

CFPs, IFFPs, and IFAs 2026 Amendments

Drinking Water, Public Safety, Parks, Wastewater,
Water Rights Acquisition, and Storm Drainage

April 21, 2026
Planning Commission Meeting

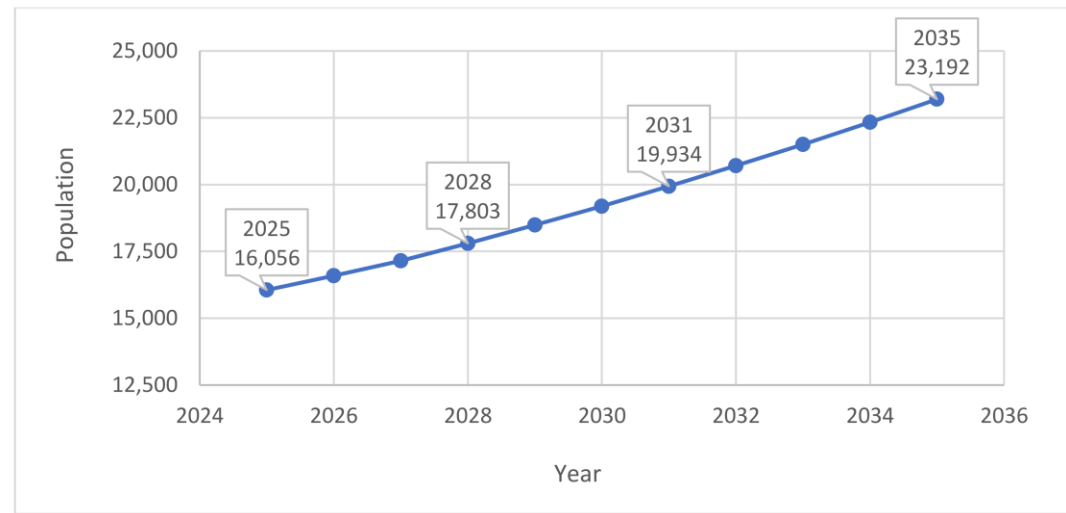


Introduction and Process

- Ensign is amending the Capital Facility Plans (CFPs), Impact Fee Facility Plans (IFFPs), and Impact Fee Analyzes (IFAs) for 2026 excluding **Transportation Only**.
 - Last amendment was in May 2025 to all plans except for Parks and Transportation which were amended in January 2026.
 - Impact fees help fund expansion of public facilities necessary to accommodate new growth.
 - Plans are amended yearly.
 - Have met with City Staff to discuss projects and incorporated City Staff comments in amendments.
 - It takes 90 days before amended impact fees go into effect once City Council approves.
 - Developer funded projects are not impact fee eligible.
- Demographics were updated with 2026 Sewer Rate Study and utilized in CFP, IFFP, and IFAs. The actual growth rate in 2025 was 2.93% and a projected growth rate of 3.5% in 2026 and 2027 is utilized with a 4.0% growth rate from 2028 to 2035 which is the end of the 10-year planning period. For the past 26 years, Grantsville's average growth rate is approximately between 4.5% to 5.0% with spikes of approximately 10% during COVID years.
- Determined capital improvement projects using demographics and the level of service.
- Determined non-capital improvement project costs (i.e. interest expense, existing capital assets, professional expenses, future debt service, etc.).

Demographics

- Population Projection in 10-year Planning Period

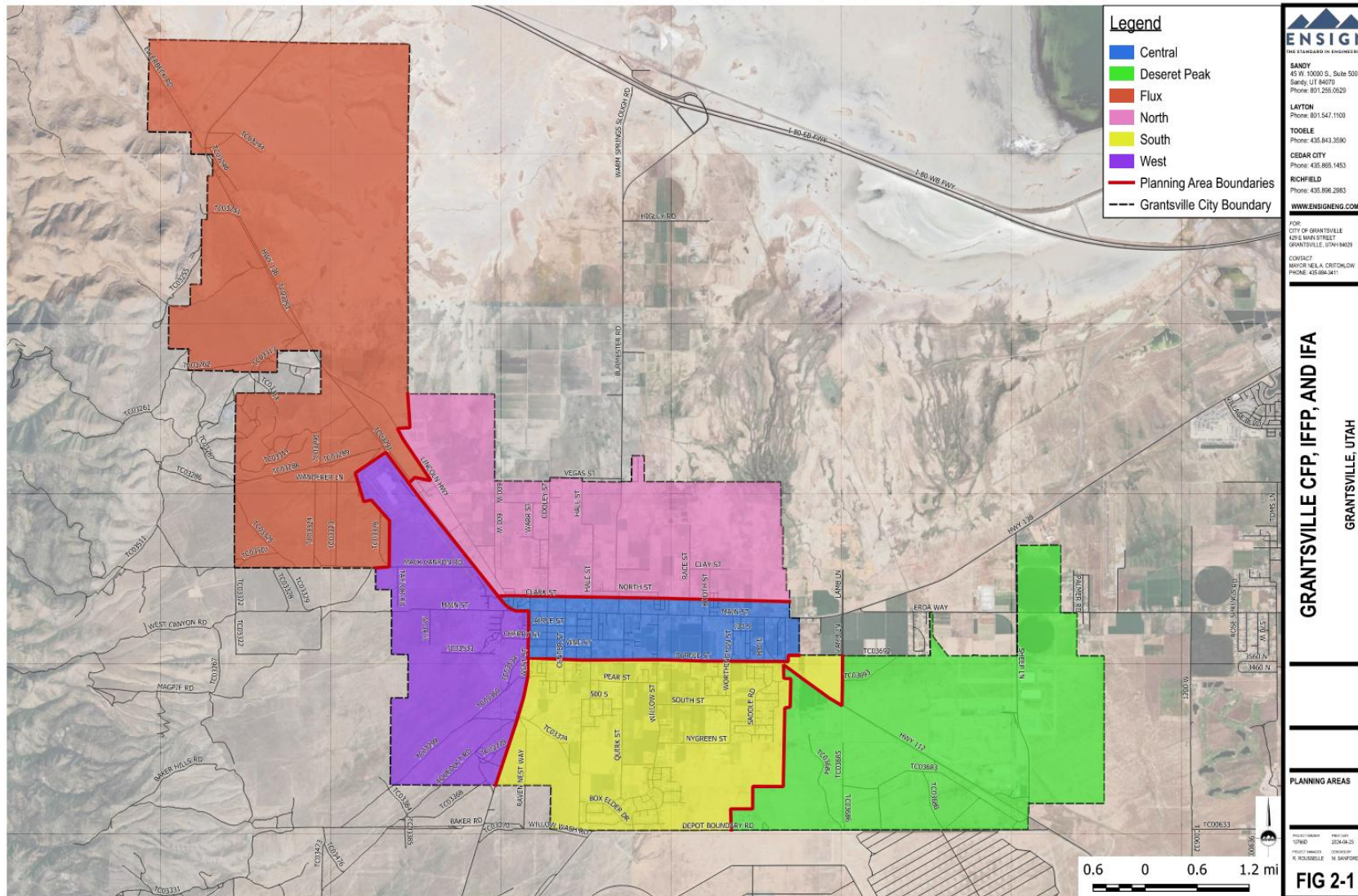


- Current Service Connections and ERCs

Service Connection Type	Service Connections	Units	ERC / Unit	ERCs
Single Family	4,609	4,618	1.00	4,618
Multi-Unit	46	290	0.52	151
Trailer	8	208	1.12	233
Commercial	110	155	7.34	1,138
Church	10	11	4.57	50
School	7	12	5.09	61
Construction Water	20	20	6.81	136
City Rate	5	33	10.59	349
Total	4,815	5,347		6,736

Demographics

- Planning Sub-Areas



Demographics

- Projected ERCs and Growth Distribution in 10-year Planning Period

Year:	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035												
Projected Population:	16,056	16,592	17,148	17,803	18,486	19,193	19,934	20,705	21,501	22,332	23,192												
Residential Growth Rate:	2.93%	3.5%	3.5%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%												
Commercial Growth Rate:	0.73%	0.88%	0.88%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%												
Service Connection Type	ERC / Unit	Units	ERCs	Units	ERCs	Units	ERCs	Units	ERCs	Units	ERCs	Units	ERCs	Units	ERCs	Units	ERCs	Units	ERCs	Units	ERCs	Units	ERCs
Single Family	1.00	4,618	4,618	4,780	4,780	4,947	4,947	5,145	5,145	5,351	5,351	5,565	5,565	5,788	5,788	6,020	6,020	6,261	6,261	6,511	6,511	6,771	6,771
Multi-Unit	0.52	290	151	300	156	311	162	323	168	336	175	349	181	363	189	378	197	393	204	409	213	425	221
Trailer ¹	1.12	208	233	208	233	208	233	208	233	208	233	208	233	208	233	208	233	208	233	208	233	208	233
Commercial	7.34	155	1,138	156	1,145	157	1,152	159	1,167	161	1,182	163	1,196	165	1,211	167	1,226	169	1,240	171	1,255	173	1,270
Church ²	4.57	11	50	11	50	11	50	12	55	12	55	13	59	13	59	14	64	14	64	15	69	15	69
School ³	5.09	12	61	12	61	12	61	13	66	13	66	14	71	14	71	15	76	16	81	16	81	17	87
Construction Water	6.81	20	136	21	143	22	150	23	157	24	163	25	170	26	177	27	184	28	191	29	197	30	204
City Rate ⁴	10.59	33	349	35	371	36	381	37	392	37	392	39	413	39	413	40	424	41	434	42	445	42	445
Total		5,347	6,736	5,523	6,939	5,704	7,136	5,920	7,383	6,142	7,617	6,376	7,888	6,616	8,141	6,869	8,424	7,130	8,708	7,401	9,004	7,681	9,300
<i>Increase from 2025</i>		-	-	176	203	357	400	573	647	795	881	1,029	1,152	1,269	1,405	1,522	1,688	1,783	1,972	2,054	2,268	2,334	2,564

¹ Trailer units are not expected to increase.

² Church growth rate is 1 church per 1,480 population.

³ School growth rate is 1 school per 1,360 population.

⁴ City Rate growth rate is based on anticipated City projects.

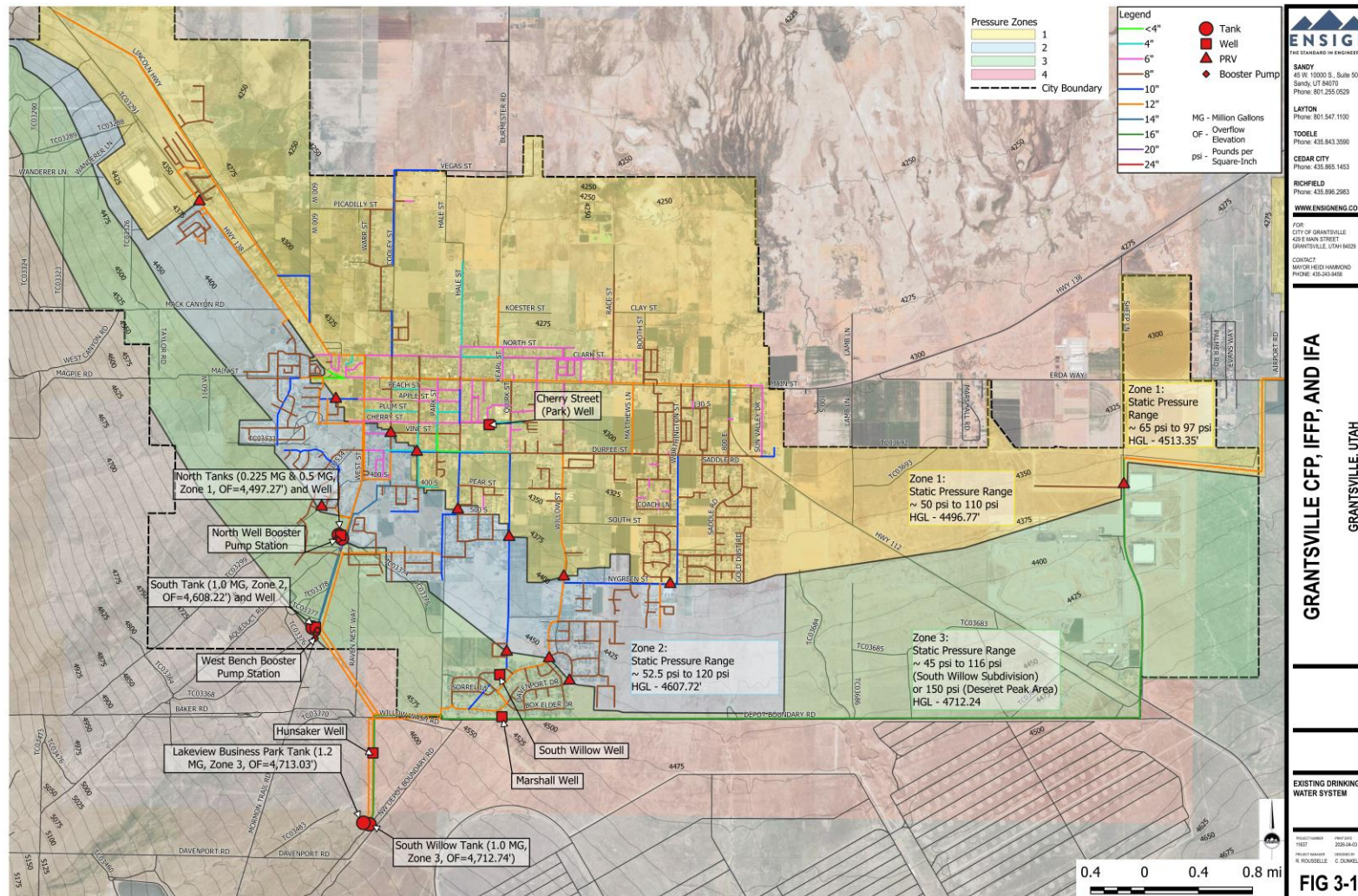
Drinking Water (Existing)

