GROUP A. PROJECT MANAGEMENT

A.1 Title and Approval Sheet

Quality Assurance Project Plan

for

Post Fire Rehabilitation of the Bear Creek Watershed

Submitted by:

New Mexico Environment Department

Surface Water Quality Bureau

APPROVAL SIGNATURES

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Acronyms

DQO	Data Quality Objectives
EPA	United States Environmental Protection Agency
GNFS	Gila National Forest Service
NMED	New Mexico Environment Department
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
SOP	Standard Operating Procedures
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
USACOE	United States Army Core of Engineers
USDA	United States Department of Agriculture
USFS	United States Forest Service

A3. Distribution List

Table 1 below contains the distribution list, project roles and responsibilities for this project. The QA Officer will ensure that copies of this QAPP and any subsequent revisions are distributed to members 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 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 will be collected by the SWQB Project Officer and will be given to the QA Officer for filing with the original approved QAPP.

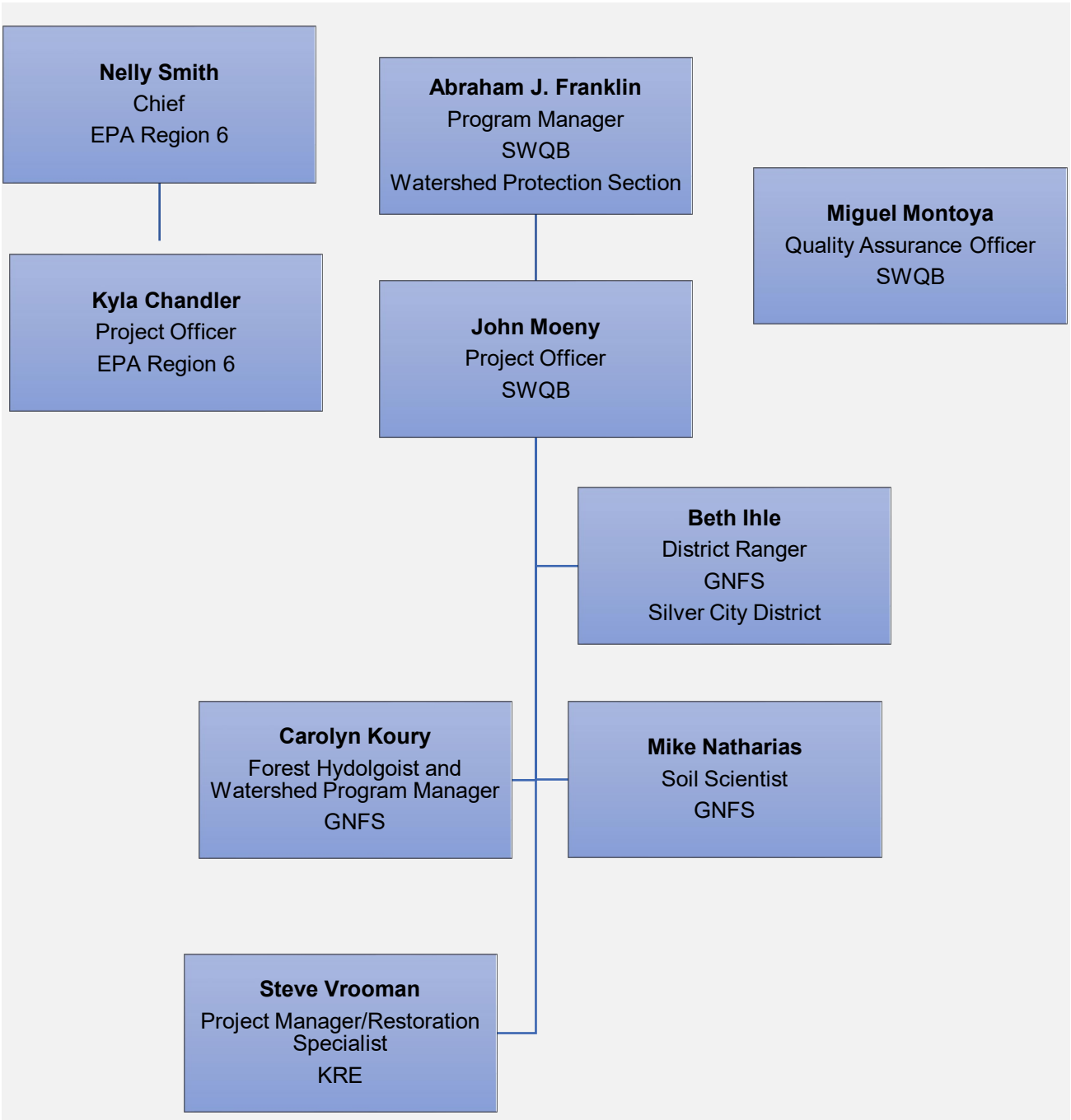
Table 1. Distribution list, Project Roles, and Responsibilities

