NEW MEXICO ENVIRONMENT DEPARTMENT

Surface Water Quality Bureau

2021-2022 Watershed Survey

DRAFT FIELD SAMPLING PLAN

Jemez River Watershed

2/12/2021

Prepared by

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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
PSRS	Point Source Regulation Section
QAPP	Quality Assurance Project Plan
SLD	Scientific Laboratory Division
SOP	Standard Operating Procedure
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

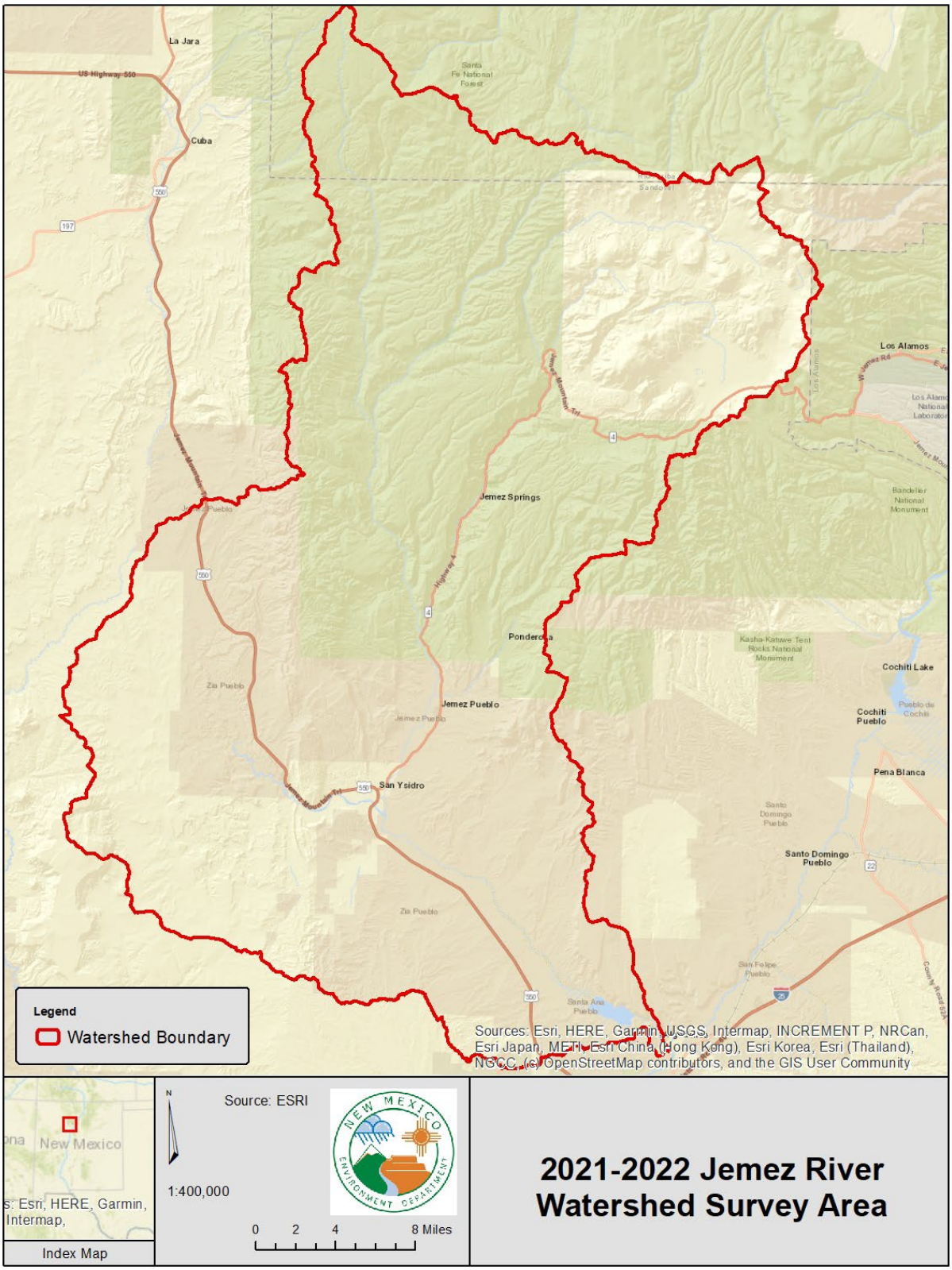
The purpose of this Field Sampling Plan (Plan) is to provide a detailed description of the two-year Water Quality Survey to be conducted in the Jemez River watershed during 2021-2022 by the New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB). It has been prepared in accordance with SWQB *Standard Operating Procedure 2.1: Field Sampling Plan Development and Execution* (NMED/SWQB 2019). 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 2018) (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 project area includes the Jemez River (**Figure 1**) and the perennial tributaries and associated lakes within the watershed (HUC 13020202). Historic and current land uses in the watershed include ranching, silviculture, recreation, mining, 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 watershed includes U.S. Forest Service, National Park Service, New Mexico State Parks, Bureau of Land Management (BLM), Tribal, and State and Private parcels. The study area encompasses approximately 1,040 square miles (~2,690 square kilometers) in New Mexico, most of which is within Sandoval County, with the northernmost portions of the watershed extending into Rio Arriba County. The watershed is located within Omernik Level III Ecoregions 21 (Southern Rockies) and 22 (Arizona/New Mexico Plateau) (USEPA 2006).

The Jemez Watershed was last monitored 2013-2014. That water quality survey identified waters that are attaining New Mexico Water Quality Standards (WQS) and waters that are impaired (i.e. not attaining their specific designated uses). Streams within the watershed are divided into assessment units (AUs) based on differing geological and hydrological properties, and each AU is assessed individually using data from one or more monitoring sites located along the AU. For this survey, selected monitoring locations will be sampled 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). The type of monitoring planned at each site is discussed and summarized in **Section 5.0,** Sampling Plan.

Figure 1. 2021-2022 Jemez River Watershed Survey Area



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 coordinators.

Table 1. Personnel Roles and Responsibilities

Team Member	Position/Role	Responsibilities
Kris Barrios Monitoring, Assessment, and Standards Section Program Manager Kristopher.Barrios@state.nm.us 505-946-8713	Program Manager	Approve FSP, directs staff to publish the FSP according to program and/or grant requirements. Manage project personnel and resources throughout the project in coordination with Project Supervisor and Project Manager(s). Provide oversight and coordinate with QAO and Project Manager(s) on any data collection activities conducted not in accordance with the FSP, QAPP, or current SOPs. Conduct environmental data collection activities in accordance with the developed FSP, QAPP, and current SWQB SOPs.
Charles Dentino Monitoring Team Supervisor Charles.Dentino1@state.nm.us (505) 946-8868	Project Supervisor	Manage project personnel and resources throughout the project in coordination with Program Manager and Project supervisor. Conduct environmental data collection activities in accordance with the developed FSP, QAPP, and current SWQB SOPs. Any data collection activities conducted not in accordance with the FSP, QAPP, or current SOPs will be documented and reported to the Program Manager and QAO. Conduct mid-project meeting with team to discuss any changes to the project plan. Coordinates and conducts post-project

