

Prepping Your Wastewater for Future Potable Reuse

July 2024

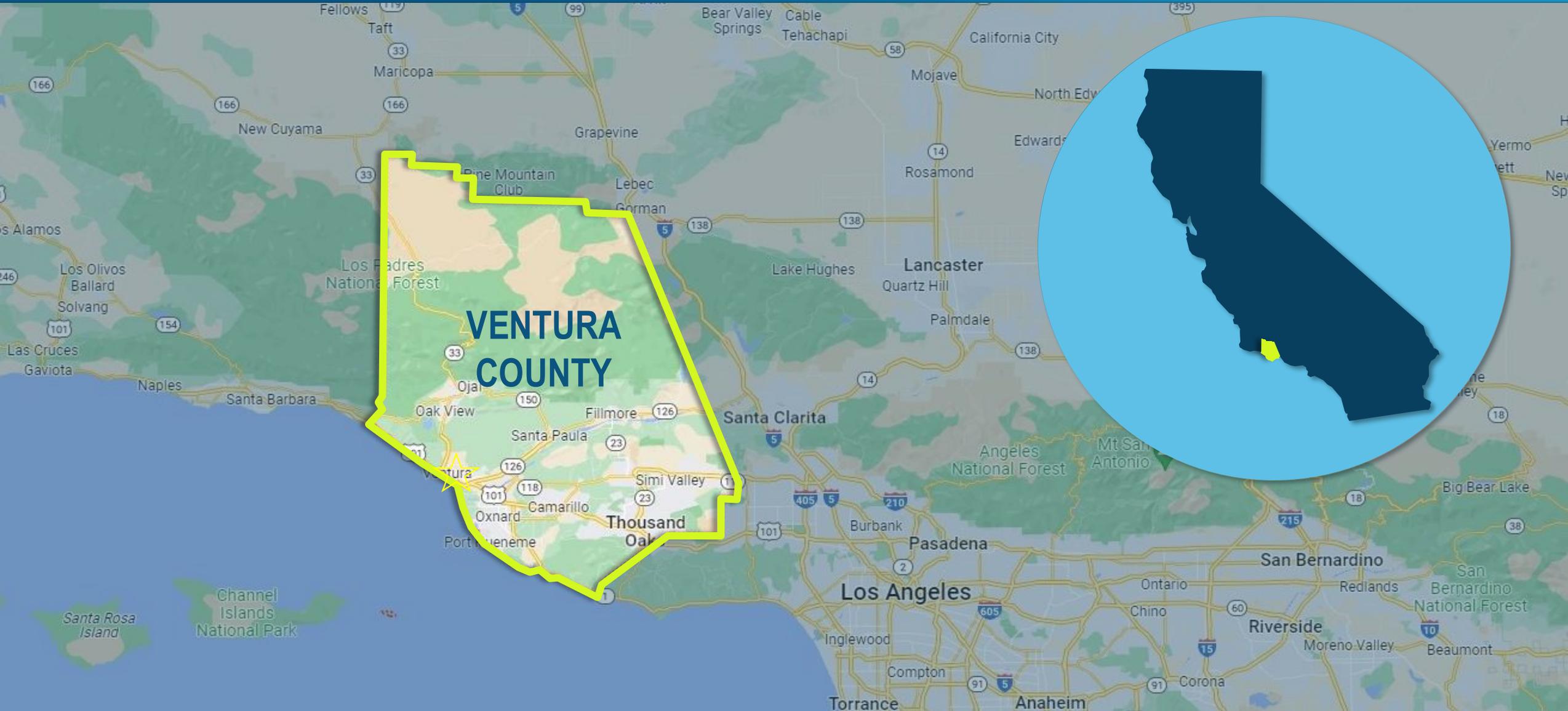
 Kennedy Jenks

 Trussell

 VENTURA WATER.



VenturaWaterPure Groundwater Replenishment Project

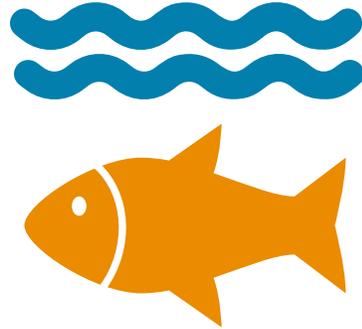


VenturaWaterPure – Overall Program Objectives



<2 MGD

Reduce Discharge to the
Santa Clara Estuary



<4 mg/L as N

Reduced Nutrient Levels
in the Discharge



~3,500 AFY

Beneficial Reuse – IPR for a
Sustainable Water Supply



New Ocean Outfall and Concentrate Line

New Advanced Water Purification Facility (AWPF)

New distribution pumps and pipelines

Ventura Water Reclamation Facility (VWRF)

New MBR/UV Process

Santa Clara River Estuary

New Injection Wells



PROJECT COMPONENTS

Ocean Outfall

VWRF Upgrades

AWPF

Injection Wells

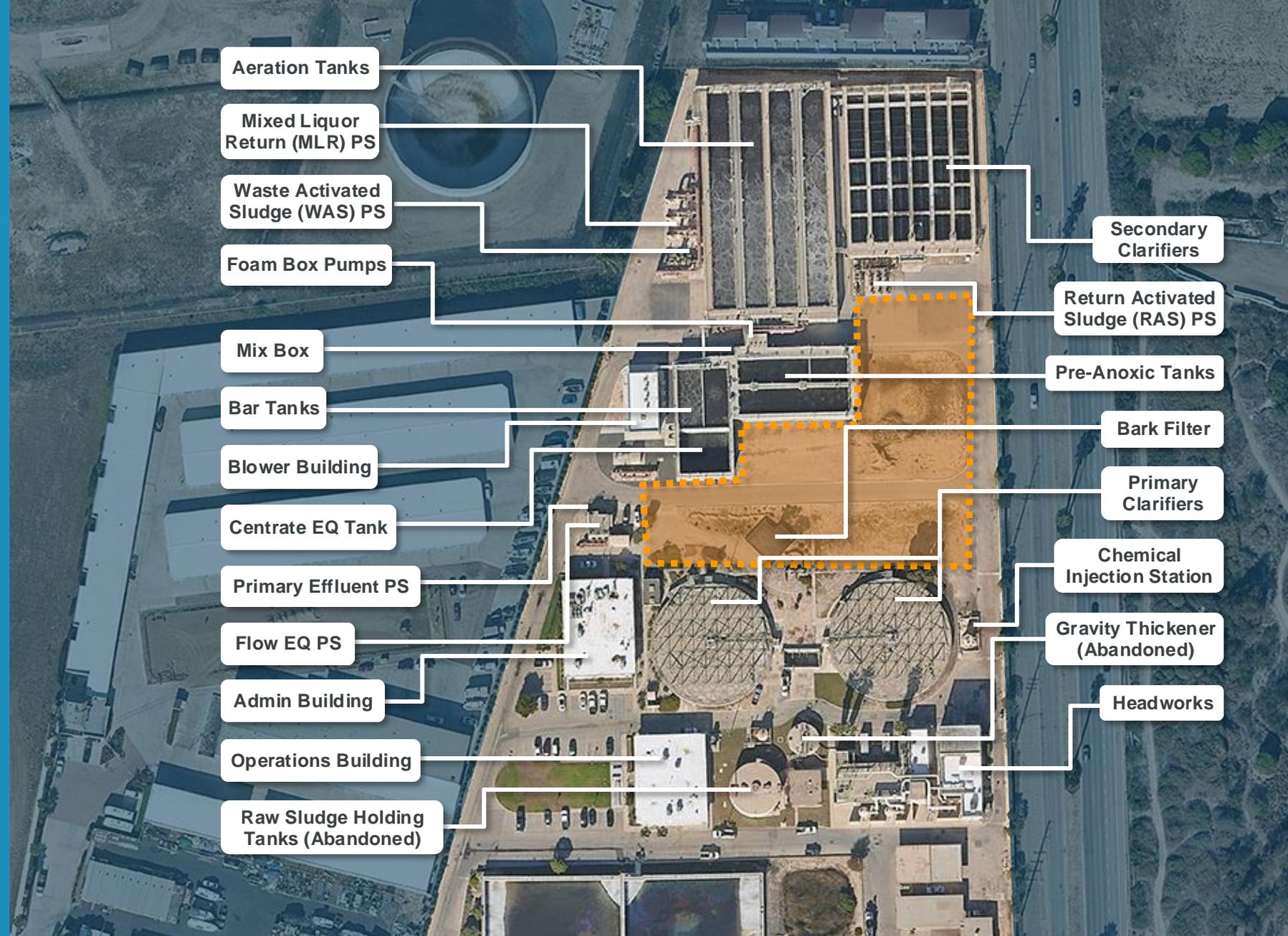
Ventura Water
Reclamation
Facility (VVRF)

