
City of
Thousand Oaks

City of Thousand Oaks

Conejo Valley Groundwater Study

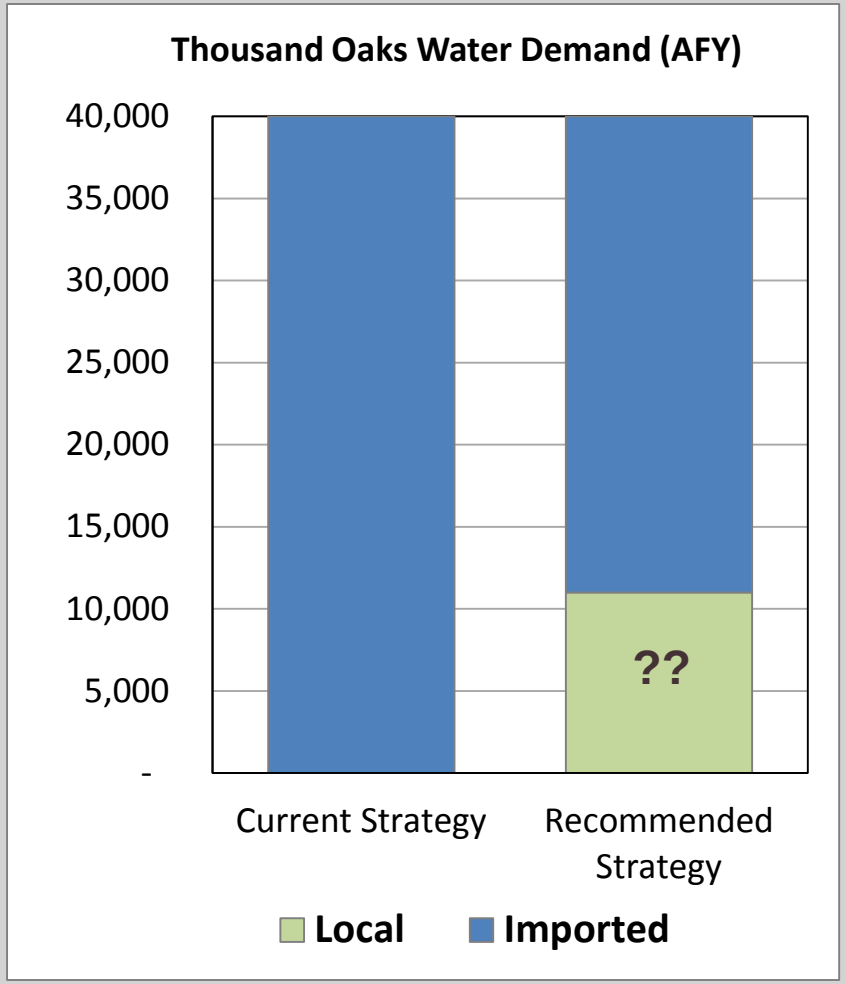
Study Overview and Recommendations

Jay Spurgin, Public Works Director

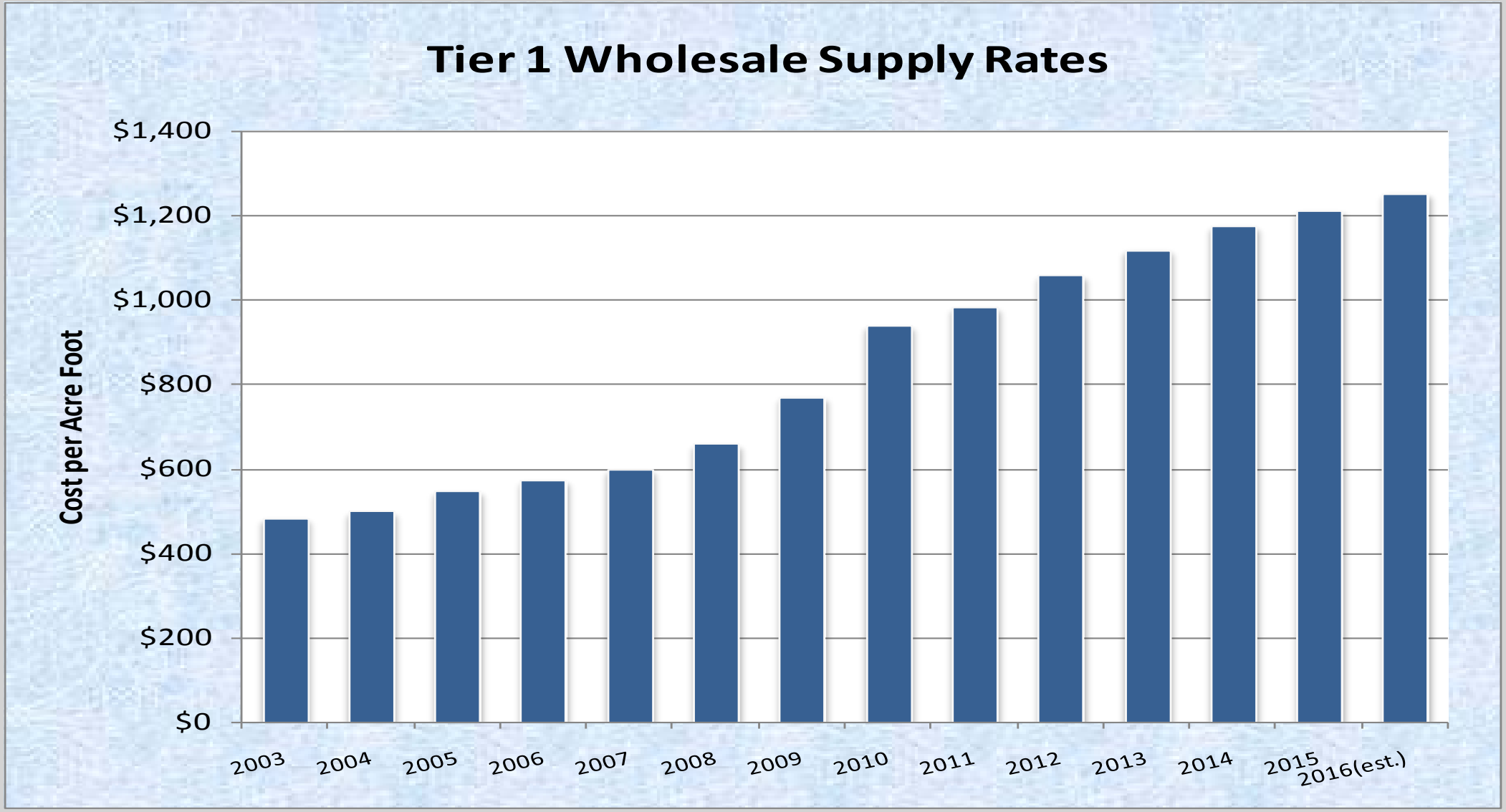
January 26, 2016

Study Drivers and Goal

- Early Conejo Valley development relied solely on groundwater
- Imported State Water became available, in late 1960s
- Study drivers:
  - Costs of imported water increasing (~$1,400/AF in 2016)
  - State Water unreliability
- Improve reliability by increasing local supply



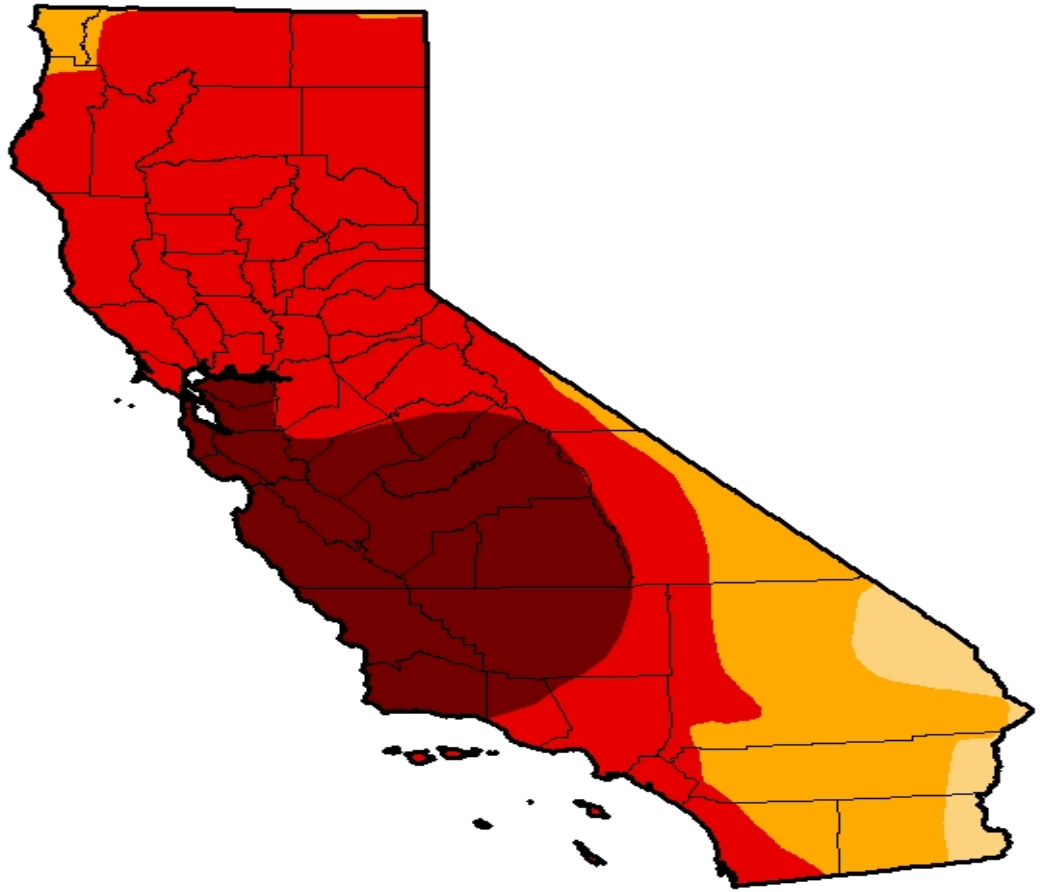
INCREASING COST OF WATER



WATER SUPPLY CHALLENGES

THE DROUGHT

U.S. Drought Monitor
California



May 6, 2014

(Released Thursday, May. 8, 2014)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	95.93	76.68	24.77
Last Week 4/29/2014	0.00	100.00	100.00	96.01	76.68	24.77
3 Months Ago 2/4/2014	1.43	98.57	94.18	89.91	67.13	9.81
Start of Calendar Year 12/31/2013	2.61	97.39	94.25	87.53	27.59	0.00
Start of Water Year 10/1/2013	2.63	97.37	95.95	84.12	11.36	0.00
One Year Ago 5/7/2013	0.00	100.00	98.16	46.25	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Mark Svoboda
National Drought Mitigation Center

http://droughtmonitor.unl.edu/

Study is Centered on Four Major Tasks

Technical Studies

- Conduct groundwater characterization/ monitoring
- Evaluate stormwater capture potential
- Assess reclaimed/non-potable market
- Evaluate large industrial dischargers.

