



Water Supply Roadmap – Proposed Shortlist for Storage

BOARD OF DIRECTORS

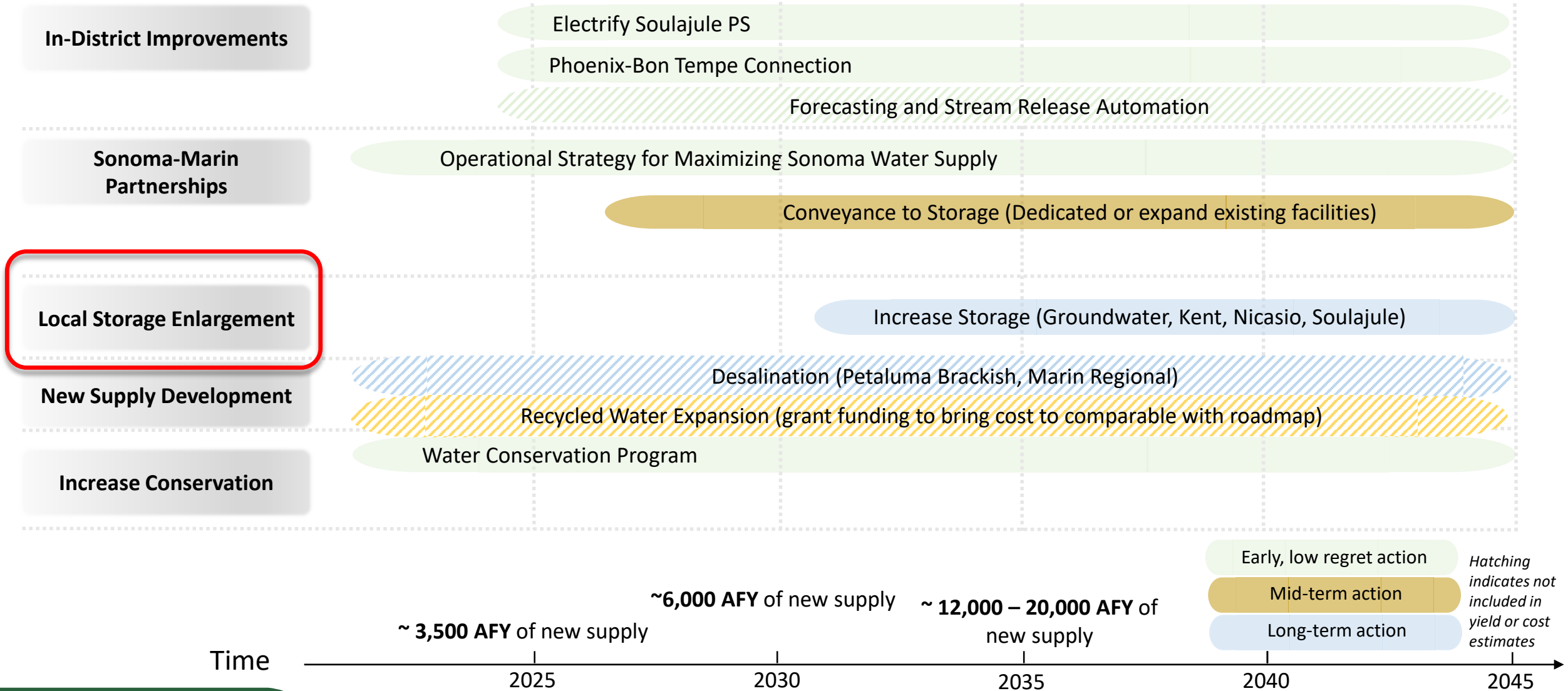
April 30, 2024



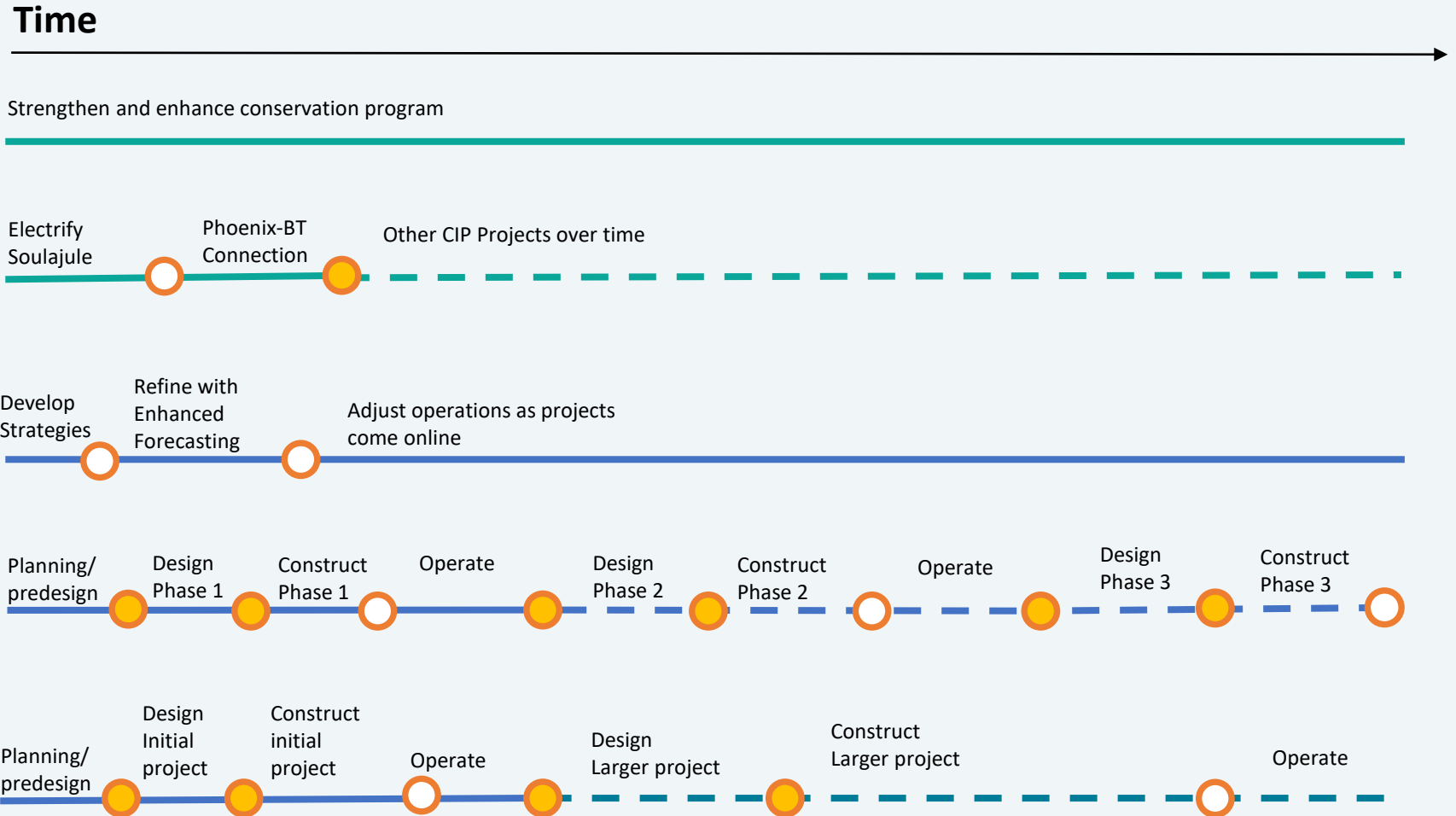
Overview

- Storage in the Context of the Roadmap
- Project Goal and Criteria
- Summary of Storage alternatives
- Screening of Alternatives
- Proposed Shortlist
- Next Steps

Roadmap for Integrated Strategy



Integrated Approach Provides Flexibility



○ Project milestone

● Decision point

Project Goal and Evaluation Criteria

- *The goal of the Project is to enhance the reliability, flexibility and resiliency of the water system to improve service to Marin Water customers.*
- Proposed Evaluation Criteria are project characteristics that allow us to:
 - Differentiate among project alternatives
 - Identify infeasible alternatives

