



City of Vacaville Recycled Water Master Plan Feasibility Study

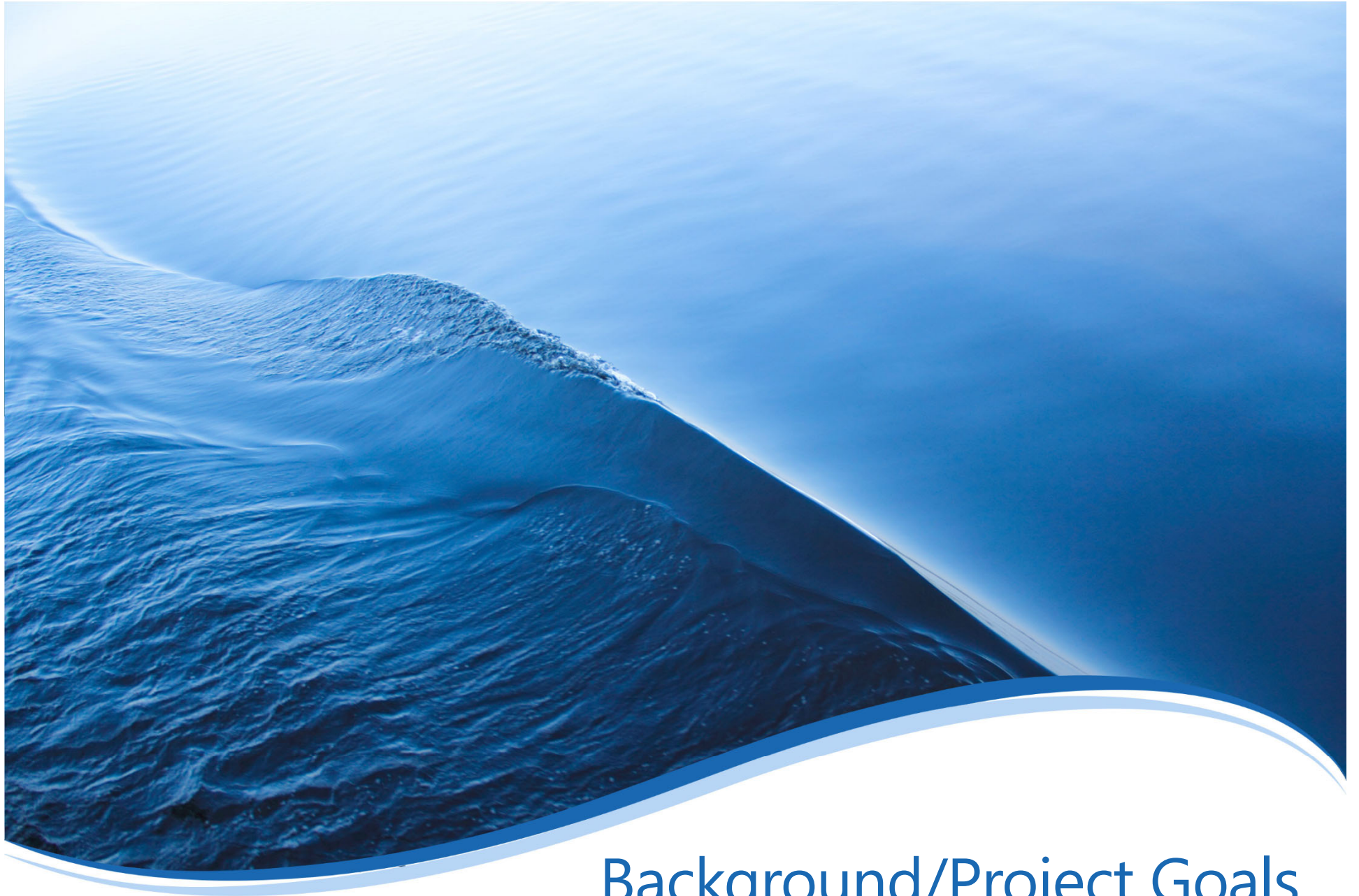
WaterReuse

Christina Castro, P.E.

January 16, 2020

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OUR BUSINESS
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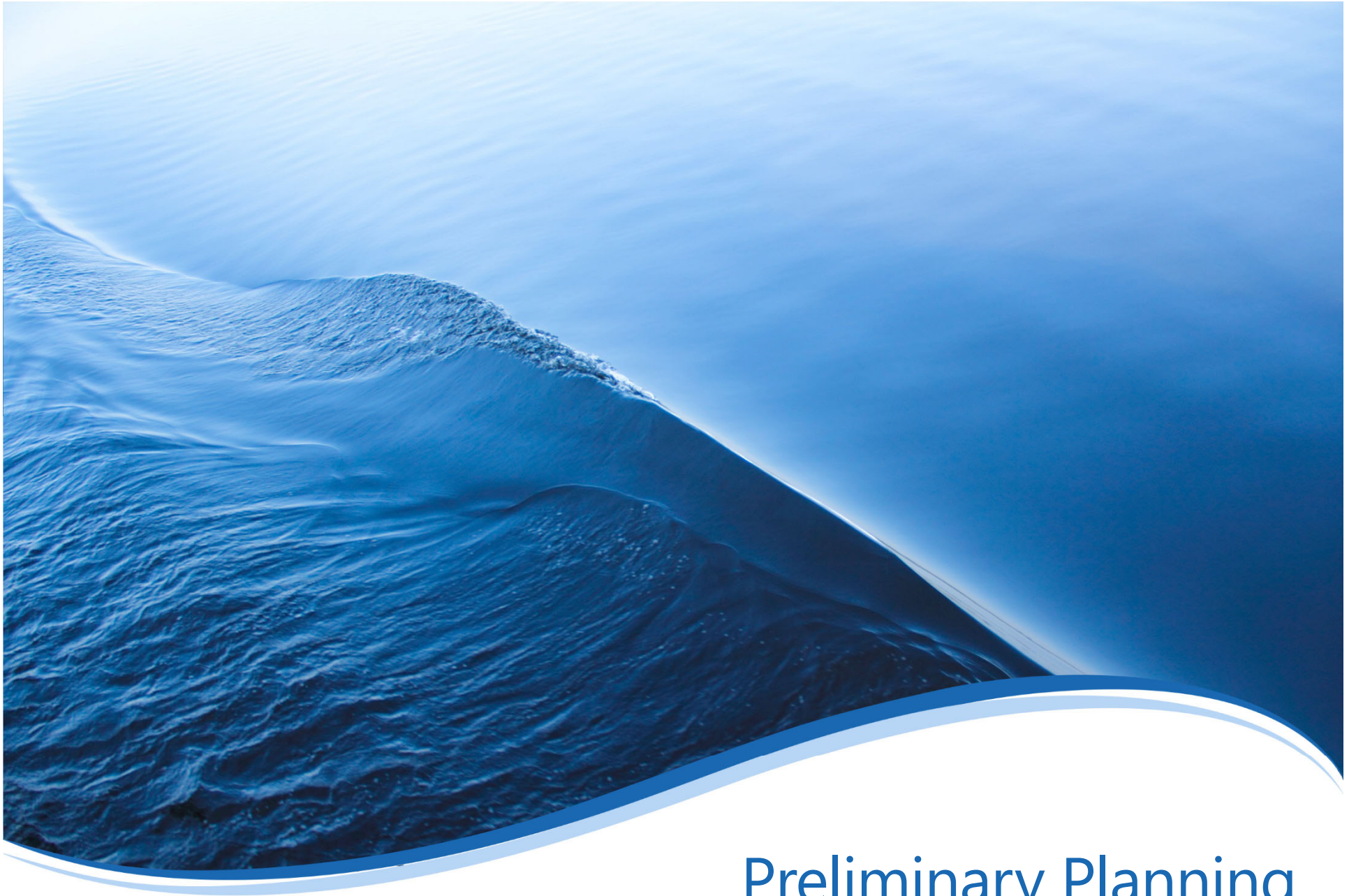
Background/Project Goals

Background

- In 2015, the City completed tertiary treatment project at Easterly
- City 2015 – 2017 Strategic Plan identifies the Recycled Water Master Plan as a key element
- In 2017, the City hired Carollo Engineers to prepare a Recycled Water Feasibility Study including CEQA

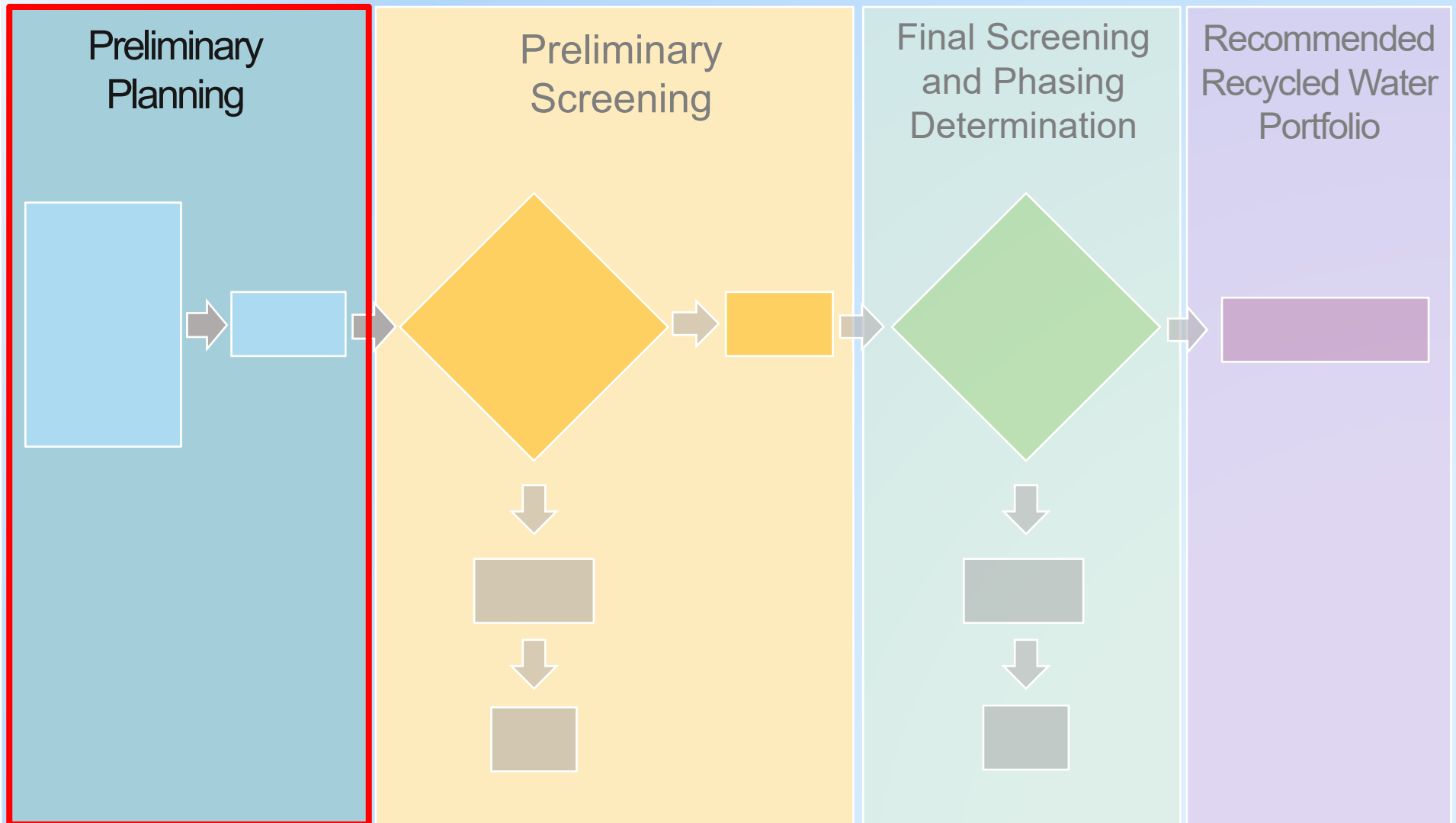
Recycled Water Program Goals

- Reduce current debt burden and maximize return on investment
- Provide recycled water as an attraction for businesses
- Conserve potable water supplies
- Define the best combination of projects that will provide maximum, practical cost recovery at minimal cost
- Deliver a Feasibility Study and associated environmental documentation that meets the SWRCB requirements for the grant



Preliminary Planning

Preliminary Planning



Preliminary Planning

Preliminary Planning

- Define use categories
- Identify customers
- Develop phasing
- Quantify Eastern recycled water supply