Team Member	Position/Role	Responsibilities
		meeting with team to discuss differences between planned and actual sampling and what data gaps, if any, exist. Write, coordinate, and assemble report and/or other grant deliverables required of the project.
Meredith Zeigler Monitoring Team Scientist - Advanced Meredith.Zeigler@state.nm.us 505-490-5866	Project Manager	Manage project resources throughout the project in coordination with Program Manager and Project Supervisor. Conduct environmental data collection activities in accordance with the developed FSP, QAPP, and current SWQB SOPs. Any data collection activities conducted not in accordance with the FSP, QAPP, or current SOPs will be documented and reported to the Program Manager and QAO. 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. Write, coordinate, and assemble report and/or other grant deliverables required of the project.
Jonathan Celmer Monitoring Team Scientist Jonathan.Celmer@state.nm.us 505-946-8808 Eliza Montoya Monitoring Team Scientist Eliza.Montoya@state.nm.us 505-819-8099 Elizabeth Stuffings Monitoring Team Scientist Elizabeth.Stuffings@state.nm.us 505-827-0160	Project Team	Conduct environmental data collection activities in accordance with the developed FSP, QAPP, and current SWQB SOPs. Any data collection activities conducted not in accordance with the FSP, QAPP, or current SOPs will be documented and reported to the Project Manager. Write assigned sections of reports and/or other grant deliverables required throughout the project.

Team Member	Position/Role	Responsibilities
Miguel Montoya Miguel.Montoya@state.nm.us 505-819-9882	QAO	Approve and ensure FSP is retained in accordance with 1.21.2 NMAC, Retention and Disposition of Public Records. Conduct audits as needed to ensure compliance with FSP, QAPP and SOPs.
Jennifer Fullam Jennifer.Fullam@state.nm.us 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 Heidi.Henderson@state.nm.us 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.
Sarah Holcomb Sarah.Holcomb@state.nm.us 505-819-9734	Point Source Regulation Section (PSRS) Liaison	Provide information and data needs pertaining to point source discharges located within the study area.
Abe Franklin Abraham.Franklin@state.nm.us 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.

2.2 Organization

For the responsibilities defined in this project; 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. The Point Source Regulation Section (PSRS) Liaison and the Watershed Protection Section (WPS) Liaison are the Program Managers for their Sections 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 §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 2020) (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 2020). The impairments for AUs in this survey area listed in **Table 2** were identified during SWQB's most recent surveys of this watershed, conducted 2013-2014, and 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 Section 20.6.4 New Mexico Administrative Code (NMAC) as governed by the New Mexico Water Quality Control Commission (WQCC) (NMAC 2020). The purpose of 20.6.4 NMAC is to establish WQS that consist of the 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 Assessment Unit.

Assessment of surface waters against the WQS occurs after the monitoring data have been verified and validated, using the most recent assessment protocols. Assessment protocols are updated every odd year (e.g. 2021) and are opened for the EPA and the public to review and comment as part of the update process. Waterbodies determined to be impaired are reported as such every even year (e.g. 2020, 2022) on the State's IR List and TMDLs or TMDL alternatives are developed for listed AUs.

Table 2. Jemez River Watershed: Impairment and TMDL Status of Survey Assessment Units

Assessment Unit Name	WQS Reference	IR Category	Impairments	TMDL Completed
American Creek (Rio de las Palomas to headwaters)	20.6.4.98	1		
Calaveras Creek (Rio Cebolla to headwaters)	20.6.4.108	5/5B	Aluminum, Total Recoverable	
Clear Creek (Rio de las Vacas to San Gregorio Lake)	20.6.4.108	5/5A	*E. coli*| Nutrients| Temperature	Turbidity| Total Organic Carbon| Nutrients| *E. coli*
Clear Creek (San Gregorio Lake to headwaters)	20.6.4.108	5/5B	Aluminum, Total Recoverable| Nutrients	Nutrients
East Fork Jemez (San Antonio Creek to VCNP bnd)	20.6.4.108	5/5B	Aluminum, Total Recoverable| Temperature	Turbidity| Temperature| Arsenic
East Fork Jemez (VCNP to headwaters)	20.6.4.108	5/5B	Aluminum, Total Recoverable| Nutrients| Turbidity	Turbidity| Nutrients

Assessment Unit Name	WQS Reference	IR Category	Impairments	TMDL Completed
Fenton Lake	20.6.4.108	5/5A	Nutrients	
Jaramillo Creek (East Fork Jemez to headwaters)	20.6.4.108	5/5B	Aluminum, Total Recoverable| Nutrients| Turbidity	Temperature| Turbidity| Nutrients
Jemez River (Jemez Pueblo bnd to Rio Guadalupe)	20.6.4.107	5/5A	Arsenic, dissolved| Boron, Dissolved| *E. coli*| Nutrients| Temperature	Arsenic, dissolved| Boron, Dissolved| *E. coli*
Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	20.6.4.107	4A	Aluminum, Total Recoverable| Arsenic, dissolved| Boron, Dissolved| *E. coli*| Nutrients| Temperature| Turbidity	Temperature| Turbidity| Arsenic, dissolved| Nutrients| Aluminum, Total Recoverable| Boron, Dissolved| *E. coli*
Jemez River (Soda Dam nr Jemez Springs to East Fork)	20.6.4.108	5/5B	Aluminum, Total Recoverable| Arsenic, Dissolved| *E. coli*| Temperature| Turbidity| pH	Arsenic, Dissolved| Aluminum, Total Recoverable| *E. coli*
Jemez River (Zia Pueblo bnd to Jemez Pueblo bnd)	20.6.4.106	5/5A	Arsenic, dissolved| Boron, Dissolved| *E. coli*| Temperature	Arsenic, dissolved| Boron, Dissolved| *E. coli*
La Jara Creek (East Fork Jemez to headwaters)	20.6.4.108	5/5B	Aluminum, Total Recoverable	
Redondo Creek (Sulphur Creek to headwaters)	20.6.4.108	5/5C	Temperature| Turbidity| pH	Temperature| Turbidity| Total Phosphorus
Rio Cebolla (Fenton Lake to headwaters)	20.6.4.108	5/5C	Nutrients| Turbidity	Temperature| Sedimentation/Siltation
Rio Cebolla (Rio de las Vacas to Fenton Lake)	20.6.4.108	5/5B	Sedimentation/Siltation| Temperature	Sedimentation/Siltation
Rio Guadalupe (Jemez River to confl with Rio Cebolla)	20.6.4.108	5/5A	Nutrients| Specific Conductance| Temperature| Turbidity	Turbidity| Temperature| Nutrients| Sedimentation/Siltation| Chronic Aluminum
Rio de las Vacas (Clear Creek to headwaters)	20.6.4.108	5/5B	Aluminum, Total Recoverable	
Rio de las Vacas (Rio Cebolla to Clear Creek)	20.6.4.108	4A	Nutrients| Temperature	Temperature| Total Organic Carbon| Nutrients
Rito Penas Negras (Rio de las Vacas to headwaters)	20.6.4.108	5/5C	Nutrients| Sedimentation/Siltation| Temperature| Turbidity	Temperature| Sedimentation/Siltation| Total Organic Carbon| Nutrients
Rito de las Palomas (Rio de las Vacas to headwaters)	20.6.4.108	5/5C	Sedimentation/Siltation| Turbidity	Temperature| Sedimentation/Siltation
Rito de los Indios (San Antonio Creek to headwaters)	20.6.4.108	5/5A	Nutrients| Temperature| Turbidity	
San Antonio Creek (East Fork Jemez to VCNP bnd)	20.6.4.108	5/5A	Aluminum, Total Recoverable| Temperature| Turbidity	Turbidity| Temperature| Arsenic
San Antonio Creek (VCNP bnd to headwaters)	20.6.4.108	5/5B	Aluminum, Total Recoverable| Nutrients| Temperature| Turbidity	Temperature| Turbidity
San Gregorio Lake	20.6.4.134	5/5A	Nutrients	
Sulphur Creek (Redondo Creek to	20.6.4.124	5/5B	Aluminum, Total Recoverable	

