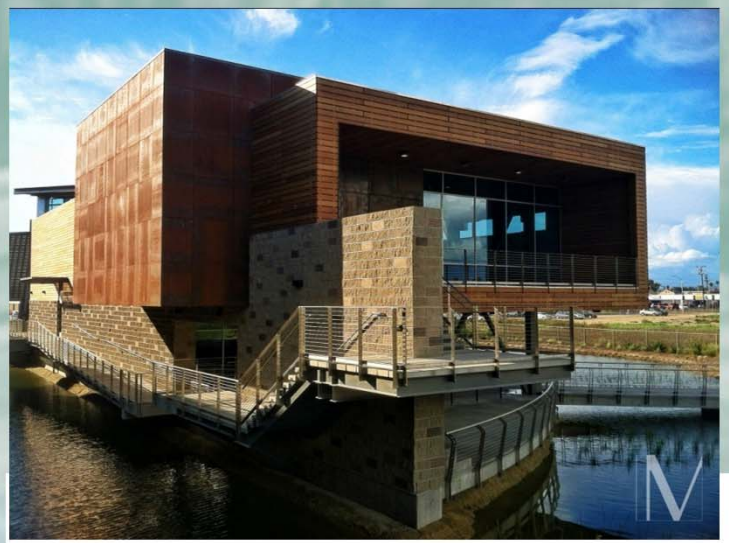


Oxnard Advanced Water Purification Facility

Mary Vorissis PE, CH2M HILL

2013 Idaho Water Reuse Conference

May 2013

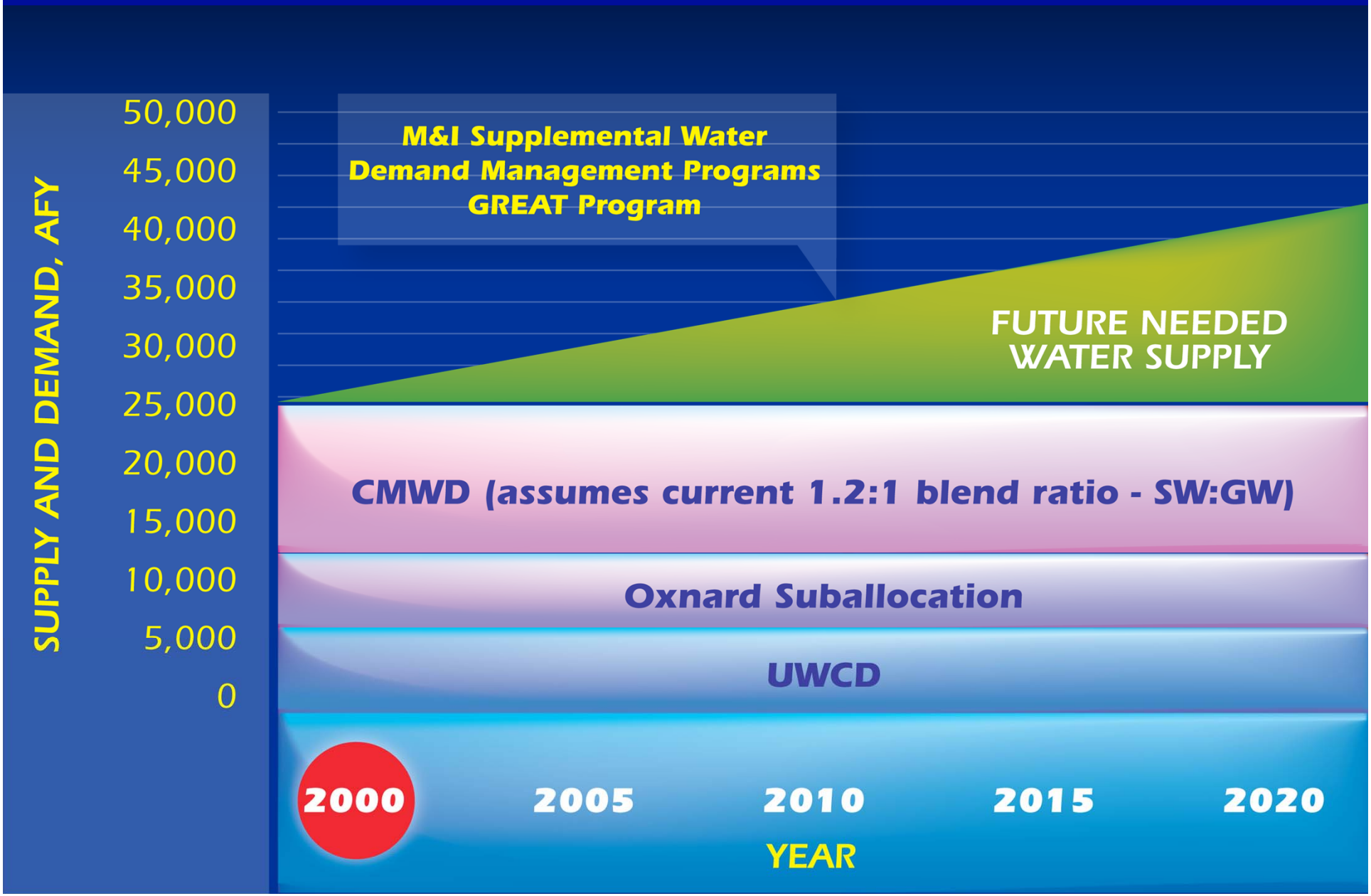
CH2MHILL

Outline

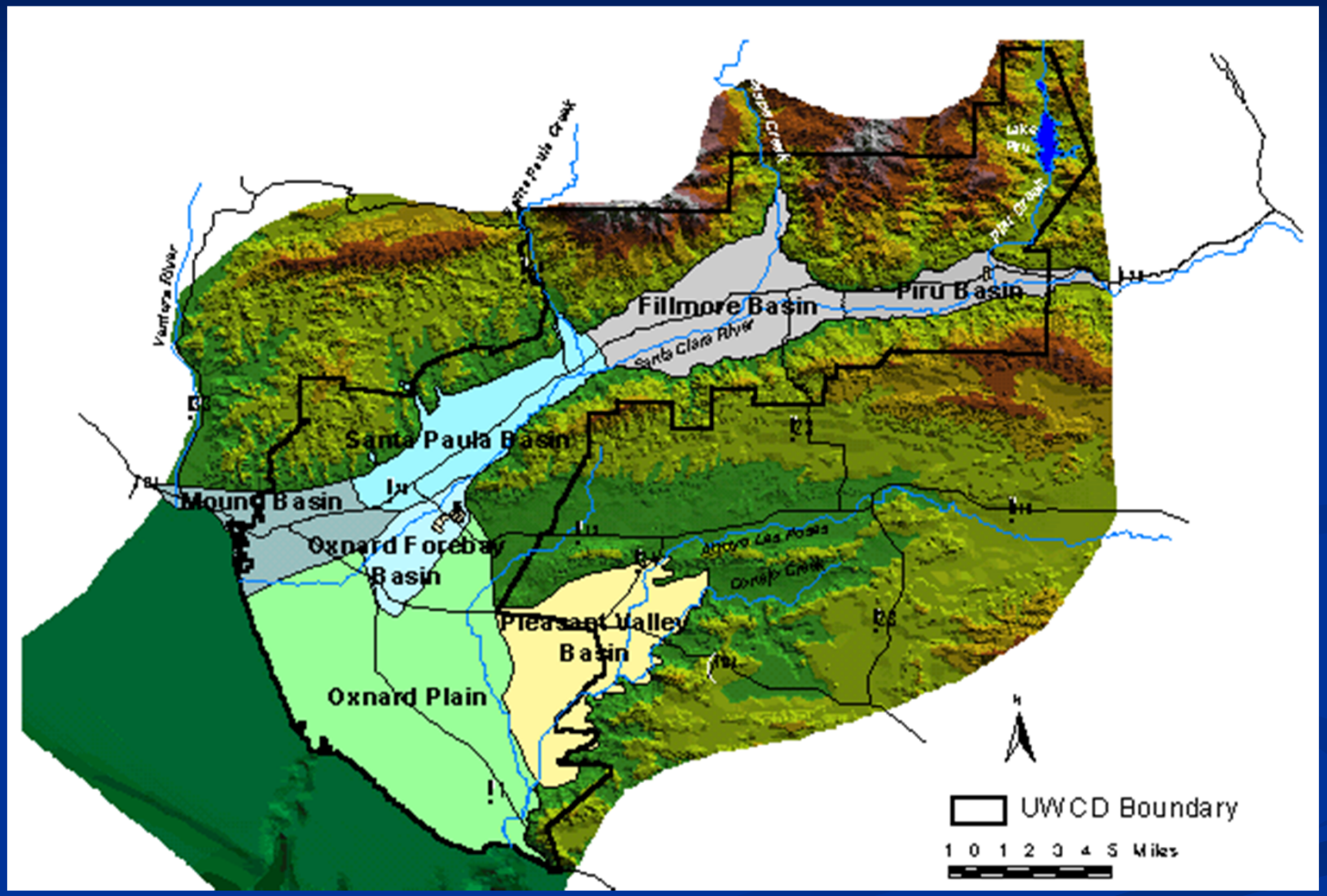
- History
- Project Background
- Advanced Water Purification Facility
- Brine-Concentrate Management via Wetlands
- Challenges