Project Options

- Screen potential supply projects for technical feasibility
- Estimate costs and supply yields for feasible projects
- Assess regulatory permitting requirements
- Evaluate other project characteristics (e.g. legal, institutional, customer acceptance).

Alternatives Analysis

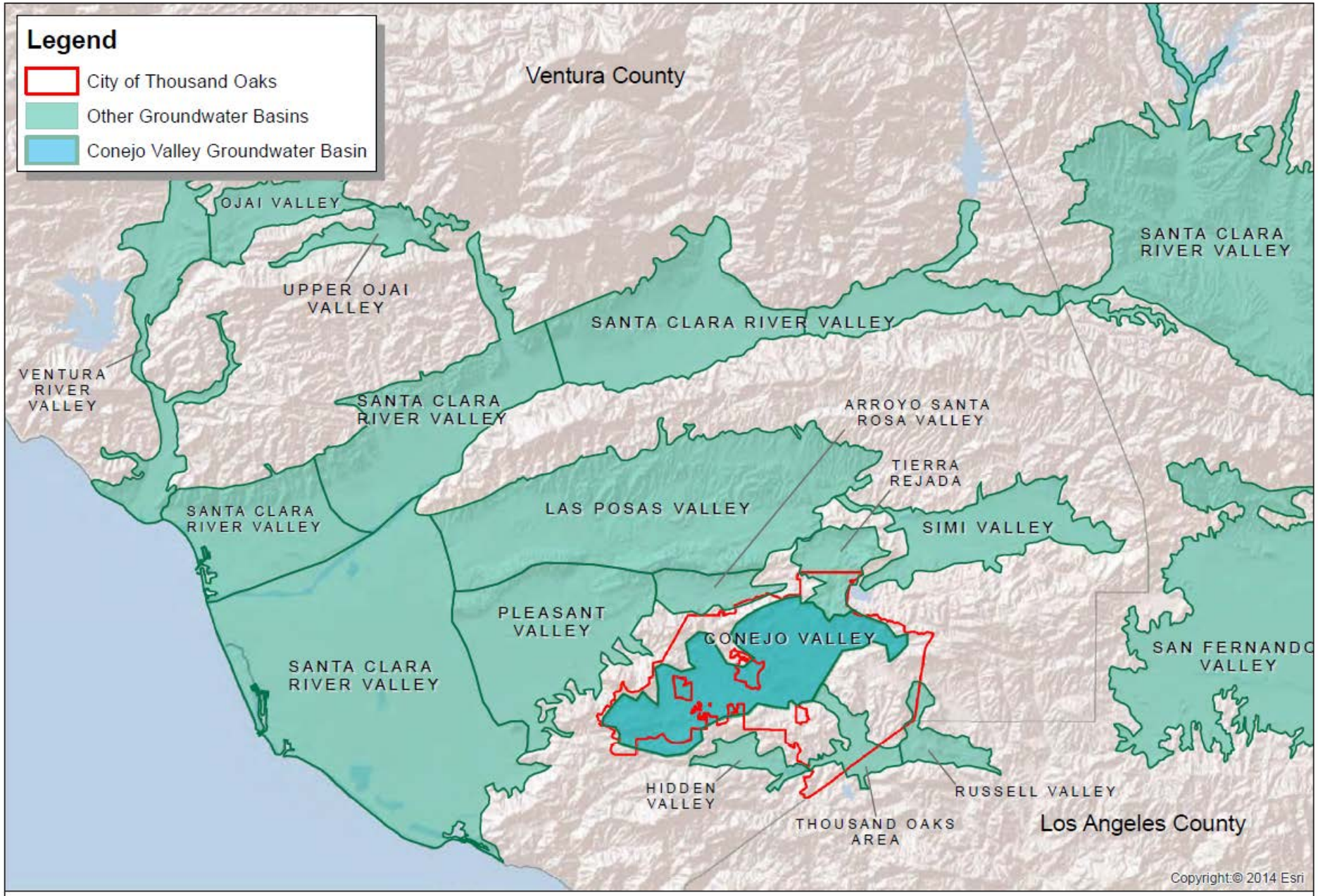
- Combine feasible projects into different alternatives
- Estimate financial impacts
- Evaluate alternatives using decision support tool
- Develop near-term and long-term strategies.

