

#### Engineering, Operations, & Technology Committee

## Reservoir Management Update

Item 7c August 14, 2023

#### Large Regional Source Water Reservoirs

Metropolitan Reservoirs

Dept. Water Resources

Bureau of Reclamation



Common Reservoir Challenges

Water quality issues can reduce operational flexibility

## Water Quality Issues

- Cyanobacteria "blooms"
  - Taste & odor (T&O) production
  - Toxin production
  - New Planktothrix bloom
- Anoxia (low dissolved oxygen)
  - Elevated manganese
  - Hydrogen sulfide production
- Invasive quagga mussels
  - Restricts delivery options for infested CRW





Comprehensive Reservoir Monitoring Program



## Suite of Monitoring Tools

- Routine field sampling and laboratory analyses
- SCUBA diving
- Remote water quality sensors/probes
- Satellite monitoring of lake conditions
- Remotely operated vehicles (ROV)
- Water quality models











Reservoir Management Toolbox

Managing lakes to ensure continued reliable water supply

## Lake Management Actions

- Cyanobacteria "blooms"
  - Tier change to avoid problem
  - Ozone at plants to reduce problem
  - Copper sulfate to eliminate problem
- Low dissolved oxygen (anoxia)
  - Aeration to mix water column
  - Deep water oxygenation (future)
- Quagga mussels (CRW)
  - Control through chlorination, cleaning, and controlled discharges



Copper sulfate treatment of cyanobacteria bloom



## Quagga Mussel Discoveries in the State Water Project

- A few invasive quagga mussels discovered in WB-SWP\_
  - Pyramid Lake- December 2016
  - Castaic Lake- August 2021
- January 2023 Metropolitan detected a single veliger (larvae) at Foothill Feeder PCS immediately downstream of Castaic Lake
  - DWR and Member Agencies notified
  - First evidence of quagga mussel reproduction in SWP
  - No additional veligers detected since January
- No evidence of widespread infestation
- Currently no impact on water system operations



ROV Inspection of Concrete Anchor and Chain Cyanobacteria Blooms 2023

- Geosmin is not harmful
- Aesthetic issue only
- Consumers can detect geosmin at 5 to 10 ng/L in treated water

## Lake Skinner Taste and Odor

- Cyanobacterial bloom increased rapidly in late June
  Produced geosmin (taste & odor)
  - Up to 43 ng/L leaving lake; 13 ng/L on July 2
  - Skinner plant effluent: 3 6 ng/L
- Lake operational changes
  - 50% lake bypass
  - Closed tier 3 and used only the deepest tier 4
  - Turned off lake aerator to avoid mixing
- Skinner plant using ozone and peroxide treatment
- Successfully treated with copper sulfate on July 7



Cyanobacteria Blooms 2023



Toxins from cyanobacteria or algae in this water can be harmful to people and animals. For your and your family's safety:



## Diamond Valley Lake Cyanotoxin Bloom

- Late June/early July: Rapidly developing cyanobacterial bloom producing cyanotoxins
- A recreational water issue only
- Drinking water not impacted
  - Water not being withdrawn from DVL for previous operational reasons
- Followed the state's voluntary guidance for monitoring and posting recreational advisories
  - No regulatory requirements
- Warning signs posted on July 5

## Implications for Water Quality



## Storm runoff entering the State Water Project

- Elevated turbidity
- Regulated contaminants
- Pathogens



# Extended period of low alkalinity (snowmelt)

- Modify treatment processes
- Blend SWP supply with higher alkalinity sources

#### Climate Impacts: Wet Years

### Castaic Lake Turbidity Events 2022-2023



Steep watershed topography makes Castaic Lake susceptible to turbidity events





#### Jensen Plant Impact and Response





Managed high turbidity by optimized chemical use and solids handling



Silverwood Lake Storm Impacts March 15



### Responding to Watershed Runoff and Spill Event

- Increased flow overwhelmed Houston Creek WWTP
- Approx. 15,000 gallons of partially treated wastewater flowed into creeks towards Silverwood Lake
- Increased raw water turbidity from runoff
- Metropolitan response actions
- Elevated raw water pathogens for 4 weeks None detected in plant effluents
- All compliance requirements met with no impacts to treated water deliveries

## Low Alkalinity Water during Surplus Conditions



## Salinity in Metropolitan Supplies Historical Trends



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### Looking into the Future



## Adapting to Climate Change

- Recent climate extremes might continue
  - Three years of drought followed by wet year climate whiplash
  - Long term drought on the Colorado River continues
- Potential for increased water quality issues
  - Low alkalinity
  - Contaminants brought by flood waters
  - Increased turbidity from wildfires and storm erosion
  - More frequent cyanobacterial blooms

Climate volatility highlights need for enhanced flexibility and requires innovation in managing lakes

#### The Future of Reservoir Management



## Innovation and Vigilance

- Forefront of reservoir management science
- Enhance monitoring of source water quality
- Improve and expand remote sensing
- Increase modeling and prediction capabilities
- Prepare for climate impacts on water quality
- Continue adapting lake operations to ensure reliable delivery and increase resiliency