The image is a satellite map of the Ventura Harbor area. A dashed orange circle highlights the central industrial and marina area. Three callout boxes are present: an orange box on the left pointing to the VVRF, an orange box on the right pointing to a specific building within the VVRF, and a white box at the bottom pointing to the river estuary. Various landmarks and streets are labeled on the map.

New MBR/UV Process

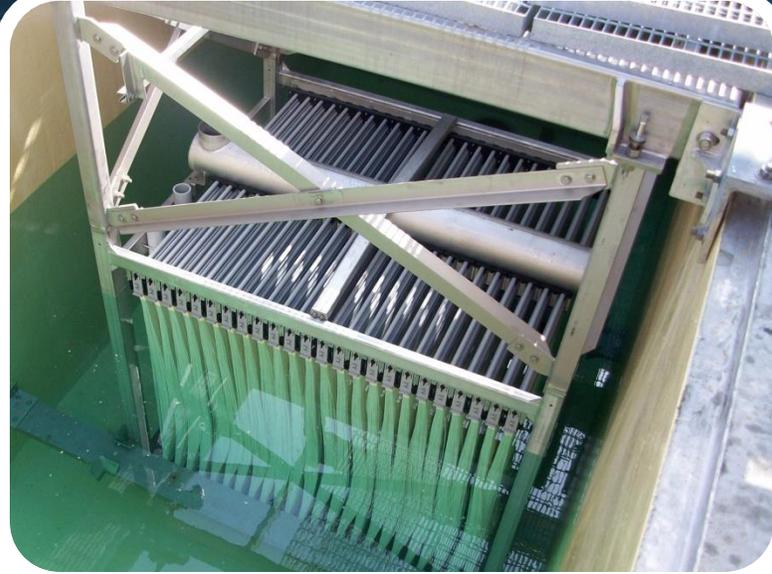
Santa Clara
River Estuary

Existing Site





Improved Biological Nutrient
Removal

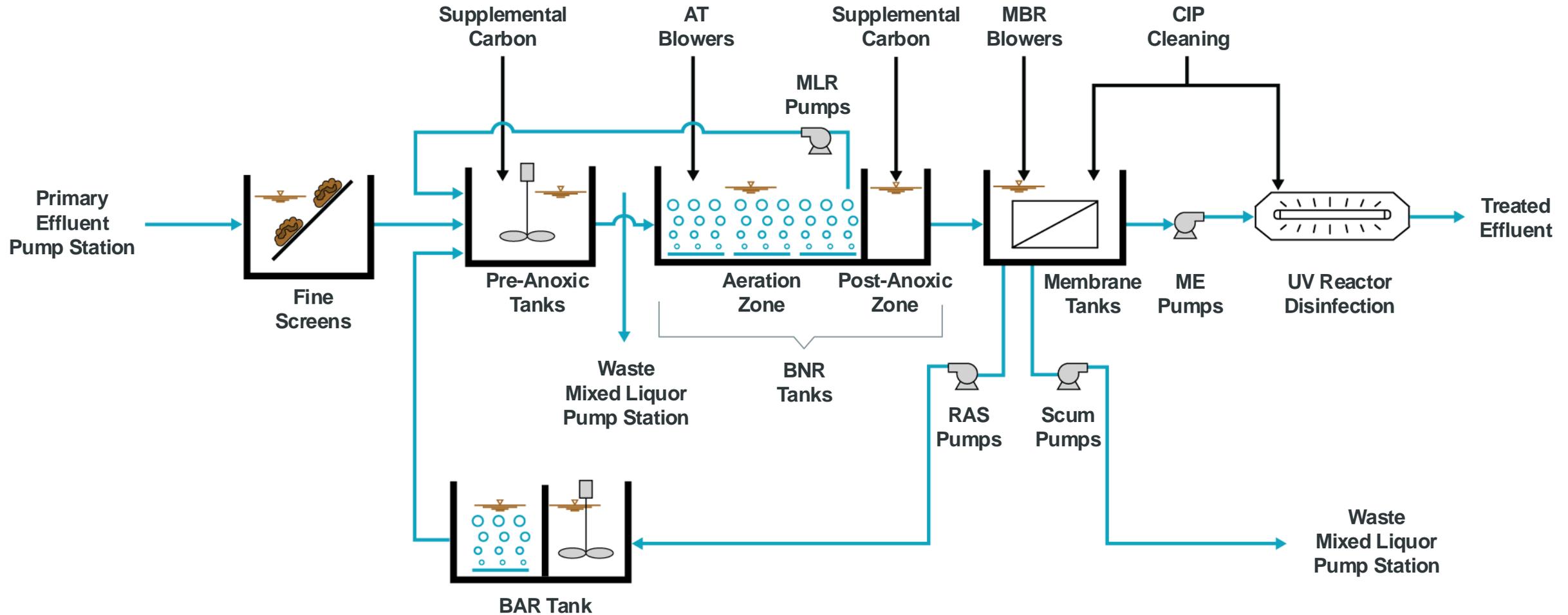


Membrane Bioreactor
Filtration

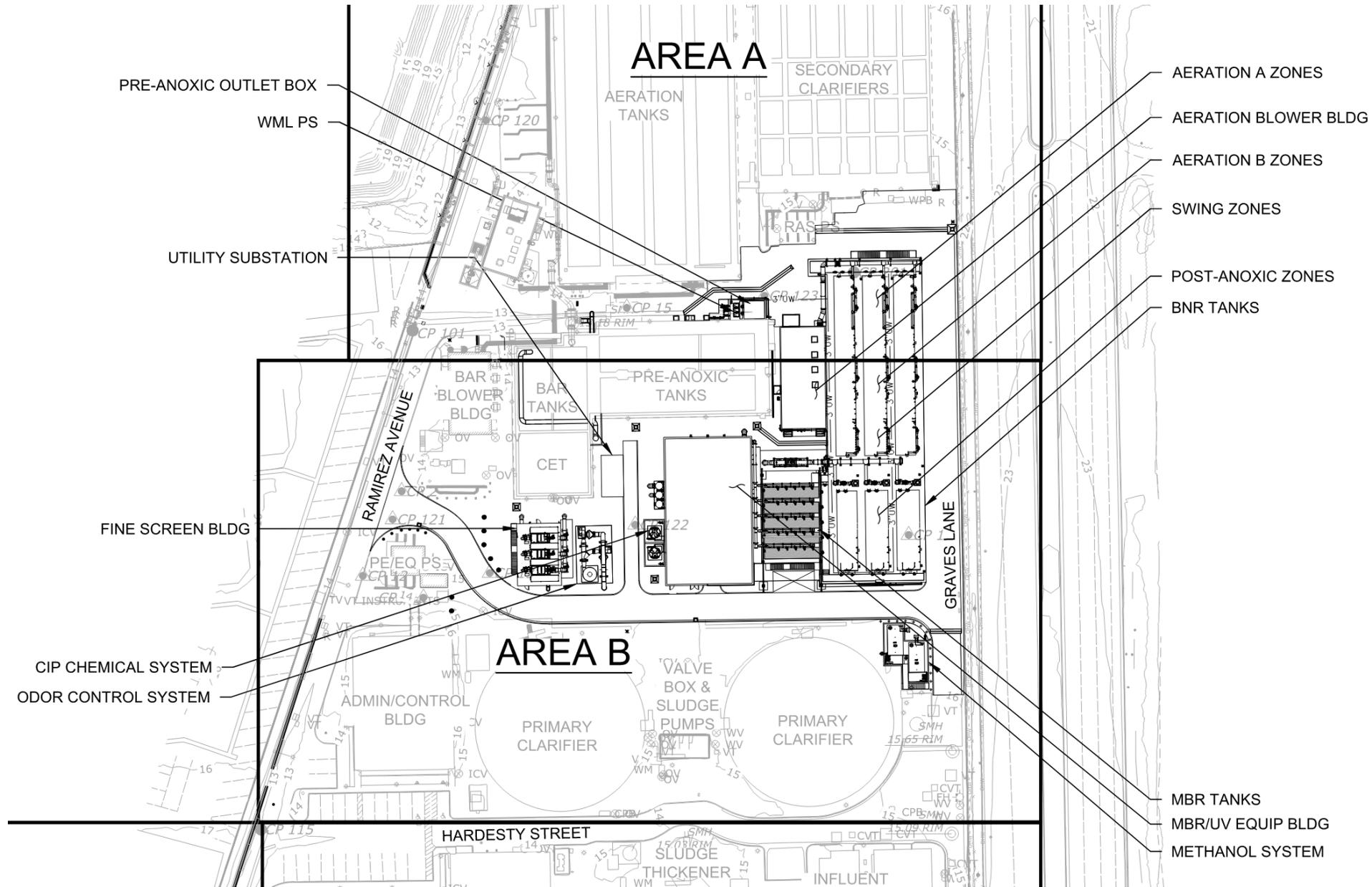


UV
Disinfection

New Biological, MBR, and UV Treatment to Meet Project Goals



Site Layout –
it will be tight,
but possible





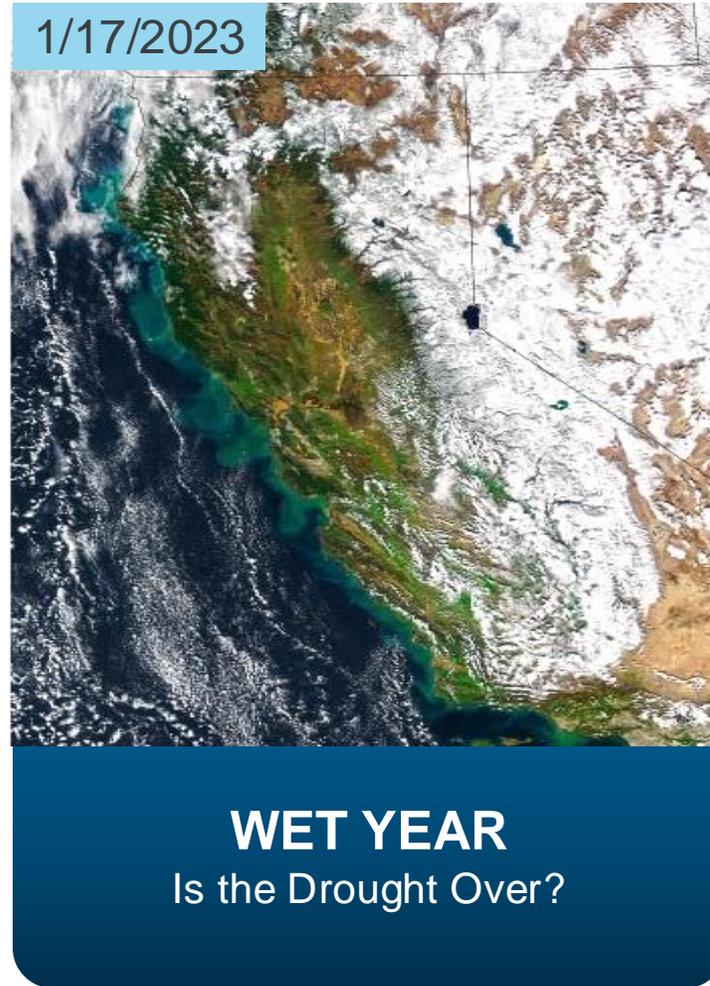


Designing for Potable Reuse



Climate Variability – The Need for New Water