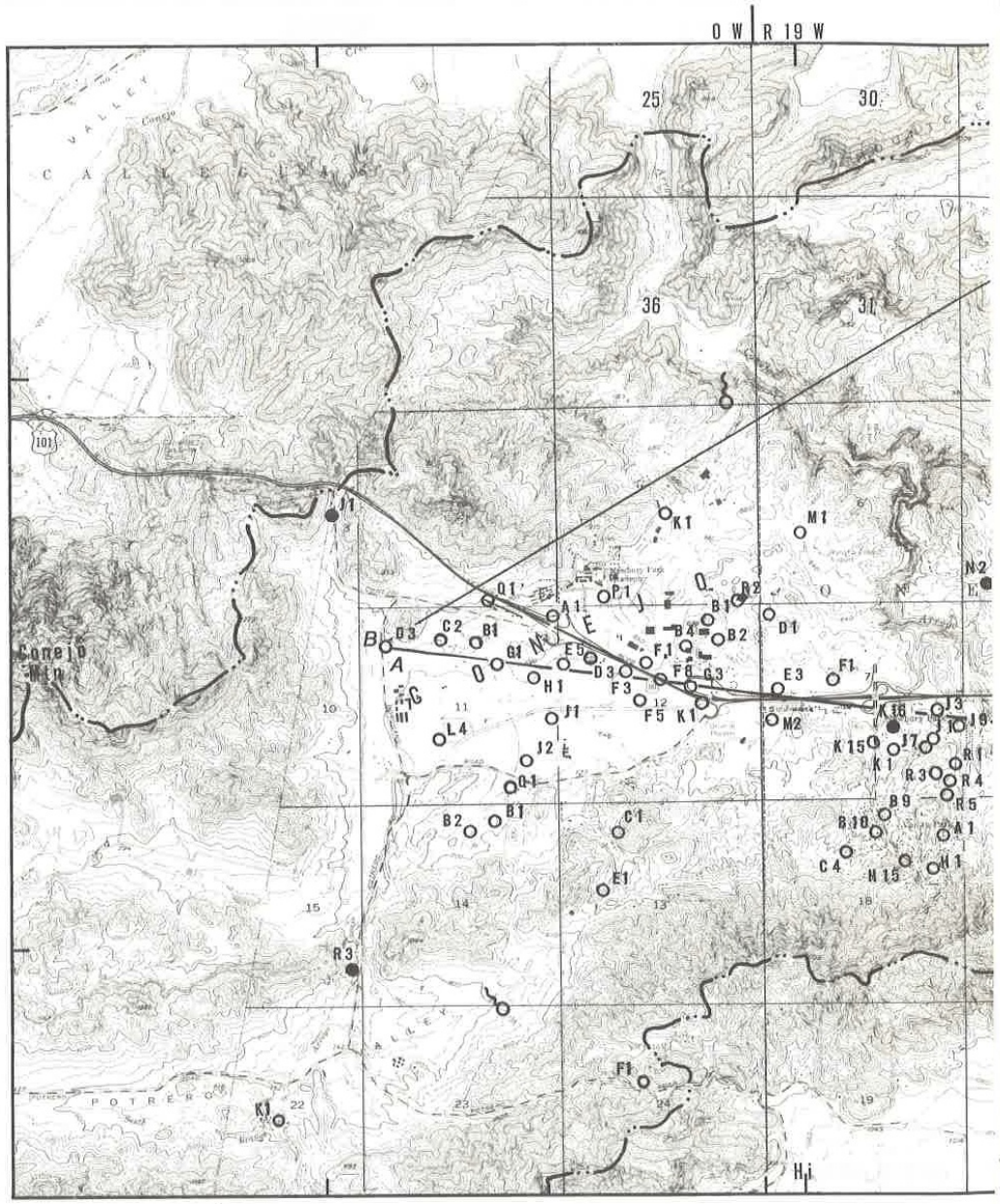
Documentation

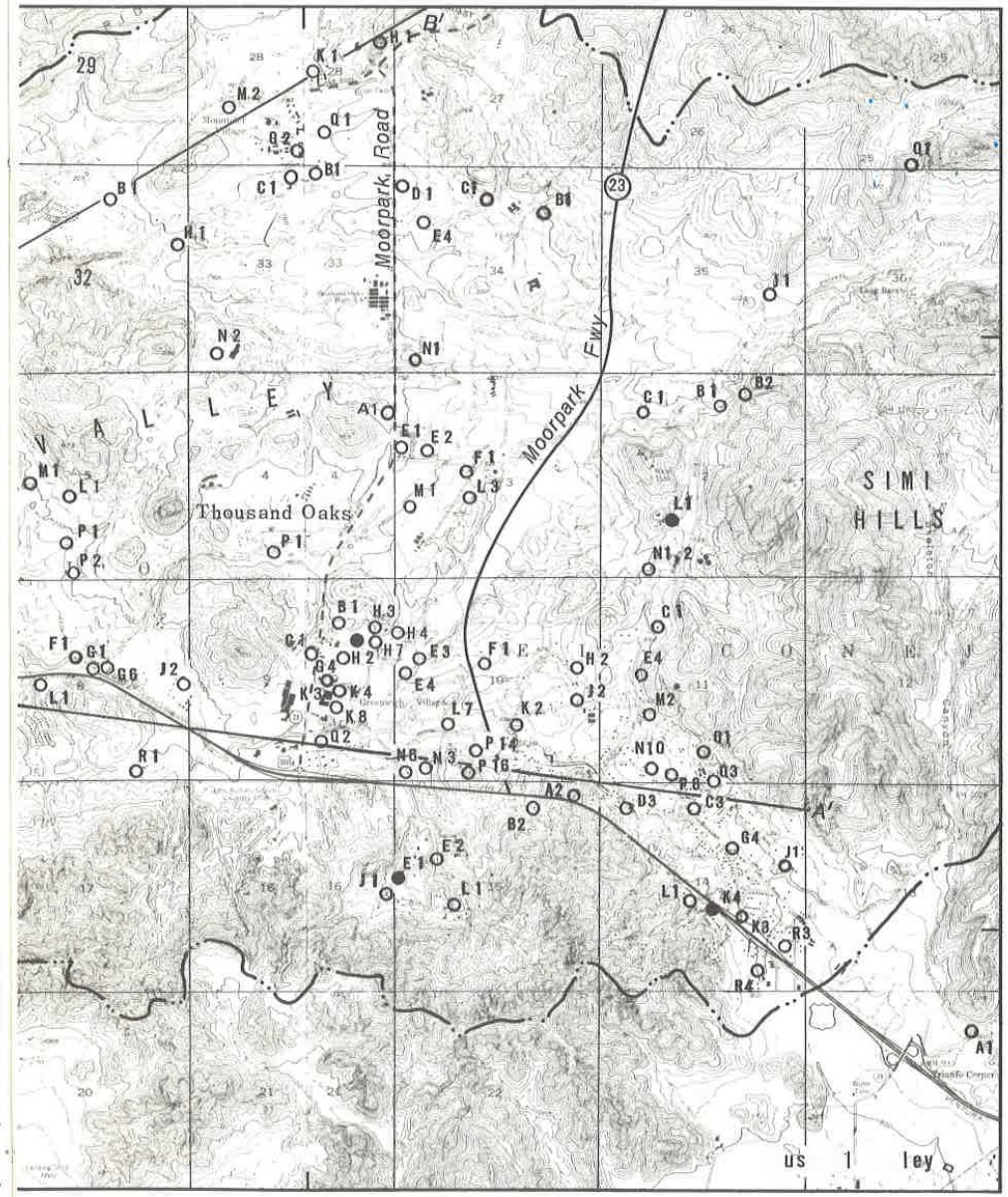
- Provide reclaimed/non-potable market study technical memorandum
- Prepare local water supply feasibility study report
- Outline requirements for future groundwater management plan.

PROJECT MANAGEMENT STAKEHOLDER COORDINATION

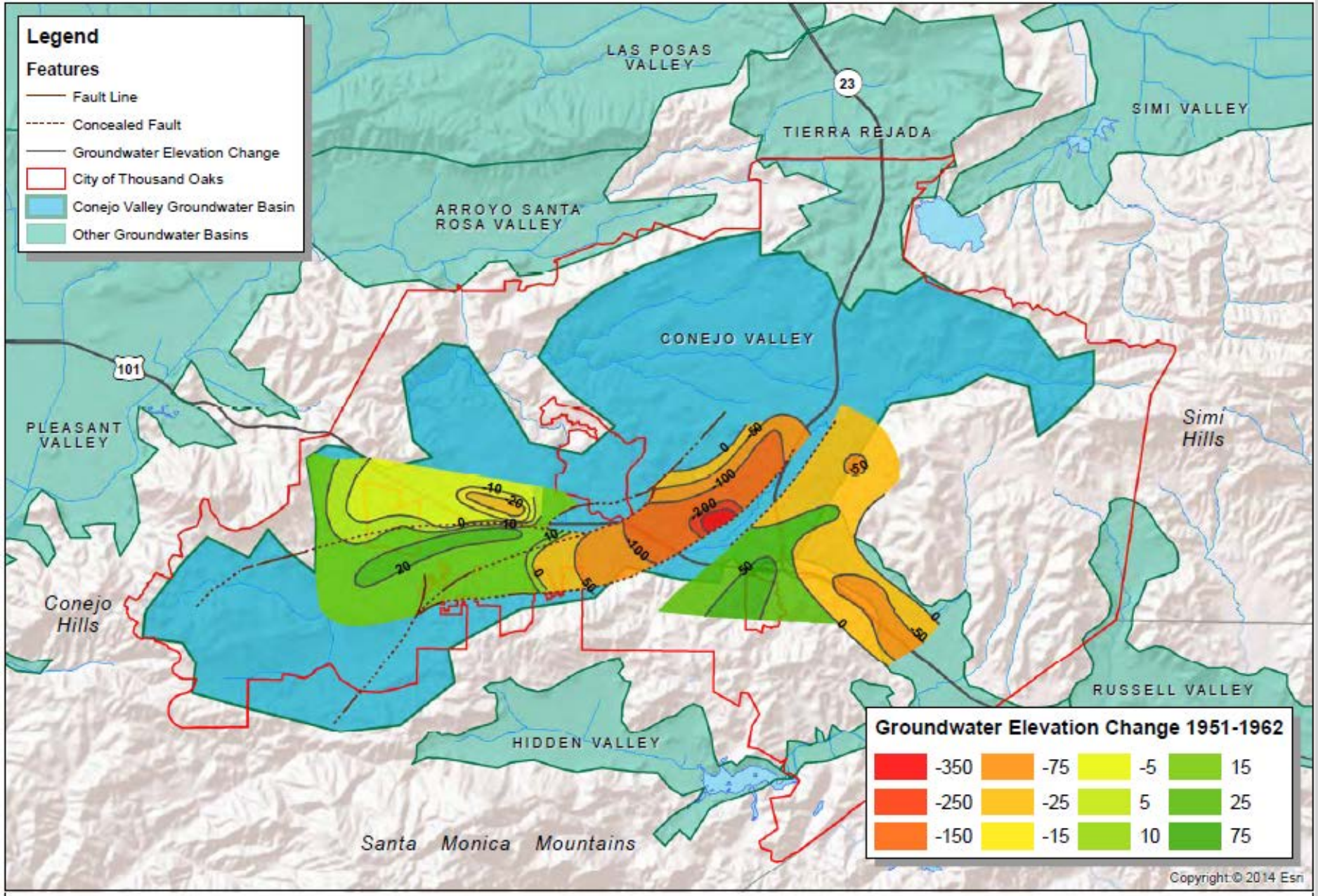
LOCATION OF THE CVGB




0 W
R 19 W
25
30
36
31
Conejo Mtn
Hi


Moorpark Road
Moorpark Fwy
23
Thousand Oaks
SIMI HILLS
A
A'
B
B'

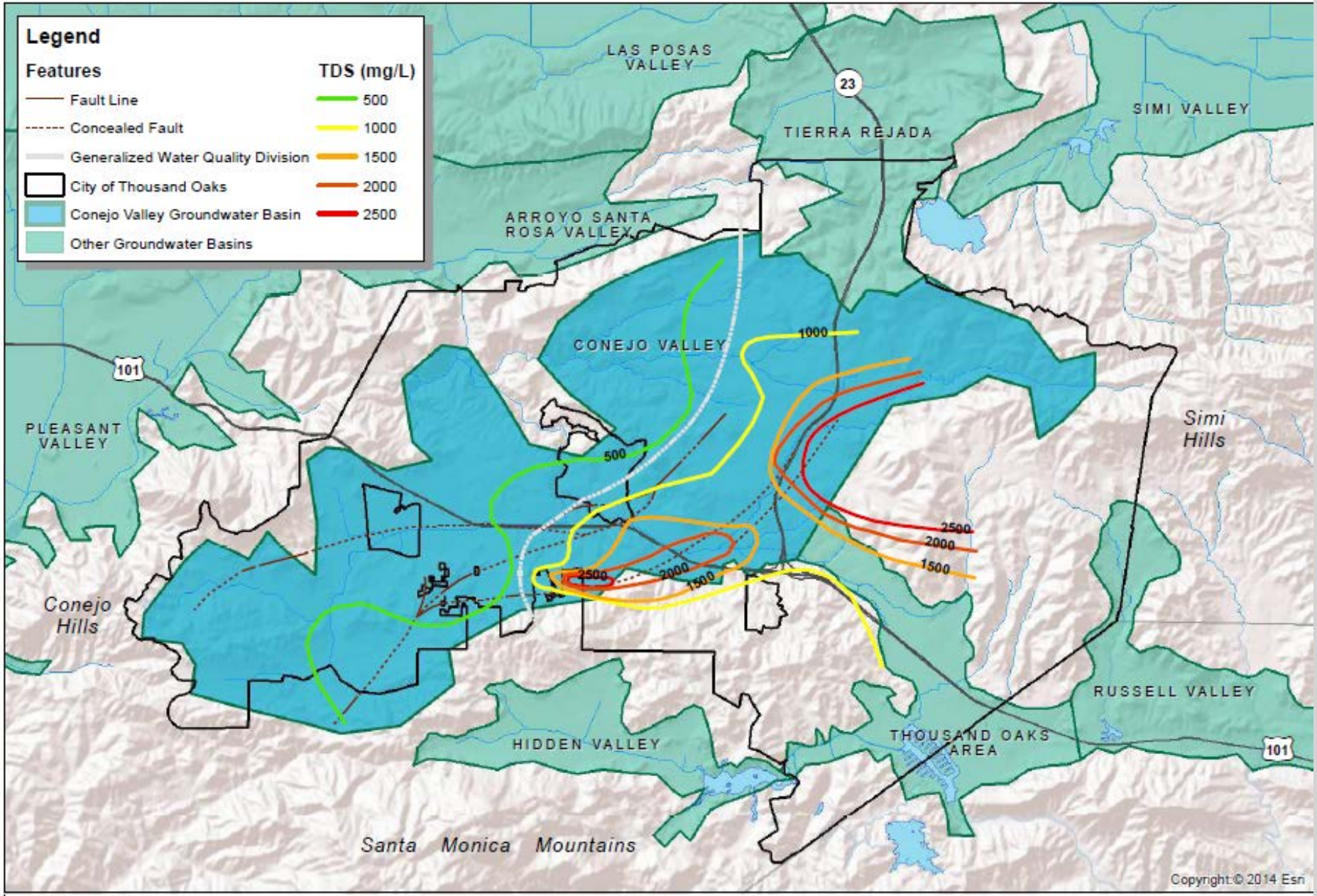
Historical Overdraft of the CVGB



CDM Smith

0 1 2 4 Miles

Thousand Oaks Ground Water Study
Groundwater Elevation Change 1951-1962 (USGS 80-63)
Figure 2-8

