Quality Assurance Project Plan

Water Quality Monitoring to Determine Pollutant Loading Sources
On-The-Ground Improvement Projects
Upper Gallinas River and Porvenir Creek Phase IV Clean
Water Act Section 319 Contract No.
667-393-2B/NMED SUB-GRANT: 667-22319SQ-1D

GROUP A. PROJECT MANAGEMENT

A.1 Title and Approval Sheet

Quality Assurance Project Plan

Water Quality Monitoring to Determine Pollutant Loading Sources
On-The-Ground Improvement Projects for
the Upper Gallinas River and Porvenir Creek Phase IV

Submitted by:
New Mexico Environment Department
Surface Water Quality Bureau

APPROVAL SIGNATURES

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ACRONYMS

AU	Assessment Unit
BAER	Burned Area Emergency Response
CFS	Cubic Feet per Second
DQO	Data Quality Objective
DQI	Data Quality Indicators
EPA	United States Environmental Protection Agency
HPWA	Hermit's Peak Watershed Alliance
HPCC	Hermit's Peak - Calf Canyon Fire
IR	Integrated Report
NMED	New Mexico Environment Department
QAPP	Quality Assurance Project Plan
QA	Quality Assurance
QAO	Quality Assurance Officer
QC	Quality Control
MRMs	Management and Restoration Measures
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
USFS	United States Forest Service
WBP	Watershed Based Plan
WQPD	Water Quality Protection Division

A3. Distribution List

Table 1 below contains the distribution list, and project roles and responsibilities for this project. The Quality Assurance Officer (QAO) will ensure that copies of this Quality Assurance Project Plan (QAPP) and any subsequent revisions are distributed to individuals who have signature authority to approve this QAPP. The Surface Water Quality Bureau (SWQB) Project Officer will ensure that copies of the approved QAPP and any subsequent revisions are distributed to the Project Manager. The Project Manager will ensure the approved QAPP and any subsequent revisions are distributed to all other project personnel listed in Table 1. All members of the distribution list who do not have signature authority to approve this QAPP will review the QAPP and sign the Acknowledgment Statement prior to initiating any work for this project. The signed Acknowledgement Statements (electronic or hard copy) will be collected by the SWQB Project Officer and will be given to the QAO for filing with the original approved QAPP.

Table 1. Distribution List and Project Roles and Responsibilities

Name	Organization	Title/Role	Responsibility	Contact Information
Abe Franklin	SWQB	WPS Program Manager	Reviewing and approving QAPP, managing project personnel and resources.	(505) 946-8952 abraham.franklin@env.nm.gov
Miguel Montoya	SWQB	QAO	Reviewing and approving QAPP, QA audits as needed to assure adherence to the approved QAPP.	(505) 819-9882 miguel.montoya@env.nm.gov
Susan Styer	SWQB	Project Officer/Field team/Trainer	Manage progress of project, preparing QAPP, project reporting, coordinating with contractors maintains project files, prepares final project report etc., data collection, training	(575) 819-9223 susan.styer@env.nm.gov
Lea Knutson	HPWA	Project Manager	Project Oversight, Verification and Validation of field data	(505) 617-1360 lknutson@hermitspeakwatersheds.org
Patrick Gutierrez	HPWA	Project Coordinator, Field team	Reporting to Project Manager. Field surveys data collection and record keeping. Oversee intern during data collection. Determine sediment load reductions.	(505) 429-8386 pgutierrez@hermitspeakwatersheds.org
Jacob Erickson	HPWA	Education/ Outreach Coordinator	Education and Outreach coordination	(505) 718 - 8403 jerickson@hermitspeakwatersheds.org
Denise Smith	HPWA	Contractor	Responsible for permits	dsmith@hermitspeakwatershed.org

Kyla Chandler	EPA	Project Officer Region 6	Reviewing and approving QAPP	(214) 665-2166 Chandler.Kyla@epa.gov
Nelly Smith	EPA	Chief Region	Reviewing and approving QAPP	(214) 665-7109 Smith.Nelly@epa.gov

A4. Project Organization

The SWQB Quality Management Plan (NMED/SWQB 2023 or most current version) documents the independence of the QAO from this project. The QAO is responsible for maintaining the official approved QAPP. A project organizational chart (Figure 1) displays hierarchy of the project.