Snowpack – NASA's Terra Satellite

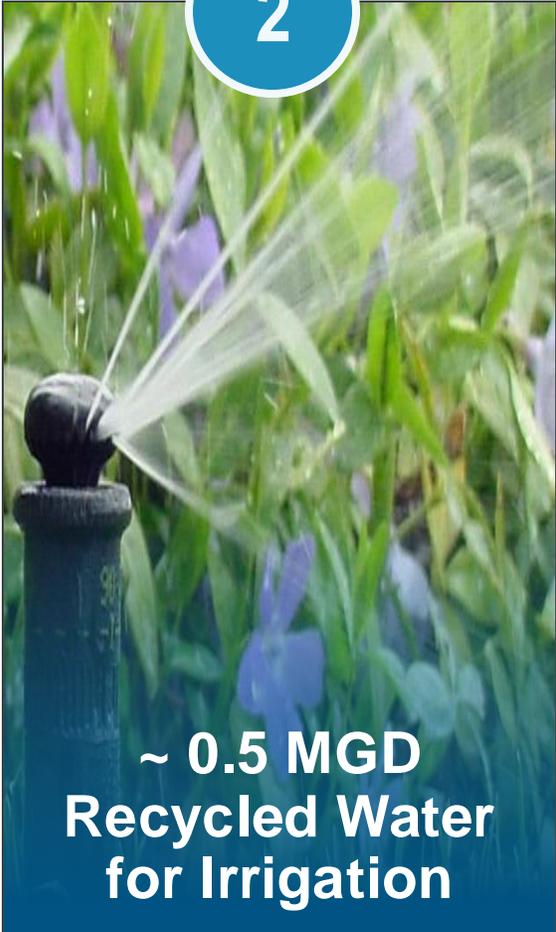


Goals for VenturaWaterPure

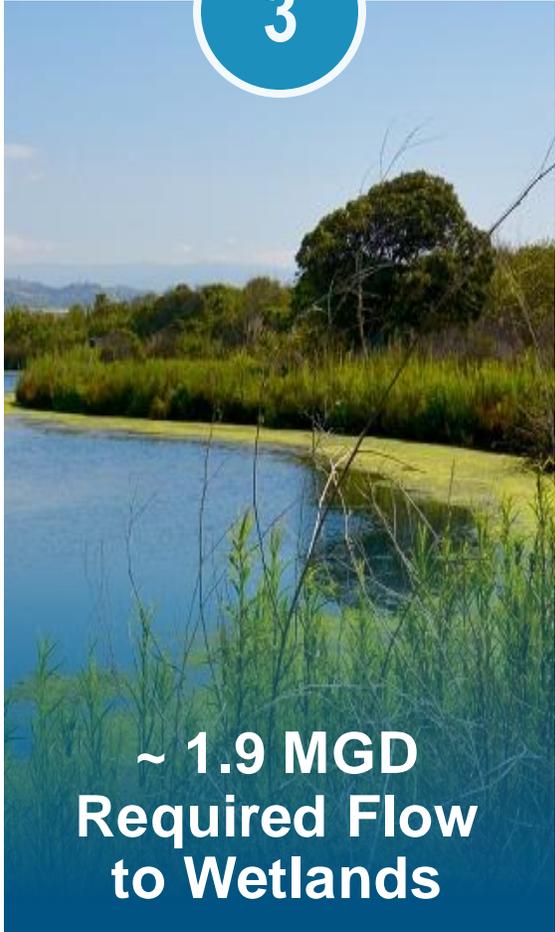
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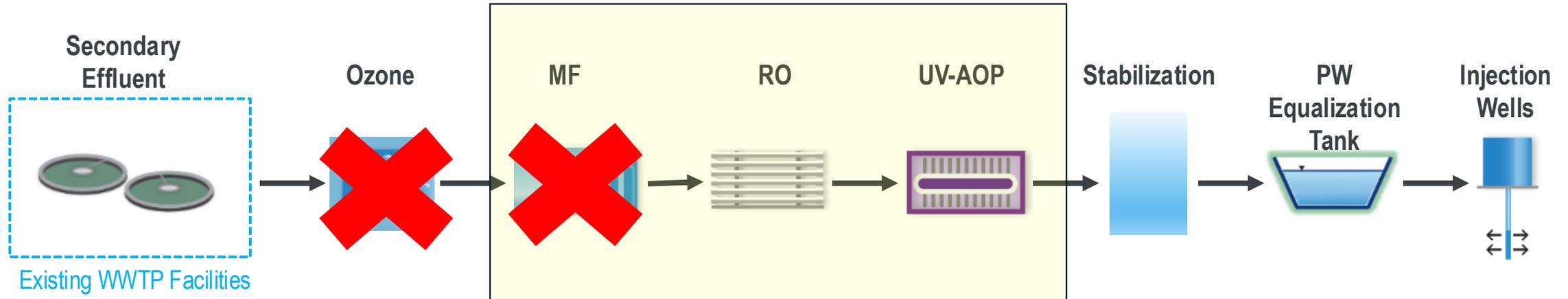
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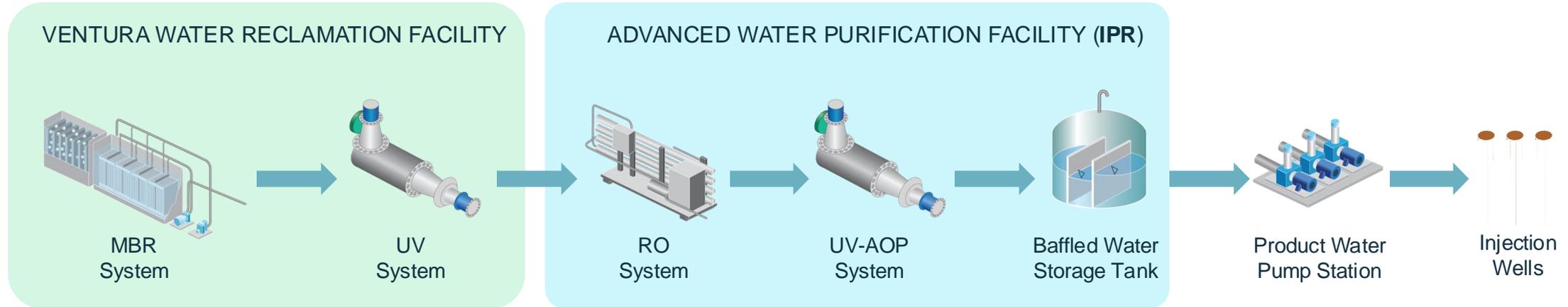


Typical California IPR Requires MF / RO / UV-AOP Treatment



Treatment Processes	Potential/Target Process Log Removal / Inactivation Credits						Total Log Removal/ Inactivation	DDW Required Log Removal/ Inactivation	Potential Total Log Removal/ Inactivation
	WWTP Secondary Effluent	Potential Ozone	MF	RO	UV/ AOP	Aquifer			
Virus	0	2	0	2	6	4	12	12	14
Giardia	0	0	4	2	6	0	12	10	12
Cryptosporidium	0	0	4	2	6	0	12	10	12
1-4 Dioxane	0	0	0	0	0.5	0	0.5	0.5	0.5

Projected Pathogen LRVs for VenturaWaterPure IPR



Projected LRVs for the VenturaWaterPure IPR Project

