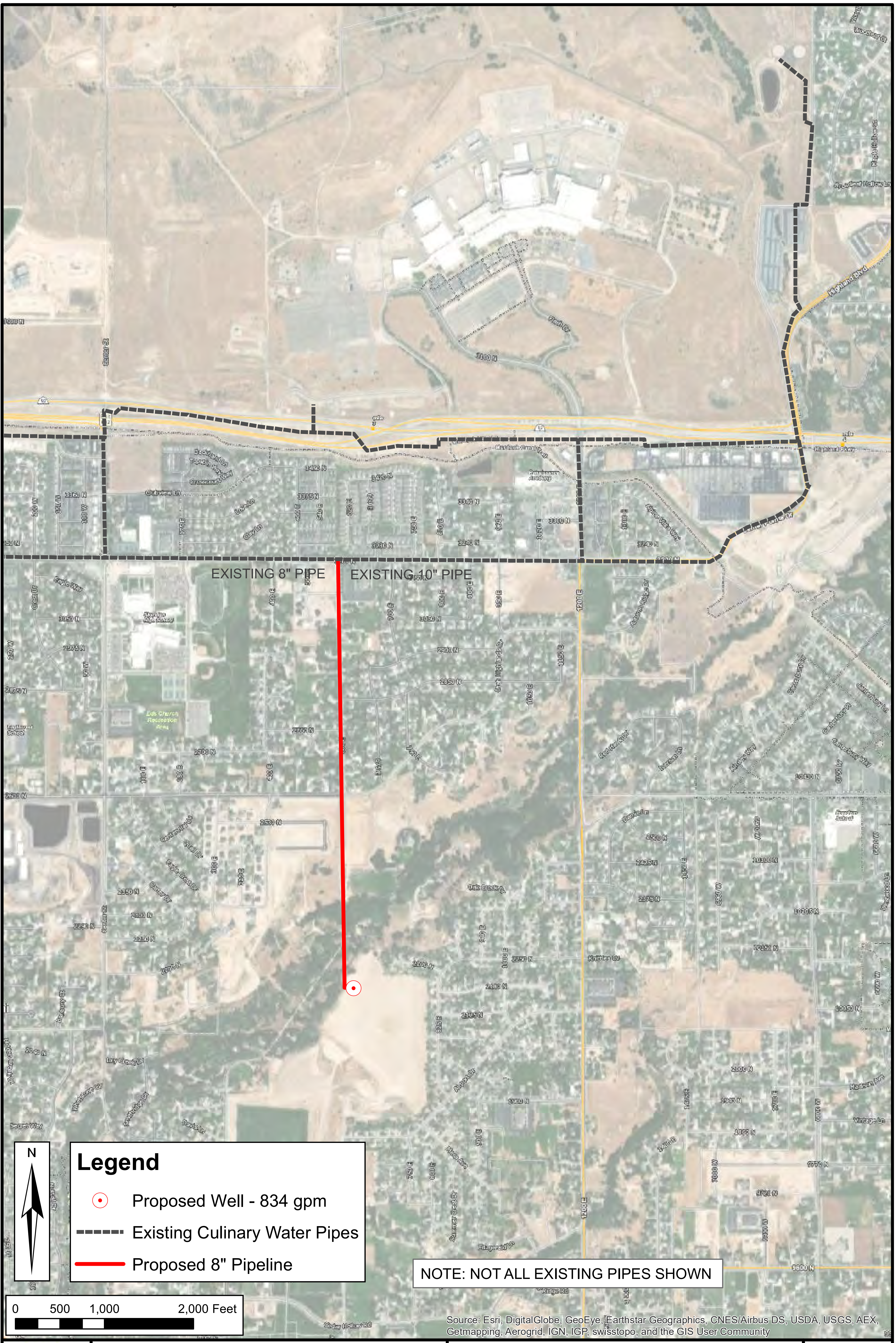
HANSEN ALLEN & LUCE INC ENGINEERS

10/07

CULINARY WATER – ONSITE DISTRIBUTION SYSTEM

FIGURE

1



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Date: 1/3/2022
Document Path: H:\Projects\432 - DR Horton\02.100 - Micron Property\GIS\Culinary Well Pipeline.mxd

HANSEN ALLEN & LUCE INC
ENGINEERS

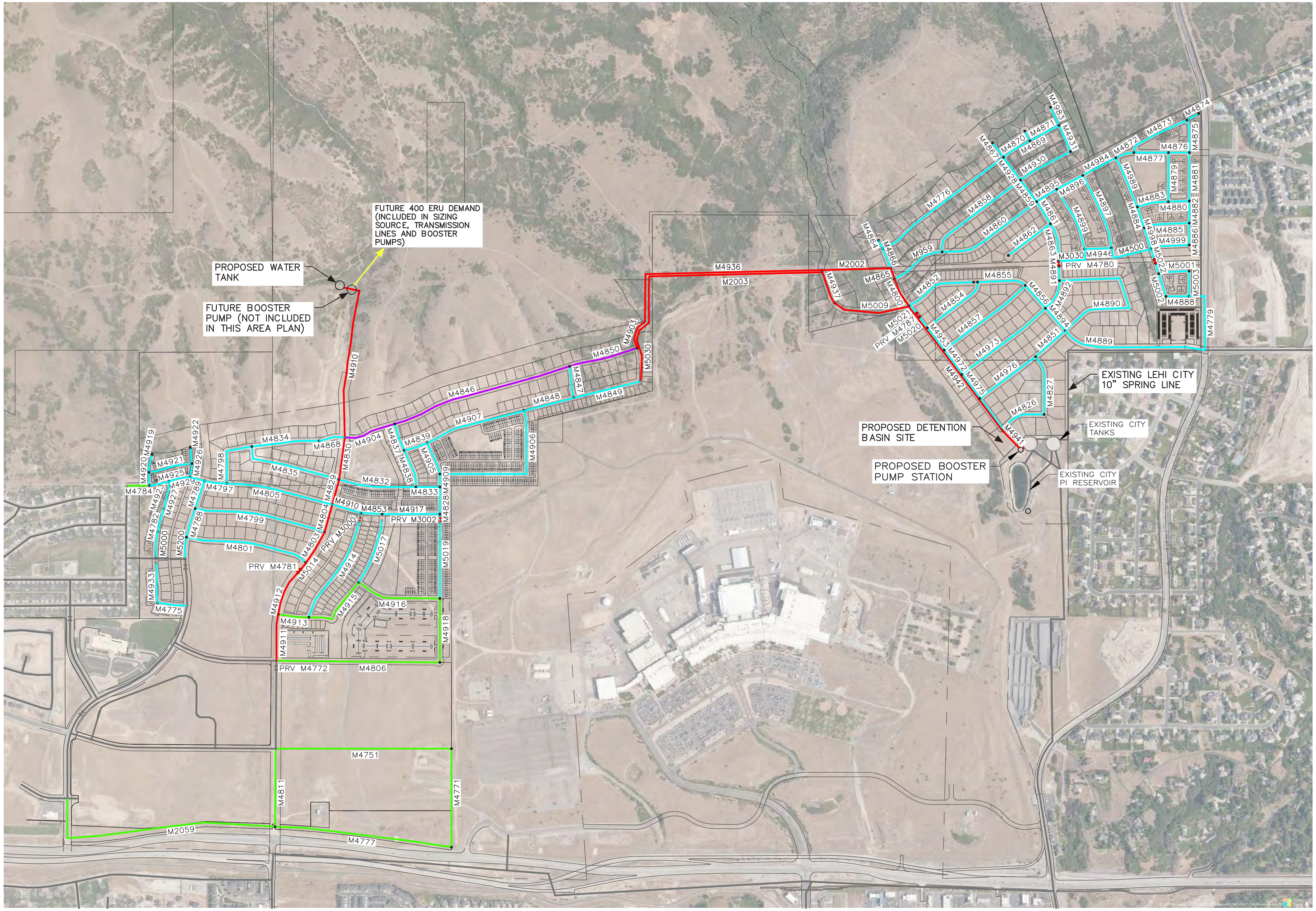
MICRON AREA PLAN AMENDMENT

OFFSITE CULINARY WATER

FIGURE
2

N

0 500 1000
SCALE IN FEET



PROPOSED WATERLINES

- 6" DIA
- 8" DIA
- 10" DIA
- 12" DIA

EXISTING WATERLINES

- 6"-20" DIA

PRV'S

- PROPOSED
- EXISTING

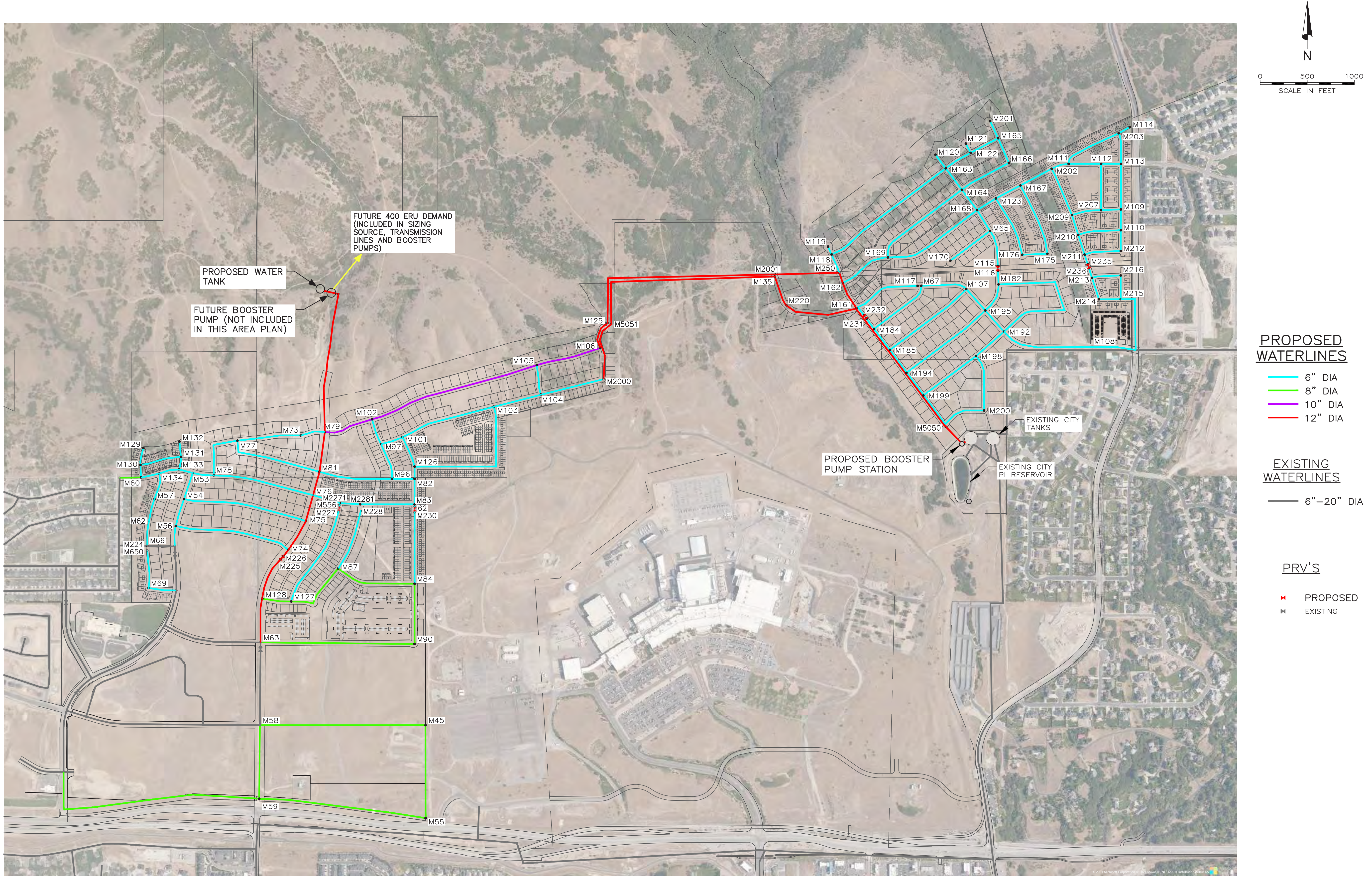
HANSEN ALLEN & LUCE INC
ENGINEERS

CULINARY WATER - PIPE NUMBERS FROM EPANET MODEL

FIGURE
3

10/07

FILE NAME: PROJECTS\432 – DR HORTON\02.100 – MICRON PROPERTY\CAD\FIGURES\FIGURE 1 WATER.DWG
FILE DATE: 1.4.2022 14:32:31 (CAH)

