Nacimiento Water Project Watershed Sanitary Survey Five-Year Update (2021-2025)

Prepared By:
County of San Luis Obispo
Department of Public Works
Water Quality Division

SYSTEM INFORMATION

SWRCB-DDW System No.:	CA4010080
System Name:	San Luis Obispo County – Nacimiento Water Project
Survey Period:	January 1, 2021 through December 31, 2025
Initial Survey Completed:	2011
Updates Completed:	2016, 2021, 2026
Name of Agency and Address:	County of San Luis Obispo Public Work Department County Government Center, Room 206 San Luis Obispo, CA 93408
Name of Watershed:	Nacimiento Reservoir (aka Lake Nacimiento)
Infrastructure:	Multi-port intake structure, 45-mile-long transmission main, three pump stations, three raw water storage reservoirs, and a SCADA system
Total Watershed Size in acres:	208,060 acres
Watershed Capacity:	377,900 acre-feet
Location:	San Luis Obispo County and Monterey County

Agencies using this watershed as a source of water supply:

Nacimiento Water Project Participants:

- City of El Paso de Robles
- Templeton Community Services District
- Atascadero Mutual Water Company
- City of San Luis Obispo
- Santa Margarita Ranch Mutual Water Company
- County Service Area 10 - Cayucos

Other Nacimiento Reservoir Partners:

- Heritage Ranch Community Services District
- Laguna Vista Boat Club
- Monterey County Parks Department
- Northshore S & B
- Nacimiento Parks Department (Oak Shores)

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TERMS, ACRONYMS, AND ABBREVIATIONS

Term	Description
123 TCP	1,2,3-Trichloropropane
CDPH	California Department of Public Health
County	County of San Luis Obispo
CSA 7A	Community Service Area 7A – Oak Shores Development wastewater treatment facility
DDW	Division of Drinking Water
District	San Luis Obispo County Flood Control and Water Conservation District
DLR	Detection Limit for the Purposes of Reporting
DO	Dissolved Oxygen
EPA	Environmental Protection Agency (United States)
FEMA	Federal Emergency Management Agency
FHL	Fort Hunter Liggett
FT	Floating Toilet
gpd	Gallons per day
HABs	Harmful Algal Blooms
Hg	Mercury
HWL	High Water Level
MCL	Maximum Contaminant Level
MCL-2	Secondary Contaminant Level
MCWRA	Monterey County Water Resources Agency
mg/L	Milligrams per liter
µg/L	Micrograms per liter
ND	Not Detected
NGVD29	National Geodetic Vertical Datum of 1929
NRWMAC	Nacimiento Regional Water Management Advisory Committee
NPDES	National Pollutant Discharge Elimination System
NWP	Nacimiento Water Project
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PWD	Public Works Department
RWQCB	Regional Water Quality Control Board (Central Coast Region)
SDWA	Safe Drinking Water Act
SLO	San Luis Obispo
SOC	Synthetic Organic Chemical(s) or Semi-volatile Organic Chemical(s)
SSO	Sanitary Sewer Overflow
SUVA	Specific Ultraviolet Absorbance
SWRCB	(California) State Water Resources Control Board
SWTR	(Federal) Surface Water Treatment Rule
TOC	Total Organic Carbon
TTHM	Total Trihalomethanes
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Chemical(s)
WQ	Water Quality
WSS	Watershed Sanitary Survey
WTP	Water Treatment Plant

WATERSHED SANITARY SURVEY CHECKLIST

Conditions	Significant	Not Significant	Comments
I. General Conditions			
A. Changes in available water supply	X		Rainfall may impact the water supply
B. Construction of water diversion or reservoir projects		X	
C. Relocation of intakes		X	
II. Contaminant Sources			
A. Wastewater Treatment			
1. Treatment plant effluent discharges	X		
2. Storage, transport, treatment, disposal to land	X		
3. Residential septic systems		X	
4. Commercial/industrial septic systems		X	
B. Reclaimed Water		X	
C. Urban Areas		X	
D. Agricultural Crop Land Use		X	
E. Pesticide/Herbicide Use		X	
F. Grazing Animals	X		
G. Concentrated Animal Facilities (feedlots, etc.)		X	
H. Wild Animal Populations		X	
I. Mines			
1. Active		X	
2. Inactive	X		
J. Disposal Facilities			
1. Solid waste		X	
2. Hazardous waste		X	
K. Logging		X	
L. Recreation			
1. Reservoir body contact	X		
2. Reservoir non-body contact		X	
M. Unauthorized Activity			
1. Illegal dumping		X	
2. Underground storage tank leaks		X	
3. Other			
N. Traffic Accidents/Spills			
1. Transportation corridors		X	
2. History of accidents/spills		X	
O. Groundwater Discharges			
1. Natural discharge		X	
2. Gas, oil, geothermal wells		X	
P. Seawater Intrusion		X	
Q. Geologic Hazards			
1. Landslides		X	
2. Earthquakes		X	
3. Floods		X	
4. Other		X	
R. Fires	X		
III. Growth			
A. Population/General Urban Area Increase		X	
B. Land Use Changes		X	
C. Industrial Use Increase		X	
IV. Water Quality			
A. Changes in Raw Water Quality		X	
B. Difficulty Meeting Drinking Water Standards		X	

SUMMARY

The Nacimiento Reservoir and its watershed form a large, complex system that supports a wide range of land uses and activities. Ownership and jurisdiction are divided among numerous public agencies and private parties, and the area is home to residents, agricultural operations, recreational users, and critical infrastructure. The reservoir also serves as an important drinking water source, with the San Luis Obispo County Flood Control and Water Conservation District (District) holding an annual allocation of 17,500 acre-feet.

The District does not have jurisdiction over the entire watershed, which limits its ability to directly influence all land use decisions or management practices. Land use authority for the lower portion of the Nacimiento watershed rests with the County of San Luis Obispo (County). Although several control measures exist to help protect water quality, their effectiveness depends on consistent implementation and enforcement.

The sheer number of potential contaminant sources, combined with the watershed's large size and the reservoir's remote location, makes effective oversight challenging. As a result, the District must rely on cooperative relationships with agencies, landowners, and other entities that hold authority within the watershed or are actively engaged in its use.

The watershed supports extensive recreation, rural living, and agriculture, particularly grazing and viticulture, alongside other historical and ongoing uses such as military operations and mining. These diverse activities create multiple potential sources of contamination that pose both immediate and long-term risks to water quality. Threats to the reservoir as a drinking water supply stem from widespread grazing, unrestricted body-contact recreation, numerous domestic wastewater systems, and the possibility of a major wildland fire.

Mercury from abandoned mines in the Nacimiento watershed remains an environmental concern. Its presence in the Nacimiento Reservoir has led to mercury accumulation in fish at levels that are unsafe for human consumption, raising public concern about overall water safety. However, mercury does not threaten the reservoir's drinking water quality. The District has not detected mercury in samples taken from the Nacimiento Reservoir in the past five years.

In 2023, heavy rainstorms caused significant erosion near the County Service Area 7A – Oak Shores wastewater treatment facility (CSA 7A), undermining the structural integrity of the embankment and creating a high-risk situation in which wastewater could enter the Nacimiento Reservoir if the embankment collapses. The County installed an interim boulder reinforcement while permanent repairs are designed and constructed. To further reduce the risk of discharge, CSA 7A modified its treatment operations and removed nearby ponds from service and will continue operating under this configuration until long-term stabilization is complete.

A strong water quality monitoring program remains essential for detecting impacts from potential contaminant sources and directing protection efforts where they are most effective (Recommendation #3, p. 65). This five-year update shows that watershed conditions remain stable. Continued monitoring provides flexibility to adapt to changing regulations, public concerns, and watershed conditions, ensuring the District can continue safeguarding water quality as future challenges arise.

INTRODUCTION AND PURPOSE

Surface water (lakes, reservoirs, rivers, and groundwater under the influence of surface water) can contain contaminants that pose risks to drinking water consumers. In response to the 1996 Safe Drinking Water Act amendments, the federal government and the State of California established regulations to reduce these risks, including the requirement to complete a watershed sanitary survey at least every five years (California Code of Regulations, Title 22, Chapter 17, Article 7).

This Watershed Sanitary Survey evaluates the Nacimiento Reservoir raw water source used by the Nacimiento Water Project (NWP) participants. The overall purpose of the sanitary survey is to describe the physical and hydrogeological characteristics of the watershed, summarize source water quality data, and identify existing activities or potential contamination sources that could affect the Nacimiento Reservoir. It also documents any significant changes since the previous survey, reviews current watershed control and management practices, evaluates the system's ability to meet surface water treatment requirements, and provides recommendations for any necessary corrective actions. The survey also supports long-term watershed management and planning. The initial survey was completed in 2011; this report is the third five-year update and covers data from 2021 through 2025.

WATERSHED PHYSICAL AND HYDROGEOLOGICAL DESCRIPTIONS

Land Use

Nacimiento Reservoir is an 18-mile-long reservoir with 165 miles of shoreline in the southern Santa Lucia Range. At full capacity, it covers 5,727 acres, reaches depths of up to 190 feet, and holds 377,900 acre-feet of water. The surrounding 208,060-acre[1] watershed (325 square miles) is nearly equally split between Monterey County (104,480 acres) to the north and San Luis Obispo County (103,580 acres) to the south (see Figure 1).

The upper watershed is dominated by federally owned land (see Figure 2). The Nacimiento River begins in the Santa Lucia Mountains south of Cone Peak within the Los Padres National Forest, which encompasses 11,400 acres of the upper watershed. From there, the river flows 10 miles through the forest before entering Fort Hunter Liggett, a U.S. Army training installation covering 79,960 acres. It then continues 19 miles through the base and another 7 miles through privately owned agricultural land before reaching the 800-foot elevation, where the reservoir begins. Most remaining upper-watershed land, about 13,310 acres, is privately owned and zoned for agriculture.

The lower watershed consists primarily of privately owned land used for agriculture, rural residences, open space, and recreation. The Monterey County Water Resources Agency (MCWRA) is the primary public landowner in this area, holding 10,062 acres associated with the dam and reservoir, including 7,114 acres above the 800-foot elevation and 2,948 acres below it. The Bureau of Land Management owns an additional 2,208 acres.

Most of the watershed remains undeveloped open space. Population centers are limited to small communities along the lakeshore, while the rest of the watershed is rural and sparsely populated.

[1] All measurements have some inherent error. Acreage values reported here may differ slightly from those reported elsewhere. All acreages were rounded to the nearest ten for use in this report.

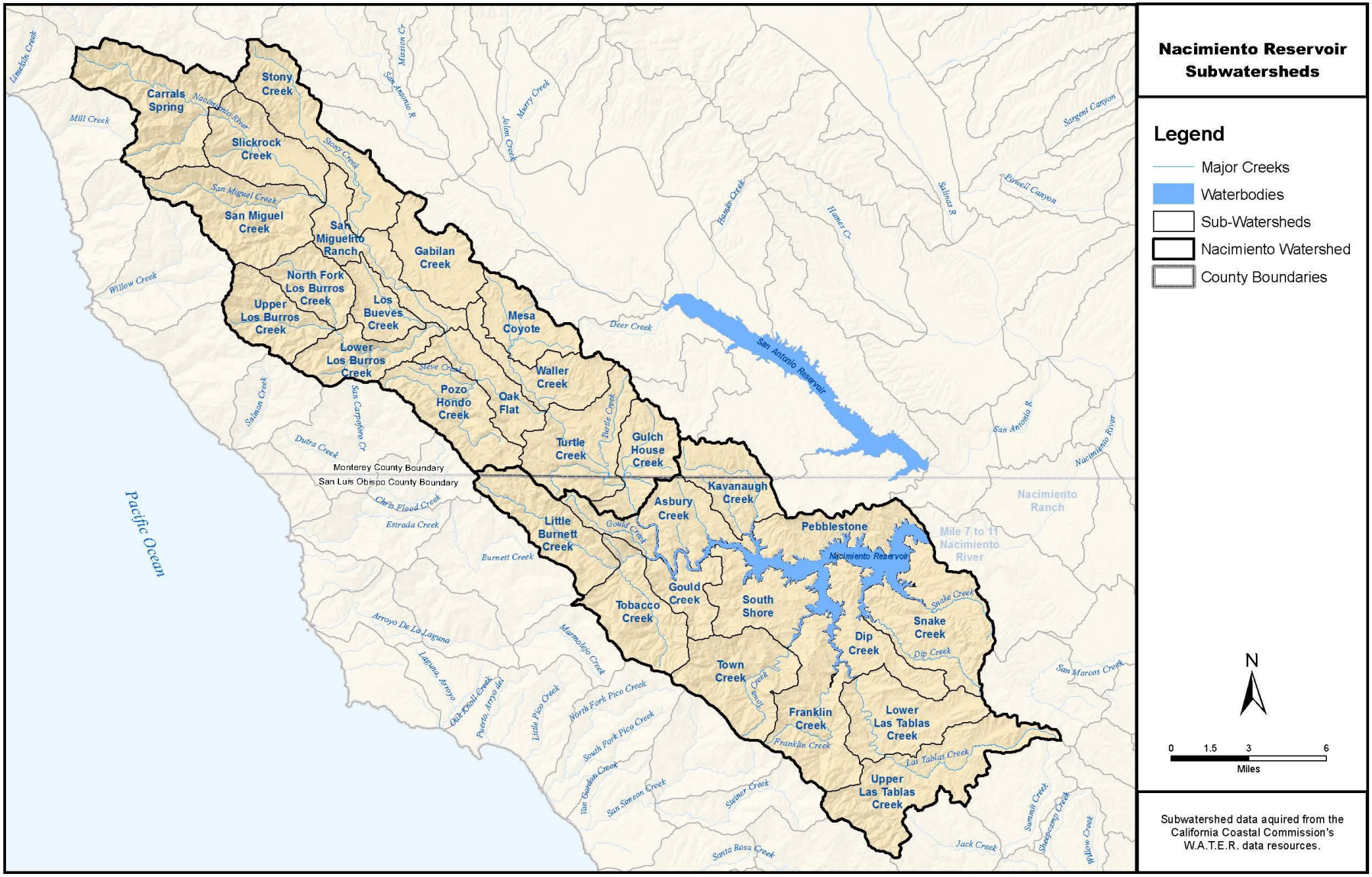

Figure 1: Nacimiento Reservoir Watershed

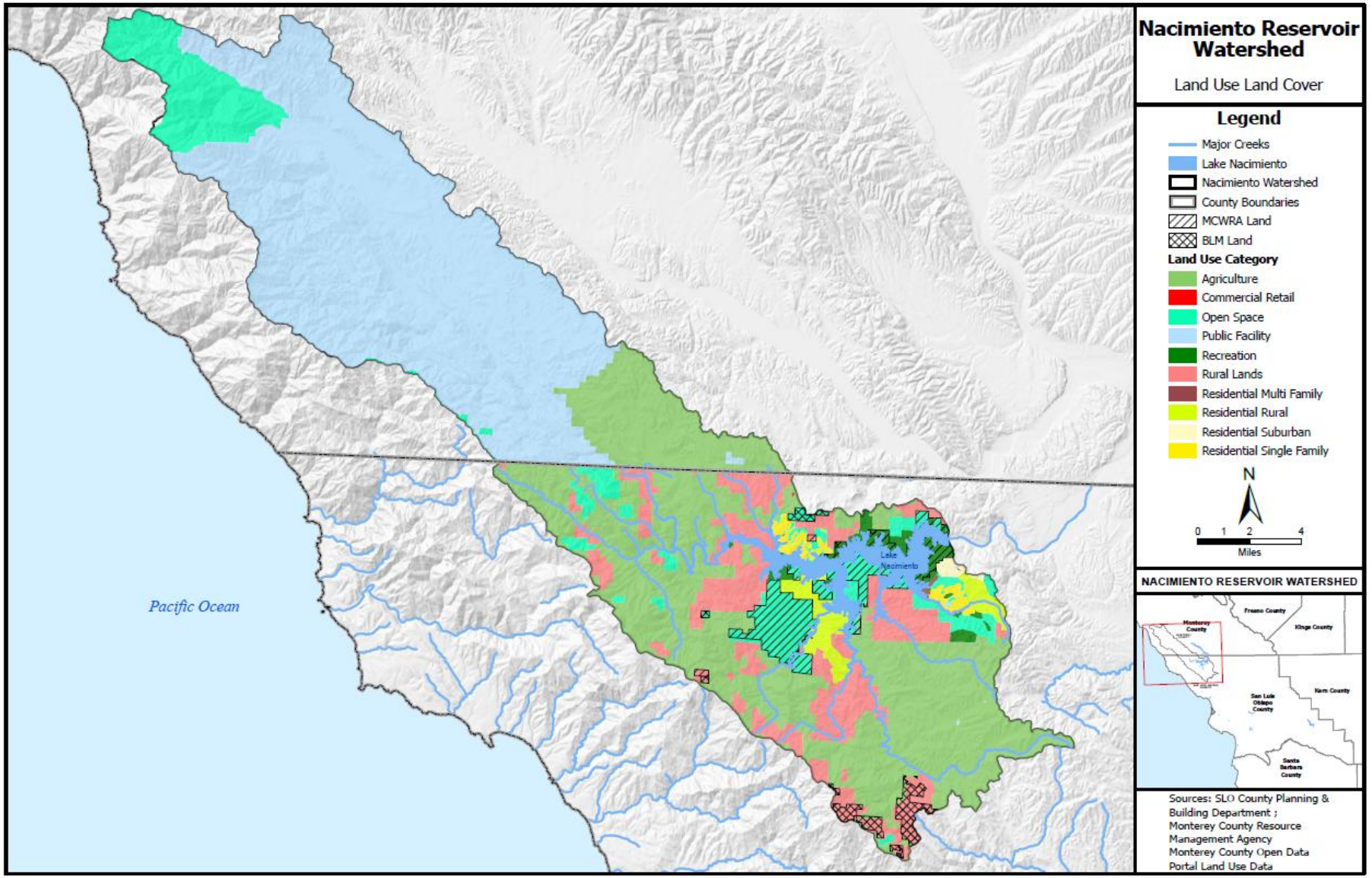

Figure 2: Nacimiento Watershed Land Use

Topography

The Nacimiento River originates in the Santa Lucia mountain range, which forms the western border of the watershed. The watershed is characterized by rugged, largely mountainous, and undeveloped terrain. Most of the mountains trend northwest to southeast, with rounded ridges, steep sides, and narrow canyons (USDA Forest Service). The steepest mountains are found in the northwest portion of the watershed, where the Nacimiento River originates, ranging up to 3,744 ft. high at Alder Peak, and becoming somewhat gentler toward the eastern and southern portions of the watershed. Within Fort Hunter Liggett (FHL) in the upper watershed, slopes in the upper Nacimiento River Valley are typically less than 20%; steeper slopes (61-80%) occur primarily in the western area of the watershed, and some very small areas have slopes greater than 80% (US Army Reserve Training Center, Fort Hunter Liggett, CA).

The underlying geology primarily consists of the Paso Robles Formation which are alluvial sediments from minerals and pebbles; and the Vaqueros Formation comprised of sandstone and shale (Chipping, 1987).

Hydrological Profile

Located within the Paso Robles Hydrologic Area, the reservoir is influenced by at least 19 tributaries. Key watersheds creeks monitored for water quality include Snake, Dip, Las Tablas, Town, Kavanaugh, and the Narrows.

Hydrological patterns are driven by highly seasonal rainfall, occurring mostly between December and March. Inflows naturally carry higher concentrations of minerals due to the leaching of the surrounding geology.

Reservoir Operations

The Nacimiento Reservoir has an intake structure near the dam, which allows operators to select water from seven different elevations to optimize quality. The NWP operates under Domestic Water Supply Permit No. 04-06-10P-006, issued by the State Water Resources Control Board (SWRCB) – Division of Drinking Water on October 21, 2010. It functions as a wholesale system that provides untreated surface water to participating public water agencies, including the City of Paso Robles, Templeton Community Services District, Atascadero Mutual Water Company, Santa Margarita Ranch Mutual Water Company, and the City of San Luis Obispo, as well as several smaller districts and users.

The NWP system includes a reservoir intake, three storage reservoirs, three booster pump stations, four turnouts, and a raw water transmission system, and delivers untreated surface water to participating agencies as a supplemental supply. Under an agreement with MCWRA, the District holds an entitlement to 17,500 acre-feet annually, with up to 15,750 acre-feet deliverable depending on reservoir conditions. Deliveries to participating agencies began in 2011.

POTENTIAL SOURCES OF CONTAMINATION/HAZARDS

Wastewater

The primary contamination risk comes from potential spills associated with wastewater facilities, septic systems, holding tanks, recreational restrooms, and public floating toilets around the reservoir (see Figure 3).

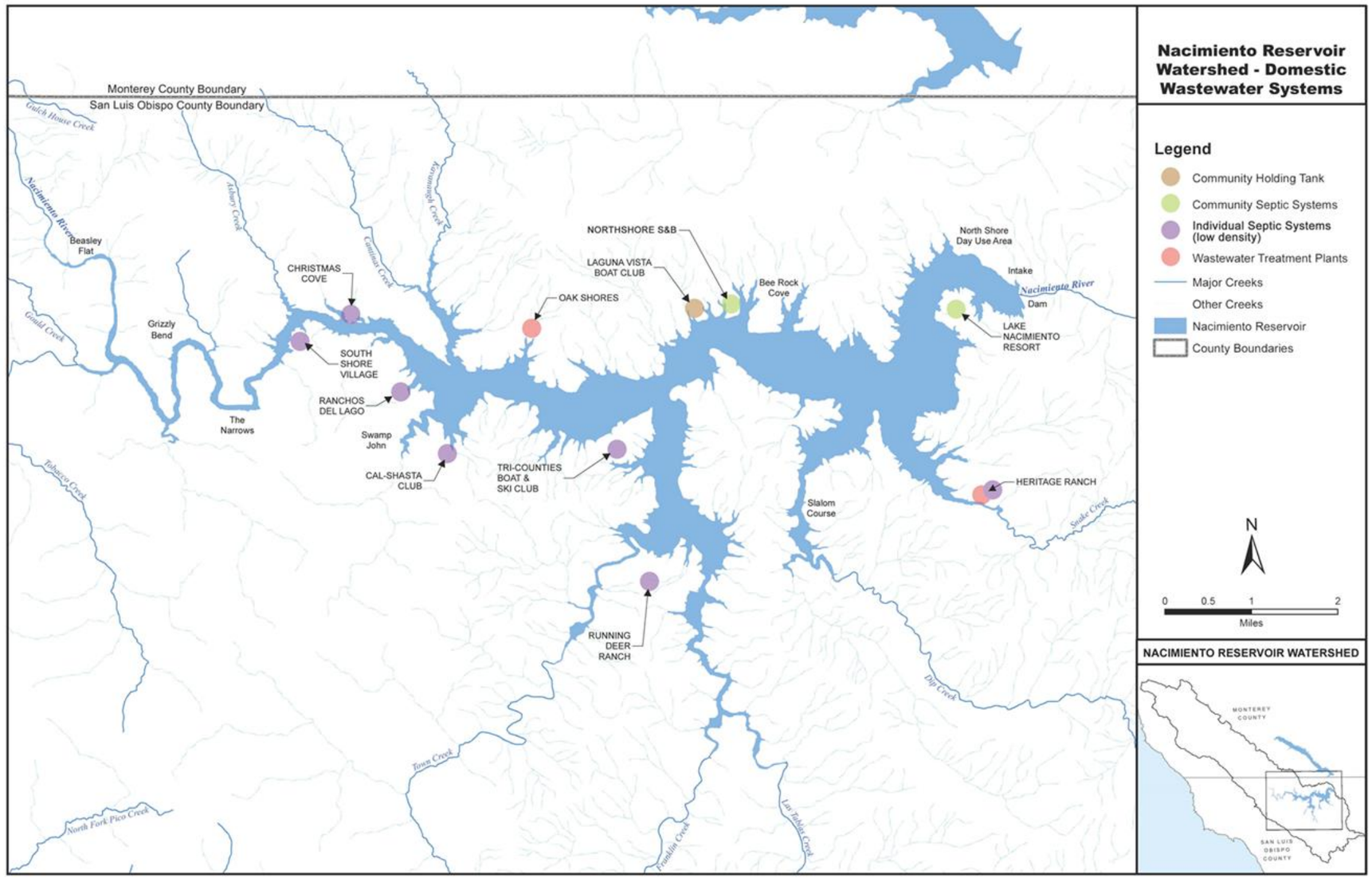

Figure 3: Nacimiento Reservoir Wastewater Systems

Wastewater Facilities

Heritage Ranch

Most of Heritage Ranch is served by a community wastewater system operated by the Heritage Ranch Community Services District. The collection system is regulated under SWRCB Order No. 2006-0003-DWQ, and treatment and disposal are governed by Central Coast Regional Water Quality Control Board (RWQCB) Order No. R3-2011-0007 (NPDES Permit No. CA0048941). The system serves approximately 1,590 connections, with an additional 290 undeveloped parcels approved for future connections.