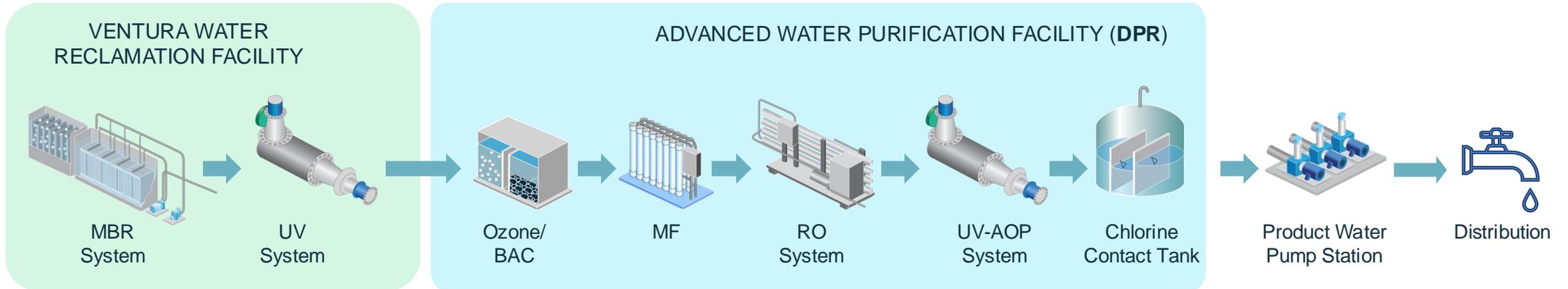
Pathogen	MBR ¹	UV	RO ²	UV-AOP	Chlorine	GW Basin ³	Project Total	Total Req'd.
Virus	1.0-2.0	1.5	1.5	6	2	2.0-6.0	14-17	12
Giardia cysts	2.5-3.5	4	1.5	6	0	0	14-15	10
Cryptosporidium oocysts	2.5-3.5	4	1.5	6	0	0	14-15	10

¹ Tier 2 LRVs assume up to 1 additional LRV for V/G/C. Actual LRVs may vary based on testing results

² Based on total organic carbon (TOC) removal

³ Actual credit will be determined by a tracer study upon project startup

Projected Pathogen LRVs for VenturaWaterPure DPR



Projected LRVs for a Potential Future VenturaWaterPure DPR Project

Pathogen	MBR ¹	UV	O ₃ /BAC	MF	RO ²	UV-AOP	Chlorine	Project Total	Total Req'd.
Virus	1.0-2.0	1.5	6	0	1.5	6	6	22-23	20
Giardia cysts	2.5-3.5	4	6	4	1.5	6	1	25-26	14
Cryptosporidium oocysts	2.5-3.5	4	1	4	1.5	6	1	19-20	15

¹ Tier 2 LRVs assume up to 1 additional LRV for V/G/C. Actual LRVs may vary based on testing results