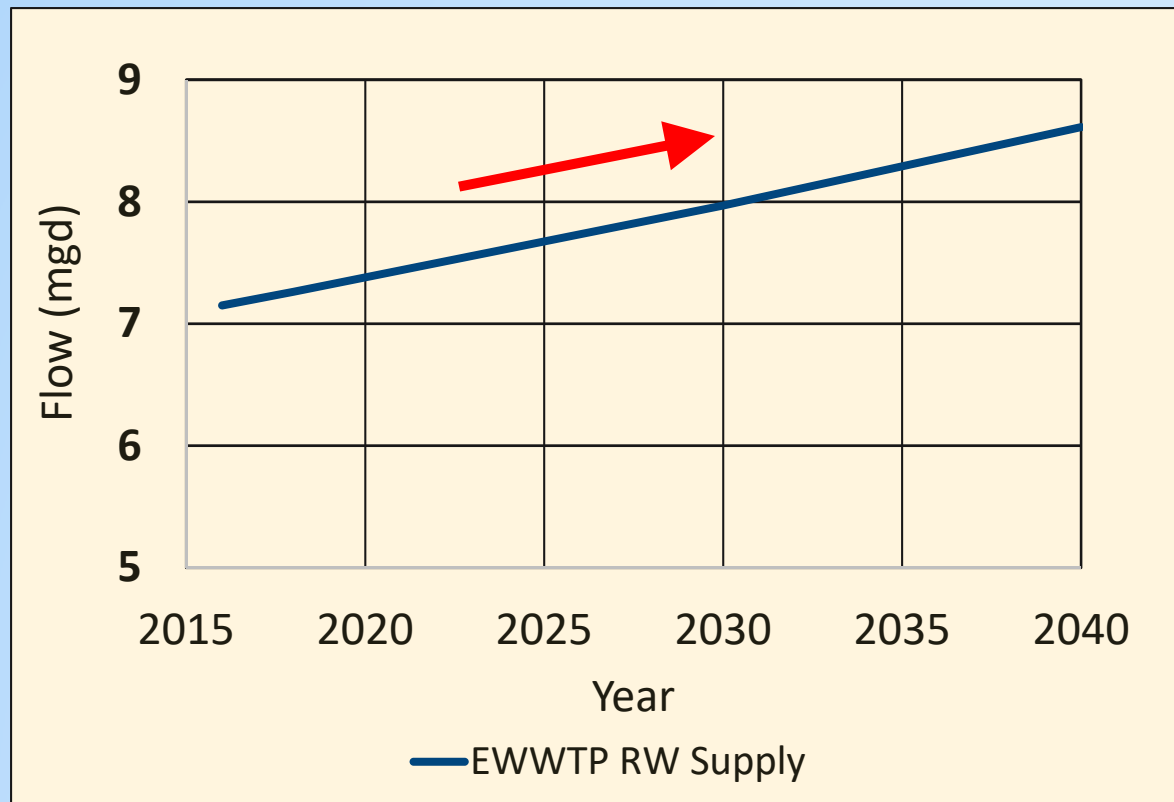
Develop recycled water concepts

Final Screening and Phasing Determination

Recommended Recycled Water Portfolio

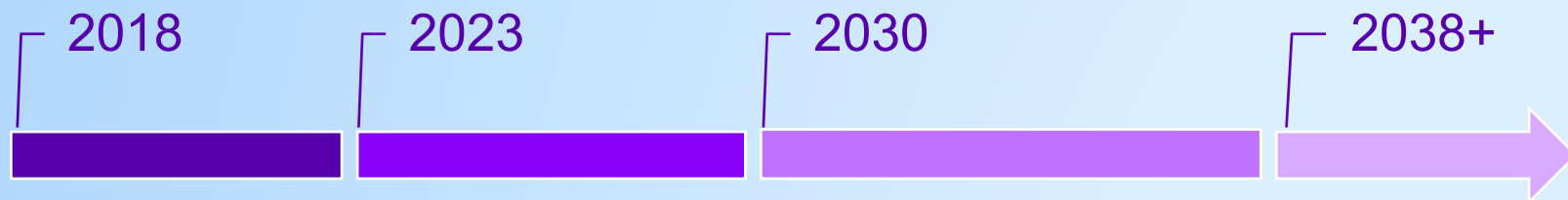
Recycled Water Availability

- Current Easterly discharge ~ 7.2 mgd
- Projected to increase with population growth



Project Phasing

- **Immediate Term** – 1 to 5 years
- **Near Term** – 6 to 12 years
- **Long Term** – 13 to 20 years
- **Distant Term** – more than 21 years

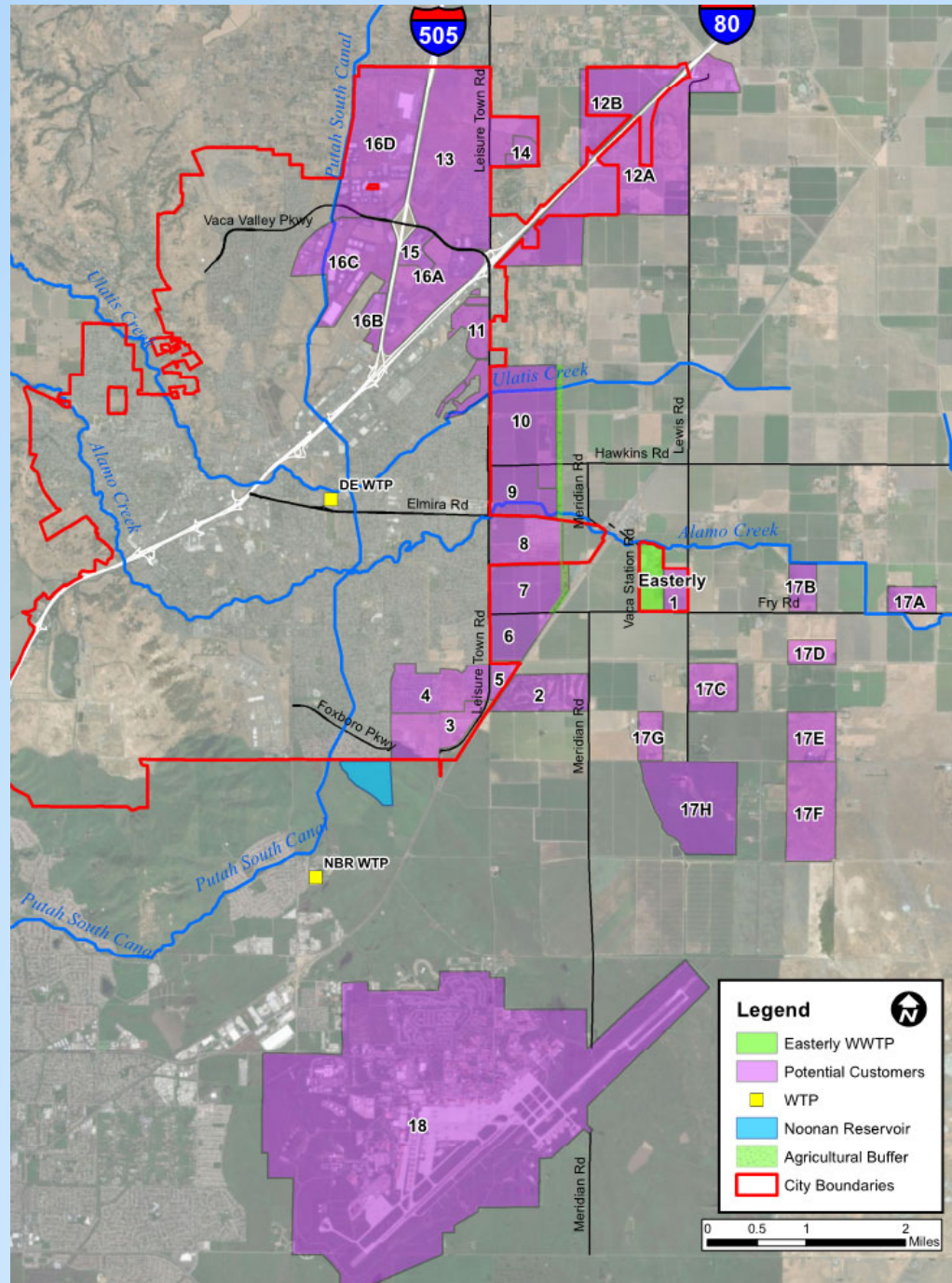


Potential Recycled Water Uses

• Downstream Diversion	Exchange/sell water to entities downstream of Easterly
• Direct Industrial Reuse	Boilers/chillers, process water
• Agricultural Reuse	Farming
• Urban Irrigation	Medians, residential landscaping, toilet flushing
• Indirect Potable Reuse/ Groundwater Recharge	Injection wells and surface water spreading
• Direct Potable Reuse	Advanced treatment at Easterly, then to City water treatment plant, then to distribution system

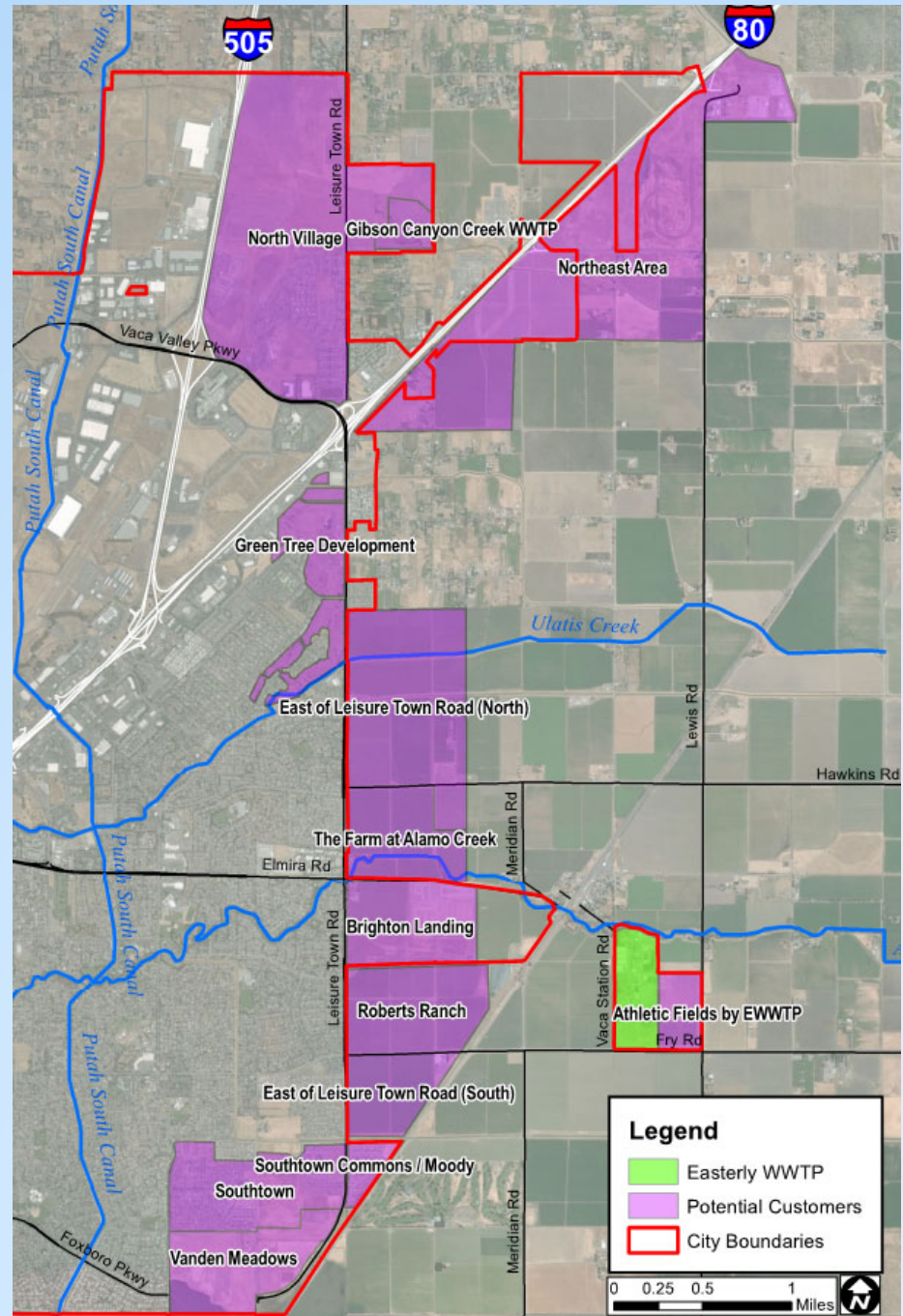
Potential Customers

- Identified 30+ potential Customers/locations
- Customers both within and outside City limits