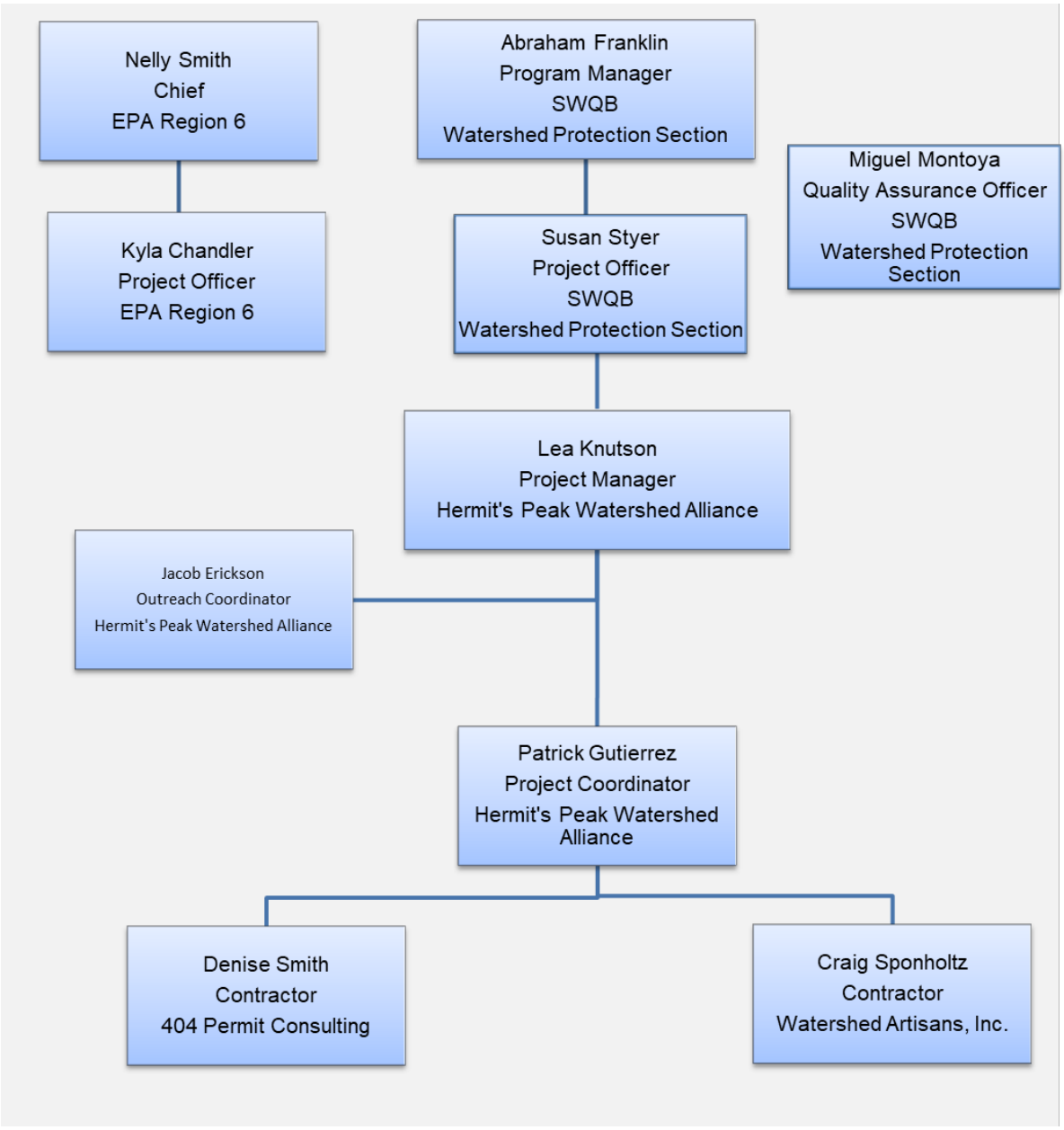


Figure 1. Organization Chart

A5. Problem Definition Background

The Upper Gallinas Watershed is a sub-watershed of the Pecos Watershed and is located in northeastern New Mexico. The watershed is 48,969 acres (76 mile^2) from its headwaters on Elk Mountain to the Las Vegas Diversion near Montezuma, NM, including Porvenir Canyon to the headwaters of Beaver Creek. This total stream length of 32.5 miles descends from 11,661 to 6,800 feet in elevation.

The Upper Gallinas Watershed is comprised of 92% forest, 6% rangeland, 2% barren and less than 1% agriculture and tundra. Land ownership is 52% U.S. Forest Service and 48% private and local government (SWQB, 2005). Private land is comprised of approximately 315 parcels that are an average of 61 acres in size. There are generally smaller land parcels near the river, especially in the Gallinas village, while the uplands tend to be comprised of larger ranches. Land use has transitioned over the last few decades from agriculture, focusing on timber, livestock, and hay production, to primarily full-time and part-time residential use and summer recreation. Currently, agriculture is limited to small, non-commercial production of livestock, hay (restricted to the valley bottom) and timber as well as personal subsistence farming.

The Upper Gallinas Watershed provides the community of Las Vegas with 90% of its water supply. The 13,166 people that live in the City of Las Vegas (U.S. Census Bureau, 2020) and some outlying areas including the Storrie Project, are heavily dependent on the Gallinas River that only produces an average flow of 14.196 CFS (average annual mean discharge for 2012-2021 from the U.S. Geological Survey Gallinas River near Montezuma Gage). City water storage capacity is also limited and impacted by recent fires, so maintaining consistent stream flows of high-quality water is of utmost concern.

The Hermits Peak fire started on April 6, 2022, from the Las Dispensas prescribed burn on the Pecos/Las Vegas Ranger District (PLVRD) of the Santa Fe National Forest (SNF). The Calf Canyon fire started on April 19, 2022, from a winter PLVRD pile burn project. The two fires merged on April 22 during high wind events. The fires were then managed as a single incident called the Hermits Peak-Calf Canyon (HPCC) Fire. HPCC fire burnt a total of 341,735 acres and 74% of the Upper Gallinas Watershed. Soil Burn Severity mapping showed 30% Low Severity, 25% Moderate Severity, and 19% High Severity in the Gallinas Watershed upstream of I-25 (USACE, 2022). Initial riparian area assessment indicate that riparian vegetation burned in some areas that previously had good canopy cover, so heat loading can be expected to increase as a result of the fire. The expected increase in sediment loading and other potential habitat degradation following the fire is now of greater concern.