² Based on total organic carbon (TOC) removal

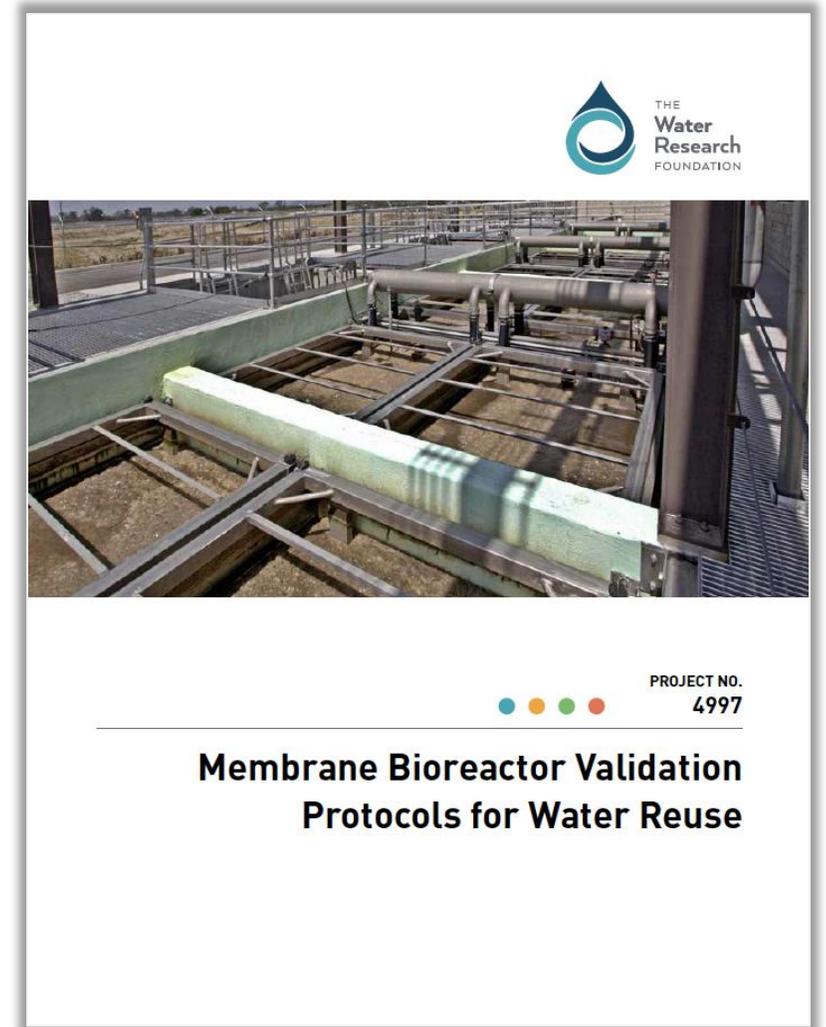
MBR Pathogen Validation in California for Potable Reuse

TIER 1: Default LRVs given turbidity requirements

- 1.0/2.5/2.5 for V/G/C

TIER 2: Demonstration of higher LRV credits through product-specific testing

- **Pre-commissioning:** 24 samples of pathogen and indicators required over a period of 3 months or longer
- **Commissioning:** Testing at full-scale with 24 samples of pathogen and indicators taken 2x/month for 12 months
- **Ongoing monitoring:** Full-scale performance confirmed using indicators and surrogates
- **2.0+/3.5+/3.5+** for V/G/C



MBR Tier 2 Validation: Indicator/Surrogate Options

Turbidity

- Performed during pre-commission and normal operation
- Continuous monitoring
- Challenged conditions
- Flat-Plate and Hollow-Fiber

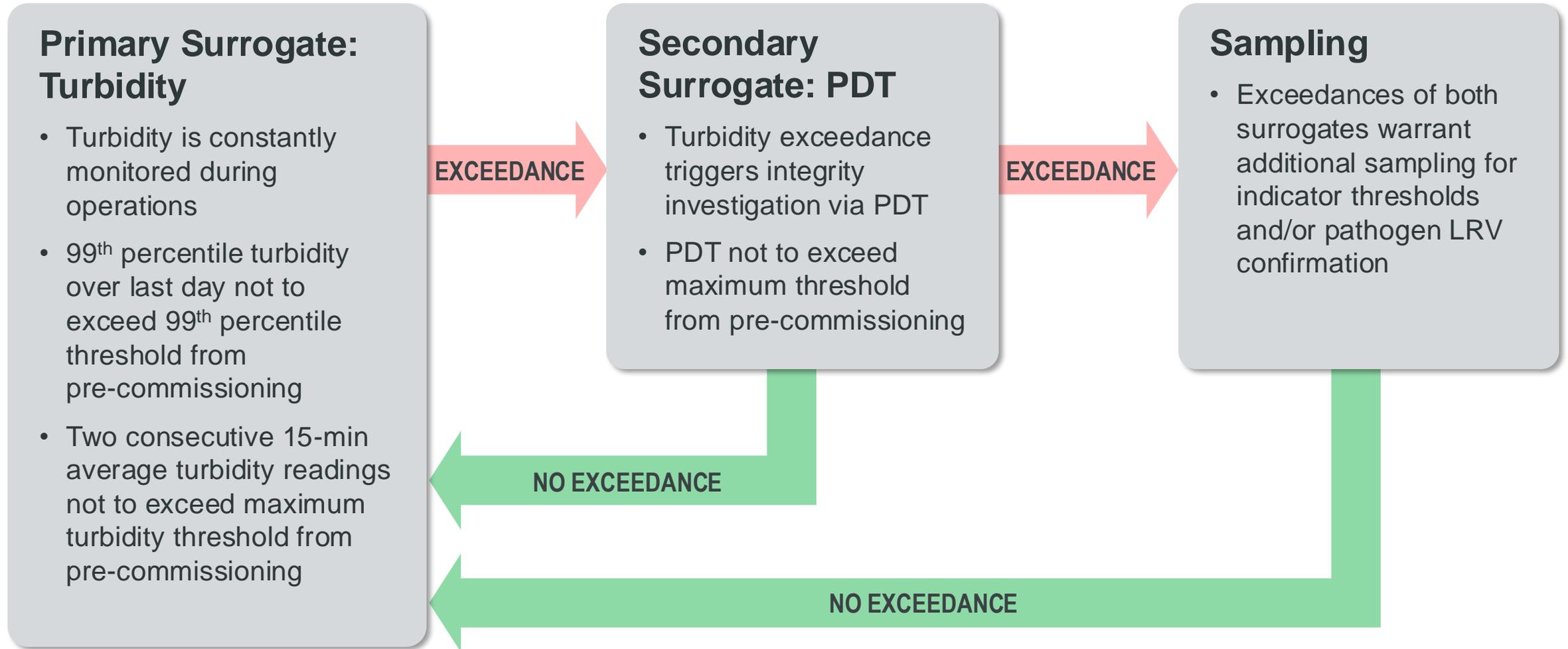
Pressure Decay Testing (PDT)

- Performed during pre-commission and normal operation
- Vendor specific intervals
- Hollow-Fiber only

Others

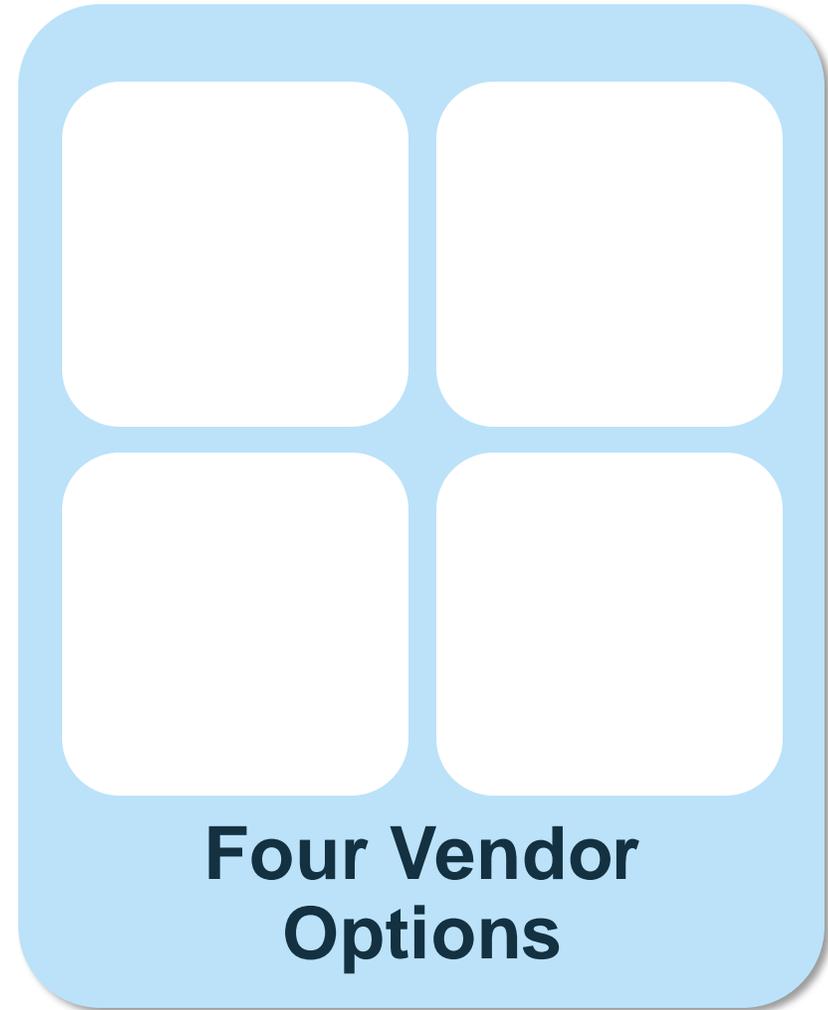
- New emerging methodologies, specifically with Flat-Plate type membranes

