



Water Supply Roadmap – Long Term Projects Update

BOARD OF DIRECTORS

February 27, 2024

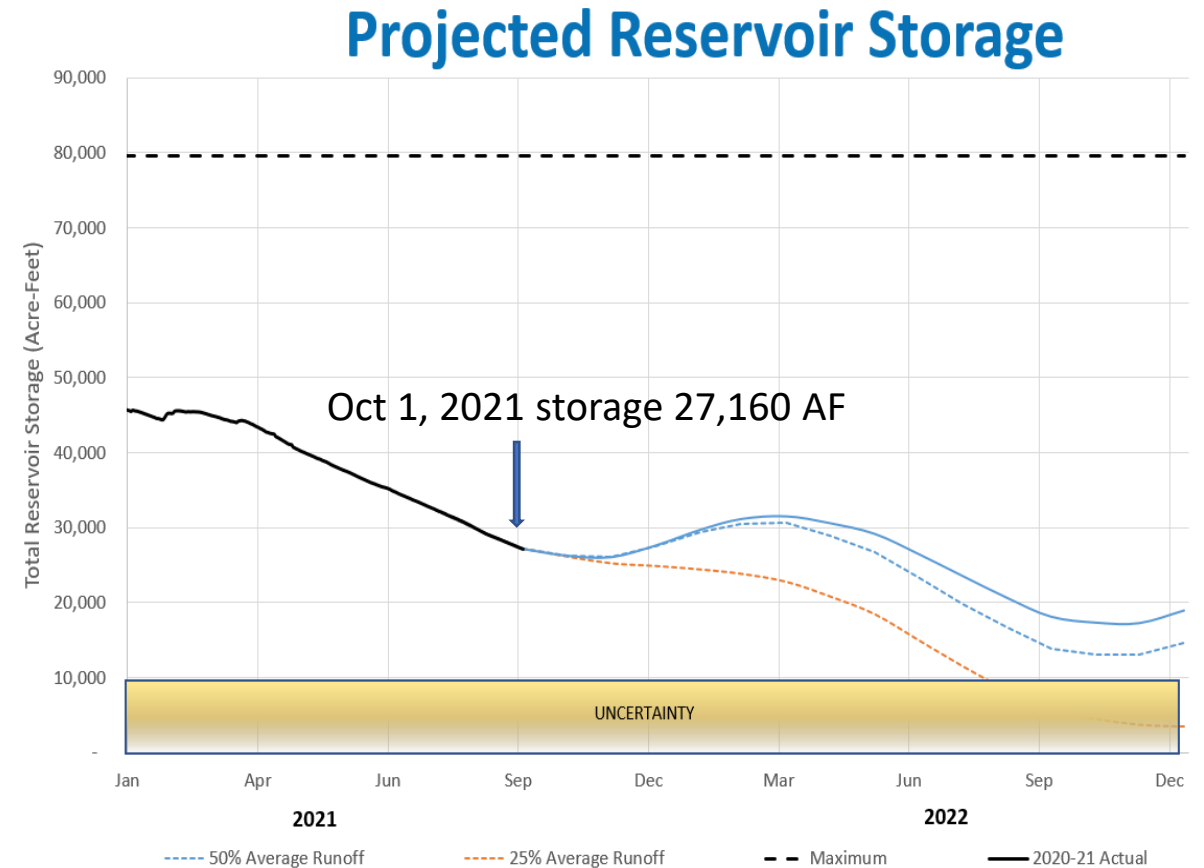


Overview

- Background
- In System Improvements
- Regional Conveyance
- Local Storage
- Next Steps

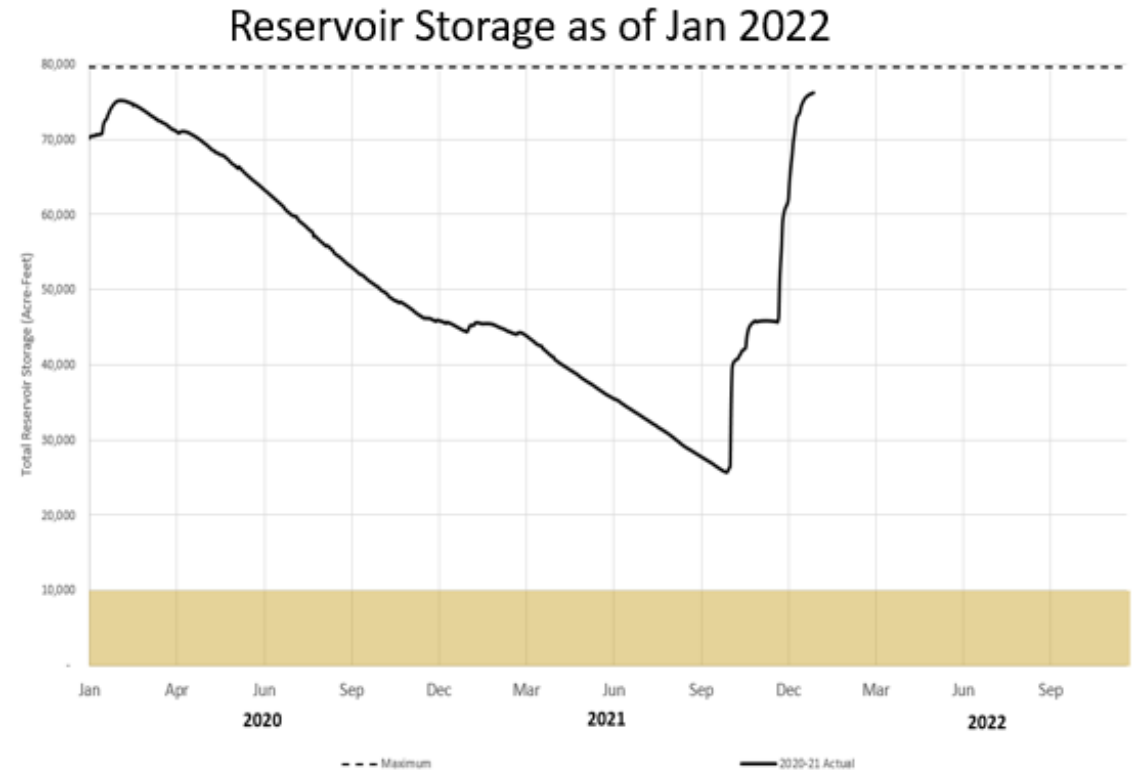
Background: Drought Emergency

- April 20, 2021 Board declared Water Shortage Emergency
- Storage on Oct 1, 2021 was 27,160 AF or less than 33% of total storage
- Only viable supply option given time available was pipe across the Richmond- San Rafael bridge

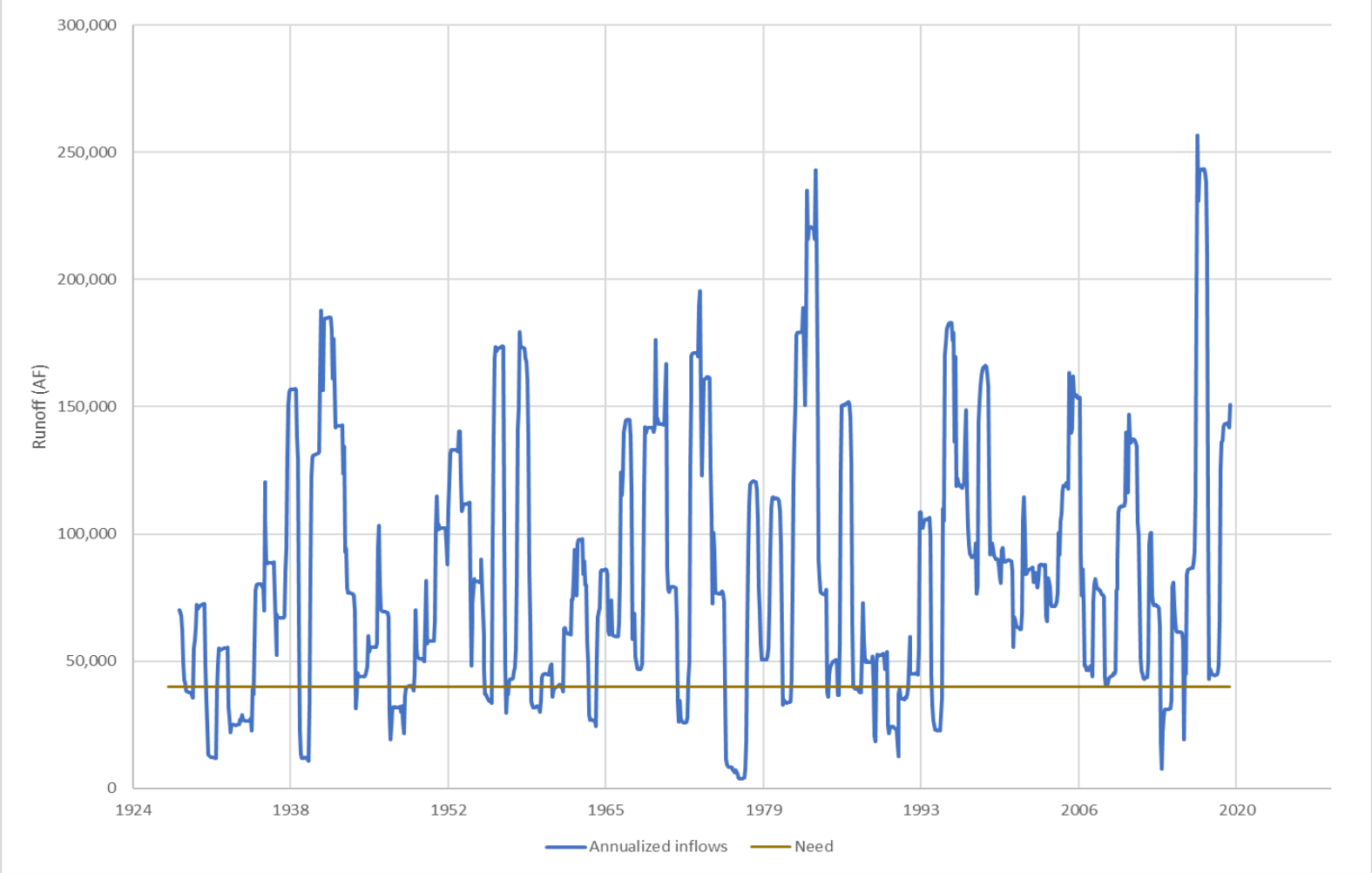


Background: Historic Rainfall

- Between Oct 1, 2021 & Jan 17, 2022 the District received 41.5 inches of rainfall
- In Feb 2022, with reservoir storage near capacity, District began the Strategic Water Supply Assessment (SWSA).
- In Feb 2023 the board identified the Integrated Water Supply Roadmap



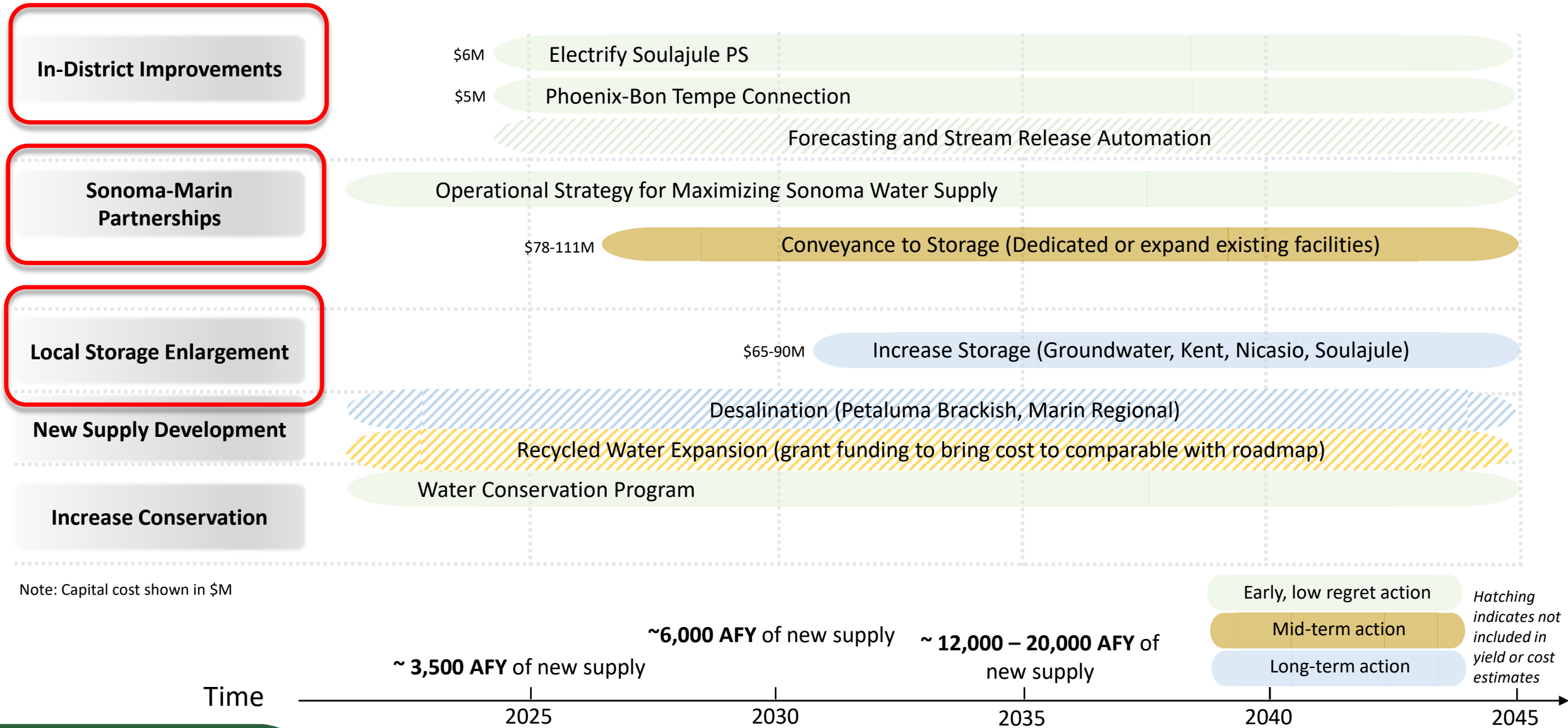
Drought Risk Drives the Need for Water Supply Resilience



While average-year water supply is ample, the timing and severity of droughts are highly variable; climate change further increases uncertainty.

An integrated strategy addresses future uncertainty via diversification.

Roadmap for Integrated Strategy



Note: Capital cost shown in \$M

Water Supply Projects In-Progress

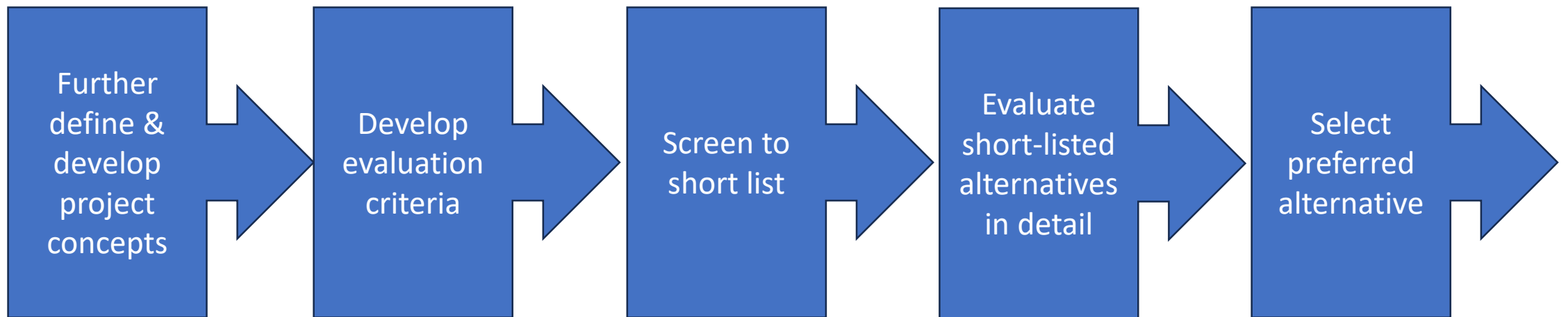
- Electrification of Soulajule Pump Station
- Stream Release Automation
- Phoenix to Bon Tempe
- Water Efficiency
 - Master Plan
 - Water Loss

Combination of projects when complete will increase supply by nearly 1000 AFY

Overview of Work to Date

- Started work on In-District Improvements
- Brought teams on board to develop Conveyance and Storage projects
 - Those teams are refining alternatives identified in the Strategic Water Supply Assessment
 - That work is feeding into CEQA analyses
- Working with Sonoma Water to refine estimates of winter water availability
- Enhancing water system model to help evaluate project options as well as optimize existing system

