



NEW MEXICO ENVIRONMENT DEPARTMENT

**Surface Water Quality Bureau**



**2021-2022 Watershed Survey**

**FIELD SAMPLING PLAN**

**Lower Pecos River and Southern High Plains Watersheds  
(2022 Revision)**

**3/11/2022**

Prepared by

Eliza Martinez  
Chuck Dentino  
Kris Barrios

**APPROVAL PAGE**

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Kris Barrios  
Program Manager, SWQB Monitoring, Assessment, and Standards  
Section

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Date

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Miguel Montoya  
SWQB Quality Assurance Officer

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Date

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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
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
QAO	Quality Assurance Officer
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 Lower Pecos River and Southern High Plains watersheds 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 2019b). The Plan describes project objectives and decision criteria, and it includes the sampling schedule with locations, constituents, 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.

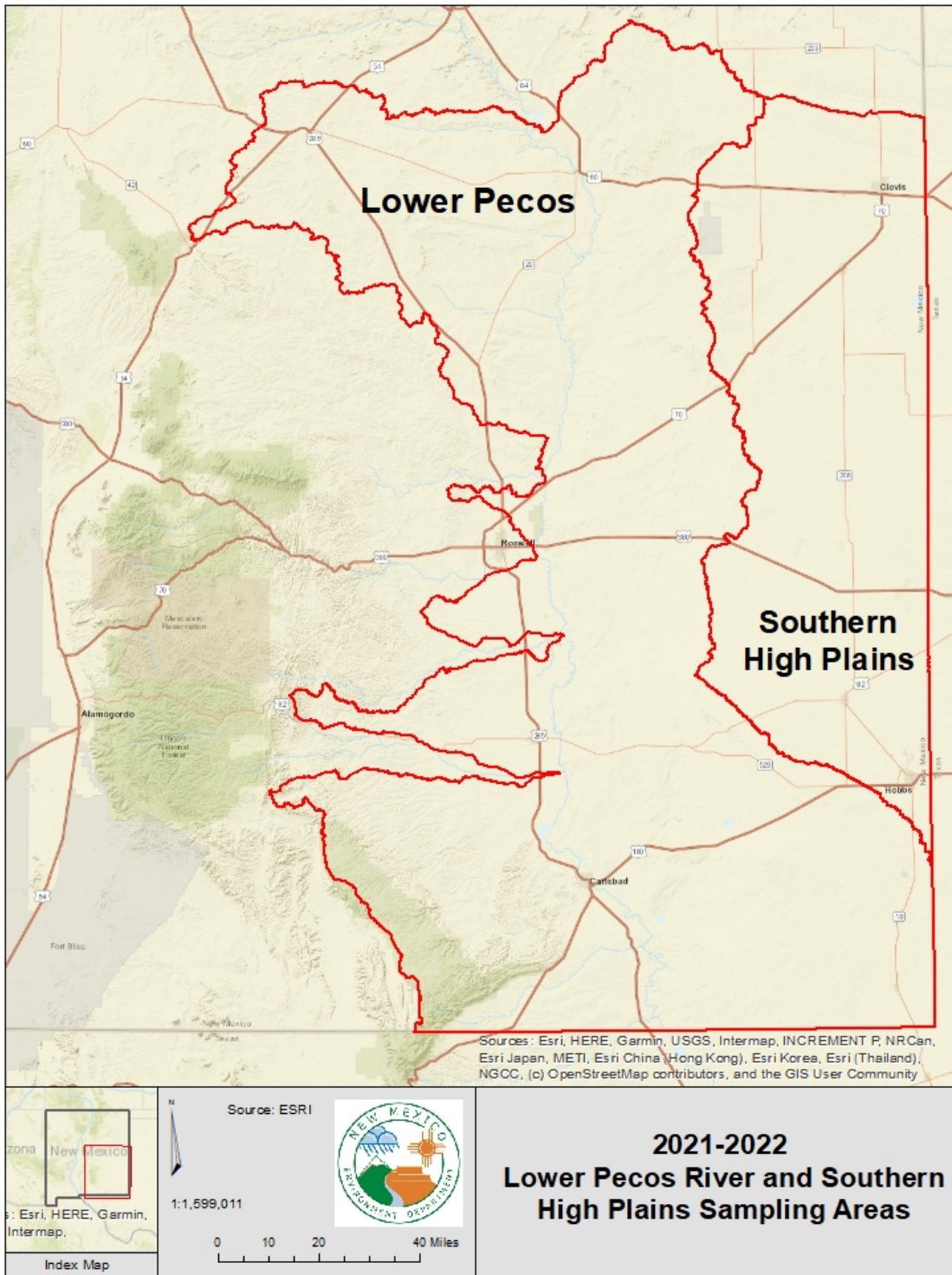
This is a companion document to the SWQB *Quality Assurance Project Plan for Water Quality Management Programs* (NMED/SWQB 2020b) (QAPP). Data will be collected according to the QAPP and the appropriate SWQB Standard Operating Procedures (SOPs). Both the QAPP and SOPs are posted on the SWQB website at <https://www.env.nm.gov/surface-water-quality/protocols-and-planning/>.

The project area includes two survey areas (Figure 1): the Lower Pecos River watershed and the Southern High plains watershed. Perennial tributaries and associated lakes with the watershed are included.

Historic and current land uses in the watersheds include irrigation, livestock, agriculture (range, pasture, and croplands), mining, oil and gas, forest, grassland, residential, shrubland, water, and wetlands. Land ownership in the watershed includes the Bureau of Land Management (BLM), U.S. Forest Service, Bureau of Reclamation (USFS BOR), National Park Service, New Mexico State Parks, and state and private parcels. The study area encompasses approximately 19,809 square miles (51,305 square kilometers) in New Mexico, located in De Baca, Chaves, Eddy, Curry, and Roosevelt counties. The watersheds are located in Omernik Level III Ecoregions 24 (Chihuahuan Desert) and 26 (Southwestern Tablelands)) (USEPA 2006).

The Lower Pecos and Southern High Plains watersheds were last monitored 2013-2014. That water quality survey of these areas identified waters that are attaining New Mexico Water Quality Standards (WQS) and waters that are impaired (i.e. not attaining their specific designated uses). Rivers and streams 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 within the AU. Lakes are assigned a unique AU for each waterbody. For this survey, selected monitoring locations will be sampled for water quality constituents from 4-8 times over two consecutive years. The total number of samples for each location is determined through a priority ranking of CWA §303(d)/ §305(b) Integrated Report (IR) classification, presence of point source discharge, 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, Sampling Plan.

Figure 1. 2021-2022 Lower Pecos River and Southern High Plains Watershed Survey Areas



## 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 FSP should be directed to the MASS project supervisor.

**Table 1. Personnel Roles and Responsibilities**

Team Member	Position/Role	Responsibilities
Kris Barrios Monitoring, Assessment, and Standards Section Program Manager <a href="mailto:Kristopher.Barrios@state.nm.us">Kristopher.Barrios@state.nm.us</a> (505) 946-8713	Program Manager	Approve FSP, direct 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 data collection activities not conducted 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.



