Skye Area Plan

2nd Amendment

Section 3 – Utilities

- Power
- Sewer
- Storm Drain
- Pressurized Irrigation
- Culinary Water

Skye Development—Full Development Load & Trigger Points for Required Power System Projects

November 30, 2022

For: D. R. Horton, Lehi Power Department

RE: Skye Development

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

Active Power Engineering, LLC

Executive Summary: The estimated load of the Skye development is 12.57 MW (13.23 MVA) depending on the final unit types and unit numbers that are ultimately built. The estimated load of the other approved Area Plan development is 1.51 MVA depending on the final unit types and unit numbers that are ultimately built. To serve the total 14.74 MVA estimated load of this development an additional substation and feeders are needed. There is available capacity on the existing Littlefield substation and feeders in the area for part of the load. The number of equivalent residential units (ERUs) from all development in the Area Plan that can be connected to the existing feeders before projects are required (the "trigger" points) was analyzed. Either Project #2, to connect feeder 812 to 821, or Project #3, the new substation and feeders, is required for more than 435 ERUs to be connected. Project #3 is required for more than 996 ERUs to be built. Both Project #2 and Project #3 are required for more than 2,700 ERUs to be built.

Scope: This study estimates the load of the full Skye Site development and the load of other approved Area Plan ERUs, and analyzes the ERU "trigger points" for the projects identified in the previous power study ("Area Master Plan/Load Study for Micron Site Development", August 16, 2021) that are required to connect the proposed load.

Proposed Connected Load Estimate: D.R. Horton proposed to connect 2,736 ERUs, an estimated 12.57 MW of load (13.23 MVA at 0.95 power factor) for residential units, mixed use units, parks, churches, and schools. These load estimates were first developed in the previous power study and revised for the additional units proposed in the full D.R. Horton Skye development. They were based on the type and number of units proposed as provided in the information from D.R. Horton (refer to "Tabulations" on Figure A1 in the Appendix) and additional information provided. 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, as shown in Table 1 (original study) and Table 2 (this study). 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.

The value of one ERU was determined by dividing the total estimated load by the number of ERUs considered in the total load. For this analysis 4.84 kVA was the value used for one ERU.

$$Total\ Est. Load\ (kVA) \div Total\ \#\ Units\ or\ ERUs = kVA\ value\ per\ ERU$$

$$13{,}230\ kVA \div 2{,}736\ Units\ or\ ERUs\ = 4.84\ kVA\ value\ per\ ERU$$

Table 1 -- Skye Site Development Load Estimate (From previous power study)

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**

Table 2 -- Skye Site Load Estimate for Full Development

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 Comm	222	6.2	0.72		0.99	1.04
Mixed Used Res	572	5.5	0.68		2.14	2.25
Townhomes	638	5.5	0.68		2.39	2.51
Cottage	123	6	0.7		0.52	0.54
Horton Plus	208	7.5	0.7		1.09	1.15
Emerald	245	8	0.7		1.37	1.44
Estate	289	10	0.7		2.02	2.13
Active Adult	370	6	0.7		1.55	1.64
Parks and Open Space	16	10	1		0.16	0.17
Civic (Church/School)	53	8	0.8		0.34	0.36
Total	**2,736**			**Total**	**12.57**	**13.23**

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.

There is other property in the Area Plan that is not under the control of D.R. Horton/Gardner Company that needs to be considered in the planning of the power system in the area. Figure 1 shows the D.R. Horton development areas and the other area with their associated ERU's. The 224 ERUs on the Entrata Property and 88 ERUs on the Peck Property are estimated to add 1.51 MVA.

$$4.84\ kVA\ per\ ERU \times (224 + 88)\ ERUs\ \div 1{,}000\ kVA\ per\ MVA\ = 1.51\ MVA$$