Assessment Unit Name	WQS Reference	IR Category	Impairments	TMDL Completed
headwaters)				
Sulphur Creek (San Antonio Creek to Redondo Creek)	20.6.4.108	5/5B	Aluminum, Total Recoverable| Temperature| Turbidity| pH	
Vallecito Ck (Jemez Pueblo bnd to Div abv Ponderosa)	20.6.4.98	5/5A	Arsenic, Dissolved	
Vallecito Ck (Perennial Prt Div abv Ponderosa to headwaters)	20.6.4.107	5/5A	Sedimentation/Siltation| Turbidity	
Virgin Canyon (Rio Guadalupe to headwaters)	20.6.4.108	2		

3.2 Objectives

Table 3 outlines the project objectives that have been identified to meet the various needs within the SWQB. Data needs have been determined based on impairments from previous studies, identified data gaps, and consultation with 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

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 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, this survey uses a targeted monitoring design to address data needs identified for assessment, TMDLs, potential standards revisions, and point source monitoring. Monitoring sites are 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 the least. 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 year-2 monitoring may be adjusted depending on year-1 analytical results.

3.4 Project Schedule

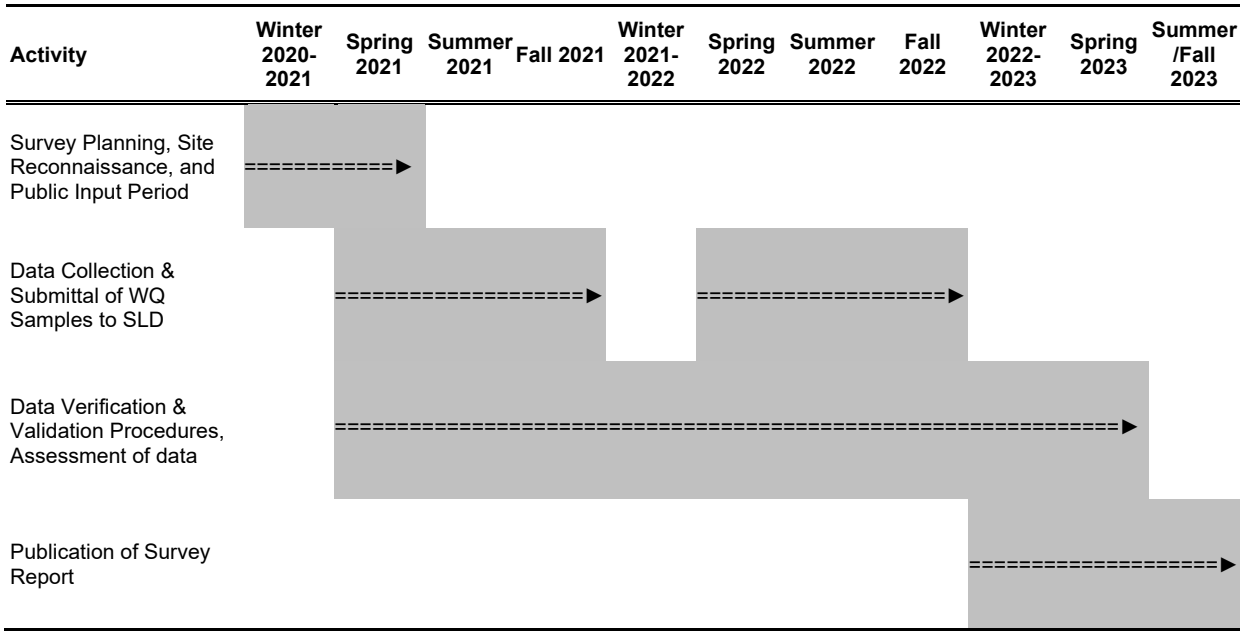
As part of the survey planning process, a 30-day public comment period will be held to receive input on any areas of concern within the AUs surveyed and to inform interested parties about the SWQB water quality survey process, the specific sampling plans in the watershed, and the assessment and TMDL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

The progress of this project will be documented and tracked from its 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 lag time to receive results is calculated 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 2024-2026 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 includes the Jemez River watershed (HUC 13020202). The sampling area includes river locations along the Jemez River upstream of the Zia Pueblo boundary to the headwaters, and the perennial tributaries and associated lakes within the watershed. The SWQB does not plan on sampling any streams within the formal boundaries of the Zia or Jemez Pueblos. **Table 5** shows a complete list of stations illustrated in **Figure 2**.