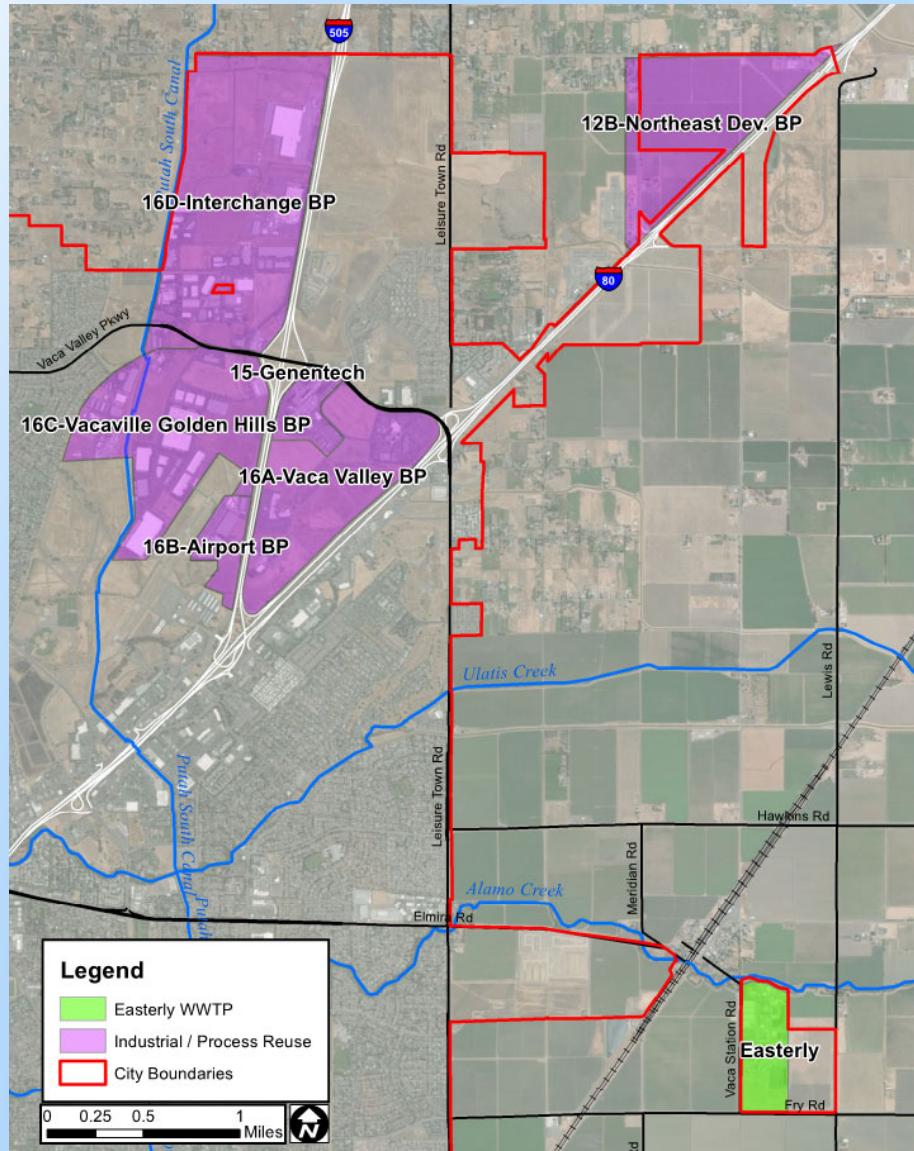


Urban Irrigation Within the City

Name	Timing
City Athletic Fields near EWWTP	1 – 5 Years
Vanden Meadows Development	1 – 5 Years
Southtown Development	1 – 5 Years
Southtown Commons / Moody	1 – 5 Years
Roberts Ranch	1 – 5 Years
Brighton Landing	1 – 5 Years
The Farm at Alamo Creek	1 – 5 Years
East of Leisure Town Rd Dev (South)	6 – 12 Years
East of Leisure Town Rd Dev (North)	6 – 12 Years
Green Tree Development	6 – 12 Years
Northeast Area Development	13 – 20 Years
North Village	13 – 20 Years
Gibson Canyon Creek WWTP	13 – 20 Years



Business and Industrial Parks

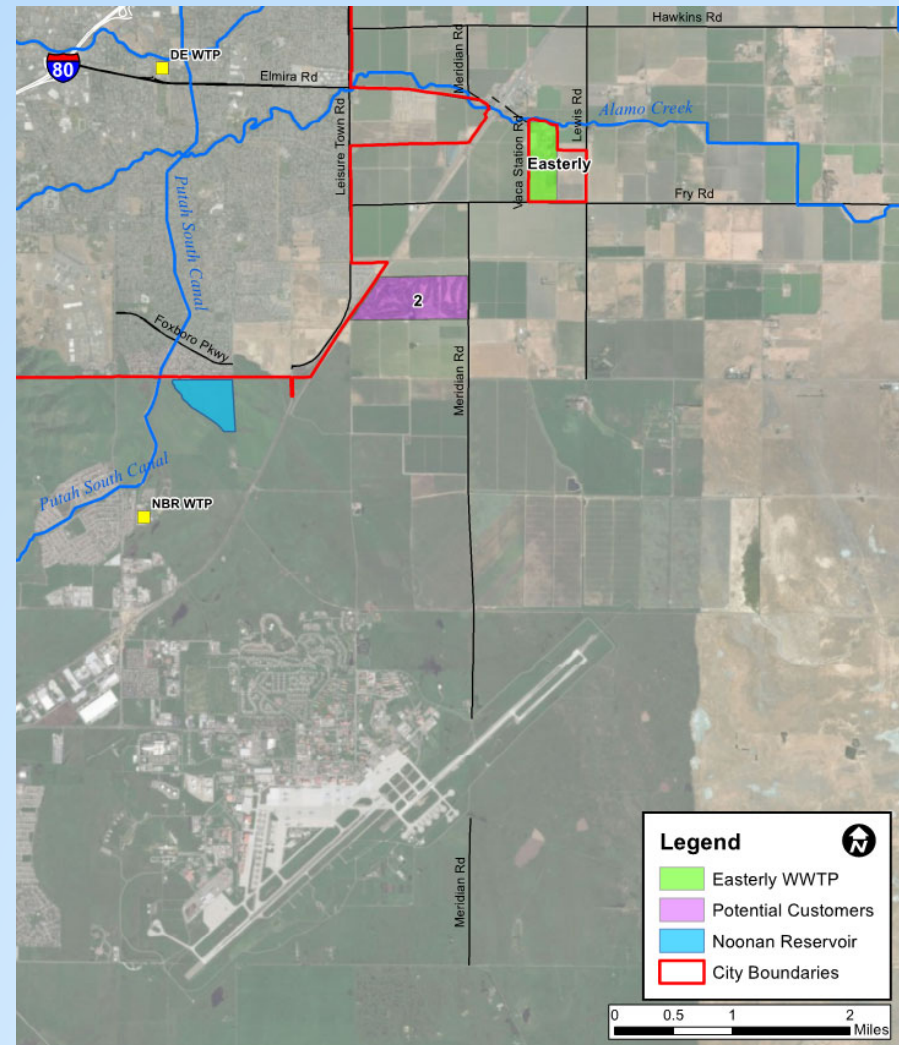


- Recycled Water helps businesses meet sustainability goals
- Recycled Water conserves potable water for other purposes

Customers Outside City Limits

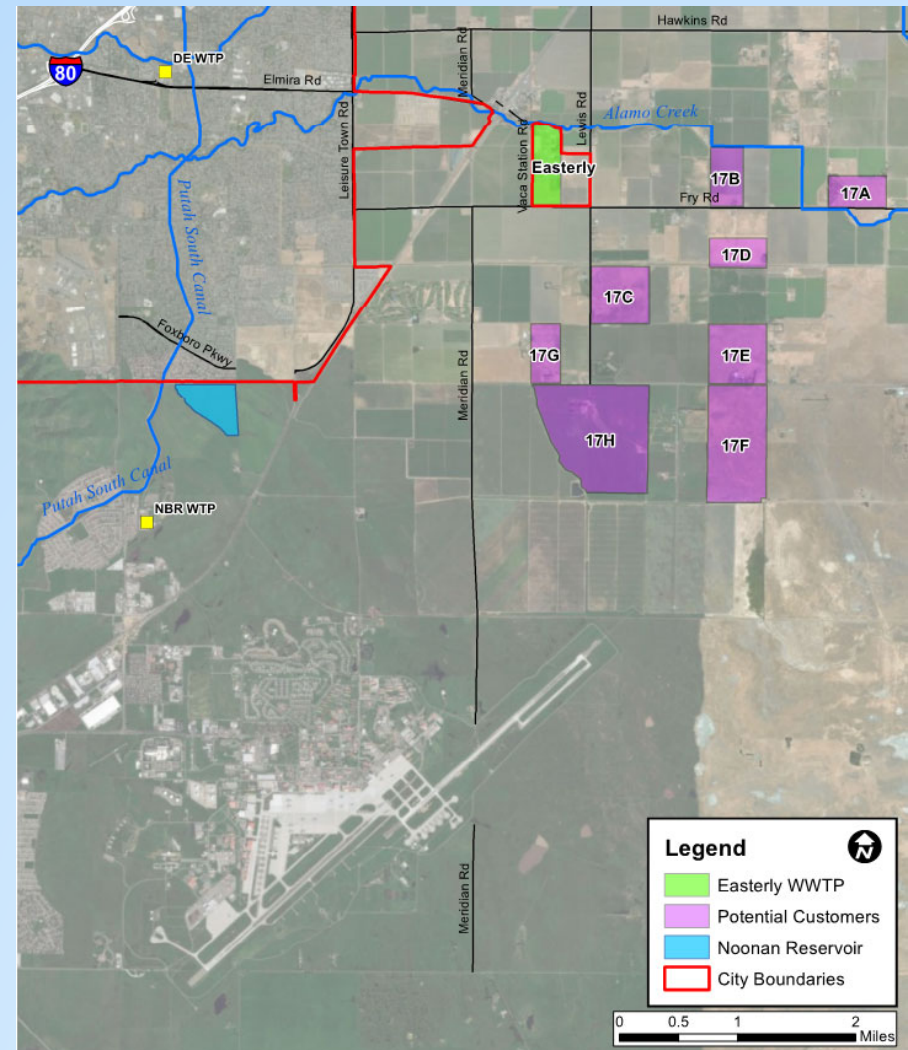
Customers Outside City Limits

- Cypress Lakes Golf Course



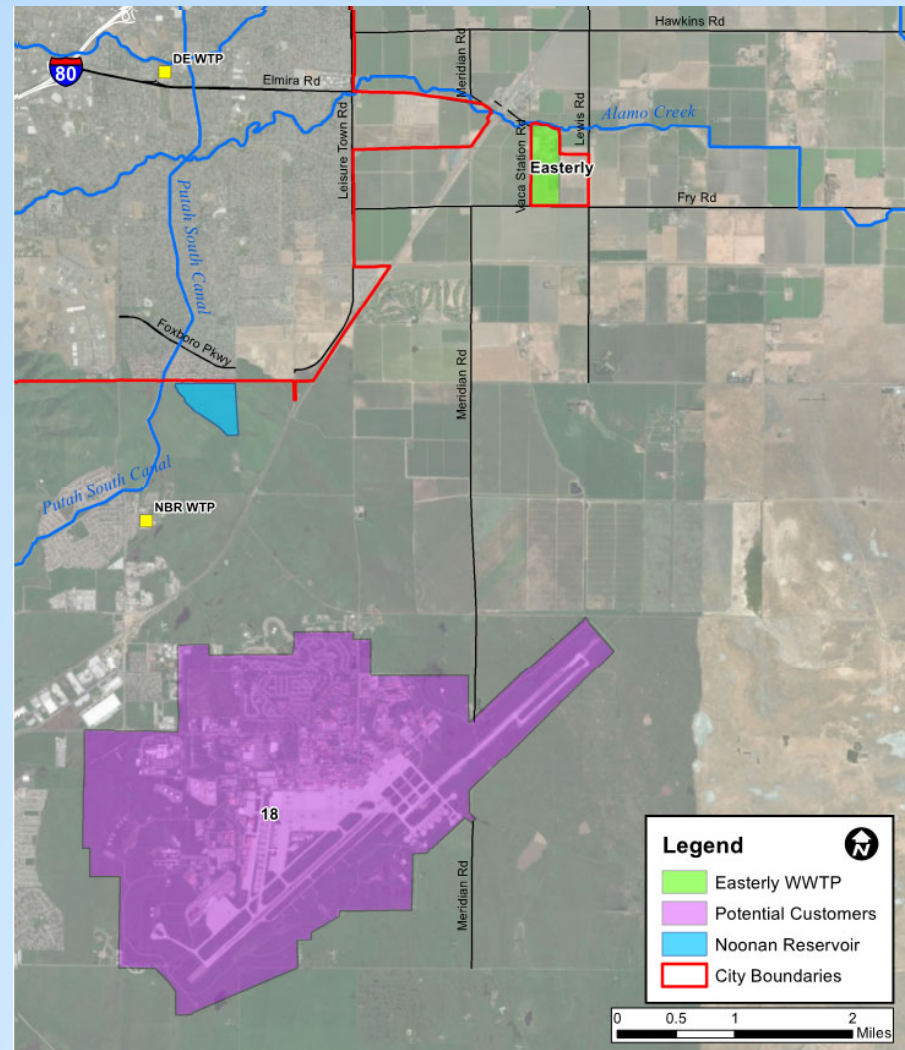
Customers Outside City Limits

- Cypress Lakes Golf Course
- Agriculture parcels (outside SID jurisdiction)



