

Thank you to our Patrons

We will begin our presentation in a few minutes...



Leadership and Excellence in Environmental Engineering and Science

AAEES Excellence in Environmental Engineering and Science Competition
2024 Grand Prize Award in Planning
City of Santa Monica, Recycled Water Master Plan

Don't Waste a Drop!

How Tech Helps Santa Monica Identify
Where & When to Expand Reuse

Alex Waite, PE
Supervising Civil Engineer
City of Santa Monica

Dawn Taffler, PE, LEED^{AP}
Vice President
Kennedy Jenks



Today's Presentation

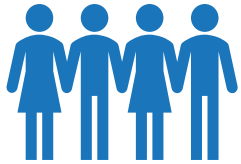
- Santa Monica's Path to Sustainability
- RWMP Approach
- Market Assessment for Non-Potable Reuse
- Portfolio Analysis for Diversifying Recycled Water Use
- Financial Implications
- Key Take-Aways and Next Steps



Santa Monica's Path to Sustainability

The background of the slide is a dark, blue-tinted photograph of a boardwalk at night. A large Ferris wheel is prominent on the right side, with its spokes radiating outwards. In the foreground, there's a wooden boardwalk with some silhouettes of people. The overall atmosphere is quiet and scenic, with some lights visible in the distance.

City of Santa Monica - Water Resources Division



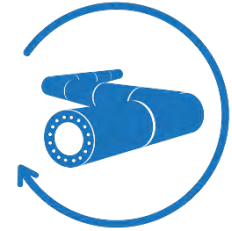
93,000+ residents
2,700+ commercial
customers



Drinking water and
fire protection



groundwater (local)
Surface water (MWD)



Sewer collection and
recycled water

9 million gallons
of high-quality drinking
water daily

14 million gallons
of wastewater captured
and delivered for treatment
each day

**4 water storage
reservoirs**
totaling 40 million gallons

1.5 million gallons
per day of advanced
treated recycled water

Goals of the City's Sustainable Water Master Plan

- Diverse, sustainable, & drought resilient water supply to support a sustainable community
- Reduction of energy footprint to support carbon reduction goals for the City
- Long-term cost benefits for ratepayers



PLAN AT A GLANCE

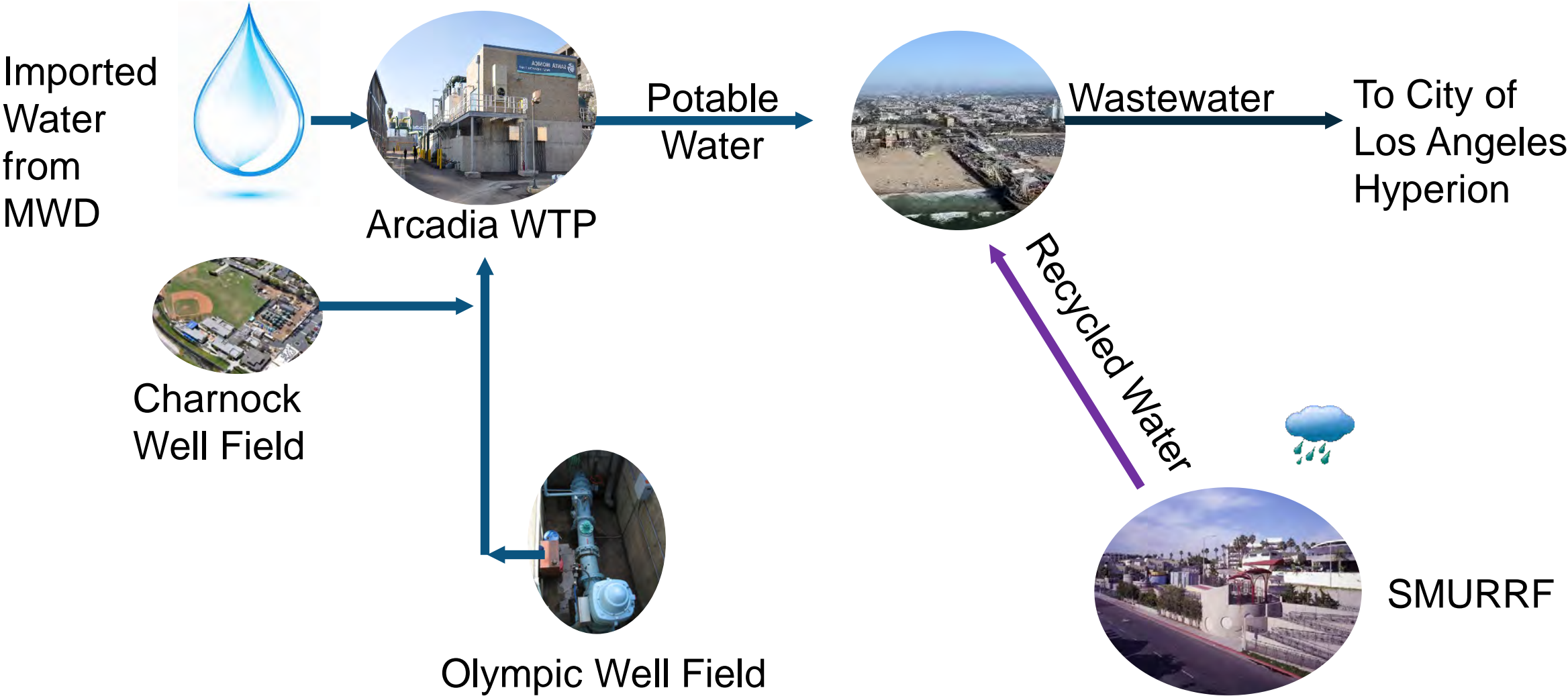
The CAAP is a guiding document that provides overarching policy direction to achieve the interim goal of an 80% reduction in emissions by 2030 and to increase Santa Monica's resilience to climate change hazards and impacts. This plan supports and enhances many existing plans and initiatives within the City. The CAAP also suggests new plans and actions to supplement ongoing efforts and create new initiatives.

SECTOR	OBJECTIVES	SUPPORTING EFFORT
ZERO NET CARBON BUILDINGS	<ul style="list-style-type: none"> • Achieve 100% renewable grid electricity • Install 100 MW of local solar energy • Reduce fossil fuel use 20% in existing buildings • Discourage fossil fuels in new buildings 	<ul style="list-style-type: none"> • Zero net energy for new residential construction (2017) • Mandatory solar for new commercial construction (2017)
ZERO WASTE	<ul style="list-style-type: none"> • Divert 93% of materials from landfills 	<ul style="list-style-type: none"> • Plastic Bag Ban (2011) • Zero Waste Strategic Operations Plan (2014) • Disposable Food Service/ware Ordinance (2018)
SUSTAINABLE MOBILITY	<ul style="list-style-type: none"> • Convert 50% of local trips to foot, bike, scooter & skateboard • Convert 25% of commuter trips to transit • Convert 50% of vehicles to electric or zero emission 	<ul style="list-style-type: none"> • Land Use & Circulation Element (2010) • Bike Action Plan (2011) • Pedestrian Action Plan (2016) • Electric Vehicle Action Plan (2017)
CLIMATE ADAPTATION		
CLIMATE READY COMMUNITY	<ul style="list-style-type: none"> • Increase community resilience to climate change • Protect vulnerable groups from impacts • Integrate climate change impacts into City planning, operations & infrastructure projects 	<ul style="list-style-type: none"> • All Hazards Mitigation Plan (2015) • Santa Monica Organizations Active in Disaster (2018)
WATER SELF-SUFFICIENCY	<ul style="list-style-type: none"> • Achieve water self-sufficiency by 2023 	<ul style="list-style-type: none"> • Water Reutilization Ordinance (2017) • Sustainable Water Master Plan (2018)
COASTAL FLOODING PREPAREDNESS	<ul style="list-style-type: none"> • Enhance natural systems to prevent damage from coastal flooding • Increase resilience of public and private assets in the coastal flood zone 	<ul style="list-style-type: none"> • Local Coastal Program Land Use Plan (2018)
LOW CARBON FOOD & ECOSYSTEMS	<ul style="list-style-type: none"> • Increase self-reliance through local food production • Reduce or sequester carbon emissions from food production, consumption, waste and landscape management and natural processes 	<ul style="list-style-type: none"> • Urban Forest Master Plan (2018)

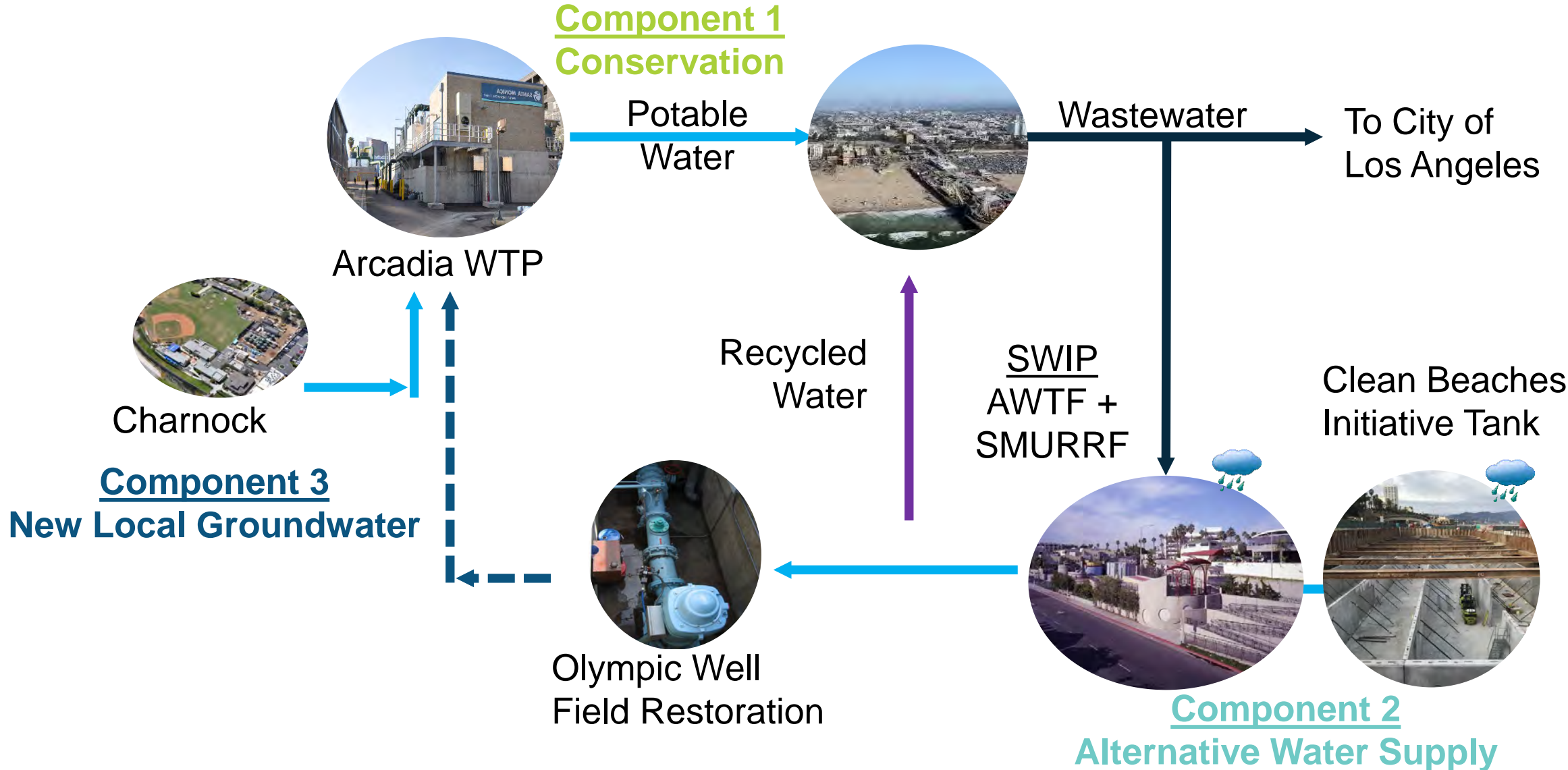
The CAAP is not an element of the City's General Plan or a regulatory document for the purpose of streamlining the California Environmental Quality Act (CEQA) process. Any policy or ordinance described in the CAAP must be developed and adopted through a public review process.



