Project Quality Assurance Project Plan

Water Quality Monitoring to Determine Pollutant Loading Sources

for the

Paso del Norte Watershed Based Plan Project

Clean Water Act Section 319 Grant No. C9-996101-13

Submitted by
New Mexico Environment Department
Surface Water Quality Bureau

APPROVAL PAGE

Chris Canavan
Project Officer, SWQB Watershed Protection Section — Date: 10/1/10

Tim Michael
Interim Quality Assurance Officer, SWQB — Date: 10/12/2010

Abe Franklin
Program Manager, SWQB Watershed Protection Section — Date: 10/12/2010

Sharon Daugherty
Environmental Protection Specialist, WQPD, EPA Region 6 — Date: 12/28/2010

for Curry Jones
Chief, State and Tribal Programs Section, WQPD, EPA Region 6 — Date: 12/28/10

TABLE OF CONTENTS

ACRONYMS

EBID	Elephant Butte Irrigation District
E. coli	Escherichia coli
EPA	United States Environmental Protection Agency
MST	Microbial Source Tracking
IEH	Institute of Environmental Health
NMED	New Mexico Environment Department
PFGE	Pulsed Field Gel Electrophoresis
PQAPP	Project Quality Assurance Project Plan
QA	Quality Assurance
QAO	Quality Assurance Officer
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
WBP	Watershed Based Plan
WQPD	Water Quality Protection Division

