Quality Assurance Project Plan Amendment

QAPP Title	Powder/Burnt Basins 2013 TMDL Water Temperature Study
Doc Control Number	DEQ07-LAB-0013-QAPP
Revision Number	4.2
Revision Date	04/29/2013
Amended Section	**Reason for Amendment**
A6 Project	Addition of continuous temperature monitoring locations in Powder River Sub-basin for 2013 field season.

Approvals

Larry Marxer, TMDL Monitoring Coordinator	05/02/2013 Date
Scott Hoatson, Quality Assurance Officer	05/02/2013 Date

Amendments

A6 Project

6. DEQ will conduct continuous temperature monitoring in the Powder River Subbasin at 17 locations (Table A6-5) during the 2013 field season. Five of these locations will also be monitored by the Powder Basin Watershed Council (PBWC). Data from these 5 sites will be compared for QA purposes. Data from the PBWC sites will be submitted to DEQ for entry into the web accessible data repository as part of a Volunteer Monitoring Project.

   Air temperature measurements are made continuously by the U.S. Bureau of Reclamation at the Phillips Dam. DEQ will also monitor air temperature continuously at two locations: Station # (site below Antone Creek) in the North Powder River watershed, and Station ID # 11857 near the mouth of the Powder River.

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Table A6-4 Continuous Temperature Monitoring Locations in Powder River Subbasin

Station ID #	Site Name	River Mile	Elevation	Lat.	Long.	Hobo #
37417	Cracker Cr. blw Wind Cr.	3	4691	44.78953	-118.19335	
37418	Cracker Creek in Sumpter	0.25	4411	44.74576	-118.20365	
37327*	Powder R. @ Huckleberry Lane	137.5	4120	44.6961	-118.1125	
26601	Powder River @ Mason Dam gauge	131	3917	44.6671	-117.9944	
37328*	Powder R. @ Kirkway, Baker City	113	3438	44.7918	-117.8335	
37419	Powder R. @ McCarty Bridge Rd.	89.5	3254	44.97233	-117.88186	
37333*	Powder R. @ N. Powder confluence	81	3215	45.02206	-117.5343	
37420	Powder R. abv. Thief Valley Res.	75	3169	45.05830	-117.84186	
11858	Powder R. @ Thief Valley Dam	69.5	3116	45.01163	-117.77822	
37335*	Powder R. @ Hwy. 203 nr Keating	58	2760	44.91378	-117.66999	
37421	Powder R. @ Crystal Palace Gulch	30	2541	44.81709	-117.37835	
37422	Powder R. nr Upper Timber Gulch	22	2287	44.77874	-117.28774	
11857	Powder R. @ Snake R. Road (IPC?)	10	2081	44.7463	-117.1718	
37423	N. Powder R. blw. Antone Cr.	13	3835	44.98630	-118.08787	
37424	N. Powder R. nr. Pond #1	3	3279	45.01387	-117.93175	
37331*	Wolf Cr. @ hwy 203	2.1	3221	45.023544	-117.540432	
36193	Eagle Cr. @ Snake River Rd. (IPC?)	0.5	2089	44.7547	-117.1730	

*collocated with PBWC station

Quality Assurance Project Plan Amendment

QAPP Title	Powder/Burnt Basins 2012 TMDL Bacteria Study
Doc Control Number	DEQ07-LAB-0013-QAPP
Revision Number	4.1
Revision Date	4/16/12
Amended Section	**Reason for Amendment**
A6 Project	Addition of continuous temperature monitoring locations in Burnt River Sub-basin
A7.g Modeling Approach	Addition of description of temperature modeling approach.
B1 Sampling Process Design	Description of temperature monitoring and data review and management procedures.

Approvals

Larry Marxer, TMDL Monitoringt Coordinator Date

Scott Hoatson, Quality Assurance Officer Date

Amendments

A6 Project

6. DEQ will conduct continuous temperature monitoring in the Burnt River Subbasin at 8 locations. Three of these locations will also be monitored by the Wallowa Whitman National Forest. Data from these 3 sites will be compared for QA purposes. An additional 13 sites will be monitored by the USFS and 2 sites will be monitored by Idaho Power Company (IPC). Air temperature measurements are made continuously by the U.S. Bureau of Reclamation at the Unity Dam. DEQ will also monitor air temperature at one location (LASR #) in the upper part of the North Fork Burnt River watershed.

Table A6-4 Continuous Temperature Monitoring Locations in Burnt River Subbasin

LASAR #	Site Name	River Mile	Elevation	Lat.	Long.	Hobo #
37108	Camp Cr. N. of Whitney (USFS)	2	4302	44.69442	-118.3221	NA
37109	Lower China Cr. (USFS)	2	4163	44.58403	-118.18267	NA
37110	Upper China Cr. (USFS)	5.5	4787	44.60704	-118.12770	NA
37111	East Camp Cr. (USFS)	7	4702	44.32494	-118.14037	NA
37113	West Camp Cr. (USFS)	7	4744	44.34883	-118.19054	NA
37114	Geiser Cr. (USFS)	1.1	4526	44.68747	-11838621	NA
37115	Greenhorn Cr. (USFS)	1	5000	44.6838	-118.46214	NA
37116	Middle Fork Burnt R. (USFS)	5	4101	44.51442	-118.28921	NA
37117	North Fork Burnt R. @First Cr. (DEQ/USFS)	7	3946	44.57818	-118.22049	9906752
37119	North Fork Burnt R. abv. Trout Cr. (USFS)	14	4113	44.64271	-118.2823	NA
37120	North Fork Burnt R. @ Hwy. 7 (DEQ/USFS)	20	4299	44.66853	-118.37511	9906742
37121	North Fork Burnt R. @ Snow Cr. (USFS)	25.7	4930	44.68511	-118.45744	NA
37122	Snow Cr.(USFS)	0.25	4970	44.68314	-118.46168	NA
37123	South Fork Burnt R. (DEQ/USFS)	10	4312	44.40733	-118.30059	9906749
37124	Trout Cr. @ mouth (USFS)	0	4114	44.64074	-118.27872	NA
37125	West Fork Burnt R. (USFS)	3	4050	44.54571	-118.26054	NA
36195	Burnt R. @ Unity Dam (DEQ)	77	3807	44.50370	-118.17624	9906740
34256	Burnt R. @ Clarks Cr. Road (IPC)	45.7	3379	44.50399	-117.72695	NA
27760	Burnt R. @ Sinker Cr. (DEQ)	31.5	2760	44.57567	-117.53554	9906750
37126	Dixie Cr. @ Beaver Cr. (DEQ)	5	2906	44.44476	-117.42924	9906744
37127	Dixie Cr. abv. Clear Cr. (DEQ)	2	2507	44.44771	-117.36504	9906751
37128	Burnt R. @ Lime (DEQ)	8	2221	44.40321	-117.30790	9906753
10726	Burnt R. @ Huntington (IPC)	3	2116	44.35507	-117.27188	NA

A7.g Modeling Approach

Temperature data from this group of sites will allow possible heatsource or other appropriate methods of temperature modeling of the Burnt River and significant tributaries. Development of generic shade curves is proposed on other listed and non-listed perennial streams.