Integrated Approach to Maximize Local Water Resources



Closing the Loop on the One-Water Cycle



Sustainable Water Infrastructure Project (SWIP)



Advanced Water Treatment Facility



Santa Monica Urban Runoff Recycling Facility



Groundwater Recharge



1.5 MGD



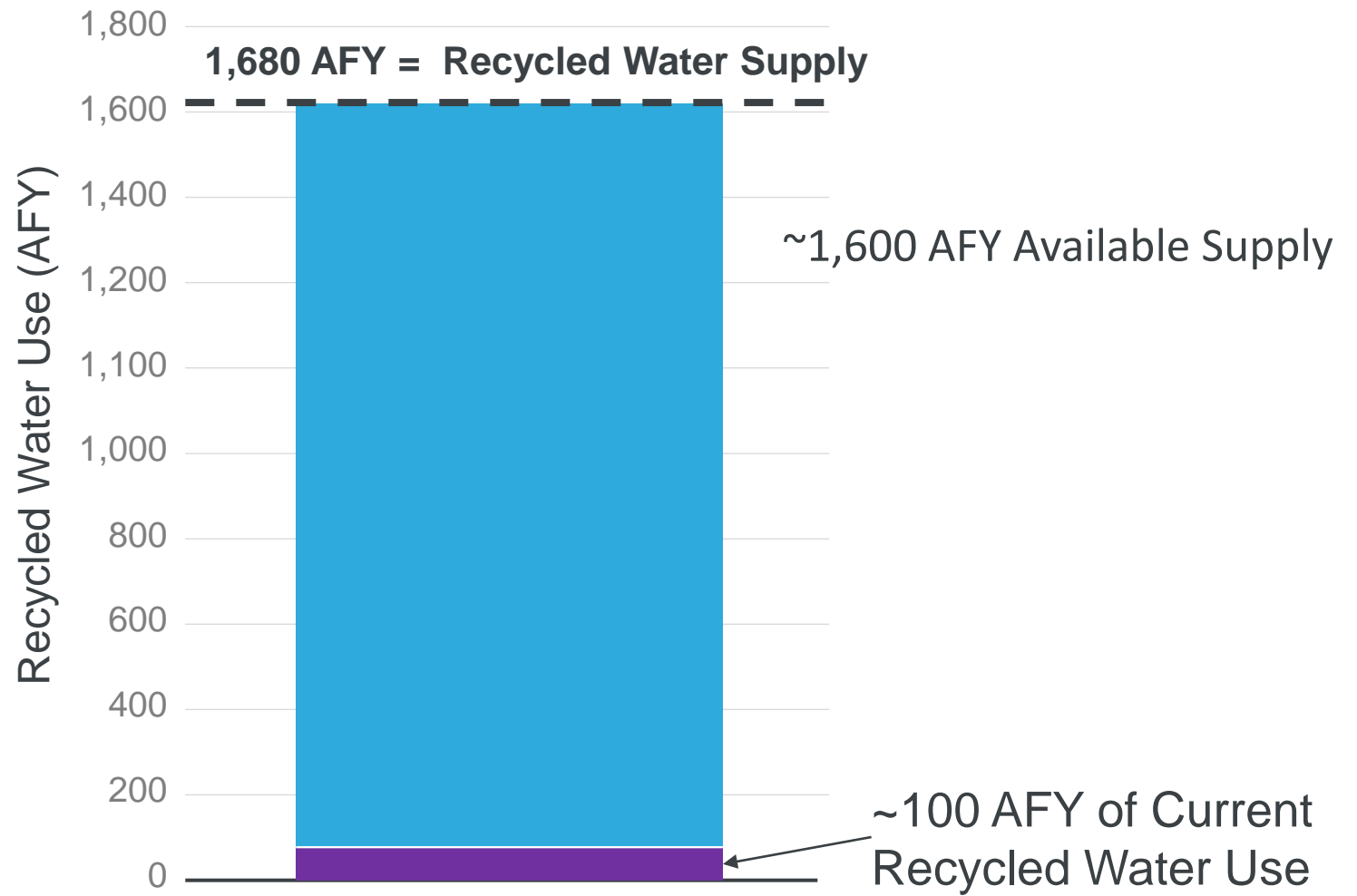
Irrigation/Dual-Plumbing





First underground AWTF in CA!

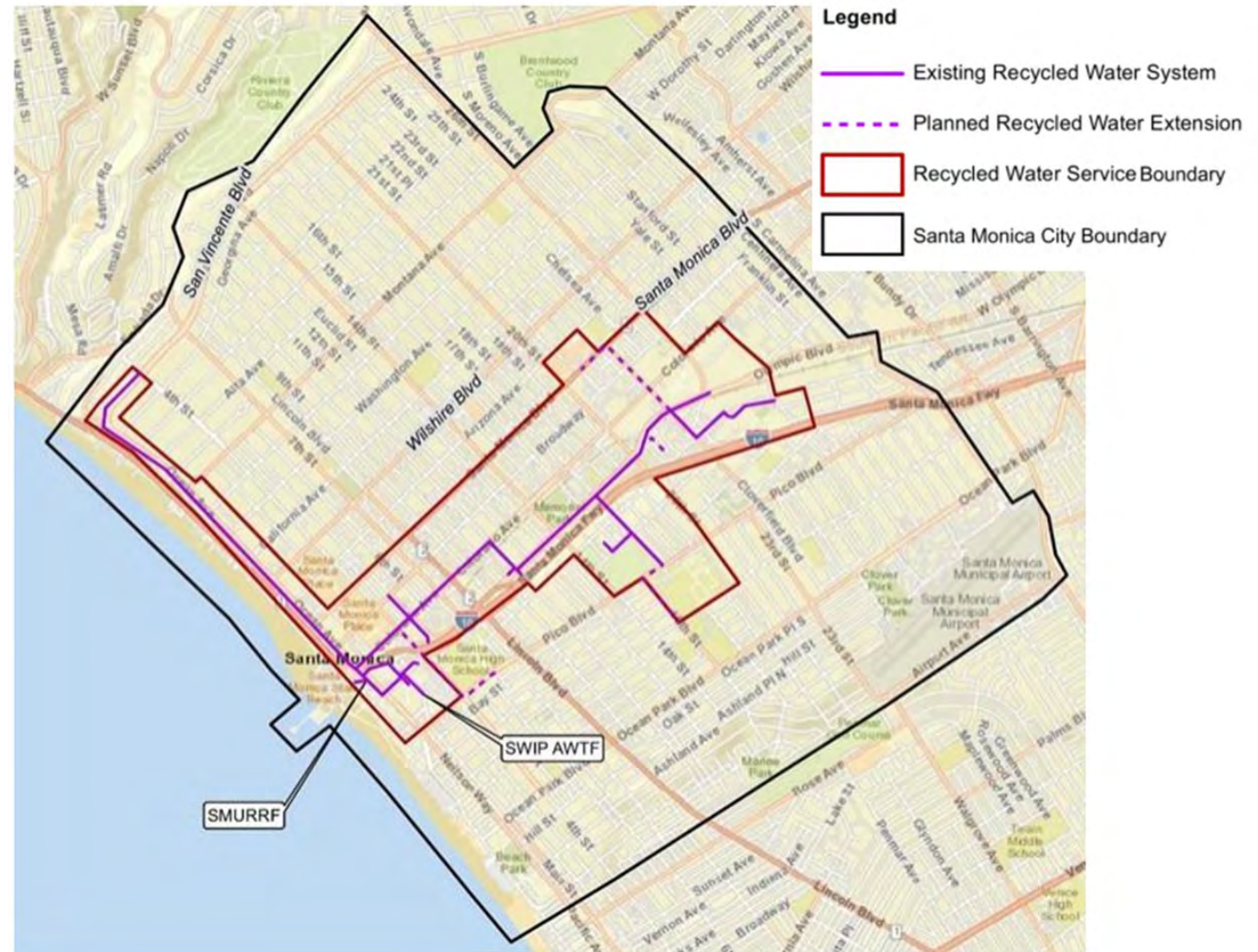
Maximizing Recycled Water Use



What About Non-Potable Use?

- ~4 miles of existing "purple pipe"
- 20 existing non-potable customers, majority are City services
- On-site supervisors and additional administrative requirements

New pipe = \$\$\$\$

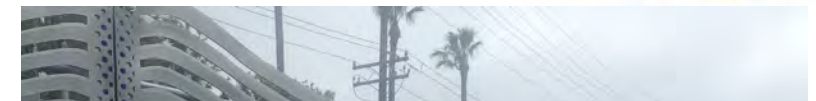
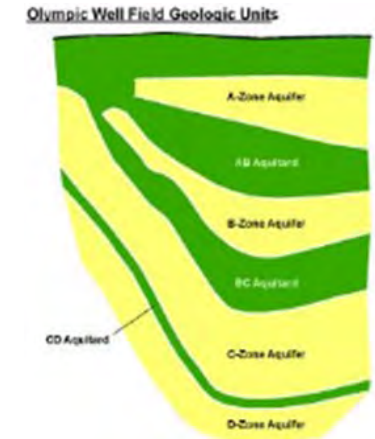


Is Groundwater Recharge the Answer?

Olympic Wellfield Aquifer System Designations			
Model Layer No.	Olympic Subbasin Wellfield Designation	Regional Aquifer Designation	
1	A-Zone Aquifer	Ballona Aquifer	Ballona
2	A/B Aquitard	Lakewood Aquifer	Lakewood Aquifer
3	B-Zone Aquifer		
4	B/C Aquitard	San Pedro Aquifer, Silverado Member	San Pedro Aquifer
5	C-Zone Aquifer		
6	C/D Aquitard	San Pedro Aquifer, Sunnyside Member	San Pedro Aquifer
7	D-Zone Aquifer		
8/9	Sunnyside Aquifer		
--	Pico Formation	Pico Formation	Pico Fm

- Targeted lower aquifer zones to avoid contamination plume mobilization
- Modeled capacity of 400 gpm

- Geologic unit "pinching" limits actual injection
- Actual capacity of 200 gpm

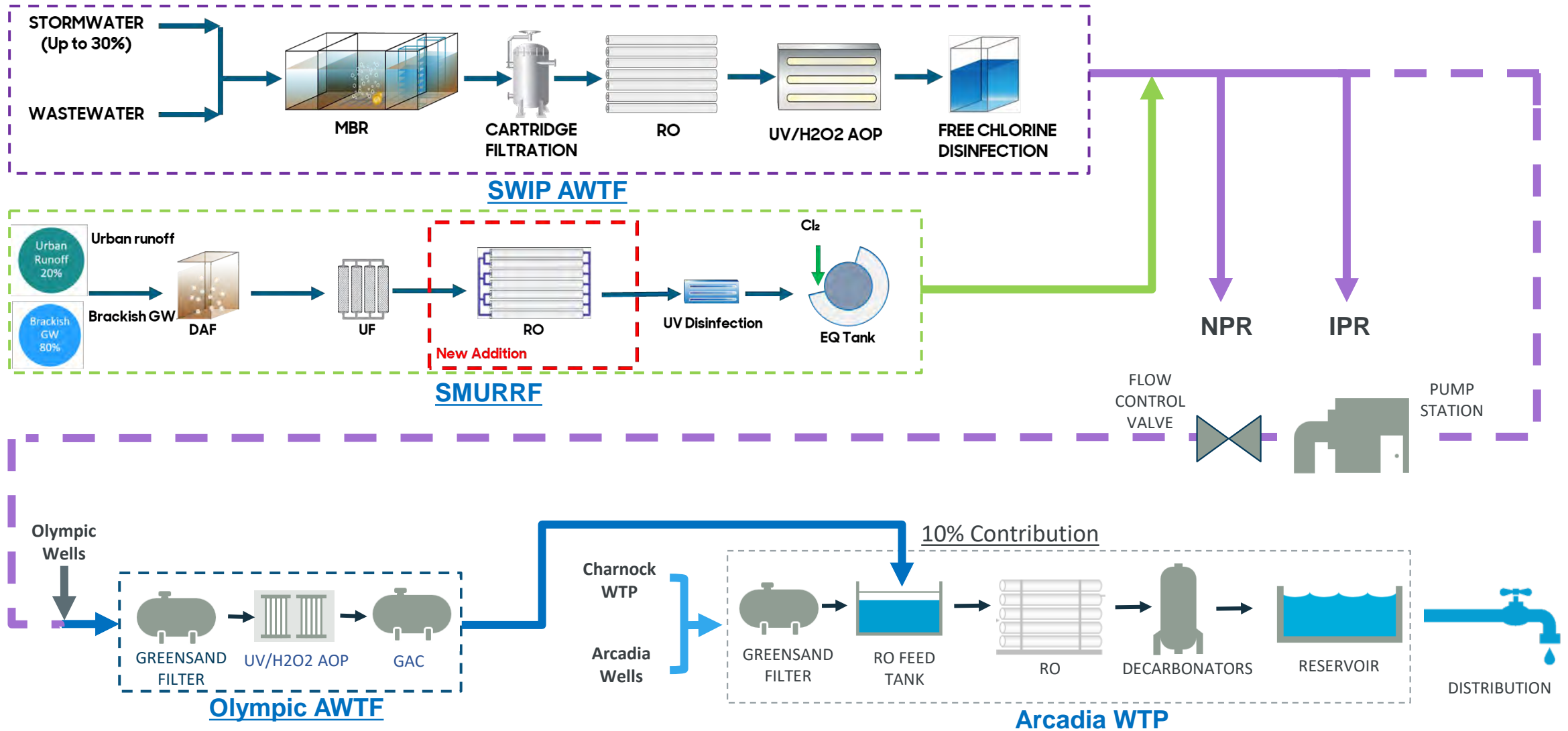


New well = \$\$\$\$



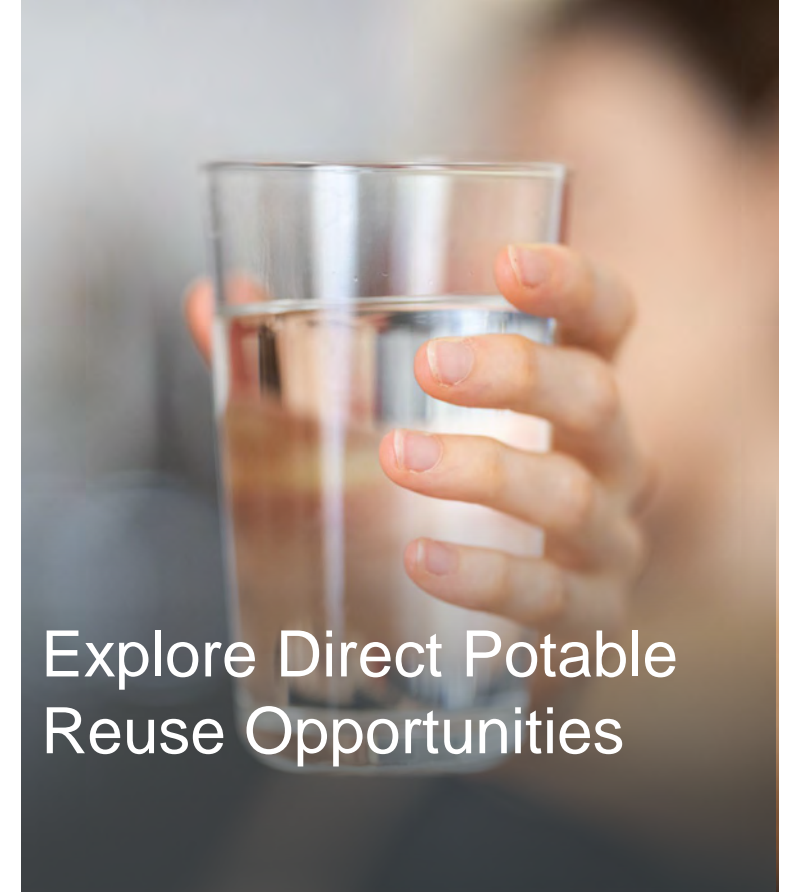
Is Direct Potable Reuse Possible?

