NEW MEXICO ENVIRONMENT DEPARTMENT

***Surface Water Quality Bureau***

# 2023-2024 Watershed Survey

# FIELD SAMPLING PLAN

## Sacramento Mountains

**3/20/2024**

**Revision 1**

Prepared by

Elizabeth Stuffings

**APPROVAL PAGE**

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# Surface Water Quality Bureau

Our mission is to preserve, protect, and improve New Mexico's surface water quality for present and future generations.

## ACRONYMS

| | |
|---|---|
| AU | Assessment Unit |
| BLM | Bureau of Land Management |
| CALM | Comprehensive Assessment and Listing Methodology |
| CWA | Clean Water Act |
| HUC | Hydrologic Unit Code (HUC) |
| IR | State of New Mexico Clean Water Act §303(d)/305(b) Integrated Report |
| MASS | Monitoring, Assessment, and Standards Section |
| MPG | Miles per gallon |
| NMED | New Mexico Environment Department |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | Non-point Source |
| PCB | Polychlorinated biphenyl |
| PFAS | Perfluorinated and Polyfluorinated Alkyl Substances |
| PSRS | Point Source Regulation Section |
| QAPP | Quality Assurance Project Plan |
| SLD | Scientific Laboratory Division |
| SOP | Standard Operating Procedure |
| SQUID | Surface Water Quality Information Database |
| SWQB | Surface Water Quality Bureau |
| TDS | Total Dissolved Solids |
| TMDL | Total Maximum Daily Load |
| TSS | Total Suspended Solids |
| UAA | Use Attainability Analysis |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Forest Service |
| WPS | Watershed Protection Section |
| WQ | Water Quality |
| WQCC | Water Quality Control Commission |
| WQS | Water Quality Standards |
| WTU | Work Time Unit |
| WWTP | Wastewater Treatment Plant |

## 1.0 INTRODUCTION

The purpose of this Field Sampling Plan (Plan) is to provide a detailed description of the two-year Water Quality Survey to be conducted in the Sacramento Mountains during 2023-2024 by the New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB). The NMED SWQB prepared the original FSP as well as Revision One in accordance with SWQB *Standard Operating Procedure 2.1: Field Sampling Plan Development and Execution* (NMED/SWQB 2023). The Plan describes project objectives and decision criteria, and it includes the sampling schedule with locations, constituents, costs, and frequencies for physical, chemical, and biological data collection. It may be amended as the need arises. Amendments will be documented and justified in the subsequent survey report.

This is a companion document to the SWQB *Quality Assurance Project Plan for Water Quality Management Programs* (NMED/SWQB 2021a) (QAPP). Data will be collected according to the QAPP and the appropriate SWQB Standard Operating Procedures (SOPs). Both the QAPP and SOPs are posted on the SWQB website at https://www.env.nm.gov/surface-water-quality/qaqc/.

The Sacramento Mountains are located in the south-central part of New Mexico, lying just east of Alamogordo in Otero, Lincoln, and Chaves counties. The project area (**Figure 1**) consists of the perennial tributaries and lakes with headwaters in the Sierra Blanca, Capitan, and Sacramento Mountain ranges. Historic and current land uses in the watersheds include ranching, silviculture, mining, recreation, and some urban and residential development. Land cover in the watershed is composed of evergreen forest, shrub/scrubland, grassland, deciduous and mixed forest, and lotic waters and wetlands. Land ownership in the watersheds includes U.S. Forest Service, National Park Service, Bureau of Land Management (BLM), Tribal, U.S. Department of Defense, U.S. Fish and Wildlife Service, and State and Private parcels. The study area encompasses approximately 1,832 square miles (~4,744 kilometers). The Sacramento Mountains are located in Omernick Level III Ecoregions 23 (Arizona/New Mexico Mountains), 24 (Chihuahuan Deserts), and 26 (Southwestern Tablelands) (USEPA 2006).

The NMED SWQB last monitored the Sacramento Mountains in 2012 to identified both waters attaining New Mexico Water Quality Standards (WQS) and impaired waters (i.e., waters not attaining their specific designated uses). Streams within the watershed are divided into assessment units (AUs) based on differing geological and hydrological properties. Each AU is assessed individually using data from one or more monitoring sites located along the AU. Lakes are assigned a unique AU for each waterbody. For this survey, the NMED SWQB will sample selected monitoring locations for water quality constituents 4-8 times over two consecutive years. The total number of samples for each location is determined through a priority ranking of Clean Water Act (CWA) §303(d)/ §305(b) Integrated Report (IR) classification, presence of point source discharge(s), and Total Maximum Daily Load (TMDL) status, among other considerations. The framework for monitoring prioritization is discussed in the SWQB 10-Year Monitoring and Assessment Strategy (available at https://www.env.nm.gov/surface-water-quality/protocols-and-planning/) (NMED/SWQB 2016 or current). The type of monitoring planned at each site is discussed and summarized in **Section 5.0,** Sampling Plan.

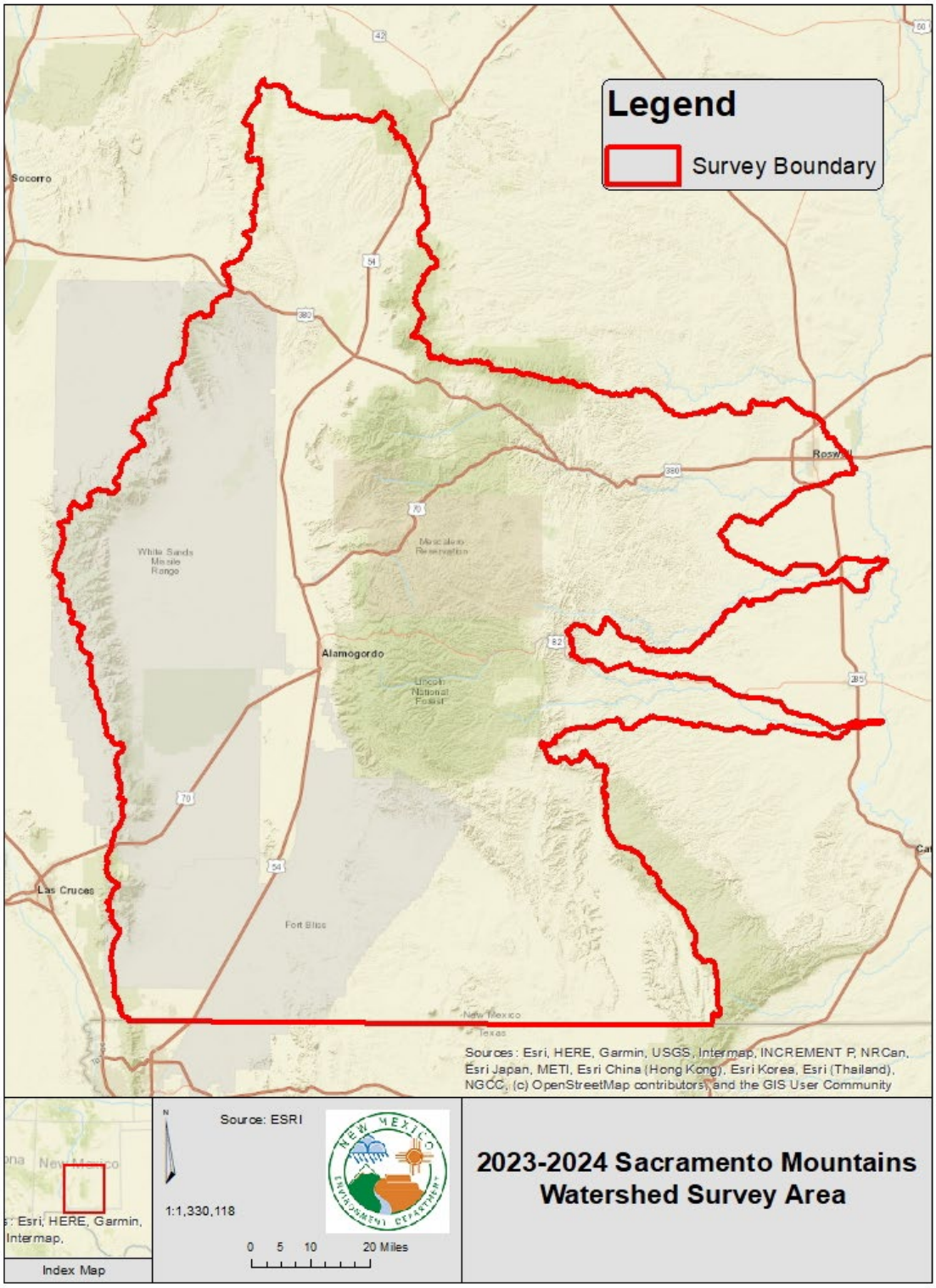



**Figure 1. 2023-2024 Sacramento Mountains Survey**

## 2.0 PROJECT PERSONNEL

### 2.1 Personnel Roles and Responsibilities

**Table 1** details the responsibilities for this project. Each team member is responsible for implementing the assigned responsibilities. If individuals are unable to fulfill their duties, it is the individual's responsibility to find assistance and/or a replacement, in coordination with appropriate supervisors. Questions or comments on this Field Sampling Plan should be directed to the MASS project supervisor.

**Table 1. Personnel Roles and Responsibilities**

| Team Member | Position/Role | Responsibilities |
|---|---|---|
| Lynette Guevara<br>Monitoring, Assessment, and Standards Section Program Manager<br>Lynnette.Guevara@env.nm.gov<br>505-629-8811 | Program Manager | Program Manager responsibilities noted in this FSP are completed in coordination with the Project Manager.<br><br>Approve FSP, directs staff to publish the FSP according to program and/or grant requirements.<br><br>Manage project personnel and resources throughout the project in coordination with Project Supervisor and Project Manager(s).<br><br>Provide oversight and coordinate with QAO and Project Manager(s) on data collection activities not conducted in accordance with the FSP, QAPP, or current SOPs.<br><br>Conduct environmental data collection activities in accordance with the developed FSP, QAPP, and current SWQB SOPs. |

| Team Member | Position/Role | Responsibilities |
|---|---|---|
| Elizabeth Stuffings<br>MASS Project Manager<br>Elizabeth.Stuffings@env.nm.gov<br>505-819-9926 | Acting Project Manager | Manage project resources throughout the project in coordination with Program Manager and Project Supervisor.<br><br>Conduct environmental data collection activities in accordance with the developed FSP, QAPP, and current SWQB SOPs. Data collection activities not conducted in accordance with the FSP, QAPP, or current SOPs will be documented and reported to the Program Manager and QAO.<br><br>Conduct mid-survey meeting with team to discuss any changes to the project plan. Coordinate and conduct post-survey meeting with team to discuss differences between planned and actual sampling and what data gaps, if any, exist.<br><br>Ensure the progress of project is kept on track by running SQUID reports and discussing on going data collection activities with Project Team.<br><br>Write, coordinate, and assemble report and/or other grant deliverables required of the project. |
| Diane Van Hoy<br>Monitoring Team Scientist<br>Diane.Van-Hoy@env.nm.gov<br>505-946-8808<br><br>Issac Martinez<br>Monitoring Team Scientist<br>Issac.martinez@env.nm.gov<br>505-699-7101 | Project Team | Conduct environmental data collection activities in accordance with the developed FSP, QAPP, and current SWQB SOPs. Data collection activities not conducted in accordance with the FSP, QAPP, or current SOPs will be documented and reported to the Project Manager.<br><br>Maintain project files in dedicated survey folder. Calibration worksheets and field forms utilized for data collection will be maintained according to SOPs.<br><br>Write assigned sections of reports and/or other grant deliverables required throughout the project. |

| Team Member | Position/Role | Responsibilities |
|---|---|---|
| Miguel Montoya<br>Miguel.Montoya@env.nm.gov<br>505-819-9882 | Acting Quality Assurance Officer (QAO) | Approve and ensure FSP is retained in accordance with 1.21.2 NMAC, Retention and Disposition of Public Records.<br><br>Documents approved changes of FSP in QA project files.<br><br>Conduct audits as needed to ensure compliance with FSP, QAPP and SOPs. |
| Michael Baca<br>Michael.Baca1 @env.nm.gov<br>505-946-8954 | Standards, Planning and Reporting Team (SPRT) Liaison | Provide information and data needs pertaining to water quality standards development and refinement located within the study area. |
| Heidi Henderson<br>Heidi.Henderson@env.nm.gov<br>505-819-9986 | TMDL and Assessment Team (TAT) Liaison | Provide information and data needs pertaining to TMDL development and assessment to be conducted in the study area. |
| Susan Lucas Kamat<br>Susan.LucasKamat@env.nm.gov<br>505-946-8924 | Point Source Regulation Section (PSRS) Liaison | Provide information and data needs pertaining to point source discharges located within the study area. |
| Kate Lacey<br>Kathryn.Lacey@env.nm.gov<br>505-946-8952 | Watershed Protection Section (WPS) Liaison | Provide information and data needs pertaining to nonpoint sources of pollution and BMPs located within the study area. |
| Maryann McGraw<br>Maryann.McGraw@state.nm.us<br>505-819-9891 | Wetlands Program Liaison | Provide information and data needs pertaining to wetlands located within the study area. |

## 2.2 Organization

The Project Manager; Project Supervisor; Project Team; Standards, Planning and Reporting Team Liaison; and TMDL and Assessment Team Liaison report to the MASS Program Manager for the responsibilities defined in this project. The Wetlands Program Liaison reports to the Watershed Protection Section (WPS) Program Manager. The Point Source Regulation Section (PSRS) Liaison and the WPS Liaison are section Program Managers and report to the SWQB Bureau Chief. An organizational chart of the SWQB is available at https://www.env.nm.gov/surface-water-quality/contact-us-3/.