Name	Organization	Title/Role	Responsibility	Contact Information
Abraham Franklin	SWQB	Program Manager	Reviewing and approving QAPP, managing project personnel and resources	505.946.8952 abraham.franklin@state.nm.us
Miguel Montoya	SWQB	QA Officer	Reviewing and approving QAPP	505.819.9882 miguel.montoya@state.nm.us
John Moeny	SWQB	Project Officer	Preparing and revising QAPP, distribution of QAPP, project reporting, coordinating with contractors and GNFS, oversight of data collection, and EPA reporting	505.819.9868 john.moeny@state.nm.us
Steve Vrooman	KRE	Project Coordinator and Manager	Project oversight, data management, and submittal of quarterly reports	505.490.0594 stevevrooman@gmail.com
Steve Vrooman	KRE	Watershed Restoration Specialist	Project design and implementation, construction oversight	505.490.0594 stevevrooman@gmail.com
Beth Ihle	GNFS	District ranger, Silver City District	Coordinating components of the project including — NEPA compliance, public notification, and review of construction documents as needed.	505.388.8201 beth.ihle@usda.gov
Carolyn Koury	GNFS	Forest Hydrologist and Watershed Manager	Review of final design plans prior to their finalization.	575.388.8378 ckoury@fs.fed.us
Mike Natharias	GNFS	Soil Scientist	Provided information regarding burn severity, post-fire treatment, soil stability and vegetation recovery. Review of final design prior to finalization.	575.388.8201 mike.natharias@usda.gov
Kyla Chandler	EPA	Environmental Protection Specialist WQPD, Region 6	Reviewing and approving QAPP	214-665-2166 chandler.kyla@epa.gov
Nelly Smith	EPA	Chief, State and Tribal Programs Section	Reviewing and approving QAPP	214-665-7109 smith.nelly@epa.gov

A.4 Project Organization

The SWQB Quality Management Plan (NMED/SWQB 2021) documents the independence of the Quality Assurance Officer (QAO) from this project. The QAO is responsible for maintaining the official approved QAPP. Figure 1 presents the organizational structure for the "Post Fire Rehabilitation of the Bear Creek Watershed" referred to in this document as the "Bear Creek Watershed Project."

Figure 1. Organization Chart



A.5 Problem Definition /Background

This QAPP refers to the project as "Bear Creek Watershed Project". The goal of this project is to improve water quality in the Bear Creek Watershed by addressing geomorphic instability in Cherry Creek resulting from post-fire flooding in 2014 and 2020. This includes work on headcuts and unstable streambanks within the Cherry Creek floodplain and will also include work on other sediment sources from the fire-impacted tributaries and road drainages that enter Cherry Creek within the project area. The purpose of this Quality Assurance Project Plan (QAPP) is to ensure valid and defensible data is used to develop a restorations and rehabilitation plan for the Bear Creek Watershed Project, and to document procedures used to determine the effectiveness of best management practices (BMPs) implemented for the reduction of sedimentation and nutrients into the Bear Creek Watershed. The QAPP will also address procedures for tracking changes to stream morphology due to implementation of BMPs. The project is being managed by Keystone Restoration Ecology (KRE) with oversight from both the New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) and United States Department of Agriculture's (USDA) Gila National Forest Service (GNFS).

Background

Bear Creek is a small tributary of the Gila River in southwest New Mexico. The stream's headwaters sit on the continental divide near the historic mining town of Pinos Altos at an elevation of 7,000 feet, while the confluence with the Gila River thirty miles downstream lies at 4,557 feet. Despite being a minor tributary to the Gila River, Bear Creek is an ecologically significant surface water providing critical habitat for the federally endangered Loach Minnow (*Tiaroga cobitis*).

The SWQB's water quality assessments in the early 2000s recognized impairments due to heavy metal contamination resulting from legacy mining in the upper watershed. Following mine reclamation in 2005, the stream has been in full attainment for its designated uses which include industrial water supply, irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, and primary contact. The upper Bear Creek watershed (HUC 150400020101) includes two significant but unassessed perennial tributaries—Cherry Creek and Wilson Creek.

In 2014 the Signal Fire severely burned the upper watershed of Cherry Creek resulting in extensive watershed instability for 3 years following the fire. Stormwater flows that coalesced in the steep upper elevation watershed were concentrated and released in a valley bottom wetland which initiated several headcuts and channel incision in the wetland. In 2020, the Tadpole Fire burned the upper reaches of Cherry, Wilson and Bear Creeks. The damage to Cherry Creek initiated in 2014 was accelerated following the Tadpole Fire with existing headcuts growing, the channel widening and additional loss of wetland vegetation (Figures 2 and 3).

Figure 2. Headcut in Cherry Creek (August 19, 2020)

Objective

As the major tributary to Bear Creek, Cherry Creek contributes significant surface and groundwater inputs to Bear Creek downstream and the loss of water storage due to geomorphic instability and wetland decline is a major concern for both the Surface Water Quality Bureau and the Gila National Forest which manages most of the land within the Bear Creek watershed.

