

IPR/Reservoir Augmentation Reservoir Storage Permitting Issues



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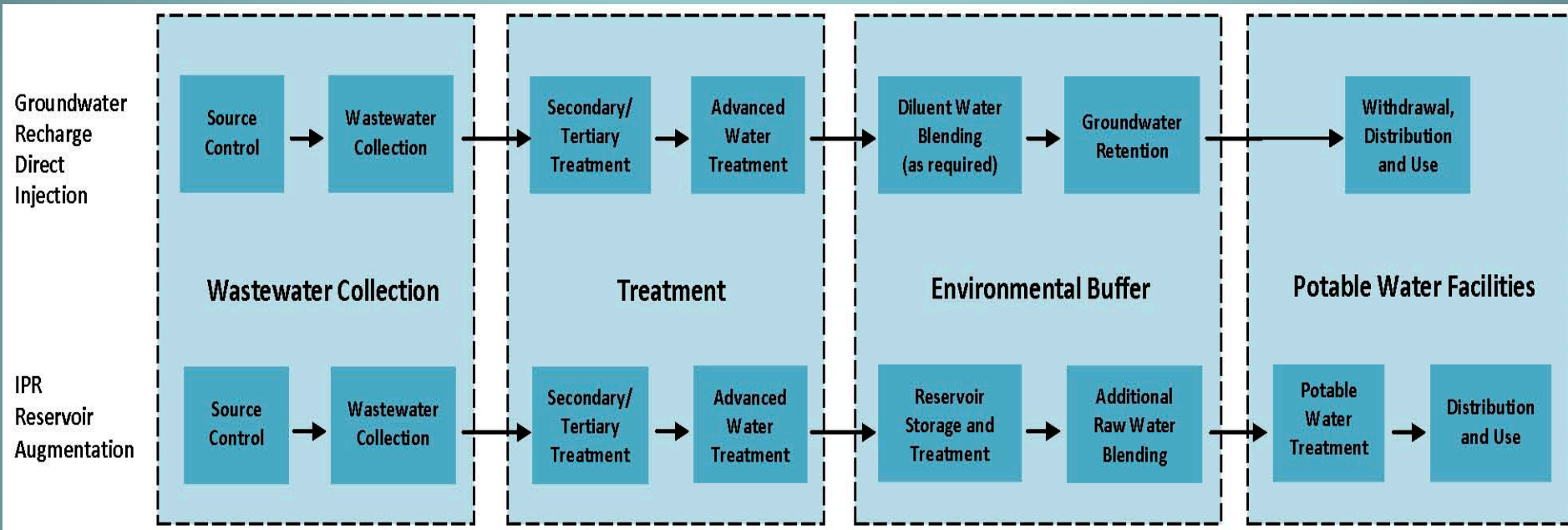
Focus of today's discussion:

- * Present overview of reservoir-related regulations for indirect potable reuse/reservoir augmentation (IPR/RA)
- * Summarize key regulatory issues affecting the City of San Diego San Vicente IPR/RA project
- * Speculate on the probable basis of statewide CDPH IPR/RA regulations