Team Member	Position/Role	Responsibilities
<p>Charles Dentino Monitoring Team Supervisor <a href="mailto:Charles.Dentino1@state.nm.us">Charles.Dentino1@state.nm.us</a> (505) 827-0101</p>	<p>Project Supervisor</p>	<p>Manage project personnel and resources throughout the project in coordination with Program Manager and Project Manager(s)</p> <p>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.</p> <p>Conduct mid-project meeting with team to discuss any changes to the project plan. Coordinate and conduct post-project meeting with team to discuss differences between planned and actual sampling and what data gaps, if any, exist.</p> <p>Write, coordinate, and assemble report and/or other grant deliverables required of the project.</p>
<p>Eliza Martinez Monitoring Team Scientist <a href="mailto:Eliza.Martinez@state.nm.us">Eliza.Martinez@state.nm.us</a> (505) 819-8099</p>	<p>Project Manager</p>	<p>Manage project resources throughout the project in coordination with Program Manager and Project supervisor.</p> <p>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.</p> <p>Conduct mid-project meeting with team to discuss any changes to the project plan. Coordinate and conduct</p>

Team Member	Position/Role	Responsibilities
		<p>post-project meeting with team to discuss differences between planned and actual sampling and what data gaps, if any, exist.</p> <p>Write, coordinate, and assemble report and/or other grant deliverables required of the project.</p>
<p>Elizabeth Stuffings Monitoring Team Scientist <a href="mailto:Elizabeth.Stuffings@state.nm.us">Elizabeth.Stuffings@state.nm.us</a> (505) 819-9926</p> <p>David Atencio Monitoring Team Scientist <a href="mailto:David.Atencio@state.nm.us">David.Atencio@state.nm.us</a></p>	<p>Project Team</p>	<p>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.</p> <p>Write assigned sections of reports and/or other grant deliverables required throughout the project.</p>
<p>Miguel Montoya <a href="mailto:Miguel.Montoya@state.nm.us">Miguel.Montoya@state.nm.us</a> (505) 819-9882</p>	<p>QAO</p>	<p>Approve FSP, and ensure FSP is retained in accordance with 1.21.2 NMAC, Retention and Disposition of Public Records.</p> <p>Conduct audits as needed to ensure compliance with FSP, QAPP and SOPs.</p>
<p>Jennifer Fullam <a href="mailto:Jennifer.Fullam@state.nm.us">Jennifer.Fullam@state.nm.us</a> (505) 946-8965</p>	<p>Standards, Planning and Reporting Team (SPRT) Liaison</p>	<p>Provide information and data needs pertaining to water quality standards development and refinement located within the study area.</p>
<p>Heidi Henderson <a href="mailto:Heidi.Henderson@state.nm.us">Heidi.Henderson@state.nm.us</a> (505) 819-9986</p>	<p>TMDL and Assessment Team (TAT) Liaison</p>	<p>Provide information and data needs pertaining to TMDL development and assessment to be conducted in the study area.</p>
<p>Susan Lucas Kamat <a href="mailto:Susan.LucasKamat@state.nm.us">Susan.LucasKamat@state.nm.us</a> 505-946-8924</p>	<p>Point Source Regulation Section (PSRS) Liaison</p>	<p>Provide information and data needs pertaining to point source discharges located within the study area.</p>
<p>Abe Franklin <a href="mailto:Abraham.Franklin@state.nm.us">Abraham.Franklin@state.nm.us</a> (505) 946-8952</p>	<p>Watershed Protection Section (WPS) Liaison</p>	<p>Provide information and data needs pertaining to nonpoint sources of pollution and BMPs located within the study area.</p>

Team Member	Position/Role	Responsibilities
Emile Sawyer <a href="mailto:Emile.sawyer@state.nm.us">Emile.sawyer@state.nm.us</a> (505) 819-9891	Wetlands Program Liaison	Provide information and data needs pertaining to wetlands 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 Wetlands Program Liaison reports to the Watershed Protection Section (WPS) Program Manager. The Point Source Regulation Section (PSRS) Liaison and the 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 2018b) (IR). It 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 in 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). “Water Quality Segment” provides the applicable WQS 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. These 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. 2022) on the State’s IR List and TMDLs or TMDL alternatives are developed for listed AUs.

**Table 2. Lower Pecos River Watershed: Impairment and TMDL Status of Survey Assessment Units**

Assessment Unit Name	WQS Reference	IR Category	Impairments	TMDL Completed
Berrendo Creek (Rio Hondo to headwaters)	20.6.4.206	3/3A		
Black River (Perennial prt Blue Spring to Double Canyon)	20.6.4.202	2		
Black River (Perennial prt Pecos River to Blue Spring)	20.6.4.202	2		
Blue Spring (Black River to headwaters)	20.6.4.202	2		
Brantley Reservoir	20.6.4.205	5	Fish Consumption Advisory - DDE, DDT Mercury - Fish Consumption Advisory	
Delaware River (Pecos River to TX border)	20.6.4.202	2		
Eagle Creek (Pecos River nr Artesia to headwaters)	20.6.4.98	2		
Figure Eight Lake	20.6.4.99	5	Nutrients	
Jal Lake	20.6.4.99	3/3A		
Lake Van	20.6.4.99	5	Temperature	
Lea Lake	20.6.4.227	1		
Lower Tansil Lake/Lake Carlsbad (Carlsbad Municipal Lake)	20.6.4.218	5	Fish Consumption Advisory - DDE, DDT PCBs - Fish Consumption Advisory	
North Spring River (Rio Hondo to headwaters)	20.6.4.206	2		
Pecos River (Avalon Reservoir to Brantley Reservoir)	20.6.4.204	5/5C	DDT - Fish Consumption Advisory Mercury - Fish Consumption Advisory	
Pecos River (Black River to Six Mile Dam)	20.6.4.202	5/5A	DDT - Fish Consumption Advisory E. coli PCBs - Fish Consumption Advisory	E. coli

Assessment Unit Name	WQS Reference	IR Category	Impairments	TMDL Completed
Pecos River (Brantley Reservoir to Rio Penasco)	20.6.4.206	1		
Pecos River (Crockett Draw to Yeso Creek)	20.6.4.207	1		
Pecos River (Eagle Creek to Rio Felix)	20.6.4.206	5/5A	Temperature	
Pecos River (Lake Carlsbad to Avalon Reservoir)	20.6.4.203	4C	Flow Regime Modification	
Pecos River (Rio Felix to Rio Hondo)	20.6.4.206	5/5A	Temperature	
Pecos River (Rio Hondo to Salt Creek)	20.6.4.206	1		
Pecos River (Rio Penasco to Eagle Creek)	20.6.4.206	1		
Pecos River (Salt Creek to Crockett Draw)	20.6.4.207	5/5A	Temperature	
Pecos River (Six Mile Dam to Lower Tansil Lake)	20.6.4.202	5/5C	DDT - Fish Consumption Advisory PCBs - Fish Consumption Advisory	
Pecos River (Truchas Creek to Sumner Reservoir)	20.6.4.207	1		
Pecos River (TX border to Black River)	20.6.4.201	5/5C	DDT - Fish Consumption Advisory Dissolved oxygen E. coli PCBs - Fish Consumption Advisory	E. coli
Pecos River (Yeso Creek to Truchas Creek)	20.6.4.207	1		
Rio Hondo (Perennial prt Pecos R to HWY 285)	20.6.4.206	1		
Sitting Bull Creek (Last Chance Canyon to Sitting Bull Spr)	20.6.4.99	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
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Assess designated use attainment for the <i>Integrated Report</i> 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, <i>Integrated Report (De-Listing)</i>
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 approach. Monitoring occurs during the non-winter months from March through November. Monitoring focuses on physical, chemical, and biological conditions, generally in perennial waters; and includes 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 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.

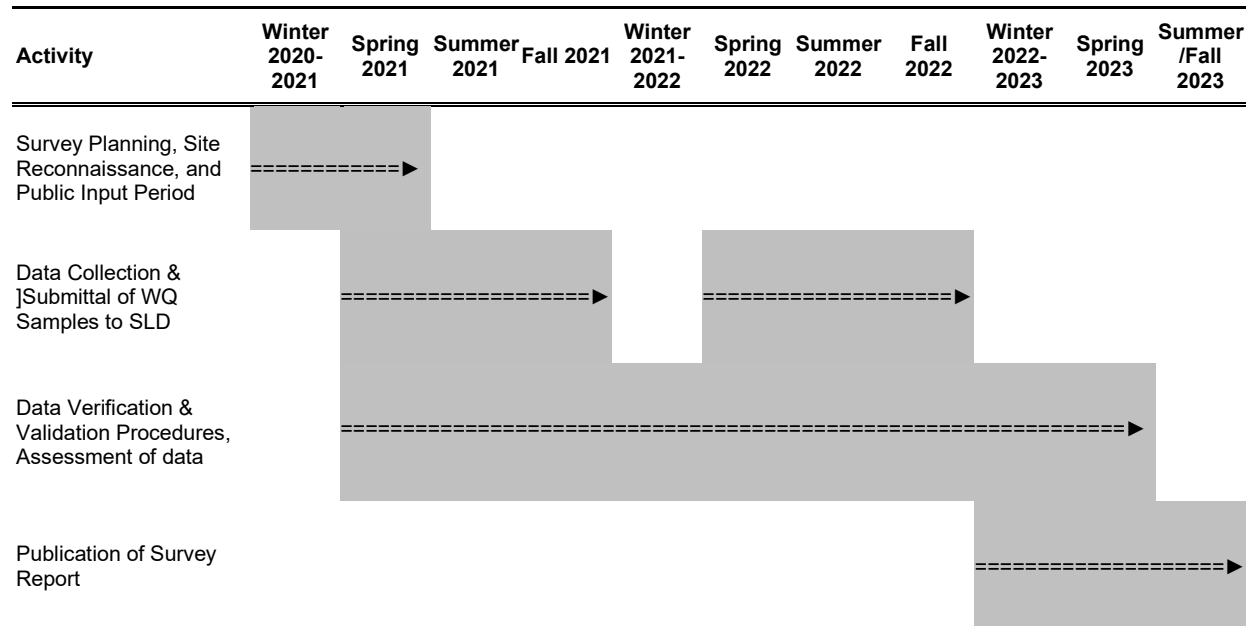
The progress of this project will be documented and tracked from its inception through implementation to ensure all sampling and analytical activities are performed in accordance with all applicable requirements and in a cost-effective manner. **Table 4** provides the project timeline.