Process Overview for Conveyance & Storage Projects



Proposed Evaluation Criteria

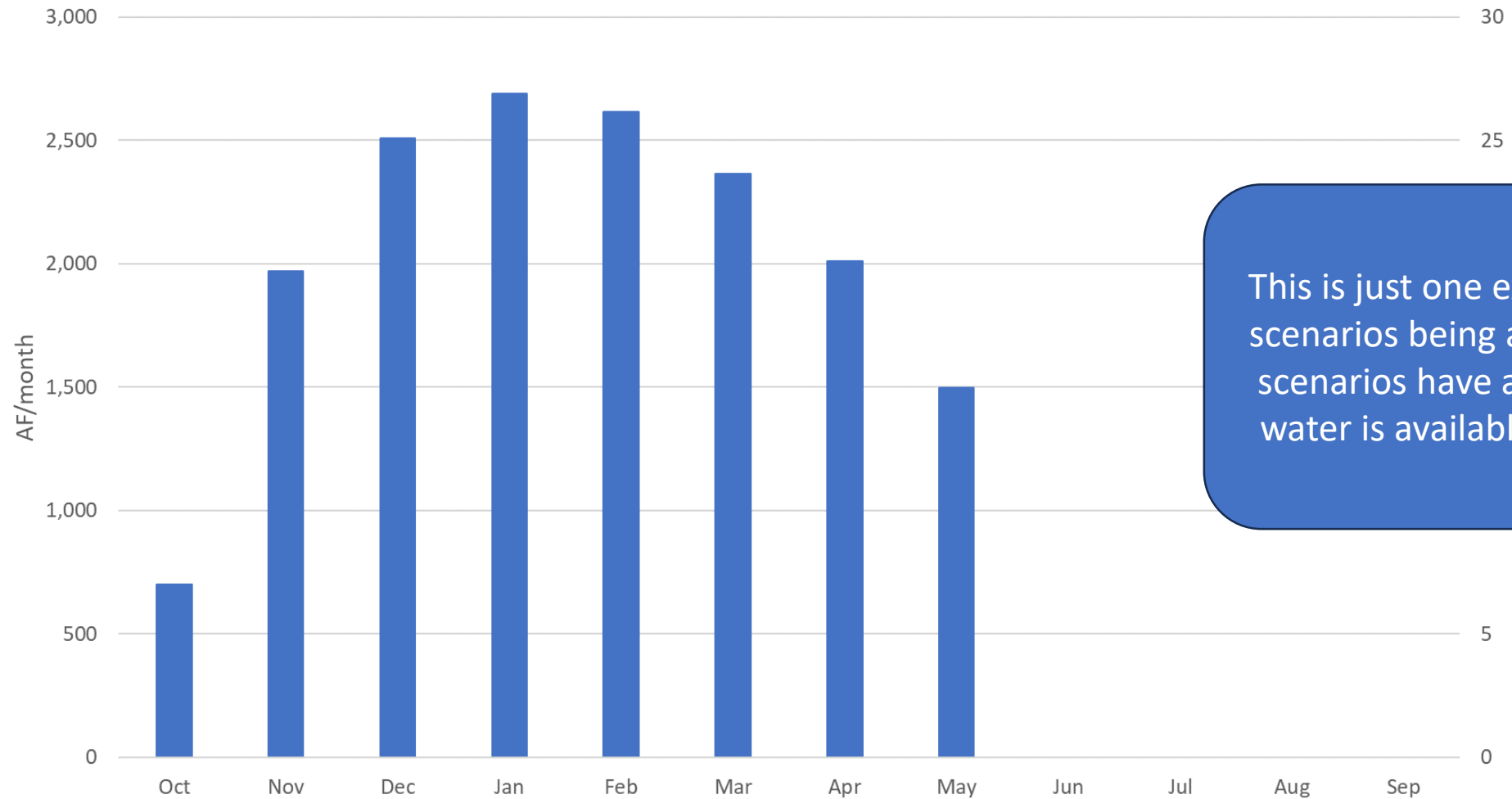
- Water Reliability and Sustainability
- Flexibility and Resiliency
- Schedule and Implementation
- Water Quality
- Environmental and Social Stewardship
- Economic and Financial

In-District Improvements

In System Improvements

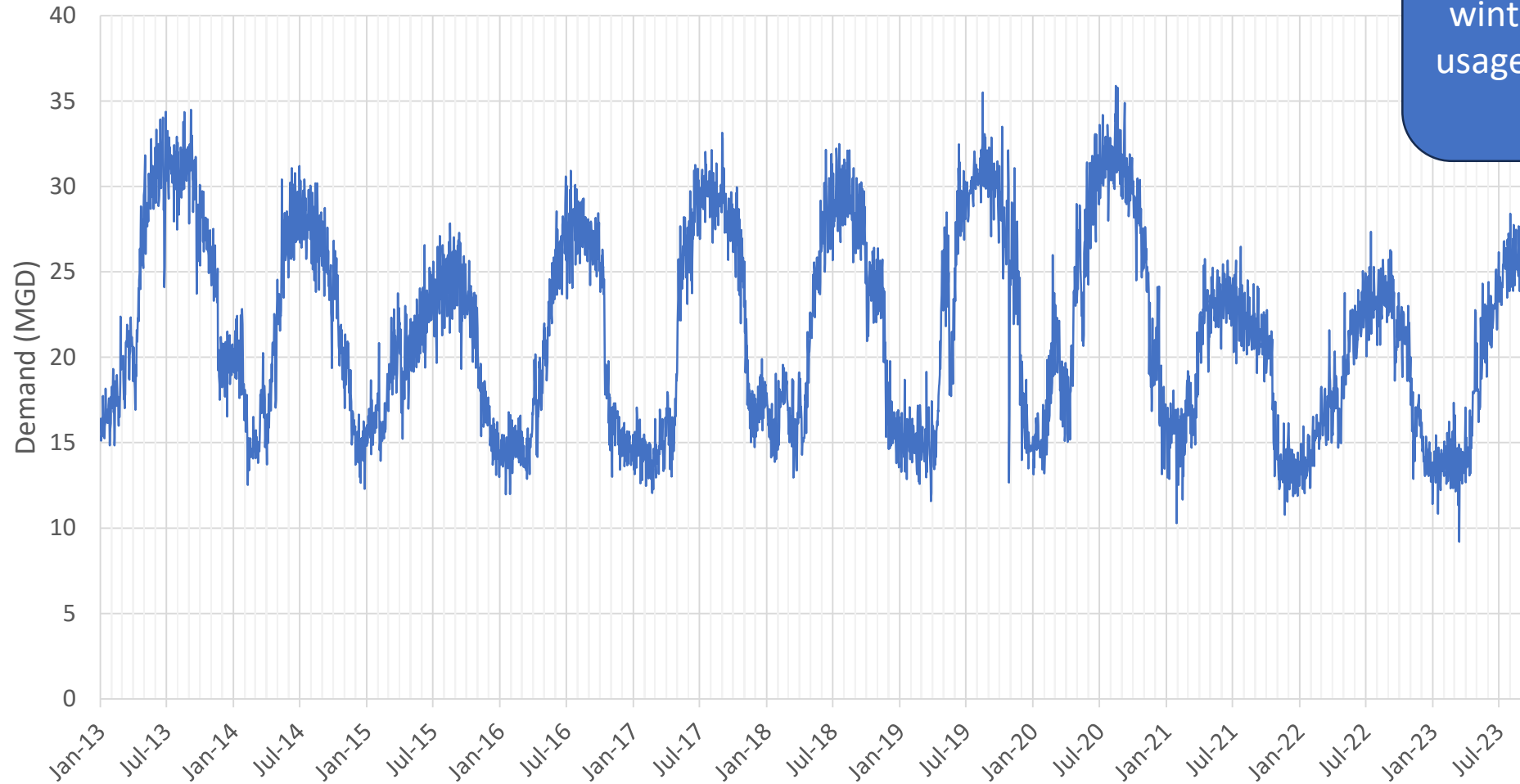
- Improvements within the District's distribution system could facilitate greater use of supplemental water from Sonoma in the winter months
- Availability of supplemental water in dry conditions likely limited to winter
- District demand in winter is limited and infrastructure improvements are needed to maximize use of supplemental water in winter

Winter Water Availability (example)



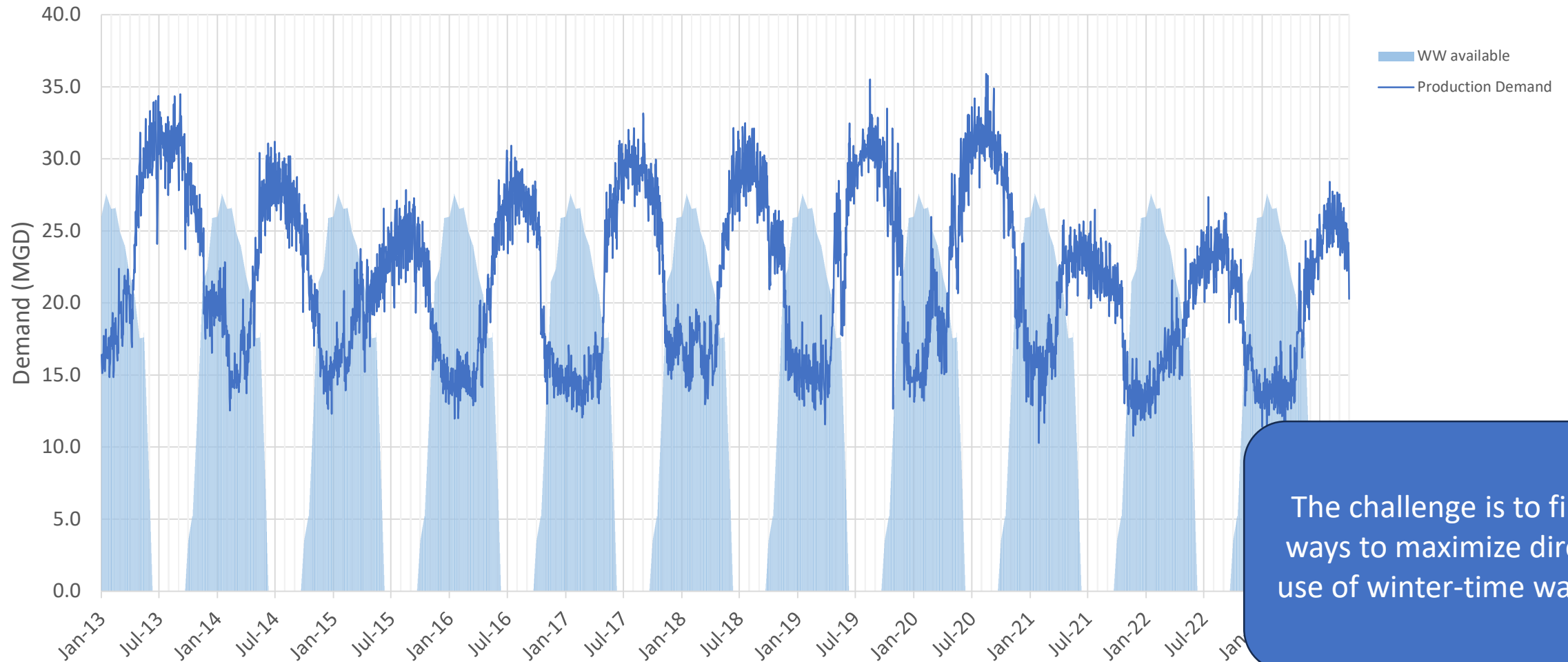
This is just one example of many scenarios being analyzed, but all scenarios have a common trait: water is available in the winter.

System Demands (historic)



Demands drop in the winter as outdoor water usage goes to nearly zero.

Mismatch of supply and demand poses challenges

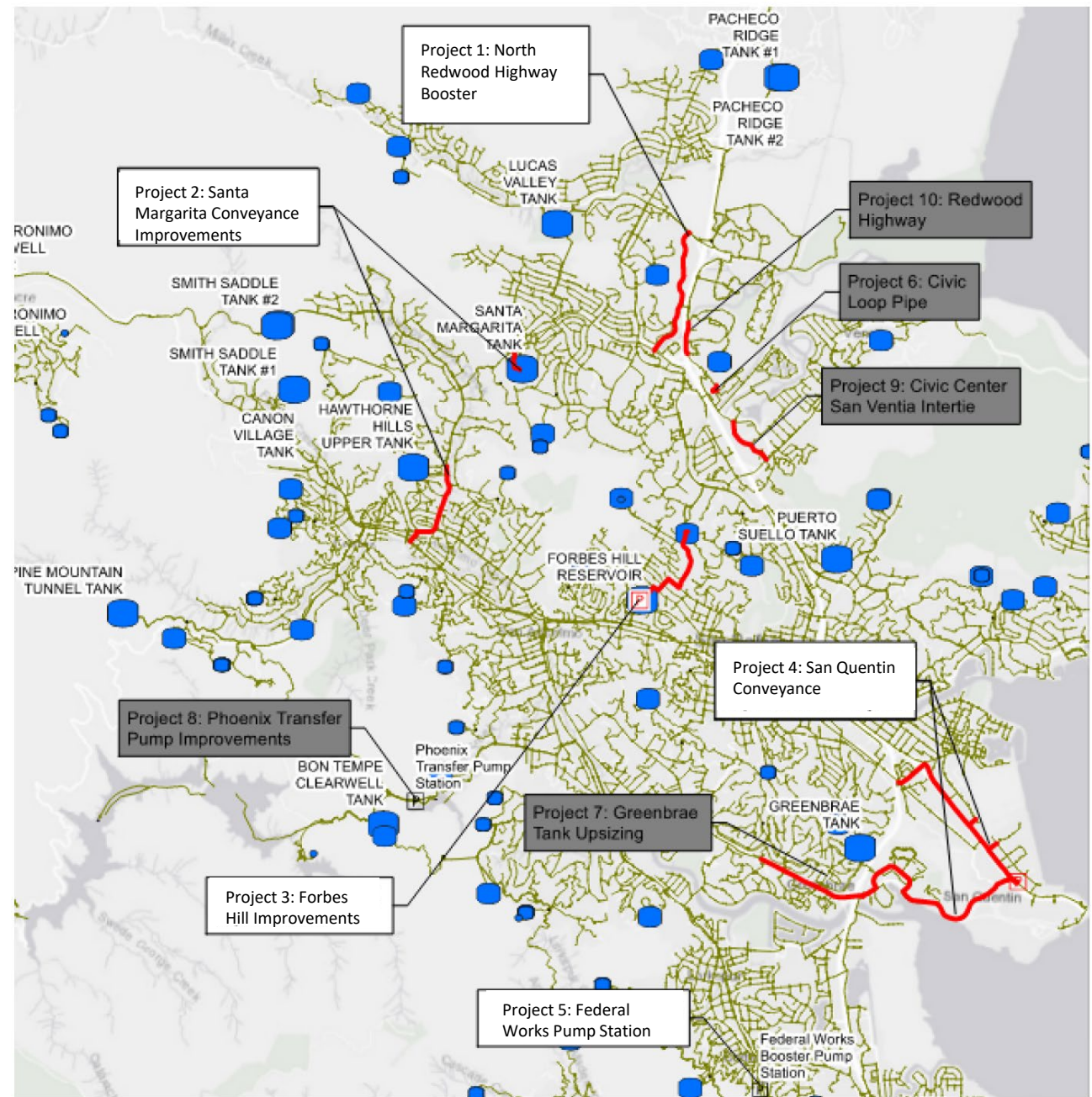


The challenge is to find ways to maximize direct use of winter-time water.

In System Improvements: Concepts

Earlier work identified ways to move water more efficiently in the winter, maximizing ability to directly use “winter water”.

The projects would generally provide additional benefits to system operations, even in non-drought years.



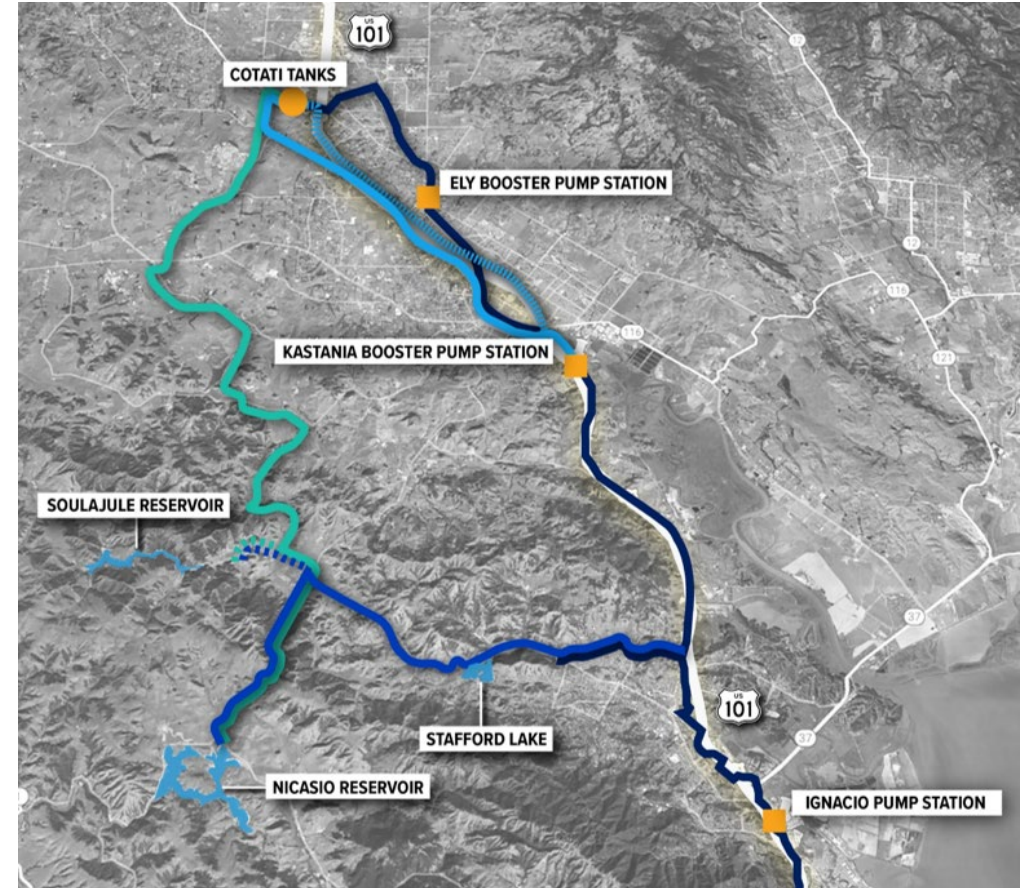
In System Improvements: Considerations

- The In System improvement projects provide benefits in all years including drought years
- The projects provide independent utility regardless of which combination of Water Supply Improvement Projects is done
- Further refinement is needed to select most cost-effective series of projects
- Highest-priority projects are being developed for consideration