B1 Sampling Process Design

When temperature loggers are used for this project, they will be deployed in the field by DEQ staff and retrieved at the end of the monitoring season by DEQ staff. Water and/or air temperature data will be collected at hourly intervals. After loggers have been retrieved, they will be forwarded to WSA staff at the DEQ Laboratory for Quality Assurance and data management procedures.

Data from USFS and IPC data loggers will be also forwarded to WSA staff at the DEQ laboratory for Quality assurance and data management procedures. DEQ Regional staff will assist USFS and IPC with field audits when needed.

QUALITY ASSURANCE PROJECT PLAN

Powder/Burnt Basins 2012 TMDL Bacteria Study

State of Oregon
Department of Environmental Quality

Laboratory and Environmental Assessment Division
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Group A Project Management

A1. Title and Approval Sheet

Regional Project Coordinator (**John Dadoly**) Date

Laboratory TMDL Monitoring Coordinator/Project Data Manager (**Larry Marxer**) Date

Quality Assurance Officer (QAO) (**Chris Redman**) Date

Signed Copy on File at DEQ

Section Manager (**Aaron Borisenko**) Date

Last Update 04/16 /2012
DEQ07-LAB-0013-QAPP
Version 4.1

Web pub#: NA

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A2. Table of Contents

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Appendices

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A3. **Distribution List**

The following DEQ personnel will be emailed regarding all aspects of this QAPP/SAP. Final reports from the contract laboratory will be faxed/emailed and mailed to the Project Manager, Regional Monitoring Coordinator and Laboratory Monitoring Coordinator/Data Manager. Final Reports from the ODEQ Laboratory may also be faxed/emailed and mailed to the Project Manager, Regional Monitoring Coordinator and Laboratory Monitoring Coordinator/Data Manager.

This QAPP will be posted on Q-Net (DEQ's internal website) at http://qnetstage/lab/qms/documents.asp. As prescribed by the laboratory's document control procedures, the official signed document will be filed at the DEQ laboratory. This project is expected to continue through multiple seasons; thus revisions should be anticipated. The Project Manager may make revisions to this plan, which must be approved by the signatories in **Section A1**. The DEQ is not responsible for the control of reprinted copies from web sites or photo copies of the original plan. It is the responsibility of the reader to ensure that they are using the most current QAPP. The QAO will replace posted network files as the plan is revised.

Table A3-1 Distribution List

NAME	PHONE	EMAIL
John Dadoly	541-278-4616	Dadoly.John@deq.state.or.us
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To track the time and expenses spent on this project DEQ personnel must use the Q-Time number **36852**

A4. **Project/Task Organization**

Table A4-1 Project / Task Responsibilities

NAME:	PROJECT TITLE/RESPONSIBILITY
John Dadoly	DEQ Eastern Region/Pendleton TMDL Coordinator; project oversight, assurance that data collected will meet the needs to address 303(d) listing.
Shannon Swantek	DEQ Laboratory Sample Tracker; sample and data tracking
Larry Marxer	DEQ Laboratory TMDL Monitoring Coordinator; QAPP development, equipment preparation, data quality assurance and management, field work assistance as needed.
Chris Redman	DEQ QA Officer; QA oversight.
Raeann Haynes	DEQ Laboratory Inorganic Lab Manager
Brian Boling	DEQ Laboratory Organic Lab Manager
Aaron Borisenko	DEQ Laboratory Watershed Assessment Section Manager

A5. **Problem Definition/Background**

This Quality Assurance Project Plan (QAPP) has been designed to assist in the future development of Total Maximum Daily Load documents for Powder River Basin. The water quality monitoring design for the Powder/Burnt River Basins is based on the following 303(d) listed parameters for fecal coliform bacteria, & temperature, ambient station monitoring, and additional bacteria monitoring conducted in 2007, (**Table A5.1, Figure A5.1, Figure A5.2.)** The goal of this QAPP is to describe the methods, location and schedule for gathering bacteria samples, ambient water samples, field data and other pertinent information necessary for a future comprehensive and intensive TMDL. Bacteria samples, ambient water samples and field parameter measurements will be collected at each of the 10 + sites (**Table A6.2**) in addition to one duplicate each day and one blank per week. Due to the remoteness of sample locations, all bacteria samples will be analyzed using the Colilert 24 Method in the DEQ Mobile lab. All bacteria samples will be collected and put directly on ice and held until all daily site samples are collected (before 6hr holding time expiration) and then processed within 2 hrs of sample receipt. (see Water Assessment Section Mode of Operations Manual "MOM's" pgs. 152-155)

The following tabulates the factors involved in identification of parameters, timing and locations for this monitoring effort:

- 303d listings (Table A5.1)
- Results of bacteria monitoring performed in the Powder River in 2007.
- Land ownership/jurisdictional boundaries (to facilitate allocation based on land management responsibility)
- Site Permission (focus on County, BLM land, and water samples at bridge crossings)
- Timing based on track record at ambient sites and similar monitoring performed in 2007/2008 (Figure 2)

- In general, sample locations (Figure 3) are placed to characterize background, adverse WQ extremes and extent. In addition, as stated above, samples are sited where access and permission avails and to delineate management boundaries.

Table A5-1 Current bacteria, dissolved oxygen and chlorophyll a 303(d) Listings, Powder River and Burnt River

WATERBODY NAME	RIVER MILE	PARAMETER	SEASON	LISTING STATUS	LIST DATE	RECEIVING WATER BODY
Powder River	115.6-130	Fecal coliform bacteria	Fall, Winter, Spring, Summer	303(d)	2004/2006	Powder River
Burnt River	45.1-77.3	Chlorophyll a	Summer	303(d)	1998	Burnt River
Burnt River	0-77.9	Dissolved Oxygen	Jan. 1 – May 15	303(d)	2004	Snake River
Burnt River	0-45.1	E. coli bacteria	Summer	303(d)	2004	Snake River

Figure A5-1 Powder River Ambient site Bacteria, near Baker City (Fecal coliform is 1982-2002, E. coli is 1996-2006)