Table 5. Jemez Watershed: Water Quality Stations

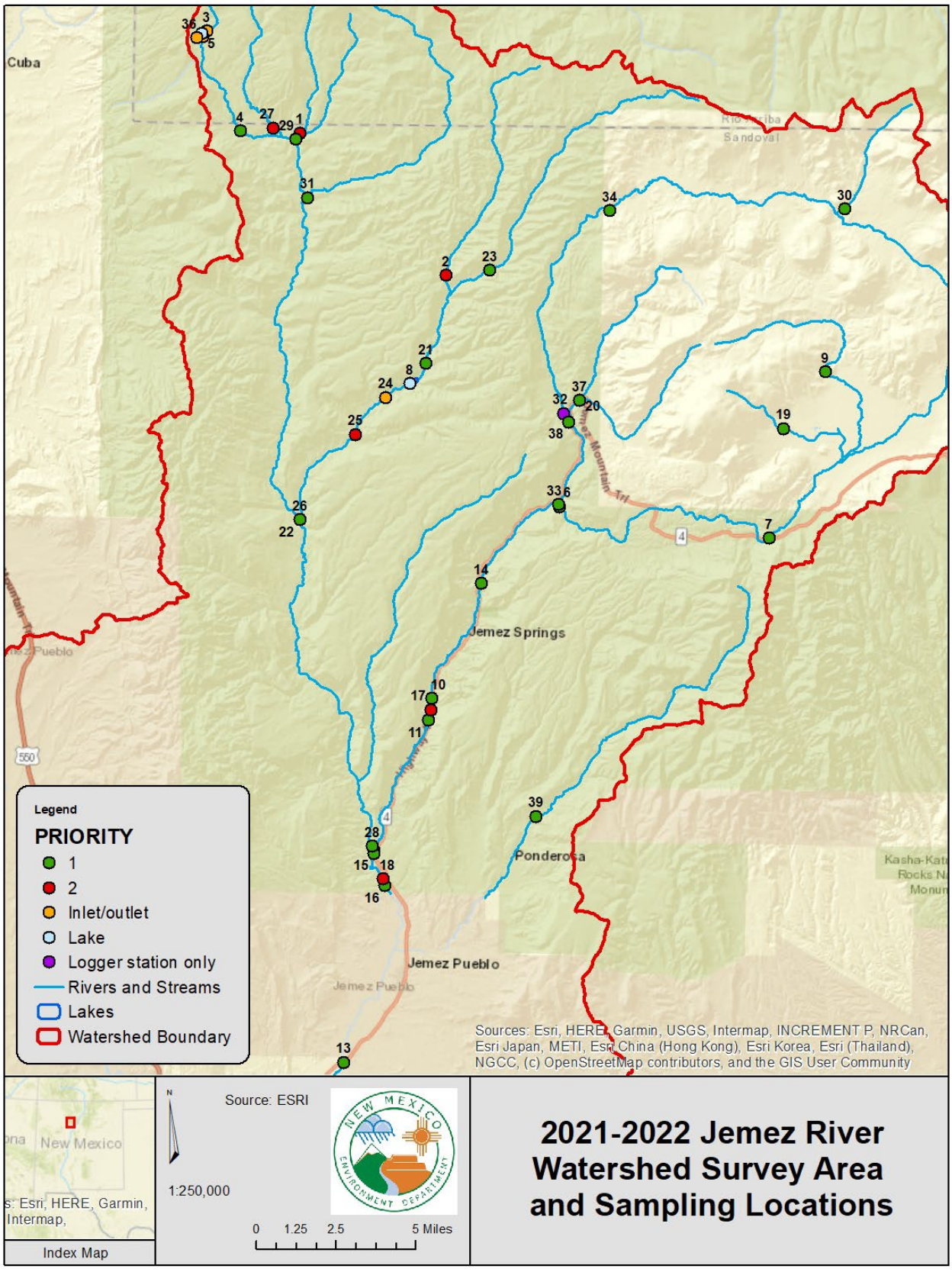
Map #	Station Name	Station ID	Assessment Unit	Rationale/Comments
1	American Creek above Rito de las Palomas - 31Americ000.1	31Americ000.1	American Creek (Rio de las Palomas to headwaters)	AU has historical listings for temperature, sedimentation/siltation and turbidity.
2	CALAVERAS CREEK ABOVE RIO CEBOLLA ON NM 126 - 31Calave001.1	31Calave001.1	Calaveras Creek (Rio Cebolla to headwaters)	AU impaired for Aluminum (total recoverable). Upstream of NPDES permit.
3	Clear Creek abv San Gregorio Lake - 31ClearC009.2	31ClearC009.2	Clear Creek (San Gregorio Lake to headwaters)	AU impaired for Aluminum (total recoverable) and Nutrients. Bottom of AU. San Gregorio inlet.
4	CLEAR CREEK AT NM 126 - 31ClearC002.3	31ClearC002.3	Clear Creek (Rio de las Vacas to San Gregorio Lake)	AU impaired for E. coli, Nutrients and Temperature. Bottom of AU.

Map #	Station Name	Station ID	Assessment Unit	Rationale/Comments
5	Clear Creek below San Gregorio Lake	31ClearC008.1	Clear Creek (Rio de las Vacas to San Gregorio Lake)	Lake outlet.
6	East Fork Jemez above confluence with San Antonio Creek - 31EFkJem000.1	31EFkJem000.1	East Fork Jemez (San Antonio Creek to VCNP bnd)	AU impaired for Aluminum (total recoverable) and Temperature. Bottom of AU.
7	East Fork Jemez River below Las Conchas day use area - 31EFkJem015.2	31EFkJem015.2	East Fork Jemez (VCNP to headwaters)	AU impaired for Aluminum (total recoverable), Nutrients and Turbidity. Lowest station in AU. Monitor for post-fire (Las Conchas) effects.
8	Fenton Lake at dam - 31FentonLkDam	31FentonLkDam	Fenton Lake	Lake is impaired for Nutrients.
9	Jaramillo Creek abv road VC 02 - 31Jarami006.0	31Jarami006.0	Jaramillo Creek (East Fork Jemez to headwaters)	AU impaired for Aluminum (total Recoverable), Nutrients and Turbidity. Bottom of AU.
10	Jemez R. abv. Jemez Springs WWTP - 31JemezR058.6	31JemezR058.6	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	Upstream of NPDES permit. AU impaired for Aluminum (total recoverable), Arsenic (dissolved), Boron (dissolved), E. coli, Nutrients, Temperature, and Turbidity.
11	Jemez R. blw Jemez Spr. WWTP - 31JemezR057.4	31JemezR057.4	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	Downstream of NPDES permit. AU impaired for Aluminum (total recoverable), Arsenic (dissolved), Boron (dissolved), E. coli, Nutrients, Temperature, and Turbidity.
12	Jemez River above Rio Guadalupe - 31JemezR049.2	31JemezR049.2	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	Bottom of AU. AU impaired for Aluminum (total recoverable), Arsenic (dissolved), Boron (dissolved), E. coli, Nutrients, Temperature and Turbidity.
13	Jemez River above San Ysidro at NM Hwy 4 - 31JemezR037.0	31JemezR037.0	Jemez River (Zia Pueblo bnd to Jemez Pueblo bnd)	AU impaired for Arsenic (dissolved), Boron (dissolved), E. coli, and Temperature.
14	Jemez River above Soda Dam - 31JemezR064.9	31JemezR064.9	Jemez River (Soda Dam nr Jemez Springs to East Fork)	AU impaired for Aluminum (total recoverable), Arsenic (dissolved), E. coli, Temperature, Turbidity, and pH. Bottom of AU.
15	Jemez River below Rio Guadalupe - 31JemezR048.7	31JemezR048.7	Jemez River (Jemez Pueblo bnd to Rio Guadalupe)	Upstream of NPDES permit. AU impaired for Arsenic (dissolved), Boron (dissolved), E. coli, Nutrients, and Temperature.
16	JEMEZ RIVER NEAR CANON, BELOW MUNICIPAL SCHOOL - 31JemezR046.6	31JemezR046.6	Jemez River (Jemez Pueblo bnd to Rio Guadalupe)	Bottom of AU and downstream of NPDES permit. AU impaired for Arsenic (dissolved), Boron (dissolved), E. coli, Nutrients, and Temperature.
17	Jemez Spr. WWTP outfall - NM0028011	NM0028011	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	NPDES permit
18	Jemez Valley Public Schools WWTP Outfall -NM0028479	NM0028479	Jemez River (Jemez Pueblo bnd to Rio Guadalupe)	NPDES permit
19	La Jara above headquarters (VCNP 15) - 31LaJara005.0	31LaJara005.0	La Jara Creek (East Fork Jemez to headwaters)	AU impaired for Aluminum (total recoverable). Only station in AU.