Project Location

WATER SUPPLY VS. DEMAND

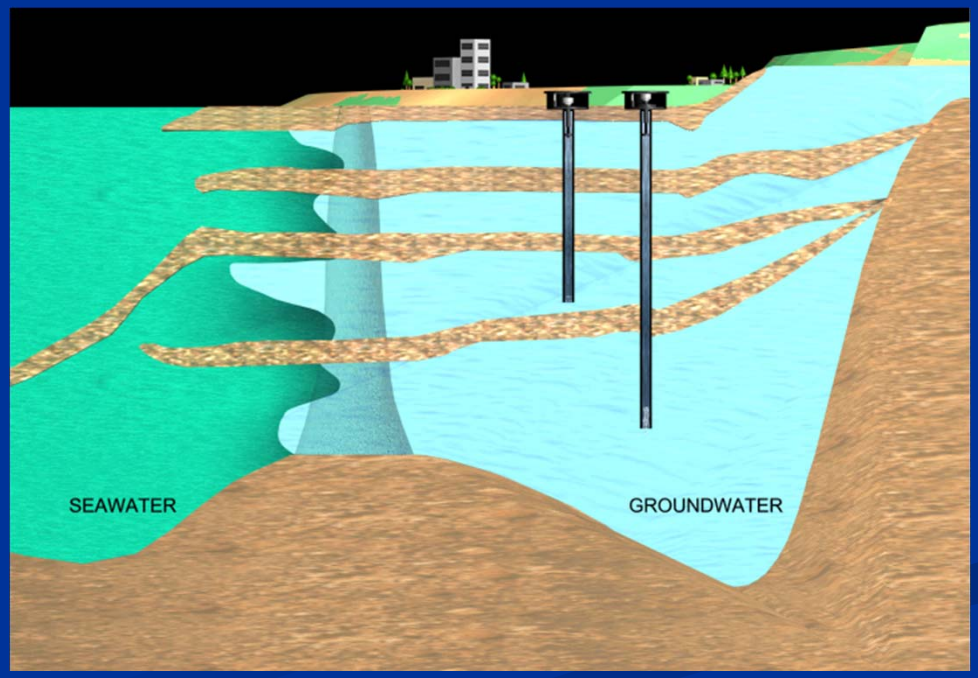


Groundwater Basins

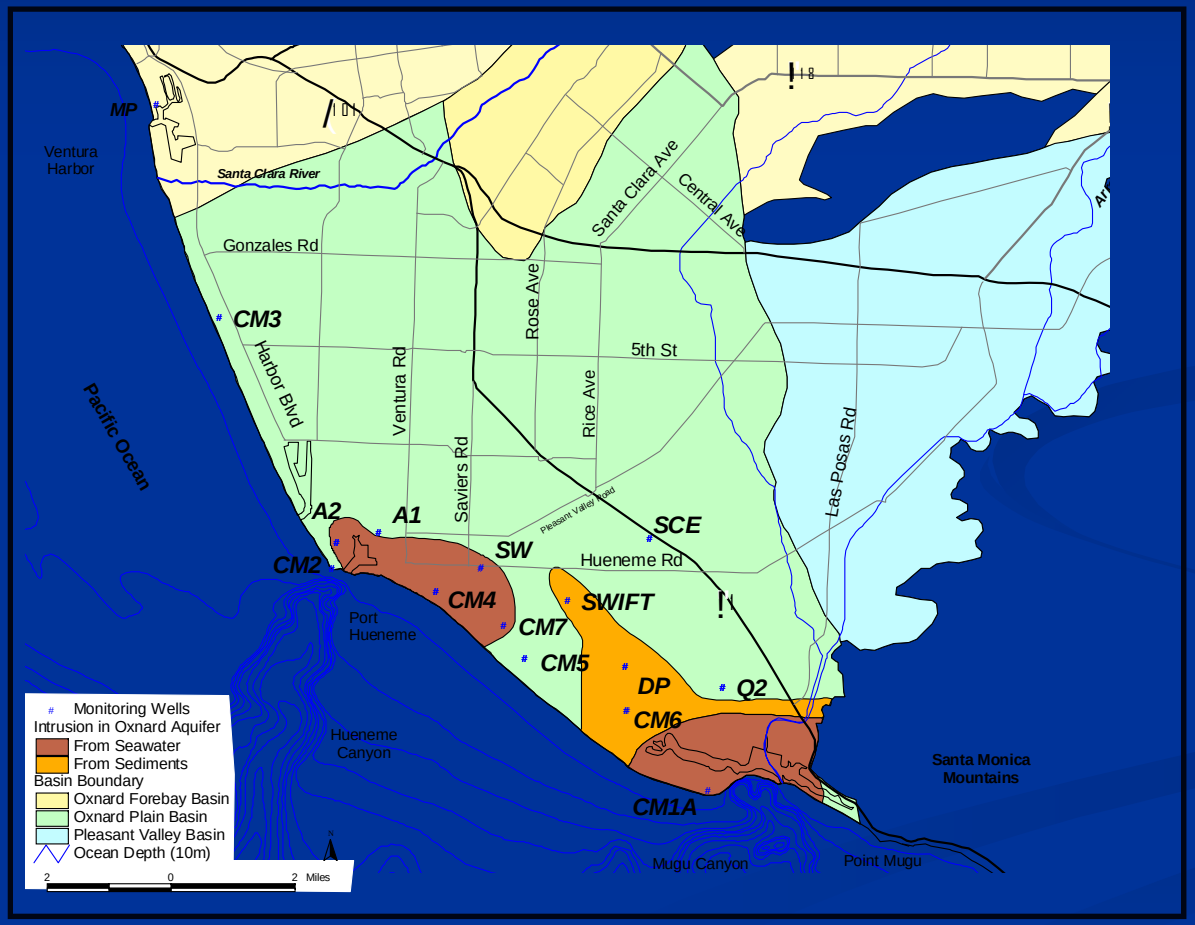


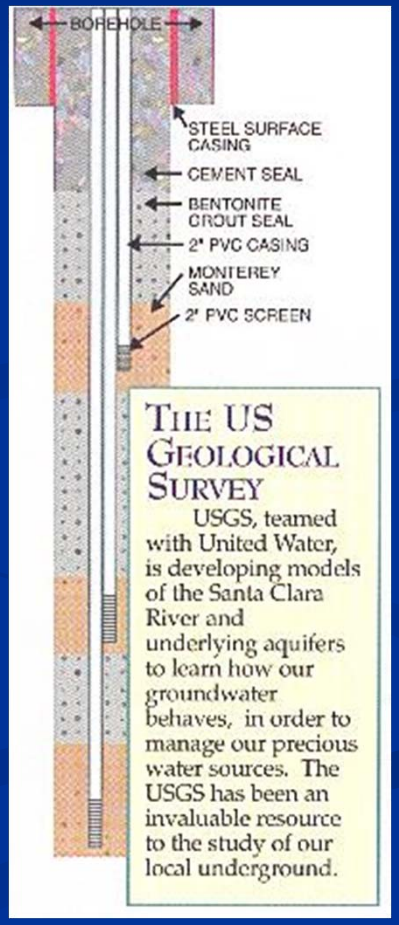
Groundwater Basin Overdraft

- Declining Water Levels
- Seawater Intrusion
  - 1st suspected in 1931
  - USGS Model indicated 1927



Seawater Intrusion





“Necessity is the mother of invention…”

Groundwater

Recovery

Enhancement

And

Treatment

Groundwater Recovery Enhancement And Treatment

GREAT™ Program

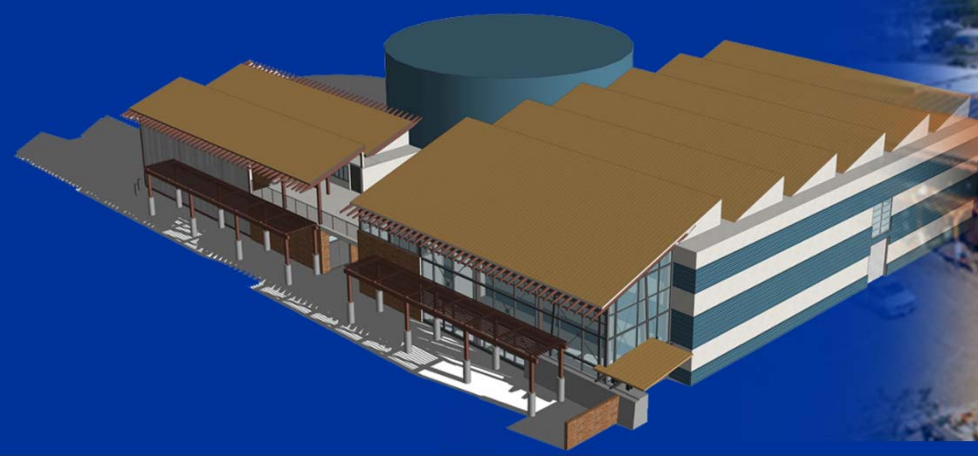
Ocean Outfall
Non-Potable Users
Seawater Intrusion Barrier
Wetlands
Industrial Dischargers
Brine Line
Water...Essential to Life, Past, Present, Future

