Project Quality Assurance Project Plan
for
Lower Animas Watershed Based Plan

Prepared by

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Acronyms

AFDM – Ash Free Dry Mass

AU – Assessment Units

AWP – Animas Watershed Partnership

BMP – Best Management Plan

CH2M - CH2M Hill Laboratory at Farmington wastewater treatment plant

CWA- Clean Water Act

DO – Dissolved Oxygen

EPA – US Environmental Protection Agency

HUC – Hydrologic Unit Code

LAWBP – Lower Animas Watershed Based Plant

MPN – Most Probable Number (*E. coli* plate analysis)

MSI – Mountain Studies Institute

MST – Microbial Source Tracking

NMED – New Mexico Environment Department

N03 & NO2 – Nitrate and Nitrite respectively

PQAPP – Project Quality Assurance Project Plan

QA – Quality Assurance

QAPP – Quality Assurance Project Plan

QC – Quality Control

SJSWCD – San Juan Soil and Water Conservation District

SJWG – San Juan Watershed Group

SOP – Standard Operating Procedures

SWQB – Surface Water Quality Bureau (NMED)

TKN – Total Kjeldahl Nitrogen

TN – Total Nitrogen

TMDL – Total Maximum Daily Load

TP – Total Phosphorus

WPS – Watershed Protection Section, SWQB

WQPD – Water Quality Protection Division

Introduction

The main issue to be addressed by the Lower Animas Watershed Based Plan (WBP) is the nutrient impairment and associated Total Maximum Daily Load (TMDL) on the lower stretch of the Animas River (San Juan River to Estes Arroyo). The purpose of this Project Quality Assurance Project Plan (PQAPP) is to document the necessary quality assurance (QA), quality control (QC), and other technical activities that will ensure that the results of the *Lower Animas WBP* will satisfy the stated performance criteria.

Although there have been numerous studies done on this reach of the Animas River and surrounding areas, *there is no comprehensive plan that utilizes this data and presents it in a manner that can be used by stakeholders and managers to efficiently address the concerns.* The goal of creating an updated plan for the Lower Animas River is to compile information and present it in a way that relates water quality data to land use and pollutant sources, identify the best management practices (BMPs) that will help address these sources, and create a strategic plan that managers can use to forward implementation.

San Juan Watershed Group (SJWG) and Animas Watershed Partnership (AWP) have undertaken multiple planning efforts which included this stretch of river. The San Juan Basin Watershed Management Plan (SJBWMP; http://www.nmenv.state.nm.us/swqb/Projects/SanJuan/BasinPlan/SanJuanBasinPlan.pdf) was completed in 2005 as a Watershed Restoration Action Strategy; while this plan gives a qualitative overview of water quality issues within four 8-digit hydrologic units (HUCs) (Animas River Watershed HUC 14080104, Upper San Juan Watershed HUC 14080101, Blanco Canyon HUC 14080103, and the Middle San Juan Watershed HUC 14080105), it does not include the detail or quantitative loading information necessary to satisfy EPA's Nine Key Elements required for watershed planning.

The SJWG has been awarded three grants from the New Mexico Environment Department since the completion of the 2005 SJBWMP (Phases I-III of the Collaborative Water Quality Improvement Project for the San Juan Watershed; https://sites.google.com/site/sanjuanwatershedgroup/projects/reports), which funded studies and implementation of associated BMPs. The Animas Nutrient Study, the Irrigation Ditch Nutrient and Bacteria Study, and a portion of the Stormwater Nutrient and Bacteria Study were conducted on the Animas River to identify activities and land use practices that were contributing sources of plant nutrients. The results indicate that a variety of non-point source activities have a cumulative impact in increasing nutrient levels from the Colorado border with New Mexico to the confluence with the San Juan River.

Nutrient enrichment is not only a function of nutrient loading, but also a function of diminished assimilative capacity. Channel modification and other disturbances to the floodplain can adversely affect assimilative capacity. Examples of channel modification and floodplain disturbance include:

- Improper rip-rap and poorly engineered bank stabilization projects
- Loss of wetlands and native riparian habitat
- Bank hardening and cut banks

Stormwater studies done on the San Juan and the La Plata rivers identified land use practices as possible contributing sources of *E. coli* bacteria, but this has not yet been investigated on the Animas River. Probable sources of fecal coliform and *E. coli* bacteria include:

- Livestock grazing and flood irrigation of grazed pasture
- Livestock grazing and holding along perennial streams

- Stormwater runoff from pasture and rangeland
- Stormwater runoff from large ephemeral washes (e.g. Canyon Largo)
- Septic systems and leaking sewage infrastructure

The crucial data gap in all of the above studies conducted by the SJWG is that they do not identify the extent to which the above land uses are present throughout the landscape, or ways to prioritize implementation projects in order to have the maximum reduction in pollutant loading.

SJWG's recent activities have focused on further identifying the sources of nutrients impairment and *E. coli* bacteria in the San Juan River and Animas River. The SJWG is in the process of conducting a Microbial Source Tracking (MST) Study, to be completed in 2014, that is designed to identify the source of *E. coli* bacteria in the river as human, cattle, horse, dog, or waterfowl. The MST and Lower Animas WBP studies will allow for implementation of targeted BMPs that address specific sources of bacteria and nutrients in the rivers. The Lower Animas WBP will augment previous studies and the current MST study to provide the detailed, local scale information necessary to address bacterial water quality issues along the lower Animas River.

1.0 PROJECT MANAGEMENT

1.1 Title and Approval Page (EPA QA/R-5 A1) - See page 1.

1.2 Table of Contents (EPA QA/R-5 A2) - See pages 2 - 3.

1.3 Distribution List (EPA QA/R-5 A3)

San Juan Soil & Water Conservation District will serve as the grantee and project manager. David Tomko/SJWG and Ann Oliver/AWP will lead outreach and stakeholder engagement. Mountain Studies Institute (MSI) with Basin Hydrology as a subcontractor will serve as the technical contractor as a nonprofit partner to assist with hydrologic modeling, field sampling campaign, and water quality analysis to develop the Lower Animas WBP.

Table 1.3: Distribution List and Project Roles and Responsibilities

Name	Organization	Position/Role	Responsibility for	Contact Information
Jeff Scarano	SWQB	MASS Program Manager	Review and approve QAPP; manage project personnel and resources	(505) 827-2814 jeff.scarano@state.nm.us
Jodey Kougioulis	SWQB	QA Officer	Reviewing and approving QAPP	(505) 827-2820 jodey.kougioulis@state.nm.us
Neal Schaeffer*	SWQB	319 Project Officer	Review and approve QAPP; manage project personnel and resources	505-476-3017 neal.schaeffer@state.nm.us
Arlene Gaines	EPA	Environmental Protection Specialist	Review and approve QAPP	(214) 665-7163 gaines.arlene@epa.gov
Curry Jones	EPA	Chief, State and Tribal Programs Section	Review and approve QAPP	(214) 665-8093 miller.donna@epa.gov
Emma Lee Deyo	SJ SWCD	Senior Project Manager	Manage and oversee grant finances and contracts	(505)334-3090 x108 emma.deyo@sanjuanswcd.com
Melissa May*	SJ SWCD	Project Manager	Prepare QAPP, coordinate project	(505)334-3090 x109 melissa.may@sanjuanswcd.com
David Tomko*	SJWG	Watershed Coordinator	Assist in QAPP preparation, provide historic data, and collect data	(505) 632-8008 jtomko73@msn.com
Ann Oliver	AWP	Watershed Coordinator	Report data, coordinate citizen involvement and outreach	(970) 903-9361 annsoliver@gmail.com
Marcie Bidwell	MSI	Executive Director	Assist in QAPP preparation, report data, quality assurance	(970) 387-5161/(970) 426-8863 marcie@mountainstudies.org
Aaron Kimple	MSI	Project Manager, Lead Sampler	Coordinate field sampling, sampling plan, data management, and reports	(970) 387-5161/(970) 749-7916 akimple@mountainstudies.org
Anthony Culpepper	MSI	Research Assistant	GIS data and field sampling	(970) 387-5161/(912) 222-7693 anthony@mountainstudies.org
Mark Oliver	Basin Hydrology	Hydrology Specialist	Design sampling plan, analysis, modeling	(970) 387-5161/(970) 903-0366 mark@basinhydrology.com

1.4 Project Organization (EPA QA/R-5 A4)

Senior Project Grant Manager - Emma Deyo will be responsible for reviewing and approving the QA Project Plan. She may provide technical input on proposed sampling design, analytical methodologies, and data review. She may assist with coordinating laboratory services.

Project Manager (Grantee) – Melissa May will have overall responsibility for assigning appropriate personnel and partners to complete the tasks included in this plan. She will ensure that the project partners adhere to the project budget. She will communicate with the SWQB Project Coordinators on work accomplished in this plan and any problems or deviations that need to be resolved. She will coordinate the efforts of the project contractors.

Watershed Coordinators - Dave Tomko and Ann Oliver will be responsible for coordinating efforts related to this project with other ongoing efforts within the watershed. They will communicate project needs to the contractor's project manager.

Technical Contractor Leads – Marcie Bidwell, MSI, will be responsible for coordinating PQAPP execution and oversight of sampling and laboratory efforts for this project. She will assign MSI staff to assist with data management, analysis, land use assessment, and compilation of the final report, as it relates to analyses for the Lower Animas WBP.

Field Sampling Lead – Aaron Kimple, MSI, will be responsible for assigning field samplers their specific tasks and objectives and ensuring PQAPP is followed in the field. He has overall responsibility for all field activities. He will report to the Contractor Project Manager.

Hydrology Specialist—Mark Oliver, Basin Hydrology, will serve as the hydrology specialist. Mark will assist with geomorphology, site selection, field sampling, and modeling solutions for the analysis.