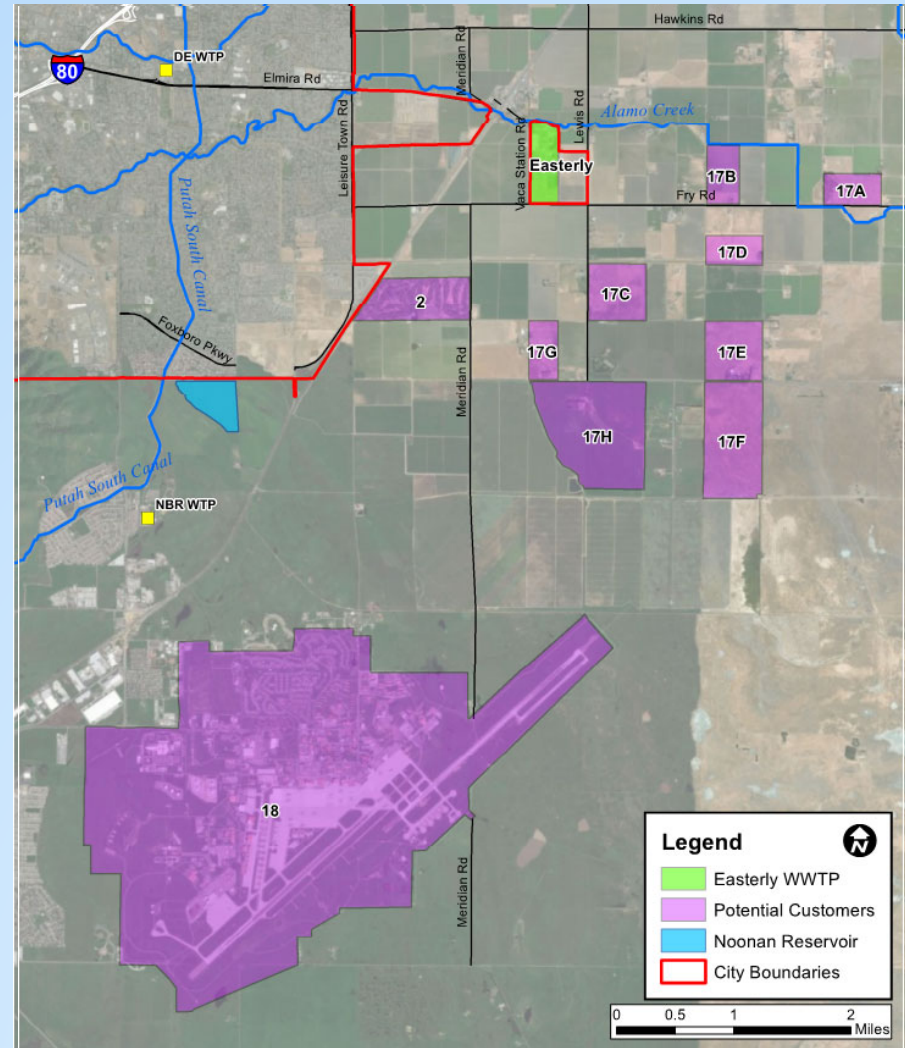
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- Travis Air Force Base



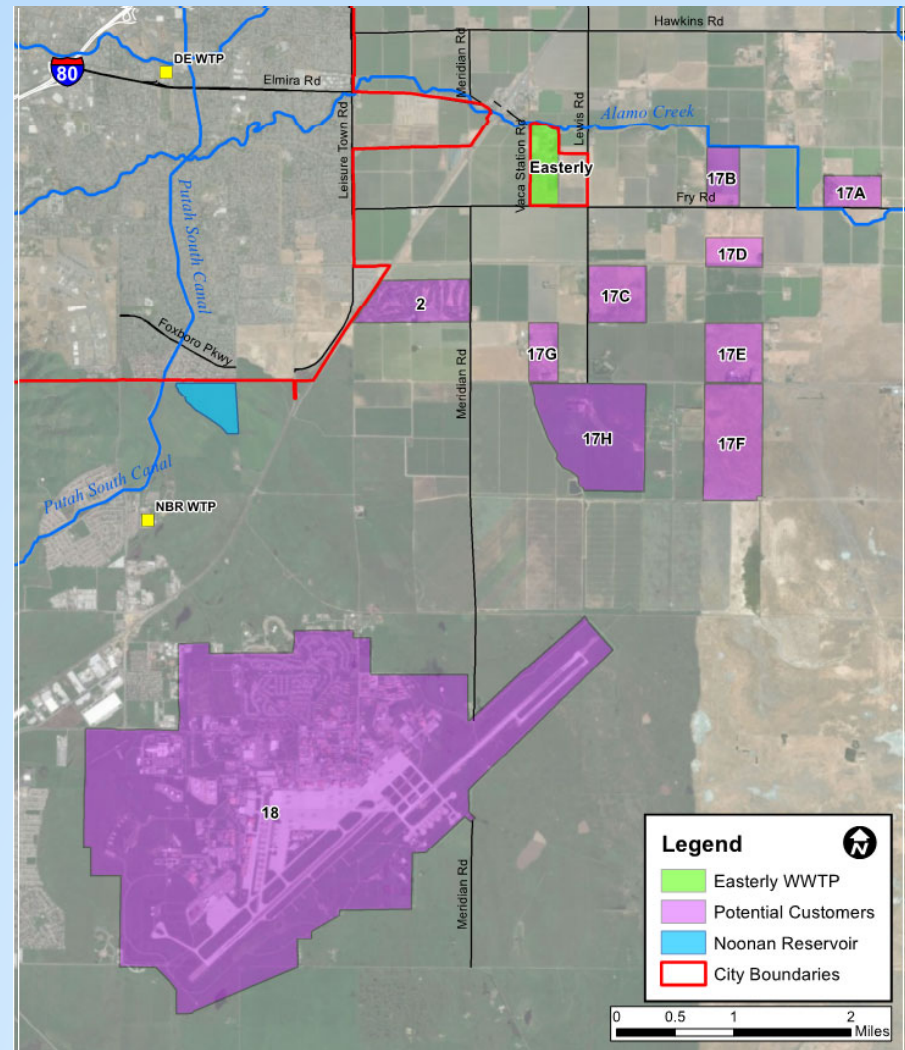
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Customers Outside City Limits

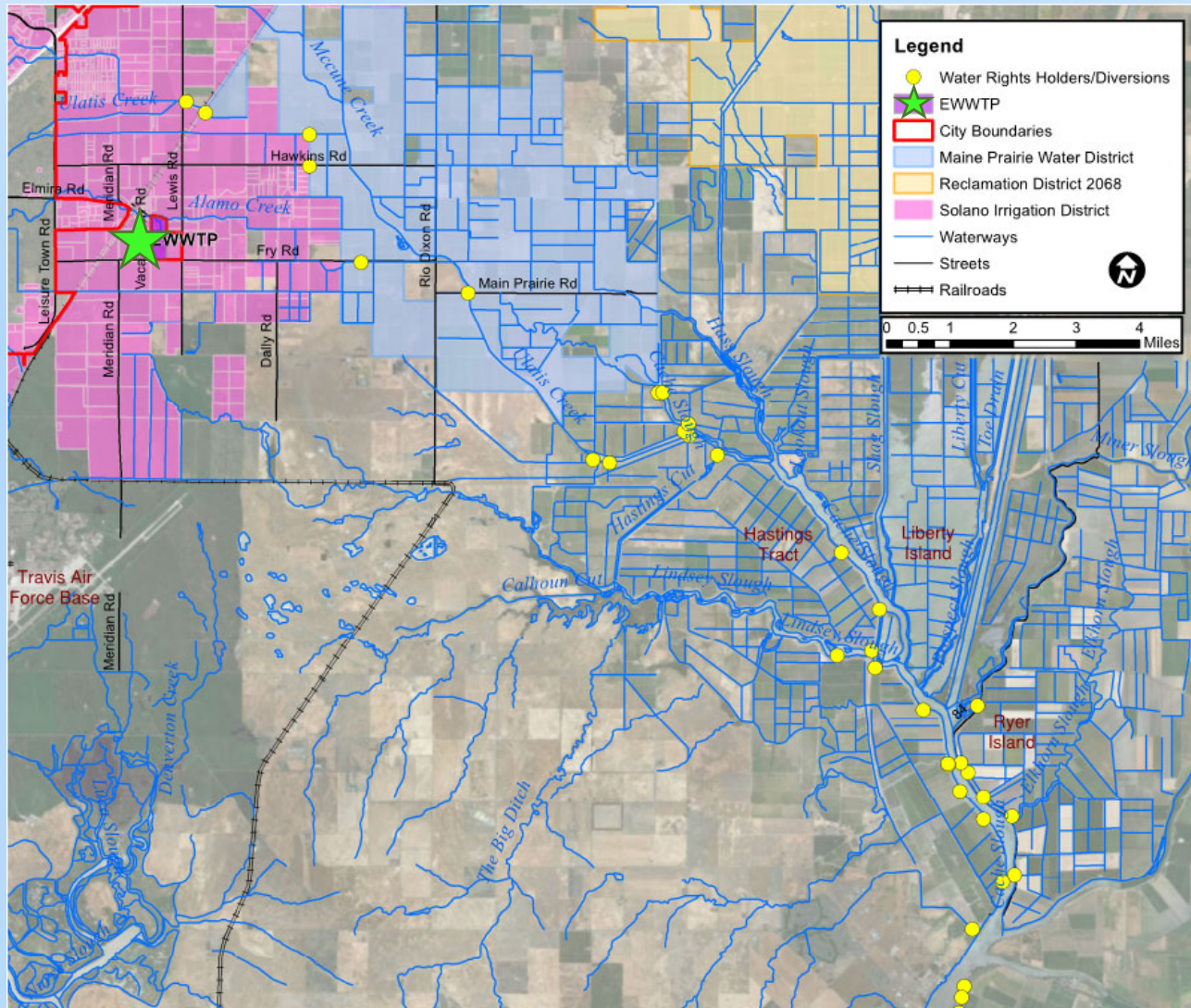
- Cypress Lakes Golf Course
- Agriculture parcels (outside SID jurisdiction)
- Travis Air Force Base
- Downstream diversions