GREAT Program Benefits

- Reduces Ocean Discharges from City of Oxnard's Wastewater Treatment Plant
- Provides Municipal & Industrial Recycled Water for Landscape Irrigation and Industrial Processes
- Provides Agricultural Irrigation Water
- Provides Water Suitable for Groundwater Injection to Repel Seawater Intrusion

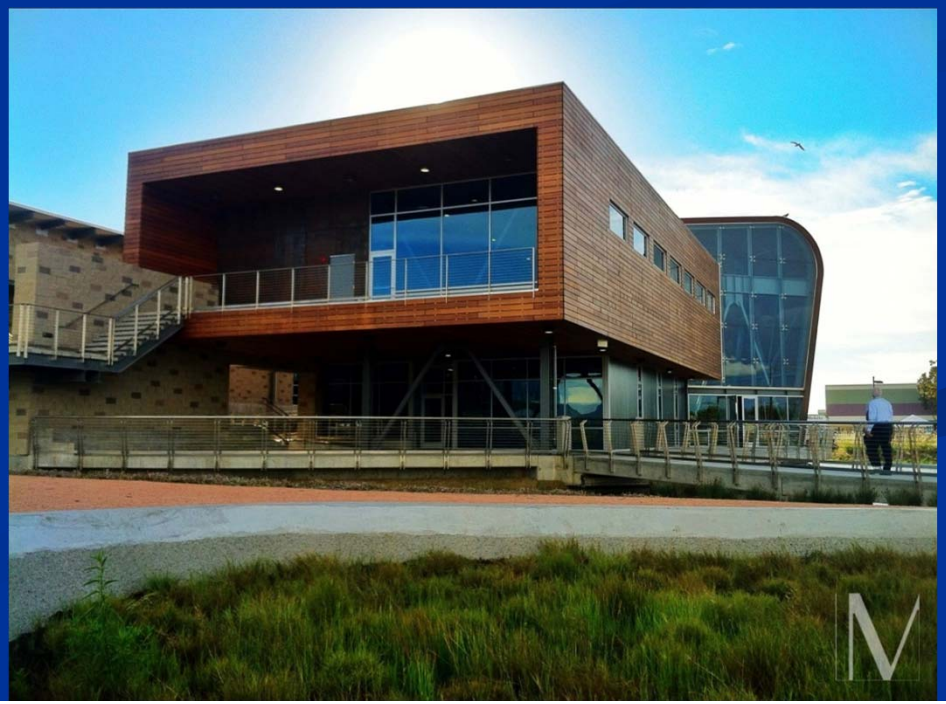
GREAT Program Desalter Facility

- Groundwater Desalter for Municipal Wells
- Maintains Blended Water Quality Objectives
  - Phase I - 7.5 mgd
  - Ultimate - 15.0 mgd
- Phase I Built in 2008



GREAT Program Advanced Water Purification Facility (AWPF)

- Provides Advanced Treatment for Water Reuse
  - Phase I - 6.25 mgd
  - Ultimate - 25.0 mgd
- Phase I Construction Completed in 2012



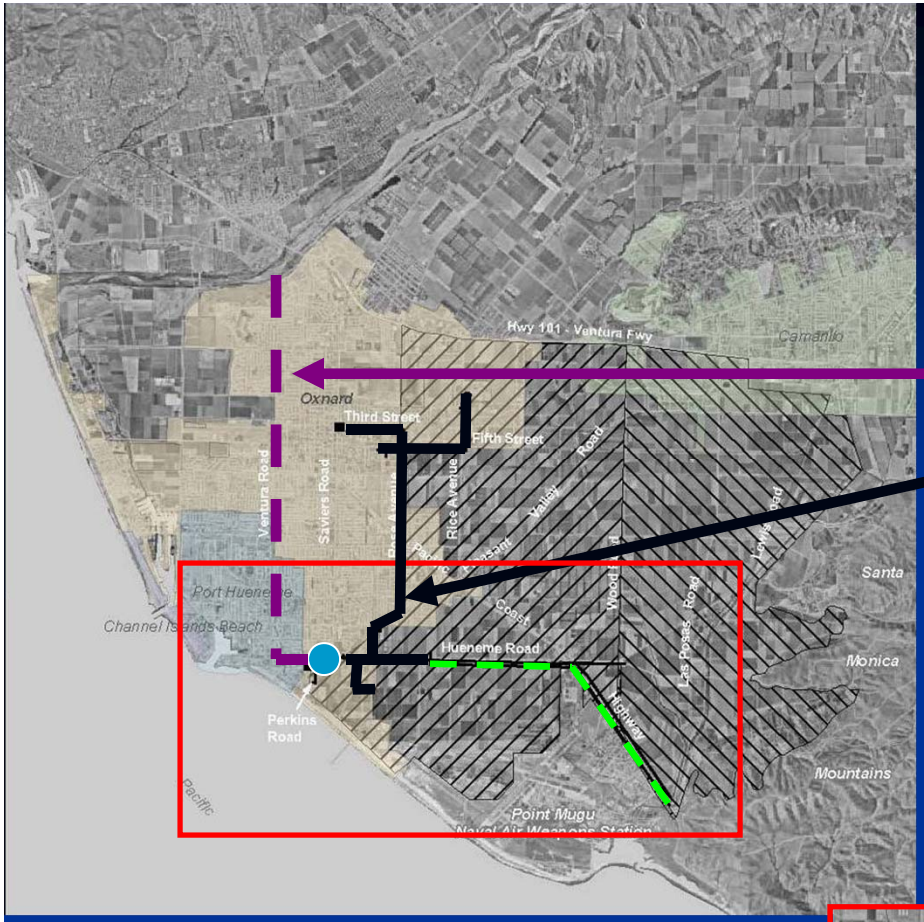
Source of Water to AWPF

- City of Oxnard WPCF
  - Secondary Effluent
  - Influent BOD and TSS - 250 mg/L
  - Influent TDS - 1700 mg/L
- Composition
  - 75% Domestic
  - 25% Industrial
- Disposal - Into Pacific Ocean via 48" diameter outfall: 5950' long and 60' deep

WPCF and AWPF Flows

- WPCF
  - Design Capacity ~31.7 mgd
  - Present Flow ~22.6 mgd
- AWPF
  - Phase 1
    - Approx. 8.0 mgd to AWPF
    - 6.25 mgd Product Water
  - Phase 2/Build out
    - Approx. 30 mgd to AWPF
    - 25 mgd Product Water