1.0 PROJECT MANAGEMENT

1.1 Distribution List

Table 1
Distribution List and Project Roles and Responsibilities

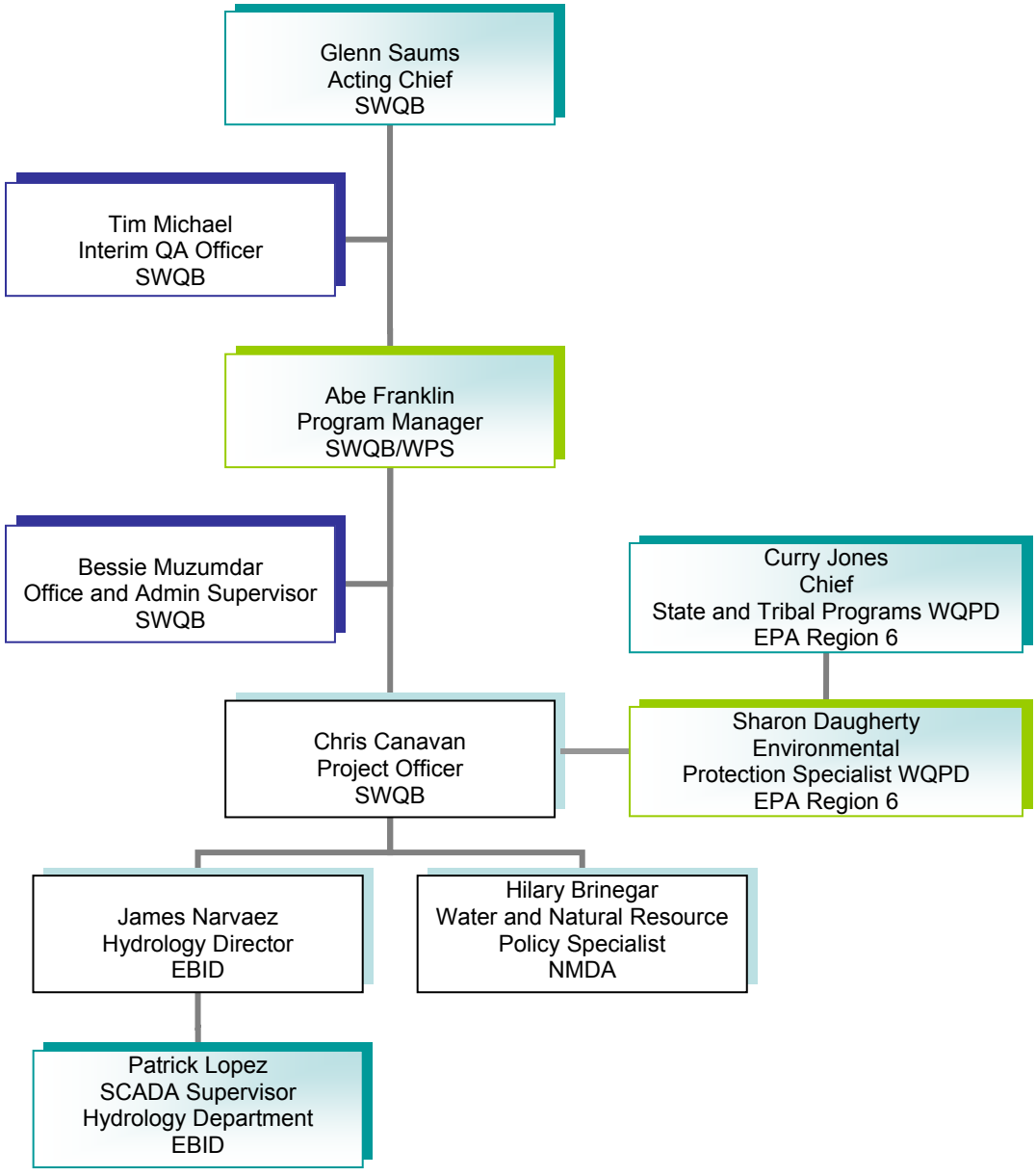
Name	Organization	Title/Role	Responsibility	Contact Information
Abe Franklin	SWQB	WPS Program Manager	Reviewing and approving PQAPP, managing project personnel and resources	(505) 827-2793 abraham.franklin@state.nm.us
Bessie Muzumdar*	SWQB	Office and Admin Supervisor	Maintaining project files	(505) 827-0584 bessie.muzumdar@state.nm.us
Tim Michael	SWQB	Interim QA Officer	Reviewing and approving PQAPP	(505) 476-3799 tim.michael@state.nm.us
Chris Canavan	SWQB	Project Officer	Preparing PQAPP, project reporting, coordinating with contractors.	(575) 647-7926 chris.canavan@state.nm.us
Hilary Brinegar*	NMDA	Water and Natural Resource Policy Specialist	Project oversight, project reporting, coordinating with contractors and report writing.	(575) 646-2642 hbrinegar@nmda.nmsu.edu
James Narvaez*	EBID	Hydrology Director	Oversee water quality sampling team in data collection and record keeping, submitting reports.	(575) 526-6671 (ext 430) jnarvaez@ebid-nm.org
Patrick Lopez*	EBID	SCADA Supervisor, Hydrology Dept	Supervise water quality sampling team	(575) 526-6671 (ext 431) patlopez@ebid-nm.org
Sharon Daugherty	EPA	Environmental Protection Specialist WQPD, Region 6	Reviewing and approving PQAPP	(214) 665-2259 daugherty.sharon@epa.gov
Curry Jones	EPA	Chief, State and Tribal Programs Section WQPD, Region 6	Reviewing and approving PQAPP	(214) 665-6793 jones.curry@epa.gov

*The Project Officer will require those marked with and asterisk to sign the PQAPP Acknowledgement Statement.

1.2 Project Organization

The Bureau Quality Management Plan (NMED/SWQB 2009) documents the independence of the QAO from this project. The QAO is responsible for maintaining the official approved PQAPP.

Figure 1
Organization Chart
Paso del Norte Watershed Based Plan Monitoring Project



1.3 Problem Definition/Background

This PQAPP documents the quality requirements for *Water Quality Monitoring to Determine Pollutant Loading Sources for the Paso del Norte Watershed Based Plan Project.*

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

Objective

The objectives of the environmental monitoring are to identify the primary spatial and temporal locations of *Escherichia coli* (*E. coli*) impairment in the El Paso-Las Cruces Watershed (USGS HUC 13030102), to estimate the associated pollutant loading from those locations and to identify the host organisms.

Background

The El Paso-Las Cruces Watershed was surveyed by the SWQB Monitoring and Assessment Section in 2004 as part of an intensive water quality survey of the lower Rio Grande in New Mexico. As a result of this survey, a Total Maximum Daily Load (TMDL) for *E. coli* was developed for the main stem of the Rio Grande from the New Mexico-Texas state line at the international boundary with Mexico, upstream to one mile below Caballo Reservoir. While this survey resulted in a TMDL, the scope of the assessment was not sufficient to specifically identify the sources of *E coli* on either a spatial or temporal scale, or from which hosts the *E. coli* emanated.