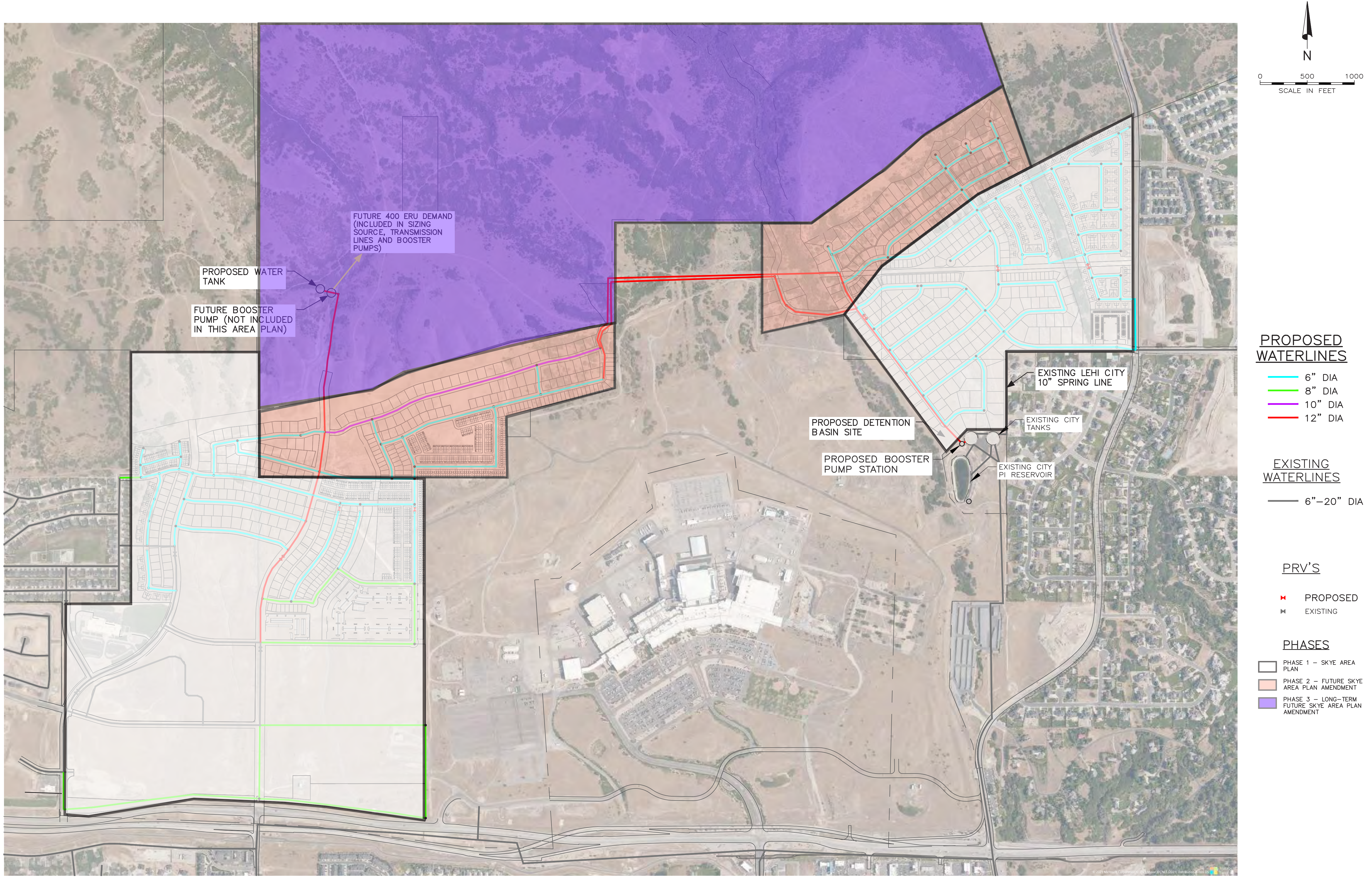


HANSEN ALLEN & LUCE INC
ENGINEERS

CULINARY WATER — JUNCTION NUMBERS FROM EPANET MODEL

FIGURE
4

10/07



FILE DATE: 1.4.2022 14:32:31 (CAH)

FILE NAME: PROJECTS\432 – DR HORTON\02.100 – MICRON PROPERTY\CAD\FIGURES\FIGURE 1 WATER.DWG

10/07

HANSEN ALLEN & LUCE INC
ENGINEERS

CULINARY WATER – DEVELOPMENT PHASING

FIGURE
5

DW Extreme Peak Flow Scenario
Model Results - Updated June 2022
Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M101	5112	0	0	5327.12	93.21
Junc M102	5122	50	50	5328.02	89.27
Junc M103	5100	137	137	5327.23	98.46
Junc M104	5123	8	8	5329.73	89.58
Junc M105	5150	46	46	5329.75	77.89
Junc M106	5148	0	0	5330.64	79.14
Junc M107	5043	9.5	9.5	5197.3	66.86
Junc M108	4975	2	2	5197.91	96.59
Junc M109	5041	0	0	5323.12	122.24
Junc M110	5025	0	0	5323.11	129.17
Junc M111	5074	0	0	5323.19	107.97
Junc M112	5067	5	5	5323.14	110.99
Junc M113	5059	0	0	5323.12	114.44
Junc M114	5079	67	67	5323.02	105.74
Junc M115	5035	0	0	5324.65	125.5
Junc M116	5035	0	0	5197.27	70.31
Junc M117	5069	18.5	18.5	5332.99	114.39
Junc M118	5135	0	0	5331.57	85.17
Junc M119	5146	0	0	5331.57	80.41
Junc M120	5167	0	0	5326.83	69.25
Junc M121	5144	0	0	5326.67	79.15
Junc M122	5134	0	0	5326.67	83.48
Junc M123	5080	0	0	5324.53	105.95
Junc M125	5163	0	0	5330.75	72.69
Junc M126	5073	104	104	5326.74	109.95
Junc M127	4952	0	0	5177.51	97.72
Junc M128	4970	0	0	5177.49	89.91
Junc M129	5165	32	32	5326.63	70.03
Junc M130	5154	0	0	5326.65	74.81
Junc M131	5129	0	0	5326.64	85.64
Junc M132	5149	6	6	5326.64	76.97
Junc M133	5121	0	0	5326.64	89.11
Junc M134	5130	0	0	5326.66	85.21
Junc M135	5135	3	3	5332.87	85.74
Junc M137	4969	0	0	5340.35	160.9
Junc M161	5070	10	10	5333.02	113.97
Junc M162	5110	4	4	5332.35	96.35
Junc M163	5148	0	0	5326.83	77.49
Junc M164	5115	45	45	5326.48	91.64
Junc M165	5130	0	0	5326.49	85.14
Junc M166	5105	0	0	5326.49	95.97
Junc M167	5076	0	0	5323.84	107.39
Junc M168	5088	0	0	5325.48	102.9
Junc M169	5098	13	13	5328.03	99.67

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M170	5066	40	40	5324.92	112.19
Junc M175	5026	62	62	5323.73	129.01
Junc M176	5034	0	0	5324.32	125.79
Junc M182	5028	18	18	5197.27	73.34
Junc M184	5050	5	5	5197.4	63.87
Junc M185	5031	0	0	5197.33	72.07
Junc M192	4995	5	5	5197.3	87.66
Junc M194	5005	0	0	5197.29	83.32
Junc M195	5020	64	64	5197.27	76.81
Junc M198	4999	2	2	5197.28	85.92
Junc M199	4990	26	26	5197.27	89.81
Junc M200	4975	13	13	5197.27	96.31
Junc M2000	5122	0	0	5332.53	91.22
Junc M201	5144	61	61	5326.42	79.04
Junc M202	5073	0	0	5323.29	108.45
Junc M203	5082	0	0	5323.09	104.46
Junc M207	5046	0	0	5323.14	120.08
Junc M209	5059	0	0	5323.16	114.46
Junc M210	5036	0	0	5323.13	124.41
Junc M211	5022	0	0	5323.13	130.48
Junc M212	5016	67	67	5323.08	133.06
Junc M213	5005	0	0	5198.53	83.86
Junc M214	4991	0	0	5198.46	89.89
Junc M215	4987	30	30	5198.39	91.59
Junc M216	4999	0	0	5198.45	86.42
Junc M220	5104	13	13	5332.91	99.19
Junc M225	5005	0	0	5178.09	75
Junc M226	5012	0	0	5325.79	135.96
Junc M227	5061	28	28	5183.32	53
Junc M2271	5061	0	0	5324.71	114.26
Junc M228	5056	27.5	27.5	5176.9	52.39
Junc M2281	5059	131	131	5324.72	115.14
Junc M230	5040	45	45	5176.43	59.12
Junc M231	5059	0	0	5197.47	60
Junc M232	5063	5	5	5332.96	116.97
Junc M235	5017	0	0	5323	132.59
Junc M236	5014	0	0	5198.63	80
Junc M250	5120	0	0	5332.24	91.96
Junc M45	4860	115	115	5070.88	91.38
Junc M5050	4976	0	0	5339.27	157.41
Junc M5051	5163	0	0	5332.59	73.48
Junc M53	5112	0	0	5326.63	93
Junc M54	5083	0	0	5326.49	105.51
Junc M55	4832	115	115	5070.88	103.51
Junc M555	5055	15	15	5173.82	51.48
Junc M556	5061	0	0	5324.38	114.12
Junc M56	5063	48	48	5326.46	114.16

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M57	5107	14	14	5326.65	95.18
Junc M59	4842	115	115	5071.34	99.37
Junc M60	5144	0	0	5326.68	79.15
Junc M62	5077	15	15	5326.66	108.18
Junc M65	5063	0	0	5325.02	113.53
Junc M67	5069	9	9	5197.33	55.6
Junc M69	5001	0	0	5173.83	74.89
Junc M73	5140	10	10	5327.63	81.3
Junc M74	5018	0	0	5325.89	133.41
Junc M75	5047	0	0	5326.3	121.02
Junc M76	5065	0	0	5326.6	113.35
Junc M77	5164	16	16	5327.06	70.65
Junc M78	5112	20	20	5326.67	93.01
Junc M79	5128	10	10	5327.93	86.63
Junc M81	5103	4	4	5327.06	97.09
Junc M82	5052	0	0	5326.69	119.02
Junc M83	5041	14	14	5326.02	123.5
Junc M84	4984	0	0	5176.61	83.46
Junc M87	4995	27.5	27.5	5176.97	78.85
Junc M90	4938	167	167	5176.49	103.34
Junc M96	5062	0	0	5326.98	114.82

DW Extreme Peak Flow Scenario
Model Results - Updated June 2022

Network Table - Links

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M2003	2173.89	12	0.85	207.07	0.59
Pipe M2059	1987.85	8	0.85	79.1	0.5
Pipe M3030	338.14	6	0.85	-96.47	1.09
Pipe M4500	405.46	6	0.85	121.02	1.37
Pipe M4751	1788.9	8	0.85	128.13	0.82
Pipe M4771	589.76	8	0.85	13.13	0.08
Pipe M4775	285.79	6	0.85	-15	0.17
Pipe M4776	1518.24	6	0.85	177.93	2.02
Pipe M4777	1818.29	8	0.85	-101.87	0.65
Pipe M4778	200.4	12	0.85	-1197.23	3.4
Pipe M4779	864.28	6	0.85	71.11	0.81
Pipe M47801	54.17	6	0.85	0	0
Pipe M4782	203.74	6	0.85	6.84	0.08
Pipe M4784	164.85	8	0.85	74.35	0.47
Pipe M4788	297.09	6	0.85	-30.14	0.34
Pipe M4789	284.87	6	0.85	-65.79	0.75
Pipe M4797	233.85	6	0.85	-36.6	0.42
Pipe M4798	596.92	6	0.85	-78.88	0.9
Pipe M4799	1305.71	6	0.85	35.65	0.4
Pipe M4800	323.33	12	0.85	902.49	2.56
Pipe M4801	1222.77	6	0.85	65.57	0.74
Pipe M4803	351.65	12	0.85	-668.29	1.9
Pipe M4804	288.81	12	0.85	-632.65	1.79
Pipe M4805	1048.24	6	0.85	22.29	0.25
Pipe M4806	1658.03	8	0.85	78.54	0.5
Pipe M4811	535.94	8	0.85	137.77	0.88
Pipe M4818	1825.74	12	0.85	-847.23	2.4
Pipe M4826	829.07	6	0.85	2.96	0.03
Pipe M4827	581.15	6	0.85	10.04	0.11
Pipe M4828	241.88	6	0.85	-166.45	1.89
Pipe M4829	251.06	12	0.85	-851.34	2.42
Pipe M4830	429.53	12	0.85	-888.5	2.52
Pipe M4832	794.95	6	0.85	28.8	0.33
Pipe M4833	231.89	6	0.85	110.71	1.26
Pipe M4834	666.09	6	0.85	-90.53	1.03
Pipe M4835	996.42	6	0.85	-4.35	0.05
Pipe M4837	276.45	6	0.85	166.53	1.89
Pipe M4838	388.91	6	0.85	81.91	0.93
Pipe M4839	236.62	6	0.85	74.62	0.85
Pipe M4846	1853.78	10	0.85	-368.33	1.5
Pipe M4847	296.51	6	0.85	23.05	0.26
Pipe M4848	521	6	0.85	222.12	2.52
Pipe M4849	667.94	6	0.85	-207.07	2.35
Pipe M4850	683.02	10	0.85	-437.38	1.79

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M4851	390.17	6	0.85	-20.4	0.23
Pipe M4852	680.07	6	0.85	18.5	0.21
Pipe M4853	199.08	6	0.85	-21.45	0.24
Pipe M4854	701.43	6	0.85	29.86	0.34
Pipe M4855	487.07	6	0.85	20.86	0.24
Pipe M4856	312.52	6	0.85	26.66	0.3
Pipe M4857	1046.89	6	0.85	15.3	0.17
Pipe M4858	1088.16	6	0.85	117.89	1.34
Pipe M4859	284.37	6	0.85	189.82	2.15
Pipe M4860	1101.43	6	0.85	152.29	1.73
Pipe M4861	244.83	6	0.85	136.47	1.55
Pipe M4862	506.39	6	0.85	40	0.45
Pipe M4863	385.71	6	0.85	-96.47	1.09
Pipe M4864	74.97	6	0.85	0	0
Pipe M4865	115.14	12	0.85	615.32	1.75
Pipe M4866	214.81	6	0.85	177.94	2.02
Pipe M4867	184.73	6	0.85	0	0
Pipe M4868	281.2	6	0.85	-100.53	1.14
Pipe M4869	103.82	6	0.85	0	0
Pipe M4870	306.36	6	0.85	69.14	0.78
Pipe M4871	333.19	6	0.85	69.13	0.78
Pipe M4872	199.54	6	0.85	70.84	0.8
Pipe M4873	621.26	6	0.85	36.7	0.42
Pipe M4874	125.89	6	0.85	-67	0.76
Pipe M4875	322.34	6	0.85	-30.3	0.34
Pipe M4876	202.35	6	0.85	25.4	0.29
Pipe M4877	331.23	6	0.85	34.13	0.39
Pipe M4879	475.13	6	0.85	3.74	0.04
Pipe M4880	201.45	6	0.85	23.46	0.27
Pipe M4881	494.13	6	0.85	-4.9	0.06
Pipe M4882	212.86	6	0.85	18.55	0.21
Pipe M4883	308.19	6	0.85	-19.72	0.22
Pipe M4884	232.24	6	0.85	28.53	0.32
Pipe M4885	428.43	6	0.85	16.82	0.19
Pipe M4886	216.79	6	0.85	35.38	0.4
Pipe M4888	250.9	6	0.85	48.57	0.55
Pipe M4889	1176.37	6	0.85	-69.11	0.78
Pipe M4890	1628.46	6	0.85	12.2	0.14
Pipe M4891	148.68	6	0.85	0	0
Pipe M4892	319.67	6	0.85	5.8	0.07
Pipe M4894	288.2	6	0.85	-31.5	0.36
Pipe M4895	230.36	6	0.85	-205.63	2.33
Pipe M4896	294.67	6	0.85	153.1	1.74
Pipe M4897	760.9	6	0.85	34.01	0.39
Pipe M4899	677.32	6	0.85	-52.53	0.6
Pipe M4903	219.96	12	0.85	-437.38	1.24
Pipe M4904	514.96	10	0.85	-151.8	0.62