Concept Development















Concept 1 – Downstream Diversions

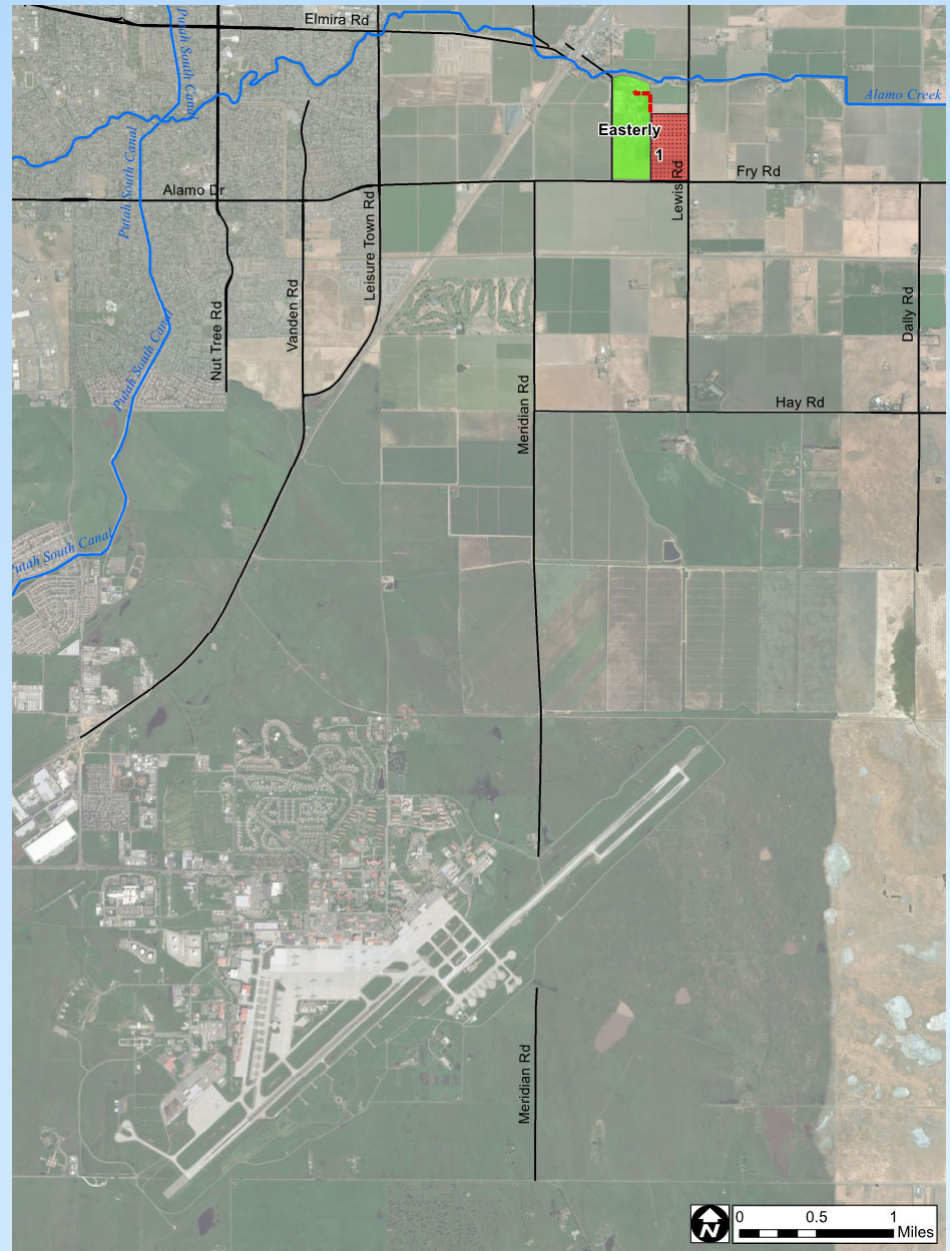


Concepts 2, 3, and 4

- **Concept 2** – athletic fields adjacent to Easterly

Legend













	Concept 2 Customers		Concept 2 Pipeline
	Concept 3 Customers - Near		Concept 3 Pipeline
	Concept 3 Customers - Long		Concept 4 Pipeline
	Concept 4 Customers - Near		Urban Irrigation
	Concept 4 Customers - Long		Agricultural Reuse
	EWWTP		Industrial Reuse

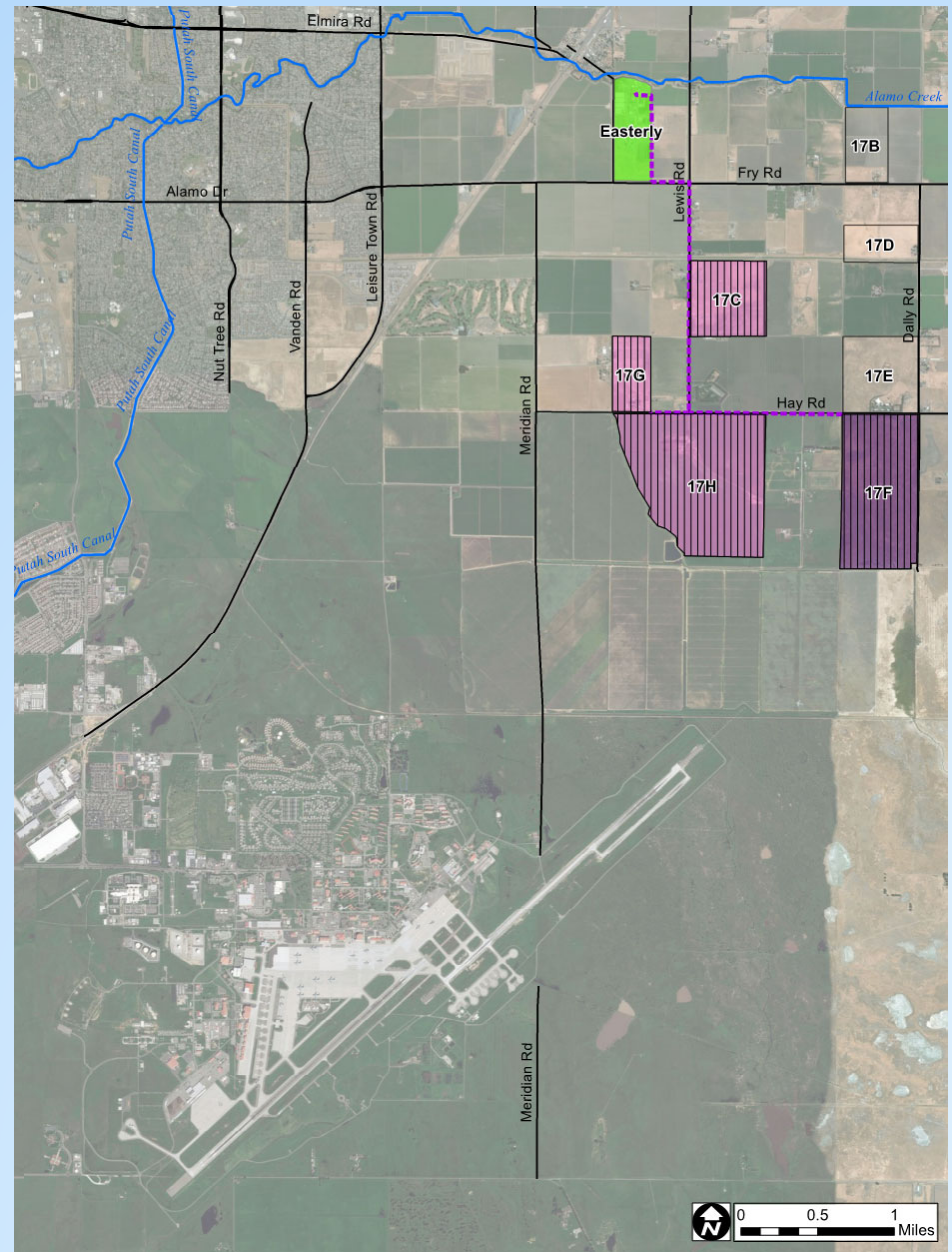


Concepts 2, 3, and 4

- **Concept 2** – athletic fields adjacent to Easterly
- **Concept 3** – agricultural customers

Legend













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	EWWTTP		Industrial Reuse

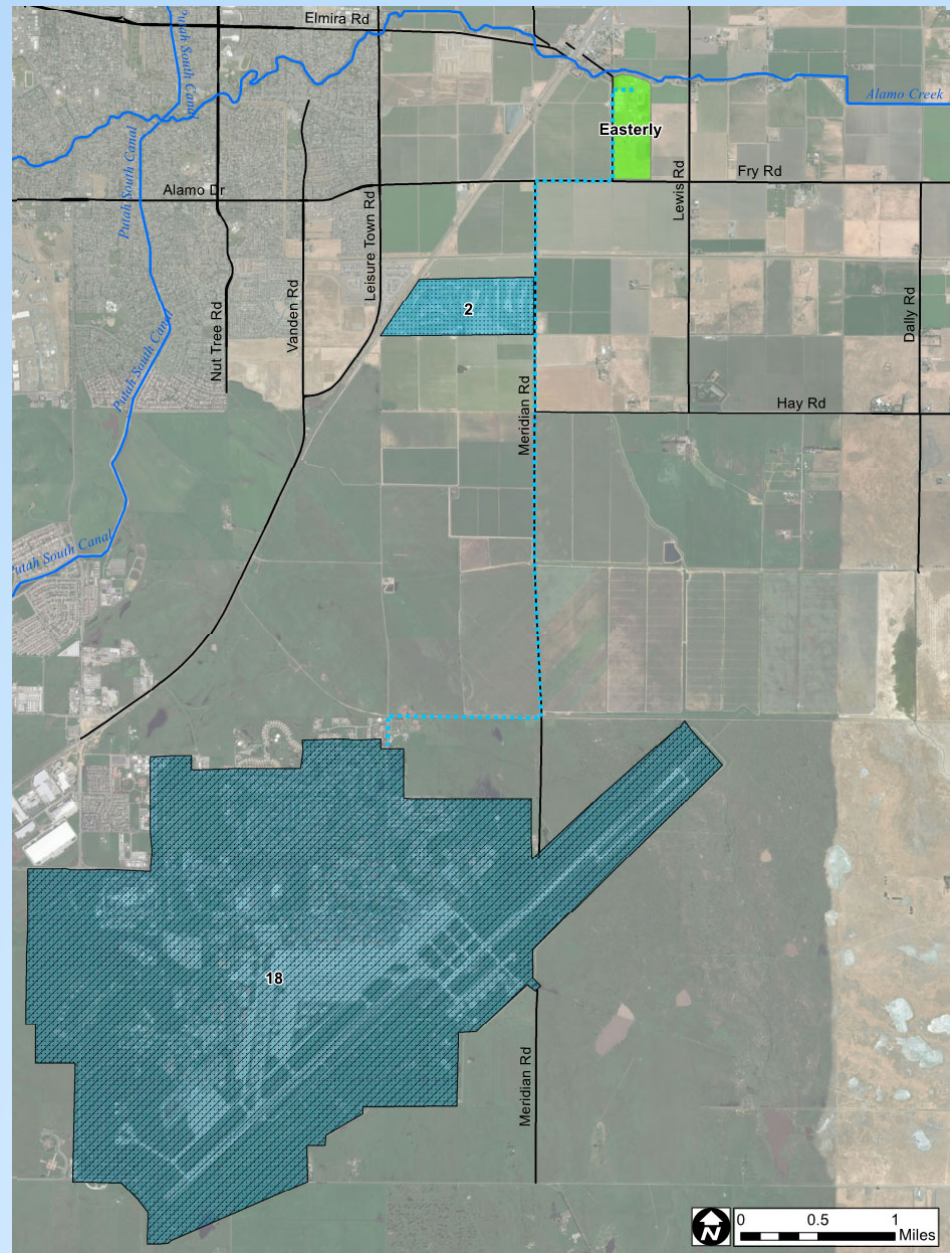


Concepts 2, 3, and 4

- **Concept 2** – athletic fields adjacent to Easterly
- **Concept 3** – agricultural customers
- **Concept 4** – Cypress Lakes Golf Course and Travis AFB

