



San Diego County Water Authority

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August 11, 2016

Sent via Electronic Mail to: sandiego@waterboards.ca.gov

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County of San Diego

Mr. David W. Gibson
Executive Officer
California Regional Water Quality Control Board, San Diego Region
2375 Northside Drive, Suite 100
San Diego, CA 92108-2700

Dear Mr. Gibson:

**Subject: Comment - CWA Section 305(b)/303(d) Integrated Report, Attn: Xueyuan Yu
Delist Nitrogen at Miramar Reservoir, Lake Murray, and San Vicente Reservoir**

Thank you for the opportunity to provide comments on the Draft *Clean Water Act Sections 305(b) and 303(d) Integrated Report for the San Diego Region*, dated July 2016. The purpose of this letter is to request that nitrogen, either as “total nitrogen as N” or “total nitrogen”, be removed (delisted) from the 303(d) list as a constituent impairing the quality from the following imported water storage reservoirs:

- Miramar Reservoir,
- Lake Murray, and
- San Vicente Reservoir.

Overview

The 2016 Draft Integrated Report proposes that Miramar Reservoir and San Vicente Reservoir be listed as 303(d) impaired for nitrogen as a pollutant name change from an earlier 303(d) listing for “total nitrogen as N”. It also recommends retaining nitrogen as a 303(d) impaired constituent for Lake Murray. Each of these reservoirs was originally listed on the basis of comparing nitrogen concentrations during 2005-2006 against an assumed Basin Plan numerical total nitrogen objective of 0.25 mg/l.¹

¹ Clean Water Act 303(d) listings for Lake Murray for nitrogen, Miramar Reservoir for “nitrogen as N”, and San Vicente Reservoir for “nitrogen as N” were presented within *Clean Water Act Sections 305(b) and 303(d) Integrated Report for the San Diego Region*, San Diego Regional Water Quality Control Board, December 2009. The 2016 Draft Integrated Report proposes that all three reservoirs be listed as impaired for nitrogen on the basis that a preponderance of 2005-2006 water quality samples in each reservoir exceeded a total nitrogen concentration of 0.25 mg/l.

The original basis for listing these reservoirs is flawed due to the following reasons:

- The 303(d) support documents fail to demonstrate that the 2005-2006 data do not comply with the Basin Plan objective for nitrogen, and further, fail to implement guidance on how to evaluate compliance with the Basin Plan nitrogen objective.
- The 303(d) support documents fail to demonstrate non-compliance with the Basin Plan narrative objective for biostimulatory substances. Water clarity and chlorophyll data were presented in the 303(d) support documents for the three reservoirs during 2005-2006, but were not evaluated, which would have demonstrated a lack of adverse biostimulation effects, and no indication of adverse impacts to beneficial uses.

Importance of Recommended Delisting

Several Water Authority member agencies including the city of San Diego are studying and developing indirect potable reuse projects using reservoir augmentation for use as potable supply. Failure to correct the inappropriate 303(d) listings for nitrogen in Miramar Reservoir, Lake Murray, and San Vicente Reservoir may hinder the San Diego Water Board's ability to permit planned or future indirect potable reuse (IPR) reservoir augmentation discharges to the reservoirs.

If the San Diego Water Board were to require that total nitrogen concentrations be maintained at or below 0.25 mg/l in imported water reservoirs, the implementation of IPR/reservoir augmentation would be rendered infeasible, as compliance with such a 0.25 mg/l nitrogen standard cannot be achieved even with the highest level of treatment proposed with draft regulations being considered by the State Water Resources Control Board Division of Drinking Water.² Incidentally, compliance could also not be achieved using imported water since total nitrogen concentrations in imported water supplies also typically exceed 0.25 mg/l.³

Delisting nitrogen as a 303(d) impaired constituent for Miramar Reservoir, Lake Murray, and San Vicente Reservoir would:

- Properly reflect the fact that the Basin Plan does not establish a not-to-be-exceeded numerical nitrogen water quality standard of 0.25 mg/l for all reservoirs.
- Acknowledge that the San Diego Water Board has the flexibility to assess compliance with Basin Plan nitrogen objectives by taking into account reservoir-specific nitrogen:phosphorus (N:P) ratios and nutrient loading conditions.
- Be consistent with the "Sustainable Local Water Supply" element of the *San Diego Water Board Practical Vision*. The Sustainable Local Water Supply element of the Practical Vision encourages implementation of IPR and proposes that the San Diego

2 See Advanced Water Purification Facility Study Report (City of San Diego, January 2013) available at the following websites:
<https://www.sandiego.gov/sites/default/files/legacy/purewater/pdf/projectreport/awpfstudyreport.pdf>.