The collection system includes approximately 12 miles of pipeline and 10 lift stations that convey wastewater to a secondary treatment facility. One lift station (#5) is located about 200 feet horizontally from the high water level (HWL), while all others are farther away; all lift stations are at least 25 feet vertically above the HWL. The treatment plant is situated approximately 1,100 feet from the HWL and has a design capacity of 0.4 million gallons per day.

Effluent is pumped approximately 3.5 miles to a disposal area consisting of storage ponds and sand filters located outside of the reservoir watershed. The treatment facility, originally constructed in 1978, currently treats about 200,000 gallons per day. Treated effluent is discharged to a drainage channel tributary to the Nacimiento River.

Between 2021 and 2025, one Category 1[2] sanitary sewer overflow (SSO) was reported. Additional details are available at the link below.

https://www.waterboards.ca.gov/water_issues/programs/sso/sso_map/sso_pub.shtml

Oak Shores

The CSA 7A wastewater facility, located within the Nacimiento watershed, provides treatment for the Oak Shores residential subdivision. The plant operates under SWRCB Order WQ 2014-0153-DWQ, which establishes General Waste Discharge Requirements for Small Domestic Wastewater Treatment Systems, as well as Monitoring and Reporting Program R3-2022-0055.

The collection system is comprised of approximately six miles of collection line and six lift stations. The residential development extends to the HWL of the reservoir and the gravity collection system includes an interceptor line which is buried in the ground below the HWL (800 ft. NGVD 29), including one 60 ft. deep lift station (#3) and 49 manholes. All other lift stations are located at least 1,000 ft. away from the HWL. Over time, erosion of the shore has exposed sections of the interceptor line and several lateral lines. This exposure increases the risk of damage due to undermined pipe supports, which can lead to joint failure. Additionally, it raises concerns about vandalism and accidental damage by lake users.

CSA 7A is designed for a capacity of 100,000 gallons per day (gpd) and secondary treatment via two aeration ponds and two settling lagoons (see Figure 4). The treatment plant is located approximately 1,000 ft horizontally away from and more than 100 ft above the HWL. Effluent is pumped nearly two miles from the treatment plant to spray fields located within the reservoir

[2] Category 1 is a spill that entered Waters of the State or a drainage channel and was not fully captured

watershed, over 2,000 ft horizontally away from the HWL. Three additional percolation ponds are available for disposal when irrigation is not an option. The facility is currently operating under modified conditions while repairs are completed following storm-related damage (see Figure 4 and Figure 5). Additional photos of the storm damage are included in APPENDIX A: Photos of 2023 Storm Erosion and Interim Repair

Between 2021 and 2025, five SSOs occurred in the CSA 7A wastewater collection system. One was classified as Category 1 on April 6, 2021. This spill originated from manhole overflow and entered a storm drain culvert to a dry creek bed where it was absorbed into the soil and did not enter the reservoir. The remaining four were Category 3 under 1,000 gallons that did not reach surface water.

Figure 4: CSA 7A Oak Shores Wastewater Treatment Facility

Figure 5: Interim Storm Repair at CSA 7A

Septic Systems

Onsite wastewater treatment systems (OWTS) are commonly called septic systems. The public recreation area (Lake Nacimiento Resort), one small community (Northshore S&B) and one elementary school (Cappy Culver) each have a community septic system. Numerous homes and some small private businesses have individual septic systems.

Lake Nacimiento Resort

Located less than one mile from the NWP intake structure, this public recreation area is served by a community septic system operated by the Monterey County Parks Department under the provisions of Central Coast RWQCB Order No. 96-26.

The system consists of 16 septic tanks and 10 lift stations, with a total design capacity of 36,000 gpd. Based on a review of aerial imagery, at least 12 septic tanks appear to be located more than 200 feet horizontally from the HWL, while up to four tanks may be within 200 feet of the HWL.

Effluent from septic tanks in the lower portion of the facility is conveyed to a holding tank at the Pine Knoll campground, located approximately 300 feet from the HWL. From the Pine Knoll lift station, wastewater is pumped approximately 1.6 miles to a disposal area located outside of the reservoir watershed, consisting of percolation/evaporation ponds and a spray field.

Effluent from septic tanks in the upper campgrounds is routed to a holding tank at the Oak Knoll campground, located within 200 feet of the HWL. Wastewater from the Oak Knoll lift station is conveyed to the same offsite disposal area via a shared force main.

RWQCB Order No. 96-26 authorizes a maximum discharge of 36,000 gpd to the disposal area. Septic tanks are pumped annually, and biosolids are transported to the watershed for disposal.

Northshore S&B

The community of Northshore S&B (formerly known as Northshore Ski & Boat Club) is located about 4.3 river miles from the NWP intake structure. Wastewater is collected via less than 1 mile of collection line into three 1,500 gallon septic tanks that operate in series, followed by an effluent tank. Effluent is pumped from this tank approximately 700 ft. to a leach field that is served by an eight line distribution box. The tanks are located 20 ft. above and within 100 ft. horizontally of the HWL. The leach field is located 47 ft. above and within 500 ft. horizontally of the HWL. System design capacity is 10,000 gpd, with actual flows ranging from 1,500 gpd in the off-season to 5,000 gpd during peak usage. The septic tanks are pumped once per year. Although the facility is located near the HWL, it is approximately six river miles away from the NWP intake structure.

Cappy Culver Elementary School

Cappy Culver Elementary School is located in the north part of the Village of Heritage Ranch, slightly more than 1 mile away from the HWL at its closest point. The school is regulated by SWRCB 97-010-DWQ.

Individual homes and private businesses

Individual septic systems are used in the communities of Cal Shasta Club, Christmas Cove, Ranchos del Lago, Running Deer Ranch, South Shore Village, Tri Counties Ski and Boat Club, portions of Heritage Ranch, and in all other individual lots. These lots and communities are scattered along both the north and the south shore of the reservoir. All such systems are located on parcels that are at least one acre in size.

Two private campgrounds and several ranches and wineries are in the lower watershed, several miles away from the reservoir, which also utilize septic systems.

Depending upon the age of the local site development around the lake, many of the individual sewage disposal systems were installed before meaningful code requirements were adopted and/or enforced. Many of the older improvements were not installed in conformance with current stringent County and State percolation testing and sewage system design requirements.

Chemical toilets

Lake Nacimiento Resort

Monterey County Parks Department (MCPD) owns portable chemical toilets which are placed around the recreation area as needed, including the north shore day use area as well as the more heavily used beaches at the resort on the south shore. MCPD owns a pumper truck and services the toilets as needed. Waste is disposed into the resort septic system. (Staff, Personal Communication)

Fort Hunter Liggett

Troop training exercises are held in the Nacimiento River watershed on FHL more than 25 miles from the NWP intake structure. Chemical toilets are used when troops are in the field. Although hunting and fishing are allowed on FHL, there are no permanent facilities for sportsmen, but chemical toilets are set up for large events (e.g. fishing derby). All chemical toilets are pumped out and the waste is disposed of in the FHL wastewater treatment plant which is located outside the Nacimiento River watershed (Dunphy).

Campground Restrooms

The Lake Nacimiento Resort is located less than one mile from the NWP intake structure and is served by a community septic system operated by Monterey County Parks staff. The resort includes seven campgrounds, with the number of available sites and amenities varying by season. During the summer peak, more than 300 campsites are open, supported by 33 flush toilets and 8 chemical toilets, as shown in Table 1.

Table 1: Nacimiento Resort Campgrounds

CAMPGROUND	Camp Sites	Flush Toilets (Vault)	Chemical Toilets	Showers	Fresh Water	Comments
Eagles Ridge	60	0	6	No	Yes	Walk-in Sites
Oak Knoll	40	5	0	Yes	Yes	Boat Trailer Spaces
Pine Knoll	120	8	0	Yes	Yes	Close to Water Access
Quails Roost	60	8	0	Yes	Yes	Not Recommended for RVs/Trailers
Rocky Canyon	14	6	0	Yes	Yes	Group Sites; Tent Camping Only
Sandy Point	12	6	2	Yes	Yes	Single and Group Sites
TOTAL	**306**	**33**	**8**			

Floating Toilets

Floating toilets (FTs) remain a concern in the Nacimiento watershed (see Figure 6). They are placed at various locations around the reservoir - including the Marina, Oak Shores, Bee Rock, and Dip Creek - with the number and placement changing seasonally based on lake levels and demand (see Figure 7). During peak season, they are cleaned at least twice a week, holding tank levels are checked at each cleaning, and pump-outs occur as needed.

Replacing FTs with onshore chemical toilets has been considered, but maintenance and access challenges make this difficult. Most shoreline property is privately owned, and servicing land-based units would require extensive agreements and coordination. The State provides grant funding for FTs to encourage boaters to use them rather than discharging waste into the lake, and Monterey County staff prefer maintaining FTs over not having facilities available.

Further evaluation is needed because the draft *Guidelines for Evaluating Applications for Recreational Use Permits at Domestic Water Supply Reservoirs* (November 15, 2020) state that floating restrooms should be prohibited unless special approval is obtained from California Department of Public Health (CDPH).

Figure 6: Example of a Nacimiento Reservoir Floating Toilet

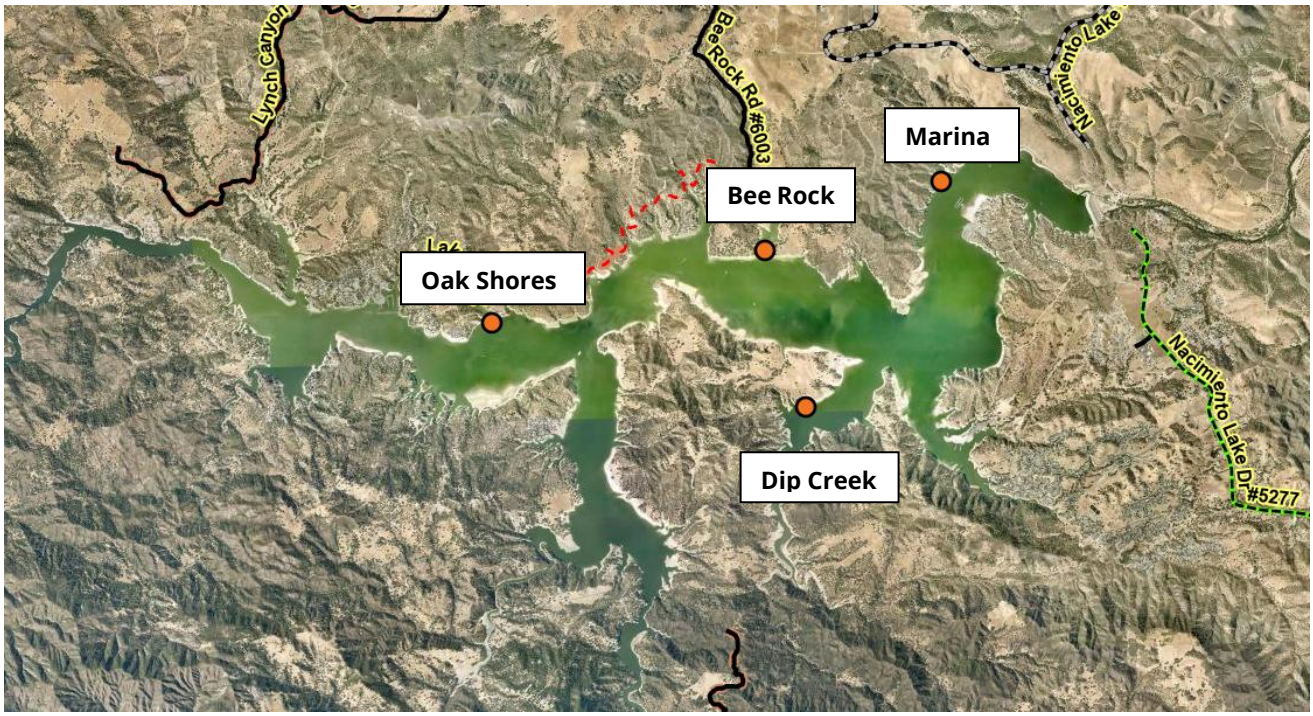

Figure 7: Floating Toilet Locations

Vault toilets

There are public campgrounds in the upper watershed, more than 40 miles from the NWP intake structure. Located in the Los Padres National forest, adjacent to the Nacimiento River, these campgrounds are small and used seasonally. Some of these campgrounds have vault toilets that are maintained by National Forest Service staff. (San Luis Obispo County Flood Control and Water Conservation District)

Urban Areas

Possible contaminants such as nutrients, pathogens, and trash are a concern from urban runoff. The two largest population centers in the Nacimiento Reservoir watershed are the two private residential communities of Heritage Ranch and Oak Shores; both are located adjacent to the reservoir itself. Storm drains installed around the lake direct storm water flow directly to Nacimiento Reservoir. While a few storm drains may have an oil separator, most do not.

Fueling Stations

The Lake Nacimiento Resort public recreation area has a fueling station for boats located on the reservoir. Two fuel pumps are located on the docks at the resort marina (Figure 8). Two double-walled 12,000 gallon underground storage tanks that service these pumps are located beneath the marina parking lot (Figure 9). A double-walled pipeline runs underground from the storage tanks for approximately 100 yards to a junction box. A flexible triple-walled fuel line runs above ground from the junction box along the shore to the fuel pumps on the dock (Figure 10, Figure 11).

The distance from the junction box to the pumps varies as the lake elevation changes; it can range from less than 25 yards to approximately 400 yards. The lines are inspected at least daily, and the entire system is inspected monthly. Boaters fill their vessels over open water.

Figure 8: Fuel pumps on Lake Nacimiento Resort docks

Figure 9: Underground fuel storage tanks loading ports at Lake Nacimiento Resort

Figure 10: Lines that run to Lake Nacimiento Resort docks

Figure 11: Lines to Lake Nacimiento Resort docks

The Oak Hill Commercial Center located at the north end of Heritage Ranch has a vehicle fueling station with four pumps. Three double-walled storage tanks; one has a capacity of 20,000 gallons, and the other two each have a capacity of 6,000 gallons. The station is located approximately 1.2 linear miles from the HWL of Nacimiento Reservoir.

Pesticide/Herbicide Use

Agriculture as well as pesticide and herbicide use are present throughout the watershed. Crops include barley, fava beans, grapes, olives, peaches, persimmons, pomegranate, walnuts, and industrial hemp shown in APPENDIX B. Over 2,400 events of pesticide and herbicide use were registered between 2021 and 2025. Pesticide and herbicide usage is required to be reported to the County of San Luis Obispo Agriculture Commissioner's Office. A Summary of Pesticide and herbicide usage and the acreage treated can be seen below (Table 2). During the past five years, on average, 14,600 acres per year, or about 7.0 percent of the watershed has been affected by pesticide usage. Over the last five years we can see a rise in the number of pesticides being used (see Figure 12: Pesticide/Herbicide Annual Usage Graph).

Table 2: Summary of Pesticide Treated Amounts

Summary of All Pesticide Usage 2021 - 2025			
Year	**Treated Area (Acres)**	**Treated Amount (Gallons)**	**Treated Amount (Pounds)**
2021	11150	2131	7100
2022	13801	2987	7788
2023	15873	2822	8075
2024	15395	2439	11410
2025	16622	3346	10678
Average	**14568**	**2745**	**9010**
Total	**72840**	**13725**	**45051**

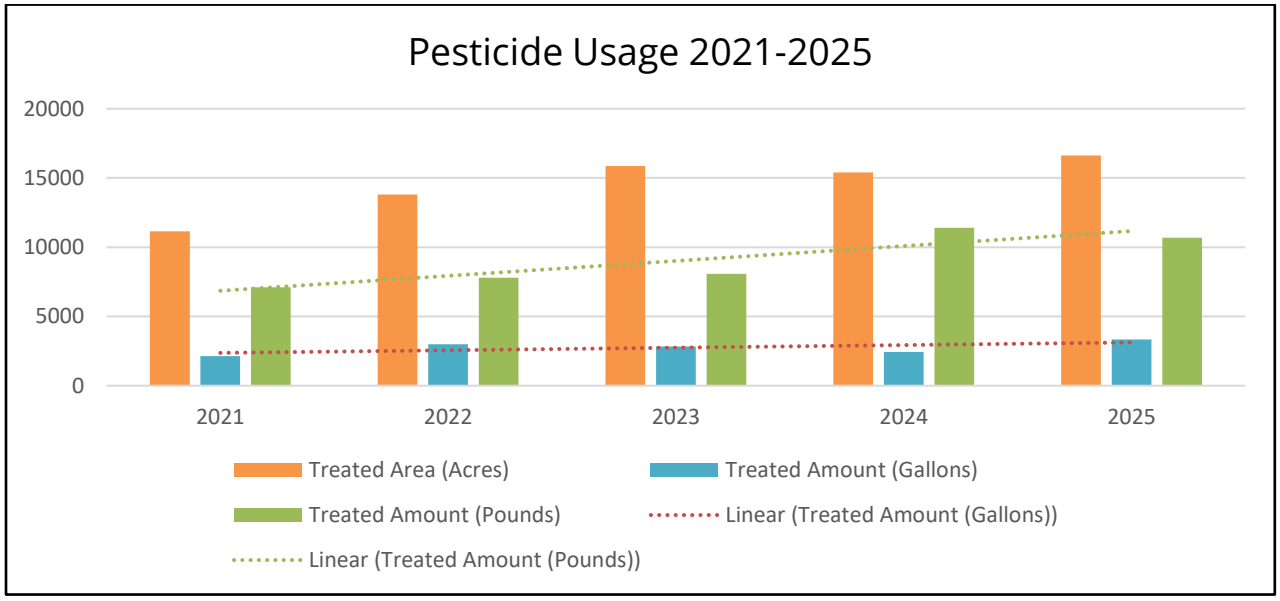

Figure 12: Pesticide/Herbicide Annual Usage Graph

Grazing Animals

Cattle are present throughout the watershed year-round and are frequently observed very close to, or directly in, the reservoir. County staff have documented cattle along the north and south shores, the Las Tablas and Snake Creek arms, the stretch of Las Tablas Creek from the Klau and Buena Vista mine site to the reservoir, and the north shore of the Nacimiento River near the Narrows. No fencing or other barriers prevent cattle from accessing the water.

Cattle grazing can introduce contaminants such as Giardia and *E. coli*, and their activity can increase turbidity and nutrient levels, promoting nuisance algal growth that can affect water treatment processes.

Despite these sightings, cattle numbers are relatively small compared to the size of the watershed. Only one instance of cattle near the dam or intake structure has been recorded; Monterey County was notified and cattle were removed from the area.

Mines

Active

The Lime Mountain Company is an active open-pit calcium carbonate mine located in the lower watershed, at Lime Mountain, approximately 4 miles south of Nacimiento Reservoir. The mine continues to operate. No updated information could be found on the mine, but recent state and county records confirm ongoing compliance and operational status. The mine is inspected annually by the San Luis Obispo County Department of Planning and Building, acting as an agent of the California Department of Conservation, Office of Mine Reclamation. The State Office of Mine and Reclamation requires the County to conduct annual mine inspections for all active mines within the unincorporated areas of the county. These inspections include on-site visits to ensure that the mines are operating within their approved boundaries and following the requirements of their approved reclamation plans. The operational standard remains "zero-discharge," with all stormwater and operational runoff managed through on-site detention basins to prevent sediment or mineral discharge into the Nacimiento Reservoir watershed (County of San Luis Obispo, 2014).

Inactive

The Klau and Buena Vista Mines, located about six miles south of Nacimiento Reservoir in the Las Tablas Creek drainage, have been inactive since 1970 but remain a health concern due to mercury contamination. Mercury from the mines migrated into Las Tablas Creek and ultimately settled in reservoir sediments. The site is now a federal Superfund cleanup area, with ongoing investigation and long-term remediation planning.

Past EPA actions have included stabilizing mine features, reducing acid mine drainage, removing 120,000 cubic yards of contaminated material to an on-site repository (2000), stabilizing a sinkhole and slope failure (2002), and removing the former mercury processing building and contaminated soils (2006). Contaminated materials remain temporarily capped pending final cleanup.

While the lake's water is generally considered safe for swimming and drinking (after treatment), the mercury in the lakebed undergoes a biological process that makes it dangerous to consume certain fish. The Office of Environmental Health Hazard Assessment and the County have issued a fish advisory for the Nacimiento Reservoir (Figure 13).

A map of active and inactive mines in the lower watershed is shown in Figure 14.

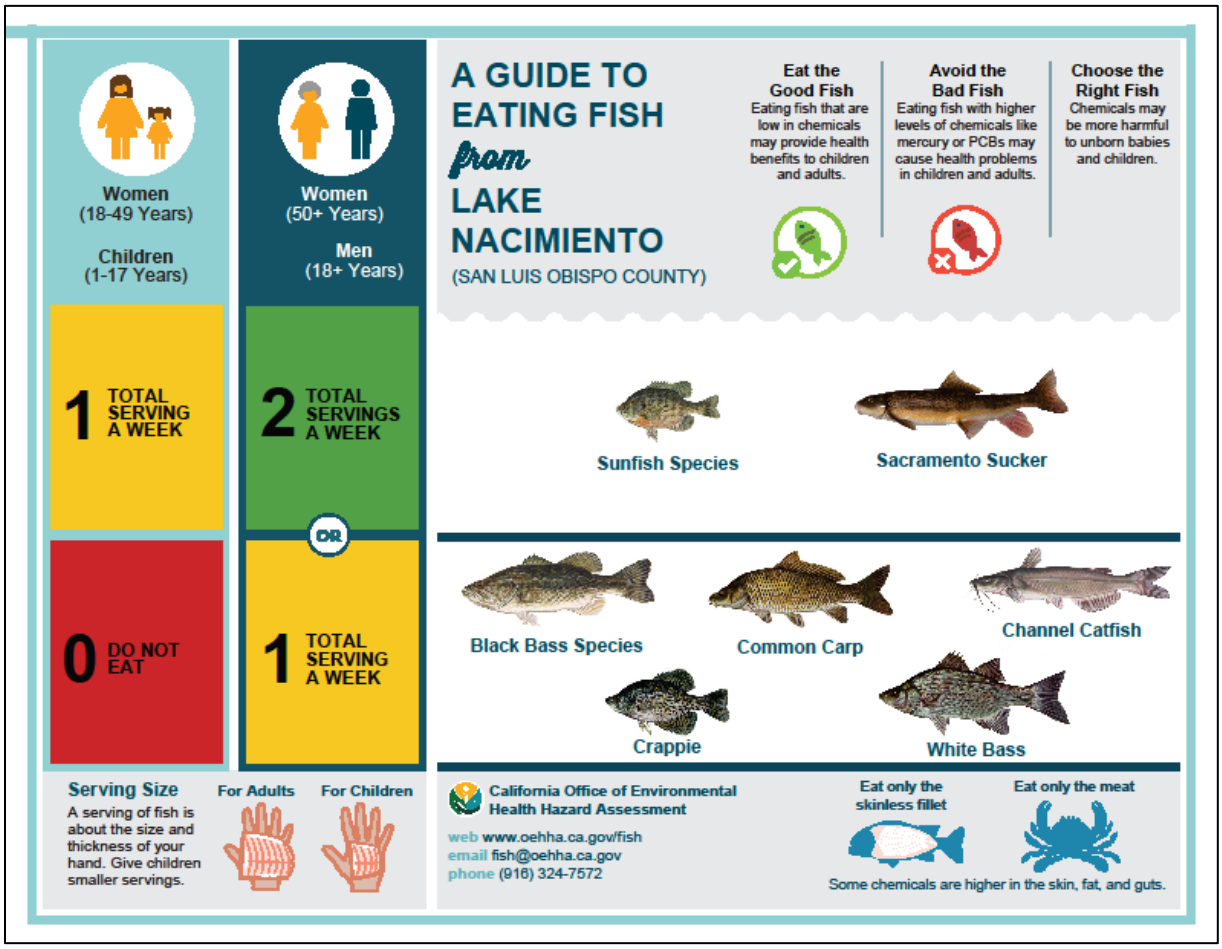

Figure 13: Guide to Eating Fish from The Nacimiento Reservoir

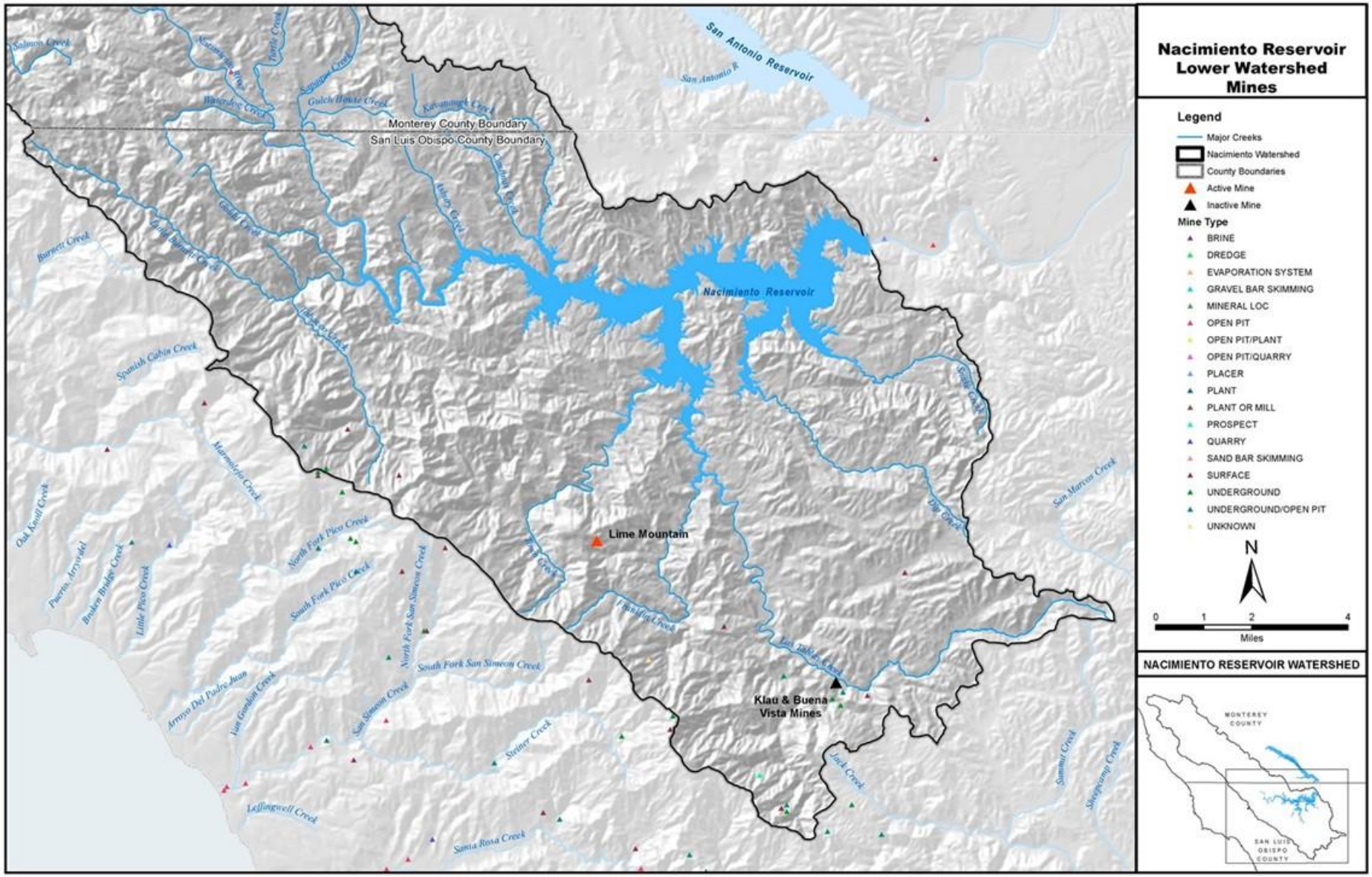

Figure 14: Lower Watershed Mines

Landslides

The majority of the Nacimiento Lower Watershed has a high to moderate potential for landslides which have the potential to contribute large amounts of suspended solids to the reservoir in a short period of time. See the map in APPENDIX C.