Map #	Station Name	Station ID	Assessment Unit	Rationale/Comments
20	Redondo Creek Above Sulphur Creek - 31Redond000.1	31Redond000.1	Redondo Creek (Sulphur Creek to headwaters)	AU impaired for Temperature, Turbidity, and pH. Bottom of AU.
21	Rio Cebolla ~0.5 mile above Fenton Lake - 31RCebol011.4	31RCebol011.4	Rio Cebolla (Fenton Lake to headwaters)	AU impaired for Nutrients and Turbidity. Lake inlet/downstream of NPDES permit.
22	Rio Cebolla above the Rio de las Vacas - 31RCebol000.1	31RCebol000.1	Rio Cebolla (Rio de las Vacas to Fenton Lake)	AU impaired for Sedimentation/Siltation and Temperature. Bottom of AU. Historic Rio Grande Cutthroat Trout restoration stream.
23	Rio Cebolla at campground abv Seven Springs hatchery - 31RCebol017.9	31RCebol017.9	Rio Cebolla (Fenton Lake to headwaters)	Upstream of NPDES permit. AU impaired for Nutrients and Turbidity.
24	Rio Cebolla at Hal Baxter Trail - 31RCebol009.6	31RCebol009.6	Rio Cebolla (Rio de las Vacas to Fenton Lake)	Lake outlet. AU impaired for Sedimentation/Siltation and Temperature.
25	Rio Cebolla at Lake Fork Canyon- 31RCebol007.0	31RCebol007.0	Rio Cebolla (Rio de las Vacas to Fenton Lake)	AU impaired for Sedimentation/Siltation and Temperature. Monitoring for potential exclosure effects on improving water quality.
26	Rio de Las Vacas above the Rio Cebolla - 31RVacas000.1	31RVacas000.1	Rio de las Vacas (Rio Cebolla to Clear Creek)	AU impaired for Nutrients and Temperature. Bottom of AU
27	Rio de Las Vacas at SR 126 - 31RVacas023.7	31RVacas023.7	Rio de las Vacas (Clear Creek to headwaters)	AU impaired for Aluminum (total recoverable). Bottom of AU
28	Rio Guadalupe above Jemez River - 31RGuada000.1	31RGuada000.1	Rio Guadalupe (Jemez River to confl with Rio Cebolla)	AU impaired for Nutrients, Specific Conductance, Temperature and Turbidity. Bottom of AU.
29	Rito de las Palomas at NM Hwy 126 - 31RPalom000.1	31RPalom000.1	Rito de las Palomas (Rio de las Vacas to headwaters)	AU impaired for Sedimentation/Siltation, Turbidity. Bottom of AU.
30	Rito de los Indios above San Antonio Creek - 31RIndio000.2	31RIndio000.2	Rito de los Indios (San Antonio Creek to headwaters)	AU impaired for Nutrients, Temperature and Turbidity. Bottom of AU.
31	Rito Penas Negras at NM Hwy 126 - 31RPNegr000.1	31RPNegr000.1	Rito Penas Negras (Rio de las Vacas to headwaters)	AU impaired for Nutrients, Sedimentation/Siltation, Temperature, and Turbidity. Bottom of AU
32	San Antonio Creek @ La Cueva - 31SanAnt005.3	31SanAnt005.3	San Antonio Creek (East Fork Jemez to VCNP bnd)	AU impaired for Aluminum (total recoverable), Temperature and Turbidity. Better location in AU for logger deployment
33	San Antonio Creek abv confl w East Fork Jemez River - 31SanAnt000.1	31SanAnt000.1	San Antonio Creek (East Fork Jemez to VCNP bnd)	AU impaired for Aluminum (total recoverable), Temperature and Turbidity. Bottom of AU.
34	San Antonio Creek abv VCNP boundary - 31SanAnt017.7	31SanAnt017.7	San Antonio Creek (VCNP bnd to headwaters)	AU impaired for Aluminum (total recoverable), Nutrients, Temperature and Turbidity. Bottom of AU.
35	San Gregorio Deep - 33SanGregorLk	33SanGregorLk	San Gregorio Lake	Lake is listed as impaired for Nutrients.
36	San Gregorio outlet @	no ID	San Gregorio Lake	Potential lake outlet only; AU not

Map #	Station Name	Station ID	Assessment Unit	Rationale/Comments
	Nacimiento Creek			in survey.
37	Sulphur Creek Above Redondo Creek - 31Sulphu001.3	31Sulphu001.3	Sulphur Creek (Redondo Creek to headwaters)	AU impaired for Aluminum (total recoverable).
38	Sulphur Creek above San Antonio Creek - 31Sulphu000.1	31Sulphu000.1	Sulphur Creek (San Antonio Creek to Redondo Creek)	AU is listed as listed as impaired for Aluminum (total recoverable), Temperature, Turbidity, and pH. Bottom of AU.
39	Vallecito abv Ponderosa diversion - 31RValle012.2	31Vallec012.2	Vallecito Ck (Perennial Prt Div abv Ponderosa to headwaters)	AU impaired for Sedimentation/Siltation and Turbidity. Bottom of AU and lowest perennial segment. Data need post-fire.

Figure 2. Jemez River 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 2018).

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

1. Jemez River Watershed Survey 2021-2022

Project activities will be documented on SWQB Monitoring Field Sheets. Information from field sheets will be entered into the SWQB database and maintained 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 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 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 are levels are expected, such as WWTPs, will be analyzed using a method with a higher reporting limit.

Table 6 outlines the two-year survey targeted monitoring water quality analytes to be measured and their sampling frequency.