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IPR Concept



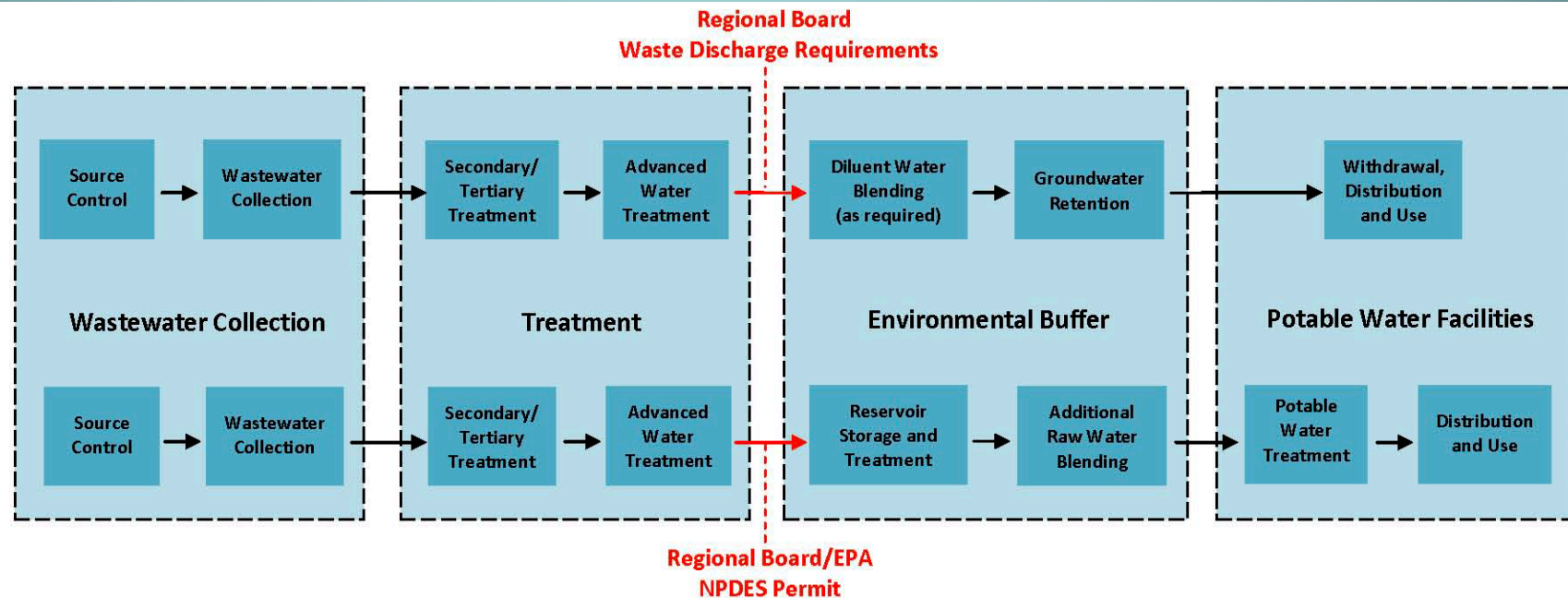
Comparison of IPR Reservoir Augmentation Concept
With Direct Injection Groundwater Recharge

Key Required IPR/RA Permits

Type of Permit	Issuing Agency	Permittee	Permit Incorporates	When Permit is Issued
Water Supply Permit	<ul style="list-style-type: none"> California Department of Public Health 	Water purveying agency	<ul style="list-style-type: none"> State and federal drinking water requirements Project-specific CDPH requirements 	<ul style="list-style-type: none"> After project implementation
NPDES Discharge Permit	<ul style="list-style-type: none"> California Regional Water Quality Control Board U.S. Environmental Protection Agency 	Reservoir augmentation discharger	<ul style="list-style-type: none"> Clean Water Act requirements State and regional water quality plan standards and requirements Site-specific discharge requirements CDPH requirements 	<ul style="list-style-type: none"> After CEQA Before project start-up

CDPH Water Supply Permit regulates entire range aspect of project

CDPH Water Supply Permit



**Regional Board/EPA permits address discharges to groundwater/surface water,
But incorporate applicable CDPH requirements**

CDPH IPR/RA Regulation:

- Statewide IPR/RA regulations are in development; scheduled for adoption in 2016 per Senate Bill 918
- Until adoption of statewide regulations, CDPH reviews IPR/RA projects on a case-by-case basis
- CDPH concept approval provided in 1994 for City of San Diego San Vicente Reservoir IPR/RA project
- CDPH concept approval provided in 2012 for City of San Diego IPR/RA project for expanded San Vicente Reservoir IPR/RA project

Reservoir Discharge Permit:

- IPR/RA discharge is regulated by EPA as a “wastewater” subject to requirements of the Clean Water Act
- California Regional Water Quality Control Board issues NPDES permits per authority delegated by the U.S. Environmental Protection Agency
- NPDES permits will establish discharge concentration standards based on federal, state, and regional water quality plans and standards
- NPDES permits valid for five-year period

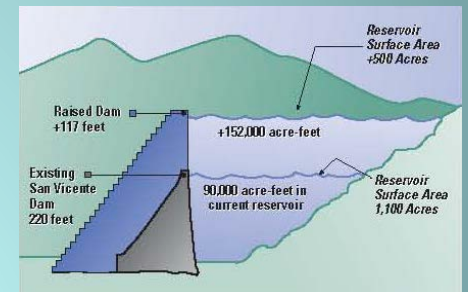
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CDPH Reservoir Issues: Proposed San Vicente Reservoir IPR/RA Project



San Vicente Reservoir
(prior to expansion)



Expanded San Vicente Reservoir

IPR/RA Reservoir Storage

Key CDPH Concerns and Goals

CDPH Issue	CDPH Goal
Time to respond	Minimize potential for short-circuiting
Environmental Buffer	Provide additional pathogen barrier

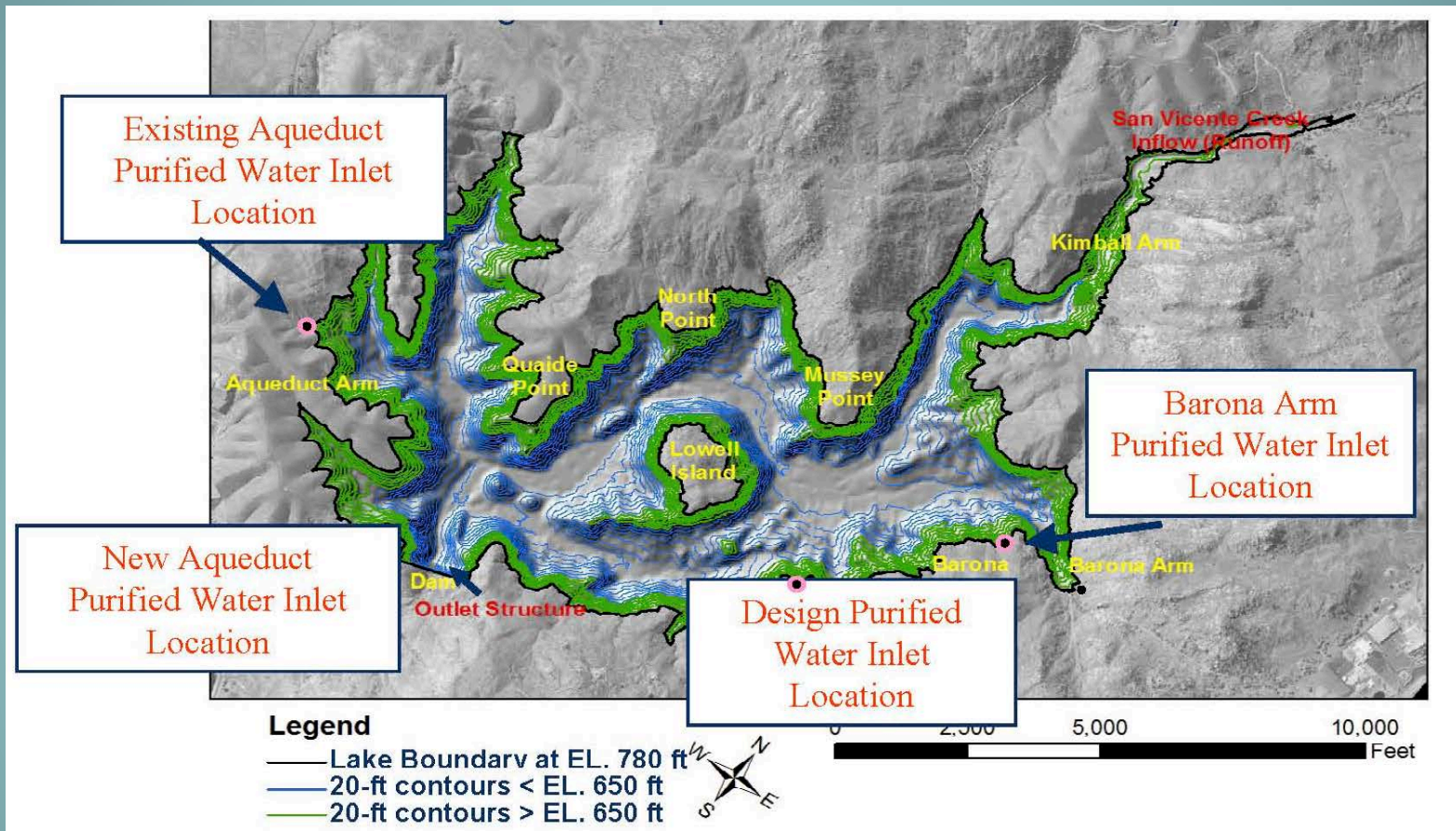
CDPH issues and goals consistently expressed during the 20-year planning history of the City of San Diego San Vicente Reservoir IPR/RA project