- Level of Service

- Unit Average Day Demand = 807 gpd/ERC (0.618 ac-ft/year/ERC)
 - Indoor Demand = 195 gpd/ERC (0.218 ac-ft/year/ERC)
 - Outdoor Demand = 612 gpd/ERC (0.400 ac-ft/year/ERC)
- Unit Peak Day Demand = 1,416 gpd/ERC (0.983 gpm/ERC)
 - Indoor Demand = 275 gpd/ERC (0.191 gpm/ERC)
 - Outdoor Demand = 1,141 gpd/ERC (0.792 gpm/ERC)
- Peak Instantaneous Demand:
 - Indoor Demand = $10.8 * (ERCs)^{0.64}$ gpm/ERC
 - Outdoor Demand = 1.58 gpm/ERC
- Fire Flow:
 - Industrial/Commercial Buildings = 2,050 gpm for 4 hours (492,000 gallons)
 - Residential = 1,500 for 2 hours

Drinking Water System Capacity Requirements:

- Sources:
 - Supply Peak Day Demand
- Storage:
 - Storage for Average Day Demand plus Fire Flow (Industrial/Commercial Buildings Fire Flow)
- Distribution:
 - Per UAC R309-105-9, distribution systems should maintain a minimum pressure at all points in the system during:
 - Peak Day Demand plus Fire Flow - 20 psi
 - Peak Instantaneous Demand - 30 psi
 - Peak Day Demand - 40 psi
 - Max Velocity Requirements:
 - Peak Day and Peak Instantaneous Demand - 5 fps
 - Peak Day Demand plus Fire Flow - 10 fps



Drinking Water (Proposed)

- Capital Improvement Projects and Impact Fee Eligible Costs

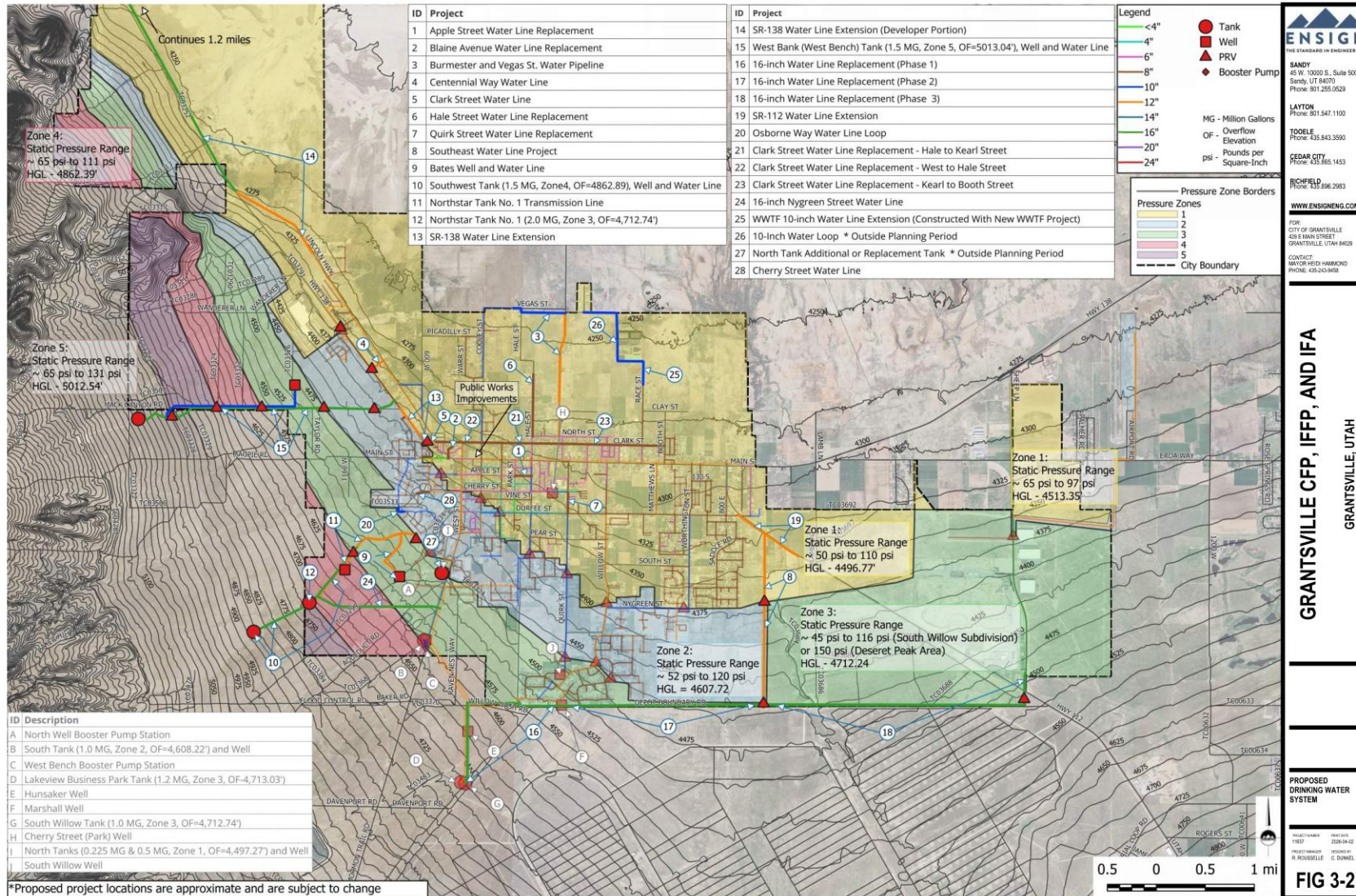
Project	Construction Year	Current Year (2025) Cost Estimate	Construction Year Cost Estimate	Proportionate Share	Impact Fee Eligible Cost
Bates Well	2027	\$3,041,918.77	\$3,258,579.43	0% ²	\$0.00
West Bank Well	2027	\$3,518,067.73	\$3,768,642.10	0% ²	\$0.00
Southwest Well	2031	\$2,979,952.08	\$3,663,121.97	0%	\$0.00
Northstar Tank No. 1	2026	\$3,387,223.88	\$3,505,776.72	0.00%	\$0.00
West Bank Tank	2027	\$4,898,123.85	\$5,246,992.72	0% ²	\$0.00
Southwest Tank	2031	\$3,825,690.00	\$4,702,749.81	0% ²	\$0.00
Osborne Way Water Line Loop	2026	\$76,356.25	\$79,028.72	27.6%	\$21,788.13
SR-138 Water Line Extension (Developer Portion)	2026	\$6,272,971.05	\$6,492,525.04	0% ²	\$0.00
Northstar Tank No. 1 Transmission Line	2026	\$2,504,135.45	\$2,591,780.19	0% ²	\$0.00
SR-138 Water Line Extension	2027	\$566,221.70	\$606,550.84	27.6%	\$167,225.41
Generator	2027	\$269,200.00	\$288,373.77	27.6%	\$79,504.34
SR-112 Water Line Extension	2027	\$540,168.75	\$578,642.27	0% ²	\$0.00
Southeast Water Line Project	2028	\$1,507,959.92	\$1,671,902.12	0% ²	\$0.00
Clark Street Water Line Project	2029	\$480,299.94	\$551,155.23	27.6%	\$151,952.90
Burmester and Vegas Street Water Pipeline Project	2031	\$973,445.29	\$1,196,612.81	27.6%	\$329,904.86
Centennial Way Water Line Project	2035	\$357,093.75	\$503,716.00	27.6%	\$138,873.96
Public Works Improvements	2035	\$1,318,982.50 ¹	\$1,860,555.08	27.6%	\$512,953.03
Hale Street Water Line Replacement	2029	\$878,172.10	\$1,007,722.68	27.6%	\$277,828.06
Total		\$37,395,983.01	\$41,574,427.50		\$1,680,030.71

¹ The cost shown for the Public Works Improvements project is half of the total cost estimate because this project cost will be split evenly between the wastewater and drinking water utilities.

² The proportionate share is 0% because the project is expected to be constructed by developers.

Drinking Water (Proposed)

- Capital Improvement Projects Figure



Drinking Water Impact Fees

- Impact Fees
 - Existing Impact Fees

Water Meter Size (inches)	Maximum Flow Rate (gpm)	ERCs	Impact Fee
3/4	25 ¹	1	\$2,497.04
1	40 ¹	1.6	\$3,995.27
1 1/2	50 ¹	2	\$4,994.08
2	100 ¹	4	\$9,988.16
3	200 ²	8	\$19,976.33
4	400 ²	16	\$39,952.65
6	800 ²	32	\$79,905.30
8	1,000 ²	40	\$99,881.63
Non-Residential Development Indoor			\$25.46 per fixture unit
Non-Residential Development Outdoor			\$15,780.55 per irrigated acre

¹ From AWWA M6 Table 5-3 Displacement Meters.

² From AWWA M6 Table 5-3 Electromagnetic and Ultrasonic Meter Type 1.

- Proposed Maximum Allowable Impact Fees

Water Meter Size (inches)	Maximum Flow Rate (gpm)	ERCs	Impact Fee
3/4	25 ¹	1	\$2,841.56
1	40 ¹	1.6	\$4,546.49
1 1/2	50 ¹	2	\$5,683.11
2	100 ¹	4	\$11,366.22
3	200 ²	8	\$22,732.45
4	400 ²	16	\$45,464.89
6	800 ²	32	\$90,929.79
8	1,000 ²	40	\$113,662.24
Non-Residential Development Indoor			\$28.97 per fixture unit
Non-Residential Development Outdoor			\$17,957.79 per irrigated acre

¹ From AWWA M6 Table 5-3 Displacement Meters.

² From AWWA M6 Table 5-3 Electromagnetic and Ultrasonic Meter Type 1.

Public Safety

- Level of Service

Department	Staff Level of Service	Facility Level of Service
Police	1.87 staff per 1,000 population ¹	232.1 sq ft building area per staff member
Fire	3.14 firefighters per 1,000 population	0.0565 fire stations per 1,000 population
Animal Control	0.156 officers per 1,000 population	90.3 sq ft building area per 1,000 population

¹ Police staff LOS does not include animal control officers, crossing guards, or victim advocate volunteers.