The burn severity map is a primary input used by the United States Geological Survey in debris flow modeling. Methods and data are available at https://www.usgs.gov/programs/landslide-hazards/science/emergency-assessment debris-flow-hazards. The model estimates the probability of debris flow occurrence and the volume of debris (a slurry of water, ash, rock fragments, and sediment) with given amounts of rain. The USGS debris flow assessment report indicates a high-level of debris flow hazard for much of the area https://landslides.usgs.gov/hazards/postfire_debrisflow/detail.php?objectid=424. During the 2022 monsoon season a high number of floods occurred mobilizing tons of debris and greatly altering channel morphology throughout the watershed.

According to 20.6.4.215 NMAC Standards for Interstate and Intrastate Surface Waters, the Gallinas River

(Las Vegas Diversion to USFS boundary, NM-2212_00) has a designated use of high quality cold-water aquatic life. As referenced in the *2022-2024 State of New Mexico CWA §303(d)/§305(b) Integrated Report (IR)* Appendix A, the high quality coldwater aquatic life designated use is not supporting due to an exceedance of the temperature criterion. The IR identifies the temperature impairment as category 4A, which states impaired for one or more designated uses, but does not require development of a TMDL because a TMDL has already been completed. The temperature impairment was first listed in 1998 and according to the TMDL (2005), probable sources contributing to impairment included highway/road/bridge runoff, livestock, loss of riparian habitat, rangeland grazing, and streambank modifications/destabilization.

Furthermore, the *2022-2024 State of New Mexico CWA §303(d)/§305(b) IR* Appendix A lists a major tributary of the Gallinas River, El Porvenir Creek (also referred to as Porvenir Creek, Porvenir Canyon, and Beaver Creek), from Santa Fe National Forest boundary to Hollinger Canyon (NM-2212_05) as not supporting its high quality cold-water aquatic life use due to a temperature and dissolved oxygen criterion exceedances.

The temperature impairment in the upper Gallinas River is also supported by two NMED-SWQB reports, *Water Quality Assessment of the Gallinas River and Tecolote Creek* (Hopkins, 2004) and *Gallinas Watershed Thinning Monitoring* (SWQB, 2010). Both studies, based on continuous temperature monitoring data, conclude that the upper Gallinas has a consistent increase in temperature due to stream width and lack of canopy.

The *Updated Watershed Based Plan for the Upper Gallinas River* (UWBPGR) (HPWA, 2012) was developed to address this temperature impairment. That WBP confirms the temperature impairment where 9 out of 12 monitored sites exceeded temperature standards. Further explanations of impairment are included in the plan (see pages 10-15 of WBP for more detailed information). This impairment was reconfirmed during the On-the-Ground Improvement Projects for the Upper Gallinas River and Porvenir Creek Phase II which was completed on June 30, 2018 and Phase III completed on June 30, 2022.

The temperature listing occurred before the HPCC fire which greatly exacerbated the problems, severely impacting the watershed, removing shading, and increasing erosion. The USGS has installed the following stream gages in the Gallinas Watershed as well as a number of precipitation stations to monitor the effects of the fire and provide early flood warnings to downstream communities (available at https://waterdata.usgs.gov/monitoring-location/08380400/#parameterCode=00065&period=P7D):

Objective

Given the tremendous impact of the HPCC Fire, temperature impairment is taking a back seat to efforts to reduce flood damage and sediment loading, and to prevent or reduce additional impairment caused by the Hermits Peak and Calf Canyon Fire. Restoration activities will be carried out to promote more robust establishment of riparian vegetation to increase canopy cover and reduce heat loading in the long term. Activities will also focus on reestablishing floodplain connectivity to promote deposition of post-fire sediment and debris and stabilizing ephemeral tributary drainages to prevent downcutting and sequester sediment and debris in headwater areas. Implementation records will include length of stream treated, acres seeded, numbers of erosion control and flood mitigation structures built, number of landowners served, and volunteers engaged. All work in stream channels will be plotted on a map and the location of each structure installed will be listed on a spreadsheet. The purpose of this project is to

reduce stream temperature and increase canopy cover and reduce impairment caused by the Hermits Peak and Calf Canyon Fire. Data collected before and after treatment methods will attempt to quantify the response and effectiveness of these projects in the Upper Gallinas Watershed (USGS HUC 130600010801, 130600010802 and 130600010805) given the confounding factors of floods and debris flows resulting from the fire.

When changes affect the scope, implementation or assessment of the outcome, this QAPP will be revised to keep project information current. The SWQB Project Officer, with the assistance of the QAO, will determine the impact of any changes on the technical and quality objectives of the project. This QAPP will be reviewed annually by the Project Manager and the SWQB Project Officer to determine the need for revision.

