Long-Range Committee

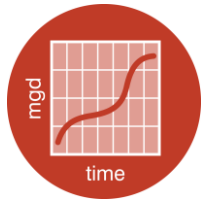
WATER AND WASTEWATER MASTER PLANS

carollo

ALPINE SPRINGS COUNTY WATER DISTRICT // FEBRUARY 14, 2023

// Agenda

Overview of existing water and wastewater systems



Demand and flow projections

Condition assessments

Hydraulic evaluations

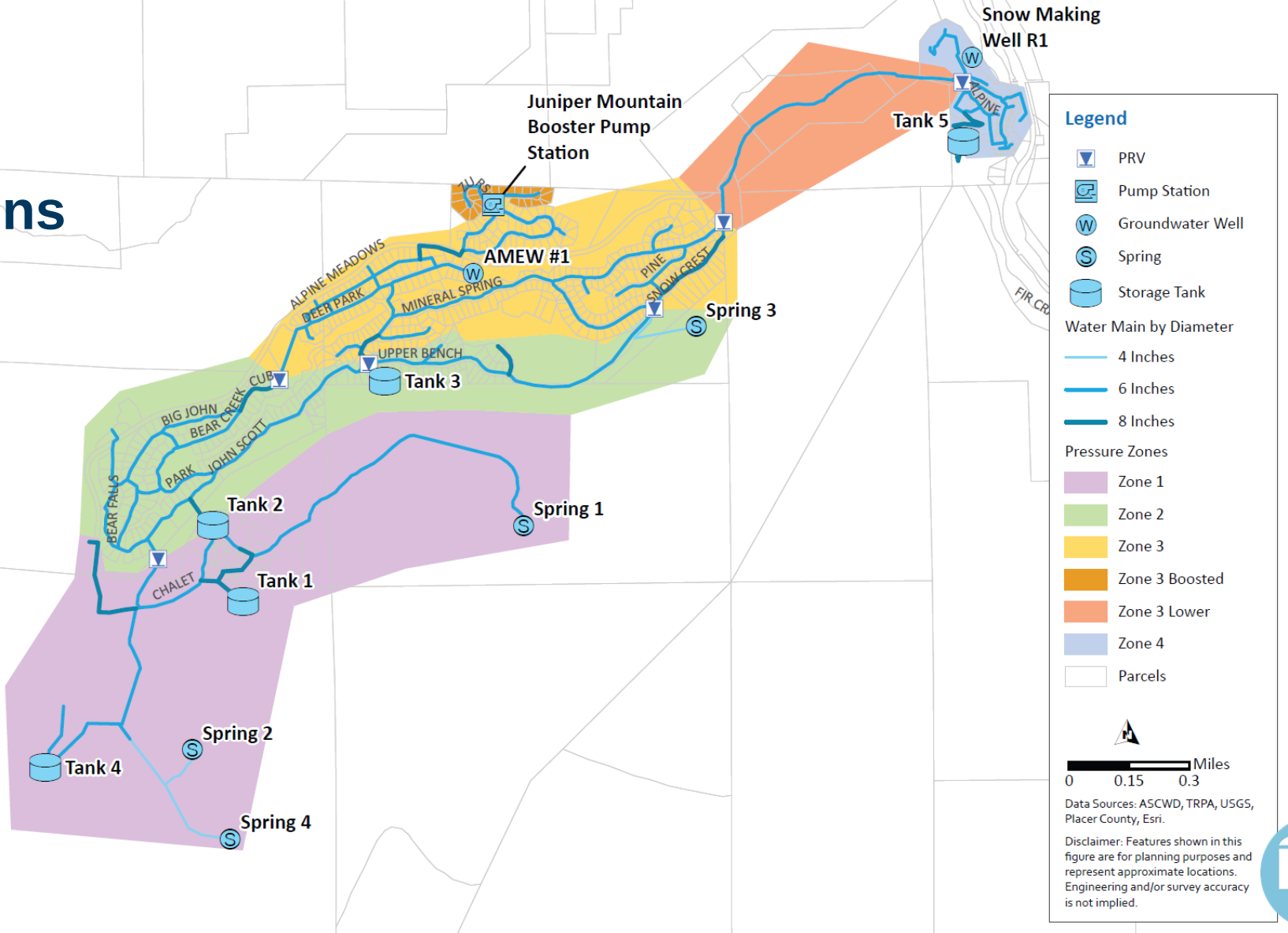
Proposed improvements

Capital improvement plan

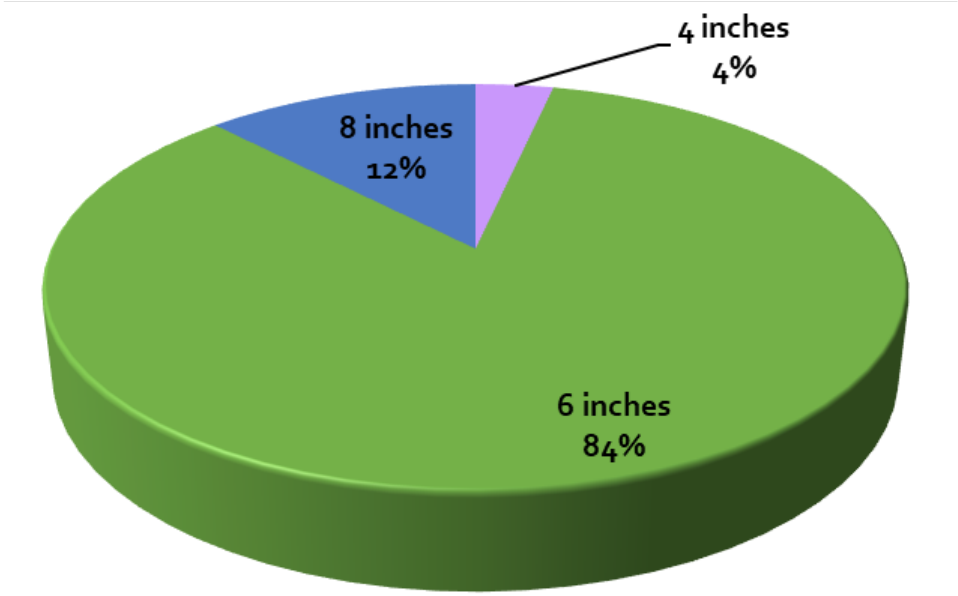
Existing Water System Overview

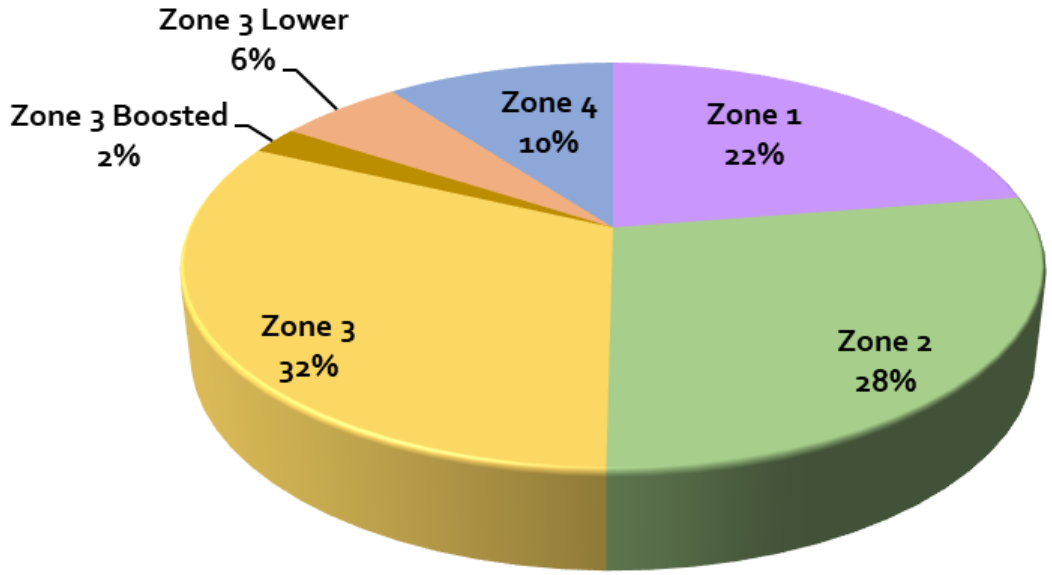
// The water system consists of various above- and below-grade assets

- **6 pressure regulating stations**
- **1 booster pump station**
- **4 springs**
- **2 groundwater wells**
- **5 storage tanks**
- **14.5 miles of pipelines**



// The distribution system pipelines are mainly 6 inches in diameter

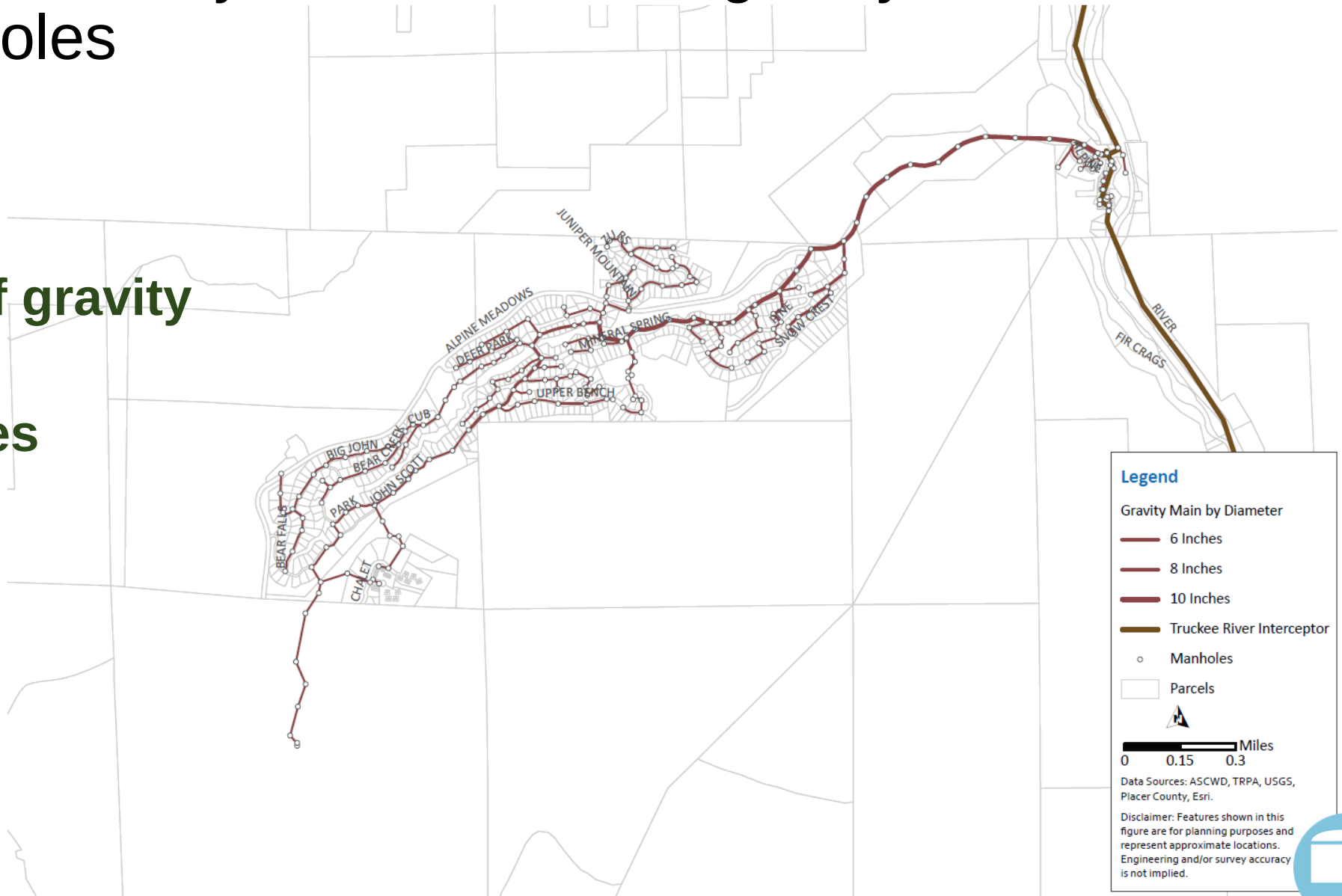




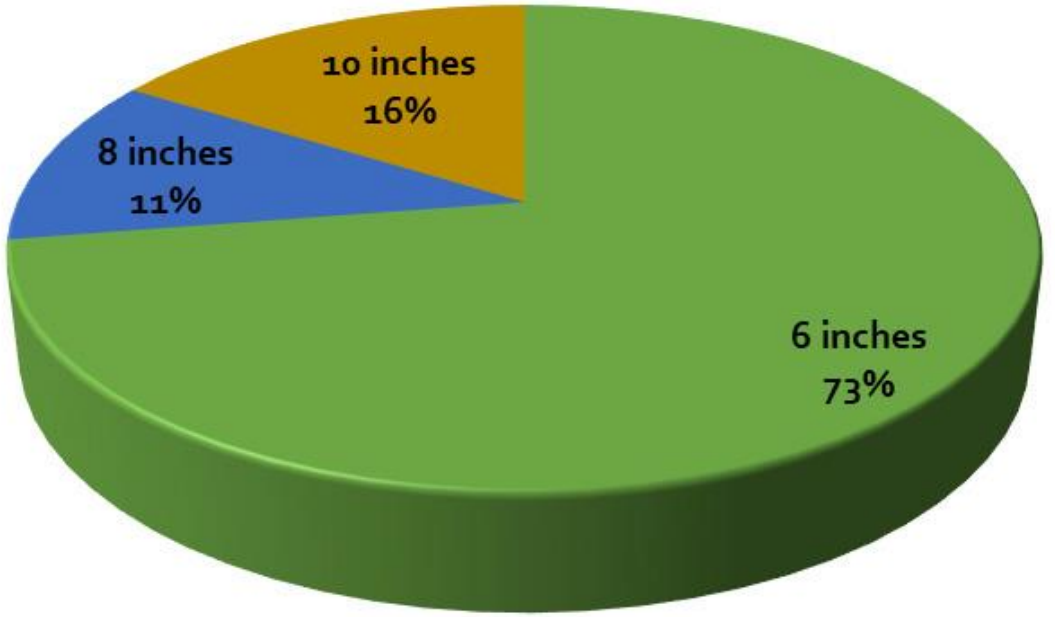
Existing Wastewater System Overview

// The wastewater system consists of gravity sewer mains and manholes

- **10.3 miles of gravity mains**
- **231 manholes**



// The gravity sewer mains are mainly 6 inches in diameter



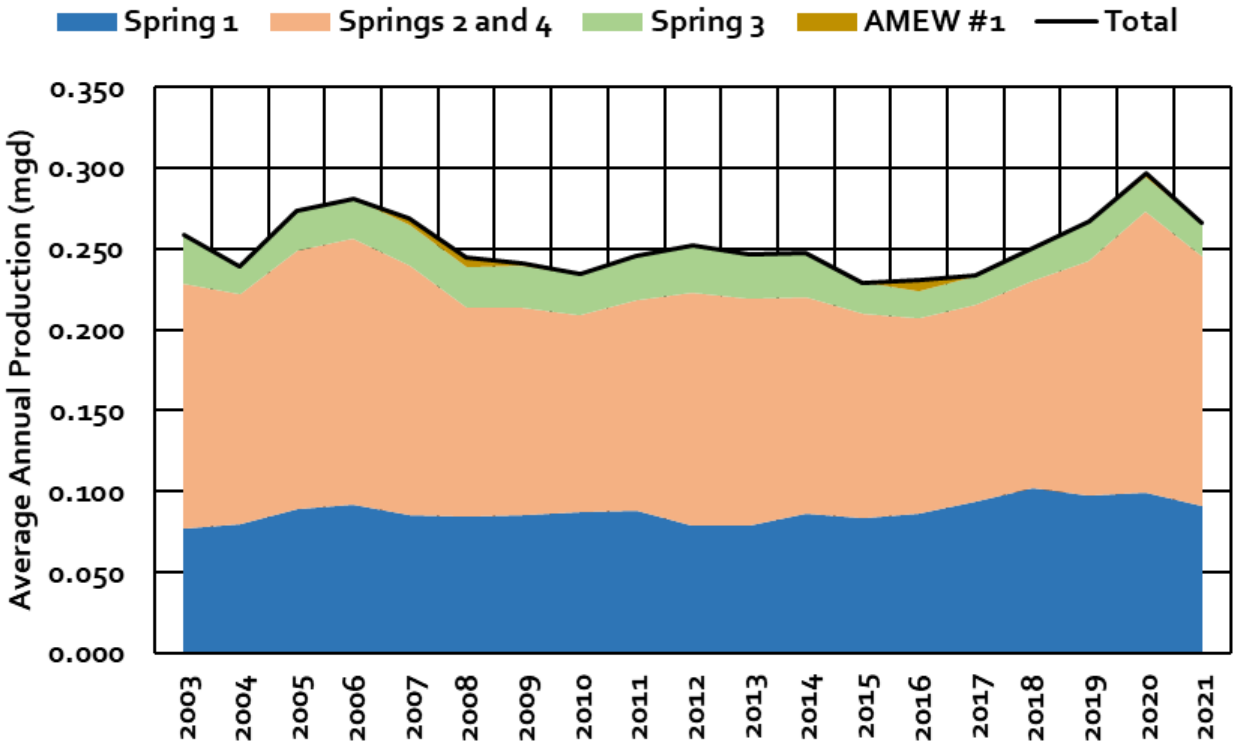
Existing and Projected Water Demands and Wastewater Flows