- Title 22 Advanced Treated Recycled Water Pipeline
- Title 22 Diluent Water Pipeline
- Blended Recycled Water and Olympic Groundwater Pipeline
- - - New Title 22 Advanced Treated Recycled Water Pipeline



Why a Master Plan?

To plan for capital investments in future recycled water infrastructure development, *so no drops are wasted!*

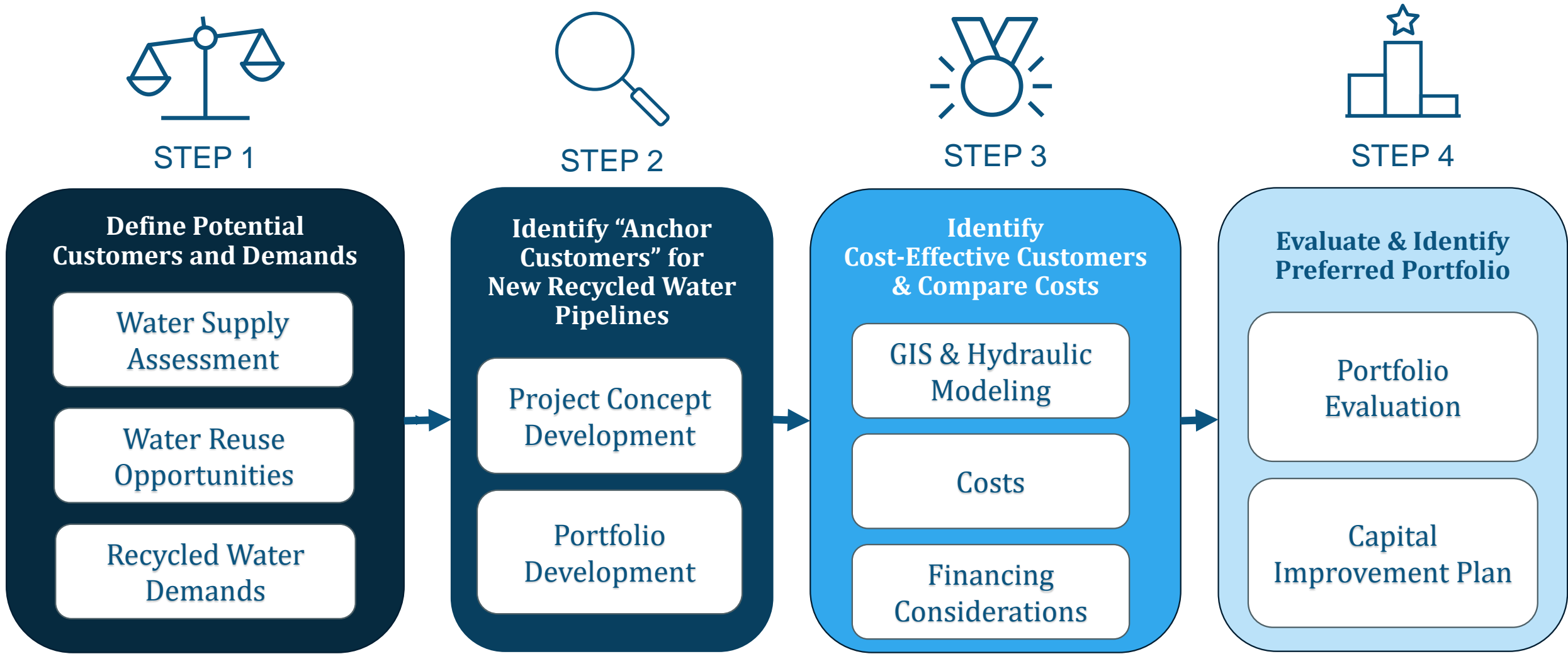




Santa Monica's RWMP

A Road Map to Maximize Reuse

Santa Monica's Step-by-Step Process to get to a Preferred Portfolio



Comprehensive Master Plan to get to a Preferred Portfolio



STEP 1

Define Potential
Customers and
Demands



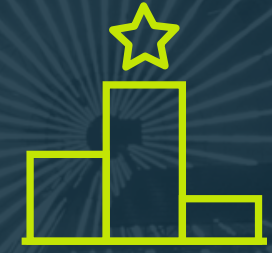
STEP 2

Identify "Anchor
Customers" for
New Recycled
Water Pipelines



STEP 3

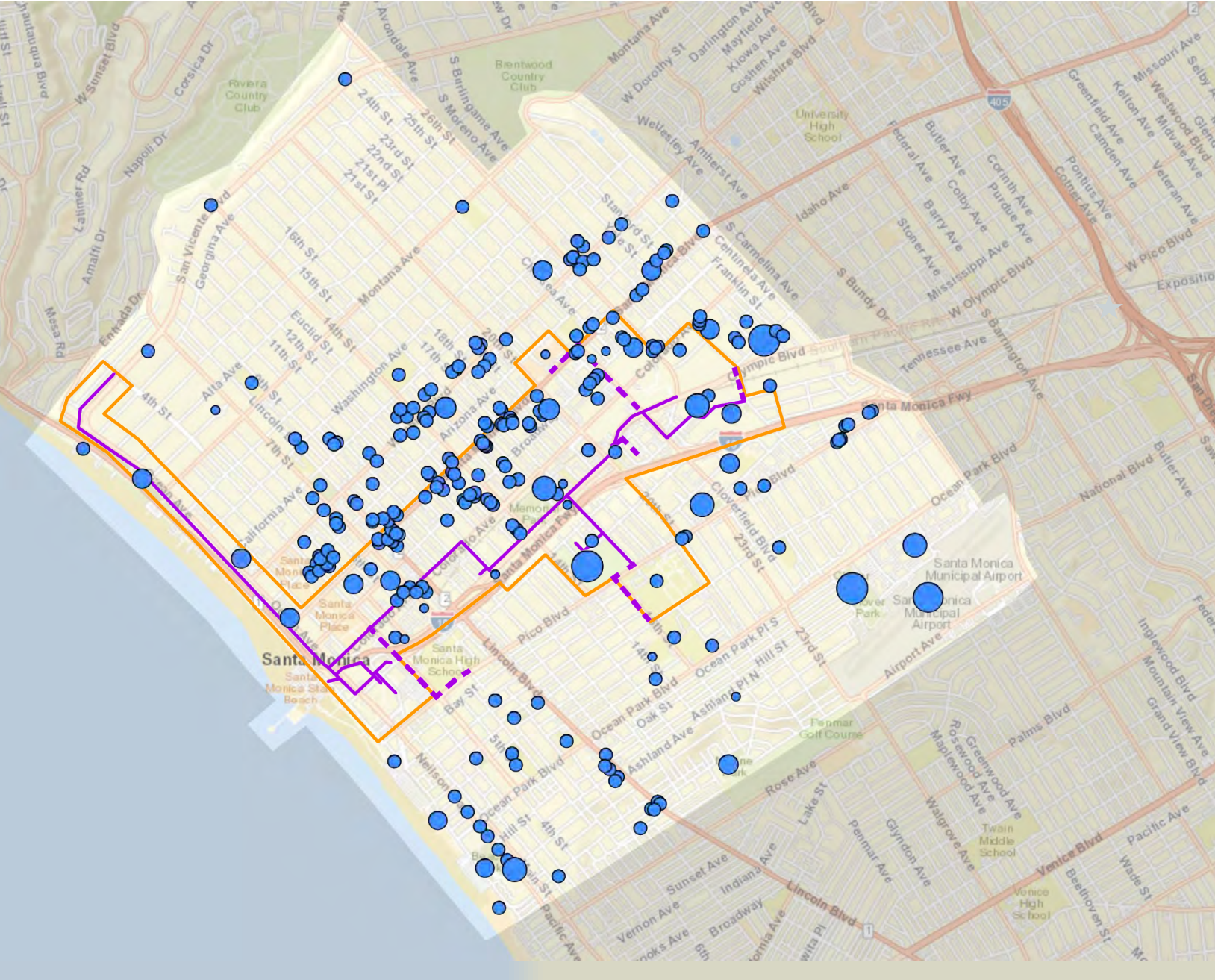
Identify
Cost-Effective
Customers &
Compare Costs



STEP 4

Evaluate & Identify
Preferred Portfolio

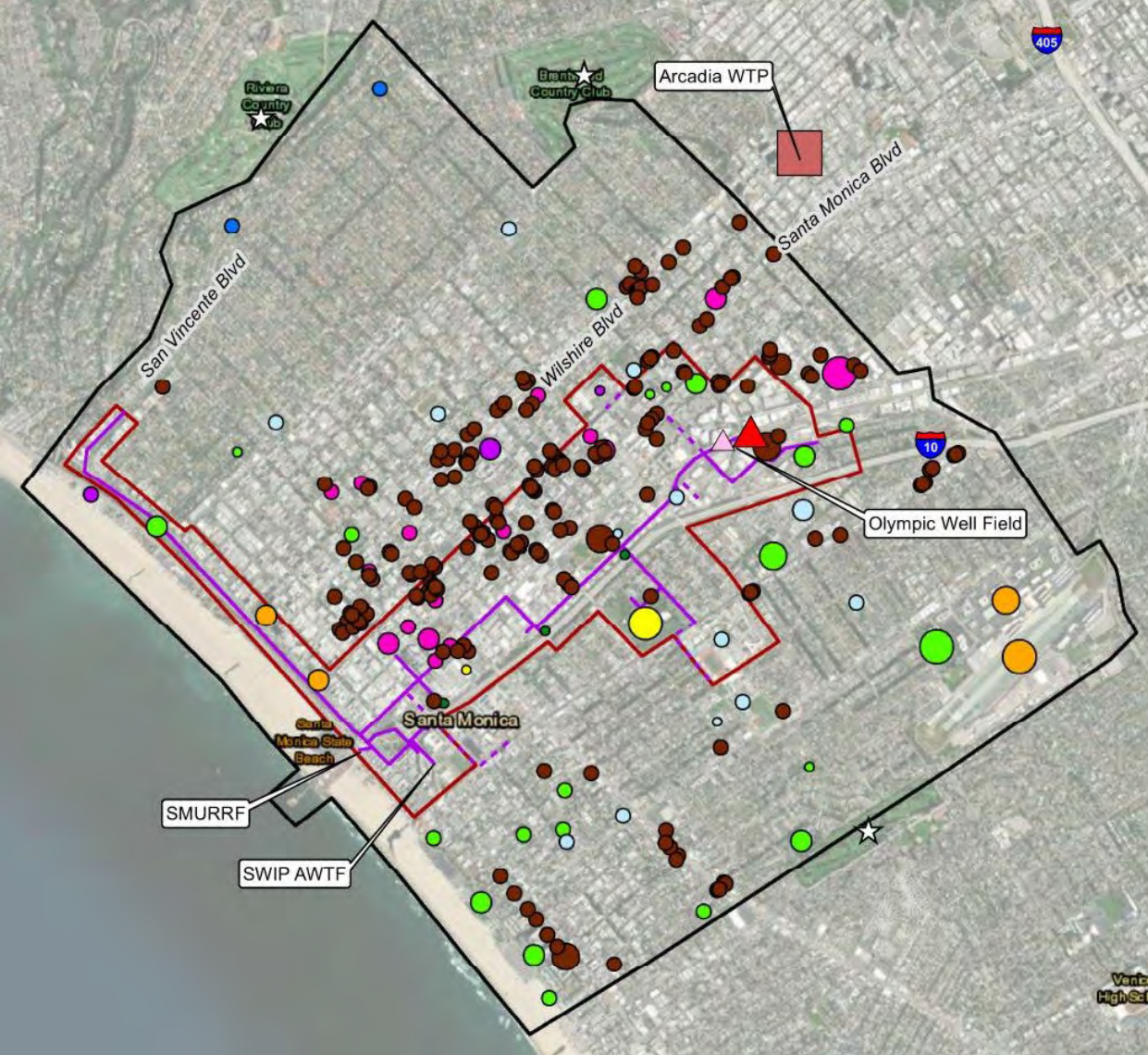
Market Assessment of Non-Potable Demands



- Existing Recycled Water System
- Potential Customer

- Parks/Green Space
- Future Developments
- Schools
- Commercial/Industrial Sites

Market Assessment for Non-Potable and Potable Uses



Color/Symbology Legend

Potential NPR Customers

- Caltrans
- City Facilities
- Commercial
- Future Developments
- SSI Sites
- Medians