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M4905	331.23	6	0.85	105.02	1.19
Pipe M4906	1471.7	6	0.85	-54.72	0.62
Pipe M4907	1014.93	6	0.85	-30.4	0.34
Pipe M4909	144.64	6	0.85	55.74	0.63
Pipe M4910	337.19	6	0.85	240.98	2.73
Pipe M4911	473.69	12	0.85	-779.83	2.21
Pipe M4912	428.69	12	0.85	-733.84	2.08
Pipe M4913	340.42	8	0.85	-45.99	0.29
Pipe M4914	1090.05	6	0.85	234.46	2.66
Pipe M4915	678.95	8	0.85	188.46	1.2
Pipe M4916	840.41	8	0.85	133.46	0.85
Pipe M4917	563.54	6	0.85	-152.45	1.73
Pipe M4918	611.98	8	0.85	-88.46	0.56
Pipe M4919	170.04	6	0.85	-32	0.36
Pipe M4920	118.81	6	0.85	-43.72	0.5
Pipe M4921	406.81	6	0.85	11.72	0.13
Pipe M4922	155.84	6	0.85	-6	0.07
Pipe M4923	186.37	6	0.85	30.63	0.35
Pipe M4925	193.21	6	0.85	23.47	0.27
Pipe M4926	133.52	6	0.85	5.72	0.06
Pipe M4927	304.9	6	0.85	7.16	0.08
Pipe M4928	279.76	6	0.85	108.8	1.23
Pipe M4929	135.67	6	0.85	29.19	0.33
Pipe M4930	575.66	6	0.85	-8.13	0.09
Pipe M4931	279.03	6	0.85	8.13	0.09
Pipe M4933	417.15	6	0.85	15	0.17
Pipe M4936	2886.07	12	0.85	437.38	1.24
Pipe M4937	344.01	12	0.85	-210.07	0.6
Pipe M4940	100.1	12	0.85	1241.46	3.52
Pipe M4941	278.62	12	0.85	1241.46	3.52
Pipe M4942	1619.15	12	0.85	1241.46	3.52
Pipe M4946	263.53	6	0.85	149.01	1.69
Pipe M4953	273.7	6	0.85	-47.53	0.54
Pipe M4972	325.26	6	0.85	32.23	0.37
Pipe M4973	1054.86	6	0.85	-11.64	0.13
Pipe M4975	291.19	6	0.85	20.6	0.23
Pipe M4976	692.55	6	0.85	-8.36	0.09
Pipe M4983	184.08	6	0.85	61	0.69
Pipe M4984	375.76	6	0.85	119.09	1.35
Pipe M4989	525.66	6	0.85	48.25	0.55
Pipe M4998	214.82	6	0.85	11.71	0.13
Pipe M4999	367.29	6	0.85	31.62	0.36
Pipe M5000	271.56	6	0.85	-21.84	0.25
Pipe M5001	293.3	6	0.85	-48.57	0.55
Pipe M5002	246.48	6	0.85	52.53	0.6
Pipe M5003	224.29	6	0.85	52.53	0.6
Pipe M5009	772.69	12	0.85	-223.07	0.63

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M5014	72.88	12	0.85	733.87	2.08
Pipe M5017	676.01	6	0.85	-27.5	0.31
Pipe M5019	779.75	6	0.85	-45	0.51
Pipe M5020	96.35	6	0.85	-82.39	0.93
Pipe M5021	76.96	6	0.85	-87.39	0.99
Pipe M5022	123.81	6	0.85	-101.11	1.15
Pipe M5023	92.56	6	0.85	-101.11	1.15
Pipe M5030	530.9	12	0.85	207.07	0.59
Pipe M5102	49.73	6	0.85	262.43	2.98
Pipe M5200	215.68	6	0.85	-83.43	0.95

DW Peak Hourly Flow Scenario with Fire (550gpm)
Model Results - Updated June 2022

Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M101	5112	0	0	5326.49	92.94
Junc M102	5122	50	40	5327.36	88.98
Junc M103	5100	137	109.6	5326.95	98.34
Junc M104	5123	8	6.4	5330.08	89.73
Junc M105	5150	46	36.8	5330.1	78.04
Junc M106	5148	0	0	5331.35	79.44
Junc M107	5043	9.5	7.6	5197.39	66.9
Junc M108	4975	2	1.6	5197.98	96.62
Junc M109	5041	0	0	5327.26	124.04
Junc M110	5025	0	0	5327.25	130.97
Junc M111	5074	0	0	5327.31	109.76
Junc M112	5067	5	4	5327.27	112.78
Junc M113	5059	0	0	5327.26	116.24
Junc M114	5079	67	53.6	5327.2	107.54
Junc M115	5035	0	0	5328.35	127.11
Junc M116	5035	0	0	5197.38	70.36
Junc M117	5069	18.5	14.8	5334.38	114.99
Junc M118	5135	0	0	5333.13	85.85
Junc M119	5146	0	0	5333.13	81.08
Junc M120	5167	0	0	5329.89	70.58
Junc M121	5144	0	0	5329.78	80.5
Junc M122	5134	0	0	5329.78	84.83
Junc M123	5080	0	0	5328.27	107.57
Junc M125	5163	0	0	5331.51	73.01
Junc M126	5073	104	83.2	5326.06	109.65
Junc M127	4952	0	0	5177.03	97.51
Junc M128	4970	0	0	5177.02	89.7
Junc M129	5165	32	25.6	5324.91	69.29
Junc M130	5154	0	0	5324.93	74.06
Junc M131	5129	0	0	5324.92	84.89
Junc M132	5149	6	4.8	5324.92	76.23
Junc M133	5121	0	0	5324.92	88.36
Junc M134	5130	0	0	5324.92	84.46
Junc M135	5135	3	2.4	5334.21	86.32
Junc M137	4969	0	0	5341.71	161.5
Junc M161	5070	10	8	5334.4	114.57
Junc M162	5110	4	3.2	5333.73	96.94
Junc M163	5148	0	0	5329.89	78.81
Junc M164	5115	45	36	5329.65	93.01
Junc M165	5130	0	0	5329.66	86.51
Junc M166	5105	0	0	5329.66	97.35
Junc M167	5076	0	0	5327.78	109.09

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M168	5088	0	0	5328.94	104.4
Junc M169	5098	13	10.4	5330.73	100.84
Junc M170	5066	40	32	5328.56	113.77
Junc M175	5026	62	49.6	5327.7	130.73
Junc M176	5034	0	0	5328.12	127.44
Junc M182	5028	18	14.4	5197.38	73.39
Junc M184	5050	5	4	5197.44	63.89
Junc M185	5031	0	0	5197.41	72.1
Junc M192	4995	5	4	5197.41	87.71
Junc M194	5005	0	0	5197.39	83.36
Junc M195	5020	64	51.2	5197.38	76.86
Junc M198	4999	2	1.6	5197.39	85.96
Junc M199	4990	26	20.8	5197.38	89.86
Junc M200	4975	13	10.4	5197.38	96.36
Junc M2000	5122	0	0	5333.76	91.76
Junc M201	5144	61	48.8	5329.61	80.43
Junc M202	5073	0	0	5327.38	110.22
Junc M203	5082	0	0	5327.24	106.26
Junc M207	5046	0	0	5327.27	121.87
Junc M209	5059	0	0	5327.28	116.25
Junc M210	5036	0	0	5327.26	126.2
Junc M211	5022	0	0	5327.26	132.27
Junc M212	5016	67	53.6	5327.23	134.86
Junc M213	5005	0	0	5198.55	83.86
Junc M214	4991	0	0	5198.48	89.9
Junc M215	4987	30	24	5198.42	91.61
Junc M216	4999	0	0	5198.48	86.43
Junc M220	5104	13	10.4	5334.26	99.77
Junc M225	5005	0	0	5178.09	75
Junc M226	5012	0	0	5323.58	135.01
Junc M227	5061	28	22.4	5183.32	53
Junc M2271	5061	28	22.4	5323.48	113.73
Junc M228	5059	27.5	22	5176.37	50.86
Junc M2281	5059	131	104.8	5323.57	114.64
Junc M230	5040	45	36	5175.82	58.85
Junc M231	5059	0	0	5197.47	60
Junc M232	5063	5	4	5334.37	117.59
Junc M235	5017	0	0	5327.15	134.39
Junc M236	5014	0	0	5198.63	80
Junc M250	5120	0	0	5333.6	92.55
Junc M45	4860	115	92	5064.64	88.67
Junc M5050	4976	0	0	5340.63	157.99
Junc M5051	5163	0	0	5333.85	74.03
Junc M53	5112	0	0	5324.92	92.26
Junc M54	5083	0	0	5324.67	104.71

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M55	4832	802.5	642	5063.67	100.38
Junc M555	5055	15	12	5170.42	50.01
Junc M556	5061	0	0	5323.23	113.62
Junc M56	5063	48	38.4	5324.54	113.33
Junc M57	5107	14	11.2	5324.86	94.4
Junc M59	4842	115	92	5068.99	98.35
Junc M60	5144	0	0	5324.95	78.41
Junc M62	5077	15	12	5324.83	107.39
Junc M620	5040	0	0	5325.11	123.54
Junc M65	5063	0	0	5328.62	115.09
Junc M67	5069	9	7.2	5197.4	55.64
Junc M69	5001	0	0	5170.43	73.41
Junc M73	5140	10	8	5326.7	80.9
Junc M74	5018	0	0	5323.76	132.49
Junc M75	5047	0	0	5324.52	120.25
Junc M76	5065	0	0	5325.09	112.7
Junc M77	5164	16	12.8	5325.85	70.13
Junc M78	5112	20	16	5325.1	92.34
Junc M79	5128	10	8	5327.12	86.28
Junc M81	5103	4	3.2	5325.86	96.57
Junc M82	5052	0	0	5325.89	118.68
Junc M83	5041	14	11.2	5325.11	123.1
Junc M84	4984	0	0	5175.94	83.17
Junc M87	4995	27.5	22	5176.42	78.61
Junc M90	4938	167	133.6	5175.73	103.01
Junc M96	5062	0	0	5326.03	114.4

DW Peak Hourly Flow Scenario with Fire (550gpm)

Model Results - Updated June 2022

Network Table - Links

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M2003	2182.25	12	0.85	237.57	0.67
Pipe M2059	1987.85	8	0.85	201.73	1.29
Pipe M3030	338.52	6	0.85	-81	0.92
Pipe M4500	399.87	6	0.85	103.44	1.17
Pipe M4751	1788.9	8	0.85	365.36	2.33
Pipe M4771	589.76	8	0.85	273.36	1.74
Pipe M4775	283.65	6	0.85	-12	0.14
Pipe M4776	1518.24	6	0.85	145.93	1.66
Pipe M4777	1818.29	8	0.85	-368.64	2.35
Pipe M4778	223.55	12	0.85	-1226.78	3.48
Pipe M4779	864.28	6	0.85	68.35	0.78
Pipe M47801	42.85	6	0.85	0	0
Pipe M4782	203.74	6	0.85	-29.95	0.34
Pipe M4784	164.85	8	0.85	76.39	0.49
Pipe M4788	297.09	6	0.85	-60.97	0.69
Pipe M4789	284.87	6	0.85	-91.62	1.04
Pipe M4797	233.85	6	0.85	-86.78	0.98
Pipe M4798	596.92	6	0.85	-109.97	1.25
Pipe M4799	1305.71	6	0.85	30.66	0.35
Pipe M4800	323.33	12	0.85	906.38	2.57
Pipe M4801	1222.77	6	0.85	77.33	0.88
Pipe M4803	351.65	12	0.85	-916.88	2.6
Pipe M4804	288.81	12	0.85	-886.22	2.51
Pipe M4805	1048.24	6	0.85	7.19	0.08
Pipe M4806	1658.03	8	0.85	12.88	0.08
Pipe M4811	535.94	8	0.85	258.91	1.65
Pipe M4818	1775.53	12	0.85	-946.78	2.69
Pipe M4826	829.07	6	0.85	0.55	0.01
Pipe M4827	581.15	6	0.85	9.85	0.11
Pipe M4828	250.32	6	0.85	-178.15	2.02
Pipe M4829	251.06	12	0.85	-1103.05	3.13
Pipe M4830	429.53	12	0.85	-1075.1	3.05
Pipe M4832	794.95	6	0.85	-41.94	0.48
Pipe M4833	231.89	6	0.85	73.13	0.83
Pipe M4834	666.09	6	0.85	-111.98	1.27
Pipe M4835	996.42	6	0.85	-10.79	0.12
Pipe M4837	276.45	6	0.85	171.37	1.94
Pipe M4838	388.91	6	0.85	115.07	1.31
Pipe M4839	236.62	6	0.85	48.31	0.55
Pipe M4846	1853.78	10	0.85	-467.68	1.91
Pipe M4847	296.51	6	0.85	18.34	0.21
Pipe M4848	521	6	0.85	249.51	2.83