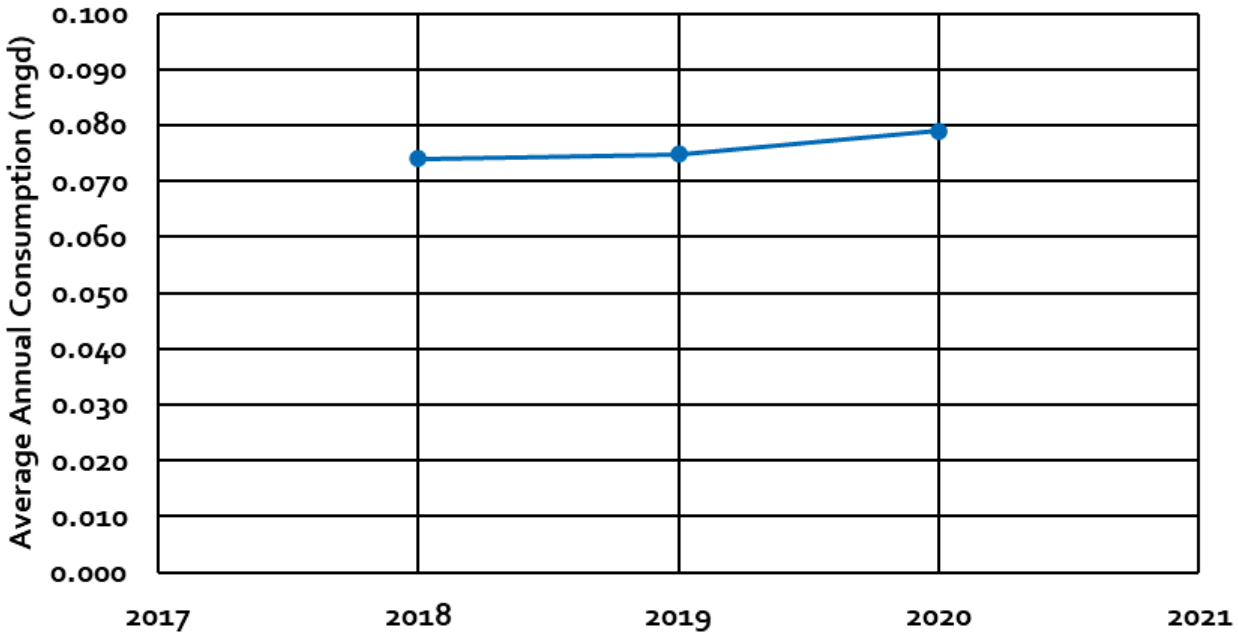
// Existing and projected demand and flows provide the basis for hydraulic capacity and performance evaluations

Parameter	Meaning
Average day demand (ADD)	Average daily water demand
Maximum day demand (MDD)	Maximum daily water demand
Average dry weather flow (ADWF)	Average daily wastewater flow during dry season
Peak wet weather flow (PWWF)	Maximum wastewater flow during major storm event

Existing Demands and Flows

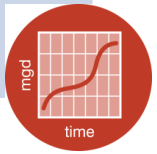
// Existing demands were calculated using historical production and consumption data and assumed water loss



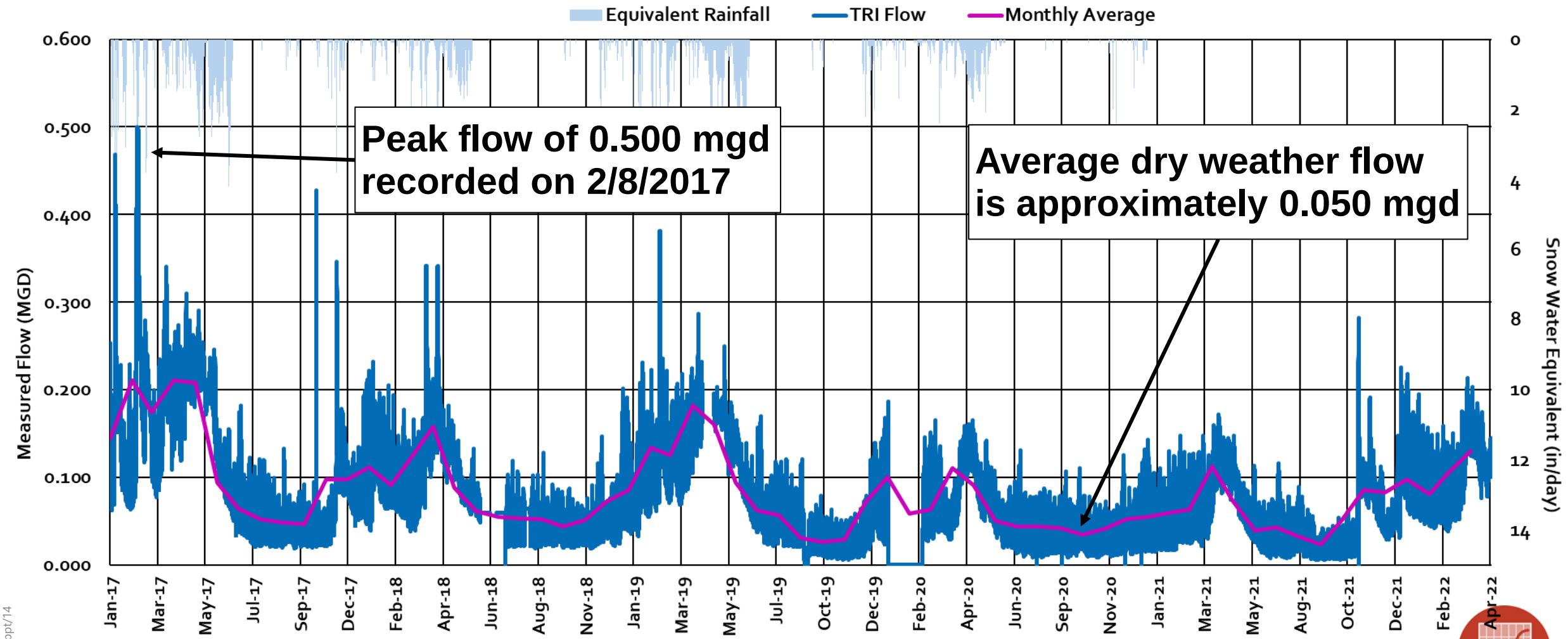


// The ADD and MDD were estimated to equal **0.086 mgd and 0.297 mgd**

Demand Category	Value	Source
Consumption	0.073 mgd	2018 to 2020 water meter data
Overflow to snowmaking ponds	0.162 mgd	Estimated using meter data from spring 2022
Unaccounted-for-water (UFW)	0.013 mgd	Assumed 15% of average day demand
Average flow to ASCWD pond	0.030 mgd	Staff estimate
Total production	0.253 mgd	2003 to 2020 spring and well meter data
Average day demand (ADD)	**0.086 mgd**	Consumption + UFW
Maximum day demand (MDD)	**0.297 mgd**	Estimated using MDD:ADD peaking factor of 3.45



// Existing flows were determined using historical TRI data



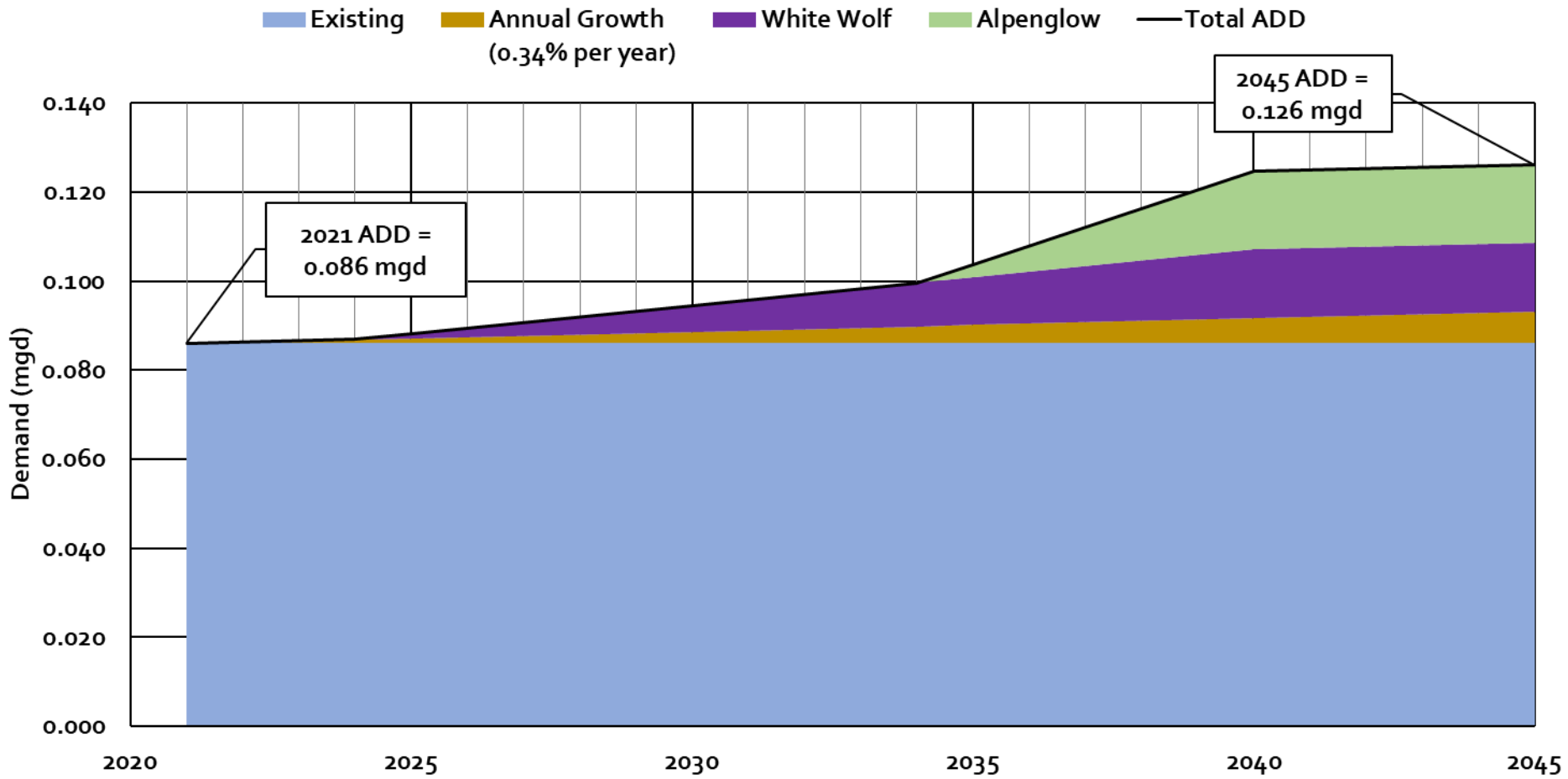
Demand and Flow Projections

// Demand and flow projections through 2045 assumed an annual growth rate of 0.34% along with planned developments

Growth Category	Projected Development Schedule	Average Annual Growth Rate	Total Added SFRs by 2045
Annual Growth	N/A	0.34% (i.e., 2 SFRs)	46
Alpenglow Development	2025 - 2040	3.25 SFRs	52
White Wolf Development	2035 - 2040	9.67 SFRs	58

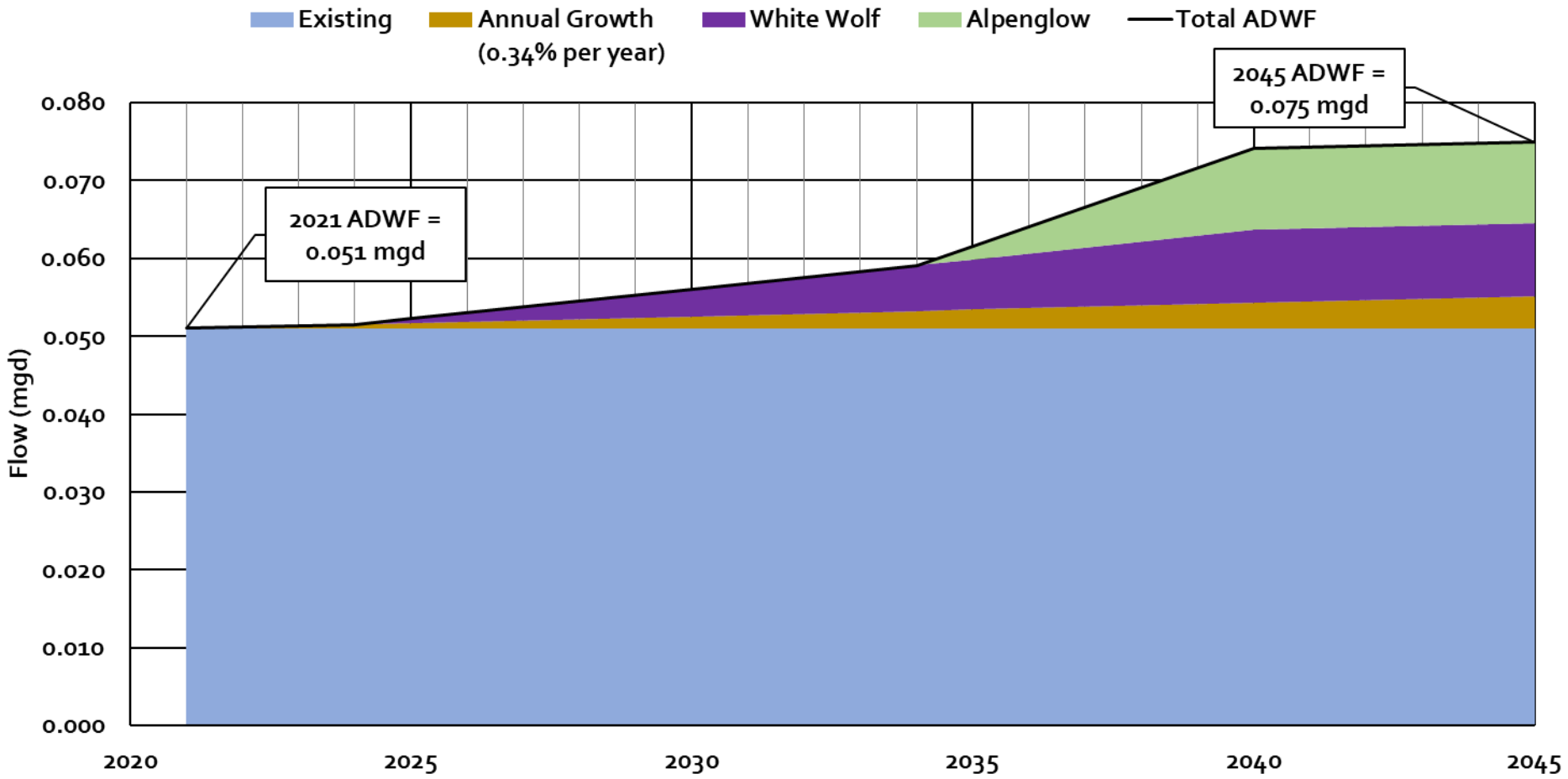
- Source: T-TSA 2022 Master Sewer Plan
- SFR = single family residence