Fires

The Nacimiento Reservoir Lower Watershed is at high or very high risk for fire (See the map in APPENDIX D). Severe wildfires can remove vegetation cover and organic soil horizons, increasing surface runoff and soil erodibility. These effects can degrade water quality, increase turbidity, contribute to reservoir sedimentation, and impair aquatic habitat and infrastructure performance.

Floods[3]

Nacimiento Dam is classified as "Extremely High" downstream hazard potential dam by the Division of Safety of Dams of the California Department of Water Resources. A 2017 State law (Calif. Water Code Sections 6160-61) requires that an Emergency Action Plan and dam failure inundation maps be prepared for all dams so classified. The Monterey County Water Resources Agency has prepared maps to fulfill this requirement. These flood inundation maps are based on the latest flood simulation models and are estimates of the maximum flood depth, the flood arrival time, and the flood recession time that would occur in two different scenarios: an embankment failure at Nacimiento Dam, and a spillway failure at Nacimiento Dam. See the map in APPENDIX E and APPENDIX F.

Earthquake Faults

Geologic fault hazards, including seismic events and fault displacement, can adversely affect watershed. Ground shaking and surface rupture may destabilize slopes, increasing the likelihood of landslides, accelerated erosion, and elevated sediment loading to streams and reservoirs. Fault activity may also disrupt groundwater systems by modifying subsurface flow paths, damaging aquifer formations, or altering the location and discharge rates of springs. Seismic events can further compromise water infrastructure, including pipelines, dams, intake structures, and treatment facilities, increasing the potential for contamination, service disruptions, and reduced system reliability. A fault hazard map is provided in APPENDIX G.

3 Monterey County's website: *https://www.co.monterey.ca.us/government/government-links/water-resources-agency/projects-facilities/dams-and-reservoirs/inundation-maps*

Recreation

The majority of the Nacimiento Reservoir watershed is open space. Nacimiento Reservoir allows for many types of recreation, both on shore and on the water, including camping, hiking, horseback riding, fishing, boating, swimming, water skiing, and personal watercraft use.

Some limited recreation occurs in the rest of the watershed, including camping in the upper reaches of the watershed in the Los Padres National Forest, hunting and fishing on Fort Hunter Liggett, and two small private camps in the lower watershed, several miles away from the reservoir.

Nacimiento Reservoir is one of only a few drinking water supply reservoirs in the State of California where body contact recreation is allowed. Because body contact recreation is allowed, Nacimiento Reservoir attracts water skiers, wake boarders, swimmers, and waders from throughout the state and beyond, as well as many local visitors who enjoy these activities in the remote reservoir's natural beauty, generally calm water, large wide-open spaces, numerous coves, and warm weather.

While these uses enhance public enjoyment, increased human and vessel activity can influence water quality through fuel and oil residues, shoreline erosion, sediment disturbance, invasive species introduction, and localized bacterial inputs, particularly during peak recreation seasons. Proper management, public education, and enforcement of boating and sanitation regulations are essential to protect the lake as a surface drinking water source while allowing safe recreational use. See Figure 15 for a map of the Lake Nacimiento Campgrounds.

Figure 15: Lake Nacimiento Campgrounds

Precipitation

Over the past five years, the Nacimiento Reservoir has received approximately 67 inches of rainfall, with most precipitation occurring from October through March. Annual totals ranged from 16.5 inches in 2021 to 6.9 inches in 2022. Monthly precipitation data for 2021–2025 are summarized in Table 3 (MCWRA Dam and Reservoir Daily Data) and Table 4 (SLO County Water Station 703).

The watershed lies in the rain shadow of the Santa Lucia Range, where historical average annual precipitation is highest along the western crest (35–55 inches per year) and decreases eastward to about 14 inches at the dam (Figure 16). Nearly all precipitation falls as rain, with occasional snow at higher elevations. The region's Mediterranean, semi-arid climate brings cool, wet winters and hot, dry summers, with temperatures ranging from below freezing to over 100°F (USDA Forest Service; USDI National Park Service).

The Nacimiento river is the only tributary with a stream gauge, operated by the U.S. Geological Survey at the 800-foot elevation. Because the steep upper watershed receives the most intense rainfall, runoff responds rapidly to storms, causing sharp increases and decreases in flow. Summer flows typically drop to zero, while winter flows often exceed 5,000 cubic feet per second. The highest recorded flow since monitoring began in 1971 was 36900 cubic feet per second in March 1995 (USGS website).

Table 3: Nacimiento Reservoir Precipitation Summary 2021-2025

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2021	8.35	0.01	0.69	0	0.01	0	0	0	0.01	1.67	0.07	5.68	16.5
2022	0.02	0	1.15	0.17	0	0	0.01	0.02	0.14	0.01	0.94	4.48	6.9
2023	6.72	1.92	4.5	0	0.21	0.01	0	0	0.02	0.01	0.38	2.07	15.8
2024	4.5	4.47	2.36	1.4	0.06	0	0	0	0.42	0	1.68	0.61	15.5
2025	0.56	2.62	1.88	0.42	0	0	0	0	0.18	1.17	2.64	2.65	12.1
Monthly Averages	4.0	1.8	2.1	0.4	0.1	0	0	0	0.2	0.6	1.1	3.1	66.9

Table 4: Station #703: Rocky Butte

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2021	15.16	0.16	1.77	0	0	0	0	0.12	0.04	5.84	1.36	19.4	43.9
2022	0.08	0	2.44	1.2	0	0	0	0	3.28	0	4.16	27.24	38.4
2023	27.4	8	27.64	0	0.44	0	0	0.56	0.44	0.16	5.16	21.28	91.1
2024	13.84	16.12	10.88	4.04	0.92	0	0	0	0	0	8.52	2.0	56.3
2025	0.28	16.08	8.12	0.44	0	0	0	0	0.47	3.47	10.64	17.18	56.7
Monthly Averages	11.35	8.07	10.17	1.14	0.27	0	0	0.14	0.85	1.89	5.97	17.42	286

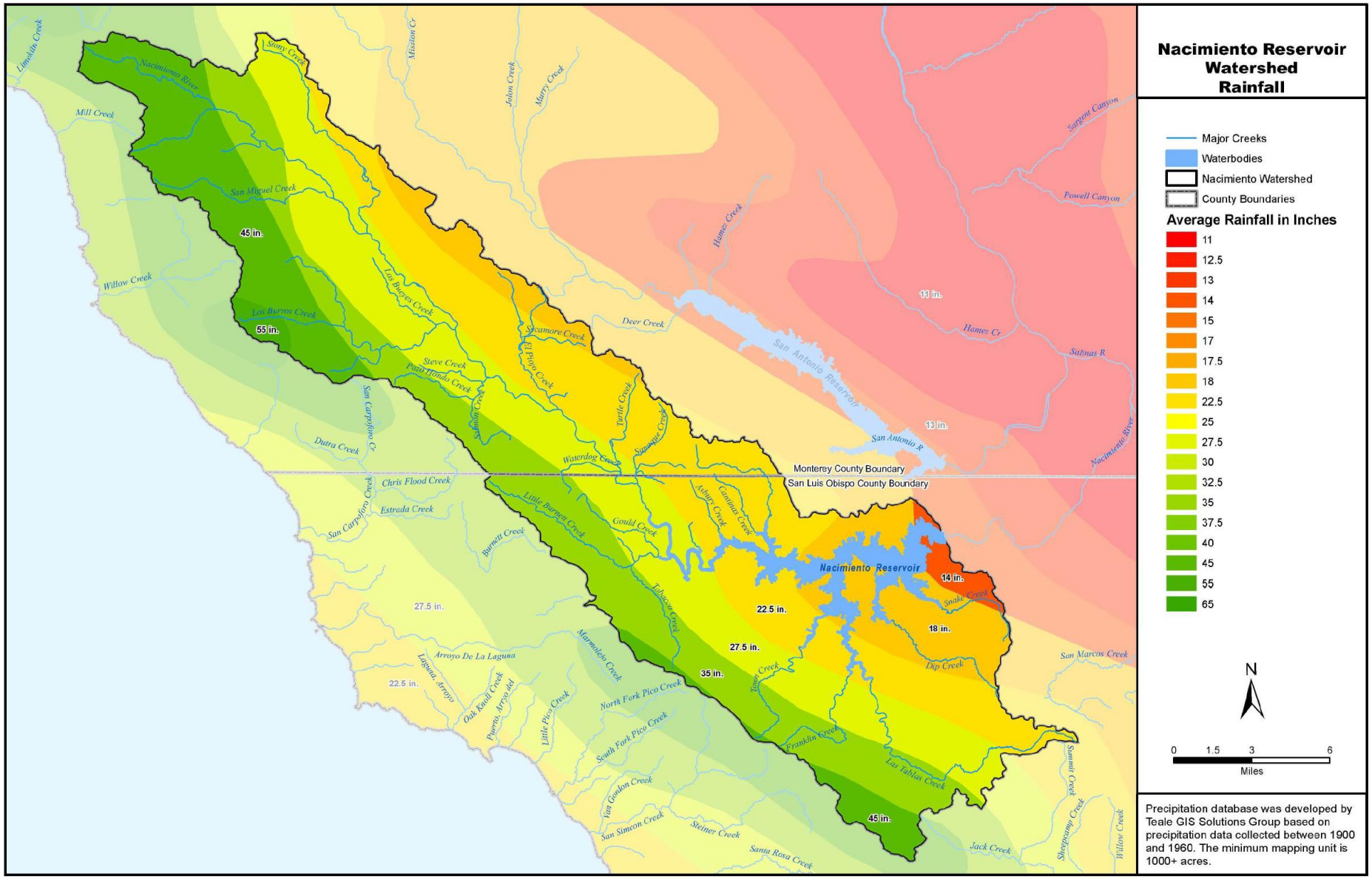

Figure 16: Nacimiento Reservoir Watershed Rainfall

WATERSHED QUALITY ASSESSMENT

This section will summarize water quality in the watershed based on analytical results and field inspections conducted over the past five years. The most significant impact on the watershed area during this monitoring period was the increase in rainfall after a long period of drought, which caused sediment to enter the reservoir and spike turbidity, microbial levels, and metal concentrations.

Data availability has decreased compared to the previous watershed survey due to reduced water levels from drought conditions during half of the monitoring period (2021-2023, see Figure 17) and the inability to take samples. Some monitoring has decreased since the previous watershed survey due to budget constraints affecting sampling and analytical efforts. However, other monitoring has been implemented such as increased watershed monitoring and additional nutrient monitoring.

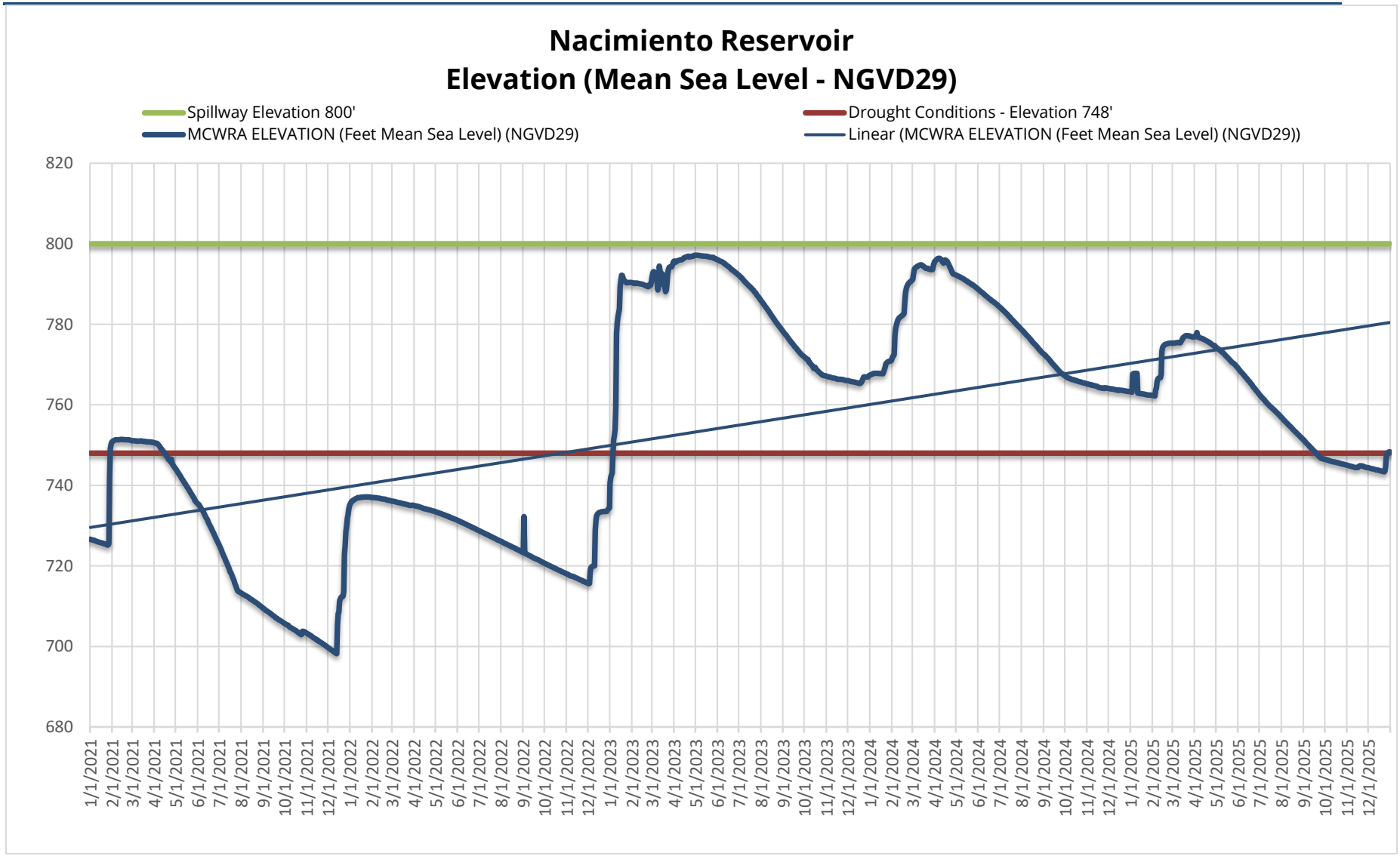

Figure 17: Nacimiento Reservoir Elevation

The sample locations include the raw water from the Intake Pumping Station (Nacimiento Reservoir Inlet), the elevation intakes collected at twenty-foot intervals (780' – 660', see Figure 18) from the reservoir log boom, and six watershed tributaries in the Nacimiento watershed (Dip Creek, Las Tablas Creek, Narrows, Snake Creek, Town Creek, and Kavanaugh Creek). Since the inflows are seasonal, analytical data for some of the elevation intakes and the tributaries may not be available for all sampling events. For Monitoring Locations, see Figure 19.

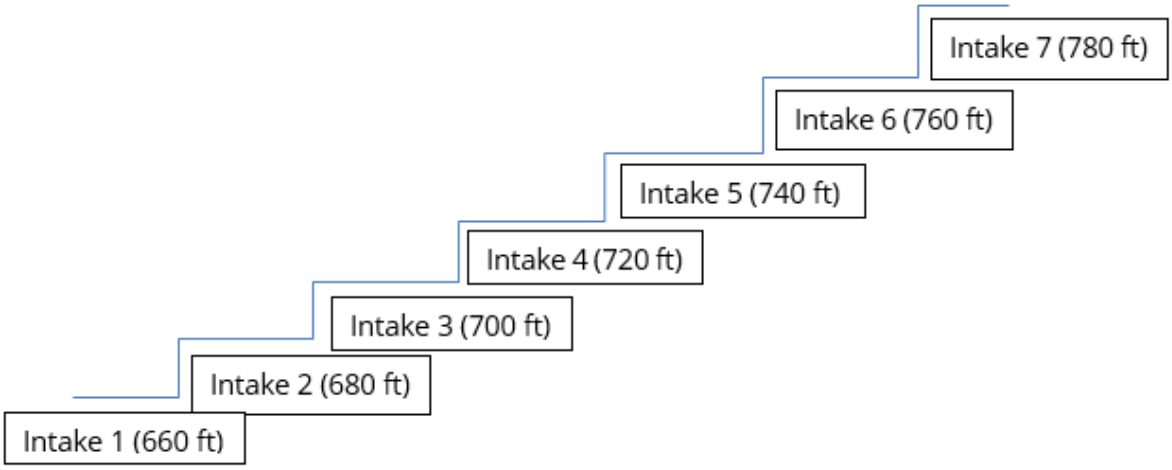

Figure 18: Nacimiento Reservoir Intake Elevations

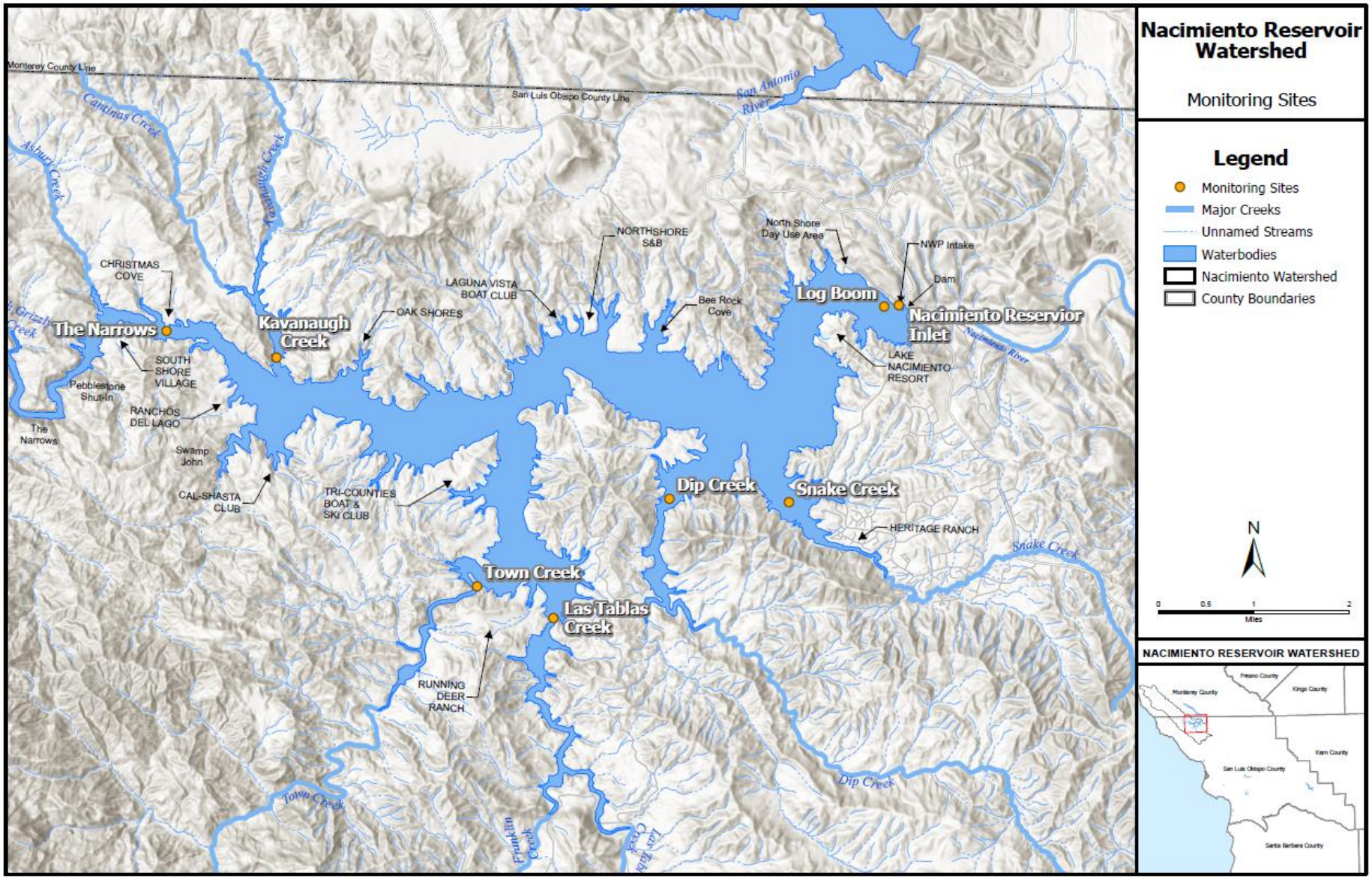

Figure 19: Monitoring Sites

Water Quality Monitoring Program

The following sample matrix summarizes routine sampling for the Nacimiento Reservoir watershed (See Table 5). If two are present, the monitoring schedule changed within the five-year period from the first to the second schedule.

Table 5: Water Quality Monitoring Matrix

Summary of Water Quality Monitoring	Nacimiento Reservoir Inlet	Reservoir Intake Elevations	Nacimiento Watershed Creeks
Bacteriological	Monthly	-----	-----
Odor	Monthly	Monthly	-----
Limnology	Monthly	Monthly	Annually
Algae/ Algal Toxins	Monthly	Monthly	-----
Aluminum, Iron, and Manganese	Quarterly/Monthly	Quarterly/Monthly	Annually
General Mineral/ Inorganic	Quarterly	-----	Annually
Nutrients	---/Annually	-----	---/Annually
Volatile Organic Carbons	Every 3 Years /Annually	-----	-----
SOC (Atrazine and Simazine)	Every 9 Years	-----	-----
123 TCP	Every 3 Years	-----	-----
Total Organic Carbon	Monthly	-----	---/Annually
Asbestos	Every 9 Years	-----	-----
Radiological	Every 9 Years	-----	-----

Monthly field inspections of artificial substrates are performed to monitor for the presence of invasive mussels. No invasive mussels have been detected.

SWRCB currently regulates 27 Volatile Organic Chemicals (VOCs) and 33 Synthetic Organic Chemicals (SOCs) in drinking water. In the Nacimiento Reservoir watershed, VOCs and SOCs which are most likely to contaminate the water are those associated with agricultural operations (pesticides), with urban land use (fire retardants and petroleum products), and with vessels (fuel). The Nacimiento Reservoir was granted a waiver from monitoring most of the SOCs in 2013. Monitoring has been reduced to atrazine and simazine every 9 years and 1,2,3-Trichloropropane (123 TCP) every 3 years. Compliance monitoring for VOCs changed from every 3 years to annually. Samples were collected at the Nacimiento Reservoir Inlet and there were no detections for VOCs and SOCs.