3 See Limnology and Reservoir Detention Study of San Vicente Reservoir (Flow Science, 2013), available online at the following websites:
<https://www.sandiego.gov/sites/default/files/legacy/purewater/pdf/projectreport/limnologyreport.pdf>.

Water Board “address” nitrogen 303(d) listings for San Vicente Reservoir and other IPR reservoirs.⁴

- Be consistent with guidance provided to date by the San Diego Water Board to Water Authority member agencies who are proceeding with IPR/reservoir augmentation projects.⁵ This guidance is supportive of preventing biostimulation using a phosphorus-limited approach in which low reservoir phosphorus concentrations are consistently maintained and reservoir N:P ratios are managed to maintain targeted levels that are consistent with supporting reservoir beneficial uses.

Rationale for Proposed Delisting: Basin Plan Objective for Nitrogen

The 303(d) nitrogen listings were based on the incorrect assumption that the Basin Plan establishes a one-size-fits-all, not-to-be-exceeded numerical nitrogen concentration standard of 0.25 mg/l for all reservoirs. The Water Authority disagrees with this interpretation of the Basin Plan objectives, for the following reasons.

The Basin Plan establishes the following objective for biostimulatory substances:

Inland surface waters, bays and estuaries and coastal lagoon waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growths cause nuisance or adversely affect beneficial uses.

Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those which stimulate algae and emergent plant growth. Threshold total phosphorus (P) concentrations shall not exceed 0.05 mg/l in any stream at the point where it enters any standing body of water, nor 0.025 mg/l in any standing body of water. A desired goal in order to prevent plant nuisance in streams and other flowing waters appears to be 0.1 mg/l total P. These values are not to be exceeded more than 10% of the time unless studies of the specific water body in question clearly show that water quality objective changes are permissible and changes are approved by the Regional Board. Analogous threshold values have not been set for nitrogen compounds; however, natural ratios of nitrogen to phosphorus are to be determined by surveillance and monitoring and upheld. If data are lacking, a ratio of N:P = 10:1 on a weight to weight basis, shall be used.

While the Basin Plan establishes a numerical phosphorus threshold of 0.025 mg/l within any standing body of water, the Basin Plan clearly states that “analogous threshold values have not been set for nitrogen compounds.” Instead, the Basin Plan directs that “natural ratios of nitrogen to phosphorus are to be determined by surveillance and monitoring and upheld.” The intent of this requirement is clear – the Basin Plan directs that reservoir-specific N: P data are to be used in assessing compliance with the nitrogen objective.

In accordance with the Basin Plan, a required first step in evaluating compliance with the Basin Plan nitrogen objective is to identify whether data are available to assess reservoir-specific N:P

⁴ See pages 14-16 of the “Sustainable Local Water Supply” element the *San Diego Water Board Practical Vision*, adopted by the Regional Water Board in 2013.

⁵ See Regional Water Board correspondence to the City of San Diego dated February 7, 2013 (244506jllim), in which notes that the Regional Water Board could implement effluent concentration limitations in NPDES permits for IPR reservoir augmentation projects on the basis of site-specific nitrogen:phosphorus (N:P) ratios to implement the existing Basin Plan objectives for nitrogen and biostimulation.

ratios. If data are available, reservoir specific N:P ratios and reservoir-specific nutrient loading conditions can be assessed. If data are not available, the default 10:1 N:P value can be used.