MBR Tier 2 Validation: Pre-Commissioning/Normal Operation Workflow



Selecting Pre-Qualified MBR Systems

- 1. Membrane Product:**
1 year of successful operation at a municipal WWTP in the U.S.
- 2. MBR system must have completed Tier 2 validation testing or be in the process of conducting Tier 2 validation testing in CA**



Five MBR Products Met the Pre-Qualification Criteria

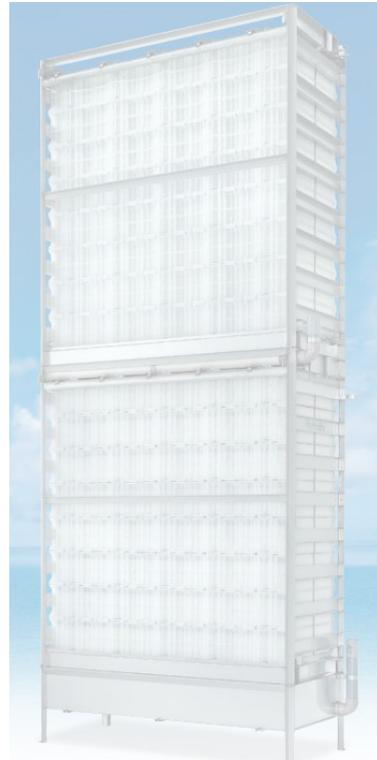
Flat-Plate

Pros:

- Higher flux rates
- Decreased ragging
- Higher MLSS

Cons:

- Larger membrane tanks
- Higher overall air scour demand
- Inability to perform PDT



Kubota SP900

Hollow-Fiber

Pros:

- Smaller membrane tanks
- Lower overall air scour demand

Cons:

- More susceptible to ragging
- Lower fluxes
- More chemical requirements



DuPont B40N



Koch Pulsion LE44



Veolia ZW500D



Veolia ZW500EV

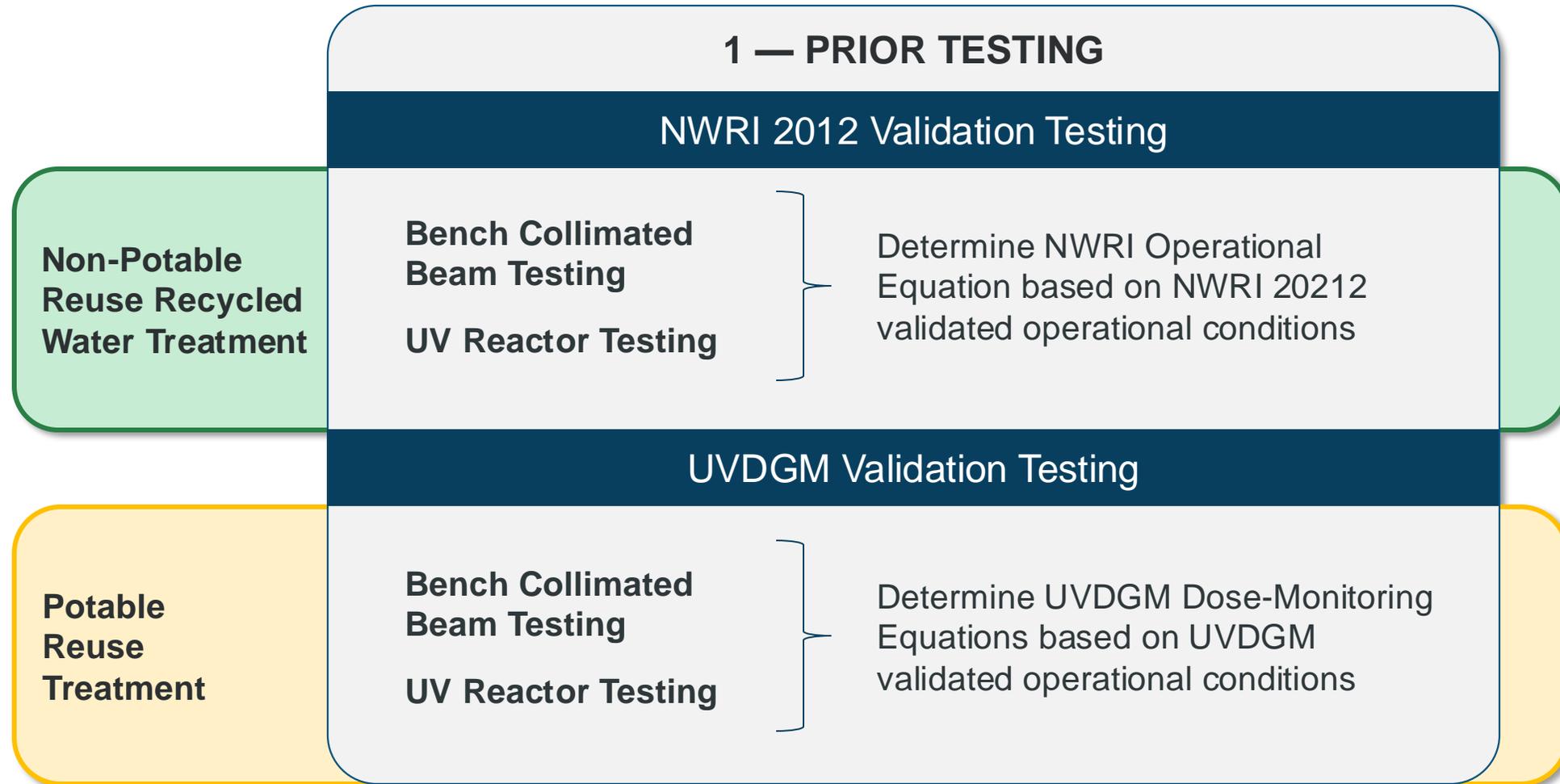
UV Regulatory Considerations for Non-Potable & Potable Reuse

Item	Non-Potable Guidelines (NWRI 2012)	Potable Reuse Guidelines (UVDGM)
Target Microorganism	MS2	MS2
Design UV Dose	80 mJ/cm ² for MF ^a	MS2 RED to meet target pathogen inactivation ^{a,b}
Onsite Testing Requirement	UV spot check bioassays during startup	Not required
Inlet-Outlet Piping Configuration	Not prescribed	≥ 5 pipe diameters upstream based on validated conditions
Turbidity Requirement	≤0.2 ntu (95% of time) ≤0.5 ntu (100% of time)	Per MBR requirement
UVT Requirement	≥ 65%	Per range in Validation Report