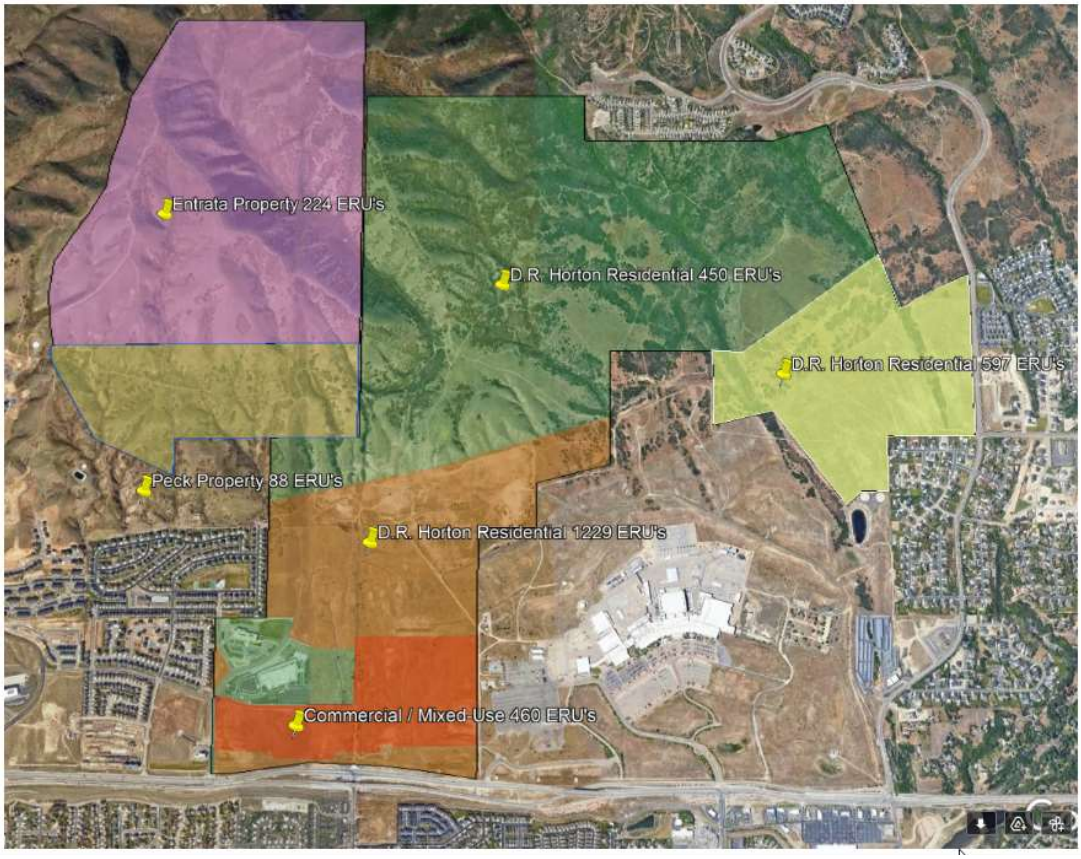


Figure 1--ERU Distribution Based on Current Lehi City Approvals (from Nov. 7, 2022, email from Scott Bishop)

A total of 3,048 ERUs are considered in this study.

$$(2{,}736\ D.R.Horton\ ERUs + 224\ Entrata\ ERUs + 88\ Peck\ ERUs\ ) = 3{,}048\ ERUs$$

Total power estimate for the study area is 14.74 MVA:

$$(13.23\ MVA, for\ D.R.Horton\ ERUs + 1.51\ MVA, for\ Entrata\ \&\ Peck\ ERUs) = 14.74\ MVA$$

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 (see Figure A2 in the Appendix). Lehi City Power uses a design criteria of loading substation transformers

and feeders to no more than 60% of rated capacity in normal operation. 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 A in the Appendix shows the load recorded in 2022 on each substation transformer and the feeders that could serve the new load, as well as the forecasted 2023-2032 loading on each.

Analysis of Development Load Addition: The Skye site development is estimated to add a total of about 2,736 ERUs—13.23 MVA (613 amps) of load--to whatever substation transformers and feeders they are fed from. The other development in the area is estimated to add 312 ERUs—1.51 MVA (70 amps) of load to the same transformers and feeders.

The total ERUs and the total associated load need to be considered in the power system planning in this area. The power system capacity (substation, transformer, feeders) that is required to be added will serve the entire load in the area regardless of the who does the development. Handling of the financial responsibility for the cost of the required power system additions is not within the scope of this study.