In contradiction to this, however, the 2016 Draft Integrated Report and the prior December 2009 Integrated Report⁶ make no attempt made to:

- Justify why an assumed 10:1 N:P ratio was used in the 303(d) analysis for each reservoir even through reservoir-specific N:P data were available,
- Utilize the available data to statistically assess reservoir-specific N:P ratios in Miramar Reservoir, Lake Murray, or San Vicente Reservoir,
- Evaluate how N:P ratios may affect compliance with the Basin Plan biostimulation narrative objective,
- Clarify that N:P ratios in Miramar Reservoir, Lake Murray, or San Vicente Reservoir are a function of the quality of imported water that is delivered to the reservoirs, or
- Acknowledge that the San Diego Water Board has the flexibility to assess compliance with the Basin Plan nitrogen objective through evaluation of reservoir-specific N:P data, reservoir-specific nutrient load conditions, and reservoir-specific effects on beneficial uses.

Instead, the 303(d) listings were established simply on the basis of comparing reservoir water quality concentrations for nitrogen during 2005-2006 with an assumed not-to-be-exceeded numerical total nitrogen standard of 0.25 mg/l.⁶ In addition to being inconsistent with the Basin Plan requirement to “identify and uphold” N:P ratios, this approach ignores data presented within the 303(d) documentation. Data presented within the December 2009 Integrated Report clearly indicates the dominance of phosphorus-limiting conditions within the three reservoirs during 2005-2006, as:

- Phosphorus was detected in only one of the 28 Miramar Reservoir samples during 2005-2006, and N:P ratios in Miramar Reservoir were consistently significantly higher than 10:1.⁷
- Phosphorus was detected in only one of 28 Lake Murray samples during 2005-2006, and N:P ratios in Lake Murray were consistently significantly higher than 10:1.⁷

6 See Appendix H of the *Clean Water Act Sections 305(b) and 303(d) Integrated Report for the San Diego Region*, San Diego Regional Water Quality Control Board, December 2009.

7 See water quality data files from the City of San Diego presented in Appendix H of the *Clean Water Act Sections 305(b) and 303(d) Integrated Report for the San Diego Region*, San Diego Regional Water Quality Control Board, December 2009.

- Phosphorus was detected in six of the 37 San Vicente Reservoir samples during 2005-2006, but all of these detections occurred during the first 90 days of this two-year period. N:P ratios in San Vicente Reservoir were significantly in excess of 10:1 in an overwhelming majority of the samples collected during 2005-2006.⁷

Rationale for Proposed Delisting: Narrative Basin Plan Objective for Biostimulation

The intent of the Basin Plan objective is to ensure that concentrations of nitrogen and phosphorus are maintained at levels below which stimulate algae or emergent plant growth or otherwise adversely impact beneficial uses. Consistent with the Basin Plan, the goal of preventing adverse biostimulation can be achieved through a limited-nutrient approach in which reservoirs are managed to consistently achieve phosphorus-limited conditions (e.g. high N:P ratios). Provided that reservoir phosphorus concentrations can be effectively managed and controlled, total nitrogen concentrations in Miramar Reservoir, Lake Murray, and San Vicente Reservoir can exceed 0.25 mg/l without causing any adverse biostimulation, impacts to beneficial uses, or noncompliance with any Basin Plan numerical or narrative standard.

Data for 2005-2006 presented within the December 2009 Integrated Report and 2016 Draft Integrated Report demonstrate compliance with the Basin Plan narrative objective for biostimulation. Table 1 (page 5) summarizes water transparency data for the three reservoirs that are presented, but not otherwise evaluated or mentioned, in the December 2009 Integrated Report and 2016 Draft Integrated Report.

As shown in Table 1, Secchi disk values in Miramar Reservoir during 2005-2006 show a high degree of water clarity during all conditions. Observed Secchi disk values at Miramar Reservoir were typically on the order of 25 feet. Secchi disk values in Lake Murray were typically on the order of a dozen feet, while values in San Vicente were typically on the order of 14 feet. While 90th percentile Secchi disk values for Lake Murray and San Vicente Reservoir were on the order of 6-7 feet, these lower values typically occurred in January/February, and may be more indicative of storm and climatic conditions than algae production. In general, water clarity at the three reservoirs during 2005-2006 tended to be highest (e.g. clearest) during summer months, when algal growth tends to be higher. This data substantiates the lack of adverse biostimulation effects in these reservoirs and should be considered as part of the weight-of-evidence approach for determining attainment of water quality standards, consistent with the state's *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) list*.