Evaluation Criteria

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

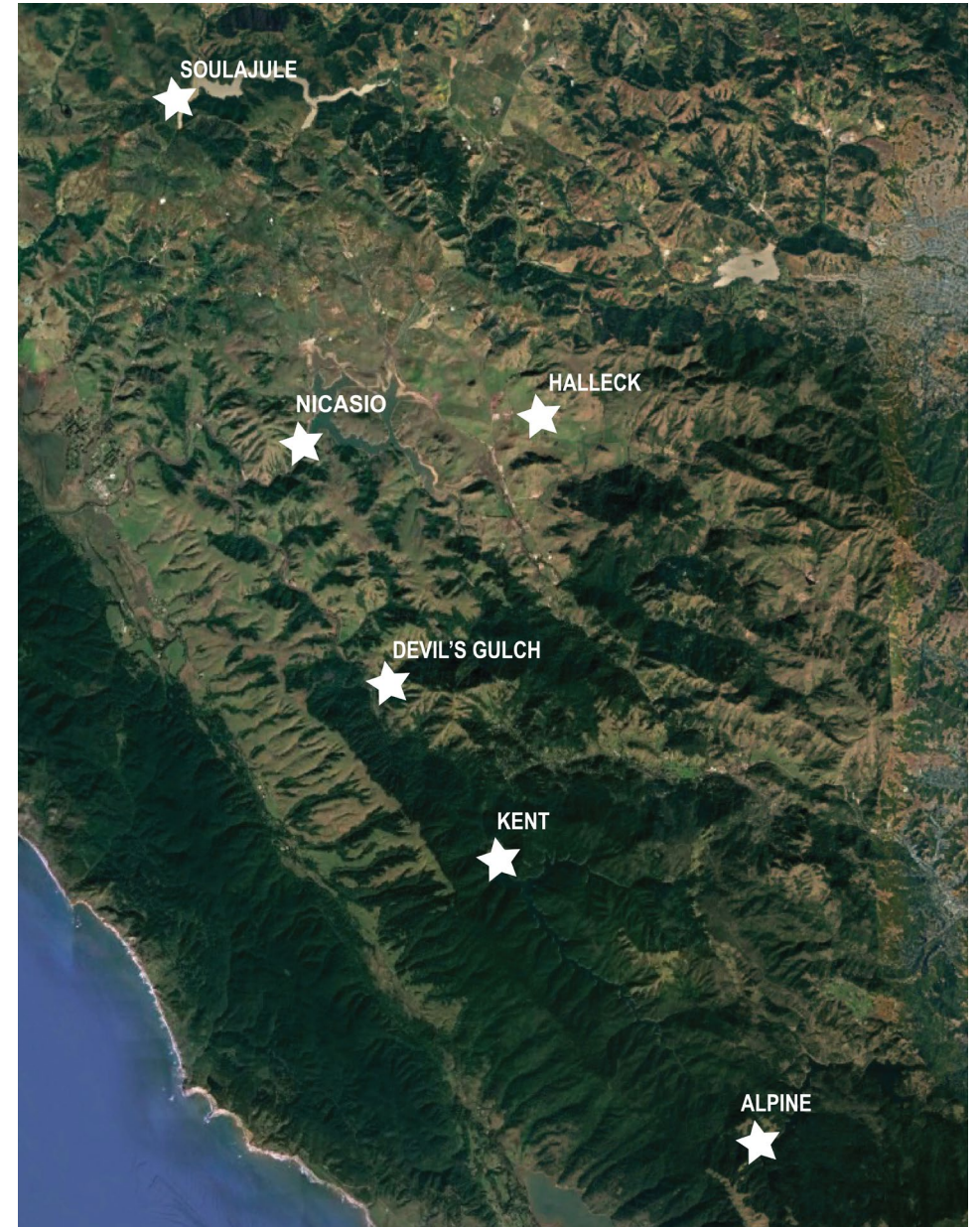
Use of the Criteria for Screening

Criterion	Information Responsive to the Criterion
Water Reliability and Sustainability	<p>Does the alternative meet the goal to develop additional storage? What is the yield in acre-feet? Are there substantial technical risks that threaten the alternative’s technical or economic feasibility?</p>
Flexibility and Resiliency	<p>Does the alternative integrate well with Marin Water’s operations? Is the alternative flexible to work over a range of future scenarios? Is the alternative’s performance relatively insensitive to future uncertainty?</p>
Schedule and Implementation	<p>Are there substantial concerns regarding constructability or compatibility with existing land uses?</p>
Water Quality	<p>Would managing water quality of downstream releases during construction pose challenges?</p>
Environmental and Social Stewardship	<p>Alternatives not screened out at this stage will receive detailed study in the next phase of work.</p>
Economic and Financial	<p>Is the alternative cost-effective, i.e., economically feasible considering its benefits relative to its likely costs? Is the alternative affordable, i.e., financially feasible?</p>

Local Storage Alternatives

- Existing Reservoir Enlargement
 - Alpine
 - Kent
 - Nicasio
 - SoulaJule
- New Reservoir Construction
 - Devil's Gulch
 - Halleck
 - Upper Nicasio
- New Spillway Gates
 - Nicasio
 - SoulaJule
 - Kent
 - Alpine
- Other
 - Dredging

Blue font indicates alternative was added during the current work.