Water Reuse

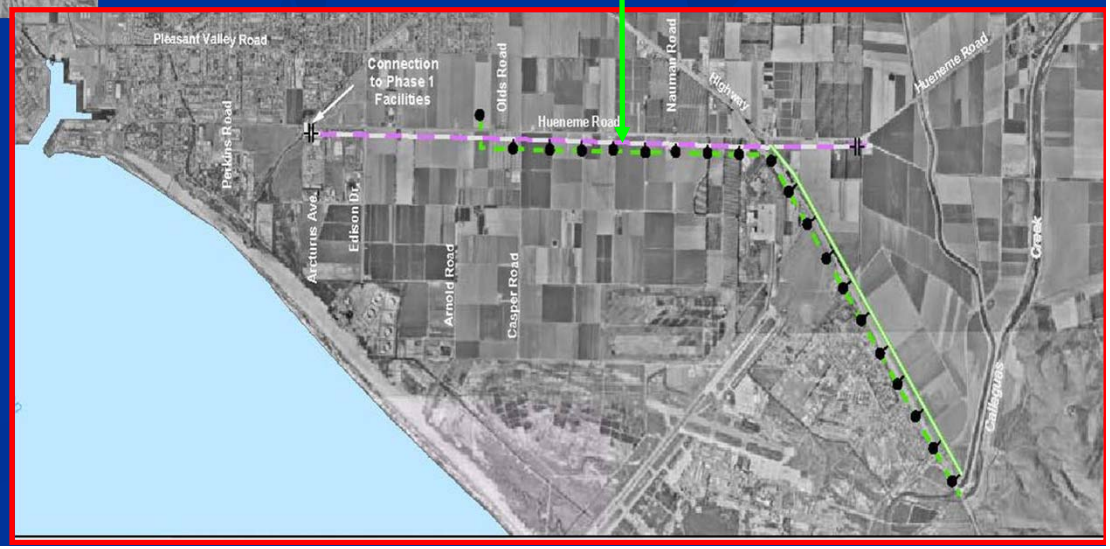


Phase I

- Municipal Users
- Existing Irrigation Lines

Future Phase

- Seawater Intrusion Barrier



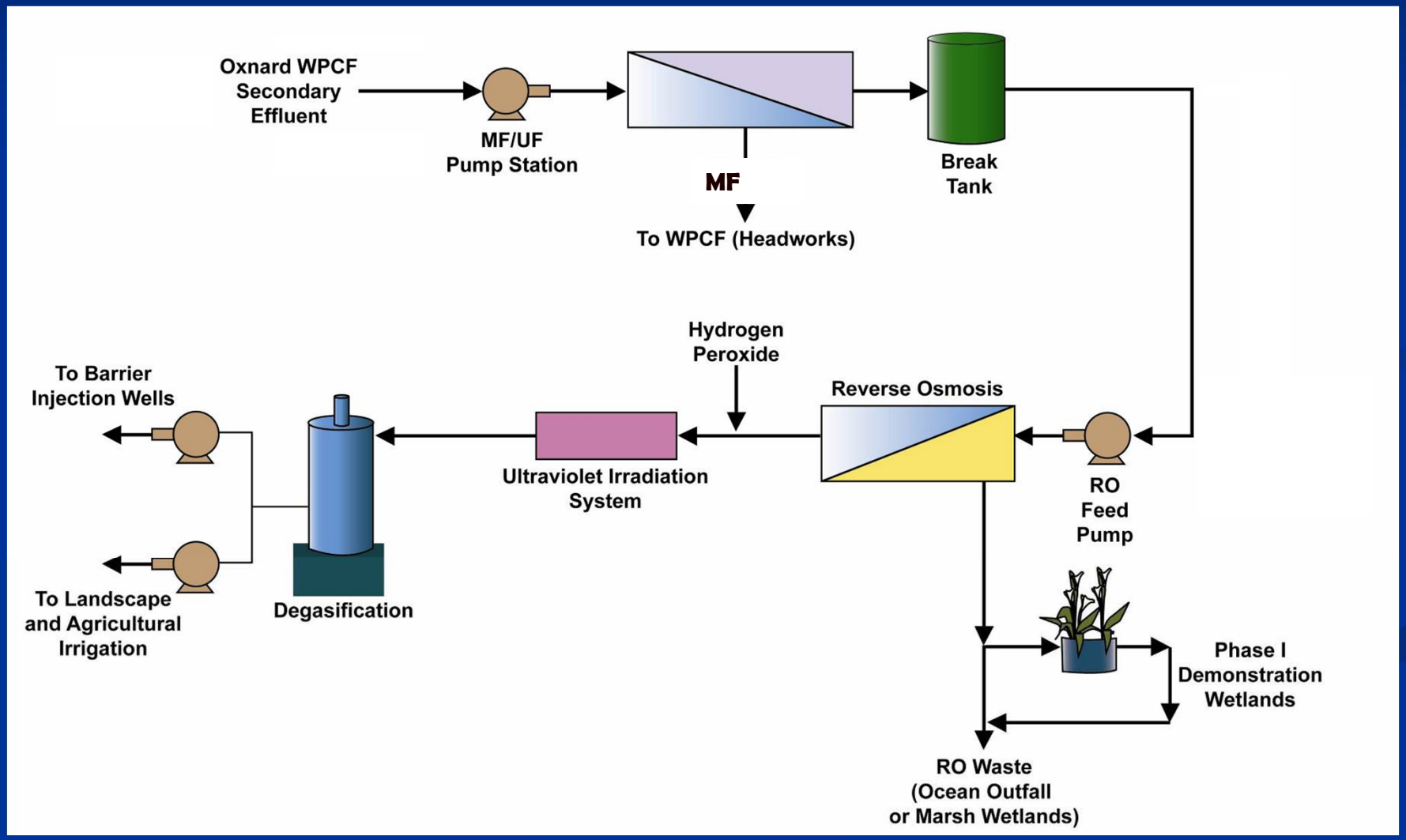
Irrigation Quality Requirements

- Tertiary Quality to meet:
  - Food crops
  - Parks and playgrounds
  - School yards
  - Residential landscaping
  - Unrestricted access golf courses
  - Any other irrigation use not specifically prohibited
- Filtered Wastewater
  - Section 60301.320
- Disinfected Tertiary Recycled Water
  - Section 60301.230

Groundwater Quality Requirements

- Health Laws Related to Recycled Water
  - Title 22 – Water Recycling Criteria
  - Title 17 – Cross Connection Criteria
- Draft Groundwater Recharge Reuse Regulations
- NPDES Permit