CDPH Concept Approval

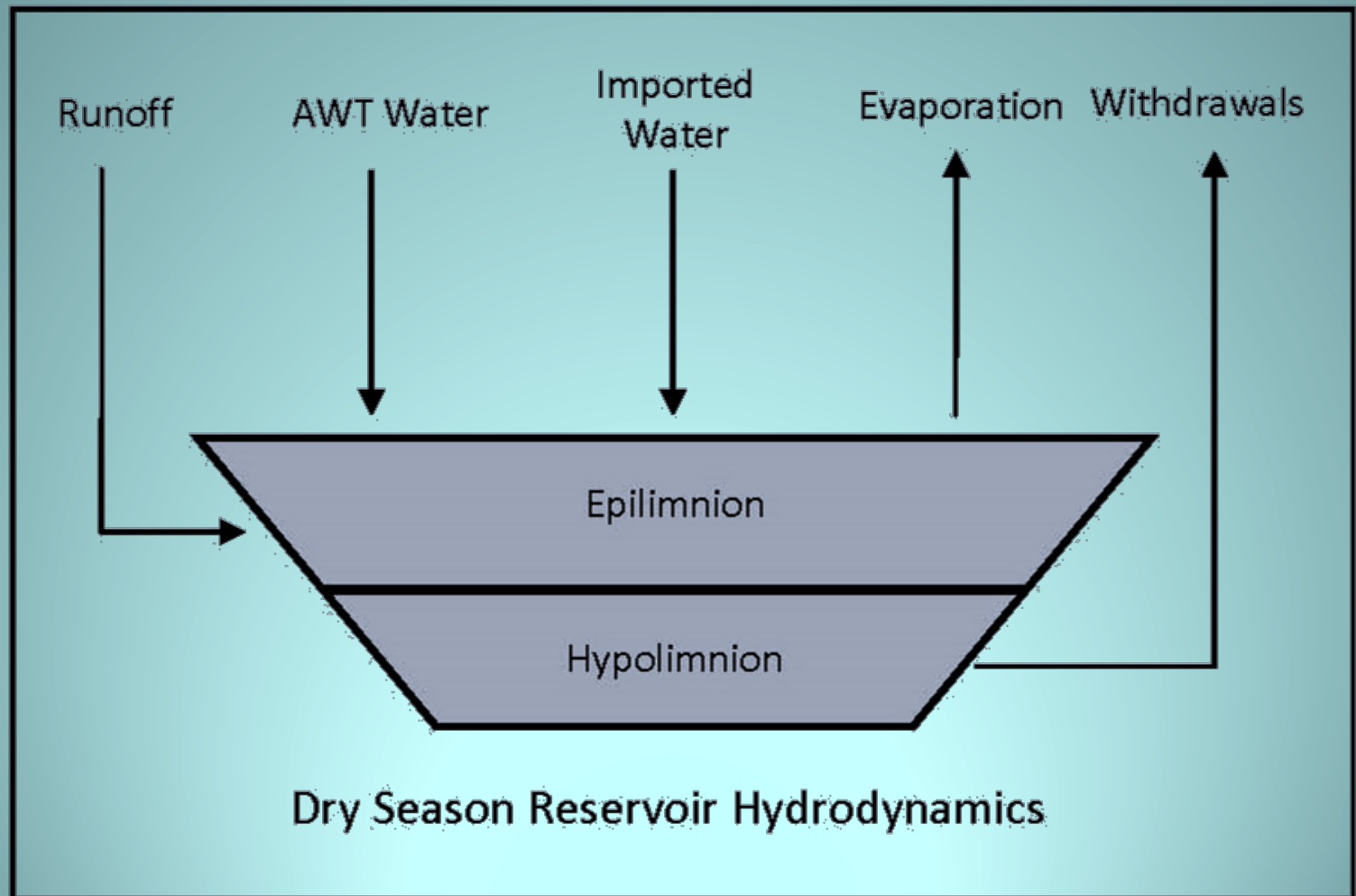
City of San Diego IPR/RA at San Vicente Reservoir