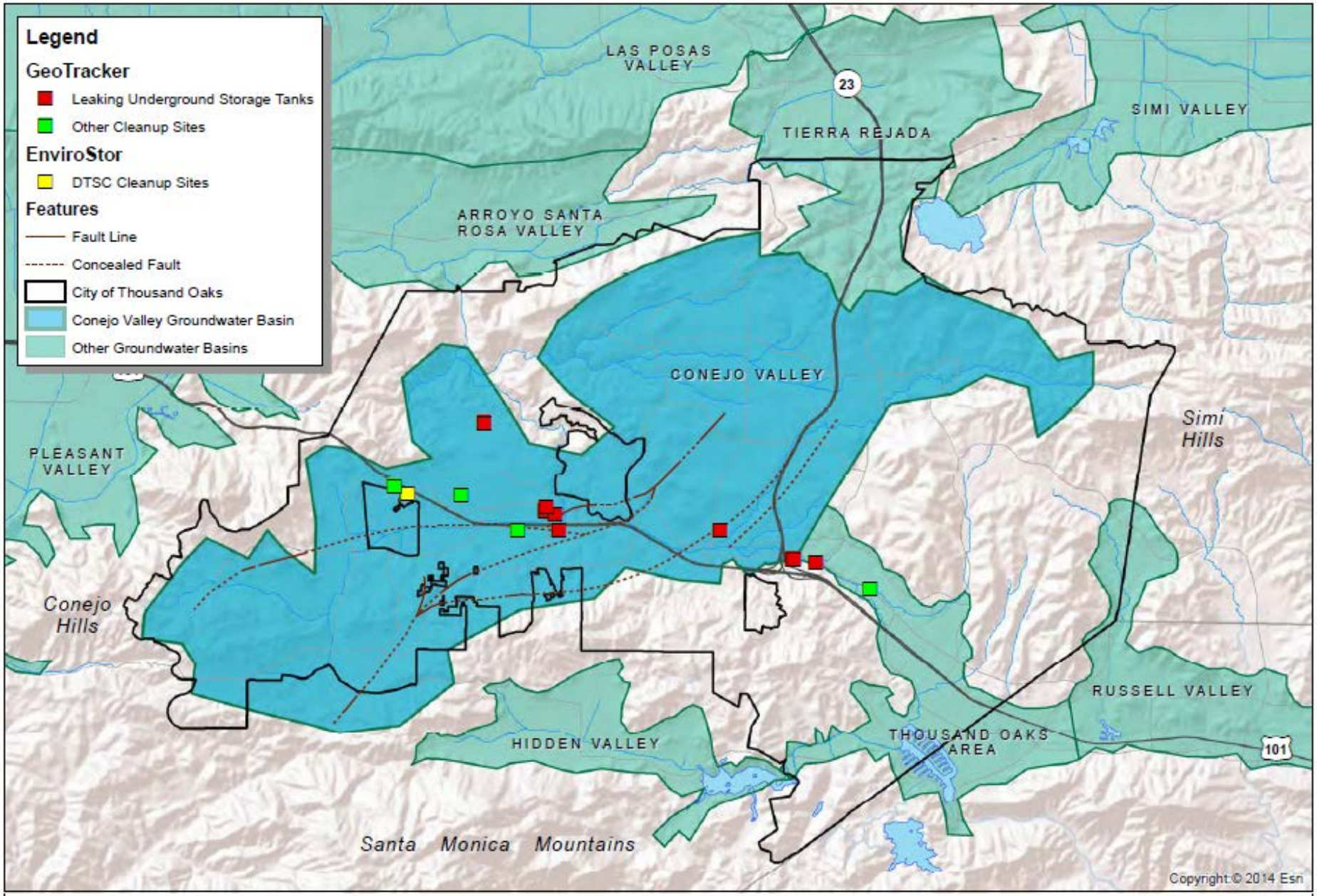


Thousand Oaks Ground Water Study
Total Dissolved Solids (USGS 80-63)
Figure 3-1

CDM Smith

0 1 2 4 Miles

HISTORICAL WATER QUALITY IN THE CVGB



CDM Smith

0 1 2 4 Miles

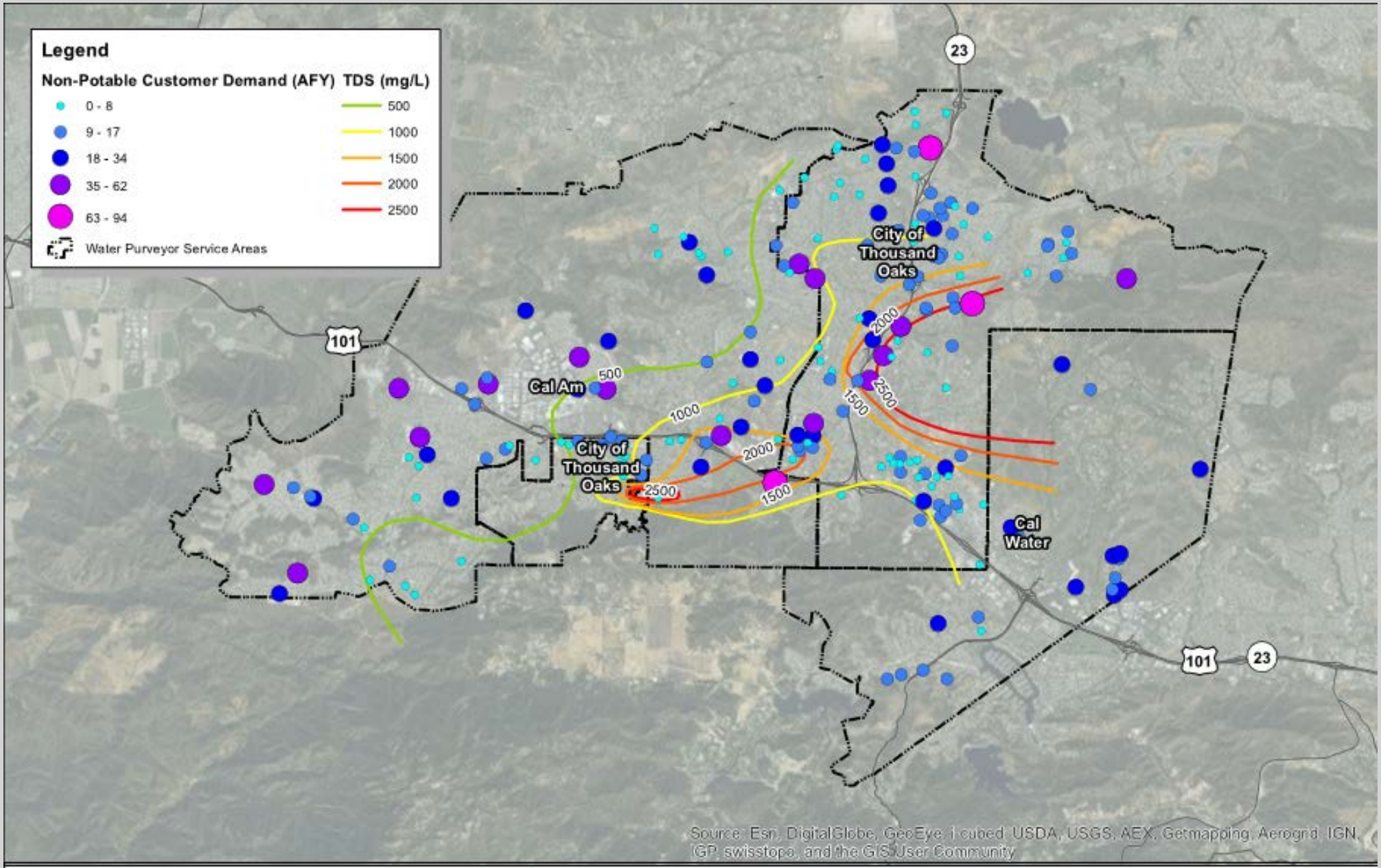
Thousand Oaks Ground Water Study
Environmental Cleanup Sites Affecting Groundwater
Figure 4-2

Environmental Cleanup Sites that may have Impacted Groundwater

CVGB Operational Yield Assessment

Method	Operational Yield (AFY)	
	Low Range	High Range
Prior estimate (USGS) based on Conejo Creek Discharge	2,000	
Current Estimate based on Conejo Creek Discharge	3,300	3,500
Replenishment of overdraft post 1963	2,000	3,000
Water budget analysis	8,000*	
SELECTED BASIN YIELD	**3,500**	