- Builder's Remedy Projects
- Parks
- Schools

IPR and DPR Demands

- ▲ IPR - GRR
- ▲ Expanded IPR-GRR
- DPR

Legend

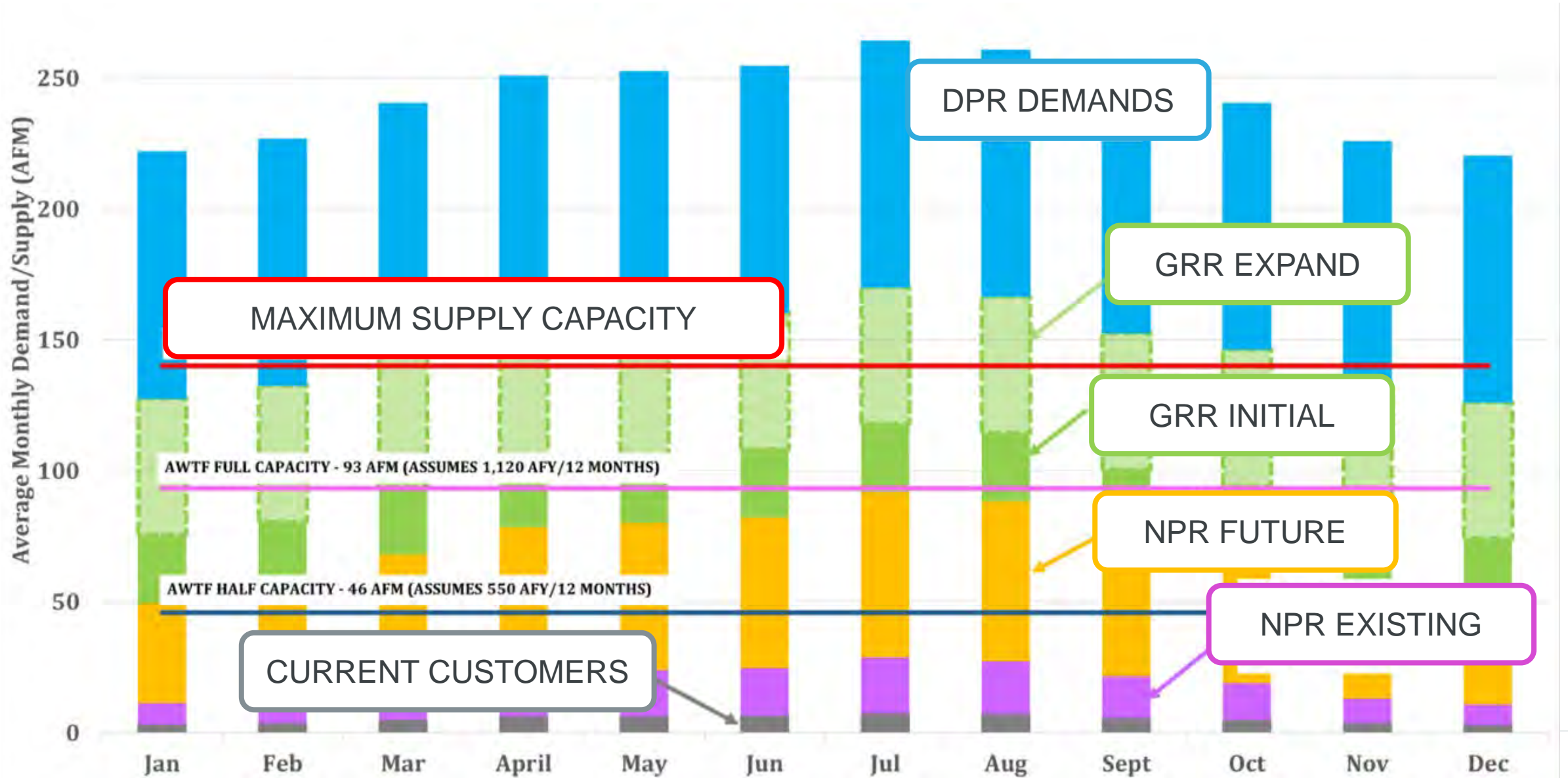
- Existing Recycled Water System
- - - Planned Recycled Water Extension

- Recycled Water Service Area
- Santa Monica City Boundary
- ★ Potential Recycled Water Customers Outside City Limits

Relative RW Demand (AFY)

- | | |
|---|---|
| ○ 0 - 1 | ▲ 325 |
| ○ 1 - 5 | ▲ 645 |
| ○ 5 - 10 | ■ 1,130 |
| ○ 10 - 20 | |
| ○ > 20 | |

Market Assessment Revealed that the City is Supply Limited



Comprehensive Master Plan to get to a Preferred Portfolio



STEP 1

Define Potential
Customers and
Demands



STEP 2

Identify "Anchor
Customers" for
New Recycled
Water Pipelines



STEP 3

Identify
Cost-Effective
Customers &
Compare Costs





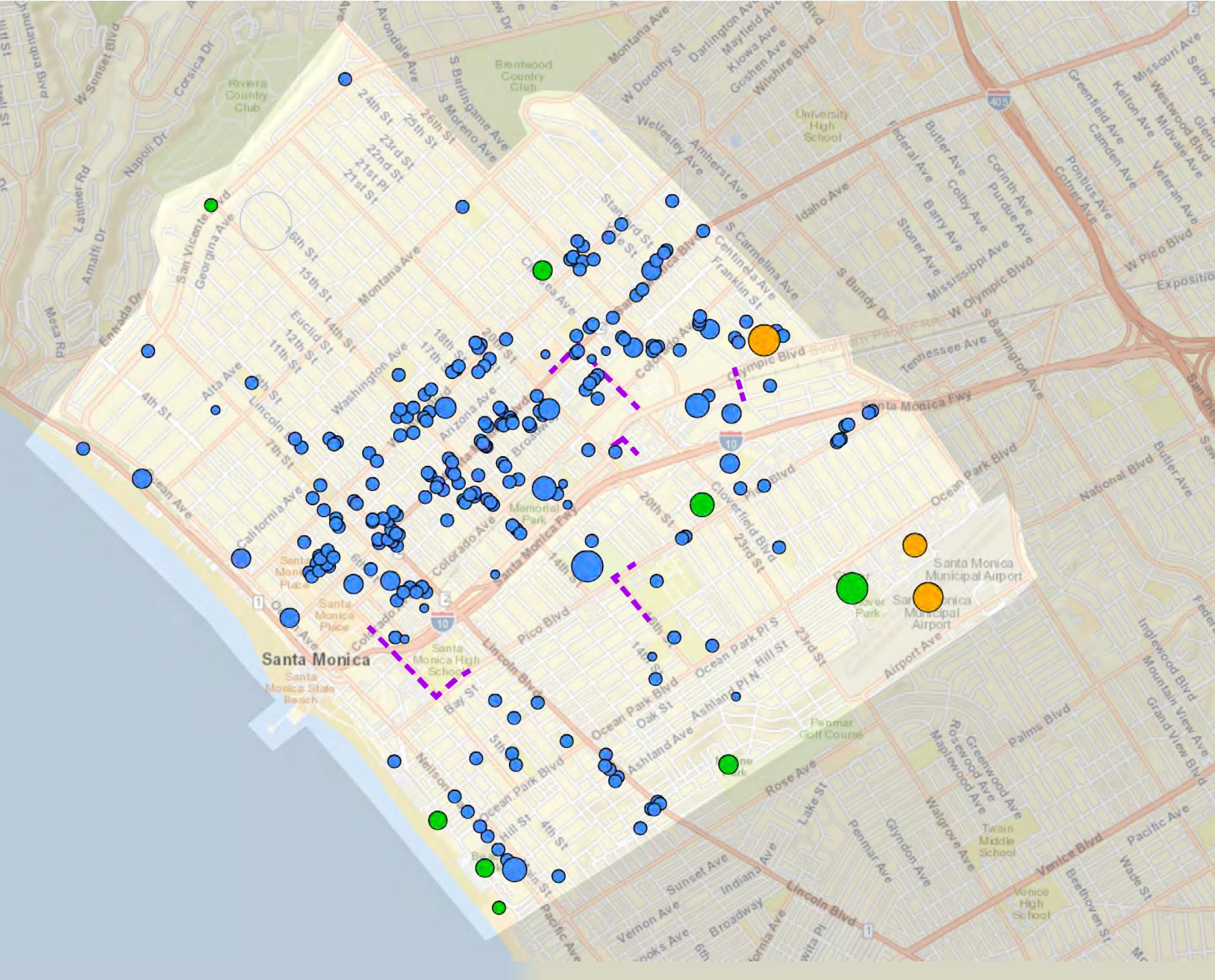
STEP 4

Evaluate & Identify
Preferred Portfolio

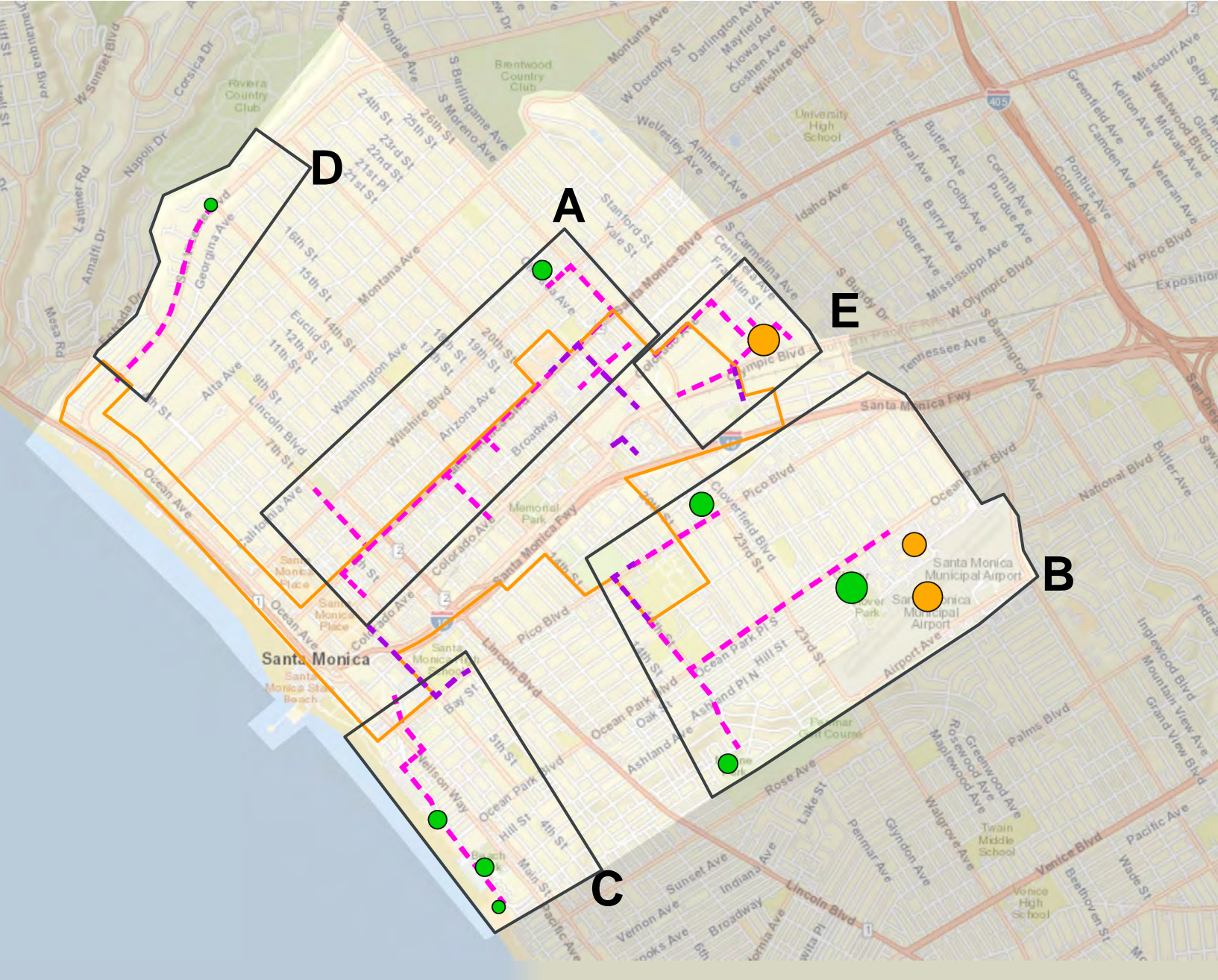
Identifying "Anchor Customers"




Prioritized customers for non-potable reuse

-  Parks/Green Space
-  Large Future Developments

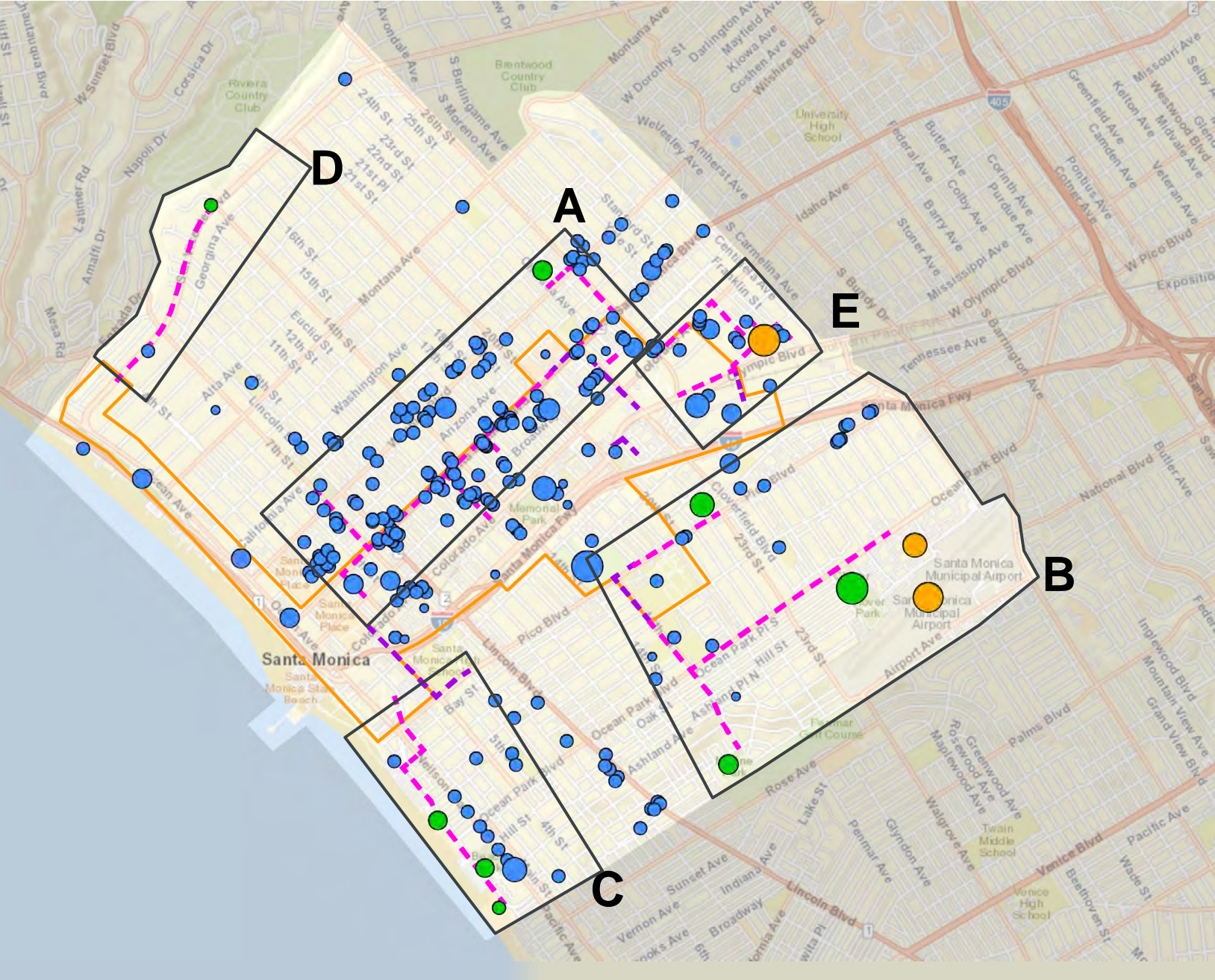





New Recycled Water Pipeline to "Anchor Customers"