Water Quality Goals

The goal of this project is to address geomorphic instability in Cherry Creek resulting from post-fire flooding in 2014 and 2020 as seen in Figure 2 and Figure 3. Water quality improvements will result from reduced sediment and concomitant nutrient loading from headcuts and unstable streambanks within the Cherry Creek floodplain. Additional water quality improvements will be realized by addressing sediment sources from the fire-impacted tributaries and road drainages that enter Cherry Creek within the project area. The gully and streambank erosion worksheet within the Spreadsheet Tool for Estimating Pollutant Loads (STEPL) was used to produce a rough estimate that the project will prevent 34 tons per year of new sediment loading, 46.6 pounds per year of new nitrogen loading, and 17.9 pounds per year of new phosphorus loading from occurring. By improving the Cherry Creek floodplain, the wetland system that is currently extant, but declining will be maintained and improved resulting in increased water storage, pollutant filtration and habitat for aquatic obligate species. Even though Cherry

Creek has never been assessed by NMED for water quality attainment, and Bear Creek is not currently impaired for either nutrients or sediment, this project will be a fundamental check against long-term degradation of water quality in both streams.

Figure 3. Soil and wetland loss due to channel widening (August 19, 2020)

A.6 Project/Task Description

Description

The project intends to develop a restoration and rehabilitation plan which will include BMPs to address geomorphic instability in Cherry Creek resulting from post-fire flooding in 2014 and 2020. The BMPs will address headcuts and unstable streambanks within the Cherry Creek floodplain and will also include work on other sediment sources from the fire-impacted tributaries and road drainages that enter Cherry Creek within the project area. The proposed management measures will be designed to reduce streamflow velocity, reduce or eliminate headcutting and bank erosion, promote sheet flow across a broad floodplain, increase water infiltration and storage and increase wetland vegetative cover. By improving the Cherry Creek floodplain, the wetland system that is currently extant, but declining will be maintained and improved resulting in increased water storage, pollutant filtration and habitat for aquatic obligate species.

The gully and streambank erosion worksheet within the STEPL was used to produce a rough estimate of annual load reductions for sediment, nitrogen, and phosphorus. Annual detailed load reductions using STEPL will be calculated by the SWQB Project Officer after construction and implementation of BMPs. The model STEPL itself has been validated and verified as a model and is widely accepted and used by Federal and State agencies.

A field assessment and analysis of stream and watershed condition for restoration and rehabilitation plans will be completed by KRE by Summer 2021 (Task 1 in approved work plan). The assessment will include measurements for stream morphology of a reference reach within the project area. The data collected in the field assessment and analysis will include Rosgen level II measurements and will be used to develop the restoration and rehabilitation plan including treatment type (BMPs), location and material quantities needed. A "as-built" document will be produced after implementation of restoration and rehabilitation plan that indicates location and type of BMP throughout project area.

Steve Vrooman of KRE will be responsible for monitoring improvements to water quality and demonstrating successful implementation of the proposed BMPs. The monitoring will include parameters that will focus on physical changes to stream morphology documented through repeat measures of channel and floodplain geometry and repeat photo-documentation.

Monitoring BMPs for effectiveness will also utilize photo-documentation points which will confirm physical changes to stream morphology and success of the BMP implementation. Several treatment types (BMPs) throughout the project will be monitored to ensure that they are functioning as designed and not in need of repair. These BMPs will be monitored as part of the photo-documentation effort but will also be inspected to assure that no excessive erosion or failure of key structural members has occurred or is imminent. Notes (field notebook or field sheets) will be made to describe the condition of the structures and any proposed maintenance tasks, which will be included in the annual photo monitoring report. As a benchmark used for reporting any noticeable change in structural integrity that is significant enough to warrant further evaluation or change in structure function will be reported to the SWQB Project Officer immediately.

All monitoring component of the project are discussed in more detail in the Data Generation and Acquisition section of this QAPP.

Schedule

Task 1 – Field assessment and analysis of stream geomorphology, watershed condition, sediment inputs, restoration design, and US Army Corps of Engineers 404 permitting.

- Responsible Party: Keystone Restoration Ecology.
- Timeline: Summer 2021.
- Deliverable: Restoration plan including treatment type, location and material quantities needed, 404/401 permit.

Task Description

Keystone Restoration Ecology will travel to the remote site and conduct a project area-wide investigation over the course of one or several days. The assessment will include measurements of stream geomorphology equivalent to a Rosgen Level II survey, and a visual survey of both the Tadpole and Signal Peak burn scars for sources of sediment loading and instability. The assessment will include reference reaches in unburned areas with similar watershed area and slope. Topography will be measured with a laser level, LIDAR and other methods. Collected data will be analyzed in conjunction with available data from the USFS (soil types, burn severity maps, aerial and LIDAR imagery) to develop design drawings and rehabilitation plans. Design will inform the necessary USACE 404 permitting which will be required prior to construction (Task 2).

Task 2—Implementation of rehabilitation plan.

• Responsible Party: Keystone Restoration Ecology

• Timeline: Summer/Fall 2021.