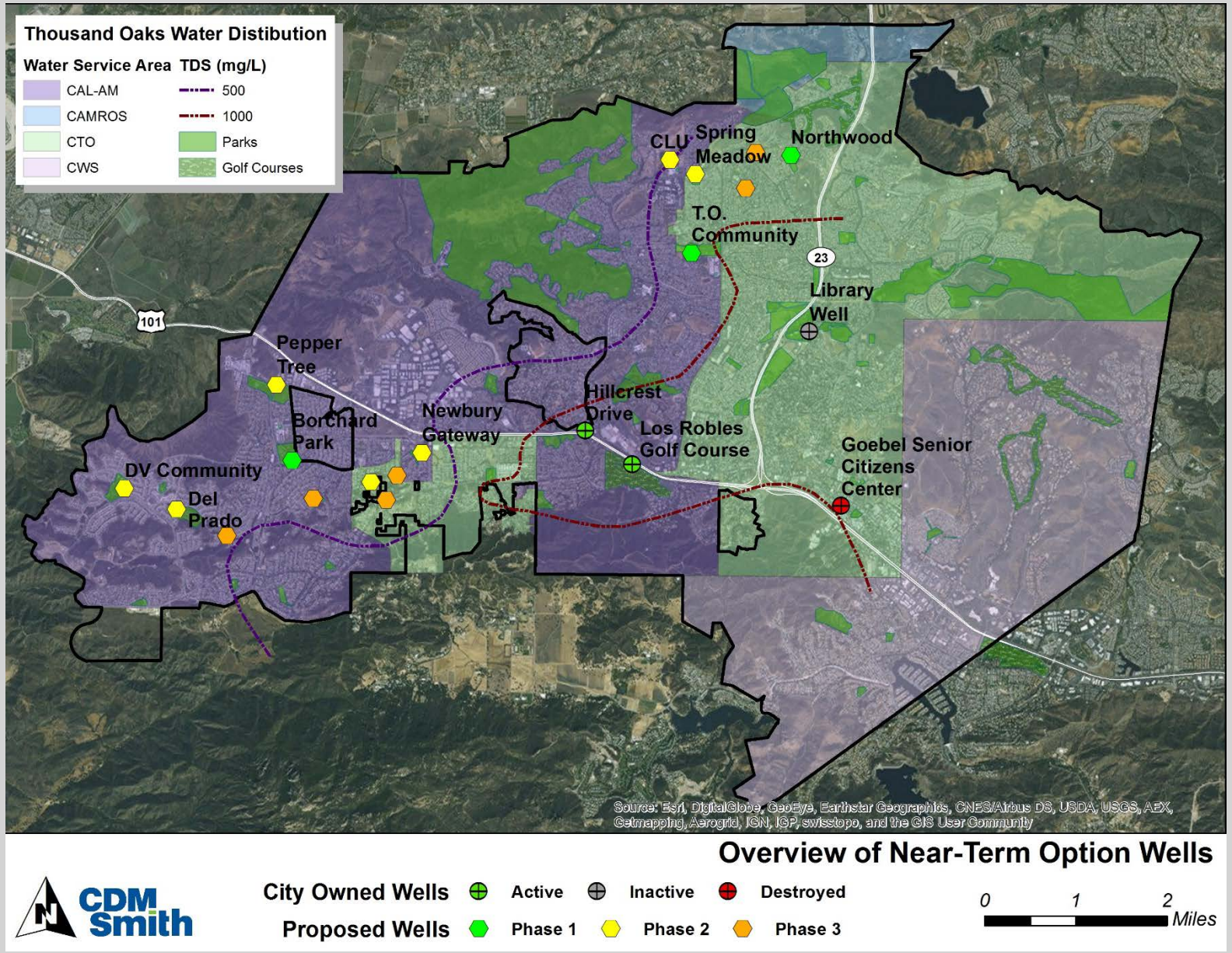
POTENTIAL NON-POTABLE WATER DEMAND



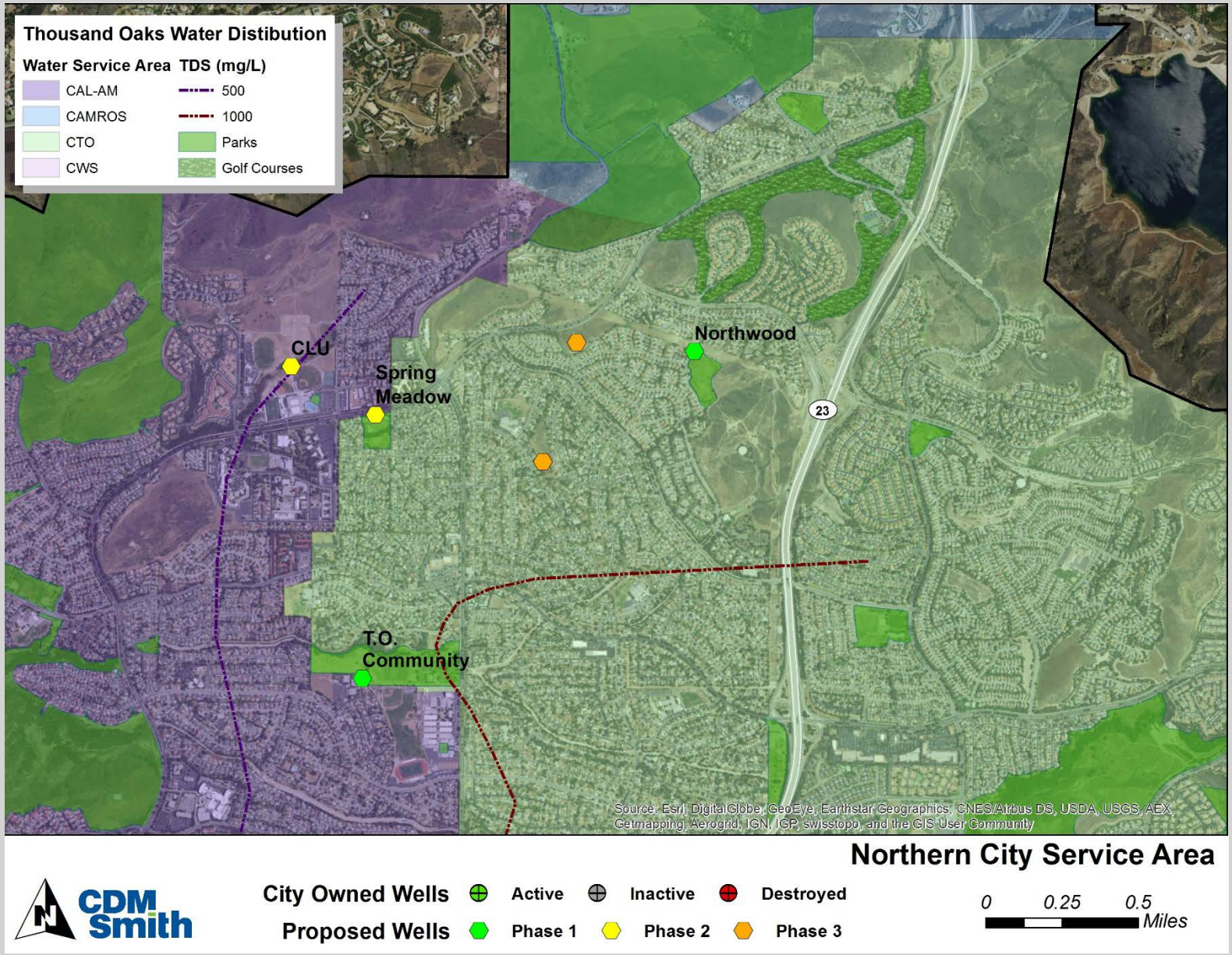
GROUNDWATER AND REUSE SUPPLY OPTIONS

Near-Term	Mid-Term	Long-Term
Groundwater Phase 1 • Extract from higher quality areas of groundwater basin for non-potable uses • Partial treatment at Los Robles Golf course to reduce TDS and iron **Target Yield = 480AFY**	**Groundwater Phase 3** • Additional wells with minimal treatment for potable distribution **Target Yield = 1,260 AFY** -OR- **Brackish Desalination** • Brackish GW desalination **Target Yield = 650 AFY**	**Potable Reuse** • Direct Potable Reuse/Reservoir Augmentation **Target Yield:** • **Small-Scale = 2,600 AFY** • **Large-Scale = 7,200 AFY**
Groundwater Phase 2 • Minimal treatment for potable distribution **Target Yield = 1,800 AFY**	**Additional Non-Potable Reuse** • Non-potable reuse from LVMWD **Target Yield = 615 AFY**	**Groundwater Recharge** • Camrosa GWR **Target Yield = 200 AFY**
Additional water conservation Target Yield = TBD		