## 3.0 PROJECT DESCRIPTION

### 3.1 Background

Section 303(d) of the Federal Water Pollution Control Act, known as the Clean Water Act (CWA), requires that each state submit to the U.S. Environmental Protection Agency (EPA) a list of water quality limited segments that require load allocations, waste load allocations, and TMDLs. The current CWA §303(d) Program in New Mexico consists of three major steps: monitoring of surface waters, assessing monitoring data against the WQS, and developing TMDLs for those waters not meeting water quality standards (i.e., impaired).

CWA §305(b) requires that each state also submit a biennial report to the U.S. Congress through the EPA. The two requirements are combined into *The State of New Mexico §303(d)/§305(b) Integrated List and Report* (NMED/SWQB 2022) (IR). The IR also serves as a source of basic information on water quality and water pollution control programs in New Mexico.

In accordance with the above stated statutory requirements, the IR report contains the following information:

- An assessment of surface water quality;
- An analysis of the extent to which the CWA §101(a) goal of surface water quality to provide for protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water is being achieved;
- An overview of progress in water pollution control and recommendations for further action; and
- A description of the nature of nonpoint source pollution and of programs for nonpoint source control.

The activities described in this Plan are focused toward meeting the goals of the most recent, EPA-approved IR (NMED/SWQB 2022). The impairments for AUs in this survey area listed in **Table 2** were identified during the SWQB's most recent survey of this watershed, conducted 2012, and may include data from a variety of other investigations. The "IR Category" column provides the current AU's status in the IR (see **Appendix A** for definitions). "WQS Reference" provides the applicable Water Quality Standard reference as assigned to each AU and described in 20.6.4 New Mexico Administrative Code (NMAC) as governed by the New Mexico Water Quality Control Commission (WQCC) (NMAC 2022). The purpose of 20.6.4 NMAC is to establish WQS that consist of applicable designated uses of surface waters of the state, the water quality criteria necessary to protect those uses, and an antidegradation policy. The "TMDL Completed" column lists the EPA-approved TMDLs for the AU.

Assessment of surface waters against the WQS occurs after monitoring data have been verified and validated, using the most recent assessment protocols. Assessment protocols are updated every odd year (e.g., 2023) and are opened for EPA and public review and comment. Waterbodies determined to be impaired are reported as such every even year (e.g., 2024, 2026) on New Mexico's IR List. TMDLs or TMDL alternatives are typically developed for impaired AUs.

## Table 2. Sacramento Mountains: Impairment and TMDL Status of Survey Assessment Units

| Assessment Unit Name | WQS Reference | IR Category | Impairment(s) | TMDL(s) Completed |
|---|---|---|---|---|
| Agua Chiquita (perennial portions of McEwan Cny to headwaters) | 20.6.4.208 | 5/5A | *E. coli* \| Turbidity | Turbidity |
| Agua Chiquita (Rio Penasco to McEwan cny) | 20.6.4.97 | 2 | | |
| Alto Lake | 20.6.4.98 | 1 | | |
| Berrendo Creek (Rio Hondo to Middle Berrendo Creek) | 20.6.4.206 | | | |
| Bonito Lake | 20.6.4.223 | 2 | | |
| Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd) | 20.6.4.209 | 4A | *E. coli* | *E. coli* |
| Dog Canyon Creek (perennial portions) | 20.6.4.810 | 5/5C | Temperature | |
| Eagle Creek (Alto Lake to S. Fork Eagle Creek) | 20.6.4.98 | 3/3A | | |
| Eagle Creek (Rio Ruidoso to Alto Lake) | 20.6.4.98 | 2 | | |
| Eagle Creek (S. Fork Eagle Creek to headwaters) | 20.6.4.209 | | | |
| Fresnal Canyon (La Luz Creek to Salado Canyon) | 20.6.4.801 | 5/5C | *E. coli* \| Flow Regime Modification | |
| Fresnal Canyon (Salado Canyon to headwaters) | 20.6.4.801 | 2 | | |
| Grindstone Canyon (Carrizo Creek to Grindstone Rsvr) | 20.6.4.98 | 1 | | |
| Grindstone Canyon (Grindstone Rsvr to headwaters) | 20.6.4.97 | 3/3A | | |
| Grindstone Reservoir | 20.6.4.209 | 5/5B | Temperature | |
| Karr Canyon (Fresnal Canyon to headwaters) | 20.6.4.801 | 5/5A | Sedimentation/Siltation | |
| La Luz Creek (Fresnal Creek to headwaters) | 20.6.4.98 | 3/3A | | |
| Lake Holloman | 20.6.4.99 | 5/5A | Arsenic, dissolved | |
| Lake Lucero (North) | 20.6.4.98 | 3/3A | | |
| Lake Lucero (South) | 20.6.4.98 | 3/3A | | |
| Lake Stinky | 20.6.4.99 | 3/3A | | |
| Little Creek (Eagle Creek to headwaters) | 20.6.4.98 | 3/3A | | |
| Malpais Springs | 20.6.4.99 | 3/3A | | |
| Mound Springs | 20.6.4.99 | 3/3A | | |
| Nogal Creek (Tularosa Creek to Mescalero Apache bnd) | 20.6.4.801 | 5/5A | *E. coli* \| Temperature | *E. coli* |

| Assessment Unit Name | WQS Reference | IR Category | Impairment(s) | TMDL(s) Completed |
|---|---|---|---|---|
| North Spring River (Rio Hondo to headwaters) | 20.6.4.206 | 2 | | |
| Rio Bonito (Perennial prt Rio Ruidoso to NM 48 near Angus) | 20.6.4.208 | 4C | Flow Regime Modification | |
| Rio Bonito (Perennial prt NM 48 near Angus to headwaters) | 20.6.4.209 | 5/5C | Benthic Macroinvertebrates \| *E. coli* \| Flow Regime Modification \|Temperature | *E. coli* |
| Rio Felix (Intermittent pt Lincoln cyn to Mescalero Apache) | 20.6.4.98 | 3 | | |
| Rio Felix (Intermittent reaches abv Hagerman Canal) | 20.6.4.98 | 3 | | |
| Rio Felix (Perennial prt abv Old School rd to Lincoln Cyn) | 20.6.4.206 | 3 | | |
| Rio Felix (Perennial prt Pecos River to Hagerman Canal) | 20.6.4.206 | 3/3A | | |
| Rio Hondo (HWY 285 to Bonney Canyon) | 20.6.4.98 | 3/3A | | |
| Rio Hondo (Perennial prt Pecos R to HWY 285) | 20.6.4.206 | 1 | | |
| Rio Hondo (Perennial reaches Bonney Canyon to Rio Ruidoso) | 20.6.4.208 | 4C | Flow Regime Modification | Fecal Coliform |
| Rio Penasco (HWY 24 to Cox Canyon) | 20.6.4.208 | 4A | Turbidity | Turbidity |
| Rio Penasco (Pecos River to Bluewater Creek) | 20.6.4.98 | 3/3A | | |
| Rio Penasco (Perennial prt Bluewater Creek to HWY 24) | 20.6.4.206 | 1 | | |
| Rio Penasco (Perennial prt Cox Canyon to headwaters) | 20.6.4.208 | 2 | | |
| Rio Ruidoso (Carrizo Ck to Mescalero Apache bnd) | 20.6.4.209 | 4A | Nutrients \|Phosphorus (Total) \|Temperature \|Turbidity | Nutrients \|Phosphorus (Total) \|Temperature \|Turbidity |
| Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | 20.6.4.208 | 4A | *E. coli* \| Nutrients \| Turbidity | *E. coli* \| Nutrients \| Turbidity |
| Rio Ruidoso (North Fork abv Mescalero Apache bnd) | 20.6.4.209 | 2 | | |
| Rio Ruidoso (Perennial prt Rio Bonito to Eagle Ck) | 20.6.4.208 | 3/3A | | |
| Rio Ruidoso (US Hwy 70 Bridge to Carrizo Ck) | 20.6.4.209 | 4A | *E. coli* \| Nutrients \| Temperature | *E. coli* \| Nutrients \| Temperature |
| S. Fork Eagle Creek (Eagle Creek to Mescalero Apache bnd) | 20.6.4.209 | 4C | Flow Regime Modification | |
| Sacramento R (Arkansas Canyon to Scott Able Canyon) | 20.6.4.98 | 3/3A | | |
| Sacramento R (Perennial prt Scott Able | 20.6.4.805 | 5/5A | Sedimentation/Siltation | |

| Assessment Unit Name | WQS Reference | IR Category | Impairment(s) | TMDL(s) Completed |
|---|---|---|---|---|
| Canyon to headwaters) | | | | |
| Salado Canyon (Fresnal Canyon to headwaters) | 20.6.4.801 | 2 | | |
| Salt Creek (Tularosa Valley) | 20.6.4.99 | 3/3A | | |
| San Andres Canyon (S San Andres Canyon to headwaters) | 20.6.4.801 | 3/3A | | |
| San Andres Canyon (Taylor Ranch Rd to S San Andres Canyon) | 20.6.4.97 | 3/3A | | |
| Scott Able Canyon (Sacramento R to road NF-64 abv canyon) | 20.6.4.98 | 3/3A | | |
| South Fork Rio Bonito (Rio Bonito to headwaters) | 20.6.4.209 | 2 | | |
| Three Rivers (Perennial prt HWY 54 to USFS exc Mescalero) | 20.6.4.802 | 4C | Flow Regime Modification | |
| Three Rivers (USFS bnd to headwaters) | 20.6.4.802 | 1 | | |
| Tularosa Ck (perennial prt downstream of old HWY 70 xing) | 20.6.4.99 | 3/3A | | |
| Tularosa Creek (Old HWY 70 xing to Mescalero Apache bnd) | 20.6.4.801 | 2 | | |

## 3.2 Objectives

Table 3 outlines the project objectives identified to meet the various SWQB needs. Data needs have been determined based on core parameters needed to complete assessments, impairments from previous studies, identified data gaps, and consultation with the SWQB MASS, PSRS, and WPS staff as well as other state agencies, federal agencies, tribes, local watershed groups, and interested parties.

**Table 3. Project Objectives**

| Purpose for Water Quality Data Collection | Question to be answered | Decision Criteria | Products/ Outcomes |
|---|---|---|---|
| Assess designated use attainment for the *Integrated Report* and provide information to the public on the condition of surface waters | Are sampled waterbodies meeting WQS criteria? | WQS criteria interpreted through the CALM | Integrated Report |
| Develop load and waste load allocations for TMDLs | What is the maximum pollutant load a waterbody can receive and meet the requirements of the WQS? | WQS criteria and critical flow volume | TMDL loading calculations and NPDES permit limits |
| Evaluate restoration and mitigation measures implemented to control NPS pollution | Have watershed restoration activities and mitigation measures improved water quality? | WQS criteria and historic data | Project Summary Reports, NPS Annual Report, *Integrated Report (De-Listing)* |
| Develop or refine the WQS | Are the existing uses appropriate for the waterbody? | Data sufficient to support a petition to the WQCC to revise WQS | Use Attainability Analyses (UAA); Site Specific Criteria; Amendments to WQS |
| Obtain data for ambient/baseline water quality upstream of NPDES outfall | What is the water quality above the NPDES outfall? | Survey chemical, physical and biological data | NPDES Permits / Certifications |

## 3.3 Monitoring Strategy

The SWQB monitoring of surface waters across the State currently occurs, on average, every ten years using a rotational watershed sampling approach. Monitoring occurs during the non-winter months from March through November and focuses on physical, chemical, and biological conditions, mostly in perennial waters, including sampling for most pollutants that have numeric and/or narrative criteria in the WQS.