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M4849	674.21	6	0.85	-237.57	2.7
Pipe M4850	683.02	10	0.85	-522.82	2.14
Pipe M4851	390.17	6	0.85	-20.22	0.23
Pipe M4852	680.07	6	0.85	14.8	0.17
Pipe M4853	214.98	6	0.85	-62.15	0.71
Pipe M4854	701.43	6	0.85	19.91	0.23
Pipe M4855	487.07	6	0.85	12.71	0.14
Pipe M4856	312.52	6	0.85	15.45	0.18
Pipe M4857	1046.89	6	0.85	10.34	0.12
Pipe M4858	1088.16	6	0.85	97.5	1.11
Pipe M4859	284.37	6	0.85	158.62	1.8
Pipe M4860	1101.43	6	0.85	126.53	1.44
Pipe M4861	244.83	6	0.85	113	1.28
Pipe M4862	506.39	6	0.85	32	0.36
Pipe M4863	385.71	6	0.85	-81	0.92
Pipe M4864	74.97	6	0.85	0	0
Pipe M4865	109.52	12	0.85	668.75	1.9
Pipe M4866	220.11	6	0.85	145.93	1.66
Pipe M4867	184.73	6	0.85	0	0
Pipe M4868	281.2	6	0.85	-119.98	1.36
Pipe M4869	103.82	6	0.85	0	0
Pipe M4870	306.36	6	0.85	56.44	0.64
Pipe M4871	333.19	6	0.85	56.43	0.64
Pipe M4872	199.54	6	0.85	59.22	0.67
Pipe M4873	621.26	6	0.85	30.14	0.34
Pipe M4874	125.89	6	0.85	-53.6	0.61
Pipe M4875	322.34	6	0.85	-23.46	0.27
Pipe M4876	202.35	6	0.85	21	0.24
Pipe M4877	331.23	6	0.85	29.08	0.33
Pipe M4879	475.13	6	0.85	4.08	0.05
Pipe M4880	201.45	6	0.85	19.45	0.22
Pipe M4881	494.13	6	0.85	-2.46	0.03
Pipe M4882	212.86	6	0.85	16.99	0.19
Pipe M4883	308.19	6	0.85	-15.37	0.17
Pipe M4884	232.24	6	0.85	25.52	0.29
Pipe M4885	428.43	6	0.85	12.42	0.14
Pipe M4886	216.79	6	0.85	29.41	0.33
Pipe M4888	250.9	6	0.85	44.36	0.5
Pipe M4889	1176.37	6	0.85	-66.75	0.76
Pipe M4890	1628.46	6	0.85	11.73	0.13
Pipe M4891	148.68	6	0.85	0	0
Pipe M4892	319.67	6	0.85	2.67	0.03
Pipe M4894	288.2	6	0.85	-30.8	0.35
Pipe M4895	230.36	6	0.85	-172.15	1.95
Pipe M4896	294.67	6	0.85	128.33	1.46

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M4897	760.9	6	0.85	28.23	0.32
Pipe M4899	677.32	6	0.85	-43.82	0.5
Pipe M4903	219.96	12	0.85	-522.82	1.48
Pipe M4904	514.96	10	0.85	-256.31	1.05
Pipe M4905	331.23	6	0.85	112.88	1.28
Pipe M4906	1471.7	6	0.85	-75.34	0.85
Pipe M4907	1014.93	6	0.85	-64.58	0.73
Pipe M4909	144.64	6	0.85	105.02	1.19
Pipe M4910	332.07	6	0.85	-224.02	2.54
Pipe M4911	473.69	12	0.85	-1034.85	2.94
Pipe M4912	428.69	12	0.85	-994.21	2.82
Pipe M4913	340.42	8	0.85	-40.64	0.26
Pipe M4914	1115.81	6	0.85	241.37	2.74
Pipe M4915	678.95	8	0.85	200.72	1.28
Pipe M4916	840.41	8	0.85	156.72	1
Pipe M4917	558.26	6	0.85	166.95	1.89
Pipe M4918	611.98	8	0.85	-120.72	0.77
Pipe M4919	170.04	6	0.85	-25.6	0.29
Pipe M4920	118.81	6	0.85	-38.28	0.43
Pipe M4921	406.81	6	0.85	12.68	0.14
Pipe M4922	155.84	6	0.85	-4.8	0.05
Pipe M4923	186.37	6	0.85	38.11	0.43
Pipe M4925	193.21	6	0.85	-3.05	0.03
Pipe M4926	133.52	6	0.85	7.88	0.09
Pipe M4927	304.9	6	0.85	41.15	0.47
Pipe M4928	279.76	6	0.85	89.49	1.02
Pipe M4929	135.67	6	0.85	4.84	0.05
Pipe M4930	575.66	6	0.85	-7.63	0.09
Pipe M4931	279.03	6	0.85	7.63	0.09
Pipe M4933	410.95	6	0.85	12	0.14
Pipe M4936	2887.42	12	0.85	522.82	1.48
Pipe M4937	337.34	12	0.85	-239.97	0.68
Pipe M4940	100.1	12	0.85	1238	3.51
Pipe M4941	281.85	12	0.85	1238	3.51
Pipe M4942	1623.29	12	0.85	1238	3.51
Pipe M4946	263.53	6	0.85	124.81	1.42
Pipe M4953	273.7	6	0.85	-30.54	0.35
Pipe M4972	325.26	6	0.85	20.2	0.23
Pipe M4973	1054.86	6	0.85	-7.62	0.09
Pipe M4975	291.19	6	0.85	12.58	0.14
Pipe M4976	692.55	6	0.85	-8.77	0.1
Pipe M4983	184.08	6	0.85	48.8	0.55
Pipe M4984	375.76	6	0.85	100.1	1.14
Pipe M4989	525.66	6	0.85	40.89	0.46
Pipe M4998	214.82	6	0.85	13.1	0.15

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M4999	367.29	6	0.85	24.19	0.27
Pipe M5000	287.17	6	0.85	17.95	0.2
Pipe M5001	293.3	6	0.85	-44.36	0.5
Pipe M5002	246.48	6	0.85	47.99	0.54
Pipe M5003	224.29	6	0.85	47.99	0.54
Pipe M5009	772.69	12	0.85	-250.37	0.71
Pipe M5014	72.88	12	0.85	994.21	2.82
Pipe M5017	674	6	0.85	-22	0.25
Pipe M5019	779.14	6	0.85	-36	0.41
Pipe M5020	96.35	6	0.85	-54.45	0.62
Pipe M5021	76.96	6	0.85	-58.45	0.66
Pipe M5022	123.81	6	0.85	-92.35	1.05
Pipe M5023	92.56	6	0.85	-92.35	1.05
Pipe M5030	535.8	12	0.85	237.57	0.67
Pipe M5102	36.78	6	0.85	263.77	2.99
Pipe M5200	231.59	6	0.85	-54.76	0.62

SKYE
AREA PLAN

PRESSURIZED IRRIGATION SECTION

(HAL Project No.: 432.02.100)

Richard M Noble

REGISTERED PROFESSIONAL ENGINEER
No. 168241
RICHARD M. NOBLE
7/14/2022
STATE OF UTAH

July 2022

HANSEN
ALLEN
& LUCE INC
ENGINEERS

INTRODUCTION

The pressurized irrigation element of the Skye Area Plan includes all of the infrastructure needed to provide a reliable supply of irrigation water to 147 irrigated acres to be located adjacent to the Texas Instruments (formerly Micron) facility in Lehi, Utah. The plan also provides for an additional 249 irrigated acres associated with future development not included in this area plan but to be addressed in future area plan amendments. The system includes a well, storage reservoir, booster pump station, pipelines, and pressure reducing stations (see Figures 1 and 2). In addition to irrigation water, the system will provide fire protection for residential units within the development.

Water Source

The pressurized irrigation water source for the Skye Area Plan includes a single new well to be constructed at approximately 1500 North and 1200 East (see Figure 2). The well will have an equipped flow capacity of 1,388 gallons per minute (gpm). Of this capacity, 516 gpm is allocated to this area plan and 872 gpm is allocated to future area plan amendments. During construction of the well, a sanitary seal will be installed outside the first 100 feet of well casing to allow for future flexibility of use for the well in case it needs to be used as a drinking water source.

Offsite Transmission Pipeline

The new well will connect to the existing 12-inch diameter pipeline in 1200 East (see Figure 2).

Booster Pump Station

A new 1,388 gpm booster pump station will be constructed downhill from the existing Lower Hills Reservoir to provide lift into the upper zone of Skye Area (see Figure 1). An additional outlet with an appropriately sized screen will be provided at the Low Hills reservoir will be required to feed the booster pump station. The booster pump will be designed to operate concurrently with the well pump so that when the well pump is turned on the booster pump will also turn on. Through this method of operation the Skye Area will not need to rely on storage capacity from the Lower Hills Pond. Concurrent operation of the well pump and the booster pump will also avoid overtaxing the existing transmission/distribution pipeline system

Storage Pond

A new 1.3-million-gallon (4.0 acre-feet) water storage pond will be constructed to north of the Skye Area. Of this storage capacity, 923,000 gallons will be provided for this area plan and the remaining 377,000 gallons will be provided for a future plan amendment. The elevation of the overflow will match the overflow elevation of the existing Seasons P.I. Reservoir (Elev. 5332 ft.), which is located west of the Skye Area.

Pressure Reducing Stations

The plan includes six new pressure reducing stations and 3 existing pressure reducing stations that will control pressures in upper, middle and lower pressure zones. The pressure reducing stations will use a 20-foot by 18-foot buried concrete vault that will contain valves for both the culinary water system and the pressurized irrigation system. The vaults will be constructed outside the street right-of-way in a public utility easement according to Lehi City standards.

Distribution Pipelines

Distribution pipelines ranging from 8-inches to 16-inches in diameter will provide for distribution of water throughout the Skye Area in accordance with Lehi City pressure requirements (see Figures 1, 3, and 4). Distribution pipelines 12 inches in diameter and smaller will use PVC C-900 pipe materials for all pipelines within Lehi City street rights-of-way. Pipelines 16 inches in diameter and pipelines constructed within easements on privately-owned land will use Class 350 Ductile Iron Pipe. The following are the pipe numbers for these ductile iron pipes: M2002, M2003, M5320, M3030, M4500, and M5400.

Project Phasing

The long-term plan for the Skye Area includes three phases as shown in Figure 5. Phase 1 represents this area plan and includes 147 irrigated acres. Phase 2 represents a future area plan amendment that will contain an area to be addressed in a boundary adjustment between Lehi and Draper Cities and includes 69 irrigated acres. Phase 3 is a long-term future phase that is located north on Phases 1 and 2 and includes 180 irrigated acres. Future area plan amendments will be required for Phases 2 and 3. However, capacity for these future phases has been included in determining source, transmission, booster pump, and storage (Phase 2 only) capacities as listed in Table 1.

Within Phase 1 an interim phase of development will occur. The plan outlined in this document represents the long-range plan for the culinary water system. However, construction of these facilities will likely take 1 to 2 years to accomplish. Lehi City has agreed that, on an interim basis, 51.59 irrigated acres will be allowed to be platted and occupied in the Skye area based on available existing capacity in the Seasons Reservoir and the Sand Pit Well.

Certain other Lehi City water system infrastructure projects that are currently in progress must also be completed before this interim development can proceed. These improvements include re-equipping the Sand Pit Well, construction of the Vialletto Pressure Irrigation Reservoir and Booster Pump Station, construction of the Flight Park Pressure Irrigation Reservoir and Booster Pump Station, and construction of the 1200 East Culinary Water Booster Pump Station. Completion of the long-range source, transmission, booster pumps, and storage outlined in this plan is required before development beyond the interim number of ERUs can occur.

Table 1 - Micron Area Pressurized Irrigation Water System
Design Criteria and System Requirements (Results)

	Lehi City Design Criteria	Results	Notes
Irrigated Acres		147	Phase 1 Development (this area plan)
		69	Phase 2 Development (boundary adjustment between Lehi and Draper)
		180	Phase 3 Development (long-term future)
		397 irr. acres	Total of 3 Phases
Average Flow:	3.5 gpm/acre	516 gpm	Phase 1 Development (this area plan)
		242 gpm	Phase 2 Development (boundary adjustment between Lehi and Draper)
		630 gpm	Phase 3 Development (long-term future)
		1,388 gpm	Total of 3 Phases
Peak Hourly Flow:	6.78 gpm/acre	1,000 gpm	Phase 1 Development (this area plan)
		469 gpm	Phase 2 Development (boundary adjustment between Lehi and Draper)
		- gpm	Phase 3 peak flow not included in this analysis
		1,469 gpm	Total of Phases 1 and 2
Irrigation Storage:	5,040 gal./acre	743,098 gal.	Phase 1 Development (this area plan)
		348,768 gal.	Phase 2 Development (boundary adjustment between Lehi and Draper)
		- gal.	Phase 3 storage not included in this analysis
		1,091,866 gal.	Total of Phases 1 and 2
Source:	**3.5 gpm/acre**	516 gpm	Phase 1 Development (this area plan)
		242 gpm	Phase 2 Development (boundary adjustment between Lehi and Draper)
		630 gpm	Phase 3 Development (long-term future)
		1,388 gpm	Total of 3 Phases
Fire Storage:	1,500 gpm - 2 hrs.	180,000 gal.	Assumes all commercial and civic buildings are sprinklered
Total Storage		1,271,866 gal.	Total does not include storage for north area (future development)
Minimum Pressure	50 psi at peak hourly flow 20 psi at peak hourly flow + fire	50.02 psi 35.94 psi	at Node M92 at Node M94
Fire Flow	1,500 gpm	1,500 gpm	Residential only. Assumes all commercial and civic buildings are sprinklered