Requirement to Address CDPH Concern	Time to Respond	Environmental Buffer
Maintain 12-month mean hydraulic detention time (V/Q) at all times		✓
Locate inflow and outflow diversion sites to minimize potential for short-circuiting	✓	✓
Maintain minimum 100:1 initial dilution at all times	✓	✓
Demonstrate compliance with short-circuiting, initial dilution, and detention requirements utilizing a calibrated and verified reservoir hydrodynamic model	✓	✓
Discharge purified water above the thermocline and withdraw reservoir waters from below the thermocline when reservoir stratification occurs	✓	✓
Maintain ability to take reservoir offline on 24-hour notice	✓	

IPR Discharge Locations Evaluated at San Vicente Reservoir



Reservoir Stratification and Short-Circuiting Prevention:



Reservoir Modeling Results: City of San Diego IPR/RA Studies

- Introduction of IPR water does not materially affect reservoir stratification
- Mean hydraulic detention times of more than a decade are projected under typical reservoir operating conditions
- Minimum of 2000:1 initial dilution of 24-hour IPR discharge is maintained during reservoir turnover under typical reservoir operating conditions
- Minimum of 200:1 initial dilution of 24-hour IPR discharge is maintained during reservoir turnover under all extreme conditions (including emergency drawdown or extended drought)

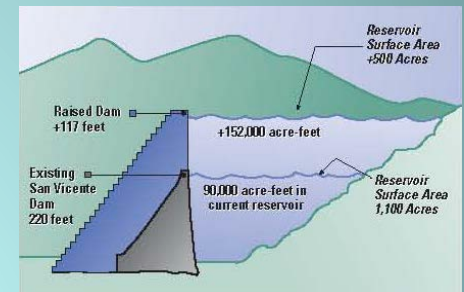
Pathogen Reduction Findings: City of San Diego IPR/RA Studies

- Solar radiation can cause significant inactivation in a matter of hours in the most resistant viral strains
- Effects of solar radiation on pathogen inactivation can be influenced by time of year, depth of epilimnion, and water clarity; pathogen inactivation is reduced during winter periods
- Even during winter periods, UV inactivation in surface waters can be greater than reported inactivation rates in groundwater
- Greater than 6 logs of virus inactivation at San Vicente Reservoir is projected during times of reservoir stratification (10 months of year)
- Greater than 2 logs of virus inactivation at San Vicente Reservoir is projected during reservoir turnover (2 months of year)