A6. Project/Task Description

Description

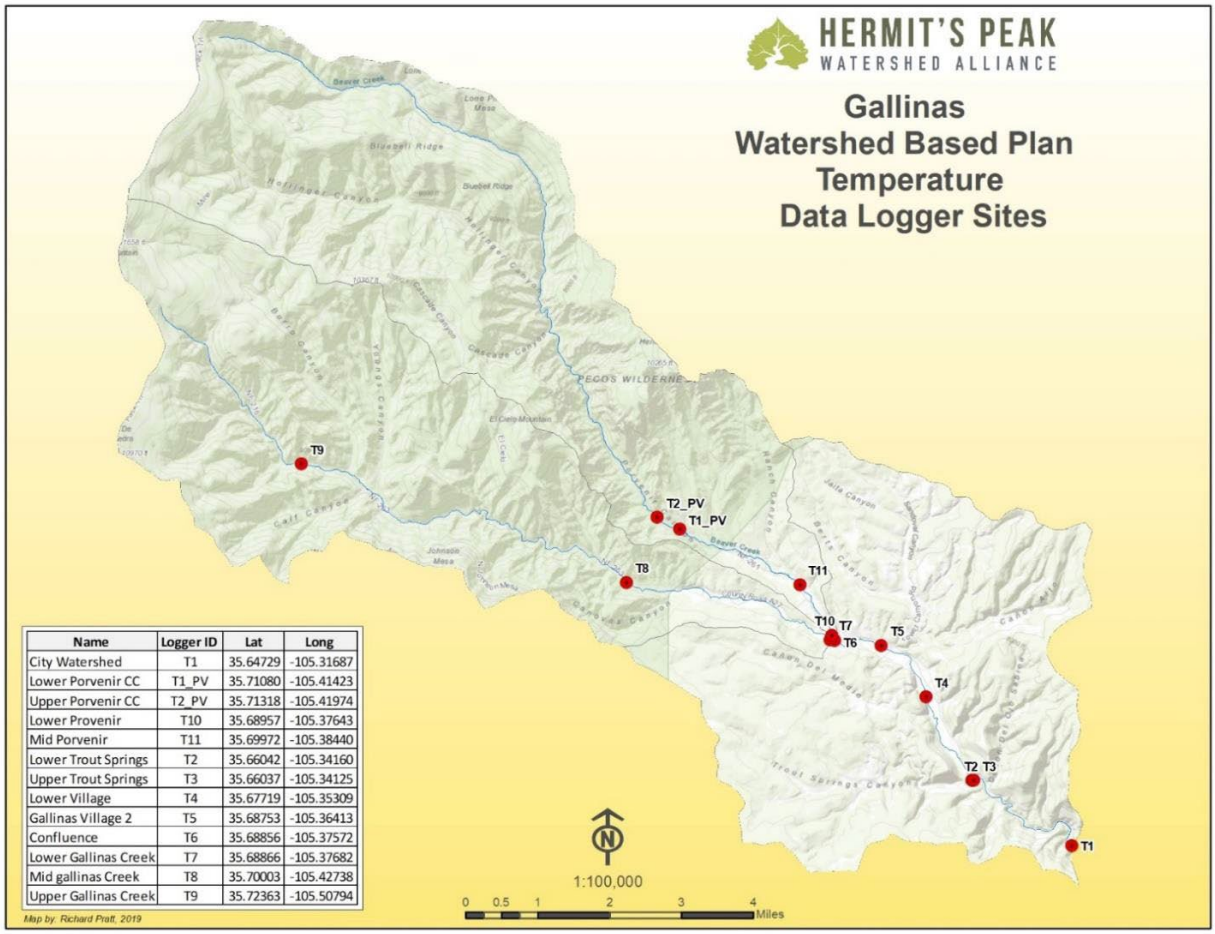
In summary the Project will monitor stream temperature and sonde parameters on the Upper Gallinas River and Porvenir Creek. Channel dimensions (cross-sections), pebble counts, and canopy cover data will also be collected at temperature monitoring stations that are representative of each AU one time in 2023 and 2024. Cross sections measurement will include flood-prone and bankfull widths where possible to allow calculation of the entrenchment ratio. Photographic documentation will also be conducted by HPWA to address 404 permitting and to document implementation of Management and Restoration Measures (MRMs) and possible changes in water quality.

Temperature monitoring sites will be chosen from those consistently monitored over the past 10 years (Figure 1) and based on potential for capturing changes to stream temperature due to instream restoration and on-the-ground implementation of MRMs while also considering access and potential loss of equipment due to flooding in the post fire environment. Thermographs will also be deployed in AU (NM-2212_00) on the Upper Gallinas to monitor changes in stream temperature. Long-term deployment location will include above and below the confluence of the Gallinas River and Porvenir Creek, and at the bottom of the temperature impaired AU (NM-2212_00) above Las Vegas Diversion. Deployment location on the Gallinas River will be at previously established monitoring sites developed during prior HPWA projects. If resources and time allow stream temperature data may also be collected at newly established monitoring sites and the top and bottom of temperature impaired AUs.

Instantaneous water quality measurements will be taken at 5 of the temperature data logger locations once per month from June to September with a multiparameter Sonde. Sonde measurements will include turbidity, temperature, pH, dissolved oxygen saturation, dissolved oxygen concentration, conductivity, specific conductance, and salinity. All water quality data will be collected at locations representative of ambient stream conditions, generally in the transition between a riffle/run and a pool, or at the toe of a pool, rather than in shallow riffles or deep pools.

Photographic documentation will be conducted for each project area. Photographs will be taken before and after MRM implementation. Photographic documentation data will be used to monitor change due to MRM implementation and meet the 404 Nationwide Permit (NWP) terms and conditions. Five photo points will be established for two large projects; one at the City of Las Vegas/Fire Station project and one at the Trout Springs project. For all other, ephemeral or intermittent channel projects, one photo monitoring point will be established and additional photos of the site will be taken.

Figure 1. Location and names of HPWA monitoring sites. Sites T2_PV, T11, and T4 will not monitored during Phase IV.