// Average day water demands are projected to increase to 0.126 mgd by 2045



* Assumes added ADD of 300 gpd per SFR

// Average dry weather wastewater flows are projected to increase to 0.063 mgd by 2045



* Assumes return-to-sewer ratio of 60% (i.e., ADWF = 60% of ADD)

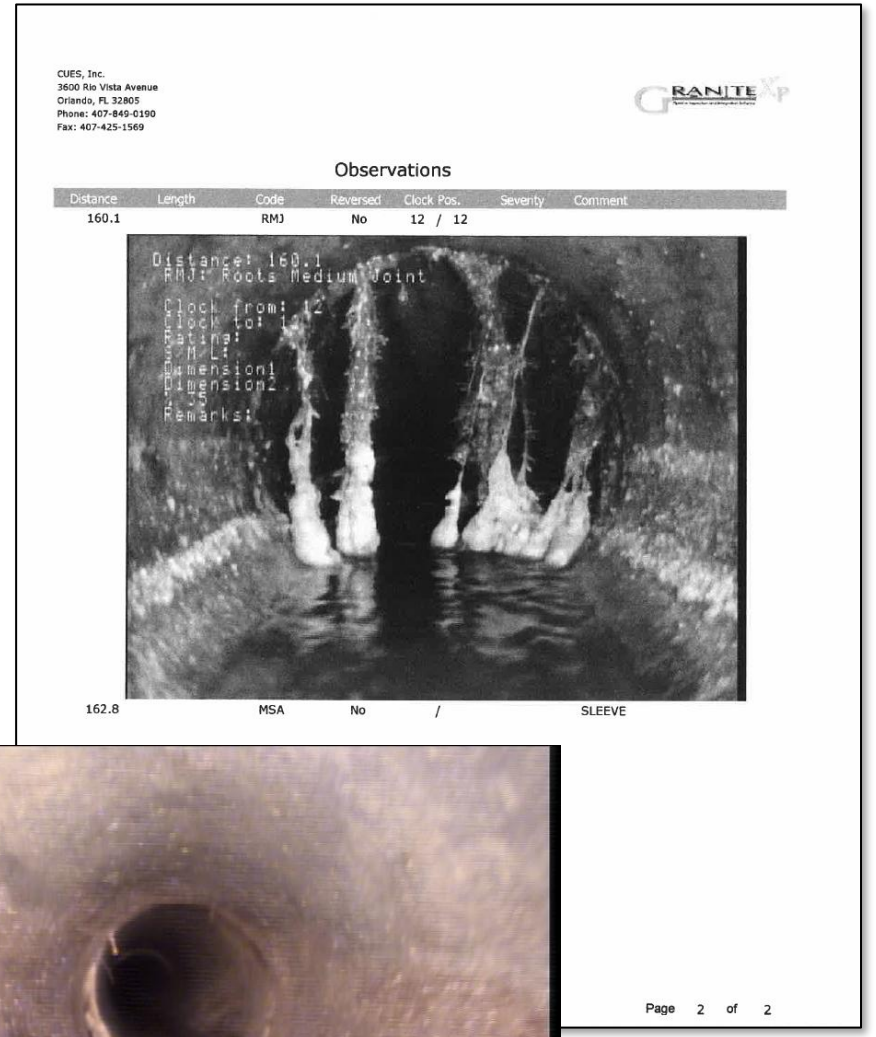
// The water and wastewater systems were evaluated using the 2021 and 2045 MDD and HOF

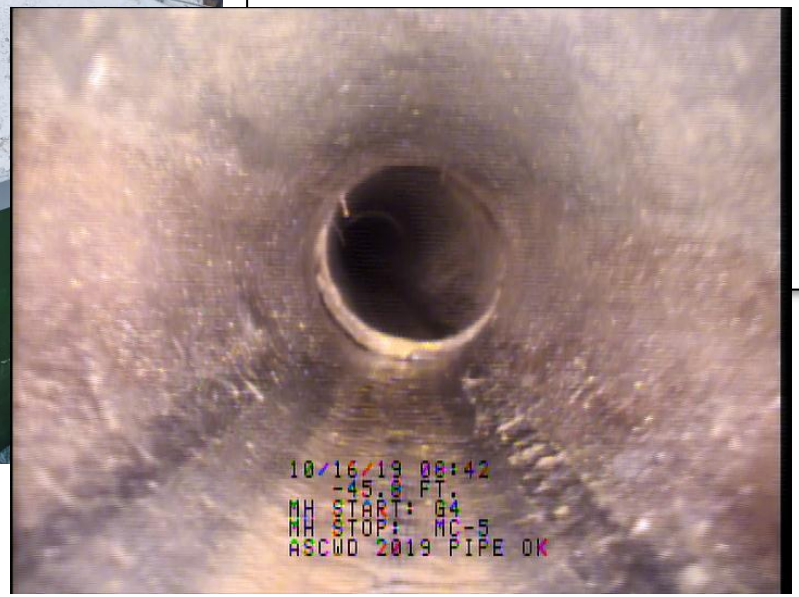
Year	ADD (mgd)	MDD (mgd)	ADWF (mgd)	HOF (mgd)
2021	0.086	0.297	0.051	0.123
2045	0.126	0.435	0.075	0.180

Condition Assessments

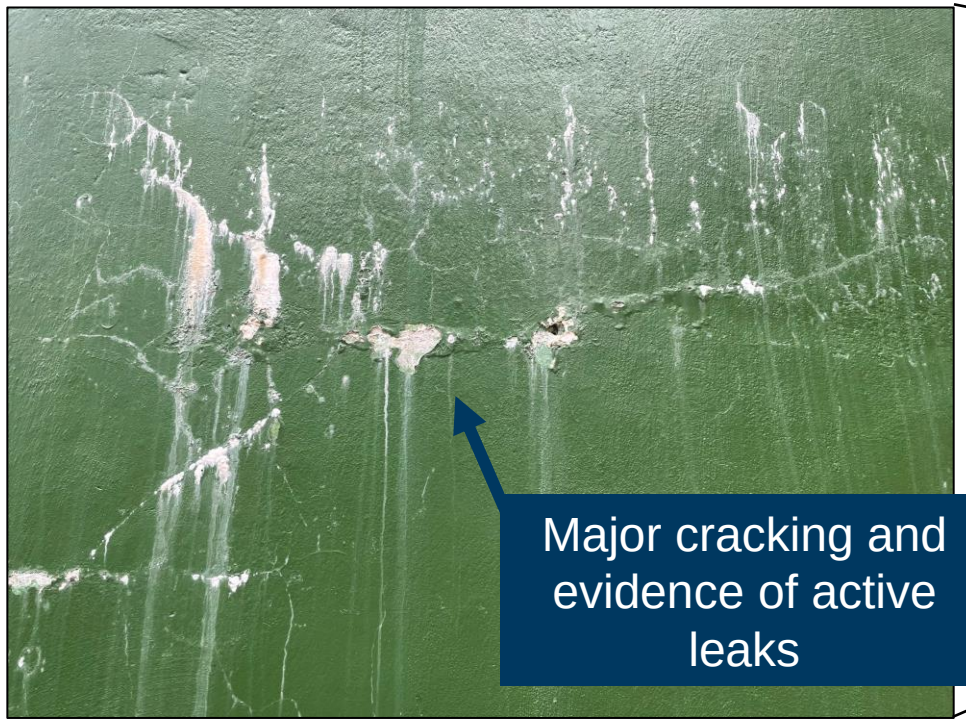
// Desktop assessments were conducted to evaluate infrastructure condition

- Field inspection in July 2021
- Review of available asset data
  - CCTV data
  - GIS data
  - Operational data

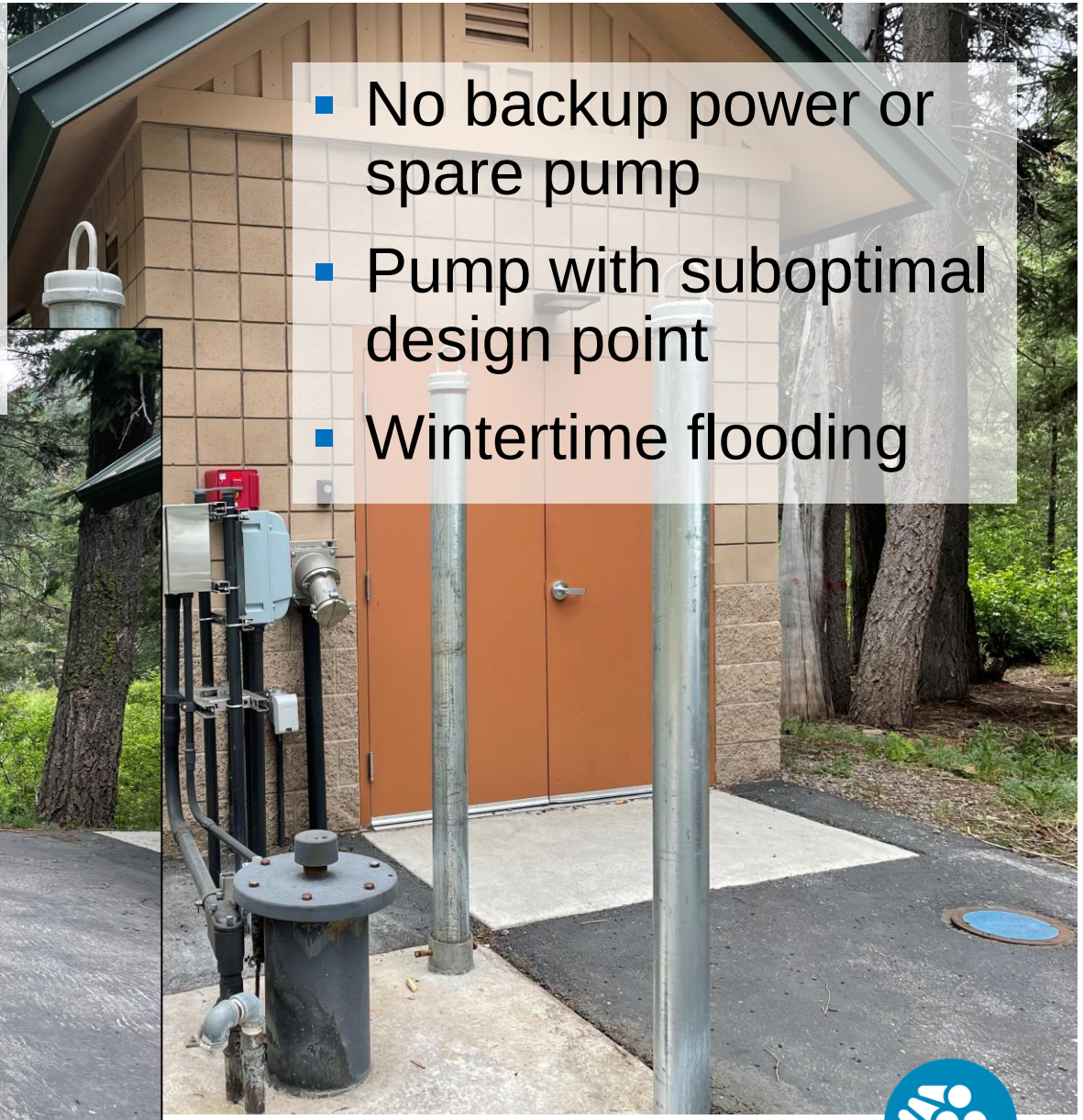




// The older water storage tanks are in poor condition and require rehabilitation or replacement

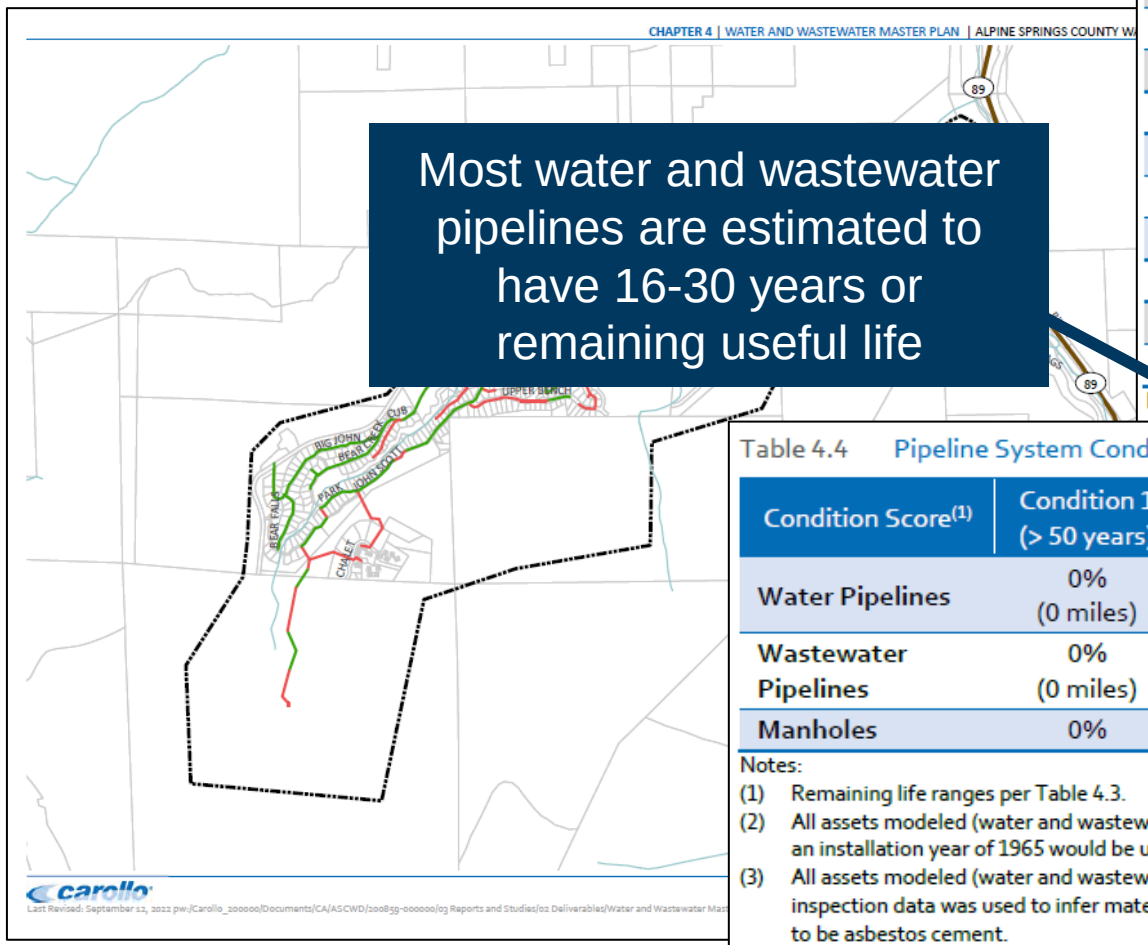


// The Alpine Meadows Estates Well #1 (AMEW #1) has hydraulic and operational issues that lead to advanced degradation and redundancy concerns