-  Parks/Green Space
-  Future Development
-  New Recycled Water Pipeline

Identifying Additional Customers for Non-Potable Reuse



-  Parks/Green Space
-  Future Development
-  New Recycled Water Pipeline

Comprehensive Master Plan to get to a Preferred Portfolio



STEP 1

Define Potential
Customers and
Demands



STEP 2

Identify "Anchor
Customers" for
New Recycled
Water Pipelines



STEP 3

Identify
Cost-Effective
Customers &
Compare Costs

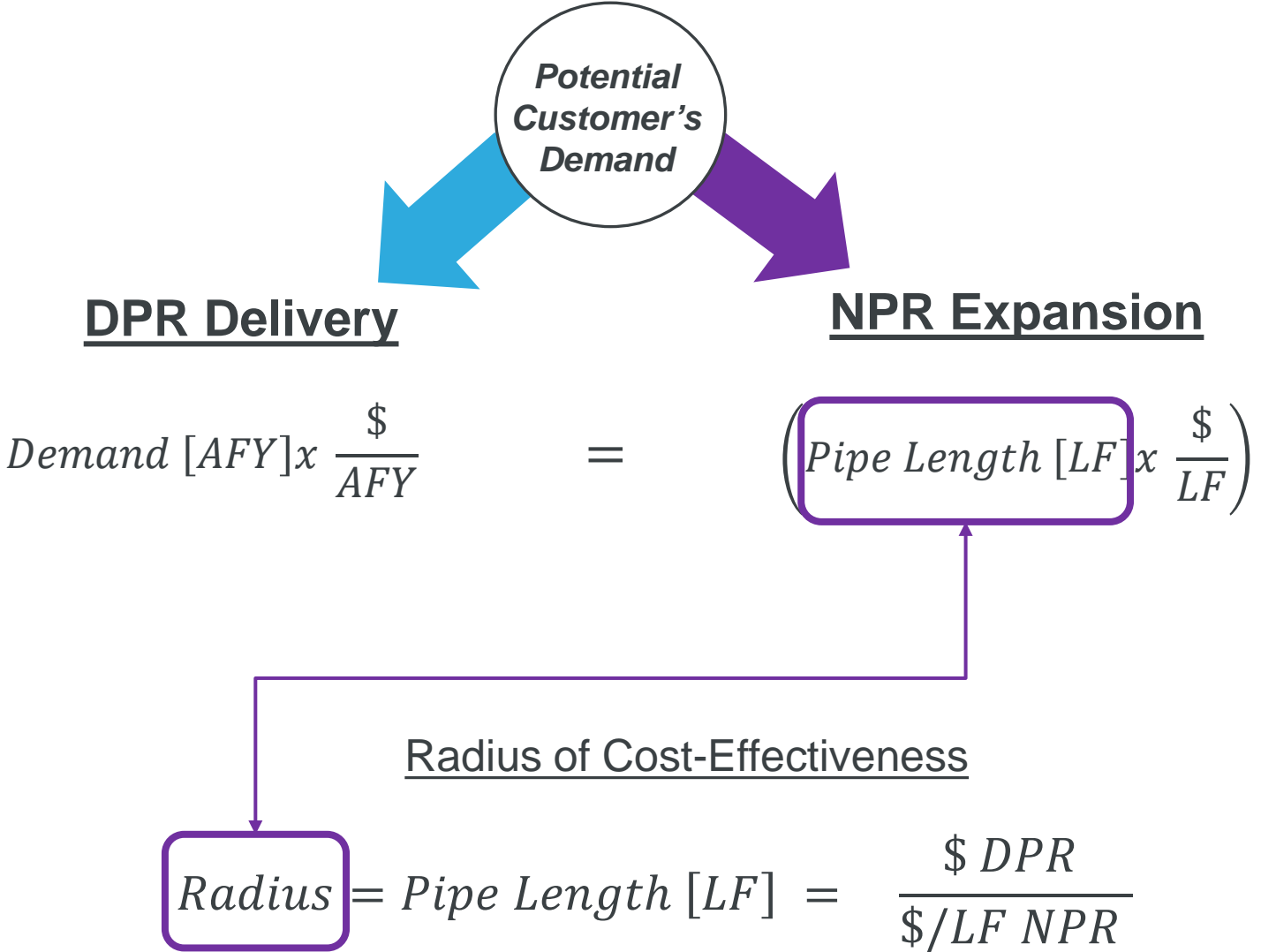


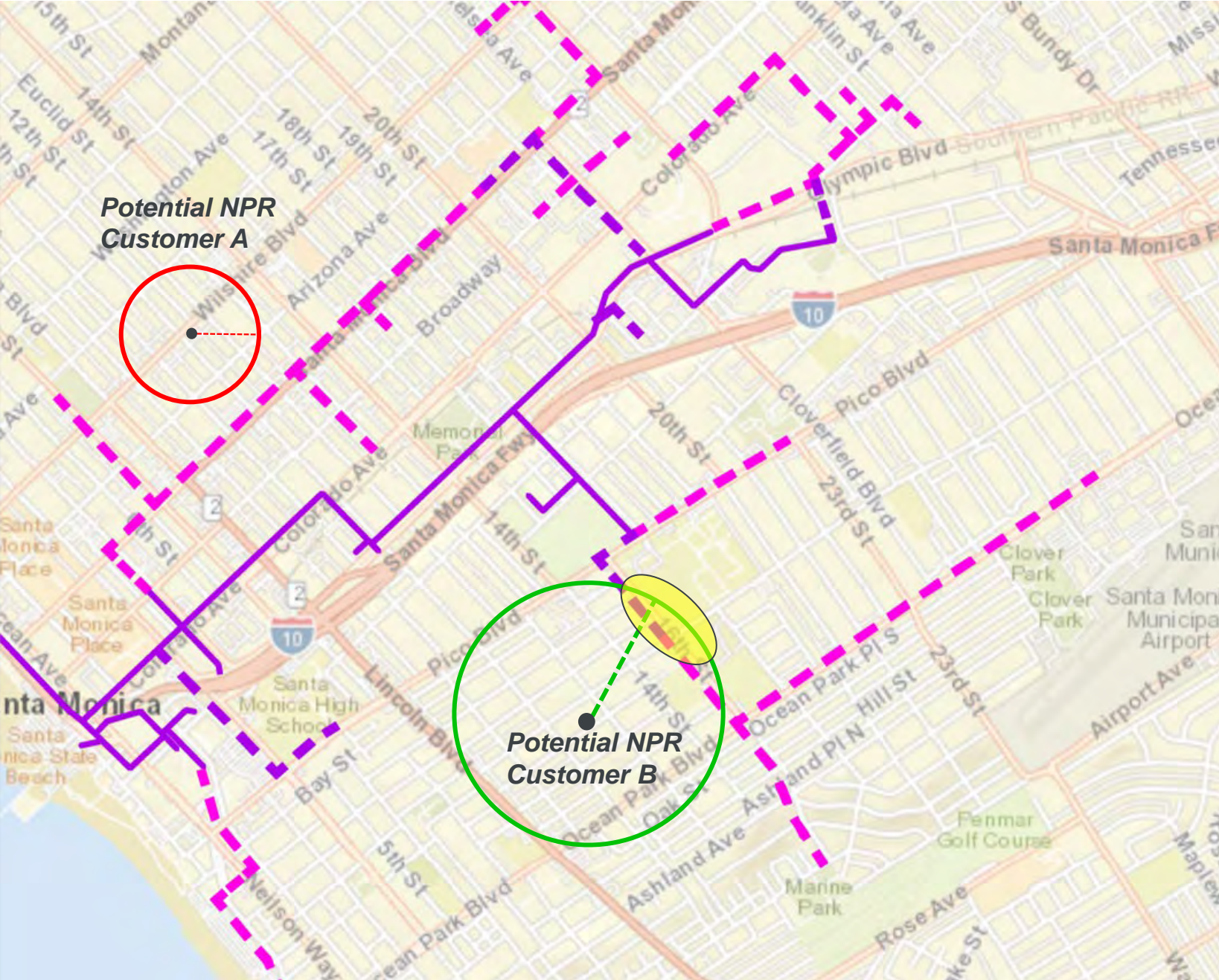
STEP 4

Evaluate & Identify
Preferred Portfolio

Radius of Cost-Effectiveness = Relative Comparison of Key Parameters

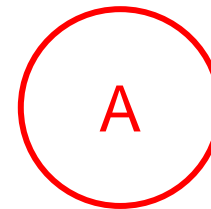
↳ *The distance at which a potential customer can be cost-effectively connected to a recycled water pipeline.*



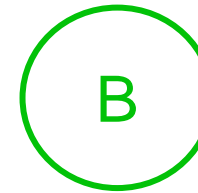


Identifying Cost-Effective Customers Using GIS

Radius of Cost-Effectiveness

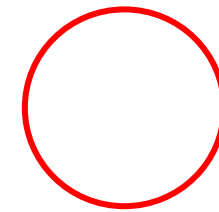
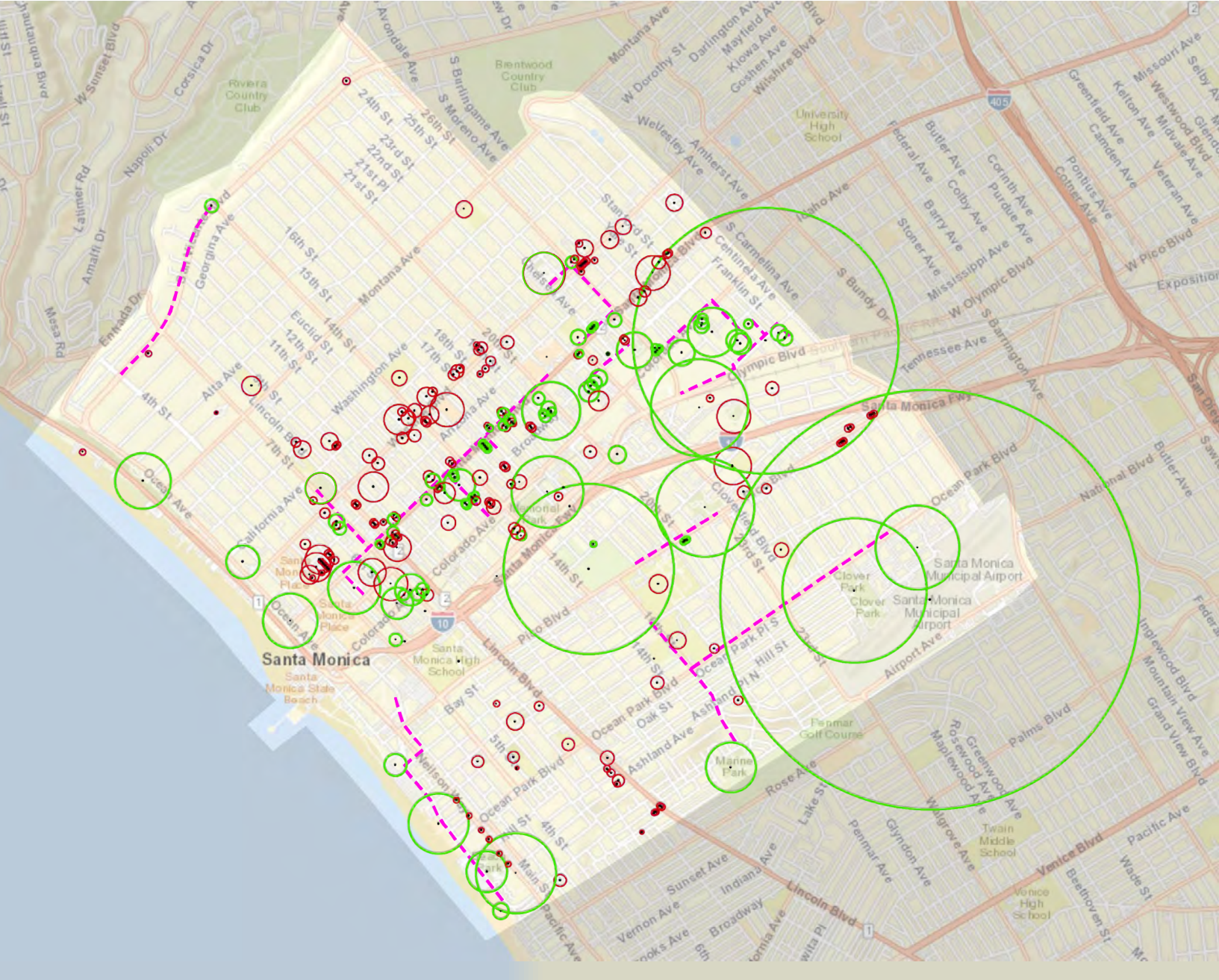