Legend













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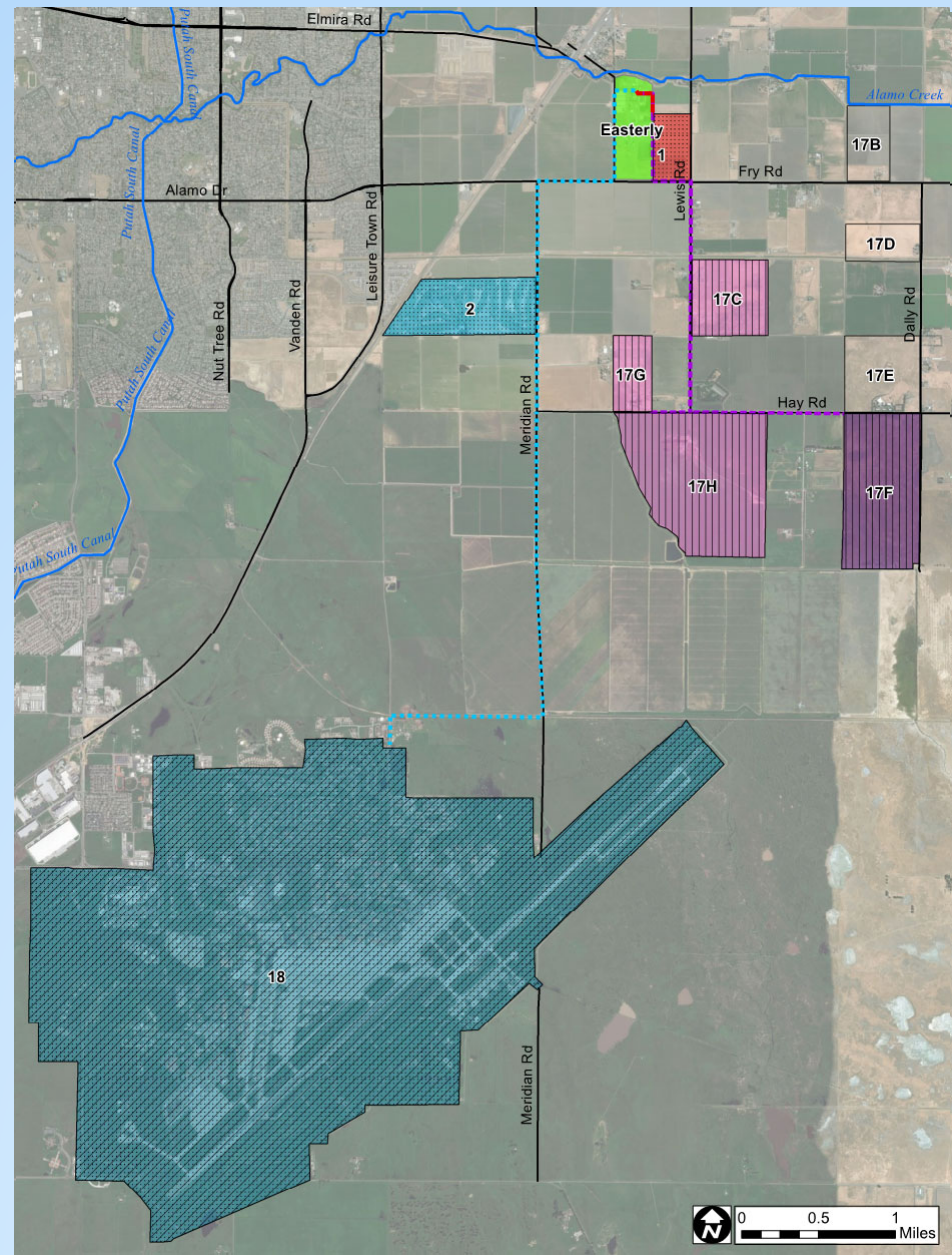


Concepts 2, 3, and 4

- **Concept 2** – athletic fields adjacent to Easterly
- **Concept 3** – agricultural customers
- **Concept 4** – Cypress Lakes Golf Course and Travis AFB

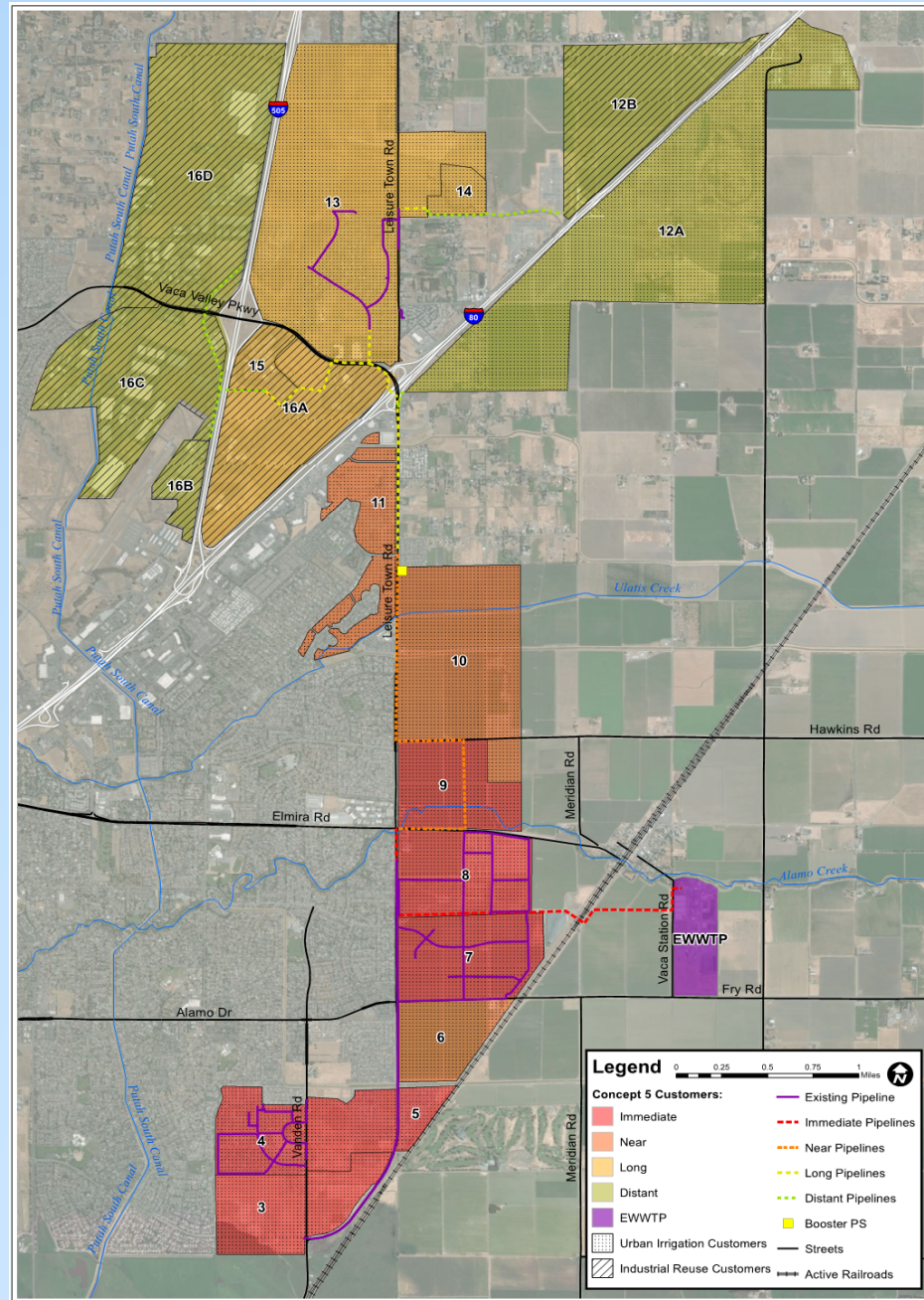
Legend

	Concept 2 Customers		Concept 2 Pipeline
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	Concept 4 Customers - Near		Urban Irrigation
	Concept 4 Customers - Long		Agricultural Reuse
	EWWTTP		Industrial Reuse



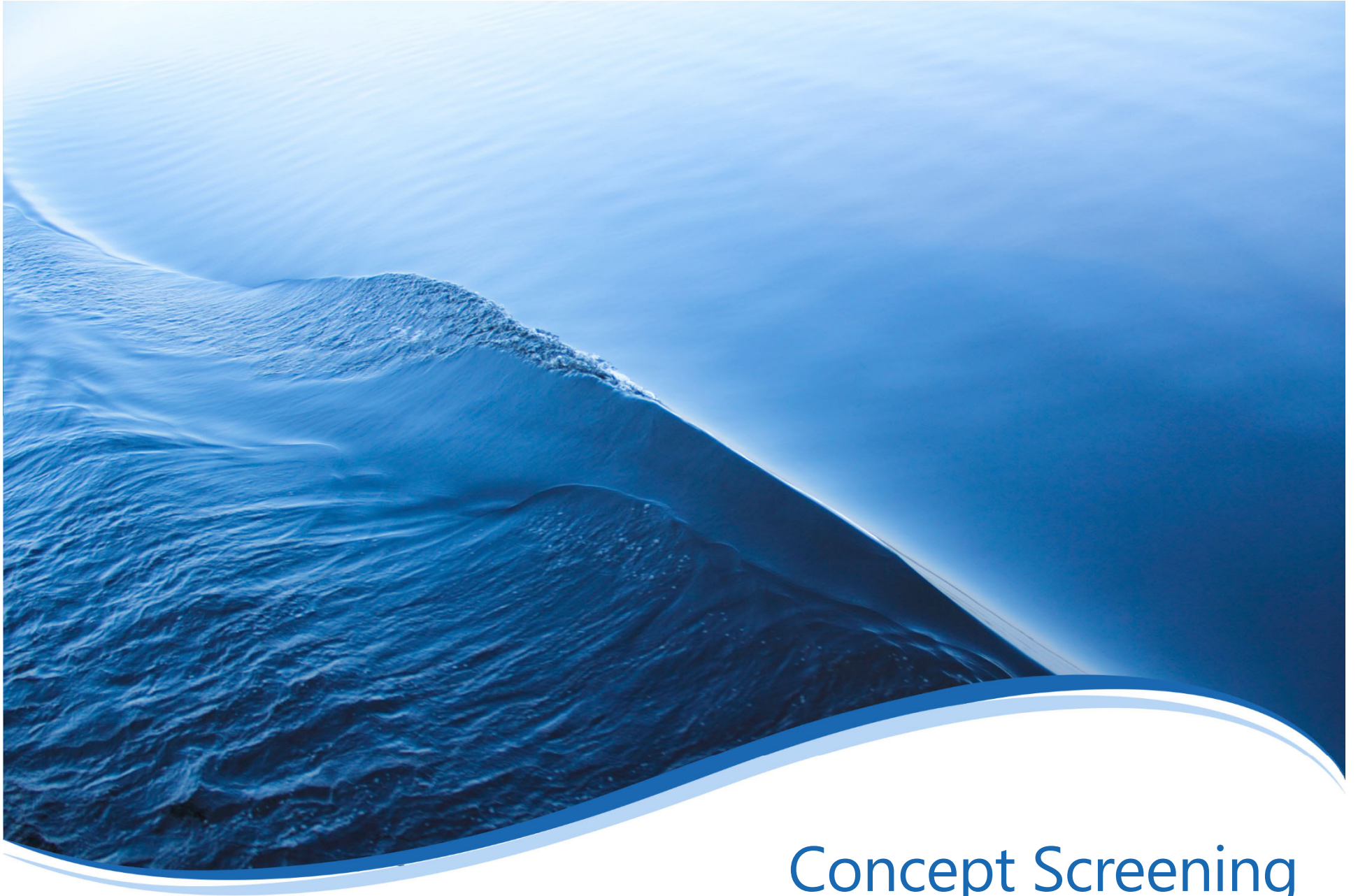
Concept 5 – North Developments/ Industrial

- Utilizes new and existing recycled water pipelines
- Development Specific Plans require/ encourage recycled water use
- Attractive to industries
- Frees up potable water for other uses