Analysis of the load addition in increments over multiple years (as assumed in the previous study) shows the trigger ERU points when new capacity is needed. Littlefield substation transformer T2, and feeders 821 and 822 have capacity for 435 ERUs. For development of more than 435 ERUs there are two projects identified that provide the capacity needed:

- Project #2—Extend feeder 812 to offload the Littlefield T2 transformer and feeder 821;
- Project #3—Build a new substation with four feeders.

  (Note-- The project numbering has been maintained to match the prior power studies. Project #1 was part of the original power study for the development. It has been completed by Lehi City so it is not included in this list.)

To develop more than 435 ERUs in the area the power system capacity in the area needs to be increased. The two projects listed will both ultimately need to be built. The order in which they are built does not matter. The capacity additions they provide are different: Project #2, extending feeder 812 across Timpanogos Highway provides capacity for a total of 996 ERUs (includes the initial 435 ERUs); and Project #3, a new substation with four feeders provides for a total of 2,700 ERUs (also, includes the initial 435 ERUs).

Since the total number of ERUs in the Area Plan currently approved by Lehi City is 3,294 ERUs, both projects are required. [NOTE: 246 ERUs have already been built and connected—these are not included in the initial 435 ERUs.] The extension of feeder 812 and the new substation with

additional feeders are needed in the area to achieve the capacity required by the Lehi Power design criteria and serve the area's load at full buildout. Table A in the appendix shows this analysis.

The new substation with four feeders is limited to serving a total of 2,700 ERUs by the capacity of Littlefield T2 transformer to back-up the load in the case where the new substation transformer is not available to serve load. By having Project #2 built and in-service some load is transferred from Littlefield T2 transformer, and the limitation is resolved. Then the total 3,294 ERUs in the Area Plan currently approved by Lehi City can be served in normal operation and be backed-up during the off-normal condition of the outage of the new substation.

Required System Additions: The system improvements and additions that are required in this area for connecting the estimated 2,736 ERUs – 12.57 MW (13.23 MVA) of load—for the Skye site development are the same as those that were identified in the previous power study. The same system improvements and additions are required for connecting the additional estimated 312 ERUs—1.51 MVA of load—for the other approved development in the area. The projects, the ERU trigger points, and ERU capacity available after the projects (determined in this analysis) are listed in Table 3.

Table 3--Required System Additions (from previous Power Study)

#	Project Description	Total ERU Trigger Point	Total ERUs Capacity Available After Project	Summary
1	*COMPLETED* Cross SR-92 with 822 & tie to 813	*COMPLETED*	*COMPLETED*	Bore under SR-92 and two aqueducts. Tie 822 and 813. Feed new load from 822. *This project was COMPLETED in 2022 by Lehi Power.*
2	Connect 812 to 821	435 ERUs	996 ERUs	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	435 ERUs (or 996 ERUs if Project #2 is built and in service first)	2,700 ERUs	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 #2 installs a new crossing of SR-92, Timpanogos Highway, extending Littlefield substations feeder 812 to a point on the north side of SR-92 where it can be used to off-load feeder 821 so feeder 821 will have capacity to serve the load of the development. This project includes crossing two aqueducts, also.

Project #3 is an additional substation with new transformer and four new feeders that is needed to serve the development load. Property for the substation—zoned as public facilities—will need to be provided. A transmission interconnection agreement with Rocky Mountain Power for tapping a 138 kV transmission line will be needed to feed the new substation. Two of the four new feeders from the substation feed the area east of the new substation. The two other feeders from the new substation are needed to tie to feeders 821 and 822 and feed the development area south and west of the new substation. Two additional feeder conduits for spares or future feeders should also be installed with this project.