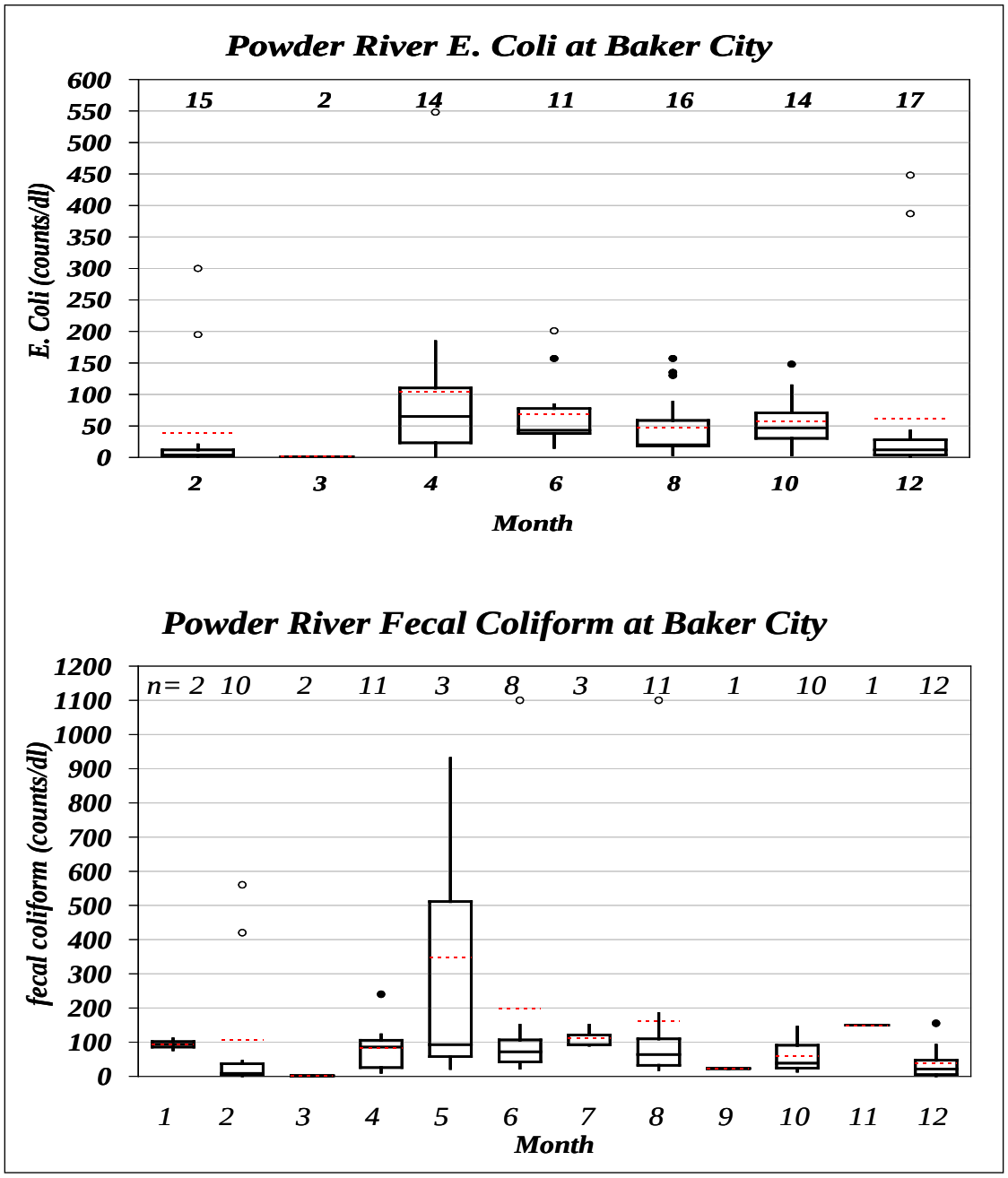
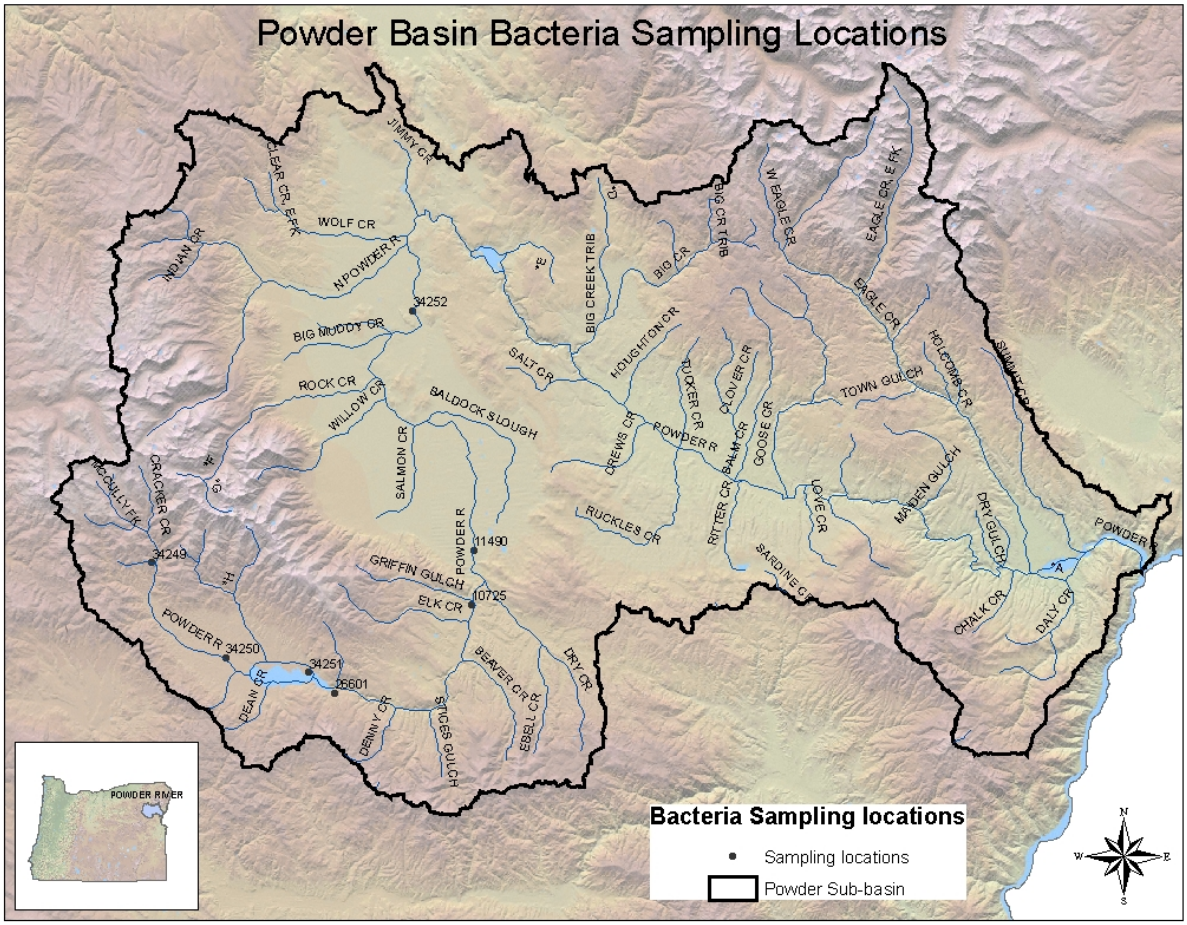