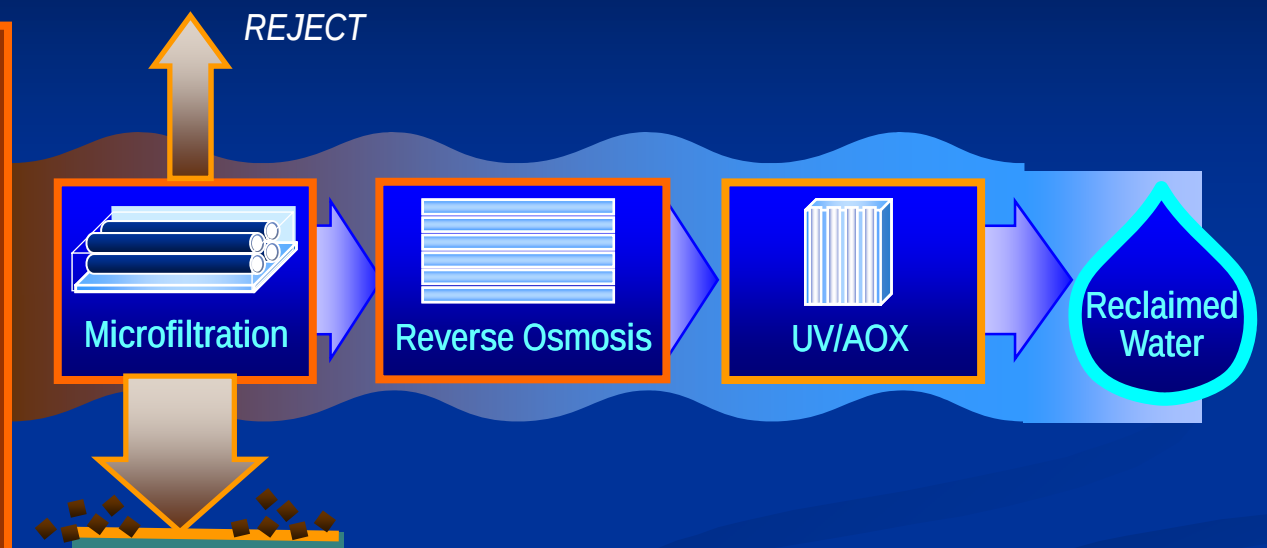
AWPF - Process Flow Schematic



MF/UF – Target Contaminants

Secondary Effluent Contaminants

- Turbidity
- Inorganics
- Virus
- Bacteria
- Protozoa
- Organics
- CECs

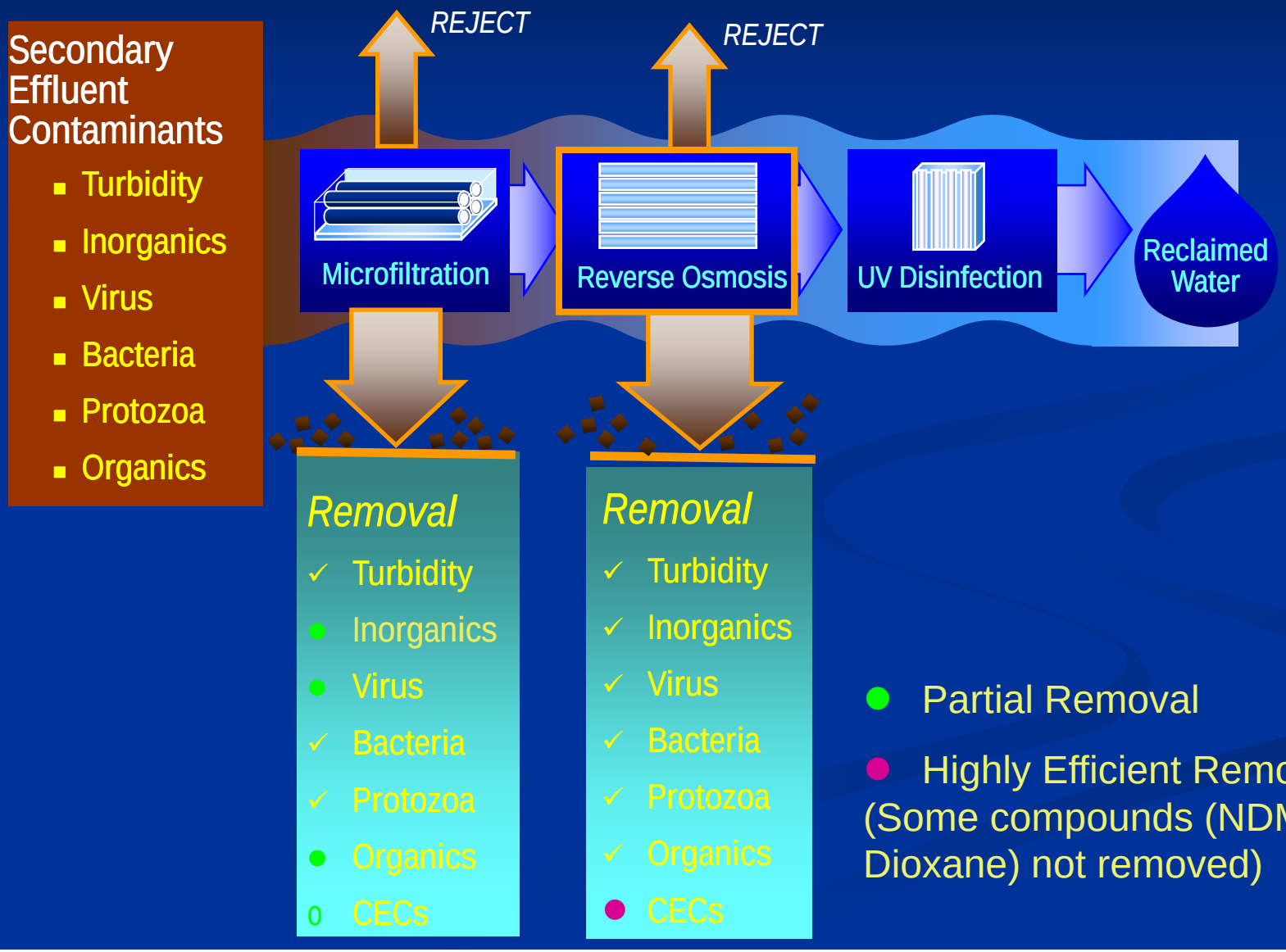


Removal

- ✓ Turbidity
- ● Inorganics
- ● Virus
- ✓ Bacteria
- ✓ Protozoa
- ● Organics
- 0 CECs

● Partial Removal

RO – Target Contaminants

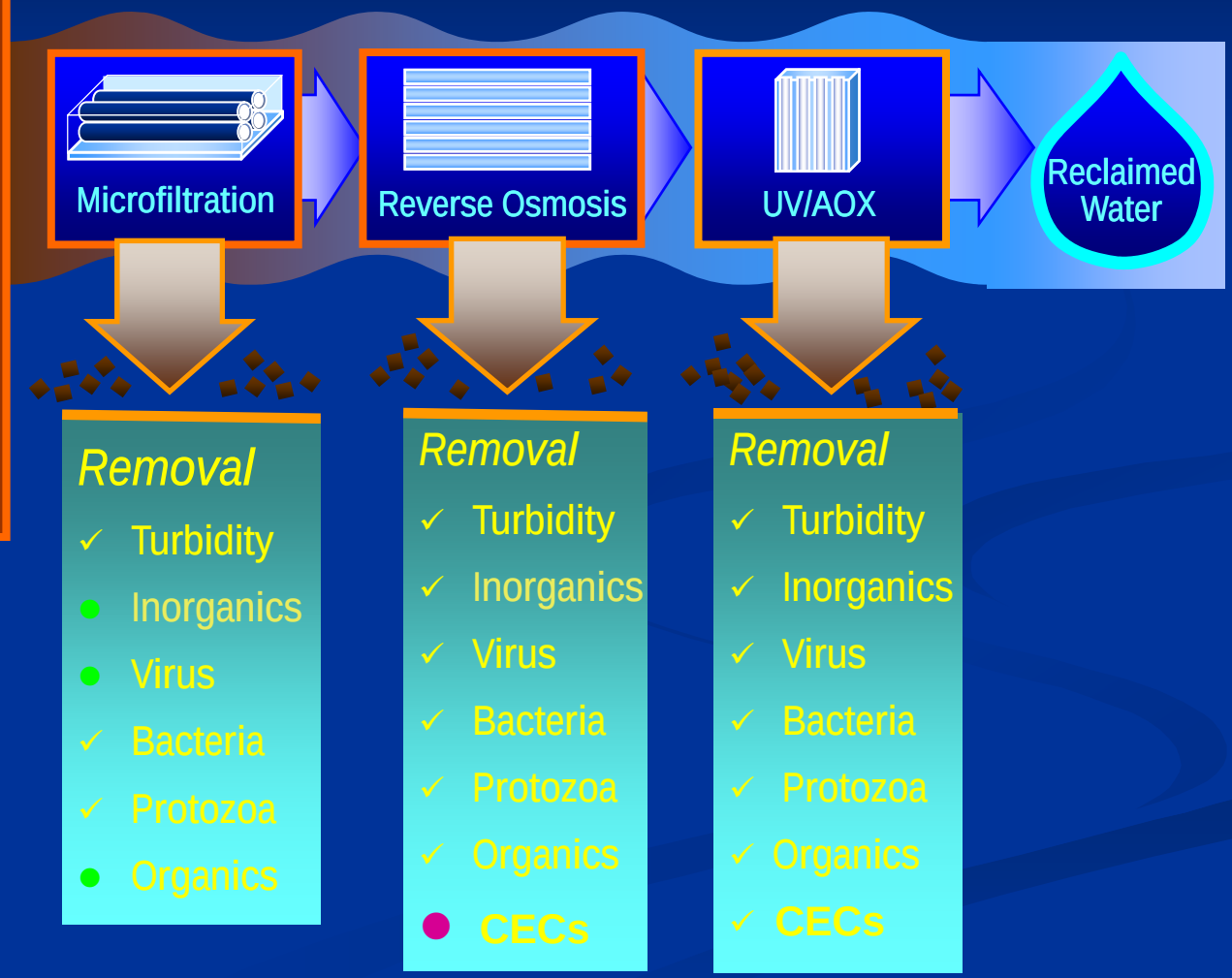


- ● Partial Removal
- ● Highly Efficient Removal (Some compounds (NDMA, 1-4 Dioxane) not removed)