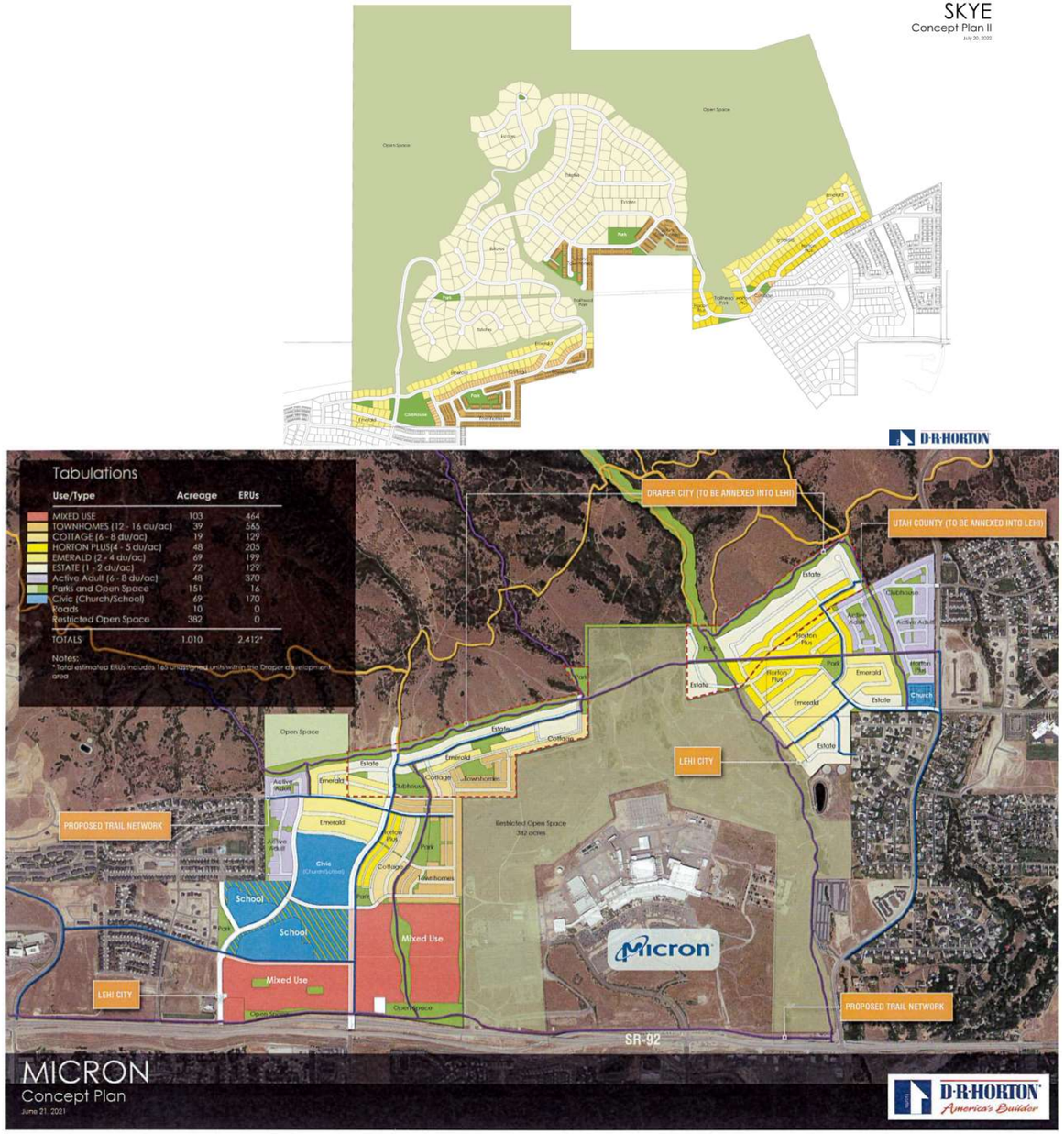
All feeders need to be installed in public utility easements where they are accessible to Lehi City Power's heavy equipment. Figure A3 in the Appendix shows most feeders following the roads in the development concept. One route shown to connect new feeders to the area east of the new substation is shown 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 Skye development is 12.57 MW (13.23 MVA) depending on the final unit types and unit numbers that are ultimately built. The estimated load of the other approved Area Plan development is 1.51 MVA depending on the final unit types and unit numbers that are ultimately built. To serve the total 14.74 MVA estimated load of this development an additional substation and feeders are needed. There is available capacity on the existing Littlefield substation and feeders in the area for part of the load. The number of ERUs from all development in the Area Plan that can be connected to the existing feeders before projects are required (the "trigger" points) was analyzed. Either Project #2, to connect feeder 812 to 821, or Project #3, the new substation and feeders, is required for more than 435 ERUs to be connected. Project #3 is required for more than 996 ERUs to be built. Both Project #2 and Project #3 are required for more than 2,700 ERUs to be built.