Laboratory Analysis Leads

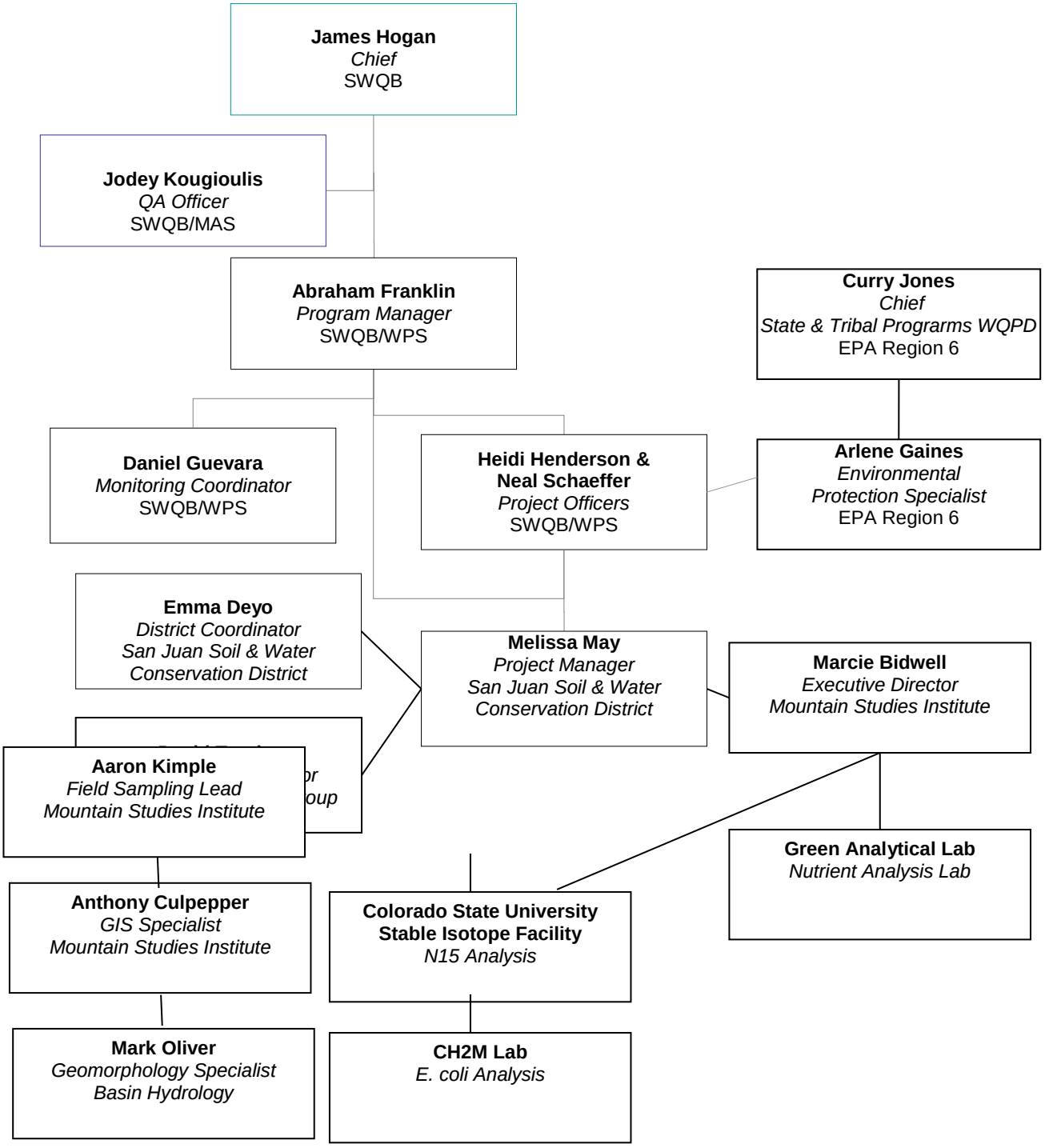
Monica Peterson will be the contact person for OMI-CH2M Hill laboratory (Farmington, NM 505-325-6953) and will oversee all analysis and laboratory QA/QC for *E.coli* (IDEXX standard method 9223b-2004). OMI-Ch2M Hill uses EPA approved methods for all analyses and conducts QA/QC methods on all analyses.

Jacob Miller at Green Analytical Laboratory (GAL) (Durango, CO 970-247-4220) will conduct all analysis and laboratory QA/QC for nutrient constituents specified in this plan, except for E.coli and N15 analysis. GAL uses EPA approved methods for all analyses. GAL's Quality Manual is updated annually and can be provided upon request.

Dan Ruess at the Colorado State University EcoCore Analytical Services Stable Isotope Facility (CSU 970-471-5573) will conduct all analysis and laboratory QA/QC for the N15 analysis. The calibration standards are the nitrates USGS 32, USGS 34, and USGS 35, and are supplied by NIST (National Institute of Standards and Technology, Gaithersburg, MD). Additional standards are included in each batch to monitor and correct for instrumental drift and linearity.

Other Key Project Positions – Anthony Culpepper (MSI) will coordinate GIS and mapping to address pollution sources and sampling locations.

Figure 1.4: Organization Chart



1.5 Problem Definition/Background (EPA QA/R-5 A5)

Goal: To characterize the timing, magnitude, and source of nutrient pollution and subsequent TMDL, E. coli, and chlorophyll-a in the lower Animas River between Estes Arroyo in Aztec NM to the confluence with the San Juan River at Farmington NM. The compiled information will relate water quality data to land use and pollutant sources, identify the BMPs that will best address these sources, and create a strategic plan that managers can use to move forward with implementation.

The lower Animas River includes 36.52 impaired stream miles and 16.92 miles covered by a current TMDL. Segments of the Animas are listed on the 2012-2014 Clean Water Act (CWA) Section 305(b)/303(d) list for the following impairments:

- Animas River Watershed (14080104)(Figure 1)
  1. Animas River (San Juan River to Estes Arroyo) **NM-2403.A_00**
     Nutrients, *E. coli* Bacteria, Temperature, and Turbidity
  2. Animas River (Estes Arroyo to Southern Ute Boundary) **NM-2404_00**
     Phosphorus, *E. coli* Bacteria, Temperature, Turbidity, and Sedimentation

Previous studies have been too short or erratic in duration or scope to provide an adequate baseline of nutrient loads within the watershed, and were inconclusive in identifying the sources of these pollutants.

1.6 Project/Task Description and Schedule (EPA QA/R-5 A6)

The Lower Animas Watershed Based Plan will focus on 17 sites identified from the 2006 nutrient study as “hot spots” for high load contributors of nitrogen, phosphorus, or both. For these targeted sites 44 subsamples have been identified to capture information both by 12-digit HUC and by the assumed catchments for each of the 17 sites. All sites and subsamples are within the Animas River Watershed (HUC 14080104) to specifically address six 12-digit HUCs within the New Mexico reaches of the river, herein referred to as the Lower Animas (Figures 1.6a and 1.6b). Quantitative analysis of pollutant loading, chlorophyll-a, and *E. coli* will be focused solely within these six subwatersheds:

HUC 140801041001	Cox Canyon	40.78 mi^2
HUC 140801041002	Ditch Canyon - Animas River	57.36 mi^2
HUC 140801041003	Tucker Canyon - Animas River	43.00 mi^2
HUC 140801041004	Estes Arroyo - Animas River	57.83 mi^2
HUC 140801041005	Flora Vista Arroyo - Animas River	42.82 mi^2
HUC 140801041006	City of Farmington - Animas River	33.36 mi^2

The Animas River from its confluence with the San Juan River (at Farmington, NM) upstream to Estes Arroyo in Aztec, NM (NM-2403.A_00) is the priority stream reach addressed by this project. The subwatersheds listed above are those that flow directly into or are immediately upstream of this reach. This includes 36.52 impaired stream miles and 16.92 miles covered by a current TMDL.

A large amount of water quality data has been collected by the San Juan Watershed Group (SJWG) and other regional partners (Animas Watershed Partnership, Southern Ute Indian Tribe, Colorado Department of Public Health and Environment, NMED, USGS, etc.) for watersheds outside of the Lower Animas, both upstream within the Animas River Watershed and in neighboring HUCs in the San

Juan River Basin (Figure 1). The Lower Animas Watershed Based Plan (Lower Animas WBP) will incorporate this existing information into a watershed characterization to the extent that it aids the planning process, overlaps with the population center served by the SJWG, and facilitates an inclusive approach to correcting water quality impairments. This includes the Animas River Watershed (HUC 14080104) upstream of the New Mexico- Colorado/Southern Ute Indian Tribe state line, Upper San Juan Watershed (HUC 14080101) downstream of Navajo Reservoir, Blanco Canyon (better known as Canyon Largo, HUC 14080103) and the Middle San Juan Watershed (HUC 14080105) within New Mexico and upstream of the Navajo Nation boundary.

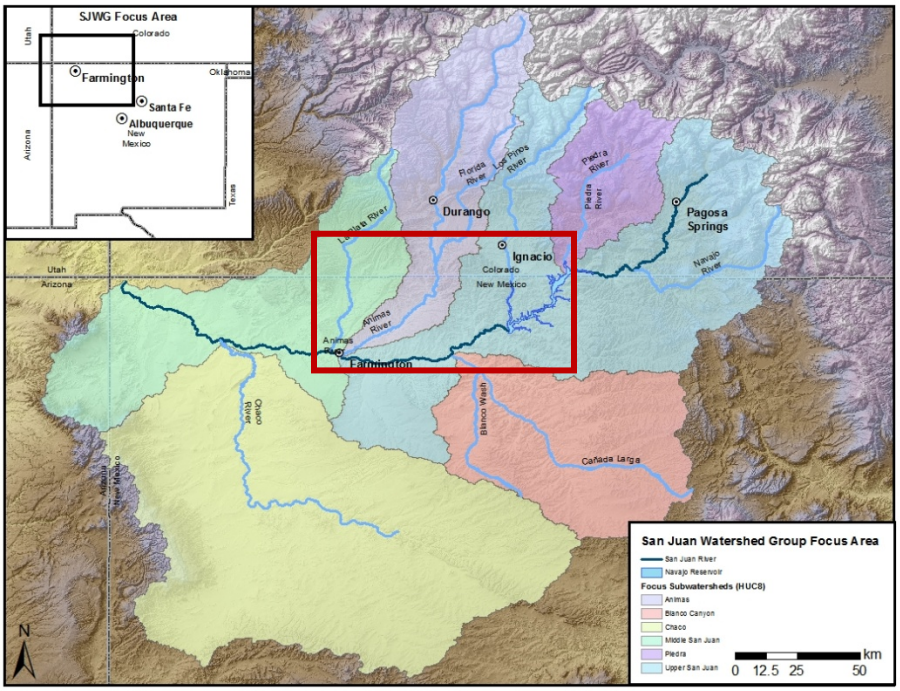


Figure 1.6a: Regional watershed map highlighting Animas River Watershed

General focus area of the San Juan Watershed Group is highlighted in red. Animas River Watershed (HUC 14080104) is shown in light purple.

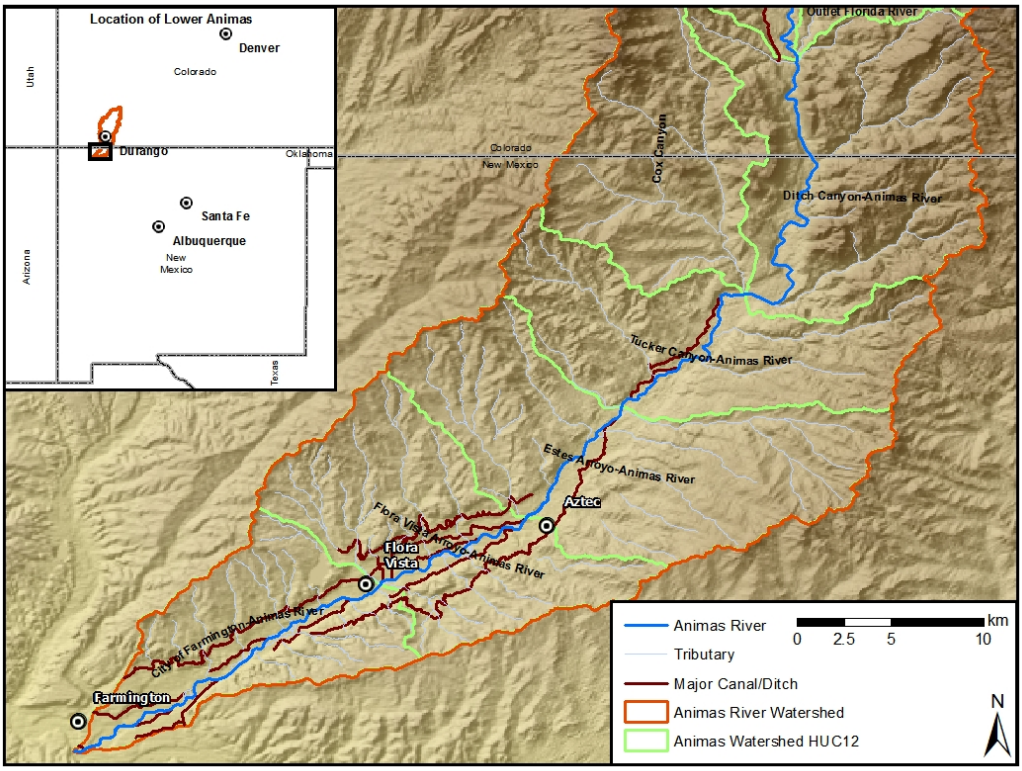
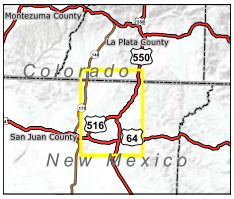


Figure 1.6b: Six priority HUC12 watersheds of Lower Animas Watershed Based Plan

The six subwatersheds of the LAWBP study area are shown in green and irrigation ditches in dark red.