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 Lower Pecos River watershed and the Southern High Plains watershed. The Lower Pecos River sampling area includes the Pecos River and tributaries from below Sumner Reservoir to the Texas border. **Table 5.** shows a complete list of stations illustrated in **Figure 2.**

**Table 5. Lower Pecos River watershed: Water Quality Stations**

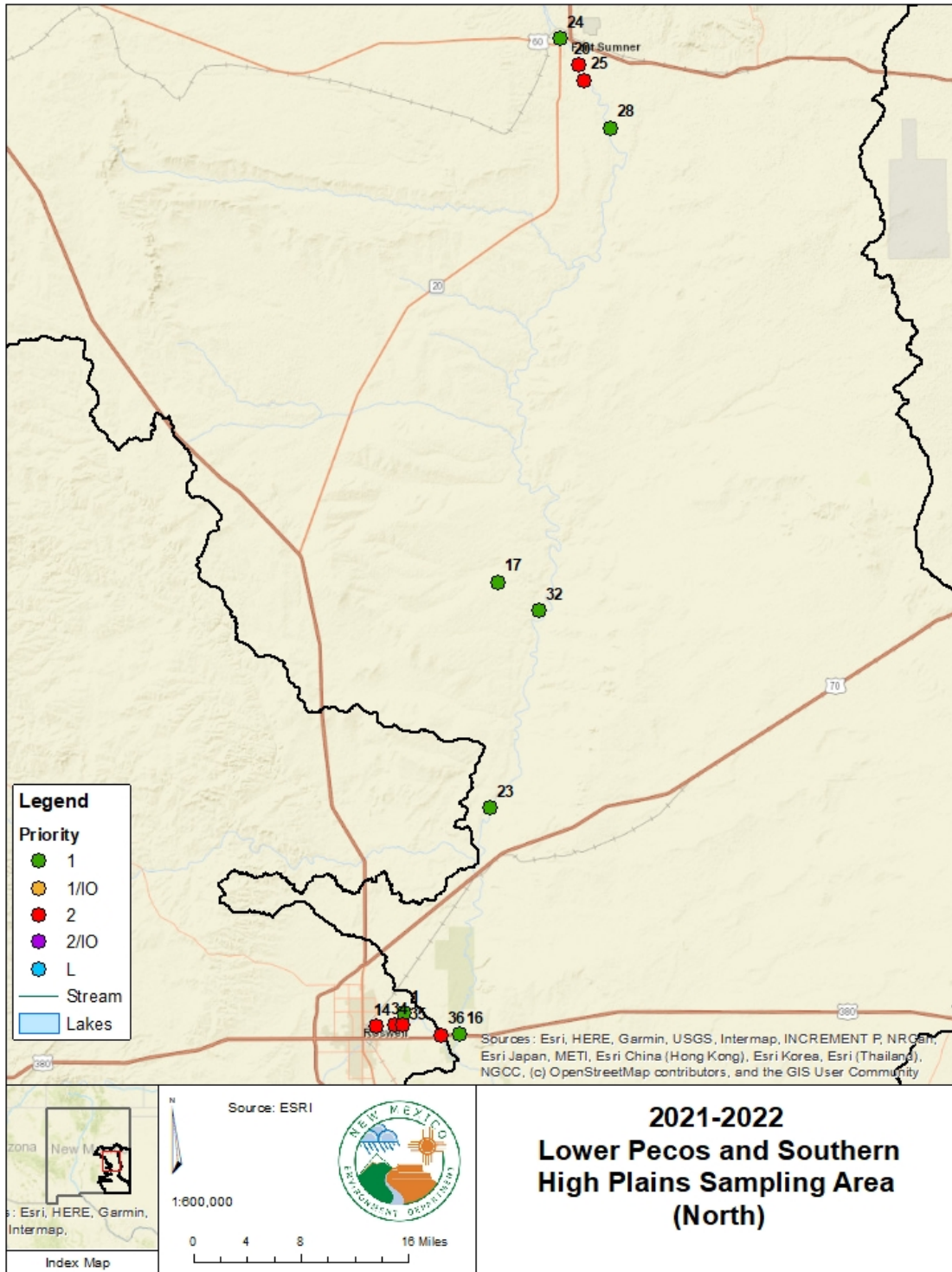
Map #	Station Name	Station ID	Assessment Unit	Rationale/Comments
1	Berrendo Creek at N Red Bridge Road - 57Berrendo001.7	57Berrendo001.7	Berrendo Creek (Rio Hondo to headwaters)	Bottom of AU
2	Black River above Blue Spring- 60BlackR027.6	60BlackR027.6	Black River (Perennial prt Blue Spring to Double Canyon)	Bottom of AU
3	Black River blw RR Xing - 60BlackR002.8	60BlackR002.8	Black River (Perennial prt Pecos River to Blue Spring)	Bottom of AU
4	Blue Springs @ Bounds Property - 60BlueSp000.1	60BlueSP000.1	Blue Spring (Black River to headwaters)	Bottom of AU
5	BRANTLEY RESERVOIR DEEP NEAR DAM - 60BrantleyDam	60BrantleyDam	Brantley Reservoir	Fish Consumption Advisory - DDE, DDT PCBs - Fish Consumption Advisory
6	BRANTLEY RESERVOIR SHALLOW - 60BrantleySha	60BrantleySha	Brantley Reservoir	Lake shallow station
7	DELAWARE RIVER AT HIGHWAY 285 BRIDGE - 62Delawa006.0	62Delawa006.0	Delaware River (Pecos River to TX border)	Bottom of AU
8	Figure Eight Lake (sink hole) - 56FigEightLkD	56FigEightLkD	Figure Eight Lake	Nutrient Impairment
9	Jal Lake - 99JalLakeDeep	99JalLake Deep	Jal Lake	Fish kill occurred in 2020 which also resulted in duck mortalities
10	Lake Carlsbad deep station (near railroad bridge) - 60LCarlsbdDpRR	60LCarlsbdDpRR	Lower Tansil Lake/Lake Carlsbad (Carlsbad Municipal Lake)	Fish Consumption Advisory - DDE, DDT PCBs - Fish Consumption Advisory
11	Lake Van - 56LakeVanDeep	56LakeVanDeep	Lake Van	Temperature impairment
12	LEA LAKE DEEP 1/3 LAKELENGTH FROM VIS. CENTER.	56LeaLakeDeep	Lea Lake	High recreation area
13	Lea Lake overflow abv NM409	56LeaLakeOve	Lea Lake	Lea lake outfall
14	North Spring River at Loveless Park - 57NSprin002.0	57NSprin002.0	North Spring River (Rio Hondo to headwaters)	Bottom of AU
15	Pecos R abv Lake Carlsbad 60PecosR099.8	60PecosR099.8	Pecos River (Lake Carlsbad to Avalon Reservoir)	Bottom of AU
16	PECOS R AT TATUM BR NR ROSWELL, NMEX - 56PecosR273.0	56PecosR273.0	Pecos River (Rio Hondo to Salt Creek)	Bottom of AU
17	Pecos R blw Cottonwood Creek 56PecosR177.0	56PecosR177.0	Pecos River (Eagle Creek to Rio Felix)	Above WWTP
18	Pecos River @ Wichita Rd. near Dexter - 56PecosR239.9	56PecosR239.9	Pecos River (Rio Felix to Rio Hondo)	AU impaired for temperature  Bottom of AU