- No backup power or spare pump
- Pump with suboptimal design point
- Wintertime flooding

// Pipeline condition information was extrapolated from CCTV and GIS data



Most water and wastewater pipelines are estimated to have 16-30 years or remaining useful life

Table 4.3 Pipeline Remaining Useful Life Assumptions

Asset Type	Original Useful Life (Years)[1]	Length of Pipe (miles)	Percentage of Length
Water Distribution Pipes		**16.8**	
Asbestos Cement (ACP)	85	16.8	100
Wastewater Collection Pipes		**10.5**	
Asbestos Cement (ACP)	85	10.2	97
Ductile Iron (DIP)	85	< 1	<1
Polypropylene (PP)	75	< 1	<1
Polyvinyl Chloride (PVC)	70	< 1	<1
Vitrified Clay (VCP)	75	< 1	1
Other Pipeline Asset Types			
Manholes	75	238 assets	N/A

Note

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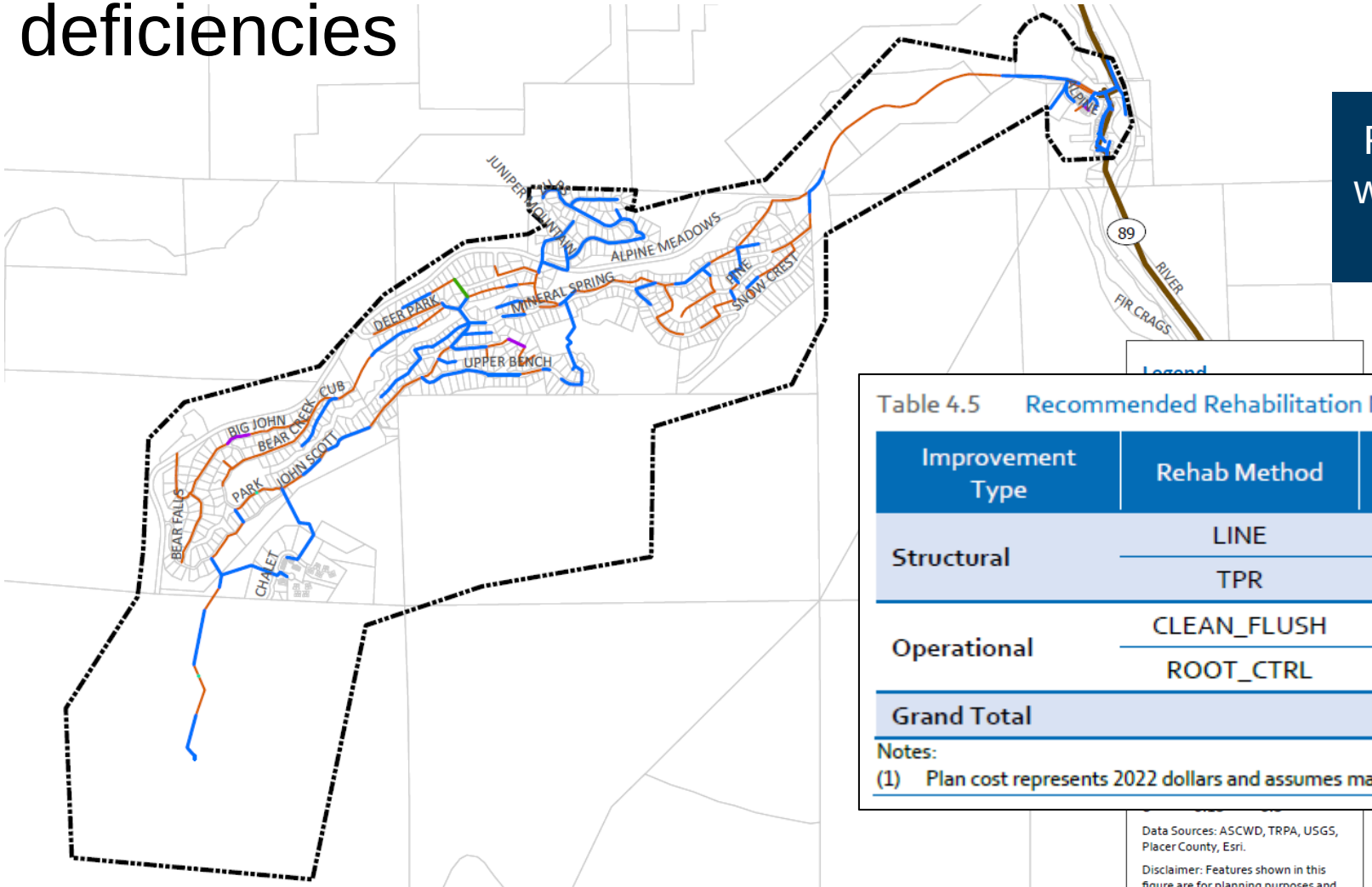
Table 4.4 Pipeline System Condition and Remaining Life Results

Condition Score[1]	Condition 1 (> 50 years)	Condition 2 (31-50 years)	Condition 3 (16-30 years)	Condition 4 (6-15 years)	Condition 5 (≤ 5 years)
Water Pipelines	0% (0 miles)	0% (0 miles)	100% (16.8 miles)	0% (0 miles)	0% (0 miles)
Wastewater Pipelines	0% (0 miles)	0% (0 miles)	95% (10.1 miles)	4% (0.4 miles)	<1% (<0.1 miles)
Manholes	0%	0%	100%	0%	0%

Notes:
(1) Remaining life ranges per Table 4.3.
(2) All assets modeled (water and wastewater) did not have available installation year data. The assumption was made that an installation year of 1965 would be used.
(3) All assets modeled (water and wastewater) did not have available material data. For the wastewater system, pipe inspection data was used to infer material type where possible. When pipes had unknown pipe material, it was assumed to be asbestos cement.

// Rehabilitation and replacement (R&R) recommendations were developed to mitigate gravity main condition deficiencies



Recommended R&R was estimated to cost around $0.5M

Table 4.5 Recommended Rehabilitation Methods

Improvement Type	Rehab Method	Total Pipe Length (ft)	Plan Cost[1]
Structural	LINE	283	$29,723
	TPR	544	$7,380
Operational	CLEAN_FLUSH	27,809	$250,284
	ROOT_CTRL	637	$210,764
Grand Total		29,273	$498,151

Notes:
(1) Plan cost represents 2022 dollars and assumes material cost and labor only.

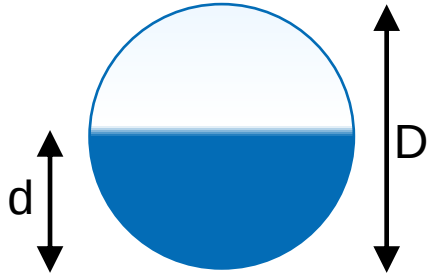
// Expanded monitoring and standardized evaluation protocols can help the District understand changing R&R needs as the systems continue to age

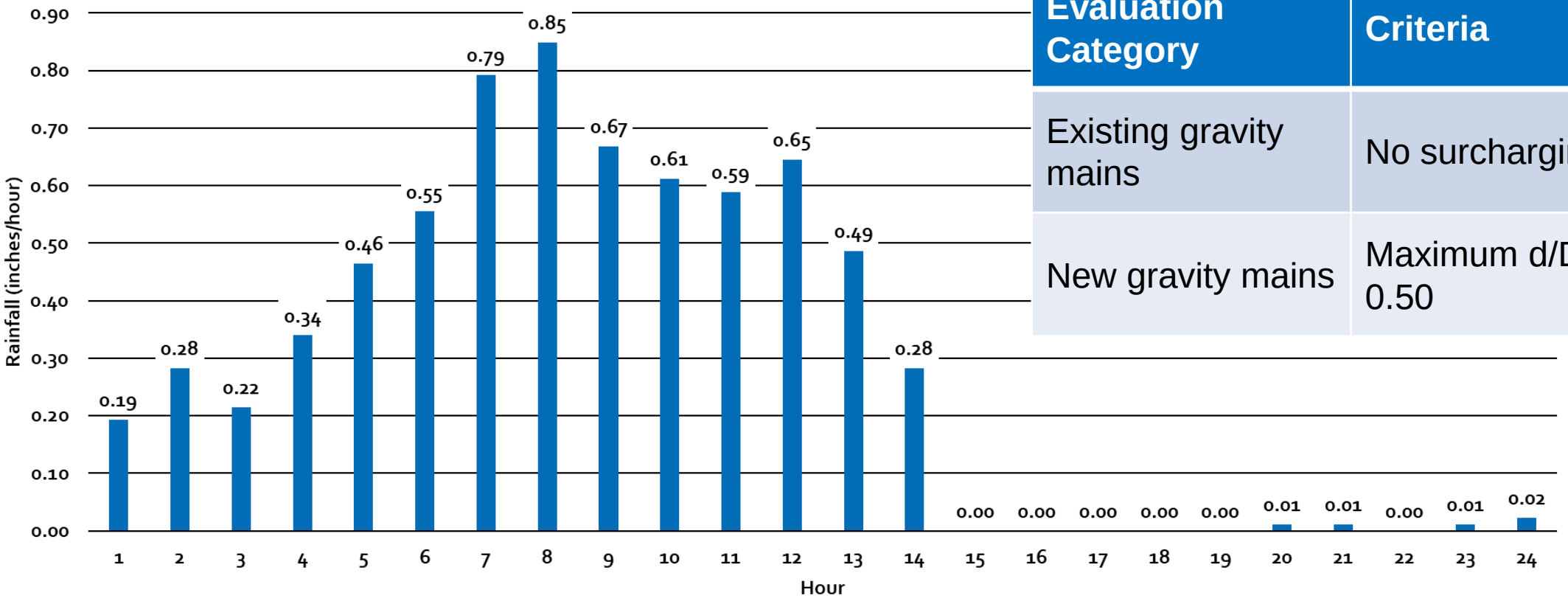
- Address GIS data gaps
- Develop Condition Assessment Protocol (CAP)
- Develop formal tracking system
- Establish key performance indicators (KPIs)


Hydraulic Evaluations

Wastewater System Hydraulic Analysis

// The wastewater system was evaluated under existing and projected peak wet weather flow (PWWF) conditions





Evaluation Category	Criteria
Existing gravity mains	No surcharging
New gravity mains	Maximum d/D of 0.50

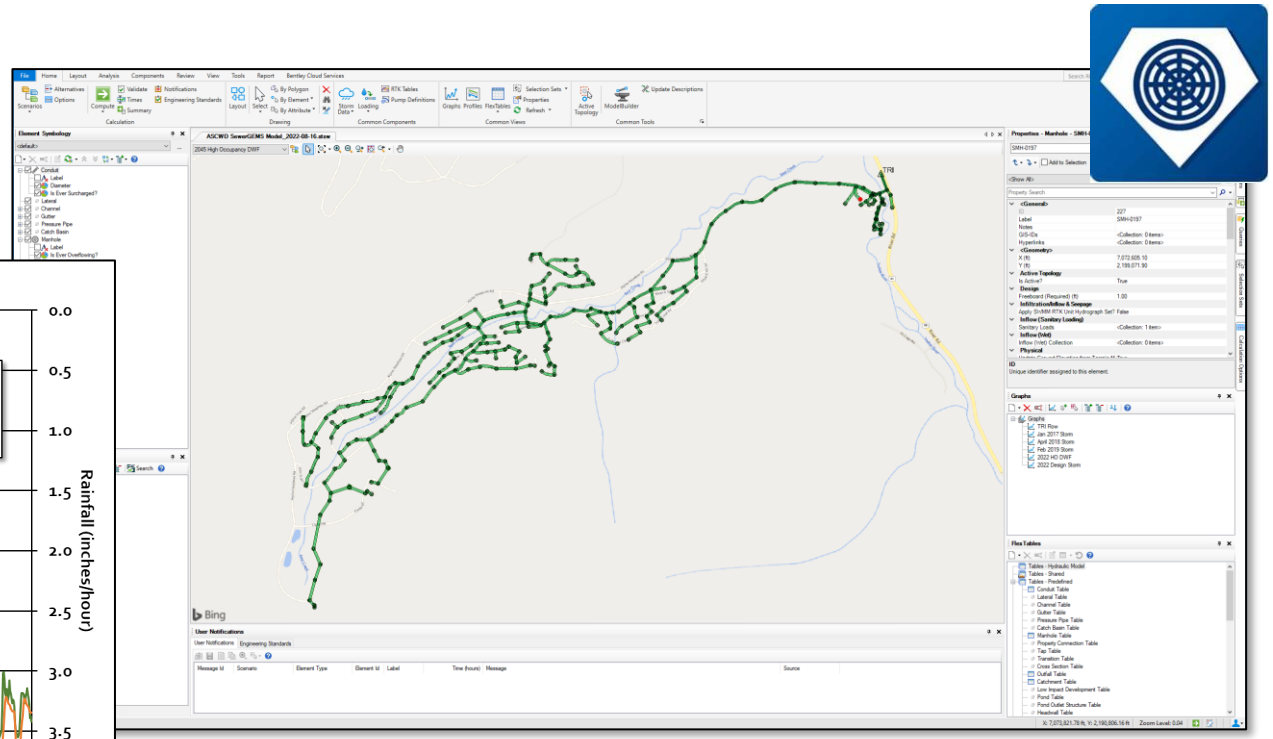
// A hydraulic model was developed to performance the wastewater system hydraulic evaluation