To achieve the goals outlined in Section 3.2, the NMED SWQB utilized a targeted monitoring design to address data needs identified for assessment, TMDLs, potential standards revisions, and point source monitoring. Monitoring sites were selected based on the data needs for an assessment unit, accessibility, and representation of and within the assessment unit. Each assessment unit is represented by one or more monitoring stations, each of which receives 4–8 site visits during the survey. Through public outreach, inter-agency coordination, and a scoring system which considers a variety of factors, a two-tier monitoring system – primary and secondary – has been developed to prioritize AUs. High ranking priority waters (primary AUs) receive the greatest amount of monitoring, whereas low ranking waters (i.e., secondary AUs) receive less. The two-year monitoring allows more data to be collected from the highest priority waters to better capture inter-annual variability due to hydrologic conditions during sampling events and provide information to adjust year-2 monitoring depending on year-1 analytical results.

## 3.4 Project Schedule

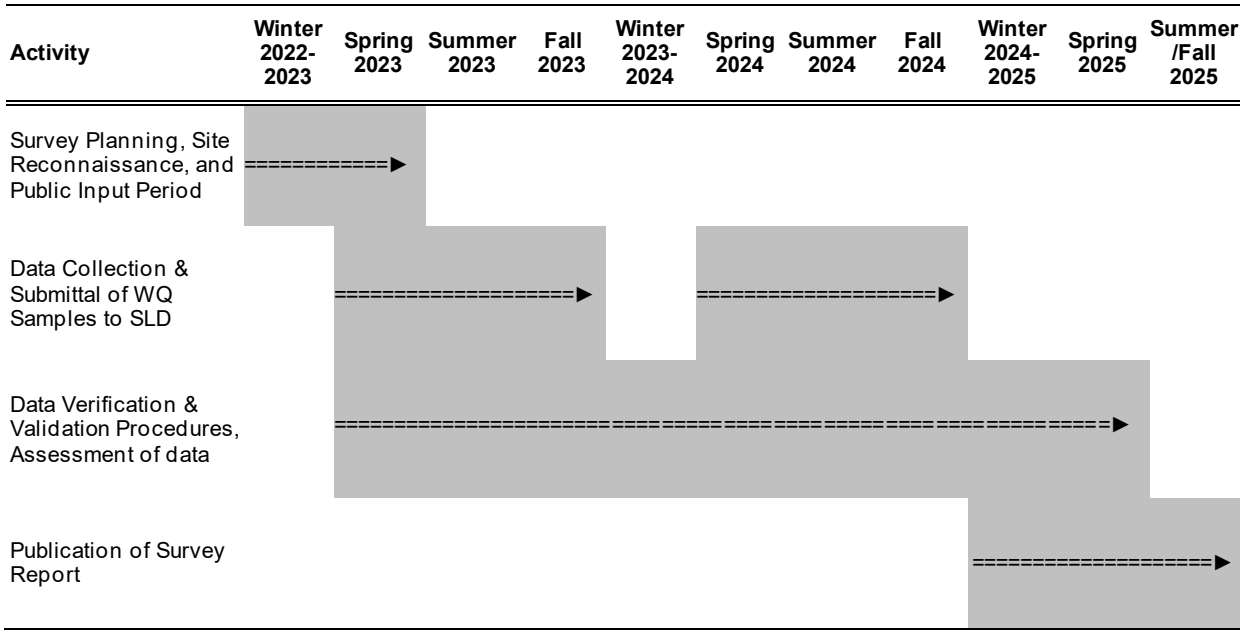
As part of the survey planning process, the NMED SWQB holds a 30-day public comment period to solicit input on any areas of concern within the AUs surveyed and to inform interested parties about the SWQB water quality survey process, the specific sampling plans in the watershed, and the assessment and TMDL processes.

The NMED SWQB will document the progress of this project and track it from inception through implementation to ensure all sampling and analytical activities are performed in accordance with all applicable requirements and in a cost-effective manner. **Table 4** provides the project timeline.

Water chemistry results typically take several months to return from the analytical laboratory, the New Mexico Scientific Laboratory Division (SLD). The NMED SWQB has incorporated the lag time to receive results into the schedule. When sample results are received, they undergo verification and validation according to SWQB SOPs. The final step of the project is the publication of a survey report on the SWQB website that summarizes the data collection effort and documents changes to the original and revised FSP. The final survey report will be made available at: https://www.env.nm.gov/surface-water-quality/water-quality-monitoring/.

Following project completion, the data will be assessed for incorporation into the 2026-2028 IR List. Once the assessments are complete, the TMDL development process will begin for any identified impairments.

**Table 4. Project Schedule**




### 3.5 Project Location

The project area consists of the perennial tributaries and lakes with headwaters in the Sierra Blanca, Capitan, and Sacramento Mountain ranges. The survey area includes the Rio Hondo watershed (HUC 13060008), Rio Felix watershed (HUC 13060009), Rio Penasco watershed (13060010), Tularosa Valley watershed (HUC 13050003), and the Salt Basin watershed (HUC 13050004). The SWQB does not plan on sampling any streams within the formal boundaries of the Mescalero Apache Tribe. **Table 5** shows a complete list of stations illustrated in **Figure 2**.

**Table 5. Sacramento Mountains: Water Quality Stations**

| Map # | Station Name | Station ID | Assessment Unit | Rationale/Comments |
|---|---|---|---|---|
| 1 | Agua Chiquita abv Rio Penasco - 59AguaCh001.1 | 59AguaCh001.1 | Agua Chiquita (Rio Penasco to McEwan Cny) | Bottom of AU |
| 2 | Agua Chiquita abv Sacramento - 59AguaCh035.2 | 59AguaCh035.2 | Agua Chiquita (perennial portions McEwan Cny to headwaters) | AU has historical listings for turbidity and *E. coli* |
| 3 | ALTO LAKE - 57AltoLake | 57AltoLake | Alto Lake | Lake monitoring |
| 4 | Alto Lake Inlet - 57EagleC030.1 | 57EagleC030.1 | Alto Lake | Alto Lake inlet |
| 5 | CARRIZO CREEK ABOVE THE RIO RUIDOSO - 57Carriz000.1 | 57Carriz000.1 | Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd) | AU has historical listing for *E. coli*. Bottom of AU. |
| 6 | Carrizo Creek at Mescalero Boundary - 57Carriz003.0 | 57Carriz003.0 | Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd) | AU has historical listing for *E. coli*. Monitor water leaving Tribal lands. |

| Map # | Station Name | Station ID | Assessment Unit | Rationale/Comments |
|---|---|---|---|---|
| 9 | Dog Canyon at Nature Trail - 48DogCan002.7 | 48DogCan002.7 | Dog Canyon Creek (perennial portions) | AU has historical listing for temperature |
| 10 | Eagle Creek abv Alto Lake - 57EagleC031.1 | 57EagleC031.1 | Eagle Creek (Alto Lake to S. Fork Eagle Creek) | Bottom of AU |
| 11 | Eagle Creek below Alto Lake - 57EagleC030.0 | 57EagleC030.0 | Eagle Creek (Rio Ruidoso to Alto Lake) | Alto Lake outfall |
| 12 | Fresnal Creek above Salado Canyon - 48FresCa008.3 | 48FresCa008.3 | Fresnal Canyon (Salado Canyon to headwaters) | Bottom of AU |
| 13 | FRESNAL CREEK AT ALAMOGORDO WATER INTAKE - 48FresCa001.0 | 48FresCa001.0 | Fresnal Canyon (La Luz Creek to Salado Canyon) | AU has historical listings for *E. coli* and flow regime modification. Bottom of AU. |
| 14 | Grindstone Canyon above Grindstone Reservoir - 57Grinds002.0 | 57Grinds002.0 | Grindstone Canyon (Grindstone Rsvr to headwaters) | Grindstone Canyon Reservoir inlet. Bottom of AU. |
| 15 | GRINDSTONE CANYON RESERVOIR DEEP - 57GrindCanRes | 57GrindCanRes | Grindstone Canyon Reservoir | AU has historical listing for temperature. Lake monitoring. |
| 16 | Grindstone Canyon Reservoir outfall - 57Grinds001.6 | 57Grinds001.6 | Grindstone Canyon (Carrizo Creek to Grindstone Rsvr) | Grindstone Canyon Reservoir outfall |
| 17 | Grindstone Canyon Reservoir Inlet - 57GrindInlet | 57GrindInlet | Grindstone Canyon Reservoir | Grindstone Canyon Reservoir inlet |
| 18 | Karr Canyon above Raven Road - 48KarrCa002.9 | 48KarrCa002.9 | Karr Canyon (Fresnal Canyon to headwaters) | AU has historical listing for sedimentation/siltation. Only station in AU. |
| 19 | LA LUZ CREEK AT CR A-70 - 48LaLuzC014.2 | 48LaLuzC014.2 | La Luz Creek (Fresnal Creek to headwaters) | Lowest station in AU likely to have water |
| 20 | Lake Holloman Deep | 48LHollomanDp | Lake Holloman | Lake sampling |
| 21 | N Fk Eagle Creek at FSR 127 - 57NEagle000.2 | 57NEagle000.2 | North Fork Eagle Creek (Eagle Creek to headwaters) | Bottom of AU |
| 22 | N Fk Rio Ruidoso abv ski lodge - 57NRuido00 9.4 | 57NRuido00 9.4 | Rio Ruidoso (North Fork abv Mescalero Apache bnd) | Lowest accessible station in AU. Monitor water leaving ski area. |
| 23 | NOGAL CREEK AT COUNTY ROAD B-17 - 48NogalC000.2 | 48NogalC000.2 | Nogal Creek (Tularosa Creek to Mescalero Apache bnd) | AU has historical listings for *E. coli* and temperature. Bottom of AU. |
| 24 | RIO BONITO ABV HWY 70 BRIDGE - 57RBonit001.0 | 57RBonit001.0 | Rio Bonito (Perennial prt Rio Ruidoso to NM 48 near Angus) | AU has historical listing for flow regime modification. Bottom of AU. Data needed for nutrients assessment. |
| 25 | Rio Bonito at BLM Apple Orchard Site - 57RBonit027.7 | 57RBonit027.7 | Rio Bonito (Perennial prt Rio Ruidoso to NM 48 near Angus) | AU has historical listing for flow regime modification. |
| 26 | RIO BONITO AT FR 107 - 57RBonit061.1 | 57RBonit061.1 | Rio Bonito (Perennial prt NM 48 near Angus to headwaters) | AU has historical listings for benthic macroinvertebrates, flow regime modification, E. coli, temperature, phosphorus (Total). Bonito Lake inlet. Data needed to assess possible AU split. |

| Map # | Station Name | Station ID | Assessment Unit | Rationale/Comments |
|---|---|---|---|---|
| 27 | RIO BONITO AT HWY 48 BRIDGE-USGS Gage 0838850 - 57RBonit053.4 | 57RBonit053.4 | Rio Bonito (Perennial prt NM 48 near Angus to headwaters) | AU has historical listings for benthic macroinvertebrates, flow regime modification, E. coli, temperature, phosphorus (Total). Data needed for nutrients assessment. |
| 28 | Rio Felix at Special Area on Flying H Ranch - 58RFelix114.1 | 58RFelix114.1 | Rio Felix (Perennial prt abv Old School rd to Lincoln Cyn) | Bottom of AU |
| 29 | Rio Hondo below Riverside on Rio Hondo Land and Cattle property - 57RHondo105.8 | 57RHondo105.8 | Rio Hondo (Perennial reaches Bonney Canyon to Rio Ruidoso) | AU has historical listing for flow regime modification. |
| 30 | RIO PENASCO AT BLUFF SPRINGS - 59RPenas170.4 | 59RPenas170.4 | Rio Penasco (Perennial prt Cox Canyon to headwaters) | Lowest station in AU likely to have water |
| 31 | Rio Penasco at Helena Road blw USGS Gage 08397620 - 59RPenas090.0 | 59RPenas090.0 | Rio Penasco (Perennial prt Bluewater Creek to HWY 24) | Only station in AU |
| 32 | Rio Penasco at NM 24-USGS Gage 08397600 - 59RPenas108.4 | 59RPenas108.4 | Rio Penasco (HWY 24 to Cox Canyon) | AU has historical listing for turbidity. Bottom of AU. |
| 33 | Rio Ruidoso @ CR E002 – 57RRuido030.5 | 57RRuido030.5 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Downstream of NPDES permit |
| 34 | RIO RUIDOSO ABOVE CARRIZO CREEK - 57RRuido045.3 | 57RRuido045.3 | Rio Ruidoso (Carrizo Ck to Mescalero Apache bnd) | AU has historical listings for nutrients, phosphorus (Total), temperature, and turbidity. Bottom of AU. |
| 35 | Rio Ruidoso abv Hwy 70 bridge - 57RRuido031.5 | 57RRuido031.5 | Rio Ruidoso (US Hwy 70 Bridge to Carrizo Ck) | AU has historical listings for *E. coli*, nutrients, and temperature. Bottom of AU. |
| 36 | Rio Ruidoso at CR 16 Bridge near Hondo - 57RRuido001.3 | 57RRuido001.3 | Rio Ruidoso (Perennial prt Rio Bonito to Eagle Ck) | Bottom of AU |
| 37 | RIO RUIDOSO AT GLENCOE-FR 443 - 57RRuido019.8 | 57RRuido019.8 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | AU has historical listings for E. coli, nutrients, and turbidity. Bottom of AU. |
| 38 | Rio Ruidoso at Mescalero boundary at USGS Gage 08386505 - 57RRuido052.4 | 57RRuido052.4 | Rio Ruidoso (Carrizo Ck to Mescalero Apache bnd) | AU has historical listings for nutrients, phosphorus (Total), temperature, and turbidity. |
| 40 | Rio Ruidoso blw Ruidoso Downs Racetrack @ Joe Welch Dr - 57RRuido039.4 | 57RRuido039.4 | Rio Ruidoso (US Hwy 70 Bridge to Carrizo Ck) | AU has historical listings for E. coli, nutrients, and temperature. |
| 41 | RUIDOSO NEW WWTP OUTFALL PIPE - NM0029165 | NM0029165-M | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | NPDES permit |
| 42 | S Fk Rio Bonito abv Blue Hole Pond - 57SRBonit000.3 | 57SRBonit000.3 | South Fork Rio Bonito (Rio Bonito to headwaters) | Bottom of AU |
| 44 | SACRAMENTO RIVER AT USGS GAGE - 49Sacram014.6 | 49Sacram014.6 | Sacramento R (Perennial prt Scott Able Canyon to | AU has historical listing for sedimentation/siltation. Bottom of AU. |