Asbestos was last sampled in May 2019. No asbestos was detected. Asbestos is required every 9 years.

Radiological testing for gross alpha-emitting elements (which include the alpha emitting radioactive elements Radium-226, Radium-228, and Uranium-238) is conducted every 9 years on the raw water. Radiological monitoring was completed in 2019. The gross alpha was 2.220 +/- 0.849 picocuries per liter (pCi/L), which is a unit used to measure radioactivity in water. The

result was well below the EPA's maximum contaminant level (MCL) of 15 pCi/L for gross alpha radiation.

Constituents of Concern

Microbial

Under the Surface Water Treatment Rule (SWTR), water systems using lakes, rivers, or reservoirs must address microbial risks by ensuring effective filtration and disinfection to remove or inactivate pathogens, including bacteria, viruses, and protozoa such as *Cryptosporidium* and *Giardia*. Systems are required to monitor source and treated water, use indicator organisms like *E. coli* to detect contamination, and maintain operational controls to prevent microbial intrusion, including managing runoff, protecting watershed areas, and mitigating algal blooms. The rule ensures that surface water sources deliver safe, pathogen-free drinking water to consumers.

Inorganics and Metals

Metals enter the reservoir through storm runoff, geological erosion, and agricultural activities. Heavy metals including arsenic, aluminum, and mercury are primary concerns within a watershed due to their ability to bioaccumulate in sediments and aquatic life. Unlike microbial pollutants, these metals do not degrade over time, posing persistent neurological and toxicological risks to human health and ecosystems. Iron and manganese can promote the growth of iron bacteria which can cause corrosion in the pipeline and can also produce undesirable tastes and odors in finished water.

Nutrients

Treated wastewater disposal and agricultural activities, including cattle grazing and field crop fertilization, can contribute nutrients to both surface water and groundwater supplies. Nutrient loading can trigger algal growth, which depletes dissolved oxygen and stresses aquatic habitats. The appearance of blue-green algal blooms is an indication that the nutrient levels in the watershed have increased.

Algae

Algae in a watershed and lake can significantly impact water quality and ecosystem health. Excessive algal growth, especially during nutrient-rich conditions, can alter the physical characteristics of the water, causing green or brown discoloration, unpleasant odors, and increased turbidity, which reduces light penetration and affects aquatic life. Of particular concern are Harmful Algal Blooms (HABs), which produce toxins that threaten human health, wildlife, and livestock. HABs can disrupt recreational use, damage water treatment processes, and cause long-term ecological imbalances, making their prevention, monitoring, and management critical for maintaining safe and clean water supplies.

Organics

Organic contaminants in surface water, particularly pesticides and herbicides from agricultural runoff, are a major concern for drinking water sources because they can be toxic to humans and aquatic life even at low concentrations. Additionally, natural organic matter (measured as total

organic carbon, TOC) in the water can react with disinfectants like chlorine during treatment to form disinfection byproducts (DBPs), including trihalomethanes (THMs) and haloacetic acids (HAA5), which pose long-term health risks. These combined issues make careful monitoring, watershed management, and treatment processes essential to ensure safe drinking water.

Microbiological Summary

Total coliform and *E. coli* concentrations are monitored monthly at the Nacimiento Reservoir Inlet as a potential indicator of pathogens in raw water delivery. Nacimiento watershed creeks were monitored for coliforms prior to 2021 and there were no significant contributions to the reservoir. There were no Nacimiento watershed creeks monitored for coliforms during this period.

The Surface Water Treatment Rule (SWTR) was implemented in June 1989 to reduce illnesses caused by pathogens in drinking water. The disease-causing pathogens include *Legionella*, *Giardia lamblia, and Cryptosporidium*. The Nacimiento Reservoir monitored the Long Term 2 Enhanced Surface Water Treatment Rule (LT2) from 2014 through 2017. No *Giardia* or *Cryptosporidium* were detected for all the monthly collections during this monitoring period.

A total of 60 bacteriological samples were collected from the raw water between 2021 and 2025. The average raw water total coliform was 1605 MPN/100mL and ranged from 8.5 to 24,000 MPN/100mL. The average raw water *E. coli* was < 1 MPN/100mL and ranged from < 1 to 10 MPN/100mL. The highest total coliform was observed during a 40-foot intake elevation change. Typically, the intakes were changed one 20-foot elevation at a time. Coliforms were higher during the winter months as rainfall contributed to an increase in runoff and microbiological concentrations. Overall, coliform results are acceptable and do not pose a significant impact on water treatment by NWP participants. Total coliform and *E. coli* levels are shown in Table 6, Figure 20 and Figure 21.

Table 6: Raw Water Intake in Use Coliform Summary 2021-2025

Date	Total Coliforms (MPN/100 mL)	*E. coli* (MPN/100mL)
Minimum	8.5	< 1
Maximum	24000	10
Average	1605	< 1
Median	390	< 1
Count	60	60

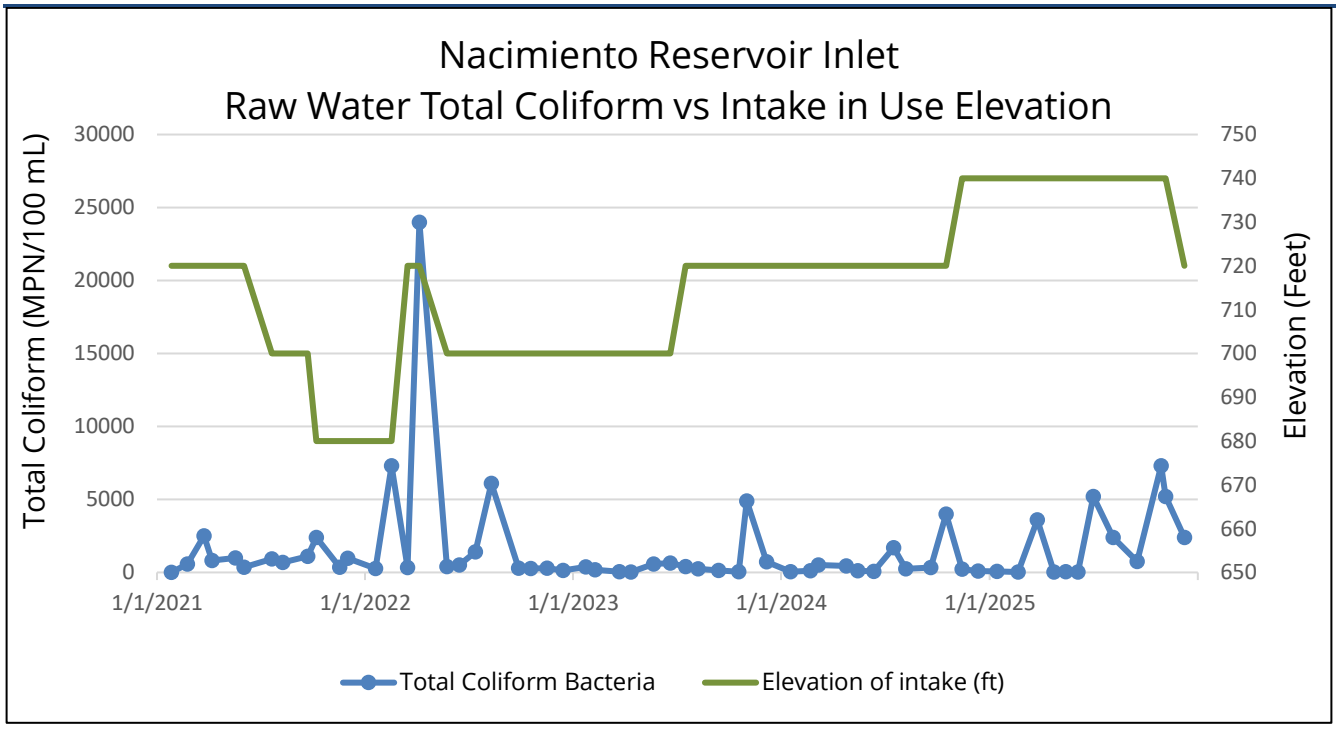

Figure 20: Total Coliform vs Intake in Use Elevation

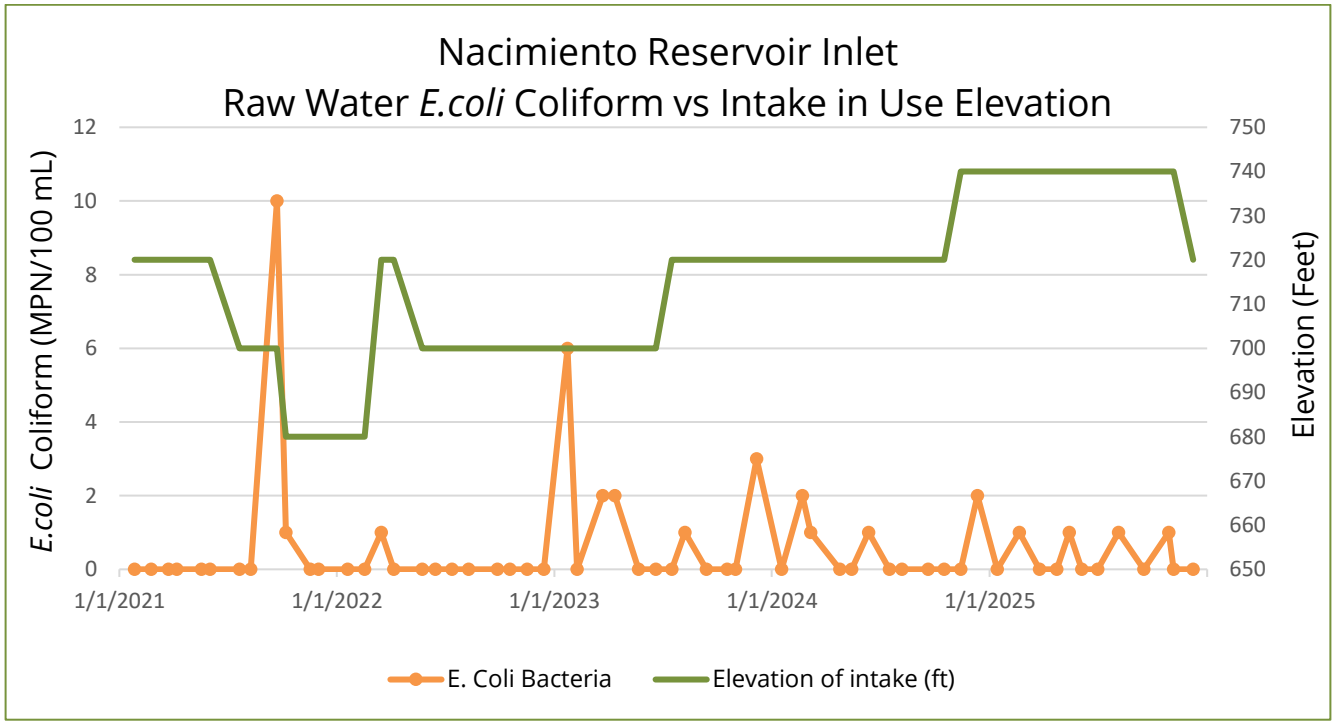

Figure 21: E. Coli Coliform vs Intake in Use Elevation

See Table 7 below for a summary of bacteriological data separated by the intake elevations. As water levels decreased, fewer intakes were available for collection. Total coliforms vary greatly in individual intakes and throughout the months.

Table 7: Intake Elevation Bacteriological Data Summary 2021 – 2025

Site	Calculation	Total Coliform (MPN/100mL)	*E. coli* (MPN/100mL)
Intake 2 (680')	Minimum	280	< 1
	Maximum	7300	1
	Average	2264	< 1
	Median	980	< 1
	Count	5	5
Intake 3 (700')	Minimum	21	< 1
	Maximum	6100	10
	Average	821	1.2
	Median	390	< 1
	Count	17	17
Intake 4 (720')	Minimum	8.5	< 1
	Maximum	24000	3
	Average	1842	< 1
	Median	390	< 1
	Count	25	25
Intake 5 (740')	Minimum	17	< 1
	Maximum	7300	2
	Average	1922	< 1
	Median	230	< 1
	Count	13	13

Nutrients Summary

Nutrient monitoring in the Nacimiento watershed initially included only nitrite, nitrate, and TOC. The Nacimiento Reservoir Inlet was sampled monthly for TOC and quarterly for nitrite and nitrate as part of the General Mineral analysis, while watershed creeks, Dip Creek, Las Tablas, and the Narrows, were monitored annually for nitrite and nitrate. In 2023, nutrient monitoring expanded to include three additional creek sites: Kavanaugh Creek, Snake Creek, and Town Creek. Beginning in 2025, the nutrient program was further updated to add additional nutrient constituents to the annual monitoring schedule for both the Reservoir Inlet and watershed creeks. In December 2025, monitoring frequency was revised again, establishing monthly nutrient sampling at the Nacimiento Reservoir Inlet and quarterly sampling for the watershed creeks.

Nitrogen and phosphorus are monitored to assess nutrient loading and reduce the potential for algal growth. EPA guidelines recommend total phosphorus levels in lakes and reservoirs remain below 0.025 mg/L (EPA Quality Criteria for Water, 1986) and drinking water nitrate levels remain below 10 mg/L. Nutrient results from the Nacimiento Reservoir have consistently met these recommendations, with most constituents either below guideline levels or non-detect. At the Reservoir Inlet, no detections above state reporting limits were observed for nitrite, nitrate, total nitrogen, total phosphorus, or total reactive phosphorus. Detectable nutrients included ammonia, Total Kjeldahl Nitrogen, total organic carbon, and total organic nitrogen. In the watershed creeks, ammonia, nitrite, nitrate, total phosphorus, and total nitrogen were all non-detect. A summary of nutrient data is provided in Table 8.

Table 8: Nutrient Data Summary

Site	Calculation	Ammonia as Nitrogen (mg/L)	Nitrite as Nitrogen (mg/L)	Nitrate as Nitrogen (mg/L)	Total Phosphorus as P (mg/L)	Total Reactive Phosphorus as P (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)	Total Organic Carbon (mg/L)	Total Organic Nitrogen (mg/L)
Nacimiento Reservoir Inlet - Raw	Minimum	-	< 0.10	< 0.10	-	-	-	-	1	-
	Maximum	-	< 0.40	0.38	-	-	-	-	5.8	-
	Average	-	< 0.40	< 0.40	-	-	-	-	3.8	-
	Median	0.063	< 0.40	< 0.40	< 0.05	< 0.05	0.26	< 1.0	3.6	0.18
	Count	1	20	20	1	1	1	1	59	1
Watershed - Dip Creek	Minimum	-	< 0.10	0.17	-	-	-	-	-	-
	Maximum	-	< 0.40	0.17	-	-	-	-	-	-
	Average	-	< 0.40	< 0.40	-	-	-	-	-	-
	Median	< 0.030	< 0.40	< 0.40	< 0.023	-	0.16	< 1.0	2.8	0.16
	Count	1	5	5	1	0	1	1	1	1
Watershed - Kavanaugh Creek	Minimum	-	< 0.40	< 0.40	-	-	-	-	-	-
	Maximum	-	< 0.40	< 0.40	-	-	-	-	-	-
	Average	-	< 0.40	< 0.40	-	-	-	-	-	-
	Median	< 0.030	< 0.40	< 0.40	< 0.023	-	0.31	< 1.0	2.8	0.31
	Count	1	3	3	1	0	1	1	1	1
Watershed - Las Tablas Creek	Minimum	-	< 0.40	< 0.40	-	-	-	-	-	-
	Maximum	-	< 0.40	< 0.40	-	-	-	-	-	-
	Average	-	< 0.40	< 0.40	-	-	-	-	-	-
	Median	< 0.030	< 0.40	< 0.40	< 0.023	-	0.18	< 1.0	2.9	0.18
	Count	1	5	5	1	0	1	1	1	1
Watershed - Snake Creek	Minimum	-	< 0.40	< 0.40	-	-	-	-	-	-
	Maximum	-	< 0.40	< 0.40	-	-	-	-	-	-
	Average	-	< 0.40	< 0.40	-	-	-	-	-	-
	Median	< 0.030	< 0.40	< 0.40	< 0.023	-	0.18	< 1.0	2.8	0.18
	Count	1	3	3	1	0	1	1	1	1
Watershed - The Narrows	Minimum	-	< 0.40	< 0.40	-	-	-	-	-	-
	Maximum	-	< 0.40	< 0.40	-	-	-	-	-	-
	Average	-	< 0.40	< 0.40	-	-	-	-	-	-
	Median	< 0.030	< 0.40	< 0.40	< 0.023	-	0.29	< 1.0	2.2	0.29
	Count	1	5	5	1	0	1	1	1	1
Watershed - Town Creek	Minimum	-	< 0.40	< 0.40	-	-	-	-	-	-
	Maximum	-	< 0.40	< 0.40	-	-	-	-	-	-
	Average	-	< 0.40	< 0.40	-	-	-	-	-	-
	Median	< 0.030	< 0.40	< 0.40	< 0.023	-	0.14	< 1.0	2.9	0.14
	Count	1	3	3	1	0	1	1	1	1

Limnology Summary

The County of San Luis Obispo monitors the Nacimiento reservoir monthly and uses the limnological data to assess seasonal variability in water quality. The data is used to select the Nacimiento Reservoir intake(s) with the best quality water for delivery to the participating water agencies. Limnological monitoring (turbidity, temperature, dissolved oxygen, pH, and visibility) was conducted monthly at the reservoir intake structure at 5' intake elevations.

A thermocline forms gradually in March and April, and the reservoir becomes stratified, peaking in late summer from July to September. The thermocline appears at depths of approximately 20 to 40 feet during the summer months. In the fall, the thermocline gradually disappears. From December to January, temperatures are typically uniform throughout the water column.

As the thermocline develops, dissolved oxygen is highest at the surface, then decreases significantly through the thermocline. From 2021-2022, there were cooler temperatures and noticeable DO depletion past the thermocline. From 2023-2025, temperatures remained stable past the thermocline and there was slightly more DO available throughout the water column. Occasionally, in the summers from 2023-2025, the DO would decline and then increase slightly again. The intakes in use pulled raw water near the surface of the reservoir to remain as close as possible above the thermocline where there was more adequate DO. See Appendix H for the Nacimiento Reservoir Temperature and Dissolved Oxygen Profiles. A summary of field limnology data can be found below in Table 9.

Turbidity measures the cloudiness of water and serves as an indicator of water quality and filtration effectiveness. Higher turbidity levels are often linked to increased concentrations of disease-causing microorganisms, including viruses, parasites, and certain bacteria. These organisms can lead to symptoms such as nausea, cramps, diarrhea, and headaches. Runoff from rain events significantly contribute to increased turbidity as shown in Figure 22. The Drinking Water Primary Maximum Contaminant Level (MCL) for turbidity is determined by treatment techniques, while the Secondary MCL is set at 5 NTU (Nephelometric Turbidity Units) and are used here to aid in treatment decisions of the raw water from the Nacimiento Water Project.

Table 9: Nacimiento Reservoir Limnology Summary

Site	Calculation	Depth (ft)	Dissolved Oxygen (mg/L)	pH-field	Temp (°C)	Turbidity-field (NTU)
Nacimiento Reservoir Inlet - Raw	Minimum	2	2.38	7.12	10.5	1.2
	Maximum	95	9.91	8.54	22.3	56
	Average	40	5.87	7.74	15.5	8.9
	Median	30	5.75	7.74	15	4.2
	Count	60	60	60	60	60
Intake 1 (660')	Minimum	40	0.02	6.99	9.3	1.5
	Maximum	140	9.25	8.72	21.6	130
	Average	95	3.31	7.56	12.7	13
	Median	100	3.11	7.46	12.4	8.3
	Count	60	59	59	59	60
Intake 2 (680')	Minimum	20	0.04	7.01	9.5	1.7
	Maximum	120	9.05	8.63	23.8	66
	Average	75	3.49	7.52	13.1	11
	Median	80	3.29	7.49	12.2	6
	Count	60	59	59	59	60
Intake 3 (700')	Minimum	2	0.05	7.08	9.8	1.5
	Maximum	95	9.11	8.41	25.4	100
	Average	55	4.41	7.56	13.6	10
	Median	60	4.65	7.54	12	4.5
	Count	60	60	60	60	60
Intake 4 (720')	Minimum	2	0.25	7.09	10.1	0.97
	Maximum	75	9.91	8.57	26.1	100
	Average	42	5.38	7.68	14.2	8.7
	Median	45	5.59	7.64	12.3	3
	Count	52	52	52	52	52
Intake 5 (740')	Minimum	2	1.64	7.33	10.9	0.98
	Maximum	55	11.3	8.38	24.7	98
	Average	32	5.98	7.76	14.9	9.8
	Median	30	6.13	7.72	13.3	2.4
	Count	39	39	39	39	39
Intake 6 (760')	Minimum	2	1.35	7.34	11	0.58
	Maximum	35	9.85	8.58	27.7	100
	Average	19	6.49	7.96	16.6	11
	Median	15	6.68	7.87	14.4	2.3
	Count	31	31	31	31	31
Intake 7 (780')	Minimum	2	5.98	7.78	11.1	1.6
	Maximum	15	9.42	8.66	27.1	99
	Average	10	7.84	8.26	18.9	17
	Median	10	7.7	8.27	18.8	2.3
	Count	15	15	15	15	15

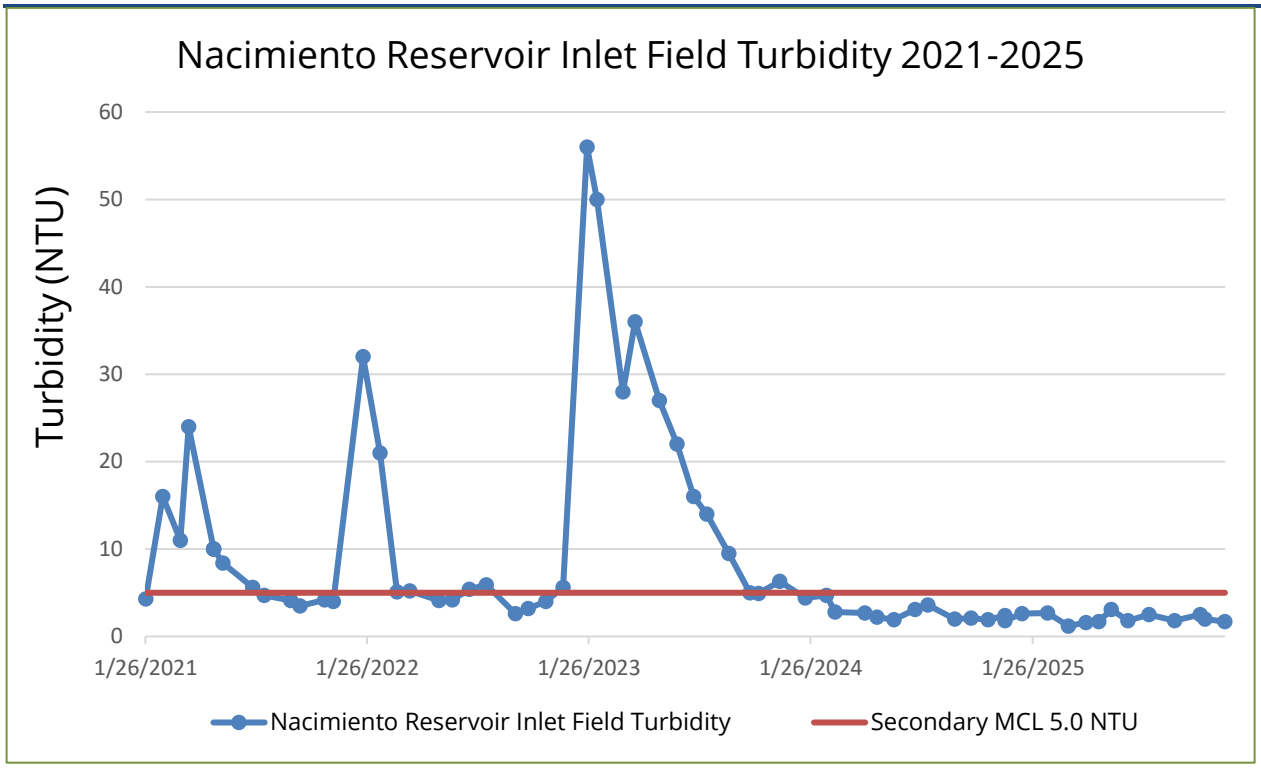

Figure 22: Nacimiento Reservoir Inlet Field Turbidity 2021-2025

Physical Summary

From 2021-2025, odors at the reservoir intakes ranged from not detected (ND) to 50 TON and at the Nacimiento Reservoir Inlet ranged from ND to 30 TON. At the Nacimiento Reservoir Inlet, there was one instance of a sulfur odor collected when the intake in use DO was below 0.5 mg/L and the odor was 30 TON. On average, odors at the Nacimiento Reservoir Inlet were reasonably low at 3.0 TON and the majority of the odor samples were described as fishy, earthy, and grassy. The Drinking Water Secondary MCL for Odor is 3.0 TON. Objectionable tastes and odors in domestic water supplies are often related to the occurrence of low oxygen levels and/or algal blooms. See data summary Table 10 below for the Nacimiento Reservoir Inlet and Reservoir Intakes in and the Nacimiento Reservoir Inlet Odors in Figure 23.