Table 2

Skye Area Plan Irrigated Acres Tabulation

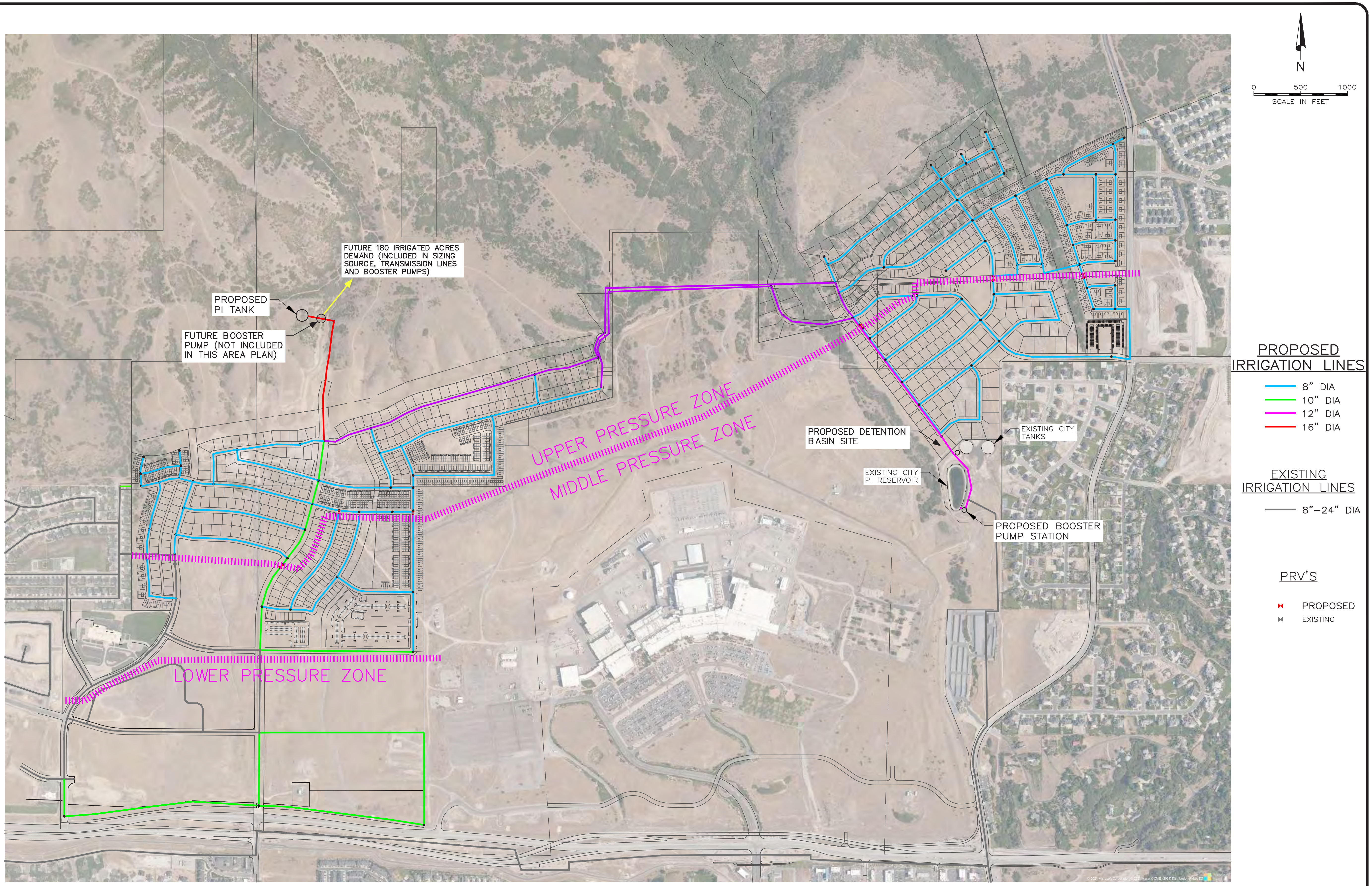
Parcel	Land Use	Net Acres	Irrigated %	Irrigated Acres
1	Open Space	3.67	0%	0.00
2	Open Space	8.9	90%	8.01
3	Gardner MU	93	25%	23.25
4	DR Horton MU	14.35	25%	3.59
6	Open Space	2.3	0%	0.00
8	Single Story Duplex	3.4	80%	2.72
9	Horton Plus (Alley)	7.5	40%	3.00
10	Church Site	20.43	40%	8.17
11	Horton Plus (Alley)	6.8	40%	2.70
12	Cottage	8.9	40%	3.56
13	Park	2.6	100%	2.60
14	Townhomes	10.5	40%	4.20
15	Alley-Load Towns	2.8	80%	2.27
16	Emerald	1.0	80%	0.80
17	Emerald	16.1	80%	12.88
18	Townhomes	3.0	40%	1.20
19	Emerald	6.7	80%	5.36
Total (Lehi - west portion)				**84.31**
20	Emerald	4.3	80%	3.44
21	Emerald	3.5	80%	2.78
22	Clubhouse	4.4	80%	3.52
23	Emerald	19.1	80%	15.28
24	Horton Plus	7.0	40%	2.80
25	Cottage	3.7	40%	1.48
26	Townhomes	12.3	40%	4.92
27	Cottage	4.6	40%	1.86
28	Park	3.0	100%	3.00
29	30' Buffer Easement	1.6	0%	0.00
Total (Draper -west portion)				**39.08**
West Total				**123.39**

Parcel	Land Use	Net Acres	Irrigated %	Irrigated Acres
30A	Estates	8.9	80%	7.12
30B	Estates	1.0	80%	0.80
31A	Emerald	9.1	80%	7.28
31B	Emerald	24.1	80%	19.28
32	Park	2.1	100%	2.10
33a	Horton Plus	3.1	40%	1.24
33b	Horton Plus	5.3	40%	2.12
34A	Cottage	1	40%	0.40
34B	Cottage	2.3	40%	0.92

35	Cottage	1.7	40%	0.68
36	Estates	2.7	80%	2.16
37	Church	3.6	40%	1.44
38	Active Adult	4.3	40%	1.72
39	Active Adult	19.37	40%	7.75
40	Park	6.7	0%	0.00
41	Active Adult	8.3	40%	3.32
42	Horton Plus	10.7	40%	4.28
43A	Cottage	1.3	40%	0.52
Total (Lehi - east portion)				**63.13**
43B	Cottage	0.13	40%	0.05
44	Cottage	0.78	40%	0.31
45	Horton Plus	1.6	40%	0.64
46	Horton Plus	12	40%	4.80
47	Park	2	0%	0.00
48	Emerald	23	80%	18.40
49	Park	6.8	0%	0.00
50	Estates	6.2	80%	4.96
51	Estates	1.2	80%	0.96
Total (Draper - east portion)				**30.12**

East Total	**93.25**

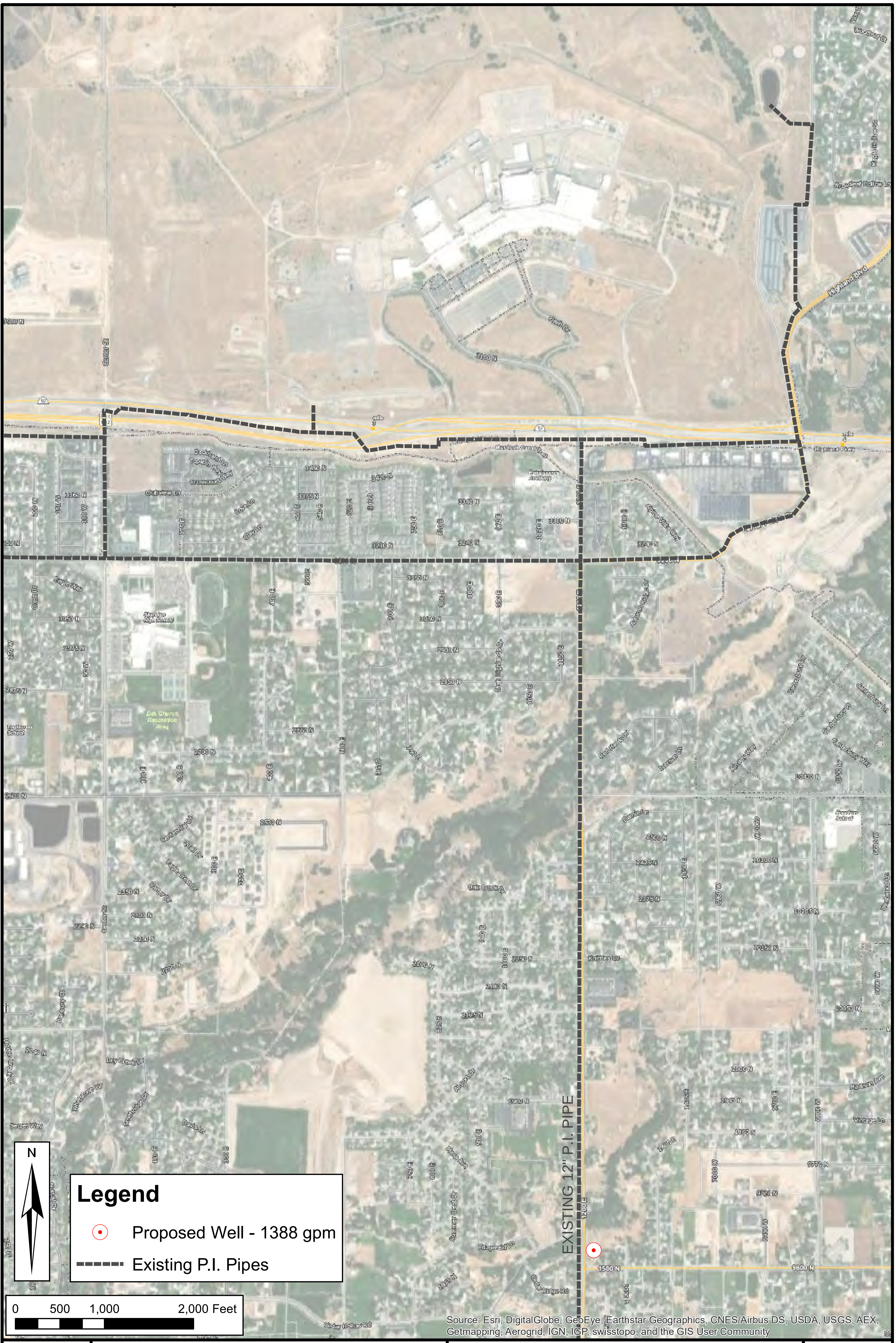
Total Development	**216.64**



PRESSURIZED IRRIGATION – ONSITE DISTRIBUTION SYSTEM

FIGURE
1

FILE NAME: PROJECTS\432 – DR HORTON\02.100 – MICRON PROPERTY\CAD\FIGURES\FIGURE 1 IRR.DWG
FILE DATE: 1.4.2022 14:25:02 (CAH)
10/07



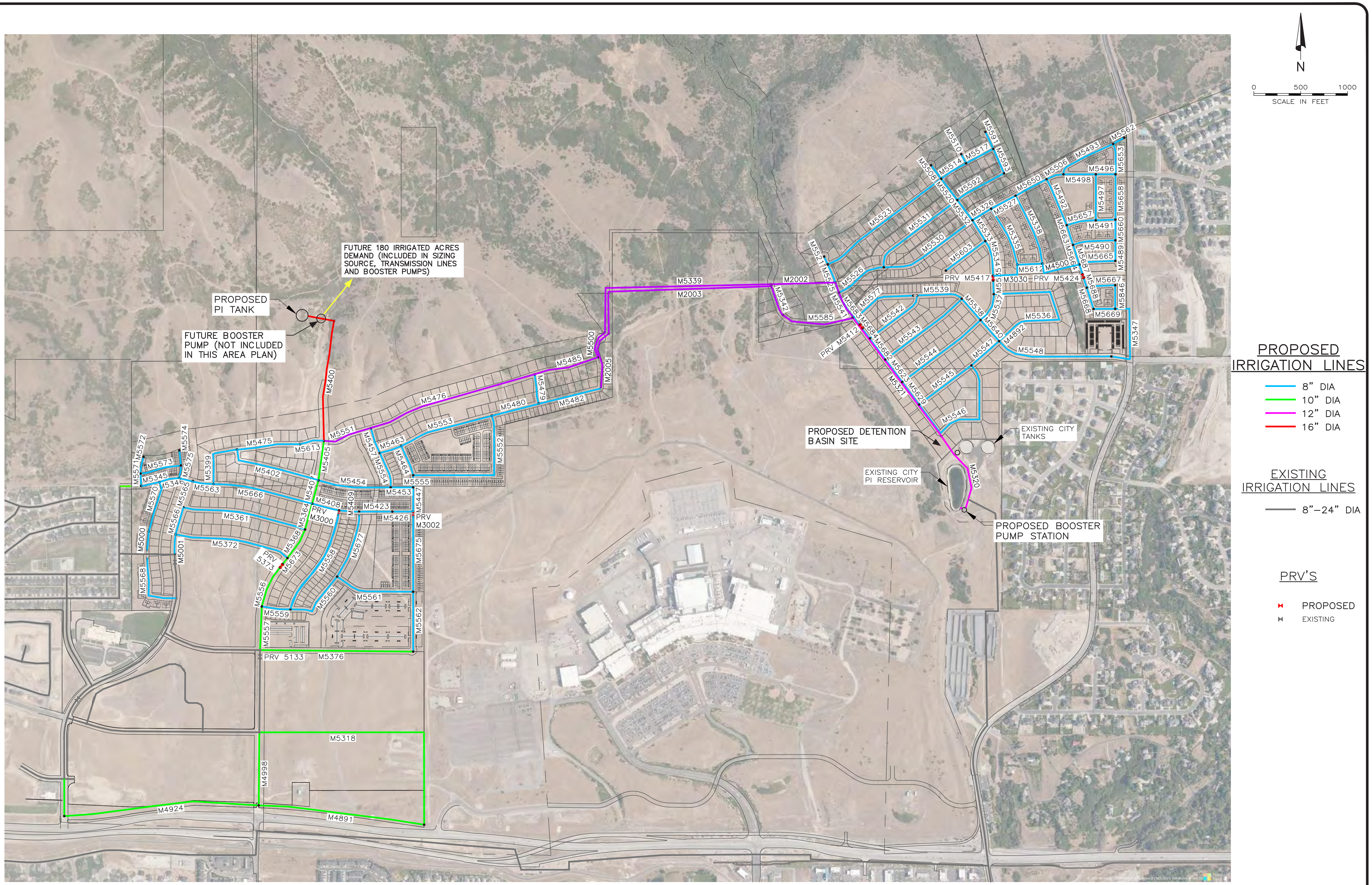
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Date: 1/4/2022
Document Path: H:\Projects\432 - DR Horton\02.100 - Micron Property\GIS\P.I. Well Pipeline v2.mxd