Map #	Station Name	Station ID	Assessment Unit	Rationale/Comments
19	Pecos River above Black River - 60PecosR056.1	60PecosR056.1	Pecos River (Black River to Six Mile Dam)	AU impaired for <i>E. coli</i>   DDT and PCBs (fish consumption advisory)   Bottom of AU
20	Pecos River above Fort Sumner WWTP outfall - 52PecosR447.8	52PecosR447.8	Pecos River (Yeso Creek to Truchas Creek)	Above WWTP
21	Pecos River above Rio Penasco - 56PecosR160.2	56PecosR160.2	Pecos River (Rio Penasco to Eagle Creek)	Bottom of AU
22	Pecos River abv Brantley Reservoir near Lakewood - 60PecosR138.4	60PecosR138.4	Pecos River (Brantley Reservoir to Rio Penasco)	Bottom of AU   Lake Inlet
23	Pecos River at pipeline upstream of Salt Creek – 52PecosR311.7	52PecosR311.7	Pecos River (Salt Creek to Crockett Draw)	AU is listed as impaired for temperature   Bottom of AU
24	PECOS RIVER AT FORT SUMNER, U.S. 60 BRIDGE - 52PecosR453.4	52PecosR453.4	Pecos River (Truchas Creek to Sumner Reservoir)	Bottom of AU
25	PECOS RIVER AT GRAVEL PIT DOWNSTREAM FROM WWTF - 52PecosR445.5	52PecosR445.5	Pecos River (Yeso Creek to Truchas Creek)	Below WWTP
26	PECOS RIVER AT PIERCE CANYON CROSSING, NM - 60PecosR033.2	60PecosR033.2	Pecos River (TX border to Black River)	PSRS Request
27	PECOS RIVER AT U.S. 82 BRIDGE NEAR ARTESIA - 56PecosR169.0	56PecosR169.0	Pecos River (Rio Penasco to Eagle Creek)	AU impaired for temperature   Bottom of AU
28	Pecos River above Taiban Creek – 52PecosR434.0	52PecosR434.0	Pecos River (Yeso Creek to Truchas Creek)	Bottom of AU
29	PECOS RIVER BELOW BRANTLEY DAM AT THE USGS GAGE - 60PecosR123.1	60PecosR123.1	Pecos River (Black River to Six Mile Dam)	Below WWTP   Bottom of AU
30	Pecos River below Carlsbad WWTP near Otis - 60PecosR088.1	60PecosR088.1	Pecos River (Six Mile Dam to Lower Tansil Lake)	Below WWTP   Bottom of AU
31	PECOS RIVER BELOW LOWER TANSIL DAM - 60PecosR093.2	60PecosR093.2	Pecos River (Six Mile Dam to Lower Tansil Lake)	Lake Outlet. Above WWTP.
32	Pecos River below Six Mile Draw - 52PecosR343.0	52PecosR343.0	Pecos River (Crockett Draw to Yeso Creek)	Bottom of AU.
33	Pecos River near Red Bluff at County Road 725 - 60PecosR011.6	60PecosR011.6	Pecos River (TX border to Black River)	AU impaired for <i>E. coli</i> , dissolved oxygen, DDT and PCBs (fish consumption advisory)   Bottom of AU
34	Rio Hondo abv Roswell WWTP - 57RHondo011.5	57RHondo011.5	Rio Hondo (Perennial prt Pecos R to HWY 285)	Bottom of AU
35	Rio Hondo at Roswell blw effluent discharge at gage 08393610 - 57RHondo010.6	57RHondo010.6	Rio Hondo (Perennial prt Pecos R to HWY 285)	Below WWTP
36	Rio Hondo at US 380 Bridge - 57RHondo004.3	57RHondo004.3	Rio Hondo (Perennial prt Pecos R to HWY 285)	Above WWTP

Map #	Station Name	Station ID	Assessment Unit	Rationale/Comments
37	Sitting Bull Creek below recreation area - 60Sittin000.8	60Sittin000.8	Sitting Bull Creek (Last Chance Canyon to Sitting Bull Spr)	Bottom of AU