| Map # | Station Name | Station ID | Assessment Unit | Rationale/Comments |
|---|---|---|---|---|
| | | | headwaters) | |
| 45 | SACRAMENTO RIVER BELOW SCOTT ABLE CANYON - 49Sacram013.7 | 49Sacram013.7 | Sacramento R (Arkansas Canyon to Scott Able Canyon) | Lowest station in AU likely to have water |
| 46 | Salado Canyon at Salado Canyon Trestle - 48Salad0001.1 | 48Salad0001.1 | Salado Canyon (Fresnal Canyon to headwaters) | Bottom of AU |
| 47 | SCOTT ABLE CREEK ABOVE SACRAMENTO RIVER - 49ScottA000.1 | 49ScottA000.1 | Scott Able Canyon (Sacramento R to road NF-64 abv canyon) | Bottom of AU |
| 48 | South Fork Eagle Creek abv Eagle Creek- 57SEagle000.1 | 57SEagle000.1 | S. Fork Eagle Creek (Eagle Creek to Mescalero Apache bnd) | AU has historical listing for flow regime modification. Bottom of AU. |
| 49 | THREE RIVERS AT FOREST SERVICE CAMPGROUND - 48ThreeR022.8 | 48ThreeR022.8 | Three Rivers (USFS bnd to headwaters) | Bottom of AU |
| 50 | THREE RIVERS AT U.S. HWY 54 - 48ThreeR001.0 | 48ThreeR001.0 | Three Rivers (Perennial prt HWY 54 to USFS exc Mescalero) | AU has historical listing for flow regime modification. Bottom of AU. |
| 51 | Tularosa Creek ABV USGS GAGE 08481500 NR BENT- 48RTular030.0 | 48RTular030.0 | Tularosa Creek (Old HWY 70 xing to Mescalero Apache bnd) | Lowest station location in AU likely to have water. Data needed for nutrients assessment. |
| 52 | Tularosa Creek at Hwy 54 – 48Tular014.9 | 48Tular014.9 | Tularosa Ck (perennial prt downstream of old HWY 70 xing) | Lowest station in AU |

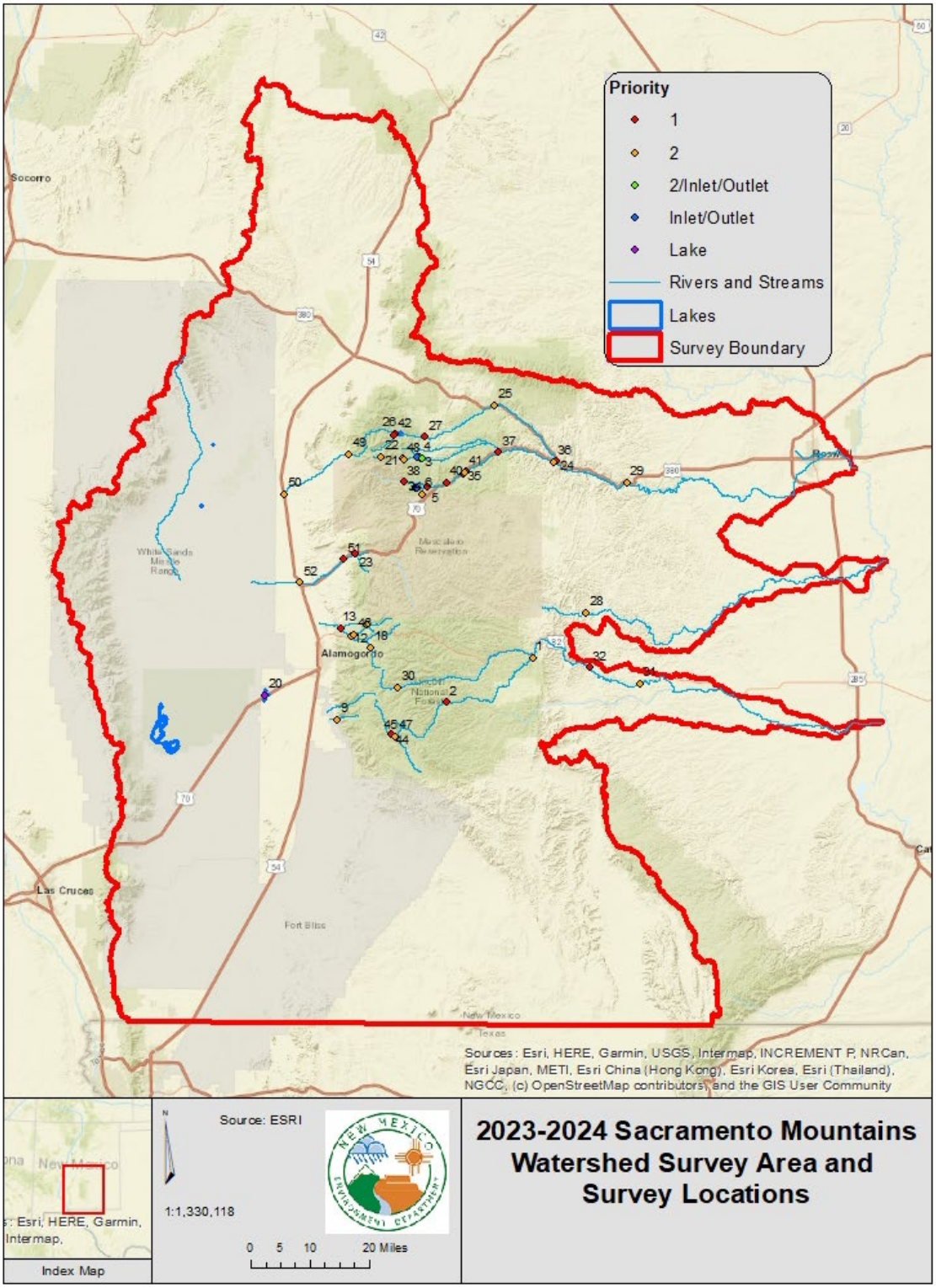



**Figure 2. Sacramento Mountains Sampling Area and Monitoring Locations**

## 4.0 DOCUMENTATION

Project documents will include this field sampling plan, field sheets (including chemistry, biohabitat, probable source observations and data logger deployment/retrieval sheets), calibration records, electronic data logger downloads, data validation and verification records, sample collection data, lab submittal forms, and records of analytical data in hard copy or in electronic form.

Documents will be maintained in accordance with the requirements of the SWQB QAPP for Water Quality Management Programs (NMED/SWQB 2021a).

The survey data will be organized within the following project folder in the SWQB database:

- Sacramento Mountain Watersheds 2023-2024

The NMED SWQB will document project activities on SWQB Monitoring Field Sheets and enter and maintain information from field sheets in the SWQB database in accordance with the SWQB QAPP and SOPs. Analytical results will be electronically transferred into the SWQB database and uploaded to US EPA'S Water Quality Exchange (WQX) database. The project is completed once the Survey Report is finalized.

Narrative descriptions of progress, any plan deviations, issues, or corrective actions throughout the project will be documented in the mid-survey revised FSP and the Survey Report. Any deviations from SOPs and other field, laboratory, and data analysis practices will be presented to the MASS Program Manager and the Quality Assurance Officer for consideration and approval.

## 5.0 SAMPLING PLAN

### 5.1 Chemistry Sampling

Sample collection techniques, preservation and acidification requirements, equipment, and quality control activities associated with the sampling of surface water for analytes listed in Table 6 will be conducted in accordance with SWQB SOP 8.1 Chemical Sampling – Equipment Cleaning Procedure, SOP 8.2 Chemical Sampling in Lotic Environments, SOP 9.1 Bacteriological Sampling and SOP 12.1 Lake Sampling.

Water quality samples will be analyzed by the SLD or the SWQB laboratory in accordance with procedures outlined in the SWQB SOPs. Nutrient samples where high phosphorus levels are expected, such as WWTPs, will be analyzed using a method with a higher reporting limit.

**Table 6** outlines the water quality analytes to be measured during the two-year survey and their sampling frequency. The Priority column of **Table 6** documents chemical sampling priority for each sampling station. The numbers listed within the analyte columns describe the number of analyte samples planned for each station during the 2023-2024 survey. The footnotes to **Table 6** contain more detailed information.

Chemistry sample analytical suites for each station are planned based on the data needs identified for each assessment unit and to address the most common sources of impairment in lakes and streams. Due to limited resources, not all the water quality criteria listed in 20.6.4.900 NMAC will be sampled at all

stations. Radionuclides and volatile/semi-volatile organic compounds will be sampled in major tributaries, above and below NPDES permit discharges, and lakes. PCBs generally will not be sampled in the water column since these compounds have not been detected at levels of concern in previous water samples for these areas. Assessment units with current or historic metals impairments have received higher numbers of metals samples.

In addition to the analytes listed, instantaneous measurements for field parameters such as temperature, specific conductance, salinity, dissolved oxygen concentration, dissolved oxygen saturation, pH, and turbidity will be measured at each site using an In-Situ® multi-parameter sonde in accordance with SWQB SOPs.

**Table 6. Sacramento Mountains Survey: Water Chemistry Sampling Frequency**

| Map # | Station Name | Station ID | Assessment Unit | Priority[1] | TDS/TSS[2] | Nutrients (low P)[3] | Nutrients (high P)[4] | Total Metals[5] | Dissolved Metals[6] | *E. coli* | Microbial Source Tracking[7] | Volatile Organics[8] | Semi-Volatile Organics[8] | Radionuclides[9] | PFAS[8] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Agua Chiquita abv Rio Penasco - 59AguaCh001.1 | 59AguaCh001.1 | Agua Chiquita (Rio Penasco to McEwan Cny) | 2 | 4 | 4 | | 4 | 4 | 4 | | 2 | 2 | 2 | |
| 2 | Agua Chiquita abv Sacramento - 59AguaCh035.2 | 59AguaCh035.2 | Agua Chiquita (perennial portions McEwan Cny to headwaters) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 3 | ALTO LAKE - 57AltoLake | 57AltoLake | Alto Lake | L | 4 | 4 | | 4 | 4 | 4 | | 2 | 2 | 2 | |
| 4 | Alto Lake Inlet - 57EagleC030.1 | 57EagleC030.1 | Alto Lake | IO | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 5 | CARRIZO CREEK ABOVE THE RIO RUIDOSO - 57Carriz000.1 | 57Carriz000.1 | Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 6 | Carrizo Creek at Mescalero Boundary - 57Carriz003.0 | 57Carriz003.0 | Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 9 | Dog Canyon at Nature Trail - 48DogCan002.7 | 48DogCan002.7 | Dog Canyon Creek (perennial portions) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 10 | Eagle Creek abv Alto Lake - 57EagleC031.1 | 57EagleC031.1 | Eagle Creek (Alto Lake to S. Fork Eagle Creek) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 11 | Eagle Creek below Alto Lake - 57EagleC030.0 | 57EagleC030.0 | Eagle Creek (Rio Ruidoso to Alto Lake) | 2/IO | 4 | 4 | | 4 | 4 | 4 | | | | | |