Lower Animas Watershed Plan

2006 Sites Targeted for 2014 Sampling

3 UTM Zone 13N Date: 3/13/2014

Figure 1.6c: Sites targeted for 2014 water quality sampling

Schedule

The nutrient sampling will be conducted during three distinct hydrologic flow regimes from April-October 2014: Run-off (April-May), Monsoonal (July-August), and Base (September-October) flows.

Table 1.6: Sampling schedule for 2014 nutrient monitoring program.

Site numbers (#)'s are based on priority sites designated in the Lower Animas River Nutrient Source Identification report (B.U.G.S. Consulting 2007).

Sampling Period	Site#	Site Subsample IDs[1]	Land Use
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	20	20_R_b_IS 20_R_a_ID	AG-LowDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	22	22_R_a_IF 22_R_b_IS	AG
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	25	25_R_a_IF 25_R_b_ID 25_R_c_ID 25_R_d_ID	AG-LowDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	27 Lower	27_R_a_IF 27_R_b_ID 27_R_c_ID 27_R_d_IA	Native-AG-LowDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	27 Upper	27_R_e_IA	Native-AG-LowDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	41 Lower	41_R_b_ID 41_R_c_IA 41_R_d_ID	Native-AG-LowDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	41 Upper	41_R_e_IA	Native-AG-LowDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	45	45_L_a_ID 45_L_b_ID	AG-MedDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	49	49_L_a_ID 49_L_b_IA 49_L_C_ID	AG-MedDenRes

Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	52	52_L_a_ID 52_L_b_ID	AG-MedDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	55	55_L_a_ID 55_L_a1_IF 55_L_b_ID 55_L_c_ID	Native-Urban
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	68	68_R_a_ID 68_R_b_ID	Native-Urban
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	69	69_L_a_ID 69_L_b_ID 69_L_c_ID	AG-MedDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	70	70_L_a_ID 70_L_b_ID 70_L_c_ID	AG-MedDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	72	72_L_a_IF 72_L_c_ID	AG-MedDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	73	73_R_a_IF 73_R_b_ID	AG-MedDenRes
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	89	89_R_a_ID 89_R_c_IF	HighDesRes-Urban
Run-off (April-May) & Monsoonal (July-August) & Base (Sept-Oct)	92	92_L_a_ID 92_L_b_IF	HighDesRes-Urban
Total Sites	**17**		
Total Subsamples	**44**		
QC Samples (~10%)		**Approx. 5 subsamples**	

[1]Site Subsample ID's list the site # from the 2006 field season (see B.U.G.S. 2007), location on river Left (L) or Right (R), subsample # at site using letters (i.e. a = 1, b = 2, c = 3, etc.) and subsample Land Use (ID = In Ditch, IA = In Arroyo, IS = In Stream, IF = In Flow). Blanks and duplicates will be identified with a "B" or "D" respectively. The project team will secure permission to access the sites listed below from property owners and appropriate agencies; therefore, final site selection may be adjusted from this list if access is not available.

1.7 Quality Objectives and Criteria for Measurement Data (EPA QA/R-5 A7)

1.7.1 Objectives and Project Decisions

The baseline data collection of Lower Animas WBP is intended to answer the following questions: What are the most probable causes and locations of nutrient pollution within the project reach? To answer this question, presence/absence of nutrient sources will be compared with flow data and timing and magnitude of nutrient pollution. Moreover, collection sites have been selected to bracket reaches with differing sources (i.e. septic, agricultural runoff) to inform managers for future restoration efforts.

Stated as a decision: The information gathered by the Lower Animas WBP will provide baseline information associated with potential land use sources that will enable development of reach-specific and impairment-specific restoration measures.

1.7.2 Action Limits/Levels

The quality of the data will be adequate to provide a high level of confidence for development of reach-specific and impairment-specific restoration measures, and to be used in impairment assessments by SWQB staff.

1.7.3 Measurement Performance Criteria/Acceptance Criteria

The measurement quality objectives will be sufficient to achieve the Data Quality Objectives and will be in conformance with those listed in the Bureau QAPP.

See Table 2.5.1 Quality Control Requirements for Laboratory Analyses
See Table 2.5.2 Quality Control Requirements for Field Measurements

1.8 Special Training Requirements/Certification (EPA QA/R-5 A8)

This project will be implemented by staff from MSI, SJWG, AWP, Basin Hydrology, and volunteers. The lead sampler for MSI will be Aaron Kimple M.S., who will be responsible for data collection and for following the requirements of the Bureau QAPP and the methodologies outlined in this PQAPP. Under the direction of Mr. Kimple, MSI project staff are responsible for data collection and for following the requirements of the PQAPP and other specified data collection methodology. David Tomko, M.S., and Melissa May, M.S., (approved for sample collection under the MST 604 PQAPP) will be the backup lead samplers. May, Tomko, and MSI all have extensive experience collecting water quality samples and following established protocols. Samples will be collected in the field by one lead sampler accompanied by one SJWG volunteer. Volunteers will be briefed on the sampling protocols by the lead samplers, and will only collect samples in the presence of a lead sampler. Training of volunteers will be in accordance with the Bureau QAPP. No further specialized training is required for SWQB staff.

1.9 Documents and Records (EPA QA/R-5 A9)

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

Project documents include this PQAPP, field notebooks, calibration records, sonde download data, validation and verification records, sample collection data, records of analytical data in hard copy or in electronic form and QC records. Documents will be maintained in accordance with the requirements of the PQAPP.

Table 1.9: Reporting Format and Storage

Monitoring Technique	Reporting Format	Storage Location And Time
INDIRECT MEASUREMENTS		
Flow measurements from nearest USGS gage	Data recorded in field notebook, transferred to Excel spreadsheets, double checked later when final data released	Paper copies in project file, electronic copies on CD and hard drive at SWQB and SJSWCD.
INDIRECT MEASUREMENTS		
Nutrient lab results (TKN, N03 & NO2, TP)	Chain of custody sheets, Excel spreadsheet of results from Green Analytical Lab (GAL)	Paper copies in project file, electronic copies on CD and hard drive at Green, SWQB, and SJSWCD.
N15 lab results - ^{15}N from solid periphyton	Chain of custody sheets, Excel spreadsheet of results from the UC Davis laboratory	Paper copies in project file, electronic copies on CD and hard drive at CSU Stable Isotope Lab, SWQB, and SJSWCD
Chlorophyll-a and Ash Free Dry Mass (AFDM)	Chain of custody sheets, Excel spreadsheet of results from Green Analytical Lab (GAL)	Paper copies in project file, electronic copies on CD and hard drive at SWQB and SJSWCD.
E. coli IDEXX	Chain of custody sheets, Excel spreadsheet of results from Farmington lab (OMI-CH2M)	Paper copies in project file, electronic copies on CD and hard drive at SWQB and SJSWCD.
Field measurements and Sonde Data (pH, Temperature, DO, Flow, Conductivity,)	Data recorded in field notebook, transferred to Excel spreadsheets	Paper copies in project file, electronic copies on CD and hard drive at SWQB and SJSWCD.

All field and laboratory data will be summarized in an Excel spreadsheet to be submitted as an Appendix to the final report.

2.0 DATA GENERATION AND ACQUISITION

2.1 Sampling Design (Experimental Design) (EPA QA/R-5 B1)

The LAWBP study has been designed to collect nutrients, flow, and ambient water quality data at regular intervals spanning the major changes in river flow throughout the year. Sampling will occur during three distinct periods to capture spring run-off and the first flush of irrigation water (April-May),

monsoonal flows (July-August), and post-monsoon baseline flows (September-October). Twenty two sites have been designated priorities based on previous sampling (B.U.G.S. 2007 and Anderson et al. 2011) and within each site 2-5 subsampling areas will be sampled, each with a different in-flow source (ex – in ditch, in stream, in flow, in arroyo). Quality control and assessment processes will use field blanks and field replicates to assess overall quality of sampling and laboratory analysis. For nutrient analysis 10% of field sites (approximately 5 sites) will have blanks and replicates collected. We will attempt to collect 10% of *E. coli* sites for quality assessment. N15 sampling will provide sufficient material for laboratory replicates and approximately 5% of sites will include field blanks.

Sites were selected with two criteria in mind: 1) Sampling in areas with known pollution problems to increase chances of identifying and correcting these sources; 2) Bracketing inflows and possible sources.

2.2 Sampling Methods (EPA QA/R-5 B2)

Direct samples: Methods for samples collected directly under the Lower Animas WBP PQAPP:

Nutrients - Nitrogen and Phosphorus: SOP 8.1, 8.2 – Chemical Sampling; SOP 10.0 – Nutrient Sampling. Using the sample bottles provided by GAL, label the bottle, and record in field notebook and chain of custody sheet.

Site Name (# corresponding to B.U.G.S. 2007 report)
ID = Site#_River Left or Right_Subsample letter_Location (ID=in ditch, IS= in stream, IF=inflow, IA= in arroyo)_Type (S=Sample, D=duplicate or B=blank)
Example = 45_L_a_ID_S
2013-04-01 (YYYY-MM-DD)
13:45 (military time)
M.May (sampler's first initial and last name)

Collect a sample using the 500 mL bottle attached to the sampling pole, filling the bottle in the highest-flowing section of the river. Decant water into labeled bottle to the designated mark, replace cap. Follow all procedures recommended by GAL.

Following SOP 8.2 Chemical Sampling in Lotic Environments, a field blank will be collected at a rate of 10% of the total number of samples collected for nutrients.

E.coli Procedure: SOP 9.1 – Bacteriological Sampling
Using the 125mL sample bottles provided by OMI-CH2M, label the bottle, and record in field notebook and chain of custody sheet.