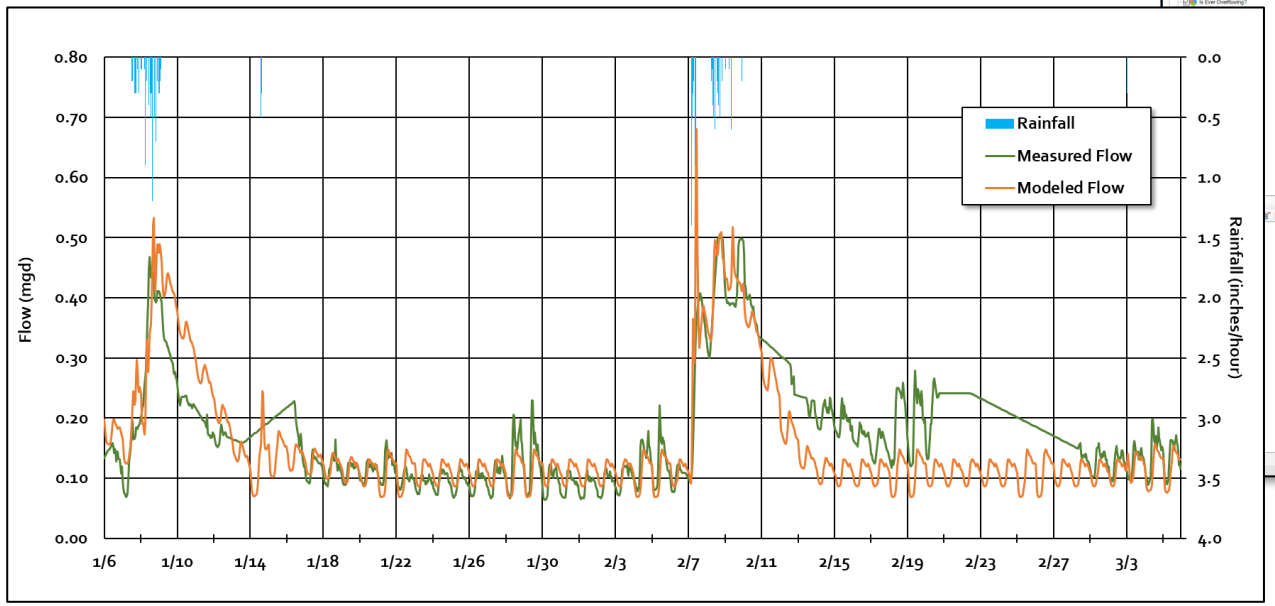
Dry Weather Calibration

Adjust model base flows to match measured ADWF

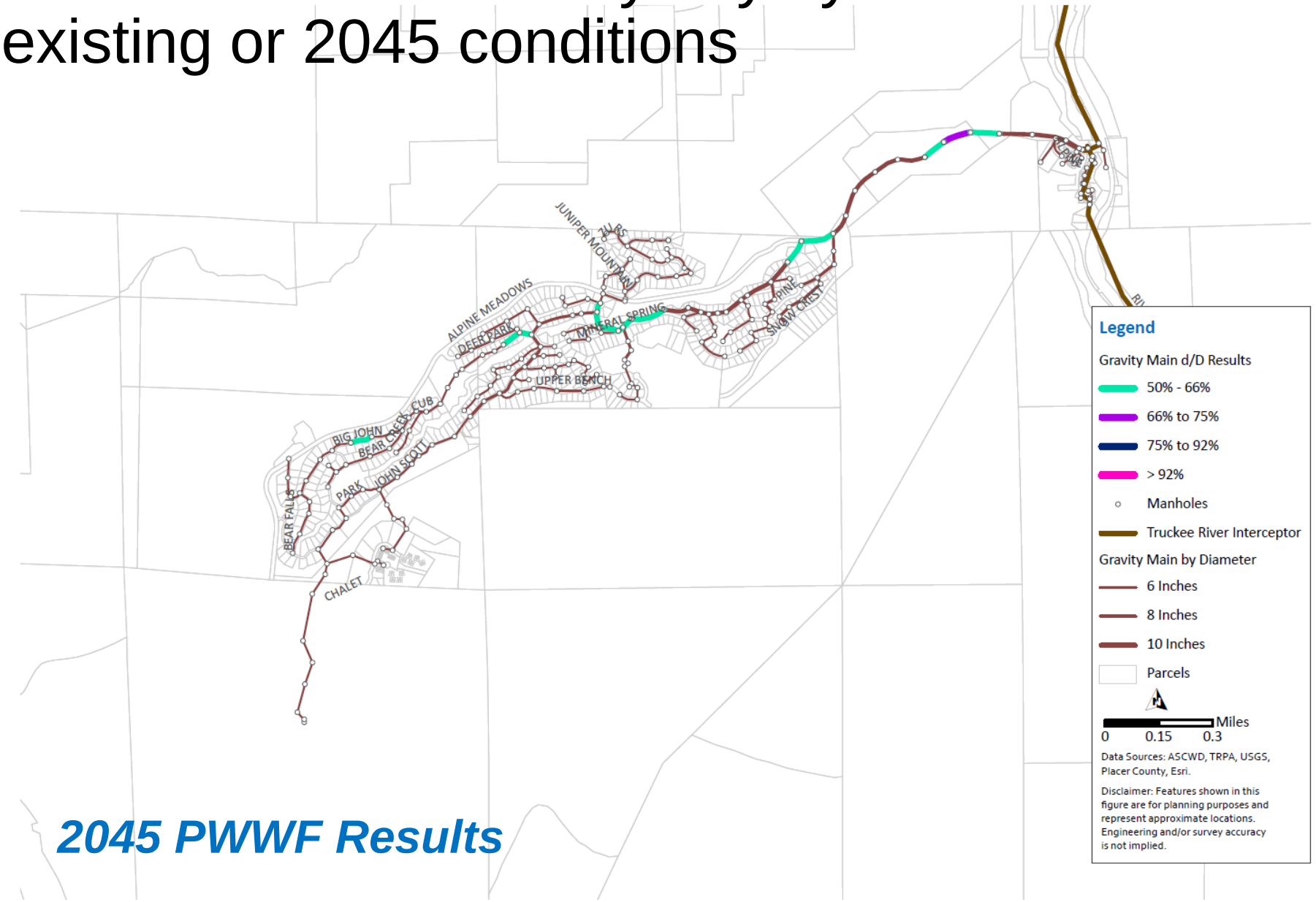
Wet Weather Calibration

Adjust model RTK parameters to match measured wet weather response





// The evaluation did not identify any hydraulic deficiencies under existing or 2045 conditions



2045 PWWF Results


Water System Hydraulic Analysis

// The water system was evaluated against hydraulic performance, storage, pumping, and fire flow criteria

Parameter	Proposed Criteria
Minimum Supply and Storage Capacity per Pressure Zone	
Firm supply	MDD
Operational storage	25% of MDD
Emergency storage	100% of MDD
Fire storage Zones 1 and 4 (commercial) Zones 2 and 3 (residential)	 1,750 gpm for 2 hours (0.21 MG) 1,500 gpm for 2 hours (0.18 MG)
Hydraulic Performance	
Peak hour demand minimum pressure	35 psi
Residual fire flow pressure	20 psi

// The supply evaluation revealed supply deficits in Zones 3 and 4

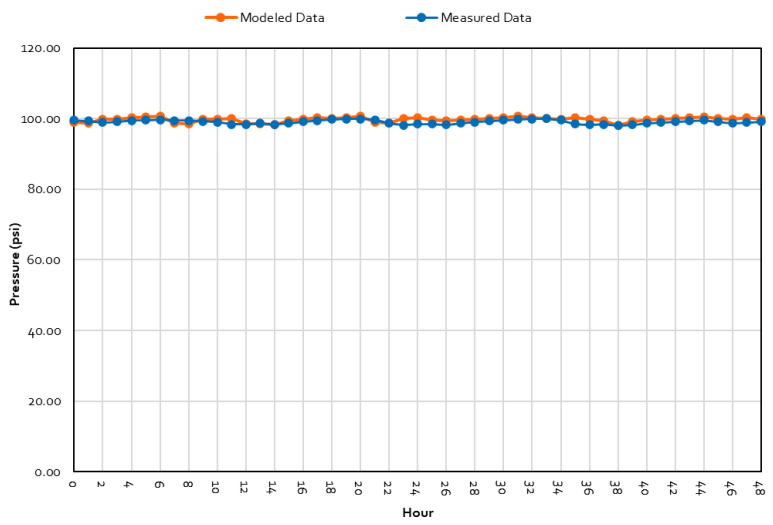
Pressure Zone	Required Supply (gpm)		Available Supply (gpm)		Supply Surplus/ (Deficit) (gpm)	
	Existing	2045	Existing	2045	Existing	2045
Zone 1	23.5	103.4	178.0	178.0	**154.5**	**74.6**
Zone 2	51.1	60.1	154.5	74.6	**103.4**	**14.5**
Zone 3	92.5	97.5	117.4	28.5	**24.9**	**(69.0)**
Zone 3 Boosted	8.0	12.2	40	(55.0)	**12.9**	**(67.2)**
Zone 3 Lower	1.7	1.7	16.9	(77.1)	**15.1**	**(78.9)**
Zone 4	30.7	32.6	15.1	(78.9)	**(15.6)**	**(111.5)**

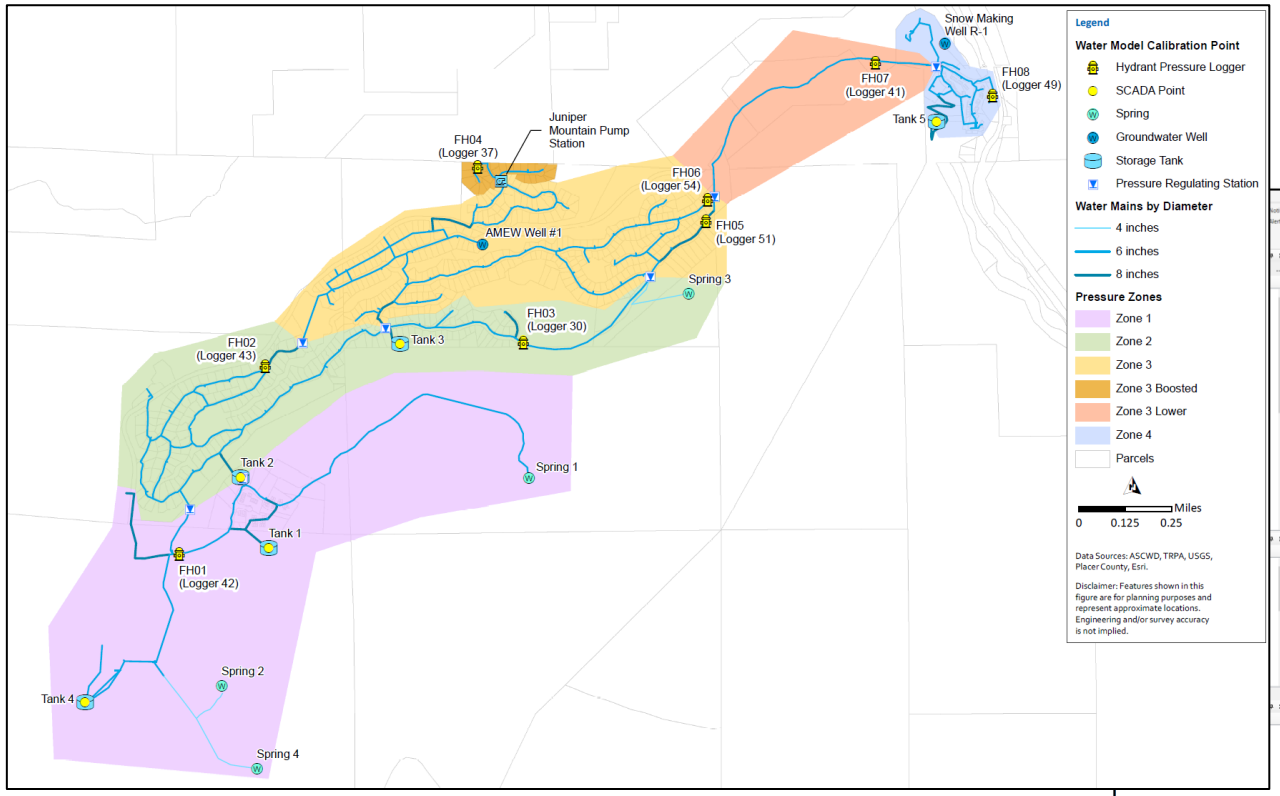
// The storage evaluation indicates sufficient storage capacity through the 2045 planning horizon

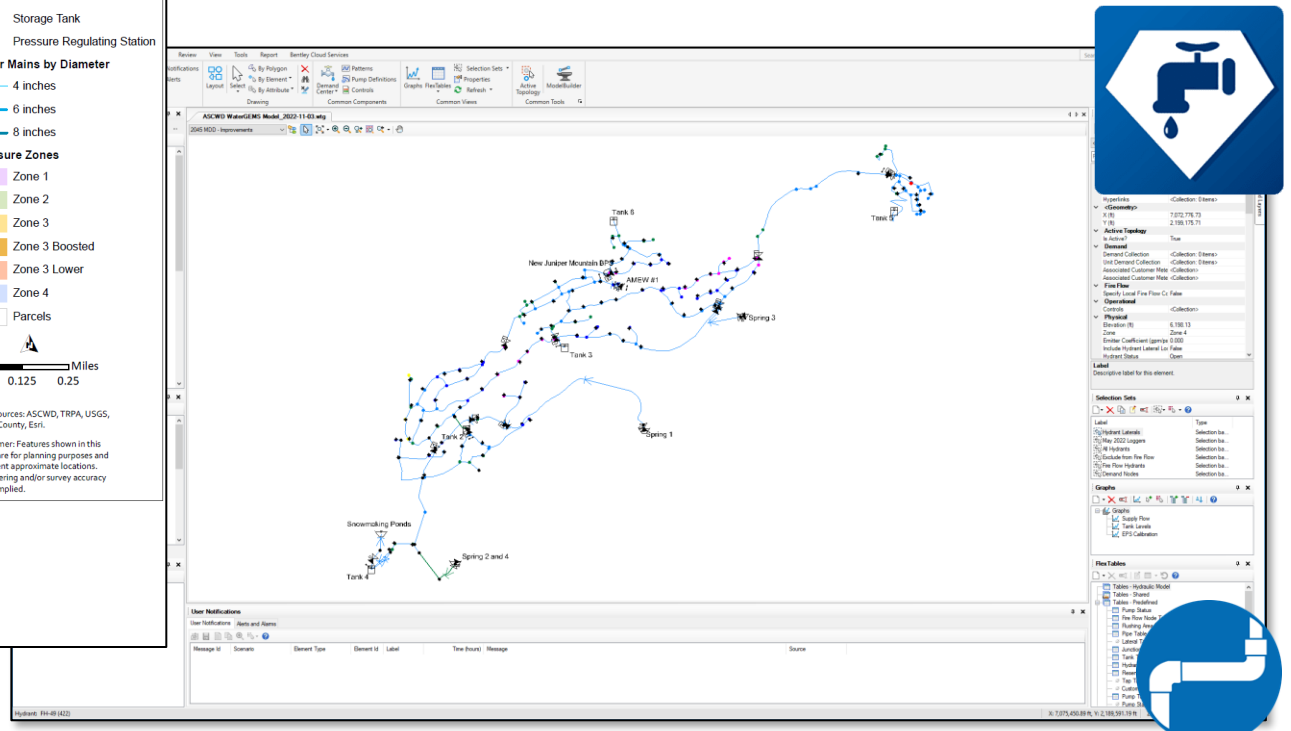
Pressure Zone	Required Storage (MG)		Available Storage (MG)		Storage Surplus/ (Deficit) (MG)	
	Existing	2045	Existing	2045	Existing	2045
Zone 1	0.25	0.40	1.02	1.02	**0.77**	**0.62**
Zone 2	0.27	0.29	1.11	1.08	**0.84**	**0.79**
Zone 3	0.35	0.36	1.19	1.15	**0.84**	**0.80**
Zone 3 Boosted	0.19	0.19	1.25	1.21	**1.05**	**1.02**
Zone 3 Lower	0.18	0.18	1.15	1.11	**0.97**	**0.93**
Zone 4	0.27	0.27	1.26	1.23	**0.99**	**0.96**