Figure A5-2 Powder Basin Bacteria sampling locations 2007/2008



A6. **Project Task/Description**

The field work needed to complete the requirements of this QA Plan will include the following items:

1. The collection and analysis of 5 bacteria samples within a 30-day period for E. coli analysis at each site listed in **Table A6.2**;

   1a. The "5 samples in 30 days" sampling events will be conducted in April, June, August & October 2012 , and February 2013 .

   Because of the geographical distance between the sites listed in Table A6.2, separate 30-day sampling events will be conducted for Powder River Sub-basin and the Burnt River Sub-basin.

   1b. Each 30-day sampling event will consist of two 1-week field trips.

   The first 1-week field trip will include:

   * The collection of daily bacteria samples from each station on 3 consecutive days;

* The deployment of YSI datasondes at three designated sites in the Burnt River Basin.

* The collection of one set of ambient water samples for nutrient analysis and field parameter measurements at all stream sites and WWTP sites listed in Tables A6-**2 & A6-3**

The second 1-week field trip will include;

* The collection of daily bacteria samples and field parameter measurements on 2 consecutive days;

* The recording of flow/discharge measurements at the respective sites in each sub-basin where access to the river is available.

1c. Field parameter measurements will include water temperature, pH, specific conductance, dissolved oxygen and turbidity.

2. The ambient water samples will be sent to the DEQ Laboratory for chemical analysis for ammonia, nitrate-nitrite, Total Kjeldahl Nitrogen, Total Phosphorus, Ortho-phosphorus.and chlorophyll-a.

3. The YSI brand datasondes will be deployed at the three sites on the Burnt River (**Table A6-2 & A6-3**) to record continuous data for water temperature, pH, specific conductance and dissolved oxygen. The deployment period will be for 48-60 hours.

Daily bacteria samples will be collected within a 6-hour holding time; all bacteria samples will be processed within 2 hours of the last sample collected.

4. One set of ambient water nutrient samples and field parameter measurements will be collected one time during each 30-day sampling event at each of the sites listed in **Table A6-2 & A6-3.** Chemical analysis will be the same as listed in Item #2 above.

5a. The North Powder and Halfway Wastewater Treatment Plants <u>do not</u> discharge to the river from May thru November. The Baker City Wasterwater Treatment Plant does not discharge to the Powder River when its holding pond is frozen. Effluent sample collection at these sites will be limited to sampling events that occur during the discharge period.

Table A6-1 Estimated Field Sampling Event Schedule

Basin	Fld.Dates	#Daily Spls	Bacteria	Nutrients	Cont. DS	Flow
Powder R.	4/9-13/12	3	X	X		
Burnt R.	4/9-13/12	3	X	X	X	
Powder R.	4/23-26/12	2	X			
Burnt R.	4/23-26/12	2	X			
Powder R.	/ 6/4-8/12	3	X	X		
Burnt R.	/ 6/4-8/12	2	X		X	
Powder R.	6/25-2812	3	X	X		
Burnt R.	6/25-28/12	2	X			
Powder R.	8/6-10/12	3	X	X		
Burnt R.	8/6-10/12	3	X	X	X	
Powder R.	8/27-30/12	2	X			X
Burnt R.	8/27-30/12	2	X			X
Powder R.	11/5-9/12	3	X	X		
Burnt R.	11/5-9/12	2	X		X	
Powder R	11/26-29/12	3	X	X		
Powder R.	11/26-29/12	2	X			
Powder& Burnt Rvs.	2/11-15/13	3	X	X	X	
Powder & Burnt Rvs.	2/25-28/13	3	X	X		

Table A6-2 Sample Locations (5 Bact. Samples & 1 nutrient sample per 30-day event)

LASAR #	SITE NAME	RM	LAT	LONG	FIELD *	BACT	NUTRIENTS	CHLOR. A	CONT.DS
36191	N. Powder R. @ Hwy. 30 Br.	2	45.0185	-117.9216	x	x	x	x	
36192	N. Powder R.@ Miller Rd. Br.	10	45.0130	-118.0540	x	x	x	x	
11857	Powder R. @ Snake R. Rd.	10	44.7463	-117.1718	x	x	x	x	
36193	Eagle Cr. @ Snake R. Rd.	0.5	44.7547	-117.1730	x	x	x	x	
36382	Pine Creek @ Hwy. 71 near mouth	0.1	44.9718	-116.8563	x	x	x	x	
34256	Burnt R. @ Clark Cr. Rd. Br.	45.8	44.5038	-117.7274	x	x	x	x	x
36195	Burnt R. @ Unity Res. Dam	77	44.5038	-118.1773	x	x	x	x	x
36196	S. Fk Burnt R. @ Rouse Ln.Br.	1	44.4880	-118.2016	x	x	x	x	
36197	Mid. Fork Burnt R. @ Rice Road Bridge	1.5	44.5073	-118.2158	x	x	x	x	
36198	W.Fk. Burnt R.@ Rice Rd Br.	2.5	44.5268	-118.2230	x	x	x	x	

***DO, pH, temperature, conductivity**,

Table A6-3 Sample Locations (One Sample per 30-day event)

LASAR #	SITE NAME	RM	LAT	LONG	FIELD *	BACT	NUTRIENTS	CHLOR. A	TOTAL REC. MERCURY	CONT.DS
12617	Baker City WWTP Effluent		44.81708	-117.828528	x	x	x	x		
12627	N. Powder WWTP Effluent		45.03472	-117.90078	x	x	x	x		
19918	Halfway WWTP Effluent		44.08765	-117.10018	x	x	x	x		
12624	Powder River @ Bidwell Road		45.0130	117.8839	x	x	x	x		
36383	Pine Creek at Hwy. 414, Halfway, OR		44.8773	117.0992	x	x	x	x	x	
31914	Huntington WWTP Effluent		44.35652	-117.25549	x	x	x	x		
36385	Burnt River at Hwy. 30 u/s of Huntington, OR		44.3627	-117.2805	x	x	x	x		x
36384	Dixie Creek at near mouth @ Hwy. 30		44.4456	-117.3302	x	x	x	x		

***DO, pH, temperature, conductivity**,

A6.1 Flow Measurements

A flow measurement will be collected by DEQ regional staff one time during summertime low-flow season at each site locate where access is available. Written permission to enter private property must be obtained in advance of any field sampling or flow monitoring work.