Table 1
Water Clarity Data, 2005-2006
Miramar Reservoir, Lake Murray, and San Vicente Reservoir

Parameter	Secchi Disk Depth (feet)		
	Miramar Reservoir	Lake Murray	San Vicente Reservoir
Maximum Value	37.4	27.2	26.6
Average Value	25.1	13.0	14.0
Median Value	25.6	11.8	14.4
90 th Percentile Value	18.8	6.6	6.9

Data Source: Data for 2005-2006 from the City of San Diego, as reported within *Clean Water Act Sections 305(b) and 303(d) Integrated Report for the San Diego Region* (San Diego Regional Water Quality Control Board, December 2009).

Table 2 summarizes chlorophyll “a” values for Miramar Reservoir, Lake Murray, and San Vicente Reservoir that were presented (but not evaluated) within the 2009 and 2016 303(d) support documents. Chlorophyll a is an indicator of algal biomass and is commonly used to assess eutrophic conditions in lakes or reservoirs. A number of states have or are considering water quality standards for Chlorophyll a, and have incorporated chlorophyll a numeric targets into nutrient TMDLs, including in California. Based on an analysis of the frequency of severe algal bloom conditions, setting a summer mean target of 5 µg/L means that blooms will almost never occur, while with a target of 10 µg/L blooms will be rare.⁸ The North Carolina State University Water Quality Group suggests that water supply reservoirs maintain mean chlorophyll a concentrations less than 15 µg/L, and the State of Oregon has a phytoplankton water quality standard for lakes that thermally stratify of 10 µg/L.⁸ In California, the Indian Creek Reservoir nutrient TMDL assigns a Secchi depth of not less than 2 ft and a maximum summer chlorophyll a concentration of 10 µg/L to protect beneficial uses.⁸

As shown in Table 2, chlorophyll a concentrations in Miramar Reservoir in the upper 20 feet of the reservoir were less than 2 µg/l during almost all times. Chlorophyll a concentrations in the epilimnion in San Vicente Reservoir were typically below 2 µg/l, and 90th percentile values were on the order of 3 µg/l. Chlorophyll a concentrations in Lake Murray were also typically below 2 µg/l, and 90th percentile values (which occurred during the spring of 2006) were below levels typically associated with eutrophic conditions.⁹ This data further substantiates a lack of adverse biostimulation in these reservoirs.

⁸ See Tetra Tech Report Prepared for U.S. EPA Region IX and California State Water Resources Control Board, Planning and Standards Implementation Unit, *Technical Approach to Develop Nutrient Numeric Endpoints for California* (2006)

⁹ See U.S. Geological Survey Report 2004-5086, *Predicting Water Quality by Relating Secchi Disk and Chlorophyll a to Satellite Imagery for Michigan Inland Lakes* (2004), and Carlson R.E. (1977), A trophic state index for lakes. *Limnology and Oceanography*. Vol. 22, No. 2.

Table 2
Chlorophyll a Data, 2005-2006
Miramar Reservoir, Lake Murray, and San Vicente Reservoir

Reservoir	Reservoir Depth	Chlorophyll "a" Concentration (µg/l)	
		Median Value	90 th Percentile
Miramar Reservoir	1 meter (3.3 feet)	0.6	1.7
	3 meters (9.9 feet)	0.3	1.7
	5 meters (16.7 feet)	0.4	1.9
Lake Murray	1 meter (3.3 feet)	1.6	5.8
	3 meters (9.9 feet)	1.6	5.1
	5 meters (16.7 feet)	1.5	5.1
San Vicente Reservoir	1 meter (3.3 feet)	1.5	3.5
	3 meters (9.9 feet)	1.5	3.2
	5 meters (16.7 feet)	1.6	3.4

Data Source: Data for 2005-2006 from the City of San Diego, as reported within *Clean Water Act Sections 305(b) and 303(d) Integrated Report for the San Diego Region* (San Diego Regional Water Quality Control Board, December 2009).