Maps/Drawings

Figure A1. Skye Development Concept Maps and ERU Tables



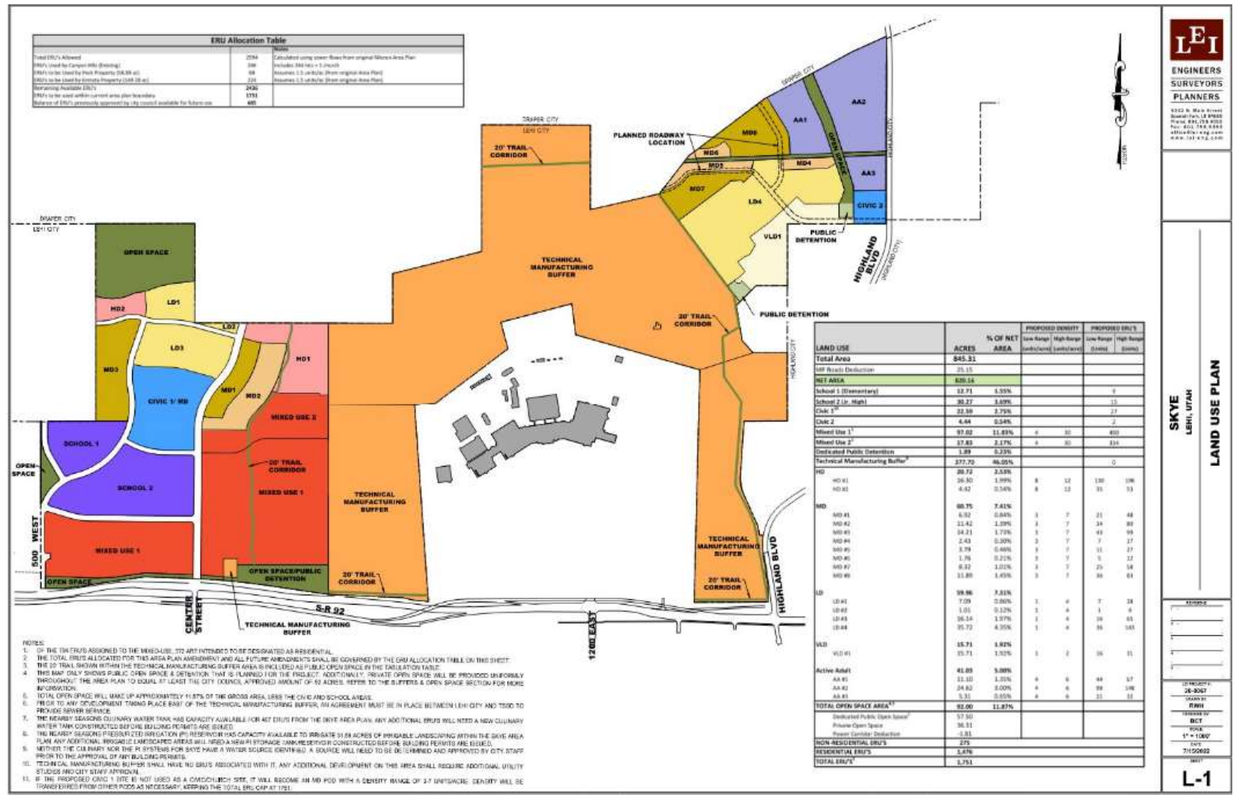


Figure A2. Lehi City Power Substations and Feeders