Public Safety

- Capital Improvement Projects

Project	Building Area (sq ft)	Construction Priority		Current Year (2025) Cost Estimate
		Begin Planning	Completion	
Animal Control Shelter	4,500	2025	2033	\$1,567,581.40 ¹
Justice Center Renovations	N/A	2028	2029	\$19,580.00 ¹
Justice Center Police Expansion	4,497	2033	2034	\$1,246,608.00 ¹
New City Hall Building	20,000	2032	2034	\$9,681,145.54 ¹
Existing City Hall Renovations	N/A	2033	2034	\$2,425,500.00 ¹
Future Satellite Fire Station and Ladder Truck	N/A	N/A	N/A	\$0.00
Total				\$14,940,414.94

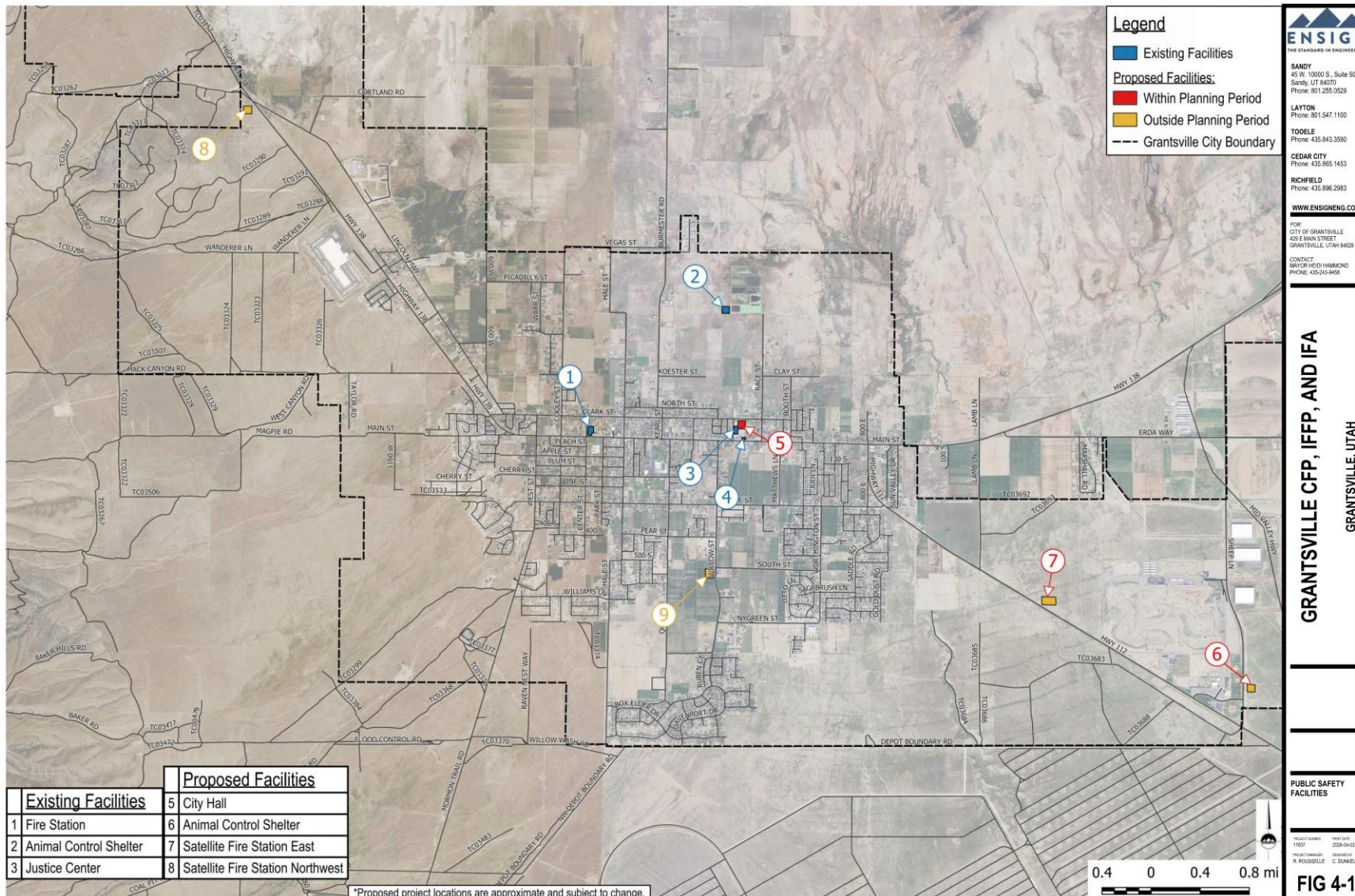
¹ Cost estimates are based on rough costs per square footage. These should be updated when project details are determined.

² Assumed that 50% of the Animal Control Shelter will be jointly paid and constructed in 2033

- Impact fee Eligible Costs

Project	Construction Year	Current Year (2025) Cost Estimate	Construction Year Cost Estimate	Proportionate Share	Impact Fee Eligible Cost
Animal Control Shelter	2033	\$1,567,581.40	\$2,064,205.35	14.3%	\$295,585.40
Justice Center Police Expansion	2034	\$1,246,608.00	\$1,698,998.74	34.0%	\$578,158.28
Total		\$2,814,189.40	\$3,763,204.10		\$873,743.68

Public Safety



Public Safety

- Impact Fees

- Existing Impact Fees

Land Use	Impact Fee
Single Family	\$1,037.12 per Dwelling Unit
Multi-Unit	\$448.05 per Dwelling Unit
Non-Residential	\$615.28 per 1,000 sq ft building area

- Proposed Maximum Allowable Impact Fees

Land Use	Impact Fee
Single Family	\$712.43 per Dwelling Unit
Multi-Unit	\$2,388.62 per Dwelling Unit
Non-Residential	\$3,070.10 per Non-Residential Unit

- Calls Per Unit

Type	Units	Calls	Calls/Unit
Single Family	4,618	2,655	0.575
Multi-Family	290	559	1.928
Non-Residential	178	441	2.478

Parks, Recreation Facilities, Open Spaces, and Trails

- Level of Service

Parameter	LOS Requirement
Park Acreage per 1,000 population	4.00 acres

Parks, Recreation Facilities, Open Spaces, and Trails

- Capital Improvement Projects and Impact Fee Eligible Costs

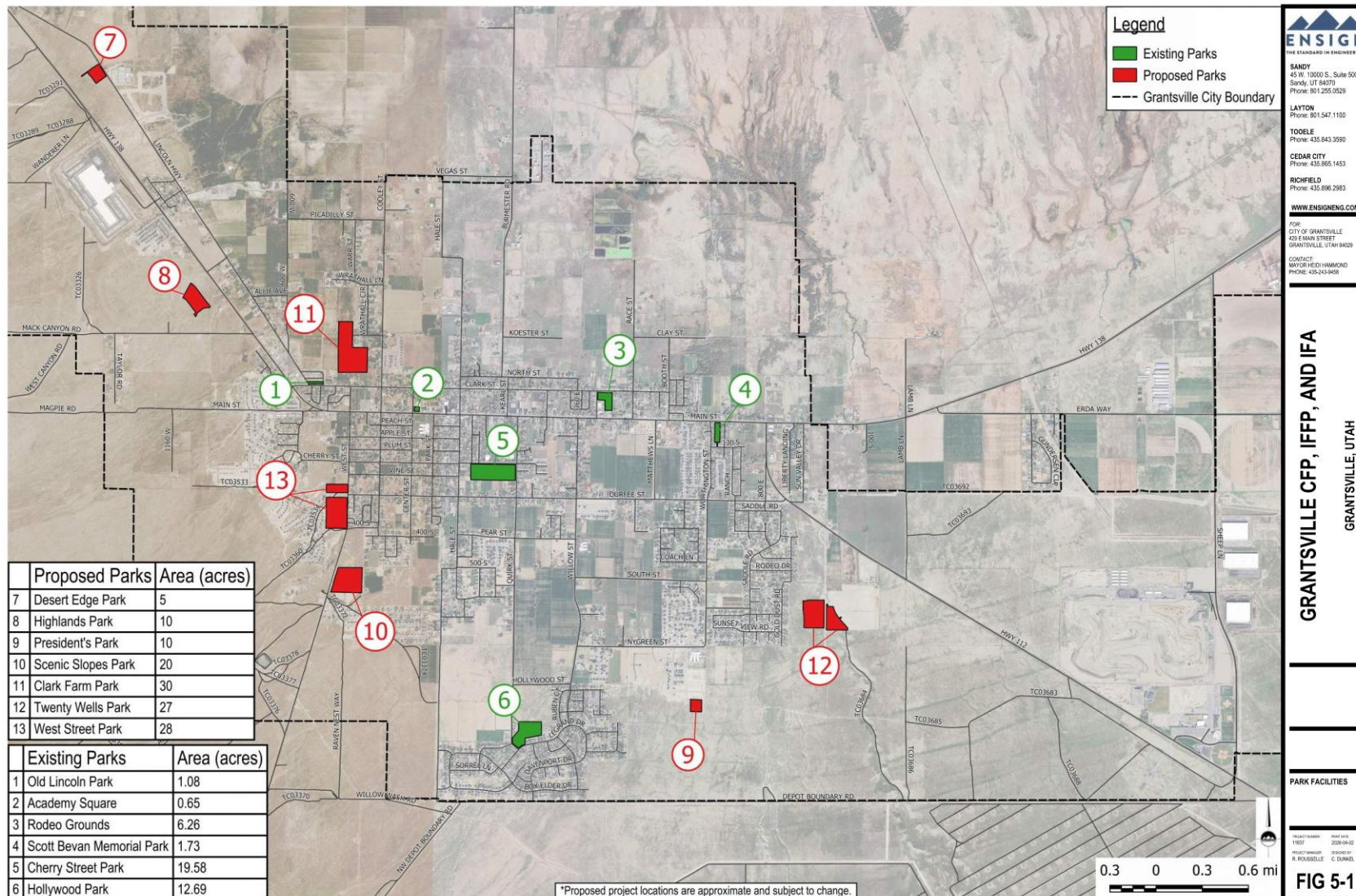
Project	Construction Year	Current Year (2025) Cost Estimate	Construction Year Cost Estimate	Proportionate Share	Impact Fee Eligible Cost
West Street Park	2026	\$297,903.23	\$308,329.84	19.7%	\$60,752.89
Scenic Slopes Park, Utilities, Pump Track, Site Improvements	2026	\$3,170,969.33	\$2,420,969.33 ²	100.0%	\$2,420,969.33
Desert Edge Park	2027	\$2,664,070.11	\$2,853,818.50	0% ¹	\$0.00
Scenic Slopes Parking, Park Amenities, Ball Courts	2028	\$2,447,372.82	\$2,713,445.99	100.0%	\$2,713,445.99
President's Park	2034	\$1,695,904.66	\$2,311,343.97	100.0%	\$2,311,343.97
Scenic Slopes Park Baseball and Soccer Field	2032	\$3,198,537.29	\$4,069,432.67	100.0%	\$4,069,432.67
Twenty Wells Park	2032	\$8,628,500.00	\$10,977,861.62	0% ¹	\$0.00
Highlands Park	2033	\$3,392,678.66	\$4,467,509.92	0% ¹	\$0.00
Clark Farm Park	2034	\$3,405,170.23	\$4,640,897.49	0%	\$0.00
Total		\$28,901,106.33	\$34,763,609.34		\$11,575,944.86

¹ The proportionate share is 0% because the project is expected be constructed by developers.

² Construction Year Cost based on Resolution No. 2025-71 not inflated, without grant of \$750k which is not impact fee eligible.

Parks, Recreation Facilities, Open Spaces, and Trails

- Capital Improvement Projects Figure



Parks, Recreation Facilities, Open Spaces, and Trails

- Impact Fees

- Existing Impact Fees

Land Use	Impact Fee
Single Family and Multi-Unit	\$4,032.45 per Dwelling Unit

- Proposed Maximum Allowable Impact Fees

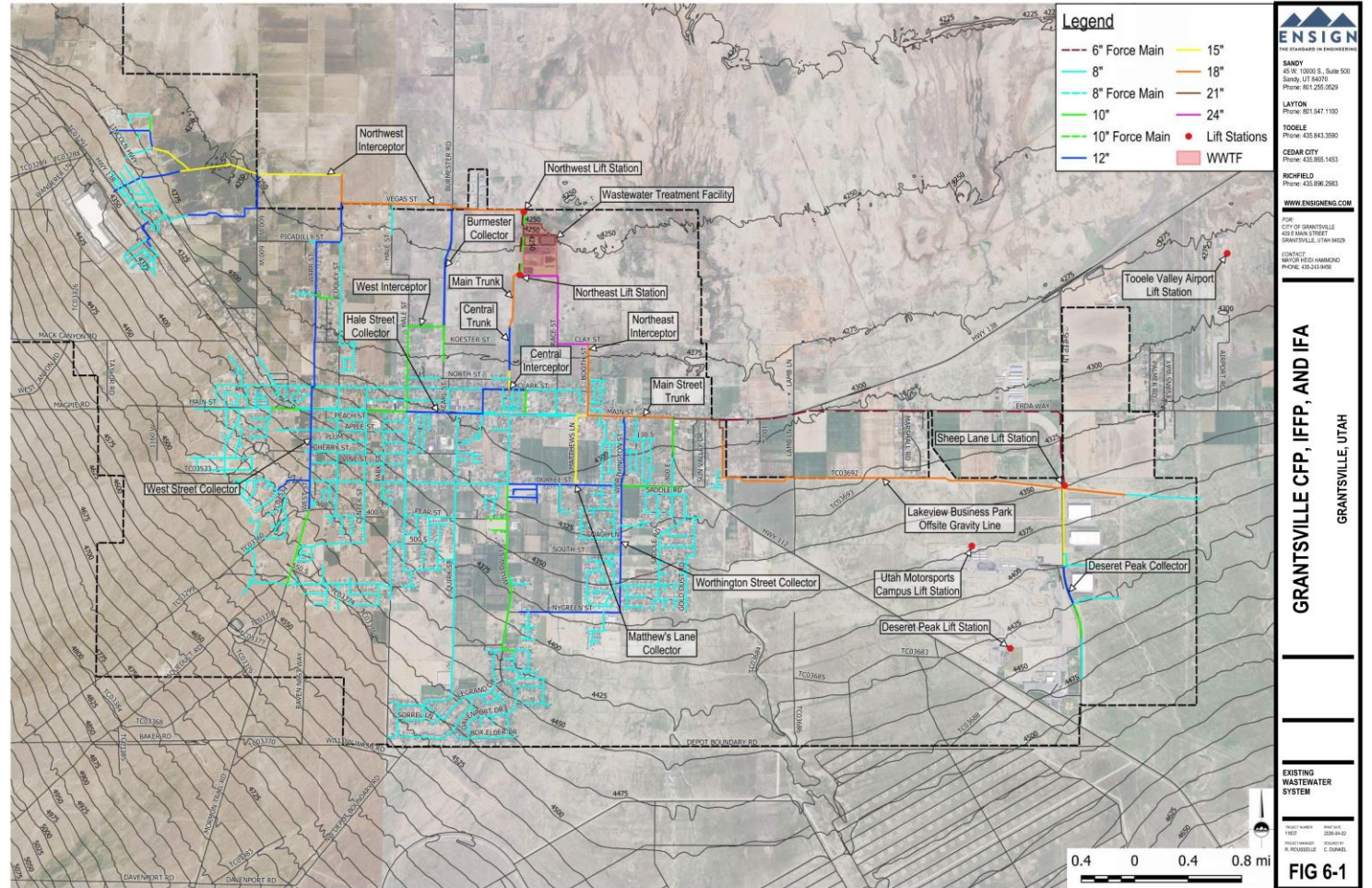
Land Use	Impact Fee
Single Family and Multi-Unit	\$3,762.18 per Dwelling Unit

- Note: Developer constructed parks are shown as not impact fee eligible.