Regional Board/EPA Reservoir Discharge Issues: Proposed San Vicente Reservoir IPR/RA Project



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(prior to expansion)



Expanded San Vicente Reservoir

Key NPDES Permit Issues for IPR/RA Projects

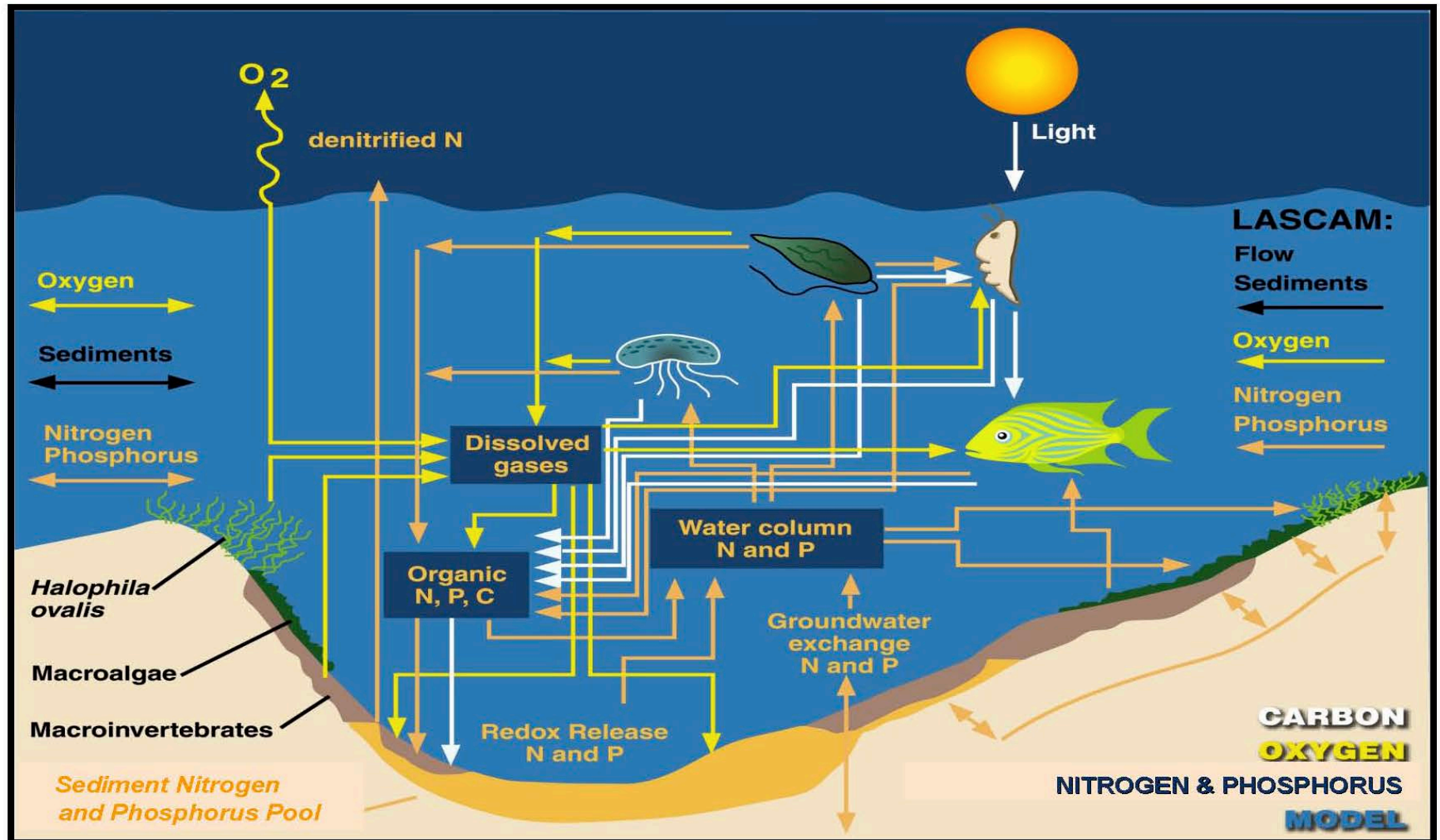
Regulation	Potential Issue
Basin Plan water quality objectives	<ul style="list-style-type: none">• Stringent nutrient standards• Secondary drinking water standards established in Basin Plan as enforceable federal water quality standards• Basin Plan dissolved oxygen standards do not address natural reservoir thermal stratification
California Toxics Rule receiving water standards	<ul style="list-style-type: none">• Standards for protection of aquatic life may be significantly more stringent than drinking water standards
303(d) Impaired Water listing status	<ul style="list-style-type: none">• Impaired water listings may impact how Regional Board may establish discharge standards