Not Cost-Effective for Non-Potable Reuse

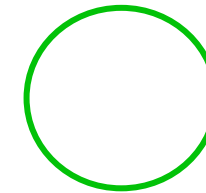


Cost-Effective for Non-Potable Reuse

Radius of Cost-Effectiveness Results



Not Cost-Effective
for Non-Potable
Reuse



Cost-Effective for
Non-Potable
Reuse

Comprehensive Master Plan to get to a Preferred Portfolio



STEP 1

Define Potential
Customers and
Demands



STEP 2

Identify "Anchor
Customers" for
New Recycled
Water Pipelines



STEP 3

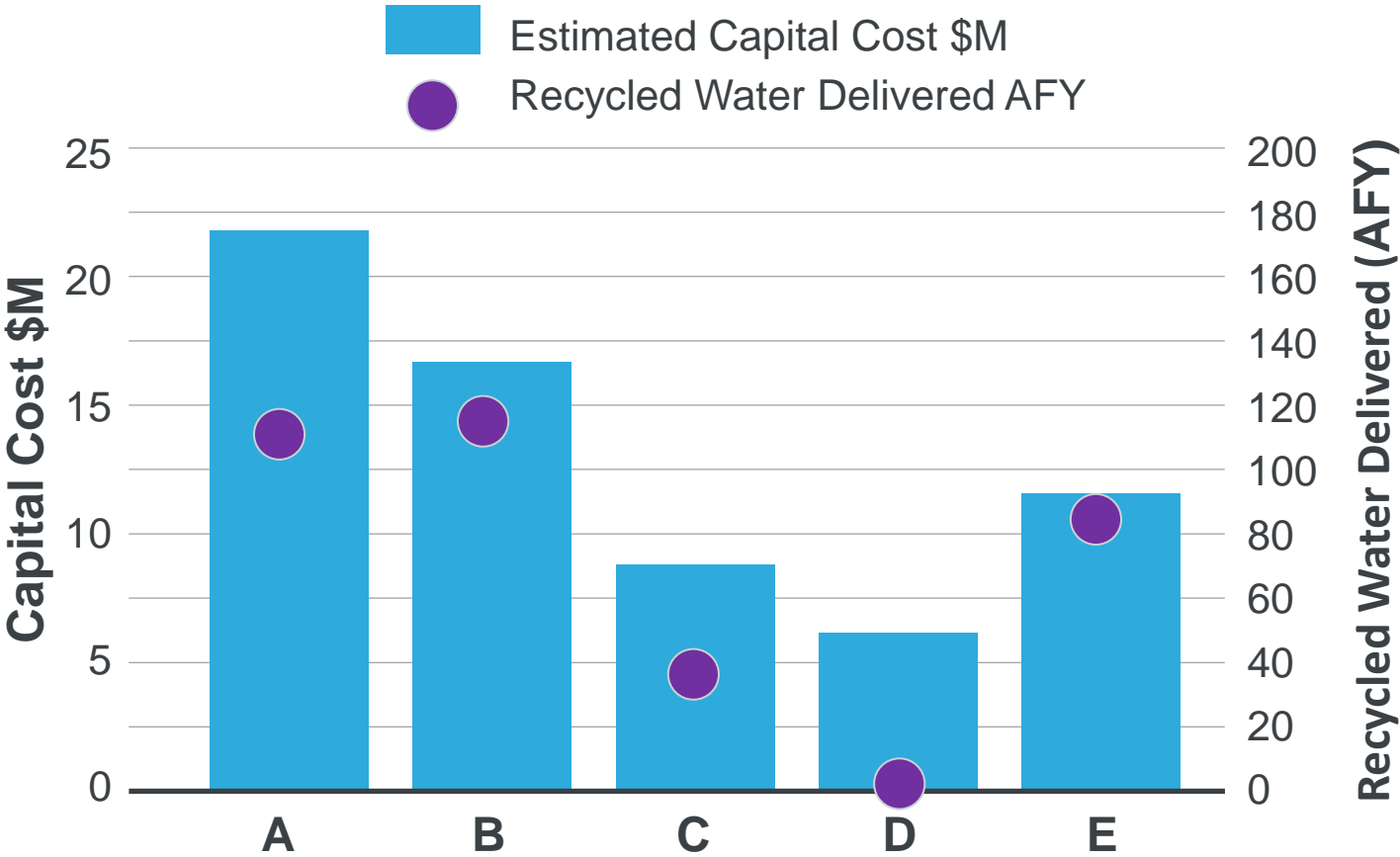
Identify
Cost-Effective
Customers &
Compare Costs



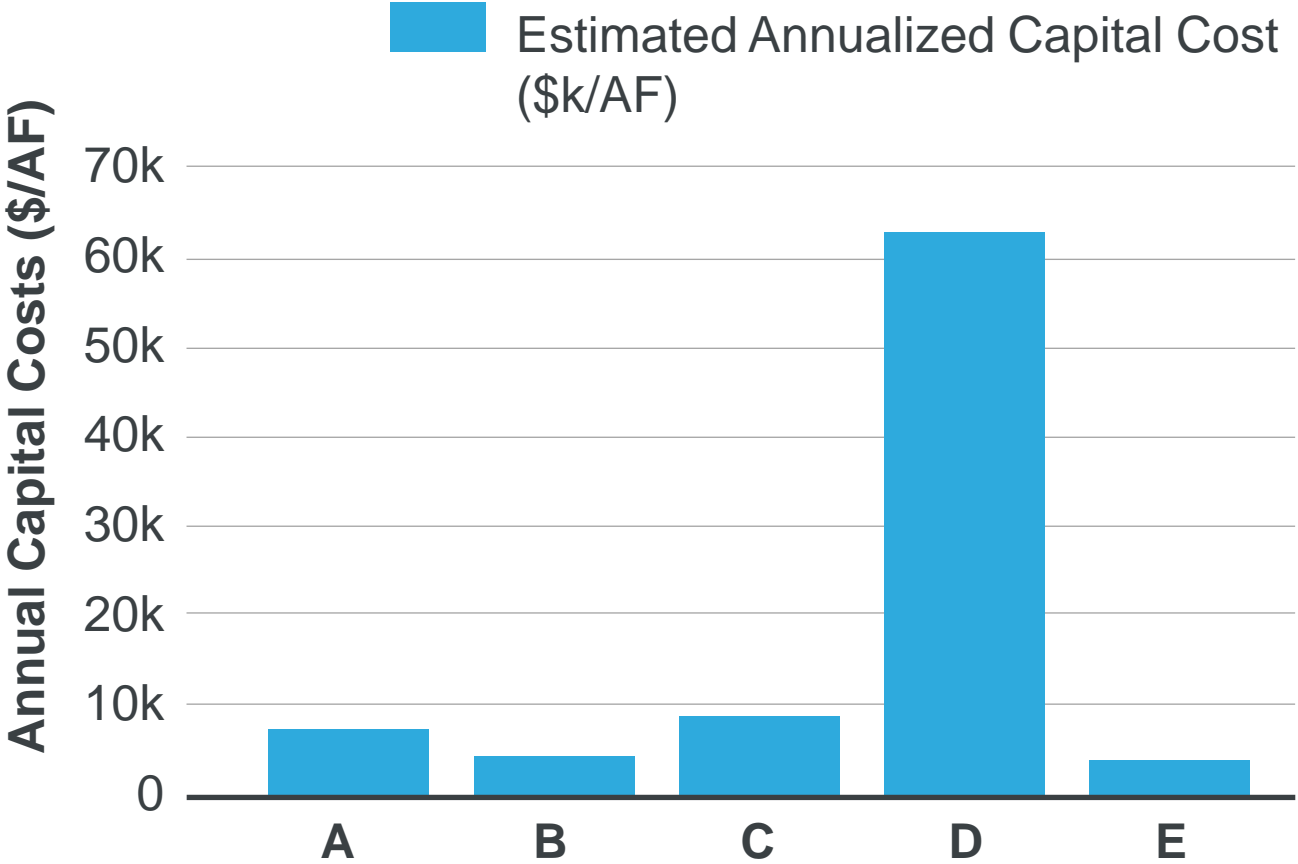
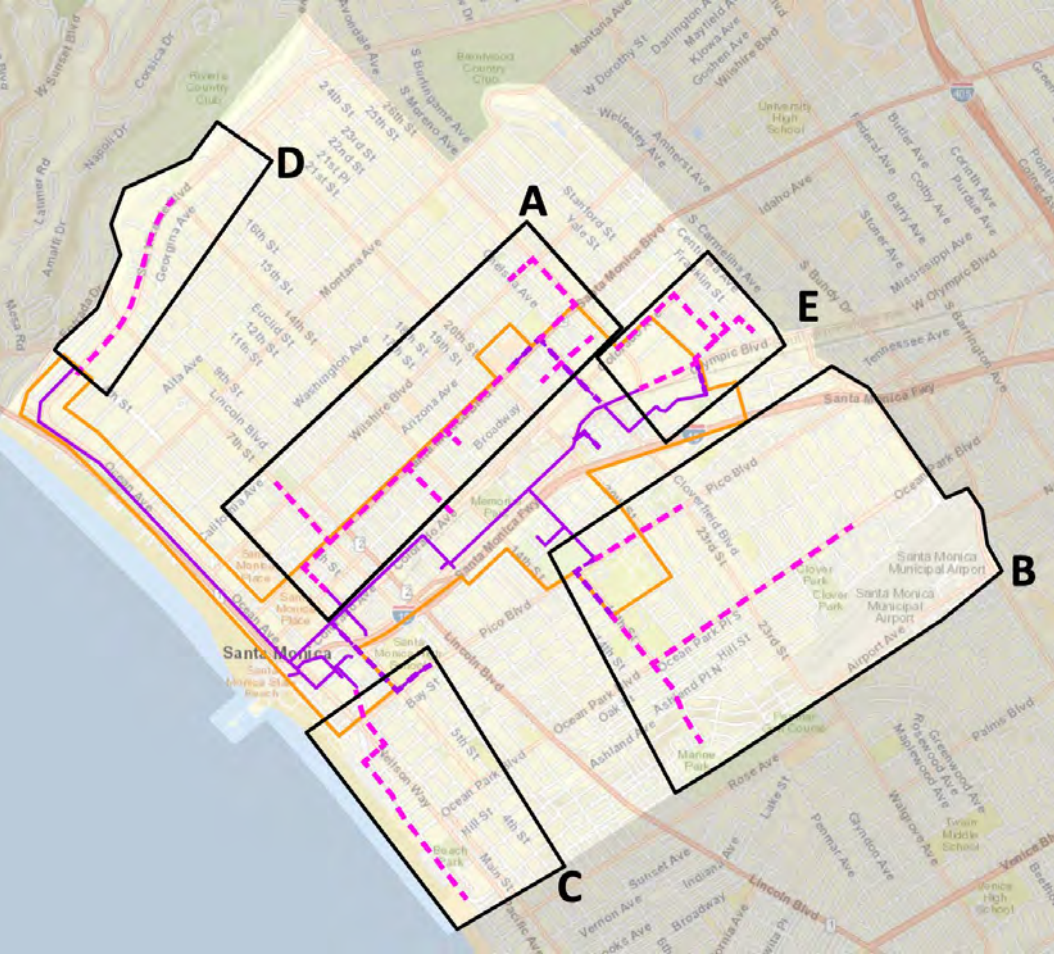
STEP 4