| Map # | Station Name | Station ID | Assessment Unit | Priority[1] | TDS/TSS[2] | Nutrients (low P)[3] | Nutrients (high P)[4] | Total Metals[5] | Dissolved Metals[6] | *E. coli* | Microbial Source Tracking[7] | Volatile Organics[8] | Semi-Volatile Organics[8] | Radionuclides[9] | PFAS[8] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | Fresnal Creek above Salado Canyon - 48FresCa008.3 | 48FresCa008.3 | Fresnal Canyon (Salado Canyon to headwaters) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 13 | FRESNAL CREEK AT ALAMOGORDO WATER INTAKE - 48FresCa001.0 | 48FresCa001.0 | Fresnal Canyon (La Luz Creek to Salado Canyon) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 14 | Grindstone Canyon above Grindstone Reservoir - 57Grinds002.0 | 57Grinds002.0 | Grindstone Canyon (Grindstone Rsvr to headwaters) | 2/IO | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 15 | GRINDSTONE CANYON RESERVOIR DEEP - 57GrindCanRes | 57GrindCanRes | Grindstone Canyon Reservoir | L | 4 | 4 | | 4 | 4 | 4 | | 2 | 2 | 2 | |
| 16 | Grindstone Canyon Reservoir outfall - 57Grinds001.6 | 57Grinds001.6 | Grindstone Canyon (Carrizo Creek to Grindstone Rsvr) | 2/IO | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 17 | Grindstone Canyon Reservoir Inlet - 57GrindInlet | 57GrindInlet | Grindstone Canyon Reservoir | IO | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 18 | Karr Canyon above Raven Road - 48KarrCa002.9 | 48KarrCa002.9 | Karr Canyon (Fresnal Canyon to headwaters) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 19 | LA LUZ CREEK AT CR A-70 - 48LaLuzC014.2 | 48LaLuzC014.2 | La Luz Creek (Fresnal Creek to headwaters) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 20 | Lake Holloman Deep | 48LHollomanDp | Lake Holloman | L | | | | | | 2 | | | | | 2 |
| 21 | N Fk Eagle Creek at FSR 127 - 57NEagle000.2 | 57NEagle000.2 | North Fork Eagle Creek (Eagle Creek to headwaters) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 22 | N Fk Rio Ruidoso abv ski lodge - 57NRuido00 9.4 | 57NRuido00 9.4 | Rio Ruidoso (North Fork abv Mescalero Apache bnd) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 23 | NOGAL CREEK AT COUNTY ROAD B-17 - | 48NogalC000.2 | Nogal Creek (Tularosa Creek to Mescalero | | 4 | 4 | | 4 | 4 | 4 | | | | | |

| Map # | Station Name | Station ID | Assessment Unit | Priority[1] | TDS/TSS[2] | Nutrients (low P)[3] | Nutrients (high P)[4] | Total Metals[5] | Dissolved Metals[6] | *E. coli* | Microbial Source Tracking[7] | Volatile Organics[8] | Semi-Volatile Organics[8] | Radionuclides[9] | PFAS[8] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 48NogalC000.2 | | Apache bnd) | 1 | | | | | | | | | | | |
| 24 | RIO BONITO ABV HWY 70 BRIDGE - 57RBonit001.0 | 57RBonit001.0 | Rio Bonito (Perennial prt Rio Ruidoso to NM 48 near Angus) | 1 | 4 | 4 | | 4 | 4 | 4 | | 2 | 2 | 2 | |
| 25 | Rio Bonito at BLM Apple Orchard Site - 57RBonit027.7 | 57RBonit027.7 | Rio Bonito (Perennial prt Rio Ruidoso to NM 48 near Angus) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 26 | RIO BONITO AT FR 107 - 57RBonit061.1 | 57RBonit061.1 | Rio Bonito (Perennial prt NM 48 near Angus to headwaters) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 27 | RIO BONITO AT HWY 48 BRIDGE-USGS Gage 0838850 - 57RBonit053.4 | 57RBonit053.4 | Rio Bonito (Perennial prt NM 48 near Angus to headwaters) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 28 | Rio Felix at Special Area on Flying H Ranch - 58RFelix114.1 | 58RFelix114.1 | Rio Felix (Perennial prt abv Old School rd to Lincoln Cyn) | 2 | 4* | 4 | | 4 | 4 | 4 | | | | | |
| 29 | Rio Hondo below Riverside on Rio Hondo Land and Cattle property - 57RHondo105.8 | 57RHondo105.8 | Rio Hondo (Perennial reaches Bonney Canyon to Rio Ruidoso) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 30 | RIO PENASCO AT BLUFF SPRINGS - 59RPenas170.4 | 59RPenas170.4 | Rio Penasco (Perennial prt Cox Canyon to headwaters) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 31 | Rio Penasco at Helena Road blw USGS Gage 08397620 - 59RPenas090.0 | 59RPenas090.0 | Rio Penasco (Perennial prt Bluewater Creek to HWY 24) | 2 | 4 | 4 | | 4 | 4 | 4 | | 2 | 2 | 2 | |
| 32 | Rio Penasco at NM 24-USGS Gage 08397600 - 59RPenas108.4 | 59RPenas108.4 | Rio Penasco (HWY 24 to Cox Canyon) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |

| Map # | Station Name | Station ID | Assessment Unit | Priority[1] | TDS/TSS[2] | Nutrients (low P)[3] | Nutrients (high P)[4] | Total Metals[5] | Dissolved Metals[6] | *E. coli* | Microbial Source Tracking[7] | Volatile Organics[8] | Semi-Volatile Organics[8] | Radionuclides[9] | PFAS[8] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | Rio Ruidoso @ CR E002 – 57RRuido030.5 | 57RRuido030.5 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | 1 | 4 | 4 | | 4 | 4 | 4 | 3 | | | | |
| 34 | RIO RUIDOSO ABOVE CARRIZO CREEK - 57RRuido045.3 | 57RRuido045.3 | Rio Ruidoso (Carrizo Ck to Mescalero Apache bnd) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 35 | Rio Ruidoso abv Hwy 70 bridge - 57RRuido031.5 | 57RRuido031.5 | Rio Ruidoso (US Hwy 70 Bridge to Carrizo Ck) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 36 | Rio Ruidoso at CR 16 Bridge near Hondo - 57RRuido001.3 | 57RRuido001.3 | Rio Ruidoso (Perennial prt Rio Bonito to Eagle Ck) | 2 | 4 | 4 | | 4 | 4 | 4 | | 2 | 2 | 2 | |
| 37 | RIO RUIDOSO AT GLENCOE-FR 443 - 57RRuido019.8 | 57RRuido019.8 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 38 | Rio Ruidoso at Mescalero boundary at USGS Gage 08386505 - 57RRuido052.4 | 57RRuido052.4 | Rio Ruidoso (Carrizo Ck to Mescalero Apache bnd) | 1 | 4 | 4 | | 4 | 4 | 4 | 3 | | | | |
| 40 | Rio Ruidoso blw Ruidoso Downs Racetrack @ Joe Welch Dr - 57RRuido039.4 | 57RRuido039.4 | Rio Ruidoso (US Hwy 70 Bridge to Carrizo Ck) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 41 | RUIDOSO NEW WWTP OUTFALL PIPE - NM0029165 | NM0029165-M | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | 2 | 2 | | 2 | | | 2 | | | | | |
| 42 | S Fk Rio Bonito abv Blue Hole Pond - 57SRBonit000.3 | 57SRBonit000.3 | South Fork Rio Bonito (Rio Bonito to headwaters) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 44 | SACRAMENTO RIVER AT USGS GAGE - 49Sacram014.6 | 49Sacram014.6 | Sacramento R (Perennial prt Scott Able Canyon to headwaters) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 45 | SACRAMENTO RIVER BELOW SCOTT ABLE CANYON - | 49Sacram013.7 | Sacramento R (Arkansas Canyon to Scott Able Canyon) | | 4 | 4 | | 4 | 4 | 4 | | | | | |

| Map # | Station Name | Station ID | Assessment Unit | Priority[1] | TDS/TSS[2] | Nutrients (low P)[3] | Nutrients (high P)[4] | Total Metals[5] | Dissolved Metals[6] | *E. coli* | Microbial Source Tracking[7] | Volatile Organics[8] | Semi-Volatile Organics[8] | Radionuclides[9] | PFAS[8] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 49Sacram013.7 | | | 2 | | | | | | | | | | | |
| 46 | Salado Canyon at Salado Canyon Trestle - 48Salad0001.1 | 48Salad0001.1 | Salado Canyon (Fresnal Canyon to headwaters) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 47 | SCOTT ABLE CREEK ABOVE SACRAMENTO RIVER - 49ScottA000.1 | 49ScottA000.1 | Scott Able Canyon (Sacramento R to road NF-64 abv canyon) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 48 | South Fork Eagle Creek abv Eagle Creek- 57SEagle000.1 | 57SEagle000.1 | S. Fork Eagle Creek (Eagle Creek to Mescalero Apache bnd) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 49 | THREE RIVERS AT FOREST SERVICE CAMPGROUND - 48ThreeR022.8 | 48ThreeR022.8 | Three Rivers (USFS bnd to headwaters) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 50 | THREE RIVERS AT U.S. HWY 54 - 48ThreeR001.0 | 48ThreeR001.0 | Three Rivers (Perennial prt HWY 54 to USFS exc Mescalero) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 51 | Tularosa Creek ABV USGS GAGE 08481500 NR BENT- 48RTular030.0 | 48RTular030.0 | Tularosa Creek (Old HWY 70 xing to Mescalero Apache bnd) | 1 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| 52 | Tularosa Creek at Hwy 54 – 48Tular014.9 | 48Tular014.9 | Tularosa Ck (perennial prt downstream of old HWY 70 xing) | 2 | 4 | 4 | | 4 | 4 | 4 | | | | | |
| | Quality Control | | Blanks Collected per QAPP | | 10 | 10 | | | 19 | 19 | | 4 | | | 2 |
| | Total Number of Samples | | | | 196 | 194 | 2 | 184 | 203 | 207 | 6 | 16 | 12 | 12 | 4 |

## 5.2 Physical Habitat, Biological Sampling, and Datalogger Deployment

Measuring biological response indicators (fish, macroinvertebrates, and phytoplankton) concurrent to physical habitat measurements and chemistry gives an overall interpretation of the biological integrity of

the reach represented. These data also provide further information such as characteristics of sediment and nutrients currently cycling through the stream and potential sources of water quality stress.

The SWQB currently collects fish, periphyton, macroinvertebrates and physical habitat data at select sites to assess waterbodies for potential impairment from increased temperatures, sediment deposition, nutrient enrichment, and toxic pollutants.

Sampling methods will be conducted in accordance with the SWQB SOPs. Fish data will be collected in accordance with SOP 11.4 Fish Community Sampling. Macroinvertebrate sampling will be conducted in accordance with SOP 11.2 Benthic Macroinvertebrates. Biological sampling will be conducted within a biological index period for appropriate comparability of samples and life history requirements. Physical habitat data will be collected in accordance with SOP 5.0 Physical Habitat Measurements. Chlorophyll *a* and microcystin will be collected in accordance with SOP 12.1 Lake Sampling.

Sondes and data loggers will be deployed at select sites in the stream for a minimum of 7 days to record specific conductance, dissolved oxygen, turbidity, or pH fluctuations. For more information on minimum deployment intervals needed to complete the assessment for specific parameters, please refer to the most up to date CALM (NMED/SWQB 2021b). Thermographs (water temperature data loggers) are generally deployed from May through September in targeted AUs throughout the survey to measure temperature fluctuations. Thermographs will be deployed in accordance with SOP 6.3 Temperature data loggers.

Resources, site access, and other issues do not allow for the deployment of datalogging instruments or collection of biological and habitat data at every AU. Stations are selected for biological and physical habitat monitoring based on 1) current IR status, 2) results from nutrient, sediment, and temperature data, 3) observations of the surrounding land use including upland and riparian habitat conditions, and observation of probable source(s). Additional sites determined to be in "reference", or "best available condition" will also be selected for biological and physical monitoring for inclusion in development and refinement of biological and habitat criteria. **Table 7** summarizes the biological and habitat sampling that is planned for this survey. The Priority column of **Table 7** documents chemical sampling priority for each sampling station. The numbers listed within the **Table 7** data type columns describe the type and number of data collection events planned for each station during the 2023-2024 survey. The footnotes to **Table 7** contain more detailed information.

Sonde/DO/conductivity logger deployments described in **Table 7** are planned in accordance with the data requirements identified in the current 2023 CALM (NMED/SWQB 2023).