The apparent color is often impacted by turbidity, as shown in Figure 24. For efficiency, the apparent color was reduced in the monitoring schedule from monthly to annually, as this constituent can be echoed in field turbidities.

Table 10: Summary of Physical Data Raw Water Intake in Use

Site	Calculation	Apparent Color (PCU)	Odor (TON)
	MCL	—	3
	DLR	—	1
Nacimiento Reservoir Inlet - Raw	Minimum	9	ND
	Maximum	72	30
	Average	26	3
	Median	20	2
	Count	36	60
Intake 1 (660')	Minimum	8	ND
	Maximum	100	50
	Average	32	3
	Median	26	2
	Count	33	60
Intake 2 (680')	Minimum	7	ND
	Maximum	97	4
	Average	29	2
	Median	22	2
	Count	33	60
Intake 3 (700')	Minimum	7	1
	Maximum	110	50
	Average	27	3
	Median	20	2
	Count	33	60
Intake 4 (720')	Minimum	7	1
	Maximum	110	50
	Average	26	3
	Median	18	2
	Count	26	52
Intake 5 (740')	Minimum	7	ND
	Maximum	110	10
	Average	39	2
	Median	33	2
	Count	13	39
Intake 6 (760')	Minimum	7	ND
	Maximum	110	4
	Average	38	2
	Median	29	2
	Count	10	31
Intake 7 (780')	Minimum	7	1
	Maximum	110	4
	Average	38	2
	Median	25	2
	Count	8	15

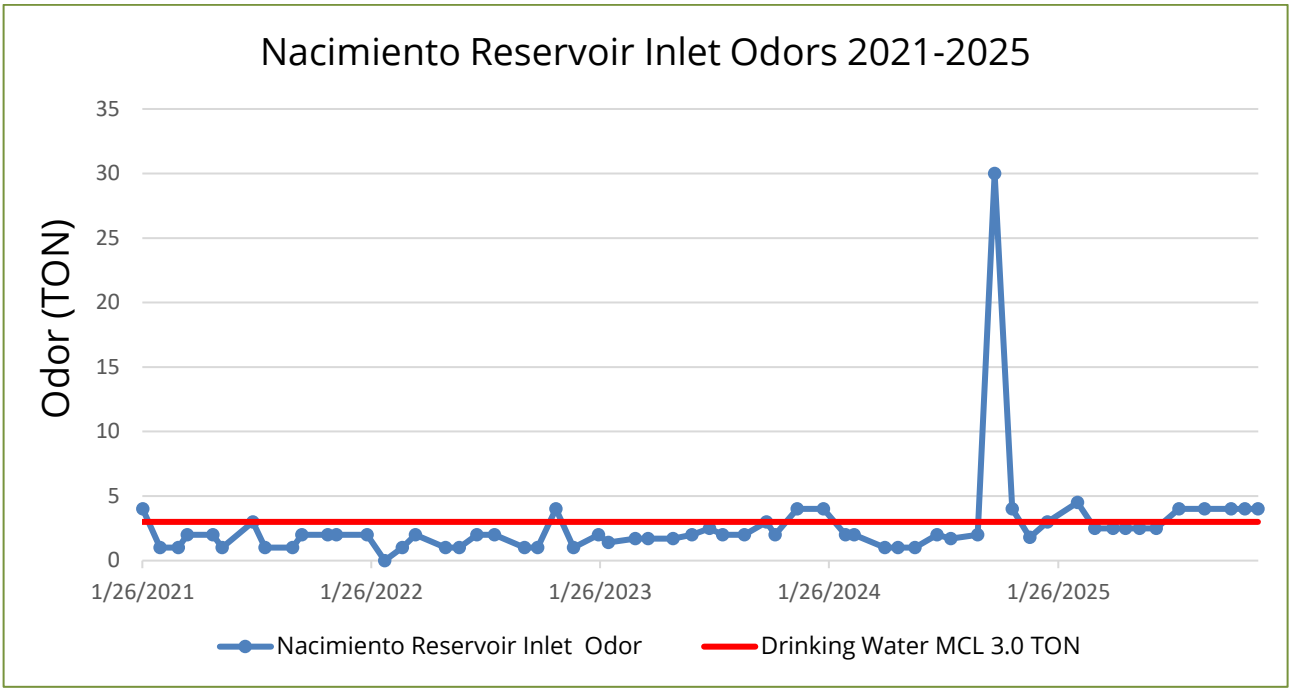

Figure 23: Nacimiento Reservoir Inlet Odors

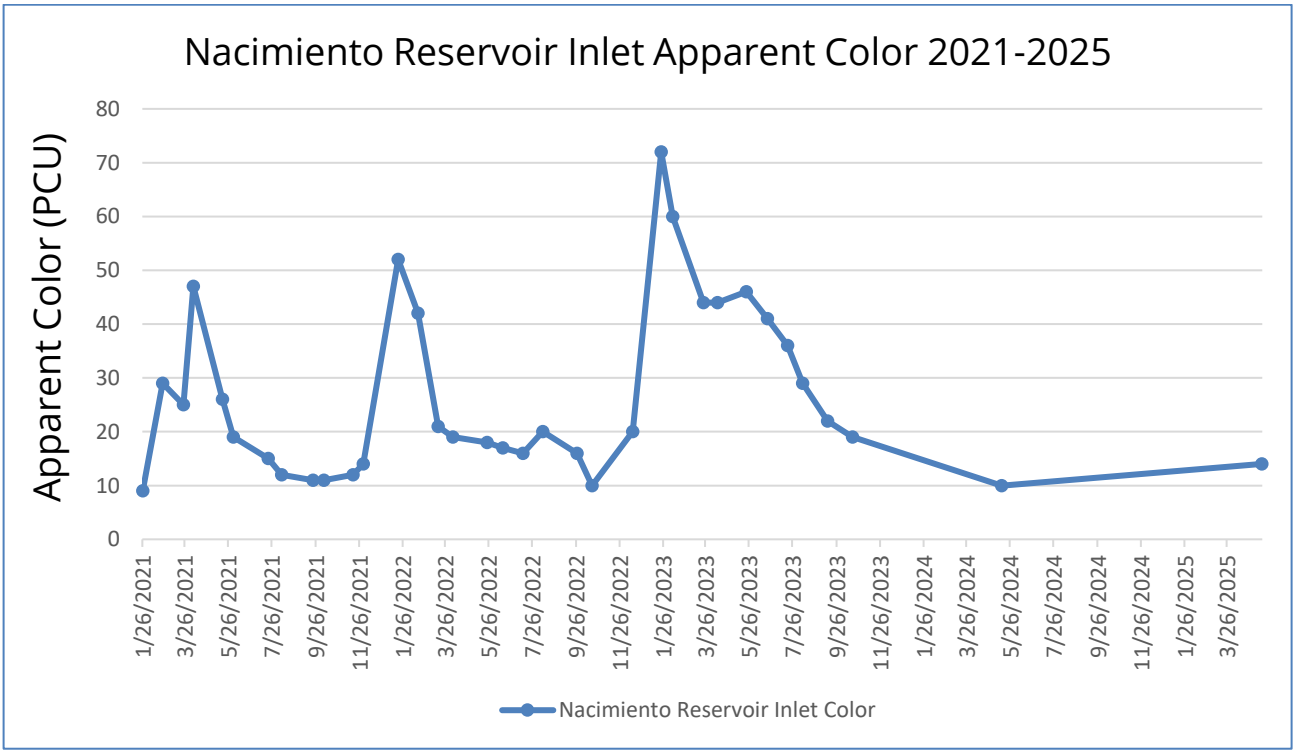

Figure 24: Nacimiento Reservoir Inlet Apparent Color

Algae Summary

Algae are aquatic plants. Phytoplankton are microscopic algae which float freely in water. Other algae are macroscopic and may attach to surfaces. Algae can cause a multitude of problems in surface water treatment plants, drinking water distribution, and become a health risk if algal toxins are produced. Algae type, quantity, and behavior can each affect the level of concern. Generally, algae counts under 5000 Cells/mL are not problematic. Some selected algal genera of concern are shown in Table 11 below.

Table 11: Selected Algal Genera and Water Quality Issues[4]

Algal Genus	Water Quality Issues				
	Taste & Odor	Filter-& screen clogger	Dermatoxin	Hepatotoxin	Neurotoxin
Blue-Greens (cyanobacteria)					
Anabaena	x	x	x	x	x
Anabaenopsis			x	x	
Aphanizomenon	x		x	x	x
Cylindrospermopsis			x	x	x
Lyngbya (Plectonema)	x		x	x	x
Microcystis			x	x	x
Oscillatoria	x		x	x	x
Diatoms					
Asterionella	x	x			
Cymbella		x			
Fragilaria		x			
Navicula		x			
Synedra	x	x			
Tabellaria	x	x			
Flagellates					
Ceratium	x	x			
Greens					
Chlorella		x			
Dinobryon	x	x			
Pandorina	x				
Spirogyra		x			
Staurastrum	x				
Trachelomonas		x			

4 Standard Methods of the Examination of Water and Wastewater, 19th edition
https://www.nalms.org/getting-to-know-cyanobacteria-the-basics-blooms-toxins-and-taxa-text/

Samples were collected monthly from the Nacimiento Reservoir Inlet and reservoir intakes at twenty-foot intervals. Enumeration and classification of algae have helped with early detection of HABs. Total algae counts at the Nacimiento Reservoir Inlet ranged from not detected to 16,000 cells/mL. The maximum blue greens were 900 cells/mL, diatoms were 16,000 cells/mL, green algae was 3,800 cells/mL. See Table 12 for Algae Count Data Summary.

Algae are found throughout the water column year-round. Higher algae levels generally occur in the upper level of the water column between April and November. On average, the Nacimiento Reservoir Inlet and reservoir intakes total algae were below 800 cells/mL. See Figure 25 for an overview of the total algae monitored from the Nacimiento Reservoir Inlet and Intakes.

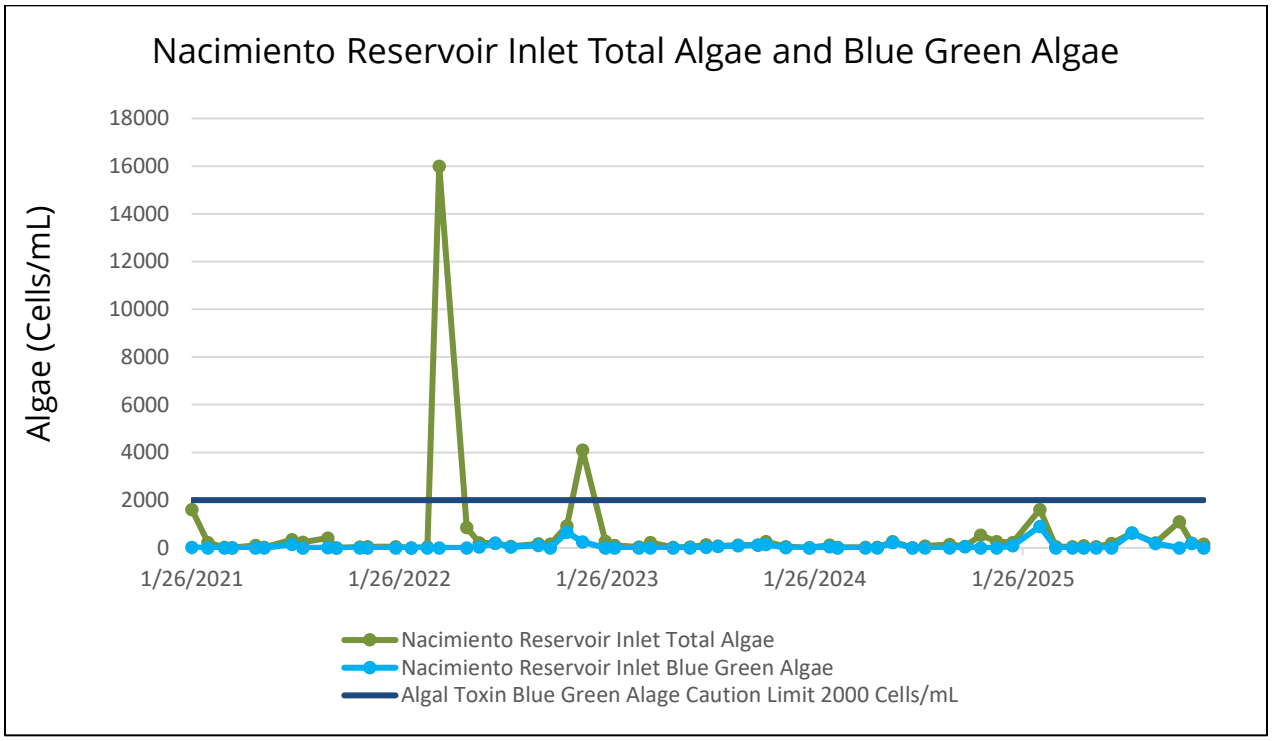

Figure 25: Nacimiento Reservoir Inlet Total Algae and Blue Green Algae

Table 12: Algae Count Data Summary

Site	Calculation	Total Algae Count (Cells/mL)	Blue-green Algae (Cells/mL)	Cryptomonads (Cells/mL)	Diatoms (Cells/mL)	Dinoflagellates (Cells/mL)	Flagellates (Cells/mL)	Goldens (Cells/mL)	Greens (Cells/mL)
Nacimiento Reservoir Inlet - Raw	Minimum	0	0	0	0	0	0	0	0
	Maximum	16000	900	300	16000	78	91	450	3800
	Average	556	70	20	301	3	3	11	146
	Median	115	0	5	0	0	0	0	16
	Count	60	60	60	60	60	60	60	60
Intake 1 (660')	Minimum	0	0	0	0	0	0	0	0
	Maximum	12000	12000	160	310	9	48	30	3900
	Average	495	337	13	17	0	2	1	126
	Median	78	0	1	0	0	0	0	13
	Count	60	60	60	60	60	60	60	60
Intake 2 (680')	Minimum	0	0	0	0	0	0	0	0
	Maximum	4900	4900	160	550	78	71	30	4000
	Average	404	210	18	25	2	3	1	144
	Median	95	0	3.5	0	0	0	0	20.5
	Count	60	60	60	60	60	60	60	60
Intake 3 (700')	Minimum	0	0	0	0	0	0	0	0
	Maximum	6100	5400	250	440	130	70	60	1600
	Average	441	274	17	17	4	3	2	122
	Median	97	0	5	0	0	0	0	22
	Count	60	60	60	60	60	60	60	60
Intake 4 (720')	Minimum	3	0	0	0	0	0	0	0
	Maximum	17000	2800	260	17000	25	36	73	1700
	Average	756	266	20	357	2	2	4	106
	Median	145	0	8	3	0	0	0	26
	Count	52	52	52	52	52	52	52	52
Intake 5 (740')	Minimum	3	0	0	0	0	0	0	0
	Maximum	4900	4800	110	210	30	29	180	1600
	Average	456	288	25	22	2	1	15	105
	Median	160	0	18	0	0	0	0	24
	Count	39	39	39	39	39	39	39	39
Intake 6 (760')	Minimum	6	0	0	0	0	0	0	0
	Maximum	7900	7800	110	1600	24	30	260	380
	Average	673	498	27	65	1	1	20	63
	Median	130	0	18	6	0	0	0	30
	Count	31	31	31	31	31	31	31	31
Intake 7 (780')	Minimum	38	0	0	0	0	0	0	0
	Maximum	3400	890	210	110	88	18	3100	290
	Average	504	111	37	21	12	1	211	108
	Median	250	36	20	3	0	0	0	71
	Count	15	15	15	15	15	15	15	15

Algal Toxin Monitoring

When blue-green algae counts exceed 2000 cells/mL, algal toxin screens (Cylindrospermopsin and Microcystin) are performed and confirmed if algal toxins are present. The Nacimiento Reservoir Inlet blue-green algae count did not exceed 2000 cells/mL and no algal toxin screens were performed. For good measure, when blue-green algae counts exceeded in the reservoir intakes, most of the samples were analyzed for algal toxin screens and all analyzed samples resulted in non-detects, see Table 13 for a summary of algae counts and algal toxin data.

Table 13: Potential Harmful Algae Bloom - Data Summary

Date	Location	Total Algae Count (Cells/mL)	Blue-green Algae (Cells/mL)	Cylindrospermopsin Screen (ug/L)	Microcystin Screen (ug/L)
7/21/2021	Intake 3 (700')	6100	5400	< 0.5	< 0.5
7/13/2022	Intake 1 (660')	2200	2200	<0.6	<0.8
7/13/2022	Intake 4 (720')	2000	1900	<0.6	<0.8
9/27/2022	Intake 3 (700')	2200	2000	< 0.6	< 0.8
9/27/2022	Intake 4 (720')	3000	2800	< 0.6	< 0.8
11/16/2022	Intake 1 (660')	12000	12000	< 0.5	< 0.4
9/13/2023	Intake 2 (680')	4900	4900	—	—
9/13/2023	Intake 6 (760')	5100	5100	—	—
10/18/2023	Intake 5 (740')	4900	4800	< 0.6	< 0.5
10/18/2023	Intake 6 (760')	7900	7800	< 0.6	< 0.5
9/16/2025	Intake 5 (740')	2700	2600	—	—

Metals Summary

Iron, Manganese, and Aluminum

Iron, manganese, and aluminum are abundant at the Nacimiento Reservoir. At the Nacimiento Reservoir Inlet and intake elevations, iron and manganese were monitored monthly (2021–2025), while aluminum shifted from quarterly to monthly monitoring in 2023.

The Drinking Water Secondary MCL for Iron is 300 µg/L and for Manganese is 50 µg/L. The Drinking Water Primary MCL for Aluminum is 1,000 µg/L and Secondary MCL is 200 µg/L. See Figure 26 and Figure 27 for graphs of the Nacimiento Reservoir Inlet compared to the primary and secondary MCLs.

At greater depths, oxygen depleted, and the concentration of iron and manganese increased. On average, aluminum, iron and manganese at the Nacimiento Reservoir Inlet met the secondary limits, with manganese at the maximum limit. In general, higher levels of aluminum are present in the winter months and at less depths. Elevated aluminum, iron and manganese levels were a result of stormwater runoff. The optimal water quality on average for aluminum, iron and manganese were between intake elevations 720 feet to 780 feet. A Summary of aluminum, iron and manganese can be found in Table 14.

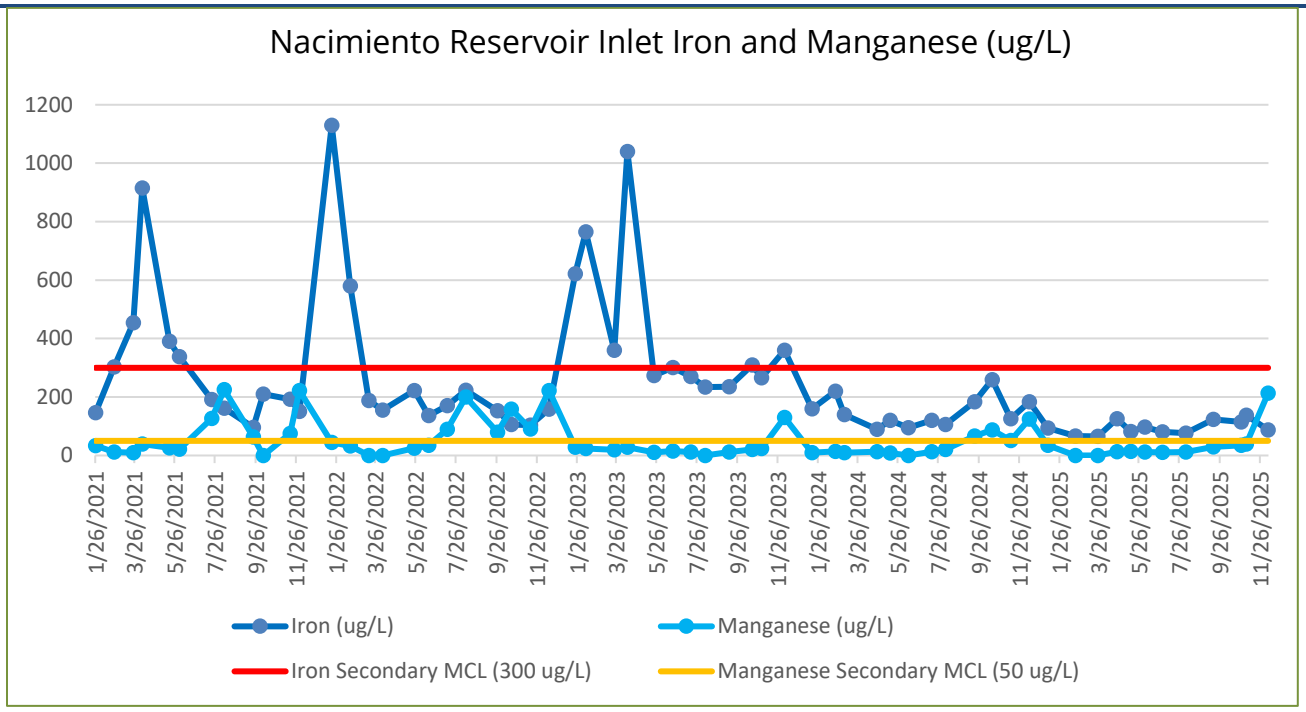

Figure 26: Nacimiento Reservoir Inlet Iron and Manganese

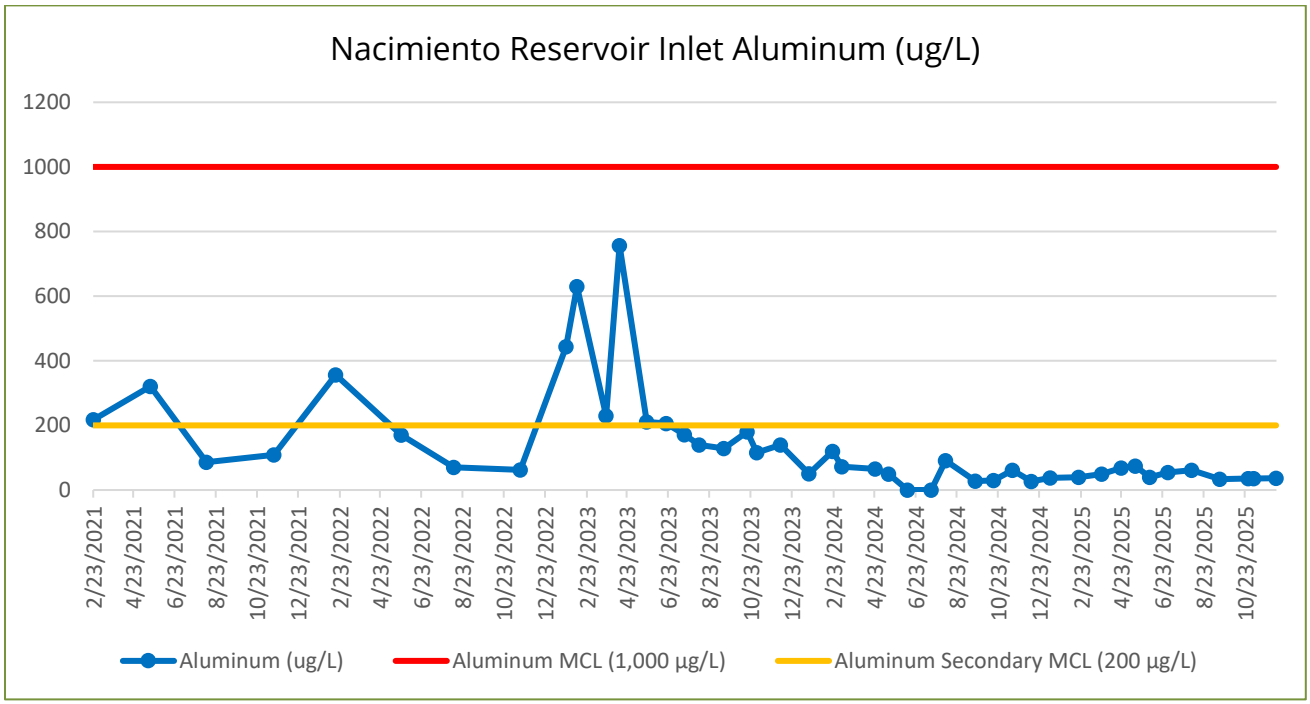

Figure 27: Nacimiento Reservoir Inlet Aluminum

Table 14: Aluminum, Iron, and Manganese Summary

Site	Calculation	Aluminum (ug/L)	Iron (ug/L)	Manganese (ug/L)
	MCL/MCL-2*	1000/200*	300*	50*
	DLR	50	100	20
Nacimiento Reservoir Inlet - Raw	Minimum	ND	65.3	ND
	Maximum	757	1130	225
	Average	134	248	50
	Median	71	167	24
	Count	44	60	60
Intake 1 (660')	Minimum	ND	26.1	ND
	Maximum	689	1210	1500
	Average	149	389	201
	Median	89.4	283	55.2
	Count	36	60	60
Intake 2 (680')	Minimum	ND	21.8	ND
	Maximum	665	1160	1860
	Average	152	307	131
	Median	70.8	221.5	32.6
	Count	36	60	60
Intake 3 (700')	Minimum	ND	27.6	ND
	Maximum	763	1010	447
	Average	149	240	56.1
	Median	86.8	164	19
	Count	36	60	60
Intake 4 (720')	Minimum	ND	23.1	ND
	Maximum	739	1100	220
	Average	130	197	30
	Median	46	94	12.15
	Count	36	52	52
Intake 5 (740')	Minimum	ND	ND	ND
	Maximum	752	1120	220
	Average	127	191	22
	Median	40.5	64.4	7.14
	Count	36	39	39
Intake 6 (760')	Minimum	ND	ND	ND
	Maximum	746	1140	123
	Average	130	191	14
	Median	31.1	56	2.2
	Count	31	31	31
Intake 7 (780')	Minimum	ND	8	ND
	Maximum	1010	1330	36.6
	Average	208	284	7.5
	Median	45.9	54	0
	Count	15	15	15

Mercury

The Drinking Primary MCL for Mercury is 2 µg/L. Mercury was collected annually and there were no detections.