Alpine Reservoir Enlargement

Criterion	Information Responsive to the Criterion
Water Reliability and Sustainability	<p>Can provide needed storage, e.g. 24 TAF*.</p> <p>Large ancient landslide would require careful investigation to verify technical feasibility.</p>
Flexibility and Resiliency	<p>Seamless integration with Marin Water’s operations.</p> <p>Watershed area would allow reservoir to fill; however, the reservoir is not a candidate to store imported water.</p>
Schedule and Implementation	<p>Construction efficiency would be reduced by presence of the Northern Spotted Owl.</p> <p>Marin Water owns the area that would be inundated by the reservoir expansion.</p>
Water Quality	<p>Water quality of releases would need to be managed during construction.</p>
Environmental and Social Stewardship	<p>Would have effects on biological resources. These and other environment aspects would receive detailed study in the next phase of work, if the alternative moves forward.</p>
Economic and Financial	<p>\$1,296M construction cost</p> <p>This alternative is not considered economically or financially feasible.</p>



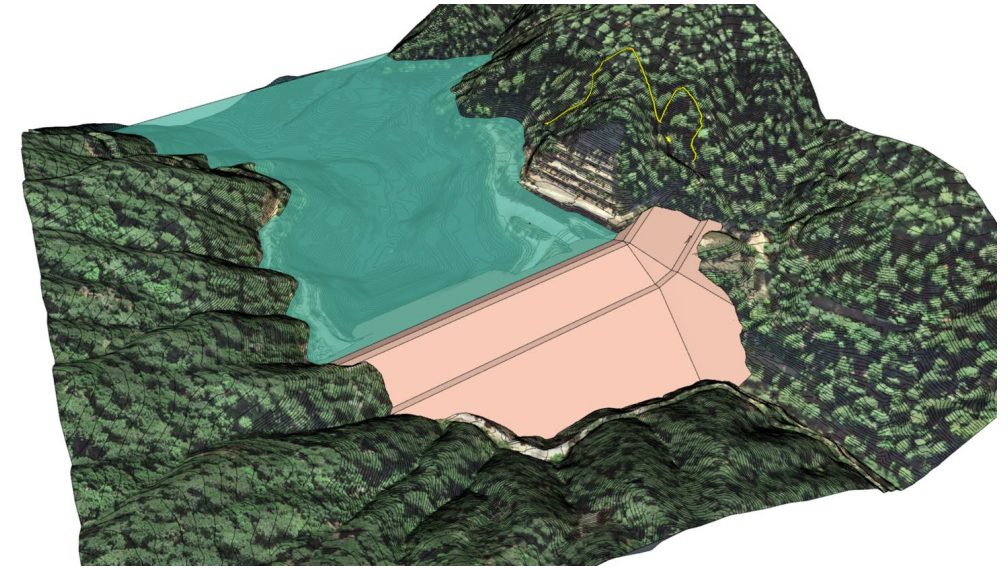
This alternative is *not* considered feasible.

* TAF = Thousand Acre-Foot.

Kent Reservoir Enlargement

Criterion	Information Responsive to the Criterion
Water Reliability and Sustainability	Can provide needed storage, e.g. 20 TAF*. Substantial technical challenges exist in the design of the dam and spillway, which could impact cost and feasibility.
Flexibility and Resiliency	Seamless integration with Marin Water's operations. Watershed area would allow reservoir to fill; however, the reservoir is not a candidate to store imported water.
Schedule and Implementation	Construction efficiency would be reduced by presence of the Northern Spotted Owl. Marin Water owns the area that would be inundated by the reservoir expansion.
Water Quality	Water quality of creek releases would need to be managed during construction.
Environmental and Social Stewardship	Would have effects on biological resources. These and other environment aspects will receive detailed study in the next phase of work, if the alternative moves forward.
Economic and Financial	\$613M construction cost The feasibility of this alternative is questionable given its relatively high cost.