HANSEN ALLEN & LUCE INC
ENGINEERS

MICRON AREA PLAN AMENDMENT	OFFSITE PRESSURIZED IRRIGATION	FIGURE 2

FILE NAME: PROJECTS\432 – DR HORTON\02.100 – MICRON PROPERTY\CAD\FIGURES\FIGURE 1 IRR.DWG FILE DATE: 1.4.2022 14:25:02 (CAH)

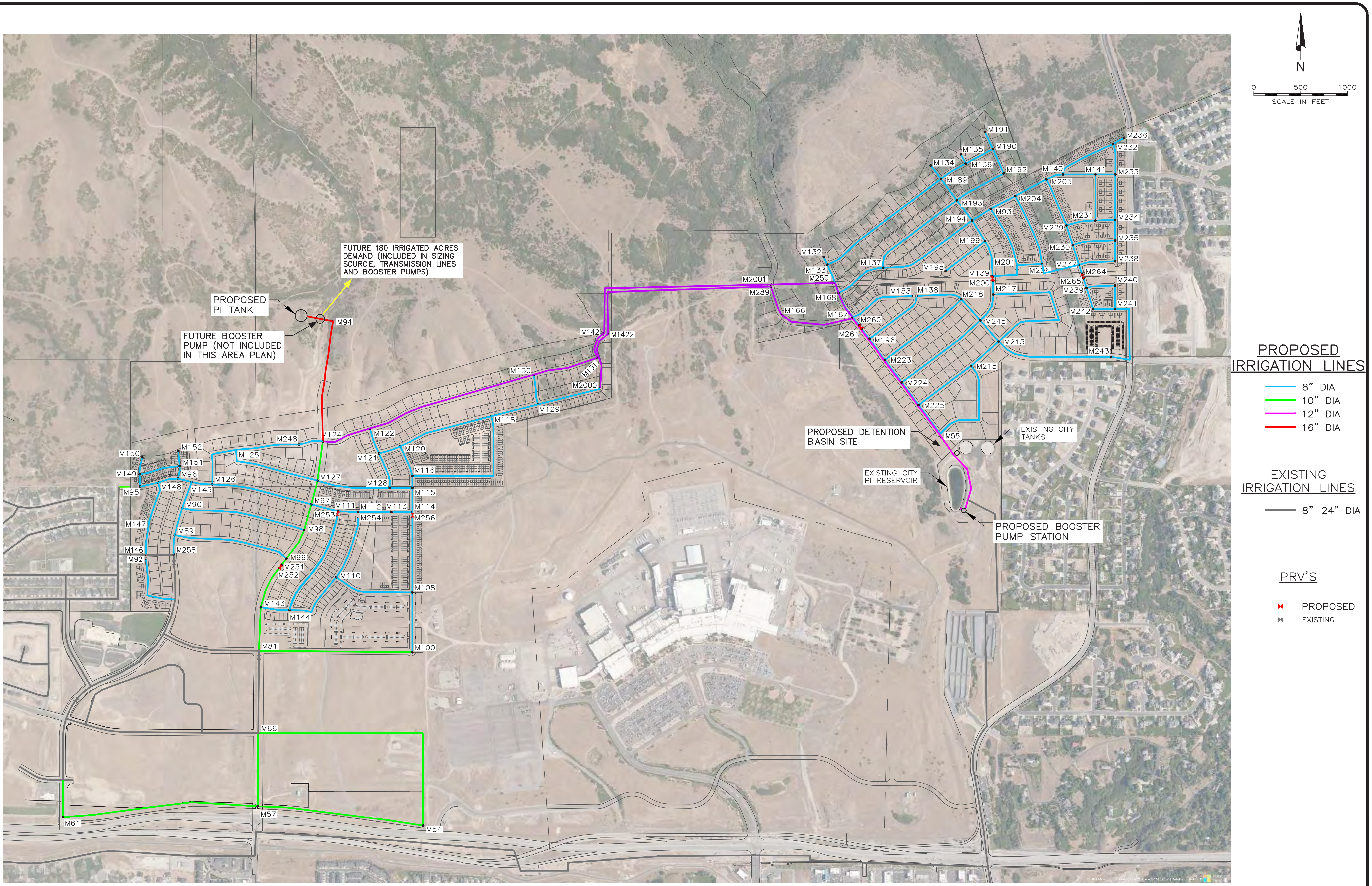


HANSEN ALLEN & LUCE INC
ENGINEERS

10/07

PRESSURIZED IRRIGATION – PIPE NUMBERS FROM EPANET MODEL

FIGURE
3



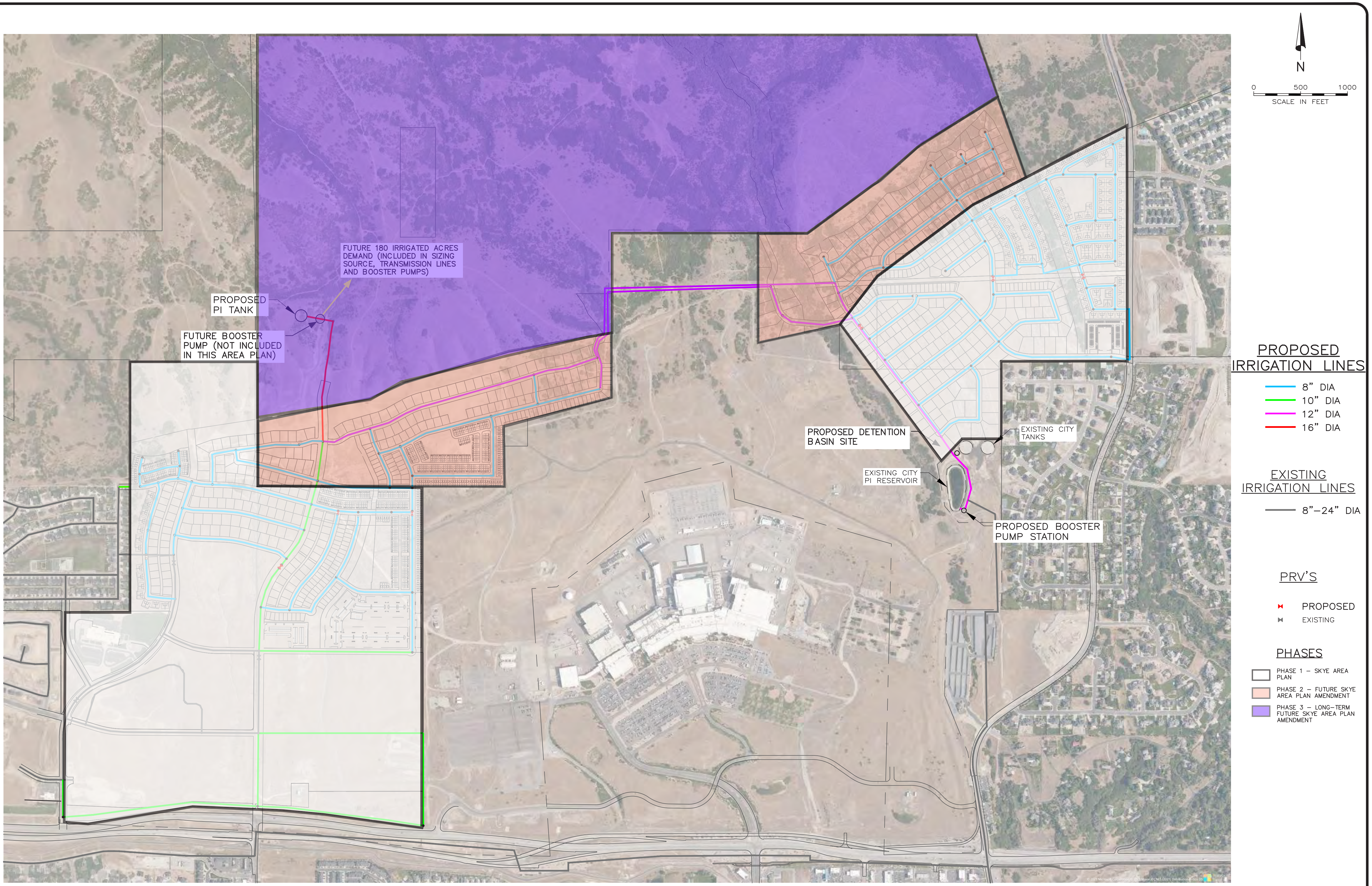
HANSEN ALLEN & LUCE INC
ENGINEERS

PRESSURIZED IRRIGATION – JUNCTION NUMBERS FROM EPANET MODEL

FIGURE
4

FILE NAME: PROJECTS\432 – DR HORTON\02.100 – MICRON PROPERTY\CAD\FIGURES\FIGURE 1 IRR.DWG
FILE DATE: 1.4.2022 14:25:02 (CAH)

10/07



FILE NAME: PROJECTS\432 – DR HORTON\02.100 – MICRON PROPERTY\CAD\FIGURES\FIGURE 1 IRR.DWG

FILE DATE: 1.4.2022 14:25:02 (CAH)

10/07

HANSEN ALLEN & LUCE INC
ENGINEERS

PRESSURIZED IRRIGATION – DEVELOPMENT PHASING

FIGURE
5

PI Peak Hourly Flow Scenario Without Fire
Model Results - Updated June 2022
Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M100	4938	2.48	24.38	5188.56	108.57
Junc M102	4952	0	0	5188.47	102.46
Junc M103	4960	0	0	5188.47	99
Junc M108	4984	0	0	5188.58	88.64
Junc M110	4995	1.8	17.7	5188.65	83.91
Junc M111	5062	0	0	5342.09	121.36
Junc M112	5060	1.57	15.43	5342.19	122.27
Junc M113	5040	0	0	5342.4	131.03
Junc M114	5039	0	0	5342.53	131.52
Junc M115	5052	0	0	5342.69	125.96
Junc M116	5075	3.3948	33.37	5342.77	116.03
Junc M118	5100	1.932	18.99	5343.17	105.37
Junc M120	5112	0	0	5342.85	100.03
Junc M121	5103	0	0	5342.85	103.93
Junc M122	5122	0	0	5342.95	95.74
Junc M124	5128	2.43	23.89	5342.83	93.09
Junc M125	5164	3.7	36.37	5342.21	77.22
Junc M126	5112	0	0	5341.75	99.55
Junc M127	5103	1.9	18.68	5342.33	103.7
Junc M128	5062	1.0212	10.04	5342.69	121.62
Junc M129	5123	1.28064	12.59	5343.82	95.68
Junc M130	5150	10.54	103.62	5343.77	83.96
Junc M131	5148	0	0	5344.12	84.98
Junc M132	5148	0	0	5345.68	85.65
Junc M133	5146	0	0	5345.68	86.52
Junc M134	5165	0	0	5344.69	77.86
Junc M135	5146	0	0	5344.63	86.07
Junc M136	5134	0	0	5344.63	91.27
Junc M137	5086	0.3588	3.53	5345.04	112.24
Junc M138	5060	1.0488	10.31	5185.82	54.52
Junc M139	5033	0	0	5344.39	134.93
Junc M140	5074	0	0	5344.14	117.05
Junc M141	5065	0	0	5344.13	120.95
Junc M142	5163	2.1	20.65	5344.23	78.53
Junc M1422	5163	0	0	5345.56	79.1
Junc M143	4978	0	0	5188.93	91.4
Junc M144	4965	0	0	5188.82	96.98
Junc M145	5116	0	0	5341.39	97.66
Junc M147	5077	0.94	9.24	5341.22	114.49
Junc M148	5127	0	0	5341.26	92.84
Junc M149	5150	0	0	5341.26	82.87
Junc M150	5164	0.828	8.14	5341.26	76.81

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M151	5127	0	0	5341.29	92.85
Junc M152	5149	0	0	5341.29	83.32
Junc M153	5060	1.0488	10.31	5346.57	124.17
Junc M166	5104	3.42	33.62	5346.31	104.99
Junc M167	5070	0.276	2.71	5346.57	119.84
Junc M168	5110	0.69276	6.81	5345.93	102.23
Junc M189	5148	0	0	5344.69	85.23
Junc M190	5130	0	0	5344.56	92.97
Junc M191	5144	12.7	124.85	5344.5	86.88
Junc M192	5105	3.312	32.56	5344.58	103.81
Junc M193	5115	0	0	5344.65	99.51
Junc M194	5088	0	0	5344.53	111.15
Junc M196	5050	0	0	5185.86	58.87
Junc M198	5070	2.9532	29.03	5344.44	118.92
Junc M199	5062	0	0	5344.46	122.39
Junc M200	5033	1.449	14.25	5185.78	66.2
Junc M2000	5122	0	0	5345.41	96.8
Junc M201	5034	0	0	5344.34	134.47
Junc M204	5076	0	0	5344.26	116.24
Junc M205	5073	0	0	5344.16	117.49
Junc M206	5026	2.2908	22.52	5344.25	137.9
Junc M213	4995	2.05	20.15	5185.81	82.68
Junc M215	5000	4.9	48.17	5185.79	80.5
Junc M217	5028	0.4692	4.61	5185.78	68.37
Junc M218	5037	0	0	5185.81	64.48
Junc M223	5031	0	0	5185.82	67.08
Junc M224	5012	5.02	49.35	5185.79	75.3
Junc M225	4990	0	0	5185.79	84.83
Junc M229	5046	0	0	5344.13	129.18
Junc M230	5036	0	0	5344.11	133.51
Junc M231	5042	0	0	5344.13	130.91
Junc M232	5078	0	0	5344.13	115.31
Junc M233	5061	0	0	5344.13	122.68
Junc M234	5041	0	0	5344.12	131.34
Junc M235	5025	0	0	5344.11	138.27
Junc M236	5079	2.673	26.28	5344.13	114.88
Junc M237	5022	0	0	5344.1	139.57
Junc M238	5016	2.67306	26.28	5344.1	142.17
Junc M239	5005	0	0	5187.03	78.87
Junc M240	4999	0	0	5186.97	81.45
Junc M241	4987	1.1868	11.67	5186.93	86.63
Junc M242	4991	0	0	5186.98	84.92
Junc M243	4972	1	9.83	5186.5	92.94
Junc M245	5024	13.3	130.75	5185.78	70.1
Junc M248	5140	2.37	23.3	5342.62	87.79