A7. Quality Objectives and Criteria

The ODEQ Laboratory uses its document control procedures to ensure the most recently approved Quality Systems documents are available for implementation. These documents are available through Q-Net at (http://deq05/Lab/qms/documents.asp). Specific Quality Systems documents cited in this QAPP contain a hyperlink to the controlled document for easy reference.

Samples collected for laboratory analysis will be analyzed following standard DEQ protocol as described in the Laboratory Quality Manual (DEQ91-LAB-0006-LQM) and the Laboratory's analytical SOPs. Procedures for collecting Water Quality samples and conducting field analyses are described in the Watershed Assessment Section Mode of Operations Manual (MOMs) (DEQ03-LAB-0036-SOP).

Specific QA Objectives for this project are:

• Collect a sufficient number of samples, sample duplicates and field blanks to evaluate the potential for contamination from sampling equipment and techniques.

• Analyze a sufficient number of QC Standards, blanks and duplicate samples in the Laboratory environment to effectively evaluate results against numerical QA goals established for precision and accuracy.

• Implement sampling techniques in such a manner that the analytical results are representative of the media and conditions being sampled.

The following Data Quality Indicators describe the quality of the data required to satisfy the goals and objectives of this project and is assessed by the following QA/QC parameters:

- Precision
- Accuracy/Bias
- Sensitivity
- Representativeness
- Comparability
- Completeness

Precision and accuracy control limits are defined in **Table A7.1 Data Quality Criteria** for project specific parameters. Data quality codes stored in LIMS and LASAR to simplify database queries of quality data are defined in section C1. Data not meeting the Data Quality Indicator control limits will receive a code other than "A". Precision requirements for the field equipment (conductivity/salinity & turbidity meters, etc.) are consistent with the Data Quality Matrix in Chapter 4, "Data Quality" of the Oregon Plan for Salmon and Watersheds Water Quality Monitoring Guidebook, (2001).

A7.a Precision

Precision is a measure of the scatter of the data when more than one measurement is made on the same sample. Scatter is commonly attributed to sampling activities and/or chemical analysis. For duplicate measurements, precision will be expressed either as the difference or the relative percent difference. Field duplicates must be collected at a frequency of one per set of ten stations sampled or at least one per sampling expedition (1 week period).

Precision shall be estimated by measuring the variability of duplicate measurements. The best estimate of precision for the overall monitoring program is the comparison of duplicate samples collected in the field. The variability in the results obtained from field duplicate samples is the sum of the sampling and analytical variability (measurement uncertainty).

For those methods that do not consume the entire sample, the laboratory will prepare and analyze an in-lab replicate aliquot at the rate of one per set of twenty samples.

Field duplicate samples will be collected at a frequency of 1 per daily sampling per team during a sampling expedition. (minimum of 10% of the field samples).

Table A-7 lists the relative percent difference criteria for both field and laboratory duplicates.

Precision will be estimated from both in-lab replicate analyses and field duplicate samples. Sample results will be flagged as "B" data, if corrective action measures do not resolve precision errors.

A7.b Accuracy/Bias

Accuracy is a measure of the error between reported test results and the true sample concentration. Inasmuch as true sample concentrations are not known, a priori, accuracy is usually inferred from recovery data as determined by sample spiking and/or Laboratory Control Samples. Spiked samples will be run on a 5% frequency or one per 20 sets of samples; whichever is greater. Laboratory Control Samples (LCS) will be prepared with each preparation batch. If control standards are not available for the preparation of an LCS or sample spike (e.g. alkalinity), QC reference standards will be used in place of the LCS and no matrix spikes will be performed.

The Laboratory Control Samples (LCS) prepared with each batch of samples will be used to estimate accuracy and where applicable matrix spikes will be used in conjunction with the LCS. All sample results batched with a failed LCS will be flagged as "B" data. The sample result of a failed MS will also be flagged as "B" data.

A7.c Sensitivity

Blank samples must be less than the Limit of Quantitation (LOQ) for each analyte listed in **Table A7-1 Data Quality Criteria**. Laboratory Method Blanks (MB) will be prepared along with each LCS. The MB will be used to assess the sensitivity of the method. If corrective action measures fail to resolve MB errors, results batched with the MB will be flagged as "B" data.

Field blank samples will be processed at a frequency of one blank per field sampling event (see **Table B5-1**). Field blanks will be used to assess sample handling contamination. If corrective action measures fail to resolve apparent contamination issues, the sample results associated with the failed daily QC will estimated be given a DQL of "B" in LASAR.

This project requires analytical data based on OAR 340-041-0053, Table 20: Water Quality Toxic Criteria Summary standards. It is therefore necessary to report data below the DEQ Laboratory's Limit of Quantitation (LOQ) for a few parameters. See Table A7.1 Data Quality Criteria.

A7.d Representativeness

Representativeness is a qualitative term that should be evaluated to determine whether in situ and other measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the media and phenomenon measured or studied.[1] The intent of this project is to measure contaminant levels in the ambient environment.

Representativeness is controlled by using well defined sampling and sample handling SOPs. Sampling procedures are designed so that results are representative of the matrix being sampled. Sample handling protocols for storage, preservation and transportation have been developed to preserve the representativeness of the collected samples. Proper documentation will establish that protocols have been followed and sample identification and sample integrity assured. If it is determined that sample integrity has been compromised data will be flagged as "B" data.

Samples that are not representative of the population often occur in judgmental sampling because not all the units of the population have equal or known selection probabilities[2]. The rational for selecting sampling stations is described in section B1 below.

The location of the sample will be referenced to latitude and longitude using a GPS. Samples will be collected at or near the center of the stream channel where the water is well mixed and representative of the ambient conditions. The time and date range measurements are made and physical samples collected will be recorded with every sample. All efforts will be made to confirm the accuracy of this sample meta-data.

Since special or unusual sample conditions might affect the accuracy of an analysis, it is helpful to have information about the sample matrix. Results of such matrix tests may give additional insight into the representativeness of the analyses. Tests describing the sample matrix may be requested on a site-specific basis. When appropriate, other QA tools such as ion balance reports, solid balances, conductivity-dissolved solid comparisons, etc. will be used to establish the representativeness of the data.