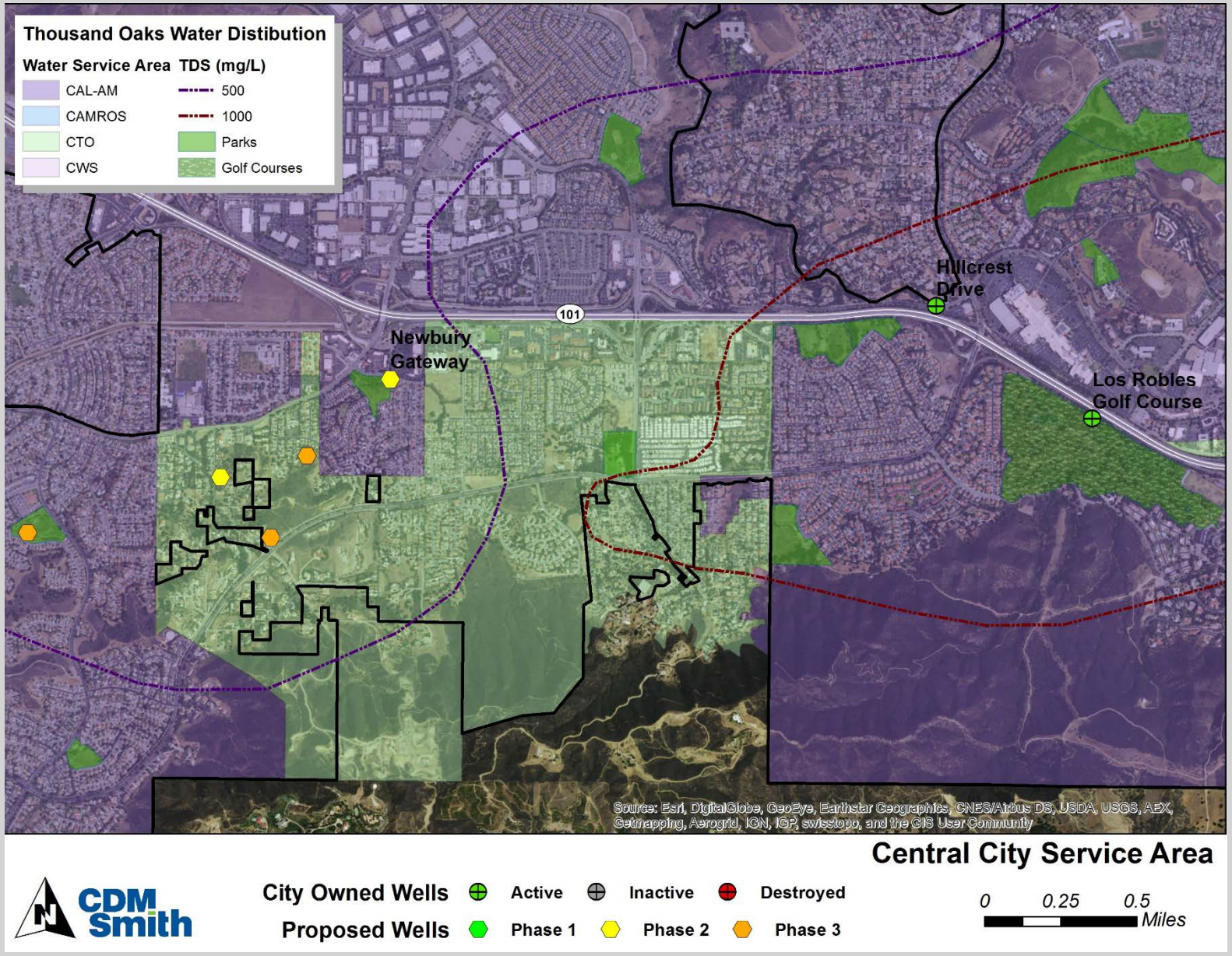
Overview of Proposed Groundwater Wells



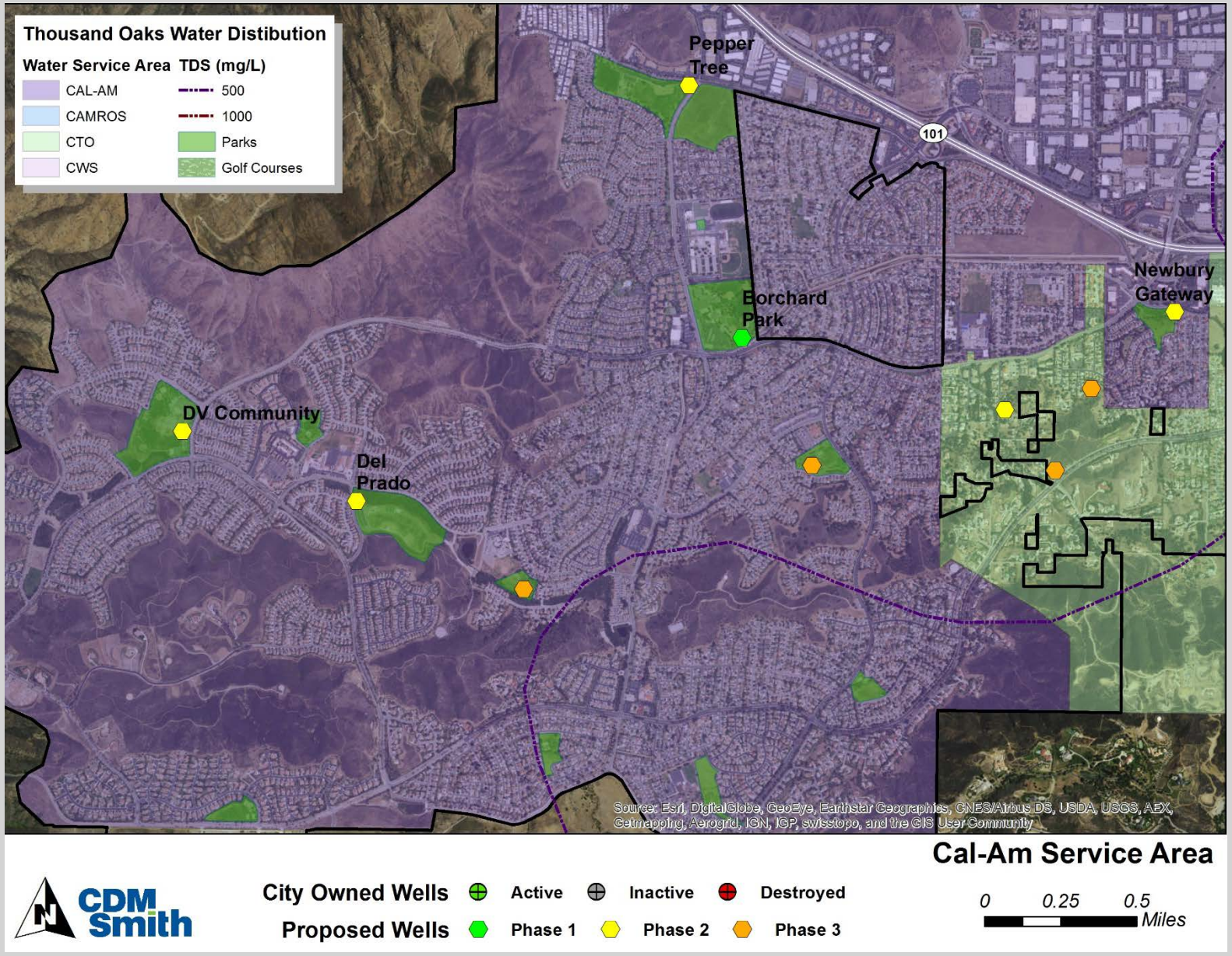
GROUNDWATER OPTIONS – NORTH CITY SERVICE AREA



GROUNDWATER OPTIONS – CENTRAL CITY SERVICE AREA



GROUNDWATER OPTIONS – CAL AM SERVICE AREA



GROUNDWATER OPTIONS SUMMARIZED

Service Area	Near-Term		Mid-Term	Groundwater Total
	Phase 1	Phase 2	Phase 3	
North City Capacity (AFY)	240	600	420	1,260
Central City Capacity (AFY)	180	420	420	1,020
Cal Am Capacity (AFY)	60	780	420	1,260
Total Capacity (AFY)	**480**	**1,800**	**1,260**	**3,540**
Capital Cost ($M)	$7.95	$20.08	$14.94	
O&M Cost ($M)	$0.20	$0.45	$0.24	

Other Mid-Term Options

1. Brackish Groundwater Desalination
2. Additional non-potable recycled water from LVMWD

Conceptual Costs for Other Mid-Term Options

Option	Yield (AFY)	Capital Costs ($M)	O&M Costs ($M)
Brackish GW Desalination	650	$14.40	$0.40
Additional Non-Potable Reuse	615	$12.53	$0.80*

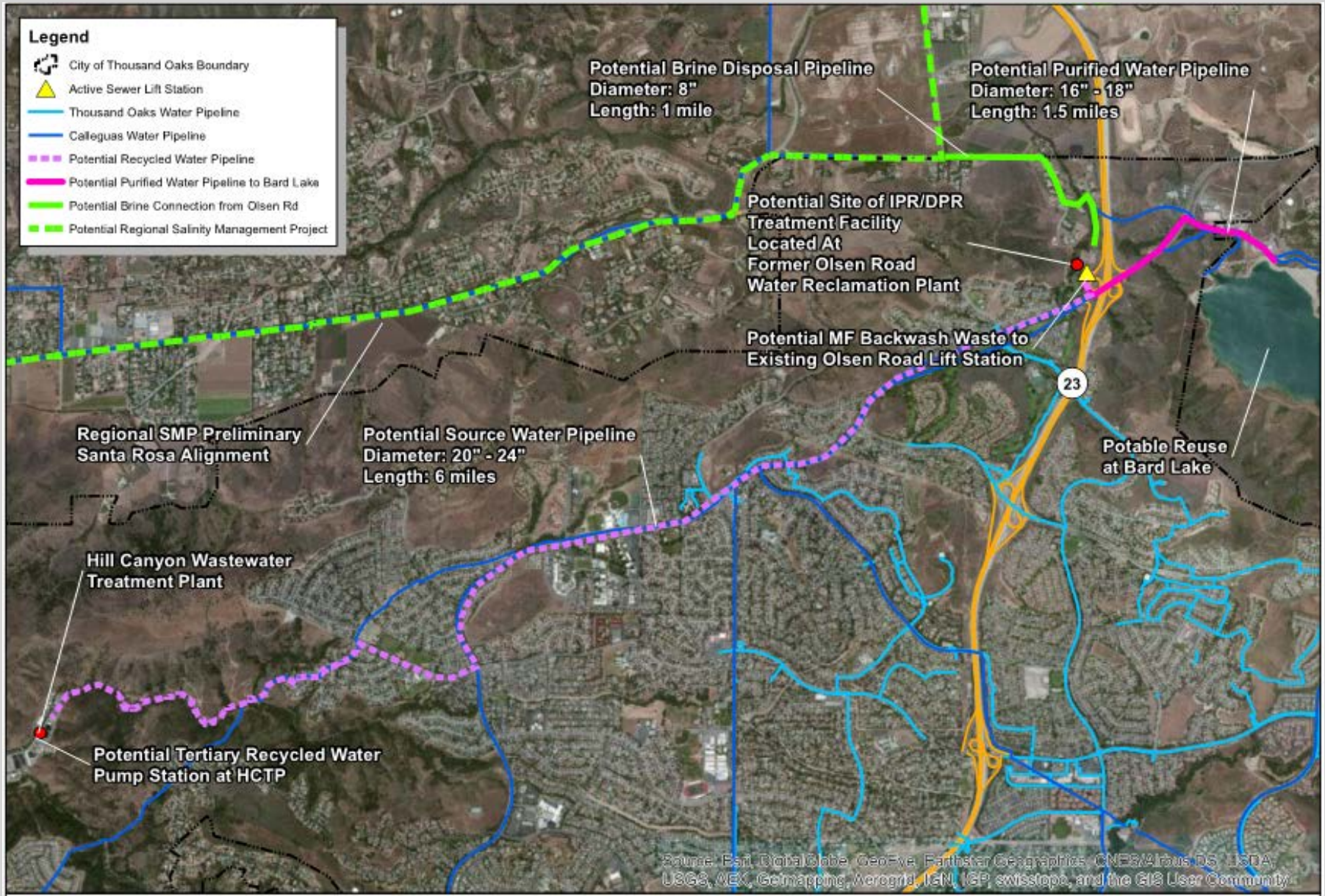
* Purchase cost of recycled water from LVMWD estimated at $1,300/AF.