Conveyance to Storage

Conveyance Overview

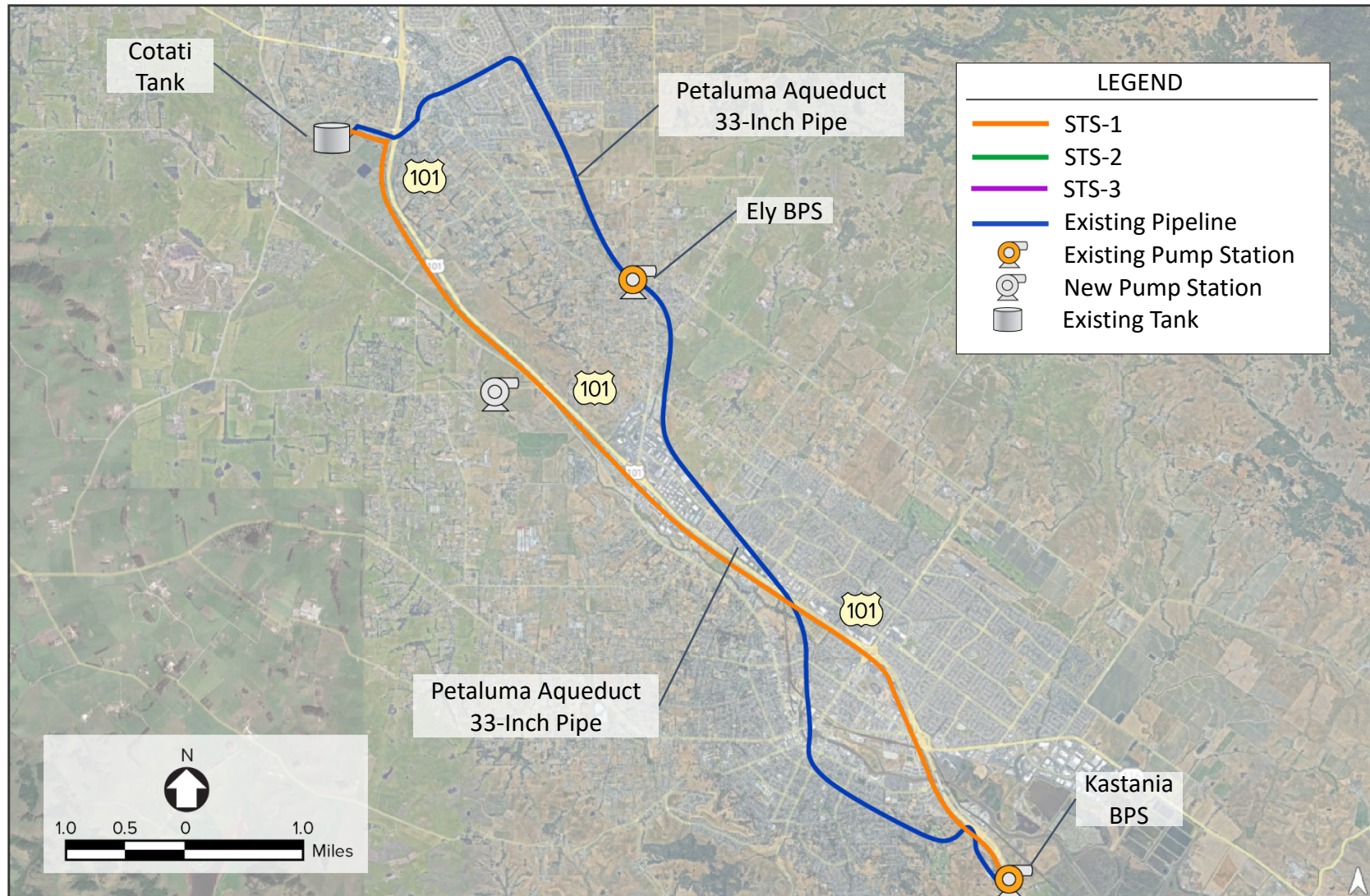
- Goal is to bring more supplemental water during the winter time from Sonoma to Marin
- The various conveyance alternatives seek to move water from a point of connection near Sonoma Water's Cotati Tank site through or around Petaluma and into a Marin Water Reservoir
- Different conveyance alternatives have different alignments, challenges, costs and yield



Project Alternatives

Alternative	Description	Length (miles)
STS-1	Cotati Tanks to Kastania PS along 101 Corridor	10.5
STS-2	Cotati Tanks to Kastania PS through downtown Petaluma	12.1
STS-3	<i>Cotati Tanks to Kastania PS through rural roads</i>	<i>15.5</i>
STAF-1	Stafford Lake to Nicasio Reservoir	8.0
STAF-2	Stafford Lake to Soulajule Reservoir	6.8
STAF-3	<i>Stafford Lake to Nicasio and Soulajule Reservoir</i>	<i>11.0</i>
PETA-1	North Marin Aqueduct to Nicasio Reservoir	13.2
PETA-2	North Marin Aqueduct to Soulajule Reservoir	12.0
PETA-3	<i>North Marin Aqueduct to Nicasio and Soulajule Reservoir</i>	<i>16.2</i>
PETA-4	<i>North Marin Aqueduct to Nicasio and Soulajule Reservoir via San Antonio Road</i>	<i>14.8</i>
COTATI-1	Cotati Tanks to Nicasio Reservoir	24.2
COTATI-2	Cotati Tanks to Soulajule Reservoir	20.5
COTATI-3	<i>Cotati Tanks to Nicasio and Soulajule Reservoir</i>	<i>25.9</i>

Southern Transmission System (STS)



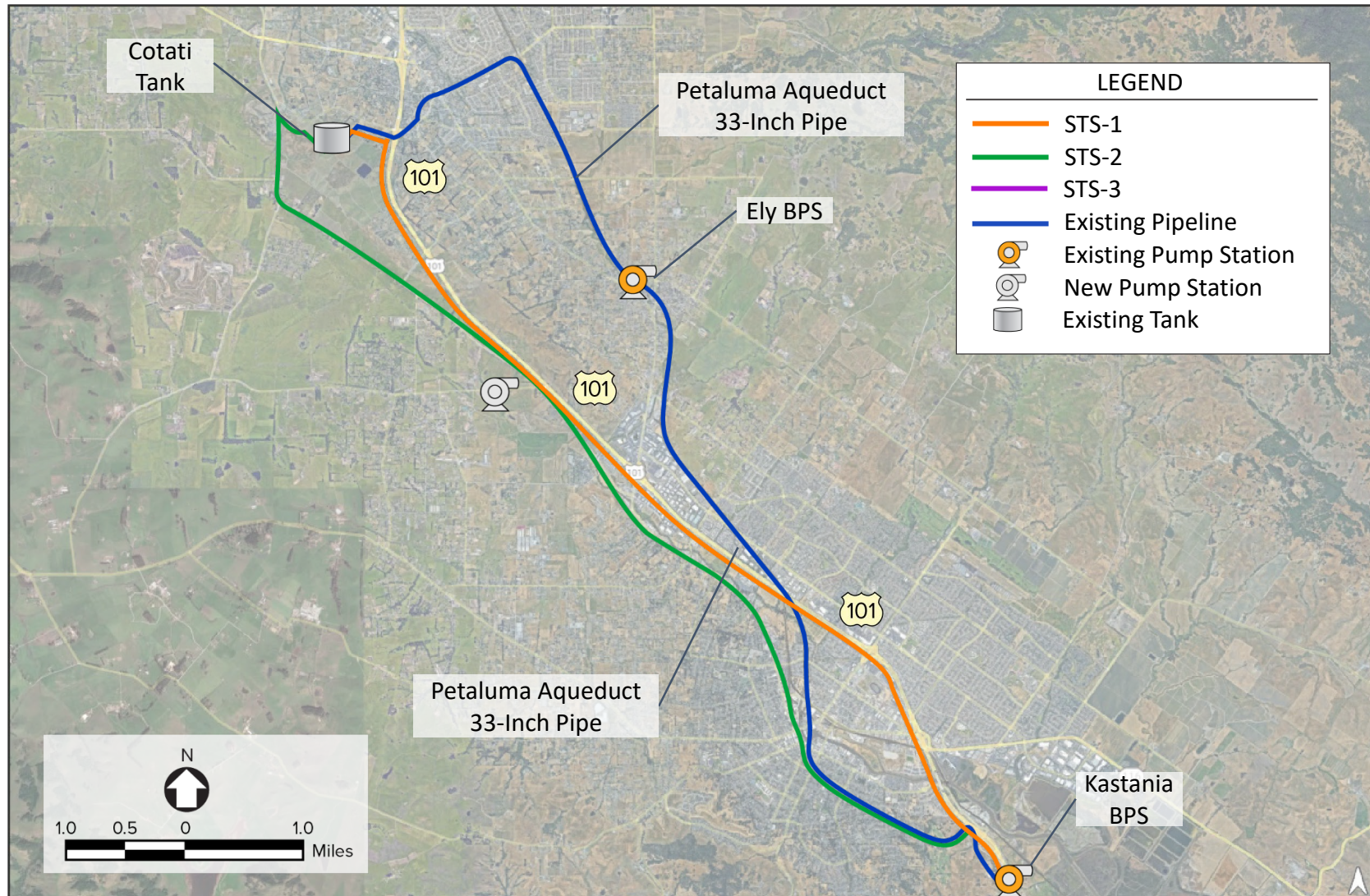
Advantages:

- Reduces high velocities and flow constrictions in the Petaluma Aqueduct
- Increases system redundancy

Disadvantages:

- Does not convey water to storage
- Does not fix constrictions downstream of Kastania PS
- Challenging pipeline corridor(s)

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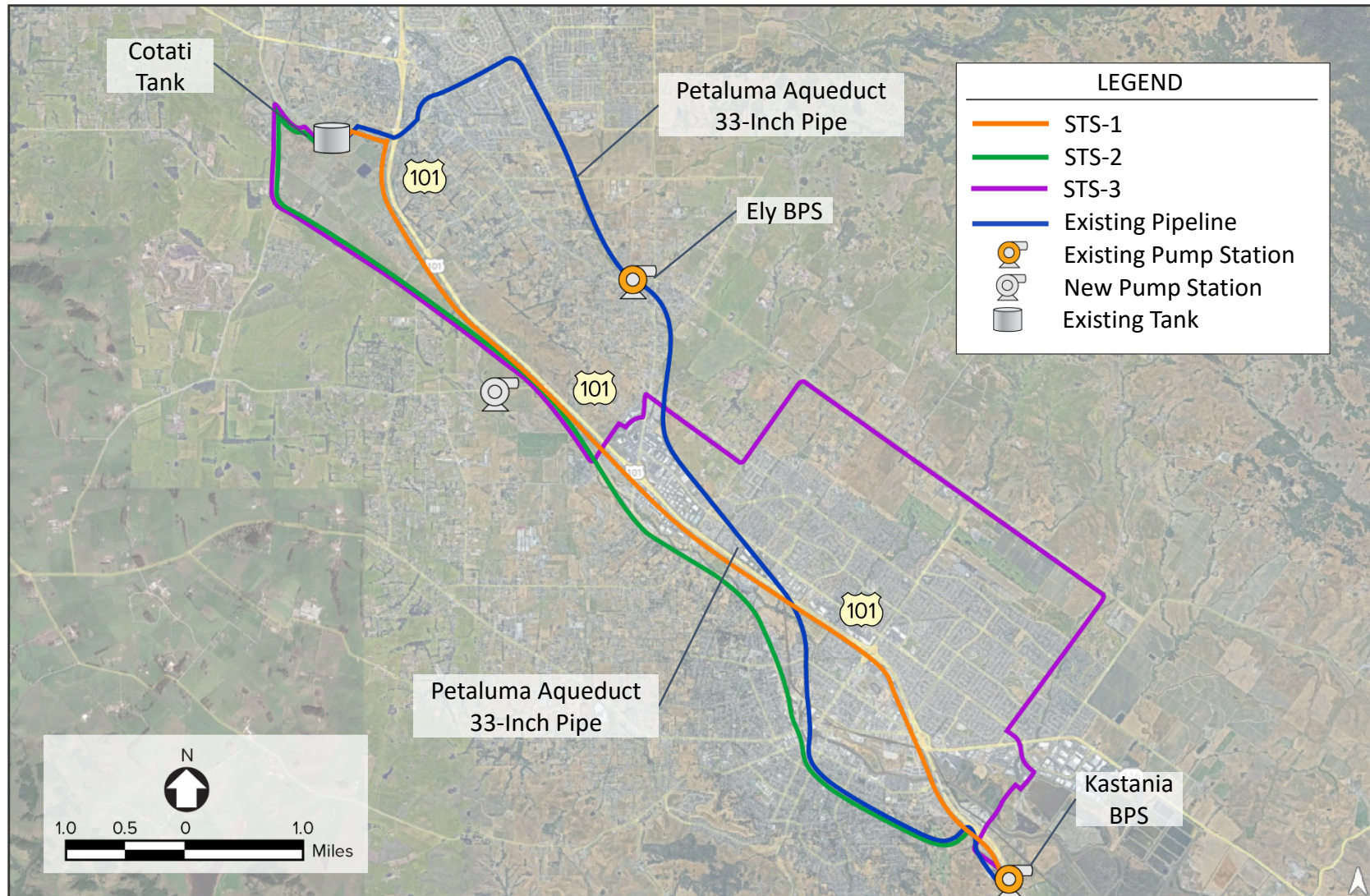
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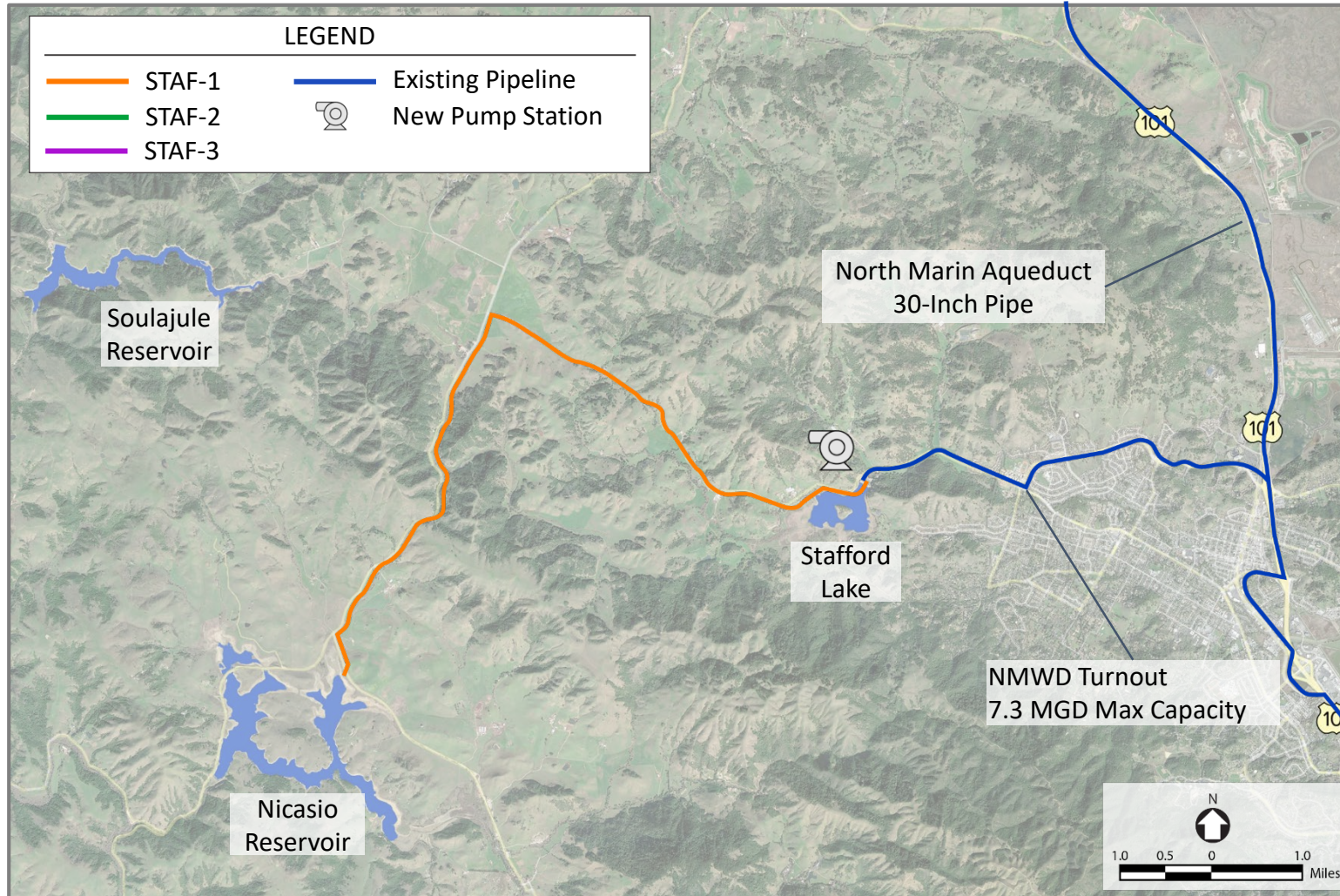
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Stafford Transmission System (STAF)