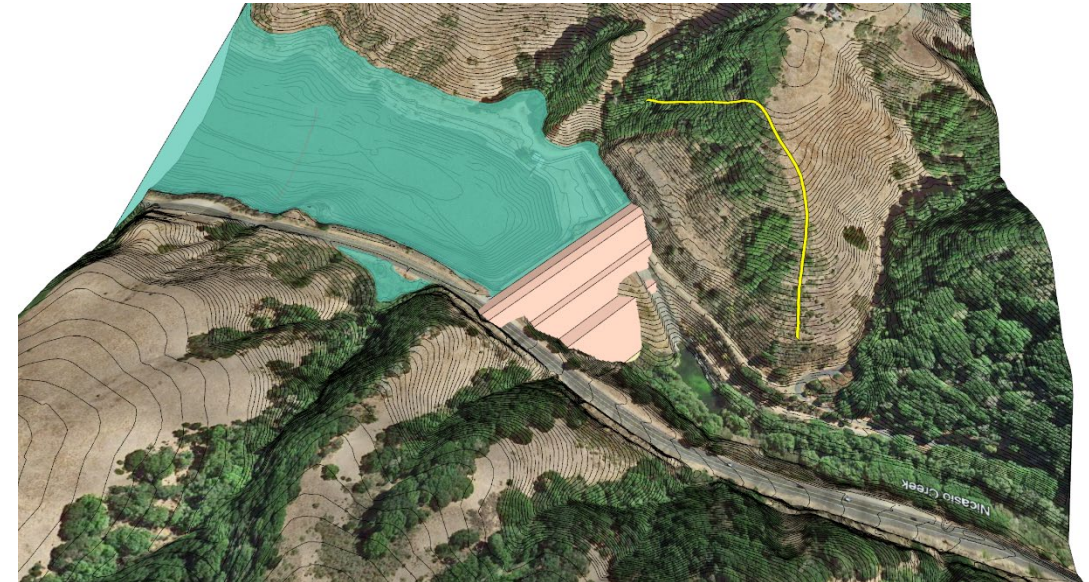
* TAF = Thousand Acre-Foot.



This alternative *may* be feasible.

Nicasio Reservoir Enlargement

Criterion	Information Responsive to the Criterion
Water Reliability and Sustainability	Can provide needed storage, e.g. 20 TAF*. Dam raise is technically feasible, but measures to protect the town of Nicasio pose considerable technical challenges.
Flexibility and Resiliency	Seamless integration with Marin Water's operations.
Schedule and Implementation	Constructability appears favorable. Inundates lands surrounding existing reservoir.
Water Quality	Water quality of creek releases would need to be managed during construction.
Environmental and Social Stewardship	Would have effects on biological and architectural resources.
Economic and Financial	\$1,243M construction cost – <i>financially infeasible.</i>

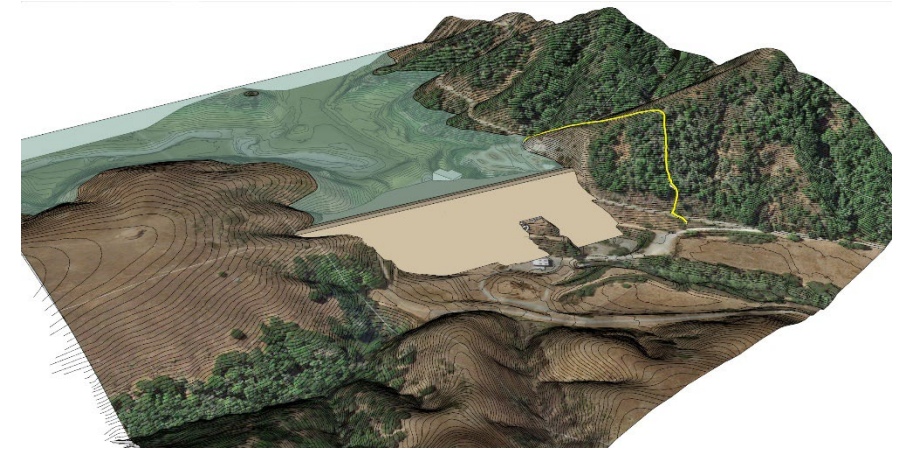


* TAF = Thousand Acre-Foot.

This alternative is ***not*** considered feasible.