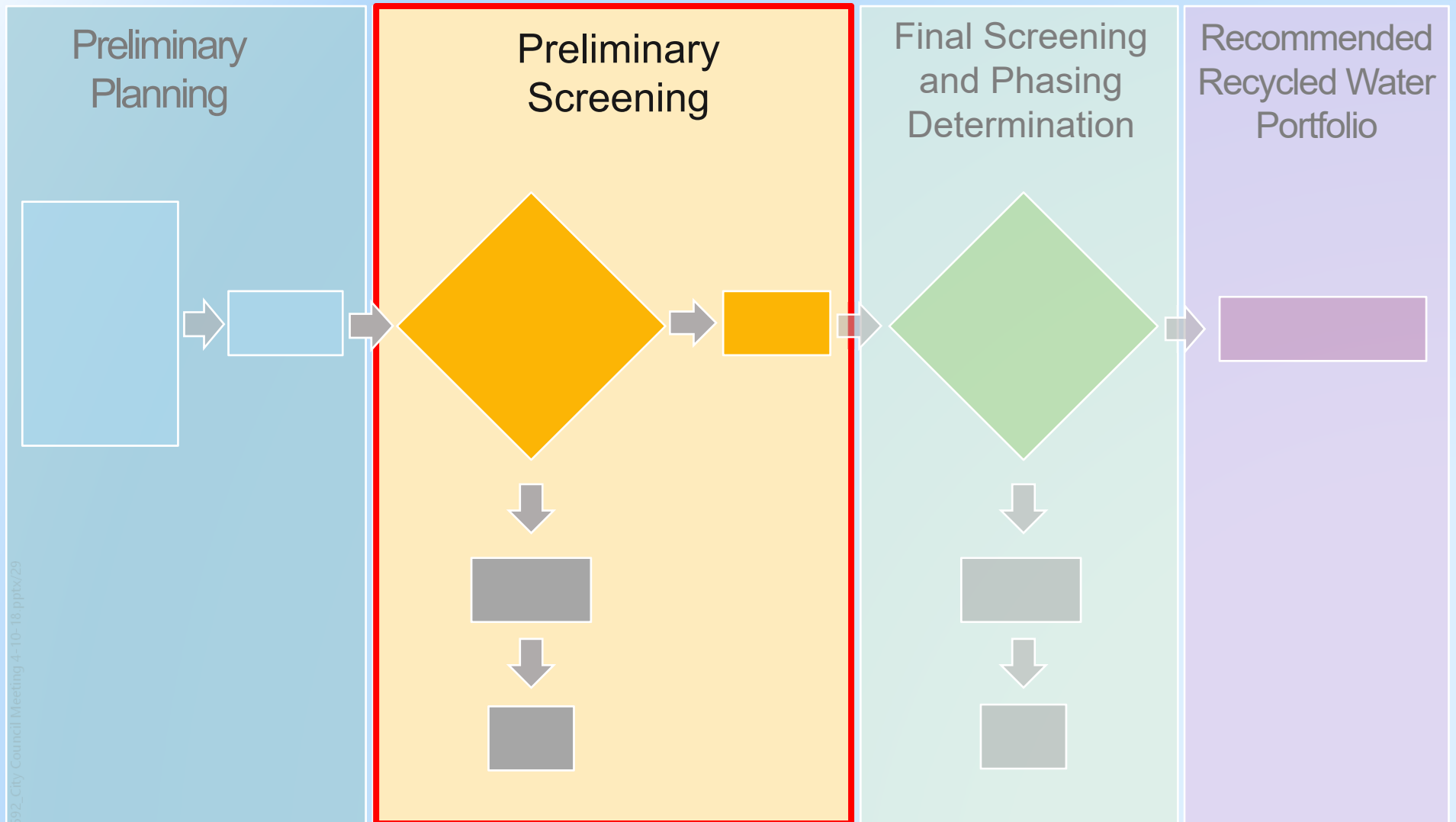
Concepts 6, 7, 8, and 9

- **Concept 6** – Indirect Potable Reuse via injection wells
 - **Concept 7** – Indirect Potable Reuse via reservoir augmentation (Noonan Reservoir)
 - **Concept 8** – Direct Potable Reuse to NBR WTP or City DE WTP
 - **Concept 9** – No Project Alternative
-
- Concepts 6 – 8 all require additional treatment facilities
 - Benefits would primarily be environmental, with minimal ROI

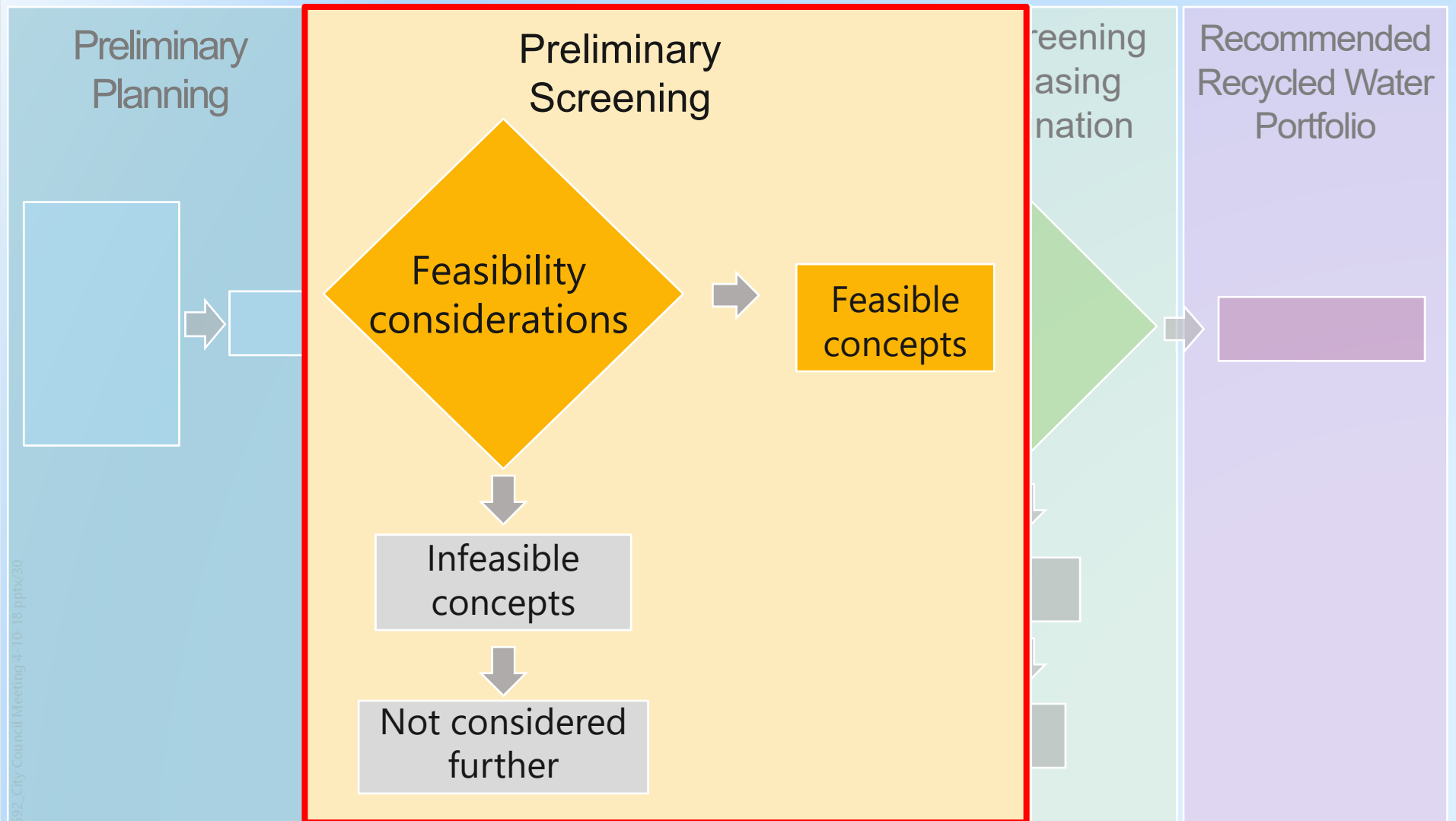


Concept Screening

Preliminary Screening



Preliminary Screening



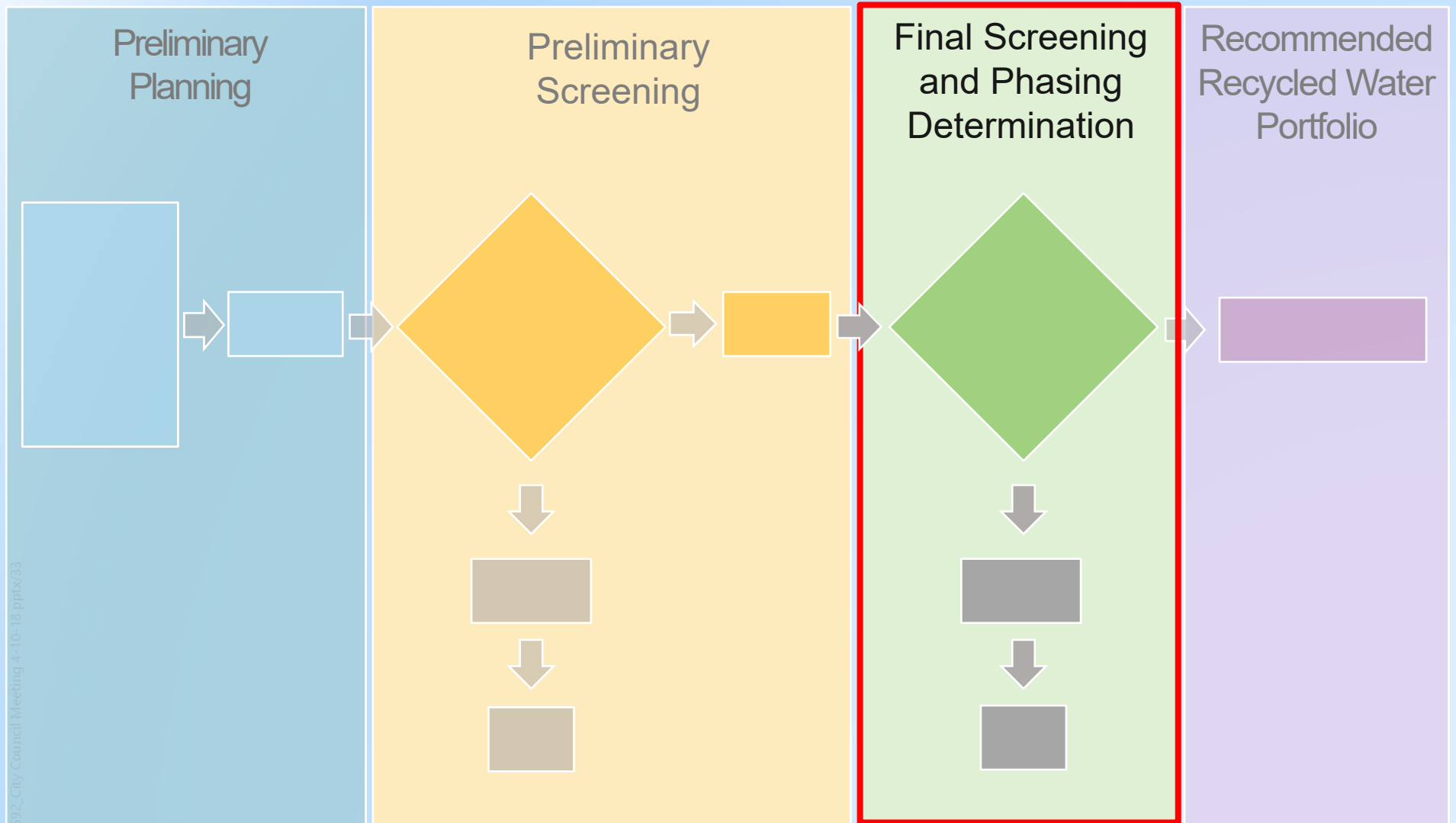
Qualitative Comparison of Concepts

Concept	Customer Location	Energy Use	Environmental Impact	Community/ Stakeholder Acceptance	Ease of Implementation	Agency Coordination	Volume of Use/ Seasonality	Return on Investment	OVERALL RANKING
1: Downstream Diversions	+	N/A	+	+	+	++	++	+	1
2: Athletic Fields	+	+	+	+	+	+	++	++	2
3: Agricultural Irrigation	+	+	+	+	++	++	++	++	4
4: Cypress Golf Course/Travis	++	++	+	+	+	++	++	++	5
	+++	+++	+	++	+++	++	+	++	7
5: East of Leisure Town Rd Developments/Industrial	+	+	+	+	++	+	++	++	3
	++	++	+	+	++	++	++	++	6
6: Wells, IPR	++	+++	++	++	+++	+	+	+++	8
7: Reservoir Augmentation, IPR	+++	++	+++	++	+++	++	+	+++	10
8: DPR to NBR WTP	+++	+++	+	+++	++	+	+	+++	9