Site Name (# corresponding to B.U.G.S. 2007 report)
ID = Site#_River Left or Right_Subsample letter_Location
Example = 45_L_a_ID
2013-04-01 (YYYY-MM-DD)
13:45 (military time)
M.May (sampler's first initial and last name)

Collect a sample using the 500 mL bottle attached to the sampling pole, filling the bottle in the highest-flowing section of the river. Decant 100mL of water into labeled CH2M bottle to the marked shoulder. Cap when filled. During transit, samples must be held at 1-4C. Samples must be delivered to CH2M Environmental Laboratory by 3 PM on day of sampling, within 4-6 hours of collection. Laboratory

analysis must begin no later than 8 hours after collection or the sample will not be useable.

N15 methods - Analysis of ^{15}N from periphyton: SOP 11.2 – Periphyton Sampling
At each site periphyton were collected by scraping an area of 10 cm^2 from substrate. Collect samples using a 500-1000 mL bottle or whirlpak and following methods in SOP 11.2. Keep samples chilled and in darkness during field work. Samples must be filtered or frozen within 12 hours of collection. The dislodged periphyton and liquid will be placed into a labeled container and stored on ice. Following the periphyton collection, the longest axis of each rock was measured and recorded. Within 10 hours of collection, samples will be filtered on ashed glass fiber filters and stored frozen. Periphyton samples which consisted of clumps or filaments will be blended prior to filtration. Within 3 days, the frozen filter samples will be dried at 60°C, and then encapsulated in tin capsules. Samples will be shipped to the isotope laboratory for analysis.
In the field, samplers will label the bottle, and record in field notebook and chain of custody sheet.

Site Name (# corresponding to B.U.G.S. 2007 report)
ID = Site#_River Left or Right_Subsample letter_Location
Example = 45_L_a_ID
2013-04-01 (YYYY-MM-DD)
13:45 (military time)
M.May (sampler's first initial and last name)

Chlorophyll-a methods: SOP 11.2 – Periphyton Sampling
Using the 500-1000ml sample bottles, label the bottle, and record in field notebook and chain of custody sheet.

Site Name (# corresponding to B.U.G.S. 2007 report)
ID = Site#_River Left or Right_Subsample letter_Location
Example = 45_L_a_ID
2013-04-01 (YYYY-MM-DD)
13:45 (military time)
M.May (sampler's first initial and last name)

Determine type of sampling method based on river/water characteristics (large river method, targeted riffle method, or reach wide multi-habitat method). Establish five equidistant transects following protocols in section 6.1.3.1 (Reach Layout of SOP 5.0). Record the habitat and dominant substrate type at each sample location. Use appropriate sampling method for substrate type (ring method for cobble and gravel, or woody snags). Collect samples using a 500-1000 mL bottle and following methods in SOP 11.2. Keep samples chilled and in darkness during field work. Samples must be filtered or frozen within 12 hours of collection. Samples can be frozen for 28 before analysis for chlorophyll-a.

Sonde Measurements:
MSI and SJWG staff will collect sonde data (DO, pH, temperature, turbidity, and conductivity) using the same sampling sites and sampling period for Nutrient Survey and Sampling SOP 10.0. All sampling will be done by MSI and SJWG staff in accordance with the Bureau QAPP. Either YSI ProPlus of Horiba U-52 meters will be used to collect the data and all calibration, cleaning, and maintenance will following manufacture's guidelines (See Table 2.5.2: Quality Control Requirement for Field Analyses).

In-direct samples: Methods for samples collected in-directly under this PQAPP for the LAWBP study:

Flow Measurements: USGS gaging stations will be used to approximate flow at the five sampling sites. Most recent instantaneous flow at five gaging stations will be recorded in the field notebook each morning before sampling begins. This will serve the dual purpose of ensuring safety of the samplers (avoiding extremely high flow conditions or taking the appropriate safety precautions) and providing a flow estimate for comparison to other sampling sites/dates.

Final flow measurements will be obtained and entered into the database once USGS changes its flow data from provisional to final (~6months from time of sampling).

In field flow measurements will be conducted, where feasible and safe, for subsample locations from ditches and arroyos. In field flow measurements will conform to USGS protocols and will be conducted with either mechanical or electromagnetic flow meters. For sites with low flow or that are too shallow to measurement with a flow meter, estimations will be made as needed. Any flow calculated as an estimate will be noted as such in the data QAQC.

2.3 Sample Handling and Custody (EPA QA/R-5 B3)

Table 2.3. Analytical Method, Containers, Preservation, and Holding Times Requirements

Matrix/Media:

Analytical Parameter[1] and/or Field Measurements[2]	Analytical Method Number	Containers (number, size/volume, type)	Preservation Requirements (chemical, temperature, light protection)	Maximum Holding Times[3]
ANALYTICAL PARAMETER:				
E.coli	SOP 9.1	125 mL sterile polypropylene containing sodium thiosulfate	Ice, dark cooler	4 hrs to lab, 6 hrs to analysis
TKN	EPA 351.2	Poly H2SO4 - 250mL	pH<2 H2SO4; Cool 4°C	28 days
NO3+NO2	EPA 353.2	Poly H2SO4 - 125mL	pH<2 H2SO4; Cool 4°C	28 days
TP	EPA 365.3	Poly H2SO4 - 500mL	pH<2 H2SO4; Cool 4°C	28 days
N15	Sigman et al. 2001 and Casciotti et al. 2002	500- 1000 mL HDPE Nalgene bottle or whirlpak	Filtered and frozen	3 months (possibly longer)
FIELD MEASUREMENTS:				
Temperature	SOP 6.2	na	na	na
Dissolved	SOP 6.2	na	na	na

Table 2.3. Analytical Method, Containers, Preservation, and Holding Times Requirements

Matrix/Media:

Analytical Parameter[1] and/or Field Measurements[2]	Analytical Method Number	Containers (number, size/volume, type)	Preservation Requirements (chemical, temperature, light protection)	Maximum Holding Times[3]
Oxygen (DO)				
pH	SOP 6.2	na	na	na
TDS	SOP 6.2	na	na	na
Conductivity	SOP 6.2	na	na	na
Photopoints	SOP 4.3	na	na	na
Optical Brightners	SOP 6.2	na	na	na

[1] Analytical parameter includes both field and laboratory analyses.
[2] Field measurement parameters include those parameters measured directly in the field (e.g., dissolved oxygen, turbidity, pH, etc.).
[3] Maximum holding times include all pertinent holding times for each analytical parameter (e.g., from sample collection to sample preparation, from sample preparation to analysis, from sample collection to analysis, etc.) and field measurement (e.g., from sample collection to measurement).

2.4 Analytical Methods (EPA QA/R-5 B4)

2.4.1 Field Measurements Methods

Sonde Measurements (pH, conductivity, temperature, dissolved oxygen)

Field measurements methods for sonde/YSI will be consistent with previous study. See Sampling and Analysis Plan for Animas River: Surface Water Sampling for Impacts of Nutrients (B.U.G.S. 2009)

2.4.2 Field Analyses Methods

Instantaneous readings from YSI meters do not require analyses in the field, although instruments will be calibrated, cleaned, and maintained according to manufacturer's guidelines (See Table 2.5.2: Quality Control Requirement for Field Analyses).

2.4.3 Laboratory Analyses Methods (Off-Site)

Nutrient Analysis (Green Analytical Labs in Durango, CO): see Table 2.5.1 for EPA analysis methods.

E. coli (Ch2M Hill Lab in Farmington, NM): IDEXX method following NMED SOP 9.1 (See Table 2.5.1) and standard method 9223b-2004.

δ^{15}N (Colorado State University Stable Isotope Lab) - Analysis of ^{15}N

Solid sample ^{15}N analysis is completed by Carlo Erba NA 1500 (Milano, IT) elemental analyzer coupled to a VG Isochrom continuous flow IRMS (Isoprime Inc., Manchester, UK). Final δ^{15}N values are calculated by adjusting the provisional values such that correct δ^{15}N values for an internal check are

obtained. The calibration standards are the nitrates USGS 32, USGS 34, and USGS 35, and are supplied by NIST (National Institute of Standards and Technology, Gaithersburg, MD). Additional standards are included in each batch to monitor and correct for instrumental drift and linearity (Sigman et al. 2001; Casciotti et al. 2002). Samples expected to contain nitrogen (> 0.4g) should the prepared according to Granger and Sigman (2009) prior to submission to the CSU.

See Table 2-3. Analytical Method, Containers, Preservation, and Holding Times Requirements

Table 2.4.3 Analytical Parameters and Laboratory Limits

Analytical Parameter[1]	Laboratory Limits[2] (applicable units)	
	Quantitation Limits (MRL)	Detection Limits (if appropriate)(MDL)
TKN	0.500mg/L	0.344mg/L
NO3/NO2	0.0200mg/L	0.0101mg/L
Total Phosphate	0.0500mg/L	0.0163mg/L
E. coli	1.0 MPN/100ml	1.0 MPN/100ml
N15	0.4 for 15N on filter	0.4 for 15N on filter

[1] Analytical parameters include both field and laboratory analyses.
[2] Laboratory quantitation limits and detection limits are those that an individual laboratory or organization is able to achieve for a given analysis on a routine basis.
C Quantitation limits are the minimum concentrations that can be identified and quantified above the detection limit within some known limits of precision and accuracy/bias. It is recommended that the quantitation limit is supported by the analysis of a standard of equivalent concentration (typically, the lowest calibration standard).
C Detection limits are the minimum concentration that can be detected above background or baseline/signal noise of an instrument.

2.5 Quality Control Requirements (EPA QA/R-5 B5)

Table 2.5.1 Quality Control Requirements for Laboratory Analyses

QC Sample:	Data Quality Indicator (DQI)	Frequency/ Number	Method/SOP QC Acceptance Limits
LABORATORY ANALYSIS:			
TKN	Field Blank & Duplicate sample	**10%**	**EPA 351.2 & NMED SOP 8.2**
NO3+NO2	Field Blank & Duplicate sample	**10%**	**EPA 353.2 or EPA 300.0 & NMED SOP 8.2**
N15	Field Blank	**<10%**	**nitrates USGS 32, USGS 34, and USGS 35, and are supplied by NIST**
TP	Field Blank & Duplicate sample	**10%**	**EPA 365.3 & NMED SOP 8.2**
Chlorophyll-a & AFDM	na	**0%**	**NMED SOP 11.2**
***E.coli* IDEXX**	Field blank	**<10%**	**SM 9222 G. & NMED SOP 9.1**

2.5.2: Quality Control Requirements for Field Analyses

Table 2.5.2: Quality Control Requirements for Field Analyses
Water Samples for Analyses of Total Nutrients

QC Sample:	Data Quality Indicator (DQI)	Frequency/ Number	Method/SOP QC Acceptance Limits	Acceptance Criteria/ Measurement Performance Criteria[1]	Corrective Action
FIELD ANALYSIS:					
pH[1]	Meter Standardization	Initially	NMED SOP 6.1	Refer to manufacture's instructions	See manufacture's instructions for calibration and electrode care
	Calibration	Daily	NMED SOP 6.1	A minimum of 2 primary or secondary standard buffers must be used; Buffers must bracket expected pH of sample; Buffers must be 3 or more pH units apart;	1. Allow buffer temperatures to reach equilibrium 2. Repeat measurement with successive volumes of fresh buffer until acceptance criteria are met 3. Replace electrode(s) (follow

				Buffer readings must be within 0.05 pH units of buffer's true value	manufacture's instructions)
	Buffer pH Check	Check a calibration buffer solution after every 10 samples (minimum)	NMED SOP 6.1	<±0.1 pH unit difference	1. Repeat measurement with successive volumes of fresh buffer until acceptance criteria is met before continuing analysis 2. Recalibrate meter and re-analyze samples
Temperature (°C)	Compare meter to aquatic thermometer	Every sample	NMED SOP 6.1	<2 Ec difference from buffer	Refer to manufacture's instructions concerning the pH meter temperature compensating function
Flow meter	Compare to nearby USGS flow gauge	Weekly	NMED SOP 7.0	na	na
Dissolved Oxygen (DO)	Calibration	Daily	NMED SOP 6.1	±2% of calibrated instrument (see YSI Dissolved Oxygen Measurement FAQ's)	Refer to manufacture's instructions
Turbidity	Calibration	Daily	NMED SOP 6.1	±2% of calibration standards	Refer to manufacture's instructions

[1] – Source EPA Region 9 Data Quality Indicators (pH in Liquid SW-846 method 9040)

2.5.3 Laboratory Analysis Quality Control

Duplicates, field and lab blanks will be completed by the laboratory for all water chemistry analyses. Data verification and validation will follow NMED SOP 15.0 and should be done by the responsible lab. Duplicates, field and lab blanks will be properly labeled, identified on the COC record, and labs will be notified of labeling method to facilitate QC procedures. QC samples will account for 10% of the total samples collected.