• Deliverable: Photo-documentation and narrative written report describing completed work, and an "as-built" document showing structure locations and type.

Task Description

Pending approval by NMED of the restoration plan produced under Task 1, KRE will mobilize equipment and supplies to the project area to complete construction in Summer 2021. Construction items include building a series of in-stream rock structures both with machines and by hand, topsoil salvage, machine grading, planting and watering willows, and reseeding disturbed areas. Construction is expected to be completed within 20 working days with 3 machines.

Task 3—Follow-up site visit, monitoring, structure repair as necessary, and final reporting

• Responsible Party: Keystone Restoration Ecology

• Timeline: Summer 2022

• Deliverable: Post-construction Rosgen II surveys of channel cross-sections and photo-documentation. Written report describing any damage to structures or vegetative plantings and completed repair work (if required). Final report summarizing work completed and before/after changes to the site resulting in functional restoration of the stream and water quality improvement.

Task Description

KRE will return to the site after the summer monsoon season to assess and repair any damage to structures or vegetative plantings. This task also includes follow-up monitoring for USACE 404 permit requirements including repeating Rosgen Level II surveys. KRE will produce a final report which summarizes pre and post construction conditions and improvements to stream geomorphology and water quality.

Table 2. Project Task, products, responsible party, timeline

Task	Product	Responsible Party	Approximate State Date	Approximate Completion Date

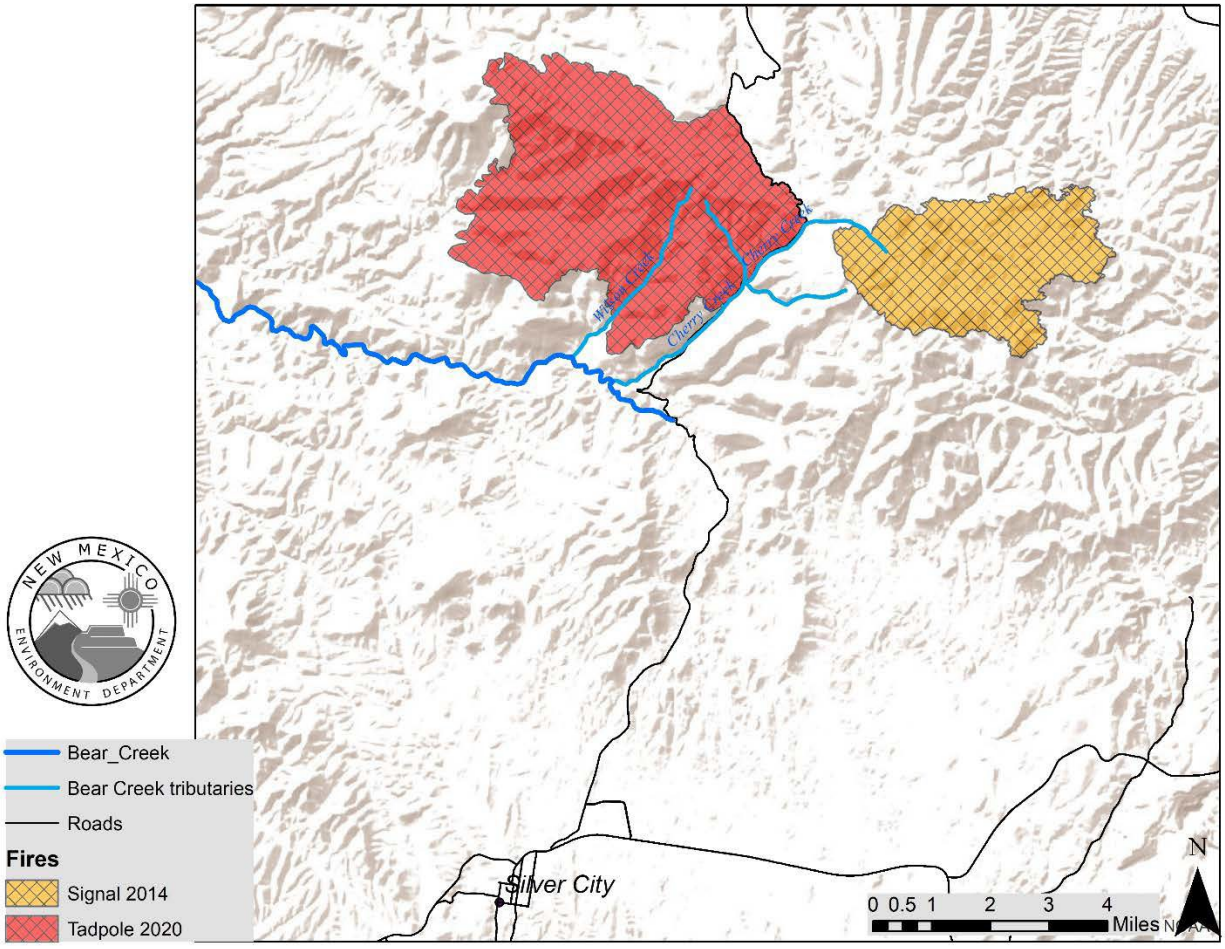
Administrative	Procurement for contract	SWQB	January 2021	April 2021
Planning	Field site visit (no data collection)	SWQB, KRE, GNFS	May 2021	October 2021
Quality Assurance Project Plan	Approved QAPP	SWQB	March 2021	May 2021
Develop Restoration Plan	Restoration Plan	KRE	May 2021	August 2021
Implementation of Restoration Plan	Restoration implementation	KRE	Fall 2021	Spring 2022
Rosgen Level II	Field assessment with Measurements: cross-section and longitudinal profile and plan-form	KRE	May 2021	August 2022
Planting Monitoring	Photo-documentation	KRE	Fall 2021	Summer 2022
Restoration Structure Monitoring	Photo-documentation, "as-builts" showing structure type and location	KRE	Fall 2021	Summer 2022
Photo-documentation Reporting to SWQB Project Officer	Annual reporting including narrative written report	KRE	Fall 2021	Fall 2022
Reporting to EPA	Quarterly Reports, Annual Load Reduction Estimates, and Final Report to EPA	SWQB Project Officer	July 2021	Winter 2022