Trace Metals/Inorganics

Other metals are typically found in small (trace) amounts in water are monitored quarterly for the Nacimiento Reservoir Inlet. The summary can be found under General Minerals.

General Minerals

General mineral chemicals are general water quality indicators. If there is a change in these indicators this may indicate industrial, agricultural, grazing, or recreational runoff issues in the watershed.

Nacimiento Reservoir Inlet samples were collected quarterly for general mineral analysis. Most of the constituents met drinking water MCLs, turbidity was the only constituent over the drinking water secondary MCL. However, the raw water data is available to support treatment decisions. There were additional general mineral constituents monitored at Nacimiento Reservoir Inlet and no detections found for antimony, beryllium, cadmium, MBAS, perchlorate, PFAS, selenium, silver, TCP524, thallium, VOCs, and zinc.

From 2021-2025 general minerals were collected annually from the following three creek watershed sites: Dip Creek, Las Tablas, and the Narrows. In 2023, three new creek sites were added; Kavanaugh Creek, Snake Creek, and Town Creek. Most of the constituents met drinking water MCLs. Field pH and turbidity were the only constituents over drinking water MCLs. There were no detections in the Nacimiento watershed creeks for antimony, arsenic, beryllium, cadmium, chromium (VI), copper, cyanide, lead, MBAS, nickel, perchlorate, silver, thallium, and zinc. See Table 15 and Table 16 for general mineral data summary on the Nacimiento Reservoir Inlet and Nacimiento watershed creeks.

Table 15: Nacimiento Reservoir Inlet – Raw General Mineral Data Summary

Calculation	Aggressiveness I0ex	Arsenic (ug/L)	Barium (ug/L)	Boron (ug/L)	Calcium (mg/L)	Chloride (mg/L)	Chromium (ug/L)	Chromium (VI) (ug/L)	Copper (ug/L)	Cyanide (ug/L)	Electrical CoOuctivity (umhos/cm)	Fluoride (mg/L)	Langelier I0ex	Lead (ug/L)	Magnesium (mg/L)	Nickel (ug/L)	pH (SU)	Potassium (mg/L)	Sodium Adsorption Ratio	Sulfate (mg/L)	Total Alkalinity as CaCO3 (mg/L)	Total Dissolved Solids (mg/L)	Total Hardness as CaCO3 (mg/L)	Turbidity (NTU)
MCL/ *SMCL	—	10	1000	—	—	*500	50	10	*1000	150	*1600	2	—	15	—	100	8.5	—	—	*500	—	*1000	—	*5
DLR	—	2	100	—	—	—	10	0.1	—	100	—	0.1	—	—	—	10	—	—	—	—	—	—	—	—
Minimum	10.9	ND	26.0	ND	18.1	ND	ND	ND	ND	ND	200	ND	-1.2	ND	9.4	ND	6.57	1.0	0.17	20	62	140	88	2
Maximum	12.0	1.6	56.7	57.9	38.1	13.1	4.7	0.03	4.0	16.0	420	0.19	0.05	1.7	17.4	19.9	8.00	1.9	0.43	45	139	450	167	22
Average	11.5	0.52	38.7	38.5	27.6	4.9	0.25	0.01	0.35	0.89	283	0.07	-0.54	0.4	13.1	0.95	7.44	1.4	0.33	30	94	179	123	8
Median	11.6	ND	38.3	43.4	28.2	5.0	ND	ND	ND	ND	275	0.05	-0.42	0.5	13.1	ND	7.65	1.3	0.34	30	92	170	124	4
Count	20	19	20	20	20	20	30	3	21	18	20	20	19	19	20	21	19	20	17	20	20	20	20	5

Table 16: Watershed Creek General Mineral Data Summary

Site	Year	Aggressiveness Index	Aluminum (ug/L)	Barium (ug/L)	Boron (ug/L)	Calcium (mg/L)	Chloride (mg/L)	Chromium (ug/L)	Dissolved Oxygen (mg/L)	Electrical Conductivity (umhos/cm)	Fluoride (mg/L)	Iron (ug/L)	Langelier Index	Magnesium (mg/L)	Manganese (ug/L)	pH-field (SU)	Potassium (mg/L)	Sodium (mg/L)	Sodium Adsorption Ratio	Sulfate (mg/L)	Temperature (°C)	Total Alkalinity as CaCO3 (mg/L)	Total Dissolved Solids (mg/L)	Total Hardness as CaCO3 (mg/L)	Turbidity-field (NTU)
	MCL / *SMCL	—	1000/ *200	1000	—	—	*500	50	—	*1600	2	300	—	—	50	8.5	—	—	—	*500	—	—	*500	—	*5
	DRL	—	50	100	—	—	—	10	—	—	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Watershed - Dip Creek	2021	12.4	68.5	39.2	48.9	28.1	7	ND	—	—	ND	84.2	0.58	13.4	6.3	—	1.44	9.62	0.37	33	—	96	160	125	2.8
	2022	12.3	71.7	40.9	53.7	27.4	12	ND	8.93	—	0.14	118	0.56	13.5	17.3	8.28	1.71	8.09	0.32	29	25.5	93	170	124	5.1
	2023	12	52.4	27.5	33.7	21.9	4	ND	8.31	220	0.1	79.2	0.21	10.1	ND	8.43	1.28	7.17	0.32	24	24.6	67	180	96.3	3.5
	2024	12.4	66	31	ND	26	ND	1.1	9.12	250	0.1	78	0.56	12	3.7	8.63	1	8.3	—	29	23.2	84	170	110	3.3
	2025	12.3	44.9	37.4	43.8	28.6	5	ND	8.35	270	ND	42.9	0.41	13.8	ND	8.41	1.23	9.26	0.36	33	21.4	100	170	128	2.6
Watershed - Kavanaugh Creek	2021	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2022	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2023	12.2	38.5	28.7	34.7	24.1	4	ND	9.66	250	0.11	46.9	0.49	11.4	ND	8.59	1.27	8	0.34	27	26.1	74	150	107	3.4
	2024	12.5	58	31	ND	26	ND	1.1	9.48	260	0.1	78	0.65	12	8.9	8.73	ND	8.5	—	30	22.9	86	160	110	3.5
	2025	12.2	42.9	37.2	42.5	26.2	5	ND	7.02	270	0.1	66.8	0.32	13.9	12.7	8.37	1.14	9.39	0.37	32	20.7	101	170	123	3.7
Watershed - Las Tablas Creek	2021	12.3	51.9	41.1	48.5	28.9	7	ND	—	—	0.05	68.6	0.44	13.7	8.7	8.44	1.44	10	0.38	34	—	101	160	129	2.6
	2022	12.5	54	45	54.6	28.4	12	ND	8.67	—	0.14	42.2	0.66	13.8	13.4	8.03	1.88	9.82	0.37	32	24.3	104	190	133	3.8
	2023	12.5	33.2	30.6	35.8	25.5	4	ND	9.12	250	0.11	43.5	0.77	11.6	ND	8.87	1.3	8.01	0.33	31	25.6	72	180	111	2.4
	2024	12.6	44	34	ND	29	ND	1.2	9.22	280	0.11	61	0.81	13	8.7	8.8	1.1	8.6	—	37	23.9	91	180	130	2.5
	2025	12.3	46.6	37.6	43.2	26.3	ND	ND	8.46	270	0.14	50.4	0.46	13.5	ND	8.49	1.18	9.42	0.37	34	22	98	170	121	2.9

Site	Year	Aggressiveness Index	Aluminum (ug/L)	Barium (ug/L)	Boron (ug/L)	Calcium (mg/L)	Chloride (mg/L)	Chromium (ug/L)	Dissolved Oxygen (mg/L)	Electrical Conductivity (umhos/cm)	Fluoride (mg/L)	Iron (ug/L)	Langelier Index	Magnesium (mg/L)	Manganese (ug/L)	pH-field (SU)	Potassium (mg/L)	Sodium (mg/L)	Sodium Adsorption Ratio	Sulfate (mg/L)	Temperature (°C)	Total Alkalinity as CaCO3 (mg/L)	Total Dissolved Solids (mg/L)	Total Hardness as CaCO3 (mg/L)	Turbidity-field (NTU)
	MCL / *SMCL	—	1000/ *200	1000	—	—	*500	50	—	*1600	2	300	—	—	50	8.5	—	—	—	*500	—	—	*500	—	*5
	DRL	—	50	100	—	—	—	10	—	—	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Watershed - Snake Creek	2021	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2022	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2023	12.3	38.8	27.8	33.6	21.7	4	ND	8.9	330	0.1	54.3	0.54	10.1	ND	8.75	1.27	7.26	0.32	24	23.7	72	160	95.8	2.7
	2024	12.3	63	32	ND	25	ND	1.1	8.01	250	0.11	62	0.54	11	4.1	8.61	1.1	8	—	29	23.6	88	170	110	2.5
	2025	12.3	49.8	37.9	42	27.5	5	ND	8.01	270	0.16	53.8	0.43	13.6	ND	8.42	1.22	9.25	0.36	34	22.8	100	170	125	3.4
Watershed - The Narrows	2021	12.3	98.5	42.9	50	30.9	8	ND	—	—	0.07	145	0.46	15.2	95.3	8.43	1.51	10.5	0.38	35	—	102	180	140	5.2
	2022	12.2	36.3	42.5	56.1	30	12	ND	8.85	—	0.19	45.1	0.43	15.3	31.8	8.44	1.92	11.5	0.4	34	24.9	119	200	154	3.1
	2023	12	36.5	29	35.6	25.7	4	ND	9.08	260	0.11	44.4	0.24	12.2	ND	8.27	1.25	8.52	0.35	29	26.1	80	160	115	3
	2024	12.5	37	31	ND	26	ND	1.1	9.12	270	0.1	35	0.65	13	4.7	8.69	ND	8.6	—	31	22.8	95	160	120	2.3
	2025	12.4	ND	41.5	55.7	30.6	5	ND	8.75	320	0.11	33.3	0.49	20.1	ND	8.42	ND	10.4	0.36	32	20.4	128	200	159	1.5
Watershed - Town Creek	2021	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2022	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2023	12.2	34.1	30.1	34.9	24.8	4	ND	8.58	240	0.11	41.1	0.43	11.3	ND	8.55	1.28	7.65	0.32	29	25.2	72	170	109	1.6
	2024	12.5	43	33	ND	27	ND	ND	8.4	260	0.12	58	0.72	12	7.5	8.74	1.1	8.2	—	32	24	87	150	120	2.2
	2025	12.3	38	37.3	42.3	26.5	ND	ND	8.57	270	0.11	40.8	0.44	13.4	ND	8.49	1.15	9.41	0.37	34	21.4	100	170	121	2.2

WATERSHED CONTROL AND LAKE MANAGEMENT PRACTICES

Invasive Mussel Prevention Program

Quagga and zebra mussels are invasive freshwater bivalves native to the Black and Caspian Seas. Using strong byssal threads, they attach to hard surfaces such as boats, docks, water intake structures, and delivery systems. They reproduce rapidly, producing millions of offspring each year, and can cause significant damage to infrastructure, recreation, and local ecosystems. Since their discovery in the Great Lakes in the 1980s, these mussels have spread to 29 U.S. states, including Arizona, Nevada, Colorado, and California.

Golden mussels (*Limnoperna fortunei*) were first detected in California in 2024, marking a significant new invasive species threat to the state's waterways. Likely introduced through ballast water or contaminated equipment, golden mussels pose serious risks because they reproduce rapidly, form dense colonies, and readily attach to infrastructure such as water intake pipes, pumps, and treatment facilities, leading to operational and economic impacts. Unlike zebra or quagga mussels, golden mussels can tolerate a wider range of temperatures, lower calcium concentrations, and poorer water quality, allowing them to spread into waters previously considered low risk for other invasive mussels. Their high adaptability and fast growth increase the potential for ecological disruption, including competition with native species and altered nutrient cycling, making early detection and management critical for California's water resources.

To help **PREVENT** the spread of invasive mussels to the County of San Luis Obispo's reservoirs, officials at lakes Nacimiento, Lopez, and Santa Margarita expect all boaters to comply with a **"CLEAN, DRAIN, DRY"** program. All watercraft must be **"CLEAN, DRAIN, and DRY"** upon arrival at any local lakes.

Monitoring for invasive mussels began in June 2008 and continues year-round. Park Rangers and trained staff inspect vessels for signs of infestation. In addition, staff conduct monthly monitoring of submerged substrates placed at marinas, fishing docks, and log booms to detect early colonization and conduct plankton tows for veligers. Preventing the introduction of invasive mussels protects lake infrastructure, public access, the environment, and the local economy. The County of San Luis Obispo maintains a State-approved mussel prevention program.

To find out more about mussel prevention and how to help stop the spread, please visit the following link: https://www.usgs.gov/ecosystems/invasive-species-program/maps

For the most updated map of infested California lakes, scan the QR code below:

Quagga and Zebra Information

Figure 28: Invasive Mussels

Golden Mussel Information

No suspicious organisms or evidence of their existence in the reservoir or watershed has been observed since monitoring began.

Algal Toxin Management

Cyanobacteria, other freshwater algae, and their toxins are on the EPA's Contaminant Candidate List. The Contaminant Candidate List (CCL) is a list of contaminants that are currently not subject to any proposed or promulgated national primary drinking water regulations, but are known or anticipated to occur in public water systems. Contaminants listed on the CCL may require future regulation under the Safe Drinking Water Act (SDWA). For more information, please go to the EPA's website at https://www.epa.gov/ccl/contaminant-candidate-list-4-ccl-4-0.3.

Cyanotoxins, from certain types of blue-green algae, in high concentrations have been known to cause illness, paralysis and even death in livestock and wildlife. Algae which have been known to produce toxins, such as Aphanizomenon, Anabaena, Microcystis, and Oscillatoria.

The Nacimiento Reservoir is monitored monthly for algae levels. When blue green algae counts are greater than 2000 cells/mL, algal toxins are performed. This testing is conducted for the Nacimiento Reservoir Inlet and if available, algal toxins are also performed for the intake elevation which exceeded blue green algae.

The State also monitors harmful algal blooms (HABs) and their water quality data show no confirmed harmful algal toxin exceedances that would trigger health advisories. The State map showing which sites were tested for harmful algal blooms can be found on the following link: https://mywaterquality.ca.gov/habs/where/freshwater_events.html

Based on cyanotoxin testing results and or visual indicators confirming the presence of HABs, the State requires each body of water to post an advisory level, CAUTION, WARNING or DANGER (Figure 29 and Figure 30).

Figure 29: Algal Bloom and Toxin Signage

Figure 30: Example Blue-Green Algae Bloom

Interlake Tunnel Project

MCWRA has proposed construction of an interlake tunnel to convey water by gravity from the Nacimiento Reservoir to Lake San Antonio to improve regional reservoir operations. The conceptual project consists of an approximately 12,000-foot-long, 10-foot-diameter tunnel connecting the two reservoirs. Since 2021, MCWRA circulated a Draft Environmental Impact Report (Draft EIR) for public review in 2023; however, the project remains in the Draft EIR phase and has not progressed significantly as of 2025.

General Management Practices

Source Protection & Monitoring

- Monthly reservoir inspection reports submitted to the California Division of Drinking Water
- Comprehensive water quality monitoring program
- Aquatic Invasive Mussel Monitoring and Prevention Program
- County Agricultural Commissioner regulates pesticide use within the watershed

Access Control & Security

- Controlled public access through the main park entrance and some private communities
- Intake protected by exclusion zone with buoys and log boom
- Reservoir fenced, posted, and closed to public access
- Active lake patrols enforce state and local boating regulations
- Emergency response plan established for contamination events

Wastewater & Infrastructure Protection

- Wastewater effluent discharge to the lake is prohibited
- Treatment plant and disposal facilities located remote from intake
- 24-hour operator availability

CHANGES TO THE WATERSHED VULNERABILITY

No significant changes were observed in overall watershed water quality. The Klau-Buena Vista mine runoff continues to be an ongoing concern within the watershed, although it does not impact drinking water quality of the water for drinking water use.

In 2023, severe storm erosion undermined the structural integrity of the treatment pond adjacent to CSA 7A (Figure 31, Figure 32). The storm damage created a potential pathway for effluent or partially treated wastewater to reach the Nacimiento Reservoir in the event of slope failure. The County implemented immediate slope stabilization measures using interim boulder buildup. To further mitigate discharge risk, CSA 7A modified its treatment operations by taking the ponds nearest the compromised slope offline and will continue modified operations until the permanent repair is finished. Design is complete and construction will commence June 2026.

Figure 31: Drainage Channel Blowout and Stabilization of Embankment

Figure 32: Oak Shores Facility Settling Pond Stabilization and Nacimiento Lake

SYSTEM COMPLIANCE WITH PRESENT AND FUTURE REGULATIONS

Surface Water Treatment Rule

Surface water treatment requirements under the U.S. Environmental Protection Agency's (EPA) Surface Water Treatment Rule (SWTR) and the Safe Drinking Water Act ensure that public water systems using surface water or groundwater under the influence of surface water provide multiple barriers against microbial contamination. Required processes include coagulation, flocculation, sedimentation, filtration, and disinfection, aimed at reducing pathogens such as *Giardia, Cryptosporidium*, and viruses. Systems must also monitor turbidity, microbial indicators, and disinfectant residuals to confirm treatment effectiveness. Enhanced requirements, including the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), address higher-risk waters and sensitive populations by requiring additional pathogen removal based on source water quality (EPA, 1989; EPA, 2006).

In California, the SWRCB enforces both federal surface water treatment rules and additional state-specific requirements. Systems must monitor microbial indicators, turbidity, and disinfection byproducts, and maintain operational standards to ensure compliance. Periodic sanitary surveys and source water assessments evaluate watershed protection, treatment performance, and potential contamination risks, ensuring public health protection and adherence to both federal and state standards (SWRCB, 2023).

Based on monitoring for *Giardia lamblia, Cryptosporidium*, and general microbial indicators, our source water consistently falls into the lowest bin classification. This categorization confirms low microbial vulnerability and allows our treatment facilities to effectively meet federal and state requirements. By maintaining these standards, the NWP ensures that water diverted for both groundwater recharge and municipal supply remain a safe, reliable resource.

Per- and polyfluoroalkyl substances (PFAS) Information

Per- and polyfluoroalkyl substances (PFAS), including perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), are persistent man-made chemicals used in products that resist heat, oil, and water. Because they do not readily break down, PFAS can migrate through soil, contaminate groundwater, and bioaccumulate in fish, wildlife, and humans. Studies have linked certain PFAS to increased cholesterol, low infant birth weight, immune system effects, thyroid disruption, and some cancers. In April 2024, the U.S. Environmental Protection Agency finalized enforceable national drinking water standards (Maximum Contaminant Levels) for several PFAS, including PFOA and PFOS at 4 ng/L (ppt), with monitoring and compliance requirements phased in over the next several years.

In California, notification and response levels remain in effect while additional state-specific regulations are developed. Notification levels are precautionary, health-based advisory levels. Response levels are higher concentrations at which water systems are recommended to remove a source from service, provide treatment, or issue public notification. All California public water systems will be required to monitor for PFAS by 2027, with earlier testing required for systems considered at risk. Nacimiento Raw water has not shown any detection of PFAS in the four quarters of monitoring samples collected and analyzed.

Table 17: PFAS Notification Limits

Analyte	Notification Level, ng/L	Response Level, ng/L (running four quarter average)
PFOA (Perfluorooctanoic acid)	4.0	10
PFOS (Perfluorooctane sulfonic acid)	4.0	40
PFHxS (Perfluorohexane sulfonic acid)	3.0	10
PFHxA (Perfluorohexanoic acid)	1,000	10,000
PFBS (Perfluorobutane sulfonic acid)	500	5,000

Algal Toxins

The U.S. Environmental Protection Agency (EPA) has issued non-enforceable health advisories for cyanotoxins in drinking water, including microcystin-LR (0.3 µg/L for children; 1.6 µg/L for adults) and cylindrospermopsin (0.7 µg/L for children; 3.0 µg/L for adults) (EPA, 2015). In California, the California SWRCB has established an enforceable maximum contaminant level (MCL) of 1.0 µg/L for microcystin-LR and a notification level of 0.7 µg/L for cylindrospermopsin, requiring monitoring, public notification, and treatment when levels warrant action (SWRCB, 2024). Conventional surface water treatment processes—such as coagulation, filtration, activated carbon adsorption, and oxidation—are recognized as effective barriers for cyanotoxin control (EPA, 2015).

Future regulatory development is expected to proceed through the EPA's Contaminant Candidate List (CCL) process, which identifies unregulated contaminants that may require national standards under the Safe Drinking Water Act (EPA, 2023). Cyanotoxins have been included in prior CCL cycles, and continued occurrence data collection may support regulatory determinations and potential federal MCLs. At the state level, California continues to evaluate harmful algal bloom impacts and emerging contaminant data, which could result in expanded monitoring requirements or additional health-based standards as scientific understanding advances (SWRCB, 2024).

Unregulated Contaminant Monitoring Rule (UCMR)

The Unregulated Contaminant Monitoring Rule (UCMR), administered by the U.S. Environmental Protection Agency, requires public water systems to monitor for contaminants that do not yet have established MCLs (EPA, 2023a). Data generated through UCMR cycles provide nationwide occurrence information that supports health assessments and regulatory determinations under the Safe Drinking Water Act. This structured monitoring approach serves as the primary mechanism for identifying contaminants that may warrant future federal drinking water standards.

Recent UCMR monitoring has included lithium to better understand its prevalence in drinking water supplies (EPA, 2023a). Although no federal or California MCL currently exists for lithium, monitoring data will inform future health risk evaluations. Lithium is used therapeutically at controlled doses for bipolar disorder, but long-term exposure to elevated levels in drinking water may affect kidney and thyroid function (EPA, 2023a). Depending on nationwide occurrence and health risk findings, future regulatory actions could include health advisories, notification levels, or eventual establishment of enforceable MCLs.

CONCLUSIONS AND RECOMMENDATIONS

Constituent concentrations in the reservoir fluctuate widely due to a range of short- and long-term influences. Seasonal temperature shifts, drought, runoff events, and dam operations all play a role, as do changes in potential contaminant sources such as recreational activity, urban development, agricultural practices, and military operations.

Grazing livestock and body-contact recreation continue to pose contamination risks, occurring extensively on and around the reservoir, with grazing also widespread throughout the lower watershed. Although San Luis Obispo County holds land-use authority in the lower watershed, it lacks jurisdiction within the watershed itself, limiting its ability to influence activities or management practices that affect water quality. Existing control measures offer only partial protection, as their effectiveness depends on consistent implementation and enforcement—both of which are difficult given the watershed's size, the reservoir's remote location, and the number of potential contaminant sources.

Mercury remains a contaminant of concern primarily because of public perception rather than actual risk. Importantly, no mercury has been detected at the Nacimiento Reservoir Inlet.

The 2023 storm events intensified these challenges by causing severe hillside erosion near CSA 7A, creating a significant contamination risk to the watershed. In response, facility operations were modified to prevent any sewage discharge into Nacimiento Reservoir. The County completed the embankment repair design and will commence construction June 2026.

Recommendation 1 – Drought and Severe Storm Patterns

Continue to monitor the reservoir and watershed. Long periods of drought followed by heavy storms can alter the landscape and impact the water quality of the reservoir. Water quality data should continue to be monitored monthly from the Nacimiento Reservoir Inlet and the reservoir intake elevations for general physical and metals such as aluminum and iron. Continue annual general mineral monitoring for Nacimiento Reservoir Inlet and watershed sites.

Recommendation 2 – Invasive Mussel Inspection Program

Maintain the current County Invasive Mussel Inspection Program. Invasive mussels have not been found in local San Luis Obispo County lakes to date, due in part to inspection program efforts, along with responsible boat owners' prevention efforts. Since 2010, cooperation between Monterey and San Luis Obispo County agencies have worked together to plan, advise, and organize the Mussel Prevention Program at the Nacimiento Reservoir.