2.5.4 Data Quality Indicators

Measurement data quality will be monitored using the quantitative and qualitative data quality indicators described in Section 1.5 of the SWQB QAPP (SWQB, 2013).

Data Quality Indicators

Data Quality Indicator	Data Acquisition
Precision	Precision will be ensured by consistently assigning the same people the responsibilities of collecting, recording and analyzing data. If resources allow, replicate field data may be obtained.
Accuracy	Accuracy based on the use of methods determined to be reliable
Bias	Bias will be reduced by using professional and experienced staff to collect and analyze data
Representativeness	Nearly all sites deemed to be part of the reference data set will be sampled. Sample selection is representative of the entire sample unit.
Comparability	This project will collect new data where no data is available for comparison. However methods for data collection are standardized and reproducible.
Completeness	All known sites within the subclass were selected to cover the range of conditions.

Nutrients: Following SOP 8.2 Chemical Sampling in Lotic Environments, a field blanks and replicates will be collected at a rate of 10% of the total number of samples collected for nutrients. See Table 1.6 for details.

E.coli: Field blanks will be collected at a rate that budget permits, with a goal of 10% of the total number of samples collected for E.coli.

N15: Field blanks will be collected at a rate that budget permits, with a goal of 10% of the total number of samples collected for N15.

2.6 Instrument/Equipment Testing, Inspection, and Maintenance (EPA QA/R-5 B6)

Field Measurements:
In-stream measurements will be completed using YSI 85 and 100 meters to determine pH, temperature, conductivity, and dissolved oxygen. YSI meters will be tested for proper operation, battery power, and sensors will be cleaned and DO membrane rinsed per manual guidelines. GPS units will be tested for operation, battery power, satellite signals, and proper date/time and datum. Flow meter

Lab Analyses:
Green Analytical Laboratories (nutrients), CH2M (*E. coli*), and EcoCore Analytical Services at Colorado State University (N15) are responsible for all testing, inspection, and maintenance of their lab instruments, including all standard QA/QC processes and SOP's necessary under their EPA certification.

2.6.1 Field Measurement Instruments/Equipment

Calibration and maintenance of all field instruments will follow manufacture's guidelines and instructions.

2.7 Instrument/Equipment Calibration and Frequency (EPA QA/R-5 B7)

2.7.1 Field Measurement Instruments/Equipment

See Table 2.5. Quality Control Requirements for Field Analyses of Water Samples for Analyses of Total Nutrients

2.8 Inspection/Acceptance Requirements for Supplies and Consumables (EPA QA/R-5 B8)
Sampling bottles are all single-use only, and will be discarded if contamination occurs. Sample bottles are new and sterile, and caps are stored in a new sterile whirlpak while sample collection occurs. Bottles for E.coli and TN and TP collection are sterile and provided by the laboratories. If sampler touches the threads of the bottle or cap during sample collection, or otherwise suspects sample bottle contamination, bottle will be discarded.

Laboratories will follow all standard QA/QC processes and SOPs necessary under their EPA certification.

2.9 Data Acquisition Requirements (Non-Direct Measurements) (EPA QA/R-5 B9)

Flow measurements: USGS gaging stations will be used to approximate flow near the 17 sampling sites. Most recent instantaneous flow at five gaging stations will be recorded in the field notebook each morning before sampling begins. This will serve the dual purpose of ensuring safety of the samplers (avoiding extremely high flow conditions or taking the appropriate safety precautions) and providing a flow estimate for comparison to other sampling sites/dates.

Final flow measurements will be obtained and entered into the database once USGS changes its flow data from provisional to final (~6months from time of sampling).

Sampling Site	USGS Station Used	
Animas- State Line	09363500	ANIMAS RIVER NEAR CEDAR HILL, NM
Animas-Aztec	09364010	ANIMAS RIVER BELOW AZTEC, NM
Animas-Farmington	09364500	ANIMAS RIVER AT FARMINGTON, NM

2.10 Data Management (EPA QA/R-5 B10)

See Table 1.9 for details. All samples collected will be recorded in the field notebook and on the chain of custody sheets for their respective labs. Copies of chain of custody sheets will be made and retained at the SJSWCD office before delivering samples. All field measurements, notes, calibrations, USGS flows, and weather information will be retained in the lab notebook and copied to an Excel spreadsheet in the SJSWCD office before field notebook is taken out on subsequent sampling days. SJSWCD files are backed up daily on a remote server.

3.0 ASSESSMENT AND OVERSIGHT

3.1 Assessments/Oversight and Response Actions (EPA QA/R-5 C1)

The SWQB Project Officer will provide project oversight by periodically assisting with and/or reviewing data collection efforts, twice per year during the life of the project. Quarterly reports will describe the progress of the project tasks and any potential problems with task implementation or schedule. This process includes justification for adjusting the task, or the task schedule, and making adjustments to the timeline if applicable. The SWQB Project Officer will be responsible for approving any changes and ensuring changes are implemented by the designated party. All problems and adjustments to the project plan will be documented in the project file and included in the final report.

3.2 Reports to Management (EPA QA/R-5 C2)

Quarterly reports are submitted by the contractor 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.

4.0 DATA REVIEW AND USABILITY

4.1 Data Review, Verification, and Validation Requirements (EPA QA/R-5 D1)

Data will be considered usable if there is reasonable evidence that the requirements of this PQAPP were followed. Data verification and validation will follow methods stated in NMED SOP 15.0 (Data Verification and Validation procedures) including the proper flagging/coding of blank and duplicate samples, determination of sample holding times, and the use of Relative Percent Difference (RPD).

4.2 Verification and Validation Methods (EPA QA/R-5 D2)

The Project Manager will ensure that valid and representative data are acquired. Verification of field sampling and analytical results will occur in the review of data, performed by the Project Manager. Data will then be provided to the SWQB Project Officer for their review, upon request. In the event questionable data are found, the SWQB Project Officer will consult with project personnel to determine the validity of the data. Results of the verification process will be included in the final reports.

4.3 Reconciliation with User Requirements (EPA QA/R-5 D3)

The user requirement is a restatement of the data quality objective: The information gathered by the LAWBP will provide baseline information that will enable development of reach-specific and impairment-specific restoration measures.

If project results do not meet this requirement, then additional monitoring may be necessary to fill in data gaps and it may be necessary to extend the monitoring period to collect additional information.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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April 3, 2014

Mr. Jodey Kougioulis
Quality Assurance Officer
Surface Water Quality Bureau
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1190 St. Francis Drive
Santa Fe, NM 87502-6610

Dear Mr. Kougioulis:

The review of the *Quality Assurance Project Plan for the Animas and San Juan Concurrent Nutrient and Bacteria Monitoring San Juan Watershed Microbial Source Tracking Project* that was received on March 28, 2014 from the Surface Water Quality Bureau has been completed. The QAPP is submitted for completion of a task under the Clean Water Act, Section 604(b) work plan and Cooperative Agreement number C6-35000047.

The QAPP has been approved and the expiration date of the QAPP is April 3, 2015. Enclosed is the completed QAPP signature page for your record. In future correspondence relating to this QAPP, please reference QTRAK #14-215. If you have any questions, you may contact me at (214) 665-7163.

Sincerely yours,

Arlene Gaines
Project Officer
State & Tribal Programs Section

Enclosure

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Quality Assurance Project Plan
for
Animas and San Juan Concurrent Nutrient and Bacteria Monitoring
San Juan Watershed Microbial Source Tracking Project

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Acronyms

AU	Assessment Unit
AWP	Animas Watershed Partnership
BHP	BHP Billiton New Mexico Coal Company
CH2M	CH2M Hill Laboratory at Farmington wastewater treatment plant
DO	Dissolved Oxygen
EPA	United States Environmental Protection Agency
GBS	Geoffrey Smith Environmental, LLC
LAWBP	Lower Animas Watershed Based Plan
MSI	Mountain Studies Institute
MST	Microbial Source Tracking
NMED	New Mexico Environment Department
NO3+NO2	Nitrate plus Nitrite
PQAPP	Project Quality Assurance Project Plan
QA	Quality Assurance
QAO	Quality Assurance Officer
QC	Quality Control
QAPP	Quality Assurance Project Plan
SJSWCD	San Juan Soil and Water Conservation District
SJWG	San Juan Watershed Group
SM	Source Molecular Laboratories, Inc.
SOP	Standard Operating Procedures
SWQB	New Mexico Environment Department Surface Water Quality Bureau
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
USGS	United States Geological Survey
WPS	Watershed Protection Section, Surface Water Quality Bureau
WQPD	Water Quality Protection Division

INTRODUCTION

The purpose of this Project Quality Assurance Project Plan (PQAPP) is to document the necessary quality assurance (QA), quality control (QC), and other technical activities that will be implemented to ensure that the results of the work performed for the *Animas and San Juan Concurrent Nutrient and Bacteria Monitoring* project will satisfy the stated performance criteria. It will describe the activities of the title project and relevant activities from the *Microbial Source Tracking study for the San Juan River Watershed* (privately funded by BHP Billiton) in the acquisition of environmental data or information from direct measurement activities, existing data, or generated by models.

This PQAPP will cover the data collection efforts (total nitrogen and total phosphorous) described in the 604(b) work plan for the titled project and Microbial Source Tracking and E. coli collections effort from the separately funded concurrent *Microbial Source Tracking study for the San Juan River Watershed* (MST study) sampling project. The work plan states that the project will analyze the extent of exceedances, seasonality, and relationships between TN and TP, and compare them to river flow and the constituents measured in the Microbial Source Tracking study.

This PQAPP is a companion document to the Bureau QAPP (*Surface Water Quality Bureau Quality Assurance Project Plan for Water Quality Management Programs*, NMED/SWQB 2013 or most current version). The Bureau SOP (*Standard Operating Procedures for Data Collection*, NMED/SWQB 2013 or most current version) is incorporated in the Bureau QAPP by reference. Unless otherwise specified, all policies and procedures in the Bureau QAPP will be followed.