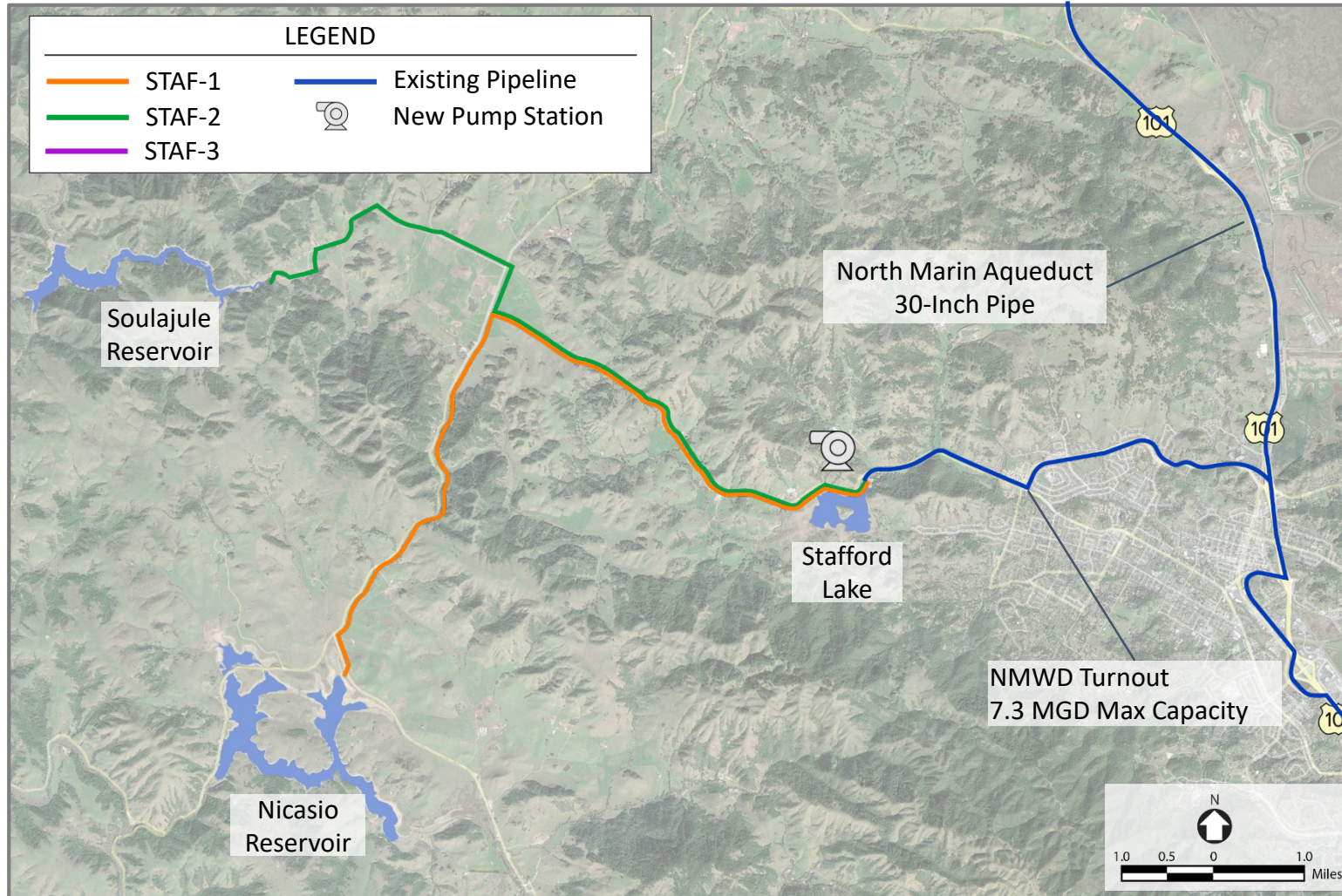
Advantages:

- Conveys water to storage reservoirs
- Utilizes existing infrastructure
 - Existing infrastructure has adequate capacity in winter

Disadvantages:

- Water supply benefit limited by existing NMWD pipeline
 - Max capacity of 7.3 mgd
 - Capacity will be reduced when NMWD uses pipeline
- Requires agreement with NMWD

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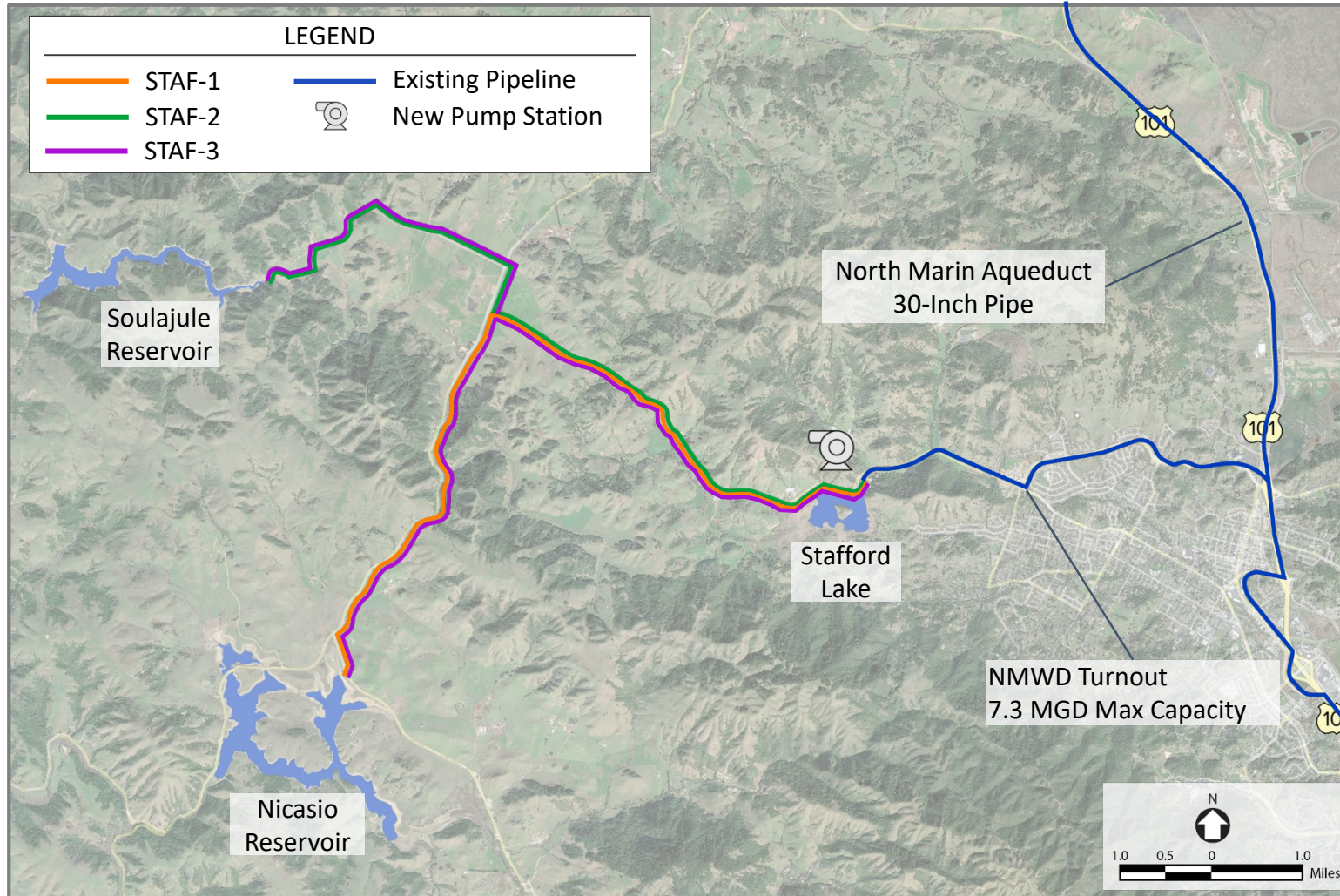
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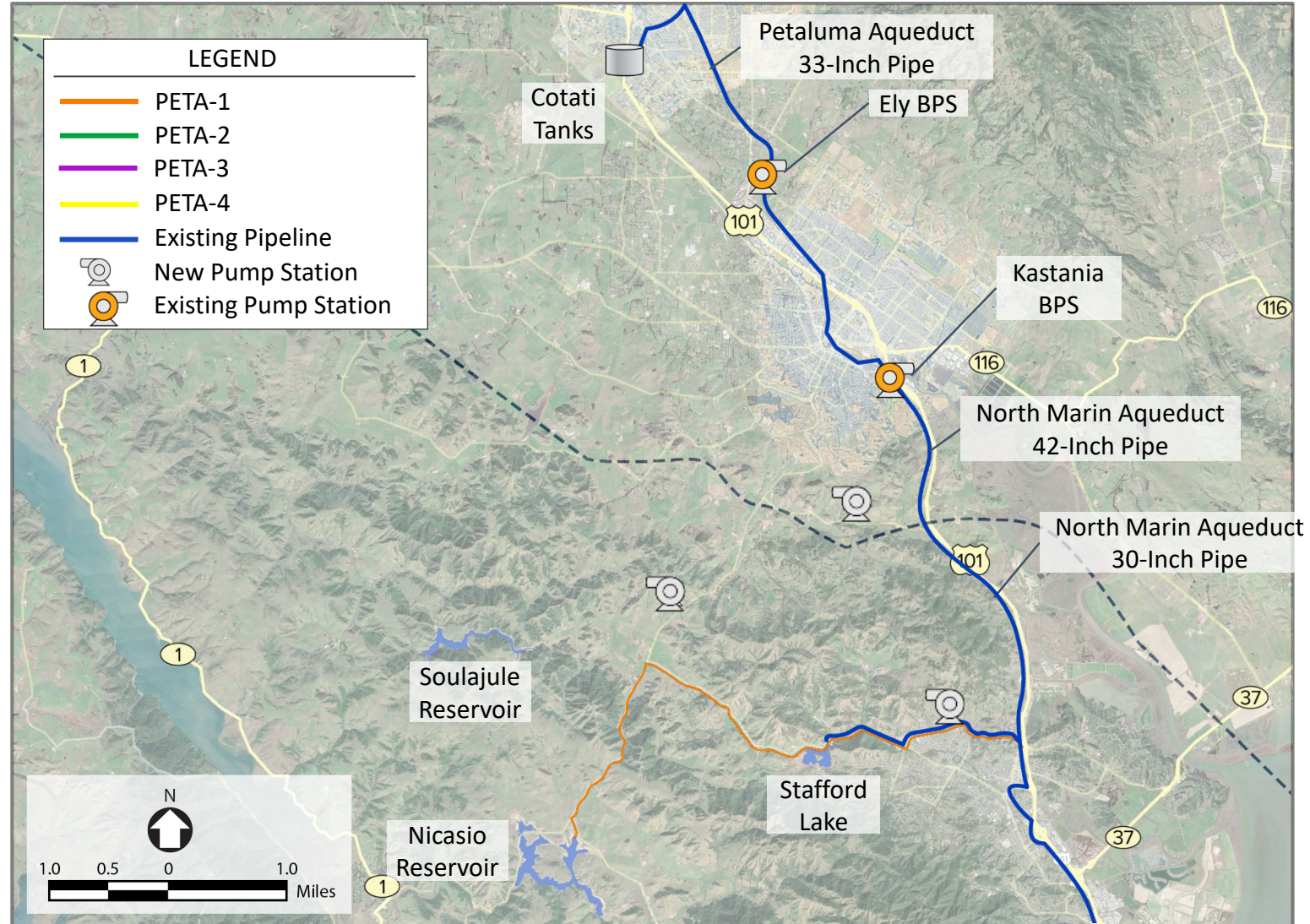
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Petaluma Aqueduct System (PETA)



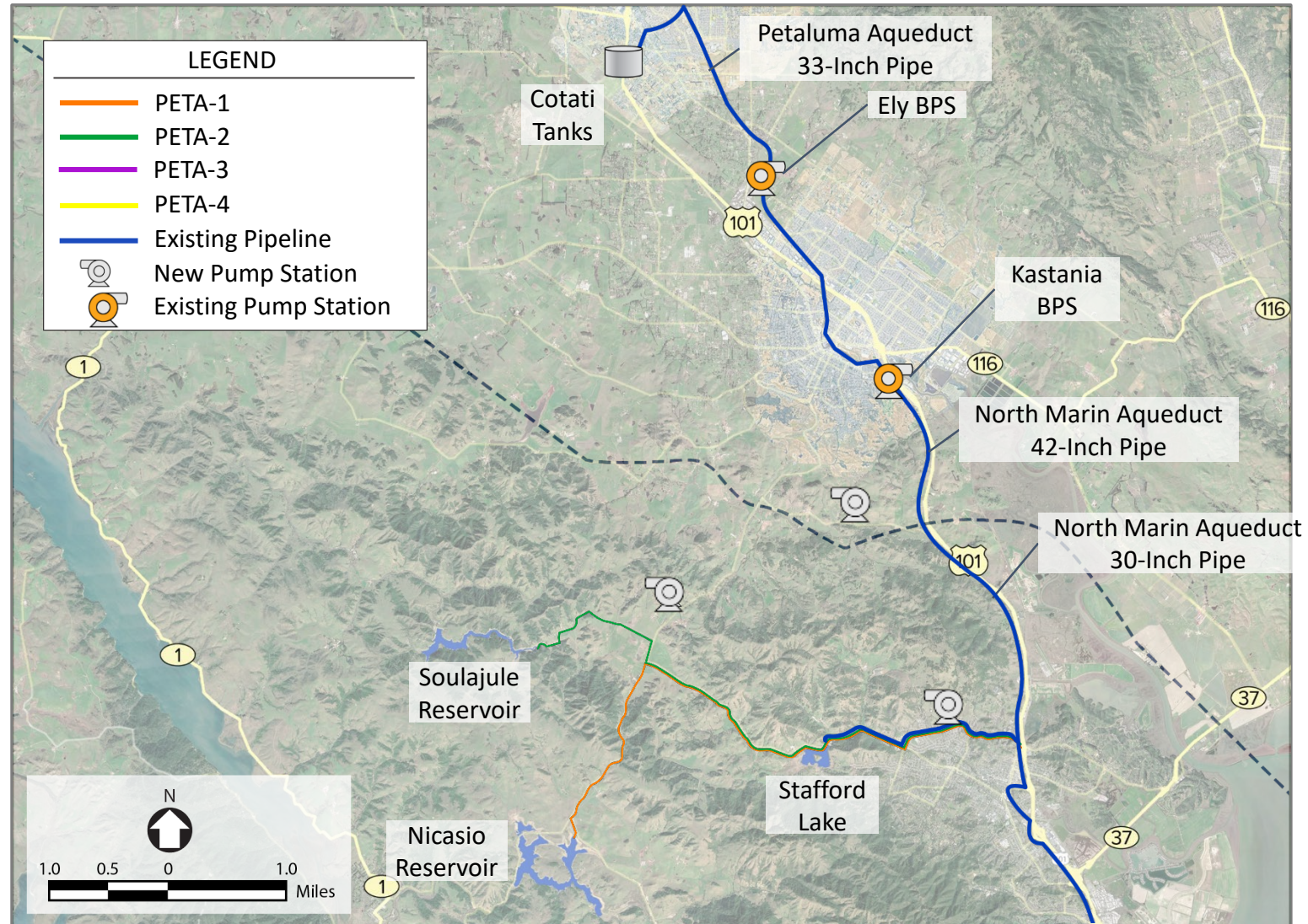
Advantages:

- Conveys water to storage reservoirs
- Utilizes existing infrastructure
- Higher water supply benefit compared to STAF alternatives

Disadvantages:

- Upstream improvements also required depending on desired water supply

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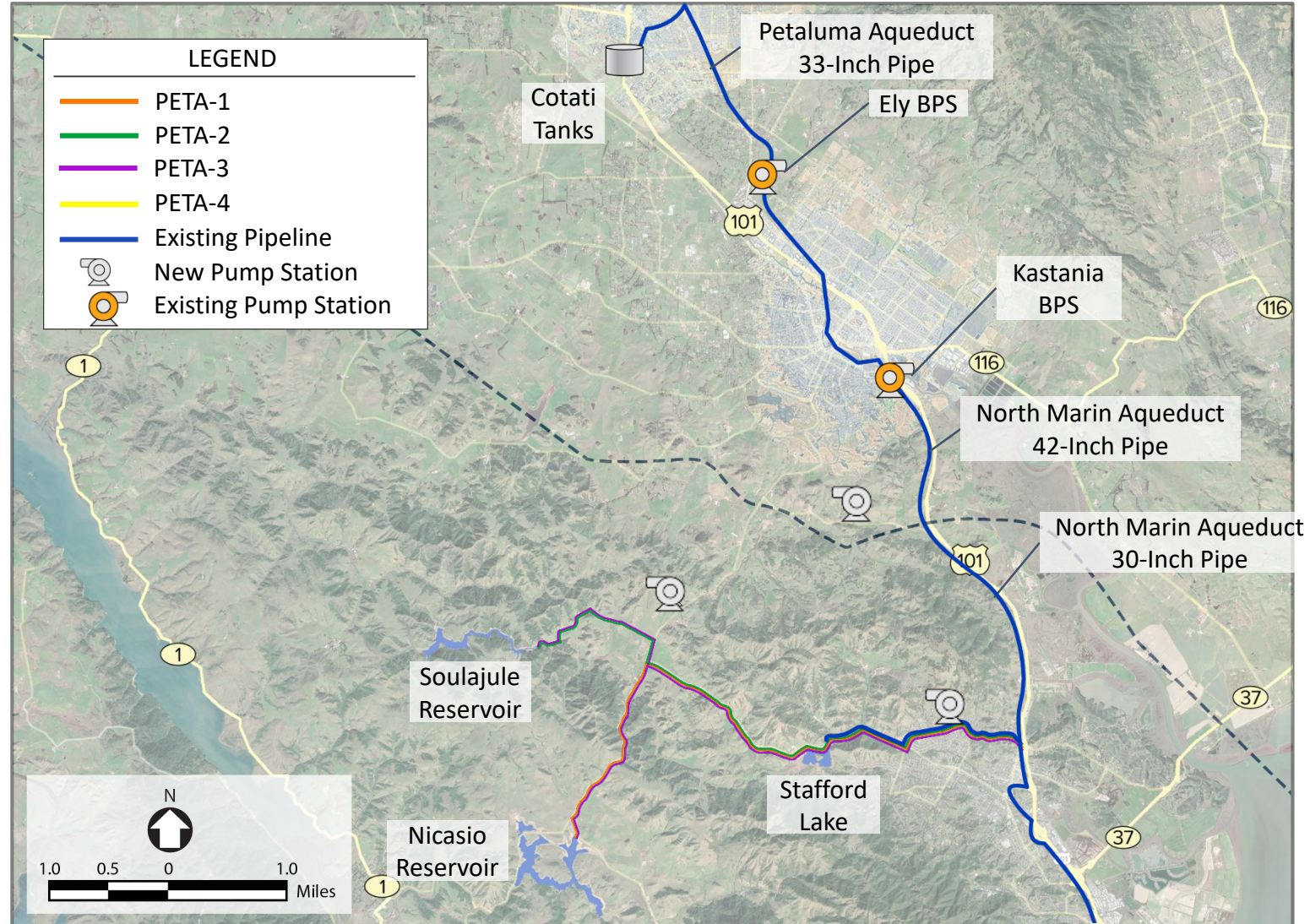
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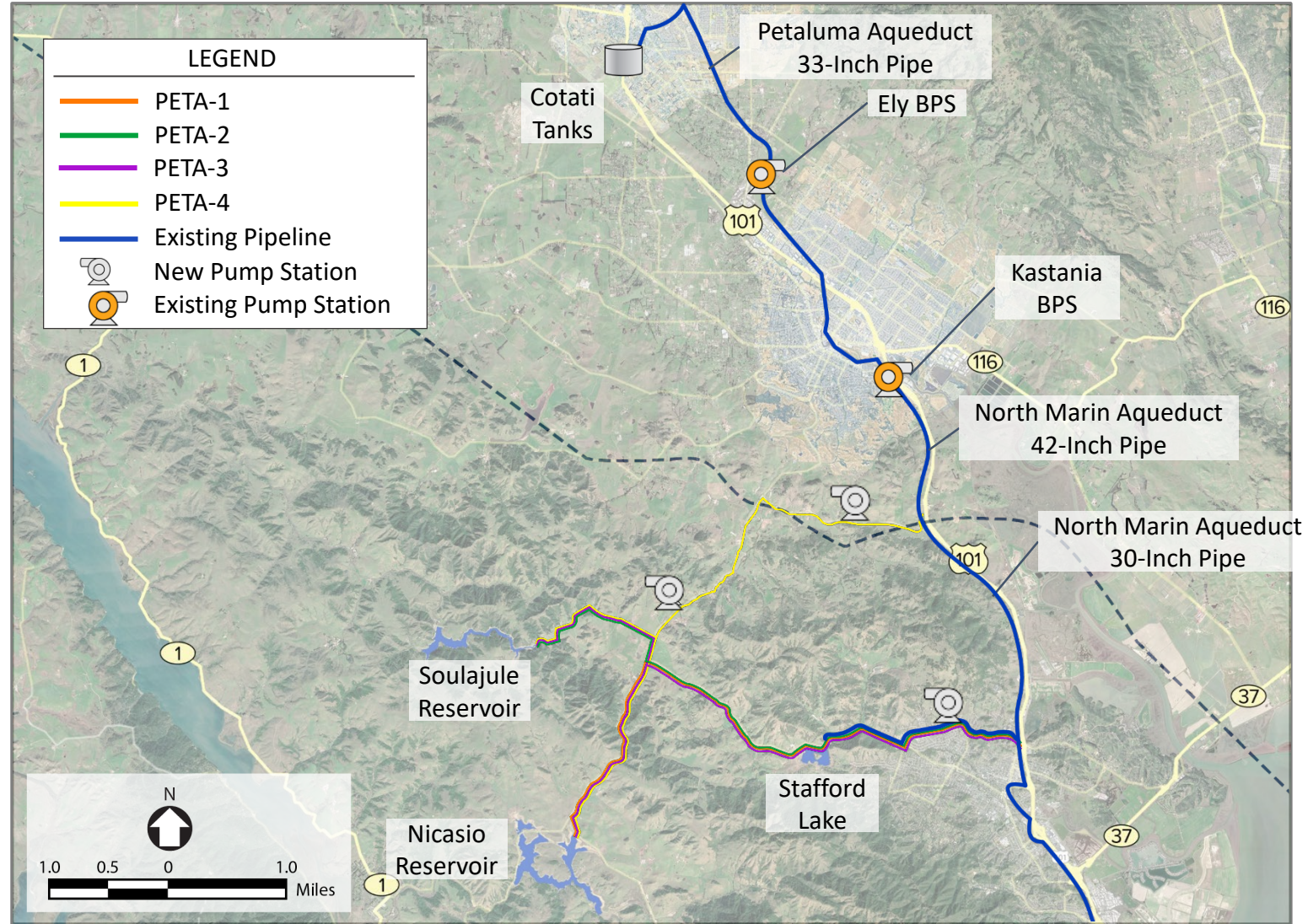
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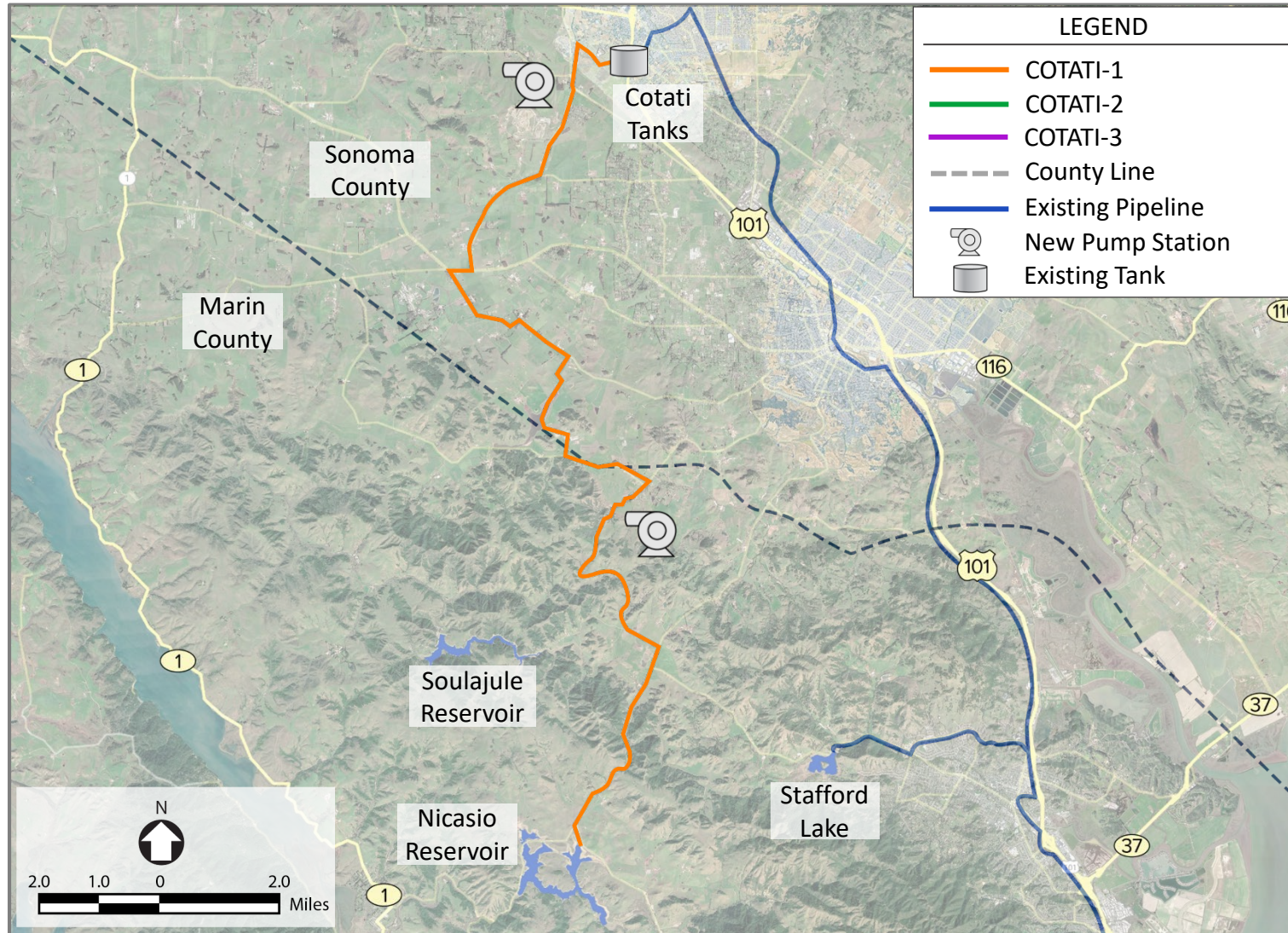
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Cotati Transmission System (COTATI)



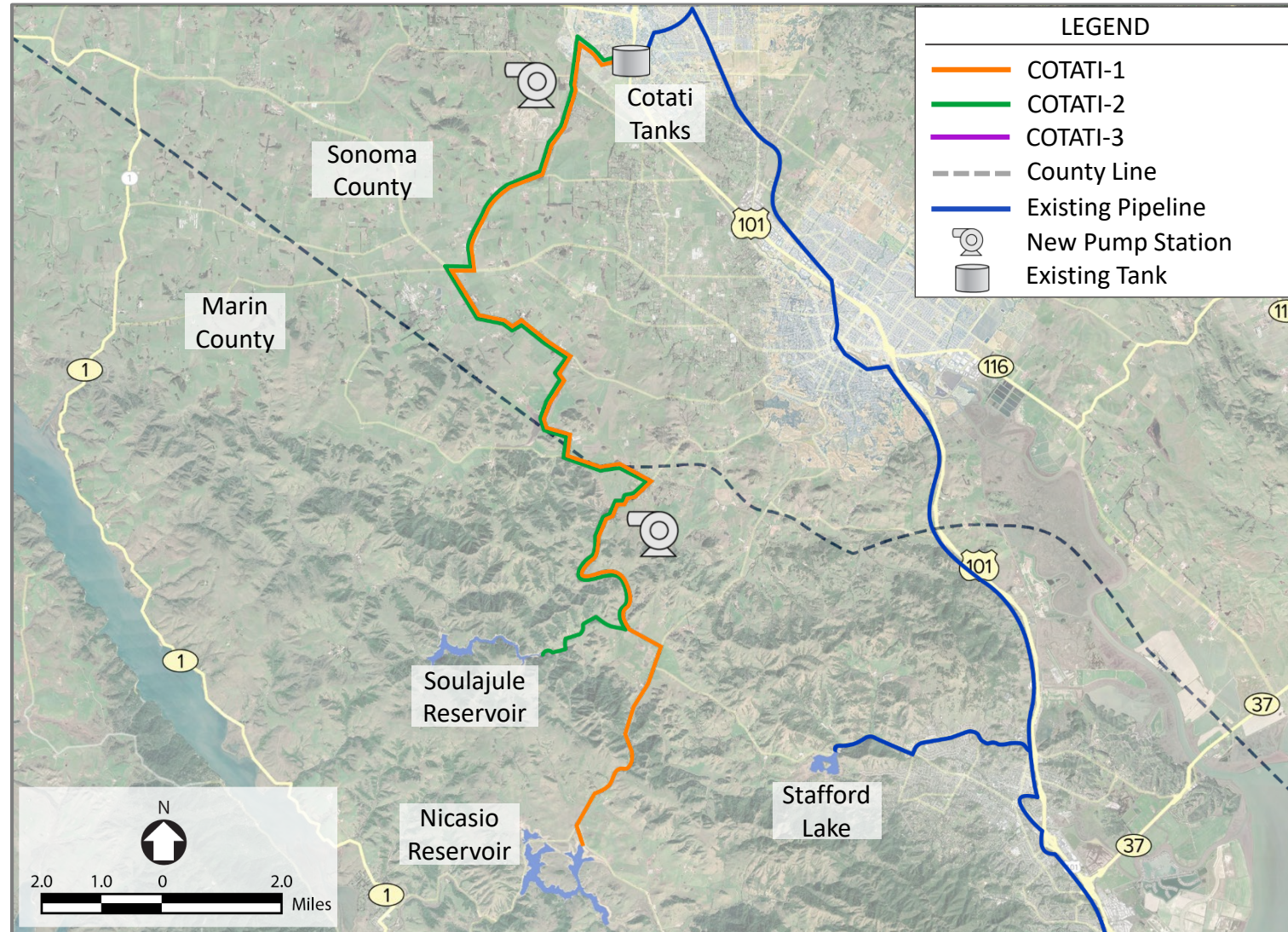
Advantages:

- Conveys water to storage reservoirs
- Water supply benefit not limited by existing infrastructure
- Provides system redundancy

Disadvantages:

- Utilizes no existing MMWD infrastructure
- Additional pipeline and pump station infrastructure required

Cotati Transmission System (COTATI)



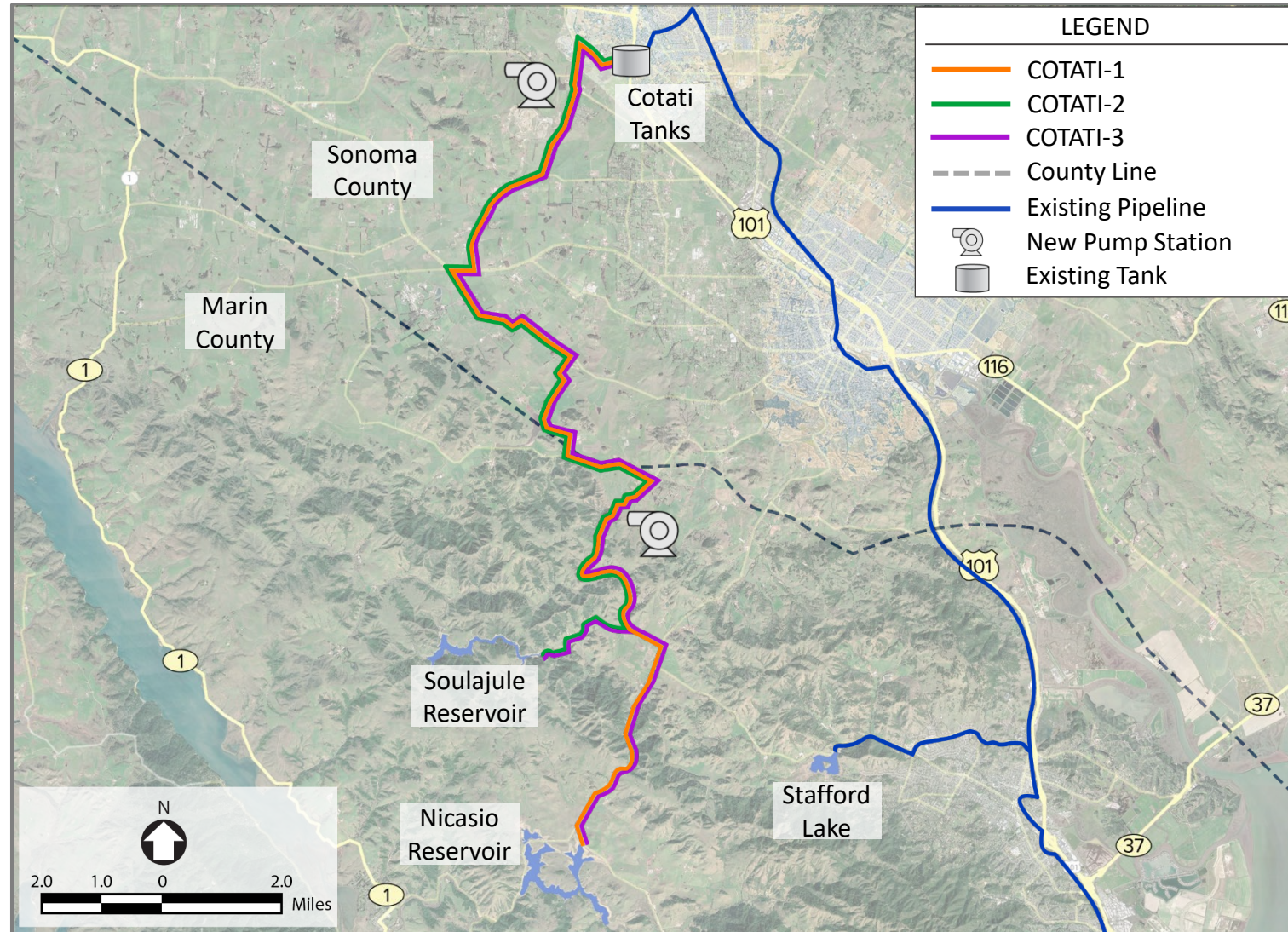
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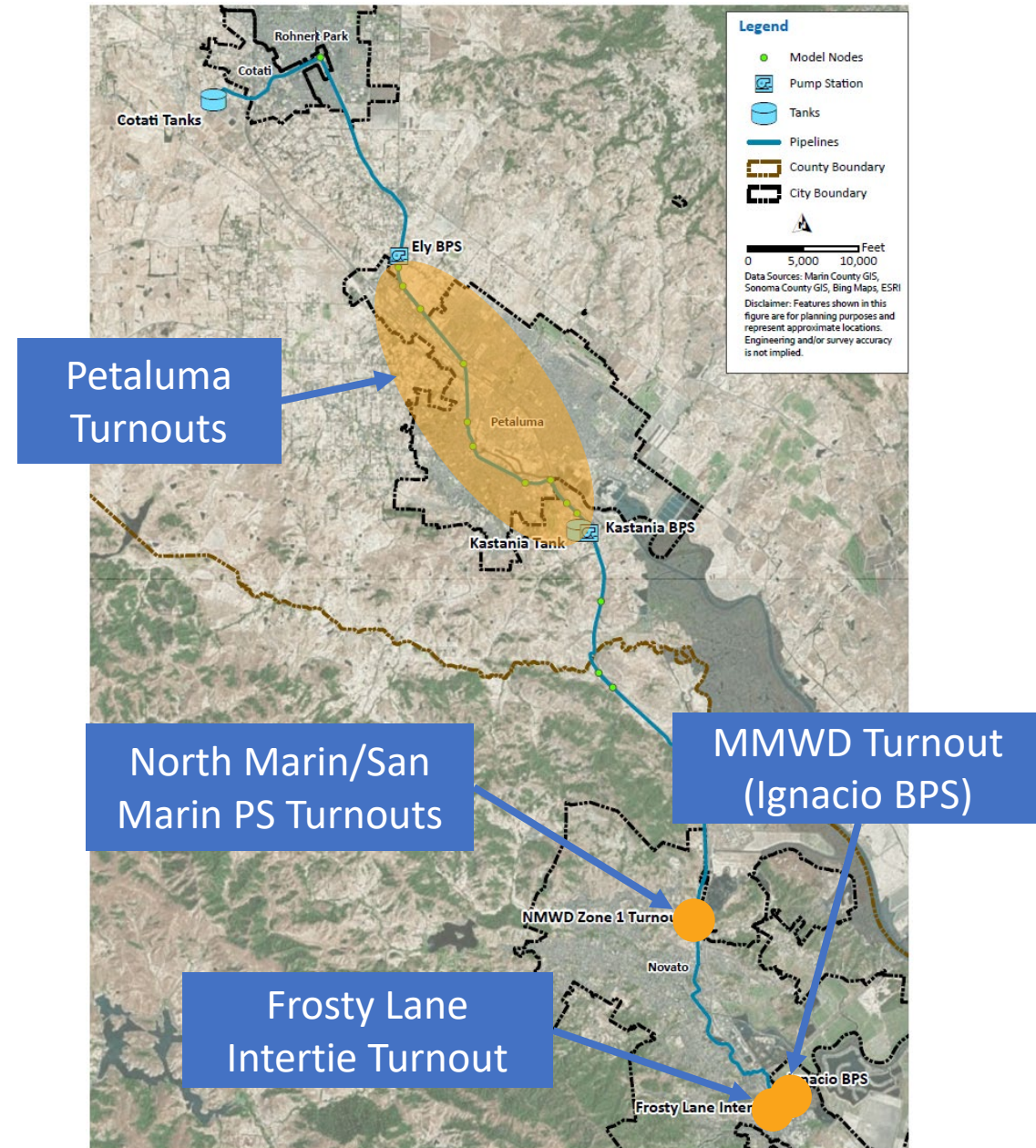
Disadvantages:

- Utilizes no existing MMWD infrastructure
- Additional pipeline and pump station infrastructure required

High level hydraulic model of alternatives

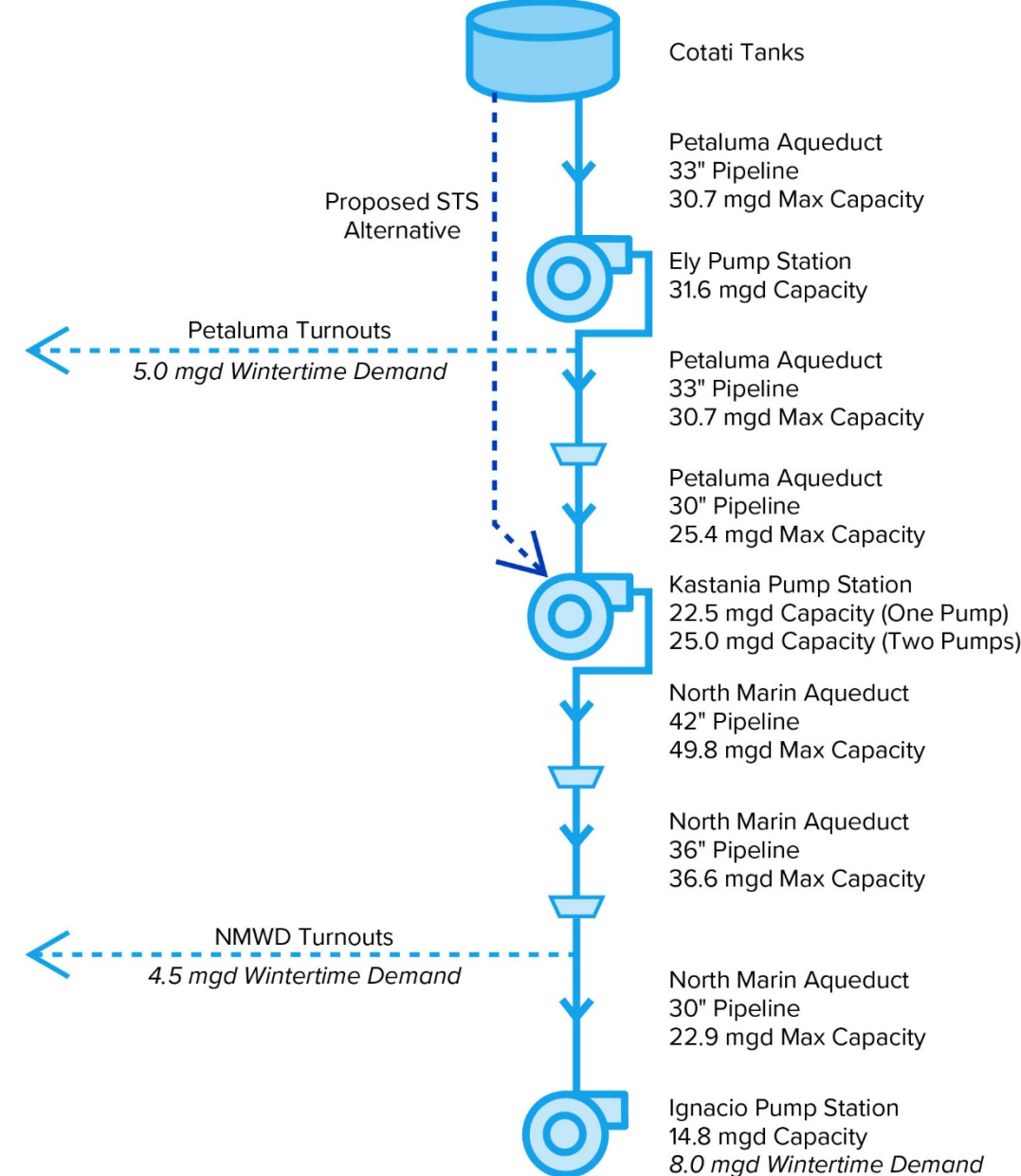
Model considers:

- Existing transmission system
- Turnouts
 - Petaluma
 - North Marin/San Marin PS
 - Frosty Lane Intertie
 - Ignacio BPS
- Wintertime demands



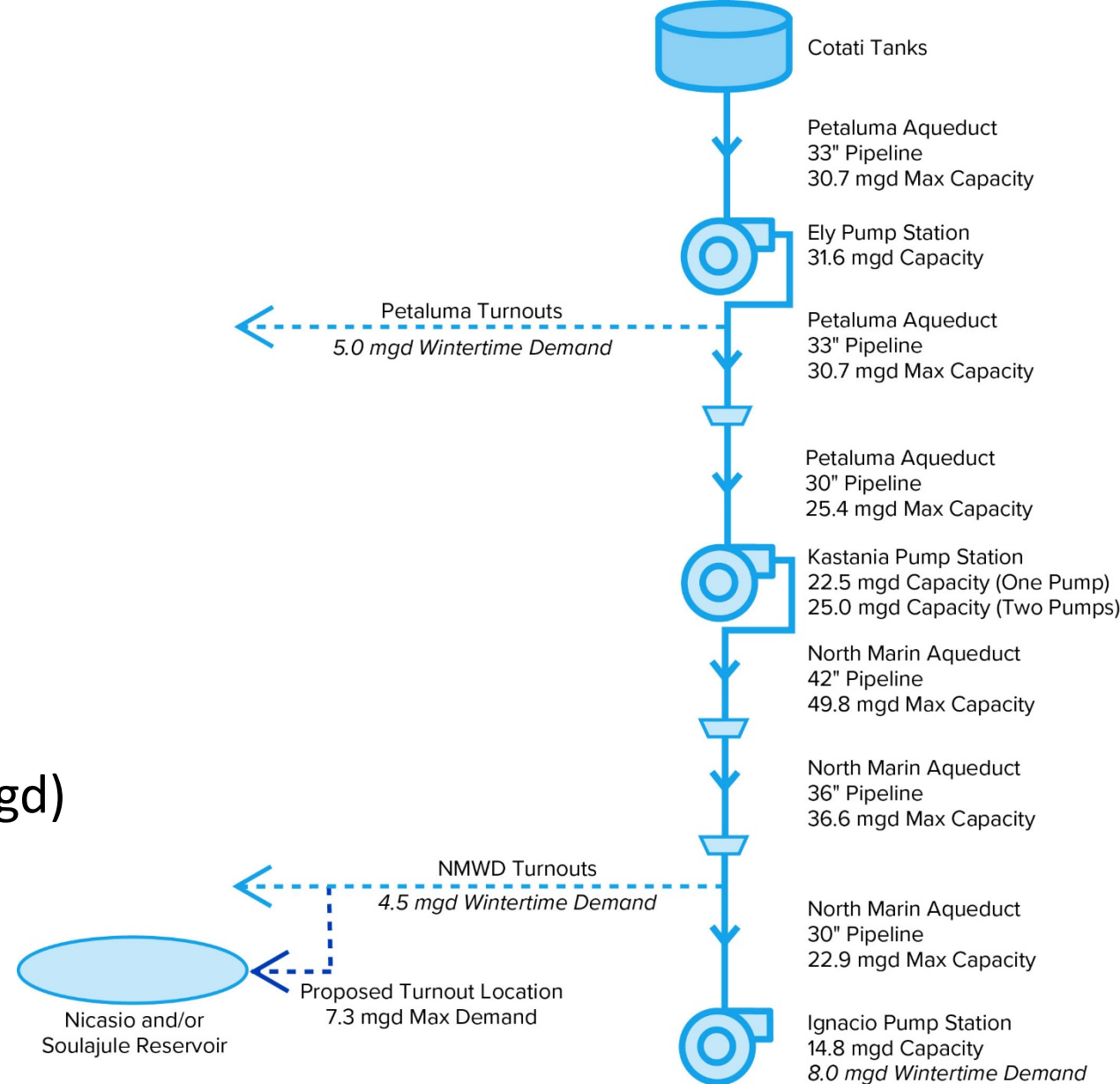
Southern Transmission System (STS)

- Alternatives:
 - STS-1
 - STS-2
 - STS-3
- System Demand = 17.5 mgd (Winter)
- Additional Capacity = 0.0 mgd
- STS provides reliability

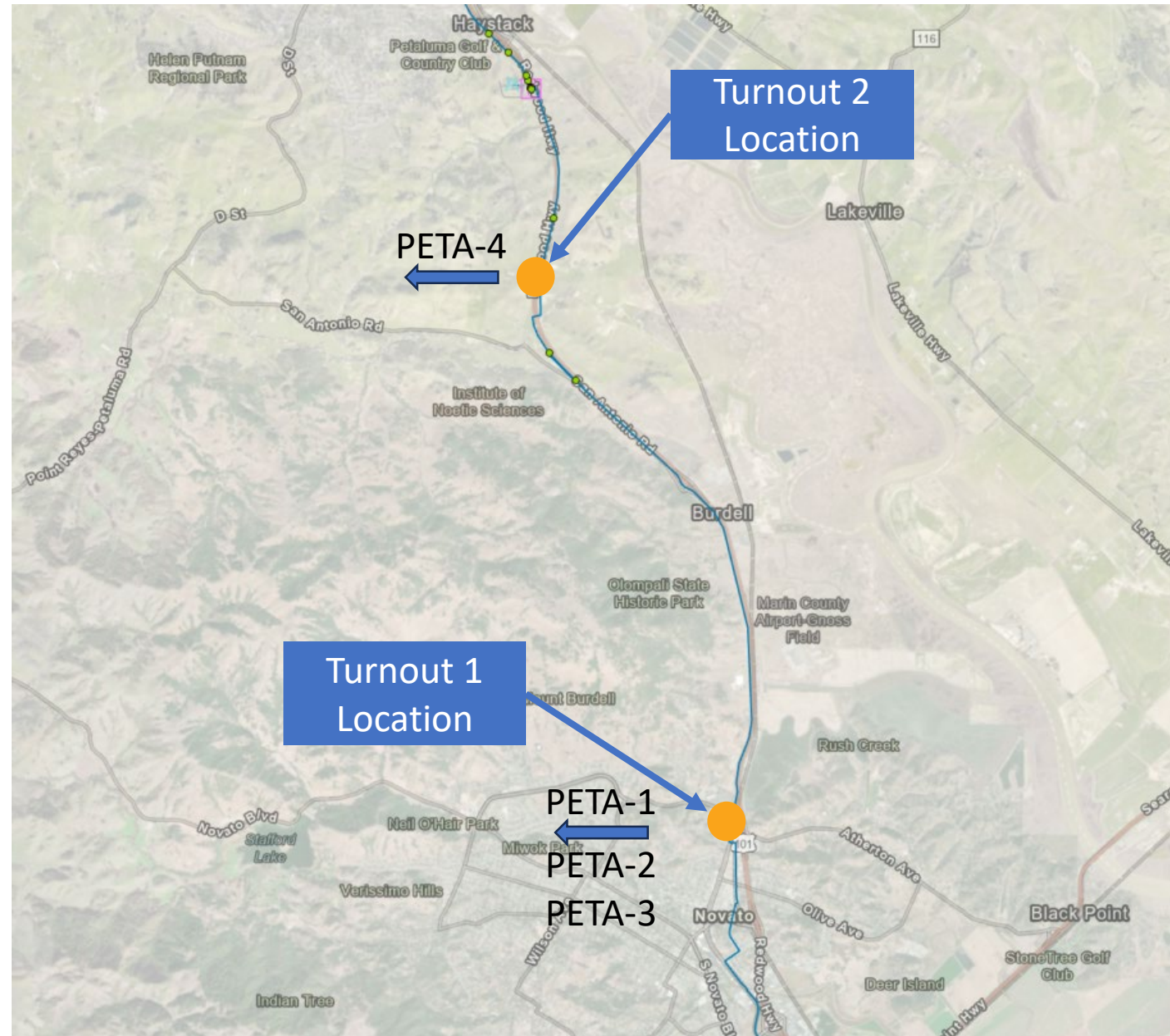


Stafford Transmission System (STAF)

- Alternatives:
 - STAF-1
 - STAF-2
 - STAF-3
- System Demand = 17.5 mgd (Winter)
- Additional Capacity = 2.8 mgd (7.3 mgd)