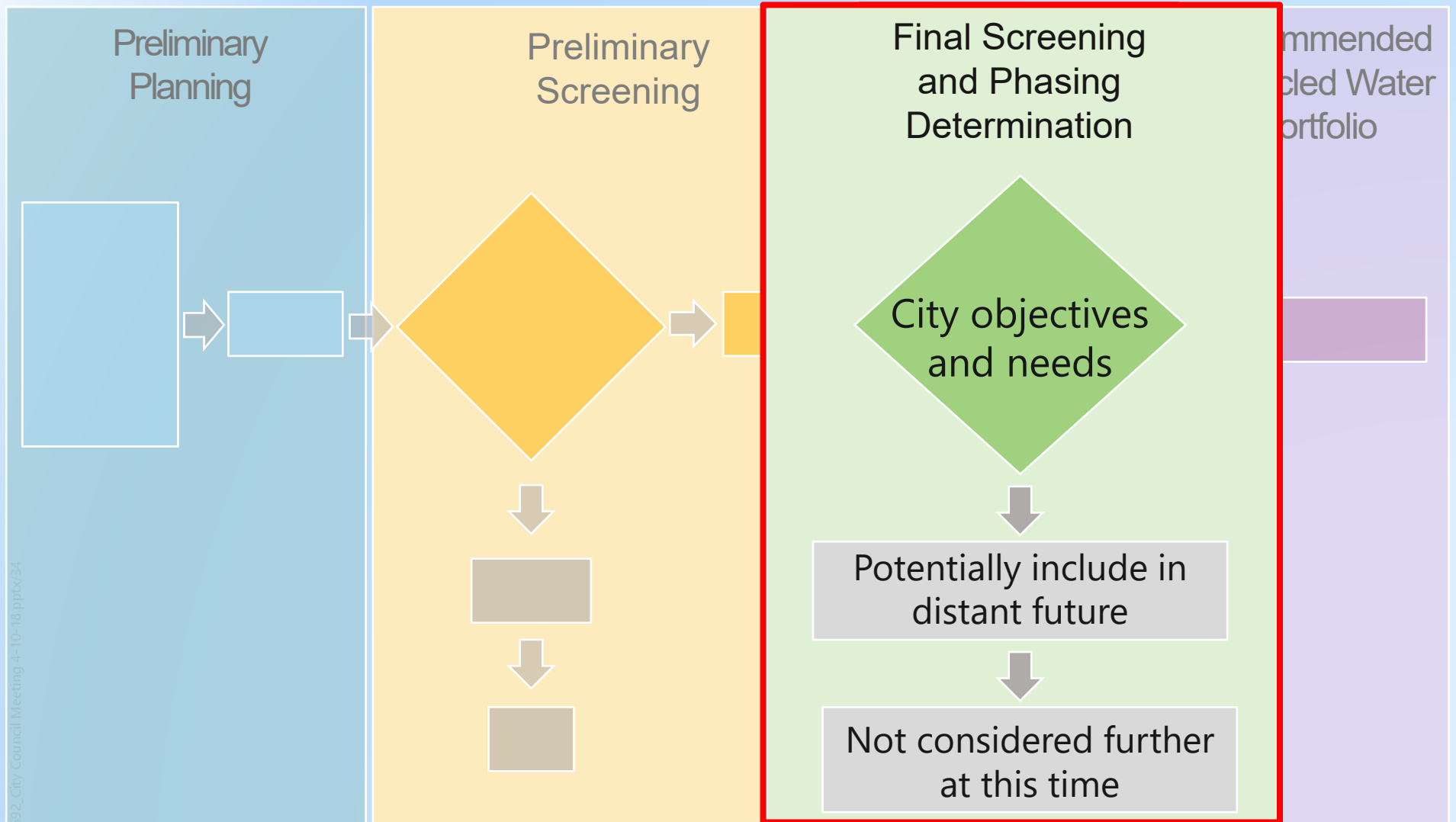
Infeasible Concepts

- IPR – Injection wells located near the Gibson Creek Canyon WWTP
- IPR – Reservoir augmentation at Noonan Reservoir
- DPR to the DE WTP
- DPR to the NBR WTP

Final Screening



Final Screening



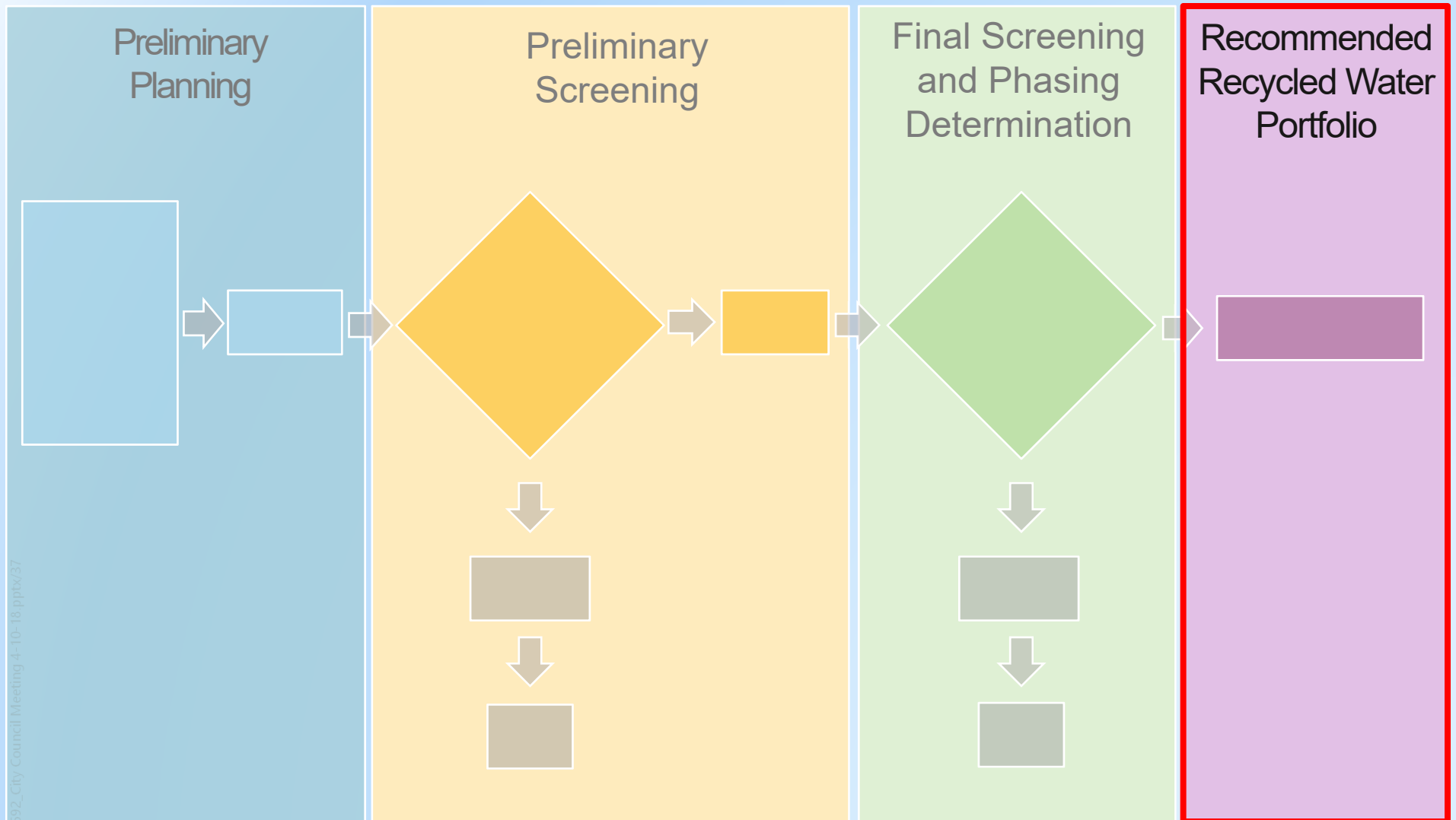
Concepts Not Considered Further At This Time

- Travis AFB
- Some of the Agriculture Customers
- Industrial developments northwest of I-505
- Northeast Area Development
- IPR near Easterly and Ag Buffer



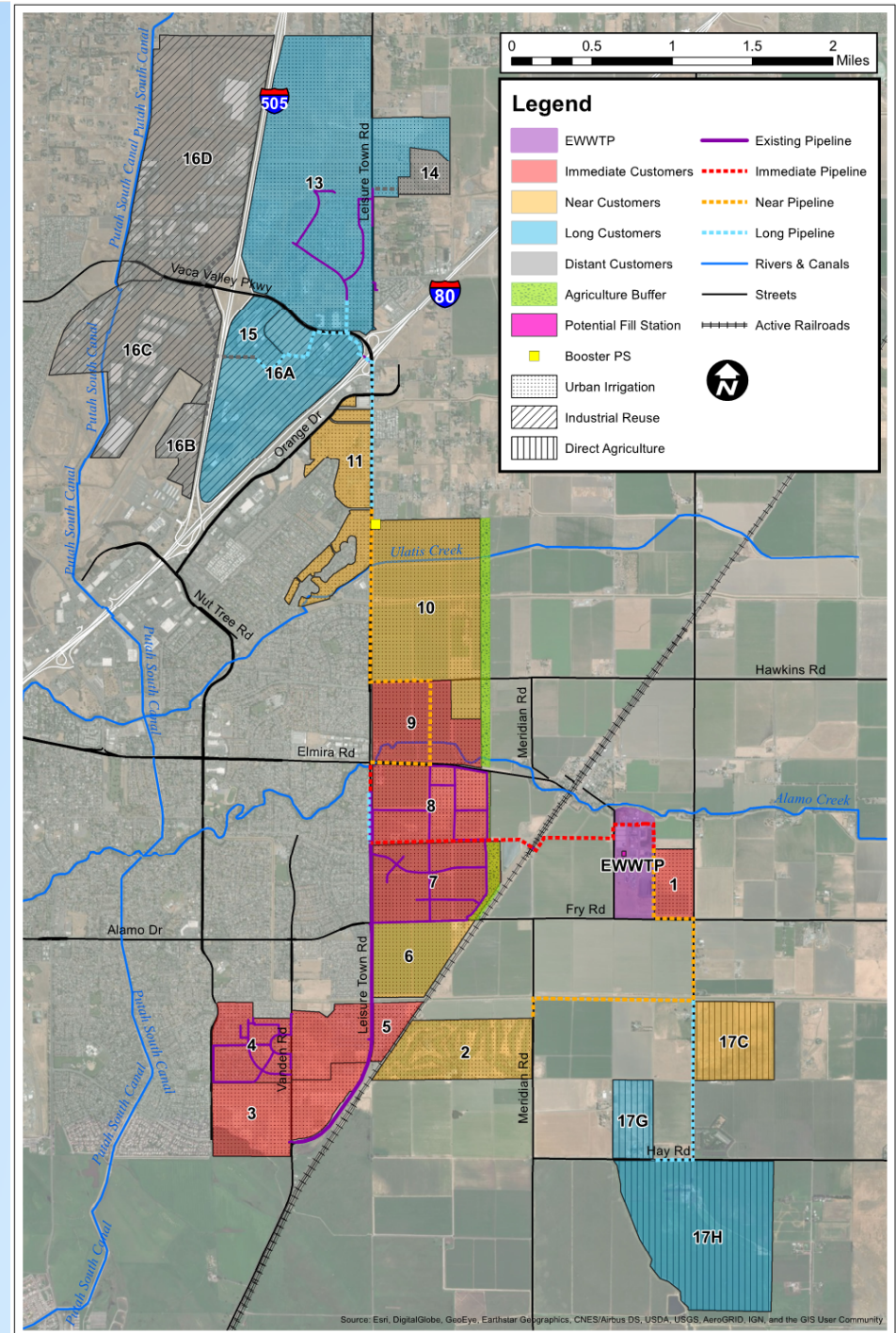
Recommended Portfolio

Final Screening



Phased Recycled Water Program

- Includes customers within and outside City limits
- Variety of use types:
 - Urban reuse,
 - Industrial uses,
 - Agriculture irrigation,
 - Downstream diversions
- Utilizes existing recycled water pipelines



Recycled Water Demands by Type and Phase

Phase	Urban Irrigation (afy)	Direct Agriculture (afy)	Industrial (afy)	Downstream Diversions (afy)
Immediate	745	0	0	1,680
Near	730	435	0	560
Long	670	1,545	310	0
Total	2,150	1,980	310	2,240

Potential Potable Water Off-Sets

Phase	Ave Day Demand (MGD)	Ave Day Demand (AFY)
Immediate Term:	0.67	745
Near Term:	0.35	400
Long Term:	0.29	985
TOTAL:	1.31	2,130

- The potable off-set could be used for other purposes or available to other markets



Cost Estimates/Financing

Recommended Recycled Water Program Costs

Phase	Project Cost ⁽¹⁾ (\$M)	Annual O&M (\$1,000)	Annualized Total Cost ⁽²⁾ (\$1,000)	Unit Cost ⁽³⁾ (\$/AF)
Immediate	\$6.5	\$30.5	\$450	\$285
Near	\$12.6	\$105.5	\$1,350	\$440
Long	\$24.9	\$419.8	\$3,280	\$590
Overall:	\$43.9	\$419.8	\$3,280	\$590

Notes:

(1) Includes markups for legal, engineering, and design. Costs are not cumulative

(2) Includes O&M and energy costs. Annualized costs are cumulative.

(3) Assumes 1.5 mgd downstream diversions outside Solano County and 0.5 mgd within Solano County.

Funding Sources

- State Water Resources Control Board Grants
- SFR loans
- Development Impact Fees
- User agreements
- Recycled water direct sales
- Potable water off-sets sales

Next Steps...

- Survey work
- Detailed Planning of the Immediate Phase Project
- Hydraulic Model Development