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

1.0 PROJECT MANAGEMENT

1.1 Title and Approval Page (EPA QA/R-5 A1) - See page 1.

1.2 Table of Contents (EPA QA/R-5 A2) - See pages 3.

1.3 Distribution List (EPA QA/R-5 A3)

Table 1-3. Distribution List and Project Roles and Responsibilities

Name	Organization	Position/Role	Responsibility for	Contact Information
Jeff Scarano	SWQB	MASS Program Manager	Reviewing and approving QAPP; managing project personnel and resources	(505) 827-2814 jeff.scarano@state.nm.us
Jodey Kougioulis	SWQB	QA Officer	Reviewing and approving QAPP	(505) 827-2820 jodey.kougioulis@state.nm.us
Heidi Henderson	SWQB	604b Project Coordinator	Reviewing and approving QAPP; managing project personnel and resources	(505) 222-9571 heidi.henderson@state.nm.us
Arlene Gaines	EPA	Environmental Protection Specialist	Review and approve QAPP	(214) 665-7163 gaines.arlene@epa.gov
Curry Jones	EPA	Chief, State and Tribal Programs Section	Review and approve QAPP	(214) 665-8093 miller.donna@epa.gov
Emma Lee Deyo	SJ SWCD	District Manager	Manage and oversee grant finances and contracts	(505) 334-3090 x108 emma.deyo@sanjuanswcd.com
Melissa May*	SJ SWCD	Project Manager, Lead Sampler	Prepare QAPP, collect data, Prepare final report	(505) 334-3090 x109 melissa.may@sanjuanswcd.com
David Tomko*	SJWG	Watershed Coordinator	Assist in QAPP preparation, collect data, assist with final report	(505) 632-8008 jtomko73@msn.com
Marcie Bidwell*	MSI	Executive Director	Assist in QAPP preparation, assign staff to analyze and report data	(970) 426-8863 marcie@mountainstudies.org
Geoffrey Smith*	GBS	Technical Consultant	Analyze and report data, prepare final report for MST study	(575) 646-6080 gsmith@nmsu.edu
Monica Peterson*	CH2M	Laboratory Lead	Analyze and report data	(505) 325-6953 Monica.Peterson@ch2m.com
Ann Oliver*	AWP	Watershed Coordinator	Distribute final data and report	(970) 903-9361 annsoliver@gmail.com

The persons listed above will receive a copy of the PQAPP. The Project Coordinator will require those marked with an asterisk to sign the QAPP Acknowledgement Statement.

1.4 Project Organization (EPA QA/R-5 A4)

Contractor (or Grantee) Project Manager Melissa May will have overall responsibility for assigning appropriate personnel to complete the tasks included in this plan. She will ensure that the project budget is adhered to. She will communicate with the SWQB Project Coordinator on work accomplished in this plan and any problems or deviations that need to be resolved.

Grant Manager Emma Deyo will be responsible for all contractual and financial elements of this project. She will execute all contracts, and work with Project Coordinator to ensure the project budget is adhered to.

Field Sampling Lead Melissa May will have overall responsibility for all field activities. She will be responsible for training and supervising field sampling volunteers, and ensuring adherence to all QA objectives. Ms. May received her M.S. in Wildlife and Fisheries Science from Pennsylvania State University in 2011, and completed her master's thesis on the assessment of nutrient pollution using periphyton indicators in freshwater streams. Ms. May has four years' experience with sample collection, lab analysis, and data analysis through her positions as research assistant in the Penn State Aquatic Ecology Lab (2008-2011), water quality technician at the Prince William Sound Science Center (summer 2011), and lead sampler for the MST study (2013).

Watershed Coordinator Dave Tomko will be responsible for coordinating efforts related to this project with other ongoing efforts within the watershed. He will communicate project needs to the contractor's project manager, recruit volunteers, coordinate stakeholder involvement, assist in compiling final reports, and fill in for the lead sampler if necessary. Mr. Tomko has been the SJWG Watershed Coordinator since 2005. He has a B.S. in Biology and M.S. in Management, and worked for NMED's Farmington Field Office for 26 years, and has extensive experience with NMED sampling protocols.

Laboratory and Data Analysis Leads

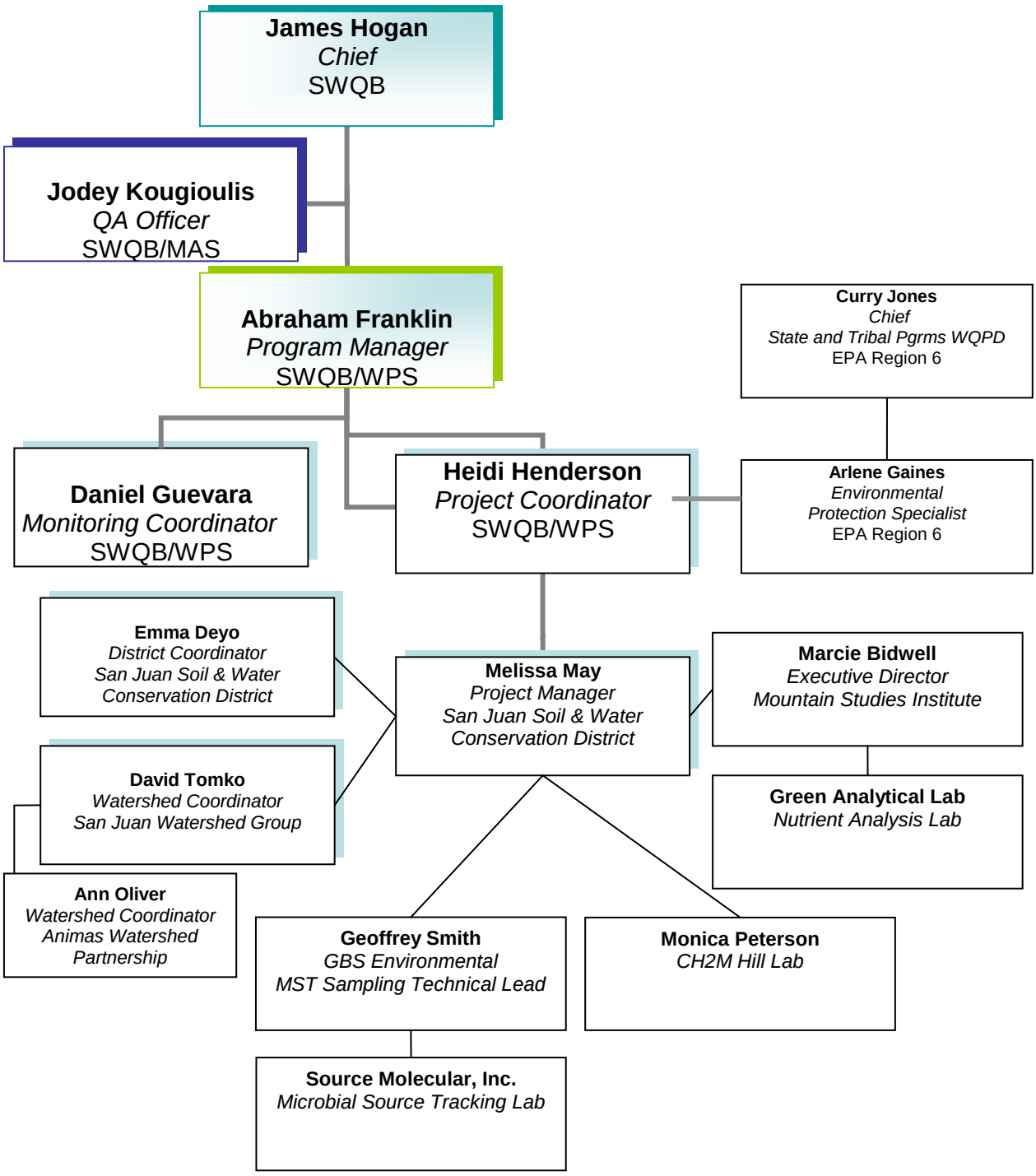
Dr. Geoffrey Smith will be responsible for assigning appropriate laboratory staff from Source Molecular Lab (Miami, FL) to perform the MST analyses specified in this plan. He will assist with data analysis and compilation of the final report.

Marcie Bidwell will be responsible for assigning MSI staff to coordinate sampling and laboratory efforts from this project with similar projects within the watershed. She will assign MSI staff to assist with data analysis and compilation of the final report, as it relates to analyses for the Lower Animas Watershed Based Plan.

Monica Peterson will be the contact person for CH2M Hill laboratory in Farmington, NM and will oversee all analysis and laboratory QA/QC for E.coli.

Jacob Miller will be the main contact for Green Analytical Laboratory in Durango, CO. They will conduct all analysis and laboratory QA/QC for nutrient constituents specified in this plan following EPA approved procedures (Green Analytical 2014).

Figure 1-1. Organization Chart



1.5 Problem Definition/Background (EPA QA/R-5 A5)

Goal: To characterize the timing, magnitude, and source of bacteria and nutrient pollution in the Animas and San Juan Rivers.

Segments of the Animas and San Juan Rivers are listed on the 2012-2014 CWA Section 305(b)/303(d) list for the following impairments:

- Animas River Watershed (14080104)
  1. Animas River (San Juan River to Estes Arroyo) **NM-2403.A_00**
     Nutrients, *E. coli* Bacteria
  2. Animas River (Estes Arroyo to Southern Ute Boundary) **NM-2404_00**
     Phosphorus, *E. coli* Bacteria
- Upper San Juan Watershed (14088181)
  1. San Juan River (Animas River to Canon Largo (Blanco Canyon)) **NM-2401_00** (previously listed for *E.coli*)
- Middle San Juan Watershed (14080105)
  1. La Plata River (McDermott Arroyo to Southern Ute Boundary) NM-2402.A_01
     Nutrients, *E. coli* Bacteria
  2. La Plata River (San Juan River to McDermott Arroyo) NM-2402.A_00
     E. coli Bacteria
  3. San Juan River (Navajo Nation boundary at Hogback to Animas River) **NM-2401_10**
     E. coli Bacteria

Input from the San Juan Watershed Group led to bacteria and nutrient pollution being selected as the highest priority pollutants to address. Bacteria load reductions ranging from 42% to 82% are needed in order to meet EPA *E. coli* standards in the impaired river segments, while the Animas TMDL would require 42% reductions in total nitrogen and 59% reductions in total phosphorus to meet target loads.

Previous studies have been too short in duration/scope to provide an adequate baseline of nutrient and bacteria loads within the watershed, and were inconclusive in identifying the sources of these pollutants.

1.6 Project/Task Description and Schedule (EPA QA/R-5 A6)

Project Description: The combined Nutrient and Bacteria Monitoring Project will monitor five sites on the Animas and San Juan Rivers, which were selected to bracket the four assessment units (AUs) listed in bold in Section 1.5 above. The nutrient data collection (TN and TP) is being funded by the 604(b) program, and is directly dependent on this PQAPP.