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M250	5120	0	0	5345.81	97.84
Junc M251	5012	0	0	5340.74	142.44
Junc M252	5005	11	108.14	5189.63	80
Junc M253	5053	1.863	18.32	5188.8	58.84
Junc M254	5056	2.4564	24.15	5188.64	57.47
Junc M256	5040	2.898	28.49	5188.56	64.37
Junc M260	5063	0.4278	4.21	5346.55	122.86
Junc M261	5059	0.4278	4.21	5185.93	55
Junc M264	5017	0	0	5344.02	141.7
Junc M265	5014	0	0	5187.09	75
Junc M289	5135	0.66	6.49	5346.2	91.51
Junc M54	4845	4.01	39.42	5069.1	97.1
Junc M55	4976	0	0	5354.64	164.06
Junc M57	4842	4.01	39.42	5069.1	98.4
Junc M61	4855	9.5375	93.76	5069.05	92.75
Junc M87	4950	0	0	5358.41	176.96
Junc M89	5063	1.035	10.18	5341.2	120.54
Junc M90	5083	8.9	87.5	5341.27	111.91
Junc M92	5055	0.94	9.24	5188.48	57.84
Junc M93	5077	0	0	5344.37	115.85
Junc M94	5260	124.2	180.09	5342.96	35.94
Junc M95	5141	0	0	5341.25	86.77
Junc M96	5117	0	0	5341.31	97.19

PI Peak Hourly Flow Scenario Without Fire

Model Results - Updated June 2022

Network Table - Links

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M2002	2857.09	12	0.85	-454.58	1.29
Pipe M2003	2157.42	12	0.85	324.83	0.92
Pipe M2005	527.19	12	0.85	324.83	0.92
Pipe M3030	314.42	8	0.85	-81.45	0.52
Pipe M4500	427.01	8	0.85	120.18	0.77
Pipe M4866	212.34	8	0.85	168.21	1.07
Pipe M4891	1752.34	10	0.85	0.63	0
Pipe M4924	2107.5	10	0.85	50.91	0.21
Pipe M4936	136.59	10	0.85	-42.85	0.18
Pipe M4998	545.01	10	0.85	-89.71	0.37
Pipe M5000	299.48	8	0.85	48.8	0.31
Pipe M5001	234.88	8	0.85	-21.57	0.14
Pipe M5127	176.51	12	0.85	1411.93	4.01
Pipe M5275	86.26	8	0.85	-14.57	0.09
Pipe M5308	577.31	8	0.85	-8.13	0.05
Pipe M5315	200.65	8	0.85	-14.57	0.09
Pipe M5316	1113.09	8	0.85	-6.45	0.04
Pipe M5318	2326.02	10	0.85	40.05	0.16
Pipe M5320	759.69	12	0.85	1411.93	4.01
Pipe M5321	1625.65	12	0.85	1411.93	4.01
Pipe M5326	248.15	8	0.85	167.09	1.07
Pipe M5327	272.22	8	0.85	127.74	0.82
Pipe M5332	158.36	8	0.85	-89.01	0.57
Pipe M5333	255.28	16	0.85	-523.91	0.84
Pipe M5335	649.12	8	0.85	39.35	0.25
Pipe M5338	773.23	8	0.85	21.9	0.14
Pipe M5342	369.79	12	0.85	331.32	0.94
Pipe M5345	199.52	8	0.85	-41.45	0.26
Pipe M5346	195.62	8	0.85	99.48	0.63
Pipe M5347	719.27	8	0.85	161.79	1.03
Pipe M5361	1282.21	8	0.85	-53.33	0.34
Pipe M5364	305.09	10	0.85	-518.18	2.12
Pipe M5368	335.33	10	0.85	-464.85	1.9
Pipe M5372	1212.16	8	0.85	104.75	0.67
Pipe M5376	1636.58	10	0.85	-4.73	0.02
Pipe M5399	563.87	8	0.85	-192.15	1.23
Pipe M5400	1608.99	16	0.85	343.82	0.55
Pipe M5402	1024.76	8	0.85	-67	0.43
Pipe M5405	416.05	10	0.85	417.96	1.71
Pipe M5407	252.31	10	0.85	470.72	1.92
Pipe M5408	286.06	8	0.85	-143.42	0.92
Pipe M5409	213.53	8	0.85	-143.42	0.92

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M5423	361.75	8	0.85	-158.86	1.01
Pipe M5426	213.32	8	0.85	158.86	1.01
Pipe M5447	268.97	8	0.85	-158.86	1.01
Pipe M5453	220.42	8	0.85	13.6	0.09
Pipe M5454	784.58	8	0.85	138.44	0.88
Pipe M5457	264.3	8	0.85	123.58	0.79
Pipe M5463	239.21	8	0.85	-11.29	0.07
Pipe M5464	309.55	8	0.85	102.31	0.65
Pipe M5475	668.58	8	0.85	-161.53	1.03
Pipe M5476	1840.65	12	0.85	-406.44	1.15
Pipe M5479	302.81	8	0.85	76.12	0.49
Pipe M5480	516.26	8	0.85	236.12	1.51
Pipe M5482	696.29	8	0.85	-324.83	2.07
Pipe M5485	681.11	12	0.85	-433.94	1.23
Pipe M5486	250.54	8	0.85	83.46	0.53
Pipe M5489	223.21	8	0.85	-37.16	0.24
Pipe M5490	433.75	8	0.85	0.26	0
Pipe M5491	217.11	8	0.85	20.31	0.13
Pipe M5492	512.77	8	0.85	47.42	0.3
Pipe M5493	654.73	8	0.85	-25.33	0.16
Pipe M5496	223.05	8	0.85	17.54	0.11
Pipe M5497	476.6	8	0.85	-15.54	0.1
Pipe M5498	333.02	8	0.85	33.08	0.21
Pipe M5506	189.1	8	0.85	-58.41	0.37
Pipe M5508	169.11	8	0.85	0	0
Pipe M5510	100.96	8	0.85	0	0
Pipe M5514	321.5	8	0.85	89.25	0.57
Pipe M5517	330.54	8	0.85	89.25	0.57
Pipe M5520	298.31	8	0.85	78.96	0.5
Pipe M5521	82.59	8	0.85	0	0
Pipe M5523	1509.59	8	0.85	168.21	1.07
Pipe M5525	112.84	12	0.85	622.8	1.77
Pipe M5526	551.08	8	0.85	270.31	1.73
Pipe M5530	1093.16	8	0.85	141.87	0.91
Pipe M5531	1066.21	8	0.85	124.92	0.8
Pipe M5532	275.84	8	0.85	135.71	0.87
Pipe M5533	245.34	8	0.85	110.49	0.71
Pipe M5534	377.3	8	0.85	81.45	0.52
Pipe M5535	154.39	8	0.85	-14.24	0.09
Pipe M5536	1594.91	8	0.85	-23.47	0.15
Pipe M5537	336.67	8	0.85	-4.61	0.03
Pipe M5538	309.13	8	0.85	54.05	0.35
Pipe M5539	451.9	8	0.85	34.85	0.22
Pipe M5541	312.15	12	0.85	-899.91	2.55
Pipe M5542	688.56	8	0.85	45.16	0.29

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M5543	1019.48	8	0.85	19.2	0.12
Pipe M5544	1056.04	8	0.85	11.1	0.07
Pipe M5545	699.05	8	0.85	0.54	0
Pipe M5546	1426.59	8	0.85	0.28	0
Pipe M5547	378.36	8	0.85	-47.36	0.3
Pipe M5548	1276.13	8	0.85	-151.96	0.97
Pipe M5550	220.86	12	0.85	433.94	1.23
Pipe M5551	532.92	12	0.85	-282.86	0.8
Pipe M5552	1514.84	8	0.85	-103.53	0.66
Pipe M5553	1022.28	8	0.85	-113.6	0.73
Pipe M5554	382.04	8	0.85	134.88	0.86
Pipe M5555	125.3	8	0.85	172.46	1.1
Pipe M5556	484.32	10	0.85	461.46	1.89
Pipe M5557	448.7	10	0.85	343.7	1.4
Pipe M5558	1130.72	8	0.85	-18.31	0.12
Pipe M5559	347.05	8	0.85	117.76	0.75
Pipe M5560	675.25	8	0.85	99.45	0.63
Pipe M5561	833.23	8	0.85	57.6	0.37
Pipe M5562	623.28	8	0.85	-29.11	0.19
Pipe M5563	214.08	8	0.85	282.71	1.8
Pipe M5564	157.88	8	0.85	-155.19	0.99
Pipe M5565	292.86	8	0.85	-127.52	0.81
Pipe M5566	279.22	8	0.85	93.35	0.6
Pipe M5568	690.21	8	0.85	-9.24	0.06
Pipe M5570	483.95	8	0.85	-58.04	0.37
Pipe M5571	141.36	8	0.85	47.56	0.3
Pipe M5572	160.74	8	0.85	-8.14	0.05
Pipe M5573	428.2	8	0.85	-55.7	0.36
Pipe M5574	129.22	8	0.85	0	0
Pipe M5575	144.65	8	0.85	55.71	0.36
Pipe M5577	693.86	8	0.85	10.31	0.07
Pipe M5585	720.78	12	0.85	-364.94	1.04
Pipe M5591	184.63	8	0.85	-124.85	0.8
Pipe M5592	583.69	8	0.85	68.17	0.44
Pipe M5593	315.49	8	0.85	-35.61	0.23
Pipe M5603	544.84	8	0.85	-29.03	0.19
Pipe M5612	254.28	8	0.85	120.8	0.77
Pipe M5613	272.73	8	0.85	-184.83	1.18
Pipe M5623	322.54	8	0.85	61.27	0.39
Pipe M5629	301.03	8	0.85	-0.82	0.01
Pipe M5640	289.52	8	0.85	-60.98	0.39
Pipe M5650	386.34	8	0.85	105.84	0.68
Pipe M5652	105.35	8	0.85	26.28	0.17
Pipe M5653	318.1	8	0.85	-0.95	0.01
Pipe M5657	300.86	8	0.85	4.77	0.03

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M5658	488.86	8	0.85	-16.59	0.11
Pipe M5660	216.91	8	0.85	36.9	0.24
Pipe M5663	229.22	8	0.85	42.65	0.27
Pipe M5664	209.83	8	0.85	42.39	0.27
Pipe M5665	364.02	8	0.85	-10.89	0.07
Pipe M5666	1073.71	8	0.85	-90.56	0.58
Pipe M5667	293.55	8	0.85	83.46	0.53
Pipe M5668	240.89	8	0.85	90	0.57
Pipe M5669	232.27	8	0.85	90	0.57
Pipe M5673	69.65	10	0.85	-569.6	2.33
Pipe M5675	804.56	8	0.85	-28.49	0.18
Pipe M5677	701.1	8	0.85	-24.15	0.15
Pipe M5682	260.73	8	0.85	80.48	0.51

PI Peak Hourly Flow Scenario with Fire (1500gpm)
Model Results - Updated June 2022

Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M100	4938	2.48	24.38	5173.49	102.04
Junc M102	4952	0	0	5169.1	94.07
Junc M103	4960	0	0	5169.34	90.71
Junc M108	4984	0	0	5174.56	82.57
Junc M110	4995	1.8	17.7	5176.27	78.55
Junc M111	5062	0	0	5338.05	119.61
Junc M112	5060	1.57	15.43	5338.45	120.65
Junc M113	5040	0	0	5339.2	129.64
Junc M114	5039	0	0	5339.65	130.27
Junc M115	5052	0	0	5340.2	124.88
Junc M116	5075	3.3948	33.37	5340.45	115.02
Junc M118	5100	1.932	18.99	5341.12	104.48
Junc M120	5112	0	0	5340.72	99.11
Junc M121	5103	0	0	5340.75	103.02
Junc M122	5122	0	0	5341.35	95.05
Junc M124	5128	2.43	23.89	5341.35	92.44
Junc M125	5164	3.7	36.37	5339.08	75.86
Junc M126	5112	0	0	5337.47	97.7
Junc M127	5103	1.9	18.68	5339.23	102.36
Junc M128	5062	1.0212	10.04	5340.21	120.55
Junc M129	5123	1.28064	12.59	5342.03	94.91
Junc M130	5150	10.54	103.62	5342.02	83.2
Junc M131	5148	0	0	5342.37	84.22
Junc M132	5148	0	0	5343.95	84.91
Junc M133	5146	0	0	5343.95	85.77
Junc M134	5165	0	0	5342.97	77.11
Junc M135	5146	0	0	5342.91	85.32
Junc M136	5134	0	0	5342.91	90.52
Junc M137	5086	0.3588	3.53	5343.32	111.5
Junc M138	5060	1.0488	10.31	5185.82	54.52
Junc M139	5033	0	0	5342.67	134.18
Junc M140	5074	0	0	5342.42	116.3
Junc M141	5065	0	0	5342.41	120.2
Junc M142	5163	2.1	20.65	5342.49	77.77
Junc M1422	5163	0	0	5343.82	78.35
Junc M143	4978	0	0	5179.06	87.12
Junc M144	4965	0	0	5178.05	92.32
Junc M145	5116	0	0	5336.73	95.64
Junc M147	5077	0.94	9.24	5336.59	112.48
Junc M148	5127	0	0	5336.74	90.88
Junc M149	5150	0	0	5336.77	80.93
Junc M150	5164	0.828	8.14	5336.77	74.86