**Figure 2. Lower Pecos River and Southern High Plains Watersheds: Northern Sampling Area and Monitoring Locations**



**Figure 3. Lower Pecos River and Southern High Plains Watersheds: Southern Sampling Srea and Monitoring Locations**

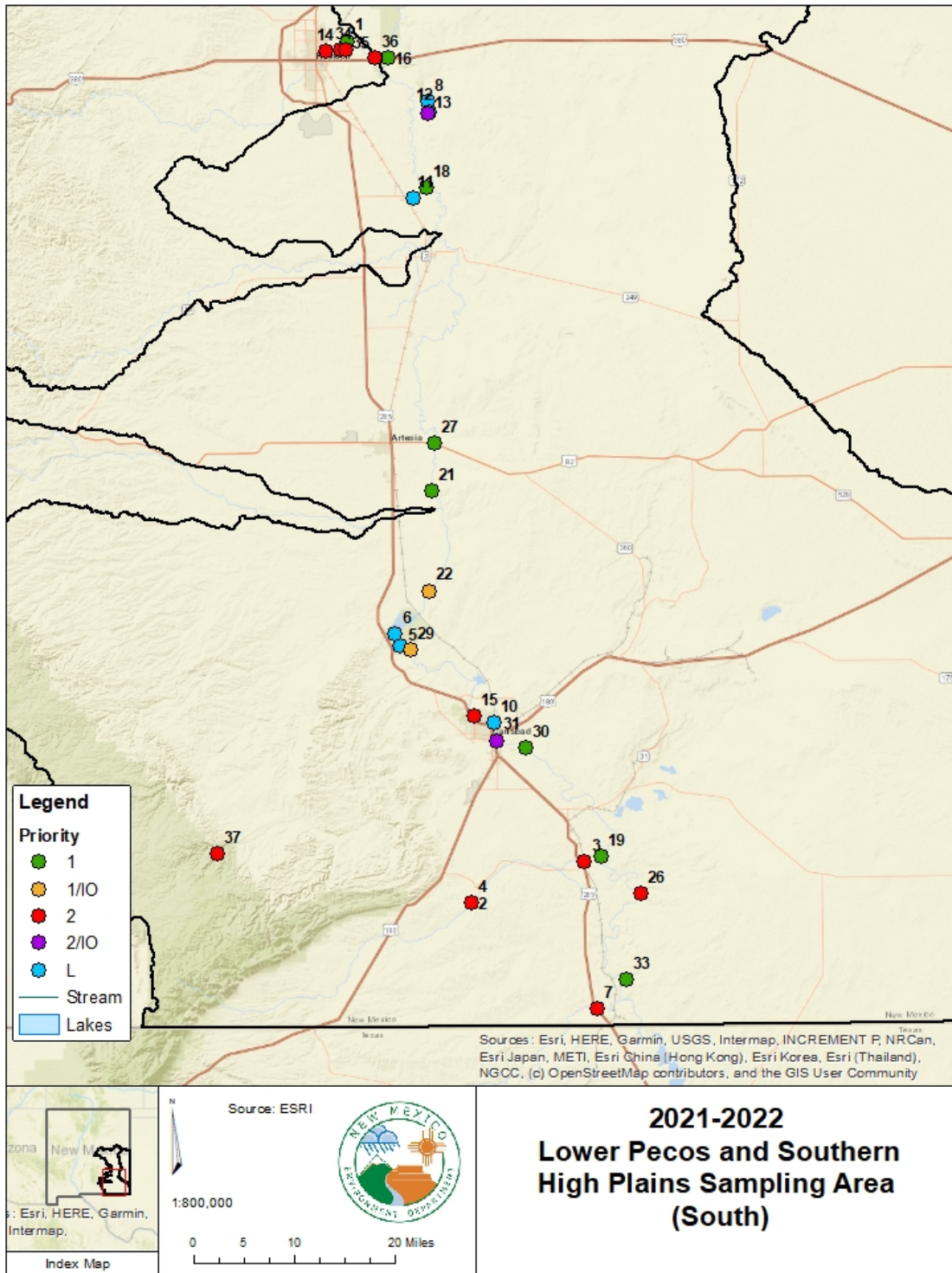
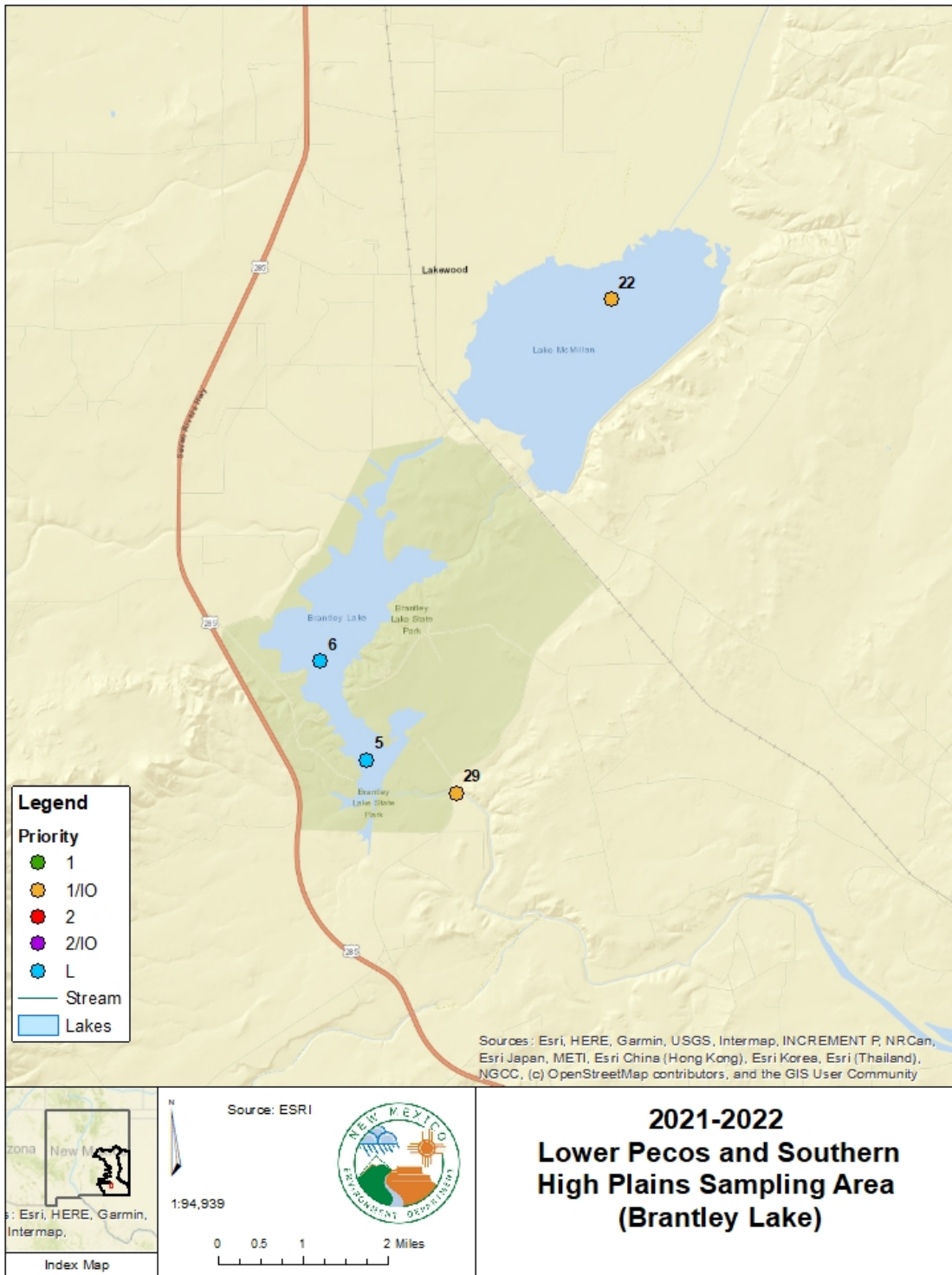




Figure 5. Lower Pecos River and Southern High Plains Watersheds: Brantley Lake



## 4.0 DOCUMENTATION

Project documents will include this field sampling plan, calibration records, field sheets (including chemistry, bio-habitat, and data logger deployment/retrieval sheets), 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 2018a).

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

- Lower Pecos River Survey 2021-2022

Project activities will be documented in SWQB Monitoring Field Sheets. Information from field sheets will be entered into the SWQB database and maintained in accordance with SWQB's 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 MASS Program Manager and the QAO 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 2021-2022 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 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. Lower Pecos Watershed Survey: Water Chemistry Sampling Frequency**

Map #	Station Name	Station ID	Assessment Unit	PRIORITY <sup>1</sup>	TDS/TSS/SO <sub>4</sub> -/Cl-	Nutrients <sup>2</sup>	Dissolved Organic Carbon (DOC)	Total Metals <sup>3</sup>	Dissolved Metals <sup>4</sup>	E. coli	Volatile Organics	Semi-Volatile Organics <sup>5</sup>	Radionuclides <sup>6</sup>
1	Berrendo Creek at N Red Bridge Road - 57Berrendo001.7	57Berrendo001.7	Berrendo Creek (Rio Hondo to headwaters)	1	8	8	3	6	6	8			
2	Black River above Blue Spring- 60BlackR027.6	60BlackR027.6	Black River (Perennial prt Blue Spring to Double Canyon)	2	4	4	2	4	4	4			
3	Black River blw RR Xing - 60BlackR002.8	60BlackR002.8	Black River (Perennial prt Pecos River to Blue Spring)	2	6	6	2	4	4	6			
4	Blue Springs @ Bounds Property - 60BlueSp000.1	60BlueSP000.1	Blue Spring (Black River to headwaters)	2	6	6	2	4	4	6			
5	BRANTLEY RESERVOIR DEEP NEAR DAM - 60BrantleyDam	60BrantleyDam	Brantley Reservoir	L	4	4	1	2	2	4	2	2	2
6	BRANTLEY RESERVOIR SHALLOW - 60BrantleySha	60BrantleySha	Brantley Reservoir	L	4	4	1	2	2	4			
7	DELAWARE RIVER AT HIGHWAY 285 BRIDGE - 62Delawa006.0 <sup>8</sup>	62Delawa006.0	Delaware River (Pecos River to TX border)	2	6	6	2	4	4	6 <sup>8</sup>			
8	Figure Eight Lake (sink hole) - 56FigEightLkD	56FigEightLkD	Figure Eight Lake	L	4	4	1	2	2	4	2	2	2
9	Jal Lake - 99JalLakeDeep	99JalLake Deep	Jal Lake	L	4	4	1	2	2	4	2	2	2
10	Lake Carlsbad deep station (near railroad bridge) - 60LCarlsbdDpRR	60LCarlsbdDpRR	Lower Tansil Lake/Lake Carlsbad (Carlsbad Municipal Lake)	L	4	4	1	2	2	4	2	2	2
11	Lake Van - 56LakeVanDeep	56LakeVanDeep	Lake Van	L	4	4	1	2	2	4	2	2	2
12	LEA LAKE DEEP 1/3 LAKELENGTH FROM VIS. CENTER.	56LeaLakeDeep	Lea Lake	L	4	4	1	2	2	4	2	2	2
13	Lea Lake overflow abv NM409	56LeaLakeOve	Lea Lake	2/10	4	4	1	4	4	4			
14	North Spring River at Loveless Park - 57NSprin002.0	57NSprin002.0	North Spring River (Rio Hondo to headwaters)	2	6	6	2	4	4	6			
15	Pecos R abv Lake Carlsbad 60PecosR099.8	60PecosR099.8	Pecos River (Lake Carlsbad to Avalon Reservoir)	2	4	4	2	4	4	4	2	2	4