Nacimiento Reservoir boaters have played a major role in protecting local water resources by assisting in local boat inspections and educating locals and visitors to CLEAN, DRAIN, and DRY all boats and equipment before visiting local lakes and being prepared to have boats inspected. This group effort should continue and adapt to future rules, regulations, and findings.

Recommendation 3 – Water Quality Monitoring

The evaluation of the Nacimiento Water Project monitoring program since the initial watershed assessment and background data collection is an ongoing process. As new regulations, public concerns, and changes in the reservoir and watershed occur, the spectrum of analytical and field monitoring will change as well. The current monitoring plan for the watershed and reservoir are listed in the following table (see Table 18).

Recommended additional extensive monitoring for the Nacimiento Reservoir Inlet and watersheds after major rain events, fire events, or sewage spills.

Table 18: Water Quality Monitoring Summary

Summary of Water Quality Monitoring	Nacimiento Reservoir Inlet	Reservoir Intake Elevations	Nacimiento Watershed Creeks
Bacteriological	Monthly	-----	-----
Odor	Monthly	Monthly	-----
Limnology	Monthly	Monthly	Annually
Algae/ Algal Toxins	Monthly	Monthly	-----
Aluminum, Iron, and Manganese	Monthly	Monthly	Quarterly
General Mineral/ Inorganic	Quarterly	-----	Annually
Nutrients	Quarterly	-----	Quarterly
Volatile Organic Carbons	Annually	-----	-----
SOC (Atrazine and Simazine)	Every 9 Years	-----	-----
123 TCP	Every 3 Years	-----	-----
Total Organic Carbon	Monthly	-----	-----
Asbestos	Every 9 Years	-----	-----
Radiological	Every 9 Years	-----	-----

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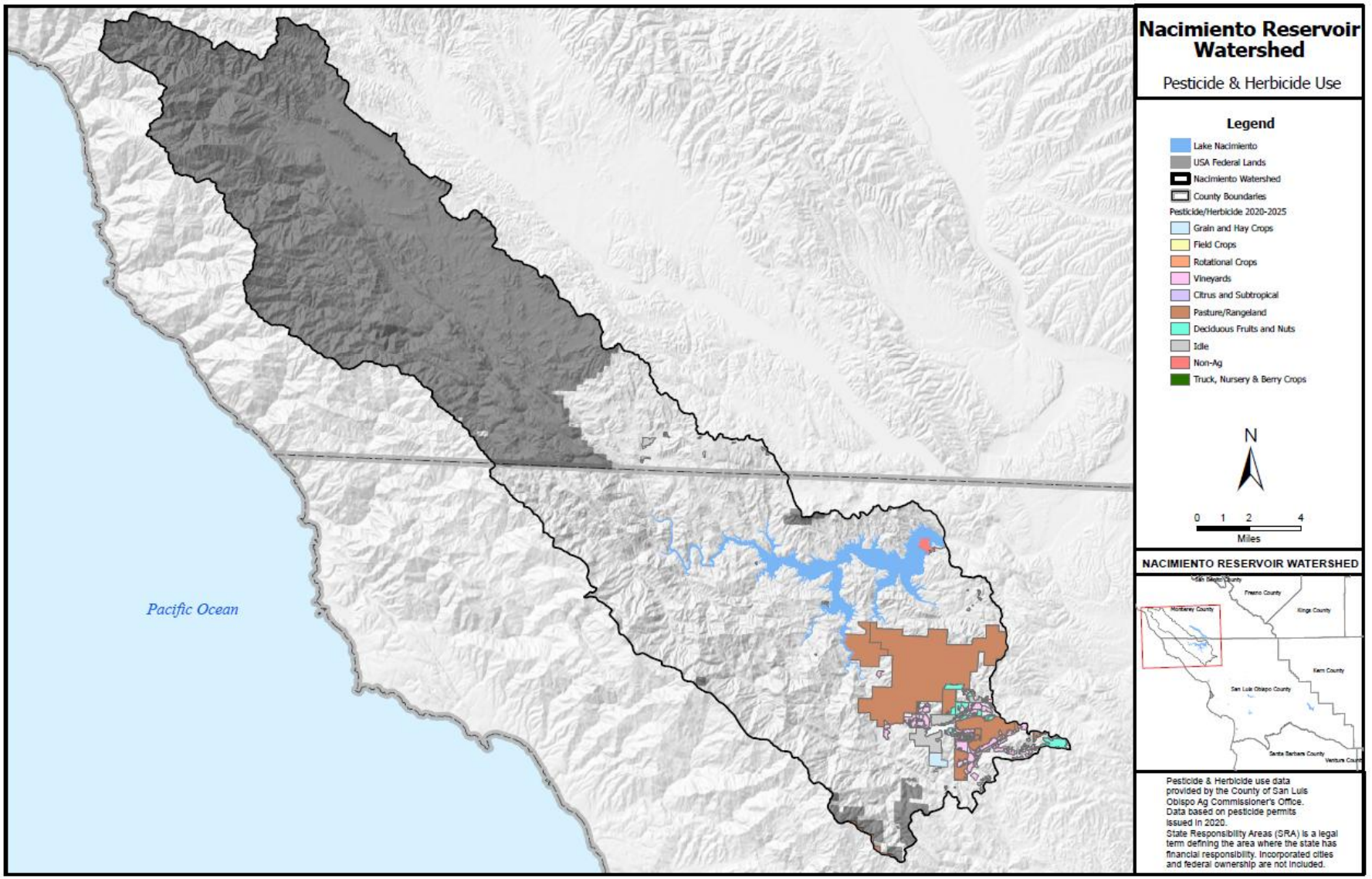
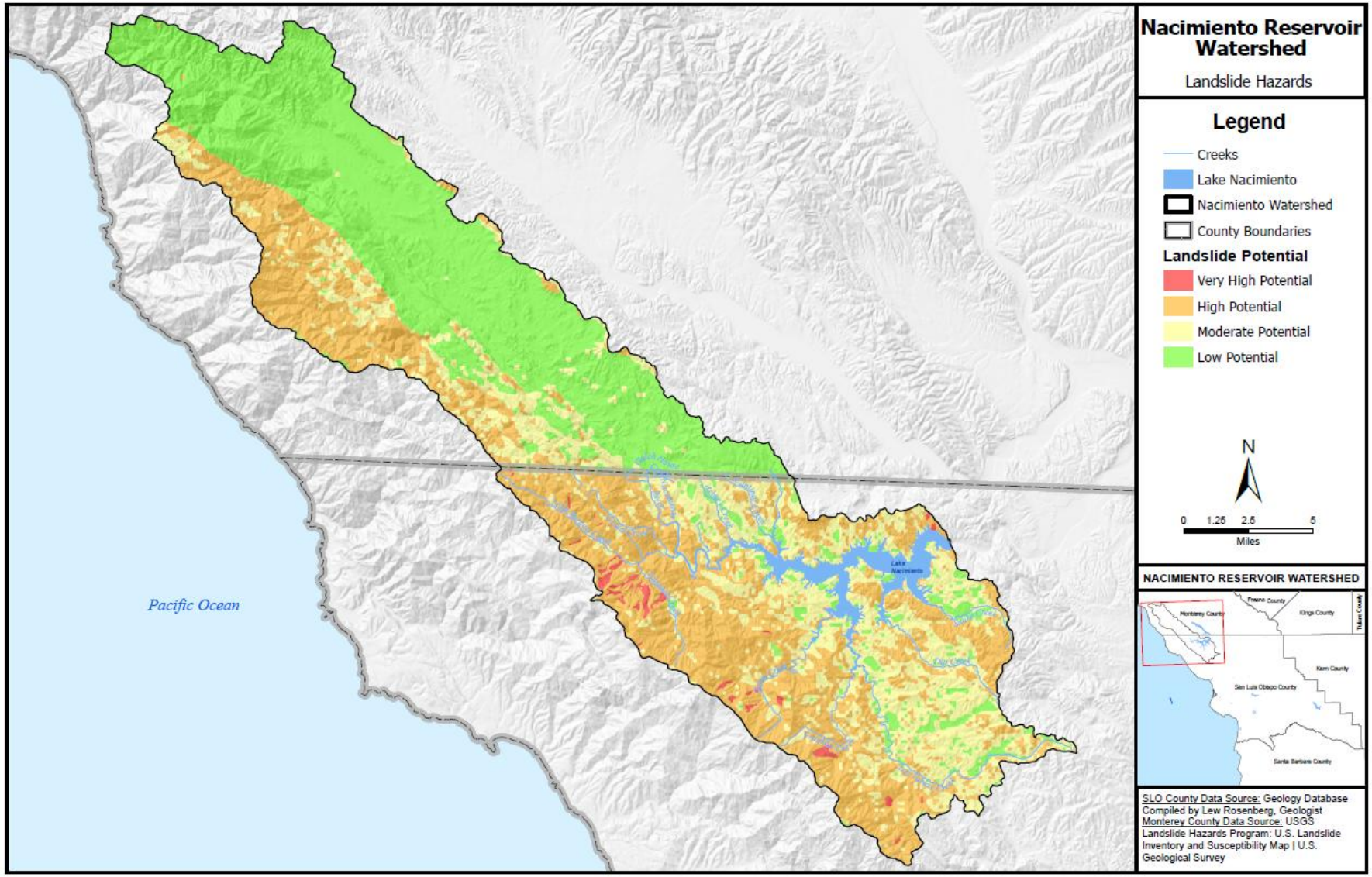
APPENDIX A: Photos of 2023 Storm Erosion and Interim Repair