Wastewater (Existing)

- Level of Service

Component	Parameter	Level of Service	
Collection System	Average Day Flow	150 gpd/ERC	
	Peaking Factors	Miles From WWTF	Factor
		<1	1.85
		>1 and <1.6	2.25
>1.6	4		
Lift Stations	Peak Inflow	0.35 gpm/ERC	
	Average Day Flow	150 gpd/ERC	
Wastewater Treatment Facility	Peak Day Flow	175 gpd/ERC	
	Peak Instantaneous Flow	0.4 gpm/ERC	



Wastewater (Proposed)

- Capital Improvement Projects and Impact Fee Eligible Costs

Project	Construction Year	Current Year (2025) Cost Estimate	Construction Year Cost Estimate	Proportionate Share	Impact Fee Eligible Cost
SR112 Interceptor	2027	\$2,988,835.56	\$3,201,715.37	0% ²	\$0.00
West Bank Interceptor Segment 1	2027	\$376,287.40	\$403,088.47	8.8% ⁴	\$35,294.63
West Bank Interceptor Segment 2	2027	\$39,832.00	\$42,669.03	13.5% ⁴	\$5,756.82
West Bank Interceptor Segment 3	2027	\$3,927,403.66	\$4,207,132.99	0% ²	\$0.00
Southeast Sewer Line	2027	\$1,564,982.00	\$1,676,447.84	0% ²	\$0.00
Vegas Street Collector	2035	\$5,790,294.14	\$8,167,781.74	0.0%	\$0.00
Northwest Lift Station - Upsize Force Main	2028	\$194,363.06	\$215,493.80	100%	\$215,493.80
Proposed Wastewater Treatment Facility	2026	\$48,402,175.15 ³	\$48,402,175.15	12.8%	\$6,205,158.85
Public Works Improvements	2035	\$1,318,982.50 ¹	\$1,860,555.08	27.6%	\$512,953.03
Total		\$64,603,155.47	\$68,177,059.48		\$6,974,657.14

¹ The cost shown for the Public Works Improvements project is half of the total cost estimate because this project cost will be split evenly between the wastewater and drinking water utilities.

² The proportionate share is 0% because the project is expected be constructed by developers.

³ Proposed WWTF is 2026 cost estimate.

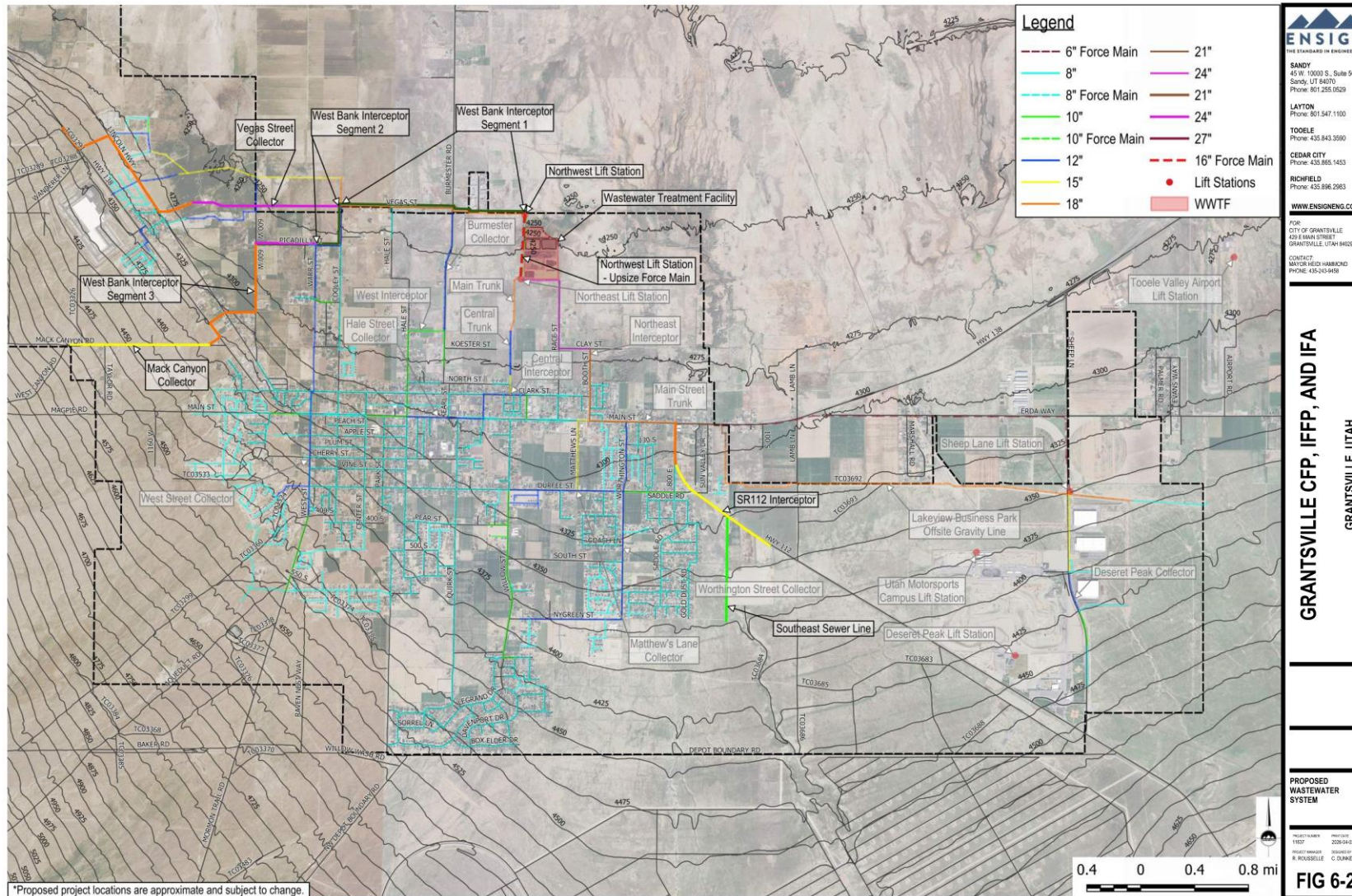
⁴ The proportionate share within the planning period for Segment 1 is calculated by dividing planning period ERCs (1,544 ERCs) by upsize capacity [36-inch capacity (26,682 ERCs) - Deseret minimum diameter (9,050 ERCs)]=17,632 ERCs.

The proportionate share within the planning period for Segment 2 is calculated by dividing planning period ERCs (1,544 ERCs) by upsize capacity [36-inch capacity (15,008 ERCs) - Deseret minimum diameter (3,565 ERCs)]=11,443 ERCs.

The costs shown for West Bank Interceptor Segment 1 and 2 in the table are upsize costs only.

Wastewater (Proposed)

- Capital Improvement Projects Figure



Wastewater Impact Fees

- Impact Fees
 - Existing Impact Fees

Water Meter Size (inches)	Maximum Flow Rate (gpm)	ERCs	Impact Fee
3/4	25 ¹	1	\$5,949.41
1	40 ¹	1.6	\$9,519.05
1 1/2	50 ¹	2	\$11,898.81
2	100 ¹	4	\$23,797.63
3	200 ²	8	\$47,595.25
4	400 ²	16	\$95,190.50
6	800 ²	32	\$190,381.00
8	1,000 ²	40	\$237,976.25
Non-Residential Development			\$247.89 per fixture unit

¹ From AWWA M6 Table 5-3 Displacement Meters.

² From AWWA M6 Table 5-3 Electromagnetic and Ultrasonic Meter Type 1.

- Proposed Maximum Allowable Impact Fees

Water Meter Size (inches)	Maximum Flow Rate (gpm)	ERCs	Impact Fee
3/4	25 ¹	1	\$6,081.18
1	40 ¹	1.6	\$9,729.89
1 1/2	50 ¹	2	\$12,162.36
2	100 ¹	4	\$24,324.72
3	200 ²	8	\$48,649.44
4	400 ²	16	\$97,298.89
6	800 ²	32	\$194,597.77
8	1,000 ²	40	\$243,247.22

¹ From AWWA M6 Table 5-3 Displacement Meters.

² From AWWA M6 Table 5-3 Electromagnetic and Ultrasonic Meter Type 1.

Water Rights Acquisition

- Level of Service

Parameter	Level of Service
Indoor Use	0.218 acre-feet/year/ERC
Outdoor Use	3.33 acre-feet/year/irrigated acre

Water Rights Acquisition

- Existing Impact Fees

- Category 1 includes single family homes only.
- Category 2 covers all other types of development not included in Category 1.
- Proposed Impact Fees

- Indoor Use

Land Use	Water Right Quantity (ac-ft)	Impact Fee	Unit
Single Family Residential	0.218	\$6,322.00	per Dwelling Unit
Multi-Unit Residential	0.107	\$3,103.00	per Dwelling Unit
Non-Residential	0.00908	\$263.32	per fixture unit

- Category 1 Outdoor Use (No Waterwise Landscaping)

Category 1 Lot Size	Water Right Quantity (ac-ft)	Impact Fee
7,000 sq ft	0.34	\$9,931.90
8,000 sq ft	0.39	\$11,350.74
10,000 sq ft	0.49	\$14,188.43
14,000 sq ft	0.68	\$19,863.80
1/2 acre	1.07	\$30,902.40
2/3 acre	1.42	\$41,203.20
3/4 acre	1.60	\$46,353.60
1.0 acre	2.13	\$61,804.80
> 1.0 acre	2.13	\$61,804.80

- Category 1 Outdoor Use (Waterwise Landscaping Front Yard Only)

Category 1 Lot Size	Water Right Quantity (ac-ft)	Impact Fee
7,000 sq ft	0.31	\$9,051.12
8,000 sq ft	0.36	\$10,344.13
10,000 sq ft	0.45	\$12,930.17
14,000 sq ft	0.62	\$18,102.23
1/2 acre	0.97	\$28,161.90
2/3 acre	1.29	\$37,549.20
3/4 acre	1.46	\$42,242.85
1.0 acre	1.94	\$56,323.80
> 1.0 acre	1.94	\$56,323.80

- Category 2 Outdoor Use (No Waterwise Landscaping)

Category 2 = (irrigated area, acres) * (3.33 ac-ft/irr. ac) * \$29,000

- Category 2 Outdoor Use (Waterwise Landscaping)

Category 2 = (irrigated area, acres) * (2.28 ac-ft/irr. ac) * \$29,000

Water Rights Acquisition

- Proposed Maximum Allowable Impact Fees
 - Category 1 includes single family homes only.
 - Category 2 covers all other types of development not included in Category 1.
- Proposed Impact Fees

- Indoor Use

Land Use	Water Right Quantity (ac-ft)	Impact Fee	Unit
Single Family Residential	0.218	\$6,322.00	per Dwelling Unit
Multi-Unit Residential	0.120	\$3,480.00	per Dwelling Unit
Non-Residential	0.00908	\$263.32	per fixture unit

- Category 1 Outdoor Use (No Waterwise Landscaping)

Category 1 Lot Size	Water Right Quantity (ac-ft)	Impact Fee
7,000 sq ft	0.34	\$9,931.90
8,000 sq ft	0.39	\$11,350.74
10,000 sq ft	0.49	\$14,188.43
14,000 sq ft	0.68	\$19,863.80
1/2 acre	1.07	\$30,902.40
2/3 acre	1.42	\$41,203.20
3/4 acre	1.60	\$46,353.60
1.0 acre	2.13	\$61,804.80
> 1.0 acre	2.13	\$61,804.80

- Category 1 Outdoor Use (Waterwise Landscaping Front Yard Only)

Category 1 Lot Size	Water Right Quantity (ac-ft)	Impact Fee
7,000 sq ft	0.31	\$9,051.12
8,000 sq ft	0.36	\$10,344.13
10,000 sq ft	0.45	\$12,930.17
14,000 sq ft	0.62	\$18,102.23
1/2 acre	0.97	\$28,161.90
2/3 acre	1.29	\$37,549.20
3/4 acre	1.46	\$42,242.85
1.0 acre	1.94	\$56,323.80
> 1.0 acre	1.94	\$56,323.80

- Category 2 Outdoor Use (No Waterwise Landscaping)

Category 2 = (irrigated area, acres) * (3.33 ac-ft/irr. ac) * \$29,000

- Category 2 Outdoor Use (Waterwise Landscaping)

Category 2 = (irrigated area, acres) * (2.28 ac-ft/irr. ac) * \$29,000

Storm Drainage

- Level of Service

- On City's website under "Storm Drainage Design Requirements"

https://www.grantsvilleut.gov/departments/community_economic_development/construction_standards.php



GRANTSVILLE CITY
STORM DRAINAGE DESIGN REQUIREMENTS

1. Storm Water Collection System Requirements:

a) Design Storms:

The storm water pipe collection system shall be designed to convey the 24-hour duration – Annual Exceedance Probability (AEP) 10-percent (10%) storm, 24-hour duration event if there is a continuous pathway to the Great Salt Lake. Collection systems for basin and street shall be sized for the AEP 1-percent (1%) storm, 24-hour duration event when discharging to an approved City release point.