Map #	Station Name	Station ID	Assessment Unit	PRIORITY <sup>1</sup>	TDS/TSS/SO <sub>4</sub> <sup>-</sup> /Cl <sup>-</sup>	Nutrients <sup>2</sup>	Dissolved Organic Carbon (DOC)	Total Metals <sup>3</sup>	Dissolved Metals <sup>4</sup>	E. coli	Volatile Organics	Semi-Volatile Organics <sup>5</sup>	Radionuclides <sup>6</sup>
16	PECOS R AT TATUM BR NR ROSWELL, NMEX - 56PecosR273.0	56PecosR273.0	Pecos River (Rio Hondo to Salt Creek)	1	8	8	3	6	6	8			
17	Pecos R blw Cottonwood Creek 56PecosR177.0	56PecosR177.0	Pecos River (Eagle Creek to Rio Felix)	1	8	8	3	6	6	8	2	2	4
18	Pecos River @ Wichita Rd. near Dexter - 56PecosR239.9 <sup>8</sup>	56PecosR239.9	Pecos River (Rio Felix to Rio Hondo)	1	8	8	3	6	6	8 <sup>8</sup>			
19	Pecos River above Black River - 60PecosR056.1	60PecosR056.1	Pecos River (Black River to Six Mile Dam)	1	8	8	3	6	6	8	4	4	4
20	Pecos River above Fort Sumner WWTP outfall - 52PecosR447.8	52PecosR447.8	Pecos River (Yeso Creek to Truchas Creek)	2	4	4	2	4	4	4	2	2	2
21	Pecos River above Rio Penasco - 56PecosR160.2	56PecosR160.2	Pecos River (Rio Penasco to Eagle Creek)	1	8	8	3	6	6	8	4	4	4
22	Pecos River abv Brantley Reservoir near Lakewood - 60PecosR138.4	60PecosR138.4	Pecos River (Brantley Reservoir to Rio Penasco)	1/IO	8	8	3	6	6	8	4	4	4
23	Pecos River at pipeline upstream of Salt Creek – 52PecosR311.7	52PecosR311.7	Pecos River (Salt Creek to Crockett Draw)	1	8	8	3	6	6	8			
24	PECOS RIVER AT FORT SUMNER, U.S. 60 BRIDGE - 52PecosR453.4 <sup>7,8</sup>	52PecosR453.4	Pecos River (Truchas Creek to Sumner Reservoir)	1	8	8	3	6	6	8 <sup>7,8</sup>			
25	PECOS RIVER AT GRAVEL PIT DOWNSTREAM FROM WWTF - 52PecosR445.5	52PecosR445.5	Pecos River (Yeso Creek to Truchas Creek)	2	4	4	2	4	4	4	2	2	2
26	PECOS RIVER AT PIERCE CANYON CROSSING, NM - 60PecosR033.2	60PecosR033.2	Pecos River (TX border to Black River)	2	4	4	2	4	4	4	2	2	2
27	PECOS RIVER AT U.S. 82 BRIDGE NEAR ARTESIA - 56PecosR169.0	56PecosR169.0	Pecos River (Eagle Creek to Rio Felix)	1	8	8	3	6	6	8	2	2	2
28	Pecos River above Taiban Creek – 52PecosR434.0	52PecosR434.0	Pecos River (Yeso Creek to Truchas Creek)	1	8	8	3	6	6	8			
29	PECOS RIVER BELOW BRANTLEY DAM AT THE USGS GAGE - 60PecosR123.1	60PecosR123.1	Pecos River (Avalon Reservoir to Brantley Reservoir)	1/IO	8	8	3	6	6	8	4	4	4
30	Pecos River below Carlsbad WWTP near Otis - 60PecosR088.1	60PecosR088.1	Pecos River (Six Mile Dam to Lower Tansil Lake)	1	8	8	3	6	6	8	4	4	4
31	PECOS RIVER BELOW LOWER TANSIL DAM - 60PecosR093.2	60PecosR093.2	Pecos River (Six Mile Dam to Lower Tansil Lake)	2/IO	4	4	2	4	4	4	2	2	2
32	Pecos River below Six Mile Draw - 52PecosR343.0	52PecosR343.0	Pecos River (Crockett Draw to Yeso Creek)	1	8	8	3	6	6	8			
33	Pecos River near Red Bluff at County Road 725 - 60PecosR011.6	60PecosR011.6	Pecos River (TX border to Black River)	1	8	8	3	6	6	8	4	4	4

Map #	Station Name	Station ID	Assessment Unit	PRIORITY <sup>1</sup>	TDS/TSS/SO <sub>4</sub> <sup>-</sup> /Cl <sup>-</sup>	Nutrients <sup>2</sup>	Dissolved Organic Carbon (DOC)	Total Metals <sup>3</sup>	Dissolved Metals <sup>4</sup>	E. coli	Volatile Organics	Semi-Volatile Organics <sup>5</sup>	Radionuclides <sup>6</sup>	
34	Rio Hondo abv Roswell WWTP - 57RHondo011.5	57RHondo011.5	Rio Hondo (Perennial prt Pecos R to HWY 285)	2	4	4	2	4	4	4	2	2	2	
35	Rio Hondo at Roswell blw effluent discharge at gage 08393610 - 57RHondo010.6	57RHondo010.6	Rio Hondo (Perennial prt Pecos R to HWY 285)	2	4	4	2	4	4	4	2	2	2	
36	Rio Hondo at US 380 Bridge - 57RHondo004.3	57RHondo004.3	Rio Hondo (Perennial prt Pecos R to HWY 285)	2	4	4	2	4	4	4				
37	Sitting Bull Creek below recreation area - 60Sittin000.8	60Sittin000.8	Sitting Bull Creek (Last Chance Canyon to Sitting Bull Spr)	2	4	4	2	4	4	4				
Quality Control				Blanks collected per QAPP				22	22	9	17	22	6	
Total Number of Samples				238	238	81	164	181	238	60	54	58		

<sup>1</sup>Priority rankings: 1 are highest priorities, and 2 the lowest. "L" are lake stations; "IO" are lake inlets or outlets.

<sup>2</sup>Suite includes total Kjeldahl nitrogen, nitrate+nitrite, ammonia and total phosphorus. QC blanks are collected with the "Nutrients (low P)" suite.

<sup>3</sup> Suite includes aluminum, mercury, selenium

<sup>4</sup>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.

<sup>5</sup>A complete list of analytes are listed in Appendix B.

<sup>6</sup>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.

<sup>7</sup>Diluted E. coli samples will be taken due to secondary contact standard.

<sup>8</sup>Microbial source location to determine fecal pollution sources 2x for survey period.

## 5.2 PHYSICAL HABITAT, BIOLOGICAL SAMPLING, AND DATALOGGER DEPLOYMENT

Measuring biological response indicators (fish, macroinvertebrate, 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 is conducted in accordance with 11.2 Benthic Macroinvertebrates. Biological sampling is 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 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 results of the 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** summarize 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 analyte columns describe the number of analyte samples planned for each station during the 2021-2022 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 2021 CALM (NMED/SWQB 2021a). 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. Lower Pecos Watershed: Biological and Habitat Sampling**

Map #	Station Name	Station ID	Assessment Unit	Priority <sup>1</sup>	Sonde/DO/Cond <sup>2</sup>	Thermograph	Flow <sup>6</sup>	Physical Habitat	Chlorophyll a <sup>3</sup>	Phytoplankton	Microcystin <sup>4</sup>	Fish <sup>5</sup>
1	Berrendo Creek at N Red Bridge Road - 57Berrendo001.7	57Berrendo001.7	Berrendo Creek (Rio Hondo to headwaters)	1	D		6					
2	Black River above Blue Spring- 60BlackR027.6	60BlackR027.6	Black River (Perennial prt Blue Spring to Double Canyon)	2			4					
3	Black River blw RR Xing - 60BlackR002.8	60BlackR002.8	Black River (Perennial prt Pecos River to Blue Spring)	2	D		6					
4	Blue Springs @ Bounds Property - 60BlueSp000.1	60BlueSp000.1	Blue Spring (Black River to headwaters)	2	D		6					
5	BRANTLEY RESERVOIR DEEP NEAR DAM - 60BrantleyDam	60BrantleyDam	Brantley Reservoir	L					4	4	2	
6	BRANTLEY RESERVOIR SHALLOW - 60BrantleySha	60BrantleySha	Brantley Reservoir	L					4	4	2	
7	DELAWARE RIVER AT HIGHWAY 285 BRIDGE - 62Delawa006.0	62Delawa006.0	Delaware River (Pecos River to TX border)	2	D		6					