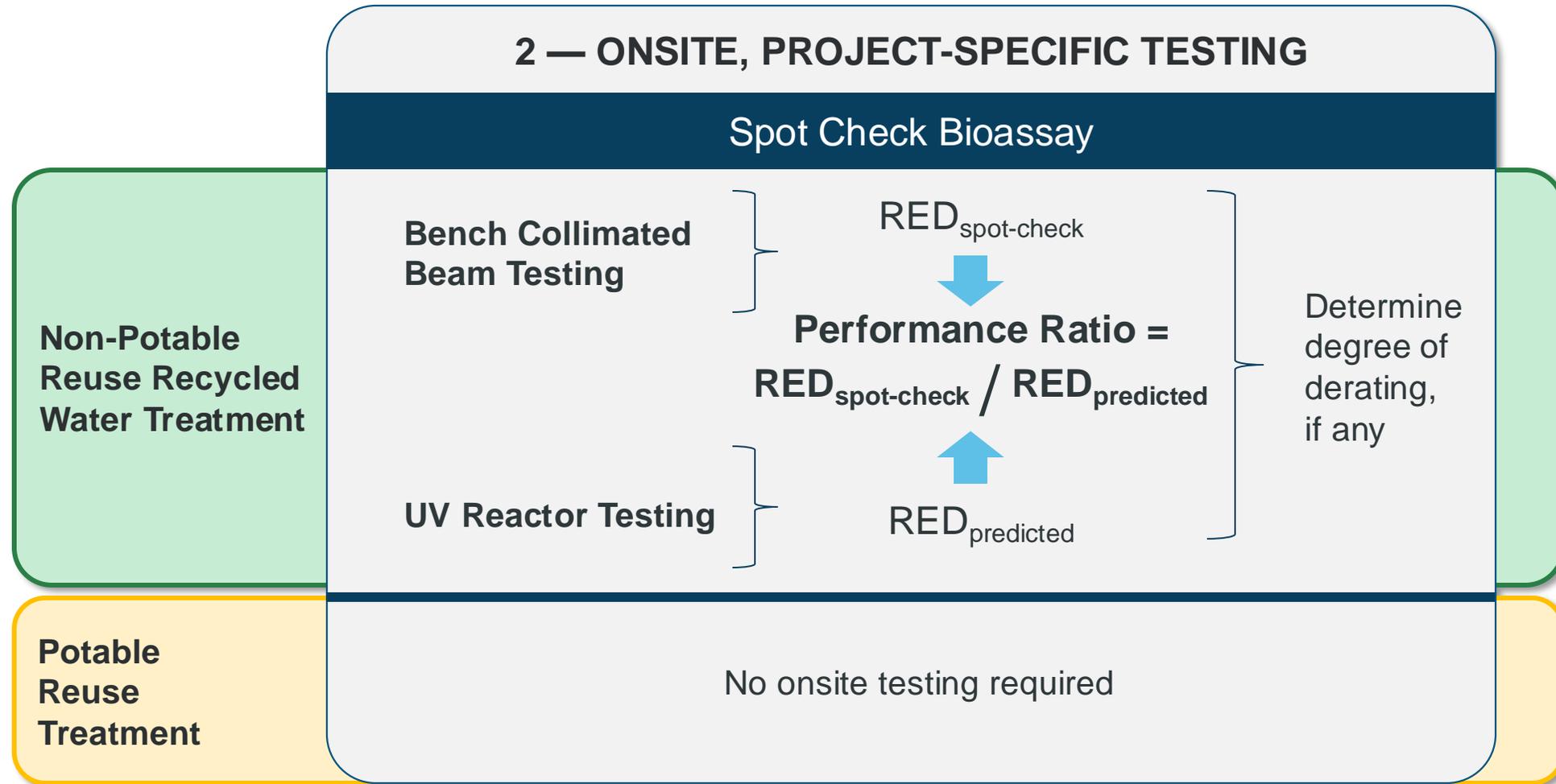
^a Must account for Lamp Aging Factor (LAF) and Fouling Factor (FF)

^b Must account for Validation Factor

Typical Workflow for UV System Validation: Non-Potable & Potable Reuse



Typical Workflow for UV System Validation: Non-Potable & Potable Reuse



Typical Workflow for UV System Validation: Non-Potable & Potable Reuse

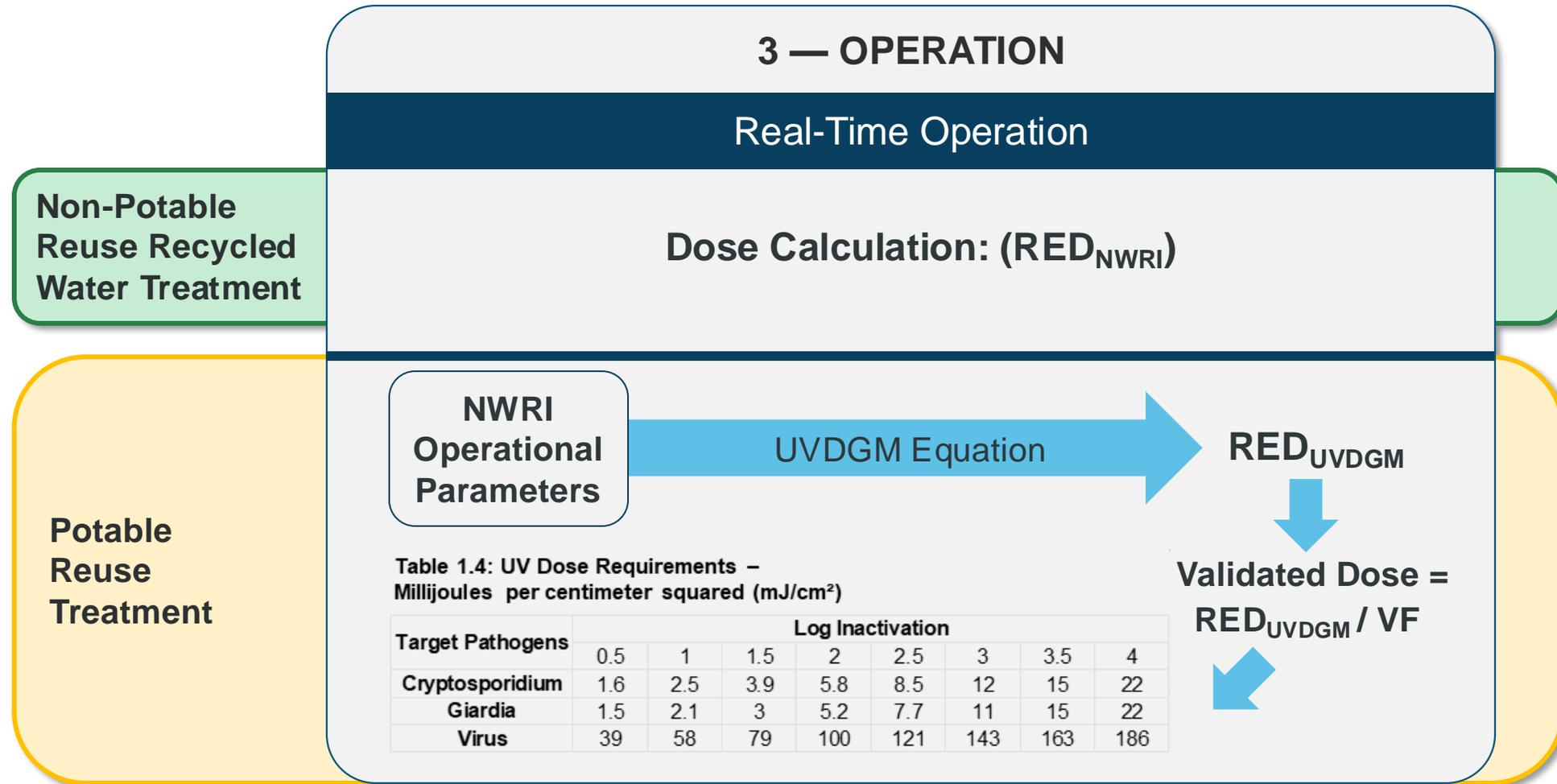


Table 1.4: UV Dose Requirements – Millijoules per centimeter squared (mJ/cm²)