## Table 7. Sacramento Mountains Survey: LTD, Biological, and Habitat Sampling

| Map # | Station Name | Station ID | Assessment Unit | Priority | Sonde/DO/Cond[2,3] | Thermograph | Flow[4] | Physical Habitat | Chlorophyll a[5] | Phytoplankton | Microcystins[6] | Macroinvertebrates | Fish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Agua Chiquita abv Rio Penasco - 59AguaCh001.1 | 59AguaCh001.1 | Agua Chiquita (Rio Penasco to McEwan Cny) | 2 | | | 4 | | | | | | |
| 2 | Agua Chiquita abv Sacramento - 59AguaCh035.2 | 59AguaCh035.2 | Agua Chiquita (perennial portions McEwan Cny to headwaters) | 1 | S | 1 | 4 | 1 | | | | | |
| 3 | ALTO LAKE - 57AltoLake | 57AltoLake | Alto Lake | L | | | | | 4 | 4 | 2 | | |
| 4 | Alto Lake Inlet - 57EagleC030.1 | 57EagleC030.1 | Alto Lake | IO | | | 4 | | | | | | |
| 5 | CARRIZO CREEK ABOVE THE RIO RUIDOSO - 57Carriz000.1 | 57Carriz000.1 | Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd) | 1 | D | 1 | 4 | 1 | | | | | |
| 6 | Carrizo Creek at Mescalero Boundary - 57Carriz003.0 | 57Carriz003.0 | Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd) | 2 | | | 4 | | | | | | |
| 9 | Dog Canyon at Nature Trail - 48DogCan002.7 | 48DogCan002.7 | Dog Canyon Creek (perennial portions) | 2 | D | 1 | 4 | 1 | | | | | |
| 10 | Eagle Creek abv Alto Lake - 57EagleC031.1 | 57EagleC031.1 | Eagle Creek (Alto Lake to S. Fork Eagle Creek) | 1 | D | 1 | 4 | 1 | | | | | |
| 11 | Eagle Creek below Alto Lake - 57EagleC030.0 | 57EagleC030.0 | Eagle Creek (Rio Ruidoso to Alto Lake) | 2/IO | D | 1 | 4 | 1 | | | | | |
| 12 | Fresnal Creek above Salado Canyon - 48FresCa008.3 | 48FresCa008.3 | Fresnal Canyon (Salado Canyon to headwaters) | 2 | D | 1 | 4 | 1 | | | | | |
| 13 | FRESNAL CREEK AT ALAMOGORDO WATER INTAKE - 48FresCa001.0 | 48FresCa001.0 | Fresnal Canyon (La Luz Creek to Salado Canyon) | 1 | D | 1 | 4 | 1 | | | | | |
| 14 | Grindstone Canyon above Grindstone Reservoir - 57Grinds002.0 | 57Grinds002.0 | Grindstone Canyon (Grindstone Rsvr to headwaters) | 2/IO | | | 4 | | | | | | |
| 15 | GRINDSTONE CANYON | 57GrindCanRes | Grindstone Canyon | | | | | | 4 | 4 | 2 | | |

| Map # | Station Name | Station ID | Assessment Unit | Priority | Sonde/DO/Cond[2,3] | Thermograph | Flow[4] | Physical Habitat | Chlorophyll a[5] | Phytoplankton | Microcystins[6] | Macroinvertebrates | Fish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RESERVOIR DEEP - 57GrindCanRes | | Reservoir | L | | | | | | | | | |
| 16 | Grindstone Canyon Reservoir outfall - 57Grinds001.6 | 57Grinds001.6 | Grindstone Canyon (Carrizo Creek to Grindstone Rsvr) | 2/IO | | | 4 | | | | | | |
| 17 | Grindstone Canyon Reservoir Inlet - 57GrindOutlet | 57GrindInlet | Grindstone Canyon Reservoir | IO | | | 4 | | | | | | |
| 18 | Karr Canyon above Raven Road - 48KarrCa002.9 | 48KarrCa002.9 | Karr Canyon (Fresnal Canyon to headwaters) | 2 | D | 1 | 4 | 1 | | | | | |
| 19 | LA LUZ CREEK AT CR A-70 - 48LaLuzC014.2 | 48LaLuzC014.2 | La Luz Creek (Fresnal Creek to headwaters) | 2 | D | 1 | 4 | 1 | | | | | |
| 20 | Lake Holloman Deep | 48LHollomanDp | Lake Holloman | L | | | | | | | 2 | | |
| 21 | N Fk Eagle Creek at FSR 127 - 57NEagle000.2 | 57NEagle000.2 | North Fork Eagle Creek (Eagle Creek to headwaters) | 2 | D | 1 | 4 | 1 | | | | | |
| 22 | N Fk Rio Ruidoso abv ski lodge - 57NRuido00 9.4 | 57NRuido00 9.4 | Rio Ruidoso (North Fork abv Mescalero Apache bnd) | 2 | D | 1 | 4 | 1 | | | | | |
| 23 | NOGAL CREEK AT COUNTY ROAD B-17 - 48NogalC000.2 | 48NogalC000.2 | Nogal Creek (Tularosa Creek to Mescalero Apache bnd) | 1 | D | 1 | 4 | 1 | | | | | |
| 24 | RIO BONITO ABV HWY 70 BRIDGE - 57RBonit001.0 | 57RBonit001.0 | Rio Bonito (Perennial prt Rio Ruidoso to NM 48 near Angus) | 1 | S | 1 | 4 | 1 | | | | | |
| 25 | Rio Bonito at BLM Apple Orchard Site - 57RBonit027.7 | 57RBonit027.7 | Rio Bonito (Perennial prt Rio Ruidoso to NM 48 near Angus) | 2 | | | 4 | | | | | | |
| 26 | RIO BONITO AT FR 107 - 57RBonit061.1 | 57RBonit061.1 | Rio Bonito (Perennial prt NM 48 near Angus to headwaters) | 1 | D | 1 | 4 | 1 | | | | | |
| 27 | RIO BONITO AT HWY 48 | 57RBonit053.4 | Rio Bonito | | D | 1 | 4 | 1 | | | | 1 | |

| Map # | Station Name | Station ID | Assessment Unit | Priority | Sonde/DO/Cond[2,3] | Thermograph | Flow[4] | Physical Habitat | Chlorophyll a[5] | Phytoplankton | Microcystins[6] | Macroinvertebrates | Fish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BRIDGE-USGS Gage 0838850 - 57RBonit053.4 | | (Perennial prt NM 48 near Angus to headwaters) | 1 | | | | | | | | | |
| 28 | Rio Felix at Special Area on Flying H Ranch - 58RFelix114.1 | 58RFelix114.1 | Rio Felix (Perennial prt abv Old School rd to Lincoln Cyn) | 2 | D | 1 | 4 | 1 | | | 2 | | |
| 29 | Rio Hondo below Riverside on Rio Hondo Land and Cattle property - 57RHondo105.8 | 57RHondo105.8 | Rio Hondo (Perennial reaches Bonney Canyon to Rio Ruidoso) | 2 | S | 1 | 4 | 1 | | | | | |
| 30 | RIO PENASCO AT BLUFF SPRINGS - 59RPenas170.4 | 59RPenas170.4 | Rio Penasco (Perennial prt Cox Canyon to headwaters) | 2 | D | 1 | 4 | 1 | | | | | |
| 31 | Rio Penasco at Helena Road blw USGS Gage 08397620 - 59RPenas090.0 | 59RPenas090.0 | Rio Penasco (Perennial prt Bluewater Creek to HWY 24) | 2 | D | 1 | 4 | 1 | | | | | |
| 32 | Rio Penasco at NM 24-USGS Gage 08397600 - 59RPenas108.4 | 59RPenas108.4 | Rio Penasco (HWY 24 to Cox Canyon) | 1 | S | 1 | 4 | 1 | | | | | |
| 33 | Rio Ruidoso @ CR E002 – 57RRuido030.5 | 57RRuido30.5 | | 1 | | | 8 | | | | | | |
| 34 | RIO RUIDOSO ABOVE CARRIZO CREEK - 57RRuido045.3 | 57RRuido045.3 | Rio Ruidoso (Carrizo Ck to Mescalero Apache bnd) | 1 | S (Turb, DO) | 1 | 4 | 1 | | | | | |
| 35 | Rio Ruidoso abv Hwy 70 bridge - 57RRuido031.5 | 57RRuido031.5 | Rio Ruidoso (US Hwy 70 Bridge to Carrizo Ck) | 1 | S (Turb, DO) | 1 | 4 | 1 | | | | | |
| 36 | Rio Ruidoso at CR 16 Bridge near Hondo - 57RRuido001.3 | 57RRuido001.3 | Rio Ruidoso (Perennial prt Rio Bonito to Eagle Ck) | 2 | S | 1 | 4 | 1 | | | | | |
| 37 | RIO RUIDOSO AT | 57RRuido019.8 | Rio Ruidoso (Eagle | | S | 1 | 4 | 1 | | | | | |

| Map # | Station Name | Station ID | Assessment Unit | Priority | Sonde/DO/Cond[2,3] | Thermograph | Flow[4] | Physical Habitat | Chlorophyll a[5] | Phytoplankton | Microcystins[6] | Macroinvertebrates | Fish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GLENCOE-FR 443 - 57RRuido019.8 | | Ck to US Hwy 70 Bridge) | 1 | (Turb, DO) | | | | | | | | |
| 38 | Rio Ruidoso at Mescalero boundary at USGS Gage 08386505 - 57RRuido052.4 | 57RRuido052.4 | Rio Ruidoso (Carrizo Ck to Mescalero Apache bnd) | 1 | | | 4 | | | | | | |
| 40 | Rio Ruidoso blw Ruidoso Downs Racetrack @ Joe Welch Dr - 57RRuido039.4 | 57RRuido039.4 | Rio Ruidoso (US Hwy 70 Bridge to Carrizo Ck) | 1 | | | 4 | | | | | | |
| 41 | RUIDOSO NEW WWTP OUTFALL PIPE - NM0029165 | NM0029165-M | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | 2 | | | | | | | | | |
| 42 | S Fk Rio Bonito abv Blue Hole Pond - 57SRBonit000.3 | 57SRBonit000.3 | South Fork Rio Bonito (Rio Bonito to headwaters) | 1 | D | 1 | 4 | 1 | | | | | |
| 44 | SACRAMENTO RIVER AT USGS GAGE - 49Sacram014.6 | 49Sacram014.6 | Sacramento R (Perennial prt Scott Able Canyon to headwaters) | 1 | D | 1 | 4 | 1 | | | | | |
| 45 | SACRAMENTO RIVER BELOW SCOTT ABLE CANYON - 49Sacram013.7 | 49Sacram013.7 | Sacramento R (Arkansas Canyon to Scott Able Canyon) | 2 | D | 1 | 4 | 1 | | | | | |
| 46 | Salado Canyon at Salado Canyon Trestle - 48Salad0001.1 | 48Salad0001.1 | Salado Canyon (Fresnal Canyon to headwaters) | 2 | D | 1 | 4 | 1 | | | | | |
| 47 | SCOTT ABLE CREEK ABOVE SACRAMENTO RIVER - 49ScottA000.1 | 49ScottA000.1 | Scott Able Canyon (Sacramento R to road NF-64 abv canyon) | 2 | D | 1 | 4 | 1 | | | | | |
| 48 | South Fork Eagle Creek abv Eagle Creek- 57SEagle000.1 | 57SEagle000.1 | S. Fork Eagle Creek (Eagle Creek to Mescalero Apache bnd) | 2 | D | 1 | 4 | 1 | | | | | |
| 49 | THREE RIVERS AT FOREST SERVICE CAMPGROUND - | 48ThreeR022.8 | Three Rivers (USFS bnd to headwaters) | | | | | | | | | 1 | |

| Map # | Station Name | Station ID | Assessment Unit | Priority | Sonde/DO/Cond[2,3] | Thermograph | Flow[4] | Physical Habitat | Chlorophyll a[5] | Phytoplankton | Microcystins[6] | Macroinvertebrates | Fish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 48ThreeR022.8 | | | 2 | D | 1 | 4 | 1 | | | | | |
| 50 | THREE RIVERS AT U.S. HWY 54 - 48ThreeR001.0 | 48ThreeR001.0 | Three Rivers (Perennial prt HWY 54 to USFS exc Mescalero) | 2 | | | 4 | | | | | | |
| 51 | Tularosa Creek ABV USGS GAGE 08481500 NR BENT- 48RTular030.0 | 48RTular030.0 | Tularosa Creek (Old HWY 70 xing to Mescalero Apache bnd) | 1 | D | 1 | 4 | 1 | | | | 1 | |
| 52 | Tularosa Creek at Hwy 54 – 48Tular014.9 | 48Tular014.9 | Tularosa Ck (perennial prt downstream of old HWY 70 xing) | 2 | | | 4 | | | | | | |
| Total Number of Sampling Events | | | | | 32 | 32 | 203 | 31 | 8 | 8 | 8 | 0 | 0 |

[1] Priority rankings: 1 are highest priority, and 2 are the lowest. "L" are lake stations; "IO" are lake inlets or outlets; "LSO" is "logger station only".

[2] Multiparameter sondes and/or dissolved oxygen (DO) loggers are deployed at sites that indicate elevated turbidity or nutrient enrichment or have been previously listed for turbidity or nutrients. Conductivity loggers are deployed to measure specific conductance over time in streams of concern.

[3] Logger types: S (sonde), D (DO logger), or C (conductivity logger)

[4] Flow, water quality and temperature data will be used from USGS gages where possible.

[5] Chlorophyll-a samples are collected at lake monitoring locations.