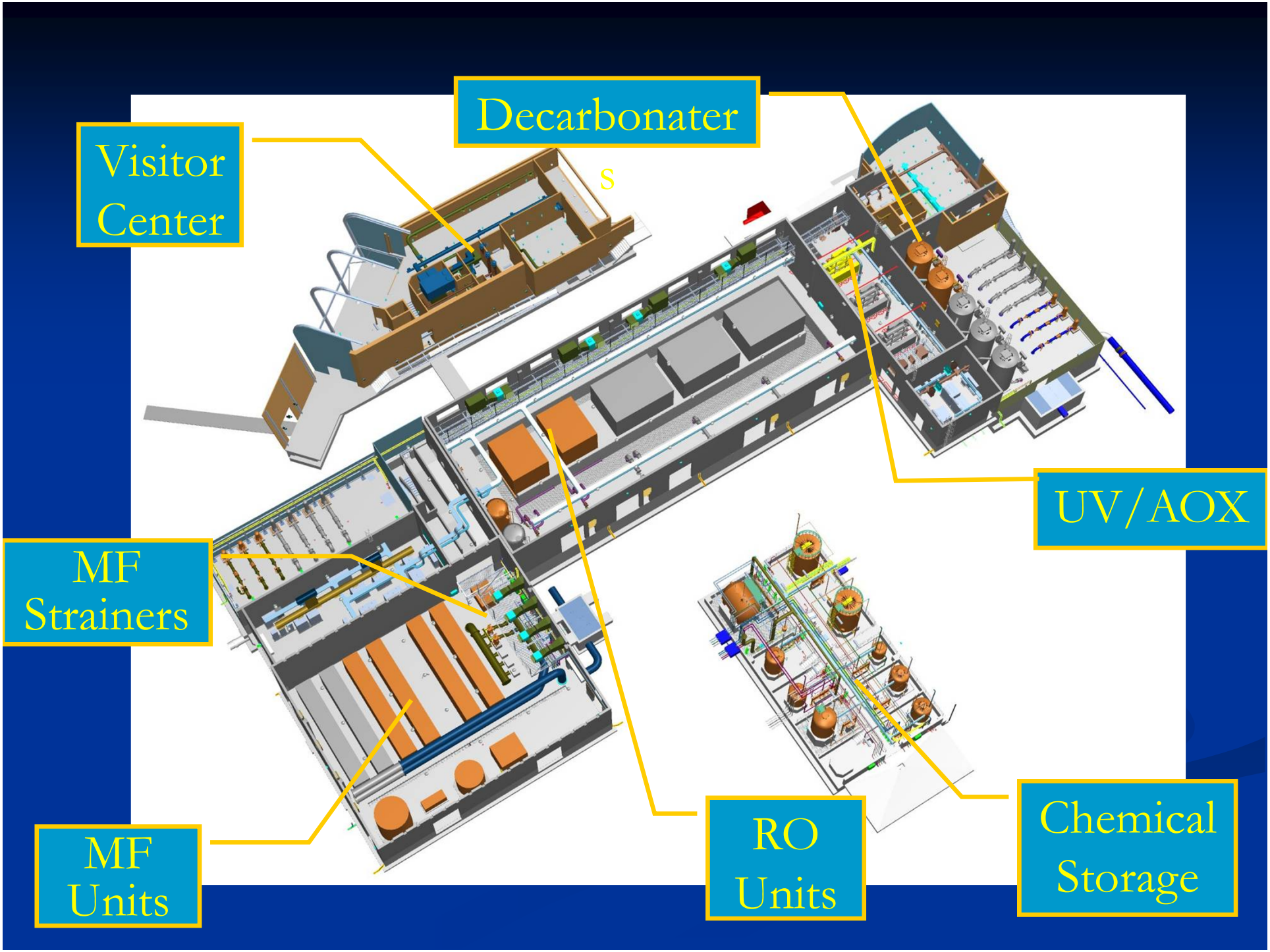
UV/AOX - Target Contaminants

Secondary Effluent Contaminants

- Turbidity
- Inorganics
- Virus
- Bacteria
- Protozoa
- Organics
- ECC



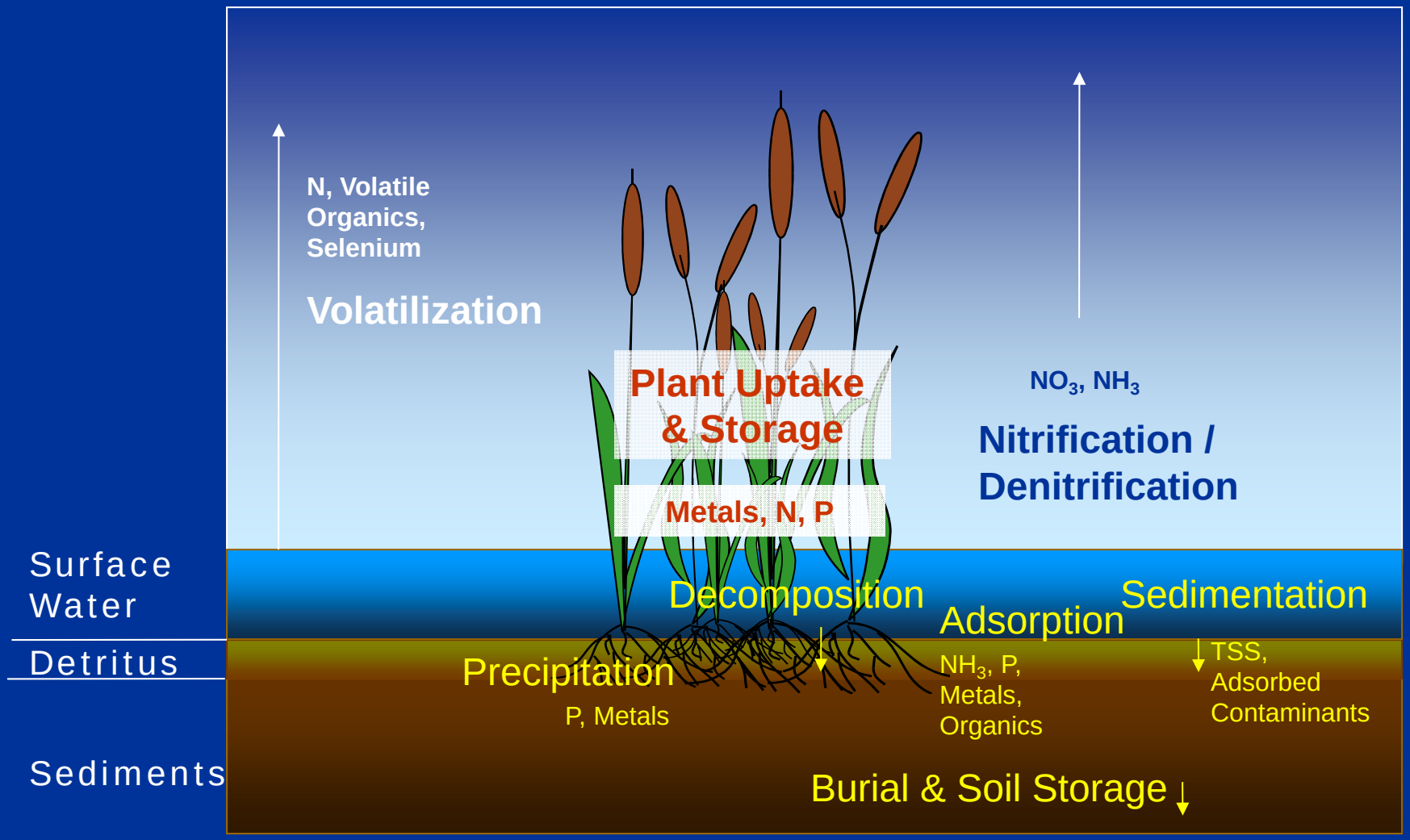
- ● Partial Removal
- ● Highly Efficient Removal


Decarbonater
Visitor Center
UV/AOX
MF Strainers
MF Units
RO Units
Chemical Storage

Constructed Treatment Wetlands

- Engineered natural systems that harness rich chemical, microbial, and physical processes found in natural wetland ecosystems
- Known abilities to treat a wide variety of wastewaters:
  - Municipal
  - Agricultural
  - Stormwater / urban non-point source
  - Many industrial wastewaters
- Numerous ancillary benefits
  - Habitat creation
  - Passive recreation and education
  - Low energy requirements

Natural Wetland Processes Engineered to Treat RO Concentrate



Novel Application of Proven Technology

- Treatment wetlands already known to treat contaminants of concern
  - Selenium
  - Nitrogen
- Historical loss of wetland habitat and function creates desire for restoration and creation
- Coastal tidal and salt marsh wetland communities tolerant of elevated TDS

Wetlands may provide unique disposal solution with numerous ancillary benefits

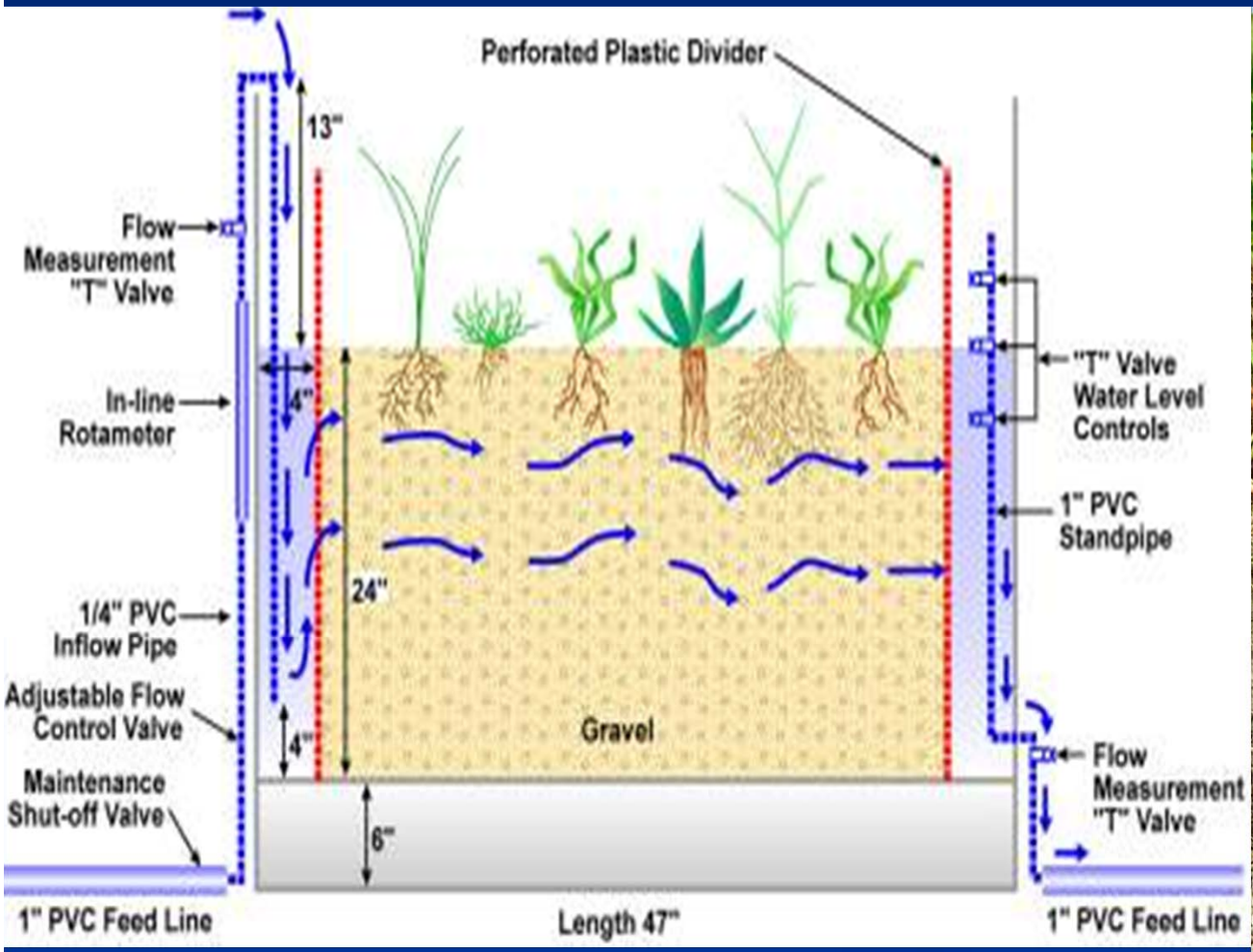
Pilot Wetlands Project

- 2 replicates of **6 technology types**
- Run for **3 years** under multiple configurations
- Significant **removal** of **nutrients** and heavy **metals**
- Effluent generally **not** found to be **toxic** to indicator organisms