// A water system hydraulic model was developed to evaluate the system's hydraulic performance

Example: FH01 EPS Calibration Results

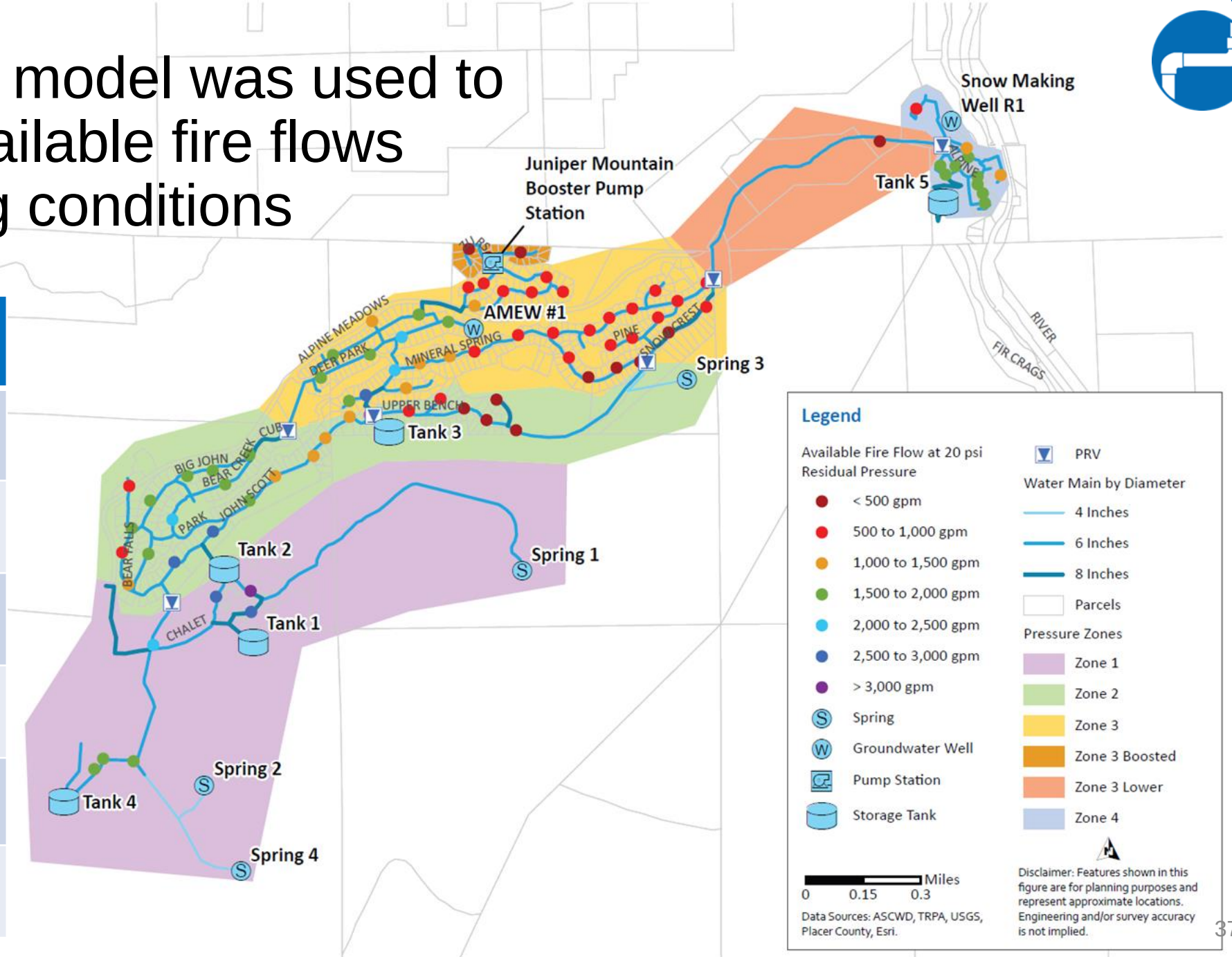






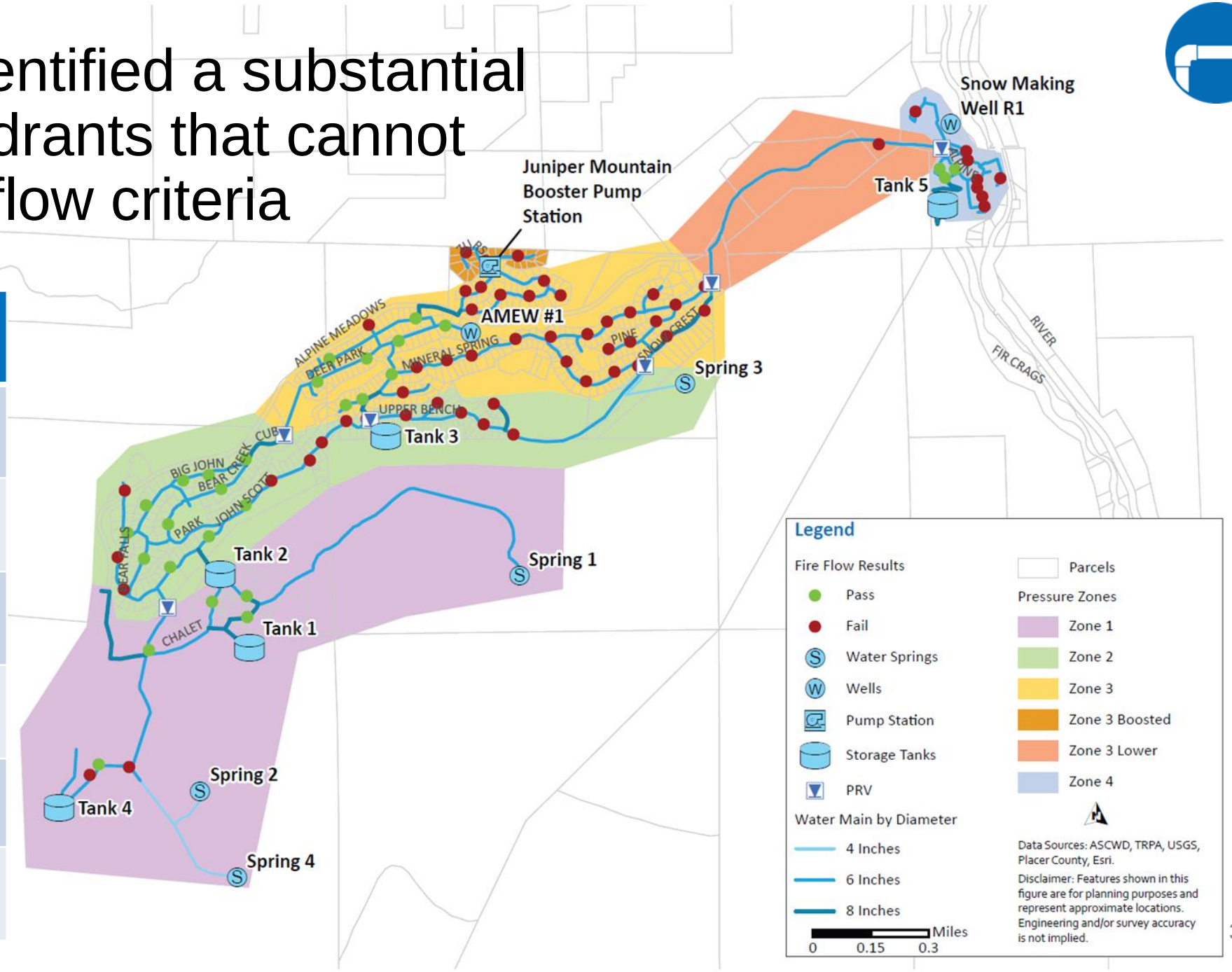
// The hydraulic model was used to determine available fire flows under existing conditions

Zone	Required Flow
Zone 1	1,750 gpm
Zone 2	1,500 gpm
Zone 3	1,500 gpm
Zone 3 Boosted	1,500 gpm
Zone 3 Lower	1,500 gpm
Zone 4	1,750 gpm



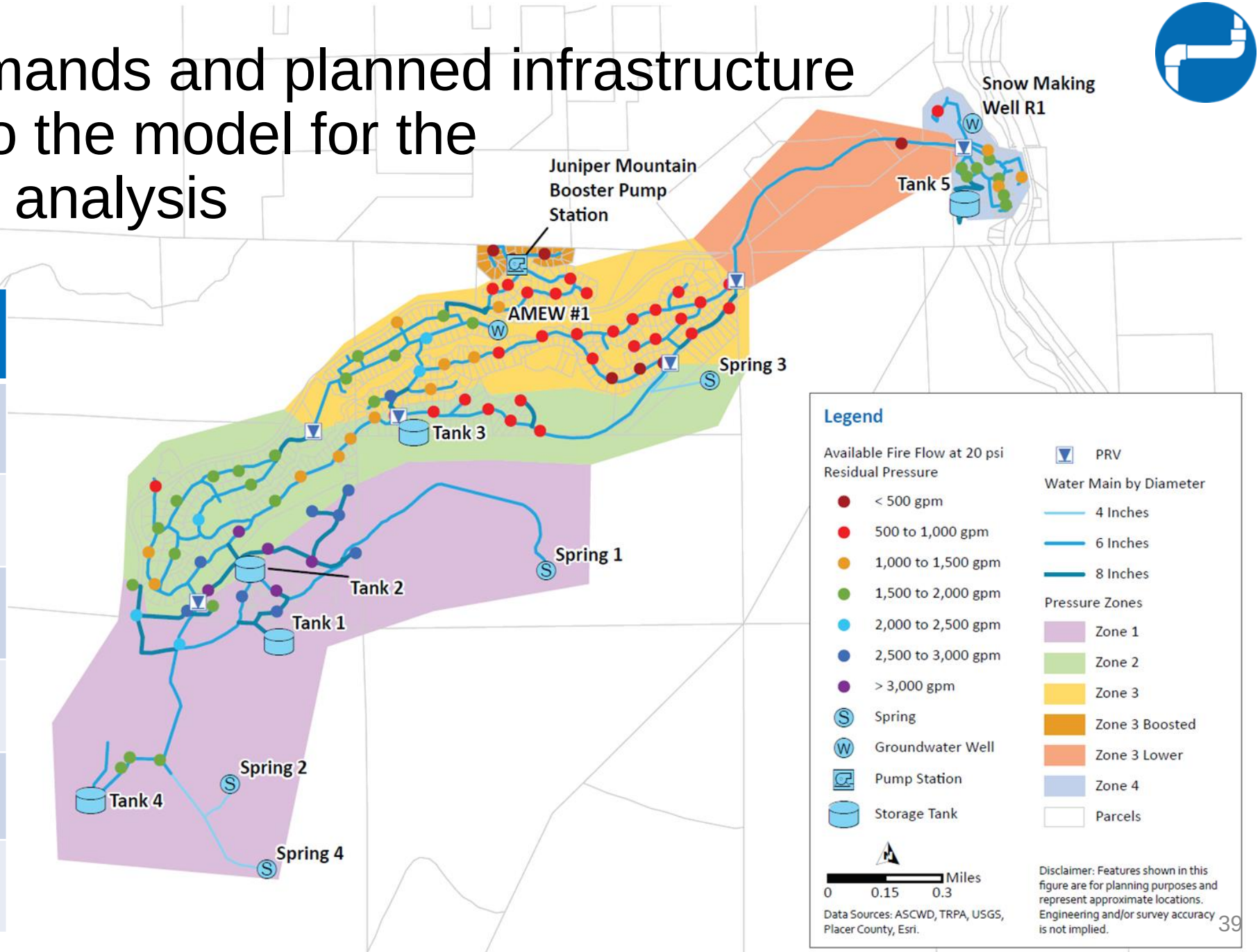
// The model identified a substantial number of hydrants that cannot meet the fire flow criteria

Zone	Required Flow
Zone 1	1,750 gpm
Zone 2	1,500 gpm
Zone 3	1,500 gpm
Zone 3 Boosted	1,500 gpm
Zone 3 Lower	1,500 gpm
Zone 4	1,750 gpm



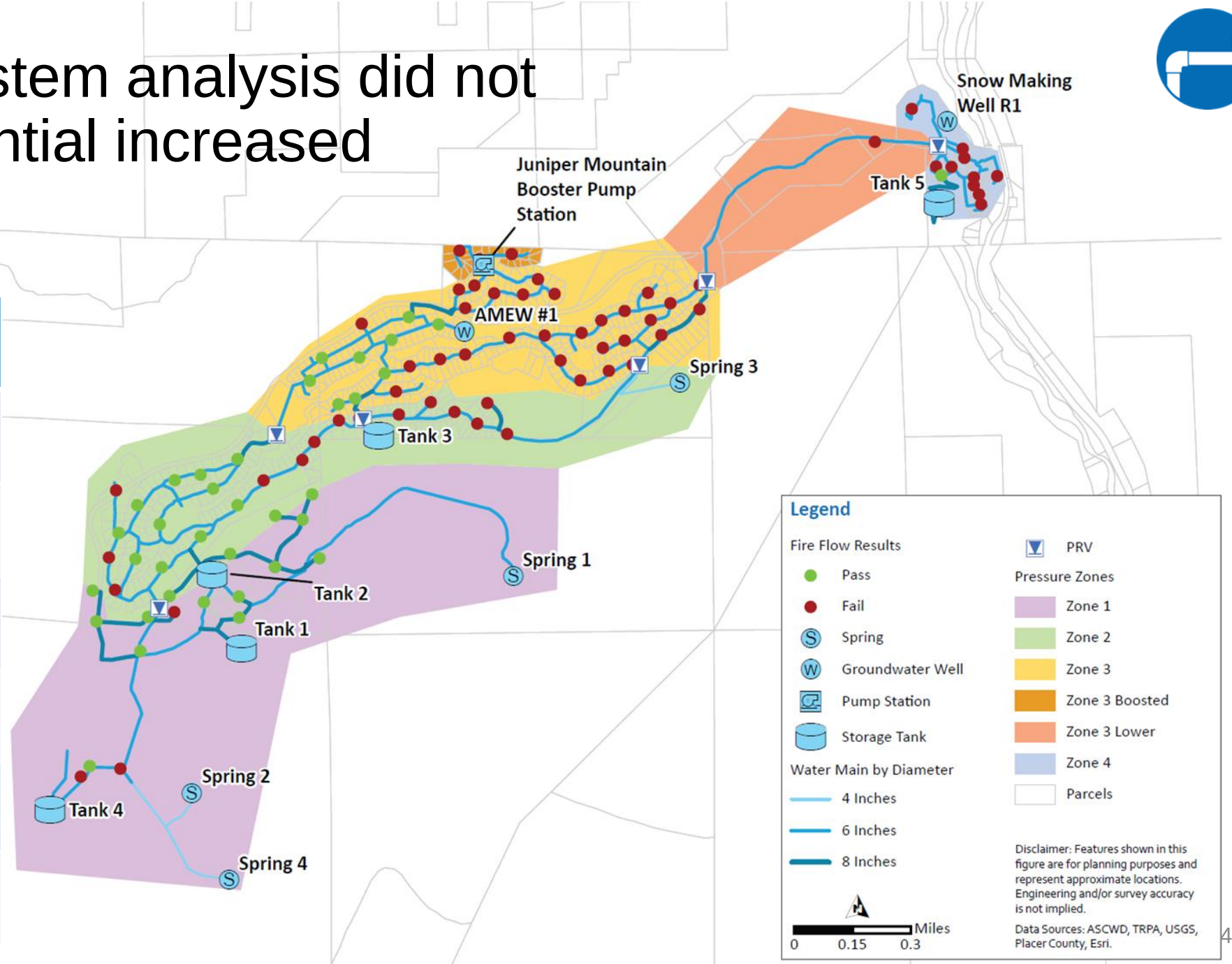
// Projected demands and planned infrastructure were added to the model for the future system analysis