Quality analytical measurements with poor field duplicate precision may point to sampling problems or heterogeneous samples and thus not representative of ambient conditions. To ensure the representative data quality indicator is correct, field duplicates must be collected within 15 minutes and 15 meters of each other, where the sample matrix is assumed to be homogeneous. Evaluation of field duplicate, lab duplicate, and accuracy data will provide information if there is error in the hypothesis that the sample is homogeneous. If field duplicate data exceeds precision limits but, lab duplicate and accuracy data is acceptable, the sampling design may be in error and the data may not represent the environmental conditions for which it was collected. If field duplicate data indicates Representativeness is acceptable, data users may assume other project data is accurate.

If laboratory corrective action cannot rectify apparent duplicate precision issue with the subproject/project station data, affected analytes in the field primary and field duplicate samples for the daily sampling event will be assigned a data quality level (DQL) of "B" data in LASAR. If the Project Coordinator determines that the duplicate precision reflects sampling conditions or procedures at other sample sites, data from those sites also may be determined to have a DQL of "B". Similarly, if the field duplicates are not collected during the survey batch all associated data collected by the sampling team within the survey batch will also be estimated and assigned a DQL of "B" in LASAR

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[1] USEPA 1998. EPA GUIDANCE FOR QUALITY ASSURANCE PROJECT PLANS EPA QA/G-5, pp 76.

[2] ibid, pp 94.

The data user should use their professional judgment to determine if other project data meets their data quality needs.

If station data is not indicative of the streams normal ambient conditions and the variances are attributable to anomalous environmental conditions, the project station data will be flagged as "F" data.

A7.e Comparability

To ensure data will be comparable to similar environmental data, the DEQ will use documented procedures for sampling, sample handling, and sample analysis, which are written to comply with nationally accepted methods. Coordination with other agencies is emphasized to ensure that data are comparable. The DEQ Laboratory will follow the analytical methods cited in **Table A7.1 Data Quality Criteria**, which are promulgated methods in 40 CFR Part 136 and the sampling procedures described in the ODEQ Laboratory Mode of Operations Manual (MOMs).

A7.f Completeness

It is expected that samples will be collected from all sites described in the Sampling and Analysis Plan (SAP) unless seasonal-related events or safety issues prevent sampling. The Project Manager may authorize re-sampling to obtain more information of qualified data.

Table A7-1 Data Quality Criteria

Parameter	Method Reference	Target MRL	LCS or SRM [i]	Lab or Field Duplicate [ii]	Holding Time	Container	Sample Preservation
Field Parameters							
Dissolved Oxygen	SM 4500-O C	1mg/L	≤ ± 0.2 mg/L[iii]	≤ ± 0.3 mg/L	Analyze Immediately[iv]	Field	NA
Flow	MOMs[v]	10cfm	N/A	N/A	NA	Field	NA
Percent DO Saturation		N/A	N/A		Analyze Immediately	Field	NA
Sample Depth		1 ft	N/A		NA	Field	NA
Temperature	EPA 170.1	1°C	≤ ± 0.5°C[vi]	≤ ± 0.5°C	NA	Field	NA
Laboratory Parameters							
pH	EPA 150.1	Sensitivity to 0.1 SU	≤ ± 0.2 S.U[vii]	≤ ± 0.3 S.U	Immediate (24 hours)	Field + QC – P: 1000 ml Poly	<4°C
Specific Conductivity (@ 25°C)	EPA 120.1	1µmhos/cm	±10-15%		28 days	Field + QC – P: 1000 ml Poly	<4°C
Turbidity	SM 2130 B	1NTU	±10-15%	± 20%	48 hours	Field + QC – P: 1000 ml Poly	<4°C
E.Coli	Colilert 24	1CFU	Positive Confirmation	10%	6hrs	250 ml C carbonate	<4°C
Ammonia	ASTM D6919-03	0.02 mg/L as N	± 10%	20%	28 days	R- 500 mL Poly	D
NO_2-NO_3	4500-NO3 F	0.005 mg/L as N	± 20%	10% Lab 20% Field	28 days	R- 500 mL Poly	D
TKN	4500-N-D	0.2 mg/L as N	± 10%	20%	28 days	R-500 mL Poly	D
Total PO_4	4500P-B,E	0.01 mg/L as P	± 10%	10% Lab 20% Field	28 days	R- 500 mL Poly	D

Parameter	Method Reference	Target MRL	LCS or SRM [i]	Lab or Field Duplicate [ii]	Holding Time	Container	Sample Preservation
Ortho-PO_4	4500-P E	0.005 mg/L as P	± 10%	10% Lab 20% Field	48 hours	DP- 250 mL Poly	C
Total Recoverable Mercury	EPA 245.1	0.000010 mg/L[viii]	± 10%	10% Lab 20% Field	28 Days	TH Poly	Preserved in Lab
Chlorophyll a	10200-H	0.1 µg/L	NA		28 days	Petri Dish	H

[i] Accuracy of analytical methods will vary based upon calibration and equipment employed.

[ii] Precision will be estimated from both in-lab replicate analyses and field duplicate samples. Sample (Field Primary) and Replicate (Field Duplicate) Results will be flagged as "B" data, if corrective action measures do not resolve precision errors.

[iii] Winkler titration or calibrated Oxygen meter.

[iv] Winkler allows stabilization and holding time for 8 hours until titration

[v] Stream flow measurements will be conducted according to the ODEQ methodology derived from USGS stream flow protocols.

[vi] Thermometer Accuracy checked with NIST standards.

[vii] Calibrated pH electrode

Preservation Codes:

C = Filter in field (0.45 µ filter) and refrigerate at 4°C.

D = Add 12 drops conc. H2SO4 to 500 mL bottle and refrigerate at 4°C. (H_2SO_4 = Sulfuric Acid).

H = Filter in field, store filter paper in petri dish and freeze on dry ice. Avoid exposure to light!

TH = Mercury bottle 500 ml Poly. Preserved with HNO_3 at the laboratory.

[viii] **Below laboratory reporting limit of 0.000020 mg/L but above MDL. Laboratory will estimate any results between 0.000010 mg/L and 0.000020**

A7.g Modeling Approach

Data evaluation relating to this monitoring effort will target the 303(d) listings for bacteria on the mainstem of the Powder River and on the Burnt River. Regarding bacteria, the timing of data collection is planned for evaluation of *E. coli* 5-sample 30-day geometric means during the months of traditionally high bacteria concentrations at the Baker City ambient site (**Figure A5.1**). The TMDL analysis method has not yet been identified yet, however current and historic data collection will support load duration curves as a likely method of analysis, targeting *E. coli* and relating this to fecal coliform concentrations. Bacteria concentration and stream discharge are the required data for this form of analysis. Another objective of this monitoring effort is bacteria source discovery. Sample sites are strategically located to distinguish USFS, Reservoir and private land contributions.