[6] If resources permit, up to 2 additional samples may be taken in high recreation areas or areas of concern for macrocystis.

## 6.0 RESOURCE REQUIREMENTS

Sample analysis costs include: SLD work-time units (WTUs) for chemical analysis performed at SLD and provided to the SWQB through a Joint Powers Agreement between the State agencies; analysis costs for chemical and biological samples sent to contract laboratories; and equipment costs for *E. coli* analysis performed by qualified SWQB staff. Sample analysis expenses are summarized in **Table 8**.

Approximate monthly fuel expenses are summarized in **Table 9**. Vehicles will require standard preventative maintenance and unforeseen costs may arise at any time.

Water quality sampling trips will require two staff. Habitat surveys will require three staff surveying one to two sites per day. Biological survey crew maximum requirements are three to four staff surveying one

to three sites per day. Staff field days and per diem costs are summarized in **Table 10**. Staff receive $155 per night per diem for travel costs. Costs not included below may involve general sampling supplies such as water quality sample containers and preservatives, sonde calibration solutions, and periphyton, macroinvertebrate, fish, and habitat sampling/monitoring equipment. Total costs for the survey are summarized in **Table 11**.

**Table 8. Biological and Chemical Cost Summary for the Sacramento Mountains Survey**

| Analyte | Total # of Samples | Cost per Sample (WTU unless indicated in $) | Total Expenditure (WTU unless indicated in $) |
|---|---|---|---|
| TDS/TSS | 192 | 45 | 8,640 |
| TDS/TSS/$SO^4$/$Cl^-$ | 4 | 105 | 420 |
| Nutrients | 196 | 100 | 19,600 |
| Nutrients (low P) | 2 | 95 | 1190 |
| Total Metals | 184 | 85 | 15,640 |
| Dissolved Metals | 203 | 140 | 28,420 |
| *E. Coli* | 207 | $8.58 | $1776.06 |
| Microbial Source Tracking | 6 | $510 | $3,060 |
| Volatile Organics | 16 | 150 | 2,400 |
| Semi-Volatile Organics | 12 | 235 | 2,820 |
| Radionuclides | 12 | 520 | 6,240 |
| PFAS EPA Method 533 | 4 | $295 | $1,180 |
| PFAS EPA Method 537.1 | 4 | $235 | $940 |
| Chlorophyll a | 8 | $40 | $320 |
| Phytoplankton | 8 | $138 | $1,104 |
| Microcystins | 8 | 150 | 1,200 |
| **Totals** | | **WTU** | 86,570 |
| | | **Dollar** | $8,380.06 |

**Table 9. Vehicle Costs for the Sacramento Mountains Survey**

| Month | Approximate Miles | Estimated MPG | Estimated Cost of Gasoline per Gallon | Total Fuel Costs/yr | Total Fuel Costs |
|---|---|---|---|---|---|
| March | 750 | 17 | $3.00 | $132.35 | $264.71 |
| April | 750 | 17 | $3.00 | $132.35 | $264.71 |
| May | 750 | 17 | $3.00 | $132.35 | $264.71 |
| June | 750 | 17 | $3.00 | $132.35 | $264.71 |
| July | 750 | 17 | $3.00 | $132.35 | $264.71 |
| August | 750 | 17 | $3.00 | $132.35 | $264.71 |
| September | 750 | 17 | $3.00 | $132.35 | $264.71 |

| | | | | | |
|---|---|---|---|---|---|
| October | 750 | 17 | $3.00 | $132.35 | $264.71 |
| **TOTAL** | | | | **$1,058.82** | **$2,117.65** |

**Table 10. Field Staff Days and Per Diem Costs for the Sacramento Mountains Survey**

| Expense | Water Chemistry Surveys* | Biological and Habitat Surveys* | Data Logger Deployments* | Per diem rate | Total/yr | Total |
|---|---|---|---|---|---|---|
| Per Diem (number of nights out per year) | 42 | 12 | 12 | $157 | $8,949 | $17,898 |
| Field Staff Days (number of days per year) | 57 | 24 | 24 | | 105 | 210 |

*A field run typically consists of two staff for two to four days

**Table 11. Total Cost Estimates for the Sacramento Mountains Survey**

| WTUs | Contract Labs $ | Supplies $ | Fuel $ | Per Diem $ | Staff Field Days |
|---|---|---|---|---|---|
| 86,570 | $$8,380.06 | $6,845.71 | $2,117.65 | $17,898 | 210 |

## 7.0 REPORTING

Following completion of the survey and verification and validation of all data collected during the project (following SWQB SOP 15.0 Verification and Validation), a final survey report will be produced that summarizes the data collected during the survey and describes any deviations from the original or amended Field Sampling Plan. Progress during the survey will be documented in biannual progress reports to EPA for the CWA 106 grant. Other reports and documents that may use information collected during this survey include TMDL reports, proposals for water quality standards revision, and/or NPDES permits.

## 8.0 REFERENCES

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NMED/SWQB. 2023. *Standard Operating Procedure 2.1: Field Sampling Plan Development and Execution.* Santa Fe, NM. Available at: https://www.env.nm.gov/surface-water-quality/sop/

U.S. Environmental Protection Agency (EPA). 2006. Level III ecoregions of the continental United States (revision of Omernik, 1987): Corvallis, Oregon, USEPA – National Health and Environmental Effects Research Laboratory, Map M-1, various scales.

## APPENDIX A

IR (Integrated Report) Category: Overall water quality standards attainment category for each assessment unit as determined by combining individual designated use support decisions. The unique assessment categories for New Mexico are described as follows:

IR Category 1 Attaining the water quality standards for all designated and existing uses. AUs are listed in this category if there are data and information that meet all requirements of the assessment and listing methodology and support a determination that the water quality criteria are attained.

IR Category 2 Attaining some of the designated or existing uses based on numeric and narrative parameters that were tested, and no reliable monitored data is available to determine if the remaining uses are attained or threatened. AUs are listed in this category if there are data and information that meet requirements of the assessment and listing methodology to support a determination that some, but not all, uses are attained based on numeric and narrative water quality criteria that were tested. Attainment status of the remaining uses is unknown because there is no reliable monitored data with which to make a determination.

IR Category 3 Insufficient or no reliable data and/or information to determine if any designated or existing use is attained. AUs are listed in this category where sufficient data to support an attainment determination for any use are not available, consistent with requirements of the assessment and listing methodology. In order to relay additional information to stakeholders including SWQB staff, Category 3 is further broken down in New Mexico into the following categories:

3A. Limited data (n = 0 to 1) available, no exceedances. AUs are listed in this subcategory when there are no exceedances in the limited data set. These are considered low priority for follow up monitoring.

3B. Limited data (n = 1) available, exceedance. AUs are listed in this subcategory when there is an exceedance in the limited data set. These are considered high priority for follow up monitoring.

IR Category 4A Impaired for one or more designated uses but does not require development of a TMDL because TMDL has been completed. AUs are listed in this subcategory once all TMDL(s) have been developed and approved by USEPA that, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the impairment of an AU, the AU remains in Category 5A (see below) until all TMDLs for each pollutant have been completed and approved by USEPA.

IR Category 4B Impaired for one or more designated uses but does not require development of a TMDL because other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future. Consistent with the regulation under 40 CFR 130.7(b)(i),(ii), and (iii), AUs are listed in this subcategory where other pollution control requirements required by local, state, or federal authority are

stringent enough to implement any water quality standard (WQS) applicable to such waters.

IR Category 4C — Impaired for one or more designated uses but does not require development of a TMDL because impairment is not caused by a pollutant. AUs are listed in this subcategory if a pollutant does not cause the impairment. For example, USEPA considers flow alteration to be "pollution" vs. a "pollutant."

IR Category 5A — Impaired for one or more designated or existing uses and a TMDL is underway or scheduled. AUs are listed in this category if the AU is impaired for one or more designated uses by a pollutant. Where more than one pollutant is associated with the impairment of a single AU, the AU remains in Category 5A until TMDLs for all pollutants have been completed and approved by USEPA.

IR Category 5B — Impaired for one or more designated or existing uses and a review of the water quality standard will be conducted. AUs are listed in this category when it is possible that water quality standards are not being met because one or more current designated use is inappropriate. After a review of the water quality standard is conducted, a Use Attainability Analysis (UAA) will be developed and submitted to USEPA for consideration, or the AU will be moved to Category 5A and a TMDL will be scheduled.

IR Category 5C — Impaired for one or more designated or existing uses and Additional data will be collected before a TMDL is scheduled. AUs are listed in this category if there is not enough data to determine the pollutant of concern or there is not adequate data to develop a TMDL. For example, AUs with biological impairment will be listed in this category until further research can determine the particular pollutant(s) of concern. When the pollutant(s) are determined, the AU will be moved to Category 5A and a TMDL will be scheduled. If it is determined that the current designated uses are inappropriate, it will be moved to Category 5B and a UAA will be developed. If it is determined that "pollution" is causing the impairment (vs. a "pollutant"), the AU will be moved to Category 4C.

**APPENDIX B**

| Organics (semi-volatiles) | Organics (volatiles) |
|---|---|
| 1,2,4-Trichlorobenzene | 1,1,1,2-Tetrachloroethane |
| 1,2-Dichlorobenzene | 1,1,1-Trichloroethane |
| 1,2-Dinitrobenzene | 1,1,2,2-Tetrachloroethane |
| 1,3-Dichlorobenzene | 1,1,2-Trichloroethane |
| 1,3-Dinitrobenzene | 1,1-Dichloroethane |
| 1,4-Dichlorobenzene | 1,1-Dichloroethene |
| 1,4-Dinitrobenzene | 1,1-Dichloropropene |
| 1-Methylnaphthalene | 1,2,3-Trichlorobenzene |
| 2,3,4,6-Tetrachlorophenol | 1,2,3-Trichloropropane |
| 2,3,5,6-Tetrachlorophenol | 1,2,4-Trichlorobenzene |
| 2,4,5-Trichlorophenol | 1,2,4-Trimethylbenzene |
| 2,4,6-Trichlorophenol | 1,2-Dibromo-3-chloropropane (DBCP) |
| 2,4-Dichlorophenol | 1,2-Dibromoethane (EDB) |
| 2,4-Dimethylphenol | 1,2-Dichlorobenzene |
| 2,4-Dinitrophenol | 1,2-Dichloroethane |
| 2,4-Dinitrotoluene | 1,2-Dichloropropane |
| 2,6-Dinitrotoluene | 1,3,5-Trimethylbenzene |
| 2-Chloronaphthalene | 1,3-Dichlorobenzene |
| 2-Chlorophenol | 1,3-Dichloropropane |
| 2-Methylnaphthalene | 1,4-Dichlorobenzene |
| 2-Methylphenol | 1,4-Dioxane |
| 2-Nitroaniline | 2,2-Dichloropropane |
| 2-Nitrophenol | 2-Butanone (MEK) |
| 3,3'-Dichlorobenzidine | 2-Chloroethyl vinyl ether |
| 3-Methylphenol & 4-Methylphenol | 2-Chlorotoluene |
| 3-Nitroaniline | 2-Hexanone |
| 4,4'-DDD | 4-Chlorotoluene |
| 4,4'-DDE | 4-Isopropyltoluene |
| 4,4'-DDT | 4-Methyl-2-pentanone |
| 4,6-Dinitro-2-methylphenol | Acetone |
| 4-Bromophenyl Phenyl Ether | Acetonitrile |
| 4-Chloro-3-methylphenol | Acrolein |
| 4-Chloroaniline | Acrylonitrile |
| 4-Chlorophenyl Phenyl Ether | Allyl chloride |
| 4-Nitroaniline | Benzene |
| 4-Nitrophenol | Bromobenzene |
| Acenaphthene | Bromochloromethane |
| Acenaphthylene | Bromodichloromethane |
| Alachlor | Bromoform |
| Aldrin | Bromomethane |
| alpha-BHC | Carbon disulfide |
| Aniline | Carbon tetrachloride |
| Anthracene | Chlorobenzene |