Name	Logger ID	Lat	Long
City Watershed	T1	35.64729	-105.31687
Lower Porvenir CC	T1_PV	35.71080	-105.41423
Upper Porvenir CC	T2_PV	35.71318	-105.41974
Lower Provenir	T10	35.68957	-105.37643
Mid Porvenir	T11	35.69972	-105.38440
Lower Trout Springs	T2	35.66042	-105.34160
Upper Trout Springs	T3	35.66037	-105.34125
Lower Village	T4	35.67719	-105.35309
Gallinas Village 2	T5	35.68753	-105.36413
Confluence	T6	35.68856	-105.37572
Lower Gallinas Creek	T7	35.68866	-105.37682
Mid gallinas Creek	T8	35.70003	-105.42738
Upper Gallinas Creek	T9	35.72363	-105.50794

The HPWA will work with private landowners to obtain permission for access to the lower end of the temperature impaired AU (NM-2212_01). MRM implementation locations will be determined as HPWA obtains permission from landowners to access private land along reaches of the Upper Gallinas and Porvenir Creek and select priority areas in the National Forest. Data collection activities at MRM locations on the Upper Gallinas and Porvenir Creek will be determined based on type of MRM and site characteristics and will occur pre- and post-implementation to be able to effectively monitor the effects of MRMs on stream water quality.

Pollutant Load Estimation Tool (PLET) will be used to calculate sediment loads from different land uses and sediment load reductions resulting from the implementation of MRMs (https://www.epa.gov/nps/plet). The Project Coordinator will be responsible for determining sediment load reductions with the assistance of the Project Manager, and NMED Project Officer as needed. Stream Segment Temperature (SSTEMP) Model (Bartholow 2002) may be used to examine changes in temperature loading. The data collected during the course of this project may also be used for future effectiveness monitoring and assessments of surface water by the SWQB.

Beaver surveys will be conducted by HPWA staff and interns using iBeaver crowd source app (https://defenders.org/blog/2021/05/ibeaver-crowd-sourcing-data-north-americas-busy-beaver). Defenders of Wildlife used Esri's Survey123 platform to create iBeaver, a data collection tool that can record the location of a user's observation and then prompt them to answer a series of survey-style questions to gather more information. This survey is relatively straightforward for the user, regardless of experience or skill level, with explanations and visuals to clarify what a user should be looking for. Over time, the information collected will fill in the knowledge gap of where beaver are, where there is and is not good beaver habitat and where there are beaver-human conflicts on the landscape that might need resolution.

Schedule of Data Collection Activities

Thermograph deployment will be conducted in 2023 and 2024. Thermographs will be deployed from June to September, to capture daily maximum stream temperatures. Thermograph data will be used as inputs into SSTEMP, to determine maximum water temperature, and to determine if MRM implementation projects have resulted in any quantitative change to stream temperature.

Instantaneous Sonde water quality measurements will be collected once per month during thermograph deployment and offload of data (from June through September).

Stream Flow data will be provided by the 5 USGS gages noted in Section A5 in addition to the Gallinas River at Montezuma, USGS Gage 08380500**.**

Photographic documentation will be conducted for each project area requiring a 404 permit at the time of project construction and completion and follow up photos will be taken annually to meet the 404 Nationwide Permit (NWP) terms and conditions.

Table 2. Products and Timeline

Task	Timelines	Product
Project Management and Administration	Spring 2023 to Fall 2023	Landowner and USFS agreements
Complete QAPP	May 2023	Complete Quality Assurance Project Plan ensuring measures are in place to collect quality data.
Deploy Thermographs Retrieve Thermographs	May-June 2023 and 2024 September 2023 and 2024	Thermographs will be deployed to capture daily maximum temperatures.
Sonde	June, July, August, September 2023, 2024	Instantaneous Sonde readings will measure turbidity, temperature, pH, dissolved oxygen, and conductivity conditions.

Photographic documentation recorded.	Pre and post implementation of instream restoration project and MRM implementation sites.	Photographic documentation at stream restoration and MRM implementation sites.
Channel dimensions (cross-sections), pebble counts, and canopy monitoring	June-Sept 2023 and 2024	Cross-sections, pebble counts, and canopy cover data from a temperature monitoring station that are representative of each AU
Survey post-fire beaver populations	May-Sept 2023 and 2024	Data on where there are beavers and good beaver habitat
Final Report	June 2025	Complete Final report

Table 3. Waterbody Attributes for the Gallinas River and El Porvenir Creek Monitoring Project

Waterbody	Assessment Unit ID	12-Digit HUC	12-Digit HUC Name
Gallinas River	NM-2212_00	130600010805	Diversion to USFS Boundary
El Porvenir Creek	NM-2212_01	130300010801	Gallinas River to SFNF Boundary
Gallinas River	NM-2212_02	130600010802	USFS Boundary to Headwaters
Beaver Creek	NM-2212_04	130600010801	El Porvenir Creek to Headwaters
El Porvernir Creek	NM-2212_05	130600010801	SFNF Boundary to Hollinger Canyon

A7. Quality Objectives and Criteria for Measurement Data

Question/Decision

The Upper Gallinas and Porvenir Creek Monitoring Project is intended to answer the following question: What are the stream load reductions as a result of implementing restoration projects and MRM implementation. This question will be answered using PLET and if resources and time allow HPWA may also consider the use of SSTEMP.

Data Quality Objective

Data will be collected according to Standard Operating Procedures and equipment manufacture specifications (See section B2) in order to provide a high level of confidence in determining the effects of

restoration on the Upper Gallinas River and Porvenir Creek.