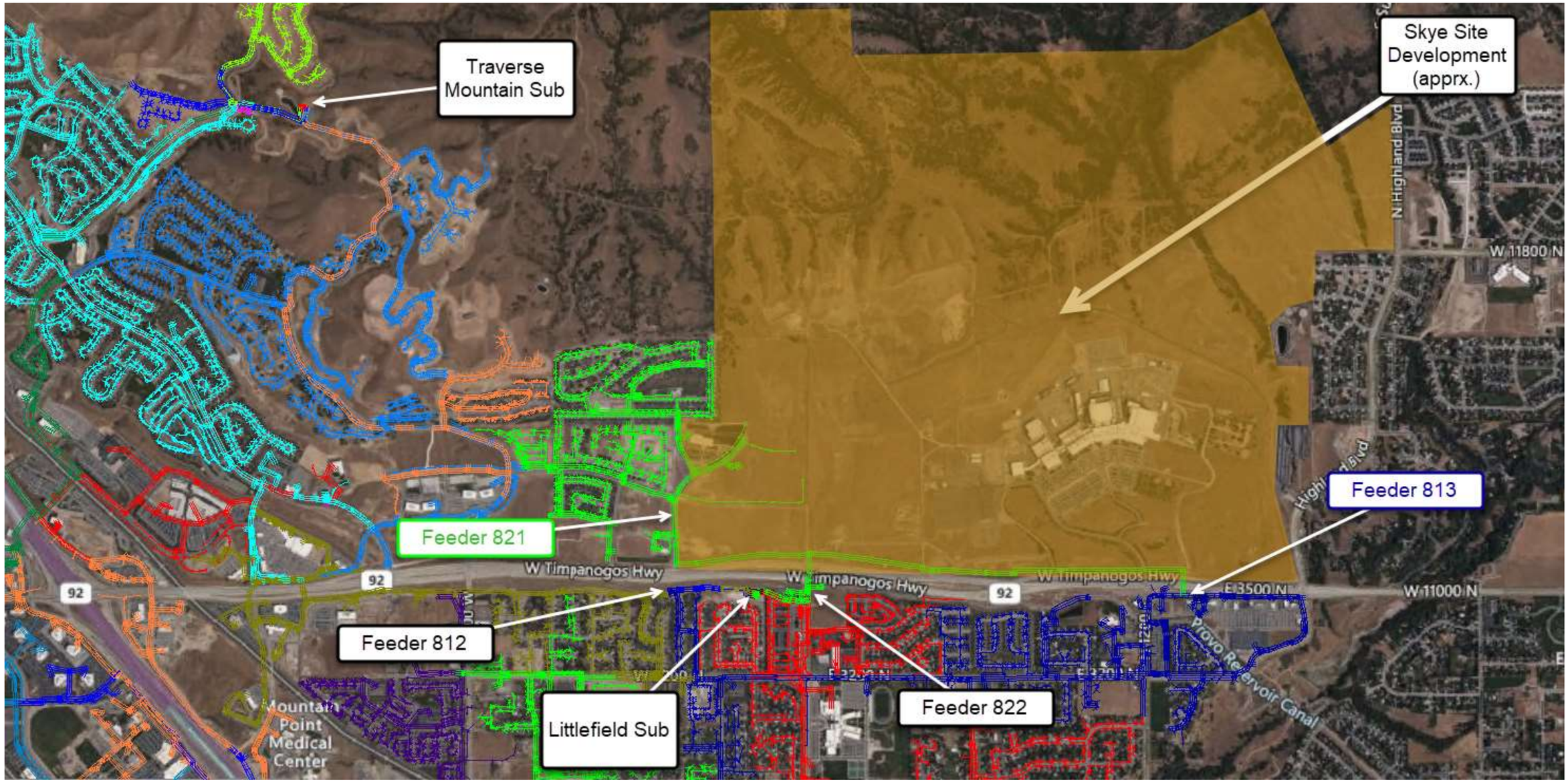


Figure A3. New Substation and Feeders Required at Full Buildout (#s represent project locations)