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 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. Jemez River Watershed 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]	Dissolved Organic Carbon	Total Metals[5]	Dissolved Metals[6]	*E. coli*	Volatile Organics[7]	Semi-Volatile Organics[7]	Radionuclides[8]
1	American Creek above Rito de las Palomas - 31Americ000.1	31Americ000.1	American Creek (Rio de las Palomas to headwaters)	2	4	4		4	4	4	4			
2	CALAVERAS CREEK ABOVE RIO CEBOLLA ON NM 126 - 31Calave001.1	31Calave001.1	Calaveras Creek (Rio Cebolla to headwaters)	2	4	4		4	4	4	4			
3	Clear Creek abv San Gregorio Lake - 31ClearC009.2	31ClearC009.2	Clear Creek (San Gregorio Lake to headwaters)	IO	4	4		4	4	4	4			
4	CLEAR CREEK AT NM 126 - 31ClearC002.3	31ClearC002.3	Clear Creek (Rio de las Vacas to San Gregorio Lake)	1	8	8		6	6	6	8			
5	Clear Creek below San Gregorio Lake	31ClearC008.1	Clear Creek (Rio de las Vacas to San Gregorio Lake)	IO	4	4		4	4	4	4			
6	East Fork Jemez above confluence with San Antonio Creek - 31EFkJem000.1	31EFkJem000.1	East Fork Jemez (San Antonio Creek to VCNP bnd)	1	8	8		6	6	6	8			
7	East Fork Jemez River below Las Conchas day use area - 31EFkJem015.2	31EFkJem015.2	East Fork Jemez (VCNP to headwaters)	1	8	8		6	6	6	8			
8	Fenton Lake at dam - 31FentonLkDam	31FentonLkDam	Fenton Lake	L	4	4		4	4	4	4	2	2	2
9	Jaramillo Creek abv road VC 02 - 31Jarami006.0	31Jarami006.0	Jaramillo Creek (East Fork Jemez to headwaters)	1	8	8		6	6	6	8			

Map #	Station Name	Station ID	Assessment Unit	PRIORITY[1]	TDS/TSS[2]	Nutrients (low P)[3]	Nutrients (high P)[4]	Dissolved Organic Carbon	Total Metals[5]	Dissolved Metals[6]	*E. coli*	Volatile Organics[7]	Semi-Volatile Organics[7]	Radionuclides[8]
10	Jemez R. abv. Jemez Springs WWTP - 31JemezR058.6	31JemezR058.6	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	1	8	8		6	6	6	8	2	2	2
11	Jemez R. blw Jemez Spr. WWTP - 31JemezR057.4	31JemezR057.4	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	1	8	8		6	6	6	8	2	2	2
12	Jemez River above Rio Guadalupe - 31JemezR049.2	31JemezR049.2	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	1	8	8		6	6	6	8			
13	Jemez River above San Ysidro at NM Hwy 4 - 31JemezR037.0 *	31JemezR037.0*	Jemez River (Zia Pueblo bnd to Jemez Pueblo bnd)	1	8	8		6	6	6	8	2	2	2
14	Jemez River above Soda Dam - 31JemezR064.9	31JemezR064.9	Jemez River (Soda Dam nr Jemez Springs to East Fork)	1	8	8		6	6	6	8			
15	Jemez River below Rio Guadalupe - 31JemezR048.7	31JemezR048.7	Jemez River (Jemez Pueblo bnd to Rio Guadalupe)	1	8	8		6	6	6	8	2	2	2
16	JEMEZ RIVER NEAR CANON, BELOW MUNICIPAL SCHOOL - 31JemezR046.6 *	31JemezR046.6*	Jemez River (Jemez Pueblo bnd to Rio Guadalupe)	1	8	8		6	6	6	8	2	2	2
17	Jemez Spr. WWTP outfall - NM0028011	NM0028011	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	2	4		4	4	4	4	4			
18	Jemez Valley Public Schools WWTP Outfall - NM0028479	NM0028479	Jemez River (Jemez Pueblo bnd to Rio Guadalupe)	2	4		4	4	4	4	4			
19	La Jara above headquarters (VCNP 15) - 31LaJara005.0	31LaJara005.0	La Jara Creek (East Fork Jemez to headwaters)	1	8	8		6	6	6	8			
20	Redondo Creek Above Sulphur Creek - 31Redond000. 1	31Redond000.1	Redondo Creek (Sulphur Creek to headwaters)	1	8	8		6	6	6	8			

Map #	Station Name	Station ID	Assessment Unit	PRIORITY[1]	TDS/TSS[2]	Nutrients (low P)[3]	Nutrients (high P)[4]	Dissolved Organic Carbon	Total Metals[5]	Dissolved Metals[6]	*E. coli*	Volatile Organics[7]	Semi-Volatile Organics[7]	Radionuclides[8]
21	Rio Cebolla ~0.5 mile above Fenton Lake - 31RCebol011.4	31RCebol011.4	Rio Cebolla (Fenton Lake to headwaters)	1/IO	8	8		8	8	8	8			
22	Rio Cebolla above the Rio de las Vacas - 31RCebol000.1	31RCebol000.1	Rio Cebolla (Rio de las Vacas to Fenton Lake)	1	8	8		6	6	6	8			
23	Rio Cebolla at campground abv Seven Springs hatchery - 31RCebol017.9	31RCebol017.9	Rio Cebolla (Fenton Lake to headwaters)	1	8	8		6	6	6	8	2	2	2
24	Rio Cebolla at Hal Baxter Trail - 31RCebol009.6	31RCebol009.6	Rio Cebolla (Rio de las Vacas to Fenton Lake)	IO	4	4		4	4	4	4			
25	Rio Cebolla at Lake Fork Canyon- 31RCebol007.0	31RCebol007.0	Rio Cebolla (Rio de las Vacas to Fenton Lake)	2	4	4		4	4	4	4			
26	Rio de Las Vacas above the Rio Cebolla - 31RVacas000.1	31RVacas000.1	Rio de las Vacas (Rio Cebolla to Clear Creek)	1	8	8		6	6	6	8			
27	Rio de Las Vacas at SR 126 - 31RVacas023.7	31RVacas023.7	Rio de las Vacas (Clear Creek to headwaters)	2	4	4		4	4	4	4			
28	Rio Guadalupe above Jemez River - 31RGuada000.1	31RGuada000.1	Rio Guadalupe (Jemez River to confl with Rio Cebolla)	1	8	8		6	6	6	8			
29	Rito de las Palomas at NM Hwy 126 - 31RPalom000.1	31RPalom000.1	Rito de las Palomas (Rio de las Vacas to headwaters)	1	8	8		6	6	6	8			
30	Rito de los Indios above San Antonio Creek - 31RIndio000.2	31RIndio000.2	Rito de los Indios (San Antonio Creek to headwaters)	1	8	8		6	6	6	8			
31	Rito Penas Negras at NM Hwy 126 - 31RPNegr000.1	31RPNegr000.1	Rito Penas Negras (Rio de las Vacas to headwaters)	1	8	8		6	6	6	8			