Note: The AEP 10-percent (10%) storm is equivalent to a 10-year recurrence interval storm and an AEP 1-percent (1%) storm is equivalent to a 100-year recurrence interval storm. The 10-year and 100-year terms are not used by Grantsville City to reduce confusion and accurately convey such storms have a 10-percent or 1-percent chance of occurring in any given year, rather than implying these events happen once every 10-years or 100-years.

b) Storm Water Runoff into Street Encroachment Requirements:

- i. Flow from the AEP 10-percent (10%) storm shall not extend more than halfway into the travel lane adjacent to the curb and a minimum 12-foot wide travel lane shall be maintained for emergency vehicles. If there is a curb then total spread must be no more than 8-feet from the curb face.

c) Easement and Access Requirements:

- i. Easement widths and access for drainage channels, detention/retention basins, lots line swales, and public storm drainage lines shall be reviewed and approved by the City Engineer. Access easements shall be a minimum width of 15-feet.

d) Acceptable Pipe Materials:

- i. Refer to the current City's preconstruction notes for acceptable pipe materials.

e) Minimum Pipe Diameter and Slope:

- i. The minimum pipe diameter for any public storm water collection system pipe is 15-inches with a minimum slope of 0.50 percent. If pipe diameter and slope is below the minimum standards then approval from the City Engineer is required.

f) Manhole Spacing:

- i. Minimum manhole spacing is 400-feet, unless otherwise approved by the City Engineer.

g) Storm Drain Structure Drops:

- i. Where changes in pipe sizes occur in a manhole, the inlet pipe crown must match or be higher than the larger outlet pipe crown.

h) Cover:

- i. Minimum cover is 18-inches or 6 inches below the pavement section whichever is greater, unless approved by City Engineer. Pipe cover must comply with pipe manufacturer's recommendations.

i) Catch Basin Requirements:

- i. Catch basins will not be allowed on the radius of curves at intersections.
- ii. Flow through catch basins shall not be allowed unless designed as a combination box with manhole lid access. Locked gate access with keys for designate basin maintenance personnel and for City emergency access shall be provided.
- iii. A manufactured snout or similar oil/debris/water separator is required prior to a detention basin, retention basin, or any other discharges from a development into a public drainage. Sump depth in



catch basin with snout shall be sized as recommended by snout manufacturer.

- iv. Catch basins shall be installed at maximum intervals of 400-feet where channelized flow is occurring.

j) Detention/Retention Basin Requirements:

- i. Public, private, or HOA detention/retention basins shall have 6-foot tall (finish grade to top of sign) telespar, or City approved, post with the following signs:

- a. "Stormwater Basin" 12-inch x 18-inch Sign
- b. "No Trespassing" 12-inch x 18-inch Sign
- c. Each sign shall be RA Type I Engineering Grade Prismatic Reflective Sheeting on 0.080 aluminum.

- ii. Public detention/retention basins with amenities shall have 6-foot tall (finish grade to top of sign) telespar, or City approved, post with the following signs:

- a. "No Dumping" 12-inch x 18-inch Sign
- b. "Stormwater Basin" Designed to collect runoff from the local storm sewer system following either a rainfall or snowmelt event. Basins temporarily hold this stormwater, provides treatment to remove pollutants, and then slowly release the water back to our waterways. No swimming, use at your own risk." 18-inch x 24-inch Sign
- c. Each sign shall be RA Type I Engineering Grade Prismatic Reflective Sheeting on 0.080 aluminum.

- iii. Storm water drainage areas need to include front yards and rear yards in the developments calculations if they do not include individual lots detention/retention basins.

- iv. Retention and detention basins shall completely infiltrate and drain within 72-hours from the beginning of a storm event for vector control. Infiltration tests shall be performed using the double ring infiltrometer test in accordance with ASTM D 3385 for all retention and detention basins. The test shall be completed at the elevation of the bottom of the basin where infiltration will occur. A factor of safety of two (2) shall be used for design and a minimum of two (2) tests shall be completed with a minimum of one (1) test per 10,000 square feet of infiltration area. These tests shall be submitted with drainage calculations to the City for review. If the retention or detention basin is constructed in gravel soils then a percolation test may be used to determine the infiltration rate. The infiltration rate shall be calculated as follows:

$$\text{Infiltration Rate} = (\text{Percolation Rate}) / (\text{Reduction Factor})$$

Where the Reduction Factor is given by**:

$$R_f = \frac{2d_1 - \Delta d}{DIA} + 1$$

With:

- d_1 = Initial Water Depth (in.)
- Δd = Average/Final Water Level Drop (in.)
- DIA = Diameter of the Percolation Hole (in.)

*** The area Reduction Factor accounts for the exfiltration occurring through the sides of percolation hole. It assumes that the percolation rate is affected by the depth of water in the hole and that the percolating surface of the hole is in uniform soil. If there are significant problems with either of these assumptions then other adjustments may be necessary.*



- v. Storm water dry wells, injections wells, or any underground storm water discharge structure is acceptable in the City, but shall comply with the Utah Department of Environmental Quality (UDEQ) Underground Injection Control (UIC) program requirements. Proof of an application pertaining to the development has been submitted under the UIC program shall be provided to the City for their records. Special consideration shall be given to water quality, groundwater depth, and other factors. Individual or single-family homes may be exempt from these requirements. Please contact the Utah Department of Environmental Quality - Water Quality for clarification. Developments may use percolation tests for underground systems which infiltrate in the horizontal and vertical planes.

- vi. 1-foot freeboard minimum above the AEP 1-percent (1%) storm, 24-hour duration event when discharging water level through spillway is required. Spillway shall be reinforced with concrete per City Detail.

- vii. Detention/retention basin minimum of top berm width shall be 3-feet.

- viii. Maximum water depths shall be 30-inches with a maximum slope of 5:1 for small detention/retention basins serving single lots or less than 5-lots unless approved by the City Engineer. Large basins serving 5-lots or more shall have a maximum slope of 3:1 and, if deeper than 3-feet, shall be provided with ingress and egress at least 12-feet wide at less than 15% grade with a 15% grade all weather surface ramp into the basin.

- ix. Vegetate basins with turf, if irrigated, or native seeded grass for maintenance purposes. If turf is installed, turf soil shall be free draining, not include clay soils, and not impact stormwater infiltration.

- x. Rocks or gravel surfacing of detention/retention basins are not allowed without City approval.

- xi. Detention/retention basins with amenities shall have accessible path to amenity which is a concrete sidewalk meeting ADA standard. Interior slope of detention/retention basin at ramp shall be between 8 Horizontal:1 Vertical to 12 Horizontal:1 Vertical slope.

- xii. Detention/Retention basins with amenities shall have a sediment forebay and be able to pass the AEO 50-percent (50%) storm, 24-hour duration event through the basin without stormwater impacting amenities.

k) Manning's n Values:

- i. n value for linings shall be determined per an approved Engineers Manual based on size and placement of materials. Calculations shall include the reference used for the n value for review by the City Engineer.

Manning's Roughness n for Open Channels			
Channel Type	Manning n		
	Minimum	Normal	Maximum
1. Lined or Constructed Channels			
a. Cement:			
1. Neat, surface	0.01	0.011	0.013
2. Mortar	0.011	0.013	0.015
b. Concrete:			
1. Trowel finish	0.011	0.013	0.015
2. Float finish	0.013	0.015	0.016

Storm Drainage

- Level of Service (Continued)



Channel Type	Manning n		
	Minimum	Normal	Maximum
3. Finished, with gravel on bottom	0.015	0.017	0.02
4. Unfinished	0.014	0.017	0.02
5. Gunite, good section	0.016	0.019	0.023
6. Gunite, wavy section	0.018	0.022	0.025
7. On good excavated rock	0.017	0.02	-
8. On irregular excavated rock	0.022	0.027	-
c. Concrete Bottom Float Finish with sides of:			
1. Dressed stone in mortar	0.015	0.017	0.02
2. Random stone in mortar	0.017	0.02	0.024
3. Cement rubble masonry, plastered	0.016	0.02	0.024
4. Cement rubble masonry	0.02	0.025	0.03
5. Dry rubble or riprap	0.02	0.03	0.035
d. Gravel Bottom with sides of:			
1. Formed concrete	0.017	0.02	0.025
2. Random stone mortar	0.02	0.023	0.026
3. Dry rubble or riprap	0.023	0.033	0.036
e. Brick:			
1. Glazed	0.011	0.013	0.015
2. In cement mortar	0.012	0.015	0.018
f. Masonry:			
1. Cemented rubble	0.017	0.025	0.03
2. Dry rubble	0.023	0.032	0.035
g. Dressed Ashlar / Stone Paving	0.013	0.015	0.017
h. Asphalt:			
1. Smooth	0.013	0.013	0.017
2. Rough	0.016	0.016	0.017
i. Vegetal Lining	0.03	-	0.5
j. Wood:			
1. Planed, untreated	0.01	0.012	0.014
2. Planed, creosoted	0.011	0.012	0.015
3. Unplanned	0.011	0.013	0.015
4. Plank with battens	0.012	0.015	0.018
5. Lined with roofing paper	0.01	0.014	0.017



Channel Type	Manning n		
	Minimum	Normal	Maximum
2. Excavated or Dredged Channels			
a. Earth, Straight, and Uniform:			
1. Clean, recently completed	0.016	0.018	0.02
2. Clean, after weathering	0.018	0.022	0.025
3. Gravel, uniform section, clean	0.022	0.025	0.03
4. With short grass, few weeds	0.022	0.027	0.033
b. Earth Winding and Sluggish:			
1. No vegetation	0.023	0.025	0.03
2. Grass, some weeds	0.025	0.03	0.033
3. Dense weeds or aquatic plants in deep channels	0.03	0.035	0.04
4. Earth bottom and rubble sides	0.028	0.03	0.035
5. Stony bottom and weedy banks	0.025	0.035	0.04
6. Cobble bottom and clean sides	0.03	0.04	0.05
c. Dragline-Excavated or Dredged:			
1. No vegetation	0.025	0.028	0.033
2. Light brush on banks	0.035	0.05	0.06
d. Rock Cuts:			
1. Smooth and Uniform	0.025	0.035	0.04
2. Jagged and irregular	0.035	0.04	0.05
e. Channels not Maintained, Weeds and Brush Uncut:			
1. Dense weeds, high as flow depth	0.05	0.08	0.12
2. Clean bottom, brush on sides	0.04	0.05	0.08
3. Same as above, highest stage of flow	0.045	0.07	0.11
4. Dense brush, high stage	0.08	0.1	0.14
3. Main Channels			
a. Clean, straight, full stage, no rifts or deep pools	0.025	0.03	0.033
b. Same as above, but more stones and weeds	0.03	0.035	0.04
c. Clean, winding, some pools and shoals	0.033	0.04	0.045
d. Same as above, but some weeds and stones	0.035	0.045	0.05
e. Same as above, lower stages, more ineffective	0.04	0.048	0.055
f. Same as (d) with more stones	0.045	0.05	0.06
g. Sluggish reaches, weedy, deep pools	0.05	0.07	0.08
h. Very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.1	0.15



Channel Type	Manning n		
	Minimum	Normal	Maximum
4. Mountain Streams, No Vegetation in Channel, Banks usually Steep, Trees and Brush along Banks Submerged at High Stages			
a. Bottom: gravels, cobbles, and few boulders	0.03	0.04	0.05
b. Bottom: cobbles with large boulders	0.04	0.05	0.07
Source:			
(1) ASCE, (1982), <i>Gravity Sanitary Sewer Design and Construction</i> , ASCE Manual of Practice No. 60, New York, NY.			
(2) Chow, V.T., (1959), <i>Open Channel Hydraulics</i> , McGraw-Hill, New York, NY.			

d) Riprap Sizing:

- i. Channel Riprap sizing calculation shall utilize Federal Highway Administration (FHWA) Hydraulic Engineering Circular (HEC) No. 14, Current Edition, Chapter 10 or equivalent standard.

m) Erosion Control:

- i. The developer shall provide a copy of their Fugitive Dust Mitigation Plan, Erosion Control Plans, SWPPP, Notice of Intent (NOI), and Notice of Termination (NOT) with the State if their construction project is greater than 1 acre. The SWPPP sign shall be posted on site and visible to adjacent public right-of-way.