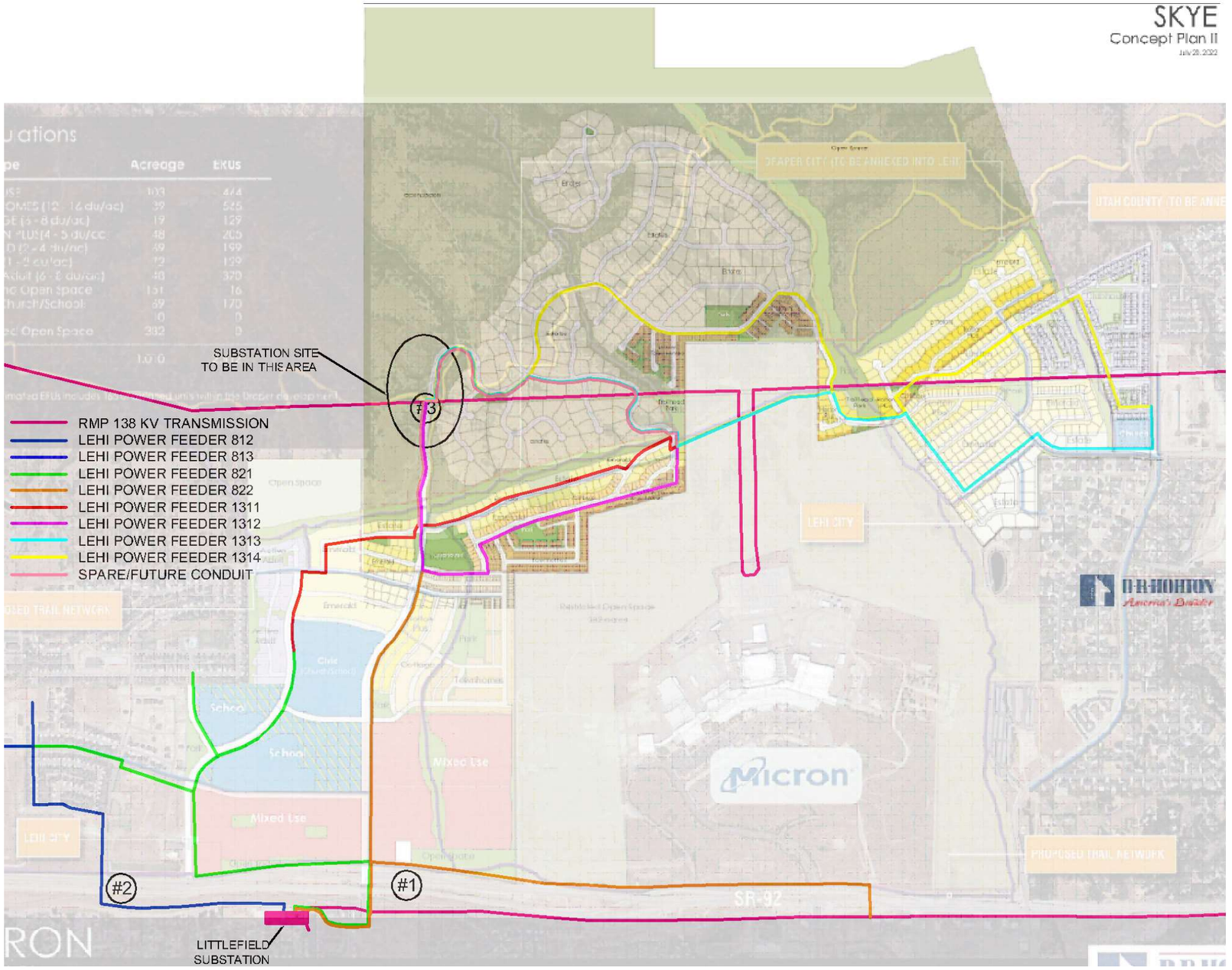


Table A. Substation and Feeder Loading Analysis (September 21, 2022)