Map #	Station Name	Station ID	Assessment Unit	PRIORITY[1]	TDS/TSS[2]	Nutrients (low P)[3]	Nutrients (high P)[4]	Dissolved Organic Carbon	Total Metals[5]	Dissolved Metals[6]	*E. coli*	Volatile Organics[7]	Semi-Volatile Organics[7]	Radionuclides[8]
32	San Antonio Creek @ La Cueva - 31SanAnt005.3	31SanAnt005.3	San Antonio Creek (East Fork Jemez to VCNP bnd)	LSO										
33	San Antonio Creek abv confl w East Fork Jemez River - 31SanAnt000.1	31SanAnt000.1	San Antonio Creek (East Fork Jemez to VCNP bnd)	1	8	8		6	6	6	8			
34	San Antonio Creek abv VCNP boundary - 31SanAnt017.7	31SanAnt017.7	San Antonio Creek (VCNP bnd to headwaters)	1	8	8		6	6	6	8			
35	San Gregorio Deep - 33SanGregorLk	33SanGregorLk	San Gregorio Lake	L	4	4		4	4	4	4	2	2	2
36	San Gregorio outlet @ Nacimiento Creek	no ID	San Gregorio Lake	IO	4	4		4	4	4	4			
37	Sulphur Creek Above Redondo Creek - 31Sulphu001.3	31Sulphu001.3	Sulphur Creek (Redondo Creek to headwaters)	1	8	8		6	6	6	8			
38	Sulphur Creek above San Antonio Creek - 31Sulphu000.1	31Sulphu000.1	Sulphur Creek (San Antonio Creek to Redondo Creek)	1	8	8		6	6	6	8			
39	Vallecito abv Ponderosa diversion - 31RValle012.2	31Vallec012.2	Vallecito Ck (Perennial Prt Div abv Ponderosa to headwaters)	1	8	8		6	6	6	8			
	Quality Control		Blanks Collected per QAPP		26	26		21		21	26	4		
Total Number of Samples					282	274	8	227	206	227	282	20	16	16

[1] Priority rankings: 1 are highest priorities (sampled 8x), and 2 the lowest (sampled 4x). "L" are lake stations; "IO" are lake inlets or outlets; “LSO” is “logger station only” and no water chemistry sampling is planned at the station.
[2] Asterisk (*) next to station indicates TDS/TSS/Cl^-/SO^4 will be collected due to water quality standards for sulfate and chloride.
[3] Suite includes total Kjeldahl nitrogen, nitrate+nitrite, ammonia, and total phosphorus. QC blanks are collected with the “Nutrients (low P)” suite.
[4]Nutrient samples where high phosphorus are levels are expected, such as WWTPs, will be analyzed using a method with a higher reporting limit.
[5]Suite includes aluminum, mercury, selenium.
[6]Suite includes aluminum, antimony, arsenic, barium, boron, beryllium, calcium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, mercury, magnesium, nickel, selenium, silicon, silver, thallium, tin, uranium, vanadium, and zinc.
[7]See Appendix B of this FSP for a complete list of analytes.

[8]A radionuclide sample will include gross alpha and gross beta. If alpha and/or beta particles are detected, Uranium mass and Radium 226 + 228 will also be analyzed.

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.

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 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.

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 in regard to assessment for specific parameters please refer to the most up to date CALM. 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.

Sampling of Chlorophyll *a*, and sonde/DO/conductivity logger deployments described in **Table 7** is planned in accordance with the current 2019 CALM (NMED/SWQB 2019). Revision of the CALM in 2021 may lead to changes in sampling methods or the sampling schedule. Any resulting changes to the FSP will be documented in the 2022 revision of this FSP or in the survey report.

Table 7. Jemez River Watershed Survey: Biological and Habitat Sampling

Map #	Station Name	Station ID	Assessment Unit	Priority[1]	Sonde/DO/Cond[2,3]	Thermograph	Flow[4]	Physical Habitat	Chlorophyll *a*[5]	Phytoplankton	Microcystins[6]	Macro-invertebrates	Fish[7]
1	American Creek above Rito de las Palomas - 31Americ000.1	31Americ000.1	American Creek (Rio de las Palomas to headwaters)	2		1	4						1
2	CALAVERAS CREEK ABOVE RIO CEBOLLA ON NM 126 - 31Calave001.1	31Calave001.1	Calaveras Creek (Rio Cebolla to headwaters)	2			4						
3	Clear Creek abv San Gregorio Lake - 31ClearC009.2	31ClearC009.2	Clear Creek (San Gregorio Lake to headwaters)	IO	D		4						
4	CLEAR CREEK AT NM 126 - 31ClearC002.3	31ClearC002.3	Clear Creek (Rio de las Vacas to San Gregorio Lake)	1	D	1	8						
5	Clear Creek below San Gregorio Lake	31ClearC008.1	Clear Creek (Rio de las Vacas to San Gregorio Lake)	IO			4						
6	East Fork Jemez above confluence with San Antonio Creek - 31EFkJem000.1	31EFkJem000.1	East Fork Jemez (San Antonio Creek to VCNP bnd)	1		1	8						
7	East Fork Jemez River below Las Conchas day use area - 31EFkJem015.2	31EFkJem015.2	East Fork Jemez (VCNP to headwaters)	1	S		8						
8	Fenton Lake at dam - 31FentonLkDam	31FentonLkDam	Fenton Lake	L					4	4	2		
9	Jaramillo Creek abv road VC 02 - 31Jarami006.0	31Jarami006.0	Jaramillo Creek (East Fork Jemez to headwaters)	1	S		8						
10	Jemez R. abv. Jemez Springs WWTP - 31JemezR058.6	31JemezR058.6	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	1			8						
11	Jemez R. blw Jemez Spr. WWTP - 31JemezR057.4	31JemezR057.4	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	1	D	1	8						
12	Jemez River above Rio Guadalupe - 31JemezR049.2	31JemezR049.2	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	1	S		8						
13	Jemez River above San Ysidro at NM Hwy 4 - 31JemezR037.0	31JemezR037.0	Jemez River (Zia Pueblo bnd to Jemez Pueblo bnd)	1		1	8	1					
14	Jemez River above Soda Dam - 31JemezR064.9	31JemezR064.9	Jemez River (Soda Dam nr Jemez Springs to East Fork)	1	S	1	8						
15	Jemez River below Rio Guadalupe - 31JemezR048.7	31JemezR048.7	Jemez River (Jemez Pueblo bnd to Rio Guadalupe)	1			8						1