Evaluate & Identify
Preferred Portfolio

Prioritizing NPR Projects that Maximize Cost-Effectiveness



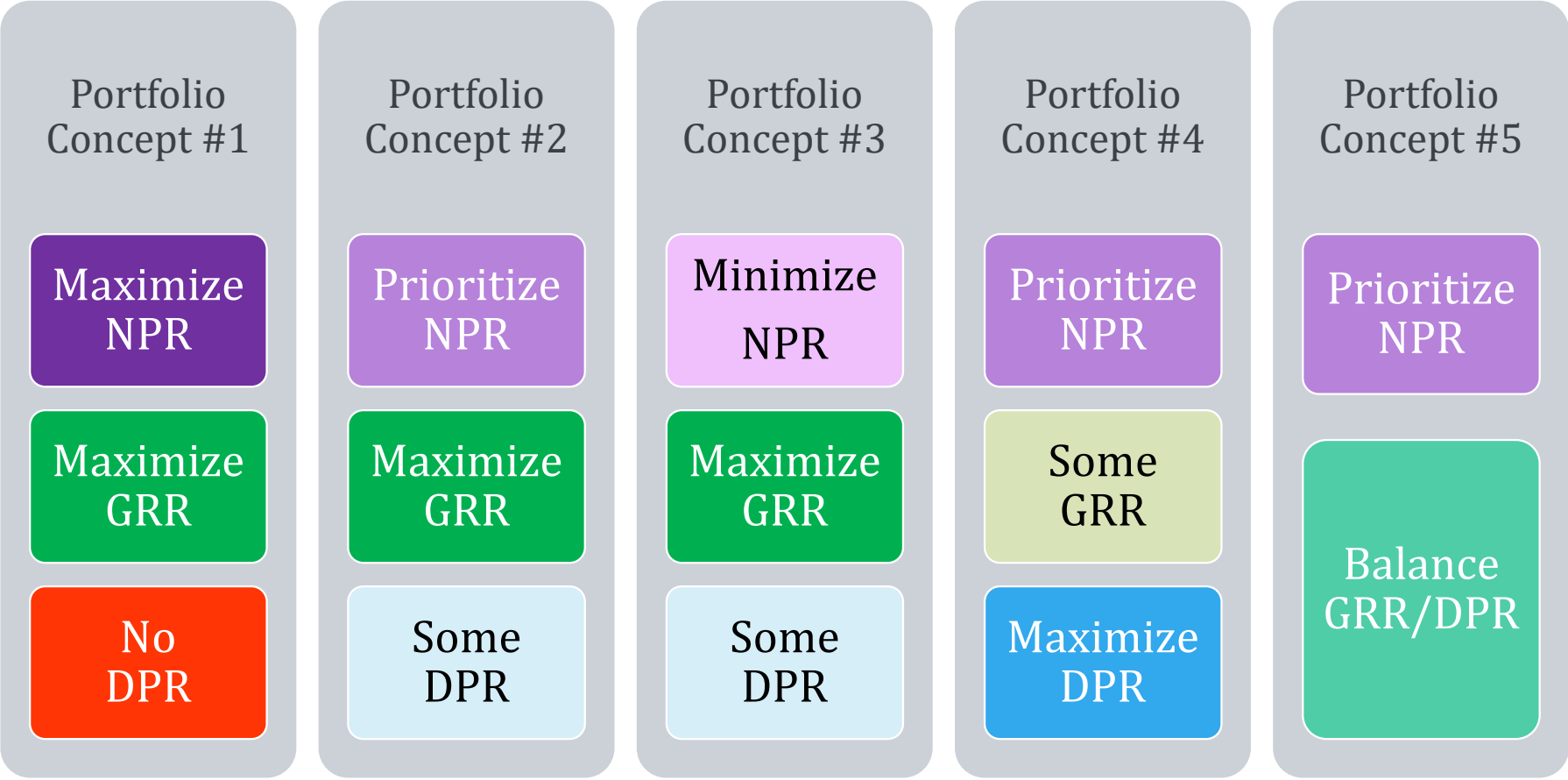
Prioritizing NPR Projects that Maximize Cost-Effectiveness



The background of the slide is a dark, blue-tinted photograph of a Ferris wheel at night. The wheel is illuminated, and its spokes are visible against the dark sky. The overall scene is dimly lit, with some lights from the surrounding area visible in the background.

Portfolio Analysis: Diversifying Recycled Water Use

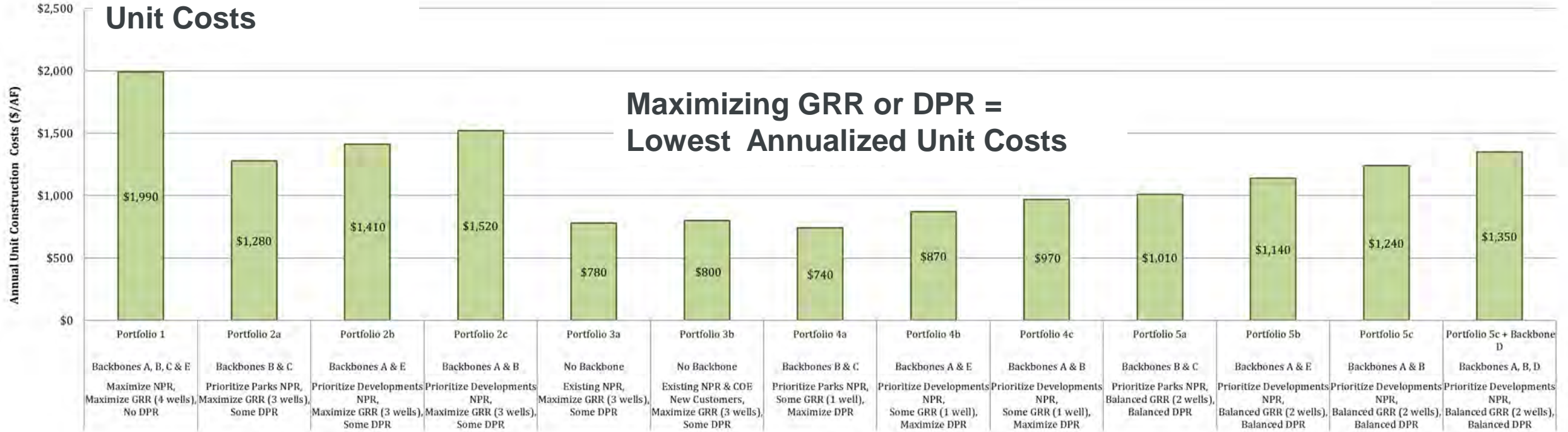
Portfolio Analysis for Diversifying Recycled Water Use



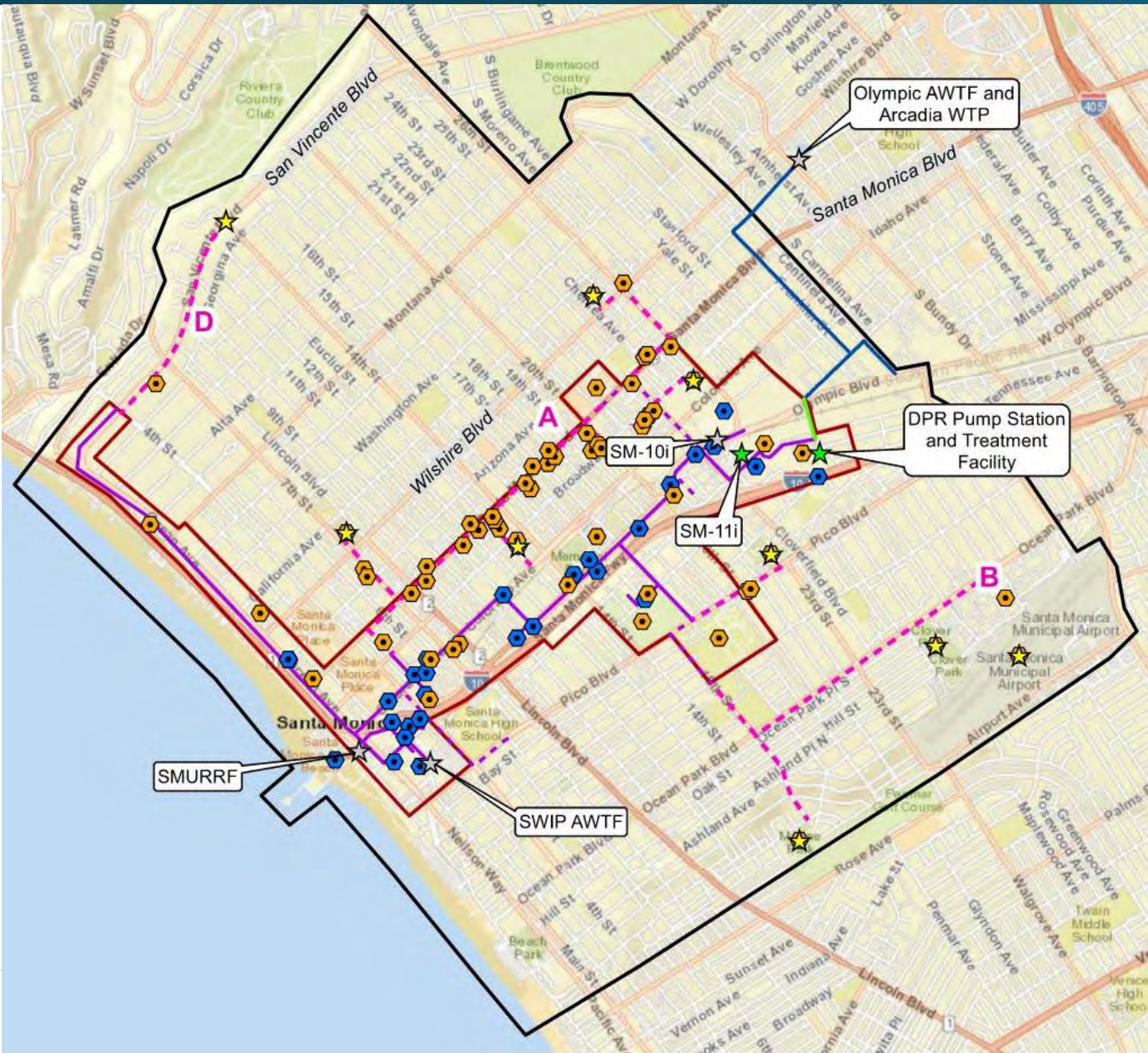
Portfolio Concept Annual Unit Construction Cost Summary

**Maximizing NPR =
Highest Annualized
Unit Costs**

**Maximizing GRR or DPR =
Lowest Annualized Unit Costs**



Preferred Portfolio Presented a Balanced Approach to Recycled Water Use



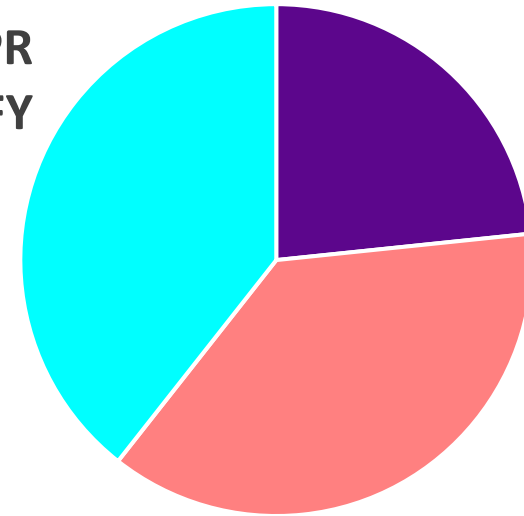
Portfolio 5 Recycled Water Use

Selective Buildout of NPR

DPR
662 AFY

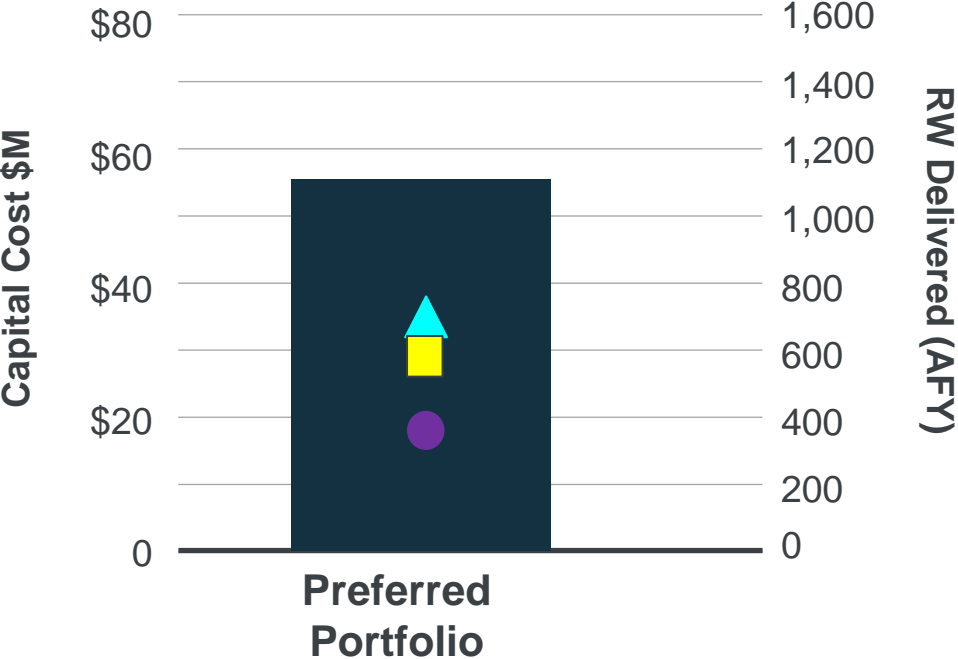
NPR
392 AFY

GRR
626 AFY

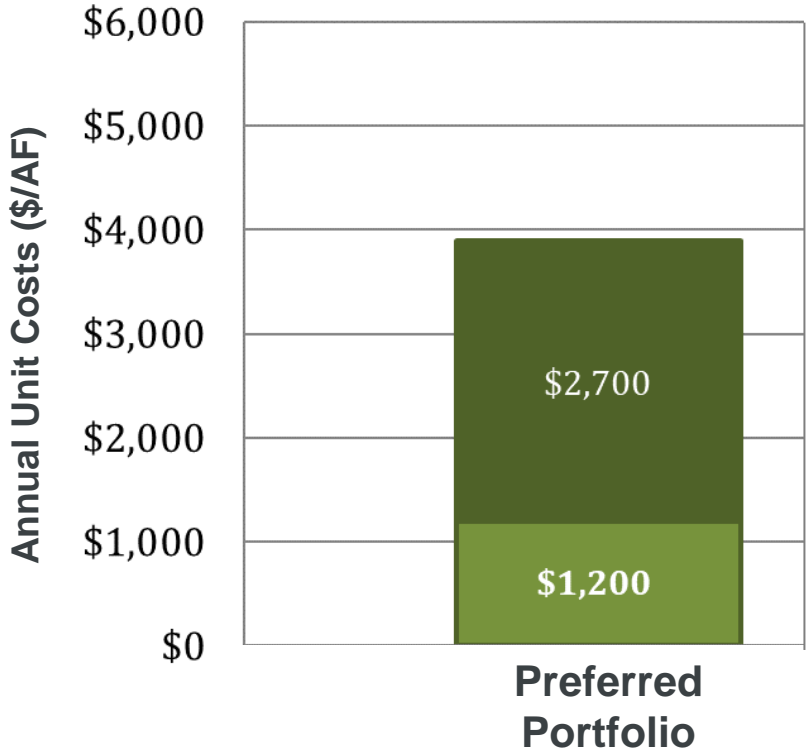


Preferred Portfolio

- Non-Potable Reuse (NPR)
- ▲ Groundwater Replenishment Reuse (GRR)
- Direct Potable Reuse (DPR)