Soulajule Reservoir Enlargement

Criterion	Information Responsive to the Criterion
Water Reliability and Sustainability	Can provide needed storage, e.g. 20 TAF*. Appears technically feasible.
Flexibility and Resiliency	Seamless integration with Marin Water's operations.
Schedule and Implementation	Constructability appears favorable. The reservoir would inundate parcels with agricultural land and structures including residences and roads. If this alternative moves forward, measures to reduce inundation or otherwise protect structures would be evaluated.
Water Quality	Water quality of creek releases would need to be managed during construction.
Environmental and Social Stewardship	Would have effects on biological and architectural resources. These and other environment aspects will receive detailed study in the next phase of work.
Economic and Financial	\$291M construction cost

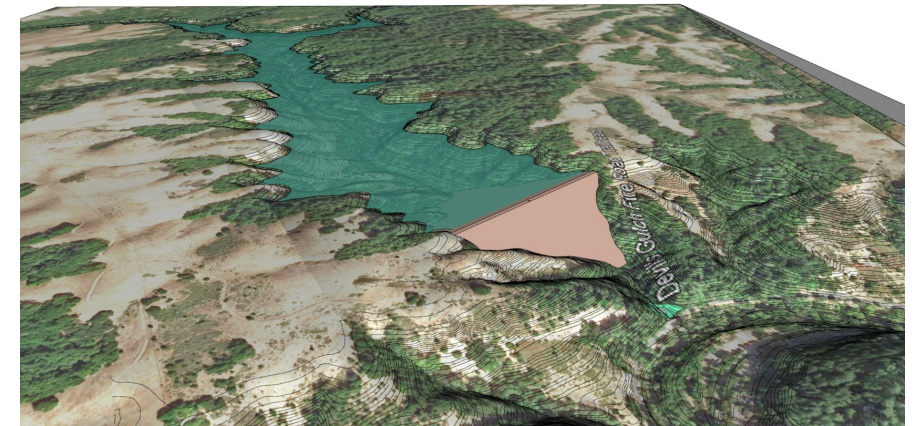


This alternative appears feasible.

* TAF = Thousand Acre-Foot.

Devil's Gulch Reservoir

Criterion	Information Responsive to the Criterion
Water Reliability and Sustainability	Can provide needed storage, e.g. 20 TAF*. Technical risk is relatively low.
Flexibility and Resiliency	The alternative would integrate well with the District's operations but would require substantial new conveyance facilities. The watershed area is not likely sufficient for the reservoir to self-fill, so water would have to be pumped in.
Schedule and Implementation	This alternative would require acquisition and conversion of state and federally owned land within Samuel P. Taylor State Park and the Golden Gate National Recreation Area. Given the existence of other viable alternatives, this fact renders the alternative <i>infeasible</i> .
Water Quality	Water quality of creek releases would need to be managed during construction.
Environmental and Social Stewardship	Would have effects on biological resources. These and other environment aspects would receive detailed study in the next phase of work, if the alternative were to move forward.
Economic and Financial	\$404M construction cost

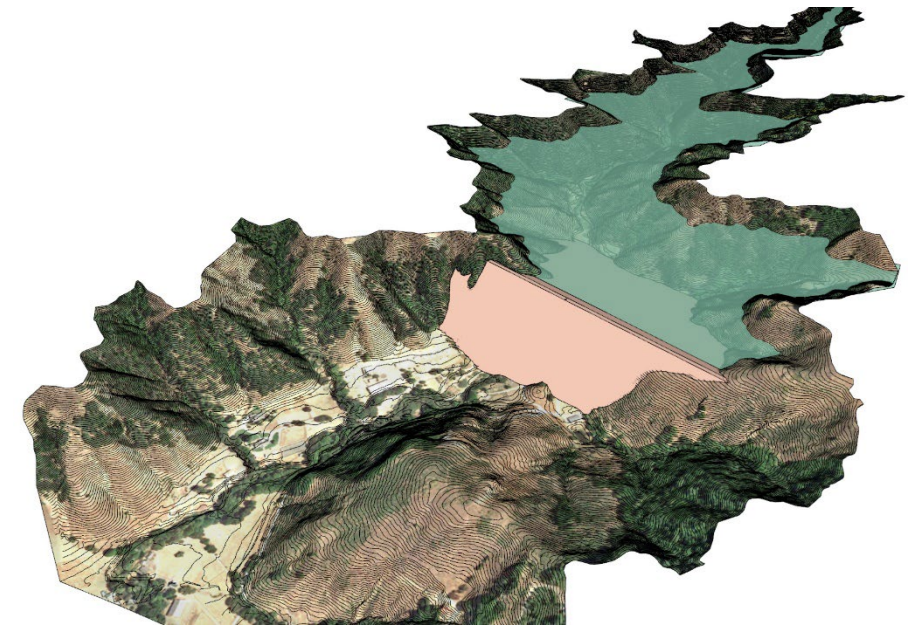


This alternative is ***not*** considered feasible.