The independently funded MST study is an in-direct sampling effort and does not have a PQAPP of its own, so relevant procedures are included in this document. This includes the collection of water samples to be analyzed for presence/absence of microbial sources (human, cattle, ruminant, horse, and bird) and concentrations of E.coli.

Other data not directly generated under this funded project but intended to be used in conjunction with collected data include flow data obtained from USGS gaging stations, and periphyton and Sonde data (D.O. & pH) collected by SWQB staff under SOP 11.2 and SOP 6.0 respectively for nutrient assessment during the project period.

Data from these studies will be used together to establish seasonal baseline conditions and compile a final report. The final report will include statistical interpretations of the data; probable analyses include load duration curves and regression curves using IBM's SPSS statistical software (SPSS 2014), taking into account site specific and seasonal variation. Presence/absence of microbial sources will be used to determine the most effective BMPs to address bacteria pollution. Presence of bacteria sources will be compared with magnitude and timing of E.coli and nutrient pollution to further assess the effectiveness of controlling different sources. Results from this study will also be used in conjunction with data from past synoptic studies to inform the Lower Animas Watershed Based Plan.

Schedule: The bacteria and nutrient sampling will be conducted weekly from April-October 2014. Of these 31 weeks, 9 weeks will be intensively sampled (twice a week) during the monsoon season in order to catch fluxes in pollutants carried in high flows after storm events. One year of bacteria sampling was already completed on this same schedule in 2013. The 2013 sampling was not included in a PQAPP of its own, but followed all procedures detailed in this document.

Microbial Source Tracking (MST) samples will be shipped on ice overnight to Source Molecular laboratory in Miami, FL for genetic analysis of bacteria in the water, to determine the presence or absence of animal bacteria sources (bird, cattle, horse, ruminant, and human). These samples will be collected weekly at four sites (two on the Animas, two on the San Juan), and twice a week during the monsoon season, for a total of 160 samples.

In addition to the MST samples for bacteria, water samples will be collected to get counts of *E. coli* bacteria on a smaller proportion of the samples. These samples are taken to the OMI-CH2M Hill laboratory at the Farmington wastewater treatment plant on the day of sample collection (*E.coli* method – Standard Methods, 20th ed., 9223B, MWF). *E. coli* samples will be collected at the same four sites mentioned above, and at a fifth site on the Animas River near the CO state line (125 samples total).

Nutrient samples will be collected at all sites visited, alternately four or five per sampling day, depending on whether *E.coli* is collected (see Table 1.6), for a total of 185 samples. Samples will be analyzed for total nitrogen (separate analyses for nitrite plus nitrate, and total Kjeldahl nitrogen) and total phosphorus.

Table 1.6 - Sampling schedule for San Juan Nutrients & Bacteria Monitoring

Microbial Source Tracking (MST), *E.coli* bacteria, and nutrient monitoring (total nitrogen and total phosphorus) 2014 sampling schedule; section highlighted in gray is an intensive nine week sampling for monsoon season with two sampling trips per week.

Month	**Date/ Week**	**MST samples** per week	**E.coli samples** per week	**Nutrient samples** per week
		4 sites	*5 sites*	*All sites visited (4 or 5)*
Funding Source:		*BHP Billiton*		*604(b)*
April	1	4	5	
April	7	4		
April	14	4	5	5
April	21	4		4
April	28	4	5	5
May	5	4		4
May	12	4	5	5
May	19	4		4
May	26	4	5	5
June	2	4		4
June	9	4	5	5
June	16	4		4
June	23	4	5	5
June	30	4		4
July	7	4	5	5
July	14	8	5	5
July	21	8	10	10
July	28	8	5	9
Aug	4	8	10	10
Aug	11	8	5	9
Aug	18	8	10	10
Aug	25	8	5	9
Sept	1	8	10	10
Sept	8	8	5	9
Sept	15	4	5	5
Sept	22	4		4
Sept	29	4	5	5
Oct	6	4		4
Oct	13	4	5	5
Oct	20	4		4
Oct	27	4	5	
QC samples:		**Lab only**	**≤ 14**	**18**
	Total:	**160**	**125-139**	**185**

Additionally, periphyton and Sonde analyses (DO and pH) may be conducted by SWQB staff as needed in order to complete the nutrient assessment requirements of SOP 10.0.

1.7 Quality Objectives and Criteria for Measurement Data (EPA QA/R-5 A7)

Objectives and Project Decisions: The baseline data collection of the San Juan Nutrients and Bacteria Monitoring Project is intended to answer the following questions: What are the most probable causes and locations of bacteria pollution within the project reach? What are the most probable causes and locations of nutrient pollution in the project reach? To answer these questions, presence/absence of microbial sources will be compared with flow data and timing and magnitude of E.coli and nutrient pollution. Moreover, sites have been selected to bracket reaches with differing sources, to ultimately inform managers for future restoration efforts.

Stated as a decision: The information gathered by the San Juan Nutrients and Bacteria Monitoring Project will provide baseline information that will enable development of reach-specific and impairment-specific restoration measures.

Action Limits/Levels: The quality of the data will be adequate to provide a high level of confidence for development of reach-specific and impairment-specific restoration measures, and to be used in impairment assessments by SWQB staff.

Measurement Performance Criteria/Acceptance Criteria: The measurement quality objectives will be sufficient to achieve the Data Quality Objectives and will be in conformance with those listed in the Bureau QAPP.

See Table 2-4. Analytical Parameters and Target Limits
See Table 2.5. Quality Control Requirements for Analyses

1.8 Special Training Requirements/Certification (EPA QA/R-5 A8)

This project will be implemented by SJSWCD staff and contractors, SJWG volunteers, and SWQB. The lead sampler for SJSWCD will be Melissa May, M.S., who will be responsible for data collection and for following the requirements of the Bureau QAPP and the methodologies outlined in this PQAPP. David Tomko, M.S., and qualified MSI staff (approved for sample collection under the LAWBP PQAPP) will be the backup lead samplers. May, Tomko, and MSI all have extensive experience collecting water quality samples and following established protocols. Samples will be collected in the field by one lead sampler accompanied by one SJWG volunteer. Volunteers will be briefed on the sampling protocols by the lead samplers, and will only collect samples in the presence of a lead sampler. Training and use of volunteers will be in accordance with the Bureau QAPP, all data collection by volunteers will be directly supervised by qualified staff. No further specialized training is required.

1.9 Documents and Records (EPA QA/R-5 A9)

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

Project documents include this PQAPP, field notebooks, calibration records, sonde download data, validation and verification records, sample collection data, records of analytical data in hard copy or in electronic form and QC records. Documents will be maintained in accordance with the requirements of the Bureau QAPP.

Table 1.9. Reporting Format and Storage

Monitoring Technique	Reporting Format	Storage Location And Time
Direct measurements:		
Microbial source ID	Chain of custody sheets, Excel spreadsheet of results from SM	Paper copies in project file, electronic copies on CD and hard drive at SM, GBS, and SJSWCD.
E.coli IDEXX	Chain of custody sheets, Excel spreadsheet of results from CH2M	Paper copies in project file, electronic copies on CD and hard drive at CH2M, SWQB and SJSWCD.
Nutrient analysis (TKN, NO3+NO2, TP)	Chain of custody sheets, Excel spreadsheet of results from Green Labs	Paper copies in project file, electronic copies on CD and hard drive at Green, SWQB, and SJSWCD.
Non-direct measurements:		
USGS stream gages – records of instantaneous flow	Flows recorded in field notebook, transferred to Excel spreadsheets, double checked later when final data released	Paper copies in project file, electronic copies on CD and hard drive at SWQB and SJSWCD.
Periphyton and Sonde data	All requirements for nutrient assessment SOP 10.0, collected by SWQB staff	Paper copies at SWQB, electronic copies on CD and hard drive at SWQB and SJSWCD.

All field and laboratory data will be summarized in an Excel spreadsheet to be submitted as an Appendix to the final report.

2.0 DATA GENERATION AND ACQUISITION

2.1 Sampling Design (Experimental Design) (EPA QA/R-5 B1)

The combined study has been designed to directly collect bacteria, nutrients and MST data, and indirectly monitor flow via USGS gages at regular intervals spanning the major changes in river flow throughout the year. Periphyton, D.O. and pH data will be acquired from the SWQB per their respective SOPs. Sampling begins in April to catch base flow conditions and the first flush of irrigation water once ditches open for the season. It then continues weekly sampling to capture spring runoff (May/June), peak irrigation and summer low flow conditions (June/July). Once monsoon rains begin (mid/late July), we will start 9 weeks of twice a week sampling in order to increase the chances of capturing the effects of runoff events without resorting to storm chasing. Finally, sampling will continue through the end of October to capture the return to baseflow post-monsoon, and the conclusion of irrigation season (ditches cleaned out and closed for the winter).

Sites were selected with three criteria in mind: 1) Sampling in areas with known pollution problems to increase chances of identifying and correcting these sources; 2) Bracketing inflows and possible sources; 3) Bracketing of AUs used in SWQB assessments. Due to the high cost of MST sampling, the four sites (Animas-Aztec, Animas-Farmington, San Juan-Farmington, San Juan-Hogback) were chosen primarily with criteria #1 in mind. A fifth site for E.coli and nutrient sampling was chosen above the NM/CO state line to satisfy criteria 2 and 3; this site will ensure that pollutant inputs at the upstream end of the Animas AU are also appropriately characterized.

See Figure 2-1 for map of site locations.

Figure 2-1. Site Map with Sampling Locations

Site Name	Latitude	Longitude
A-State Line	37.02450700	-107.87401700
A-Aztec	36.82952300	-107.99707300
A-Boyd Park	36.72075200	-108.20244600
SJ-Farmington	36.70911320	-108.21266484
SJ-Hogback	36.74602246	-108.54849310

<u>**2.2 Sampling Methods**</u> (EPA QA/R-5 B2)

Direct samples: Methods for funded (604(b) program) sample collection covered directly under this PQAPP:

Nitrogen and Phosphorus: SOP 8.1, 8.2 – Chemical Sampling; SOP 10.0 – Nutrient Sampling
Using the sample bottles provided by Green Analytical, label the bottles, and record in field notebook and chain of custody sheet.

SJ/A-Site Name
2013-04-01 (YYYY-MM-DD)
13:45 (military time)
M.May (sampler's first initial and last name)

Collect a sample using the 500 mL bottle attached to the sampling pole, filling the bottle in the highest-flowing section of the river. Decant water into labeled bottle to the designated mark, replace cap. Fill bottles for TKN, NO3+NO2, and TP using same procedure. Return bottles to cooler and store on ice.

Following SOP 8.2 Chemical Sampling in Lotic Environments, a field blank will be collected at a rate of 10% of the total number of samples collected for nutrients.

In-direct samples: Methods for sample collection funded by MST study covered under this PQAPP:

E.coli Procedure: SOP 9.1 – Bacteriological Sampling
Sanitize hands using hand sanitizer before handling sampling bottles, and between each sampling site. Using the 125mL sample bottles provided by CH2M, label the bottle, and record in field notebook and chain of custody sheet.