Measurement Quality Objectives
The measurement quality objectives will be sufficient to achieve the DQO and will be in conformance with those listed in the SWQB QAPP for *Water Quality Management Programs* (NMED/SWQB 2021). The Data Quality Indicators listed in the SWQB's QAPP applicable to the data collected for this project are precision, accuracy, bias, representativeness, comparability, and completeness.

DQI	Determination Methodologies
Precision	will be ensured by using the standardized procedures identified in this QAPP. Having two trained field team members present during data collection for stream morphology surveys.
Accuracy	the basis for determining accuracy will be staff's expertise of the monitoring methods for collecting data and ensuring the accuracy of the equipment being used is within the required range for a particular survey.
Bias	is to reduce the systematic or persistent distortion of any measurement process. Bias will be minimized by using professional and experienced staff to collect and analyze data.
Representative	monitoring locations were chosen based on proximity to and potential impact from the restoration activities or MRM with emphasis on capturing both the upstream and downstream conditions for each restoration activity.
Comparability	monitoring locations will be monumented for repeat sampling events to compare pre- and post-treatment data. Methods listed under this QAPP for data collection are standardized and reproducible with the intent to be comparable to other studies.
Completeness	surveys and monitoring methodologies will be completed in their entirety as identified in this QAPP.

A8. Special Training/Certification

This project will be primarily implemented by HPWA personnel with oversight from the SWQB Project Officer. HPWA staff are familiar with SWQB SOPs, have been trained by SWQB staff in the past and have conducted numerous CWA 319 projects. HPWA staff have also attended Natural Channel Design training for Geomorphic Processes of Natural Stream Channels in the Arid Southwest. The Project Coordinator will compete the PLET online training materials before conducting any modeling using PLET or SSTEMP. No further specialized training is required for HPWA staff working under this project. Training of field assistants, student interns and cooperating personnel will be conducted in the field with hands-on training and will be led by qualified HPWA staff. Field assistants, student interns and cooperating

personnel will be accompanied by HPWA staff when collecting samples or field measurement until such time the Project Manager determines that the individual can carry out data collection activities in accordance with the procedures identified in SOPs referenced in this QAPP. The Project Manager will be responsible for field assistants, student interns, and cooperating personnel collecting data and will require any individual collecting data under this QAPP that are not supervised to sign the QAPP acknowledgment statement.

A9. Documents and Records

The Project Manager will make copies of this QAPP and any subsequent revisions available to all individuals on the distribution list.

All personnel involved with data collection will use a bound field notebook to collect notes in the field. Field personnel will submit copies of field notes and forms to the Project Coordinator at the end of each field day.

All final reports generated by the Project Coordinator will be provided to the NMED SWQB and a hard copy will be placed in the project file. The project documents include this QAPP, field notebooks, habitat field forms, calibration records, validation and verification records and project interim and final reports. Documents held by the SWQB Project Officer will be maintained in accordance with the requirements of the SWQB's QAPP and saved on the SWQB network.

GROUP B: DATA GENERATION AND ACQUISITION

B1. Sampling Process Design

Given the tremendous impact of the HPCC Fire, temperature impairment is taking a back seat to efforts to prevent or reduce additional impairment caused by the HPCC Fire and post fire flooding. Restoration activities will be carried out to promote establishment of riparian vegetation, reestablish floodplain connectivity to promote deposition of post-fire sediment and debris, and to stabilize ephemeral tributary drainages to prevent downcutting and sequester sediment and ash in headwater areas. Projects are planned within the impaired reaches of the Gallinas River and Porvenir Creek and surrounding areas. Stream temperature and Sonde data will be collected throughout the watershed to monitor cumulative conditions as a result of project implementation. Monitoring sites located on private property will be used upon acquiring permission from landowners. Monitoring will be conducted at locations representative of ambient stream conditions, generally in the transition between a riffle/run and a pool, or at the toe of a pool, rather than in shallow riffles or deep pools.

Field team will deploy thermographs at select established thermograph monitoring sites as stated in the Project/Task Description section (A6) of this QAPP. Stream temperature will be collected with HOBO TidbiT MX Temperature 400' Data Loggers (accuracy +/-0.2 °C, resolution 0.02 °C). Data from the data loggers will be downloaded via shuttle approximately every 30 days following deployment to minimize the chance of data losses associated with stochastic events (flooding). Thermographs will collect stream temperature at 1-hour intervals.

Instantaneous Sonde water quality measurements will also be taken at 5 of the temperature data logger locations once per month from June to September with an In-Situ Aqua Troll 600 Multi-Parameter

Sonde. Measurements will include turbidity, temperature, pH, dissolved oxygen saturation, dissolved oxygen concentration, conductivity, specific conductance, and salinity.

Channel dimensions (cross-sections), pebble counts, and canopy cover data will also be collected at temperature monitoring stations that are representative of each AU at least one time in 2023 and 2024. The station(s) (at least one) most representative of each AU will be chosen in the field and the same station(s) monitored in 2023 and 2024. Cross sections measurement will include flood-prone and bankfull widths where possible to allow calculation of the entrenchment ratio.

Photographic documentation will be conducted. Five photo points will be established for two large projects; one at the City of Las Vegas/Fire Station project and one at the Trout Springs project. For all other, ephemeral or intermittent channel projects, one photo point will be established and additional photos of the site will be taken. All photo points will be documented using GPS.