2. Hydrology Requirements:

a) Rainfall Data:

- i. NOAA Atlas 14 shall be used for rainfall in the City of Grantsville (see https://hdsc.nws.noaa.gov/hdsc/pfds_map_cont.html)

b) Design Storms:

- i. To reduce post-development storm water runoff, developments must retain and treat the 80th percentile rainfall event. The 80th percentile rainfall event for Grantsville City is 0.50 inches. The Reese method, as shown below, shall be used to calculate the volumetric runoff coefficient used for determining the 80th percentile volume. For developments larger than 10 acres use the SCS Method to determine the 80th percentile volume.
 - a. Sedimentation basin shall be provided for first flush/80th percentile rainfall events in retention/detention basins and shall be designed to be easily accessed and maintained.

i. Method 1- Reese Method:

1. Comparing the imperviousness of 44 nationwide sites to their respective calculated volumetric runoff coefficient, a simple linear regression equation was created to estimate the volumetric runoff coefficient for small urban catchments. Land uses for these sites were classified as residential, mixed, commercial, industrial, and urban open and nonurban (Schueler, Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs, 1987). Outliers were removed from this dataset by Reese to derive the equation below. Removing outliers from the dataset reduces the impact of erroneous measurements (Reese, 2006). $RV = 0.91I - 0.0204$

Source: *A Guide to Low Impact Development within Utah*, Revised August 2020 by Michael Baker International.

- ii. Retain/Detain the AEP 1-percent (1%) storm, 24-hour duration event for project site.
- iii. Developments may detain the AEP 10-percent (10%) storm event, 24-hour duration if there is a

Storm Drainage

- Level of Service (Continued)



continuous pathway to the Great Salt Lake.

- iv. For West Bank drainage areas, developed drainage may discharge at the following rates if there is a continuous path to the Great Salt Lake:

24-hour Duration Storm Event	Watershed's Peak Unit Discharge (cfs/acre)	All Other Watersheds Peak Unit Discharge (cfs/acre)
10 years	0.003	0.05
100 years	0.01	0.15

Source: Table 17 in Section 5 from the Storm Water Management Study for Baker and Pope Watersheds dated April 2015 by AQUA Engineering.

- v. Refer to Table 2 and Figure 1 for a map of West Bank Watersheds.

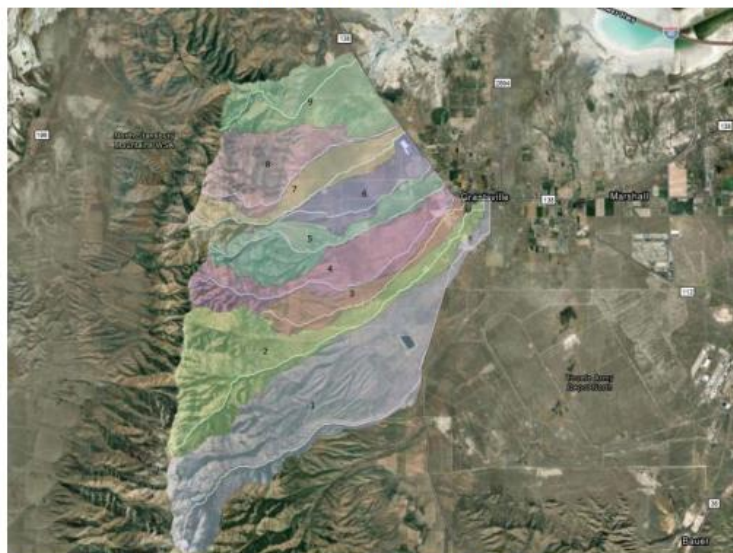
Table 2: West Bank Sub-basin Number and Name

Subbasin	Subbasin Name
1	South Willow and Coal Pit Canyon
2	North Willow Canyon
3	White Rocks
4	Baker Canyon
5	Pope Canyon
6	West Canyon 1
7	West Canyon 2
8	Dry Canyon
9	Unnamed

Source: Grantsville West Bank Development Stormwater Master Plan Report by Jones & DeMille Engineering



Figure 1: Map of West Bank Watersheds



Source: Grantsville West Bank Development Stormwater Master Plan Report by Jones & DeMille Engineering

- vi. The West Bank area consists of alluvial fans which are an accumulation of sediments fanning outwards from a concentrated source of sediments. Alluvial fans are typically formed where flow emerges from a confined channel and is free to spread and infiltrate. Due to these sediments, deposits in an alluvial fan can cause the defined channels to shift courses which is why it is important to construct sedimentation basins at the top of the alluvial fan and reinforce and define channels throughout the fan to discharge safely through existing and proposed development avoiding riverine flooding. Recently the West Bank Area has been identified as an alluvial fan Zone A based on a Base Level Engineering (BLE) analysis. This area is currently being studied by the State in more detail, but the results are currently not available. Channelization through the alluvial fan and sedimentation basins above the alluvial fan are improvements to allow storm water to flow through developments or mitigate alluvial fan hazards. Mitigation measures within the alluvial fan will need to be constructed to remove hazards either regionally or localized. Developers should coordinate with the State and FEMA MT-2 team (LOMR reviewers) along with the City and County to work through development in the alluvial fan.



3. **Drainage Calculations or Report Requirements:**

- a) If discharge will be above the allowed discharge per area rates shown on Table 1 then a pre and post development hydrologic analysis will be required showing flows will not cause a negative affect downstream. The Rational Method ($Q=CiA$) may be used in computations for the rate of runoff for urban and small watershed 100 acres or less.
 - i. Q = peak rate of runoff, cubic feet per second
 - ii. C = runoff coefficient
 - iii. i = average rainfall intensity, inches per hour
- b) The SCS method, SCS TR-55 "Urban Hydrology for Small Watershed", HEC-1/HEC-HMS, or other methods shall be used for larger watersheds.
- c) Table 2 shall be used for runoff coefficients unless approved by the City Engineer.

Table 2: Runoff Coefficients

Land Use Type	Runoff Coefficients "C"
Rural	0.25-0.35
Single Family Residential	0.45-0.60
Multi-Residential	0.60-0.70
Neighborhood Commercial	0.85
Community Commercial	0.85
Tourist Commercial	0.85
Office	0.85
Manufacturing	0.85-0.90
Distribution and Warehousing	0.85-0.90
Public Facility	0.50-0.85
Pavement and Concrete Surfaces	0.90-0.95
Park	0.25
Open Space (0-5% grade – vegetated)	0.20-0.30
Open Space (0-5% grade – no vegetation)	0.30-0.40
Open Space (5-15% grade – vegetated or unvegetated)	0.40-0.50
Open Space (Over 15% grade – sparsely vegetated, rock or clay soils)	0.40-0.60

- i. Weighted values of the runoff coefficient "C" may be required where land use is most accurately described as a mixture of the land uses listed above or where it is a mixture of pervious and impervious areas and not represented by a single entry in Table 2.
- d) Intensity-Duration-Frequency curves for NOAA Atlas 14 shall be used for determining the applicable intensity. (see https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ut)
- e) Definition for Time of Concentration
 - i. $t_c = 10$ or $\frac{L}{V} \times 60$ whichever is greater

t_c = initial time of concentration at inlet, minutes
 L = Flow line length from uppermost point of watershed to the discharge point, feet
 V = channel or overland velocity, feet per second

* Velocity shall be calculated using NRCS Urban Hydrology for Small Watersheds, current edition, or equivalent standards.

Storm Drainage

- Level of Service (Continued)



ii. Given the time of concentration at a design point, the time of concentration at the next design point is determined by adding travel time, expressed as:

iii. $t = \frac{L}{V} + \frac{L}{V \times 60}$

t = travel time, minutes
L = length of channel or conduit between design points, feet
V = channel or conduit, feet per second

4. **Submittal Requirements for Drainage Drawings and Report**

a) **Project Drawings:**

- Hydraulic grade line (HGL) profiles, (see sample sheet).
- Location and size of all existing and proposed structures.
- Proposed materials.
- Pertinent elevations and slopes.
- Pipe capacity, and the AEP 10-percent (10%) storm, and the AEP 1-percent (1%) storm, 24-hour flows, and velocities.

b) **Drainage Report or Calculations: (Shown on Drawings)** – The following standards apply to the Drainage Report or Calculations (public and private).

1. **Title Page:**

- Project name.
- Preparer's name, firm, date.
- Professional engineer's seal of preparer and signature.

2. **Introduction:**

- Site location:**
 - Street location, parcel number(s), and section reference.
 - Adjacent developments.
- Site Description:**
 - Topography, ground cover, etc.
 - Existing drainage facilities, major drainage facilities, flood hazard areas, irrigation ditches, other site conditions that must be considered.
- Proposed project description.
- Other previous studies relevant to site.

3. **Historic drainage system** (discuss the following):

- Major basins and offsite contributions:**
 - Relationship to major drainage facilities.
 - Major basin drainage characteristics (topography, runoff, cover, use, erosion, etc.).
- Sub-basin and site drainage** (i and ii may be tabulated on map):
 - Minor AEP 10-percent (10%) storm and major AEP 1-percent (1%) storm, 24-hour storm flows for each sub-basin affecting the site.
 - Existing drainage patterns: channelized or overland flow, point of discharge, etc.
 - Effect of historic flows on adjacent properties.

4. **Proposed (developed) drainage system:** (discuss each of the following)

- Criteria:**
 - Size of major basins, tributary sub-basins, and other offsite contributions.
 - Hydrologic method to be used for analysis (Rational, SCS, etc.).



iii. Design storm intensities (minor AEP 10-percent (10%) storm, major the AEP 1-percent (1%) storm, 24-hour duration event), or as required by the City Engineer.

b. **Runoff And Other Contributions:**

- Historic storm flow rates and paths.
- Developed storm flow rates and paths for minor and major storms.
- Contributions from open joined system.
- Demonstrate flows are routed to a public system with adequate capacity when/ if available.

c. **Piping:**

- Demonstrate the capacity of the storm drain system, including all downstream improvements.
- Verify storm flows and capacity from inlets to ultimate outlets of the drainage system.

d. **Detention/Retention System Including:**

- Volume required to hold the AEP 1-percent (1%) storm, 24-hour storm with 1-foot freeboard minimum above the AEP 1-percent (1%) storm, 24-hour event flowing water level through spillway.
- Show the overflow location for volumes over the AEP 1-percent (1%) storm, 24-hour duration event when discharging to an approved City release point.
- Passage of storms exceeding the AEP 10-percent (10%) storm up to the AEP 1-percent (1%) storm, 24-hour duration event when discharging to an approved City release point.
- Engineer to provide detailed description of downstream constraints (or none) and design calculations on how to mitigate the problem.
- Need for detention/retention shall be clearly identified in the preliminary or schematic report and the necessary detention/retention area shall be identified on preliminary plans.

e. **Streets:** (This information may be shown on the plans.)

- Depth and velocity of flow for major and minor storms. Demonstrate a 12-foot clear lane exists for emergency vehicles at all times.
- Drainage system.

f. **Open Channel Flow:** (This information may be shown on the plans.)

- Type.
 - Depth and velocity.
 - Freeboard.
 - HEC-RAS analysis when required by the City Engineer.
- g. Storm drains and culverts (Show all data on plans.)

5. **Areas within flood hazard zone when applicable:**

- Impacts.
- Protection.
- Compliance with Federal Emergency Management Administration (FEMA) requirements, RMC 18.12 "Flood Hazard Areas", and critical flood zones. Show existing and proposed CLOMR and LOMR information, and show status of submittal and review process.
- Provide elevation certificate for occupied structures within current BLE floodway determination. Coordinate with Utah Flood Hazards and Floodplain management for 2-D HEC-RAS model for BFE.
- Comply with Grantsville City Code, Chapter 5-3, Flood Damage Prevention Regulations.

6. **Conclusions:**

- Benefits.
- Adverse effects with solutions for mitigation of impacts.