In 2005, the Paso del Norte Watershed Council applied for a grant to develop a watershed plan to address the *E. coli* impairment. This portion (Phase I) of the Paso del Norte Watershed Based Plan was completed in December 2007. This effort, which included an extensive review of existing data, identified data gaps that indicated a need for a water quality survey designed to further delineate the *E. coli* sources.

In 2008, the New Mexico Department of Agriculture on behalf of the Paso del Norte Watershed Council submitted the Work Plan for Phase II of the Paso del Norte Watershed Based Plan (Phase II WBP). The objective of this phase, as stated under Section 7, Project Description, Addressing Water Quality Data Gaps, is as follows:

> The objective of the Phase II WBP process is to identify more specifically the subbasins or areas within the watershed that may be contributing to the water quality exceedance.

As a result, a water quality survey was initiated to examine the potential inputs of *E. coli* into the main stem of the Rio Grande in south central New Mexico below Caballo dam.

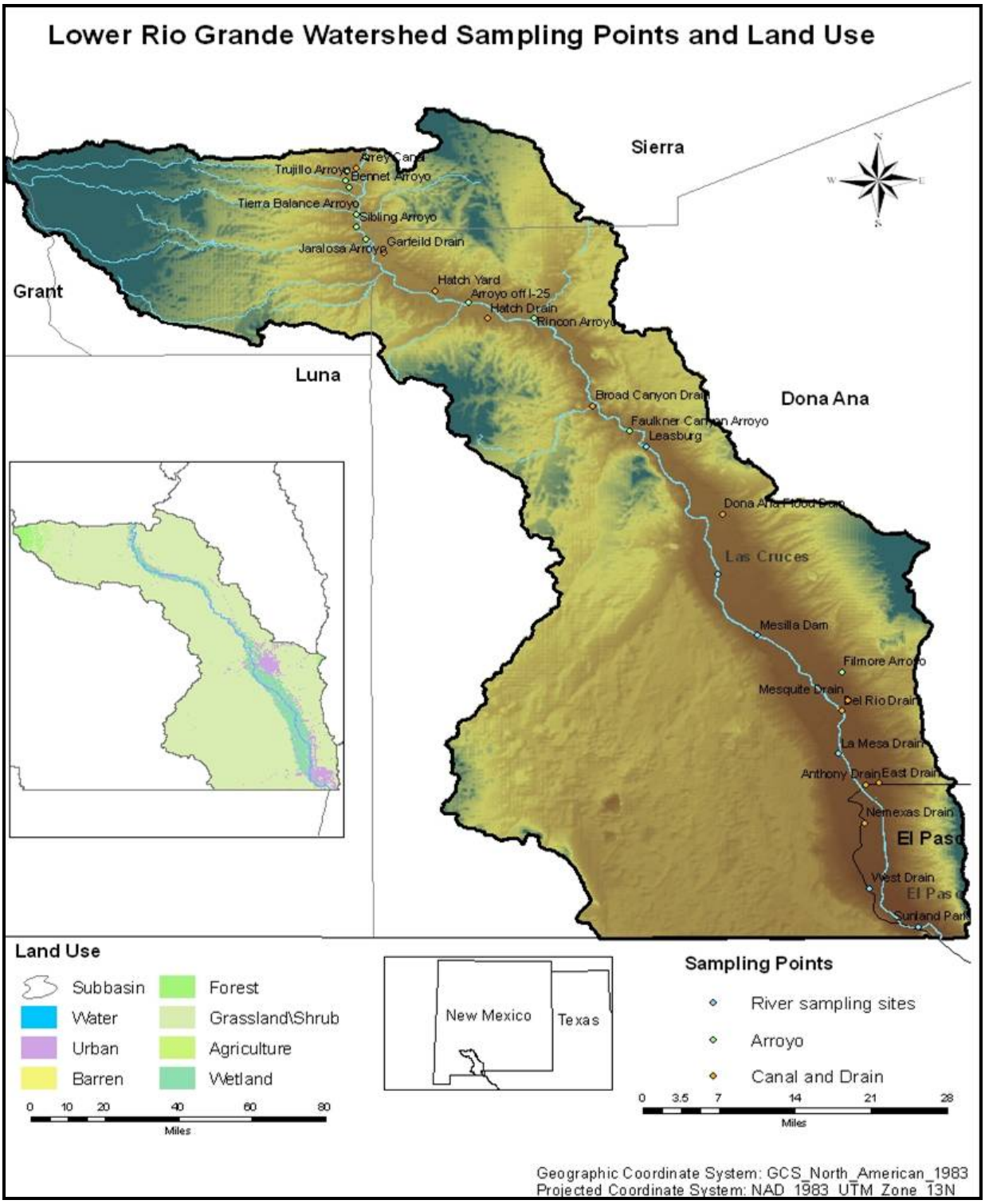
1.4 Project/Task Description

Description

Sites will be sampled monthly or quarterly for the purpose of determining spatial and seasonal variability in *E. coli* due to events such as storms, drought, manure application, etc. During the monsoon months of July through October, when runoff is expected to be greatest, additional sampling will occur as the opportunity arises. Data collected in the first year will be used to adjust the sampling program in the second year to focus on hotspots. Samples will also be collected to estimate pollutant loadings and to identify the host organisms.

Location

Figure 2



Schedule

Table 2
Sampling Schedule

Activity	Spring 2010	Summer 2010	Fall 2010	Winter 2010-2011	Spring 2011	Summer 2011	Fall 2011	Winter 2011-2012	Spring 2012
Data collection & submittal of samples for analysis.			==========▶						
Data Verification & Validation, Assessment of data				==========▶					

Sampling Stations and Rationale

Sampling stations were chosen to target potential inflows of *E. coli* into the main stem of the Rio Grande and to provide good spatial distribution. All river stations are located at a stream gauging station so that flow data will be available for pollutant loading calculations. The drain sampling stations were chosen to provide data on the primary perennial inflows into the river. The sampling points in the drains will be located upstream of the confluence with the Rio Grande and most all the drain sampling stations are also co-located with a stream gauge.