Substation/Circuit	New Load or Transfer	Growth Rate	Transformer/Circuit Rating (MVA/Amps)	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Utilization
Littlefield			66 MVA												
T1			33 MVA	8.90	11.58	12.13	12.69	13.26	13.60	13.95	14.21	14.59	14.98	15.38	47%
811	base yr. peak	3%	500 Amps	173	179	185	191	197	203	210	217	224	232	239	
	Transfer from 522				73										
	Innovation Office Bldg 4				24										
	Traverse Mountain Offices-2,0(				8										
	Ridge Office #2-3,750 kVA					11									
	Ridge Office #2-3,750 kVA						11								
	Ridge Office #2-3,750 kVA							11							
	Transfer to 513										-54				
	Transfer from 712										83				
	Transfer to 511										-34				
	Adjusted load		Amps	173	284	301	318	335	341	348	350	357	365	372	74%
812	base yr. peak	3%	500 Amps	0	0	0	0	0	0	0	0	0	0	0	
	Adjusted load		Amps	0	0	0	0	0	0	0	0	0	0	0	0%
813	base yr. peak	3%	500 Amps	250	258	267	276	285	294	304	314	324	335	346	
	Transfer to 822			-54											
	Transfer from 823			47											
	Center Pointe lot 22a & Dubois				1										
	Adjusted load		Amps	243	252	261	270	279	288	298	308	318	329	340	68%
T2			33 MVA	9.91	16.13	19.71	20.14	16.91	17.37	17.84	18.33	18.83	19.35	19.88	60%
821	base yr. peak	3%	500 Amps	167	173	178	184	190	196	203	210	217	224	231	
	Transfer from 721				67										
	Dry Crk Lake Park				0										
	Traverse Mountain Apartments				40										
	VUE Apartments-1,200 kVA				6										
	VUE Apartments-1,200 kVA				6										
	Micron Site Yr 1 of 7					23									
	Traverse Mountain Apartments					40									
	Transfer to 1311							-170							
	Adjusted load		Amps	167	292	360	366	202	208	215	222	229	236	243	49%
822	base yr. peak	3%	500 Amps	48	50	51	53	55	56	58	60	62	64	66	
	Transfer from 813			54											
	VASA				24										
	Micron Site Yr 1 of 7					74									
	Center pointe towns 3237 N Ce					4									
	Adjusted load		Amps	102	128	207	209	211	212	214	216	218	220	222	44%
823	base yr. peak	3%	600 Amps	347	358	370	382	395	408	422	436	450	465	480	
	Transfer to 813			-47											
	Ivory Ridge towns 100 E Club Vi				16										
	Vivian Estates "D" + 600 E					6									
	Adjusted load		Amps	300	327	345	357	370	383	397	411	425	440	455	76%
Littlefield Sub Total			MVA	18.81	27.70	31.84	32.83	30.17	30.97	31.79	32.54	33.42	34.33	35.27	
DRHorton Micron			33 MVA												
T1			33 MVA	0.00	0.00	0.00	0.00	6.83	8.40	10.78	13.15	14.73	15.51	16.26	49%
1311	base yr. peak	3%	550 Amps	0	0	0	0	0	0	0	0	0	0	0	
	Transfer from 821							170							
	Micron Site Yr 3 of 7							33							
	Adjusted load		Amps	0	0	0	0	203	203	203	203	203	203	203	37%
1312	base yr. peak	3%	550 Amps	0	0	0	0	0	0	0	0	0	0	0	
	Micron Site Yr 2 of 7							50							
	Micron Site Yr 3 of 7							40							
	Micron Site Yr 2 of 7							23							
	Micron Site Yr 4 of 7								73						
	Prop by Micron Site Yr 5 of 7									37					
	Micron Site Yr 5 of 7									73					
	Adjusted load		Amps	0	0	0	0	113	186	296	296	296	296	296	54%
1313	base yr. peak	3%	550 Amps	0	0	0	0	0	0	0	0	0	0	0	
	Prop by Micron Site Yr 6 of 7										37				
	Micron Site Yr 6 of 7										73				
	Micron Site Yr 8 of 7												36		
	Adjusted load		Amps	0	0	0	0	0	0	0	110	110	146	146	27%
1314	base yr. peak	3%	550 Amps	0	0	0	0	0	0	0	0	0	0	0	
	Micron Site Yr 7 of 7											73			
	Micron Site Yr 9 of 7													35	
	Adjusted load		Amps	0	0	0	0	0	0	0	0	73	73	108	20%
DRHorton Micron Sub Total			MVA	0.00	0.00	0.00	0.00	6.83	8.40	10.78	13.15	14.73	15.51	16.26	

* Lehi Power design criteria limits normal operating capacity of transformers and feeders to 60%.
Feeder 821 capacity limit taken as 360 amps (60% of 600 amps) for this study.