A8. Special Training and Certification

No special training is required for this project. Field staff must have a valid Oregon Driver's License, and be up to date with First Aid training. In general, staff safety is the top priority during field sampling events.

A9. Documentation and Records

As outlined in the DEQ Laboratory Field Sampling Reference Guide, (2010) DEQ field staff will prepare field data sheets (DEQ's standard *Chain of Custody and Field Data Forms*) prior to the field sampling events that will be submitted to the Lab with the samples. Information to be recorded on the field data sheets includes: Project name, fund code, date and time of sampling events, water body name, major basin name, general weather conditions, names of field staff, time of each sample or field measurement, LASAR station ID number, DEQ equipment ID numbers. All metadata and field data will be entered into the DEQ Laboratory LASAR database.

Field Notebook:

A bound field notebook will be maintained by DEQ field staff to provide a daily record of significant events, observations, and measurements during field investigations. This record should include water level data, field measurements, personnel, weather observations, including temperature, and cloud cover; and physical conditions. All entries in the field notebooks should be signed and dated. The field notebooks will be kept as a permanent record.

Corrections to Documentation:

All original data recorded in field notebooks, chain of custody records, and other forms will be written in waterproof ink. None of these documents will be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. If an error in made on a document assigned to one individual, that individual will make corrections by crossing a single line through the error, entering the correct information and initialing the correction.

Group B Data Generation and Acquisition

B1. Sampling Process Design

Section A5 of this document lists the basis behind selecting the sampling locations. Sites will reflect the integrated water quality affects from point and non-point source activities as well as the natural geological, hydrological and biological impacts on water quality for the watershed that they represent. Sampling frequency is based upon resources, priorities; and statistical needs for trending, determining central tendency, and data distribution characteristics. Field work will be conducted as follows:

Two short-term field monitoring trips per selected months (April, June, August, October/November 2012 & February 2013) to include collection of instantaneous ambient data for bacteria and field parameters for temperature, conductivity, and dissolved oxygen, and continuous diurnal data at selected sites. DEQ staff will drive the mobile BACT Laboratory to the Powder River Basin and staff will collect water samples at the designated site locations (see Table A6-2 & A6-3 above) on 2 or 3 consecutive days per month. Lab staff will then analyze the samples using the Colilert 24 method for E. coli bacteria in the mobile laboratory within the 6-hour holding time. E. coli results will then be given to Project Data Manager.

Where site locations safely allow, samples should be collected from the center of the main channel, at a depth of one meter or half the total depth, whichever is greater. This ensures a sample representative of environmental conditions.

B2. Sampling Methods

Sampling will be accomplished using the standard DEQ protocol described in the ODEQ Laboratory MOMs Manual. Specific sample preservation methods and holding times are summarized in Table B2-1 Sample Preservation and Holding Times

Table B2-1 Sample Preservation and Holding Times

TEST	Number of Samples to Lab	Holding Time	Container	Sample Preservation
Ammonia	50	28 days	R-500ml poly	preserved with H2SO4 (12 drops), <4°C
NO2-NO3	50	28 days	R-500ml poly	preserved with H2SO4 (12 drops), <4°C
TKN	50	28 days	R-500ml poly	preserved with H2SO4 (12 drops), <4°C
Total PO4	50	28 days	R-500ml poly	preserved with H2SO4 (12 drops), <4°C
Ortho-PO4	50	48 hours	DP-250 ml poly	(filtered sample) <4°C
Total Recoverable Hg	1-5 depending on discharge flow	28 days	TH - Poly	<4°C, HNO_3 added in lab
Chlorophyll a	50	28 days	Glass Fiber Filter	Avoid exposure to light; freeze with dry ice, and keep frozen until analysis

B3. Sample Handling and Custody Procedures

Samples for laboratory analysis will be preserved as identified in *Table B2-1 Sample Preservation and Holding Times*

and held on ice until delivered to the laboratory. Routine ODEQ sample custody protocols will be followed.

B4. Analytical Methods

All parameters are measured using the protocols previously mentioned above. Field analytical methods can be found in the Watershed Assessment Mode of Operations Manual MOMs which is available on the DEQ Laboratory website at, //deqlead02/QA_Documents/SOP/DEQ03-LAB-0036-SOP.PDF

B5. Quality Control

Duplicate quality control samples will be collected at a minimum of 10% of the total number of monitoring sites, or at least one duplicate per sampling expedition. In addition to the duplicate sample, one blank will be collected at the end of each sampling expedition.

The analyst must flag all results, which are associated with a QC measure they perform and that fails to meet control limits. The Data Quality Level will be set to "B" or the analyst may void the result and set the Data Quality Level to "C". A comment will be linked to the result explaining the QC failure.

Table B5-1 QC Per Each Daily Sampling Event

Bacteria Sampling Event	**Duplicates**	**Blanks**
Powder R team	1 per day	
Burnt R.team	1 per day	
Powder/Burnt teams combined		1 per day
Nutrients Sampling Event	**Duplicates**	**Blanks**
Powder R team	1 per day	1 per day
Burnt R.team	1 per day	1 per day

If the QAO determines the data does not meet the data quality objectives described in section A7 the Data quality levels for all affected results will be adjusted to the appropriate code defined in **Table B5-2.**

Table B5-2 Current LIMS QC Data Quality Level Codes

Code	Definition	Description
A+	DEQ Data of known Quality.	Data of known Quality. Presented by DEQ meeting current QC limits as established by the Laboratory's Quality Systems Manual.
A	non-DEQ Data of known Quality.	Data of known Quality. Submitted by entities outside of DEQ meeting current QC limits for external data as established by the DEQ Laboratory.
B	Data of suspect Quality.	Data of suspect Quality. Data may not meet established QC but is within marginal acceptance criteria or data value may be accurate, however controls used to measure Data Quality Objective elements failed i.e. batch failed to meet blank QC limit.
C	Data of unacceptable Quality.	Data of unacceptable Quality. Values are typically discarded (Void) due to analytical failure.
D	No sample collected or no reportable results.	No sample collected or no reportable results, typically due to sampling failure.
E	Data of unknown quality.	Data of unknown quality. No QA information is available, data could be valid however there is no evidence to prove either way (Educational Only, Very Questionable/Poor QA/QC).
F	Exceptional Event.	Exceptional Event. "A" Quality data but not representative of sampling conditions as required by project plan.

Data qualified as "B" data may be used for this project.

B6. Instrument/Equipment Testing, Inspection, and Maintenance

All field monitoring equipment will be tested for accuracy and /or calibrated in accordance with the procedures outlined in DEQ MOMs manual. Equipment must be maintained and inspected according to ODEQ laboratory field protocols that can be referenced in the most current version of MOMs.