Table 3
Station Locations and Rationale

Station Name	Type	Location	Station Rationale
Caballo Dam Cable	River	N 32.884608 / W 107.292800	Top of the watershed.
Garfield Drain	Drain	N 32.750100 / W 107.269000	Perennial tributary
Hatch Drain	Drain	N 32.657008 / W 107.130710	Perennial tributary
Rincon Drain	Drain	N 32.656833 / W 107.068942	Perennial tributary
Haynor Bridge	River	N 32.613417 / W 107.020450	Downstream of three major drain inflows.
Leasburg Cable	River	N 32.476992 / W 106.919769	Break between NMED assessment units.
Seldon Drain	Drain	N 32.471530 / W 106.893160	Perennial tributary
Picacho Bridge	River	N 32.296258 / W 106.824186	Above Las Cruces WWTP
Mesilla Dam	River	N 32.210194 / W 106.771786	Below Las Cruces and Mesilla
Picacho Drain	Drain	N 32.248700 / W106.822200	Perennial tributary
Del Rio Drain	Drain	N 32.104017 / W 106.893160	Perennial tributary
La Mesa Drain	Drain	N 32. 043311 / W 106.662878	Perennial tributary
Anthony Bridge	River	N 32.999500 / W 106.636222	Below Anthony WWTP and two major drains
East Drain	Drain	N 32.002131 / W 106.609131	Perennial tributary
Anthony Drain	Drain	N 31.999620 / W106.627033	Perennial tributary
Newmexas Drain	Drain	N 31.945836 / W 106.628535	Perennial tributary
West Drain	Drain	N 31.853297 / W 106.622119	Perennial tributary
Montoya Drain	Drain	N 31.806150 / W106.552011	Perennial tributary
Sunland Park	River	N 31.799119 / W 106.556.397	Bottom station and below Sunland Park WWTP

1.5 Quality Objectives and Criteria for Measurement Data

Question/Decision

The questions to be answered by the sampling are: For *E. coli*, what are the spatial and temporal locations of high concentrations, what is the loading from the major source locations, and what are the host organisms?

The decision is whether or not the subbasins or areas within the watershed that may be contributing to the water quality exceedance have been adequately identified. More specifically:

- Have the locations been identified adequately to determine spatial distribution on a large scale (urban, rural, rangeland) and to a smaller scale or "hotspots" (subwatersheds, drains, 12 digit HUC, etc.)?
- Have temporal trends of *E. coli* distribution been identified?
- Has sufficient information been collected to estimate the loading of *E. coli* from the identified "hotspots"?
- Have the sources within specific" hotspots" been identified adequately to determine the activity or host organism that is generating the *E. coli*?