Map #	Station Name	Station ID	Assessment Unit	Priority[1]	Sonde/DO/Cond[2,3]	Thermograph	Flow[4]	Physical Habitat	Chlorophyll *a*[5]	Phytoplankton	Microcystins[6]	Macro-invertebrates	Fish[7]
16	JEMEZ RIVER NEAR CANON, BELOW MUNICIPAL SCHOOL - 31JemezR046.6	31JemezR046.6	Jemez River (Jemez Pueblo bnd to Rio Guadalupe)	1	D, C	1	8	1					
17	Jemez Spr. WWTP outfall - NM0028011	NM0028011	Jemez River (Rio Guadalupe to Soda Dam nr Jemez Springs)	1									
18	Jemez Valley Public Schools WWTP Outfall - NM0028479	NM0028479	Jemez River (Jemez Pueblo bnd to Rio Guadalupe)	1									
19	La Jara above headquarters (VCNP 15) - 31LaJara005.0	31LaJara005.0	La Jara Creek (East Fork Jemez to headwaters)	1			8						
20	Redondo Creek Above Sulphur Creek - 31Redond000.1	31Redond000.1	Redondo Creek (Sulphur Creek to headwaters)	1	S	1	8						
21	Rio Cebolla ~0.5 mile above Fenton Lake - 31RCebol011.4	31RCebol011.4	Rio Cebolla (Fenton Lake to headwaters)	1/IO			8						
22	Rio Cebolla above the Rio de las Vacas - 31RCebol000.1	31RCebol000.1	Rio Cebolla (Rio de las Vacas to Fenton Lake)	1	S	1	8						
23	Rio Cebolla at campground abv Seven Springs hatchery - 31RCebol017.9	31RCebol017.9	Rio Cebolla (Fenton Lake to headwaters)	1			8						
24	Rio Cebolla at Hal Baxter Trail - 31RCebol009.6	31RCebol009.6	Rio Cebolla (Rio de las Vacas to Fenton Lake)	IO			4						
25	Rio Cebolla at Lake Fork Canyon- 31RCebol007.0	31RCebol007.0	Rio Cebolla (Rio de las Vacas to Fenton Lake)	2		1	4						
26	Rio de Las Vacas above the Rio Cebolla - 31RVacas000.1	31RVacas000.1	Rio de las Vacas (Rio Cebolla to Clear Creek)	1	D		8						
27	Rio de Las Vacas at SR 126 - 31RVacas023.7	31RVacas023.7	Rio de las Vacas (Clear Creek to headwaters)	2			4						
28	Rio Guadalupe above Jemez River - 31RGuada000.1	31RGuada000.1	Rio Guadalupe (Jemez River to confl with Rio Cebolla)	1	D, C		8						
29	Rito de las Palomas at NM Hwy 126 - 31RPalom000.1	31RPalom000.1	Rito de las Palomas (Rio de las Vacas to headwaters)	1	S		8	1					
30	Rito de los Indios above San Antonio Creek - 31RIndio000.2	31RIndio000.2	Rito de los Indios (San Antonio Creek to headwaters)	1	S	1	8						
31	Rito Penas Negras at NM Hwy 126 - 31RPNegr000.1	31RPNegr000.1	Rito Penas Negras (Rio de las Vacas to headwaters)	1	S	1	8	1					

Map #	Station Name	Station ID	Assessment Unit	Priority[1]	Sonde/DO/Cond[2,3]	Thermograph	Flow[4]	Physical Habitat	Chlorophyll *a*[5]	Phytoplankton	Microcystins[6]	Macro-invertebrates	Fish[7]
32	San Antonio Creek @ La Cueva - 31SanAnt005.3	31SanAnt005.3	San Antonio Creek (East Fork Jemez to VCNP bnd)	LSO	S	1							
33	San Antonio Creek abv confl w East Fork Jemez River - 31SanAnt000.1	31SanAnt000.1	San Antonio Creek (East Fork Jemez to VCNP bnd)	1			8						
34	San Antonio Creek abv VCNP boundary - 31SanAnt017.7	31SanAnt017.7	San Antonio Creek (VCNP bnd to headwaters)	1	S	1	8						
35	San Gregorio Deep - 33SanGregorLk	33SanGregorLk	San Gregorio Lake	L					4	4			
36	San Gregorio outlet @ Nacimiento Creek	no ID	San Gregorio Lake	IO			4						
37	Sulphur Creek Above Redondo Creek - 31Sulphu001.3	31Sulphu001.3	Sulphur Creek (Redondo Creek to headwaters)	1			8						
38	Sulphur Creek above San Antonio Creek - 31Sulphu000.1	31Sulphu000.1	Sulphur Creek (San Antonio Creek to Redondo Creek)	1	S	1	8						
39	Vallecito abv Ponderosa diversion - 31RValle012.2	31Vallec012.2	Vallecito Ck (Perennial Prt Div abv Ponderosa to headwaters)	1	S		8	1					
Total Number of Sampling Events					21	15	240	5	8	8	2	0	2

[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, sonde and temperature data will be used from USGS gages where possible.
[5] Chlorophyll-*a* samples are collected at sites that indicate nutrient enrichment or have been previously listed for nutrients.
[6] If resources permit up to 2 additional samples may be taken in high recreation areas or areas of concern for microcystins.
[7] Fish sampling will be determined by interagency cooperation and the availability of shocking equipment.

6.0 RESOURCE REQUIREMENTS

Sample analysis costs include: SLD work-time units (WTUs) for chemical analysis performed at SLD and provided to 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**.

Approximated 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 $85 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 Jemez River Watershed Survey

Analyte	Total # of Samples	Cost per Sample (WTU unless indicated in $)	Total Expenditure (WTU unless indicated in $)
TDS/TSS	266	45	11952
TDS/TSS/SO^4/Cl^-	16	105	1680
Nutrients	8	100	800
Nutrients (low P)	274	95	25992
DOC	227	30	6798
Total Metals	206	85	17510
Dissolved Metals	227	140	31724
E. Coli	282	$7.55	$2,126.08
Volatile Organics	20	150	3000
Semi-Volatile Organics	16	235	3760
Radionuclides	16	520	8320
Chlorophyll a	8	$32	$256
Phytoplankton	8	$128	$1,024
Microcystins	2	$150	$300
Macroinvertebrates		$270	$0
Totals		**WTU**	111,536
		Dollar	$3,706

Table 9. Vehicle Costs for the Jemez River Watershed Survey

Month	Approximate Miles	Estimated MPG	Estimated Cost of Gasoline per Gallon	Total Fuel Costs/yr	Total Fuel Costs
March	850	17	$2.50	$125.00	$250.00
April	850	17	$2.50	$125.00	$250.00
May	850	17	$2.50	$125.00	$250.00
June	850	17	$2.50	$125.00	$250.00
July	850	17	$2.50	$125.00	$250.00

August	850	17	$2.50	$125.00	$250.00
September	850	17	$2.50	$125.00	$250.00
October	850	17	$2.50	$125.00	$250.00
TOTAL				**$1,000.00**	**$2,000.00**

Table 10. Field Staff Days and Per Diem Costs for the Jemez River Watershed 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)	4	6		$85	$850	$1,700
Field Staff Days (number of days per year)	36		24		60	120

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

Table 11. Total Cost Estimates for the Jemez River Watershed Survey

WTUs	Contract Labs $	Supplies $	Fuel $	Per Diem $	Staff Field Days
111,536	$1,580	$5,945.77	$2,000.00	$1,700	120

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

New Mexico Administrative Code (NMAC). 2020. *State of New Mexico Standards for Interstate and Intrastate Surface Waters; 20.6.4.* New Mexico Water Quality Control Commission. Santa Fe, NM. Available at: https://www.env.nm.gov/surface-water-quality/wqs/

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U.S. Environmental Protection Agency, 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

Organics (semi-volatiles)	Organics (volatiles)
Anthracene	Chlorobenzene
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

Organics (semi-volatiles)	Organics (volatiles)
Indeno(1,2,3-cd)pyrene	
Isophorone	
Methoxychlor	
Metolachlor	
Metribuzin	
Naphthalene	
Nitrobenzene	
N-nitrosodimethylamine	
N-nitroso-di-n-propylamine	
N-nitrosodiphenylamine	
Pentachlorophenol	
Phenanthrene	
Phenol	
Prometryne	
Pyrene	
Pyridine	
Simazine	
trans-Chlordane	