B7. Instrument Calibration and Frequency

All field monitoring equipment will be tested for accuracy and /or calibrated in accordance with the procedures outlined in DEQ MOMs. All in-lab analytical instruments will be calibrated as specified in the Laboratory's SOP.

If instruments cannot be calibrated as required, data will be qualified as "B" or voided with the QC qualifier code of "C".

B8. Inspection/Acceptance of Supplies and Consumables

The analyst will be responsible for maintaining records of traceability for all reagents and standards. The procedure used to maintain traceability is described in the Laboratory Quality Manual (DEQ91-LAB-0006-LQM). The analyst must validate the usability of standards and reagents upon receipt and when expiration dates are exceed.

B9. Non-direct Measurements

Historical flow information and historical E. coli data will be collected and complied for use of ODEQ modeling staff. No additional acceptance criteria will be required for this data and will not be further qualified by DEQ staff.

B10. Data Management

Separate field data sheets will be maintained for each sampling event. Information recorded on data sheets is to include: Project name, fund code, data and time of sampling events, water body name, basin name, LASAR numbers, general weather conditions, and names of field staff, time of each sample or measurement, results and equipment ID numbers. Quality assurance staff reviews data sheets for all continuous, field and laboratory data. All data are entered into the DEQ Laboratory Analytical Storage And Retrieval (LASAR) database.

Data management will be provided through the ODEQ LIMS and LASAR databases.

The following symbols are used in final reports:

Table B10-1 Symbols/Acronyms Used in Data Reporting

Symbol or Acronym	Definition
<	Analyte concentration is less than the concentration shown

Symbol or Acronym	Definition
J	Sample result is an estimated concentration between the laboratory limit of detection (LOD) and the laboratory limit of quantitation (LOQ)
est	Sample Result is estimated. See sample result comments in the analytical report. (associated DQL is LASAR data is “B”)
(LOD)	Concentration shown is the analyte Limit of Detection.

Group C Assessment and Oversight

C1. Assessment and Response Actions

Surveillance and data management will be performed once a month to ensure data being collected will meet the needs of the project. Information collected during this project is intended to meet the needs of Section B. Success criteria include sufficient flow and E.coli analysis to address the modeling approach also outlined in Section B.

All results of the individual assessments will be complied and managed by the Data Manager.

Response actions will be developed as data becomes available. Any stop work orders or change in project scope will come from the Project Coordinator. Corrective actions will be documented as addendums to this QAPP/SAP.

C2. Reports to Management

Reports will be sent to the personnel listed in **Table C2.1** for approval and/or review. Technical Services will file all Table C2.1 reports and records together, with the exception of the LIMS Status Report. Technical Services may make these reports available to the public upon request.

Table C2-1 Laboratory Reports

	Regional (Project Manager	*Quality Assurance*	*Sample Custodian*	*Monitoring Project Manager*	*(Watershed Assessment Manager*	*Technical Services Manager*	*Inorganic Manager*
Project Summary Report	✓	✓		✓	✓		
Official Analytical Report	✓	✓	✓	✓	✓		
Analytical QC Summaries	✓	✓	✓	✓			✓
Original Field Data Records	✓	✓	✓	✓			
Sample Receipt Checklist	✓	✓	✓	✓			
Sample Preservation Summary	✓	✓	✓	✓			✓
Laboratory Audit of Field Measurements	✓	✓	✓	✓			✓
Field vs. Laboratory Analysis comparisons	✓	✓	✓	✓			
Laboratory Analysis of Field Duplicates	✓	✓	✓	✓			
Parameter Batch QC summaries	✓	✓	✓	✓			✓
Solids QC Form	✓	✓	✓	✓			✓
Ion Balance Report	✓	✓	✓	✓			✓
Technical Corrective Action	✓	✓	✓	✓			✓
Data Approval Report (DAR)			✓	✓	✓		✓
LIMS Status Tracking		✓	✓		✓	✓	✓

Group D Data Validation and Usability

D1. Data Review, Verification and Validation

The Project Officer, the QA Officer and the Data Manager will determine if the data collected meets the QA Plan objectives will review all data resulting from this project as data becomes available. Decisions to accept, qualify or reject data will be made by the Project Manager/Basin Coordinator, QA Officer and Data Manager.

D2. Verification and Validation Methods

As required by the project QA Program, field duplicate and blank samples will be collected at a rate of 1 duplicate per 10 samples collected, or at a minimum of one duplicate per sample event. Any data or sample values outside of the expected range for the parameter being measured will be rechecked for validity in the field by the field team, and if necessary, the field team will re-sample. Data that continue to be outside expected values will be further investigated to determine the cause, using alternate methodology, if available. Additional sampling may be used to verify or refute outliers collected during the prescribed sample events.

Once the data has been entered in the project database and into LASAR, the Data Manager will print a paper copy of the data and proofread it against the original field data sheets. Errors in data entry will be corrected at that time. Outliers and inconsistencies will be flagged for further review or be discarded. Data quality problems will be discussed as they occur and in the final report to data users.

D3. Reconciliation with User Requirements

As soon as possible after each sampling event, calculations and determinations for precision, completeness, and accuracy will be made and corrective action implemented if needed. If data quality indicators do not meet the project's specifications, data may be discarded and re-sampling may occur. The cause of the failure will be evaluated. If the cause is found to be equipment failure, calibration and/or maintenance techniques will be reassessed and improved. If the problem is found to be sampling team error, team members will be retrained. Any limitations on data use will be detailed in both interim and final reports, and other documentation as needed. If failure to meet project specifications is found to be unrelated to equipment, methods, or sample error, specifications may be revised for the next sampling season. Revisions will be submitted to the QA section of the DEQ Laboratory for review and/or approval.

Appendix A Field Data Forms

All field data and information will be recorded on the standard DEQ Laboratory Chain of Custody and Field Data sheets, which can be accessed at:

\\Deqlead02\qa_documents\form\DEQ06-LAB-0054-Form.xlsm

All field results for bacteria (E.coli-Colilert 24) will also be recorded on the standard DEQ Laboratory Field Data Sheet and delivered to the DEQ Laboratory Sample Tracker at the end of each field trip.

Flow measurement and data entry will utilize Flow Pro Version 6.0. This spreadsheet is available from Larry Marxer at the laboratory upon request.

Appendix B Revision History

Revision	Date	Changes	Editor
4.0	3/21/11	Section A.6 Revised & updated per 2011 monitoring schedule; Tables A6.1, A6.2 & A6.3 revised to include monitoring schedule and new site list; Tables A7.1 & B2.1 reviewed and revised as necessary.	L. Marxer
4.1	4/16/2012	Revisions per 2012 field season requirements	L. Marxer