Data Quality Objectives

1. The data quality of the *E. coli* sampling will be sufficient to answer the study question; that is, the data quality will be sufficient to identify the spatial and temporal locations of high concentrations of *E. coli*, the locations of major *E. coli* loadings, and the *E. coli* host organisms.

2. The data quality of both the *E. coli* sampling and the turbidimeter and sonde measurements will be sufficient to meet the requirements of the NMED Surface Water Quality Bureau for data to be used for water quality assessment purposes.

Measurement Quality Objectives

The measurement quality objectives will be sufficient to achieve the Data Quality Objective and will be in conformance with those listed in the Surface Water Quality Bureau Quality Assurance Project Plan.

1.6 Special Training/Certification

No special training or certification is required. Sampling will be conducted by the Elephant Butte Irrigation District (EBID) hydrology department personnel who conduct routine water quality sampling and have received prior training.

1.7 Documents and Records

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

Documents and records will include the PQAPP, field notebooks, project specific data collection sheets, spreadsheets generated for analysis, validation and verification records, the final monitoring report, and the project final report.

2.0 DATA GENERATION AND ACQUISITION

2.1 Sampling Design

Sampling will continue through October 2011 with monthly samples collected from seven stations in the Rio Grande from Caballo Dam to Sunland Park, and quarterly from 12 stations in agricultural drains along the same reach. Drain samples will be collected quarterly (July, October, January and April). Additional opportunistic sampling may occur during the summer monsoon season in major ephemeral drainages, or within the river downstream of the point at which the flow enters the river.

This sampling scheme will be utilized for the duration of the project. However, following the first year of sampling and an initial analysis of the data, four stations will be identified for analysis with microbial source tracking (MST) techniques. Sampling of these stations will be more rigorous and increased sampling events will take place during the monsoon season of 2011.

2.2 Sampling Methods

Sampling will be in accordance with "Microbial Methods for Monitoring the Environment" (Bordner and Winter 1978) with the following modifications: *E. coli* samples will be collected in certified sterile containers that do not contain sodium thiosulfate. The sodium thiosulfate dechlorination agent is not used because the water samples are not expected to contain residual chlorine. Samples will be collected utilizing a swing sampler mounted on an extension pole. This sampler is designed with a quick release clamp to hold the sample container, and facilitates sampling from a bridge and allows the technician to collect a sample from further out in the stream away from the bank.

Samplers will wear clean powder free, disposable, gloves while collecting and processing samples. Samples will be labeled, cooled to 4°C and transported to the laboratory for analysis within 6 hours of sample collection, per the m-ColiBlue24® analytical method requirements (Hach 2008).

An aliquot of the sample collected for *E. coli* analysis is decanted for the field measurement of turbidity using a Hach 2100 portable turbidimeter.

Separate samples (using separate containers) will be collected for MST analysis.

Site water parameters will be measured for temperature, pH, conductivity, and dissolved oxygen with a submersible sonde.

2.3 Sample Handling and Chain of Custody

As a component of collecting field notes, a sample chain of custody is filled out by the field technician prior to leaving the sampling station. The chain of custody is submitted with the sample upon delivery to the laboratory, and following relinquishment and receipt of the sample, the form is photocopied and a copy is provided to the field technician for the project records.

2.4 Analytical Methods

E. coli enumeration

E. coli samples will be enumerated using the m-ColiBlue24® method that incorporates specific non-coliform growth inhibitors and a selective enzymatic indicator to allow for simultaneous detection and quantitation of both *E. coli* and total coliforms. This procedure involves filtering the water sample (or the serial dilution) through a 0.45µm membrane filter, placing the filter in a Petri dish containing a filter pad and m-ColiBlue24® nutrient broth and incubating at 35 ± 0.5°C for 24 hours. Immediately following incubation, all blue colonies are enumerated as *E. coli* and red colonies are enumerated as total coliforms. Positive and negative bacterial controls are routinely run in parallel with the m-ColiBlue24® analyses.