7. **Appendices:**

a) **Hydrologic and hydraulic computations:**

- List and explain basin assumptions and input factors used.
 - Tabularized and/or discussed as necessary.
 - Indicate any sensitivity analysis performed.
 - Include source tables and references for parameters, such as soil groups, SCS curve numbers, C values, n values, etc.

ii. **Historic Runoff:**

- Off-site.
- On-site.

iii. **Developed Runoff:**

- Off-site – Flows that have been concentrated into one area from the project shall not flow higher than the project flow in that area.
 - On-site.
- iv. Detention for up to the AEP 1-percent (1%) storm, 24-hour duration event when discharging to an approved City release point:

v. **Hydraulic Computations:**

- Hydraulic grade line (HGL) minor storm.
- Hydraulic grade line (HGL) major storm.
- Inlet/outlet calculations.

vi. **Rip-rap sizing:**

b) **Drainage Plan:**

i. **Site Drainage Plan:**

- Show the existing and proposed contours for the property.
- The site drainage plan may be at the same scale as the grading plan but must meet legibility requirements for scanned documents. Show all sub-drainage areas per catch basin or channel and tabulate existing and proposed drainage showing length, calculated velocity and time of concentration on various runs of grass, gutters, etc., cumulative time of concentration, average rainfall intensity, area, runoff coefficient (weighted if necessary), and peak flows for the AEP 10-percent (10%) storm and the AEP 1-percent (1%) storm, 24-hour duration event when discharging to an approved City release point.
- All inlets and manholes shall be labeled to correspond to tabular numbering system used in drainage report. Pipe sizes, grades, velocities, peak flows and hydraulic grade lines shall be shown for all parts of the system in a tabular form on the plans.
- Both location plan (overall drainage) and sub-drainage plan shall be signed and sealed by a Utah Registered Civil Engineer and shall be included in the construction plans for the subdivision/development.
- On grading plans show peak flows for the AEP 10-percent (10%) storm and the AEP 10-percent (10%) storm at inlets and other sub-basin points of concentration, at discharge points and in channels. Show peak flows entering and leaving the site; trace path leaving site to nearest major drainage facility without adverse impact to downstream owners.
- On plan and profile sheets, show peak flows for the AEP 10-percent (10%) storm and the AEP 1-percent (1%) storm, 24-hour duration event when discharging to an approved City release point at all inlets and in pipes as per above, and in pipes show slope, velocity, and capacity, and hydraulic grade line if surcharged.
- If the lot cannot drain the yard to the street, then a basin shall be located in the rear yard to

Storm Drainage

- Level of Service (Continued)

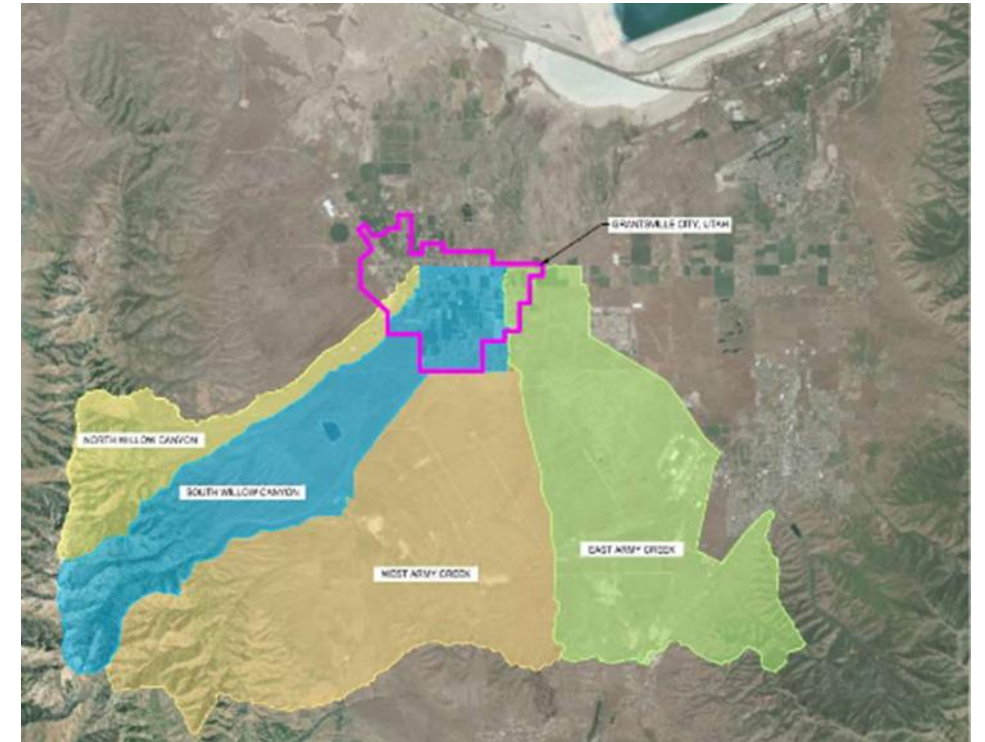
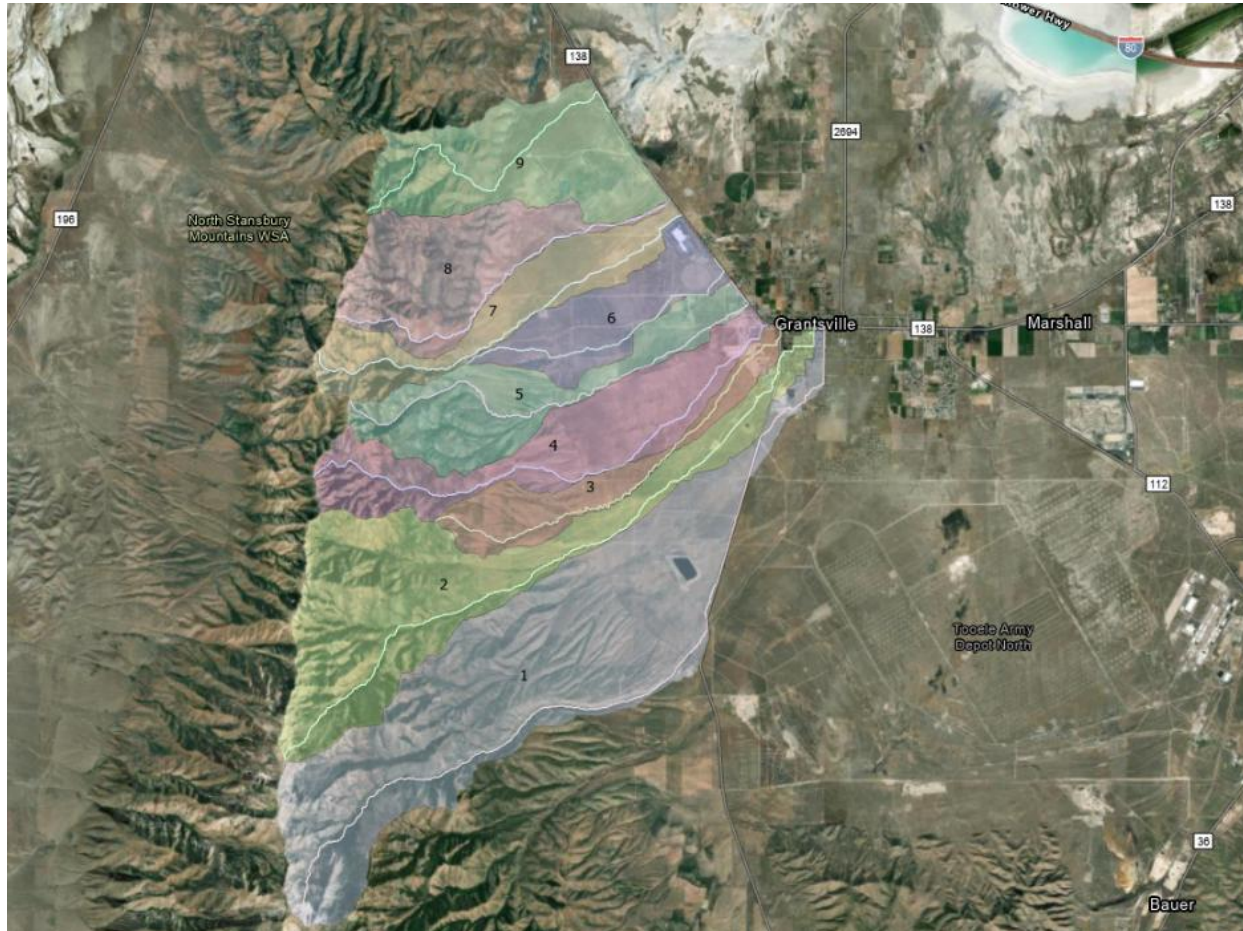


prevent storm runoff from draining to the neighbors from the back of the property.

- ii. Benchmarks – To be shown on plans with benchmarks to match the existing state approved benchmarks.
- iii. Existing and proposed property lines.
- iv. Existing and proposed drainage easements.
- v. Street names, grades, widths and rights-of-way or easements.
- vi. Routing and peak flow rate or volume at the upstream and downstream ends of the site and at various critical points on-site for both minor and major runoff. Depth and hydrograph for both storms for all sub basins.
- vii. Street cross sections showing the AEP 1-percent (1%) storm, 24-hour duration event when discharging to an approved City release point flood level, no more than one-half way into the outside travel lane for emergency vehicle clear lane.
- viii. Existing and proposed major drainage facilities.
- ix. **Open channel flow in major channels shall be provided with the following information on plans:**
 - 1) Channel and hydraulic grade line (HGL) profiles.
 - 2) Cross sections and required rights-of-way or easements at the AEP 1-percent (1%) storm, 24-hour duration event intervals or changes from the typical section.
 - 3) Location and size of all existing and proposed structures.
 - 4) Channel section and lining details.
 - 5) Freeboard for the AEP 1-percent (1%) storm, 24-hour duration event when discharging to an approved City release point.
 - 6) Channel capacity and storm flows, the AEP 10-percent (10%) storm and the AEP 1-percent (1%) storm, 24-hour duration event when discharging to an approved City release point flows and velocities.