LONG-TERM OPTIONS

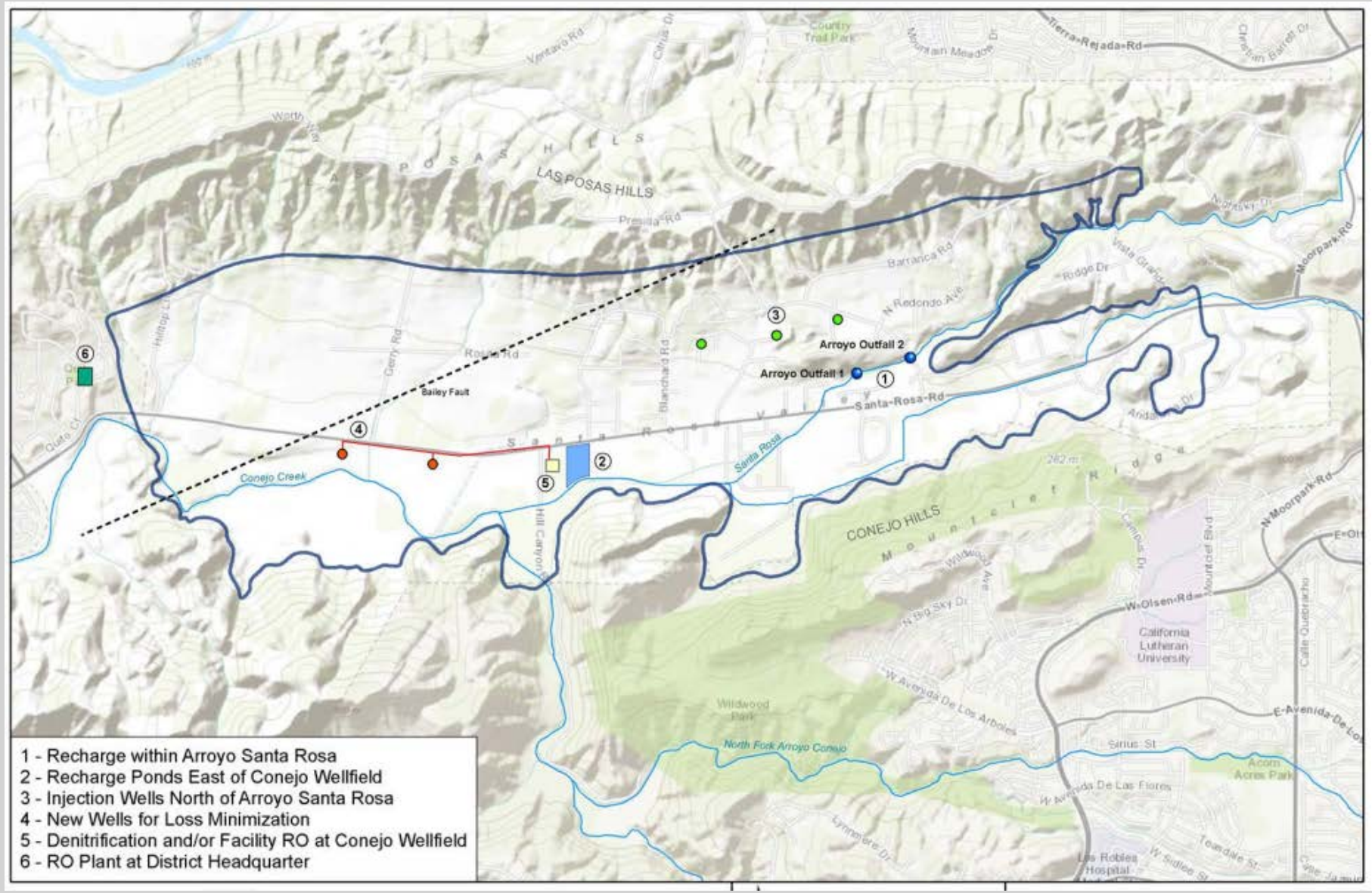
1. Direct Potable Reuse (DPR)/Reservoir augmentation (RA) utilizing Lake Bard

2. Camrosa groundwater replenishment (GWR) project in the Santa Rosa Basin

LONG- TERM OPTION 1 – POTABLE REUSE



LONG- TERM OPTION 2 – CAMROSA GWR



Conceptual Costs for Long-Term Options

Option	Yield (AFY)	Capital Costs ($M)	O&M Costs ($M)
1a – Small-Scale DPR	2,600	$57.70	$3.18*
1b – Large-Scale DPR	7,200	$116.10	$7.71*
2 – Camrosa GWR	200	$7.5M	Minimal

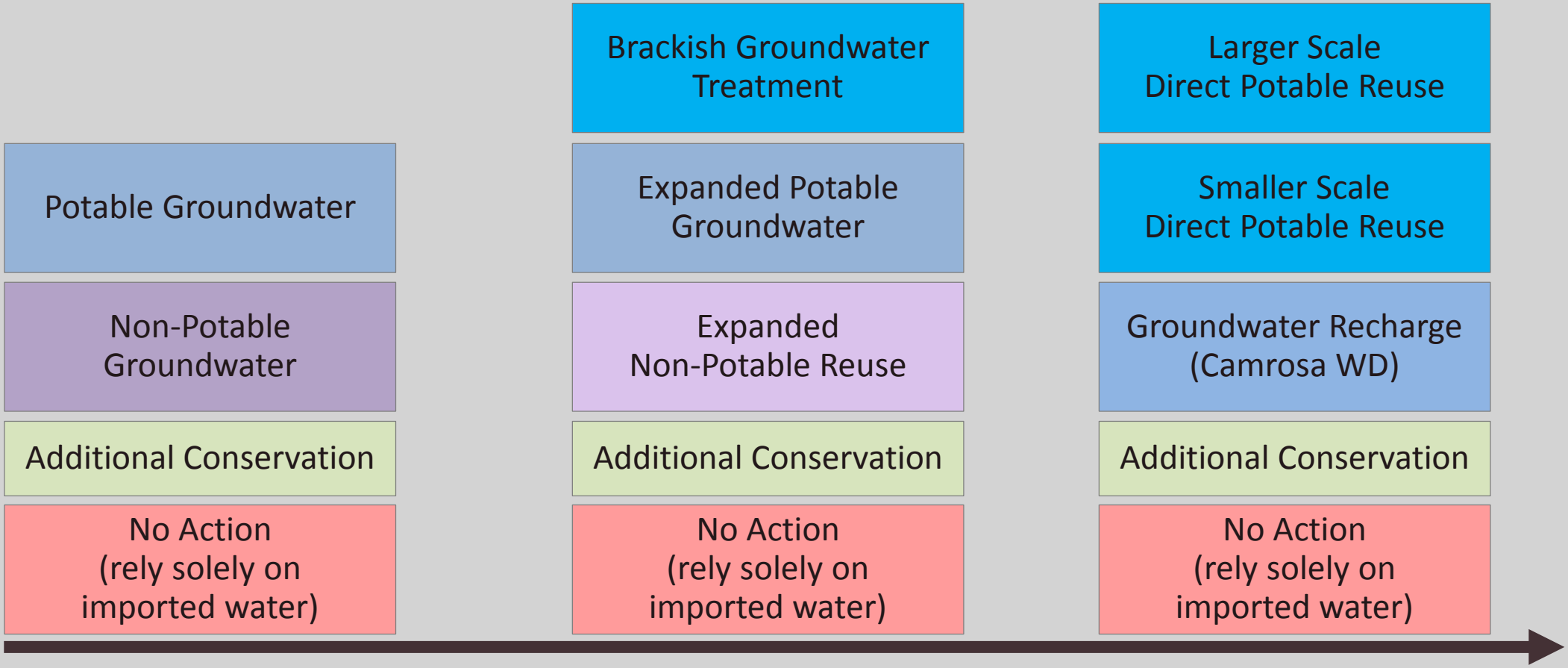
* Includes cost for water treatment at Lake Bard by Calleguas MWD.

Objectives and Metrics

No.	Objective	Weight	Sub-Objective	Sub-Weight	Metric
1	Water Reliability	30	New Local Supply	60	Percent of local supply
			Certainty of Local Water Supply	40	Certainty score*
2	Cost-Effectiveness	30	Lifecycle Cost	50	Present value score ($M)
			Capital Cost	40	Capital Cost ($M)
			Potential for Outside Funding	10	Funding score*
3	Implementation Ease	15	Institutional Complexity	40	Institutional score*
			Permitting Complexity	30	Permitting score*
			Customer Acceptance	30	Acceptance score*
4	Operational Ease	10	Operational Complexity	100	Operational score*
5	Environmental	10	Impact to Creek's Ecosystem	55	Creek score*
			Impact to HCTP	35	HCTP score*
			Carbon Footprint	10	Marginal Energy (kWh/AF)
6	Secondary Water Quality	5	Water Hardness	100	Hardness score*

* Qualitative score from 1-5, where 1 = poor performance and 5 = superior performance.

Alternatives are Assembled from Different Combinations of Options



Definition of Alternatives

Alt	Name	Description	Options			Total Local Supply (AFY)
			Near-Term	Mid-Term	Long-Term	
1	No Action	No new local supplies	None	None	None	0
2	Exploratory	Initial irrigation wells	GW Phase 1	None	None	480
3	Low Unit Cost	Alt #2 + potable wells	GW Phase 1 + 2	GW Phase 3	None	3,540
4	Low Unit Cost Plus	Alt #3 + NPR expansion	GW Phase 1 + 2	GW Phase 3 + NPR	None	4,155
5	Higher Reliability	GW Phase 1 + 2, + brackish desalination	GW Phase 1 + 2	Brackish Desal	None	2,930
6	Higher Reliability Plus	Alt #5 + NPR expansion	GW Phase 1 + 2	Brackish Desal + NPR	None	3,545
7	Full Resource Utilization A	Alt #6 + GWR in Camrosa	GW Phase 1 + 2	Brackish Desal + NPR	Camrosa GWR	3,745
8	Full Resource Utilization B	Alt #6 + Small-Scale DPR	GW Phase 1 + 2	Brackish Desal + NPR	Small-Scale DPR	6,145
9	Full Resource Utilization C	Alt #6 + Large-Scale DPR	GW Phase 1 + 2	Brackish Desal + NPR	Large-Scale DPR	10,745

Unit Cost for Options

Option	Supply Yield (AFY)	Current Unit Cost ($/AF)	Unit Cost in 2035 ($/AF)
Imported Water	As Needed	$ 1,391	$ 3,355*
Phase 1 Groundwater	480	$ 1,507	$ 1,838
Phase 2 Groundwater	1,800	$ 976	$ 1,178
Phase 3 Groundwater	1,260	$ 961	$ 1,113
Brackish Groundwater Desal	650	$ 2,051	$ 2,542
Non-Potable Reuse	615	$ 2,622	$ 3,670
Camrosa GWR	200	$ 2,439	$ 2,439
Small-Scale DPR	2,600	$ 2,174	$ 2,763
Large-Scale DPR	7,200	$ 1,781	$ 2,372
Seawater Desal (comp. only)	NA	$ 2,800	$ 3,929

* Assumes 4.5% escalation (historical escalation ~7%)