Map #	Station Name	Station ID	Assessment Unit	Priority <sup>1</sup>	Sonde/DO/Cond <sup>2</sup>	Thermograph	Flow <sup>6</sup>	Physical Habitat	Chlorophyll a <sup>3</sup>	Phytoplankton	Microcystin <sup>4</sup>	Fish <sup>5</sup>
8	Figure Eight Lake (sink hole) - 56FigEightLkD	56FigEightLkD	Figure Eight Lake	L					4	4	2	
9	Jal Lake - 99JalLakeDeep	99JalLake Deep	Jal Lake	L					4	4	2	
10	Lake Carlsbad deep station (near railroad bridge) - 60LCarlsbdDpRR	60LCarlsbdDpRR	Lower Tansil Lake/Lake Carlsbad (Carlsbad Municipal Lake)	L					4	4	2	1
11	Lake Van - 56LakeVanDeep	56LakeVanDeep	Lake Van	L					4	4	2	
12	LEA LAKE DEEP 1/3 LAKELENGTH FROM VIS. CENTER.	56LeaLakeDeep	Lea Lake	L					4	4	2	
13	Lea Lake overflow abv NM409	56LeaLakeOve	Lea Lake	2/IO			4					
14	North Spring River at Loveless Park - 57NSprin002.0	57NSprin002.0	North Spring River (Rio Hondo to headwaters)	2			6					
15	Pecos R abv Lake Carlsbad 60PecosR099.8	60PecosR099.8	Pecos River (Lake Carlsbad to Avalon Reservoir)	2			4					
16	PECOS R AT TATUM BR NR ROSWELL, NMEX - 56PecosR273.0	56PecosR273.0	Pecos River (Rio Hondo to Salt Creek)	1			8					
17	Pecos R blw Cottonwood Creek 56PecosR177.0	56PecosR177.0	Pecos River (Eagle Creek to Rio Felix)	1			8	1				
18	Pecos River @ Wichita Rd. near Dexter - 56PecosR239.9	56PecosR239.9	Pecos River (Rio Felix to Rio Hondo)	1		1	8	1				
19	Pecos River above Black River - 60PecosR056.1	60PecosR056.1	Pecos River (Black River to Six Mile Dam)	1			8					
20	Pecos River above Fort Sumner WWTP outfall - 52PecosR447.8	52PecosR447.8	Pecos River (Yeso Creek to Truchas Creek)	2			4					
21	Pecos River above Rio Penasco - 56PecosR160.2	56PecosR160.2	Pecos River (Rio Penasco to Eagle Creek)	1			8					
22	Pecos River abv Brantley Reservoir near Lakewood - 60PecosR138.4	60PecosR138.4	Pecos River (Brantley Reservoir to Rio Penasco)	1/IO			8					
23	Pecos River at pipeline upstream of Salt Creek - 52PecosR311.7	52PecosR311.7	Pecos River (Salt Creek to Crockett Draw)	1		1	8					
24	PECOS RIVER AT FORT SUMNER, U.S. 60 BRIDGE - 52PecosR453.4	52PecosR453.4	Pecos River (Truchas Creek to Sumner Reservoir)	1			8					

Map #	Station Name	Station ID	Assessment Unit	Priority <sup>1</sup>	Sonde/DO/Cond <sup>2</sup>	Thermograph	Flow <sup>6</sup>	Physical Habitat	Chlorophyll a <sup>3</sup>	Phytoplankton	Microcystin <sup>4</sup>	Fish <sup>5</sup>
25	PECOS RIVER AT GRAVEL PIT DOWNSTREAM FROM WWTF - 52PecosR445.5	52PecosR445.5	Pecos River (Yeso Creek to Truchas Creek)	2			4					
26	PECOS RIVER AT PIERCE CANYON CROSSING, NM - 60PecosR033.2	60PecosR033.2	Pecos River (TX border to Black River)	2			4					
27	Pecos River above Taiban Creek – 52PecosR434.0	52PecosR434.0	Pecos River (Yeso Creek to Truchas Creek)	1			8					
28	PECOS RIVER BELOW BRANTLEY DAM AT THE USGS GAGE - 60PecosR123.1	60PecosR123.1	Pecos River (Avalon Reservoir to Brantley Reservoir)	1/IO			8					
29	Pecos River below Carlsbad WWTP near Otis - 60PecosR088.1	60PecosR088.1	Pecos River (Six Mile Dam to Lower Tansil Lake)	1			8					
30	PECOS RIVER BELOW LOWER TANSIL DAM - 60PecosR093.2	60PecosR093.2	Pecos River (Six Mile Dam to Lower Tansil Lake)	2/IO			4					
31	Pecos River below Six Mile Draw - 52PecosR343.0	52PecosR343.0	Pecos River (Crockett Draw to Yeso Creek)	1			8					
32	PECOS RIVER NEAR LAKE ARTHUR, NM - 56PecosR194.6	56PecosR194.6	Pecos River (Eagle Creek to Rio Felix)	1		1	8					
33	Pecos River near Red Bluff at County Road 725 - 60PecosR011.6	60PecosR011.6	Pecos River (TX border to Black River)	1	D		8					
34	Rio Hondo abv Roswell WWTP - 57RHondo011.5	57RHondo011.5	Rio Hondo (Perennial prt Pecos R to HWY 285)	2			4					
35	Rio Hondo at Roswell blw effluent discharge at gage 08393610 - 57RHondo010.6	57RHondo010.6	Rio Hondo (Perennial prt Pecos R to HWY 285)	2			4					
36	Rio Hondo at US 380 Bridge - 57RHondo004.3	57RHondo004.3	Rio Hondo (Perennial prt Pecos R to HWY 285)	2	D		6					
37	Sitting Bull Creek below recreation area - 60Sittin000.8	60Sittin000.8	Sitting Bull Creek (Last Chance Canyon to Sitting Bull Spr)	2			4					
<b>Total Number of Samples</b>					6	3	192	2	29	29	15	1

<sup>1</sup>Priority rankings: 1 are the highest priorities, and 3 the lowest. "L" are lake stations; "IO" are lake inlets or outlets.

<sup>2</sup>Sondes are deployed at sites that indicate elevated turbidity or nutrient enrichment or have been previously listed for turbidity

or nutrients. Logger types =S (sonde), D (DO logger), or C (conductivity logger).

<sup>3</sup>Chlorophyll-a samples are collected at lake monitoring locations.

<sup>4</sup>If resources permit, up to 2 additional sites might be sampled in high recreation areas or areas of concern for microcystin.

<sup>5</sup>Fish sampling will be determined by interagency cooperation and the availability of shocking equipment.

<sup>6</sup>Flow, water quality, and temperature data will be used from USGS gages where possible.

## 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 **Tables 8**.

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

Water quality sampling trips will require two staff. Biological survey crew maximum requirements are three to four staff surveying one to three sites per day. Staff 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 Lower Pecos River Watershed Survey**

Analyte	Total # of Samples	Cost per Sample (WTU unless indicated in \$)	Total Expenditure (WTU unless indicated in \$)
TDS/TSS/SO <sup>4</sup> /Cl <sup>-</sup>	238	105	24,990
Nutrients (low P)	238	95	22,610
DOC	81	30	2,430
Total Metals	164	85	13,940
Dissolved Metals	181	140	25,340
<i>E. coli</i>	238	\$7.55	\$1,796.90
Microbial Source Tracking	6	\$350	\$2,100
Volatile Organics	60	150	9,000
Semi-Volatile Organics	54	235	12,690
Radionuclides	58	520	30,160
Chlorophyll a	29	\$32	\$928
Phytoplankton	29	\$128	\$3,712
Microcystin	15	150	2,250
<b>Totals</b>		<b>WTU</b>	<b>143,410</b>
		<b>Dollar</b>	<b>\$8,536.90</b>

**Table 9. Vehicle Costs for the Lower Pecos River Watershed Survey**

Month	Approximate Miles	Estimated MPG	Estimated Cost of Gasoline per Gallon	Total Fuel Costs/yr	Total Fuel Costs
March	700	17	\$3.00	\$123.53	\$247.06
April	700	17	\$3.00	\$123.53	\$247.06
May	700	17	\$3.00	\$123.53	\$247.06
June	700	17	\$3.00	\$123.53	\$247.06
July	700	17	\$3.00	\$123.53	\$247.06
August	700	17	\$3.00	\$123.53	\$247.06
September	700	17	\$3.00	\$123.53	\$247.06
October	700	17	\$3.00	\$123.53	\$247.06
<b>TOTAL</b>				<b>\$988.24</b>	<b>\$1,976.48</b>