SJ/A-Site Name
2013-04-01 (YYYY-MM-DD)
13:45 (military time)
M.May (sampler's first initial and last name)

Collect a sample using the 500 mL bottle attached to the sampling pole, filling the bottle in the highest-flowing section of the river.
Decant 100mL of water into labeled CH2M bottle to the marked shoulder. Cap when filled. During transit, samples must be held at 1-4C. Samples must be delivered to CH2M Environmental Laboratory by 3pm on day of sampling, within 4-6 hours of collection. Laboratory analysis must begin no later than 8 hours after collection or the sample will not be useable.

Microbial Source Tracking Procedure:
Sanitize hands using hand sanitizer before handling sampling bottles, and between each sampling site. Label the 500mL collection bottle, record in field notebook and on chain of custody sheet.

SJ/A-Site Name
2013-04-01 (YYYY-MM-DD)
08:45 (military time)
M.May (sampler's first initial and last name)

Collect the water sample: Adjust sampling pole to ~10ft to capture a sample in maximum flow of river. Attach bottle to sampling pole with zip tie. Unscrew cap and place in sterile Whirlpak. Do not touch threads. If contamination occurs, get a new bottle. Aim upstream and hold bottle ~3 inches below the water surface until filled. Replace cap (being careful not to touch threads) and seal sample bottle in Whirlpak for shipment. Keep sample out of sun and store immediately in cooler on ice. Pack sample bottles and ice packs in shipping container with chain of custody sheet, ship overnight to Source Molecular Laboratory in Miami, FL.

2.3 Sample Handling and Custody (EPA QA/R-5 B3)

Table 2-3. Analytical Method, Containers, Preservation, and Holding Times Requirements

Matrix/Media:

Analytical Parameter[1] and/or Field Measurements[2]	Analytical Method Number	Containers (number, size/volume, type)	Preservation Requirements (chemical, temperature, light protection)	Maximum Holding Times[3]
ANALYTICAL PARAMETER:				
TKN	EPA 351.2	Poly H2SO4 – 250 mL	pH<2 H2SO4; Cool 4°C	28 days
NO3+NO2	EPA 353.2	Poly H2SO4 - 125mL	pH<2 H2SO4; Cool 4°C	28 days
TP	EPA 365.3	Poly H2SO4 - 500mL	pH<2 H2SO4; Cool 4°C	28 days
E.coli	SOP 9.1	125 mL	Ice, dark cooler	4 hrs to lab, 8 hrs to analysis
MST	SM Quality Policy Manual 5.9	500 mL	Ice, dark cooler	24 hrs to lab

[1] Analytical parameter includes both field and laboratory analyses.
[2] Field measurement parameters include those parameters measured directly in the field (e.g., dissolved oxygen, turbidity, pH, etc.).
[3] Maximum holding times include all pertinent holding times for each analytical parameter (e.g., from sample collection to sample preparation, from sample preparation to analysis, from sample collection to analysis, etc.) and field measurement (e.g., from sample collection to measurement).

2.4 Analytical Methods (EPA QA/R-5 B4)

No field measurements or analyses will be required for completion of this study.

Laboratory methods:
Nutrient analysis: TKN, NO3+NO2, and TP will be analyzed by Green Analytical Labs in Durango, CO. EPA analysis methods are listed in Table 2-3 above.

E.coli: E.coli will be analyzed via the IDEXX QuantiTray at CH2M Hill Lab in Farmington, NM (Standard Methods, 20th ed., 9223B, MWF).

MST: Presence/absence of microbial sources will be analyzed using qPCR methods by Source Molecular laboratory in Miami, FL. Analytical and quality control information can be found in the attached *Source Molecular Quality Policy Manual Section 5.9.*

Table 2-4. Analytical parameters and target limits

Analytical Parameter[1]	Laboratory Limits[2] (applicable units)	
	Quantitation Limits	Detection Limits (if appropriate)
TKN	0.500 mg/L	0.344 mg/L
NO3+NO2	0.0200 mg/L	0.0101 mg/L
TP	0.0500 mg/L	0.0500 mg/L
E.coli	1.0 cfu/100mL	1.0 cfu/100mL
MST	See SM manual for specific limits	See SM manual for specific limits

[1] Analytical parameters include both field and laboratory analyses.
[2] Laboratory quantitation limits and detection limits are those that an individual laboratory or organization is able to achieve for a given analysis on a routine basis.
C Quantitation limits are the minimum concentrations that can be identified and quantified above the detection limit within some known limits of precision and accuracy/bias. It is recommended that the quantitation limit is supported by the analysis of a standard of equivalent concentration (typically, the lowest calibration standard).
C Detection limits are the minimum concentration that can be detected above background or baseline/signal noise of an instrument.

2.5 Quality Control Requirements (EPA QA/R-5 B5)

Measurement data quality will be monitored using the quantitative and qualitative data quality indicators described in Section 1.5 of the SWQB QAPP (SWQB, 2013).

Data Quality Indicators

Data Quality Indicator	Data Acquisition
Precision	Precision will be ensured by consistently assigning the same people the responsibilities of collecting, recording and analyzing data. If resources allow, replicate field data may be obtained.
Accuracy	Accuracy based on the use of methods determined to be reliable
Bias	Bias will be reduced by using professional and experienced staff to collect and analyze data
Representativeness	Nearly all sites deemed to be part of the reference data set will be sampled. Sample selection is representative of the entire sample unit.
Comparability	This project will collect new data where no data is available for comparison. However methods for data collection are standardized and reproducible.
Completeness	All known sites within the subclass were selected to cover the range of conditions.

Nutrients: Following SOP 8.2 Chemical Sampling in Lotic Environments, a field blank will be collected at a rate of 10% of the total number of samples collected for nutrients. See Table 1-6 for details.

E.coli: Field blanks will be collected at a rate that budget permits, with a goal of 10% of the total number of samples collected for E.coli.

MST: Known source sampling was conducted before sample collection began in 2013. Samples of known fecal material (horse, dog, deer, elk, cow, goose, chicken, human) were sent to Source Molecular Lab for analysis with source identification probes. Probes were cross-checked to ensure rates of false-positives and false-negatives were within acceptable limits. All probes passed this initial inspection.

During 2013 sampling, water samples that tested positive for human source bacteria were re-tested with an additional two probes to confirm ID; additional tests confirmed positive ID. When budget permits, these opportunistic QC checks will be continued when appropriate. Split samples may also be sent to alternate labs when budget permits. Due to the high cost of MST analysis, field blanks cannot be run with a set frequency. Additional details on laboratory QA/QC is in the attached *Source Molecular Quality Policy Manual Section 5.9*.

2.6 Instrument/Equipment Testing, Inspection, and Maintenance (EPA QA/R-5 B6)

No field instruments will be required for this project.

Laboratories will follow all standard QA/QC processes and SOPs necessary under their EPA certification. See Table 2-3 for analytical method numbers.

2.7 Instrument/Equipment Calibration and Frequency (EPA QA/R-5 B7)

No field instruments will be required for this project.

Laboratories will follow all standard QA/QC processes and SOPs necessary under their EPA certification. See Table 2-3 for analytical method numbers.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables (EPA QA/R-5 B8)

Sampling bottles are all single-use only, and will be discarded if contamination occurs. MST bottles are new and sterile, and caps are stored in a new sterile whirlpak while sample collection occurs. Bottles for E.coli and TN and TP collection are sterile and provided by the laboratories. If sampler touches the threads of the bottle or cap during sample collection, or otherwise suspects sample bottle contamination, bottle will be discarded.

Laboratories will follow all standard QA/QC processes and SOPs necessary under their EPA certification. See Table 2-3 for analytical method numbers.

2.9 Data Acquisition Requirements (Non-Direct Measurements) (EPA QA/R-5 B9)

Periphyton and Sonde Data: SWQB staff may collect periphyton and sonde data (DO, pH, etc.) using the same sampling sites and sampling period as this project, in order to complete data collection for Nutrient Survey and Sampling SOP 10.0. All sampling will be done by SWQB staff in accordance with the Bureau QAPP. Data will be acquired from SWQB staff and used in this project to assist in assessing scope and magnitude of nutrient pollution and in identifying possible pollutant sources.

Flow measurements: USGS gaging stations will be used to approximate flow at the five sampling sites. Most recent instantaneous flow at five gaging stations will be recorded in the field notebook each morning before sampling begins. This will serve the dual purpose of ensuring safety of the samplers (avoiding extremely high flow conditions or taking the appropriate safety precautions) and providing a flow estimate for comparison to other sampling sites/dates.

Final flow measurements will be obtained and entered into the database once USGS changes its flow data from provisional to final (~6months from time of sampling).

Sampling Site	USGS Station used	
Animas- State Line	09363500	ANIMAS RIVER NEAR CEDAR HILL, NM
Animas-Aztec	09364010	ANIMAS RIVER BELOW AZTEC, NM
Animas-Farmington	09364500	ANIMAS RIVER AT FARMINGTON, NM
San Juan-Farmington	09365000	SAN JUAN RIVER AT FARMINGTON, NM
San Juan-Hogback	09368000	SAN JUAN RIVER AT SHIPROCK, NM

2.10 Data Management (EPA QA/R-5 B10)

See Table 1.9 for details. All samples collected will be recorded in the field notebook and on the chain of custody sheets for their respective labs. Copies of chain of custody sheets will be made and retained at the SJSWCD office before delivering samples. All field measurements, notes, calibrations, USGS flows,

and weather information will be retained in the lab notebook and copied to an Excel spreadsheet in the SJSWCD office before field notebook is taken out on subsequent sampling days. SJSWCD files are backed up daily on a remote server.

3.0 ASSESSMENT AND OVERSIGHT

3.1 Assessments/Oversight and Response Actions (EPA QA/R-5 C1)

The SWQB Project Coordinator will provide project oversight by periodically assisting with and/or reviewing data collection efforts, twice per year during the life of the project. Quarterly reports will describe the progress of the project tasks and any potential problems with task implementation or schedule. This process includes justification for adjusting the task, or the task schedule, and making adjustments to the timeline if applicable. The SWQB Project Coordinator will be responsible for approving any changes and ensuring changes are implemented by the designated party. All problems and adjustments to the project plan will be documented in the project file and included in the final report.

3.2 Reports to Management (EPA QA/R-5 C2)

Quarterly reports are submitted by the contractor to the SWQB Project Coordinator 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 Coordinator 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.

4.0 DATA REVIEW AND USABILITY

4.1 Data Review, Verification, and Validation Requirements (EPA QA/R-5 D1)

Data will be considered usable if there is reasonable evidence that the requirements of this PQAPP were followed.

4.2 Verification and Validation Methods (EPA QA/R-5 D2)

The Project Manager will ensure that valid and representative data are acquired. Verification of field sampling and analytical results will occur in the review of data, performed by the Project Manager. Data will then be provided to the SWQB Project Coordinator for their review, upon request. In the event questionable data are found, the SWQB Project Coordinator will consult with project personnel to determine the validity of the data. Results of the verification process will be included in the final reports.

4.3 Reconciliation with User Requirements (EPA QA/R-5 D3)

The user requirement is a restatement of the data quality objective: The information gathered by the San Juan Nutrients and Bacteria Monitoring Project will provide baseline information that will enable development of reach-specific and impairment-specific restoration measures.

If project results do not meet this requirement, then additional monitoring may be necessary to fill in data gaps and it may be necessary to extend the monitoring period to collect additional information.

5.0 REFERENCES

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