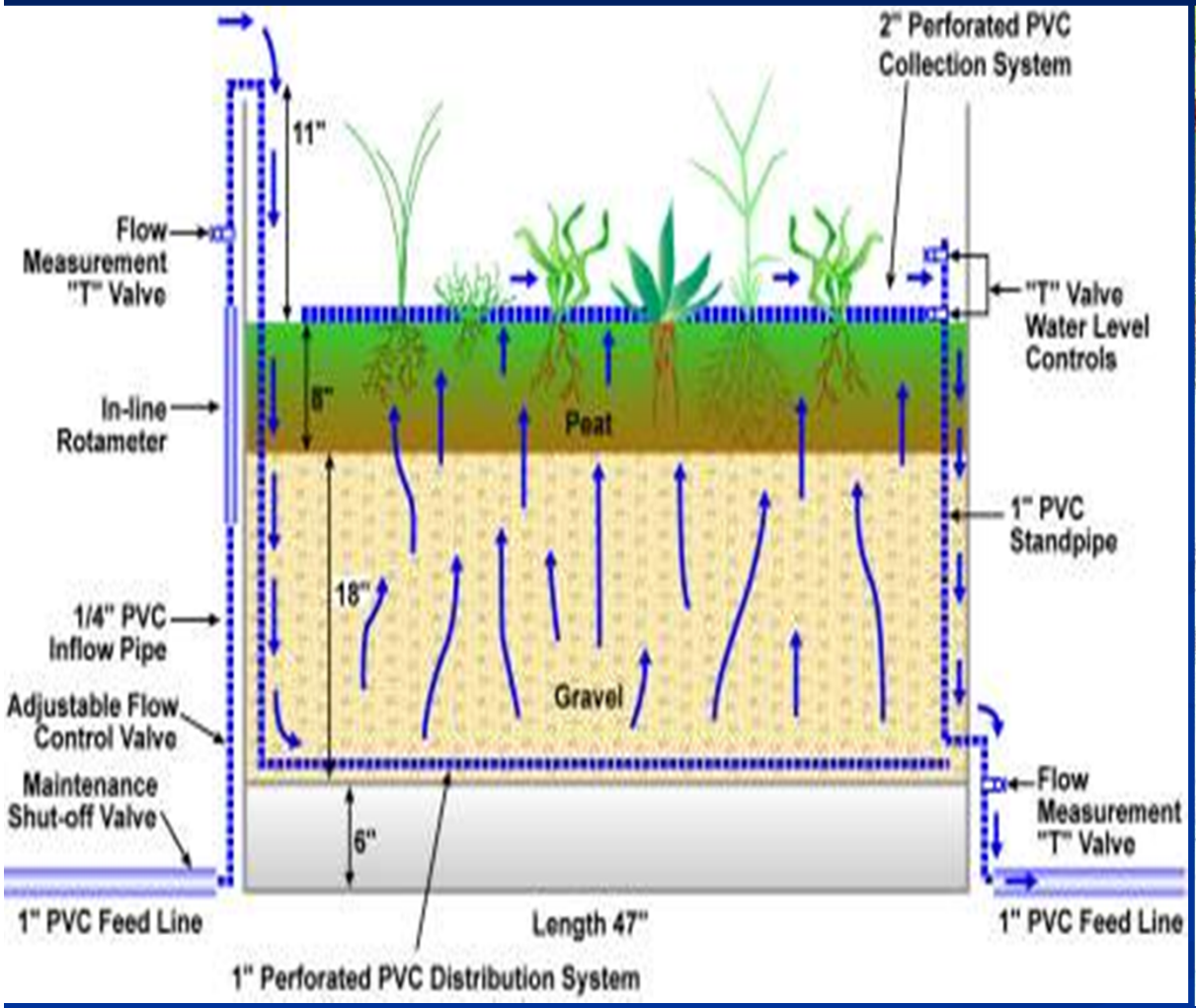
Findings from 1st Part of the Study

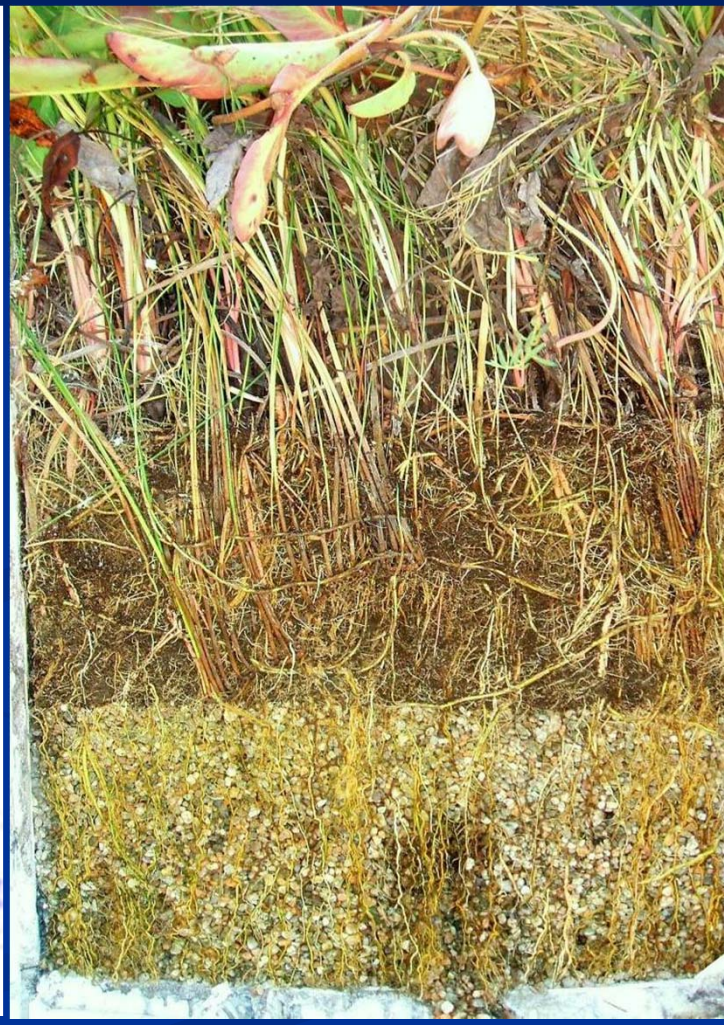
- Ecosystem Viability
  - Healthy plant communities, fish
- Water Quality Treatment
  - Nutrient/metals loss, net mass removal of virtually all measured parameters
- Effluent is ecologically safe
  - Removal to below ecological thresholds for Se, NO_3
  - WET testing showed decreases in both acute and chronic toxicity to indicator organisms
- Combination of systems in series can improve treatment efficiency