**Table 10. Stream/Lake Survey Per Diem Costs for the Lower Pecos River Watershed Survey**

Expense	Water Chemistry Surveys	Biological and Habitat Surveys	Data Logger Deployments	Per diem rate	Total/yr	Total
Per Diem (number of days per year)	48	3	4	\$151	\$8,305	\$16,610

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

**Table 11. Total Cost Estimates for the Lower Pecos River Watershed Survey**

WTUs	Contract Labs \$	Supplies \$	Fuel \$	Per Diem \$	Staff Field Days
143,410	\$8,536.90	\$5,187.08	\$1,976.48	\$16,610	110

## 7.0 REPORTING

Following completion of the survey and verification and validation of all data collected during the project, a final survey report will be produced that summarizes the data collected during the survey and describes any deviations from the original or amended FSP. 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 CATEGORY

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 exceedences. AUs are listed in this subcategory when there are no exceedences in the limited data set. These are considered low priority for follow up monitoring.
  - 3B. Limited data (n = 1) available, exceedence. AUs are listed in this subcategory when there is an exceedence 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 – LIST OF ANALYTES

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

<b>Organics (semi-volatiles)</b>	<b>Organics (volatiles)</b>
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	

## APPENDIX C - FIELD SAMPLING PLAN REVISIONS 2022

### 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. Lower Pecos Watershed: Water Quality Stations

Map #	Station Name	Station ID	Assessment Unit	2022 Revision
5	Brantley Farm Well Outfall - 60PecosFarmWellFlowAug	60PecosFarmWellFlowAug	Brantley Reservoir	Dropped due to safety concerns and lack of PPE.
6	Brantley North Well Outfall - 60PecosNorthWellFlowAug	60PecosNorthWellFlowAug	Brantley Reservoir	Dropped due to safety concerns and lack of PPE.
9	Brantley Reservoir Shallow @ 7 Rivers - 60BrantleySha7Riv	60BrantleySha7Riv	Brantley Reservoir	Dropped due to safety concerns and lack of PPE.
10	Brantley South Well Outfall - 60PecosSouthWellFlowAug	60PecosSouthWellFlowAug	Brantley Reservoir	Dropped due to safety concerns and lack of PPE.
23	Pecos River at Bitter Lake NWR, North Unit - 52PecosR305.0	52PecosR305.0	Pecos River (Salt Creek to Crockett Draw)	Changed station from 52PecosR305.0 to 52Pecos311.7 due to access.
28	Pecos River at USGS gage blw Taiban Creek - 52PecosR430.0	52PecosR430.0	Pecos River (Yeso Creek to Truchas Creek)	Changed station from 52Pecos430.0 to 52PecosR434.0 due to access.
41	Seven Rivers Flow Augmentation - 60PecosFlowAug	60PecosFlowAug	Brantley Reservoir	Dropped due to safety concerns and lack of PPE.

### Revisions to Table 6. Lower Pecos Watershed Survey: Water Chemistry Sampling Frequency

Map #	Station Name	Station ID	Assessment Unit	2022 Revision
1	Berrendo Creek at N Red Bridge Road - 57Berrendo001.7	57Berrendo001.7	Berrendo Creek (Rio Hondo to headwaters)	Increased sampling frequency to ensure enough samples for nutrient assessment.
3	Black River blw RR Xing - 60BlackR002.8	60BlackR002.8	Black River (Perennial prt Pecos River to Blue Spring)	Increased sampling frequency to ensure enough samples for nutrient and E. coli assessment.
4	Blue Springs @ Bounds Property - 60BlueSp000.1	60BlueSP000.1	Blue Spring (Black River to headwaters)	Increased sampling frequency to ensure enough

Map #	Station Name	Station ID	Assessment Unit	2022 Revision
				samples for nutrient assessment.
7	DELAWARE RIVER AT HIGHWAY 285 BRIDGE - 62Delawa006.0	62Delawa006.0	Delaware River (Pecos River to TX border)	Increased sampling frequency to ensure enough samples for nutrient and E. coli assessment. Microbial source tracking added for 2022.
14	North Spring River at Loveless Park - 57NSprin002.0	57NSprin002.0	North Spring River (Rio Hondo to headwaters)	Increased sampling frequency to ensure enough samples for nutrient assessment.
15	Pecos R abv Lake Carlsbad 60PecosR099.8	60PecosR099.8	Pecos River (Lake Carlsbad to Avalon Reservoir)	Increased Radionuclides samples to 3x in 2022 for assessment.
17	Pecos R blw Cottonwood Creek 56PecosR177.0	56PecosR177.0	Pecos River (Eagle Creek to Rio Felix)	Increased Radionuclides samples to 3x in 2022 for assessment.
18	Pecos River @ Wichita Rd. near Dexter - 56PecosR239.9	56PecosR239.9	Pecos River (Rio Felix to Rio Hondo)	Microbial source tracking added for 2022.
19	Pecos River above Black River - 60PecosR056.1	60PecosR056.1	Pecos River (Black River to Six Mile Dam)	Increased Radionuclides samples to 3x in 2022 for assessment.
21	Pecos River above Rio Penasco - 56PecosR160.2	56PecosR160.2	Pecos River (Rio Penasco to Eagle Creek)	Increased Radionuclides samples to 3x in 2022 for assessment.
22	Pecos River abv Brantley Reservoir near Lakewood - 60PecosR138.4	60PecosR138.4	Pecos River (Brantley Reservoir to Rio Penasco)	Increased Radionuclides samples to 3x in 2022 for assessment.
24	PECOS RIVER AT FORT SUMNER, U.S. 60 BRIDGE - 52PecosR453.4	52PecosR453.4	Pecos River (Truchas Creek to Sumner Reservoir)	E. coli samples need to be diluted due to exceedance in 2021. Microbial source tracking added for 2022.
29	PECOS RIVER BELOW BRANTLEY DAM AT THE USGS GAGE - 60PecosR123.1	60PecosR123.1	Pecos River (Black River to Six Mile Dam)	Increased Radionuclides samples to 3x in 2022 for assessment.
30	Pecos River below Carlsbad WWTP near Otis - 60PecosR088.1	60PecosR088.1	Pecos River (Six Mile Dam to Lower Tansil Lake)	Increased Radionuclides samples to 3x in 2022 for assessment.
33	Pecos River near Red Bluff at County Road 725 - 60PecosR011.6	60PecosR011.6	Pecos River (TX border to Black River)	Increased Radionuclides samples to 3x in 2022 for assessment.
36	Rio Hondo at US 380 Bridge - 57RHondo004.3	57RHondo004.3	Rio Hondo (Perennial prt Pecos R to HWY 285)	Increased sampling frequency to ensure enough samples for nutrient assessment.

### Revisions to Table 7. Lower Pecos Watershed: Biological and Habitat Sampling

Map #	Station Name	Station ID	Assessment Unit	2022 Revision
1	Berrendo Creek at N Red Bridge Road - 57Berrendo001.7	57Berrendo001.7	Berrendo Creek (Rio Hondo to headwaters)	Added DO logger due to nutrient exceedance in 2021
3	Black River blw RR Xing - 60BlackR002.8	60BlackR002.8	Black River (Perennial prt Pecos River to Blue Spring)	Added DO logger due to nutrient exceedance in 2021
4	Blue Springs @ Bounds Property - 60BlueSp000.1	60BlueSP000.1	Blue Spring (Black River to headwaters)	Added DO logger due to nutrient exceedance in 2021
7	DELAWARE RIVER AT HIGHWAY 285 BRIDGE - 62Delawa006.0	62Delawa006.0	Delaware River (Pecos River to TX border)	Added DO logger due to nutrient exceedance in 2021

### Revisions to Table 8. Biological and Chemical Cost Summary Survey Lower Pecos River Watershed 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 Lower Pecos River Watershed Survey

Updated cost of daily per diem due to increased per diem rates.

### Revisions to Table 11. Total Cost Estimates for the Lower Pecos River Watershed Survey

Updated WTUs based on updated chemical sampling reflected in Table 6.