B2. Sampling Methods

This Project intends to use thermograph data loggers. Thermograph data loggers will be deployed in accordance with SWQB SOP 6.3, *Temperature Data Loggers* (NMED/SWQB 2019 or most current version). HOBO TidbiT MX Temperature 400' Data Loggers (or HOBO Water Temp Pro v2 thermographs or equivalent) will be used to collect stream temperature data. The project will also utilize thermograph deployment/retrieval form found at https://www.env.nm.gov/surface-water-quality/sop/ under SWQB SOP 6.3, Temperature Data Loggers.

Water quality parameters will be measured with an In-Situ Aqua Troll 600 Multi-Parameter Water Quality Sonde. It is multiparameter sonde with interchangeable sensors and a smartphone interface that delivers accurate data and enables simplified calibration, panoramic data view, and report creation. Sondes will be maintained and calibrated according to manufacture specifications. Instantaneous Sonde measurement will be collected in accordance with SWQB SOP 6.2 Sonde Deployment (NMED/SWQB 2018 or most current version).

Channel dimensions (cross-sections), pebble counts, and canopy cover data will collected utilizing SWQB SOP 5.0 for Physical Habitat Measurements and field sheets (NMED/SWQB 2019b or most current version).

Beaver surveys will be conducted by HPWA staff and interns using iBeaver crowd source app (https://defenders.org/blog/2021/05/ibeaver-crowd-sourcing-data-north-americas-busy-beaver). The iBeaver app is a data collection tool that can record the location of a user's observation and then prompt them to answer a series of survey-style questions to gather more information.

Photo-documentation locations will selected to document MRM implementation and monitor effectiveness and changes in riparian vegetation and stream morphology. The locations will be recorded with GPS and monumented with capped rebar and/or PVC and the direction of the photo will be noted so that photos-documentation is consistent and repeatable. Field staff will take photos pre- and post-construction, log the photos on a photo-log, and then upload to a secure location for backup. All photo-documentation will be documented using Appendix 3 Photo-documentation Field Form.

PLET modeling will be used to evaluate loading and load reductions at the watershed level and may be used to evaluate loading and load reduction at a smaller scale if time and resources allow. PLET modeling will be conducted according to EPA PLET User's guide. The guide is available at: https://www.epa.gov/nps/plet. After evaluation of the model it has been determined that the model is appropriate for this project.

SSTEMP modeling, if conducted, will be completed according to Bartholow , 2002. The model has been vetted and is used by many federal and state agencies including the NMED SWQB for TMDL development for temperature impairments. The model has been determined to be appropriate for this project. Available at: https://www.sciencebase.gov/catalog/item/53ea4091e4b008eaa4f4c457

B3. Sample Handling and Custody

There are no plans to collect water samples for analysis; therefore, there are no sample handling and custody requirements.

B4 Analytical Methods

There are no plans to collect water samples for analysis; therefore, there are no analytical requirements.

B5. Quality Control

Quality control (QC) activities are technical activities performed on a routine basis to quantify the variability that is inherent to any environmental data measurement activity. The purpose for conducting QC activities is to understand and incorporate the effects the variability may have in the decision-making process. Additionally, the results obtained from the QC analysis, or data quality assessment, may identify areas where the variability can be reduced or eliminated in future data collection efforts, thereby improving the overall quality of the project being implemented.

Quality Control mechanisms are implemented as described under the Quality Objectives and Criteria for Measurement Data as well as the sampling methodologies identified under this QAPP. Additional Quality Control includes the professional expertise of the personnel working under this project.

Temperature data collected using long-term deployment will be QA'd using SWQB SOP 6.4 for Long-term Deployment Data Logger QA and SQUID Upload. The long-term data set will be analyzed using the Long-term Data Management Spreadsheet for hourly data collection (NMED/SWQB 2021c or most current version).

B6. Instrument/Equipment Testing, Inspection and Maintenance

The primary equipment needing maintenance, testing and inspection are a sonde and thermographs. Requirements and procedures are specified in the SWQB SOPs.

a. HOBO TidbiT MX Temperature 400' Data Logger, SWQB SOP 6.3 *Temperature Data Loggers* (NMED/SWQB, 2019 or most current version)

b. In-Situ Aqua Troll 600 Multi-Parameter Water Quality, Sonde will be maintained and calibrated according to manufacture specifications and SWQB SOP 6.1 Sonde Calibration and Maintenance (NMED/SWQB 2021b or most current version)

B7. Instrument/Equipment Calibration and Frequency

A calibration log will be kept maintained for the duration of the project for all monitoring devices. Procedures for the maintenance of calibration records are specified in the SWQB's QAPP for *Water Quality Management Programs* (NMED/SWQB 2021 or most current version). For this project, specific calibration requirements apply to thermographs and Sondes. Thermographs will be calibrated in accordance with SWQB SOP 6.3, *Temperature Data Loggers* (NMED/SWQB 2019 or most current version) section pertaining Thermograph Calibration Verification. Sondes will be maintained and calibrated according to SWQB SOP 6.1 Sonde Calibration and Maintenance (NMED/SWQB 2021b or most current version).

B8. Inspection/Acceptance of Supplies and Consumables

No supplies or consumables will be used for this project.

B9. Non-direct Measurements

No non-direct measurements used during the course of this project that will affect the quality of data related to this project. With documentation of the UNM QA procedures and well established USGS methods, flow and water quality data collected by the USGS and the UNM Center for Water and the Environment may be used to supplement the monitoring done by HPWA.