Project Area

The project will focus on repairing damage in upper Cherry Creek watershed. Cherry Creek is a northeast to southwest running stream draining the south side of the Pinos Altos mountain range and joining Bear

Creek which runs west to join the Gila River in Grant County (Figure 4). The target reach is bracketed on the upstream end by the "Signal Peak Road" located at 32.9411, -108.1955 (lat,long) and at the downstream end by an unnamed side canyon located at 32.9362, -108.1994. Linear stream distance is approximately 0.5 miles with an estimated 15 acres of floodplain. However, if during the course of the watershed assessment additional areas are found that are contributing to instability in Cherry Creek or contributing excessive sediment loading, these areas will be included in this project.

Figure 4. Project Area Map



Monitoring Location Selection Criteria

All the proposed treatment location will be conducted in the project area as described above using BMPs listed in Table 3 or equivalent. Monitoring locations are driven by BMP location and 404 permitting, and will include photo-documentation and Rosgen Level II measurements.

Restoration Activities

The proposed management measures are designed to reduce streamflow velocity, reduce or eliminate headcutting and bank erosion, promote sheet flow across a broad floodplain, increase water infiltration and storage and increase wetland vegetative cover. While a final design has not yet been completed, the following structures are likely to be included in the final restoration and rehabilitation plan.

Table 3. Best Management Measures for Restoration and Rehabilitation Plan

BMPs	Purpose	Number of locations
Rock baffle	Grade control	1
Boulder cross-vane	Grade control	4
Channel fill	Eliminate channel incision	7
One-rock dam	Grade Control and water infiltration	6
Channel plug	Grade control and redirect stream flowpath	6
Pool construction	Energy dissipation and water filtration	2
Zuni Bowl	Energy dissipation and water infiltration	2

A7. Quality Objectives and Criteria for Measurements

The goal of this project is to improve water quality in the Bear Creek Watershed by addressing geomorphic instability in Cherry Creek resulting from post-fire flooding in 2014 and 2020. This includes work on headcuts and unstable streambanks within the Cherry Creek floodplain and will also be realized by addressing sediment sources from the fire-impacted tributaries and road drainages that enter Cherry Creek within the project area.

Water quality improvements will result from reduced streamflow velocity, reduce or eliminate headcutting and bank erosion, promote sheet flow across a broad floodplain, increase water infiltration and storage and increase wetland vegetative cover.

The data collection and monitoring components of the Bear Creek Watershed Project are intended for use in the following:

1) Develop a restoration and rehabilitation plan; and
2) Monitor the effectiveness of BMP implementation and document changes in stream morphology.

Stated as a decision: 1) The information gathered as part of the field assessment (includes Rosgen Level II measurements) will be used in development of a restoration and rehabilitation plan; and 2) Rosgen Level II measurements and photo-documentation will be used to determine BMP implementation effectiveness and to document stream morphology changes.

Data Quality Objective (DQO)

The quality of the data will be adequate to provide a high level of confidence in development of restoration plan for the Post Fire Rehabilitation of the Bear Creek Watershed, determine effectiveness of BMP implementation and document stream morphology changes. The Data Quality Indicators (DQIs) identified in Table 1.4 must be of sufficient quality to provide a high level of confidence in the resulting decisions.

Measurement Quality Objectives (MQOs) are statements about how good the measurements need to be in order to be useful as inputs to the decision process. MQOs are often expressed as statements about the acceptable values of DQIs. The Data Quality Indicators listed in the SWQB's QAPP and

applicable to the data collected for this project are precision, bias, accuracy, representativeness, comparability, completeness, and sensitivity.