Zone	Required Flow
Zone 1	1,750 gpm
Zone 2	1,500 gpm
Zone 3	1,500 gpm
Zone 3 Boosted	1,500 gpm
Zone 3 Lower	1,500 gpm
Zone 4	1,750 gpm



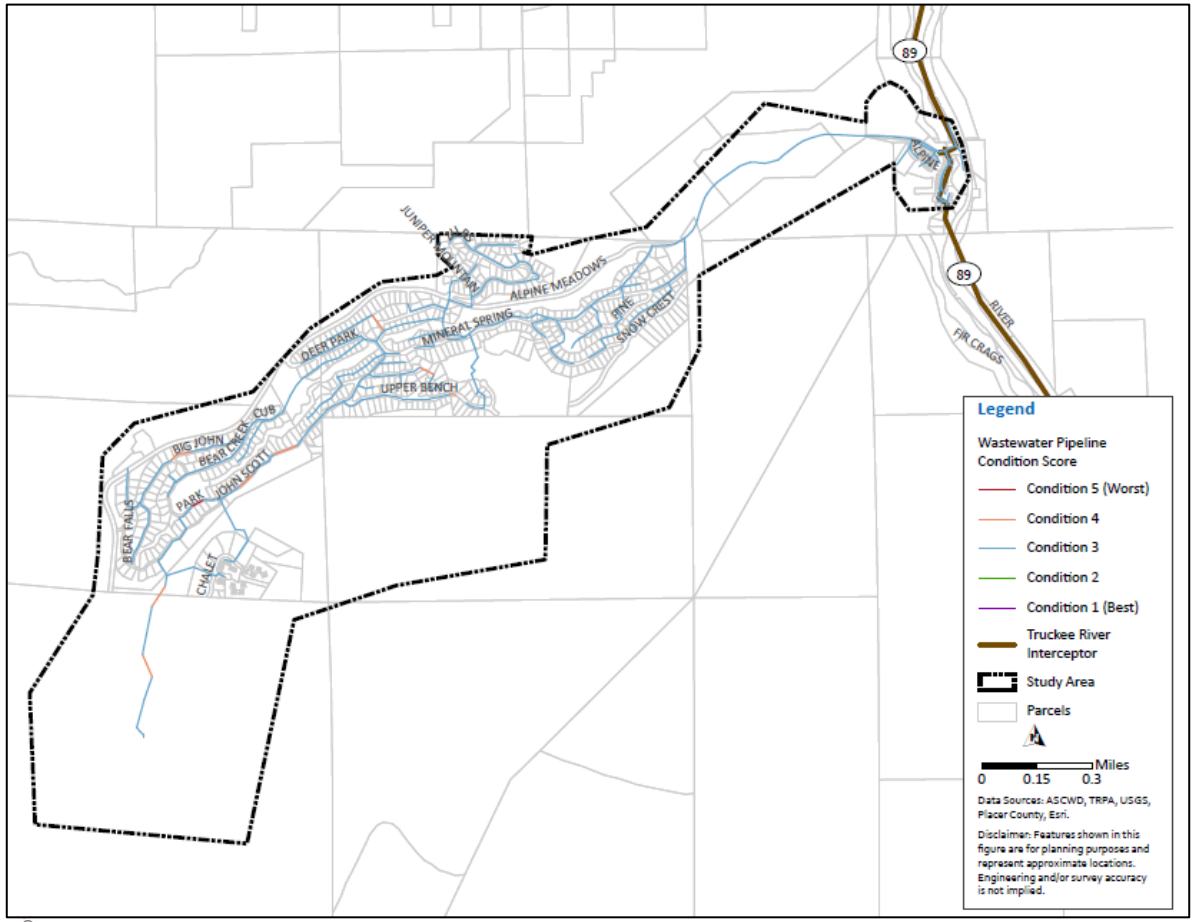
// The future system analysis did not reveal substantial increased deficiencies

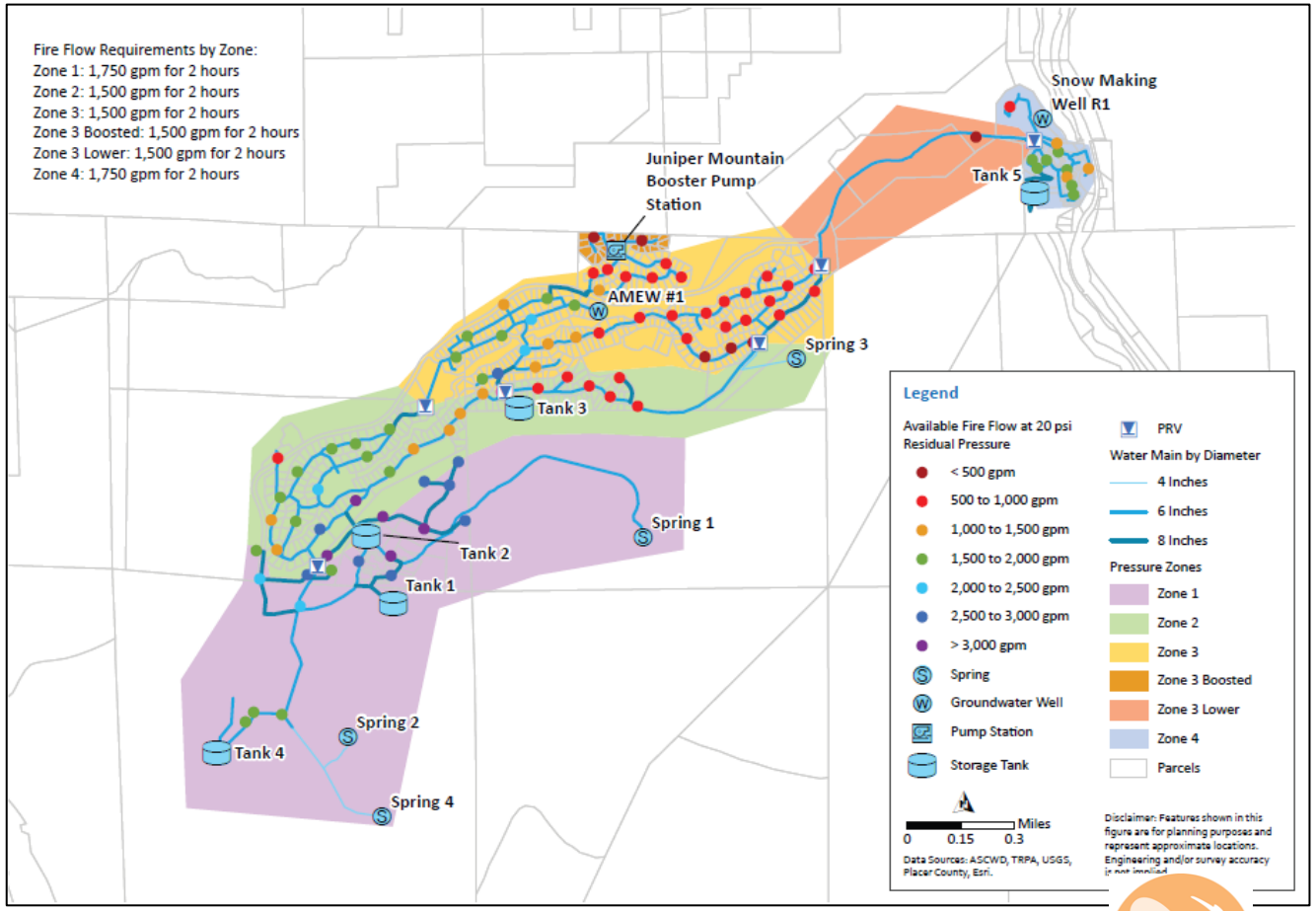
Zone	Required Flow
Zone 1	1,750 gpm
Zone 2	1,500 gpm
Zone 3	1,500 gpm
Zone 3 Boosted	1,500 gpm
Zone 3 Lower	1,500 gpm
Zone 4	1,750 gpm



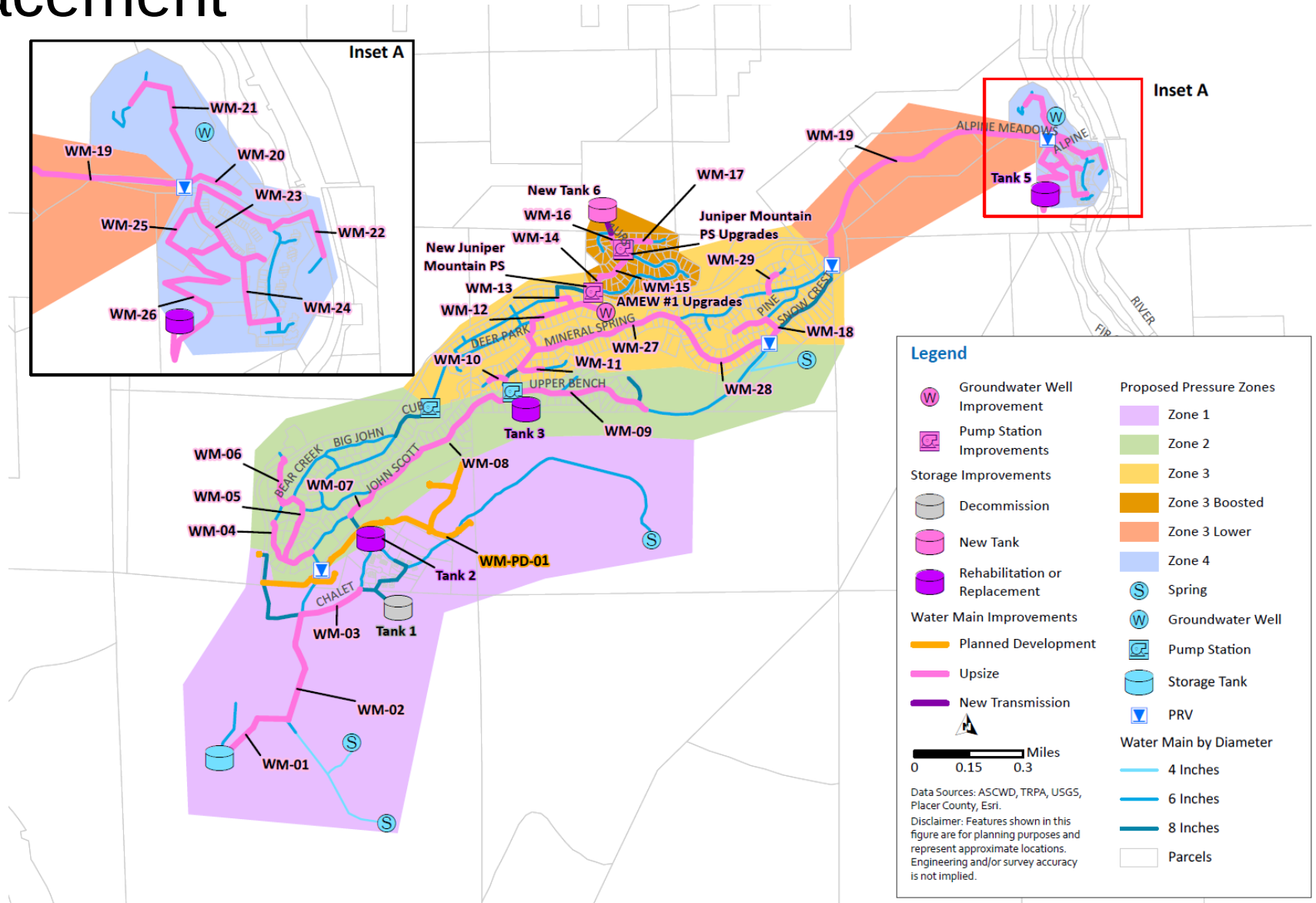
Proposed Improvements

// The proposed improvements address capacity and condition needs through the 2045 planning horizon