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M151	5127	0	0	5336.75	90.88
Junc M152	5149	0	0	5336.75	81.35
Junc M153	5060	1.0488	10.31	5344.85	123.42
Junc M166	5104	3.42	33.62	5344.58	104.24
Junc M167	5070	0.276	2.71	5344.85	119.09
Junc M168	5110	0.69276	6.81	5344.2	101.48
Junc M189	5148	0	0	5342.97	84.48
Junc M190	5130	0	0	5342.84	92.22
Junc M191	5144	12.7	124.85	5342.77	86.13
Junc M192	5105	3.312	32.56	5342.85	103.06
Junc M193	5115	0	0	5342.92	98.76
Junc M194	5088	0	0	5342.8	110.41
Junc M196	5050	0	0	5185.86	58.87
Junc M198	5070	2.9532	29.03	5342.72	118.17
Junc M199	5062	0	0	5342.73	121.64
Junc M200	5033	1.449	14.25	5185.78	66.2
Junc M2000	5122	0	0	5343.66	96.05
Junc M201	5034	0	0	5342.61	133.72
Junc M204	5076	0	0	5342.54	115.49
Junc M205	5073	0	0	5342.43	116.75
Junc M206	5026	2.2908	22.52	5342.53	137.15
Junc M213	4995	2.05	20.15	5185.81	82.68
Junc M215	5000	4.9	48.17	5185.79	80.5
Junc M217	5028	0.4692	4.61	5185.78	68.37
Junc M218	5037	0	0	5185.81	64.48
Junc M223	5031	0	0	5185.82	67.08
Junc M224	5012	5.02	49.35	5185.79	75.3
Junc M225	4990	0	0	5185.79	84.83
Junc M229	5046	0	0	5342.4	128.43
Junc M230	5036	0	0	5342.39	132.76
Junc M231	5042	0	0	5342.4	130.16
Junc M232	5078	0	0	5342.4	114.57
Junc M233	5061	0	0	5342.4	121.93
Junc M234	5041	0	0	5342.4	130.6
Junc M235	5025	0	0	5342.39	137.52
Junc M236	5079	2.673	26.28	5342.4	114.13
Junc M237	5022	0	0	5342.38	138.82
Junc M238	5016	2.67306	26.28	5342.38	141.42
Junc M239	5005	0	0	5187.03	78.87
Junc M240	4999	0	0	5186.97	81.45
Junc M241	4987	1.1868	11.67	5186.93	86.63
Junc M242	4991	0	0	5186.98	84.92
Junc M243	4972	1	9.83	5186.5	92.94
Junc M245	5024	13.3	130.75	5185.78	70.1
Junc M248	5140	2.37	23.3	5340.63	86.93

Node ID	Elevation ft	Base Demand GPM	Demand GPM	Head ft	Pressure psi
Junc M250	5120	0	0	5344.09	97.1
Junc M251	5012	0	0	5327.9	136.88
Junc M252	5005	11	108.14	5189.63	80
Junc M253	5053	1.863	18.32	5178.04	54.18
Junc M254	5056	2.4564	24.15	5176.26	52.11
Junc M256	5040	2.898	28.49	5174.53	58.29
Junc M260	5063	0.4278	4.21	5344.83	122.12
Junc M261	5059	0.4278	4.21	5185.93	55
Junc M264	5017	0	0	5342.29	140.95
Junc M265	5014	0	0	5187.09	75
Junc M289	5135	0.66	6.49	5344.47	90.76
Junc M54	4845	156.665	1540.17	5054.33	90.7
Junc M55	4976	0	0	5352.99	163.35
Junc M57	4842	4.01	39.42	5061.6	95.15
Junc M61	4855	9.5375	93.76	5062.71	90
Junc M87	4950	0	0	5356.79	176.26
Junc M89	5063	1.035	10.18	5335.45	118.05
Junc M90	5083	8.9	87.5	5335.57	109.44
Junc M92	5055	0.94	9.24	5170.44	50.02
Junc M93	5077	0	0	5342.64	115.1
Junc M95	5141	0	0	5336.78	84.83
Junc M96	5117	0	0	5336.74	95.21

PI Peak Hourly Flow Scenario with Fire (1500gpm)

Model Results - Updated June 2022

Network Table - Links

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M2002	2857.09	12	0.85	-457.2	1.3
Pipe M2003	2157.42	12	0.85	328.72	0.93
Pipe M2005	527.19	12	0.85	328.72	0.93
Pipe M3030	314.42	8	0.85	-81.45	0.52
Pipe M4500	427.01	8	0.85	120.18	0.77
Pipe M4866	212.34	8	0.85	168.17	1.07
Pipe M4891	1752.34	10	0.85	-796.96	3.26
Pipe M4924	2107.5	10	0.85	-272.93	1.11
Pipe M4936	136.59	10	0.85	-366.7	1.5
Pipe M4998	545.01	10	0.85	-563.45	2.3
Pipe M5000	299.48	8	0.85	102.61	0.65
Pipe M5001	234.88	8	0.85	-352.08	2.25
Pipe M5127	176.51	12	0.85	1418.43	4.02
Pipe M5275	86.26	8	0.85	-228.08	1.46
Pipe M5308	577.31	8	0.85	-133.87	0.85
Pipe M5315	200.65	8	0.85	-228.08	1.46
Pipe M5316	1113.09	8	0.85	-94.21	0.6
Pipe M5318	2326.02	10	0.85	743.21	3.04
Pipe M5320	759.69	12	0.85	1418.43	4.02
Pipe M5321	1625.65	12	0.85	1418.43	4.02
Pipe M5326	248.15	8	0.85	167.09	1.07
Pipe M5327	272.22	8	0.85	127.74	0.82
Pipe M5332	158.36	8	0.85	150.11	0.96
Pipe M5333	255.28	16	0.85	-1396.43	2.23
Pipe M5335	649.12	8	0.85	39.35	0.25
Pipe M5338	773.23	8	0.85	21.9	0.14
Pipe M5342	369.79	12	0.85	335.2	0.95
Pipe M5345	199.52	8	0.85	96.48	0.62
Pipe M5346	195.62	8	0.85	15.37	0.1
Pipe M5347	719.27	8	0.85	161.79	1.03
Pipe M5361	1282.21	8	0.85	208.38	1.33
Pipe M5364	305.09	10	0.85	-1278.38	5.22
Pipe M5368	335.33	10	0.85	-1486.76	6.07
Pipe M5372	1212.16	8	0.85	477.67	3.05
Pipe M5376	1636.58	10	0.85	-254.91	1.04
Pipe M5399	563.87	8	0.85	-364.85	2.33
Pipe M5400	1608.99	16	0.85	1216.34	1.94
Pipe M5402	1024.76	8	0.85	-74.85	0.48
Pipe M5405	416.05	10	0.85	884.33	3.61
Pipe M5407	252.31	10	0.85	1027.02	4.2
Pipe M5408	286.06	8	0.85	-293.45	1.87
Pipe M5409	213.53	8	0.85	-293.45	1.87

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M5423	361.75	8	0.85	-308.88	1.97
Pipe M5426	213.32	8	0.85	308.88	1.97
Pipe M5447	268.97	8	0.85	-308.88	1.97
Pipe M5453	220.42	8	0.85	-8.31	0.05
Pipe M5454	784.58	8	0.85	236.22	1.51
Pipe M5457	264.3	8	0.85	323.38	2.06
Pipe M5463	239.21	8	0.85	68.81	0.44
Pipe M5464	309.55	8	0.85	196.9	1.26
Pipe M5475	668.58	8	0.85	-326.37	2.08
Pipe M5476	1840.65	12	0.85	-364.93	1.04
Pipe M5479	302.81	8	0.85	31.99	0.2
Pipe M5480	516.26	8	0.85	284.13	1.81
Pipe M5482	696.29	8	0.85	-328.72	2.1
Pipe M5485	681.11	12	0.85	-436.55	1.24
Pipe M5486	250.54	8	0.85	83.46	0.53
Pipe M5489	223.21	8	0.85	-37.16	0.24
Pipe M5490	433.75	8	0.85	0.26	0
Pipe M5491	217.11	8	0.85	20.31	0.13
Pipe M5492	512.77	8	0.85	47.42	0.3
Pipe M5493	654.73	8	0.85	-25.33	0.16
Pipe M5496	223.05	8	0.85	17.54	0.11
Pipe M5497	476.6	8	0.85	-15.54	0.1
Pipe M5498	333.02	8	0.85	33.08	0.21
Pipe M5506	189.1	8	0.85	-58.41	0.37
Pipe M5508	169.11	8	0.85	0	0
Pipe M5510	100.96	8	0.85	0	0
Pipe M5514	321.5	8	0.85	89.24	0.57
Pipe M5517	330.54	8	0.85	89.24	0.57
Pipe M5520	298.31	8	0.85	78.93	0.5
Pipe M5521	82.59	8	0.85	0	0
Pipe M5523	1509.59	8	0.85	168.17	1.07
Pipe M5525	112.84	12	0.85	625.37	1.77
Pipe M5526	551.08	8	0.85	270.35	1.73
Pipe M5530	1093.16	8	0.85	141.88	0.91
Pipe M5531	1066.21	8	0.85	124.94	0.8
Pipe M5532	275.84	8	0.85	135.69	0.87
Pipe M5533	245.34	8	0.85	110.49	0.71
Pipe M5534	377.3	8	0.85	81.45	0.52
Pipe M5535	154.39	8	0.85	-14.24	0.09
Pipe M5536	1594.91	8	0.85	-23.47	0.15
Pipe M5537	336.67	8	0.85	-4.61	0.03
Pipe M5538	309.13	8	0.85	54.05	0.35
Pipe M5539	451.9	8	0.85	34.85	0.22
Pipe M5541	312.15	12	0.85	-902.53	2.56
Pipe M5542	688.56	8	0.85	45.16	0.29

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M5543	1019.48	8	0.85	19.2	0.12
Pipe M5544	1056.04	8	0.85	11.1	0.07
Pipe M5545	699.05	8	0.85	0.54	0
Pipe M5546	1426.59	8	0.85	0.28	0
Pipe M5547	378.36	8	0.85	-47.36	0.3
Pipe M5548	1276.13	8	0.85	-151.96	0.97
Pipe M5550	220.86	12	0.85	436.55	1.24
Pipe M5551	532.92	12	0.85	-41.55	0.12
Pipe M5552	1514.84	8	0.85	-137.05	0.87
Pipe M5553	1022.28	8	0.85	-128.09	0.82
Pipe M5554	382.04	8	0.85	254.57	1.62
Pipe M5555	125.3	8	0.85	300.57	1.92
Pipe M5556	484.32	10	0.85	1856.29	7.58
Pipe M5557	448.7	10	0.85	1488.35	6.08
Pipe M5558	1130.72	8	0.85	-18.31	0.12
Pipe M5559	347.05	8	0.85	367.94	2.35
Pipe M5560	675.25	8	0.85	349.62	2.23
Pipe M5561	833.23	8	0.85	307.78	1.96
Pipe M5562	623.28	8	0.85	-279.29	1.78
Pipe M5563	214.08	8	0.85	401.53	2.56
Pipe M5564	157.88	8	0.85	30.11	0.19
Pipe M5565	292.86	8	0.85	-431.64	2.76
Pipe M5566	279.22	8	0.85	135.76	0.87
Pipe M5568	690.21	8	0.85	-9.24	0.06
Pipe M5570	483.95	8	0.85	-111.85	0.71
Pipe M5571	141.36	8	0.85	-53.63	0.34
Pipe M5572	160.74	8	0.85	-8.14	0.05
Pipe M5573	428.2	8	0.85	45.49	0.29
Pipe M5574	129.22	8	0.85	0	0
Pipe M5575	144.65	8	0.85	-45.49	0.29
Pipe M5577	693.86	8	0.85	10.31	0.07
Pipe M5585	720.78	12	0.85	-368.83	1.05
Pipe M5591	184.63	8	0.85	-124.85	0.8
Pipe M5592	583.69	8	0.85	68.17	0.44
Pipe M5593	315.49	8	0.85	-35.61	0.23
Pipe M5603	544.84	8	0.85	-29.03	0.19
Pipe M5612	254.28	8	0.85	120.8	0.77
Pipe M5613	272.73	8	0.85	-349.67	2.23
Pipe M5623	322.54	8	0.85	61.27	0.39
Pipe M5629	301.03	8	0.85	-0.82	0.01
Pipe M5640	289.52	8	0.85	-60.98	0.39
Pipe M5650	386.34	8	0.85	105.84	0.68
Pipe M5652	105.35	8	0.85	26.28	0.17
Pipe M5653	318.1	8	0.85	-0.95	0.01
Pipe M5657	300.86	8	0.85	4.77	0.03

Link ID	Length ft	Diameter in	Roughness mft	Flow GPM	Velocity fps
Pipe M5658	488.86	8	0.85	-16.59	0.11
Pipe M5660	216.91	8	0.85	36.9	0.24
Pipe M5663	229.22	8	0.85	42.65	0.27
Pipe M5664	209.83	8	0.85	42.39	0.27
Pipe M5665	364.02	8	0.85	-10.89	0.07
Pipe M5666	1073.71	8	0.85	-36.68	0.23
Pipe M5667	293.55	8	0.85	83.46	0.53
Pipe M5668	240.89	8	0.85	90	0.57
Pipe M5669	232.27	8	0.85	90	0.57
Pipe M5673	69.65	10	0.85	-1964.43	8.02
Pipe M5675	804.56	8	0.85	-28.49	0.18
Pipe M5677	701.1	8	0.85	-24.15	0.15