Table 4. Data Quality Indicators (DQIs)

DQI	Determination Methodologies
Precision	will be ensured by following the procedures identified in this QAPP and having two monitoring participants present during all data collection activities.
Bias	the basis for determining accuracy will be staff's expertise of the survey method for collecting data and ensuring the accuracy of the equipment being used is within the required range of a particular survey
Accuracy	Location of Rosgen Level II and photo-documentation sites will be monumented so that data is consistent and repeatable.
Representative	pre-treatment assessment sites will be determined in areas anticipated to be most susceptible to erosion and location producing high amounts of sediment due to headcuts and unstable streambanks in areas impacted by fire. Photo-documentation and Rosgen Level II data will be collected at BMP implementation sites.
Comparability	monitoring locations in restoration implementation sites will be monumented for repeat sampling events to compare 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 methodologies will be completed in their entirety as identified in this QAPP.
Sensitivity	Sensitivity of metrics used will be analyzed during analysis and recalibration of data and instruments.

A.8 Special Training/Certification

This project will be primarily implemented by Steve Vrooman of KRE, also president of KRE. KRE is a Santa Fe New Mexico consulting firm founded in 2001. KRE specializes in the ecosystem restoration of natural and man-made landscapes using the sciences of ecology and geomorphology. Mr. Vrooman along with his associates of KRE have extensive experience in watershed assessment, water-harvesting road design, stream and wetlands restoration, and rangelands monitoring in New Mexico, Colorado, Arizona, and Texas.

Steven Vrooman has worked throughout the southwest with an emphasis on high desert environmental restoration of riparian and upland ecosystems. He has as BS in Biology from New Mexico Tech and MS in Biology from University of Nevada specializing in plant community ecology. Data collection and monitoring for this project will be implemented by Steve Vrooman of KRE with technical assistance and oversight from the SWQB Project Officer and USDA's GNFS staff identified on distribution list. Volunteers will be supervised by Steve Vrooman while conducting work for the project. Steve Vrooman and KRE

staff conducting work for the project will review this QAPP and sign the acknowledgment statement prior to initiating any data collection or analysis.

A.9 Documents and Records

The SWQB Project Officer will make copies of this approved QAPP and any subsequent revisions available to all individuals on the distribution list who do not have signature authority for approving the QAPP. 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 effects of any changes to the scope, implementation, or assessment of the outcome on the technical and quality objectives of the project. This Project Plan will be reviewed annually by the SWQB Project Officer to determine the need for revision.

Project documents include this QAPP, field notebooks, calibration records, validation and verification records, and recorded field data. Also included are project reports. Data captured on a global positioning system (GPS), camera, smart phone, tablet, or laptop will be downloaded to a KRE computer or an external hard drive at the end of each day. Copies will be made of all data and stored separately from the original data.

All digital project data will be kept in a project file on a KRE computer and on a separate external backup hard drive at the KRE office. Hard copy project documents will be kept in a project folder in a file cabinet in a secure location at KRE office. All hard copy documents will be digitized and stored on a KRE computers and backup on a hard drive (see Table 5). Copies of the data will be distributed by Steve Vrooman to NMED SWQB Project Officer after each filed season, typically at the end of November. Electronic data files will be stored on the SWQB network drive in accordance with 1.21.2 NMAC, *Retention and Disposition of Public Records.*

Table 5. Data Records for the Project

Document	Type of Form	Storage Location	Field Sheet Used
QAPP	Electronic (.doc)	SWQB File depot.	EPA Requirements for Quality Assurance Project Plan. EPA QA/R-5.
Rosgen Level II Field Data	Hard Copy and Electronic	KRE Office (file cabinet) and Computer & External Hard drive	Rosgen Level II field sheets and field notebook
Photo-documentation	Electronic (.jpg)	KRE Computer& External Hard drive	Field Sheet and Table 7
Interim and Final Reports	Electronic (.doc) & Hard Copy	SWQB File Depot	NA

GROUP B: DATA GENERATION AND ACQUISITION

B1. Sampling Plan

Steve Vrooman of KRE will travel to the site and conduct an initial project area-wide investigation that includes a field assessment with Rosgen Level II measurements (cross-section, longitudinal profile and plan-form measurements) over the course of one or several days. The Rosgen Level II data will utilize a laser level for the collection of measurements. The measurements collected in the field assessment will be analyzed in conjunction with data provided by the USFS that includes information regarding soil types, burn severity, aerial imagery and LIDAR in development restoration and rehabilitation plans. A reference reach will also be assessed in unburned areas of the project area using a Rosgen Level II survey to aid in development of restoration and rehabilitation plan. Photo-documentation and Rosgen Level II data will be collected at BMPs pre and post-implementation and will be used to document BMP effectiveness and stream morphology changes. Rosgen Level II measurements will be used to calculate entrenchment ratios for documenting changes in stream morphology. Rosgen Level II monitoring is expected to occur once for the initial field assessment and again in Fall 2022, see Table 6. Rosgen Level II surveys conducted in Fall 2022 will be conducted after summer monsoon runoff to assess BMP effectiveness and document stream morphology changes. Visual inspection of the watershed restoration measures (BMPs) will take place pre and post-implementation of BMPs (Table 6) and after major flood events as time permits during the course of the project. Maintenance of BMPs may occur if any damage to structures or plantings is noticed during visual inspections. Visual inspections will be documented with photo-documentation monitoring of each BMP that includes multiple photos of structure type and planting (if needed). In addition, KRE will visually look at scour both below and on the sides of the structures and write notes on structure performance and any maintenance needs. The photo-documentation and Rosgen Level II measurements will also be used to demonstrate improvements to the USACOE for the 404 permit. Photo-documentation locations will be recorded with GPS and all Rosgen Level II surveys locations will be monumented (includes GPS measurements) so that data is consistent and repeatable.