- Annual Unit O&M Costs (\$/AF)
- Annualized Unit Construction Cost (\$/AF)



Implementation Timeline

Design and Construction

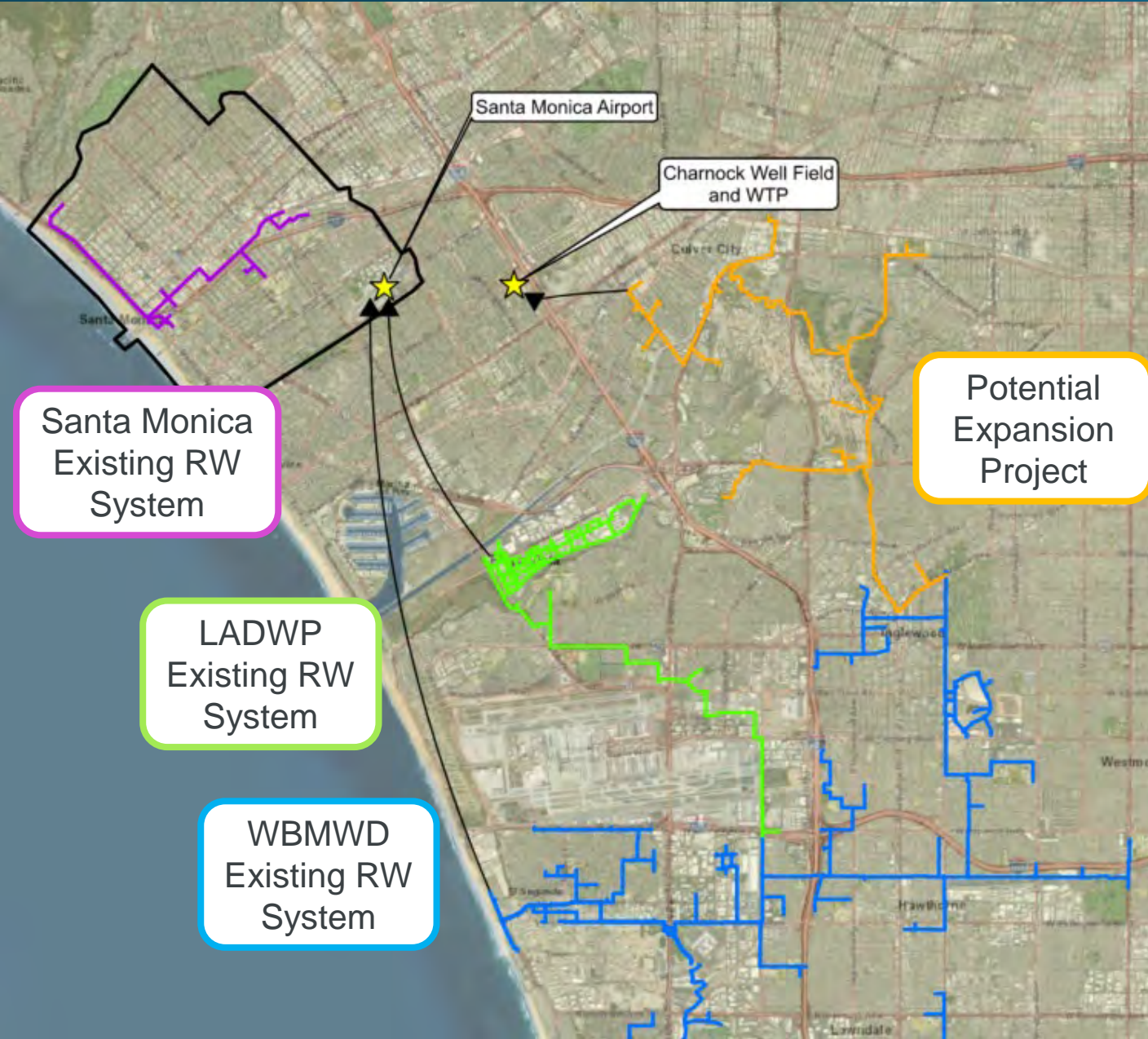
- NPR: Present to 2033
- GRR: Present to 2026
- DPR: Present to 2026

Regional Opportunities:



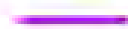



Possibilities to Share Infrastructure, Repurpose Assets
and Realize Economies of Scale



Regional Opportunities for Future Delivery of Recycled Water



Legend

-  Potential Delivery Locations for Tertiary Recycled Water
-  City of Santa Monica Boundary
-  City of Santa Monica Existing RW System
-  Los Angeles Department of Water and Power Existing RW System
-  West Basin Municipal Water District Existing RW System
-  Kenneth Hahn Expansion Project

Santa Monica Existing RW System

LADWP Existing RW System

WBMWD Existing RW System

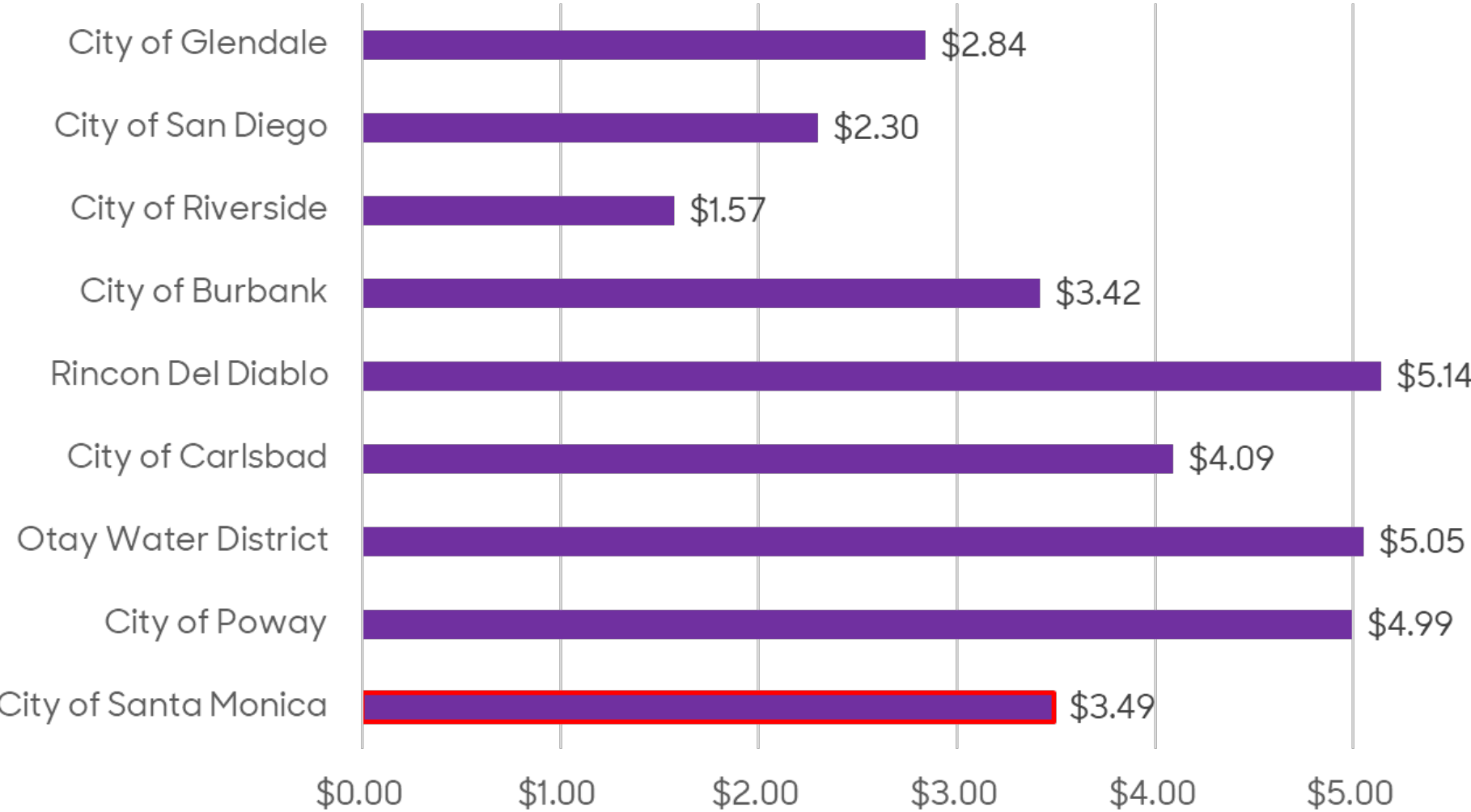
Potential Expansion Project



Financial Implications: Cost Allocations and Rate Considerations

Recycled Water Rates vs Drinking Water Rates

Uniform Recycled Water Rates in California



Drinking Water
Tier 1 Rate:
\$6.61/HCF

Goal: Recover costs while incentivizing use of recycled water supplies

Costs Allocations for the Preferred Portfolio

Proposed Costs Allocated to Water	Direct Costs from Table 9-3	SMURRF, SWIP, and Admin Costs ¹	Avoided Costs and Recycled Water Sales from Table 9-8	Total Dollars
NPR	\$2,621,764	\$938,700	(\$887,840)	\$2,672,624
GRR	\$866,937	\$1,499,046	(\$2,047,730)	\$318,254
DPR	\$547,824	\$1,585,254	(\$2,165,491)	(\$32,413)
Total, Preferred Portfolio	\$4,036,525	\$4,023,000	(\$5,101,060)	\$2,958,465

Notes:

1. Costs are allocated based on recycled water deliveries.

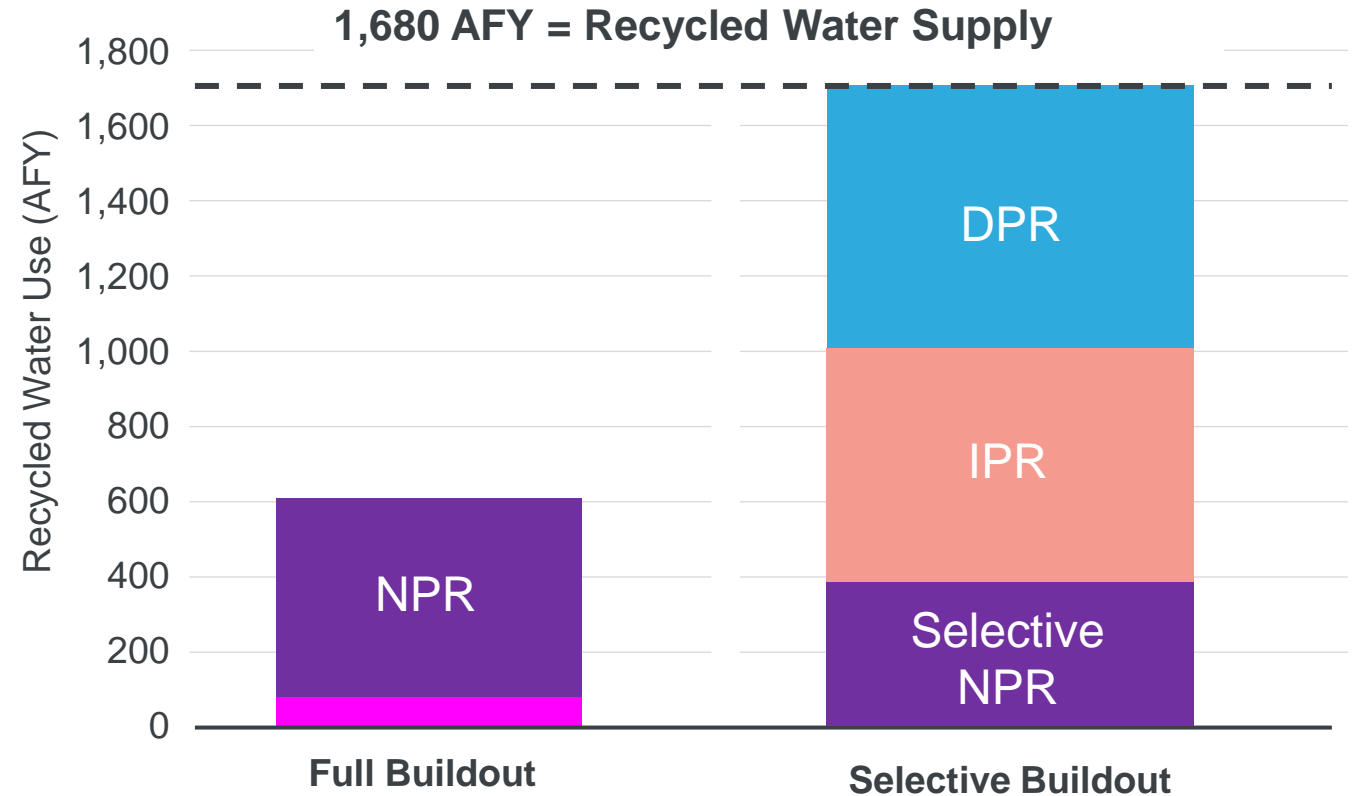
Key Takeaways & Next Steps

The background is a dark, blue-tinted photograph of an amusement park at night. A large Ferris wheel is prominent on the right side. In the foreground, there are silhouettes of people walking on a path. The overall scene is dimly lit, with some lights visible in the distance.

Don't Waste a Drop!

Key Takeaways:

- Limited Supply of Advanced Treated Recycled Water
- Implement Selective Non-Potable Reuse Projects
- Diversify Recycled Water Use



Don't Waste a Drop! Next Steps:



Expanding Pipelines to Key Customers



Constructing New Groundwater Recharge Well



One Water Master Plan - Feasibility Analysis for Direct Potable Reuse

Questions?



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Would you like to watch this webinar again?

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You will be emailed a PDH Certificate for attending this webinar within the next week.

Questions?

Email Marisa Waterman at mwaterman@aaees.org with any questions you may have.



Leadership and Excellence in Environmental Engineering and Science