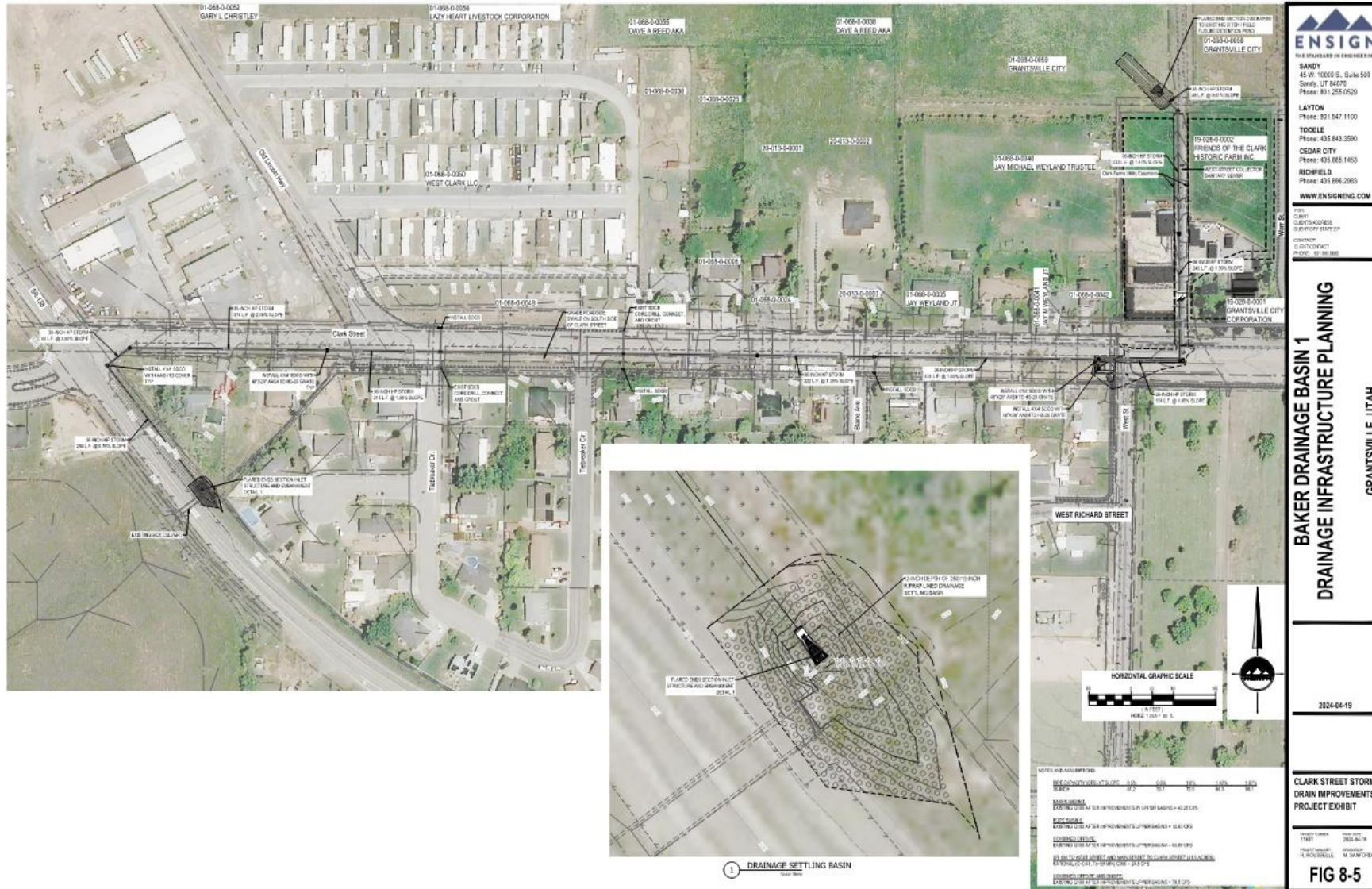
Storm Drainage

- Existing Storm Drainage Infrastructure



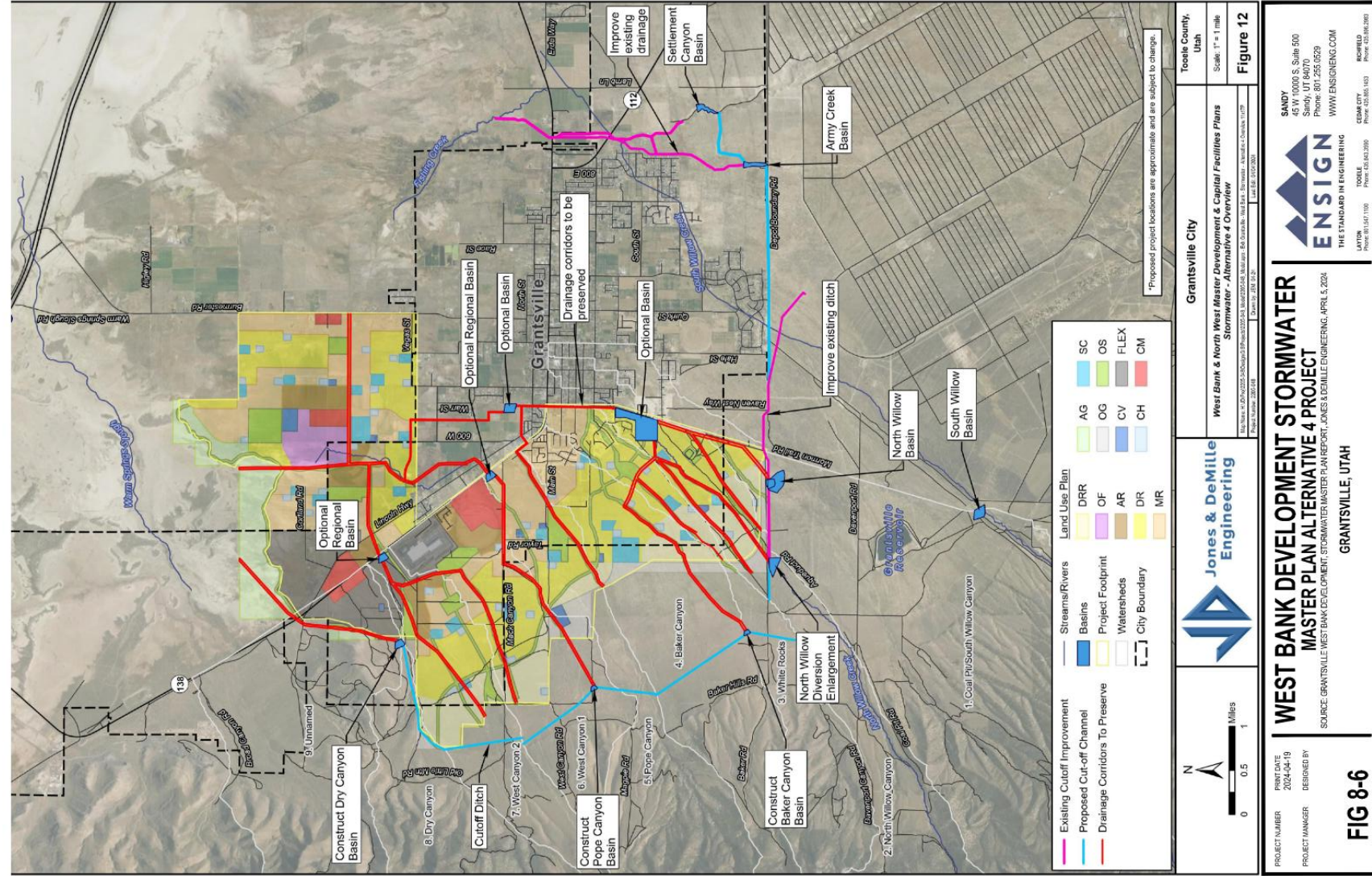
Storm Drainage

- Capital Improvement Projects (Clark Street Storm Drain Improvements Project)



Storm Drainage

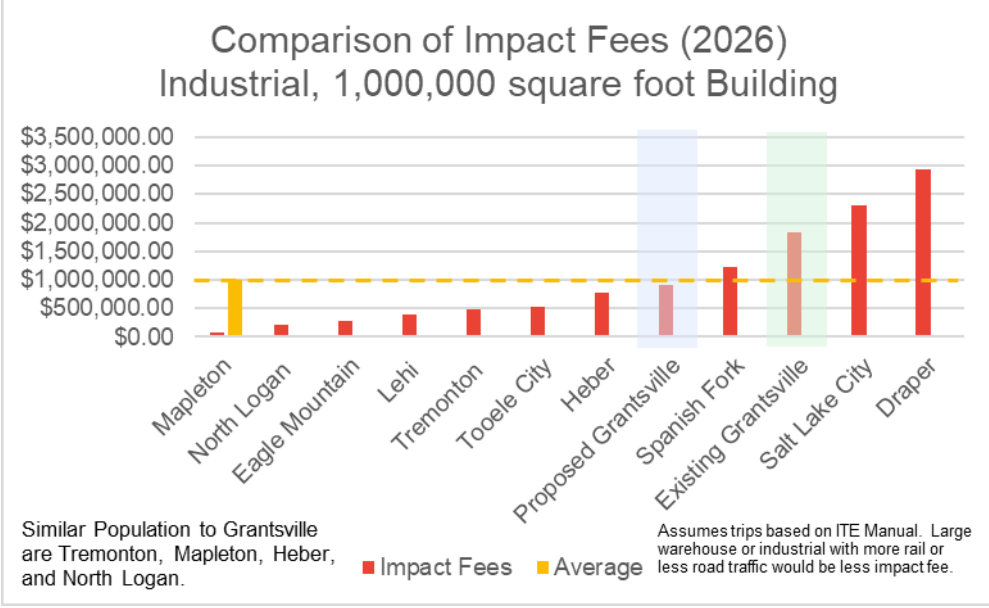
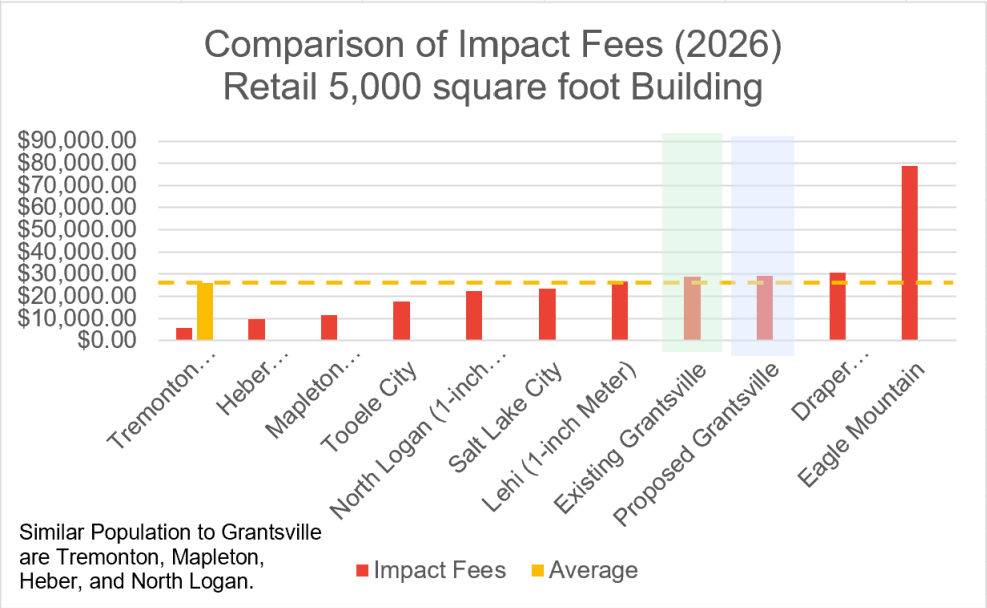
- Capital Improvement Projects (Alternative 4 – West Bank Study)



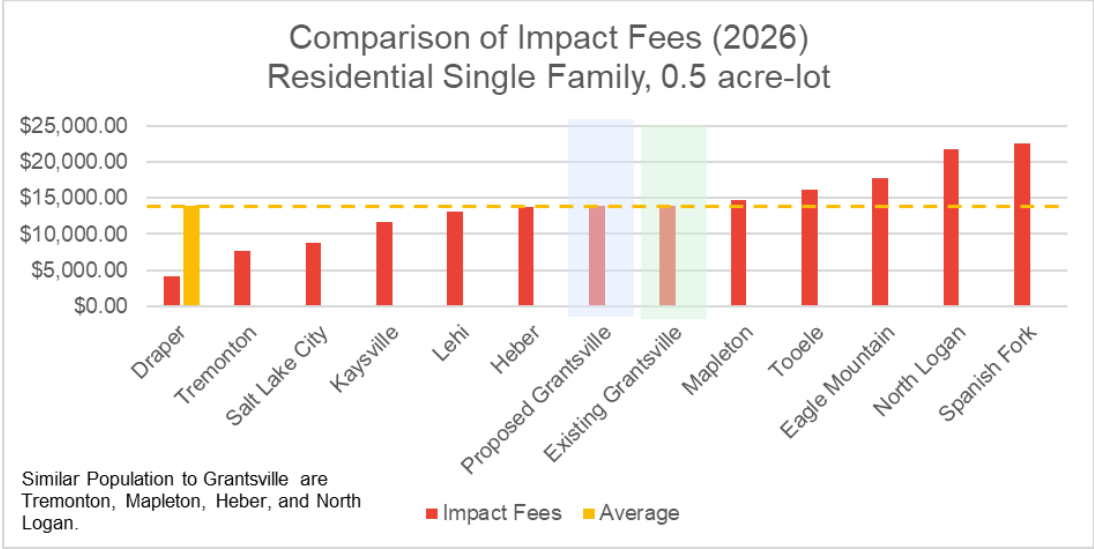
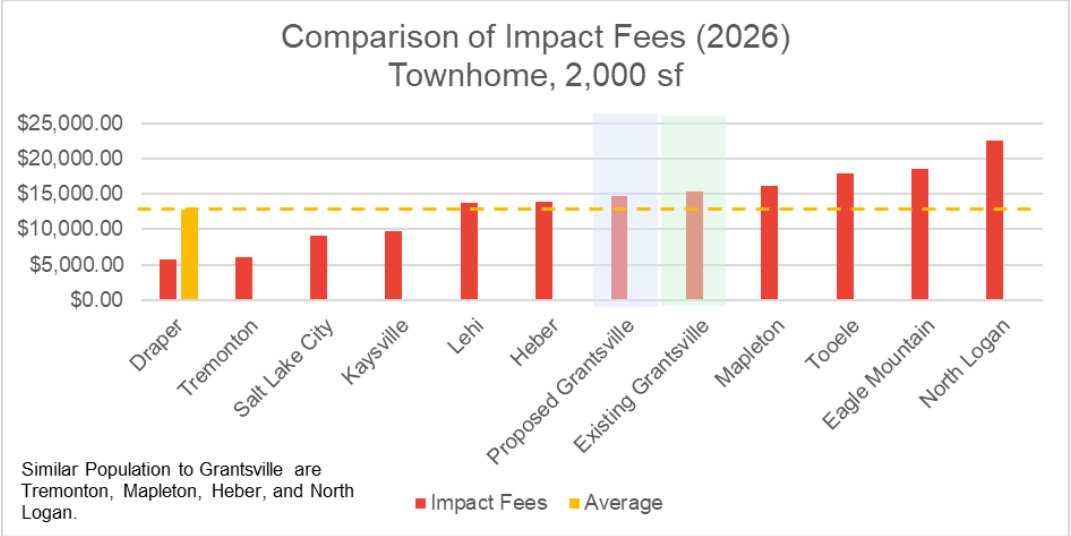
Storm Drainage

- Impact Fees
 - Not Applicable because Capital Improvement Projects address existing deficiencies.
 - Developers typically also construct improvements necessary to meet the level of service.
 - Does the City want to charge impact fees and storm water user fees in the future for improvements associated with flood plain mapping once updated?

Impact Fee Comparisons



Impact Fee Comparisons



Impact Fee Comparisons