Table 6. Project Monitoring Specifics

Responsible Party	Monitoring	Location	Frequency
KRE	Rosgen Level II: cross-section longitudinal profile and plan-form measurements	Project Area	pre-implementation of BMPs Summer 2021. Post-implementation of BMPs Fall 2022
KRE	Photographic-documentation	Restoration locations including structures and plantings	Summer 2021, Fall 2021 and Fall 2022

B2. Sampling Methods

Rosgen Level II data includes cross-sections, longitudinal profiles and plan-form measurements — will be conducted according the *River Stability Field Guide and River Stability Forms and Worksheets* (Rosgen 2014).

Photo-documentation — Each key structure will be visually inspected during the photo-monitoring period. Inspections will take note of key structural elements and connections, aggradation or degradation of key elevations as well as structural function. Key structures and elements will be photographed and reported with notes in the photo-monitoring document. All photo-documentation will be documented in a table that includes the same attributes as Table 7 Photo-documentation Form (below). Location of photo sites will be recorded with a GPS so that photos-documentation is consistent and repeatable.

Table 7 Photo-Documentation Form

Photo Point # and Site Location	Northing (GPS location)	Easting (GPS location)	Description	Comments

STEPL — modeling will be completed in accordance with the instructions provided on the US EPA. STEPL inputs will come from the STEPL Input Data Server and will follow the U.S. EPA Guide for Using STEPL Online Data Access System (https://www.epa.gov/nps/guide-using-stepl-online-data-access-system). STEPL output will be derived from the "Gully&Streambank" Spreadsheet and will require additional inputs such as gully width, gully depth, and gully length which will be estimated from field measurements using a laser level and tape measure. No other sampling collections methods are planned for STEPL load reduction estimates for this project.

B3. Sample Handling Custody

Because there are no plans to collect samples for laboratory analysis, there are no handling requirements.

B4. Analytical Methods

Because there are no plans to collect samples, no analytical methods are needed.

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.

In order for the data to be defensible and usable, the project will be implemented by KRE who are experienced watershed restoration specialist and will ensure volunteers participating in project are properly trained before conducting any work. Other actions that will assure the collection of quality data are listed below.

- Data will be recorded on forms that identify the location, date, and description of observations and recommendations for all data collection including Rosgen Level II measurements and photo-documentation
- KRE personnel will be familiar with the general principles of phot-documentation, Rosgen Level II surveying and specific requirements of this QAPP. Site maps, flagging, and GPS locations will ensure the monitoring sites are relocated.
- KRE personnel will be knowledgeable of the monitoring protocol for surveying and will be able to identify changes to, or caused by, installed BMPs.
- The data will be recorded on specialized data sheets (see Methods section of this QAPP) and transferred to electronic spreadsheets for analysis.
- Annual report will be developed after each monitoring season by KRE. The SWQB will conducted annual estimates for load reduction utilizing STEPL with data collected under this QAPP.
- The field data sheets, inspection forms and reports will be archived in by the KRE and sent to SWQB Project Officer.

B6. Instrument/Equipment Testing, Inspection and Maintenance

The Steve Vrooman of KRE is responsible for the inspecting of equipment and supplies (Table 8) prior to data collection. All field equipment will be inspected before each monitoring event. All instruments and equipment will be tested, inspected and maintained in accordance with the manufacturer's specifications as included in the associated instrument/equipment manual.

Table 8. List of Equipment and Supplies

- Laser Level
- GPS
- Camera
- Tape Measure
- Computers
- Machinery

B7. Instrument/Equipment Calibration and Frequency

It should be possible to show that all data was collected using equipment and accuracy as detailed in Table 9. Steve Vrooman will ensure laser level is calibrated to factory specifications before data collection. The laser level factory specification will be checked according to manufacture calibrations frequency. The GPS used to document photo-documentation and Rosgen Surveys will also be checked to ensure unit is recoding data as described by manufacture specifications. The GPS make and model used to record measurements will be noted on field forms. Note will include accuracy specification of GPS unit.

Table 9. Laser Level Specification

Make	Model	Accuracy
Leica Rugby	810	± 1.5 mm at 30 m and ± 1/16" at 100 ft

B8. Inspection/Acceptance for Supplies and Consumables

If there is reasonable evidence that the laser level, GPS or camera has been damaged or is not up to manufacture specification the equipment will not be used for the Project. There are no other supplies or consumables that could affect the quality of data related to this project.