* TAF = Thousand Acre-Foot.

Halleck Reservoir

Criterion	Information Responsive to the Criterion
Water Reliability and Sustainability	Can provide needed storage, e.g. 20 TAF*. Technical risk is relatively high due to unfavorable geology; this could impact cost and feasibility.
Flexibility and Resiliency	Seamless integration with Marin Water's operations. Watershed area would allow reservoir to fill.
Schedule and Implementation	Constructability is generally favorable.
Water Quality	Water quality of creek releases would need to be managed during construction.
Environmental and Social Stewardship	Would have effects on biological resources. These and other environment aspects will receive detailed study in the next phase of work, if the alternative moves forward.
Economic and Financial	\$753M construction cost This alternative is considered economically and financially infeasible.

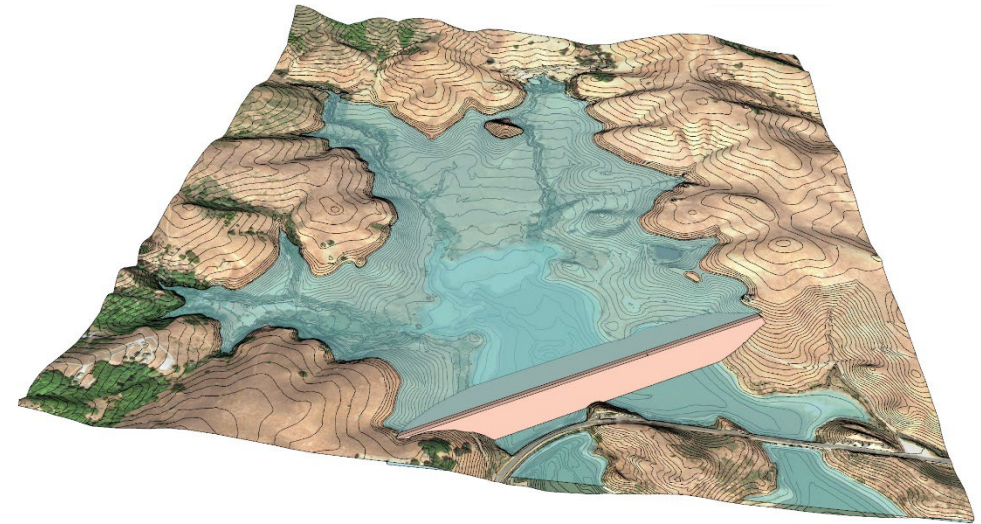


This alternative is *not* considered feasible.

* TAF = Thousand Acre-Foot.

Upper Nicasio Reservoir

Criterion	Information Responsive to the Criterion
Water Reliability and Sustainability	Can provide needed storage, e.g. 20 TAF*. Technical risk is moderate.
Flexibility and Resiliency	The alternative would integrate well with the District's operations but would likely require water from Nicasio or Soulajule to fill. The reservoir would be a potential receiving point for imported water.
Schedule and Implementation	Constructability is relatively favorable. The reservoir would inundate parcels with agricultural land and structures including residences and roads. If this alternative moves forward, measures to reduce inundation or otherwise protect structures would be evaluated.
Water Quality	Water quality of creek releases would need to be managed during construction.
Environmental and Social Stewardship	Would have effects on biological resources. These and other environment aspects will receive detailed study in the next phase of work, if the alternative moves forward.
Economic and Financial	\$606M construction cost



This alternative *may* be feasible.

* TAF = Thousand Acre-Foot.