Imported Water Dominance

Each of the three reservoirs was constructed for purposes of storing imported water. Imported water comprises virtually all of the water stored in Miramar Reservoir and Lake Murray, and imported water comprises an overwhelming majority of the water stored in San Vicente Reservoir. Table 3 summarizes capacities and watersheds of the three reservoirs. These reservoirs thermally stratify during spring, summer, and fall months.

Table 3
Dominance of Imported Water
Miramar Reservoir, Lake Murray, and San Vicente Reservoir

Reservoir	Storage Capacity (acre-feet)	Watershed Area ¹⁰ (acres)	Average Local Runoff ⁹ (acre-feet/year)	Runoff as a Percent of Storage Volume
Miramar Reservoir	6,680	640	170	3% ¹¹
Lake Murray	4,680	2,300	110	2% ¹²
San Vicente Reservoir	242,000 ¹³	47,360	3,290	1%

Note: Values rounded to nearest 10 acre-feet per year or 10 acres.

Lake Murray has a tributary watershed area of approximately 2,300 acres, but the reservoir is surrounded by a diversion ditch which intercepts dry weather flows and first flush runoff from all tributaries and diverts it around the reservoir to a discharge point below the dam. As a result of this diversion system, the local watershed does not typically contribute significant runoff to Lake Murray, and the reservoir is normally comprised almost exclusively of imported water.

Similarly, storm drain systems that serve the limited development within the small Miramar Reservoir watershed direct runoff to adjoining watersheds. Imported water thus comprises virtually 100 percent of all water stored in Miramar Reservoir.

The project to raise the San Vicente Reservoir dam has been completed, and the reservoir's capacity has increased from 90,000 to 242,000 acre-feet. This new capacity is owned by the Water Authority will be used for storing water (imported water and other local sustainable supplies such as desalinated seawater) for use in dry years or emergency supply. With this expansion, imported water will comprise an even larger share of the volume stored in San Vicente Reservoir supply. Because nutrient loads from local runoff will be diluted into a considerably larger volume of water, future nutrient concentrations within San Vicente Reservoir are projected to decrease from historic values.¹⁴

10 Source: 2015 *City of San Diego Watershed Survey*. Available online at <https://www.sandiego.gov/water/quality/environment/sanitarysurvey>.

11 Lake Murray is surrounded by a diversion ditch which intercepts dry weather flows and first flush runoff from all tributaries and diverts the runoff to a discharge point below the dam. Imported water typically comprises virtually 100 percent of Lake Murray, as the annual average local runoff that reaches Lake Murray is significantly less than 1% of the total annual imported water deliveries to the lake.

12 Storm runoff collected in the storm drain system in developed areas within the Miramar Reservoir watershed is diverted from the watershed. Imported water comprises virtually 100 percent of the water stored in Miramar Reservoir, as the local runoff contribution is negligible to the quantity of imported water to the reservoir each year.

13 The original 90,000-acre-foot capacity of San Vicente Reservoir has been expanded to 242,000 acre-feet with the recent completion of the San Vicente dam raise project. With expansion of the reservoir, nutrient loads from local runoff will now be distributed over a significantly larger reservoir volume, resulting in a projected decrease in reservoir nutrient concentrations compared to historic values.

14 See *City of San Diego Water Purification Demonstration Project, Project Report* (July 2013), available at: <https://www.sandiego.gov/sites/default/files/legacy/water/purewater/pdf/projectreports> and *Limnology and Reservoir Detention Study of San Diego Reservoir* (Flow Science Inc., 2012, located at the following website: <https://www.sandiego.gov/sites/default/files/legacy/water/pure3water/pdf/projectreport/limnologyreport.pdf>).

TMDLs Are Not Warranted or Necessary

The Integrated Report designated Miramar Reservoir, Lake Murray, and San Vicente Reservoir as “Category 5” impaired water bodies. With this Category 5 designation, the San Diego Water Board would be required to develop and implement Total Daily Maximum Loads (TMDLs) to reduce reservoir nitrogen concentrations in the reservoirs.