Interim Boulder Stabilization

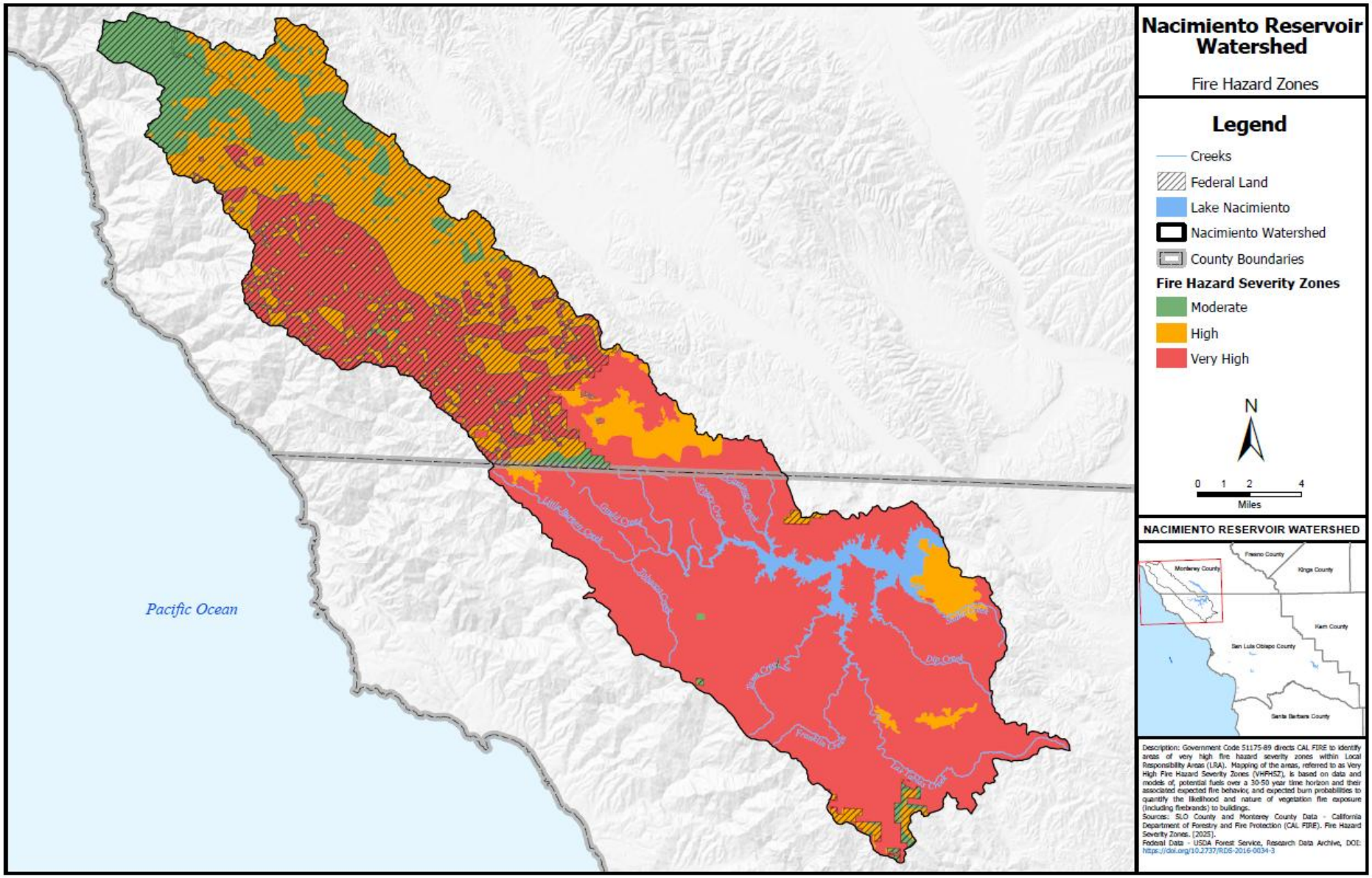
APPENDIX B: Pesticide and Herbicide Use



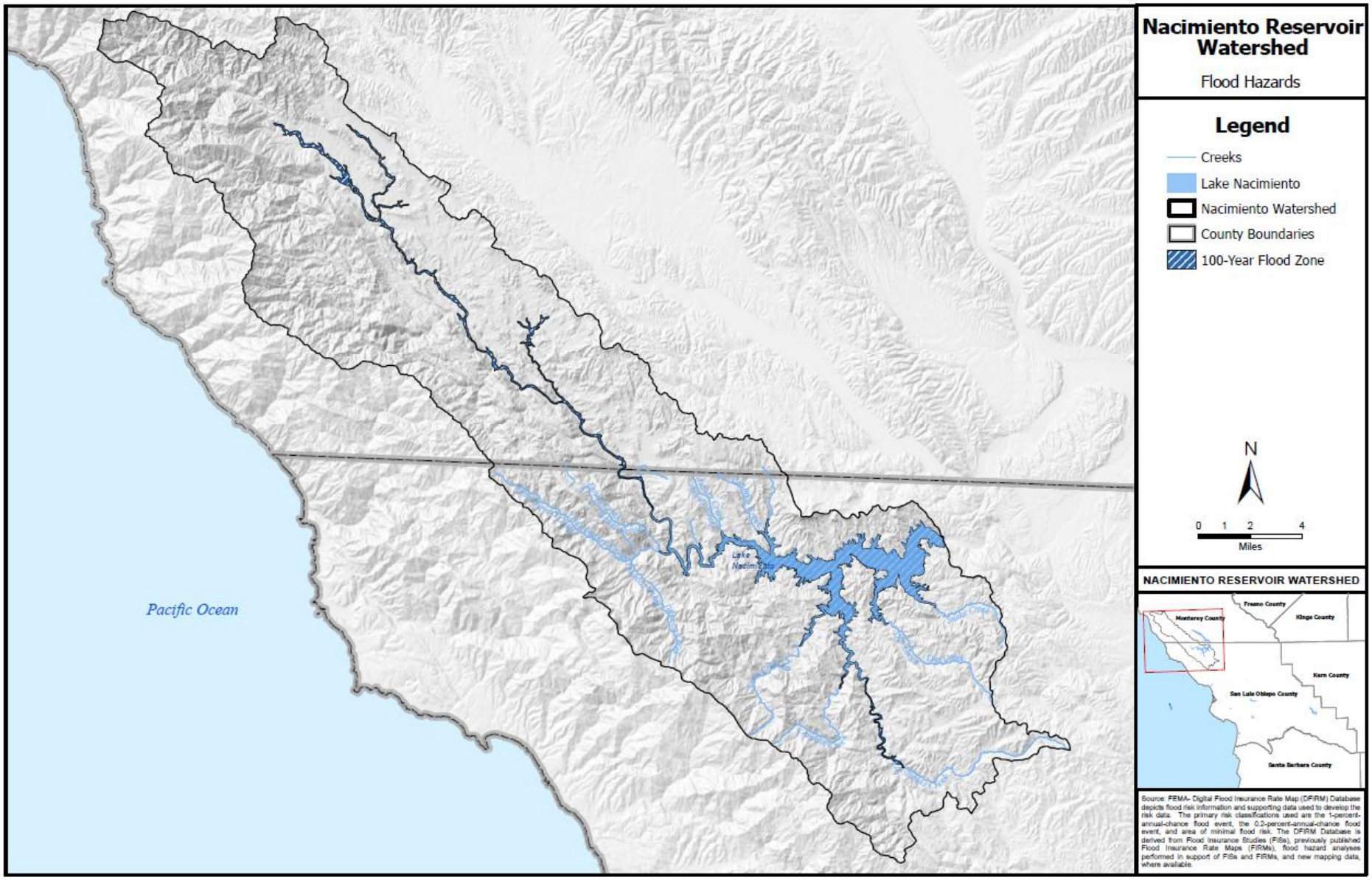
APPENDIX C: Landslide Hazards



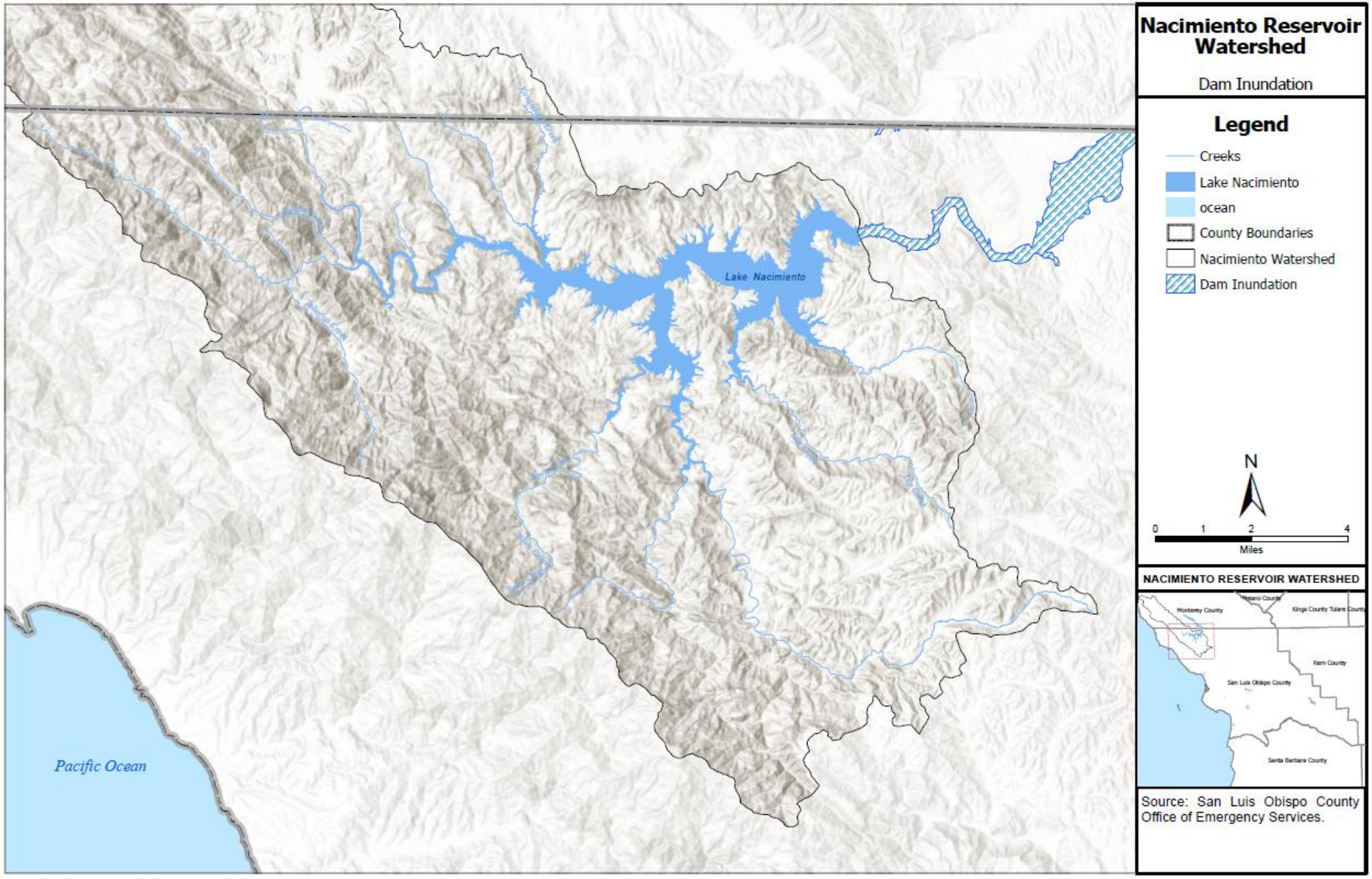
APPENDIX D: Fire Hazard Zones



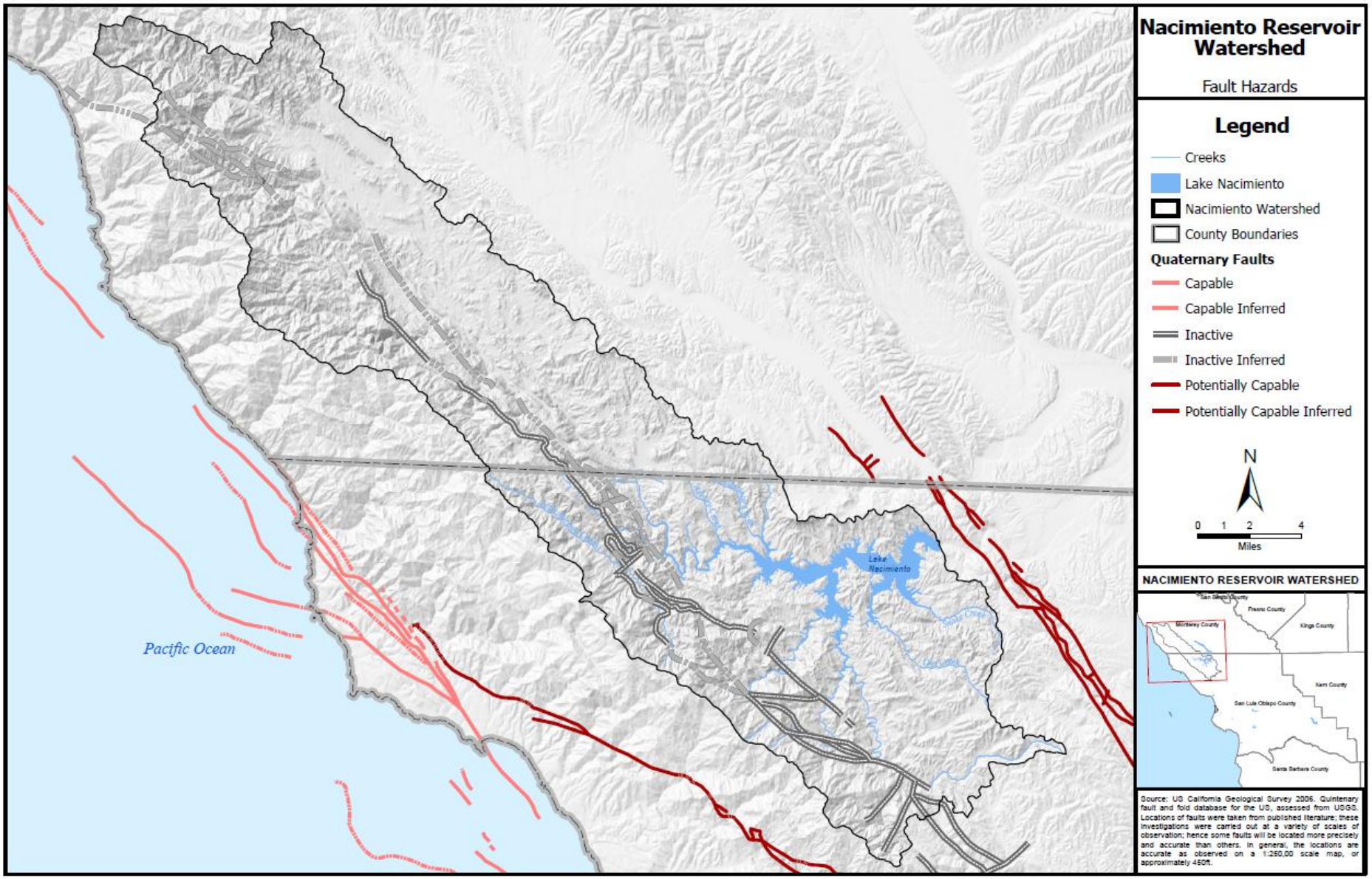
APPENDIX E: Flood Hazards



APPENDIX F: Dam Inundation



APPENDIX G: Earthquake Fault Hazards



APPENDIX H: Field Data

Nacimiento Reservoir Temperature Profile, ºC versus Depth, Feet

Nacimiento Reservoir Temperature Profile, ºC versus Depth, Feet																				
Date	2'	5'	10'	15'	20'	25'	30'	35'	40'	45'	50'	55'	60'	65'	70'	75'	80'	85'	90'	95'	100'
1/26/2021	11.1	10.7	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6
2/23/2021	13.1	11.9	11.5	11.4	11.3	11.2	11	10.4	10	9.8	9.8	9.7	9.6	9.6	9.5	9.5	9.5	9.4	9.3	9.3	9.3
3/24/2021	14	13.9	13.5	13.3	13.2	11.8	11.7	11.5	11.3	11	10.7	10.4	10.2	10	9.9	9.9	9.9	9.8	9.8	9.8	9.7
4/7/2021	16.2	15.8	14.3	12.7	11.6	11.2	11	10.9	10.6	10.4	10.2	10.2	10	9.9	9.9	9.9	9.8	9.8	9.8	9.7	9.7
5/18/2021	21.4	21.2	21	19.4	17.3	14.9	12.8	11.9	11.4	11.2	11.1	10.9	10.7	10.6	10.4	10.3	10.1	10.1	10	9.9	9.9
6/2/2021	23	22.8	22.5	22	19.1	17.2	14.2	13	12.3	12	11.6	11.6	11.2	10.9	10.9	10.6	10.2	10.1	10	10	10
7/21/2021	24.8	24.6	24.4	24.3	24.2	24.1	23.8	23.8	21.5	17.1	13.4	11.9	11.2	10.8	10.7	10.6	10.5	10.4	10.4	10.4	10.4
8/9/2021	25.9	25.5	25.4	24.9	24.5	24.2	23.5	22.5	21.2	17.2	13.7	11.9	11.2	11	10.9	11.1	11.2	11.3	11.4	11.5	11.5
9/22/2021	27.2	23.5	23.4	23.3	23.2	23	22.6	21.7	17.5	15.1	12.4	11.8	11.3	11.1	10.9	10.8	10.8	10.8	10.8	10.9	10.8
10/7/2021	21.2	21.2	21.1	21.1	21	21	20.9	20.7	16	13.5	12.2	11.7	11.2	11.1	11	10.8	10.9	10.9	10.9	10.9	11
11/17/2021	16.8	16.7	16.6	16.6	16.6	16.5	16.4	16.4	16.2	15.3	12.7	11.8	11.3	11.2	11.2	11.1	11.1	11.2	11.2	11.2	
12/1/2021	14.9	14.7	14.7	14.6	14.6	14.4	14.3	14.1	14	13.7	13.1	11.7	11.3	11.2	11.2	11.2	11.2	11.2	11.3	11.3	11.3
1/19/2022	11.8	11.4	11.2	11	10.8	10.7	10.6	10.4	10.3	10.2	10.1	10.1	10	9.9	9.8	9.7	9.7	9.5	9.4		
2/16/2022	12.4	11.9	11.7	11.5	11.2	10.7	10.4	10.1	10.1	10.1	10.1	10.1	10	10	10	10	9.9	9.8	9.7	9.6	9.6
3/16/2022	15	14.2	13.8	12.1	11.8	11.4	10.8	10.5	10.4	10.3	10.2	10.2	10.2	10.1	10	10	10	9.9	9.9	9.8	9.8
4/6/2022	17.4	17.1	16.3	15.6	13.7	12	11.1	10.8	10.6	10.4	10.4	10.3	10.3	10.2	10.2	10.2	10.1	10.1	10	10	10
5/24/2022	22.1	21.5	21.1	20.6	18.6	16.4	14	12.2	11.5	11.2	11	10.8	10.6	10.5	10.4	10.4	10.3	10.3	10.3		
6/13/2022	24.6	24.3	24.2	24.2	22.6	18.1	15.4	12.7	11.8	11.3	11	10.8	10.7	10.6	10.5	10.4	10.4	10.3	10.3	10.3	10.1
7/13/2022	26.3	26.3	26.1	24.4	21.7	19.6	16.9	14	12.8	12.2	11.9	11.3	11	10.8	10.7	10.6	10.6	10.7	10.7	10.8	10.7
8/10/2022	25.8	25.6	25.6	25.4	25	21.9	18.1	15.1	14	13	12.1	11.7	11.2	11.1	11	10.8	10.7	10.6	10.6	10.6	
9/27/2022	22.6	22.5	22.4	22.4	22.3	22.2	21.3	18	15.2	13.7	12.5	11.8	11.4	11.2	11.1	10.9	10.9	10.8	10.8	10.8	
10/18/2022	21	21	21	20.9	20.9	20.9	20.9	19.8	17	14.6	13.5	12.1	11.7	11.2	11	11	10.9	10.9	10.9	10.8	10.8
12/14/2022	11.8	11.8	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
1/23/2023	12	11.5	11.3	11.3	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.1	11.1	11.1	11.1	11.1
2/8/2023	11.5	11.1	11.1	11.1	11	11	11	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.8	10.7	10.6
3/23/2023	13	12.8	12.7	12.6	12.4	12.3	12	11.7	11.6	11.3	10.9	10.5	10.3	10.3	10.1	10.1	10.1	10	10	9.9	9.9
4/12/2023	16.2	13.8	13.7	12.6	12.4	12.1	12.1	12	11.8	11.4	11.3	11	10.8	10.7	10.6	10.4	10.4	10.4	10.3	10.3	10.3
5/22/2023	21.5	21.4	20.5	18.8	15.3	12.7	12.1	11.8	11.7	11.5	11.3	11.1	11	10.9	10.7	10.7	10.6	10.6	10.6	10.5	10.5

Nacimiento Reservoir Temperature Profile, ºC versus Depth, Feet																				
Date	2'	5'	10'	15'	20'	25'	30'	35'	40'	45'	50'	55'	60'	65'	70'	75'	80'	85'	90'	95'	100'
6/21/2023	22.9	22.7	22.6	21.8	18.9	15	13	12.3	12	11.7	11.5	11.3	11.2	11	10.9	10.9	10.8	10.8	10.7	10.7	10.5
7/19/2023	27	26.9	26.7	22.9	18.9	15.2	13.1	12.4	11.9	11.7	11.6	11.4	11.3	11.2	11.1	11	10.9	10.9	10.8	10.8	10.8
8/9/2023	26	26	26	25.8	21.4	14.8	12.9	12.1	11.9	11.7	11.5	11.4	11.3	11.2	11.1	11.1	11.1	11	11	11	11
9/13/2023	23.6	23.4	23.2	23.1	22.7	19.8	15.3	13.3	12.4	12	11.8	11.8	11.5	11.4	11.3	11.3	11.3	11.3	11.3	11.3	
10/18/2023	20.6	20.5	20.4	20.4	20.4	20.3	18.4	14.7	13.7	13.2	12.4	12.3	11.9	11.8	11.6	11.6	11.6	11.6	11.6	11.6	11.5
11/1/2023	18.4	18.4	18.4	18.4	18.4	18.4	18.4	16	13.4	12.7	12.3	11.9	11.9	11.8	11.7	11.7	11.6	11.6	11.6	11.6	11.6
12/11/2023	14.5	14.3	14.2	14.2	14.1	14.1	14.1	13.9	13.7	13.3	12.8	12.3	12.1	11.9	11.8	11.8	11.8	11.7	11.7	11.6	11.6
1/17/2024	12.1	11.9	11.8	11.8	11.8	11.8	11.8	11.7	11.7	11.7	11.7	11.7	11.6	11.6	11.6	11.6	11.5	11.5	11.5	11.5	11.5
2/21/2024	13.6	13.5	13.3	13	12.8	12.6	12.3	12	12	11.9	11.8	11.7	11.7	11.6	11.6	11.6	11.6	11.5	11.5	11.5	11.4
3/6/2024	14.5	14.5	13.8	13.5	13.2	12.9	12.7	12.3	12.1	12	11.9	11.9	11.8	11.7	11.7	11.6	11.6	11.6	11.5	11.5	11.5
4/24/2024	19.6	19.5	18.4	17.2	16.8	15.2	15	13.3	12.5	12.3	12.1	12.1	12	12	11.9	11.9	11.9	11.9	11.8	11.8	11.8
5/15/2024	22.5	22	21.2	19.2	17.7	15.7	14.7	13.6	13.2	12.8	12.4	12.3	12.2	12.1	12	12	12	11.9	11.9	11.8	11.8
6/11/2024	25.4	24.6	24.3	23.9	21	18.5	15.9	14.8	14.1	13.3	13	12.6	12.4	12.3	12.2	12.2	12.1	12.1	12.1	12	12
7/16/2024	26.5	26.6	26.5	25.5	22	19.2	16.7	14.9	14	13.4	13.1	12.7	12.5	12.4	12.3	12.2	12.2	12.1	12.1	12	12
8/7/2024	27.1	26.8	26.3	26.3	26.2	26.1	25.8	19.7	17.8	15.1	13.5	13.2	12.8	12.6	12.6	12.5	12.4	12.5	12.4	12.2	12
9/19/2024	23.7	23.7	23.7	23.7	23.6	23.6	22	18.7	18.7	16.1	15.4	14.1	13.6	13.3	13.1	12.9	12.8	12.7	12.7	12.7	12.6
10/16/2024	22.3	22.3	22.3	22.2	22.2	22.2	22.2	20.8	17.3	15.7	14.6	14.4	13.7	13.3	13.2	13.1	13	13	12.9	12.8	12.8
11/13/2024	16.8	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.3	14.9	14.2	13.8	13.5	13.3	13.2	13.1	13	12.9	12.8	12.7
12/11/2024	13.8	13.8	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.5	13.3	13.2	13.1	13	12.9	12.9
1/8/2025	12.8	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.6	12.6
2/25/2025	14.3	13.9	13.3	12.7	12.1	11.9	11.8	11.7	11.7	11.7	11.7	11.6	11.6	11.6	11.6	11.6	11.5	11.5	11.4	11.4	11.4
3/25/2025	17.4	17.1	15.6	14.4	13.9	13.4	13	12.7	12.5	12.2	12	11.9	11.8	11.8	11.7	11.7	11.7	11.7	11.6	11.6	11.6
4/23/2025	19.9	19.8	19.7	19.2	18.2	15.6	13.7	13.2	12.7	12.4	12.2	12.1	12.1	11.9	11.9	11.9	11.8	11.8	11.8	11.7	
5/13/2025	22.4	22.3	22.1	22.1	19.5	16.7	14.6	13.6	13.1	12.7	12.5	12.3	12.2	12	12	11.9	11.9	11.9	11.8	11.8	11.8
6/4/2025	24.4	24.1	24.1	23.1	21.5	19	16.6	14.7	13.7	13.2	12.8	12.6	12.4	12.3	12.2	12.1	12.1	12	11.9	11.9	11.8
7/1/2025	25.1	25	24.8	24.8	21.8	19	16.5	15	14.1	13.6	13.1	12.8	12.6	12.4	12.4	12.3	12.2	12.2	12.1	12	12
8/6/2025	24.5	24.4	24.1	24.1	24	23.4	20	17.2	15.5	14.2	13.7	13.3	13.1	12.9	12.7	12.6	12.5	12.3	12.2	12.1	12
9/16/2025	24.7	24.8	24.7	24.7	24.4	22	21	19.7	16.9	15.5	14.9	14.1	14	13.9	13.7	13.2	12.5	12.4	12.3	12.3	12.3
10/28/2025	19.3	19.3	19.2	19.2	19.2	19.2	19.2	19.2	19.2	17.9	16.2	15.4	14.9	14.4	14.2	13.5	13	12.6	12.4	12.3	12.2
11/19/2025	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.5	17.4	17.4	16	14.9	14.5	14	13.6	12.9	12.6	12.4	12.2
12/10/2025	14.6	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.4	14.4	14.4	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3

Nacimiento Reservoir Dissolved Oxygen Profile, Dissolved Oxygen versus Depth, Feet

Nacimiento Reservoir Dissolved Oxygen Profile, mg/L versus Depth, Feet																				
Date	**2'**	**5'**	**10'**	**15'**	**20'**	**25'**	**30'**	**35'**	**40'**	**45'**	**50'**	**55'**	**60'**	**65'**	**70'**	**75'**	**80'**	**85'**	**90'**	**95'**	**100'**
1/26/2021	9.67	9.52	9.39	9.36	9.13	9.11	8.93	9.03	8.96	9.05	8.74	9.07	9.1	9.25	9.07	9.14	1.6	1.63	1.25	1	0.96
2/23/2021	12.9	11.8	11.3	10.8	10.8	10.2	9.91	9.02	7.88	7.5	7.1	6.96	6.72	6.64	6.5	6.4	6.11	6.06	5.89	5.8	5.75
3/24/2021	10.2	10	9.29	9.46	8.95	7.54	7.5	7.42	6.92	6.07	5.42	5.14	4.88	4.5	4.47	4.4	4.14	4.09	4	3.8	3.86
4/7/2021	11.7	10.4	8.69	6.77	6.06	5.48	5.43	4.9	4.39	4.36	4.12	4.18	3.87	3.42	3.47	3.4	3.2	3.36	3.3	3.11	3.13
5/18/2021	7.94	7.85	7.62	5.69	3.99	2.51	2.46	3.2	3.85	3.44	3	2.32	1.94	1.71	1.15	0.69	0.64	0.48	0.5	0.4	0.3
6/2/2021	8.01	7.79	7.73	6.89	4.64	2.32	1.57	2.14	2.71	2.38	2.35	2.01	1.48	0.87	0.6	0.19	0.05	0.04	0.04	0.04	0.04
7/21/2021	5.68	4.85	4.19	3.38	4.26	3.53	1.28	1.05	0.06	0.04	0.05	0.06	0.05	0.05	0.05	0.06	0.05	0.05	0.04	0.12	0.05
8/9/2021	7.07	7.02	6.48	3.95	3.29	1.27	0.05	0.05	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.07	0.06	0.06	0.06	0.05	0.06
9/22/2021	5.72	5.31	4.78	4.97	4.25	3.22	0.63	0.03	0.03	0.02	0.02	0.04	0.04	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.03
10/7/2021	5.16	4.58	4.92	3.33	3.8	2.9	0.36	0.11	0.06	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.07	0.06
11/17/2021	4.33	3.88	3.28	3.25	3.13	2.85	0.65	0.42	0.08	0.06	0.06	0.05	0.06	0.04	0.05	0.05	0.05	0.05	0.06	0.06	
12/1/2021	5.38	4.96	4.76	4.51	2.45	2.36	2.05	1.33	1.01	0.11	0.11	0.1	0.1	0.12	0.14	0.12	0.12	0.11	0.11	0.1	0.1
1/19/2022	7.74	7.1	6.7	6.42	5.5	4.15	4.3	4.89	5.39	5.88	6.25	6.12	6.14	6.81	7.16	7.14	7.81	7.85	7.69		
2/16/2022	10.8	10.5	9.16	8.72	7.66	6.85	6.25	6.32	6.27	6.44	6.3	6.11	6.25	5.88	5.86	5.87	5.63	5.98	6.12	6.34	6.22
3/16/2022	10.3	10.6	10.1	8.32	8.03	6.68	5.18	4.59	4.3	4.32	4.29	4.29	4.32	4.35	4.14	4.14	4.2	3.78	3.09	2.77	2.72
4/6/2022	10.3	9.97	9.48	7.72	5.04	3.65	3.41	3.39	3.52	3.54	3.4	3.29	3.17	3.2	3.06	3.01	3.04	2.82	2.61	2.59	2.64
5/24/2022	7.74	7.73	7.71	7.31	5.03	2.41	1.29	1.52	1.46	1.59	1.38	1.47	1.1	1.11	0.93	0.78	0.63	0.54	0.52		
6/13/2022	7.39	7.35	7.29	7.36	5.8	1.89	0.47	0.42	0.57	0.63	0.51	0.52	0.24	0.15	0.13	0.14	0.06	0.04	0.05	0.05	0.05
7/13/2022	7.15	6.61	6.52	4.82	1.32	0.3	0.08	0.07	0.08	0.05	0.06	0.07	0.05	0.06	0.05	0.06	0.05	0.04	0.04	0.04	0.04
8/10/2022	6.35	6.9	7.02	6.65	6.07	0.05	0.04	0.06	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.04	0.05	0.04	0.04	0.03	
9/27/2022	5.67	5.69	5.42	5.21	4.41	4.1	0.15	0.1	0.1	0.11	0.1	0.11	0.11	0.1	0.16	0.14	0.13	0.12	0.11	0.1	
10/18/2022	6.32	6.31	6.07	5.84	6.02	5.76	5.79	0.46	0.09	0.09	0.1	0.08	0.1	0.08	0.07	0.09	0.08	0.09	0.08	0.07	0.05
12/14/2022	4.97	4.85	4.6	4.6	4.27	4.03	4.21	4.69	4.82	4.62	4.9	5	5.26	5.03	5.24	0.14	0.11	0.12	0.11	0.1	0.1
1/23/2023	8.45	8.2	8.03	8.01	8.22	8.36	7.94	7.86	7.84	7.82	7.84	7.86	7.62	7.5	7.11	7.16	7	7.04	6.55	6.46	6.5
2/8/2023	8.25	7.7	7.41	7.6	7.6	7.57	7.39	7.16	7.36	7.2	7.18	7.09	7.18	7.05	6.99	6.56	6.31	6.25	6.32	6.45	6.8
3/23/2023	9.13	8.92	8.77	8.28	8.4	8.48	8.19	8.32	8.26	8.24	7.7	7.61	7.63	7.74	7.79	7.82	7.9	7.78	7.68	7.62	7.67
4/12/2023	10.2	9.41	8.92	8.57	8.38	8.39	8.34	8.39	8.29	8.26	8.43	8.29	7.99	7.97	7.9	7.94	7.97	7.87	7.88	7.7	7.67
5/22/2023	8.4	7.99	7.81	7.66	5.9	6.28	6.76	6.91	6.57	6.88	7.4	7.38	7.21	7.38	7.32	7.42	7.36	7.4	7.38	7.21	7.44
6/21/2023	7.18	7.1	6.89	5.98	4.34	4.14	4.76	5.15	5.69	6.17	6.04	6.26	6.35	6.58	6.7	6.74	6.55	6.6	6.72	6.56	6.53
7/19/2023	7.48	7.39	7.47	5.86	4.01	3.81	4.36	4.55	5.08	5.34	5.74	5.95	6.38	6.41	6.5	6.6	6.69	6.64	6.62	6.59	6.55
8/9/2023	6.6	6.44	6.81	6.77	2.16	1.35	2.81	3.75	4.49	5.01	5.16	5.29	5.78	5.8	5.96	6	5.99	5.92	5.7	5.54	5.56

Nacimiento Reservoir Dissolved Oxygen Profile, mg/L versus Depth, Feet																				
Date	2'	5'	10'	15'	20'	25'	30'	35'	40'	45'	50'	55'	60'	65'	70'	75'	80'	85'	90'	95'	100'
9/13/2023	7.52	7.58	7.03	6.96	4.12	1.84	1.07	1.64	2.52	3.12	3.59	4.44	4.77	5.09	5.19	5.19	5.23	5.02	4.05	4.03	
10/18/2023	7.59	6.44	6.49	6.52	6.53	6.5	1.8	1.2	0.75	0.45	0.7	1.68	2.58	3	3.41	3.35	3.39	2.94	2.1	1.74	1.38
11/1/2023	6.3	6.18	6.14	6.11	5.72	5.62	5.67	0.27	0.26	0.25	0.85	2.09	2.28	2.51	2.78	2.36	2.15	1.51	0.73	0.61	0.7
12/11/2023	7.52	7.26	7.32	7.19	6.33	6.75	6.1	5.12	3.18	1.97	0.25	0.57	1.27	1.6	1.97	1.5	1.34	0.98	0.21	0.16	0.15
1/17/2024	4.13	3.83	3.48	3.55	3.13	3.34	3.66	3.19	3.07	4.06	4.11	3.8	2.42	2.45	2.51	1.53	1.96	1.94	3.21	3.5	3.44
2/21/2024	9.71	9.67	9.42	8.49	8.49	7.79	7.03	6.32	5.79	5.61	5.05	4.78	4.5	4.1	4.08	3.8	3.8	3.71	3.5	3.02	2.7
3/6/2024	9.3	9.3	8.81	8.76	8.24	7.8	7.16	6.68	6.47	6.25	5.67	5.21	5.2	4.63	4.36	4.1	3.87	3.86	3.73	3.75	3.61
4/24/2024	8.27	8.3	8.24	8.2	8.22	6.24	6.29	5.91	5.9	5.82	5.49	5.38	4.85	4.8	5	4.88	4.91	5.01	5.02	5	4.89
5/15/2024	8.8	8.85	9.13	9.05	8.27	7.77	7.06	6.3	6.05	5.91	5.83	5.48	5.19	5.1	4.91	4.88	4.85	4.7	4.76	7.74	4.66
6/11/2024	7.54	7.58	7.7	7.77	6.95	6.37	5.32	4.45	3.92	3.86	3.96	4.07	4.15	4.31	4.3	4.38	4.38	4.34	4.3	4.4	4.37
7/16/2024	7.1	6.73	6.82	5.86	3.04	1.7	1.35	1.42	1.72	2.02	2.15	2.58	2.93	3.1	3.28	3.34	3.33	3.07	3.05	2.95	2.82
8/7/2024	6.92	6.65	6.62	5.32	5.41	5.43	5.5	2.51	2.27	2.12	2.08	2.11	2.15	2.17	2.2	2.22	2.29	2.27	2.3	2.29	2.7
9/19/2024	6.87	6.56	6.32	6.29	6.25	6.11	2.51	1.65	0.7	0.6	0.55	0.47	0.29	0.3	0.3	0.32	0.2	0.19	0.18	0.17	0.15
10/16/2024	5.77	5.38	5.26	4.98	5.19	5.35	5.11	0.75	0.31	0.25	0.25	0.24	0.22	0.22	0.21	0.21	0.21	0.21	0.19	0.19	0.19
11/13/2024	6.16	6.08	5.77	5.82	5.9	5.87	5.82	5.95	5.85	2.6	1.14	0.52	0.3	0.24	0.21	0.2	0.18	0.18	0.17	0.17	0.16
12/11/2024	5.78	5.12	4.9	4.75	4.74	4.71	4.38	4.56	4.67	4.78	4.76	4.7	4.62	3.83	1.01	0.43	0.28	0.2	0.18	0.17	0.17
1/8/2025	5.74	5.6	5.52	5.33	5.37	5.28	5.33	5.29	5.41	5.48	5.36	5.33	5.19	5.18	5.31	5.14	5.13	5.1	4.3	2.54	2.21
2/25/2025	9.73	9.78	9.85	9.85	9.47	9.15	9.06	9	8.87	8.8	8.65	8.45	8.47	8.32	8.26	7.85	7.42	7.56	7.36	7.05	6.84
3/25/2025	8.75	9.14	9.22	9.21	9.12	8.7	8.57	8.16	7.74	7.94	7.87	7.73	7.63	7.53	7.4	7.45	7.34	7.34	7.25	6.89	6.76
4/23/2025	8.34	7.99	8.06	8.44	8.13	8.25	6.83	6.7	6.94	6.82	6.8	6.52	6.51	6.29	5.89	6.08	6.24	6.2	5.8	5.79	
5/13/2025	7.72	7.89	7.92	8.07	8.2	7.94	7.31	7	6.82	6.5	6.45	6.18	6.03	5.82	5.49	5.29	5.18	5.01	4.83	4.47	4.29
6/4/2025	7.6	7.4	7.6	7.64	6.99	6.94	6.22	4.86	4.78	4.86	4.83	4.97	4.94	4.81	4.7	4.32	3.93	3.75	3.54	3.26	3.11
7/1/2025	8.7	8.54	8.6	8.75	7.68	6.38	5.7	5.14	4.98	4.64	4.45	4.78	4.7	4.18	4.28	3.87	3.45	3.24	2.88	2.67	2.52
8/6/2025	7.05	6.78	6.79	6.38	6.58	5.29	3.26	2.26	1.85	1.74	1.84	1.94	1.55	1.24	0.9	0.65	0.45	0.27	0.23	0.21	0.18
9/16/2025	6.94	6.87	6.37	6.32	4.89	3.91	3.4	1.58	1.01	0.9	0.81	0.77	0.51	0.5	0.45	0.44	0.41	0.35	0.31	0.31	0.3
10/28/2025	6.9	6.74	6.58	6.28	5.93	5.84	5.83	5.77	5.57	1.66	1.12	0.78	0.64	0.54	0.47	0.27	0.24	0.23	0.22	0.2	0.22
11/19/2025	6.44	6.13	6.12	6.07	5.88	5.89	6.19	6.2	6.16	5.99	5.09	4.91	1.82	1.3	0.6	0.44	0.32	0.27	0.23	0.21	0.21
12/10/2025	5.2	4.68	4.55	4.61	4.69	4.47	4.59	4.44	4.55	4.48	4.47	3.14	3.77	2.72	2.32	1.51	1.3	1.26	1.22	1.16	1.11