| Organics (semi-volatiles) | Organics (volatiles) |
|---|---|
| Atrazine | Chloroethane |
| Azobenzene | Chloroform |
| Benzidine | Chloromethane |
| Benzo(a)anthracene | Chloroprene |
| Benzo(a)pyrene | cis-1,2-Dichloroethene |
| Benzo(b)fluoranthene | cis-1,3-Dichloropropene |
| Benzo(g,h,i)perylene | cis-1,4-Dichloro-2-butene |
| Benzo(k)fluoranthene | Dibromochloromethane |
| Benzyl alcohol | Dibromomethane |
| beta-BHC | Dichlorodifluoromethane |
| bis(2-Chloroethoxy)methane | Ethyl methacrylate |
| bis(2-Chloroethyl)ether | Ethylbenzene |
| bis(2-Chloroisopropyl)ether | Hexachlorobutadiene |
| bis(2-Ethylhexyl)adipate | Iodomethane |
| bis(2-Ethylhexyl)phthalate | Isobutyl alcohol |
| Butyl Benzyl Phthalate | Isopropylbenzene |
| Carbazole | m- & p-Xylenes |
| Chrysene | Methyl methacrylate |
| cis-Chlordane | Methylacrylonitrile |
| Cyanazine | Methylene chloride (Dichloromethane) |
| delta-BHC | Naphthalene |
| Dibenz(a,h)anthracene | n-Butylbenzene |
| Dibenzofuran | Nitrobenzene |
| Dieldrin | o-Xylene |
| Diethylphthalate | Pentachloroethane |
| Dimethylphthalate | Propionitrile |
| Di-n-butyl Phthalate | Propylbenzene |
| Di-n-octyl phthalate | sec-Butylbenzene |
| Endosulfan I | Styrene |
| Endosulfan II | tert-Butyl methyl ether (MTBE) |
| Endosulfan sulfate | tert-Butylbenzene |
| Endrin | Tetrachloroethene |
| Endrin aldehyde | Tetrahydrofuran (THF) |
| Endrin ketone | Toluene |
| Fluoranthene | Total trihalomethanes |
| Fluorene | Total xylenes |
| gamma-BHC (lindane) | trans-1,2-Dichloroethene |
| Heptachlor | trans-1,3-Dichloropropene |
| Heptachlor epoxide | trans-1,4-Dichloro-2-butene |
| Hexachlorobenzene | Trichloroethene |
| Hexachlorobutadiene | Trichlorofluoromethane |
| Hexachlorocyclopentadiene | Vinyl acetate |
| Hexachloroethane | Vinyl chloride |
| Indeno(1,2,3-cd)pyrene | |
| Isophorone | |

| Organics (semi-volatiles) | Organics (volatiles) |
|---|---|
| Methoxychlor | |
| Metolachlor | |
| Metribuzin | |
| Naphthalene | |
| Nitrobenzene | |
| N-nitrosodimethylamine | |
| N-nitroso-di-n-propylamine | |
| N-nitrosodiphenylamine | |
| Pentachlorophenol | |
| Phenanthrene | |
| Phenol | |
| Prometryne | |
| Pyrene | |
| Pyridine | |
| Simazine | |
| trans-Chlordane | |

| Perfluorinated and Polyfluorinated Alkyl Substances (PFAS) | | | Targeted By | |
|---|---|---|---|---|
| PFAS Compound Name | Abbreviation | CAS Number | EPA Method 537.1 | EPA Method 533 |
| perfluorobutanoic acid | PFBA | 375-22-4 | | yes |
| perfluoropentanoic acid | PFPeA | 2706-90-3 | | yes |
| perfluorohexanoic acid | PFHxA | 307-24-4 | yes | yes |
| perfluoroheptanoic acid | PFHpA | 375-85-9 | yes | yes |
| perfluorooctanoic acid | PFOA | 335-67-1 | yes | yes |
| perfluorononanoic acid | PFNA | 375-95-1 | yes | yes |
| perfluorodecanoic acid | PFDA | 335-76-2 | yes | yes |
| perfluoroundecanoic acid | PFUnA | 2058-94-8 | yes | yes |
| perfluorododecanoic acid | PFDoA | 307-55-1 | yes | yes |
| perfluorotridecanoic acid | PFTrDA | 72629-94-8 | yes | |
| perfluorotetradecanoic acid | PFTA | 376-06-7 | yes | |
| perfluorobutanesulfonic acid | PFBS | 375-73-5 | yes | yes |
| perfluoropentanesulfonic acid | PFPeS | 2706-91-4 | | yes |
| perfluorohexanesulfonic acid | PFHxS | 355-46-4 | yes | yes |
| perfluoroheptanesulfonic acid | PFHpS | 375-92-8 | | yes |
| perfluorooctanesulfonic acid | PFOS | 1763-23-1 | yes | yes |

| | | | | |
|---|---|---|---|---|
| hexafluoropropylene oxide dimer acid | HFPO-DA | 13252-13-6 | yes | yes |
| 4,8-dioxa-3H-perfluorononanoic acid | ADONA | 919005-14-4 | yes | yes |
| N-ethyl perfluorooctanesulfonamidoacetic acid | NEtFOSAA | 2991-50-6 | yes | |
| N-methyl perfluorooctanesulfonamidoacetic acid | NMeFOSAA | 2355-31-9 | yes | |
| 9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid | 9Cl-PF3ONS | 756426-58-1 | yes | yes |
| 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid | 11Cl-PF3OUdS | 763051-92-9 | yes | yes |
| perfluoro-3-methoxypropanoic acid | PFMPA | 377-73-1 | | yes |
| perfluoro-4-methoxybutanoic acid | PFMBA | 863090-89-5 | | yes |
| nonafluoro-3,6-dioxaheptanoic acid | NFDHA | 151772-58-6 | | yes |
| perfluoro(2-ethoxyethane)sulfonic acid | PFEESA | 113507-82-7 | | yes |
| 1H,1H,2H,2H-perfluorohexane sulfonic acid | 4:2FTS | 757124-72-4 | | yes |
| 1H,1H,2H,2H-perfluorooctane sulfonic acid | 6:2FTS | 27619-97-2 | | yes |
| 1H,1H,2H,2H-perfluorodecane sulfonic acid | 8:2FTS | 39108-34-4 | | yes |

**APPENDIX C – FIELD SAMPLING PLAN REVISIONS 2024**

**Figure Revisions**
Updated all sampling area maps with new stations and revised station priorities.

**Revisions to Table 1. Personnel Roles and Responsibilities**
Updated current Surface Water Quality Bureau staff.

**Revisions to Table 5. Sacramento Mountains: Water Quality Stations**

| Station Name | Station ID | Assessment Unit | 2024 Revision |
|---|---|---|---|
| CDS Rainmakers/Rancho Ruidoso Valley Estates | NM0029238 | Little Creek (Eagle Creek to headwaters) | Removed from FSP, MASS Monitoring Team is not sampling Wastewater treatment plant (WWTP) stations |
| CLOUDCROFT WASTEWATER PLANT - NM0023370 | NM0023370 | Fresnal Canyon (Salado Canyon to headwaters) | Removed from FSP, MASS Monitoring Team is not sampling WWTP stations |
| Rio Ruidoso 10 feet above WWTP outfall - 57RRuido031.0 | 57RRuido031.0 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Removed station due to access issues. Rio Ruidoso abv Hwy 70 bridge - 57RRuido031.5 serves as both a bottom of AU station and the above WWTP station. |
| Rio Ruidoso blw new WWTP, mile marker 267.5, Hwy 70 - 57RRuido030.2 | 57RRuido030.2 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Removed station due to access issues. Replaced with 57RRuido030.5 |
| Rio Ruidoso @ CR E002 – 57RRuido030.5 | 57RRuido030.5 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Added to replace 57RRuido030.2 |
| Sacramento Methodist Assembly | NM0028886 | Agua Chiquita (perennial portions McEwan Cny to headwaters) | Removed from FSP, MASS Monitoring Team is not sampling WWTP stations |

**Revisions to Table 6. Sacramento Mountains Survey: Water Chemistry Sampling Frequency**

| Station Name | Station ID | Assessment Unit | 2024 Revision |
|---|---|---|---|
| All priority 1 stations | NA | NA | Changed chemical sampling frequency from 8 visits per survey to 4 visits per survey |
| All stations | NA | NA | Removed DOC sampling events from all stations due to quality control blank hits |

| | | | |
|---|---|---|---|
| CDS Rainmakers/Rancho Ruidoso Valley Estates | NM0029238 | Little Creek (Eagle Creek to headwaters) | Removed from FSP, MASS Monitoring Team is not sampling Wastewater treatment plant (WWTP) stations |
| CLOUDCROFT WASTEWATER PLANT - NM0023370 | NM0023370 | Fresnal Canyon (Salado Canyon to headwaters) | Removed from FSP, MASS Monitoring Team is not sampling WWTP stations |
| Lake Holloman Deep | 48LHollomanDp | Lake Holloman | Added two PFAS samples to address PFAS pollution concerns in the water body |
| Rio Ruidoso 10 feet above WWTP outfall - 57RRuido031.0 | 57RRuido031.0 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Removed station due to access issues. Rio Ruidoso abv Hwy 70 bridge - 57RRuido031.5 serves as both a bottom of AU station and the above WWTP station. |
| Rio Ruidoso blw new WWTP, mile marker 267.5, Hwy 70 - 57RRuido030.2 | 57RRuido030.2 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Removed station due to access issues. Replaced with 57RRuido030.5 |
| Rio Ruidoso @ CR E002 – 57RRuido030.5 | 57RRuido030.5 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Added to replace 57RRuido030.2 |
| RUIDOSO NEW WWTP OUTFALL PIPE - NM0029165 | NM0029165 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Changed to a priority 2 station. MASS Monitoring Team is not sampling WWTPs. The station remains in the FSP as it was sampled in 2023. |
| Sacramento Methodist Assembly | NM0028886 | Agua Chiquita (perennial portions McEwan Cny to headwaters) | Removed from FSP, MASS Monitoring Team is not sampling WWTP stations |

**Revisions to Table 7. Sacramento Mountains Survey: LTD, Biological, and Habitat Sampling**

| Station Name | Station ID | Assessment Unit | 2024 Revision |
|---|---|---|---|
| All priority 1 stations | NA | NA | Changed flow sampling frequency from 8 visits per survey to 4 visits per survey |
| CARRIZO CREEK ABOVE THE RIO RUIDOSO - 57Carriz000.1 | 57Carriz000.1 | Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd) | Sonde deployment changed to a DO logger deployment. The station is located in a highly trafficked area and risk of theft is high. |
| Carrizo Creek at Mescalero Boundary - 57Carriz003.0 | 57Carriz003.0 | Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd) | DO logger deployment removed. Stream is channelized and very shallow and station is located in a highly visibly |

| | | | |
|---|---|---|---|
| | | | and public setting--not suitable for logger deployment. |
| CDS Rainmakers/Rancho Ruidoso Valley Estates | NM0029238 | Little Creek (Eagle Creek to headwaters) | Removed from FSP, MASS Monitoring Team is not sampling Wastewater treatment plant (WWTP) stations |
| CLOUDCROFT WASTEWATER PLANT - NM0023370 | NM0023370 | Fresnal Canyon (Salado Canyon to headwaters) | Removed from FSP, MASS Monitoring Team is not sampling WWTP stations |
| Rio Ruidoso 10 feet above WWTP outfall - 57RRuido031.0 | 57RRuido031.0 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Removed station due to access issues. Rio Ruidoso abv Hwy 70 bridge - 57RRuido031.5 serves as both a bottom of AU station and the above WWTP station. |
| Rio Ruidoso blw new WWTP, mile marker 267.5, Hwy 70 - 57RRuido030.2 | 57RRuido030.2 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Removed station due to access issues. Replaced with 57RRuido030.5 |
| Rio Ruidoso @ CR E002 – 57RRuido030.5 | 57RRuido030.5 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Added to replace 57RRuido030.2 |
| RIO RUIDOSO ABOVE CARRIZO CREEK - 57RRuido045.3 | 57RRuido045.3 | Rio Ruidoso (Carrizo Ck to Mescalero Apache bnd) | Mid season assessment reason added to sonde deployment |
| Rio Ruidoso abv Hwy 70 bridge - 57RRuido031.5 | 57RRuido031.5 | Rio Ruidoso (US Hwy 70 Bridge to Carrizo Ck) | Mid season assessment reason added to sonde deployment |
| RIO RUIDOSO AT GLENCOE-FR 443 - 57RRuido019.8 | 57RRuido019.8 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Mid season assessment reason added to sonde deployment |
| RUIDOSO NEW WWTP OUTFALL PIPE - NM0029165 | NM0029165 | Rio Ruidoso (Eagle Ck to US Hwy 70 Bridge) | Removed DO logger and thermograph deployments and changed to a priority 2 station. MASS Monitoring Team is not sampling WWTPs. The station remains in the FSP as it was sampled in 2023. |
| Sacramento Methodist Assembly | NM0028886 | Agua Chiquita (perennial portions McEwan Cny to headwaters) | Removed from FSP, MASS Monitoring Team is not sampling WWTP stations |

**Revisions to Table 8. Biological and Chemical Cost Summary for the Sacramento Mountains Survey**
Updated WTUs and $ costs based on updated chemical sampling reflected in Table 6.

**Revisions to Table 10. Stream/Lake Survey Per Diem Costs for the Sacramento Mountains Survey**
Updated cost of daily per diem due to increased per diem rates.

**Revisions to Table 11. Total Cost Estimates for the Sacramento Mountains Survey**
Updated WTUs and $ costs based on updated chemical sampling and increased per diem rates.

**Revisions to Appendix B**
Added PFAS compound list for EPA Methods 533 and 537.1.