Horizontal Subsurface Flow

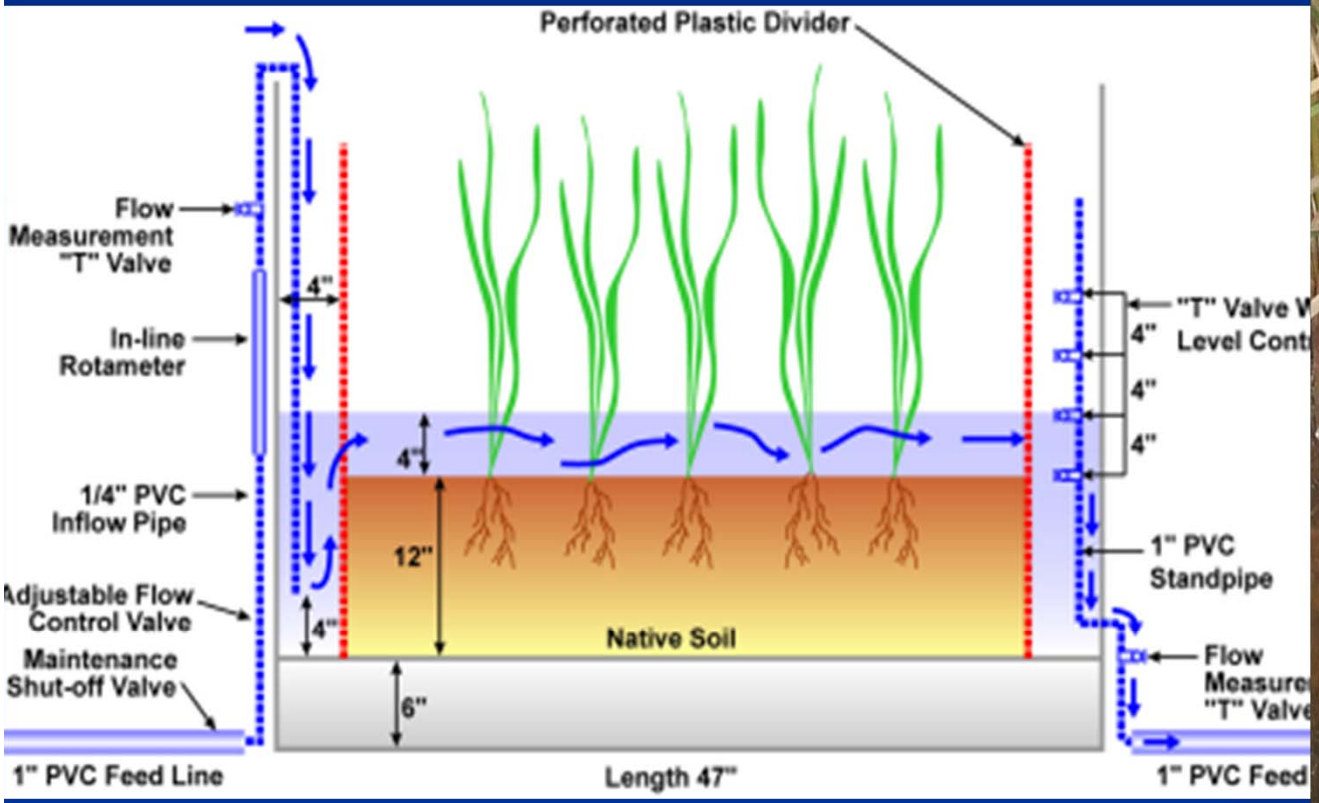


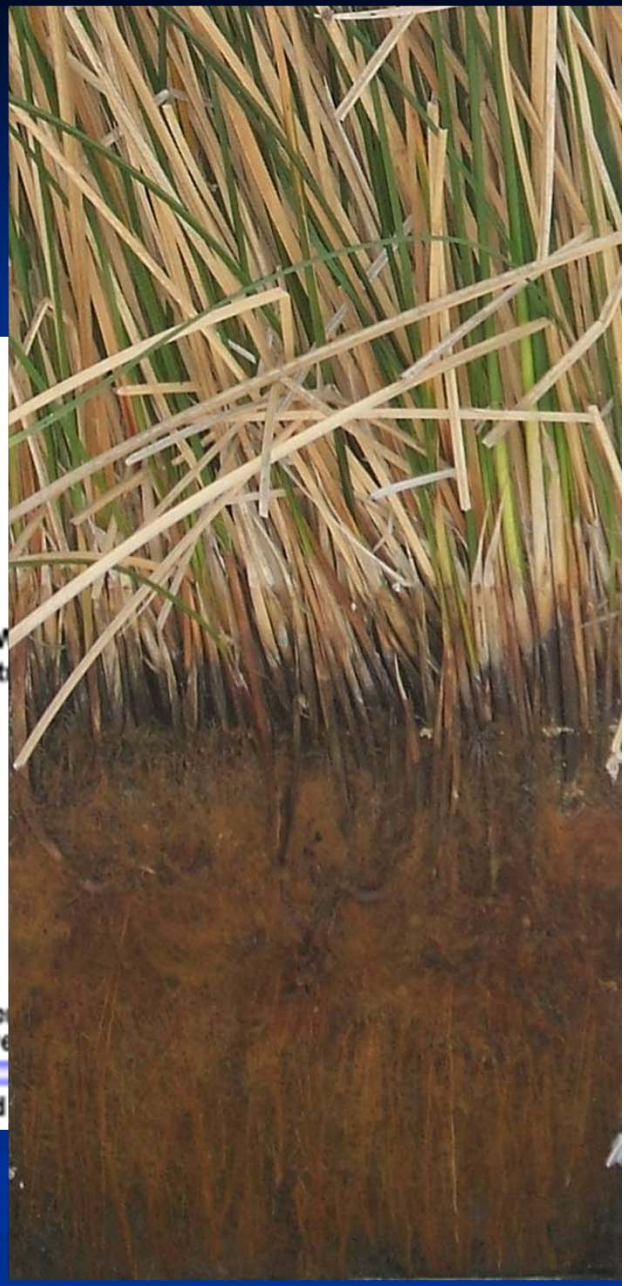
Vertical Flow



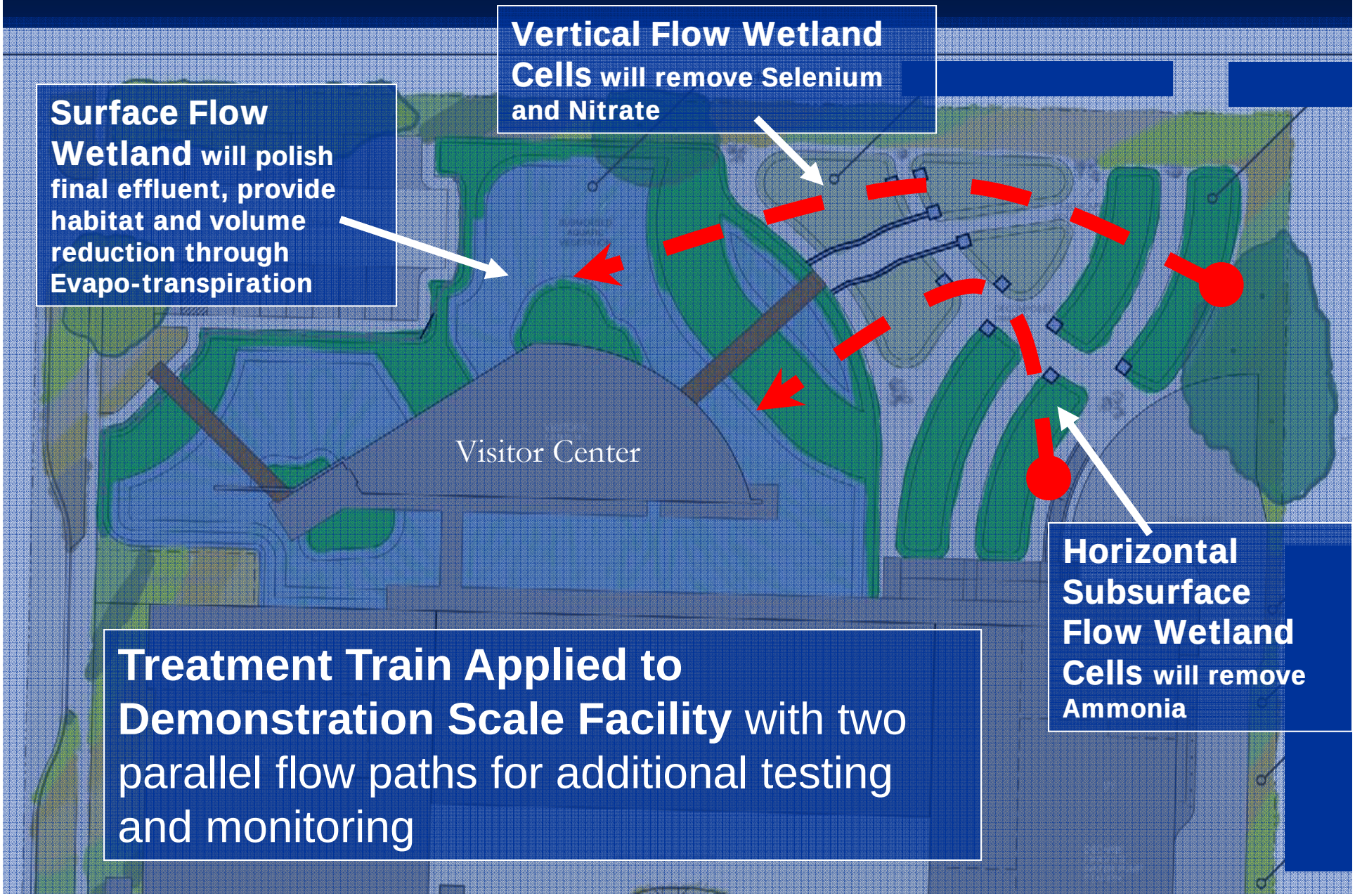


Surface Flow – Low Marsh





AWPF Natural Treatment System Plan



Treatment Train Applied to Demonstration Scale Facility with two parallel flow paths for additional testing and monitoring

The Moving Target

- Project started 2000 due to population growth
- Economic downturn 2008, new development suspended
- Growing environmental concern in Bay Delta
- Imported water costs increase
- Changes in water customer needs

Positive Response

- Project "Shovel Ready" able to capture ARRA funding ($20 million)
- Project reduces imported water and received local resources funding up to $250 per acre foot
- Developments in agriculture (Hydroponic farming)

Challenges

- Initial Customers (slow start)
- Pipelines
- Public perception (reclaimed water)

AWPF at Dusk

AWPF at Dawn