San Vicente Reservoir: Nutrient Loads

Parameter	Concentration (mg/l)			
	Basin Plan Objective	Purified Water	Imported Water Inflow	Runoff Inflow
Total nitrogen	0.25	0.78	0.17 - 0.68	0.18 - 4.2
Total phosphorus	0.025	0.004	0.024 - 0.081	0.22 - 0.32

Expansion of San Vicente Reservoir in combination with IPR/RA is projected to reduce future nutrient concentrations below historic concentrations. The City's proposed nutrient compliance approach is based on (1) regulating N:P ratios in San Vicente Reservoir to limit the potential for biostimulation, and (2) performing reservoir monitoring and modeling to confirm the lack of impacts.

Nutrient Modeling of San Vicente Reservoir:



California Toxics Rule: Implications for IPR/RA Projects

Parameter	Potential Issue
NDMA	<ul style="list-style-type: none">• Water quality objective 0.00069 is µg/l• Reverse osmosis typically achieves only partial removal• May require use of mixing zone and evaluation of environmental persistence
DDT, Aldrin, Dieldrin, Heptachlor, PCBs, PAHs	<ul style="list-style-type: none">• Receiving water standards are more stringent than approved monitoring technology (e.g. detects = noncompliance)

Note: California Toxics Rule water quality concentration standards must be achieved in receiving waters upon completing of mixing (initial dilution)

303(d) Impaired Water Listing Process:

- Regional Board is required to identify receiving waters not meeting standards per Section 303(d) of the Clean Water Act
- Regional Board is required to develop and impose TMDLs (Total Maximum Daily Loads) on both point- and non-point sources for 303(d) listed receiving waters to ensure compliance with the water quality standards

303(d) Impaired Water Listings: Implications on IPR/RA Projects:

- Barratt, El Capitan, Guajome, Hodges, Miramar, Morena, Murray, Otay, San Vicente and Sutherland are currently on 303(d) list as impaired for nitrogen or nutrients, despite limited amount of available data
- Difficult to delist receiving water once placed on the 303(d) impaired water list
- Placing imported water reservoirs on the 303(d) list may limit the ability of the Regional Board to establish water quality standards for IPR/RA projects
- TMDLs developed by the Regional Board could potentially impact or restrict allowable mass loads from IPR/RA projects

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Speculation on Development of IPR/RA Regulations:

- Conservative approach taken by City of San Diego provides significant degree of regulator comfort but sets the bar high for subsequent projects
- IPR/RA regulations will likely include metrics to address:
 - reservoir volume relative to discharge flow
 - short-circuiting
 - pathogen inactivation
- IPR/RA regulations will likely include “fail safe” requirements:
 - ability to divert IPR water elsewhere
 - ability to take reservoir offline

Speculation on Development of DPR Regulations:

- Concerns over unspecified combinations of “what ifs” are likely to likely to limit the possibility for approval of “pipe to pipe” DPR
- Future DPR approach is likely to focus on a “streamlined” version of IPR/RA where combination of short-term storage and monitoring is required to provide same degree of protection as conventional IPR/RA