Water quality in the three reservoirs, however, is a function of the quality of imported water delivered to each reservoir. Since virtually all nitrogen loads into the reservoir originate with imported water delivery and storage, no viable regulatory control strategies exist for reducing nitrogen loads into the reservoir. As a result, no meaningful water quality benefit can be gained by requiring the development and implementation of a TMDL.

Benefits of IPR Reservoir Augmentation

The City of San Diego has committed to implementing a large-scale IPR reservoir augmentation program called Pure Water San Diego. The City plans to deliver 30 million gallons per day (mgd) of purified water to Miramar Reservoir by 2021 as a first element of this long-range plan. The 30 mgd of purified water supply would replace the current imported source water for Miramar Reservoir. As part of this project, purified water would typically comprise 100 percent of the Miramar Reservoir supply.

The City proposes to implement an additional 53 mgd of potable reuse as a second element of this long-range plan by year 2035. This additional potable reuse could involve directing purified water to San Vicente Reservoir or Lake Murray.

San Diego Water Board action to delist these reservoirs as 303(d) impaired for nitrogen would remove a potentially significant regulatory obstacle to potable reuse. Since concentrations of phosphorus are projected to be lower in the purified water supply than the imported water supply, San Diego Water Board action to delist the three reservoirs as 303(d) impaired will allow for improved control of reservoir biostimulation through a reduction in reservoir phosphorus loads. Additionally, purified water will contain lower concentrations of total dissolved solids and other dissolved minerals than the existing imported supply. As a result, IPR reservoir augmentation will reduce salinity concentrations in the reservoirs, in applied irrigation waters, and in non-potable recycled water supplies. Such load reductions will, in turn, reduce irrigation-related effects on groundwater salinity and improve the ability to comply with Basin Plan groundwater quality objectives and applicable Salt and Nutrient Management Plans.

All in all, delisting Miramar Reservoir, Lake Murray, and San Vicente Reservoir as 303(d) impaired for nitrogen offers the potential for improving reservoir biostimulation control while at the same time enhancing both the quality and quantity of sustainable local water supplies.

Mr. Dave Gibson
San Diego Water Board
August 11, 2016
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Summary

In summary, the 303(d) impaired water listings for nitrogen in Miramar Reservoir, Lake Murray, and San Vicente Reservoir are erroneously based on the assumption that the Basin Plan establishes a one-size-fits-all, not-to-be-exceeded nitrogen water quality standard of 0.25 mg/l. Such a misinterpretation of the Basin Plan (e.g. assuming that nitrogen concentrations in all reservoirs must not exceed 0.25 mg/l):

- Is inconsistent with Basin Plan biostimulation objective that state that “analogous thresholds have not been established for nitrogen compounds,”
- Is inconsistent with the Basin Plan objective that N:P ratios are to be identified and upheld,
- Would eliminate the Water Board’s ability to approve IPR reservoir augmentation projects,
- Is inconsistent with existing San Diego Water Board guidance on IPR reservoir augmentation,
- Is inconsistent with imported water quality which historically has represented the overwhelming majority of all water stored in the three reservoirs,
- Is inconsistent with the state’s policy for developing the 303(d) list that advocates for a weight-of evidence approach in determining attainment of water quality standards,
- Is inconsistent with data presented within the 303(d) support documents that show no impacts to beneficial uses or significant eutrophication in the reservoirs, and
- Is inconsistent with the long-range vision of implementing IPR reservoir augmentation presented within the 2013 *San Diego Water Board Practical Vision*.

The Water Authority looks forward to working with the San Diego Water Board to protect beneficial uses of the region’s reservoirs, and to help meet the sustainable local water supply goals established within the *San Diego Water Board Practical Vision*. An important step in this process is for the San Diego Water Board to delist Miramar Reservoir, Lake Murray, and San Vicente Reservoir as impaired by nitrogen.

Thank you for considering this request to delist Miramar Reservoir, Lake Murray, and San Vicente Reservoir as impaired for nitrogen. Please contact Lesley Dobalian at (858) 522-6747, with any questions.

Sincerely,



Robert R. Yamada, P.E.
Director of Water Resources