Spillway Modifications at Various Locations

Criterion	Information Responsive to the Criterion
Water Reliability and Sustainability	The modifications, whether singly or in concert, do not meet the project goal in terms of o not meet the project goal of enhancing the water supply.
Flexibility and Resiliency	The spillway at Nicasio Reservoir stands alone in terms of flexibility because the original dam was designed to allow a spillway raise. The other locations (Soulajule, Alpine and Kent) would all require more complex systems.
Schedule and Implementation	One or more of the spillway projects, while not of sufficient scale to meet the project goals, could potentially be implemented relatively quickly and provide drought water supply.
Water Quality	There are no concerns regarding water quality from water captured passively at the various reservoirs.
Environmental and Social Stewardship	Effects on resources (e.g., biological resources) to be evaluated in the future for any spillway modifications that are moved forward.
Economic and Financial	Costs are \$3M, \$13M, \$15 and \$15M for additional storage of 3, 3, 1.8 and 1.1 TAF at Nicasio, Kent, Soulajule, and Alpine respectively. Nicasio is thus particularly favorable.

This alternative does not meet project goals. However, it is feasible and could provide value as a short-to-medium term drought supply project.

* TAF = Thousand Acre-Foot.

Reservoir Dredging

Criterion	Information Responsive to the Criterion
Water Reliability and Sustainability	Can provide needed storage, e.g. 20 TAF*.
Flexibility and Resiliency	Seamless integration with Marin Water's operations.
Schedule and Implementation	Construction would take many years and would involve many challenges.
Water Quality	Water quality of creek releases would need to be managed during the dredging.
Environmental and Social Stewardship	Would have effects on biological and architectural resources that would need to be studied if this alternative were to move forward.
Economic and Financial	\$1,000M+ construction cost – <i>economically and financially infeasible.</i>



Nicasio studied as an example, evaluation applies more generally.

* TAF = Thousand Acre-Foot.

This alternative is ***not*** considered feasible.

Summary and Next Steps

Summary

Alternative	Yield (TAF)	Cost (\$M)	Screening Results
Alpine Lake Enlargement	24	1,296	Infeasible
Kent Lake Enlargement	20	613	Potentially feasible
Nicasio Reservoir Enlargement	20	1,243	Infeasible
Soulajule Reservoir Enlargement	20	291	Feasible
Devil's Gulch Reservoir	20	404	Infeasible
Halleck Reservoir	20	753	Infeasible
Upper Nicasio Reservoir	20	606	Potentially feasible
Dredging Nicasio Reservoir	20	1,000+	Infeasible
Spillway Modifications	1.1 to 3	3 to 15	Does not meet project goals but could provide value as separate, shorter-term drought relief project(s)

Top 3 Storage Alternatives

Project Aspect	Soulajule	Upper Nicasio	Kent
Cost*	\$291M	\$606M	\$613M
Implementation	<ul style="list-style-type: none"> Technically feasible Normal constructability Would inundate private land 	<ul style="list-style-type: none"> Moderate technical risk Normal constructability Would inundate some private land 	<ul style="list-style-type: none"> Significant technical issues to work through which could add cost NSO impacts on construction cost may be substantial MMWD owns land
Reliability	<ul style="list-style-type: none"> Likely to self-fill Could receive imported water 	<ul style="list-style-type: none"> May not self-fill, and thus require pumping from Nicasio Could receive imported water 	<ul style="list-style-type: none"> Likely would self-fill Not viable to receive imported water
Environmental	To be evaluated for any alternative that moves forward.		

* Costs of alternatives are Rough-Order-of-Magnitude construction costs, excluding costs for land, engineering and permits.

Integrated Approach Provides Flexibility

Time

Continue and enhance conservation program

Conservation

In-District Improvements

Electrify Soulajule
Phoenix-BT Connection
Other CIP Projects over time

Optimize Operations

Develop Strategies
Refine with Enhanced Forecasting
Adjust operations as projects come online

Conveyance (example)

Planning/pre-design
Design Phase 1
Construct Phase 1
Operate
Design Phase 2
Construct Phase 2
Operate
Design Phase 3
Construct Phase 3

Storage (example)

CEQA Spillway Raise
Design Spillway Raise
Construct Spillway raise
Operate

Planning/pre-design of dam project
Design
Construct
Operate

○ Project milestone

● Decision point

Next Steps

- Evaluate Spillway Modifications as Separate Project(s)
- Confirm Proposed Short List of Storage Improvement Projects
 - Soulajule Enlargement
 - Upper Nicasio Reservoir
 - Kent Lake Enlargement
- Further Develop and Evaluate Short Listed Alternatives
 - Study environmental effects
 - Right-size each alternative
- Identify a Potentially Preferred Alternative