E. coli microbial source tracking

Triplicate water samples will be taken when samples are to be analyzed by MST methods. The same m-ColiBlue 24 method used in enumeration will be used for the initial *E. coli* isolation for source tracking. *E. coli* on filters will be stored at 4˚C for up to five days and then sent in insulated Styrofoam mailers overnight express to the IEH lab. At the IEH labs, the presumptive *E. coli* will be transferred to selective media and tested for *E. coli* confirmation, and then chromosomal DNA will be extracted and analyzed by Pulsed Field Gel Electrophoresis (PFGE) to identify the probable source of E. coli. Over the past number of years the IEH lab has performed PFGE analyses on *E. coli* strains because of the technique's high resolution and because it is the basis for the National Pathogen Tracking System (Stephenson 1997; Boxrud et al. 2010).

2.5 Quality Control

Field Quality Control

Each sampling run will include a field blank, which will consist of a sample bottle filled with distilled water and then placed on ice for transport to the analytical lab where it will be analyzed the same as any other sample. The *E. coli* blank count will be recorded as are other sample results. If the blank shows a detection of *E. coli*, then all of the samples for that sampling run will be flagged. Decisions regarding retention or rejection of flagged data will be made based on the use of the data.

Laboratory Quality Control

Samples that are not analyzed within the period allowed by the method (6 hours) will be flagged.

Incubation temperature and time should be within the method requirements (35°C ± 0.5°C for 24 ± 4 hours) and should be recorded. The incubator temperature should be recorded at the beginning and at the end of the incubation period.

Quality control for *E. coli* samples analyzed for MST is the responsibility of the IEH laboratory.

2.6 Instrument/Equipment Testing, Inspection and Maintenance

The instruments used to collect the data that may require testing and maintenance are the turbidimeter and the sonde. All instruments will be tested, inspected and maintained in accordance with the manufacturer's specifications as included in the user's manual.

2.7 Instrument Calibration and Frequency

The Hatch turbidimeter will be calibrated each sampling day. Sondes will be calibrated according to a standard procedure.

2.8 Data Management

The data will be maintained in the project file.

3.0 ASSESSMENT AND OVERSIGHT

3.1 Assessment and Response Actions

The SWQB Project Officer will provide project oversight by periodically assisting with and/or reviewing data collection efforts. A review of the sampling efforts will take place monthly. 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

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 VALIDATION AND USABILITY

4.1 Data Review, Validation and Verification

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

4.2 Validation and Verification Methods

The SWQB Project Officer 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 SWQB Project Officer. 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

The user requirement is a restatement of the data quality objective: the data will be sufficient to identify the spatial and temporal locations of high concentrations of *E. coli*, the locations of major *E. coli* loadings and the *E. coli* host organisms in the El Paso-Las Cruces watershed.

If the data do not meet this requirement, then steps will be taken to determine if it is possible to adjust the sampling plan, or if more data or if data of higher quality will be needed to obtain the data quality objective.

5.0 REFERENCES

Bordner, Robert and John Winter 1978. *Microbiological Methods for Monitoring The Environment*. Environmental Monitoring and Support Laboratory, Office of Research and Development, U. S. Environmental Protection Agency, Cincinnati, Ohio 45268.

Boxrud, D., T. Monson, Stiles and J. Besser 2010. *Public Health Reports*. Supplement 2, 12: 57-62. Abstract found at http://www.ncbi.nlm.nih.gov/pubmed/20518445.

Hach 2008. **Descriptive Name:** *E. coli* by m-ColiBlue24 Broth Procedure for Membrane Filtration **Official Name:** Coliforms: Membrane Filtration (simultaneous detection) In: Hach Analytical Procedures. m-ColiBlue24 Broth Procedure for Membrane Filtration. Hach: Loveland, CO. Updated February 2008. Found at https://www.nemi.gov/apex/f?p=237:38:5158424281211745::::P38_METHOD_ID:5577 and http://www.hach.com/fmmimghach?/CODE%3ADOC316.53.0121315750%7C1

NMED/SWQB 2009. *Quality Management Plan for New Mexico Environment Department Surface Water Quality Bureau Environmental Data Operations 2010*. New Mexico Environment Department/Surface Water Quality Bureau, October 2009.

Stephenson J. 1997. *New approaches for detecting and curtailing foodborne microbial infections*. JAMA 1997;277:1337-40. Abstract found at http://jama.ama-assn.org/cgi/content/summary/277/17/1337.