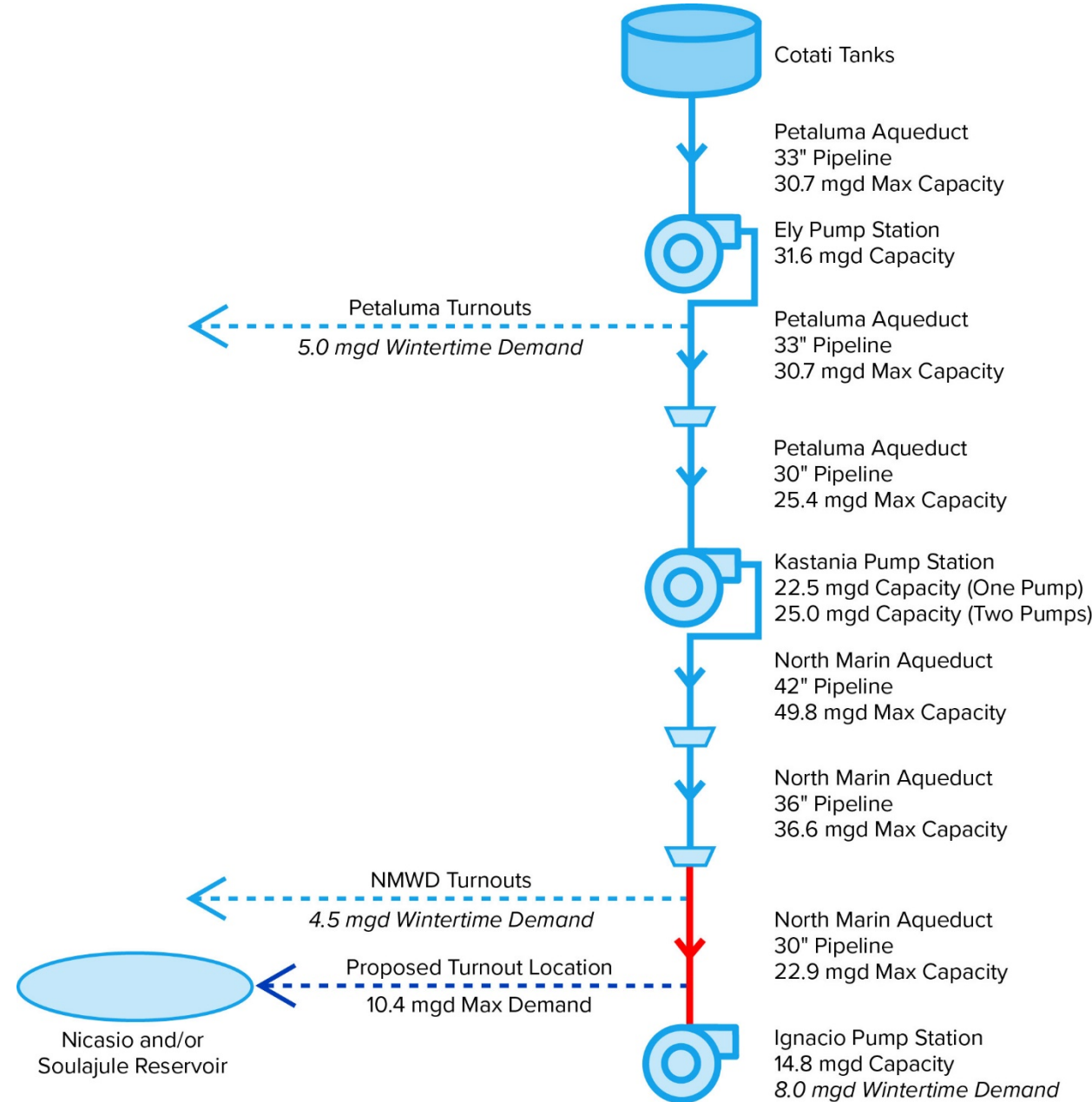


Model scenarios evaluate hydraulic impacts



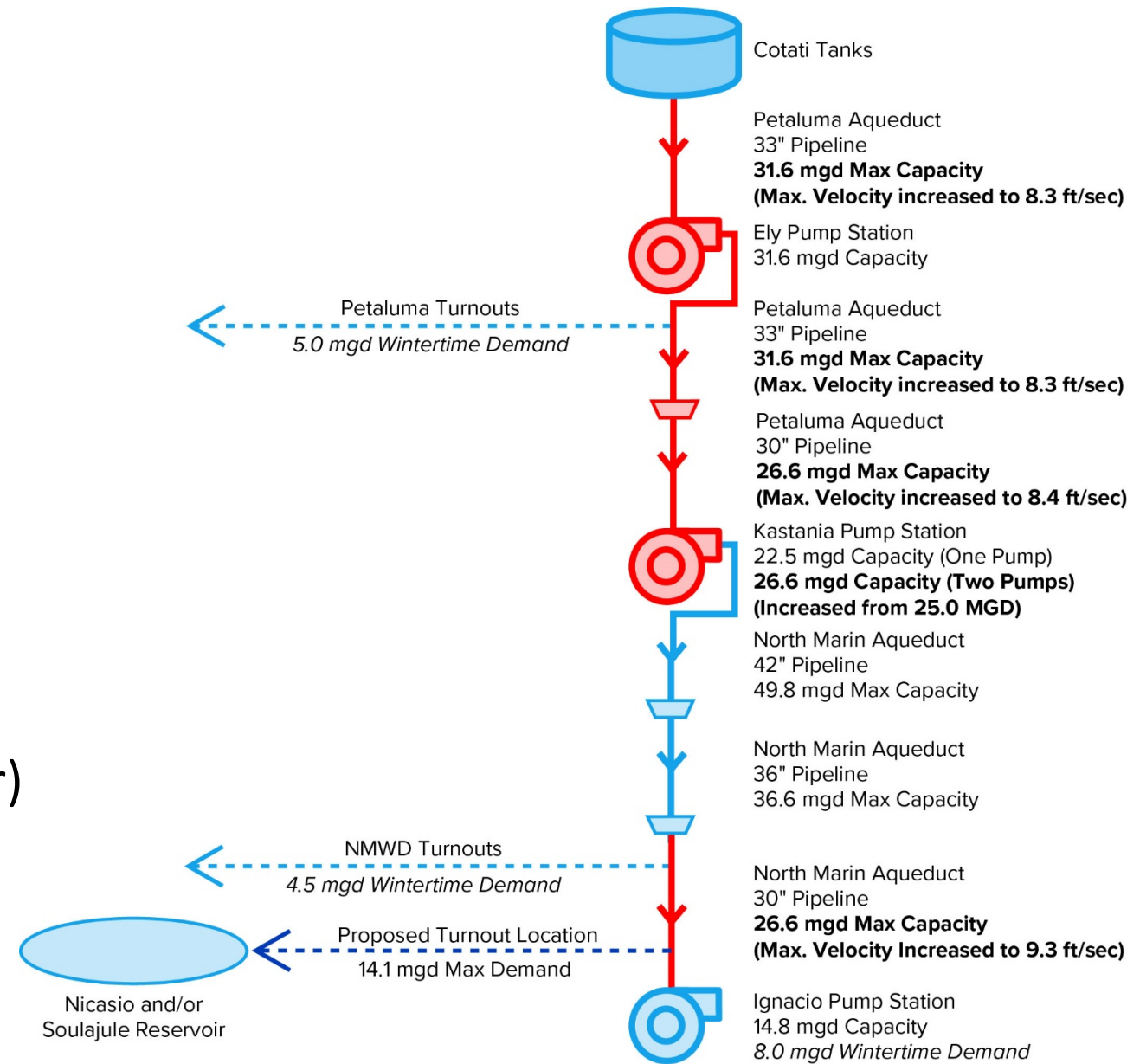
Petaluma Transmission System (PETA)

- Turnout 1 Location (Near NMWD)
- Alternatives:
 - PETA-1
 - PETA-2
 - PETA-3
- System Demand = 17.5 mgd (Winter)
- Additional Capacity = 10.4 mgd



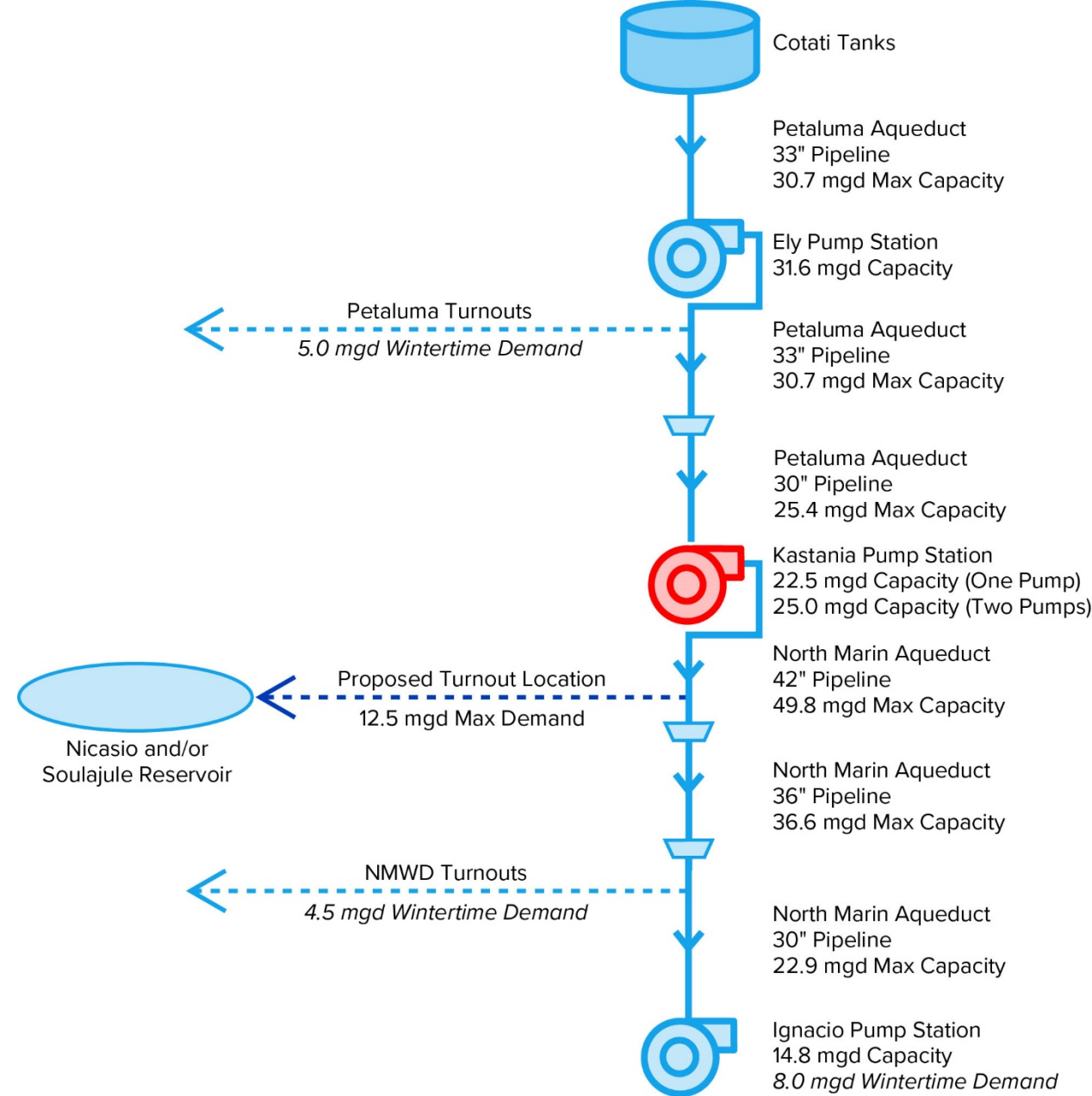
Petaluma Transmission System (PETA)

- Turnout 1 Location (Near NMWD)
- Alternatives:
 - PETA-1
 - PETA-2
 - PETA-3
- System Demand = 17.5 mgd (Winter)
- Additional Capacity = 14.1 mgd



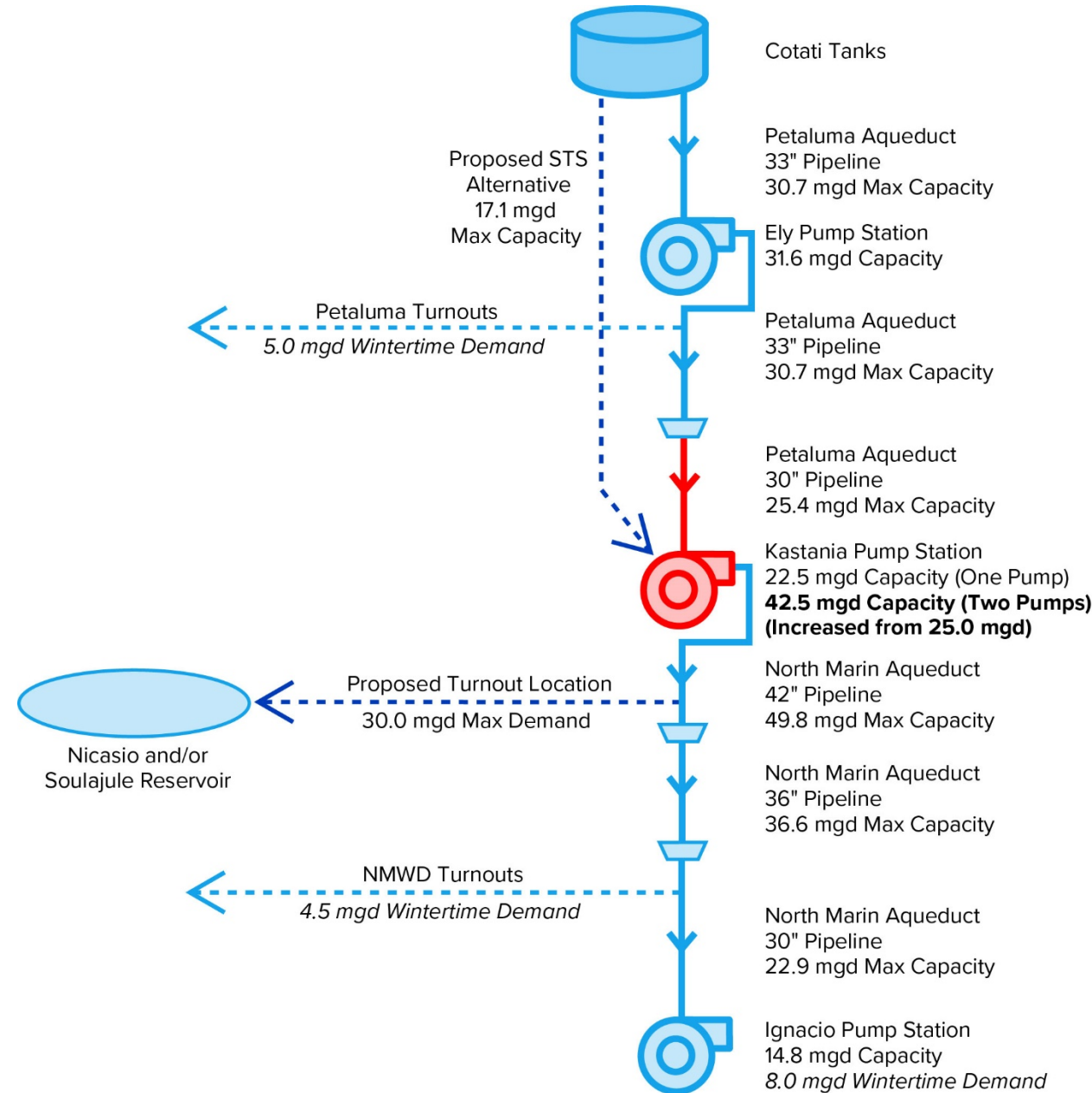
Petaluma Transmission System (PETA)

- Turnout 2 Location
- Alternatives:
 - PETA-4
- System Demand = 17.5 mgd (Winter)
- Additional Capacity = 12.5 mgd



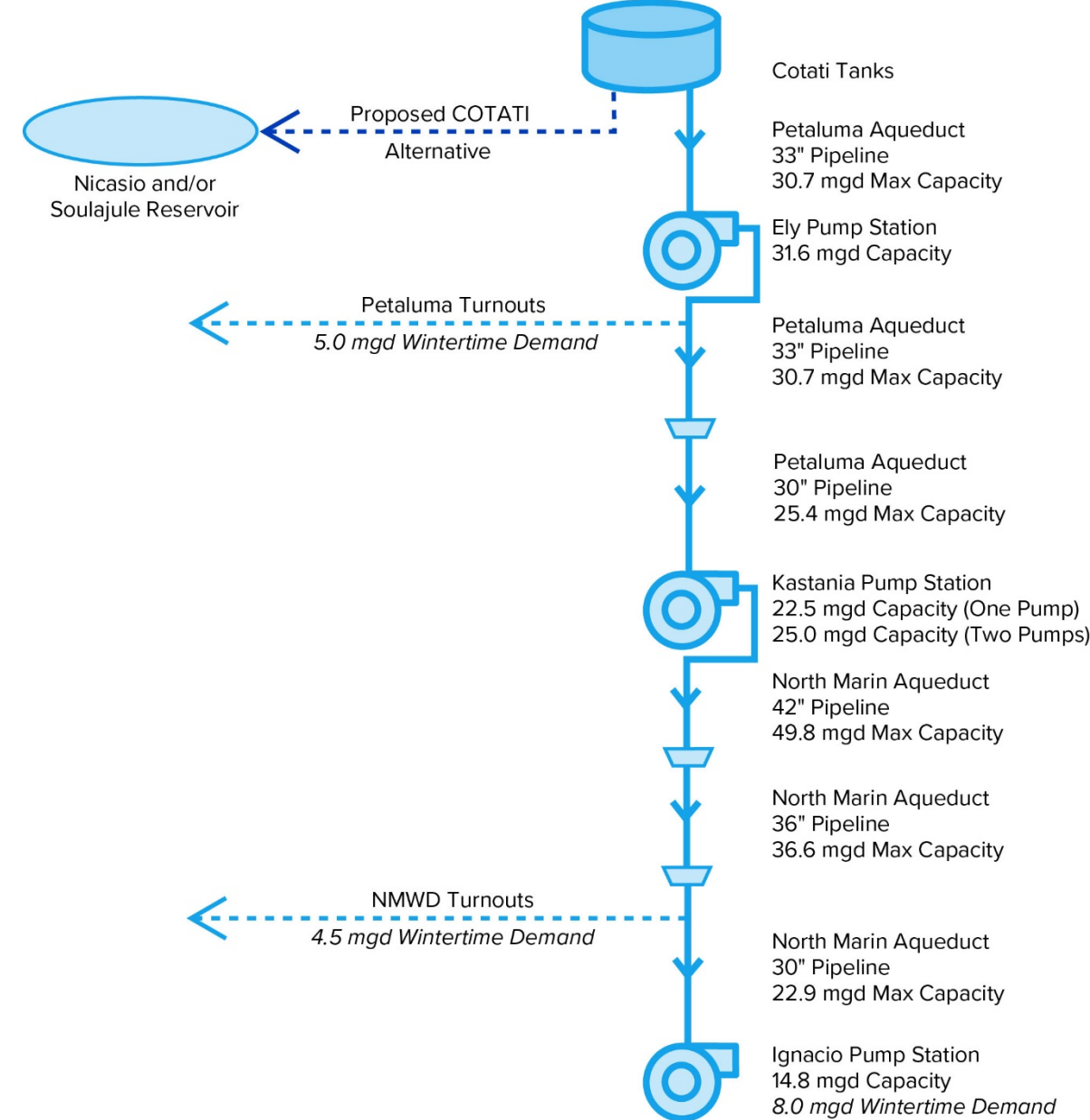
Petaluma Transmission System (PETA)