Target Pathogens	Log Inactivation							
	0.5	1	1.5	2	2.5	3	3.5	4
Cryptosporidium	1.6	2.5	3.9	5.8	8.5	12	15	22
Giardia	1.5	2.1	3	5.2	7.7	11	15	22
Virus	39	58	79	100	121	143	163	186

Selecting Pre-Qualified UV Suppliers

Requirements for UVSS :

1. UV product must have at least 1 year of successful operation at a municipal WWTP in the U.S.
2. Closed vessel with energy efficient low-pressure high-output lamps
3. UV reactors must have third-party validation and/or received California DDW regulatory approval for both non-potable and potable reuse applications



Trojan UVFlex

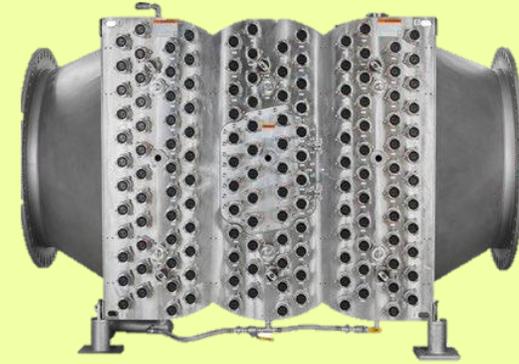
100 Series



Trojan UVFlex 100 Series

- 56" x 48" chamber
- 36" flanged connection
- 16 lamps per section
- 500-W lamps
- Max 8 sections

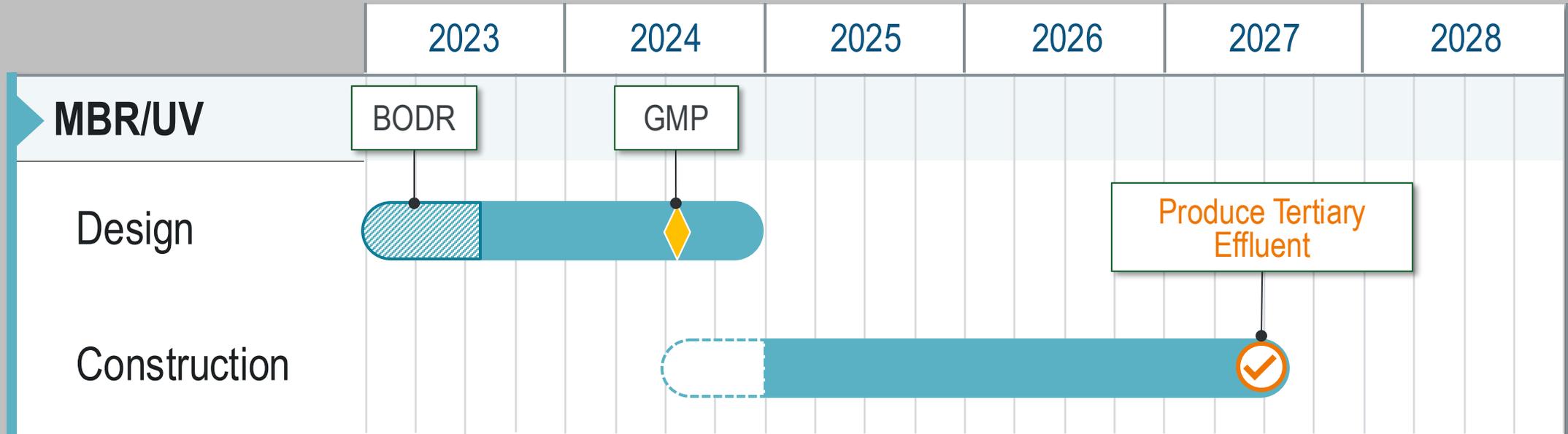
200 Series



Trojan UVFlex 200 Series

- 100" x 88" chamber
- 48" flanged connection
- 24 lamps per section
- 1000-W lamps
- Max 6 sections

Overall VWRW MBR/UV Project Schedule



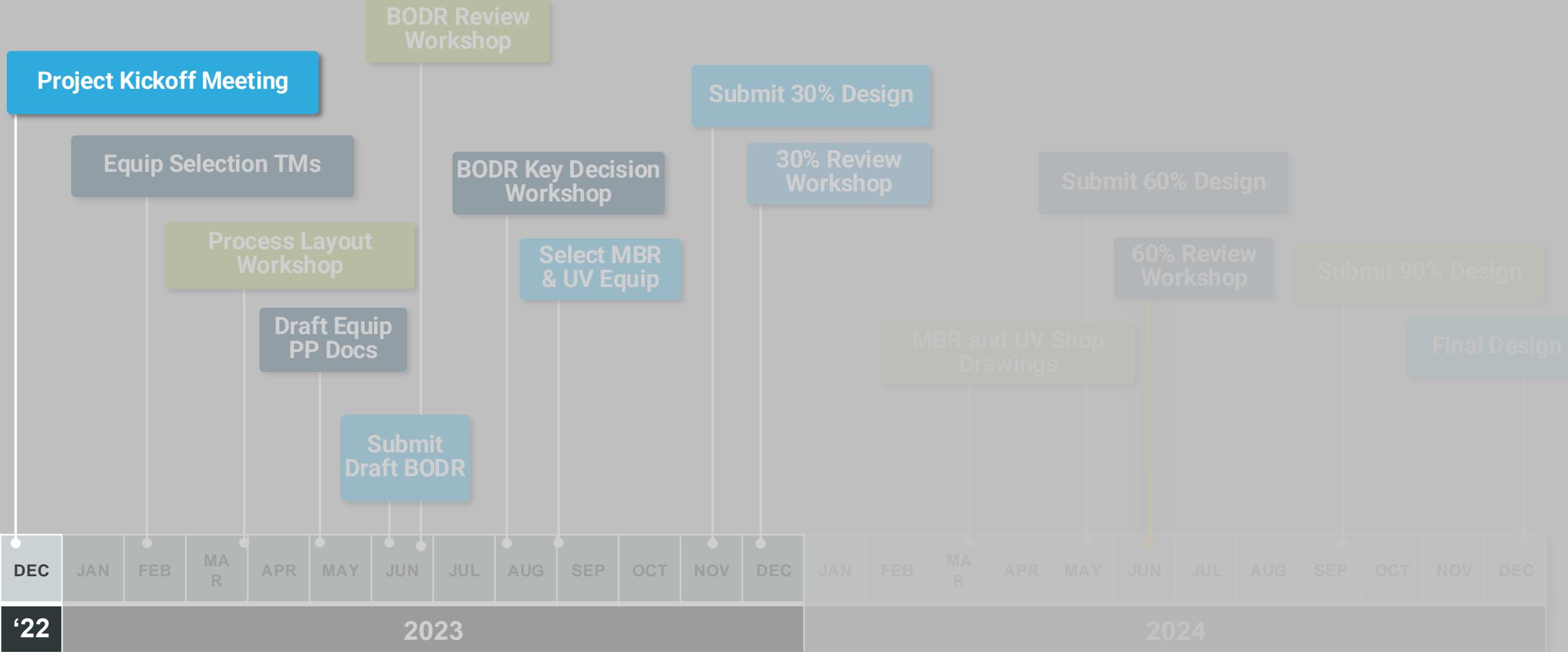
LEGEND

 Basis of Design Report Phase

 Early Construction Phase

 Guaranteed Maximum Pricing

Overall VWRW MBR/UV Project Schedule





QUESTIONS