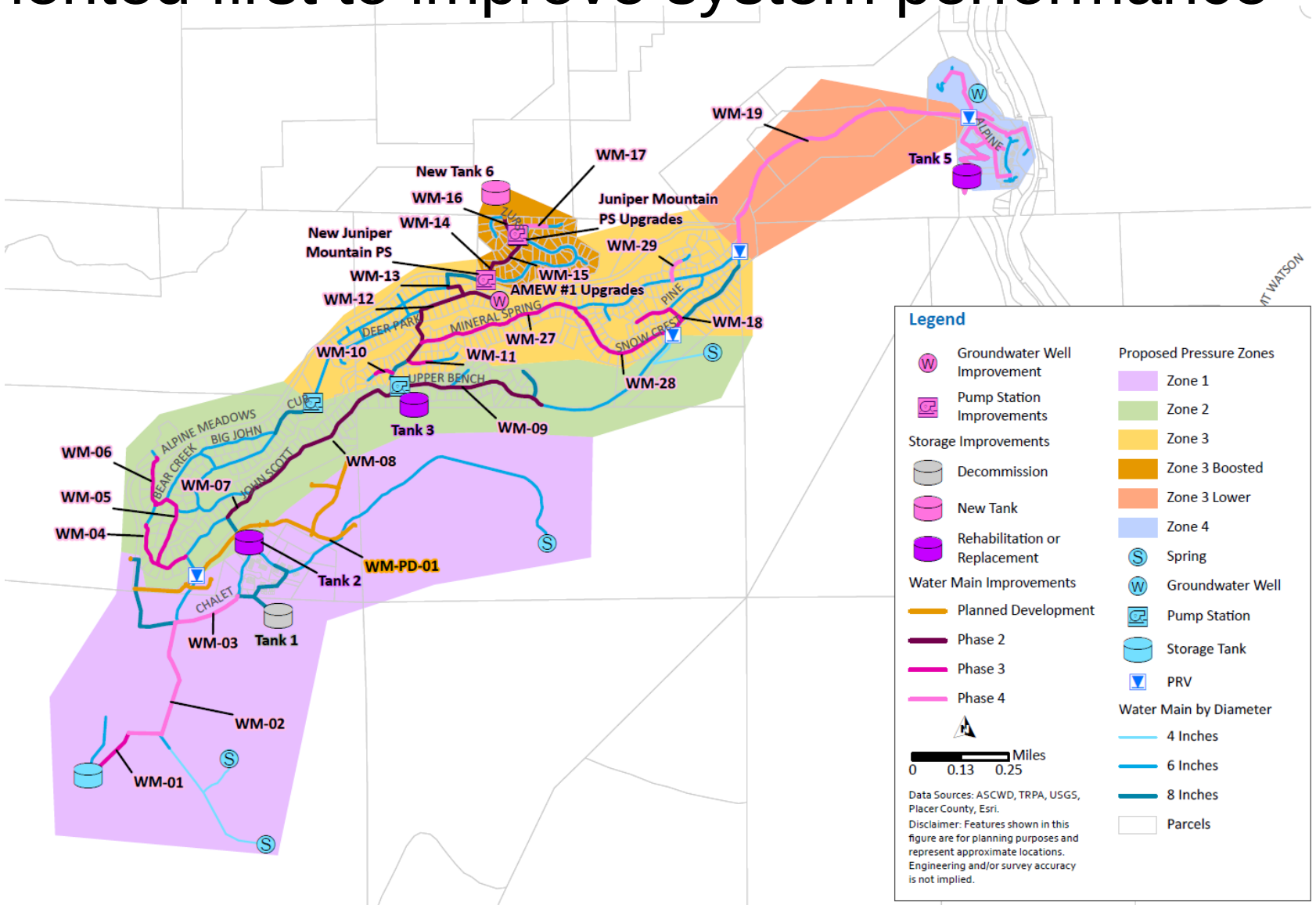




// Water system hydraulic findings help prioritize pipeline replacement

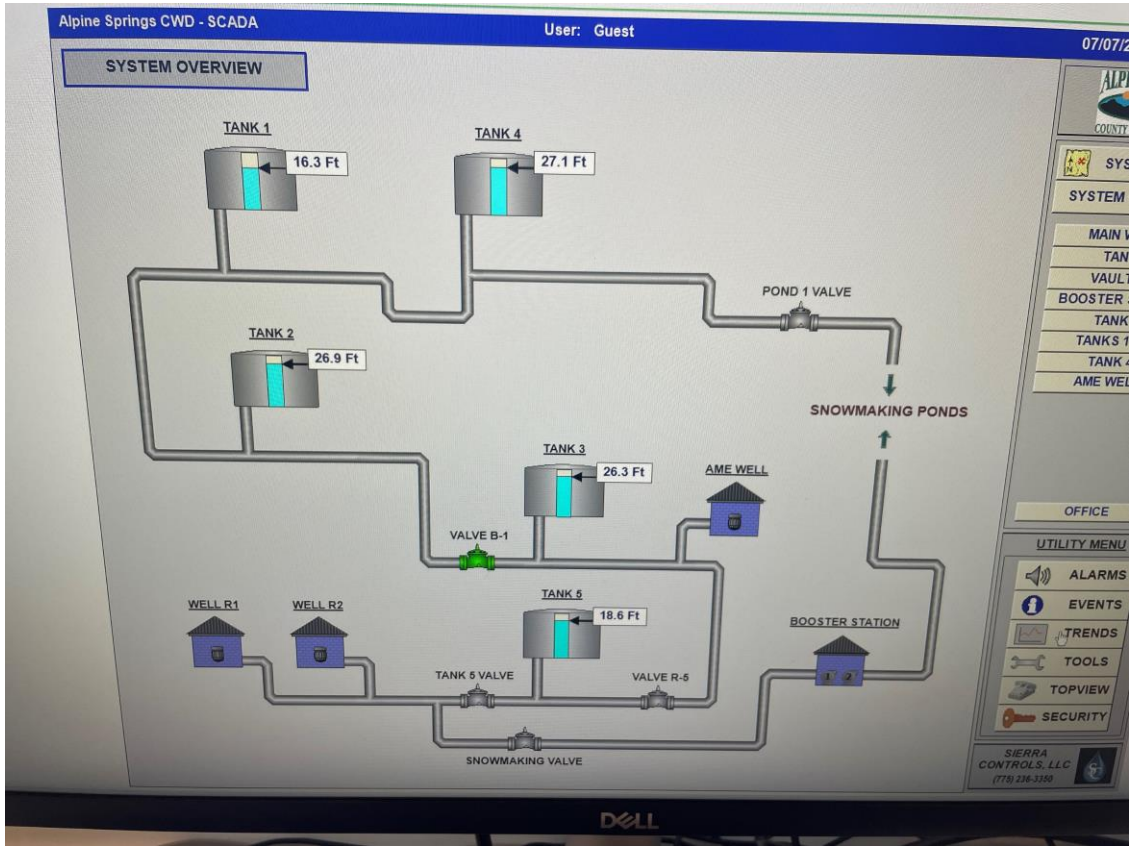


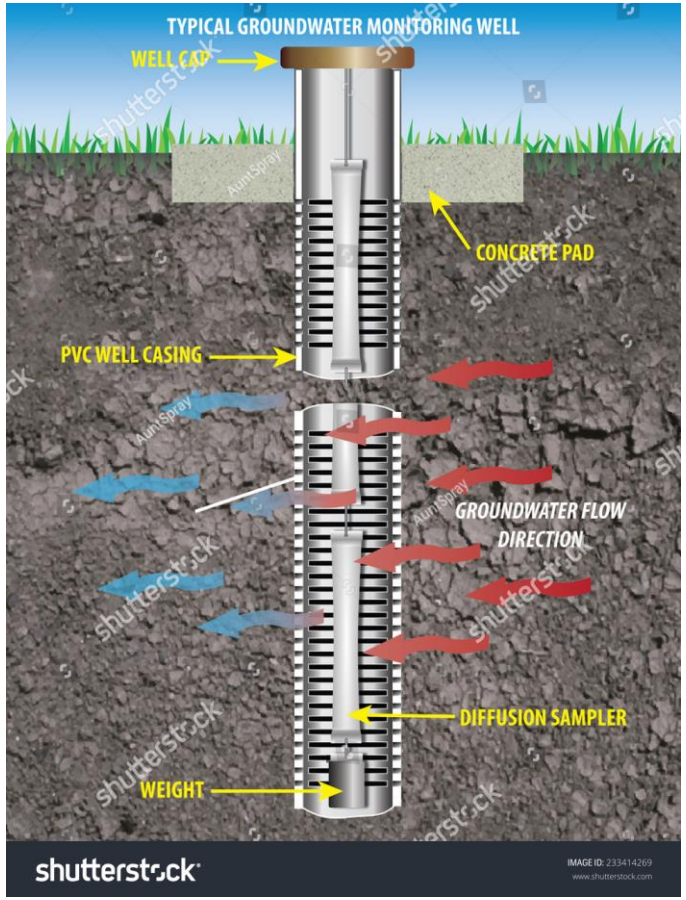
// Projects that provide greater hydraulic benefits should be implemented first to improve system performance



// Expanded monitoring and evaluation will help the District understand changing system needs over time

- Master Plan updates
- SCADA upgrades
- Groundwater monitoring






Capital Improvement Costs

// Planning level cost estimates were developed for the proposed improvements

Contingency	Assumption[1]
Estimating contingency	30 percent of baseline construction cost
Direct construction cost as percentage of baseline cost	**130 percent**
Contractor general conditions	10 percent of direct construction cost
Contractor overhead and profit	10 percent of direct construction cost
Total construction cost as percentage of baseline cost	**157 percent**
Project delivery cost[2]	15 percent of total construction cost
Total project cost as percent of baseline construction cost	**181 percent**

Notes:

(1) The listed contingencies were assumed for most project costs. Certain projects, such as the Juniper Mountain PS upgrades, do not require all contingencies.

(2) Project delivery costs consist of project and construction management, permitting, engineering, services during construction, commissioning, close-out, and legal and administrative fees.

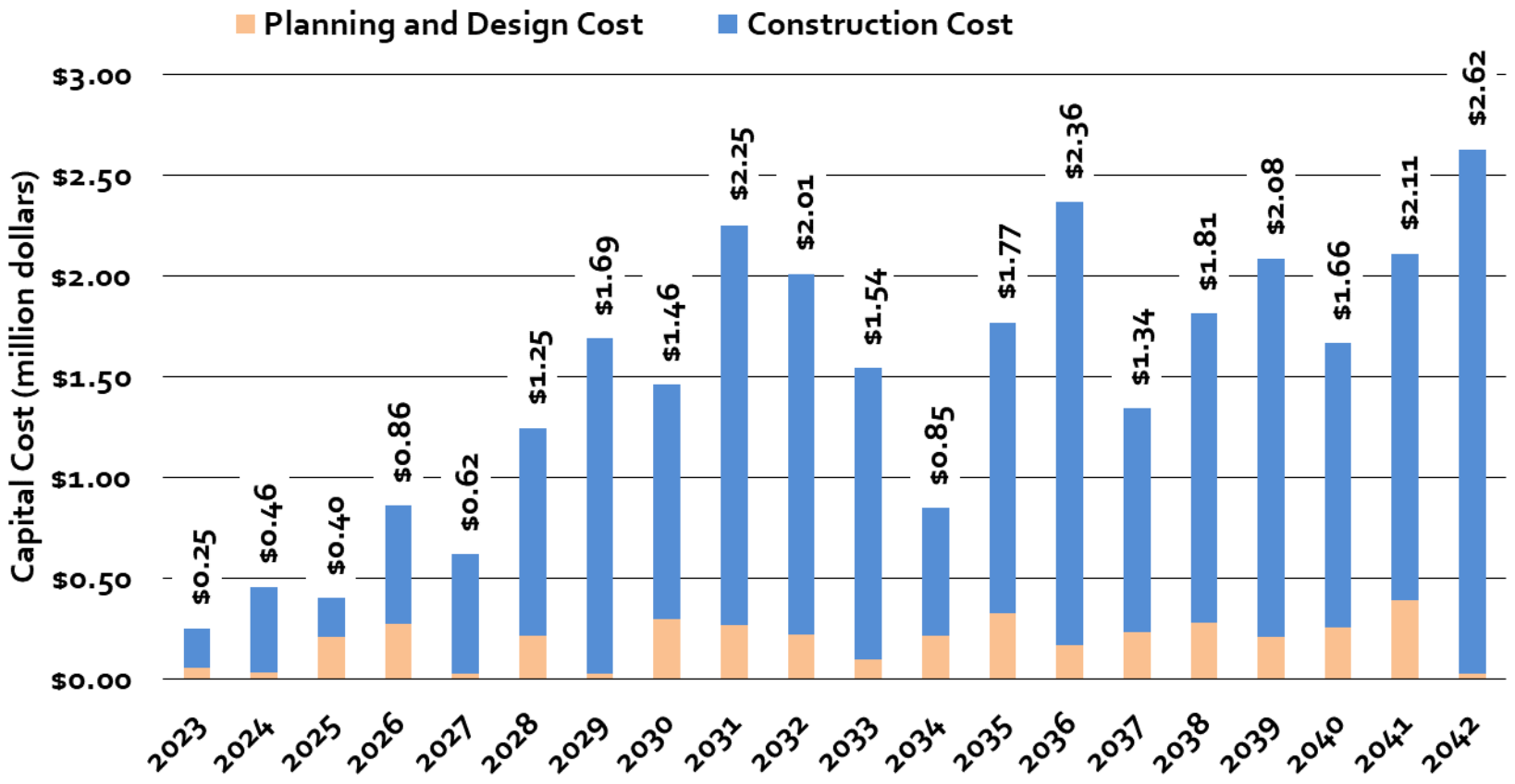
// The total 2045 capital improvement plan is estimated to cost approximately $30 million

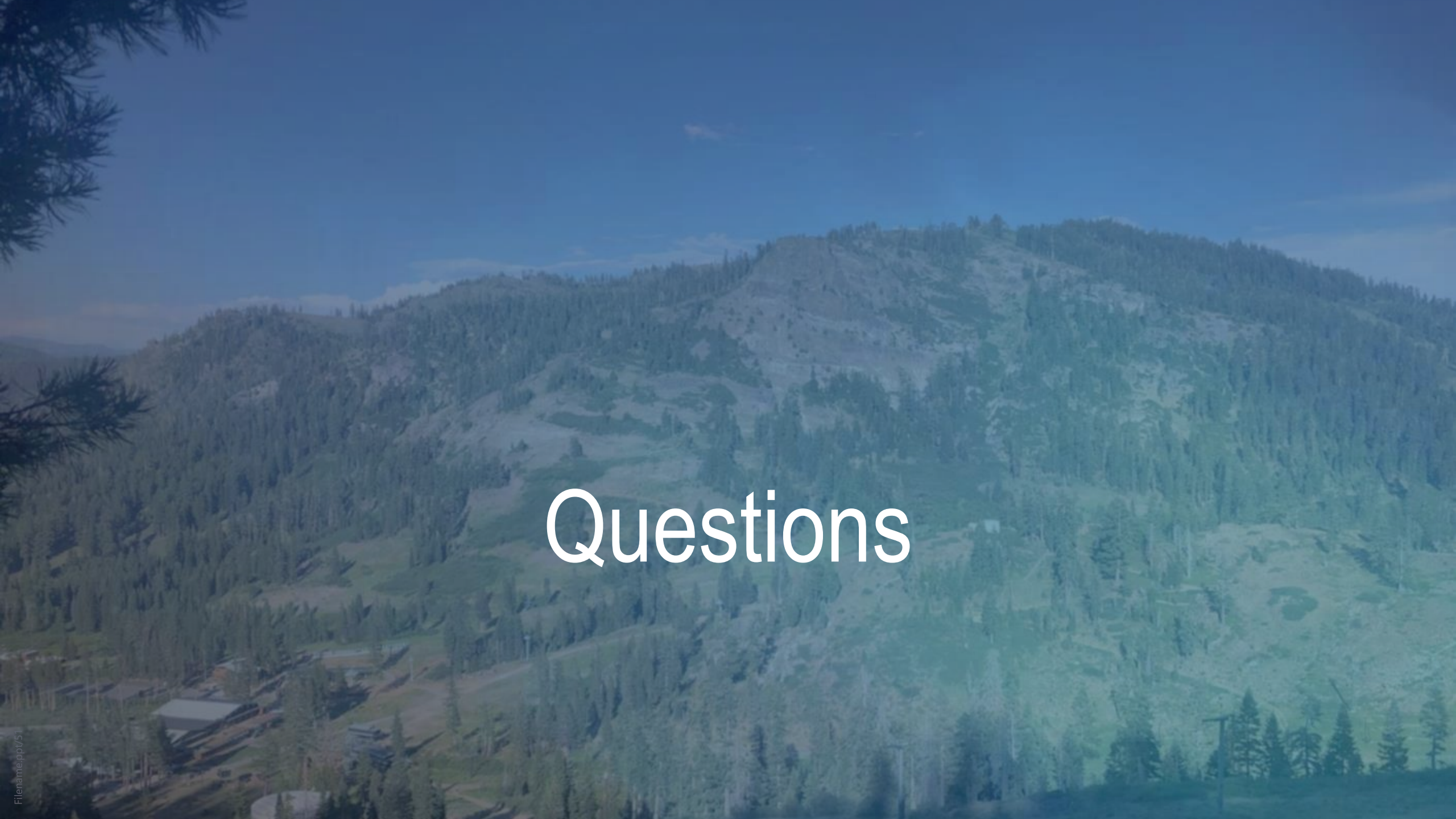
Improvement Type	Estimated Capital Cost ($ million)
Water system capacity improvements	$23.6
Water system condition improvements	$2.3
Wastewater system condition improvements	$3.5
Master Plan updates	$0.2
Total	**$29.6**

// Addressing high-priority projects is expected to cost the District around $3 million over the next 5 years

Project	Estimated Cost ($ million)
Rehabilitation of Tanks 2, 3, and 5	$1.36
Planning and design of Juniper Mountain water system improvements	$1.12
Ongoing water and wastewater rehabilitation and replacement	$0.15
AMEW No. 1 backup generator	$0.03
Total	**$2.65**

// The proposed implementation plan enables the District to achieve level of service goals within the planning horizon with gradual increases in capital expenditures




Questions