B10. Data Management

Data obtained for this project are maintained in paper and electronic files by HPWA. Data collected by HPWA staff will be delivered to SWQB Project Officer as soon as practical following the data collection event. Data will be submitted to SWQB Project Officer at least quarterly and will be maintained in the project file on the NMED SWQB network. Electronic data will be backed up on the SWQB network storage and the hard drive of SWQB Project Officer.

GROUP C: ASSESSMENT AND OVERSIGHT

C1. Assessment and Response Actions

The SWQB Project Officer will provide project oversight by periodically assisting with and/or reviewing data collection efforts. The SWQB Project Officer will conduct annual reviews of data collection efforts. The SWQB Project Officer will assess project progress to ensure the QAPP is being implemented, including periodic audits by the QAO, as needed. Any problems encountered during the course of this project will be immediately reported to the SWQB Project Officer who will consult with appropriate individuals (e.g., SWQB WPS Program Manager) to determine appropriate action. Should the corrective action impact the project or data quality, the SWQB Project Officer will alert the QAO. If it is discovered that monitoring or modeling methodologies must deviate from the approved QAPP, a revised QAPP must be approved before work can be continued. All problems and adjustments to the project plan will

be documented in the project file and included in quarterly and annual reports and summarized in the final report.

C2. Reports to Management

Quarterly and annual report reports will be submitted by the HPWA to the SWQB Project Officer and include progress of project implementation and any available data. Printouts, status reports or special reports for SWQB or EPA will be prepared upon request. Separate annual monitoring reports will also be provided and included in the final report. The SWQB Project Officer will be responsible for maintaining project progress in the EPA Grants Reporting and Tracking System and the final report, and all other required project deliverables to be submitted to the EPA under this grant.

GROUP D: DATA VALIDATION AND USABILITY

D1. Data Review, Verification and Validation

Data will be reviewed by the field team prior to leaving the field site. Data will be considered usable if there is reasonable evidence that the requirements of this QAPP were followed and the data is within acceptable range limits as defined under this QAPP. Data that appears incomplete or questionable for the parameter will be flagged for review. Flagged data will be discussed with the SWQB Project Officer to determine the potential cause and usability. If a reasonable justification for use of the data cannot be attained, those data will be not used in the analysis of stream temperature load reduction or to show changes in stream temperature due to implementation of restoration activities or MRMs unless the data can be recollected and assessed for usability.

D2. Validation and Verification Methods

Verification and Validation of field sampling results will occur in the review of data performed by the Project Manager in accordance with all applicable sections of the SWQB's SOP 15.0 for *Data Verification and Validation* (NMED/SWQB 2020 or most current version). In the event gross errors or other questionable data are found during Verification and Validation, the Project Manager will contact the SWQB Project Officer who will consult with appropriate project personnel (WPS Program Manager or QAO) to determine the validity of the data. The SWQB Project Officer will ensure that valid and representative data were acquired. The SWQB Project Officer will also ensure the completeness of records and verification of calibration. Results of the verification process will be included in the final reports to the SWQB Project Officer.

D3. Reconciliation with User Requirements

The user requirement is a restatement of the data quality objective: The quality of the data will be adequate to provide a high level of confidence of load reductions as a result of restoration projects in the Gallinas Watershed.

If project results do not meet this requirement, then additional monitoring may be necessary to fill in data gaps or it may be necessary to extend the monitoring period to measure effects that were not apparent during the project period.

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Appendix 1. QAPP Acknowledgement Form

Acknowledgement Statement

New Mexico Environment Department Surface Water Quality Bureau

Water Quality Monitoring to Determine Pollutant Loading Sources
On-The-Ground Improvement Projects for
the Upper Gallinas River and Porvenir Creek Phase IV
667-393-2B/NMED SUB-GRANT: 667-22319SQ-1D

Quality Assurance Project Plan Acknowledgement Statement

This is to acknowledge that I have received a copy (in hard copy or electronic format) of the Quality Assurance Project Plan for Water Quality Monitoring to Determine Pollutant Loading Sources On-The-Ground Improvement Projects for the Upper Gallinas River and Porvenir Creek Phase IV, Revision 00.

As indicated by my signature below, I understand and acknowledge that it is my responsibility to read, understand, become familiar with, and comply with the information provided in the document to the best of my ability.

_____
Signature

_____
Name (Please Print)

_____
Date
Return to SWQB Project Officer (Susan Styer)

Appendix 2. SWQB Physical Habitat Field Sheets

This Project will utilize the SWQB Physical Habitat Field Sheets for Stream Morphology Surveys and Bankfull Cross-Section and Flow.

The Microsoft® Word version of the SWQB Physical Habitat Field sheets can be located at: https://www.env.nm.gov/wp-content/uploads/sites/25/2017/06/5.0-SOP-Physical-Habitat_Field_Sheets_20190826-MM.docx

The Microsoft® Excel version of the SWQB Physical Habitat Field Sheets can be located at: https://www.env.nm.gov/wp-content/uploads/sites/25/2017/06/5.0-SOP-HabFieldUploadForms_20190826-MM.xlsx

Appendix 3. Photo-Documentation Field Form

Photo-Documentation Field Form

Photo Point # and Site Location	Northing (GPS location)	Easting (GPS location)	Direction of the photo	Description