- Turnout 2 Location
- Alternatives:
 - PETA-4
- System Demand = 17.5 mgd (Winter)
- Additional Capacity = 30.0 mgd
- Requires STS



Cotati Transmission System (COTATI)

- Alternatives:
 - COTATI-1
 - COTATI-2
 - COTATI-3
- System Demand = 17.5 mgd (Winter)
- Additional Capacity = 30.0 mgd
- Independent of existing system



Project Alternatives

Alternative	Description	Length (miles)	Water Supply Benefit ¹ (mgd)
STS-1	Cotati Tanks to Kastania PS along 101 Corridor	10.5	0.0 ²
STS-2	Cotati Tanks to Kastania PS through downtown Petaluma	12.1	0.0 ²
STS-3	Cotati Tanks to Kastania PS through rural roads	15.5	0.0²
STAF-1	Stafford Lake to Nicasio Reservoir	8.0	7.3
STAF-2	Stafford Lake to Soulagule Reservoir	6.8	7.3
STAF-3	Stafford Lake to Nicasio and Soulagule Reservoir	11.0	7.3
PETA-1	North Marin Aqueduct to Nicasio Reservoir	13.2	10.4 ³ 14.1 ⁴
PETA-2	North Marin Aqueduct to Soulagule Reservoir	12.0	10.4 ³ 14.1 ⁴
PETA-3	North Marin Aqueduct to Nicasio and Soulagule Reservoir	16.2	10.4³ 14.1⁴
PETA-4	North Marin Aqueduct to Nicasio and Soulagule Reservoir via San Antonio Road	14.8	12.5³ 30.0⁴
COTATI-1	Cotati Tanks to Nicasio Reservoir	24.2	30.0 ⁵
COTATI-2	Cotati Tanks to Soulagule Reservoir	20.5	30.0 ⁵
COTATI-3	Cotati Tanks to Nicasio and Soulagule Reservoir	25.9	30.0⁵

1. The water supply benefit listed is in excess of the 8.0 mgd conveyed through the existing system from Cotati Tanks to Ignacio Pump Station during wintertime operations.
2. This alternative improves existing system reliability. However, the alternative does not deliver water to storage, so the additional yield is estimated as 0 mgd.
3. This yield assumes improvements to the existing system are not made.
4. This yield assumes additional improvements are made to increase capacity of existing system to deliver higher flows.
5. Since this alternative does not utilize the existing hydraulic system, the yield can be designed to meet District preference based on the available water supply.
6. Refer to Water Conveyance Bottleneck Investigation (Woodard & Curran, 2022) for additional information.

Proposed Evaluation Criteria

- Water Reliability and Sustainability
- Flexibility and Resiliency
- Schedule and Implementation
- Water Quality
- Environmental and Social Stewardship
- Economic and Financial

Summary and Next Steps for Conveyance

Targeting the following schedule and next steps:

- April 2 Board Meeting - Discussion on criteria evaluation of alternatives, identification of top three alternatives
- May 17 Ops Meeting – review analysis for top three alternatives
- June 18 Board Meeting - Identify preferred project

Local Storage Enhancement

Local Storage Alternatives

- Existing Dam Enlargement
 - Soulajule Reservoir by means of dam raise
 - Nicasio Reservoir by means of reservoir dredging
 - Nicasio Reservoir by means of dam raise
 - Kent Reservoir by means of dam raise
- New Dam Construction
 - Construction of new Halleck Reservoir
 - Construction of new Devil's Gulch Reservoir
- Spillway reconfiguration
 - Kent Reservoir
 - Nicasio Reservoir
 - Soulajule Reservoir
 - Alpine Reservoir



Local Storage: Process

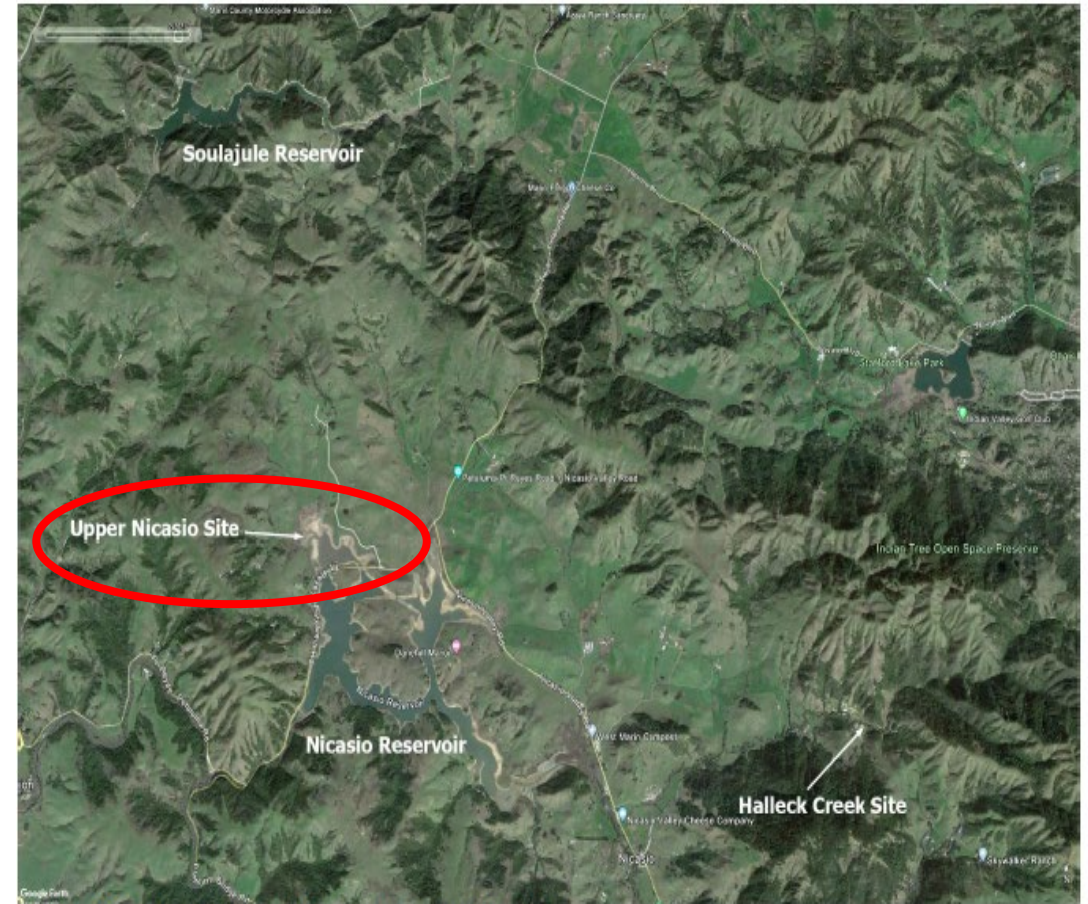
- Defining the concepts laid out in Strategic Water Supply Assessment
- Site visits
- Identifying site constraints
- Developing new information

Local Storage: Review of Existing Records

- Nicasio – possibly constructed with potential to add spillway gates without need to raise dam
- For all sites – understand where the materials for the dam construction was sourced, what were the characteristics of the material, and whether additional material is available for any future expansion
- Alpine – Dam was raised in 1940s, possibly in a way that would allow another raise

Local Storage: New Concept for Nicasio

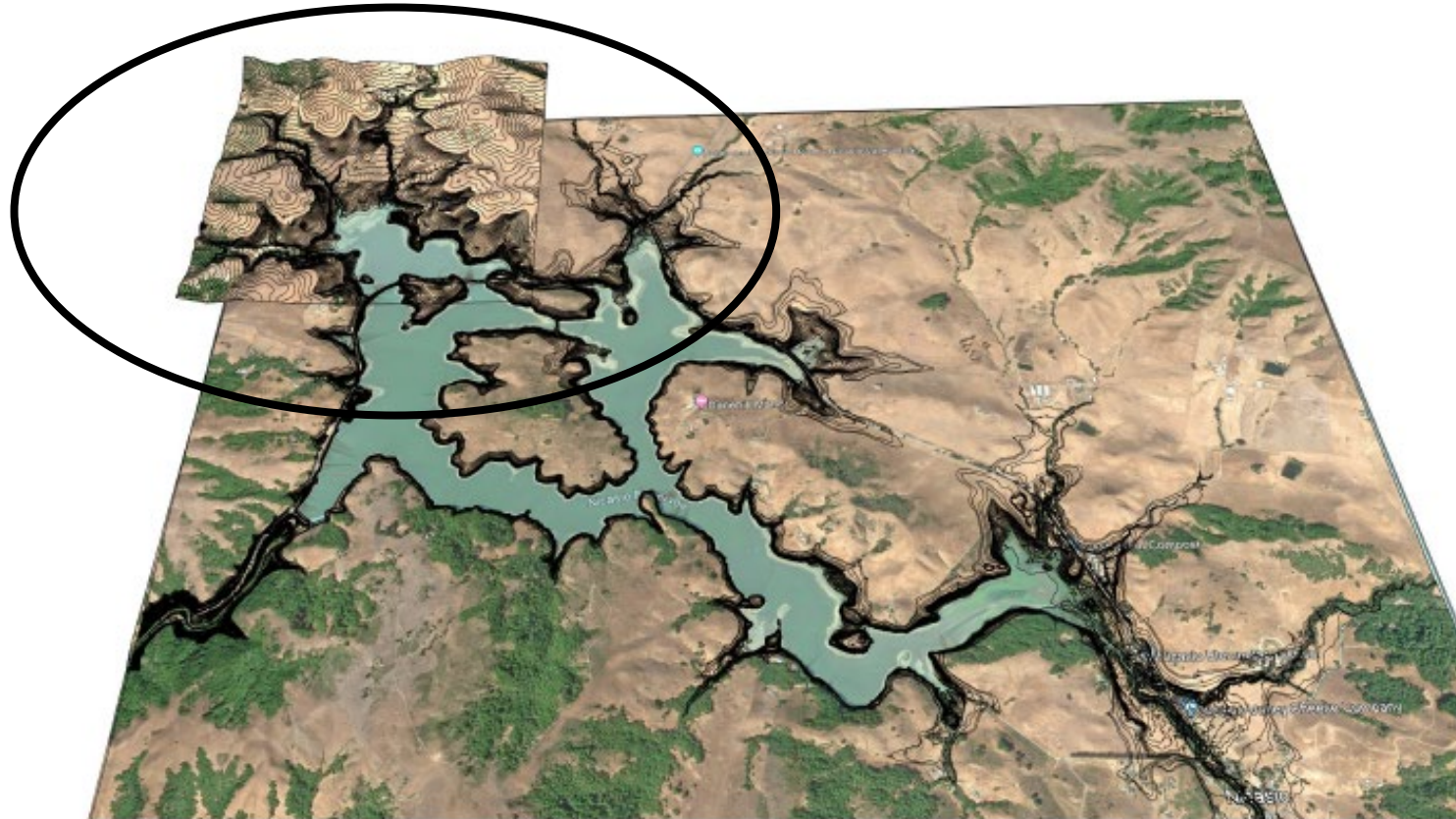
- Concept developed as team were reviewing inundation for Nicasio and considering mitigation measures
- Potentially resolves significant inundation challenges for raising Nicasio



Halleck Creek and Upper Nicasio Reservoir locations

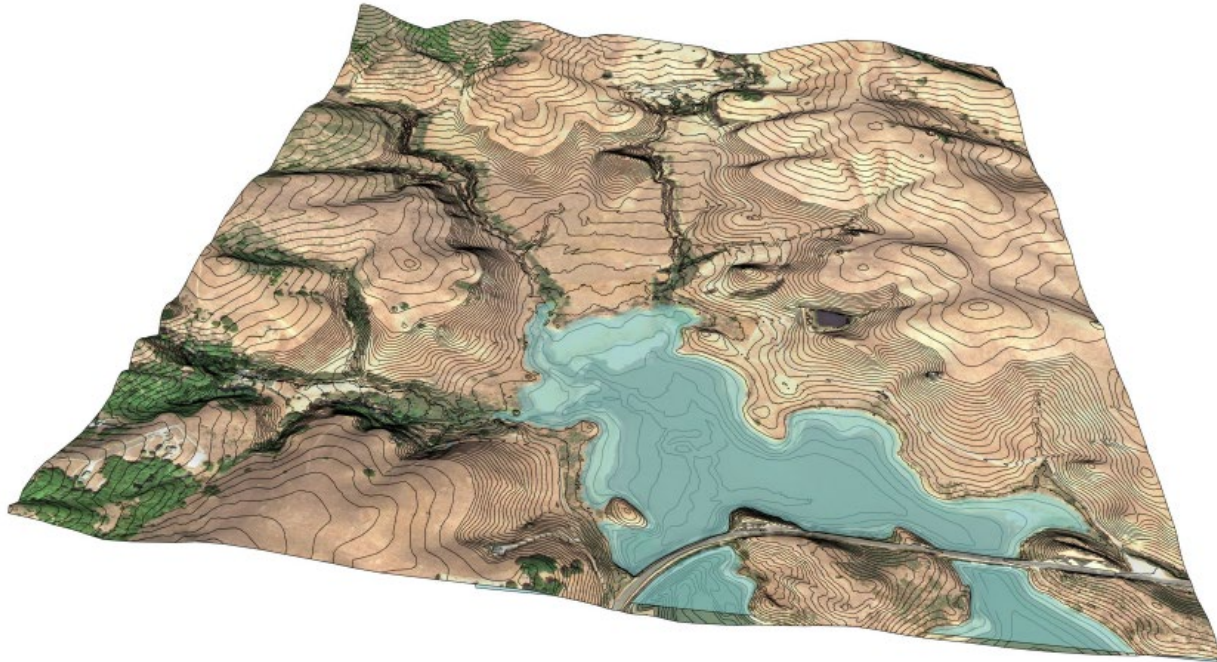
Local Storage: Upper Nicasio

Upper Nicasio Site

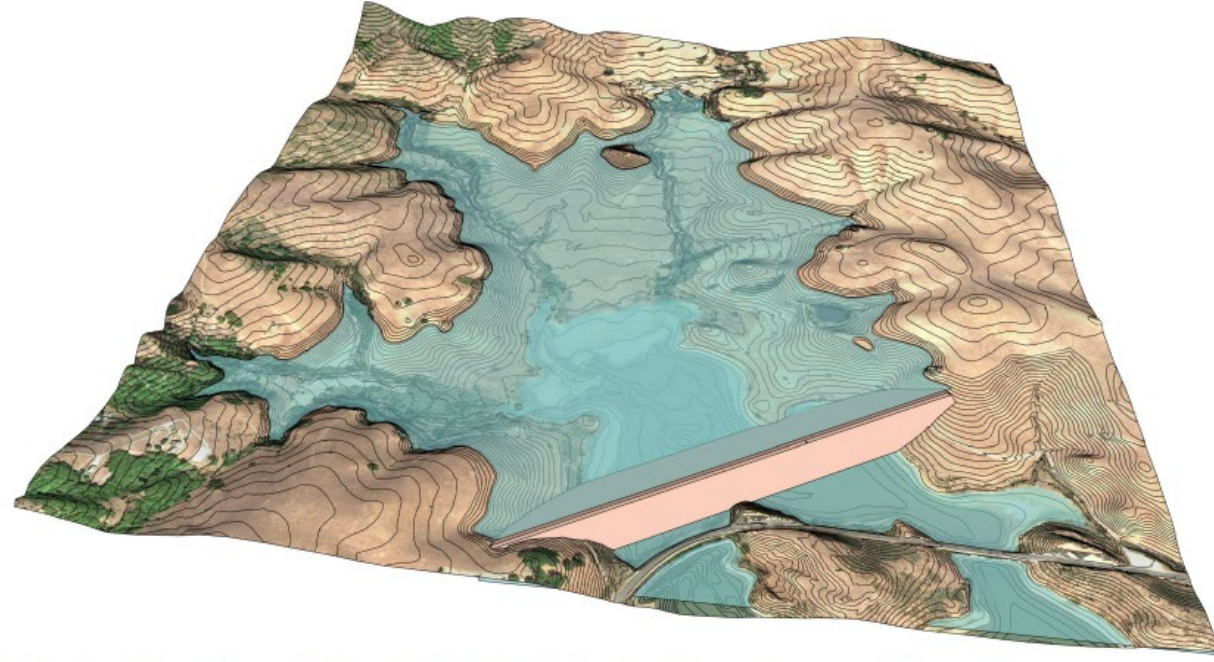


Schematic showing the Upper Nicasio site as the rectangle in the upper left portion of Nicasio Reservoir. This view is looking north.

Local Storage: Upper Nicasio



Schematic of existing Nicasio Reservoir, with reservoir level shown at spillway crest elevation of 168.3 feet.



Schematic of Upper Nicasio location with 20,000 ACFT embankment dam and reservoir, looking north

Local Storage: Next Steps

- Development of information is leading to discovery of additional sub-alternatives
- Project schedule updated to incorporate analysis of those new concepts
- Board update next month

Summary and Next Steps

- Move forward with conveyance evaluation, including shortlisting and more detailed analysis of top alternatives
- Continue definition of storage alternatives; target completion of shortlist analysis by August
- Return to board March 19 with more detailed presentation on storage