Unit Cost for Options

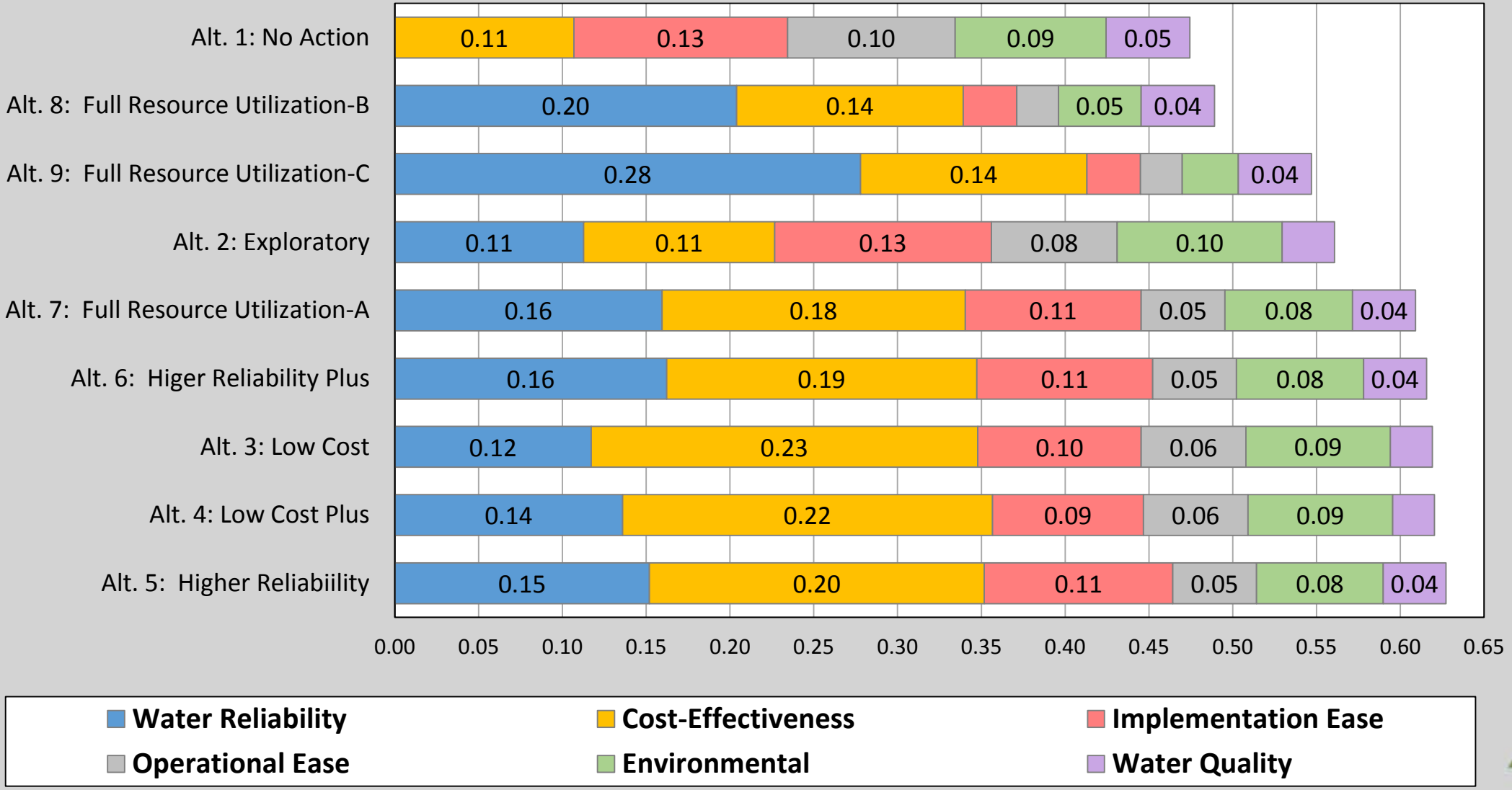
Option	Supply Yield (AFY)	Current Unit Cost ($/AF)	Unit Cost in 2035 ($/AF)
Imported Water	As Needed	$ 1,391	$ 3,355*
Phase 1 Groundwater	480	$ 1,507	$ 1,838
Phase 2 Groundwater	1,800	$ 976	$ 1,178
Phase 3 Groundwater	1,260	$ 961	$ 1,113
Brackish Groundwater Desal	650	$ 2,051	$ 2,542
Non-Potable Reuse	615	$ 2,622	$ 3,670
Camrosa GWR	200	$ 2,439	$ 2,439
Small-Scale DPR	2,600	$ 2,668	$ 3,655
Large-Scale DPR	7,200	$ 2,199	$ 2,982
Seawater Desal (comp. only)	NA	$ 2,800	$ 3,929

* Assumes 4.5% escalation (historical escalation ~7%)

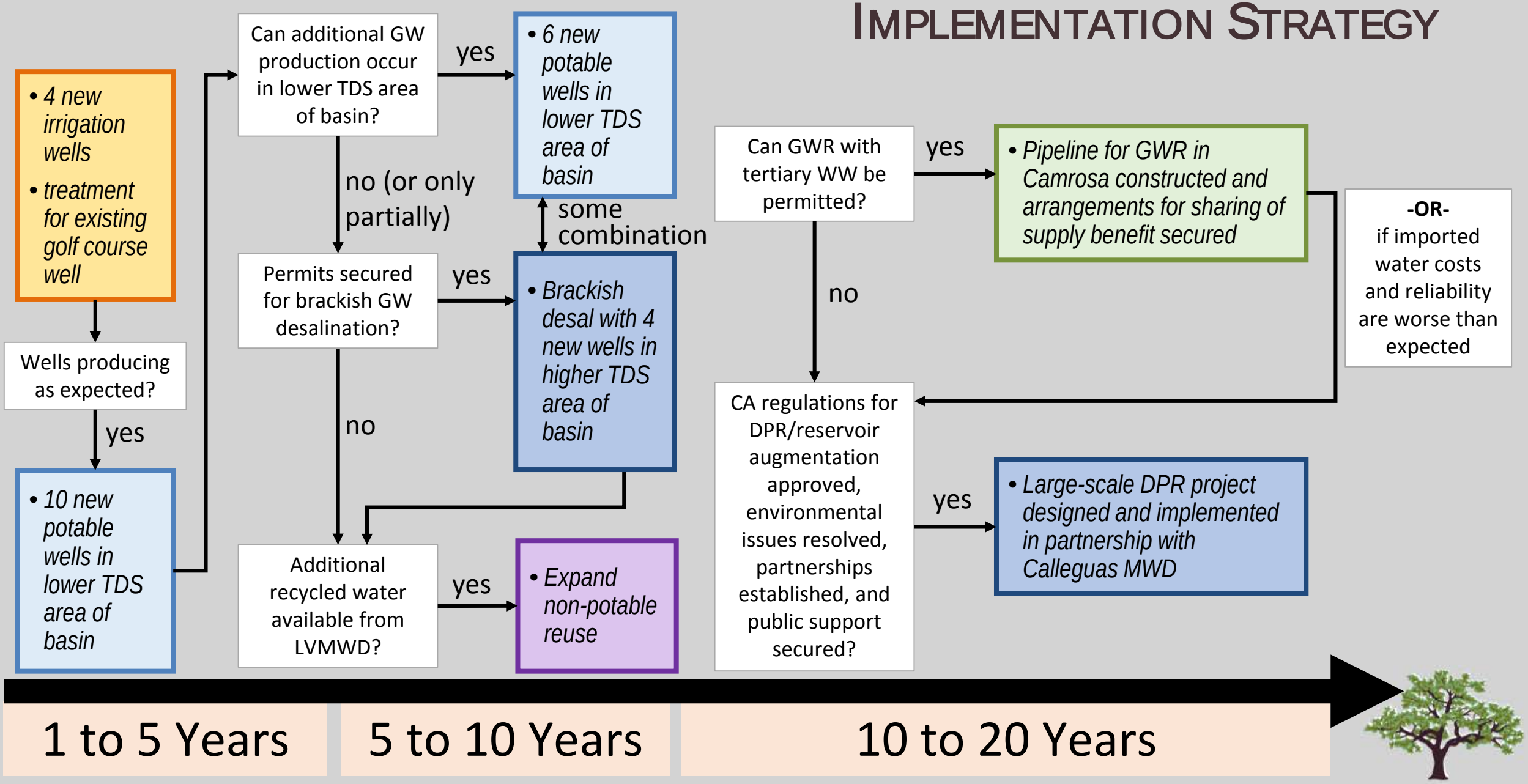
ALTERNATIVES SCORE CARD

Objective	Sub-Objective	Metric	Alternatives								
			Alt 1. No Action	Alt 2. Exploratory	Alt 3. Low Unit Cost	Alt 4. Low Unit Cost Plus	Alt 5. Higher Reliability	Alt 6. Higher Reliability Plus	Alt 7. Full Resource-A	Alt 8. Full Resource-B	Alt 9. Full Resource-C
1. Water Reliability	New Local Supply	Percent of local supply	0%	1%	9%	10%	7%	9%	9%	15%	27%
	Certainty of Local Water Supply	Certainty score	1.0	4.5	3.0	3.3	4.5	4.5	4.3	4.5	4.5
2. Cost-Effectiveness	Lifecycle Cost (2015-2040)	Present value cost ($M)	1,299	1,300	1,256	1,259	1,273	1,278	1,278	1,286	1,278
	Capital Cost	Capital cost ($M)	-	8.1	43.1	55.6	42.6	55.1	62.6	112.8	171.1
	Potential for Outside Funding	Funding score	1.0	2.0	3.0	3.3	4.0	4.3	4.3	4.5	4.5
3. Implementation Ease	Institutional Complexity	Institutional score	5.0	4.0	3.0	2.5	4.0	3.5	3.5	2.0	1.5
	Permitting Complexity	Permitting score	5.0	4.5	3.0	3.0	3.5	3.5	3.5	2.0	1.5
	Customer Acceptance	Acceptance score	3.0	5.0	5.0	5.0	4.5	4.5	4.5	1.5	1.5
4. Operational Ease	Operational Complexity	Operational score	5.0	4.0	3.5	3.5	3.0	3.0	3.0	2.0	1.5
5. Environmental	Impact to Creek's Ecosystem	Creek score	5.0	5.0	4.0	4.0	4.0	4.0	4.0	2.0	1.0
	Impact to HCTP	HCTP score	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.5	4.5
	Carbon footprint	Marginal Energy (kWh/AF)	3,300	1,341	994	995	1,437	1,365	1,295	2,165	2,663
6. Water Quality	Water Hardness	Hardness score	5.0	3.5	3.0	3.0	4.0	4.0	4.0	4.5	4.5

Alternatives Ranking with Preferred Weights



Recommended Adaptive Implementation Strategy



Benefits of Recommended Strategy

- Increase in local supply ranging from ~3,000 to 11,000, AFY depending on implementation of potable reuse
- Reduced risks from droughts and seismic events affecting imported water
- Average cost of water supply 2% to 7% lower than status quo of full reliance on imported water

Next Steps

- Develop institutional arrangements
  - Partnerships with water purveyors, Calleguas MWD and County
  - Groundwater Sustainability Agency
  - Groundwater Sustainability Plan
- Plan, design and construct first phase irrigation wells


City of
Thousand Oaks