B9. Non-Direct Measurements

The LiDAR, aerial imagery, topographic maps, soil maps, and burn severity maps are all USDA approved products and have undergone their QAQC process and are usable by the SWQB for this independent project.

B10. Data Management

Steve Vrooman of KRE, will be responsible for data collection and management. All data (photo-documentation, and Rosgen Level II measurements) will be converted to electronic format, stored and backed up by Steve Vrooman. Hard copies of field sheets will be maintained in a project binder (or field notebook) organized by date and assessment type and stored in a filing cabinet in the office of KRE.

Reports accompanied by photo-documentation and Rosgen Level II measurements will be sent to the SWQB Project Officer by approximately Fall 2021 and Fall/Winter 2022 by Steve Vrooman of KRE. Upon receiving reports and data, the SWQB Project will store data on SWQB network drive in project specific folder for the "Post fire Rehabilitation of the Bear Creek Watershed" Project. The SWQB network drive is backed up daily and maintained by the NMED Office of Information Technology. Electronic data files will be stored on the SWQB network drive in accordance with 1.21.2 NMAC, *Retention and Disposition of Public Records*

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 restoration and rehabilitation plans which includes treatment types. A review of the restoration and rehabilitation plan will be conducted by the SWQB Project Officer with assistance from USDA's GNFS staff that includes a District Ranger, Forest Hydrologist and Soil Scientist. 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 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 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 the final report.

C2. Reports to Management

Reports will be submitted by the Steve Vrooman of KRE to the SWQB Project Officer and will include progress of project and any available data Winter 2021 and again in Fall/Winter 2022. Printouts, status reports, or special reports for SWQB or EPA will be prepared upon request. The final report will be submitted by KRE to the SWQB Project Officer by Winter 2022. The SWQB Project Officer will be

responsible for submitting quarterly reports, annual load reduction estimates (utilizing STEPL), and a final report to EPA through their Grants Reporting Tracking System.

GROUP D: DATA VALIDATION AND USABILITY

D1. Data Review, Verification and Validation

Data will be reviewed by Steve Vrooman for erroneous data, incomplete data and transcription errors prior to demobilization from the field site. Data will be considered usable if 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 and applicable USFS staff to determine the potential cause and usability before implementation of restoration and rehabilitation plan. If a reasonable justification for use of the data cannot be attained, those data will be not used in analysis and implementation of activities listed under this QAPP unless the data can be recollected and assessed for usability.

D2. Validation and Verification Methods

The Steve Vrooman will ensure that valid and representative data are acquired. Verification and validation of data will occur daily after data collection (Rosgen Level II measurements and photo-documentation). A verification and validation checklist will be used to document the verification and validation process. In the event questionable data are found, the SWQB Project Officer will notified and will consult appropriate personnel to determine the validity of the data. Results of the verification and validation process will be included in the final reports.

D3. Reconciliation with User Requirements

The user requirement is a restatement of the DQOs: The quality of the data will be adequate to provide a high level of confidence in determining whether the Bear Creek Watershed Project is meeting the goals as stated in Quality Objectives and Criteria for Measurements Section of this QAPP.

If the project's results do not meet this requirement, then additional monitoring may be necessary to fill in data, which may include an extension of the monitoring period to measure effects that were not anticipated or apparent during the project period.

References:

Rosgen, Dave. 2014. River Stability Field Guide, and River Stability Forms and Worksheets Second Edition. Wildland Hydrology, Fort Collins, CO.

New Mexico Environment Department Surface Water Quality Bureau (NMED/SWQB). 2018. Quality Assurance Project Plan for Water Quality Management Programs. Available at: New Mexico https://www.env.nm.gov/surface-water-quality/protocols-and-planning/

New Mexico Environment Department Surface Water Quality Bureau (NMED/SWQB). 2020-2022. State of New Mexico Clean Water Act 303 § 3030(d)/305(b) Integrated Report and List. Available at: https://www.env.nm.gov/surface-water-quality/303d-305b/

New Mexico Environment Department Surface Water Quality Bureau (NMED/SWQB). 2021. Quality Management Plan for Environmental Data Operations. Available at: https://www.env.nm.gov/surface-water-quality/protocols-and-planning/

United States Environment Protection Agency. Spreadsheet Tool for Estimation Pollutant Loads. Available at: https://www.epa.gov/nps/spreadsheet-tool-estimating-pollutant-loads-stepl

Acknowledgement Statement

New Mexico Environment Department Surface Water Quality Bureau

Post Fire Rehabilitation of the Bear Creek Watershed
Quality Assurance Project Plan Acknowledgement Statement

This is to acknowledge that I have received a copy (in hard copy or electronic format) of the "Bear Creek Watershed Project" Quality Assurance Project Plan.

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 or Electronic Signature (e-certified accepted)

_____
Name (Please Print)

_____
Date
Return to SWQB QAO Miguel Montoya